User's Manual

LG Programmable Logic Controller

Positioning Module(Pulse-Out Type)

GLOFA

MASTER-K

G3F-POPA
G4F-POPA
G4F-POPB
G6F-POPA

LG Industrial System

Caution for safety

Please read the safety information described in the data sheet and this manual carefully prior to using the product.

Caution items described here are only for **G3F-POPA, G4F-POPA, G4F-POPB** and **G6F-POPA**.

Please refer to GLOFA CPU module or MASTER-K CPU module-related user manual respectively according to CPU module used for the details on safety information for PLC system.

Cautions are intended to remind you of precautions in the warning triangle as displayed below as based on the Danger level.

⚠ Warning	⇨ **Death, fatal wound or considerable property loss could happen if appropriate precautions are not taken.**
⚠ Caution	⇨ **Serious or slight injury or property loss could happen by dangerous situations if appropriate treatment is not taken.**

⚠ Caution may describe serious results according to situations.

Be sure to observe the 2 displays where important information is specified.

Keep the user manual nearby for prompt reference as necessary.

Designing Caution

⚠ Caution

- **Don't let input/output signal line connected with the driver and sensor be wired close to high-voltage or power cable but min. 100mm away if possible, in order to prevent abnormal operation caused by noise.**

Installing Caution

Caution

-Use PLC in conditions as described in the general specification.
-If not, electric shock, fire, abnormal operation or damage on product may occur.
-Besure to fix the module after inserting the mounting protrusion into the module mounting hole
-Abnormal operation, error or dropping may happen if the module is not equipped correctly.

Wiring Caution

Caution

-Connection distance between position-decision module and driver shall be as short as possible (1 –3 m)
-Length of the connection cable shall be as short as possible
-Use safe power source(DC 5V, DC24V)
-If any noise is expected, let input/output signal line wired in twist pair and shield cable

Caution for preparation, repair

Warning

-Don't touch the terminal when powered, abnormal operation may happen.
-Prior to cleaning or tightening the the terminal screws, let it powered off.
-If not, error or abnormal operation may happen.

Caution

-Don't remove PCB from the module case nor remodel the module.
error, abnormal operation, damage on product may happen.
Assembly/disassembly of the module shall be after powered off
-If not, error or abnormal operation may happen.

Caution for waste

Caution

- Product waste shall be processed as industrial waste .

◎ CONTENTS ◎

◎ CONTENTS ◎

◎ CONTENTS ◎

◎ CONTENTS ◎

◎ CONTENTS ◎

◎ CONTENTS ◎

◎ CONTENTS ◎

Chapter 1 Introduction

This user manual describes the specification of the positioning module displayed below, installation, how to use each positioning function, programming and wiring with outer devices.

Number of control axes	Model	Related S/W package
1-axis	G4F-POPA	POSPACK.EXE { Pospack.exe mfc42.dll msvcrt.dll msvcrt20.dll og70as.dll
2-axes	G3F-POPA	
	G4F-POPB	
	G6F-POPA	

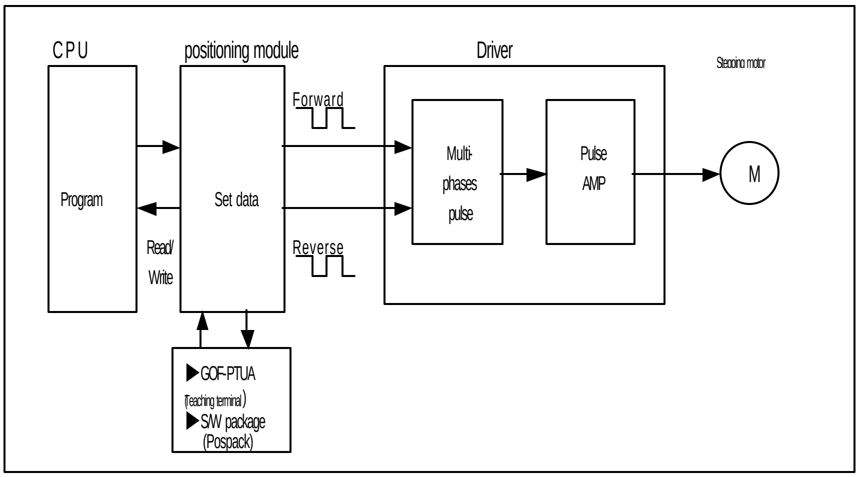


Fig. 1.1 Position control for stepping motor

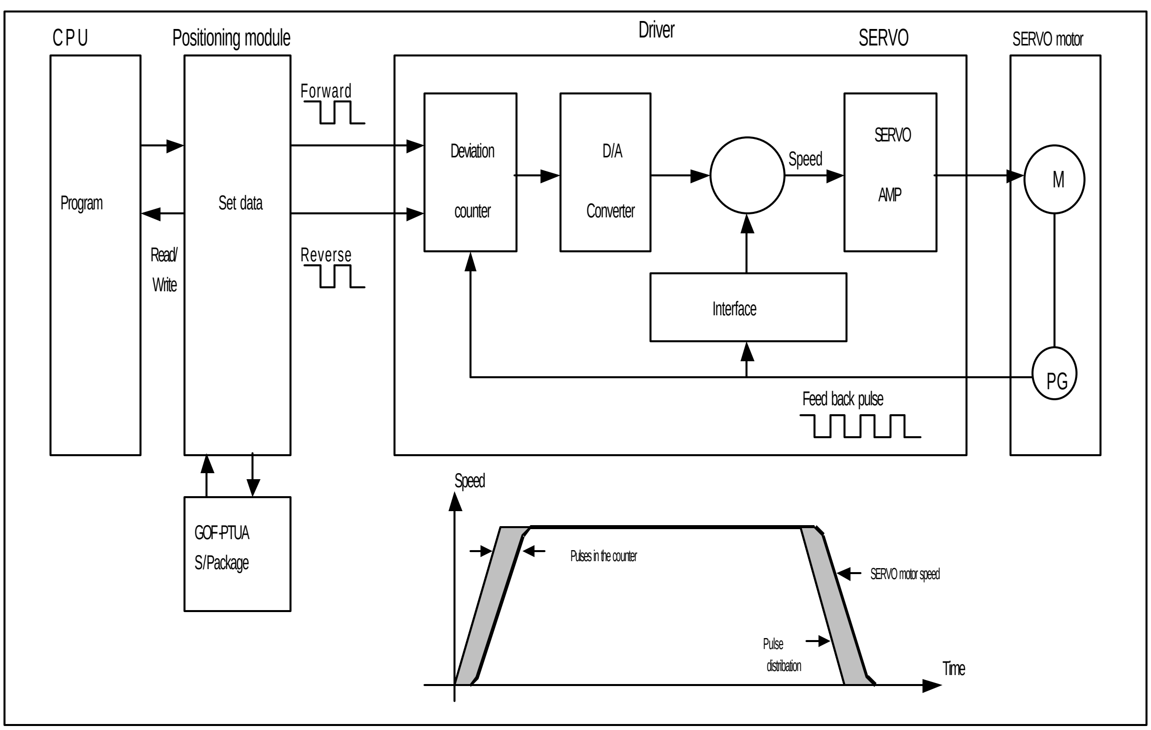


Fig.1.2 Position control for subo motor

Chapter 1 Introduction

1.1 Features

The features of the position-decision module are as follows.

1) Positioning module can be used for GLOFA GM series and MASTER-K series.

(1) Positioning module for GM3 series and K1000S series: G3F-POPA(2-axes)

(2) Positioning module for GM4 & K300S series: G4F-POPA(1-axis), G4F-POPB(2-axes)

(3) Positioning module for GM6 & K200S series: G6F-POPA(2-axes)

2) Various control functions of positioning

(1) Max.300 position-decision setting data are allowed including position-decision address and operation method per axis.

(2) Linear control by position-decision control of each axis, separate position-decision by 1 position-decision data and continuous position-decision by several data is available.

(3) Linear stepped control by position-decision control of 2-axes, separate position-decision by 1 position-decision data and continuous position-decision by several data is available.

(4) Various returning control functions to starting point.

A) Return to origin point can be performed by selection of one of those below ;

▶ origin point detection after near zero point Off

▶ origin point detection after deceleration at near zero point On

▶ origin point detection by origin point and upper/lower limit

▶ origin point detection by near zero point.

B) Position-decision control (floating point set setting) can be executed from random position to origin point of the machine.

3) The number of positioning modules used at one base is unlimited.

4) Convenient maintenance and repairs.

G6F-POPA is designed to save position-decision data, parameters and other data in the flash memory of positioning module.

1.2 Features of position-decision control function

Summary of positioning control function will be described.

1.2.1 Positioning control function

Summary of positioning by positioning datawill be described below.

1) Linear position-decision control

▶ Available operation modes are single, repeated, auto and continuous operation.

(1) 1-axis linear positioning control

Positioning of assigned axis is controlled from start address (presently stopped position) to target position.

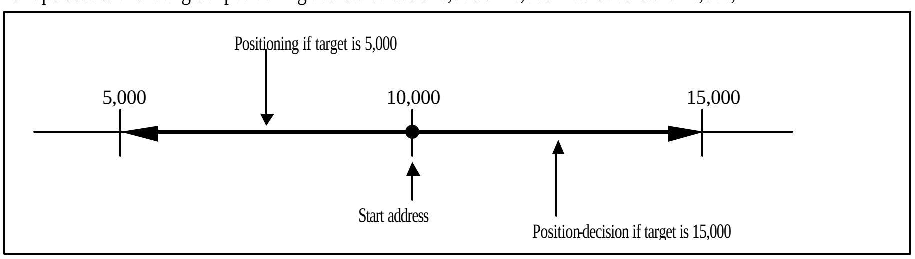
Control by absolute method (Absolute Coordinates)

A) Positioning is controlled from start address to target position.

B) Shift direction is decided by start address and target address.

[Ex.]

When operated with the target of positioning address values of 5,000 & 15,000 if start address is 10,000,



Control by incremental method (Relative Coordinates)

A) Positioning is controlled as much as target at start address.

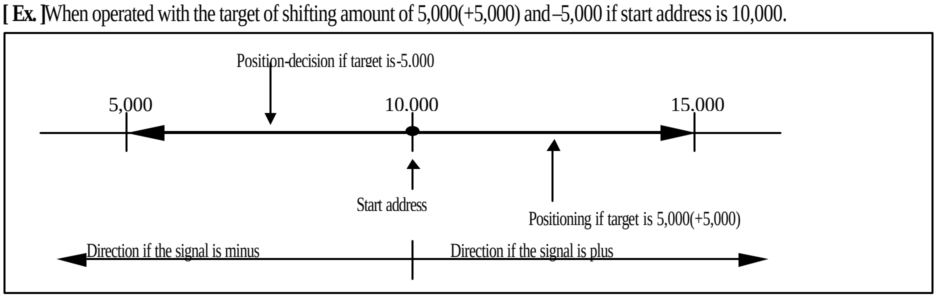
B) Shift direction is decided by signals(+/ -) of shifting amount.

- If the signal of shifting amount is + (or no signal) incremental direction

 : position decided to forward direction(address)

- If the signal of shifting amount is - decrement direction : position decided to reverse direction(address)

[Ex.]When operated with the target of shifting amount of 5,000(+5,000) and –5,000 if start address is 10,000.



(2) 2-axes linear interpolation control

Linear interpolation control is performed at start address(presently stopped position) using assigned 2-axes.

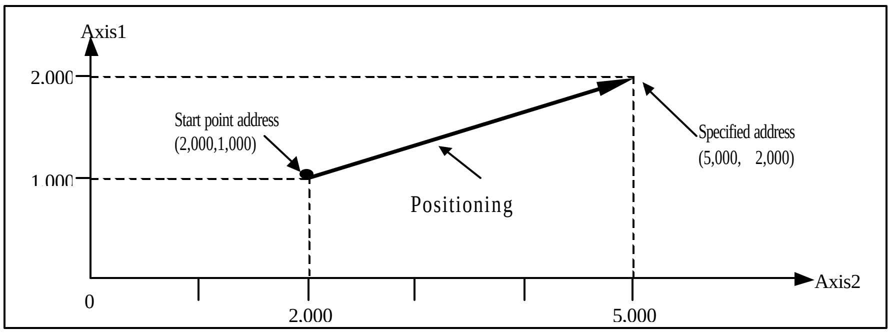
Control by absolute method (Absolute Coordinates)

A) Linear interpolation control is performed from start address to target address wsing 2-axes.

B) Travel direction is decided by start point address and specified address of each axis.

[Ex.]

When operated with the target of positioning address of axis1: 2,000 & axis2: 5,000 if start point address is axis1 : 1,000 & axis2 : 2,000.



Control by incremental method (Relative Coordinates)

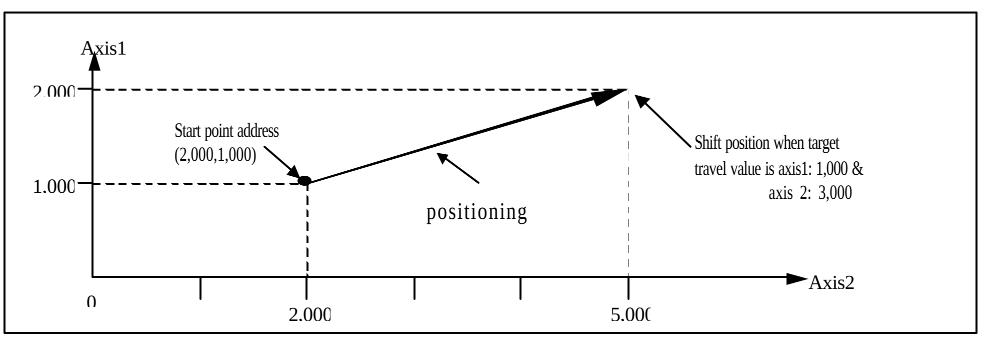
A) Positioning is controlled from start point address to the position, which includes travel direction and travel value assigned as a target per axis.

B) Travel direction of each axis is decided by travel value sign of each axis.

- If the sign of shifting amount is + (or no sign) incremental direction : positioning decided to forward direction(address)
- If the signal of shifting amount is - decrement direction : positioning decided to reverse direction(address)

[Ex.]

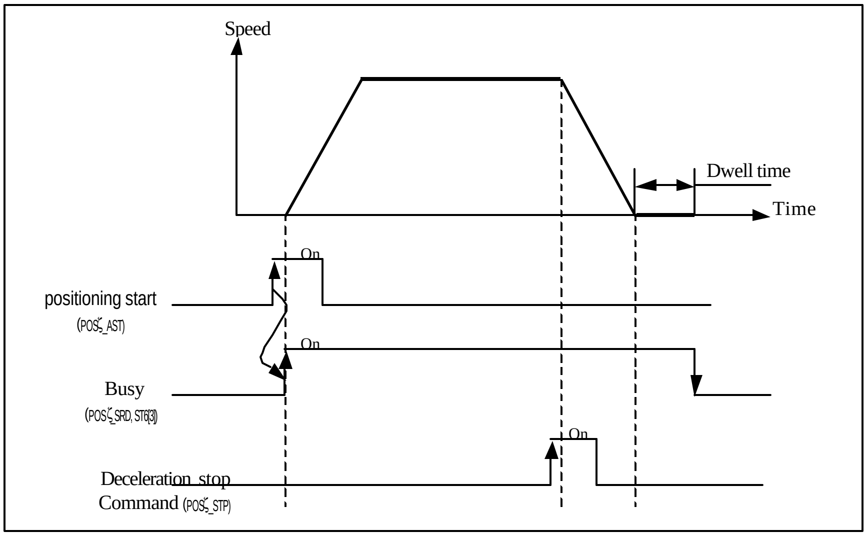
When operated with the target of travel value of axis1 :1,000 & axis2: 3,000 if start point address is axis1 :1,000 & axis2 : 2,000.



2) Speed control

positioning control is performed at the specified speed until deceleration stop command (POSζ_STP, POSζ_TMP) is input after positioning start (POSζ_AST) is executed.

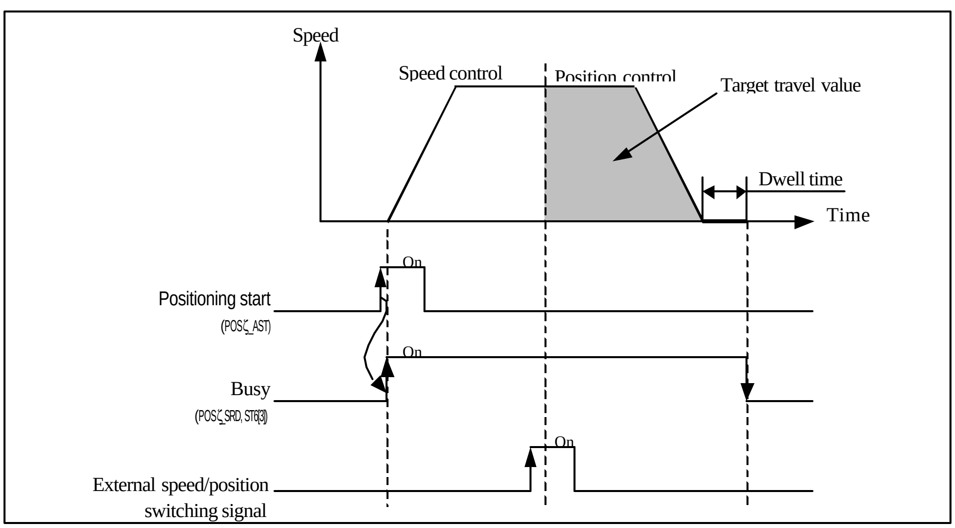
▶ Available operation mode is constant operation.



3) Speed/position switching control

If speed/position switching signal is input via positioning module outside starting from speed control by positioning start (POSζ_AST) and then changed into position control, the position is decided as much as travel value set as a target.

▶ Available operation mode is positioning constant operation.



1.2.2 Introduction of the operation mode

▶Positioning module can be set by positioning data user-defined in combination with control method (position control, speed control, speed/position switching control), positioning address, operation method, etc.

▶Max.300 positioning setting data are allowed at step No. 0– 299 per axis..

Positioning data	Step No.	Coordinates	Override	Operation method	Invalid /valid	Operation mode	Address	Mcode	Speed No.	Dwell (x 10 ㎳)
Setting range/type	0 299	Absolute/ Relative	Allowable/ Prohibited	Continuous/ Complete	Invalid / Valid	Single Repeated Auto Continuous Constant Constant(Position)	-16,744,447 16.744,447	0 255	0 127	0 999

▶Positioning operation by 1 positioning data and positioning operation by several positioning data at single positioning start(POSζ_AST :rising edge↑) are respectively decided according to user-set operation mode to the positioning data.

1) Single operation mode (positioning complete)

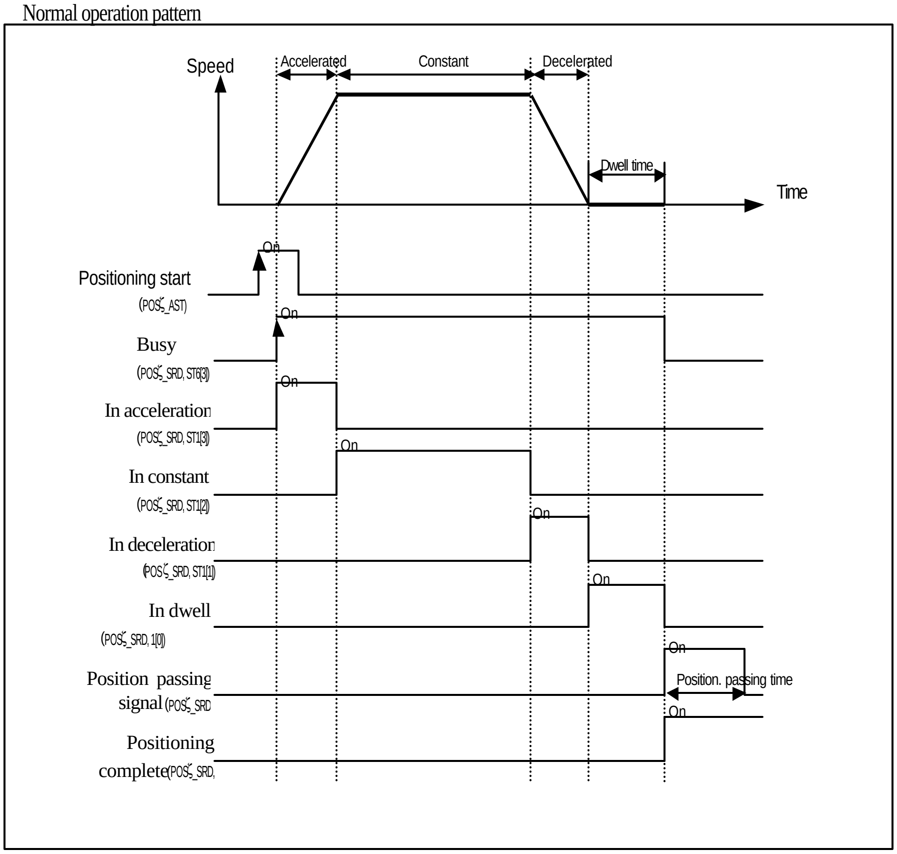
(1) Positioning is complete upon positioning executed to the target position by positioning start(POS ζ_AST :rising edge ↑) and the dwell time elapsed.

(2) Positioning complete in this operation mode can be used for the operation mode of the last positioning data in auto-operation mode and continuous operation mode.

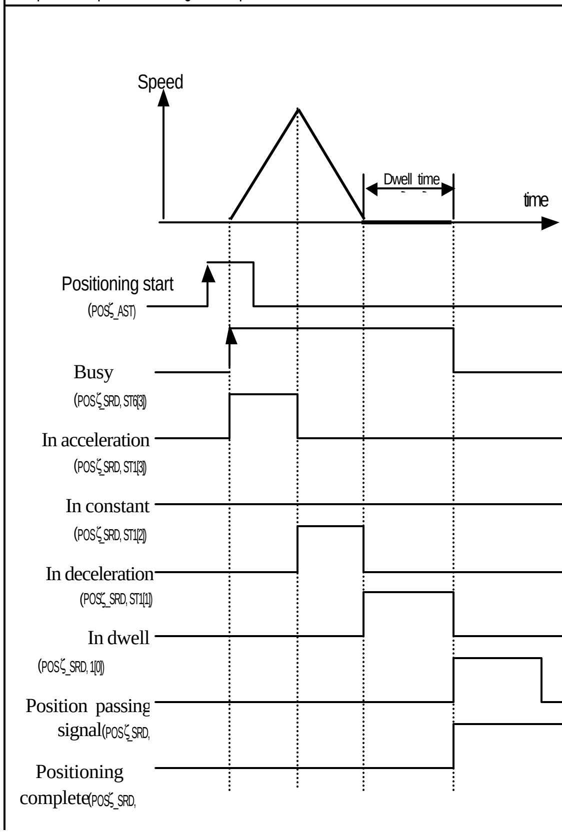
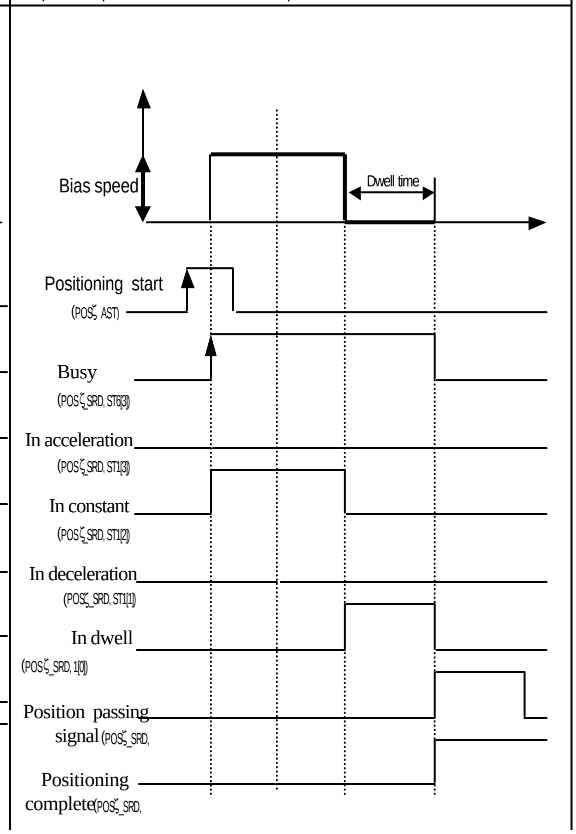
(3) Operation direction is decided according to position address value.

(4) Operation pattern is of trapezoid with acceleration, constant, and deceleration stages according to set speed and position data, however the following operation pattern may be produced in compliance with set value.

a) Normal operation pattern



b) Abnormal operation pattern

If operation speed is set larger than position travel value	If operation speed is set the same as bias speed
	

2) Repeated operation mode (positioning complete)

(1) Positioning is complete upon positioning executed to the target position by start command(POS ζ_AST :rising edge ↑) and the dwell time elapsed.

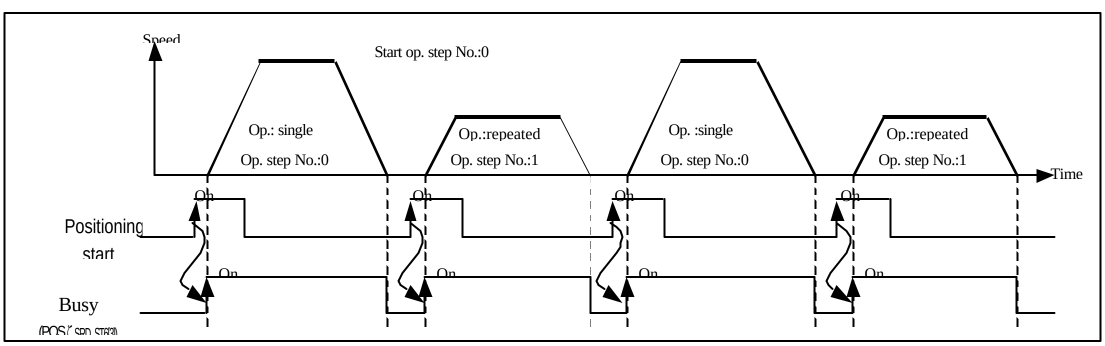
(2) The pattern of repeated operation mode is the same as separate operation, however the next operation is decided by operation step No. which is set at assignment command of operation step No. (POS ζ_SMC :rising edge ↑) previously executed after positioning is complete. Thus, if assignment command of operation step No. (POS ζ_SMC) is not previously executed,

step No. "0" is assigned and then operated at the next start command(POSζ_AST).

Accordingly it is very useful in the system where several operation steps are repeated.

(3) Operation direction is decided according to position address value.

(4) Operation pattern



3) Auto-operation mode (positioning complete)

(1) Positioning is complete upon positioning executed to the target position by positioning start(POSζ_AST :rising edge ↑) and the dwell time elapsed.

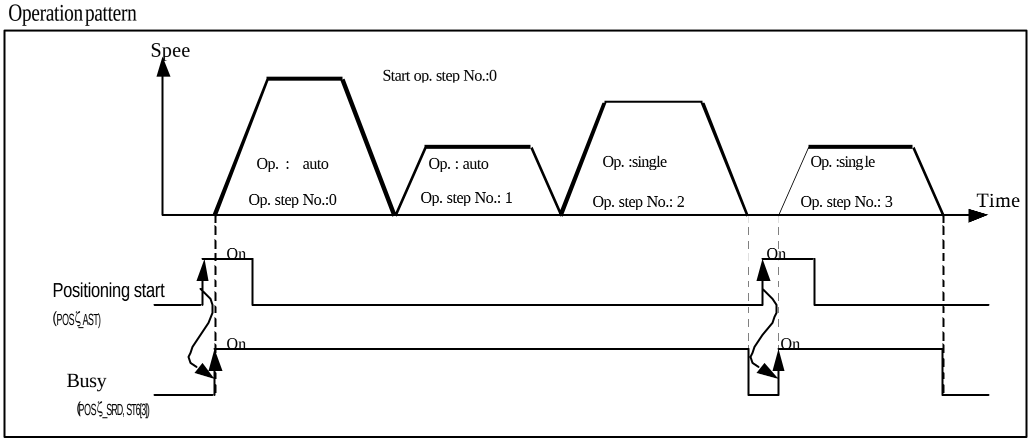
(2) Operation step (present operation step No. + 1) position is decided for operation in this mode without additional positioning start(POSζ_AST).

(3) Accordingly, operation mode of the last operation step shall be set to single operation mode or repeated operation mode.

(4) Several operation steps of auto-operation mode can be successively executed.

(5) Operation direction is decided according to position address value.

(6) Operation pattern



4) Continuous operation mode (positioning complete)

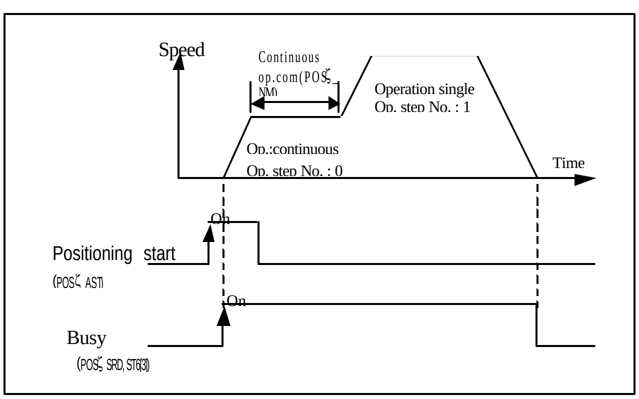
(1) Positioning is complete upon positioning executed to the target position without stopping operation step set to continuous operation mode by startcommand (POSζ_AST :rising edge↑) and the dwell time elapsed.

(2) Accordingly, operation mode of the last operation step shall be set to separate operation mode or repeated operation mode.

(3) Continuous operation command(POSζ_NM:rising edge ↑) is available if next step position and speed are desired before the presently engaged operation step reaches the target position.
However, continuous operation command(POSζ_NM) can be executed only at constant speed.

(4) Only the same direction is available for continuous operation mode, and operation direction is decided according to position address value.

(5) Operation pattern



5) Constant operation mode (positioning incomplete)

(1) In constant operation mode, the operation at speed set without target position is continued by speed control operation.

(2) Since constant operation is not the positioning operation, it displays "0" for present position and is switched over to undecided starting point state even if the starting point has been previously decided.

▶G3F-POPA, G4F-POPB, G6F-POPA : Dwell time is available but positioning complete signal is not.

▶G4F-POPA : Dwell time & positioning complete signal are unavailable.

(3) Accordingly, if the next operation step is at decided starting point state, returning to starting point shall be executed or operation after fixed starting point setting shall be executed.

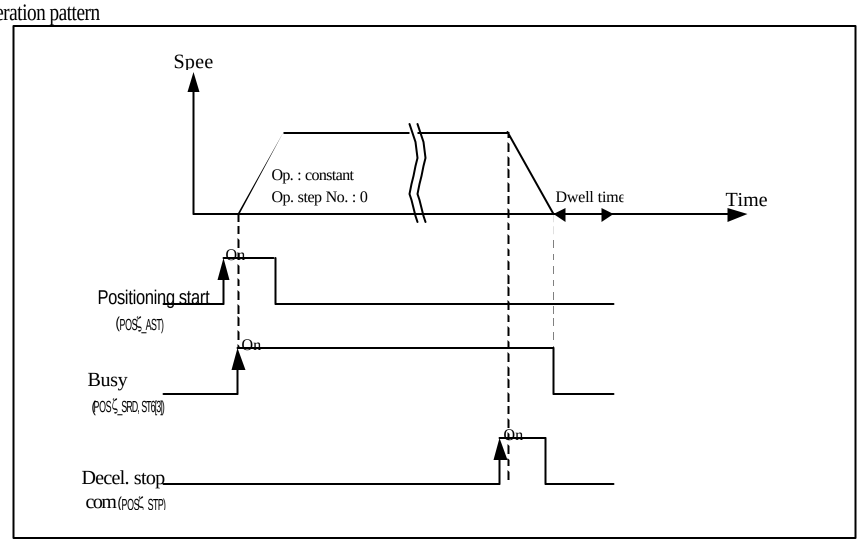
(4) If confronted by deceleration stop command(POSζ_STP:rising edge ↑) in constant operation, the correspondent step operation is regarded as complete leading to the next operation step of position data at restart.

(5) If confronted by deceleration stop command(POSζ_STP) in acceleration stage, constant stage, deceleration stage of the constant operation, it stops as decelerated.

(6) Operation direction is decided according to the prior position address.

(However, G6F-POPA is decided according to position address sign)

(6) Operation pattern



6) Positioning constant operation mode (positioning complete)

(1) If an outer input signal of speed position control-switching signal is input in speed control operation, positioning constant operation is changed into position control operation to regard the signal-detected position address value as "0" and execute positioning upto target position (position address value) set to position data to finish positioning upon the dwell time elapsed.

▶In G6F-POPA positioning module, if stopped during operation as decelerated by deceleration stop command(POSζ_STP:rising edge ↑), the correspondent step operation is regarded as incomplete leading to the same step number operation as position data at restart.

▶The outer input signal of speed/position control-switching signal is valid only in positioning constant operation mode.

(2) Positioning constant operation is available for positioning operation starting from the position of sensor input point via marker sensor input at packer or for its equivalent.

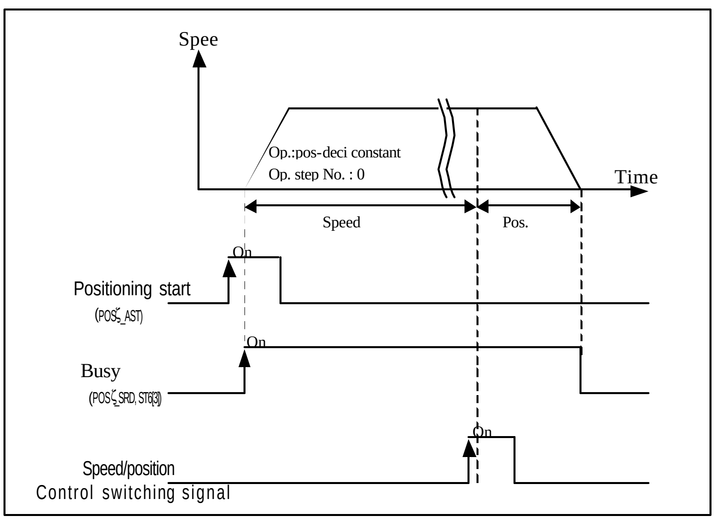
(3) Deceleration stop command(POSζ_STP) is available at acceleration stage of positioning constant operation, however speed/position control-switching signal input is available only at constant stage.

▶Error occurs if speed position control-switching signal is input during acceleration.

(4) If the position address is set smaller than positioning amount by deceleration inclination in position-decision constant operation, positioning module re-calculates the deceleration inclination for operation.

Accordingly, stop can be followed as decelerated abruptly rather than deceleration inclination set by parameters.

(5) Operation pattern



1.2.3 Introduction of acceleration/deceleration processing

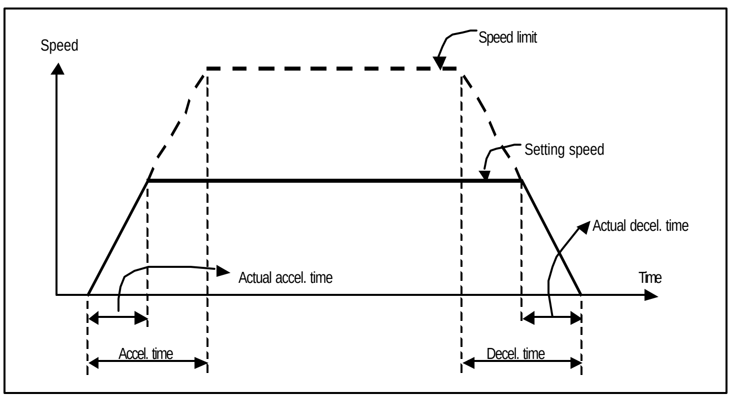
▶Applied to start point & stop point of positioning operation, starting point returning high-speed operation and jog high-speed operation, and also to continuous operation command(POSζ_NM:rising edge ↑), speed change command(POSζ_VCG:rising edge↑) and speed override command(POSζ_OR:rising edge ↑) in positioning operation.
However, error may occur if deceleration stop command(POSζ_STP) is used during acceleration/deceleration staged operation at continuous operation command(POSζ_NM), speed change command(POSζ_VCG) and speed override(POSζ_OR) in positioning operation.

▶Acceleration/deceleration time shall be set in unit of axis at parameters of S/W package.

▶Setting range is 0 999(Unit: 10 ㎳) per axis.

1) Acceleration time : Time required to reach speed limit set at parameter from speed "0" (stop state).
▷It means the time required to reach speed limit from bias speed if bias used.
(Bias speed and speed limits can be set at parameters.)

2) Deceleration time : Time required to reach speed "0" (stop state) from speed limit set at parameter
▷ It means the time required to reach bias speed from speed limit if bias used.



▶ Terms
Speed limit : Max. speed when position is decided as set within the speed limits in parameter items of S/W package.
Setting speed : Speed data value actually operated by position data.
Actual acceleration time : Time required to reach speed value set to speed data from speed "0" (stop state).
Actual deceleration time : Time required to reach speed "0" (stop state) from speed value set to speed data.

1.2.4 Introduction of starting

▶If stopped by stop causes in position controlling **(POSz _SRD, ST6[3])**, positioning can be executed at stopped position address value by restart.

▶Start type is of 1)positioning start, 2)interpolation positioning start, 3) positioning start to return to origin point, 4)jog command & 5)inching command.

▶If start executed, surely check that operation signal **(POSz _SRD, ST6[3])** is at "Off" state.

1) Positioning start **(POSz _AST)**

; A command to start operation by parameters, position data and speed data set per axis of positioning module.

2) Interpolation positioning start **(POSz _INT)**

(1) A command only available for 2-axes positioning module to perform operation in a straight shift channel as allowed by 2-axes.

(2) Take preautions for interpolation positioning start at which 2-axes are simultaneously operated.

a) Operation-related subdata is operated as based on X-axis.

; position data(step, coordinates, override, operation method, invalid/valid, operation mode, position address, M code, speed No., dwell time)

; M code mode among parameter items

b) Classified into major axis and minor axis according to positioning address amount of X-axis & Y-axis at interpolation positioning start.

; Speed data of minor axis is calculated as follows.

$$\text{Minor axis speed} = \frac{\text{Major axis speed X Minor axis length}}{\text{Major axis length}}$$

▷ Terms

major axis : X-axis or Y-axis of whichever positioning address amount is larger in applicable operation step No.

minor axis : X-axis or Y-axis of whichever positioning address amount is smaller in applicable operation step No.

; Speed, acceleration time, deceleration time and bias speed of minor axis will be recalculated at this time.

c) Operating items based on setting value per axis are

;Backlash compensation, S/W upper limit, S/W lower limit, position passing time and zone setting area of parameter items

(3) Available operation mode is separate operation, repeated operation and auto-operation only.

3) Positioning start to return to starting point **(POSz _ORG)**

▶An operation command to find origin point of the machine according to origin point return -processing method by direction, correction, speed(high/low), address and dwell time set at origin point return -parameters of each axis. And if complete signal of return to origin point is On, origin point return-operation of the machine is complete.

4) Jog command **(POSz _JOG)**

▶As a test operation function it is necessary to check system operation, wiring and position address.

▶Jog operation is available at high speed and low speed.

(1) Jog high-speed operation : acceleration/deceleration pattern available.

(2) Jog low-speed operation : acceleration/deceleration pattern unavailable.

5) Inching command **(POSz _INC)**

▶One of manual operation methods used to process minute operation as determinate operation.

▶Jog command operation is hard to move to exact position because operation starts and stops according to the command, but via the inching command with travel value easily set as desired the target is easy to reach.

▶Thus, after rapid move near to work position by jog command, perform operation by inching command for minute move to the exact work position to reach.

1.2.5 Introduction of the return to origin point

▶Origin point return is executed to check origin point of the machine when powered.

▶Various methods for origin point return are available according to the structure and stop accuracy of the machine, while approximate origin point (adjacent DOG) method is used for LG positioning module.

▶If origin point position is decided to origin point return, detection signal of origin point is not used during positioning operation.

1) Near zero point(adjacent DOG) methods

4 near zero point(adjacent DOG) methods for origin point return-processing are as follows.

(1) origin point detection after near zero point Off

(2) origin point detection after deceleration at near zero point On

(3) origin point detection by origin point and upper/lower limit

(4) origin point detection by near zero point

2) Parameter items of S/W package which influence origin point return are as follows.

(1) origin point return-direction

(2) origin point compensation

(3) origin point return-speed(high/low)

(4) origin point address

(5) dwell time for origin point return

Chapter 2 Specification

2.1 General specification

General specification of GLOFA GM series and MASTER-K series is described in Table 2.1.

<table>
<tr><th>No.</th><th>Item</th><th colspan="5">Specification</th><th>Related specification</th></tr>
<tr><td>1</td><td>Operating temperature</td><td colspan="5">0 ~ 55℃</td><td></td></tr>
<tr><td>2</td><td>Storage temperature</td><td colspan="5">−25 ~+70 ℃</td><td></td></tr>
<tr><td>3</td><td>Operating humidity</td><td colspan="5">5 ~ 95%RH, No condensation</td><td></td></tr>
<tr><td>4</td><td>Storage humidity</td><td colspan="5">5 ~ 95%RH, No condensation</td><td></td></tr>
<tr><td rowspan="8">5</td><td rowspan="8">Viration</td><td colspan="4">If vibrated intermittently</td><td>Sweep count</td><td></td></tr>
<tr><td colspan="2">Frequency</td><td>Acceleration</td><td>Amplitude of vibration</td><td>The number</td><td rowspan="7">IEC61131-2</td></tr>
<tr><td colspan="2">10 ≤ f < 57㎐
57 ≤ f ≤ 150㎐</td><td>−
9.8m/s²{1G}</td><td>0.075mm
−</td><td rowspan="6">10 times each direction of X, Y, Z</td></tr>
<tr><td colspan="4">If vibrated continuously</td></tr>
<tr><td colspan="2">Frequency</td><td>Acceleration</td><td>Amplitude of vibration</td></tr>
<tr><td colspan="2">10 ≤ f < 57㎐</td><td>−</td><td>0.035mm</td></tr>
<tr><td colspan="2">57 ≤ f ≤ 150㎐</td><td>4.9m/s²{0.5G}</td><td>−</td></tr>
<tr><td colspan="4"></td></tr>
<tr><td>6</td><td>Shocks</td><td colspan="5">• Max. shock acceleration : 147 m/s²{15G}
• Duration time : 11ms
• pulse wave : half sine wave pulse (3 times each direction of X, Y, Z)</td><td>IEC61131-2</td></tr>
<tr><td rowspan="5">7</td><td rowspan="5">Noise immunity</td><td>Square wave impulse noise</td><td colspan="4">± 1,500 V</td><td>Based on LG test spec.</td></tr>
<tr><td>Electrostatic discharge</td><td colspan="4">voltage : 4kV (contact discharge)</td><td>IEC61131-2
IEC1000-4-2</td></tr>
<tr><td>Radiated electromagnetic field</td><td colspan="4">27 ~ 500 MHz, 10 V/m</td><td>IEC61131-2,
IEC1000-4-3</td></tr>
<tr><td rowspan="2">Fast Transient / burst noise</td><td>Class</td><td>Power module</td><td>Digital input/output (24V or above)</td><td>Digital input/output (less than 24V)
Analog input/output
comm. interface</td><td rowspan="2">IEC61131-2
IEC1000-4-4</td></tr>
<tr><td>Voltage</td><td>2kV</td><td>1kV</td><td>0.25kV</td></tr>
<tr><td>8</td><td>Operating atnospher</td><td colspan="5">No corrosion gas or dust allowed</td><td></td></tr>
<tr><td>9</td><td>Altitude fruse</td><td colspan="5">2,000m or below</td><td></td></tr>
<tr><td>10</td><td>Pollution degree</td><td colspan="5">2 or below</td><td></td></tr>
<tr><td>11</td><td>Cooling method</td><td colspan="5">Natural air-cooled</td><td></td></tr>
</table>

Remark

1) IEC(International Electro technical Commission)
:An international nongovernmental organization which promotes internationally cooperated standardization in electric/electronic fields, publishes international standards and manages applicable estimation system related with.

2) Pollution degree
: An index indicating pollution level of the application environment which decides insulation performance of the device. Pollution degree 2 means that only non-conductive contamination occurs. However temporary conduction may occur according to condensation.

2.2 Performance specification

Performance specification of positioning module is described in Table 2.2.

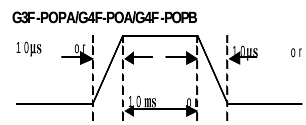
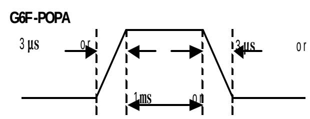
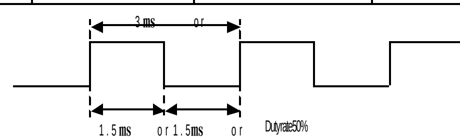
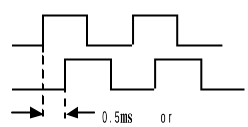
Item			Specification			
			G3F-POPA	G4F-POPB	G6F-POPA	G4F-POPA
Number of control axes			2-axes			1-axis
Input/output occupied points			64			32
Interpolation function			2-axes linear interpolation(simultaneously2-axes, separately2-axes)			No
Control method			PTP(Point to Point),linear interpolation, speed control, speed position switching control *1			PTP, speed control
Control Unit			Pulse			
Positioning data			300 data per axis (operation step No. : 0 299)			
Peripheral device	S/W package		available			
	Teaching module		available	Available	unavailable	available
Positioning	Positioning method		Absolute method/relative(incremental) method			
	Position address range		setting range : -16,744,447 16,744,447			
	Speed		Max. 200Kpps speed setting range: 10 200,000 speed setting data: 0 127			
	Acceleration/deceleration processing		Operation pattern : trapezoid method acceleration time : 10 9,990 ms deceleration time : 10 9,990 ms			
	Backlash compensation		0 ~ 999 Pulse			
	Bias speed		10 200,000			
	S/W upper/lower limit		S/W upper limit setting range : 0 16,744,447 S/W lower limit setting range : -16,744,447 0			
	Zone setting		setting number: 3 setting range : -16,744,447 16,744,447			
	Position passing time		Setting time : 0 9,990 ms			
Operation mode			Single operation, repeated operation, auto-operation, continuous operation Constant operation, Positioning constant operation			
Return to origin point	Compensation		setting range : -999 ~ 999 Pulse			
	Speed	High	speed setting range: 10 200,000			
		Low	speed setting range: 10 100,000			
	Address		setting range : -16,744,447 16,744,447			
	Dwell time		setting time : 0 9,990 ms			
	Method	1	Methods by near zero point signal and origin point signal 1) origin point detection after near zero point Off 2) origin point detection after deceleration at approximate origin point On			
		2	origin point detection by origin point and upper/lower limit			-
		3	origin point detection by near zero point			-
Manual operation	JOG		Yes			
	Manual pulse generator(MPG)		Yes		No	No
	Inching		setting range : 1 99			
	Speed/position teaching		ROM teaching		ROM/RAM teaching	ROM teaching
Others	Floating point set		available			
	Present position preset		available			
	M code mode		With, After, None			
	Continuous operation(Next move)		available			
	Speed override		Setting range : 10 150%			
	Position return prior to manual operation		available			
	Setting operation step No.		available			
Connection connector			25-pin per axis	34-pin	37-pin	16-pin
Isolation method			Photo-coupler isolation between input terminal and PLC power (Isolation unavailable between channels)			
Current consumption			390 mA	350 mA	280 mA	280 mA
Weight			537 g	296 g	137 g	296 g

*1: G6F-POPA available only

2.3 Input/output interface specification with external device

Input/output interface with the External device is described.

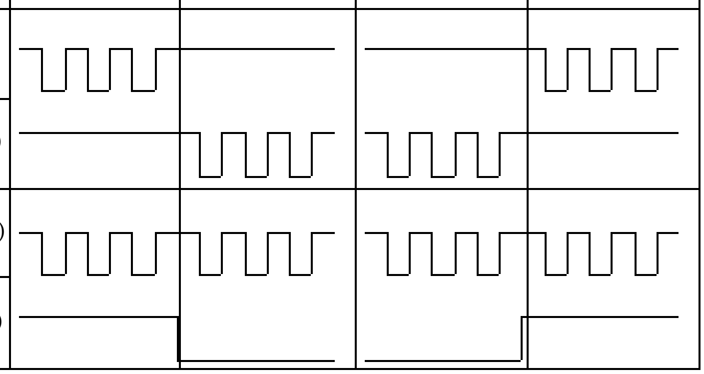
2.3.1 Input specification

Signal	Rated input voltage/current	Used voltage range	On voltage	Off voltage	Input resistance	Response time
Near zero point	DC 24V/10 mA	DC 20.4 26.4V	DC 16V or above	DC 4V or below	Approx. 2.2kΩ	1.8ms or below
External upper limit	DC 24V/10 mA	DC 20.4 26.4V	DC 16V or above	DC 4V or below	Approx. 2.2kΩ	1.8ms or below
External lower limit	DC 24V/10 mA	DC 20.4 26.4V	DC 16V or above	DC 4V or below	Approx. 2.2kΩ	1.8ms or below
Emergency stop	DC 24V/10 mA	DC 20.4 26.4V	DC 16V or above	DC 4V or below	Approx. 2.2kΩ	1.8ms or below
Origin point	DC 24V/10 mA	DC 20.4 26.4V	DC 16V or above	DC 4V or below	Approx. 2.2kΩ	On:0.1ms or below
	G3F-POPA/G4F-POA/G4F-POPB 		G6F-POPA 			
Manual pulse generator	DC 5V	DC 4.25 5.5	DC 4V or above	DC 1V or below	Approx. 430Ω	1.8ms or below
	DC 12V	DC 10.8 13.2V	DC 8V or above	DC 2V or below	Approx. 430Ω	
	1) Pulse width 					
	2)Phase difference 		Position address value increased if phase A input pulse is ahead of phase B input pulse. Position address value decreased if phase B input pulse is ahead of phase A input pulse.			
Positioning constant operation	DC 24V/10 mA	DC 20.4 26.4V	DC 16V or above	DC 4V or below	Approx. 2.2kΩ	On:1.8ms or below

2.3.2 Output specification

Signal	Rated load voltage	Operating load voltage range	Max. load current	Max. voltage descent when powered On
Pulse output (forward direction pulse, reverse direction pulse)	DC 5V	DC 4.75 5.25V	70mA	DC 0.3V or below
	DC 24V	DC 20.4 26.4V	70mA	DC 0.3V or below

Class		Forward direction		Reverse direction	
		Forward rotation	Reverse rotation	Forward rotation	Reverse rotation
A Type	FP(CW)				
	RP(CCW)				
B Type	FP(pulse)				
	RP(sign)				



2.4 External interface connector

2.4.1 Connector's pin arrangement

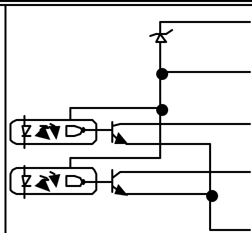
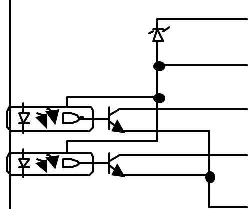
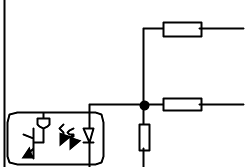
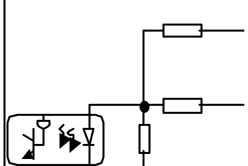
Number, signal name, signal contents, signal's input/output direction, shape of the connector pins are described.

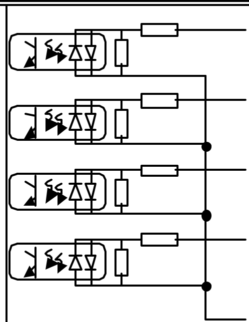
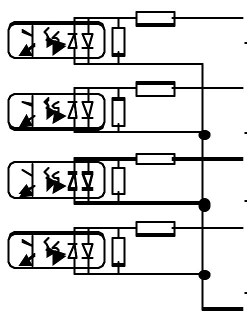
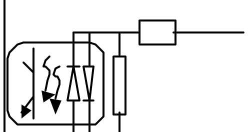
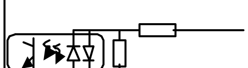
Pin No.				Signal		Input/output direction	
G3F-POPA	G4F-POPB	G6F-POPA	G4F-POPA			Positioning Module	Outer device
2	26	1	2	X_FP	X-axis forward direction pulse output	→	
11	4	2	3	X_RP	X-axis reverse direction pulse output	→	
2	25	3	-	Y_FP	Y-axis forward direction pulse output	→	
11	3	4	-	Y_RP	Y-axis reverse direction pulse output	→	
24	18	5	9	X_ZOC	X-axis origin point input(DC24V)	←	
25	28	6	4	X_ZL	X-axis origin point input(DC5V)	←	
15	6	7	8	X_ZCOM	X-axis origin point input Ground	↔	
24	17	8	-	Y_ZOC	Y-axis origin point input(DC24V)	←	
25	27	9	-	Y_ZL	Y-axis origin point input(DC5V)	←	
15	5	10	-	Y_ZCOM	Y-axis origin point input Ground	↔	
22	22	11	12	X_ORG	X-axis near zero point switch input (A contact)	←	
18	21	12	13	X_OV-	X-axis external lower limit switch input (B contact)	←	
3	22	13	14	X_OV+	X-axis external upper limit switch input (B contact)	←	
-	-	14	-	X_VTP	X-axis speed position switching input (A contact)	←	
22	31	15	-	Y_ORG	Y-axis near zero point switch input (A contact)	←	
18	20	16	-	Y_OV-	Y-axis external lower limit switch input(B contact)	←	
3	9	17	-	Y_OV+	Y-axis external upper limit switch input(B contact)	←	
-	-	18	-	Y_VTP	Y-axis speed position switching input (A contact)	←	
19	32	19	15	EMG	E. stop switch input_ X/Y-axes common (B contact)	←	
1	2	20	7	X_24V	X-axis pulse output, external power input terminal(D24V)	←	
17	24	21	11	X_5V	X-axis pulse output, external power input terminal(DC5V)	←	
10	1 23	22 23	1	X_GND	X-axis pulse output ground	↔	
1	2	24	-	Y_24V	Y-axis pulse output, external power input terminal(DC24V)	←	
17	24	25	-	Y_5V	Y-axis pulse output, external power input terminal(DC5V)	←	
10	1 23	26 27	-	Y_GND	Y-axis pulse output ground	↔	

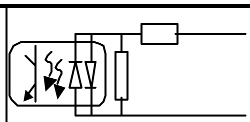
21	11 33	32 33 34 35	16	INPUT COM	Input contact common EMG X_STOP, X_OV-, X_OV+, X_ORG, X_STOP Y_STOP, Y_OV-, Y_OV+, Y_ORG, Y_STOP	↔	
4 5	13 14	-	10	PO_COM	Input contact Vcc Common (If DC24V used for outer input power, let it connected to DC24V, if DC5V used, let it connected to DC5V)	←	
9	30	-	-	MPG_A	Manual pulse generator phase A input	←	
16	8	-	-	MPG_AGND	Manual pulse generator phase A Common Ground	←	
8	29	-	-	MPG_B	Manual pulse generator phase B input	↔	
7	7	-	-	MPG_BGND	Manual pulse generator phase B Common Ground	←	
6	-	-	6	FG	Frame Ground	↔	
12 13 14 20 23	12 15 16 19 34	28 29 30 31 36 37	5	Unused			

2.4.2 Internal circuit

Internal circuit for connecting interface with the external device of the positioning module is described

Class	Internal circuit	Pin No. G3F-POPA	Pin No. G4F-POPB	Pin No. G6F-POPA	Pin No. G4F-POPA	Signal	
Pulse output terminal		1	2	20	7	X_24V	X-axis pulse output, external supplied p ower (DC 24V)
		17	24	21	11	X_5V	X-axis pulse output, external supplied power (DC 5V)
		2	26	1	2	X_FP	X-axis forward direction pulse output
		11	4	2	3	X_RP	X-axis reverse direction pulse output
		10	1 23	22 23	1	X_GND	X-axis pulse output ground
		1	2	24	-	Y_24V	Y-axis pulse output, external supplied power (DC 24V)
		17	24	25		Y_5V	Y-axis pulse output, external supplied power (DC 5V)
		2	25	3		Y_FP	Y-axis forward direction pulse output
		11	3	4		Y_RP	Y-axis reverse direction pulse output
		10	1 23	26 27		Y_GND	Y-axis pulse output Ground
Starting point input		24	18	5	9	X_ZOC	X-axis phase Z input_ Open Collector (DC 24V)
		25	28	6	4	X_ZL	X-axis phase Z input_Line Driver (DC 5V)
		15	6	7	8	X_ZCOM	X-axis phase Z input Ground
		24	17	8	-	Y_ZOC	Y-axis phase Z input_ Open Collector (DC 24V)
		25	27	9		Y_ZL	Y-axis phase Z input_Line Driver (DC 5V)
		15	5	10		Y_ZCOM	Y-axis phase Z input Ground

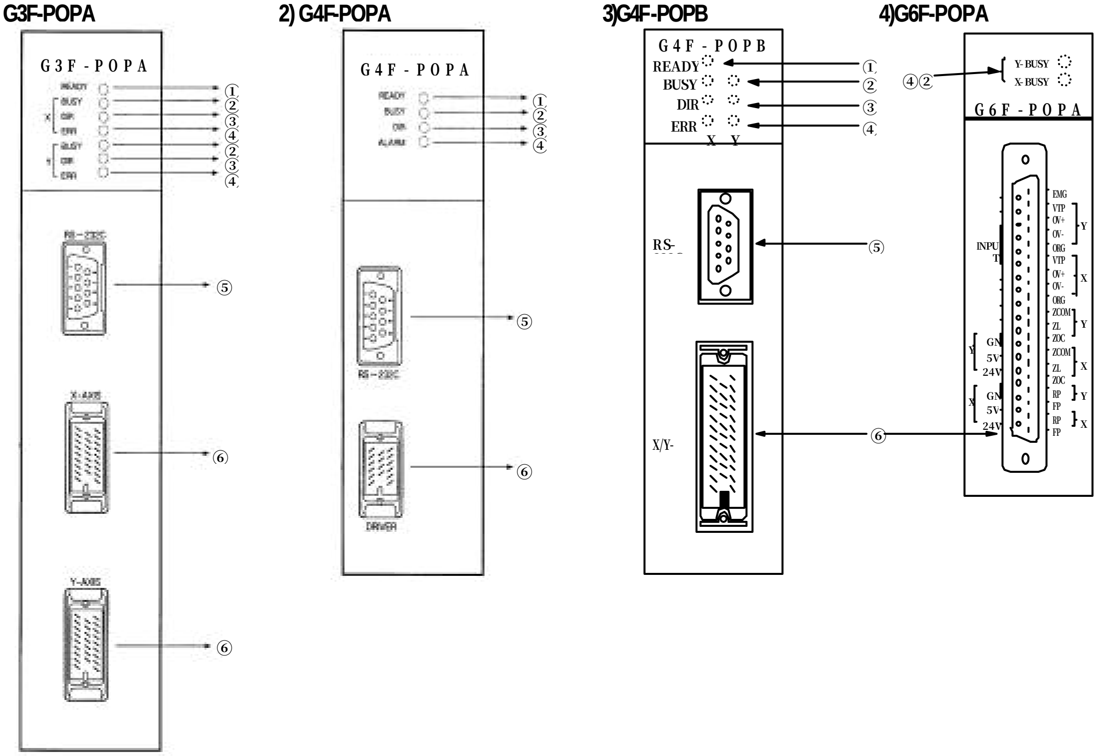
Class	Internal circuit	Pin No.				Signal	
		G3F-POPA	G4F-POPB	G6F-POPA	G4F-POPA		
X-axis input signal		18	21	12	13	X_OV-	X-axis external lower limit signal input (B contact)
		3	10	13	14	X_OV+	X-axis external upperr limit signal input (B contact)
		22	22	11	12	X_ORG	X-axis near zero point signal input (A contact)
			-	14	-	X_VTP	X-axis speed position switching signal input (A contact)
		21	11 33	32 33 34 35	16	INPUT _COM	Input signal common
Y-axis input signal		18	20	16		Y_OV-	Y-axis outer bottom limit signal input(B contact)
		3	9	17		Y_OV+	Y-axis outer top limit signal input(B contact)
		22	31	15		Y_ORG	Y-axis approximate starting point signal input (A contact)
		-	-	18	-	Y_VTP	Y-axis speed position switching signal input (A contact)
		21	11 33	32 33 34 35		INPUT _COM	Input signal common
Emergency stop signal		19	32	19	15	EMG *1	Emergency stop signal input _ X/Y-axis common (B contact)
		21	11 33	32 33 34 35	16	INPUT _COM	Input signal common
Manual pulse		9	30	-	-	MPG_A	Manual pulse generator phase A input
		8	8			MPG_ AGND	Manual pulse generator phase A Common

generator input		16	29			MPG_B	Manual pulse generator phase B input
		7	7			MPG_ BGND	Manual pulse generator phase B Common
External power		4 5	13 14	-	10	INPUT _COM	Input contact Ground Common EMG X_STOP, X_OV-, X_OV+, X_ORG, X_STOP Y_STOP, Y_OV-, Y_OV+, Y_ORG, Y_STOP
FG		6	-	-	6	FG	Frame Ground

*1:If emergency stop signal is used in G3F-POPA, only independent X-axis(19) or Y-axis(19) shall be used.

2.5 Designation and function of the parts

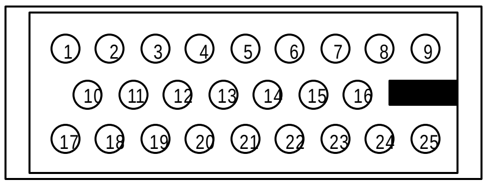
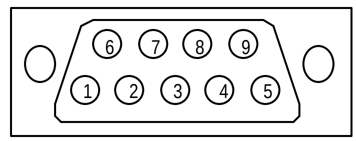
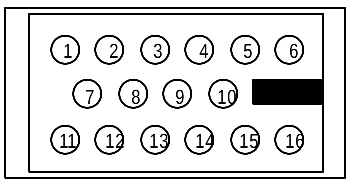
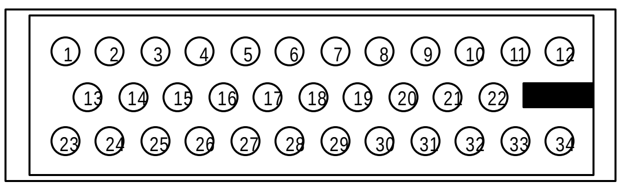
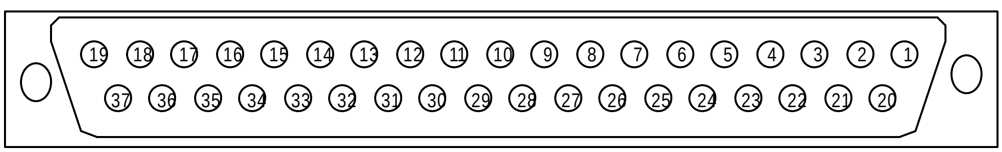
1) G3F-POPA 2) G4F-POPA 3)G4F-POPB 4)G6F-POPA



No.	Description
①	Ready signal Ready signal of positioning module.
②	Busy signal Turned "On" if each axis is in busy (operation) state.
③	DIR signal ▶On : forward pulse output ▶Off : reverse pulse output
④	ERR signal ▶G3F-POPA, G4F-POPA, G4F-POPB: turned on if error occurs. ▶G6F-POPA : flickering if error occurs. 1) Flickering at intervals of 0.5 sec. : serious error for pulse output prohibited. 2) Flickering at intervals of 1.0 sec. : trivial error for pulse output.
⑤	RS-232C connector ▶for connection with S/W package. ▶As for G6F-POPA, connection available via communication port of CPU module (However, CPU module shall be in STOP state at this time)
⑥	Externalr interface connector for connection with drive device.

2.6 Connector's pin arrangement

Connector's pin arrangement for connection with external device of positioning module is described

<table>
<tr><th rowspan="2">Model</th><th colspan="2">Connector's pin arrangement</th></tr>
<tr><th>External interface connector</th><th>RS-232C connector</th></tr>
<tr><td>G3F-POPA</td><td>Pin arrangement of X-axis & Y-axis.

</td><td rowspan="3">Connected with S/W package installed in computer

</td></tr>
<tr><td>G4F-POPA</td><td>
</td></tr>
<tr><td>G4F-POPB</td><td>
</td></tr>
<tr><td>G6F-POPA</td><td colspan="2">
</td></tr>
</table>

▶Direct connection is unavailable between G6F-POPA positioning module and computer.
Use RS-232C port of GM6 CPU module or k200s cpu module for positioning module operation using S/W package,
and perform operation with S/W package after operation mode of CP U module is let positioned at STOP state.

Chapter 3 Functions

3.1 Positioning control

Positioning control is classified into position control, speed control, speed/position switching control.

3.1.1 Position control

1) 1-axis position control

Positioning of assigned axis is controlled from start point address (presently stopped position) to specified address (travel value).

(1) Control by absolute method (Absolute Coordinates)

A) Positioning is controlled from start point address to specified address (at positioning data).

B) Positioning control is executed as based on the address(origin point address) assigned at origin point return.

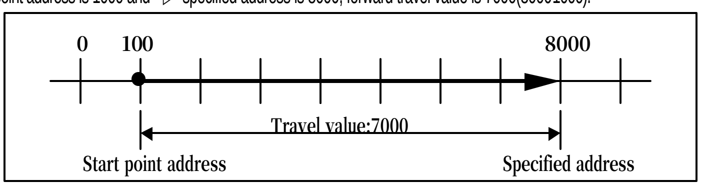
B) Travel direction is decided according to start point address & specified address.

▶start point address < specified address : position decided forward

▶start point address > specified address : position decided reverse

[Ex.]

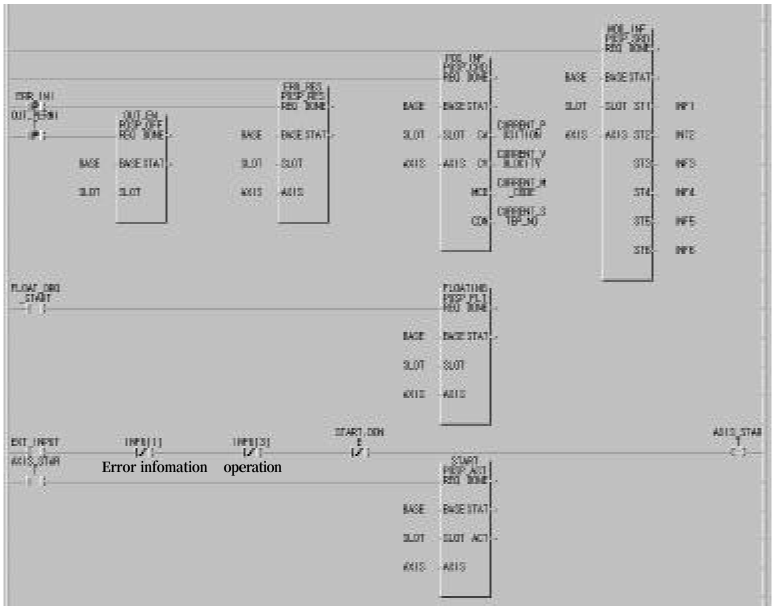
▷If start point address is 1000 and ▷specified address is 8000, forward travel value is 7000(8000-1000).



▷ Setting in S/W package

Position data items	Step No.	Coordinates	Override	Operation method	Invalid /valid	Operation mode	Address	M code	Speed No.	Dwell (x 10ms)
Setting	0	Absolute	Enable	Continuous	Valid	Single	8000	0	0	0

▷Program



Program 3.1 Basic(setting of floating point set)

Remark

Control by absolute method (Absolute Coordinates) can be started at the state that origin point has been decided.
If started at the state that origin point has not been decided, error 76 occurs. Available operation modes are single, repeated, and continuous operation.

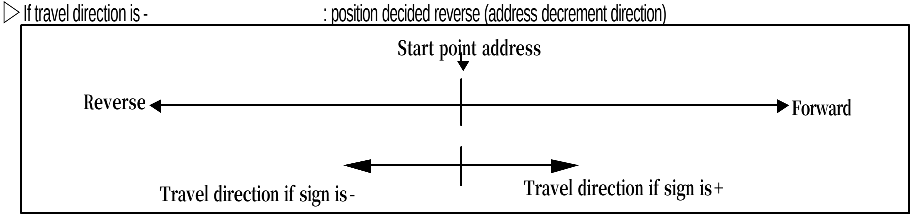
(2) Control by incremental method (relative coordinates)

A) Positioning is controlled at start point address as much as target travel value.

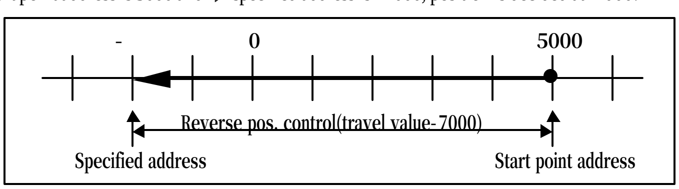
B) Travel direction is decided according to travel value sign.

▷If travel direction is + (or no sign) : position decided forward (address incremental direction)

▷If travel direction is - : position decided reverse (address decrement direction)



[Ex.] ▷If start point address is 5000 and ▷specified address is –7000, position is decided at -2000.



▷ Setting in S/W package

Position data items	Step No.	Coordin ates	Override	Operation method	Invalid /valid	Operation mode	Address	M code	Speed No.	Dwell (x 10ms)
Setting	0	Relative	Enable	Continuous	Valid	Single	-7000	0	0	0

▷Program

Program is the same as program 3.1.

2) 2axes position control

Linear interpolation control is performed at start point address(presently stopped position) using assigned 2axes.

(1) Control by absolute method (Absolute Coordinates)

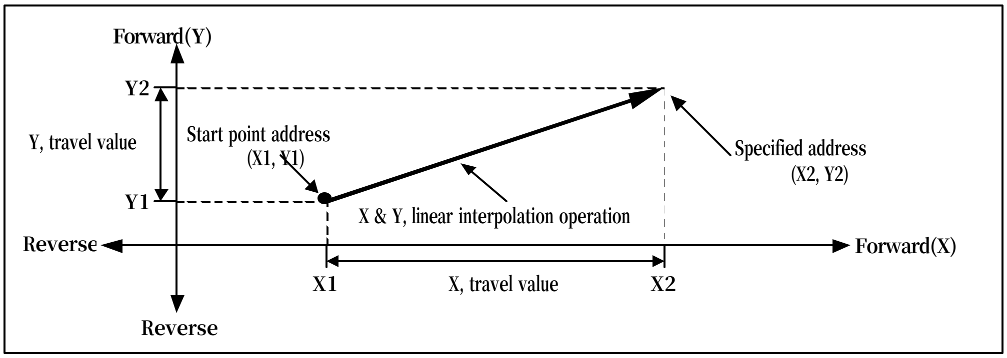
A) Linear interpolation control is executed from start point address to specified address(assigned at positioning data) via 2axes.

B) Positioning is controlled as based on the address assigned at origin point return.

C) Travel direction is decided according to start point address and specified address of each axis.

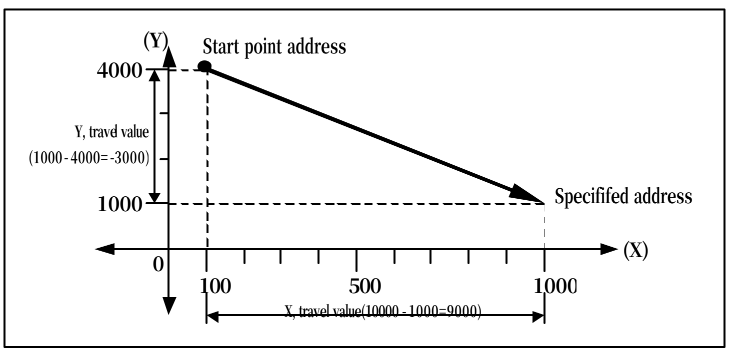
▶start point address < specified address : position decided forward

▶start point address > specified address : position decided reverse



[Ex.]

▷If start point address is (1000, 4000) and ▷specified address is (10000, 1000), the operation is as follows.

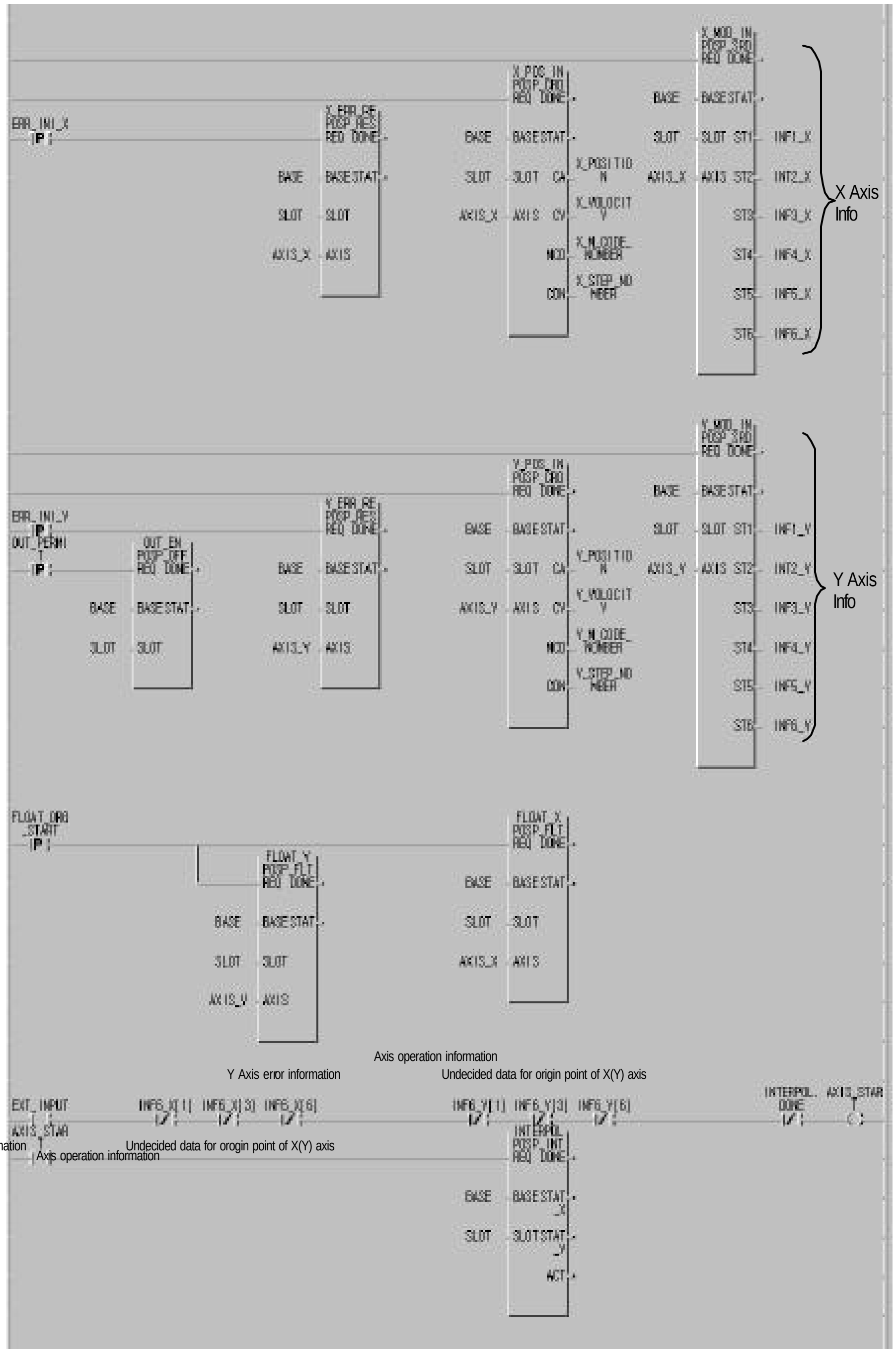


▷Setting in S/W package

Position data items	Step No.	Coordinates	Override	Operation method	Invalid /valid	Operation mode	Address	M code	Speed No.	Dwell (x 10ms)
X-axis setting	0	Absolute	Disable	Continuous	Valid	Single	10000	0	0	0
Y-axis setting	0	Absolute	Disable	Continuous	Valid	Single	1000	0	0	0

▷Program

Cancelled if output prohibited by error



Program 3.2 Basic(setting of linear interpolation start _ floating point set starting point)

Remark

Take preautions for linear interpolation start(POS■_INT:rising edge ↑) at which 2-axes are simultaneously operated.

1)Operation-related subdata is operated as based on X-axis.

; position data(step, coordinates, override, operation method, invalid/valid, operation mode, position address, M code, speed No., dwell time)

; M code mode among parameter items

2)Classified into major axis and minor axis according to positioning address amount of X-axis & Y -axis at interpolation positioning start.

; Speed data of minor axis is calculated as follows.

$$\text{Minor axis speed} = \frac{\text{Major axis speed X Minor axis distance}}{\text{Major axis distance}}$$

▷ Terms

major axis : X-axis or Y-axis of whichever positioning address amount is larger in applicable operation step No.

minor axis : X-axis or Y-axis of whichever positioning address amount is smaller in applicable operation step No.

; Speed, acceleration time, deceleration time and bias speed of minor axis will be recalculated at this time.

3)Operating items based on setting value per axis are

;Backlash compensation, S/W upper limit, S/W lower limit, position passing time and zone setting area of parameter items. Available peration mode is single operation, repeated operation and auto-operation only.

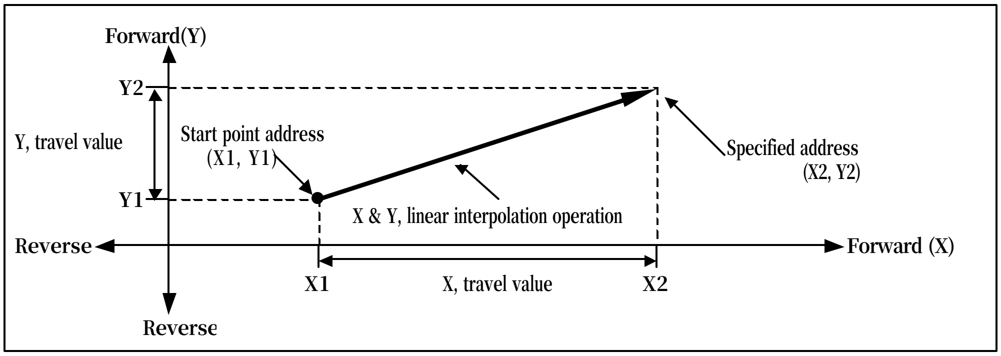
4) If required time for moving a position address value to specified address exceeds 65,535㎳, error 89 occurs.

(2) Control by incremental method (Relative Coordinates)

A) Positioning controlled to the position which includes travel direction and travel value as aimed at start point address per axis.

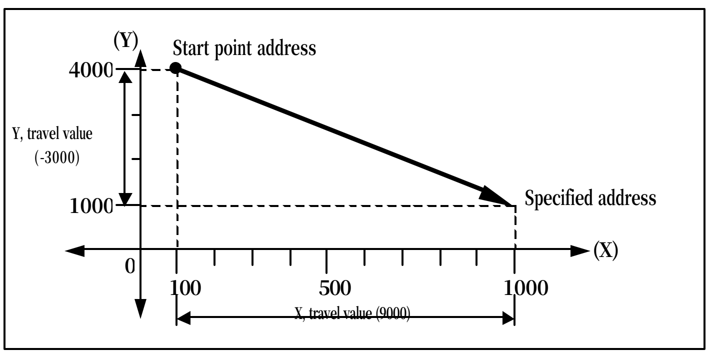
B) Travel direction of each axis is decided according to travel value sign of the axis.

- If travel value sign is + (or no sign) : position decided forward (address incremental direction)
- If travel value sign is - : position decided reverse (address decrement direction)



[Ex.]

▷If start address is (1000, 4000) and ▷target address is (9000, -3000), the operation is as follows.



▷Setting in S/W package

Position data items	Step No.	Coordinates	Override	Operation method	Invalid /valid	Operation mode	Address	M code	Speed No.	Dwell (x 10㎳)
X-axis setting	0	Relative	Disable	Continuous	Valid	Single	10000	0	0	0
Y-axis setting	0	Relative	Disable	Continuous	Valid	Single	1000	0	0	0

▷Program

Program is the same as program 3.2.

3.1.2 Speed control (constant operation mode)

▶ Speed is controlled as set until deceleration stop command is input after executed by positioning start.
(Origin point undecided if operation is stopped by deceleration stop command)

▶ Speed control includes forward start and reverse start.

Model	Forward direction start	Reverse direction start
G6F-POPA	Set position address value positive (Ex. : 100, +1000)	Set position address value negative (Ex. : -100, -1000)
G3F-POPA G4F-POPA G4F-POPB	1. If prior direction to constant operation start is forward, forward operation is continued, 2. If prior direction to constant operation start is reverse, ▷forward separate or repeated positioning operation shall be performed at a constant speed. 3.As specified in 1 & 2 above for execution of starting point decision	1 If prior direction to constant operation start is reverse, reverse operation is continued, 2. If prior direction to constant operation start is forward, ▷reverse separate or repeated positioning operation shall be performed at a constant speed. 3.As specified in 1 & 2 above for execution of starting point decision

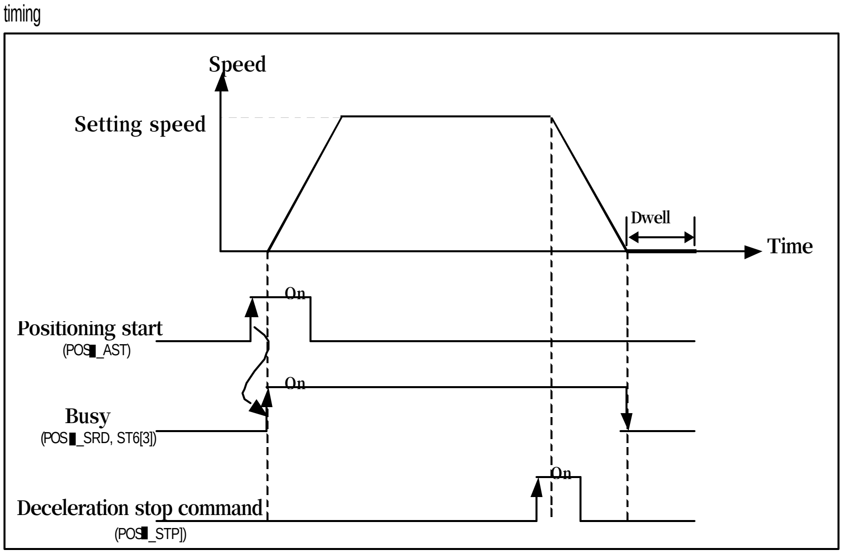
▶ If speed control is applied, the following items of positioning data have no influence on constant operation mode.

Position data items	Step No.	Coordinates	Override	Operation method	Invalid /valid	Operation mode	Address	M code	Speed No.	Dwell (x 10ms)
Items with no influence		↑	↑	↑						↑ *1

*1: Only for G4F-POPA.

▶ If M code applied, use "With" mode only.
(If "After" mode used, M code "On" signal is not output.)

▶ Operation timing

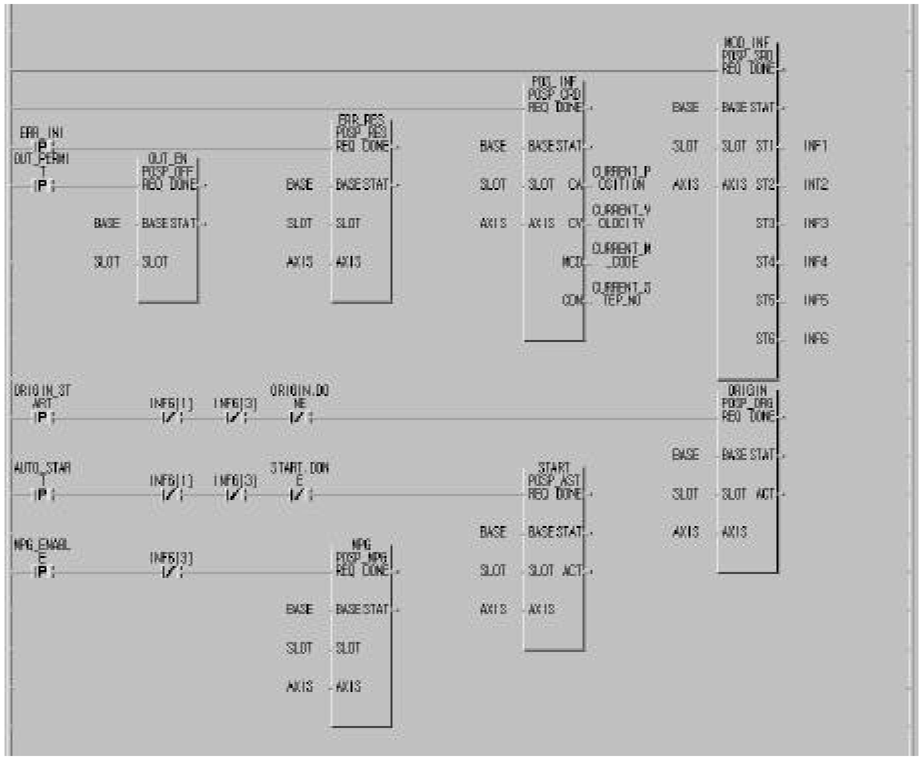


[Ex.]

▷Setting in S/W package(G6F-POPA)

Direction setting	Step No.	Coordinates	Override	Operation method	Invalid /valid	Operation mode	Address	M code	Speed No.	dwell (x 10ms)
forward direction	0	Relative	Disable	Continuous	Valid	Constant	**100**	0	0	0
reverse direction	1	Relative	Disable	Continuous	Valid	Constant	**- 100**	0	1	0

▷Program



Program 3.3 Deceleration stop(return to origin point)

3.1.3 Speed/position switching control (positioning constant operation)

▶If speed/position switching signal is input via positioning module outside while the axis set by positioning start controls speed, speed control is switched to position control to decide position as much as target travel value set.

▶Speed/position switching control is processed by outer input signal of "speed position switching input signal"in G6F-POPA and by "deceleration stop command" in G3F-POPA, G4F-POPA & G4F-POPB.

▶Position-decision constant operation is available as directed forward and reverse.

Direction setting	Step No.	Coordinates	Override	Operation method	Invalid /valid	Operation mode	Address	M code	Speed No.	Dwell (x 10ms)
Forward direction	0	**Relative**	**Disable**	Continuous	Valid	Constant (position)	**100***1	0	0	0
Reverse direction	1	**Relative**	**Disable**	Continuous	Valid	Constant (position)	**- 100***2	0	1	0

Items with no influence

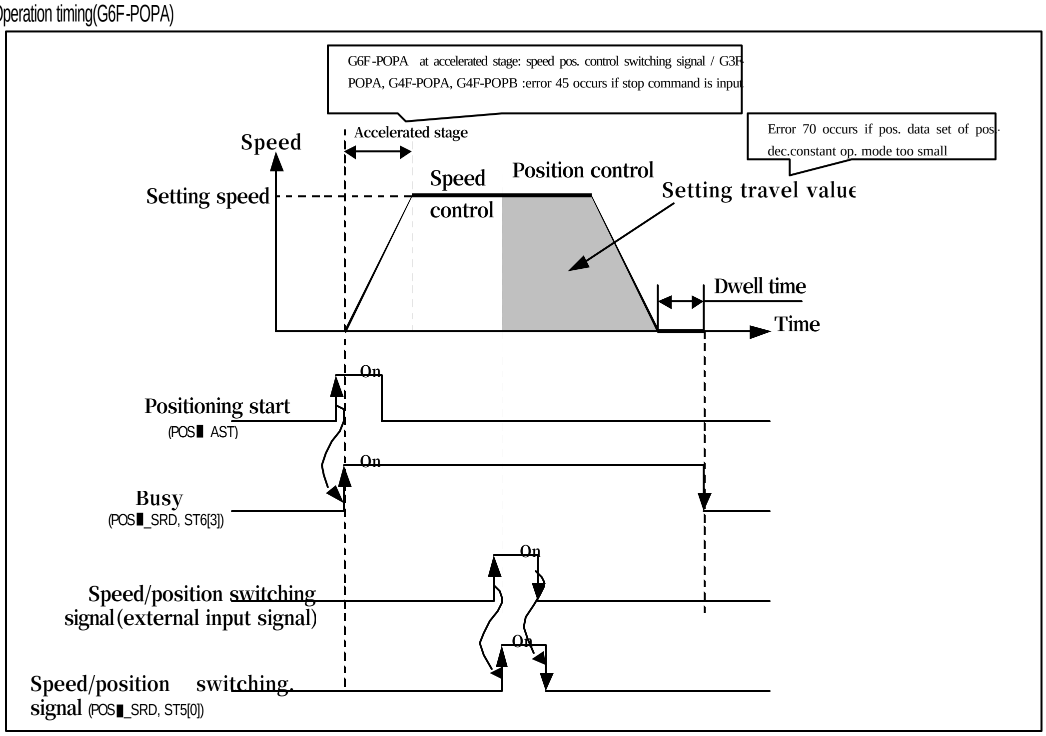
▷ Direction forward or reverse is decided according to value sign of position address in positioning constant operation.

(At this time all are processed by absolute method without distinction of methods absolute or relative)

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

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

▶Operation timing(G6F-POPA)



▶Program

Program is the same as program 3.3.

3.2 Operation mode

▶Operation mode is to form various configurations required to operate positioning data and to process position data speed with each operation step No.

▶Type of operation mode is as follows.

Control method	Operation mode	Others
Position control	Single	
	Repeated	
	Auto	
	Continuous	■Interpolation function unavailable
Speed control	Constant	■S/W upper/lower limit detection unavailable ■Interpolation function unavailable
Speed control +position control	Positioning constant operation	■Changeable from speed control to position control by -deceleration stop function block[POS ζ_STP:rising edge ↑] in G3F-POPA, G4F-POPA, G4F-POPB and -external input signal of " speed position switching input signal" in G6F-POPA ■Interpolation function unavailable

▶The following rules are between operation modes.

Nth operation \ n+1th operation	Single operation	Repeated operation	Auto-operation	Continuous operation	Constant operation	Positioning Constant operation
Single operation	Operation available	Operation available	Operation available	Operation available	Operation available	Operation available
Repeated operation	Operation available	Operation available	Operation available	Operation available	Operation available	Operation available
Auto-operation	Operation available	Operation available	Operation available	Operation unavailable	Operation unavailable	Operation unavailable
Continuous operation	Operation available	Operation available	Operation unavailable	Operation available	Operation unavailable	Operation unavailable
Constant operation	Operation available	Operation available	Operation available	Operation available	Operation available	Operation available
Positioning Constant operation	Operation available	Operation available	Operation available	Operation available	Operation available	Operation available

▶Operation mode is set at position data of S/W package.

▶ Max. 300 position data can be set per axis in the range of operation step No. 0 299.

Position data	Step No.	Coordinates	Override	Operation method	Invalid/valid	Operation mode	Address	M code	Speed No.	Dwell (x 10ms)
Setting range/type	0 299	Absolute Relative	Enable Disable	Continuous Complete	Invalid Valid	Single Repeated Auto Continuous Constant Con.(pos.)	-16,744,447 16.744,447	0 255	0 127	0 999

▶Positioning operation method by one positioning data per operation step or by several positioning data via successive operation steps at a start command is decided according to operation mode user -defined at each positioning data.

3.2.1 Separate operation

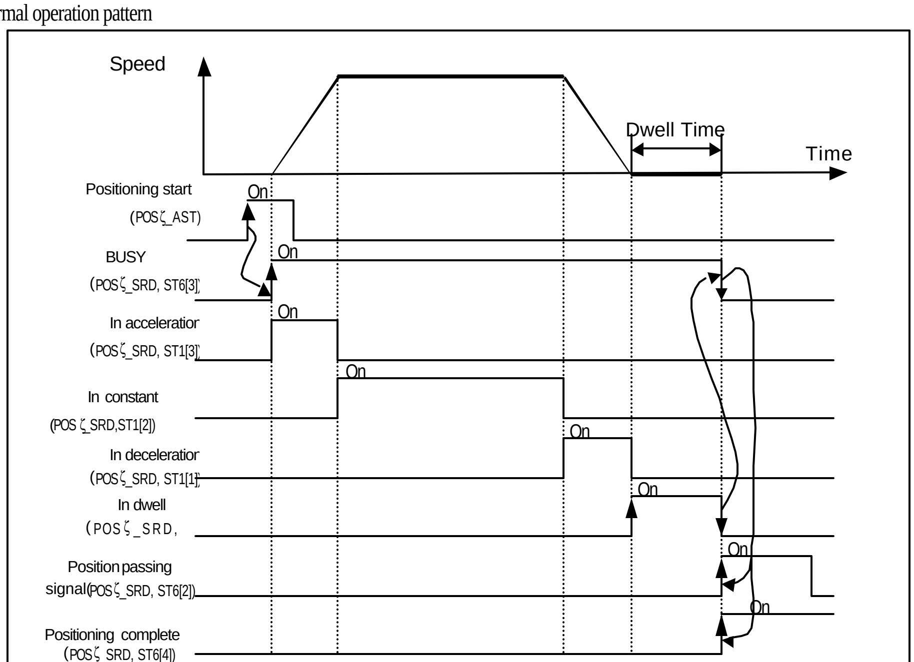
1) Positioning is complete upon positioning executed to the target position by one positioning start(POS ζ_AST :rising edge ↑) and the dwell time elapsed.

2) Positioning complete in this operation mode can be used for the operation mode of the last positioning data in auto - operation mo de and continuous operation mode.

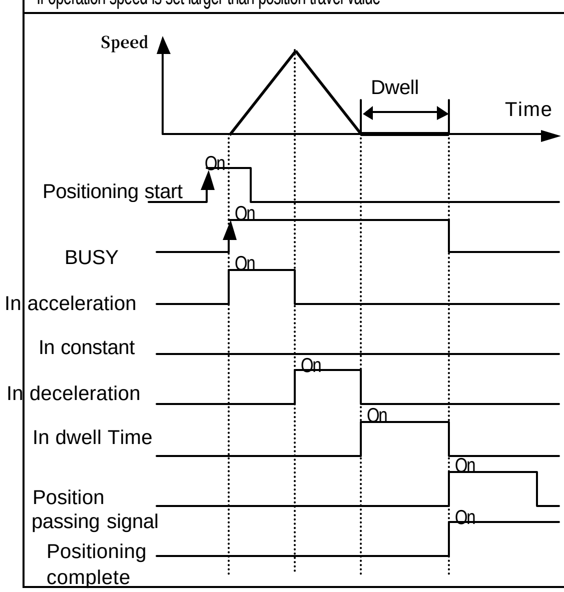
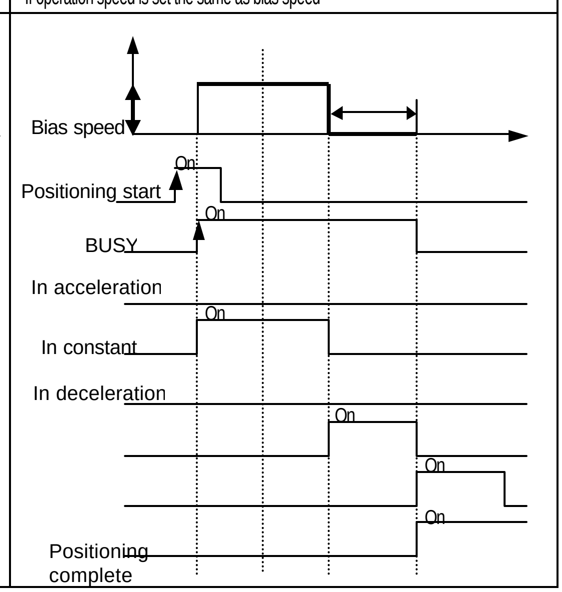
3) Operation direction is decided according to position address value.

4) Operation pattern is of trapezoid with acceleration, constant, and deceleration stages according to setting speed and position data, however the following operation pattern may be produced in compliance with set value.

a) Normal operation pattern

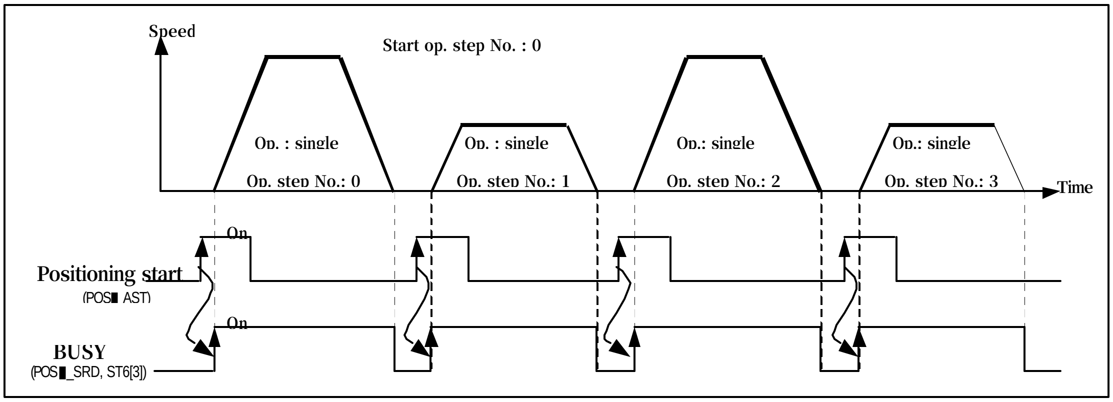


Abnormal operation pattern

If operation speed is set larger than position travel value	If operation speed is set the same as bias speed
	

[Ex.]

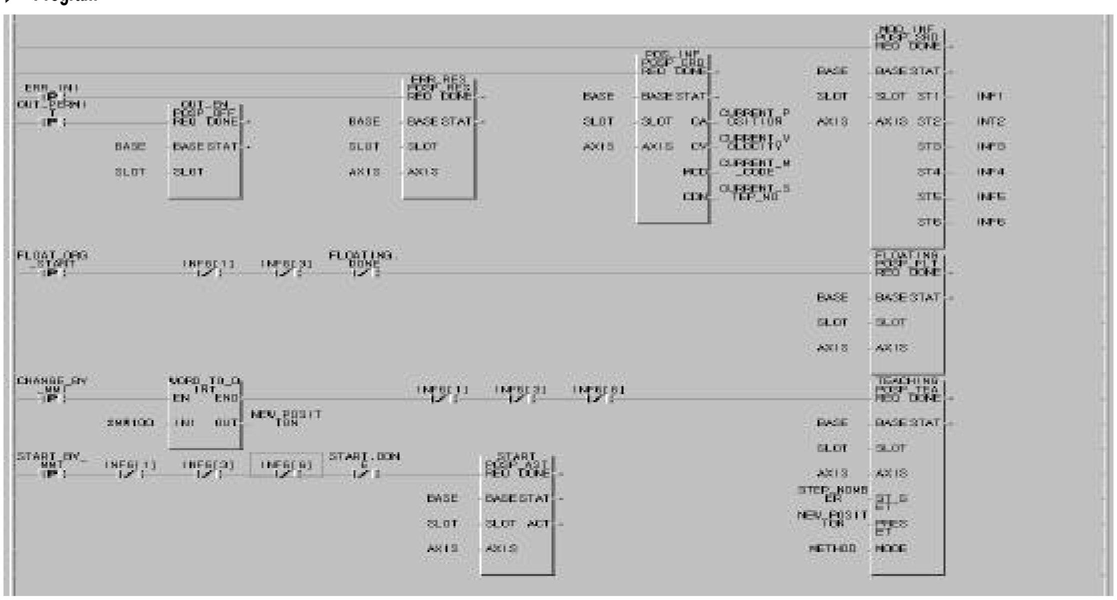
▷ Operation pattern



▷Setting in S/W package

Number of program start commands	Step No.	Coordinates	Override	Operation method	invalid/valid	Operation mode	Address	M code	Speed No.	Dwell (x 10ms)
1	0	Absolute	Disable	Continuous	Valid	Single	100	0	0	0
2	1	Absolute	Disable	Continuous	Valid	Single	200	0	1	0
3	2	Absolute	Disable	Continuous	Valid	Single	300	0	0	0
4	3	Absolute	Disable	Continuous	Valid	Single	400	0	1	0

▷ **Program**



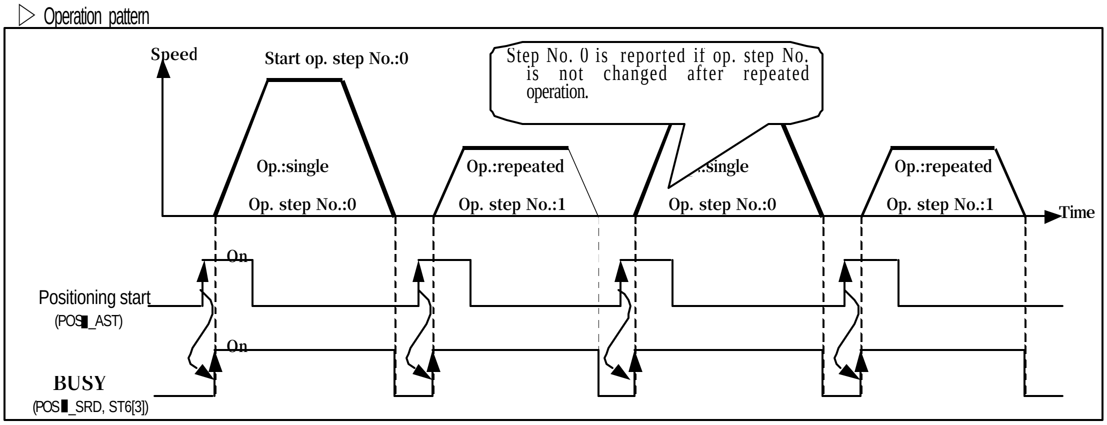
Program 3.4 Single operation (return to origin point)

3.2.2 Repeated operation

1) Positioning is complete upon positioning executed to the target position by one start command(POSζ_AST :rising edge ↑) and the dwell time elapsed.
2) The pattern of repeated operation mode is the same as single operation, however the next operation is decided by operation step No. which is set at change command of operation step No. previously executed after positioning is complete.
3) Thus, if change command of operation step No. is not previously executed, step No. "0" is assigned and then operated at the next start command. Accordingly it is very useful in the system where several operation steps are repeated.
4) Operation direction is decided according to position address value.

[Ex.1] If operated only by positioning start [POSζ_AST:rising edge ↑]

▷ Operation pattern



▷ Setting in S/W package

Number of program Positioning start	Step No.	Coordinates	Override	Operation method	Invalid /valid	Operation mode	Address	M code	Speed No.	Dwell (x 10ms)
1, 3	0	Absolute	Disable	Continuous	Valid	Separate	**100**	0	0	0
2, 4	1	Absolute	Disable	Continuous	Valid	Repeated	**200**	0	1	0
	2	Absolute	Disable	Continuous	Valid	Separate	**300**	0	2	0
	3	Absolute	Disable	Continuous	Valid	Repeated	**400**	0	3	0

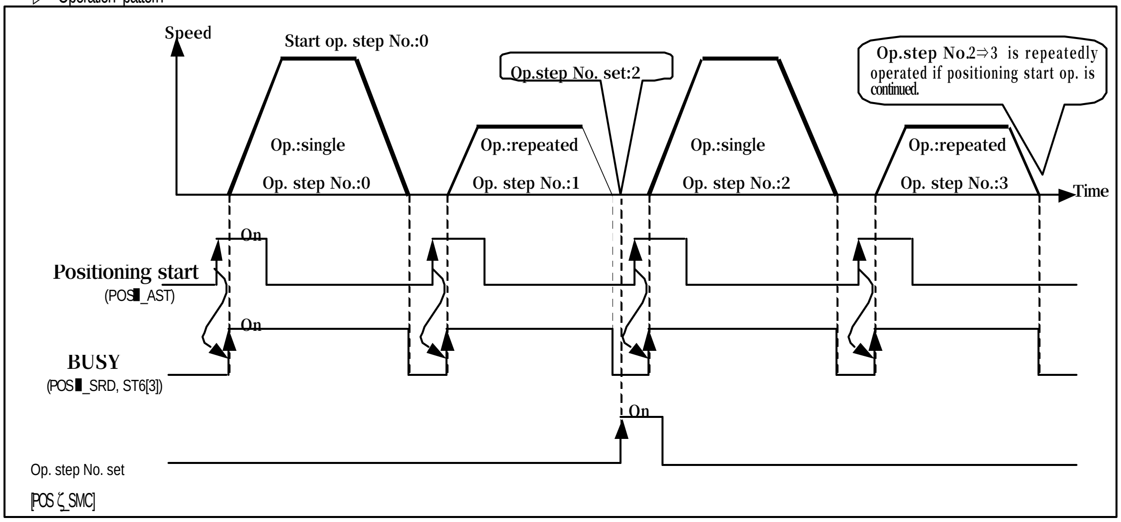
Operation step 2 & 3 are not operated.

▷Program

Program is the same as program 3.4.

[Ex.2] If operated by start command[POSζ_AST:rising edge ↑] and operation step No. setting [POSζ_SMC:rising edge ↑]

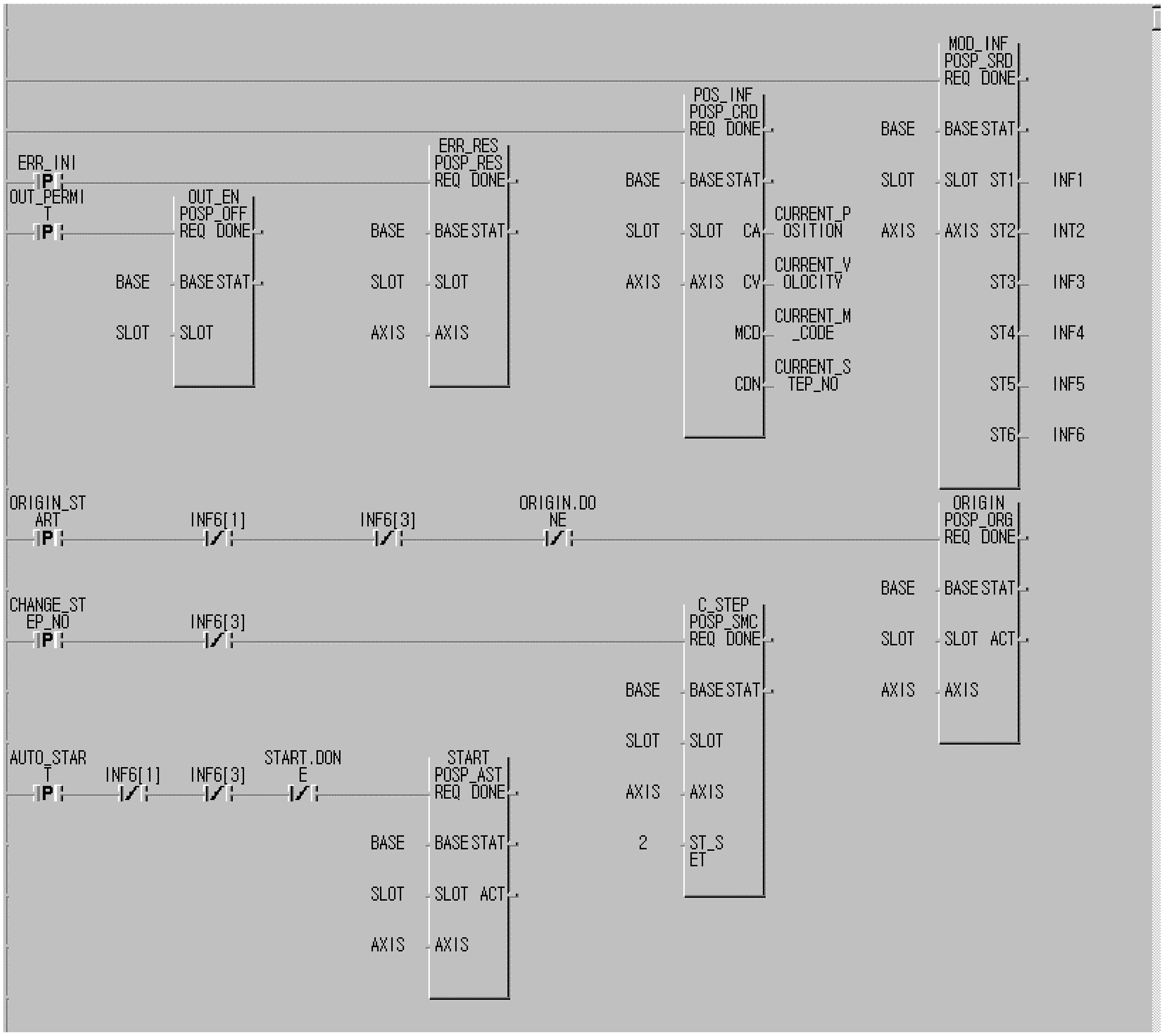
▷ Operation pattern



▷ Setting in S/W package

Number of program Positioning start	Step No.	Coordinates	Override	Operation method	Invalid /valid	Operation mode	Address	M code	Speed No.	Dwell (x 10ms)
1	0	Absolute	Disable	Continuous	Valid	Single	**100**	0	0	0
2	1	Absolute	Disable	Continuous	Valid	Repeated	**200**	0	1	0
Number changing by operation step No.setting[POSζ_SMC:rising edge ↑]										
3	2	Absolute	Disable	Continuous	Valid	Single	**300**	0	2	0
4	3	Absolute	Disable	Continuous	Valid	Repeated	**400**	0	3	0

▷Program



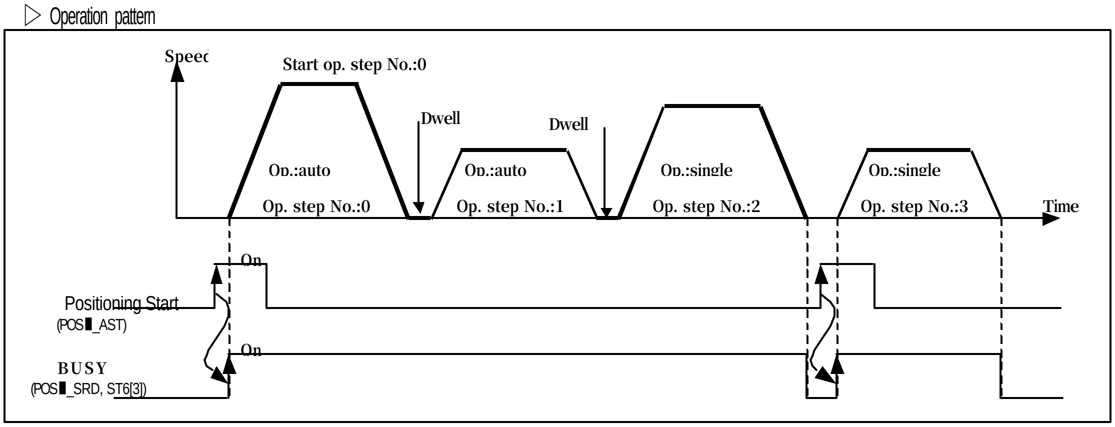
Program 3.5 Single operation (setting operation step No.)

3.2.3 Auto-operation

1) Positioning is complete upon positioning executed to the target position by one start command(POS ζ_AST :rising edge ↑) and the dwell time elapsed. And the operation step (present operation step No. + 1) position is decided for operation in this mode without additional start command (present operation step No. + 1). Accordingly, operation mode of the last operation step shall be set to single operation mode orrepeated operation mode. If not, error 66 occurs.
2) Several operation steps of auto-operation mode can be successively executed.
3) Operation direction is decided according to position address value.

[Ex.]

▷ Operation pattern



▷ Setting in S/W package

Number of program start commands	Step No.	Coordinates	Override	Operation method	Invalid/ Valid	Operation mode	Address	M Code	Speed No.	Dwell (X 10ms)
1	0	Absolute	Disable	Continuous	Valid	Auto	**100**	0	0	0
	1	Absolute	Disable	Continuous	Valid	Auto	**200**	0	1	0
	2	Absolute	Disable	Continuous	Valid	Single	**300**	0	2	0
2	3	Absolute	Disable	Continuous	Valid	Single	**400**	0	1	0

▷ Program

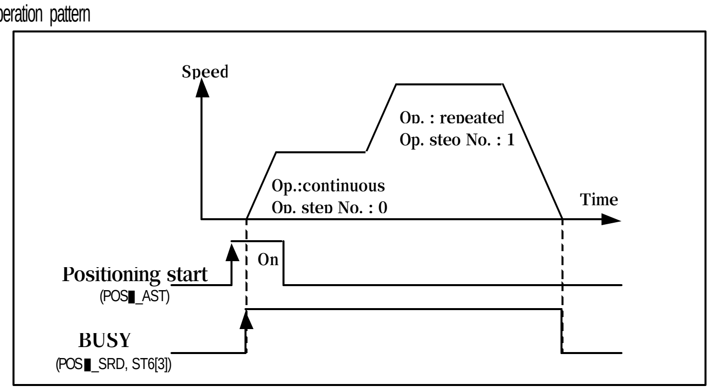
Program is the same as program 3.4.

3.2.4 Continuous operation

1) Positioning is complete upon positioning executed to the target position without stopping operation step set to continuous operation mode by one positioning start (POSζ_AST :rising edge ↑) and the dwell time elapsed. Accordingly, operation mode of the last operation step shall be set to single operation mode or repeated operation mode. If not, error 66 occurs.
2) Continuous operation command(Next Move) is available if next step position and speed are desired before the presently engaged operation step reaches the target position. However, continuous operation command(Next Move) can be executed only at constant speed.
3) Only the same direction is available for continuous operation mode, and operation direction is decided according to position address value.

[Ex.]

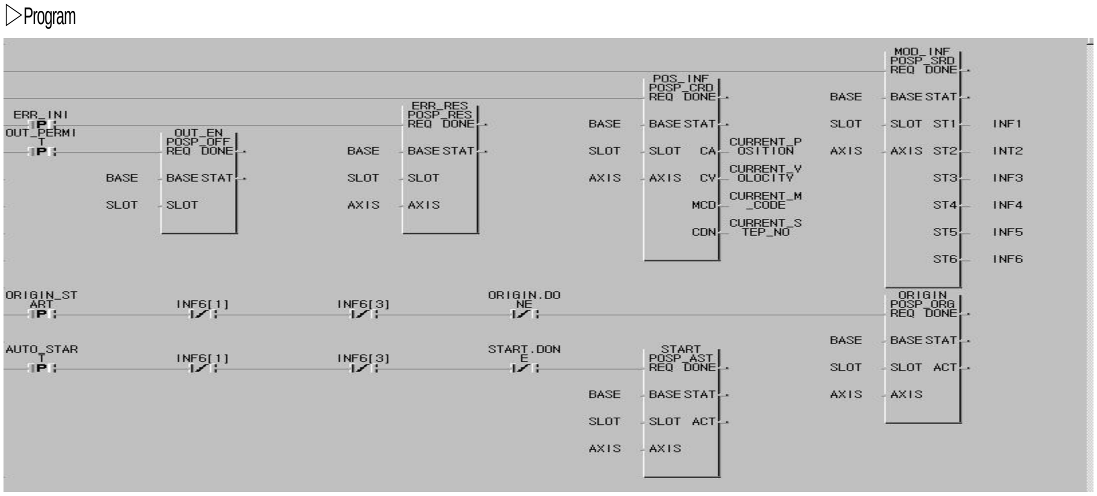
▷ Operation pattern



▷ Setting in S/W package

Number of program Positioning start	Step No.	Coordinates	Override	Operation method	Invalid/valid	Operation mode	Address	M code	Speed No.	Dwell (x 10ms)
1	0	Absolute	Disable	Continuous	Valid	Continuous	**1000**	0	0	0
	1	Absolute	Disable	Continuous	Valid	Repeated	**2000**	0	1	0

▷Program



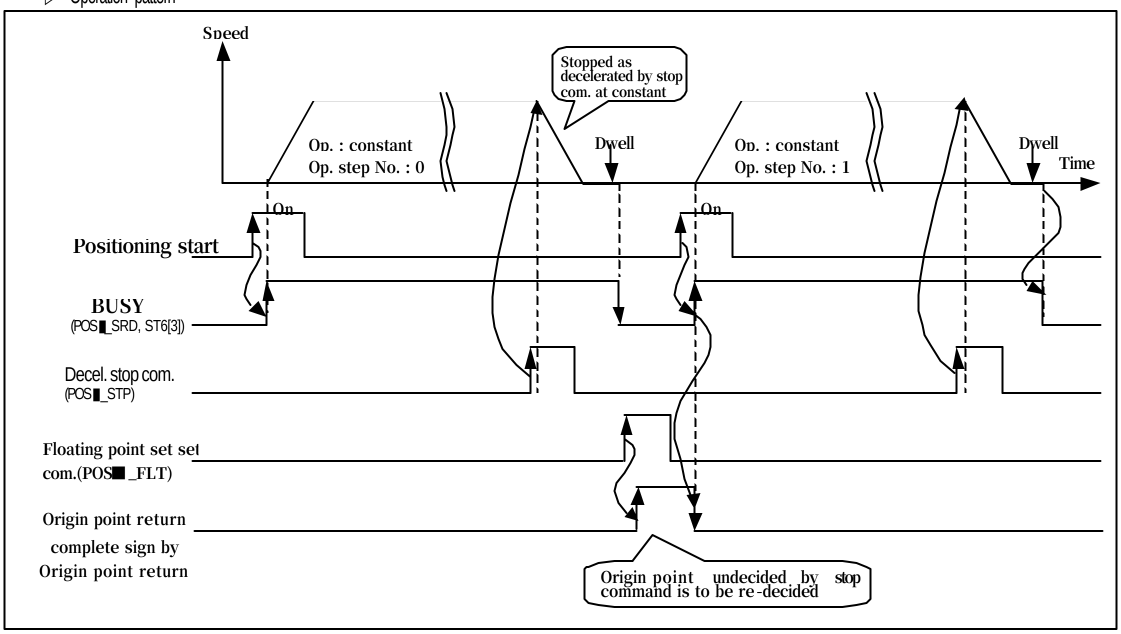
program is the same as program 3.4.

3.2.5 Constant operation

1) In constant operation mode, the operation at speed set without target position is continued by speed control operation.
Since constant operation is not the positioning operation, it displays “0”for present position and is switched
2) over to undecided origin point state even if the origin point has been previously decided.
3) Accordingly, if the next operation step is at decided origin point state, returning to origin point shall be executed or eration after floating point set setting shall be executed.
4) If confronted by deceleration stop commandin constant operation, the correspondent step operation is regarded as complete leading to the next operation step of position data at restart.
5) If confronted by deceleration stop commandin acceleration stage, constant stage, deceleration stage of the constant operation, it stops as decelerated.
6) Operation direction is decided according to the prior position address.
(However, G6F-POPA is decided according to position address sign)

[Ex.]

▷ Operation pattern



▷ Setting in S/W package

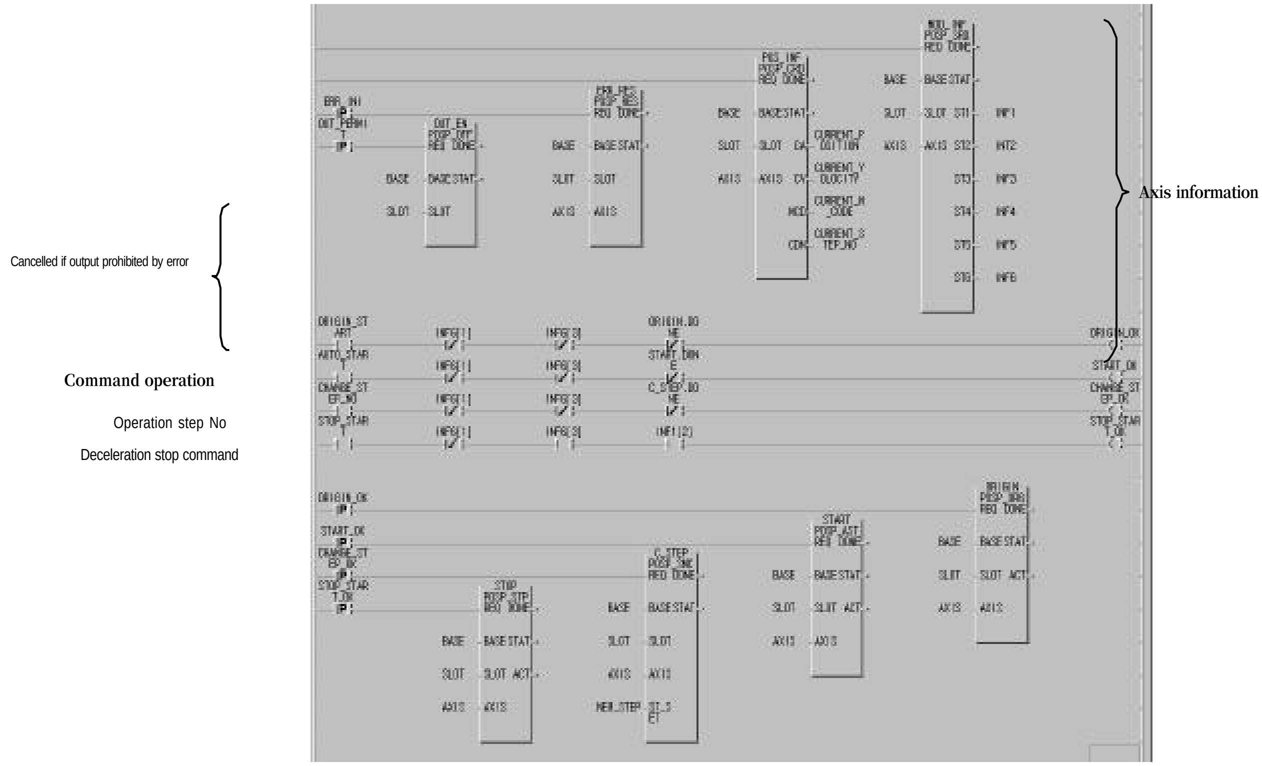
Number of program Positioning start	Step No.	Coordinates	Override	Operation method	Invalid/valid	Operation mode	Address	M code	Speed No.	Dwell (x 10ms)
1	0	Absolute	Disable	Continuous	Valid	Constant	**100**	0	0	0
2	1	Absolute	Disable	Continuous	Valid	Constant	**100**	0	0	0

Remark

▶ **1 positioning start** -> acceleration stage -> constant stage -> **deceleration stop command** -> deceleration stage -> positioning complete, origin point undecided -> **origin point decided** (origin point returning positioning start or floating point set setting command) -> **operation step No. “1”assignment > 2 start commands**

▶ In constant operation mode, dwell time is not available for G4F-POPA.

▷Program



Program3.6 Constant operation(setting operation step No.)

3.2.6 Positioning constant operation

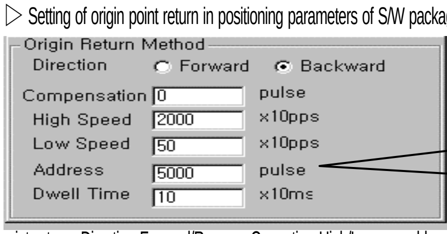
1) Positioning of positioning constant operation is complete as switched from speed control operation to position control operation.
2) Speed control operation is switched to position control operation by,
   ① External input signal of "speed position control switching input signal" and
   ② Deceleration stop command (POSζ_STP:rising edge ↑).

Class	By external input signal of "speed position control switching input signal" (POSζ_SRD, ST5[0])	By deceleration stop command(POSζ_STP:rising edge↑)
G3F - POPA	-	1. Switched from speed control to position control 2. Origin point decision ; Origin point is decided as based on the value set at Origin point return among positioning parameters in S/W package 3. Positioning is complete upon positioning executed as swifted to target address set at position data and the dwell time elapsed
G4F - POPA	-	
G4F - POPB	-	
G6F - POPA	1. Switched from speed control to position control 2. Origin point decision ; Origi n point is decided as based on the value set at origin point return among positioning parameters in S/W package 3. Positioning is complete upon positioning executed as swifted to specified address set at position data and the dwell time elapsed	Operated with the same step No. as position data when re-started as processed with applicable step operation incomplete.

Remark

▶External input signal of "speed position control switching input signal" is valid only in positioning constant operation.
▶Deceleration stop command(POSζ_STP) is available at acceleration stage of positioning constant operation, however speed position cont rol-switching signal input is available only at constant stage. Thus, error 45 occurs if speed position controlswitching signal is input during acceleration.
▶If the position address is set smaller than positioning amount by deceleration inclination in po sitioning constant operation, positioning module re-calculates the deceleration inclination for operation. Accordingly, stop can be followed as decelerated abruptly rather than deceleration inclination set by parameters.
▶Operation direction is decided according to address position and target position address value prior to operation start.

[Ex.] ▷ Setting of origin point return in positioning parameters of S/W package



Present position is set to origin point returning address if origin point return is complete by return command or floating point set is set. However there is no influence on speed position control switching.

Starting point return Direction Forward/Reverse Correction High/Low speeddressDwell time

▷ Setting of positioning data in S/W package

Number of program Positioning start	Step No.	Coordinates	Override	Operation method	Invalid/valid	Operation mode	Address	M code	Speed No.	Dwell (x 10ms)
1	0	Absolute	Disable	Continuous	Valid	Constant(position)	**10000**	0	0	0
2	1	Absolute	Disable	Continuous	Valid	Single	**12000**	0	0	0
3	2	Absolute	Disable	continuous	valid	repeated	**12000**	0	0	0

Items with no influence

▷Program

-G3F-POPA, G4F-POPA, G4F-POPB : same as program 3.4.

-G6F-POPA : same as program 3.1.

▷Operation timing : refer to 3.1.3 for the details.

3.3 Positioning stop

Causes stopping the axis during positioning are described.

3.3.1 Stop command and stop causes

Stop command and stop causes are as follows, which are classified into stop per axis and simultaneous stop of all axes.

1) If stop command or stop cause per axis is engaged, only the axis in stop command "On" or stop cause is stopped. However, if stop command or stop cause for one axis is engaged during linear interpolation control execution, both axes under interpolation control are stopped.

2) if simultaneous stop command or stop cause for all axes is engaged, both axes are stopped at stop command "On" or the point of stop cause.

Stop causes		Positioning *1	Origin point return*2	Jog operation	Manual pulse generator operation	Stop -axis	Axis operation state *3 after stopped	M code "On" signal state
By parameter setting *4	S/W upper limit range exceeded	Prompt stop				Per axis	Error state (error25) Output prohibited	Unchanged
	S/W lower limit range exceeded	Prompt stop				Per axis	Error state (error24) Output prohibited	Unchanged
By function block	Deceleration stop command	Deceleration stop				Per axis	As stopped	Unchanged
	Emergency stop Command	Prompt stop				All axes	Error state (error21) Output prohibited	"Off"
By external signal	External upper limit "on"	Prompt stop				Per axis	Error state (error23) Output prohibited	Unchanged
	External lower limit "On"	Prompt stop				Per axis	Error state (error22) Outputprohibited	Unchanged
	Emergency stop "On"	Prompt stop				All axes	Error state (error20) Outputprohibited	"Off"
By s/w Package	Deceleration stop command	Deceleration stop				Per axis	As stopped	Unchanged
By teaching module	Deceleration stop command	Deceleration stop				Per axis	As stopped	Unchanged
	Emergency stop command	Prompt stop				All axes	Error state (error21) Outputprohibited	"Off"

Remark

*1 :positioning means position control , speed control and speed/position switching control by psitioning data.

*2 : Outer input signal of near zero point and origin point signal have no influence on positioning control if origin point return is complete.

*3 : If axis operation state after stopped is output-prohibited, execute cancellation command(POSζ_OFF:rising edge ↑)of output-prohibition so to cancel output-prohibition and reset error No.

*4 : S/W upper/lower limit by parameters is unavailable in constant operation mode.

3.3.2 Stop processing and priority

1) Stop processing

Deceleration stop command(POSζ_STP:rising edge ↑) is processed differently according to acceleration stage, constant stage and deceleration stage of operation pattern.

(1) At acceleration/constant stage

▶ Since positioning operation is not complete to target position as set if stopped as decelerated by deceleration stop command,

① no positioning complete signal occurs,

② no position passing signal occurs, and

③ M code signal of After mode among M code modes is not "On".

After this, if start command is input at stop state,

left positioning distance of the present operation step that is not output is operated by absolute method, and the next operation step No. is operated by relative method.

(2) At deceleration stage

▶ Error occurs if deceleration stop command is input at deceleration stage, and positioning complete signal, position passing signal and M code signal occurs just like the normal stop.

▶ If confronted by deceleration command at deceleration stage during positioning, stop is followed after positioning address reached.

2) Emergency stop, external input upper/lower limit processing

▶ If emergency stop command or external input upper/lower limit is input during positioning control, positioning control is stopped at output-prohibited state to display error.

3) Priority of stop processing

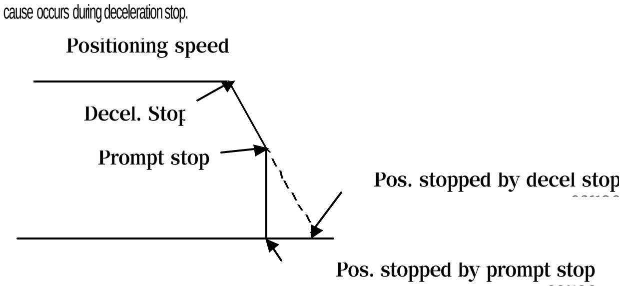
Priority of stop processing of positioning module is as follows.

Deceleration stop < Prompt stop

▶ Prompt stop is processed at the moment when prompt stop cause occurs at deceleration stage during positioning. However, if prompt stop time is longer than deceleration time, deceleration stop processing is continued even though prompt stop cause occurs during deceleration stop processing.

Remark

▶ If prompt stop cause occurs during deceleration stop.



▶ Prompt stop causes : ①internal/external emergency stop, ②external input upper/lower limit, ③s/w upper/lower limit

3.4 Restart after positioning stop

1) Restart after deceleration stop command(POSζ_STP:rising edge ↑)

(1) If deceleration stop command input at acceleration/constant stage

▶ Operation step No. in execution is performed if restarted after deceleration stop.

▶ Restart is available by changing M code signal from "On" to "Off" if With mode has been used among M code modes.

(2) If stop command input at deceleration stage

▶ The following step of the operation step No. in execution is performed if restarted after deceleration stop.

▶ M code "On" signal is not turned "On" if With mode has been used among M code modes, however M code "On" signal shall be "Off" to allow re-start if After mode has been used.

2) After internal emergency stop, external emergency stop, external input upper/lower limit, s/w upper/lower limit

▶ If internal emergency stop, external emergency stop, external input upper/lower limit and s/w upper/lower limit is input, positioning module is at ①output-prohibited state and ②origin point undecided state.

▶ cancell ①output-prohibited, re-decide ②origin point (origin point returning operation, floating poirt set setting) and

▶ perform re-start operation beginning from the operation step No. "0".

3.5Return to origin point (POSz_ORG:rising edge -)

▶To be executed to check the machine's origin point when powered.

▶Origin point return parameters shall be set per axis for origin point return.

▶Refer to 4.1, 4.6, & 4.7 for origin point return parameters.

▶If origin point position is decided by origin point return, origin point detection signal is not detected during positioning operation.

3.5.1 How to return to origin point

▶ By near zero point (near DOG)

Origin point return-processing methods by near zero point(near-DOG) are as follows.

(1) origin point detection after near zero point Off

(2) origin point detection after deceleration at near zero point On

(3) origin point detection by origin point and upper/lower limit

(4) origin point detection by near zero point.

▶ Parameter items of S/W package which influence origin point return are as follows.

(1) origin point return-direction

(2) origin point compensation

(3) origin point return-speed(high/low)

(4) origin point address

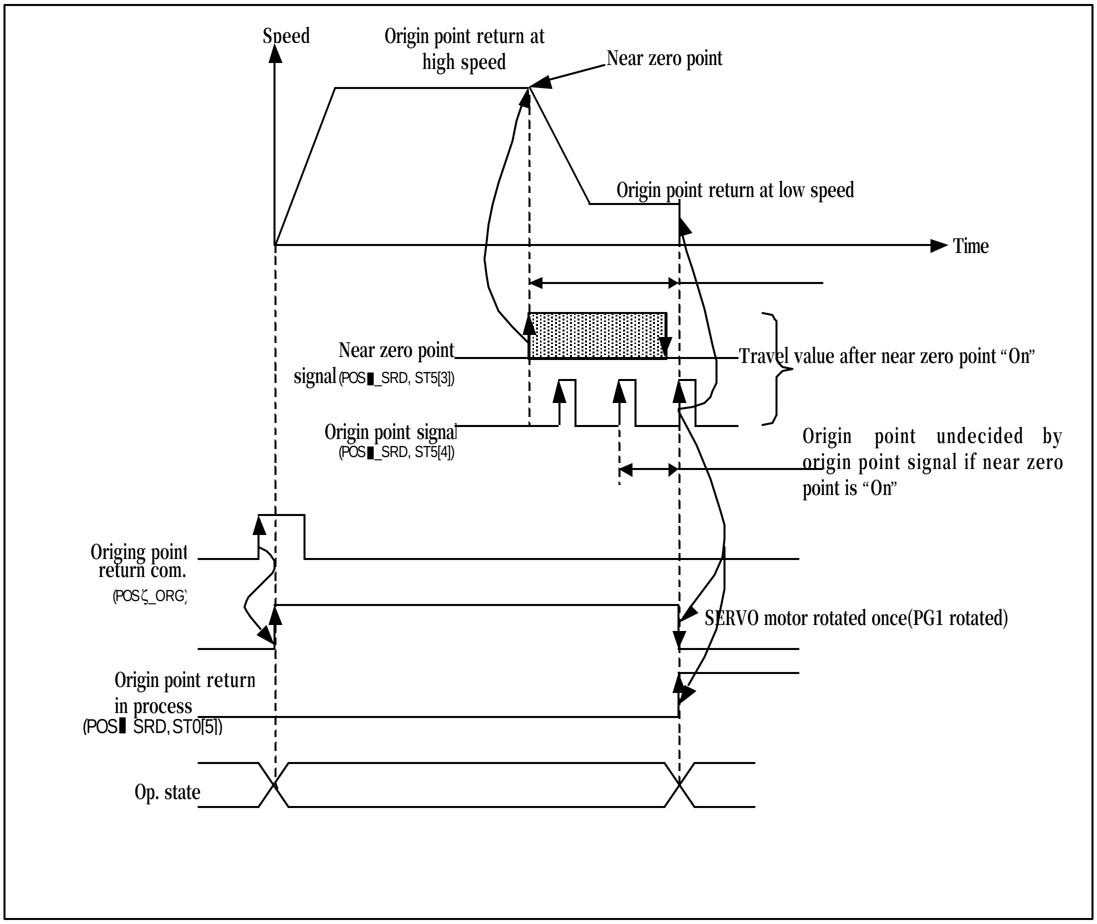
(5) dwell time for origin point return

-Refer to 4.7 for the details.

3.5.2 Origin point detection after near zero point OFF

Starting point return-command (POSζ_ORG:rising edge ↑) operation by approximate starting point and starting point signal is as follows.

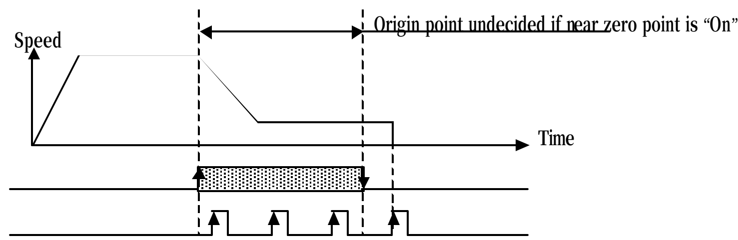
(1) Operated by origin point return at high speed as accelerated toward starting point return-direction as set.
(2) Operated by origin point return at low speed as decelerated if outer input of near zero point is engaged.
(3) Stopped if external signal of origin point signal is input after near zero point signal is changed from "On" to "Off".



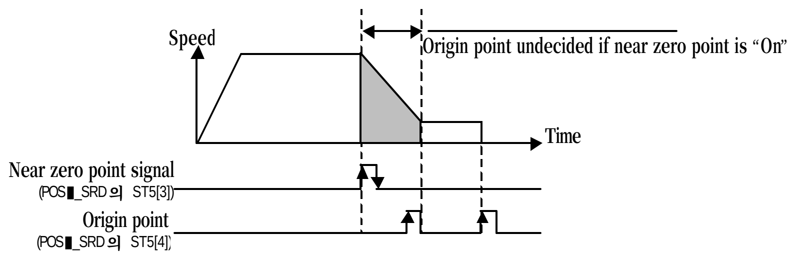
Remark

Origin point is not decided by origin point signal if near zero point point is "On".

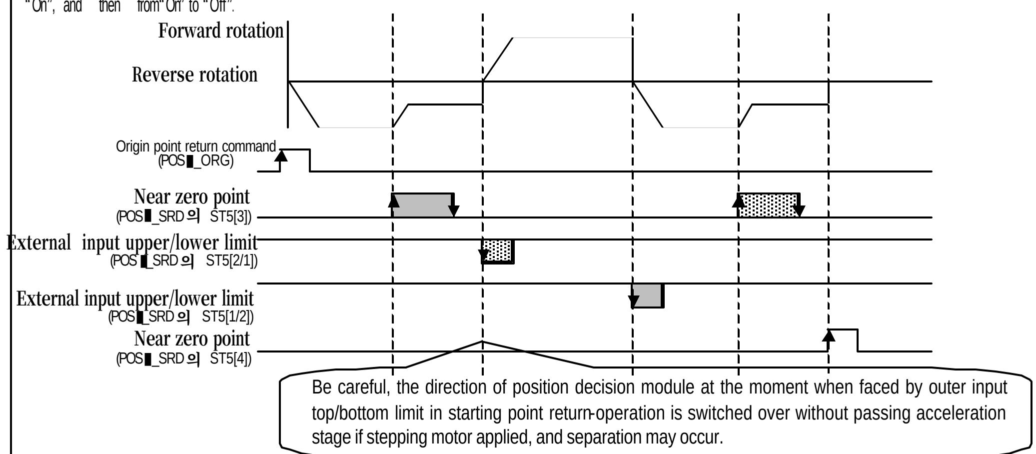
In other words, origin point is decided the moment when changed from "Off" to "On" after near zero point signal is changed from "Off" to "On"(acceleration stage -> origin point return at high speed) and then from "On" to "Off"(deceleration stage -> origin point return at low speed).



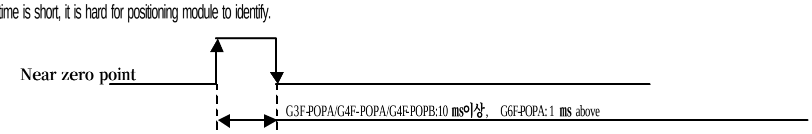
2. Origin point is not decided even if origin point is input when origin point return -speed is executed from origin point returning at high speed to deceleration stage after near zero point signal is changed from "Off" to "On", and then from "On" to "Off".



3. The operation is as follows if external upper limit(lower limit) is engaged while waiting for origin point input after near zero point signal is changed from "Off" to "On", and then from "On" to "Off".



3. If starting point's "On" time is short, it is hard for positioning module to identify.



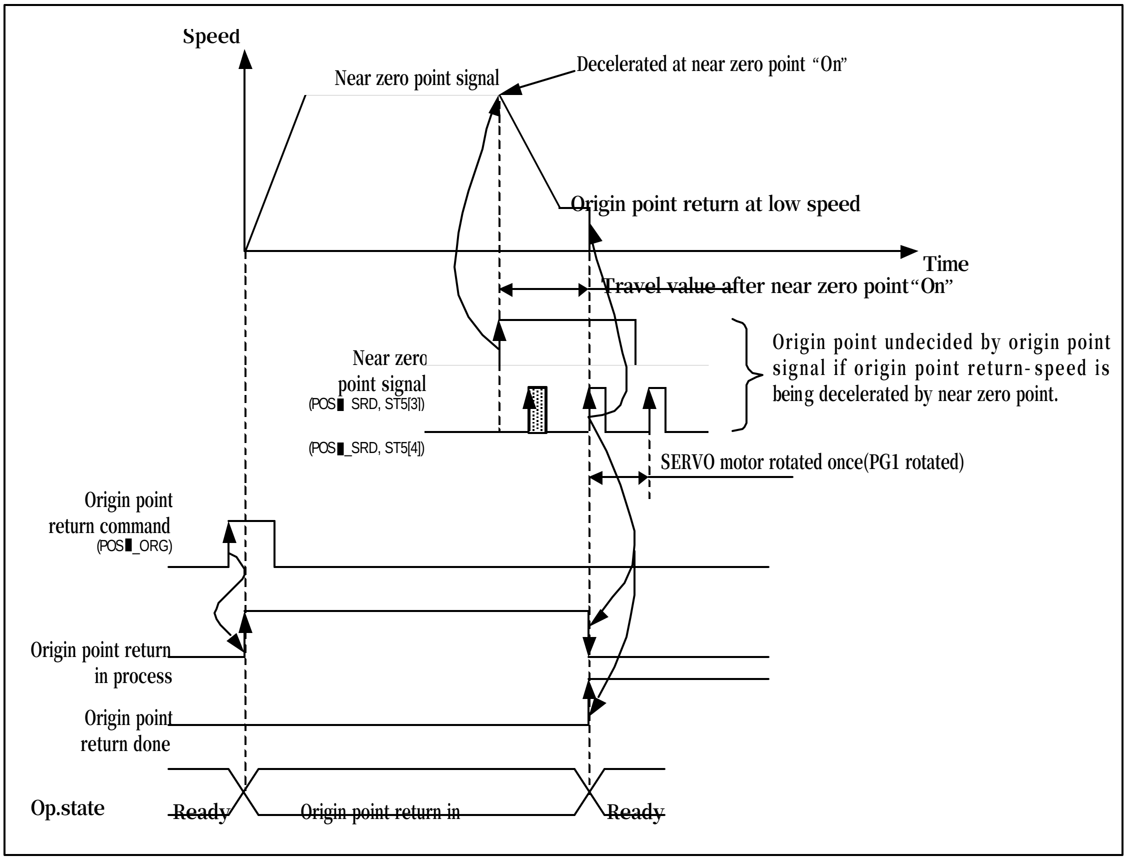
3.5.3 Origin point detection after deceleration at near zero point ON

Origin point return-command operation by near zero point and origin point signal is as follows

(1) operated by origin point return at high speed as accelerated toward origin point return-direction as set.

(2) operated by origin point return at low speed as decelerated if external near zero point signal is input at this moment.

(3) stopped with origin point decided if faced by external origin point signal regardless of "On" or "Off" signal of near zero point during origin point return-operation at low speed.



Remark

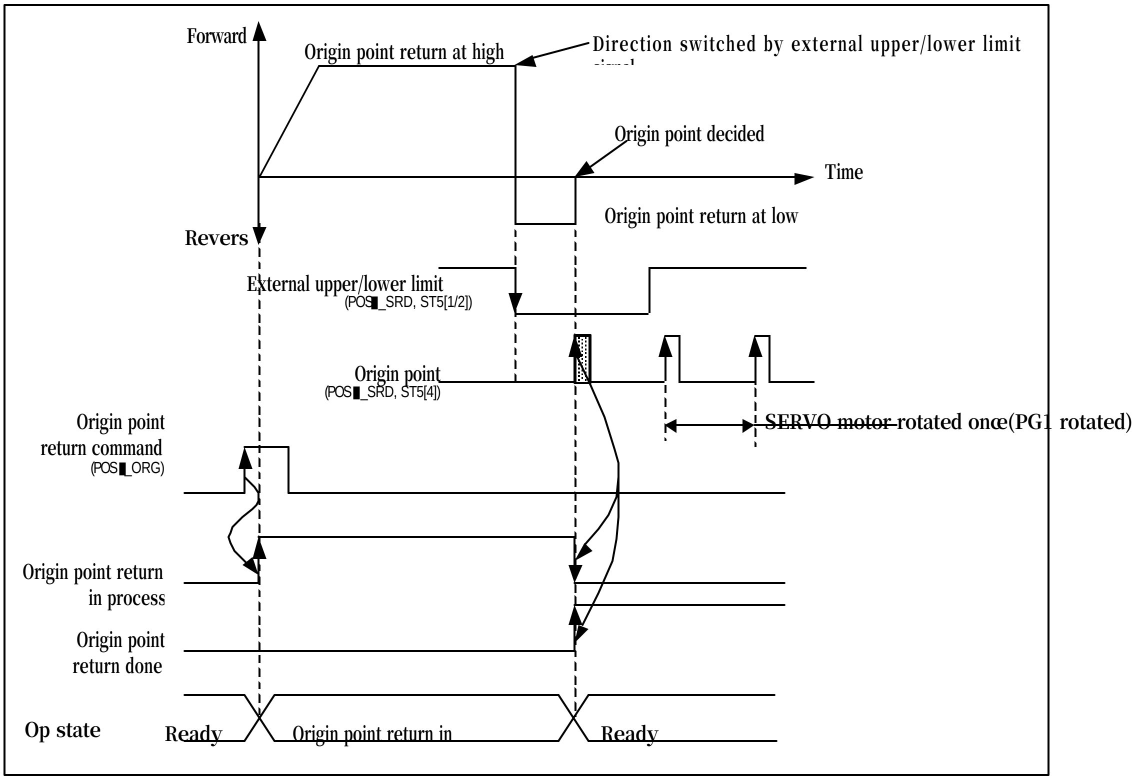
1) If approximate starting point signal is once turned "On", starting point is promptly decided by starting point signal input regardless of approximate starting point signal of "On" or "Off" during starting point return-operation at low speed via high speed and deceleration stage.
In other words, starting point is not decided by starting point signal while starting point return-speed is decelerated.

2) If faced by outer input top/bottom limit signal prior to starting point after approximate starting point signal is changed from "Off" to "On", the operation is the same as in 1 of 3.6.1.

3) If starting point signal's "On" time is short, t is hard for position-decision module to identify.

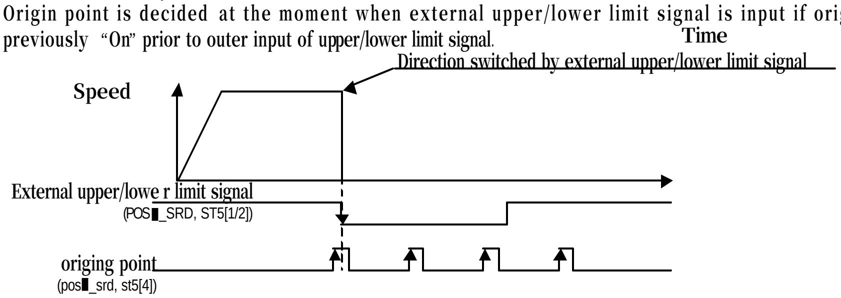
3.5.4 Origin point detection by origin point and upper/lower limit

This method is available if external upper/lower limit signal and near zero point signal are adhered closely to each other.



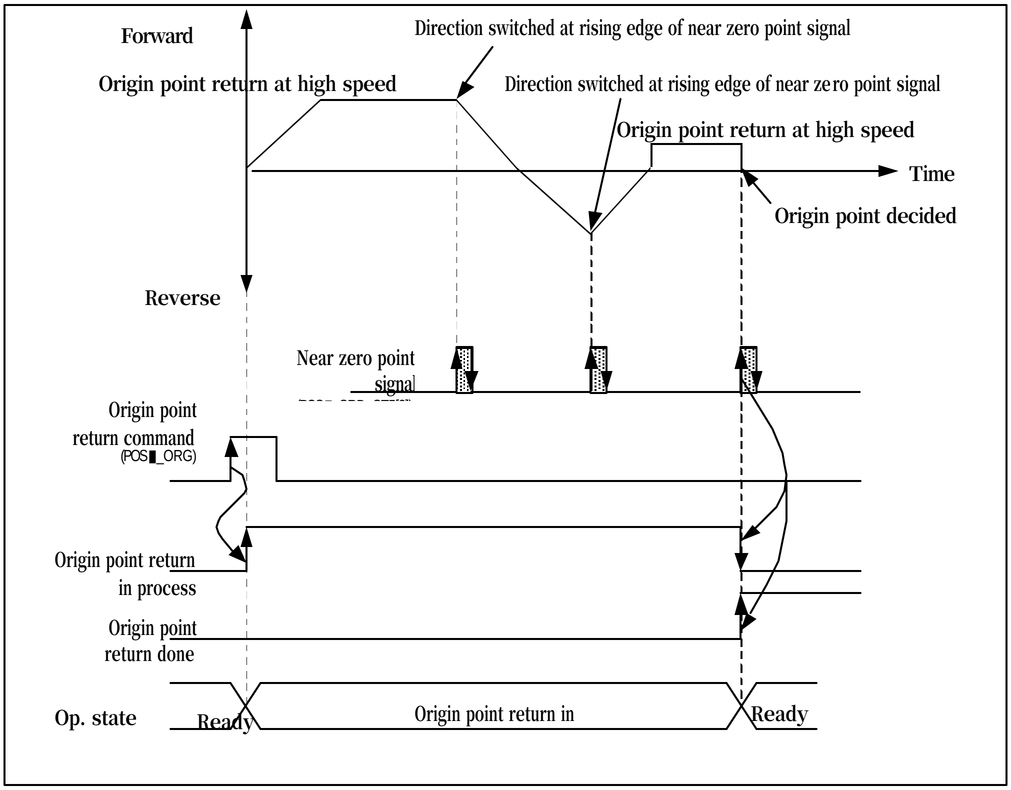
Remark

1. Origin point is decided at the moment when external upper/lower limit signal is input if origin point signal is previously "On" prior to outer input of upper/lower limit signal.



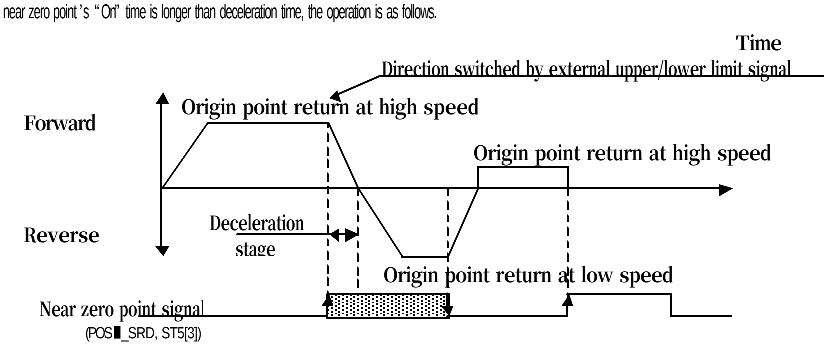
3.5.5 Origin point detection by near zero point.

This method is used to decide origin point only by near zero point.



Remark

1. If near zero point's "On" time is longer than deceleration time, the operation is as follows.



3.6 Manual operation

Manual operation includes JOG operation, manual pulse generator operation, inching operation, and position shift prior to Manual operation.

3.6.1 JOG operation (POSꙁ_JOG: level input)

1) JOG operation

▶controls positioning by jog command[POSζ_JOG].

▶monitors position address value if changed by positioning operation through JOG command.

▶Information on JOG operation is displayed at 6^{th} and 7^{th} bits of output parameter ST2 in present operation state's Bit information Read function block[POSζ_SRD]

▷ 6^{th} bit of output parameter ST2 in present operation state's Bit information Read function block :

On: in JOG operation at low speed Off: in stopping of JOG operation at low speed

▷ 7^{th} bit of output parameter ST2 in present operation state's Bit information Read function block :

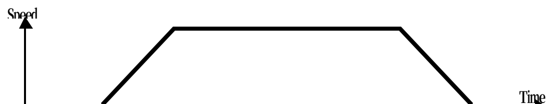
On: in JOG operation at high speed Off: in stopping of JOG operation at high speed

▶used when operated without origin point decided.

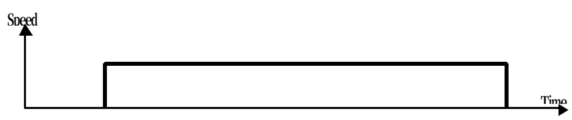
2) Acceleration/deceleration processing and jog speed

(1) Acceleration/deceleration processing is controlled as based on the time set to acceleration time and deceleration time among parameter setting items in S/W package.

▶ JOG operation at high speed: with acceleration/deceleration pattern.



▶ JOG operation at low speed: without acceleration/deceleration pattern.



(2) If JOG speed is set exceeding the setting range, error occurs and operation is impossible.

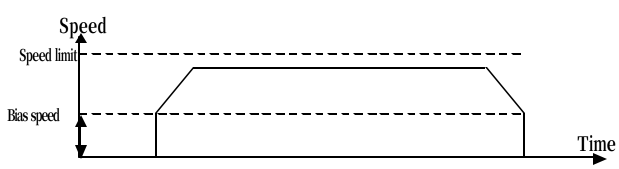
Setting range	JOG operation at high speed	1 20,000 (10 200,000 pps)	(Setting unit:10pps)
	JOG operation at low speed	1 10,000 (10 100,000 pps)	

Remark

Caution items for JOG speed setting are as follows.

1) Jog at high speed shall be carefully set as below.

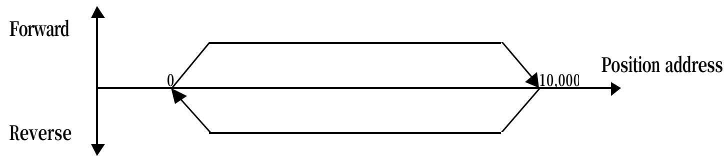
bias speed ≤ JOG at high speed ≤ speed limit

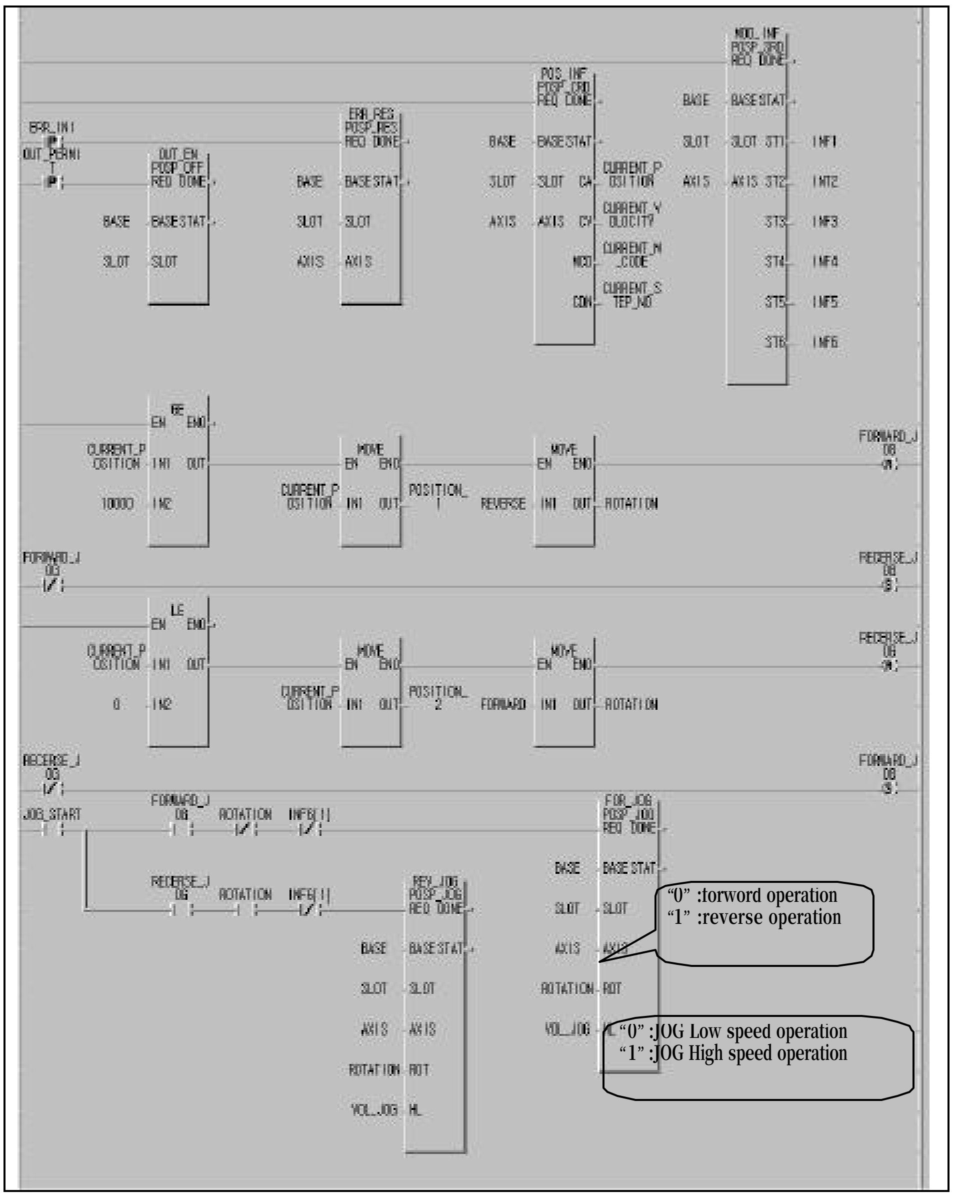


JOG at low speed can be operated regardless of bias speed and speed limit.

3) Programming example

Condition : To be repeatedly operated between random position" 0 "and " 10,000 "





program 3.7 JOG operation

Remark

▶JOG command function block operation starts JOG operation if detected input parameter"REQ" level is "On" and stops if "Off".

▶If JOG speed is too fast in program 3.7, error in position address value may occurs during repeated operation between position" 0"and " 10,000".

3.6.2 Operation of manual pulse generator (POSz_MPG:rising edge -)

1) Operation of manual pulse

▶controls positioning by pulse input from manual pulse generator.

▶used for manual accurate positioning.

2) Operation of manual pulse generator

(1) If permission command of manual pulse generator operation (**POSz_MPG**rising edge ↑**)**is executed, manual pulse operation is in permission state.
From now on, positioning control is operated by pulse input from manual pulse generator.

(2) After permission command of manual pulse generator operation (**POSz_MPG**rising edge ↑**)**is executed, manual pulse operation is in prohibition state by the following operation(start command, origin point return command, interpolation operation, JOG operation, Inching operation)

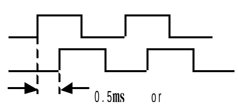
(3) Operated regardless of starting point decided or undecided.

(4) Pulse input from manual pulse generator is incremental or decrement at present position.

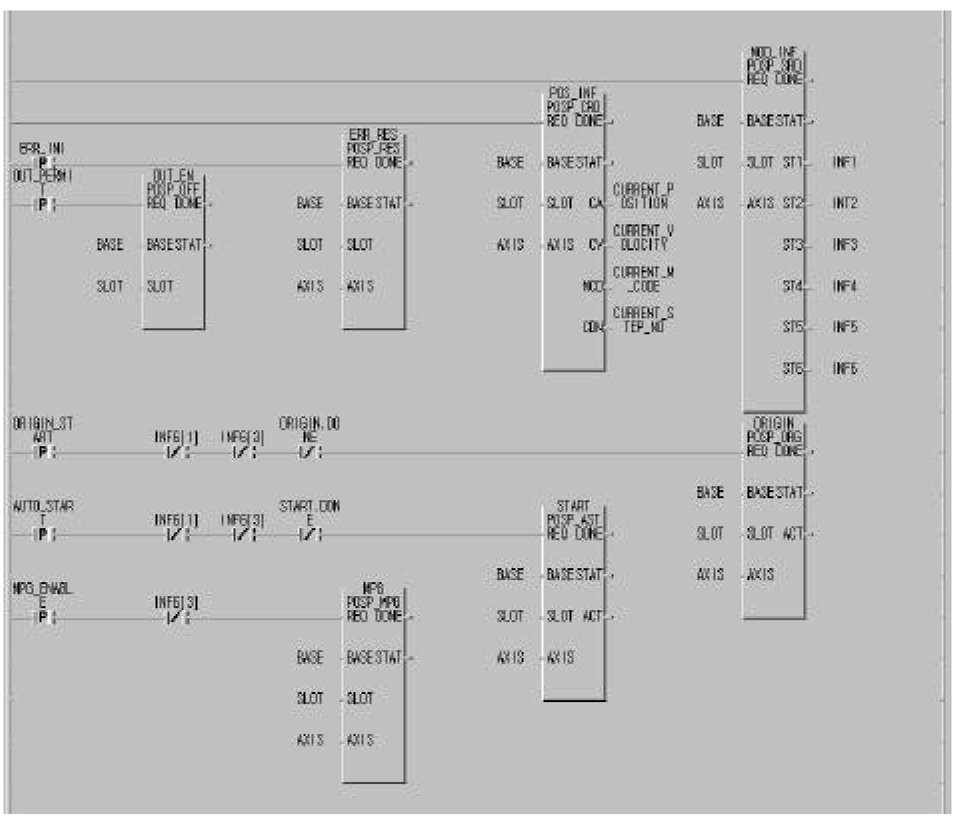
(5) Shift direction is decided according to phase difference.

▷Forward position decided : If phase A input pulse is ahead of phase B input pulse

▷Reverse position decided : If phase B input pulse is ahead of phase A input pulse



If phase A input pulse is ahead of phase B input pulse,
position address value is increment
If phase B input pulse is ahead of phase A input pulse
position address value is decrement



Program 3.8 Manual pulse generator

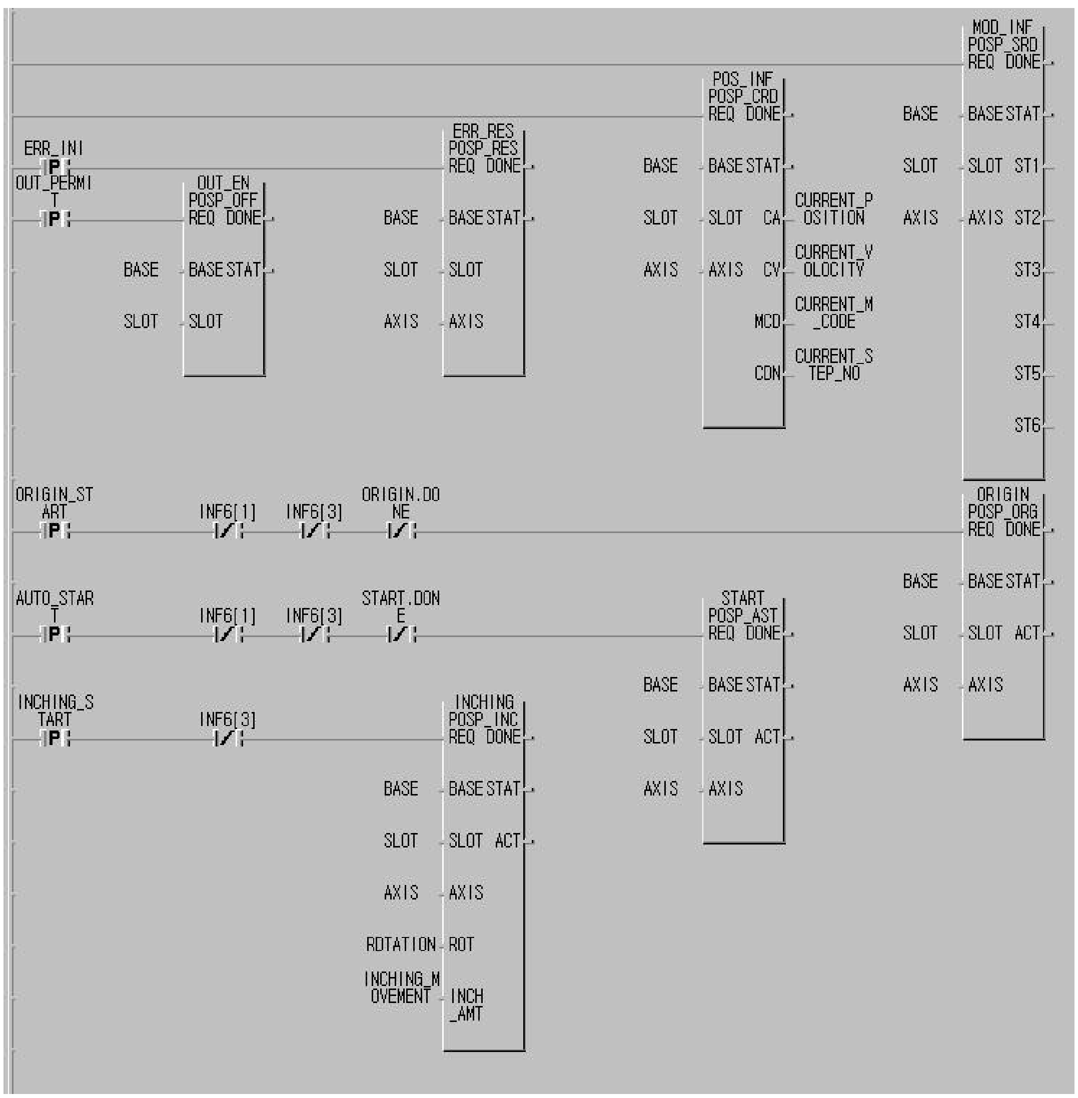
3.6.3 Inching operation(POSz_INC:rising edge -)

▶ One of manual operation methods used to process minute move as determinate operation.

▶ JOG command operation is hard to move to exact position because operation starts and stops according to the command, but via the inching command with travel value easily set as desired the target is easy to reach.

▶ Thus, after rapid move near to work position by JOG command(**POSz _JOG**), perform operation by inching command for minute move to the exact work position to reach.

▶ Setting range is 1 99 pulse, and shift speed is set to 50pps.

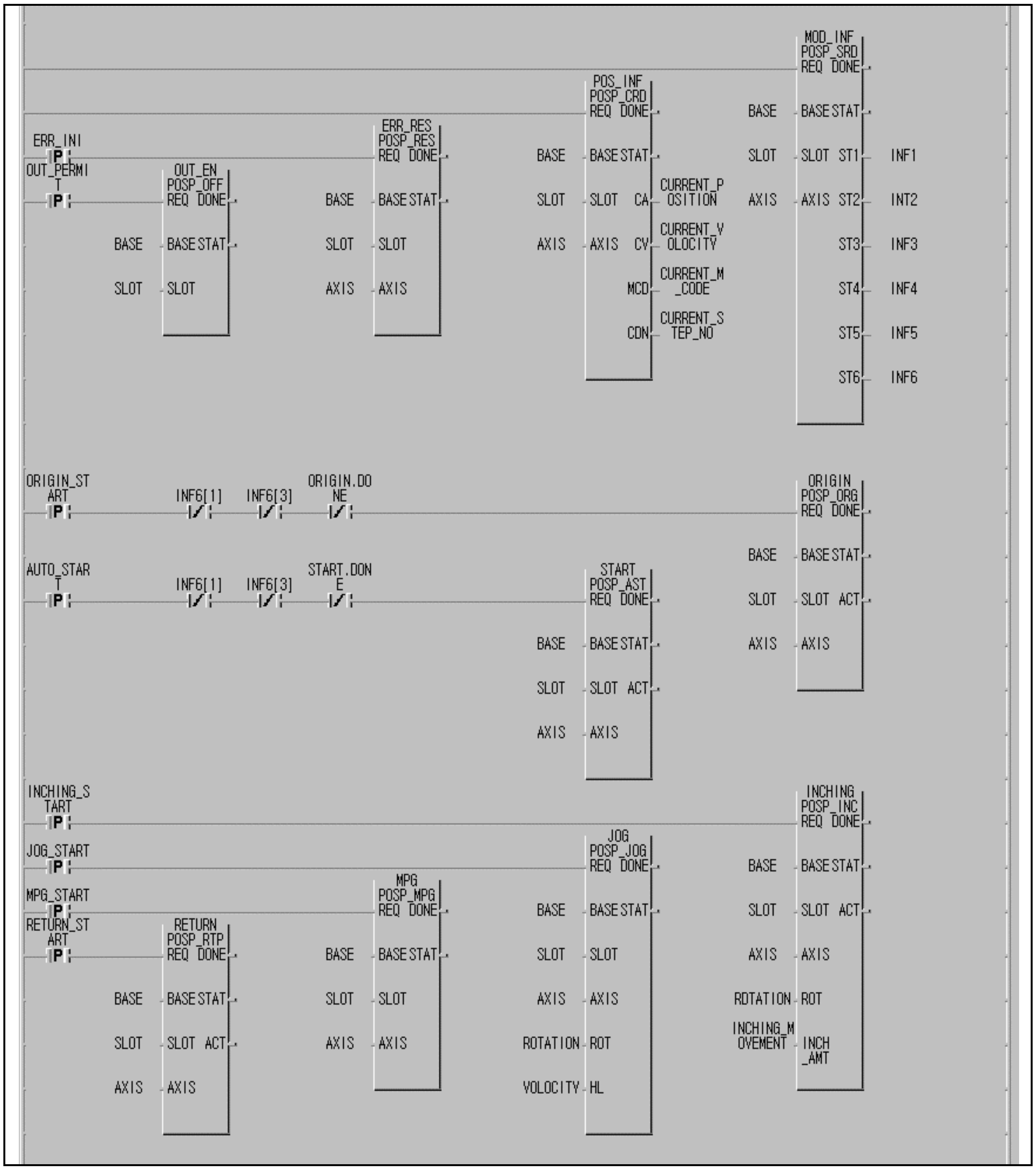


Program 3.9 Inching operations

3.6.4 Shift to prior position to manual operation (POSz _RPT:rising edge -)

▶A function used to return to prior position address to manual operation(JOG operation, Inching operation, manual pulse generator operation) when the position is changeed into manual operation.

▶Shift speed is set to 30Kpps.



Program 3.10 Shift to prior position to manual operation

Remark

▶If present position address value is "A" and position address value changed by manual JOG operation and Inching operation is "B"during operation, return to prior position of "A" to manual operation is performed by shift (POS ζ_ORG:rising edge ↑)command to prior position to manual operation.

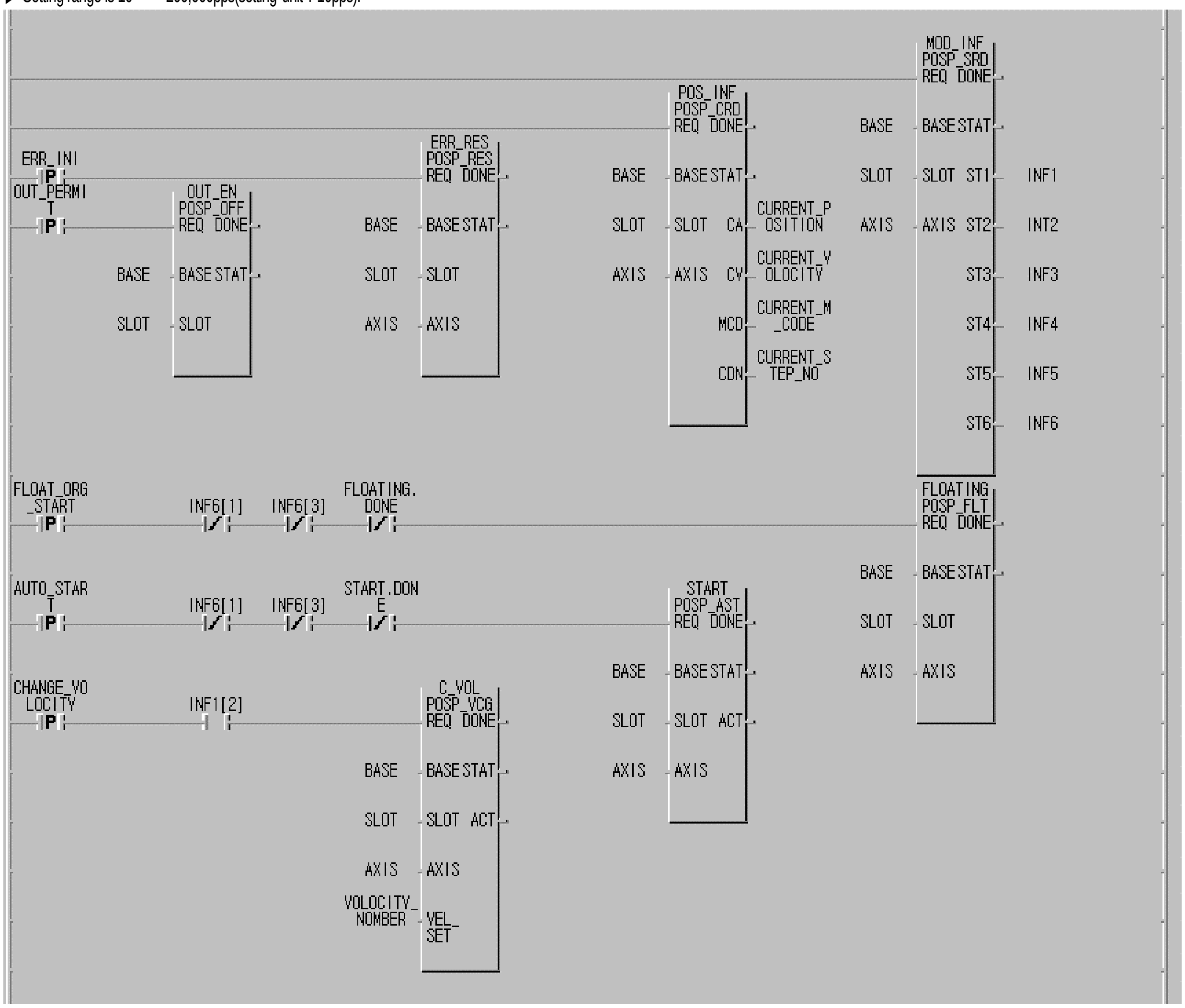
3.7 Speed change in positioning operation

3.7.1 Speed change command(POSz_VCG:rising edge -)

▶Speed change is allowed only at constant stage among operation patterns with available operation modes of single operation, repeated operation and auto-operation, which used also for JOG operation at high speed and origin point return operation at high speed.

(However, G4F-POPB & G6F-POPA are available for constant operation mode.)

▶Setting range is 10 200,000pps(setting unit : 10pps).



Program 3.11 Speed change

Remark

▶Take precautions, if the difference between present speed value used in oper ation and newly changed speed value by speed change(POS ζ_VCG:rising edge ↑) is too large, separation may occur.

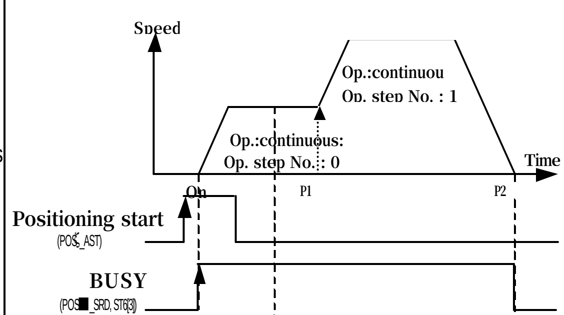
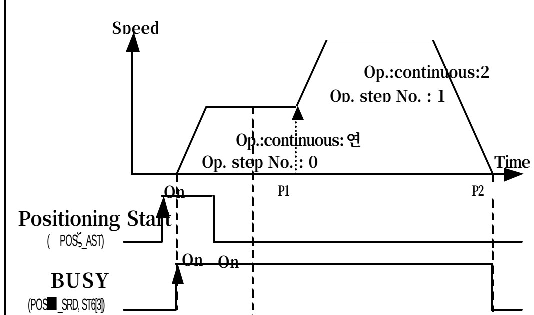
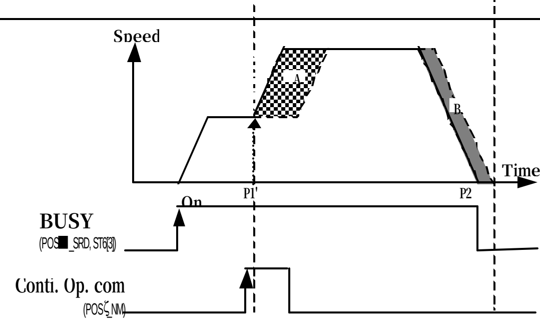
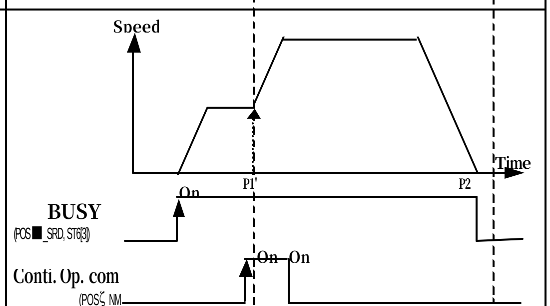
▶If reaching time to target position right after speed value is changed by the speed change is over 65,535 ms, error 89 occurs. Also, if restarted after removal of error causes at this time, operation step No. drives the operation step No. of "presently operated step No.+ 1"

3.7.2 Operation step No. change by continuous operation(POSζ_NM)

▶Used only if operation mode is continuous operation andat constant stage among operation patterns.

▶If continuous operation(POSζ_NM)command is used during operation, the operation is performed as shifted from presently operated step No. to the next operation step No.

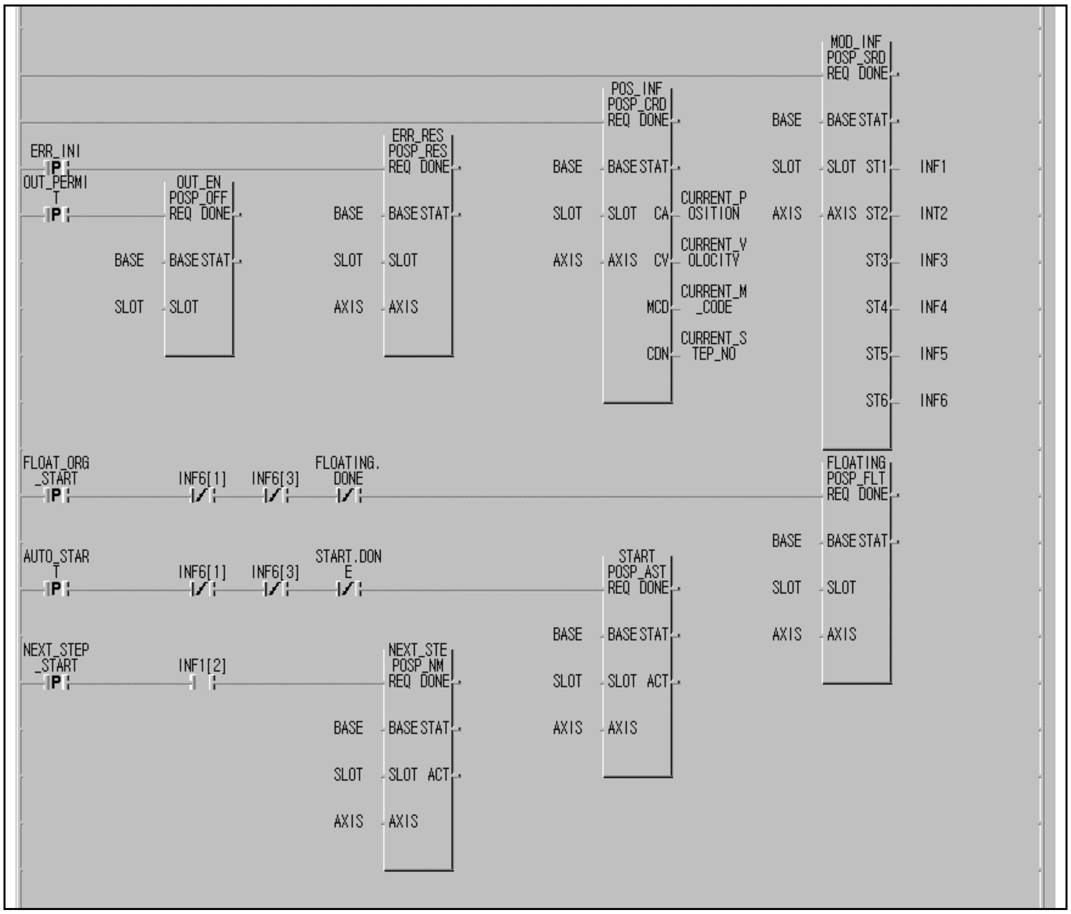
▶Continuous operation command is performed differently according to Absolute Coordinates and Relative Coordinates in position data setting.

	▶ If used in Absolute Coordinates	▶ If used in Relative Coordinates
If continuous op. command not used		
If continuous op. command used	 ▷ Area of "A" is the same as that of "B". ▷ Present position decided by continuous operation command becomes P2.	 ▷ Set target position is P1 + P2, but present position decided by continuous operation command becomes P1' + P2.

Remark

▶If decided position amount is too smaller than operation speed in continuous operation mode, error 106 occurs because calculation is unavailable. Please set operation speed of the step which was set to continuous operation mode a little lower.

▶Operation mode which can use operation step No.change by continuous operation(POS ζ_NM) is continuous operation, and the next available operation modes for the operation step are single operation, repeated operation and continuous operation.
If any other operation mode is used, error 36 occurs.



Program 3.12 Operation step No. change by continuous operation (POSζ_NM)

3.7.3 Speed change by speed override(POSζ_OR)

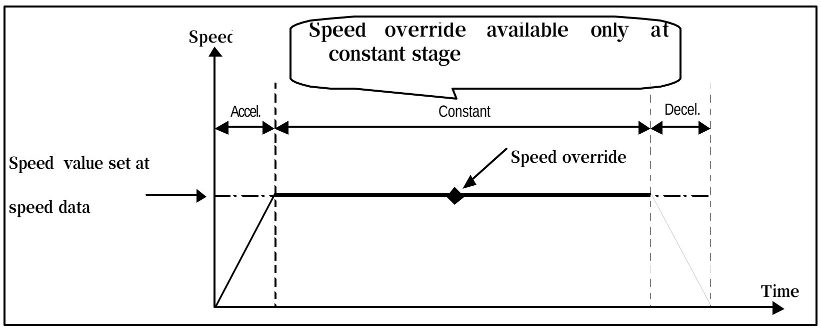
▶The override shall be set to allowable per applicable operation step at position data of S/W package for application of speed override Error 60 may occur if operated with override prohibited in the applicable operation step.at this time

▶Use only at constant staged operation pattern, if not, error 56 occurs.

▶Setting range is 1   15(setting unit: 10%). If speed is changed to other value than setting range, error 67 occurs.

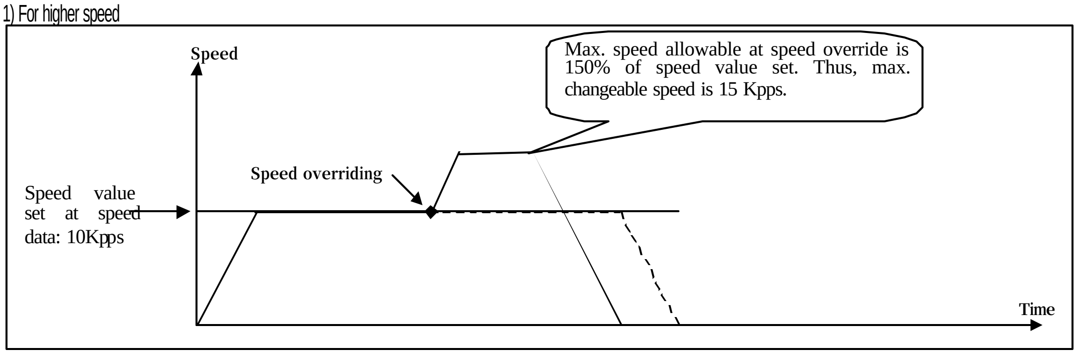
[Ex.] If speed data value is set to 2000, the speed is 20Kpps and if speed override is set to 15 (150%), the speed is 20,000 X 1.5=30,000 (30Kpps).

▶If speed override is to be continuously used, the operation shall be as based on the speed value as set at speed data.

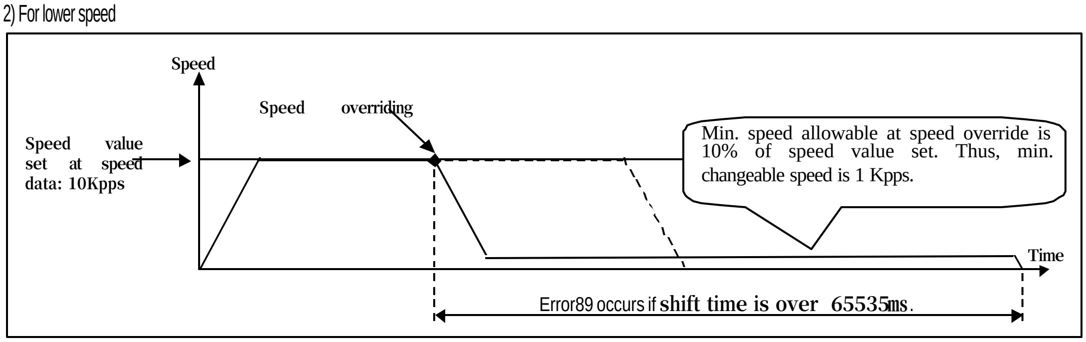


▶Take the following precautions for speed override application.

1) For higher speed



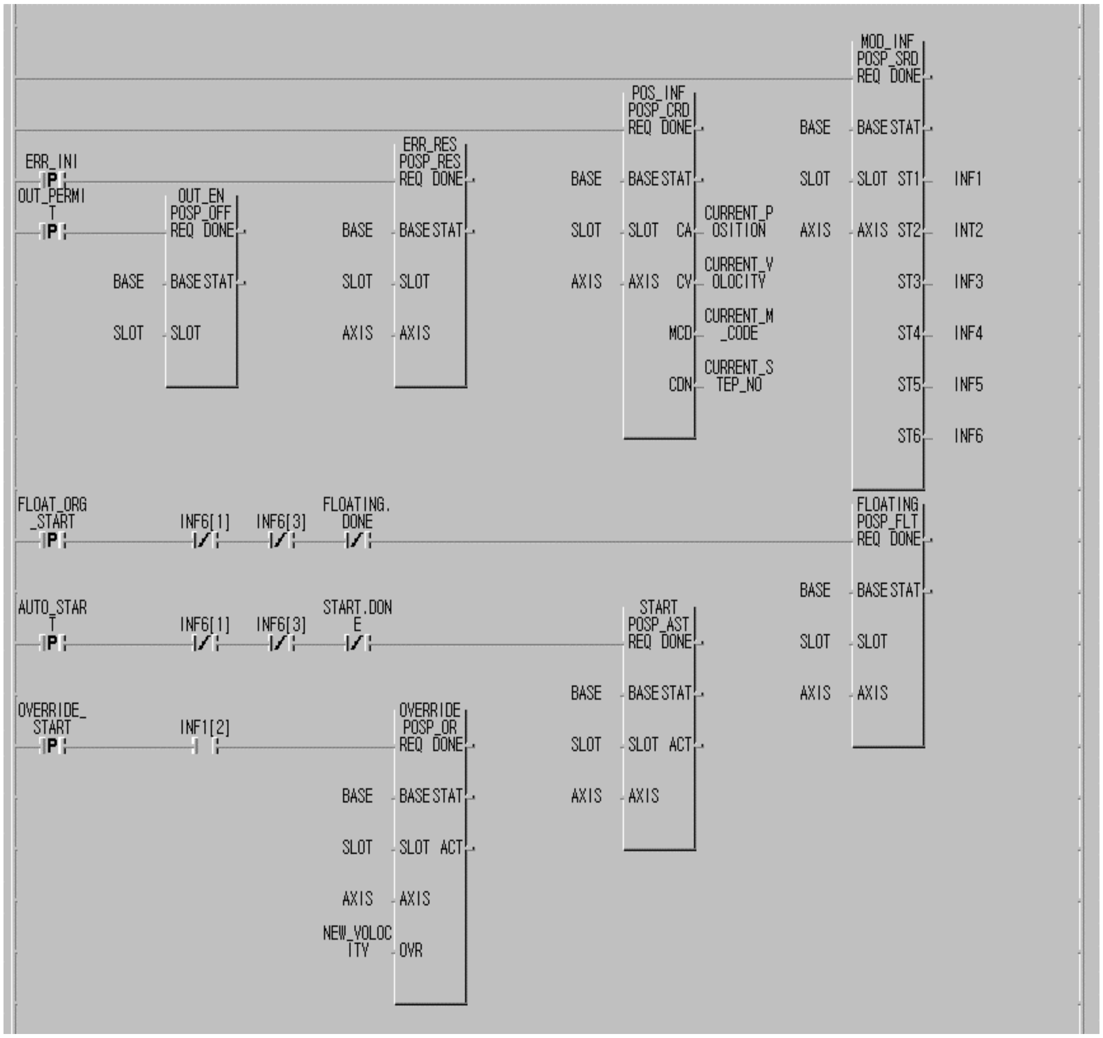
2) For lower speed



Remark

▶Caution shall be exercised for lower speed by speed override.
If reaching time to changed speed is over 65535ms in comparison with the left value from speed overriding point to target address, error 89 occurs.

▶Operation modes available for speed override are single operation, repeated operation and auto-operation.
Error 57 occurs for the other operation modes and error 59 occurs if speed override is used when the operation
Is not by start command.



Program 3.13 Speed override

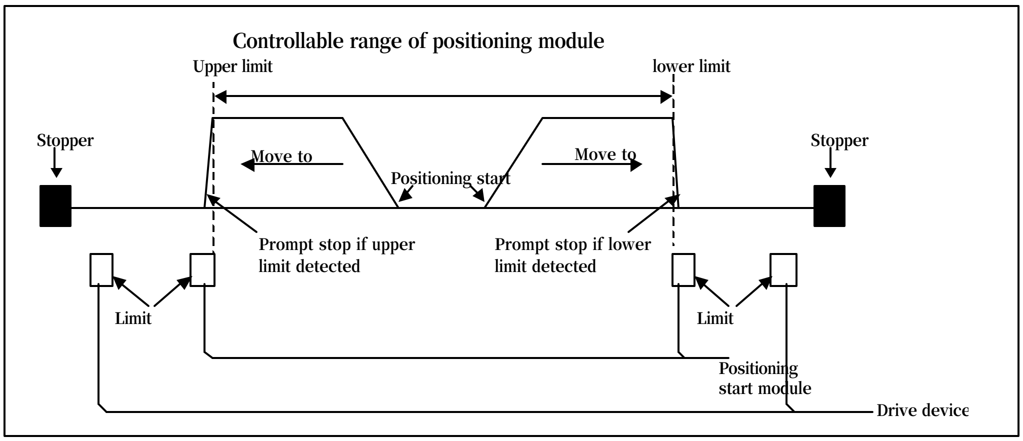
3.8 Upper/lower stroke limit

Positioning module includes external input stroke limit (external input upper limit signal, external input lower limit signal) and S/W stroke limit (S/W upper limit, S/W lower limit).

3.8.1 Outer input upper/lower stroke limit

▶Outer stroke limit includes external input upper limit signal and external input lower limit signal via external input connector of positioning module.

▶Stroke limit of positioning module is to be installed inside stroke limit/stroke end of the drive device for positioning module to stop it promptly before reaching to stroke limit/stroke end of the drive device.
Error23 if over top limit and error22 if below bottom limit may occur.



▶Positioning operation is not available if positioning module is stopped out of controllable range.
Move positioning module inside the controllable range by manual operation(JOG operation, inching operation, manual pulse generator operation) if stopped by external input stroke limit detection.

▶Output-prohibited can be cancelled and manual operation can be executed even if out of the stroke range because external input upper/lower stroke limit error is detected by the edge at positioning module.

▶Information on external input upper/lower stroke limit is displayed at 1st and 2nd bits of output parameter ST5 in present operation state's Bit information Read function block[POS_SRD].

▷1st bit of output parameter ST5 in present operation state's Bit information Read function block :

On: external input upper stroke limit undetected Off: external input upper stroke limit detected

▷2nd bit of output parameter ST5 in present operation state's Bit information Read function block :

On: external input lower stroke limit undetected Off: external input ;lower stroke limit detected

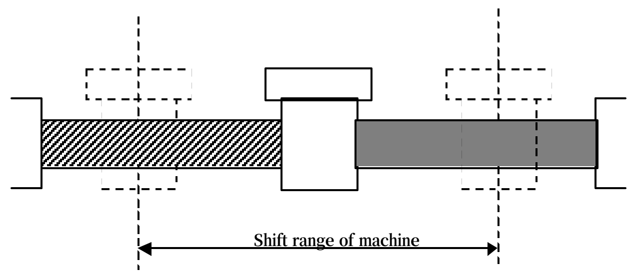
Remark

▶Both upper/lower limit signals are not detected if either upper or lower limit is just used as connected with the sensor in connection with external input upper/lower stroke limit.
Please connect the signal surely to B contact if not used.

3.8.2 S/W upper/lower stroke limit

▶S/W upper/lower stroke limit is for a function not to execute positioning if operated out of upper/lower stroke limit setting range which is set at parameters of S/W package.

▶Range check of upper/lower stroke limit is performed at operation start and during operation.



▶Function not to execute positioning by its applicable command if operated out of the setting range.

▶Information on S/W upper/lower stroke limit is displayed at 0th and 1st bits of output parameter ST2 in present operation state's Bit information Read function block[POS_SRD].

▷0th bit of output parameter ST2 in present operation state's Bit information Read function block :

On: external input upper stroke limit detected Off: external input upper stroke limit undetected

▷2nd bit of output parameter ST2 in present operation state's Bit information Read function block :

On: external input lower stroke limit detected Off: external input lower stroke limit undetected

Remark

▶S/W upper/lower stroke limit is not detected at starting point undecided.

▶If output-prohibited occurs by upper/lower limit error, origin point return shall be reexecuted after moving to starting stroke area by a manual operation like JOG operation because it is switched over to origin point-undecided state .

3.9 Random-positioned address value setting to origin point and present position change

3.9.1 Random-positioned address value setting to origin point

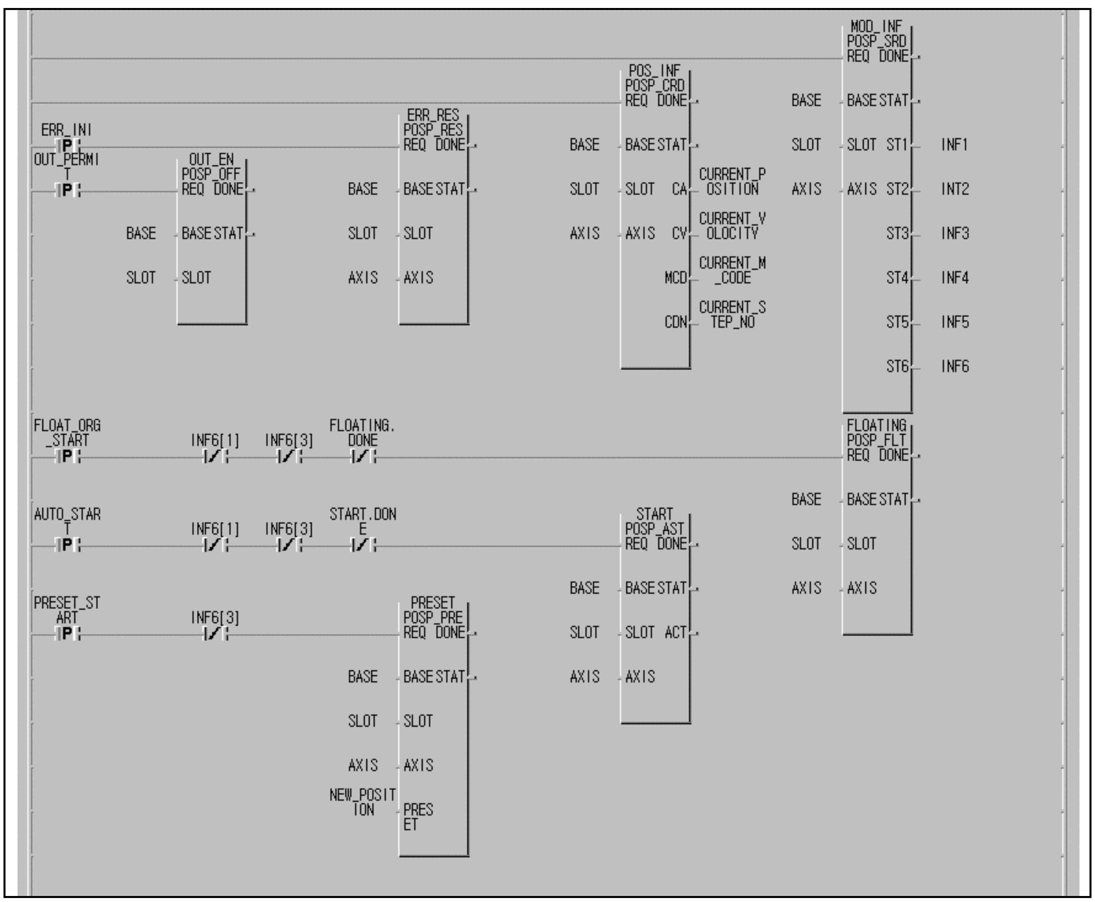
▶Random-positioned address value setting to origin point can be allowed through origin point return-address items at S/W package parameters.

▶Check of random-positioned address value of the set axis can be performed through present operation state's code information Read function block(**POSⅡ-CRD, output parameter CA**) after fixed origin point setting or origin point return is executed.

▶Also, the position present can be identified at S/W package monitor after floating point set setting or origin point return is executed.

3.9.2 Present position change(POSz_PRE:rising edge -)

▶Present position change is to change the present address value to random address value.



Program 3.14 Present position change

3.10 Floating point set setting(POSⅡ-FLT)

▶Used to set present position to origin point compulsorily without origin point return-operation of the machine.

▶The setting position at this time is the value set at origin point return address.

Remark
▶The following caution shall be exercised for program with the origin point fixed because fixed origin point setting(POSⅡ-FLT) decides compulsorily only origin point of the present position by origin point return address. 1. Remove/reset error if occurred, cancell output-prohibited and, 2. Reset the fixed origin point and then, 3. Change operation step No. to operate by operation step No.assignment(POSⅡ-SMC) for starting.

3.11 Teaching function

▶A function to change positioning address value of positioning data's step No. set to positioning address by manual operation (JOG operation, manual pulse generator operation).

▶Teaching function is available only for stopped axis.

▶Convenient for frequent application of position address value and speed value as changed.

▶G6F-POPA has RAM teaching function and ROM teaching function.
G3F-POPA, G4F-POPA and G4F-POPB has only ROM teaching function.

3.11.1 RAM teaching function and ROM teaching function

1) RAM teaching function

Speed value and position address value can be used as changed when positioning module is operated as powered on, while the values are lost if powered off.

.▶Only for G6F-POPA.

2) ROM teaching function

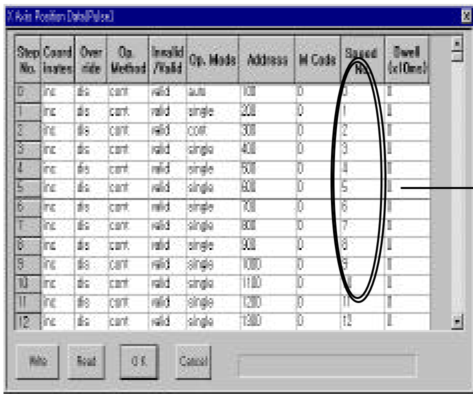
Speed value and position address value can be used as changed when positioning module is operated as powered on, in permanent preservation of the values applied even if powered off..

Remark
▶Be careful that the number of ROM teaching is limited. (available number: 100,000) ▶To increase the application number (with teaching operated step) 1) set 300 operation steps to repeated operation via software package and 2) change operation step No. (POSⅡ-SMC) to the next operation step if the teaching count number reaches 99,000 as compared with 100,000 or below(99,000) in PLC program so to 3) use upto teaching times of 99000X300=29700000.

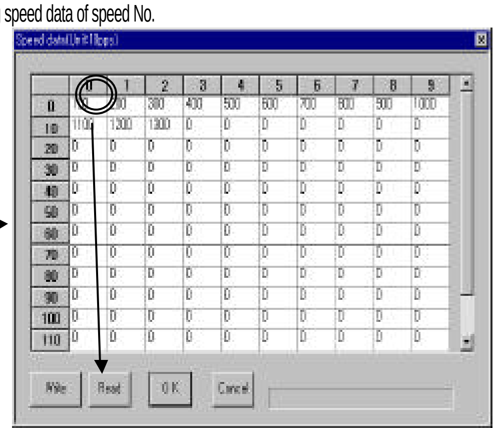
3.11.2 Speed teaching(POSz _VLT:rising edge -)

▶A function to change speed value of the speed No. set at positioning operation step.

▷Setting position data

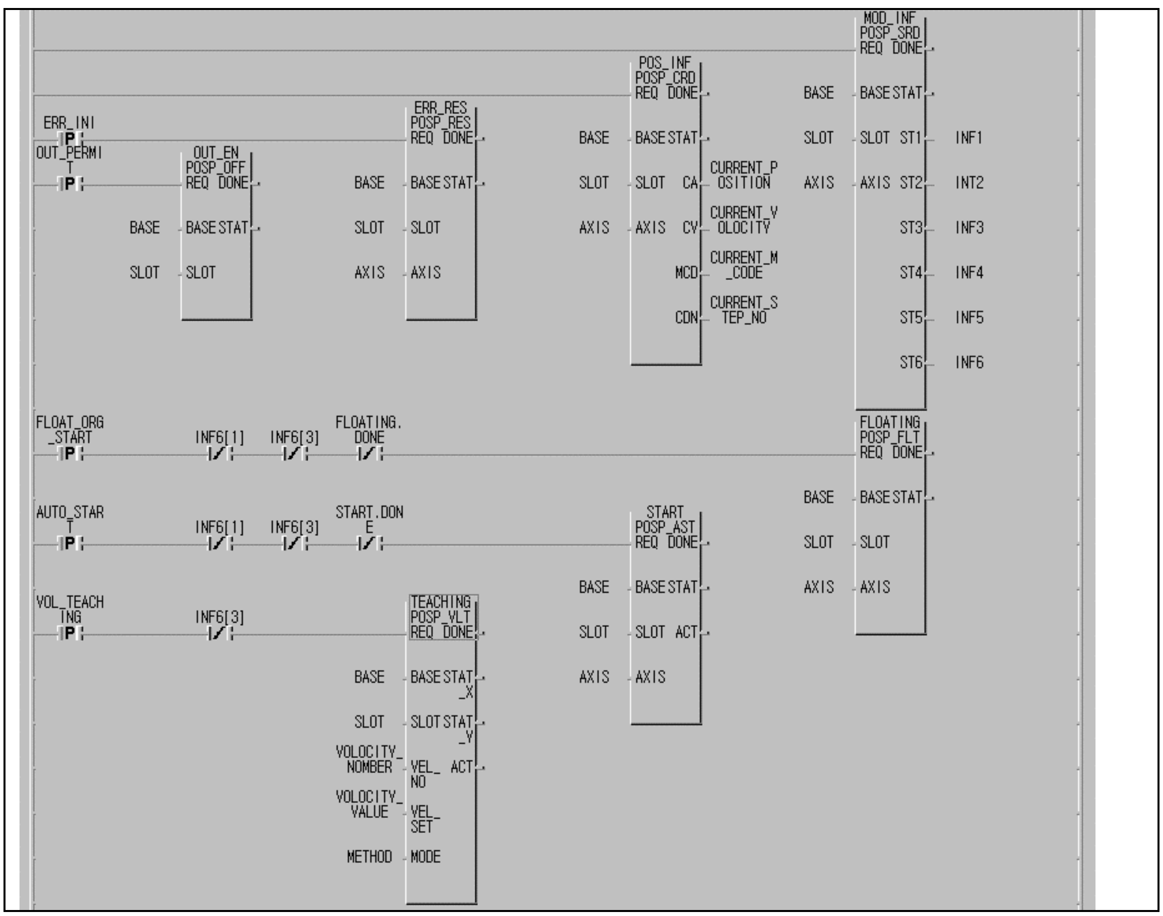


▷Setting speed data of speed No.



Use speed teaching when speed value "100(1Kpps)" of speed No.0 is applied as changed to new value.

▷Program

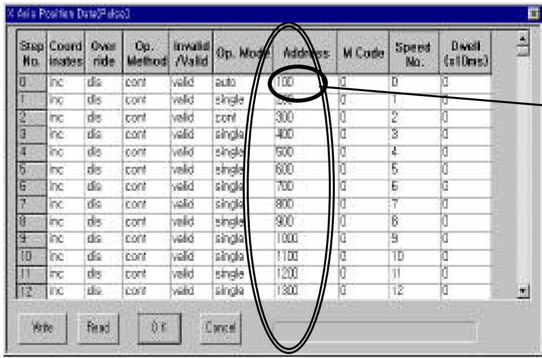


Program 3.15Speed teaching

3.11.3 Position teaching(POSz _TEA:rising edge -)

▶A function to change position address value of position data.

▷Setting position data

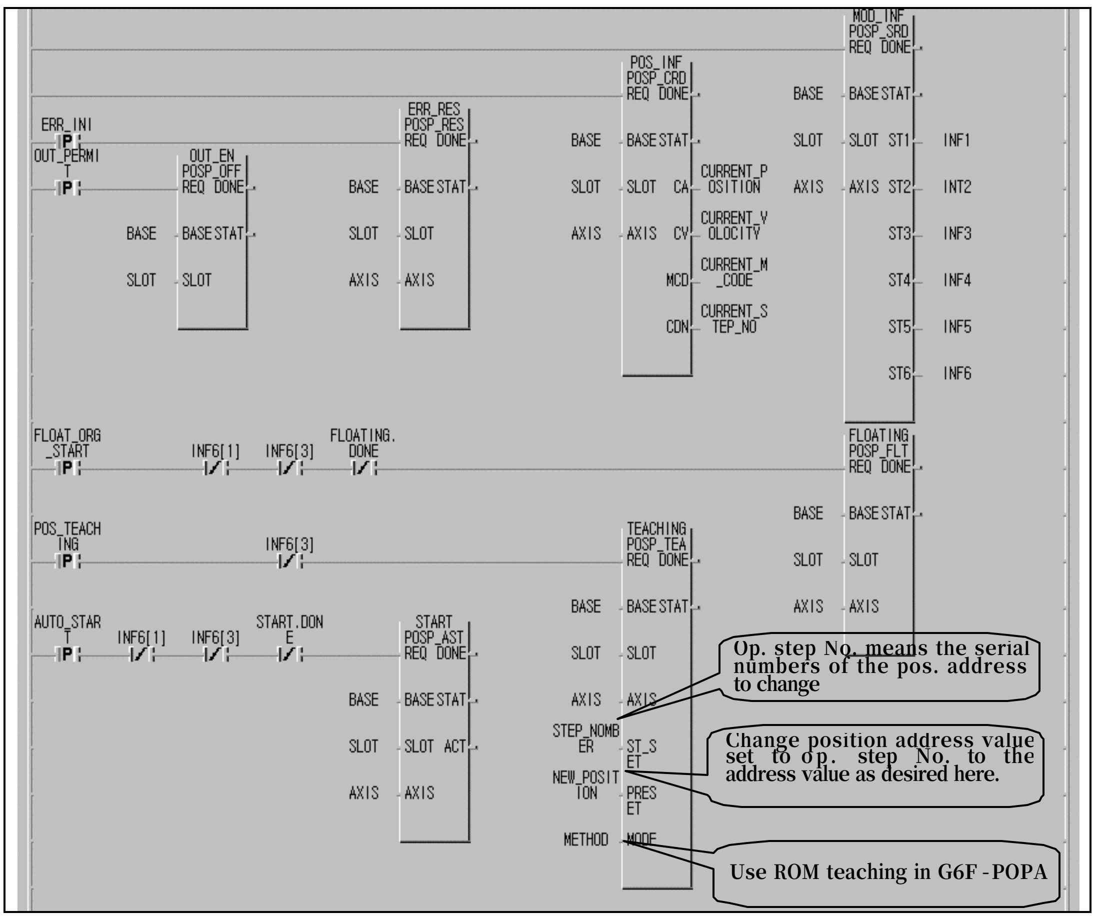

X Axis Position Data(Pulse)

Step No.	Coordinates	Override	Op. Method	Invalid /Valid	Op. Mode	Address	M Code	Speed No.	Dwell (x10ms)
0	inc	dis	cont	valid	auto	100	0	0	0
1	inc	dis	cont	valid	single	[illegible]	0	1	0
2	inc	dis	cont	valid	cont	300	0	2	0
3	inc	dis	cont	valid	single	400	0	3	0
4	inc	dis	cont	valid	single	500	0	4	0
5	inc	dis	cont	valid	single	600	0	5	0
6	inc	dis	cont	valid	single	700	0	6	0
7	inc	dis	cont	valid	single	800	0	7	0
8	inc	dis	cont	valid	single	900	0	8	0
9	inc	dis	cont	valid	single	1000	0	9	0
10	inc	dis	cont	valid	single	1100	0	10	0
11	inc	dis	cont	valid	single	1200	0	11	0
12	inc	dis	cont	valid	single	1300	0	12	0

Write Read OK Cancel

Use position teaching when position address value of position data ‘s operation step No. 0 though set to “100” is applied as changed. If position address value of operation step No. 0 is always to be changed, set operation mode to repeated and change position address value to position teaching (POSζ_TEA) prior to start

▷Program



Program 3.16 Position teaching

3.12 Setting operation step No.(POSⅡ-SMC:rising edge ↑)

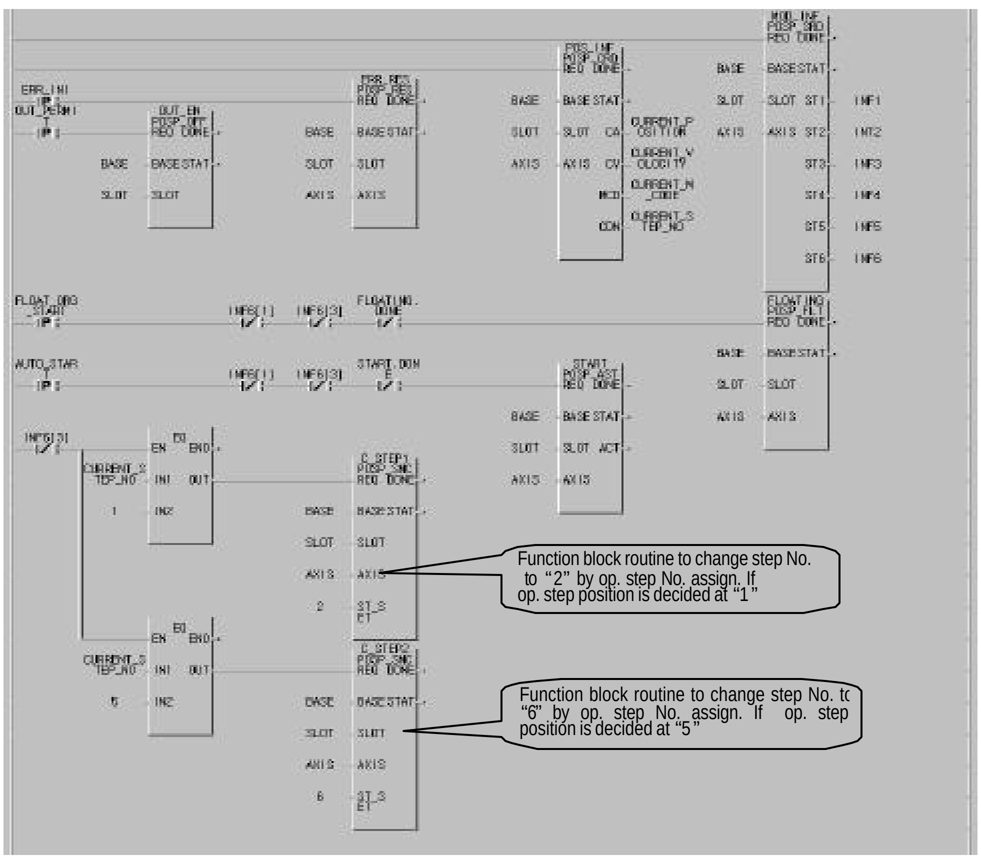
▶This is used to change operation step number to execute, which is available only when stopped.

▷Setting in S/W package

Number of program Positioning start		Coordinates	Override	Operation method	Invalid/valid	Operation mode	Address	M code	Speed No.	Dwell (x 10ms)
1	0	Relative	Disable	Continuous	Valid	Single	100	0	0	0
2	1	Relative	Disable	Continuous	Valid	Repeated	200	0	1	0
Number change by setting operation step No.[POSⅡ_SMC:rising edge -] : “2”										
3	2	Relative	Disable	Continuous	Valid	Auto	1000	0	2	0
	3	Relative	Disable	Continuous	Valid	Auto	2000	0	3	0
	4	Relative	Disable	Continuous	Valid	Auto	3000	0	4	0
	5	Relative	Disable	Continuous	Valid	Repeated	4000	0	5	0
Number change by setting operation step No.[POSⅡ_SMC:rising edge -] : “6”										
4	6	Relative	Disable	Continuous	Valid	Repeated	10000	0	6	0

Afterthis, only operation step No. “6” is repeatedly operated if only continuous positioning start(POSⅡ-AST) is used without number change.

▷Program



Program 3.17 setting operation step No.[

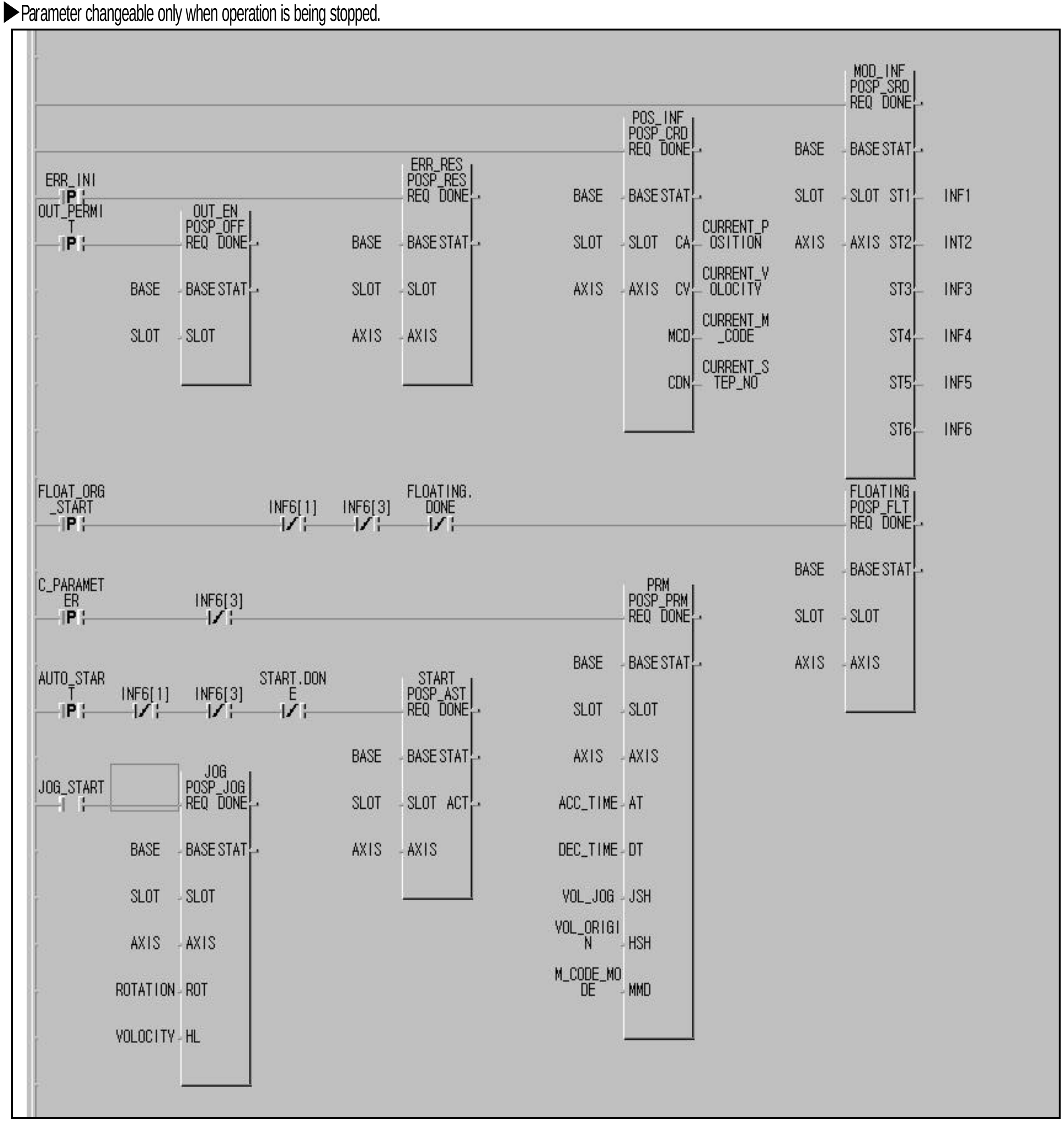
3.13 Parameter change in program (POS■-PRM:rising edge↑)

▶Some of parameters set in S/W package can be changed by parameter change command(POS■-PRM:rising edge↑).

▶Changeable items are as follows.

Items	Setting range	Description
Acceleration time	1 999	Acceleration time changeable between 10 9990ms.
Deceleration time	1 999	Deceleration time changeable between 10 9990ms.
High speed of JOG	1 20,000	High speed of JOG changeable between 10 200,000pps.
High speed of origin point return	1 20,000	High speed of origin point return changeable between 10 200,000pps.
M code mode	0 2	0 : With mode used 1 : After mode used 2 : M code mode not used

▶Parameter changeable only when operation is being stopped.

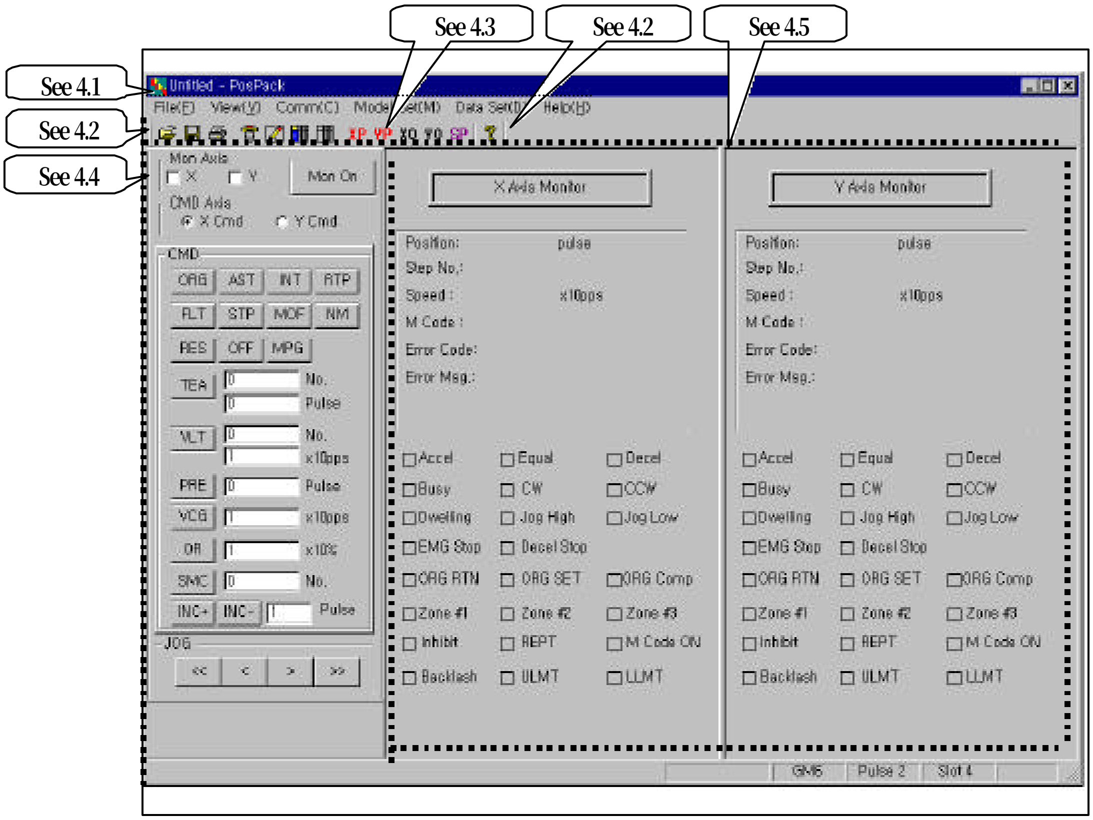


Program 3.18 Parameter change

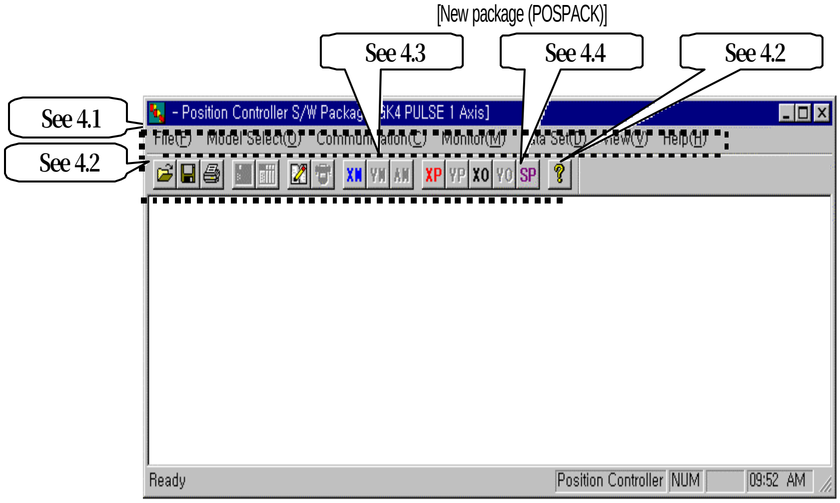
Chapter 4 S/W package

▶ Details of S/W package are described.

▶ Be careful that S/W package is changed from POSITION to POSPACK with its terms modified also.



[New package (POSPACK)]

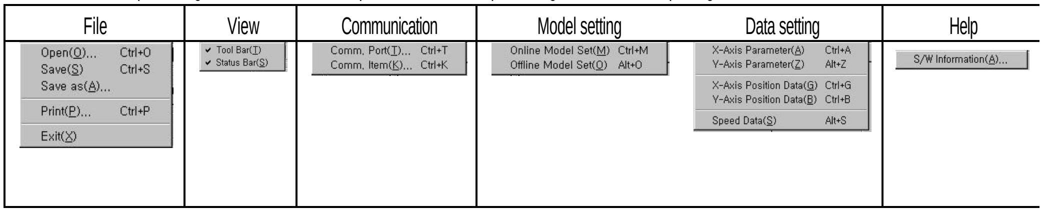


[Old package (POSITION)]

Chapter 4 S/W Package

4.1 Main manu bar

Control area of positioning files and communication ports to connect with positioning module and S/W package.



4.1.1 File

1) Open

▶Command to open a file prepared by S/W package.

▶Extension cord of the file is " *.PLS".

2) Save

▶Command to save a file prepared by S/W package.

3) Save another name

▶Command to save a file prepared by S/W package in another name.

4) Print

▶Command to print a file prepared by S/W package with the following 5 items as selected.

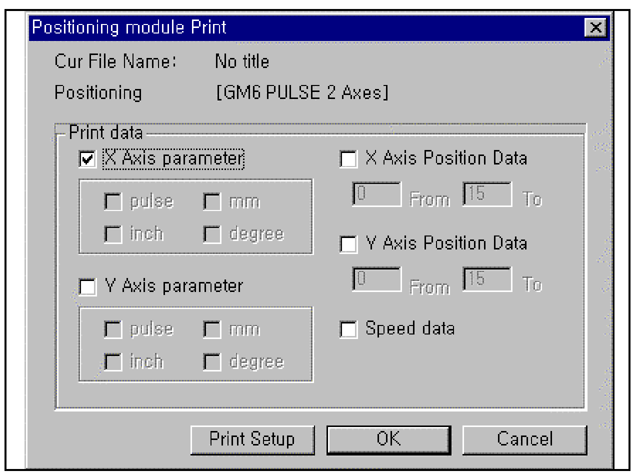
(1) X-axis parameter

(2) Y-axis parameter

(3) X-axis position data

(4) Y-axis position data

(5) Speed data



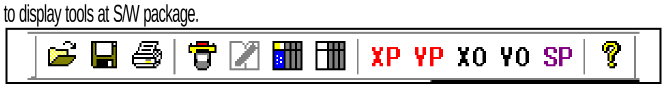
5) Close

▶Command to close S/W package program.

4.1.2 View

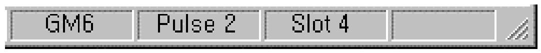
1) Tools

▶Command to display tools at S/W package.



2) State display

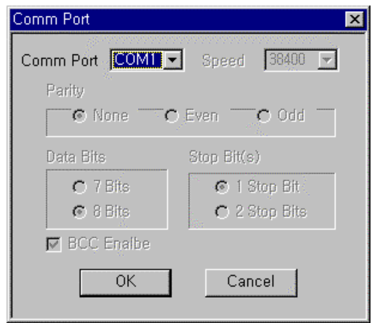
▶Command to display the state bar at the left bottom of S/W package



4.1.3 Communication

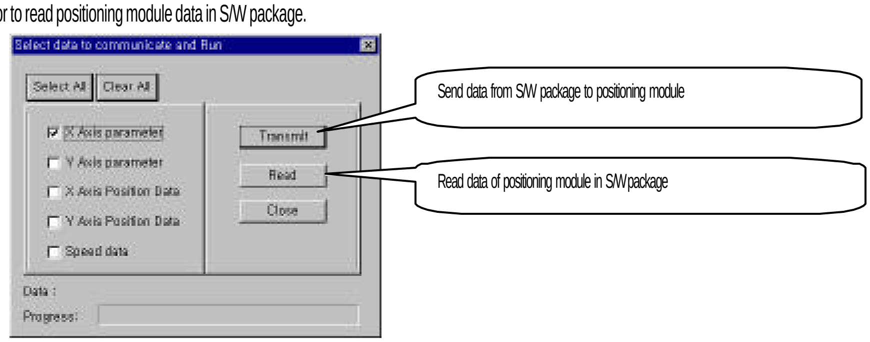
1) Communication port

▶Command to set serial communication port between computer and positioning module.



2) Communication items

▶Command to select and send parameters, position data and speed data set in S/W package to positioning module or to read positioning module data in S/W package.



4.1.4 Model setting

1) On-line model setting

▶Used for processing S/W package data with positioning module equipped.

▶Pre-operation and monitoring of each axis are available only if set to On-line model.

2) Off-line model setting

▶Used for processing S/W package data without positioning module equipped.

4.1.5 Data setting

▶Data preparing area for operation of positioning module.

▶Refer to Chapter 5 & Chapter 6 for the details.

▶5 types of data are available for the setting.

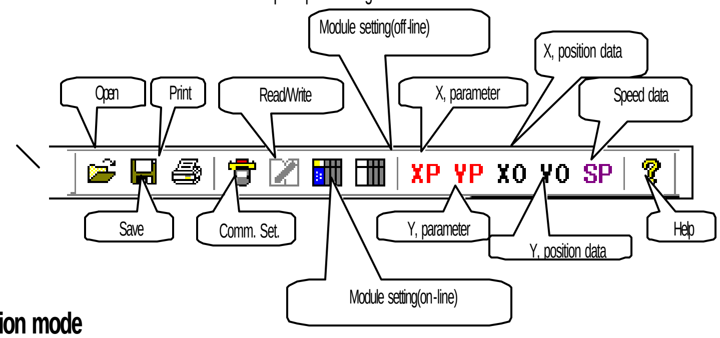
1) X-axis parameter
2) Y-axis parameter
3) X-axis position data
4) Y-axis position data
5) Speed data

4.1.6 Help

▶Area to display the version of S/W package.

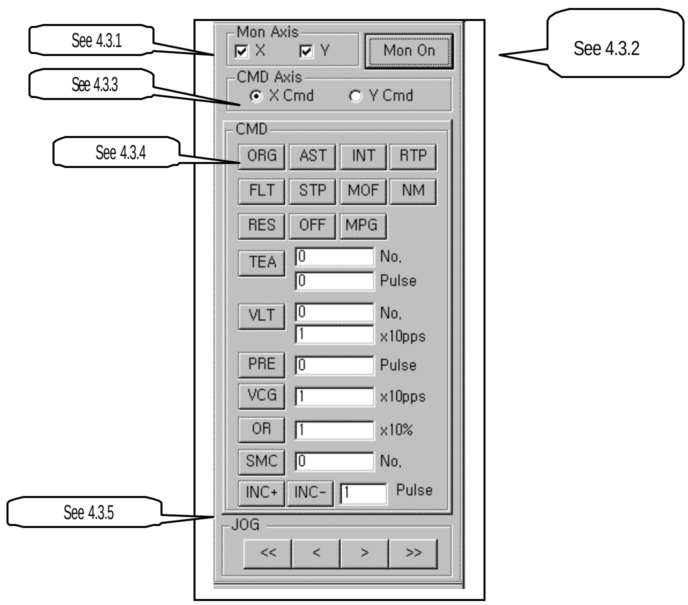
4.2 Shortened icons

Commands in 4.1 are shown via the shortened icons for quick processing.



4.3 Pre-operation mode

Area for preoperation of positioning module through S/W package.



4.3.1 Monitoring axis selection

▶To select an axis desired to monitor by positioning module.

▶① X-axis and ② Y-axis can be selected as available according to the module.

▶If no axis is selected, monitoring can not be executed.

4.3.2 Monitoring start/stop

▶Monitoring starts on the selected axis as specified in 4.3.1.

▶To start monitoring select the icon "**Monitoring start**" which will be changed to "**Monitoring stop**", and to stop monitoring select "**Monitoring stop**" which will be changed to "**Monitoring start**".

4.3.3 Command selection_ selection of the axis to preoperate

▶To select an axis desired to pre-operate or JOG-operate in S/W package.

▶Any selected axis here can be pre-operated in 4.3.4 & 4.3.5.

4.3.4 Pre-operation by S/W package

Shape of S/W package	Icons	Terms	Description of the terms	Related function block
	ORG	Origin	Origin point return-operation	POS ζ_ORG
	AST	Auto Start	Operation start	POS ζ_AST
	INT	Linear Interpolation	Linear interpolation start	POS ζ_INT
	RTP	Return To Position	Return to prior position to manual operation	POS ζ_RTP
	FLT	Floating Point Set	Floating point set setting	POS ζ_FLT
	STP	Stop	Deceleration stop	POS ζ_STP
	MOF	M Code Off	M code off	POS ζ_MOF
	NM	Next Move	Continuous operation	POS ζ_NM
	RES	Reset	Error reset	POS ζ_RES
	OFF	Pulse Out Inhibit	Output-prohibited cancelled	POS ζ_OFF
	MPG	Manual Pulse Generator	MPG allowed	POS ζ_MPG
	TEA	Position Teaching	Position teaching No.(step no.):setting range0 299 Pulse(position address):setting range ± 16,744,447	POS ζ_TEA
	VLT	Velocity Teaching	Speed teaching No.(speed data No.):setting range0 127 X10pulse(speed data):setting range0 20,000	POS ζ_VLT
	PRE	Preset	Present position preset Pulse(position address):setting range ± 16,744,447	POS ζ_PRE
	VCG	Velocity Change	Speed change X10pulse(speed data):setting range0 20,000	POS ζ_VCG
	OR	Override	Speed override X10%:setting range1 15	POS ζ_OR
	SMC	Set Move Data Number Change	Operation step No.assignment No.(step No.):setting range0 299	POS ζ_SMC
	INC+ INC-	Inching(forward) Inching(reverse)	Inching start Pulse(position address):setting range-99 99	POS ζ_INC

▷ Click the icon to execute an applicable command.

4.3.5 Jog operation by S/W package

Shape of S/W package	Icons	Terms	Description of the terms	Related function block
	<<	JOG High Speed Reverse	Reverse high-speed JOG operation	POS ζ_JOG
	<	JOG Low Speed Reverse	Reverse low-speed JOG operation	
	>	JOG High Speed Forward	Forward high-speed JOG operation	
	>>	JOG Low Speed Forward	Forward low-speed JOG operation	

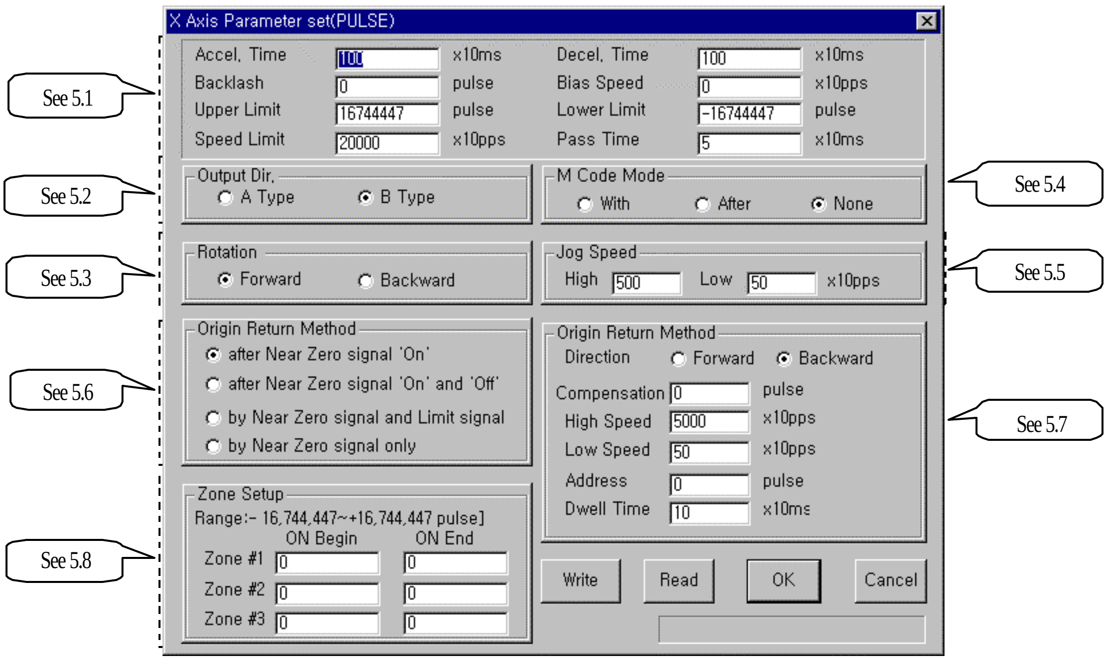
▷ Click the icon to execute an applicable command, and click oncemore to stop the command.

Chapter 5 Positioning parameter

▶Parameters to be set in S/W package are described.

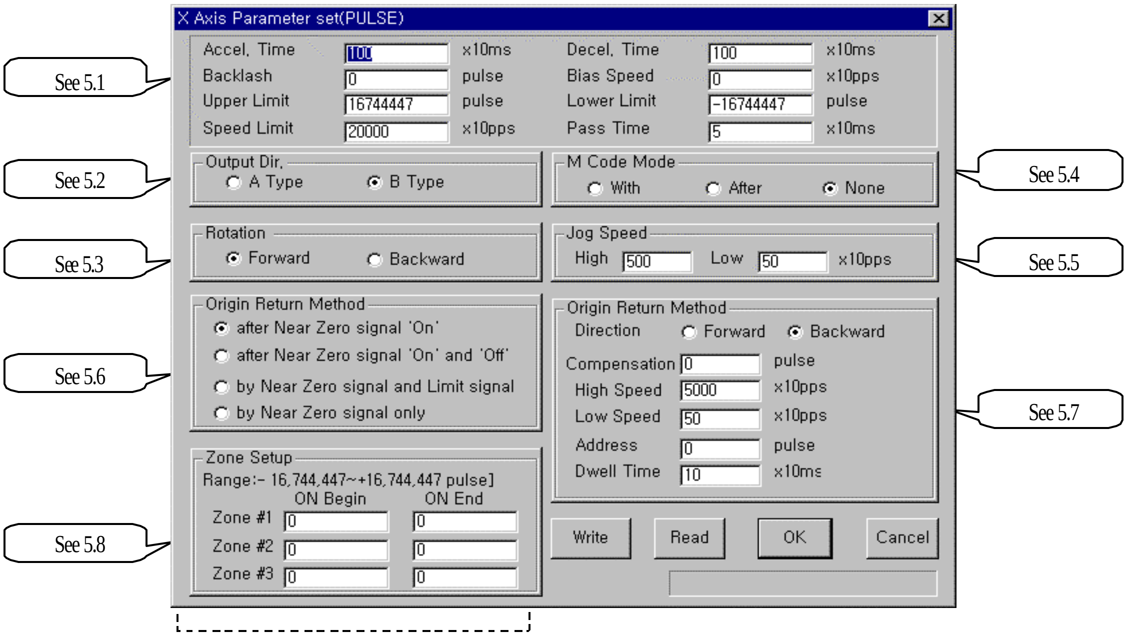
▶Be careful that S/W package is changed from POSITION to POSPACK with simultaneous control available if 2 axes used and its terms modified also.

▶Parameters of S/W package are structured as shown below. The parameter items shall be set per axis.



[New package(POSPACK)]

Send	: To write parameter setting value by positioning module
Read	: To read parameters used in positioning module to S/W package
Check	: To monitor or save new parameter setting value as changed
Cancel	: To cancel new parameter setting value and use previous value continuously



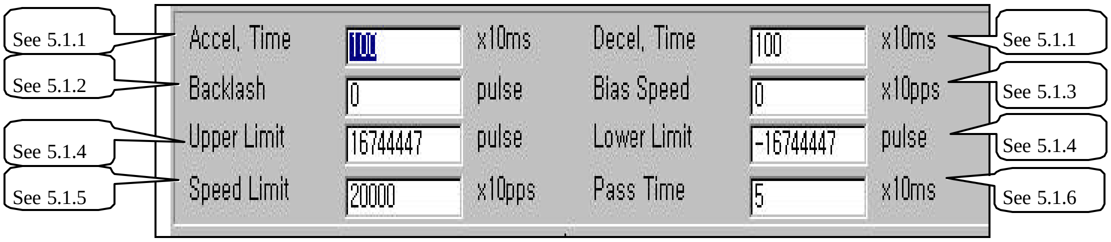
[Old package(POSITION)]

■Terms modified

Related items	Before modified (POSITION)	After modified (POSPACK)	Remarks
5.1	Bias speed	Bias speed	Refer to 5.1.3 Unit change pulse/sec ⇒ x10pps
	Stroke upper limit	S/W upper limit	Refer to 5.1.4
	Stroke lower limit	S/W lower limit	Refer to 5.1.4
5.4	No	None	Refer to 5.1.3
5.5	Jogging speed	JOG speed	
5.6	Return after origin point L/S detection	Origin point detection after Near zero point Off	
	Return upon origin point L/S detection	Origin point detection after deceleration at near zero point On	
	Return if no origin point L/S	Origin point detection by origin point and upper/lower limit	
	Return if no phase Z	Origin point detection by Near zero point	
5.8	ON position	ON start point	
	OFF position	ON end point	

5.1 Basic parameter

Basic parameters are described.



5.1.1 Acceleration/deceleration time

▶Applied to start point & stop point of positioning operation, origin point returning high-speed operation and JOG high-speed operation, and also to continuous operation command(POSζ_NM:rising edge ↑), speed change command(POSζ_VCG:rising edge↑) and speed override command(POSζ_OR:rising edge ↑) in positioning operation.

Remark
However,error may occur if deceleration stop command(POSζ_STP) is used during acceleration/deceleration staged operation at continuous operation command(POSζ_NM), speed change command(POSζ_VCG) and speed override(POSζ_OR) in positioning operation.

▶Acceleration/deceleration time shall be set in unit of axis at parameters of S/W package.

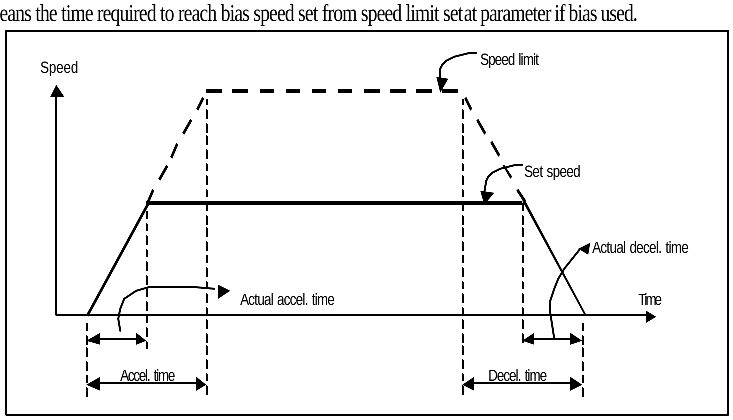
▶Setting range is 0 999(Unit: 10 ms) per axis.

1) Acceleration time : Time required to reach speed limit set at parameter from speed "0" (stop state).

▷It means the time required to reach speed limit set at parameter from bias speed set if bias used.

2) Deceleration time : Time required to reach speed "0" (stop state) from speed limit set at parameter

▷ It means the time required to reach bias speed set from speed limit set at parameter if bias used.



▶ Terms

Speed limit : Max. speed when position is decided as allowed in parameter items of S/W package.

Setting speed : Speed data value actually operated by position data.

Actual acceleration time : Time required to reach speed value set to speed data from speed "0" (stop state).

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

5.1.2 Backlash compensation

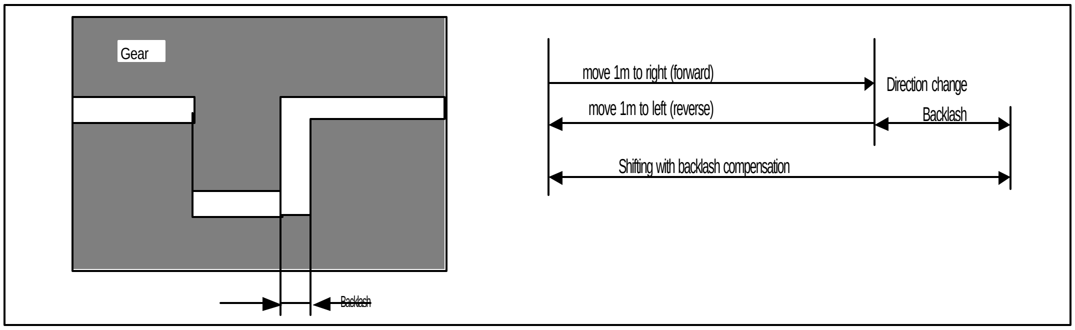
▶ Backlash means the error that the machine doesn't operate due to abrasion when rotation direction is changed in case motor shaft is connected with gear and screws.
Backlash compensation when output shall be added to positioning amount if rotation direction is to be changed.

▶ In G3F-POPA/G4F-POPA/G4F-POPB, it is available for positioning operation, and in G6F-POPA, it is available for positioning operation, inching operation and JOG operation.

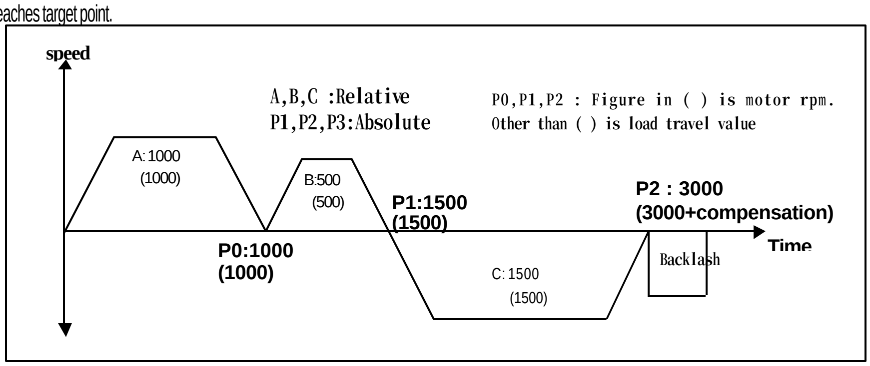
▶ Setting range is 0 999(Unit: Pulse) per axis.

Remark
Origin point return shall be surely executed if backlash compensation is ever set or changed.

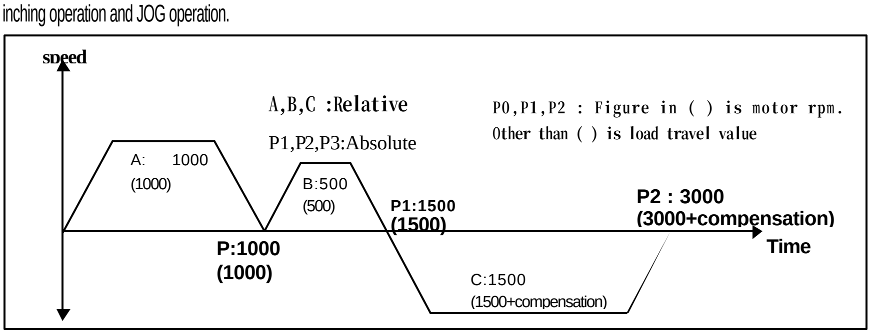
▶ Since the original position may not be reached by backlash if the position is moved 1m to right and then 1m to left again, backlash compensation shall be added.



▶ Backlash compensation is,
In G3F-POPA/G4F-POPA/G4F-POPB, moved at low speed for backlash compensation value after positioning address amount reaches target point.



In G6F-POPA, moved to target point with backlash compensation value added to address value of positioning operation, inching operation and JOG operation.



5.1.3 Bias speed

▶Stepping motor is used to reduce positioning time with start speed setting at early operation stage to make motor rotation smooth because torque may be unstable near at speed=0.

The setting speed at this case is bias speed

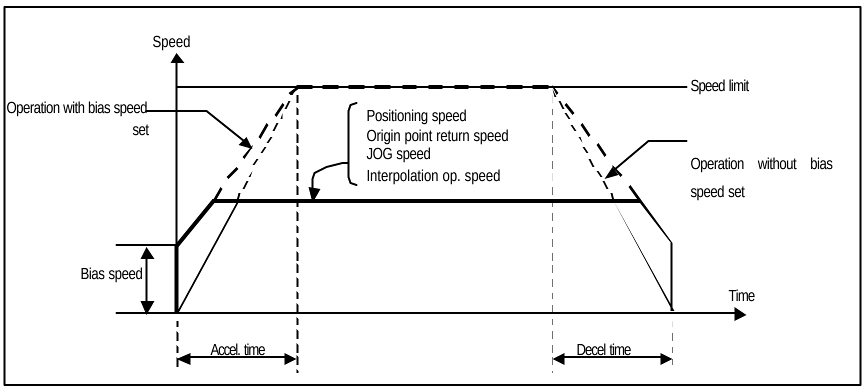
▶ Setting range is 0 20,000(Unit: 10pps) per axis.

▶ Bias speed is used for ①positioning operation by start command,

②origin point return-operation,

③JOG operation and

④major axis of interpolation operation (unavailable for minor axis).



Remark

Be careful ! If bias speed is set high, whole operation time can be reduced profitably but if set too high, impact noise occurs at start and stop points leading to damage on the machine.

▶ Bias speed shall be set within the following range.

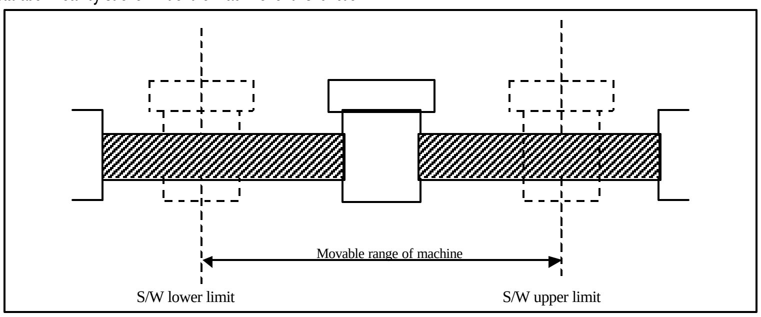
(If origin point return-speed is set lower than bias speed error 87 occurs, and if operation speed is set lower than bias speed at positioning error 86 occurs.)

1) Bias speed ≤ positioning speed data
2) Bias speed ≤ origin point return at low ≤ origin point return at high
3) Bias speed ≤ JOG at high (JOG low-speed operation has no connection with bias speed.)

5.1.4 S/W upper/lower stroke limit

; Also called as stroke upper(lower) limit.

▶ Stroke limit means movable range of the machine with its upper/lower value set to S/W upper/lower stroke limit. If operated out of the setting range, positioning will not be executed.
Namely, if operated out of the setting range, positioning by its applicable execution command is not executed.
This is used to prevent separation from upper or lower limit due to positioning address value set incorrectly and abnormal operation due to error in user program. Limit switch for emergency stop needs installation near by stroke limit of the machine for this function.



▶ Range check of upper/lower stroke limit is performed at operation start and during operation..

▶ If an error is detected by S/W upper/lower stroke limit value setting (S/W stroke upper limit address range exceeded : 25, S/W stroke lower limit address range exceeded : 24), pulse output of positioning module is prohibited.
Thus, cancell output-prohibited (POS_OFF:rising edge ↑) to detect the error and restart the operation.

▶ Setting range shall be set per axis

S/W stroke upper limit address value range : 16,744,447 16,744,447
S/W stroke lower limit address value range : -16,744,447 16,744,447 (Unit: Pulse).

5.1.5 Speed limits

▶ Max. speed of positioning operation available.

▶ Setting range is 0 20,000 (Unit: 10pps).

▶ Speed data, origin point return-speed and JOG operation speed in positioning operation are influenced by speed limits. If the value is set larger than speed limits, error will be detected.

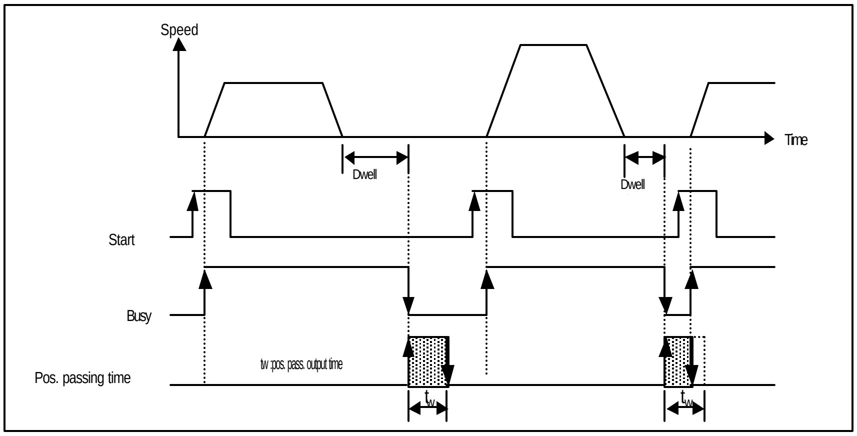
①If origin point return-speed is larger than speed limits : error 87
②If speed data for positioning operation is larger than speed limits : error 86
③If JOG operation speed is larger than speed limits : error 86

5.1.6 Position passing time

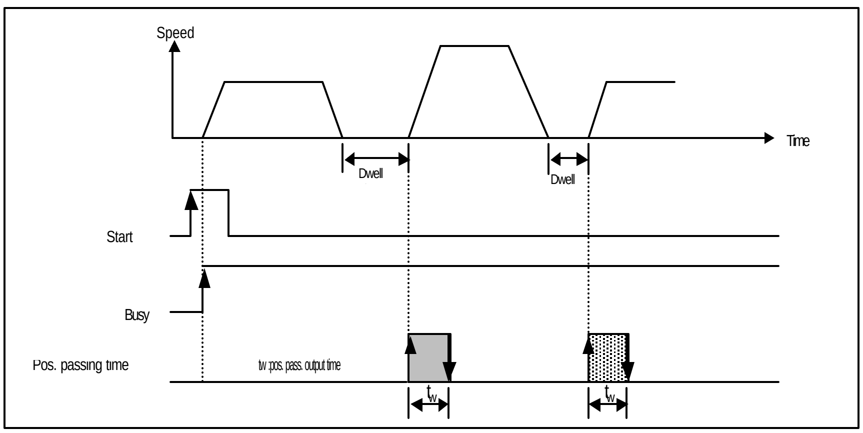
▶Signal of position passing time is turned on after positioning complete in single operation, repeated operation, auto-operation, continuous operation, constant operation with positioning and origin point returning, and is turned off after kept on as long as set.
The moment positioning start command or starting point return command is executed during position passing signal On, the signal will be Off.
In continuous operation mode, position passing signal will be output whenever shift is complete to the address set at operation step.

▶Setting range is 0 999 (Unit: 10 ms).

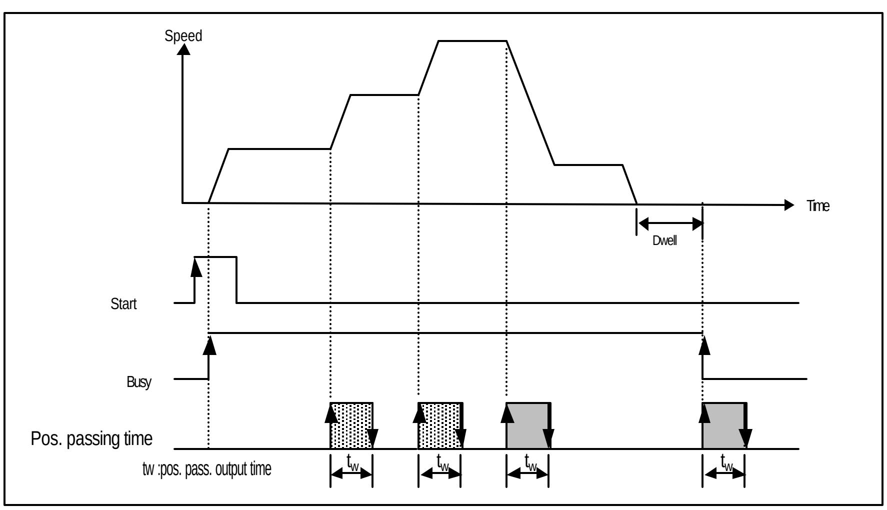
▶In single operation mode.



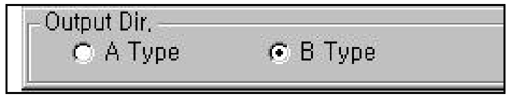
▶In auto-operation mode.



▶In continuous operation mode.



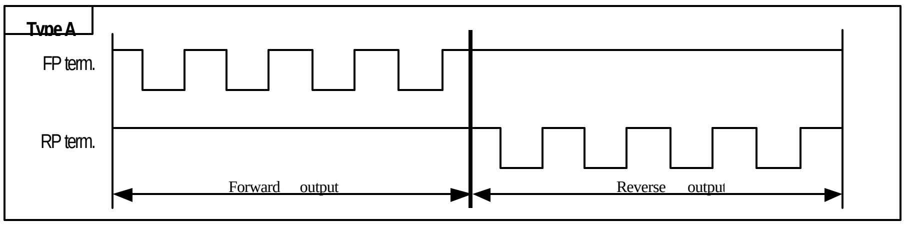
5.2 Output direction



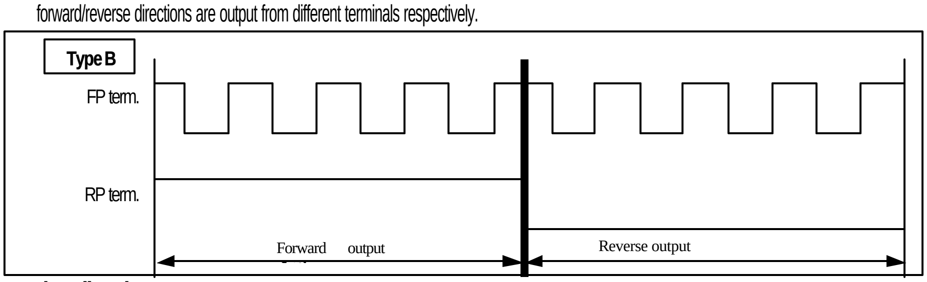
▶Since input methods used for SERVO driver or stepping motor differ each other, such a pulse-out direction of positioning module shall be selected as applicable.

▶Output direction types

Type A: Forward pulse and reverse pulse are output from different terminals respectively.

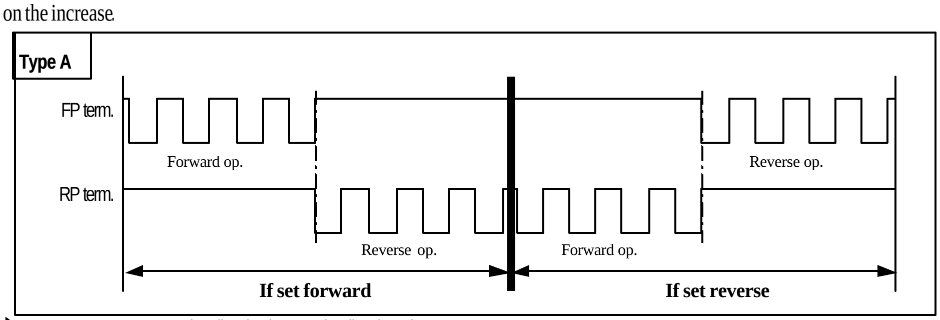


▶**Type B:** Forward pulse and reverse pulse are output from one terminal, and detection signals of forward/reverse directions are output from different terminals respectively.

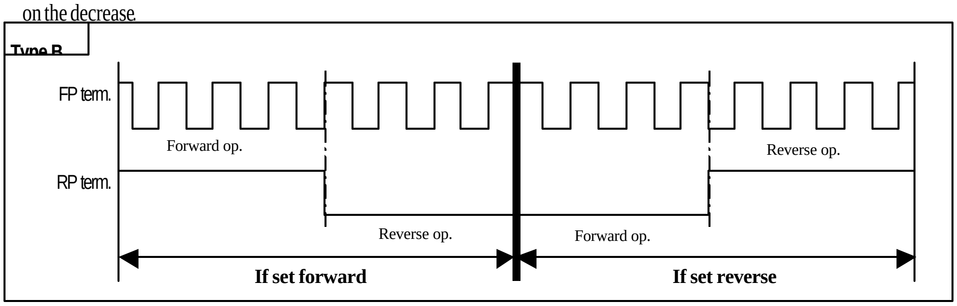


5.3 Rotation direction

▶Forward rotation : Rotation direction is set to the direction where present value of position address is on the increase.



▶Reverse rotation : Rotation direction is set to the direction where present value of position address is on the decrease.



5.4 M code mode

▶M code mode which has been set at parameters are wholly applied to all position data of its applicable axis .

▶M code No. can be set respectively per operation step No. of positioning data.

▶M code No. setting range : 0 255

▶M code can be used to check operation step No. presently executed and to perform supplementary work (clamp & drill rotation, tools exchange, etc.) by Read at output parameter "MCD" of present operation state's code Read function block(POSζ_CRD: level) in program.

▶M code signal produced during operation can be reset by M code "Off" command(POSζ_MOF:rising edge↑).

Remark

▶In G3F-POPA/G4F-POA/G4F-POPB, M code signal operates along with M code No.according to M code mode as set at parameters during positioning operation, but positioning operation can be executed by the next operation step No. regardless of M code signal "On/Off".

▶In G6F-POPA, the next operation step No. is not operated when M code signal is "On"even if positioning is complete, which will lead to error (errorNo. : 40). Thus, if M code signal is "On", M code signal shall be "Off" by M code "Off" command(POSζ_MOF:rising edge↑) for positioning operation of the next operation step No.

▶M code mode is classified into With mode and After mode accoring to output timing of M code signal.

▶Setting in S/W package

Parameters s etting

M Code Mode: ○ With ○ After ◉ None

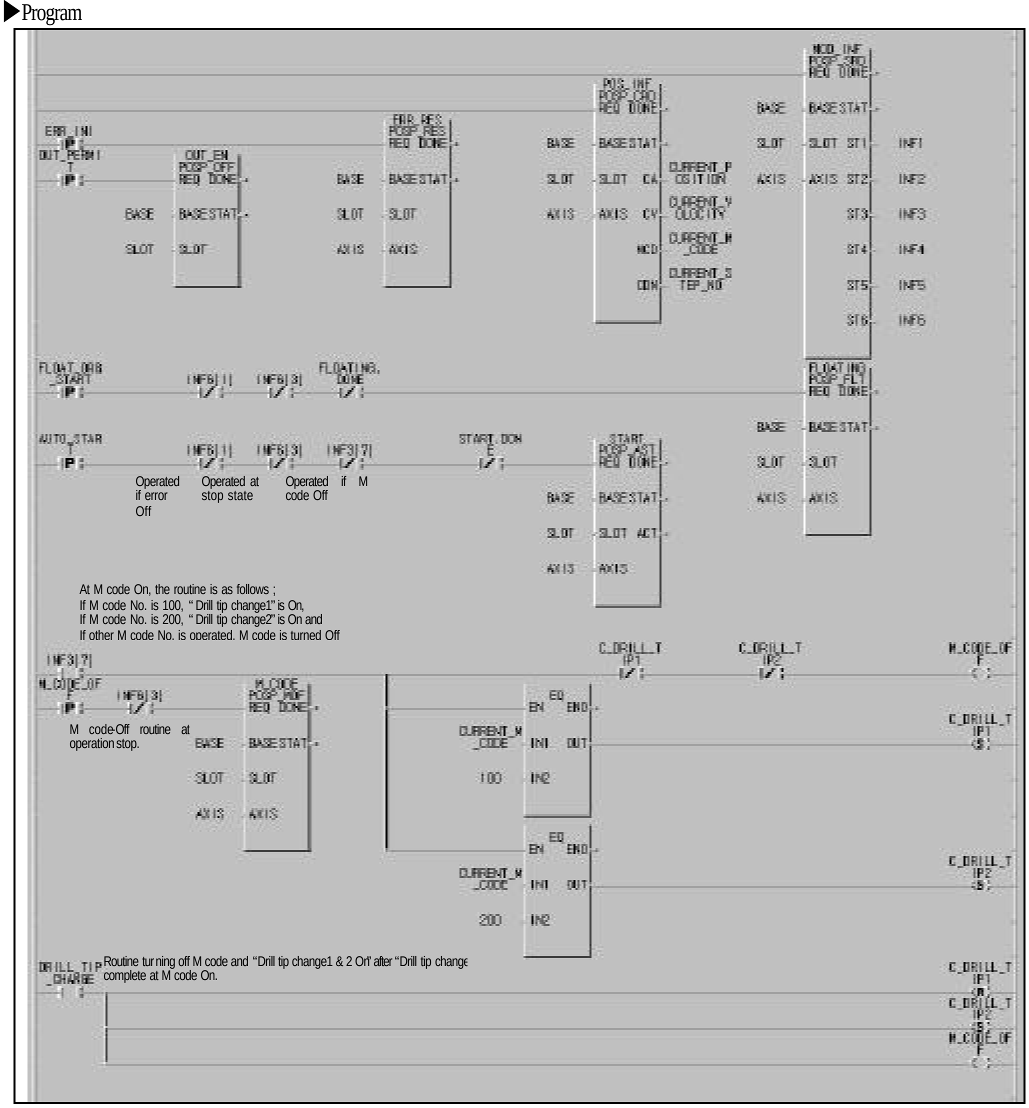
Position data setting

X Axis Position Data(Pulse)

Step No.	Coord inates	Over ride	Op. Method	Invalid /Valid	Op. Mode	Address	M Code	Speed No.	Dwell (x10ms)
2	inc	dis	cont	valid	single	1000	0	0	0
3	inc	dis	cont	valid	single	2000	0	0	0
4	inc	dis	cont	valid	single	3000	0	0	0
5	inc	dis	cont	valid	single	4000	0	0	0
6	inc	dis	cont	valid	single	5000	100	0	0
7	inc	dis	cont	valid	single	10000	0	0	0
8	inc	dis	cont	valid	single	20000	0	0	0
9	inc	dis	cont	valid	repeat	30000	0	0	0
10	inc	dis	cont	valid	single	40000	0	0	0
11	inc	dis	cont	valid	single	50000	200	0	0
12	inc	dis	cont	valid	single	0	0	0	0
13	abs	dis	cont	valid	single	0	0	0	0
14	abs	dis	cont	invalid	single	0	0	0	0

Write Read OK Cancel

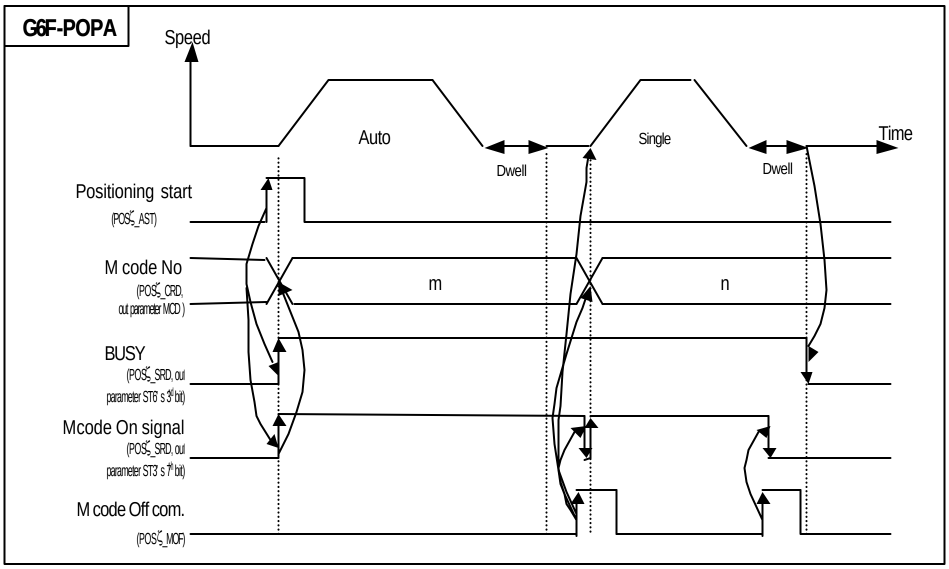
▶Program

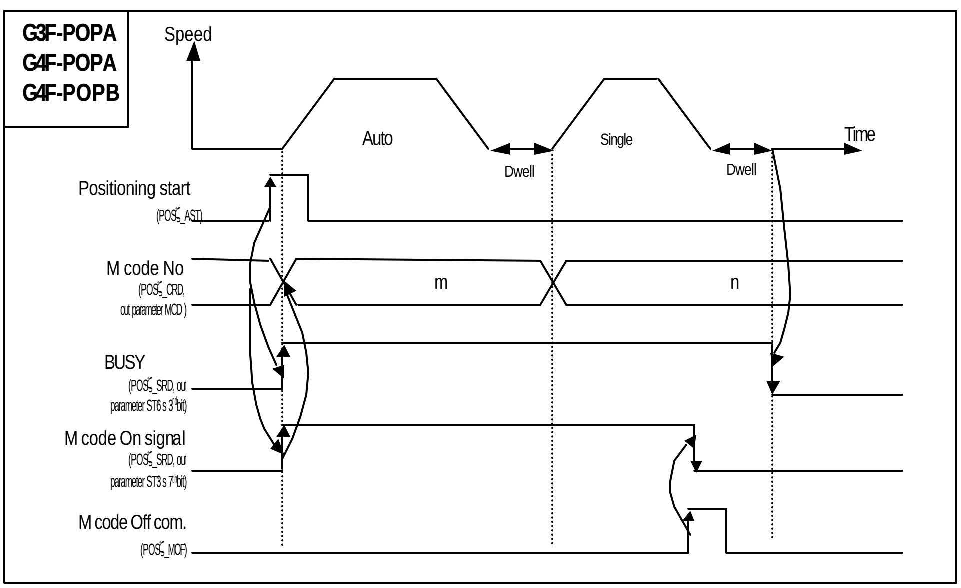


Program 5.1 M code mode

1) With mode

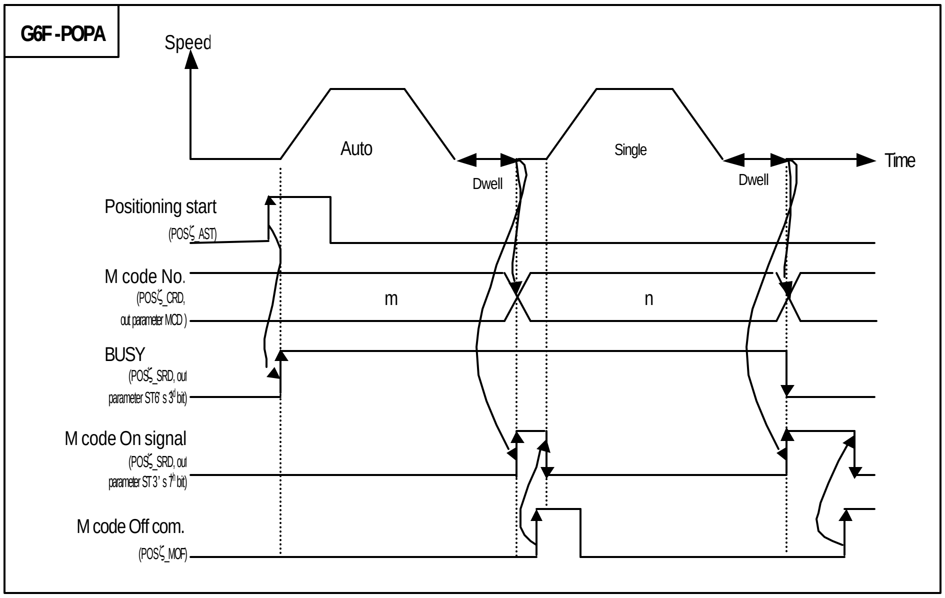
This is a mode outputting M code On signal and simultaneously producing out M code No. set at position data with start command (start: POSζ_AST, linear interpolation start: POSζ_INT) of positioning operation to output parameter "MCD" of present operation state's code Read function block (POSζ_CRD: level).

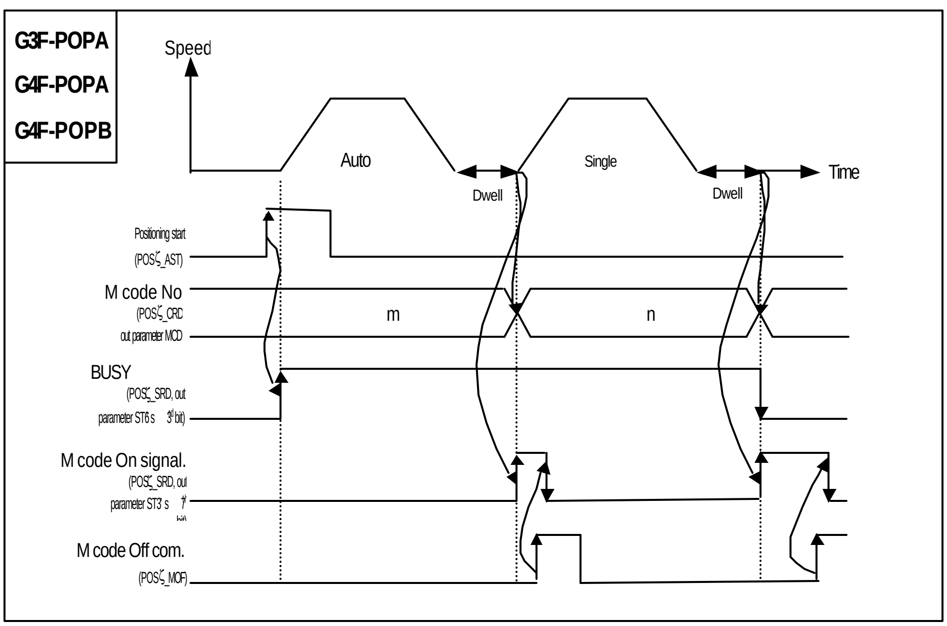




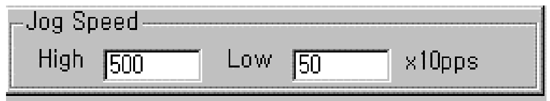
2) After mode

This is a mode outputting M code Onsignal and simultaneously producing out M code No. set at position data to output parameter “MCD” of present operation state’s code Read function block(POSζ_CRD: level) after positioning is complete by positioning start (start: POSζ_AST, linear interpolation start: POSζ_INT).





5.5 JOG speed



▶JOG speed for JOG operation[POSζ_JOG], a manual operation is available for JOG low-speed operation and JOG high-speed operation.

▶Refer to 3.6.1 JOG operation for further information.

5.5.1 High-speed

▶JOG high-speed operation is of acceleration, constant and deceleration staged pattern. Acceleration stage and deceleration stage are controlled by acceleration/deceleration time.

▶JOG high-speed setting range : 1 20,000(Unit: 10pps)

(Caution for high-speed setting: bias speed ≤ JOG high-speed ≤ speed limits)

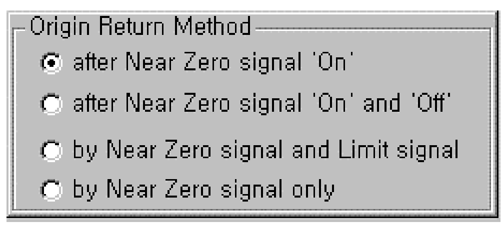
5.5.2 Low-speed

▶JOG low-speed operation has not acceleration/deceleration staged pattern but only constant staged pattern.

▶JOG low-speed setting range : 1 10,000(Unit: 10pps)

(Caution for low-speed setting: Caution required since operation is performed regardless of bias speed and speed limits.)

5.6 Origin point return-processing method



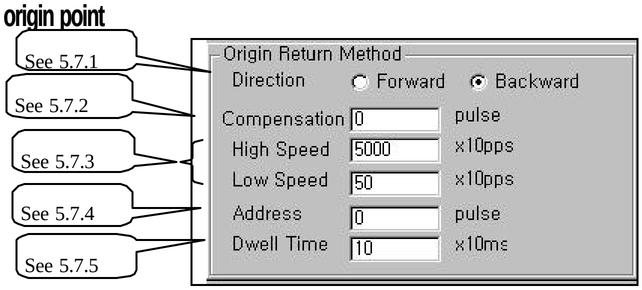
▶4 starting point return-processing methods are available as restricted respectively according to positioning modules.

Origin point return-processing method	G3F-POPA	G4F-POPA	G4F-POPB	G6F-POPA
Origin point detection after Near zero point Off	Available	Available	Available	Available
Origin point detection after deceleration at near zero point On	Available	Available	Available	Available
Origin point detection by origin point and upper/lower limit	Available	Unavailable	Available	Available
Origin point detection by Near zero point	Available	Unavailable	Available	Available

However, as for G3F-POPA O/S V3.0 or above, origin point return is available through origin point detection by origin point and upper/lower limit and by near zero point.

▶Refer to 3.5 Return to origin point for the details on origin point return-processing methods.

5.7 Return to origin point



▶Origin point return-items which are influencing origin point return-command[POSζ_ORG] processing are classified into the following 6 types.

5.7.1 Direction

▶Origin point return-direction is classified into forward rotation and reverse rotation on the basis of 5.3 Rotation direction.

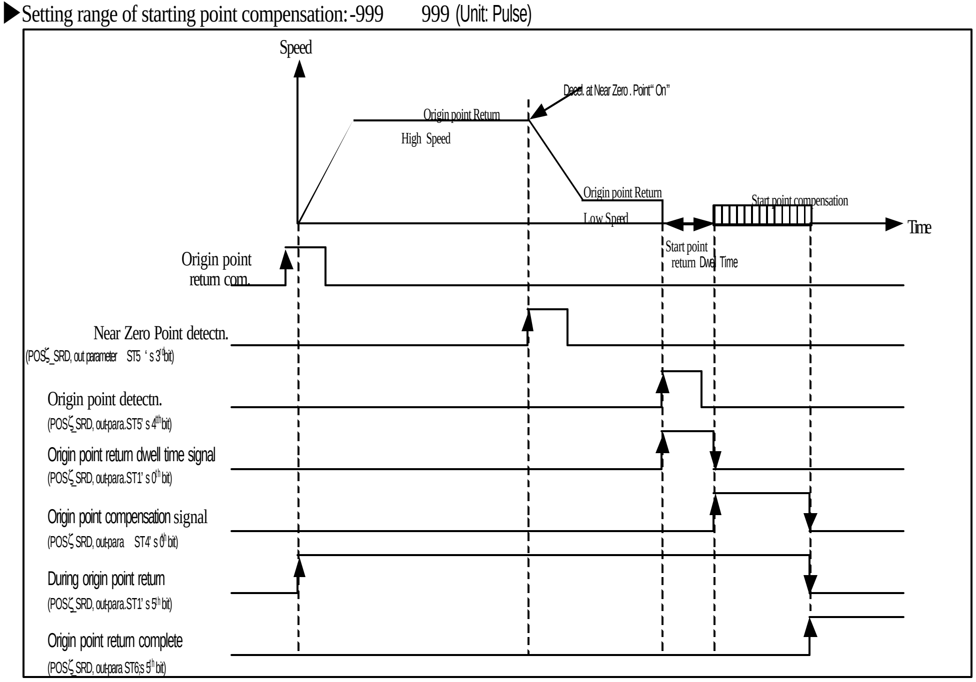
4.3 Rotation direction	Origin point return-direction	Pulse-out operation of positioning module
Forward	Forward rotation	Forward origin point return executed
	Reverse rotation	Forward and reverse origin point return executed
Reverse	Forward rotation	Reverse origin point return executed
	Reverse rotation	Reverse and forward origin point return executed

5.7.2 Compensation

▶Compensation is used at origin point detection(input at phase Z) to adjust a little divergence of the machine's origin point (difference between setting value and actual travel value due to mechanical error).

▶If origin point compensation has been set, detect origin point and then move it as much as set data (+, -) as origin point compensation when executing origin point return-command so to complete origin point return operation.

▶Setting range of starting point compensation: -999 999 (Unit: Pulse)



5.7.3 Speed of the return to origin point

▶Speed of the return toorigin point by origin point return-command includes high-speed and low-speed.

▶Setting of origin point return-speed shall be as follows ; "speed limits > origin point return high-speed > origin point return low-speed".

1) Origin point return high-speed

▶Constant staged-operation speed via acceleration stage by origin point return- command.

▶Setting range of origin point return high-speed : 1 20,000 (Unit: 10pps)

2) Origin point return low-speed

▶Constant staged-operation speed via deceleration stage by origin point return - command.

▶Setting range of origin point return low-speed : 1 20,000 (Unit: 10pps)

Remark

Origin point return low-speed shall be set as low as possible when origin point return-speed is to be set.
If the low speed is set too fast, detection of origin point signal may not be accurate.

5.7.4 Address

▶It is used to change the present address value to a setting value at origin point return address when origin point return is complete by origin point return-command,

▶Setting range of origin point return address: -16,744,447 16,744,447 (Unit: Pulse)

5.7.5 Dwell time

▶Time required to keep precise stop accuracy of subo motor used for positioning
Actually, the time required to remove remaining pulse of the variation counter right after positioning complete is the dwell time, and especially the dwell time at return to origin point is called as origin point return-dwell time.

▶Setting range of origin point return-dwell time: 0 9999(Unit: ms)

5.8 Zone setting

▶Setting available in the range of position address where positioning module can move to with the following 3 types.

▶Zone No. will be "On" when present position is passing through address value set to Zone.

▷Zone #1 : 2nd bit of output parameter ST3 in present operation state's Bit information Read function block[POSζ_SRD]

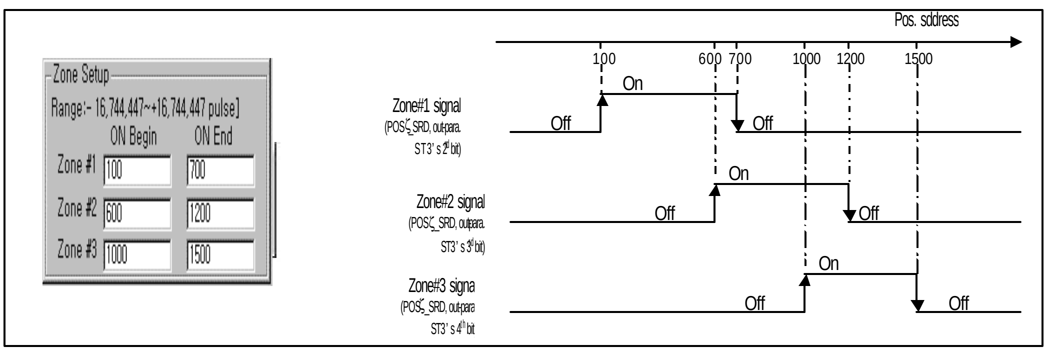
▷Zone #2 : 3rd bit of output parameter ST3 in present operation state's Bit information Read function block[POSζ_SRD]

▷Zone #3 : 4th bit of output parameter ST3 in present operation state's Bit information Read function block[POSζ_SRD]

Thus, additional work can be executed using "On" information when position set to Zone area is being controlled.

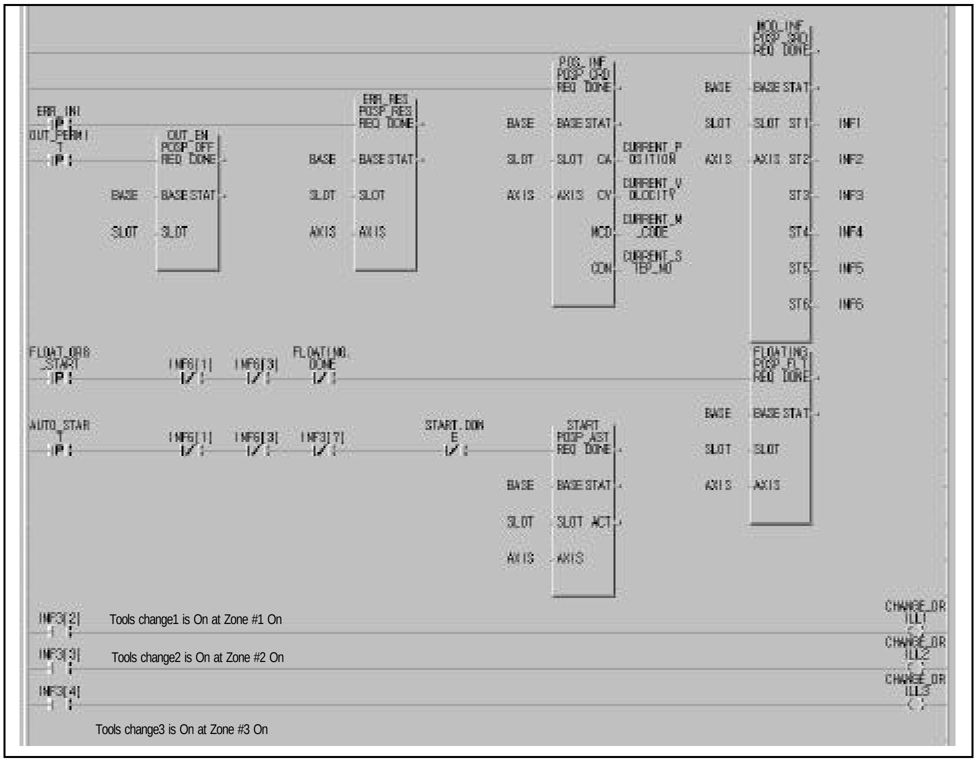
▶Setting range of Zone:-16,744,447 16,744,447(Unit: Pulse)

▶Zone setting shall be as follows.



Remark

"On start point"shall be set smaller than "On end point".

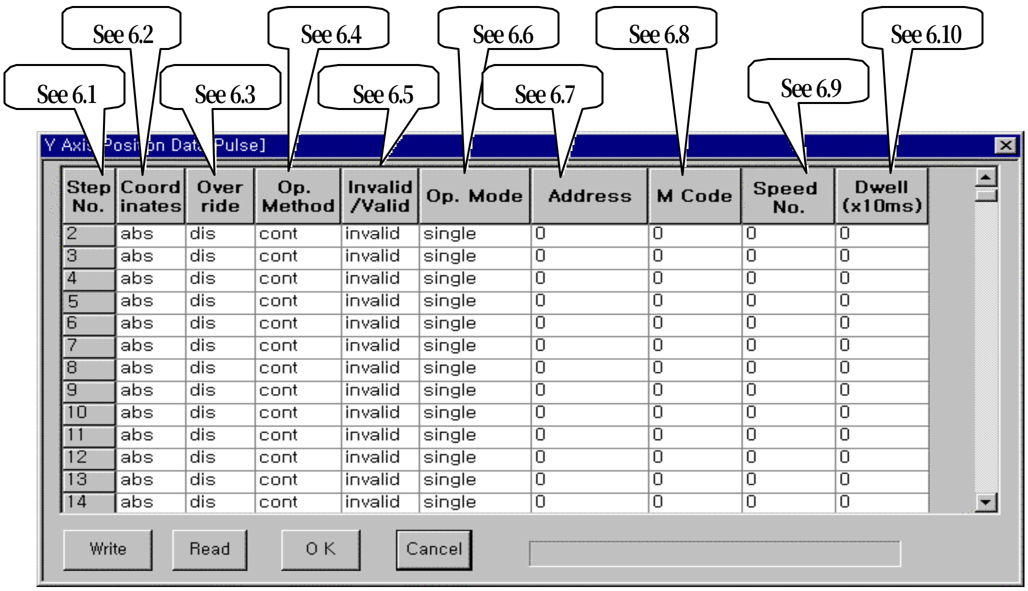


Program 5.2 Zone setting

Chapter 6 Position data for positioning

▶Position data to be set in S/W package is described.

▶Be careful that S/W package is changed from POSITION to POSPACK with its terms modified also.

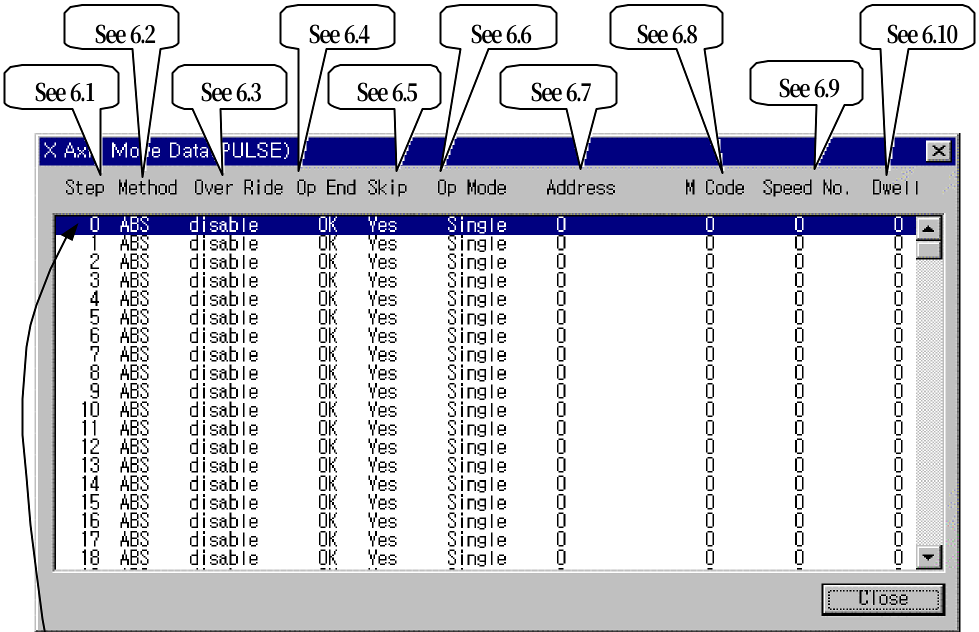


[New package(POSPACK)]

Send	: To write values set at position data by positioning module
Read	: To read position data used in positioning module to S/W package
Check	: To monitor or save new value set at position data as changed
Cancel	: To cancel new value set at position data and use previous value continuously

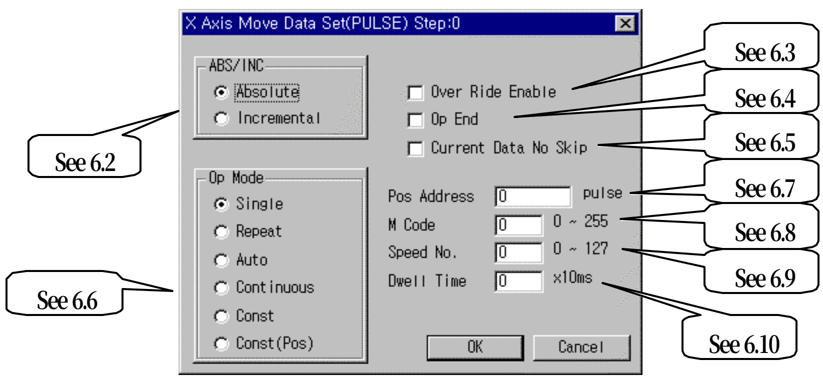
■How to prepare

Items	Step No.	Coordinates	Override	Operation Method	Invalid /valid	Operation mode	Address	M code	Speed No.	Dwell
Method	-	Use the mouse to select applicable cell								
Details of cell	-	abs inc	dis en	cont end	invalid valid	single repeat auto cont const const(pos)	Use the mouse to select applicable cell and to define the details directly.			



[Old package(POSITION)]

Double-click here to display the screen below.



■ Terms modified

Related items	Before modified (POSITION)	After modified (POSPACK)
6.1	Step	
6.2	Method	Coordinates
6.4	Operation	Operation method
6.5	Skip	Invalid/Valid
6.7	Position address	Position address(pulse)
6.9	Speed NO.	Speed No.
6.10	Dwell	Dwell time(x10 ms)

6.1 Step No.

▶Serial No. of positioning data in setting range of 0 299.
▶Positioning operation of each step No. is decided according to "6.5 Invalid/valid" setting

Remark

"If 6.5 Invalid/valid" setting is valid : applicable step No. executes positioning operation.
"If 6.5 Invalid/valid" setting is invalid : applicable step No. is skipped over until "6.5 Invalid/valid" setting is valid among the following step numbers and valid step No. if encountered executes positioning operation.

6.2 Coordinates

▶Coordinates of position data classified into Absolute Coordinates and Relative Coordinates.

6.2.1 Absolute Coordinates (control by absolute method)

A) Positioning is controlled from start address to target address (set at positioning data).
B) Positioning control is executed as based on the address (origin point address) assigned at origin point return.
C) Shift direction is decided according to start address & target address.

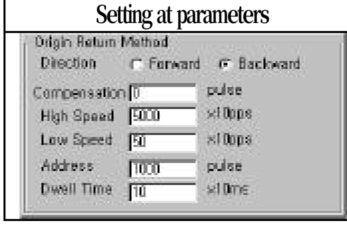
▶start address < target address : position decided forward
▶start address > target address : position decided reverse

[Ex.]

▷If origin point return address is 1000 and ▷target address is 8000, forward travel value is 7000(8000-1000).

▷ Setting in S/W package

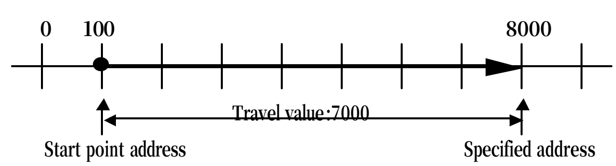
Setting at parameters



Setting at position data

Step No.	Coord inates	Over ride	Op. Method	Invalid /Valid	Op. Mode	Address	M Code	Speed No.	Dwell (x10ms)
0	abs	dis	cont	invalid	single	0	0	0	0

▷Results of positioning



Remark

Control by absolute method (Absolute Coordinates) can be started at the state that origin point has been decided.
If started at the state that origin point has not been decided, error 76 occurs. Available operation modes are separate, repeated, auto and continuous operation.

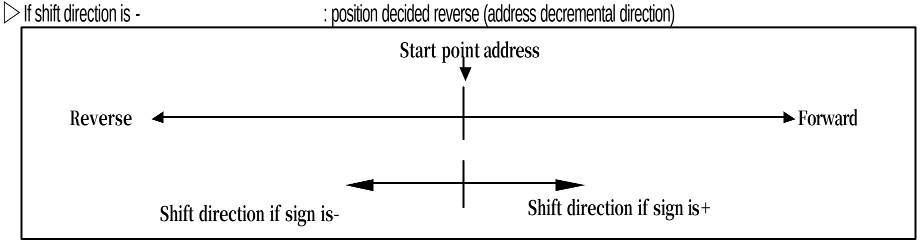
6.2.2 Relative Coordinates (control by incremental method)

A) Positioning is controlled at start address as much as target travel value.

B) Shift direction is decided according to travel value sign.

▷ If shift direction is + (or no sign) : position decided forward (address incremental direction)

▷ If shift direction is - : position decided reverse (address decremental direction)

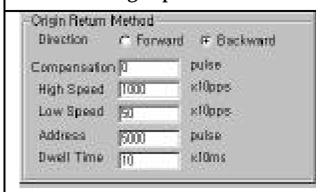


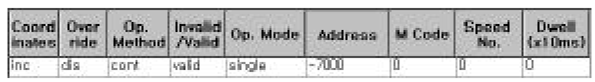
[Ex.]

▷ If origin point return address is 5000 and ▷target address is –7000, position is decided at -2000.

▷ Setting in S/W package

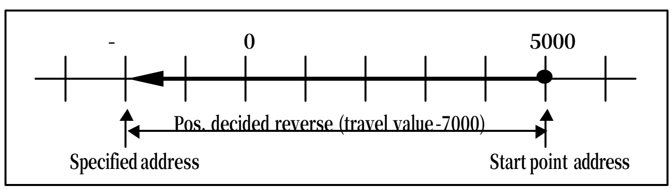
Setting at parameters	Setting at position data





Coordinates	Override	Op. Method	Invalid /Valid	Op. Mode	Address	M Code	Speed No.	Dwell (x10ms)
inc	dis	cont	valid	single	-7000	0	0	0

▷ Results of positioning



6.3 Override

▶ Override of position data means speed override classified into allowable and prohibited.
If speed override is used in program, override shall be set to allowable at position data per step No.

▶ Available only at constant staged operation pattern. If used at others "error 56" occurs.

▶ Available operation modes are separate operation, repeated operation and auto-operation.

▶ The speed will be with acceleration stage and deceleration stage if changed by speed override.

▶ Setting range is 1 15(setting unit: 10%).

[Ex.] If speed data value is set to 2000, the speed is 20Kpps and if speed override is set to 15 (150%), the speed is 20,000 X 1.5=30,000 (30Kpps).

▶ If speed override is to be continuously used, the operation shall be as based on the speed value as set at speed data.

▶ Refer to 3.7.3 for the details on Override.

6.4 Operation method

▶Operation method of position data includes continuous and complete only available for G3F -POPA and G4F -POPA.

▶continuous means that positioning operation is executed by present operation step No. and then by the next operation step No. set to valid at "6.5 Invalid/valid".

▶complete means that positioning operation is executed by present operation step No. and then not executed by the next operation step No. regardless of 6.5 Invalid/valid".

Remark

▶If positioning of operation step No. set to complete operation method is complete, operation step No. shall be changed by operation step No.assignment[POSζ_SMC:rising edge ↑] prior to the next start command[POSζ_AST:rising edge ↑].
If start command is used without operation step No. change, error 119 occurs.

6.5 Invalid/valid

▶Invalid/valid is used to decide whether or not positioning operation is to be executed per operation step No. of position data.

▶If set to invalid, positioning operation is executed not by the applicable operation step No. but by the next operation step No.

▶ If set to valid, positioning operation is executed by the applicable operation step No..

6.6 Operation mode

▶Operation modes of position data are classified into position control, speed control and speed control +position control according to control methods.

Control method	Operation mode
Position control	Single operation Repeated operation
	Auto-operation
	Continuous operation
Speed control	Constant operation
Speed control +position control	Positioning constant operation

Remark

▶Be careful that changing methods from speed control to position control differ according to positioning modules when positioning constant operation is used.
1)In G3F-POPA, G4F -POPA & G4F-POPB, speed control is changed to position control by deceleration stop[POSζ_STP:rising edge ↑] and
2)In G6F-POPA, changed by outer input signal of "speed position switching input signal".
Accordingly, deceleration stop[POSζ_STP:rising edge ↑] is regarded as a stop command in G6F-POPA with origin point undecided.

▶Refer to 3.2 Operation mode for the details.

6.7 Position address(Pulse)

▶Setting area of travel value of position data by address value.

▶Setting range is –16,744,447 16,744,447 (setting unit: Pulse).

▶Position address value is changeable in program by position teaching[POSζ_TEA:rising edge ↑].

6.8 M code

▶M code function is wholly applied to all axes by M code mode set at positioning parameter and can be used for the program by number setting per operation step No. in the setting range.

▶Setting range is 0 255.

Remark

▶How to use M code in program

1) M code No. Read is allowed by present operation state's code information Read[POSζ_CRD's output parameter MCD].

2) On/Off state of M code operation can be checked by present operation state's bit information Read[7th bit of POSζ_SRD's output parameter ST3].

▶Refer to 5.4 for the details.

6.9 Speed No.

▶It means the number of speed data set at speed data available per operation step No..

▶Setting range is 0 127.

▶Speed data value of speed No. is changeable in program by speed teaching[POSζ_VLT:rising edge ↑].

6.10 Dwell time(X 10 ㎳)

▶ assigned prior to the next positioning operation after one positioning operation is complete.

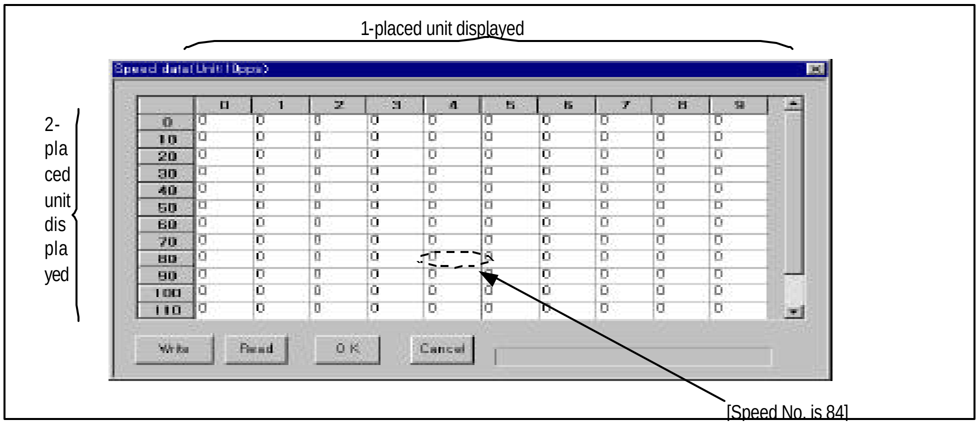
▶Setting range is 0 999 (setting unit: X10㎳).

If setting dwell time value is 50, actual dwell time is 50X10㎳(500 ㎳).

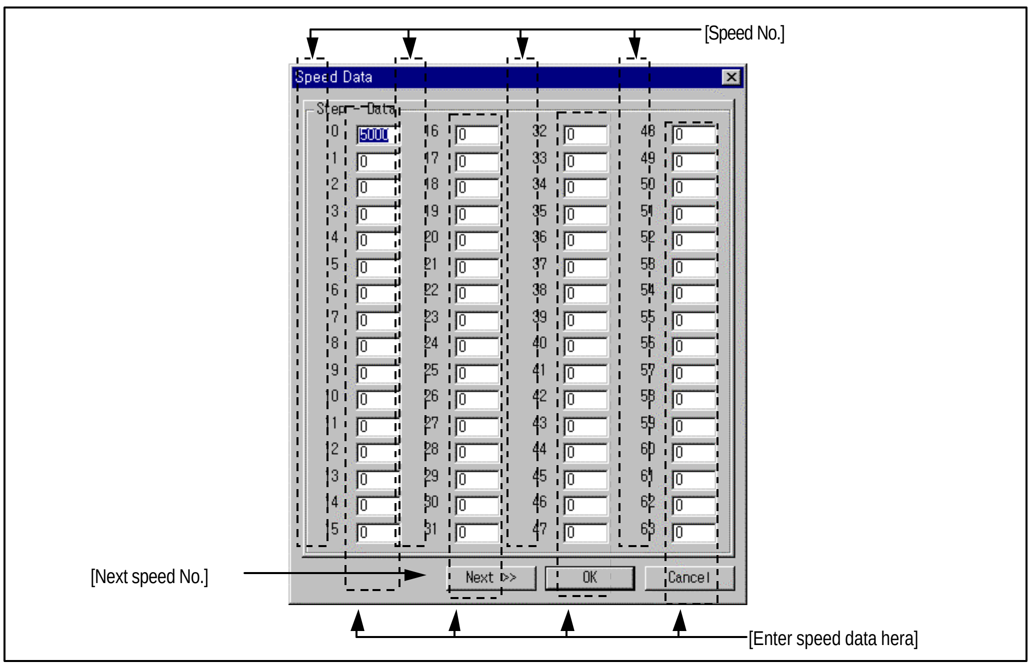
▶In particular, if SERVO motor is used it is setting data of standing -by time until stable stop state is reached since actual SERVO motor may not have reached or may have exceeded the target position even though positioning module is at stop state.

▶Operation state of the applicable axis of positioning module is kept "On" during dwell time operation, and will be "Off" with positioning complete signal "On" if dwell time elapsed.

6.11 Speed data



[New package(POSPACK)]



[Old package (POSITION)]

▶Speed data decides operation speed of position data with 128 setting types. Thus, 128 speed numbers as assigned can be used by setting speed at speed data.

▶Setting range of speed data is 0 20,000 (setting unit: X10pps).
If setting speed value is 5,000, actual speed data is 5,000X10pps(50Kpps).

▶Speed data value of speed No. is changeable in program by speed teaching function block[POS_VLT:rising edge ↑].

Remark

▶Caution for speed data setting
bias speed ≤ speed data ≤ speed limits

Chapter 7 Function Blocks

Function Blocks for positioning modules used in GMWIN are described.

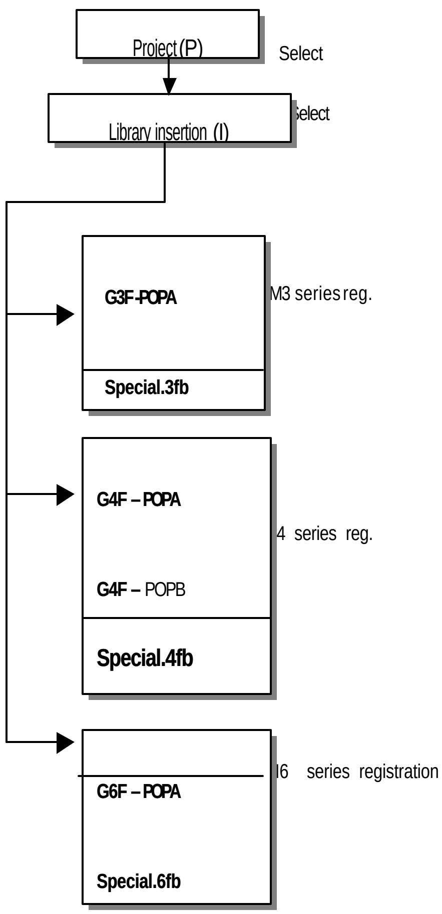
Type of Function Blocks is as follows.

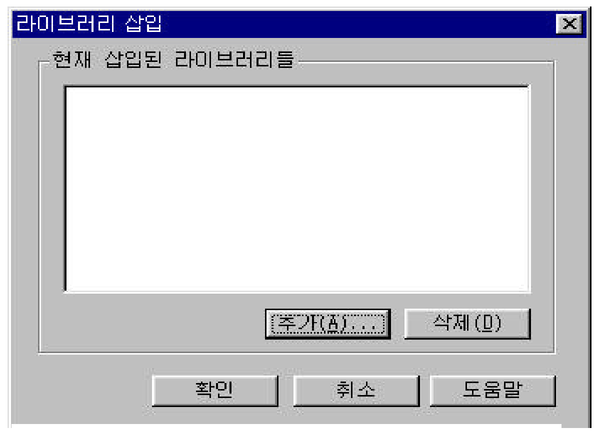
No	Class	G3F-POPA	G4F-POPA	G4F-POPB	G6F-POPA	Description	Remarks
1	For module information	POSP_CRD	POSP_CRD	POSB_CRD	POSP_CRD	Present operation state's code information Read	7.2.1
2		POSP_SRD	POSP_SRD	POSB_SRD	POSP_SRD	Present operation state's bit information Read	7.2.2
3	Auto-Operation	POSP_AST	POSP_AST	POSB_AST	POSP_AST	Start	7.3.1
4		POSP_INT	-	POSB_INT	POSP_INT	Linear interpolation start	7.3.2
5		POSP_ORG	POSP_ORG	POSB_ORG	POSP_ORG	Origin point return operation	7.3.3
6	Manual Operation	POSP_INC	POSP_INC	POSB_INC	POSP_INC	Inching operation	7.4.1
7		POSP_JOG	POSP_JOG	POSB_JOG	POSP_JOG	JOG operation	7.4.2
8		POSP_RTP	POSP_RTP	POSB_RTP	POSP_RTP	Return to prior position to manual operation	7.4.3
9		POSP_MPG	-	POSB_MPG	-	Manual pulse generator operation allowable	7.4.4
10	Teaching	POSP_TEA	POSP_TEA	POSB_TEA	POSP_TEA	Position teaching	7.5.1
11		POSP_VLT	POSP_VLT	POSB_VLT	POSP_VLT	Speed teaching	7.5.2
12	Sub-Operation	POSP_MOF	POSP_MOF	POSB_MOF	POSP_MOF	M code off	7.6.1
13		POSP_VCG	POSP_VCG	POSB_VCG	POSP_VCG	Speed change	7.6.2
14		POSP_NM	POSP_NM	POPB_NM	POSP_NM	Continuous operation	7.6.3
15		POSP_OR	POSP_OR	POPB_OR	POSP_OR	Speed override	7.6.4
16		POSP_SMC	POSP_SMC	POPB_SMC	POSP_SMC	Setting operation step No.	7.6.5
17		POSP_STP*	POSP_STP*	POSB_STP	POSP_STP	Deceleration stop(*:only in V1.0)	7.6.6
18		POSP_TMP	POSP_TMP				
19	Error	POSP_EMG	POSP_EMG	POSB_EMG	POSP_EMG	Internal emergency stop	7.7.1
20		POSP_OFF	POSP_OFF	POSB_OFF	POSP_OFF	Output-prohibited cancellation	7.7.2
21		POSP_RES	POSP_RES	POSB_RES	POSP_RES	Error reset	7.7.3
22	Others	POSP_FLT	POSP_FLT	POSB_FLT	POSP_FLT	Floating point set setting	7.8.1
23		POSP_PRE	POSP_PRE	POSB_PRE	POSP_PRE	Present position preset	7.8.2
24		-	-	-	POSP_PRM	Parameter change	7.8.3

7.1 Function Block registration for positioning module in GMWIN

Function Block can be registered as specified below while GMWIN is being executed.

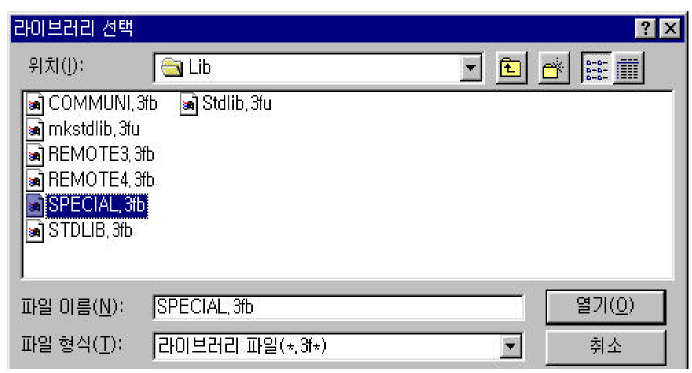
Function Block registration is available only when the project is at open state.





■ Select Add (A) to display the screen below

■ For GMWIN 3.1 or above (Ex. of G3F-POPA)

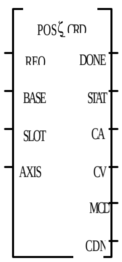


7.2 Function Block for module information Read

7.2.1 Code information Read at present operation state

(Status Code Read G3F-POPA/G4F-POPA/G6F-POPA:POSP_CRD, G4F-POPB:POSB_CRD)

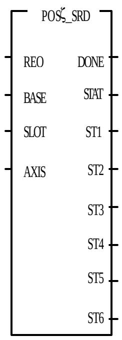
Present position address, operation speed, M code value and operation data No. of the setting axis can be read for monitoring or using as conditions in user program.

Function Block type	Class	Parameter	Data type	Description
	Input	REQ	BOOL	Request area of Function Block execution Function block executed if "0→1" (level detection) with connected condition to this area as composed during program execution.
		BASE	USINT	Base position No. Setting area of base No. positioning module is equipped on Setting range : GM1 series(0 31), GM2 series(0 7), GM3/4 series(0 3), GM6 series(0)
		SLOT	USINT	Slot position No. Setting area of slot No. positioning module is equipped on. Setting range : 0 7
		AXIS	USINT	Assignment area of axis to use If "0", X-axis operates If "1", Y-axis operates
	Output	DONE	BOOL	State displaying area of FunctionBlock execution complete If Function Block execution complete without error, "1" is output as kept until the next execution starts. If error occurs, "0" is output.
		STAT	USINT	Error-state displaying area If error occurs during Function Block execution, error No. is displayed.
		CA	DINT	Present position address displayed.
		CV	UINT	Present operation speed displayed.
		MCD	USINT	Present M code value displayed.
		CDN	UINT	Present operation data No. displayed.

7.2.2 Bit information Read at present operation state

(Status Bit Read G3F-POPA / G4F-POPA / G6F-POPA:POSP_SRD, G4F-POPB:POSB_SRD)

Present operation state of the setting axis can be read for detailed monitoring or using as conditions in user program.

Function Block type	Class	Parameter	Data type	Description
	Input	REQ	BOOL	Request area of Function Block execution Function Block executed if "0→1"(level detection) with connected condition to this area as composed during program execution.
	Input	BASE	USINT	Base position No. Setting area of base No. positioning module is equipped on Setting range : GM1 series(0 31), GM2 series(0 7), GM3/4 series(0 3), GM6 series(0)
	Input	SLOT	USINT	Slot position No. Setting area of slot No. positioning module is equipped on. Setting range : 0 7
	Input	AXIS	USINT	Assignment area of axis to use If "0", X-axis operates If "1", Y-axis operates
	Output	DONE	BOOL	State displaying area of Function Block execution complete If Function Block execution complete without error, "1" is output as kept until the next execution starts. If error occurs, "0" is output.
	Output	STAT	USINT	Error-state displaying area If error occurs during Function Block execution, error No. is displayed.
	Output	ST1	BOOL [ARRAY]	
	Output	ST2	BOOL [ARRAY]	
	Output	ST3	BOOL [ARRAY]	
	Output	ST4	BOOL [ARRAY]	
	Output	ST5	BOOL [ARRAY]	
	Output	ST6	BOOL [ARRAY]	

Remark

1) Contents of output parameters ST1 ST6 in present operation state's bit Read function block are important information surely to apply in program.

Bit No.	ST1	ST2	ST3
[0]	In dwell(Bit:On)	Upper limit detected(Bit:On)	Unused
[1]	In deceleration(Bit:On)	Lower limit detected (Bit:On)	Forward (Bit:Off),Reverse(Bit:On)
[2]	In constant(Bit:On)	Emergency stop detected (Bit:On)	ZONE#1(Bit:On)
[3]	In acceleration(Bit:On)	Pulse -out prohibited(Bit:On)	ZONE#2(Bit:On)
[4]	At stop state(Bit:On)	Inching complete(Bit:On)	ZONE#3(Bit:On)
[5]	In returning to origin point(Bit:On)	Position teaching complete(Bit:On)	Repeated operation complete (Bit:On)
[6]	In positioning(Bit:On)	In JOG low-speed operation(Bit:On)	Positioning operation complete(Bit:On)
[7]	In interpolation operation(not for G4F-POPA)	In JOG high-speed operation(Bit:On)	M code On(Bit:On)

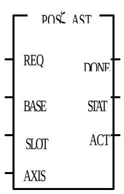
Bit No.	ST4	ST5 (terminal signal)	ST6
[0]	In origin point compensation(Bit:On)	Speed position control switching (only for G6F-POPA)	Unused
[1]	In backlash compensation(Bit:On)(not for G6F-POPA)	External upper limit signal(Bit:Off)	Error
[2]	In next move(Bit:On)	External lower limit signal(Bit:Off)	Position passing
[3]	In speed overriding(Bit:On)	External near zero point signal.(Bit:On)	In operation(Busy)
[4]	Unused	External origin point signal.(Bit:On)	Positioning complete
[5]	In stopping as decelerated & stop complete(Bit:On)	Unused	Origin point return complete
[6]	Speed teaching complete(Bit:On) (valid only in G3F-POPA/G4F-POPA V1.0)	Unused	Origin point undecided
[7]	Speed change complete (Bit:On) (valid only in G3F-POPA/G4F-POPA V1.0)	External emergency stop signal,(Bit Off)	Unused

7.3 Function Block for auto- operation

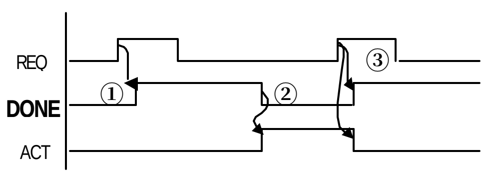
7.3.1 Start

(Auto Start G3F-POPA / G4F-POPA / G6F-POPA:POSP_AST, G4F-POPB:POSB_AST)

Output parameter ACT will be "1" if one positioning is complete by operation start command of positioning module.

Function Block type	Class	Parameter	Data type	Description
	Input	REQ	BOOL	Request area of Function Block execution at rising edge Function Block executed if "0→1"(rising edge) with connected condition to this area as composed during program execution.
		BASE	USINT	Base position No. Setting area of base No. positioning module is equipped on Setting range : GM1 series(0 31), GM2 series(0 7), GM3/4 series(0 3), GM6 series(0)
		SLOT	USINT	Slot position No. Setting area of slot No. positioning module is equipped on. Setting range : 0 7
		AXIS	USINT	Assignment area of axis to use If "0", X-axis operates If "1", Y-axis operates
	Output	DONE	BOOL	State displaying area of Function Block execution complete If Function Block execution complete without error, "1" is output, and if output parameter ACT is "1" with internal processing of Function Block complete, "0" is output.
		STAT	USINT	Error-state displaying area If error occurs during Function Block execution, error No. is displayed.
		ACT	BOOL	Operation axis displaying area Positioning module changes output parameter DONE from "1" to "0" with "1" output after processing Function Block command.

Remark



① : Function Block execution by 1st REQ

② : Function Block command processed

③ : Function Block execution by 2nd REQ

1) Relation between output parameters, DONE and ACT

2) Caution for Function Blocks of auto-operation command used in program

(1) Available only when operation is at stop state.(Busy-Off state)

(2) Available operation modes are single operation, repeated operation, auto-operation, continuous operation, constant operation and positioning constant operation.

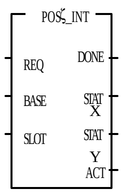
a) If auto-operation is used, continuous operation, constant operation and positioning constant operation are not available for the succeeding operation step No. to auto-operation.

b) If continuous operation is used, auto-operation, constant operation and positioning constant operation are not available for the succeeding operation step No. to continuous operation.

7.3.2 Linear interpolation start

(Linear **Int**erpolation **G3F-POPA / G6F-POPA:POSP_INT, G4F-POPB:POSB_INT)**

Command for linear interpolation operation in positioning module for 2-axes.

Function Block type	Class	Parameter	Data type	Description
	Input	REQ	BOOL	Request area of Function Block execution at rising edge Function Block executed if "0→1"(rising edge) with connected condition to this area as composed during program execution.
		BASE	USINT	Base position No. Setting area of base No. positioning module is equipped on Setting range : GM1 series(0 31), GM2 series(0 7), GM3/4 series(0 3), GM6 series(0)
		SLOT	USINT	Slot position No. Setting area of slot No. positioning module is equipped on. Setting range : 0 7
	output	DONE	BOOL	State displaying area of Function Block execution complete If Function Block execution complete without error, "1" is output, and if output parameter ACT is "1" with internal processing of Function Block complete, "0" is output.
		STAT_X	USINT	X-axis error information displayed
		STAT_Y	USINT	Y-axis error information displayed
		ACT	BOOL	Operation axis displaying area Positioning module changes output parameter DONE from "1" to "0" with "1" output after processing Function Block command.

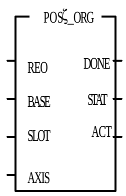
Remark

1) Caution for function blocks of linear interpolation operation command used in program
  (1) Available only when operation is at stop state.(Busy-Off state)
  (2) Available operation modes are interpolation operation, repeated operation and auto-operation.

7.3.3 Start to return to origin point

(Origin G3F-POPA / G4F-POPA / G6F-POPA:POSP_ORG, G4F-POPB:POSB_ORG)

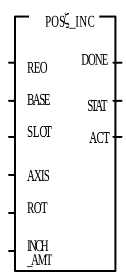
Operation command to find the machine's origin point by origin point return-processing methods with direction, compensation, speed (high/low), address and dwell time set at origin point return-parameters of each axis. If complete signal of origin point return is turned On, origin point return-operation of the machine is complete.

Function Block type	Class	Parameter	Data type	Description
	Input	REQ	BOOL	Request area of Function Block execution at rising edge Function Block executed if "0→1"(rising edge) with connected condition to this area as composed during program execution.
		BASE	USINT	Base position No. Setting area of base No. positioning module is equipped on Setting range : GM1 series(0 31), GM2 series(0 7), GM3/4 series(0 3), GM6 series(0)
		SLOT	USINT	Slot position No. Setting area of slot No. positioning module is equipped on. Setting range : 0 7
		AXIS	USINT	Assignment area of axis to use If "0", X-axis operates If "1", Y-axis operates
	Output	DONE	BOOL	State displaying area of Function Block execution complete If Function Block execution complete without error, "1" is output, and if output parameter ACT is "1" with internal processing of Function Block complete, "0" is output.
		STAT	USINT	Error-state displaying area If error occurs during Function Block execution, error No. is displayed.
		ACT	BOOL	Operation axis displaying area Positioning module changes output parameter DONE from "1" to "0" with "1" output after processing Function Block command.

7.4 Function Block for manual operation

7.4.1 Inching operation

(Inching G3F-POPA / G4F-POPA / G6F-POPA:POSP_INC, G4F-POPB:POSB_INC)

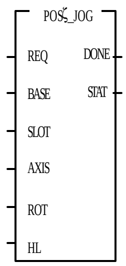
Function Block type	Class	Parameter	Data type	Description
	Input	REQ	BOOL	Request area of Function Block execution at rising edge Function Block executed if "0→1"(rising edge) with connected condition to this area as composed during program execution.
		BASE	USINT	Base position No. Setting area of base No. positioning module is equipped on Setting range : GM1 series(0 31), GM2 series(0 7), GM3/4 series(0 3), GM6 series(0)
		SLOT	USINT	Slot position No. Setting area of slot No. positioning module is equipped on. Setting range : 0 7
		AXIS	USINT	Assignment area of axis to use If "0", X-axis operates If "1", Y-axis operates
		ROT	BOOL	Direction assignment of inching operation If "0", forward operation If "1", reverse operation
		INCH_AMT	USINT	Travel value setting area in inching operation Setting range : 1 99 (Unit:Pulse)
	Output	DONE	BOOL	State displaying area of Function Block execution complete If Function Block execution complete without error, "1" is output, and if output parameter ACT is "1" with internal processing of Function Block complete, "0" is output.
		STAT	USINT	Error-state displaying area If error occurs during Function Block execution, error No. is displayed.
		ACT	BOOL	Operation axis displaying area Positioning module changes output parameter DONE from "1" to "0" with "1" output after processing Function Block command.

7.4.2 JOG operation

(JOG G3F-POPA / G4F-POPA / G6F-POPA:POSP_JOG, G4F-POPB:POSB_ JOG)

As a manual operation function for test, it is used to check system operation, wiring state and teaching position address, whose speed is classified into high and low as required.

Pulse is output by setting value if connection condition of input parameter REQ is ON, and is stopped if OFF.

Function Block type	Class	Parameter	Data type	Description
	Input	REQ	BOOL	Request area of Function Block execution Function Block executed if "0→1"(level detection) with connected condition to this area as composed during program execution.
		BASE	USINT	Base position No. Setting area of base No. positioning module is equipped on Setting range : GM1 series(0 31), GM2 series(0 7), GM3/4 series(0 3), GM6 series(0)
		SLOT	USINT	Slot position No. Setting area of slot No. positioning module is equipped on. Setting range : 0 7
		AXIS	USINT	Assignment area of axis to use If "0", X-axis operates If "1", Y-axis operates
		ROT	BOOL	Direction assignment of JOG operation If "0", forward operation If "1", reverse operation
		HL	BOOL	Speed assignment of JOG operation If "0", low-speed operation (profile without acceleration/deceleration) If "1", high-speed operation (profile with acceleration/deceleration)
	Output	DONE	BOOL	State displaying area of Function Block execution complete If Function Block execution complete without error, "1" is output as kept until the next execution starts. If error occurs, "0" is output with operation stopped.
		STAT	USINT	Error-state displaying area If error occurs during Function Block execution, error No. is displayed.

Remark

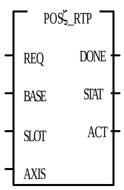
In Function Blocks for JOG start command, input parameter REQ is operated via the level.
It means JOG operation state If connection condition of REQ is On, and JOG output stopped If Off.

7.4.3 Return to prior position to manual operation

(Return To Position G3F-POPA/G4F-POPA / G6F-POPA:POSP_RTP, G4F-POPB:POSB_RTP)

Command used to return to prior position to manual operation when the position has been changed by manual operation after positioning.

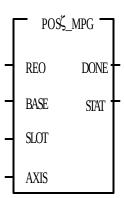
▶Manual operation means inching operation, JOG operation or manual pulse generator operation.

Function Block type	Class	Parameter	Data type	Description
	Input	REQ	BOOL	Request area of Function Block execution at rising edge Function Block executed if "0→1"(rising edge) with connected condition to this area as composed during program execution.
		BASE	USINT	Base position No. Setting area of base No. positioning module is equipped on Setting range : GM1 series(0 31), GM2 series(0 7), GM3/4 series(0 3), GM6 series(0)
		SLOT	USINT	Slot position No. Setting area of slot No. positioning module is equipped on. Setting range : 0 7
		AXIS	USINT	Assignment area of axis to use If "0", X-axis operates If "1", Y-axis operates
	Output	DONE	BOOL	State displaying area of Function Block execution complete If Function Block execution complete without error, "1" is output, and if output parameter ACT is "1" with internal processing of Function Block complete, "0" is output.
		STAT	USINT	Error-state displaying area If error occurs during Function Block execution, error No. is displayed.
		ACT	BOOL	Operation axis displaying area Positioning module changes output parameter DONE from "1" to "0" with "1" output after processing Function Block command.

7.4.4 Operation approval of manual pulse generator

(Manual Pulse Generator G3F-POPA :POSP_MPG, G4F-POPB:POSB_ MPG)

This is used to command position-decision module to be in preparation state of operation performed with outer-equipped manual pulse generator(MPG).

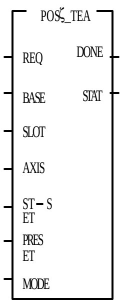
Function Block type	Class	Parameter	Data type	Description
	Input	REQ	BOOL	Request area of Function Block execution at rising edge Function Block executed if "0→1"(rising edge) with connected condition to this area as composed during program execution.
		BASE	USINT	Base position No. Setting area of base No. positioning module is equipped on Setting range : GM1 series(0 31), GM2 series(0 7), GM3/4 series(0 3), GM6 series(0)
		SLOT	USINT	Slot position No. Setting area of slot No. positioning module is equipped on. Setting range : 0 7
		AXIS	USINT	Assignment area of axis to use If "0", X-axis operates If "1", Y-axis operates
	Output	DONE	BOOL	State displaying area of Function Block execution complete If Function Block execution complete without error, "1" is output as kept until the next execution starts. If error occurs, "0" is output with operation stopped
		STAT	USINT	Error-state displaying area If error occurs during Function Block execution, error No. is displayed.

7.5 Teaching Function Block

7.5.1 Position Teaching

(Teaching G3F-POPA/ G4F-POPA/G6F-POPA:POSP_TEA, G4F-POPB:POSB_ TEA)

This is used for user to set random address value to specific operation step No.

Function Block type	Class	Parameter	Data type	Description
	Input	REQ	BOOL	Request area of Function Block execution at rising edge Function Block executed if "0→1"(rising edge) with connected condition to this area as composed during program execution.
		BASE	USINT	Base position No. Setting area of base No. positioning module is equipped on Setting range : GM1 series(0 31), GM2 series(0 7), GM3/4 series(0 3), GM6 series(0)
		SLOT	USINT	Slot position No. Setting area of slot No. positioning module is equipped on. Setting range : 0 7
		AXIS	USINT	Assignment area of axis to use If "0", X-axis operates If "1", Y-axis operates
		ST_SET	UINT	Setting area of operation step No. to execute position Teaching Setting range : 0 299
		PRESET	DINT	Setting area of position address value to execute Position Teaching Setting range : -16,744,447 16,744,447
		MODE [Note1]	BOOL	Selection area of Position Teaching type If "0", RAM Position Teaching If "1", ROM Position Teaching
	Output	DONE	BOOL	State displaying area of Function Block execution complete If Function Block execution complete without error, "1" is output as kept until the next execution starts. If error occurs, "0" is output with operation stopped
		STAT	USINT	Error-state displaying area If error occurs during Function Block execution, error No. is displayed.

Remark

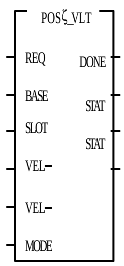
[Note1] Input parameter MODE can be used only in G6F-POPA.

- ▶ In G3F-POPA and G4F-POPA, Position Teaching command is available only at origin point decided.
- ▶ When Position Teaching Function Block has been executed, the operation step No. set at input parameter ST_SET shall be the same as the next operation step No. to be performed.
  If input parameter ST_SET setting value differs from the operation step No. to be performed, the operation step No. shall be changed to be identical by operation step No. change command(POS_SMC) Function Block prior to the next operation.
- ▶ Differences between RAM Position Teaching & ROM Position Teaching
  - In RAM Position Teaching, address value is not saved at position data, and the operation if CPU module is powered Off/On will be executed by prior address value.
  - In ROM Position Teaching, address value is saved at position data, and the operation even if CPU module is powered Off/On will be maintained.

7.5.2 Speed Teaching

(Velocity G3F-POPA / G4F-POPA / G6F-POPA:POSP_VLT, G4F-POPB:POSB_ VLT)

This is used for user to set random speed value to specific speed data No.

Function Block type	Class	Parameter	Data type	Description
	input	REQ	BOOL	Request area of Function Block execution at rising edge Function Block executed if "0→1"(rising edge) with connected condition to this area as composed during program execution.
		BASE	USINT	Base position No. Setting area of base No. positioning module is equipped on Setting range : GM1 series(0 31), GM2 series(0 7), GM3/4 series(0 3), GM6 series(0)
		SLOT	USINT	Slot position No. Setting area of slot No. positioning module is equipped on. Setting range : 0 7
		VEL_NO	USINT	Setting area of speed data No. to execute Speed Teaching. setting range : 0 127
		VEL_SET	UINT	Setting area of speed value to execute Speecd Teaching setting range : 1 20,000 (Unit : X 10Pulse)
		MODE **[Note1]**	BOOL	Selection area of Speed Teaching type If "0", RAM Speed Teaching If "1", ROM Speed Teaching
	output	DONE	BOOL	State displaying area of Function Block execution complete If Function Block execution complete without error, "1" is output, and if output parameter ACT is "1" with internal processing of Function Block complete, "0" is output.
		STAT_X	USINT	X-axis error information displayed
		STAT_Y	USINT	Y-axis error information displayed
		ACT	BOOL	Operation axis displaying area Positioning module changes output parameter DONE from "1" to "0" with "1" output after processing Function Block command.

Remark

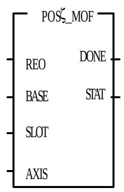
[Note1] Input parameter MODE can be used only in G6F-POPA.

7.6 Auxiliary operation

7.6.1 M code off

(M Code Off G3F-POPA/G4F-POPA/G6F-POPA:POSP_MOF, G4F-POPB:POSB_ MOF)

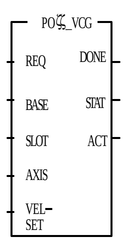
This is used to turn M code signal Off when the signal is On if M code has been set to With or After mode at parameters of each axis.

Function Block type	Class	Parameter	Data type	Description
	Input	REQ	BOOL	Request area of Function Block execution at rising edge Function Block executed if "0→1"(rising edge) with connected condition to this area as composed during program execution.
		BASE	USINT	Base position No. Setting area of base No. positioning module is equipped on Setting range : GM1 series(0 31), GM2 series(0 7), GM3/4 series(0 3), GM6 series(0)
		SLOT	USINT	Slot position No. Setting area of slot No. positioning module is equipped on. Setting range : 0 7
		AXIS	USINT	Assignment area of axis to use If "0", X-axis operates If "1", Y-axis operates
	Output	DONE	BOOL	State displaying area of Function Block execution complete If Function Block execution complete without error, "1" is output as kept until the next execution starts. If error occurs, "0" is output with operation stopped
		STAT	USINT	Error-state displaying area If error occurs during Function Block execution, error No. is displayed.

7.6.2 Speed change

(Velocity Change G3F-POPA / G4F-POPA / G6F-POPA:POSP_VCG, G4F-POPB:POSB_VCG)

It can be used to change operation speed at constant speed during operation.

Function Block type	Class	Parameter	Data type	Description
	Input	REQ	BOOL	Request area of Function Block execution at rising edge Function Block executed if "0→1"(rising edge) with connected condition to this area as composed during program execution.
		BASE	USINT	Base position No. Setting area of base No. positioning module is equipped on Setting range : GM1 series(0 31), GM2 series(0 7), GM3/4 series(0 3), GM6 series(0)
		SLOT	USINT	Slot position No. Setting area of slot No. positioning module is equipped on. Setting range : 0 7
		AXIS	USINT	Assignment area of axis to use If "0", X-axis operates If "1", Y-axis operates
		VEL_SET	UINT	Setting area of present operation speed to new value Setting range : 1 20,000 (Unit : X 10Pulse)
	Output	DONE	BOOL	State displaying area of Function Block execution complete If Function Block execution complete without error, "1" is output as kept until the next execution starts. If error occurs, "0" is output with operation stopped
		STAT	USINT	Error-state displaying area If error occurs during Function Block execution, error No. is displayed.

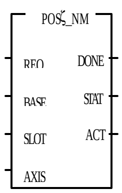
Remark

1) Caution for Function Blocks of speed change command used in program
  (1) Available only at constant speed during operation.(Busy-On state)
  (2) Available operation modes are single operation, repeated operation and auto-operation, with JOG high-speed and origin point return high-speed also usable.
  However, available for constant operation mode in G4F-POPB & G6F-POPA.

7.6.3 Continuous operation

(Next Move G3F-POPA / G4F-POPA / G6F-POPA:POSP_NM, G4F-POPB:POSB_NM)

This is used for continuous operation from present operation step No. to the next operation step No. at a random point of time without stop if continuous operation mode is applied.

Function Block type	Class	Parameter	Data type	Description
	Input	REQ	BOOL	Request area of Function Block execution at rising edge Function Block executed if "0→1"(rising edge) with connected condition to this area as composed during program execution.
		BASE	USINT	Base position No. Setting area of base No. positioning module is equipped on Setting range : GM1 series(0 31), GM2 series(0 7), GM3/4 series(0 3), GM6 series(0)
		SLOT	USINT	Slot position No. Setting area of slot No. positioning module is equipped on. Setting range : 0 7
		AXIS	USINT	Assignment area of axis to use If "0", X-axis operates If "1", Y-axis operates
	output	DONE	BOOL	State displaying area of Function Block execution complete If Function Block execution complete without error, "1" is output, and if output parameter ACT is "1" with internal processing of Function Block complete, "0" is output.
		STAT	USINT	Error-state displaying area If error occurs during Function Block execution, error No. is displayed.
		ACT	BOOL	Operation axis displaying area Positioning module changes output parameter DONE from "1" to "0" with "1" output after processing Function Block command.

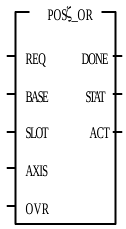
Remark

1) Caution for Function Blocks of continuous operation command used in program
  (1) Available only at constant speed during operation.(Busy-On state)
  (2) Available only for continuous operation mode.
  (3) Continuous command operation by absolute method differs from that by relative method in position data setting.

7.6.4 Speed override

(Override G3F-POPA / G4F-POPA / G6F-POPA:POSP_OR, G4F-POPB:POSB_ OR)

This is used for user to execute operation with speed value as changed at constant speed.

Function Block type	Class	Parameter	Data type	Description
	Input	REQ	BOOL	Request area of Function Block execution at rising edge Function Block executed if "0→1"(rising edge) with connected condition to this area as composed during program execution.
		BASE	USINT	Base position No. Setting area of base No. positioning module is equipped on Setting range : GM1 series(0 31), GM2 series(0 7), GM3/4 series(0 3), GM6 series(0)
		SLOT	USINT	Slot position No. Setting area of slot No. positioning module is equipped on. Setting range : 0 7
		AXIS	USINT	Assignment area of axis to use If "0", X-axis operates If "1", Y-axis operates
		OVR	USINT	Setting area of present operation speed to new value Setting range : 1 15 (Unit: 10%) Ex.) If setting value is 12, operation speed value after changed = operation speed value before changed X 120%
	output	DONE	BOOL	State displaying area of Function Block execution complete If Function Block execution complete without error, "1" is output, and if output parameter ACT is "1"with internal processing of Function Block complete, "0" is output.
		STAT	USINT	Error-state displaying area If error occurs during Function Block execution, error No. is displayed.
		ACT	BOOL	Operation axis displaying area Positioning module changes output parameter DONE from "1" to "0"with "1" output after processing Function Block command.

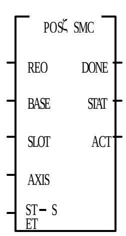
Remark

1) Caution for Function Blocks of speed override command used in program
  (1) Available only at constant speedduring operation.(Busy-On state)

7.6.5 Assignment of operation step No.

(Set Move Data Number Change G3F-POPA/G4F-POPA/G6F-POPA:POSP_SMC, G4F-POPB:POSB_SMC)

It is used to change operation step No. to be performed by the next command.

Function Block type	Class	Parameter	Data type	Description
	Input	REQ	BOOL	Request area of Function Block execution at rising edge Function Block executed if "0→1"(rising edge) with connected condition to this area as composed during program execution.
		BASE	USINT	Base position No. Setting area of base No. positioning module is equipped on Setting range : GM1 series(0 31), GM2 series(0 7), GM3/4 series(0 3), GM6 series(0)
		SLOT	USINT	Slot position No. Setting area of slot No. positioning module is equipped on. Setting range : 0 7
		AXIS	USINT	Assignment area of axis to use If "0", X-axis operates If "1", Y-axis operates
		ST_SET	UINT	Setting area of operation step No. to be performed by start command Setting range : 0 299
	Output	DONE	BOOL	State displaying area of Function Block execution complete If Function Block execution complete without error, "1" is output, and if output parameter ACT is "1"with internal processing of Function Block complete,"0" is output.
		STAT	USINT	Error-state displaying area If error occurs during Function Block execution, error No. is displayed.
		ACT	BOOL	Operation axis displaying area Positioning module changes output parameter DONE from "1" to "0"with "1" output after processing Function Block command.

Remark

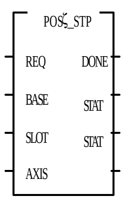
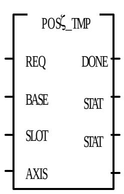
1) Caution for function blocks of operation step No. change command used in program
  (1) Available only at operation stop state.(Busy-Off state)
  (2) Operation step No. is changeable by function block of succeeding operation step No. change command to repeated operation in G3F-POPA, G4F-POPA & G4F-POPB, but not changeable in S/W package.

7.6.6 Deceleration stop

(Temporary G3F-POPA / G4F-POPA:POSP_TMP)

(Stop G3F-POPA / G4F-POPA / G6F-POPA :POSP_STP, G4F-POPB:POSB_STP)

It is used to temporarily stop operation of positioning module as decelerated.

Function Block type	Class	Parameter	Data type	Description
	Input	REQ	BOOL	Request area of Function Block execution at rising edge Function Block executed if "0→1"(rising edge) with connected condition to this area as composed during program execution.
		BASE	USINT	Base position No. Setting area of base No. positioning module is equipped on Setting range :GM1 series(0 31), GM2 series(0 7), GM3/4 series(0 3), GM6 series(0)
		SLOT	USINT	Slot position No. Setting area of slot No. positioning module is equipped on. Setting range : 0 7
		AXIS	USINT	Assignment area of axis to use If "0", X-axis operates If "1", Y-axis operates
	Output	DONE	BOOL	State displaying area of Function Block execution complete If Function Block execution complete without error, "1" is output, and if output parameter ACT is "1" with internal processing of Function Block complete, "0" is output.
		STAT_X	USINT	X-axis error information displayed
		STAT_Y	USINT	Y-axis error information displayed
		ACT	BOOL	Operation axis displaying area Positioning module changes output parameter DONE from "1" to "0" with "1" output after processing Function Block command.

Remark

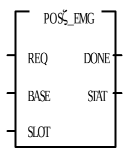
1) Caution for Function Blocks of stop command used in program
  (1) Availble at operation stop state during acceleration, constant and deceleration.(Busy-Off state)
  (2) Function Block POSP_STP of G3F-POPA and G4F-POPA can be used only in ROM V1.0.

7.7 Function Block for error processing

7.7.1 Internal emergency stop

(Emergency G3F-POPA / G4F-POPA / G6F-POPA:POSP_EMG, G4F-POPB:POSB_EMG)

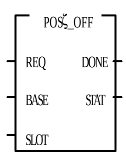
It is used to promptly stop operation in case of emergency.
Since switched over to output-prohibited and origin point-undecided state if once stopped, cancel output-prohibited and re-decide origin point to re-start.

Function Block type	Class	Parameter	Data type	Description
	Input	REQ	BOOL	Request area of Function Block execution at rising edge Function Block executed if "0→1" (rising edge) with connected condition to this area as composed during program execution.
		BASE	USINT	Base position No. Setting area of base No. positioning module is equipped on Setting range : GM1 series(0 31), GM2 series(0 7), GM3/4 series(0 3), GM6 series(0)
		SLOT	USINT	Slot position No. Setting area of slot No. positioning module is equipped on. Setting range : 0 7
	Output	DONE	BOOL	State displaying area of Function Block execution complete If Function Block execution complete without error, "1" is output as kept until the next execution starts. If error occurs, "0" is output with operation stopped
		STAT	USINT	Error-state displaying area If error occurs during Function Block execution, error No. is displayed.

7.7.2 Cancellation of output prohibition

(Pulse Out Inhibit, Off G3F-POPA/G4F-POPA / G6F-POPA:POSP_OFF, G4F-POPB:POSB_OFF)

Command to cancel pulse-out prohibited state by external emergency stop, upper/lower limit detection, etc.

Function Block type	Class	Parameter	Data type	Description
	Input	REQ	BOOL	Request area of Function Block execution at rising edge Function Block executed if "0→1" (rising edge) with connected condition to this area as composed during program execution.
		BASE	USINT	Base position No. Setting area of base No. positioning module is equipped on Setting range : GM1 series(0 31), GM2 series(0 7), GM3/4 series(0 3), GM6 series(0)
		SLOT	USINT	Slot position No. Setting area of slot No. positioning module is equipped on. Setting range : 0 7
	Output	DONE	BOOL	State displaying area of Function Block execution complete If Function Block execution complete without error, "1" is output as kept until the next execution starts. If error occurs, "0" is output with operation stopped
		STAT	USINT	Error-state displaying area If error occurs during Function Block execution, error No. is displayed.

7.7.3 Error reset

(Reset G3F-POPA / G4F-POPA / G6F-POPA:POSP_RES, G4F-POPB:POSB_ RSE)

It is used to reset error if occurred during operation or by exceeding parameter setting range.

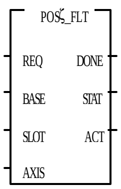
Function Block type	Class	Parameter	Data type	Description
POS_RES REQ DONE BASE STAT SLOT AXIS	Input	REQ	BOOL	Request area of Function Block execution at rising edge Function Block executed if "0→1"(rising edge) with connected condition to this area as composed during program execution.
		BASE	USINT	Base position No. Setting area of base No. positioning module is equipped on Setting range : GM1 series(0 31), GM2 series(0 7), GM3/4 series(0 3), GM6 series(0)
		SLOT	USINT	Slot position No. Setting area of slot No. positioning module is equipped on. Setting range : 0 7
		AXIS	USINT	Assignment area of axis to use If "0", X-axis operates If "1", Y-axis operates
	Output	DONE	BOOL	State displaying area of Function Block execution complete If Function Block execution complete without error, "1" is output as kept until the next execution starts. If error occurs, "0" is output with operation stopped
		STAT	USINT	Error-state displaying area If error occurs during Function Block execution, error No. is displayed.

7.8 Other Function Bblock

7.8.1 Floating point set setting

(Floating, Point Set G3F-POPA / G4F-POPA / G6F-POPA:POSP_FLT, G4F-POPB:POSB_FLT)

It is a command used to set present position to origin point compulsorily without origin point return-operation. The assigned address value to origin point return address will be the present position.

Function Block type	Class	Parameter	Data type	Description
	Input	REQ	BOOL	Request area of Function Block execution at rising edge Function Block executed if "0→1"(rising edge) with connected condition to this area as composed during program execution.
		BASE	USINT	Base position No. Setting area of base No. positioning module is equipped on Setting range : GM1 series(0 31), GM2 series(0 7), GM3/4 series(0 3), GM6 series(0)
		SLOT	USINT	Slot position No. Setting area of slot No. positioning module is equipped on. Setting range : 0 7
		AXIS	USINT	Assignment area of axis to use If "0", X-axis operates If "1", Y-axis operates
	Output	DONE	BOOL	State displaying area of Function Block execution complete If Function Block execution complete without error, "1" is output, and if output parameter ACT is "1" with internal processing of Function Block complete, "0" is output.
		STAT	USINT	Error-state displaying area If error occurs during Function Block execution, error No. is displayed.
		ACT	BOOL	Operation axis displaying area Positioning module changes output parameter DONE from "1" to "0" with "1" output after processing Function Block command.

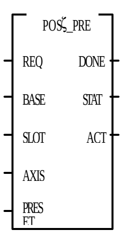
Remark

1) Caution for Function Blocks of floating point set setting command used is program
 (1) Avialable only at operation stop state.(Busy-Off state)

7.8.2 Present position Preset

(Preset G3F-POPA / G4F-POPA / G6F-POPA:POSP_PRE, G4F-POPB:POSB_PRE)

It is a command used to change present position to random position.

Function Block type	Class	Parameter	Data type	Description
	Input	REQ	BOOL	Request area of Function Block execution at rising edge Function Block executed if "0→1"(rising edge) with connected condition to this area as composed during program execution.
		BASE	USINT	Base position No. Setting area of base No. positioning module is equipped on Setting range : GM1 series(0 31), GM2 series(0 7), GM3/4 series(0 3), GM6 series(0)
		SLOT	USINT	Slot position No. Setting area of slot No. positioning module is equipped on. Setting range : 0 7
		AXIS	USINT	Assignment area of axis to use If "0", X-axis operates If "1", Y-axis operates
		PRESET	DINT	Area used to change present position Setting range : -16,744,447 16,744,447
	Output	DONE	BOOL	State displaying area of Function Block execution complete If Function Block execution complete without error, "1" is output, and if output parameter ACT is "1" with internal processing of Function Block complete, "0" is output.
		STAT	USINT	Error-state displaying area If error occurs during Function Block execution, error No. is displayed.
		ACT	BOOL	Operation axis displaying area Positioning module changes output parameter DONE from "1" to "0" with "1" output after processing Function Block command.

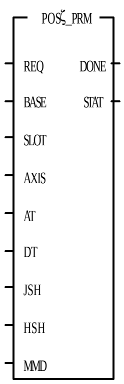
Remark

1) Caution for Function Block of preset command used in program
 (1) Available only at operation stop state.(Busy-Off state)

7.8.3 Parameter change

(Parameter Write G3F-POPA / G4F-POPA / G6F-POPA:POSP_PRM, G4F-POPB:POSB_PRM)

Command used to change acceleration time, deceleration time, JOG high-speed, origin point return high-speed and M code mode at parameters during operation.

Function Block type	Class	Parameter	Data type	Description
	Input	REQ	BOOL	Request area of Function Block execution at rising edge Function Block executed if "0→1"(rising edge) with connected condition to this area as composed during program execution.
		BASE	USINT	Base position No. Setting area of base No. positioning module is equipped on Setting range : GM1 series(0 31), GM2 series(0 7), GM3/4 series(0 3), GM6 series(0)
		SLOT	USINT	Slot position No. Setting area of slot No. positioning module is equipped on. Setting range : 0 7
		AXIS	USINT	Assignment area of axis to use If "0", X-axis operates If "1", Y-axis operates
		AT		Setting area of acceleration time at parameters setting range : 1 999(Unit: 10ms)
		DT		Setting area of deceleration time at parameters setting range : 1 999(Unit: 10ms)
		JSH		Setting area of JOG highspeed at parameters setting range : 1 20,000(Unit: X 10pps)
		HSH		Setting area of origin point return highspeed at parameters setting range : 1 20,000(Unit: X 10pps)
		MMD		Setting area of M code mode at parameters If "0", With If "1", After mode If "2", None mode
	Output	DONE	BOOL	State displaying area of Function Block execution complete If Function Block execution complete without error, "1" is output as kept until the next execution starts. If error occurs, "0" is output with operation stopped
		STAT	USINT	Error-state displaying area If error occurs during Function Block execution, error No. is displayed.

Remark

1) Caution for Function Block of parameter change used in program
(1) Available only at operation stop state.(Busy-Off state)

7.9 Error codes in Function Block

Error type displayed on output parameter STAT and actions to take against will be described.

Err. code	Description	Pulse-out type G3F-POPA	G4F-POPA	G4F-POPB	G6F-POPA	Positioning module operation status	Actions
0	In normal operation	0	0	0	0		
1	Base position No. exceeded over setting range	0	0	0	0		Set base position within setting range
2	H/W error on applicable base	0	0	0	0		Request base A/S
3	Slot position No. exceeded over setting range	0	0	0	0		Set slot position within setting range
4	Applicable slot not equipped	0	0	0	0		Install positioning module on the applicable slot
5	Different module name of applicable slot	0	0	0	0		Install positioning module on the applicable slot
6	Setting axis No. exceeded over setting range	0	0	0	0		Set correct axis No. of positioning module
7	Command given with CPU module at STOP state	0	0	0	0		Change CPU module states from STOP to RUN
8	Common-used RAM error	0	0	0	0		A/S request
9	Function Block command unavailable to execute due to module in/at operation/stop	0	0	0	0		Set correct command execution conditions
10	New command Function Block executed at the state that prior command is not complete	0	0	0	0		Program change to execute new command after prior command is complete
11	Setting aux. input value exceeded over the range	0	0	0	0		To be in setting range
13	Stop related command or emergency stop input while Function Block is executed						1. Reset error 2. Cancel output-prohibited
14	Continuous operation or speed override command input at other states than constant stage in auto-operation	0	0	0	0		Continuous operation or speed override is available only at constant stage
15	Command given with module origin point undecided	0	0	0	0		Start command after origin point decided
17	H/W error on positioning module	0	0	0	0		Cancel error if powered Off/On
18	Watchdog error	0	0	0	0		Cancel error if powered Off/On
19	Inner memory interface error	0	0	0	0		Cancel error if powered Off/On
20	External emergency stop input	0	0	0	0	Output-prohibited, Start.point undecided	1. Remove cause of external emergency stop 2. Cancel output-prohibited 3. Operate after origin point redecided
21	Internal emergency stop input	0	0	0	0	Output-prohibited, Start.point undecided	1. Remove cause of internal emergency stop 2. Cancel output-prohibited 3. Operate after origin point redecided
22	External lower limit signal input	0	0	0	0	Output-prohibited, Start.point undecided	1. Remove cause of error 2. Perform JOG operation towad upper limit 3. Operate after origin point redecided
23	External upper limit signal input	0	0	0	0	Output-prohibited, Start.point undecided	1. Remove cause of error 2. Perform JOG operation toward lower limit 3. Operate after origin point redecided
24	Present position exceeded over s/w lower limit value set at parameters	0	0	0	0	Output-prohibited, Start.point undecided	1. Change s/w lower limit address range set at parameters 2. Operate after origin point re-decided
25	Present position exceeded over s/w upper limit value set at parameters	0	0	0	0	Output-prohibited, Start.point undecided	1. Change s/w upper limit address range set at parameters 2. Operate after origin point re-decided
36	Next operation mode is incorrect in auto-operation or continuous operation mode	0	0	0	0	No operation at stop state	Do not execute next operation step during operation.
37	Interpolation operation command input in continuous, constant, and positioning constant operation mode	0	0	0	0	Unchanged	Interpolation operation is available only at single, repeated, and auto modes

40	Start command unavailable at M code ON state	X	X	X	O	No operation	1. Turn M code Off and 2. start operation
45	Speed/position control switching unavailable in acceleration of positioning constant operation mode	X	X	X	O	Present operation state unchanged	Change speed/position control switching from acceleration to constant
46 (Note1)	EOM stop or positioning stop command input in constant, positioning constant operation mode	X	Δ	X	X	Present operation state unchanged	
47	Stop command input in origin point return low speed operation	X	O	X	X	Present operation state unchanged	
48	Stop command input while return(RTP) command to prior position to manual operation is executed	O	O	O	O	Present operation state unchanged	Program change needed because stop command is processed as an error if return command to prior position to manual operation is executed.
49	stop command input during dwell time processing or origin point compensation	O	O	O	O	Present operation state unchanged	Program change needed because stop command is unavailable during dwell time processing or origin point compensation
56	Continuous operation(NM), trans. operation(OR), speed change command input at other states than constant stage during operation by start command	O	O	O	O	Present operation state unchanged	Program change needed because continuous operation(NM), trans. operation(OR), speed change command are only available at constant stage
57	Continuous operation(NM) or trans. operation (OR) command input in constant or positioning constant operation mode. Or speed change command input in continuous, constant or positioning constant operation mode	O	O	O	O	Present operation state unchanged	1. Error reset 2. Continuous operation(NM) & trans. operation(OR) unavailable in constant, positioning constant operation mode 3. Speed change unavailable in continuous, constant and positioning constant operation mode 4. Modify program
58	Continuous operation(NM) command input in other operation modes than continuous operation mode	O	O	O	O	Present operation state unchanged	1. Error reset 2. Continuous operation(NM) is available only in continuous operation mode 3. Modify program (operation mode)
59	Override and continuous operation command unavailable in other states than in operation by start command	O	O	O	O	Present operation state unchanged	1. Error reset
60	Override command input in operation step-executed set to override-prohibited	O	O	O	O	Present operation state unchanged	1. Error reset 2. Change to override allowable state
61	Continuous operation(NM) command unavailable in continuous operation whose direction is to be changed	O	O	O	O	Present operation state unchanged	1. Error reset
66	No next operation data to operate at start command. Data No. range exceeded at Position Teaching and Speed Teaching command	O	O	O	O	No operation	1. Error reset 2. Operation step no. Change
67	Overrideing rate exceeded over allowable range(1 ~ 15)	O	O	O	O	Present operation state unchanged	1. Error reset 2. To be in setting range
68	Inching amount exceeded over allowable range(1 ~ 99)	O	O	O	O	No operation	1. To be in inching setting range
69	Setting position address exceeded over s/w upper limit or s/w lower limit range at present position preset command	O	O	O	O	Output-prohibited, Start.point undecided	1. Error reset 2. Move to operation available area by JOG or manual operation and then perform restart
70	Position data setting value of positioning constant operation mode is too small	X	X	X	O	No operation	1. Change setting value of position data or speed
76	Start command of Absolute Coordinates operation data unavailable at origin point undecided state	O	O	O	O	No operation	Start after origin point decided
77	Position Teaching command input at origin point undecided state	O	O	O	X	Available after start.point decided	1. Error reset 2. Position Teaching command executed after origin point decided
78	Teaching mode value is not as assigned	X	X	X	O	No operation	To be in setting range
86	Speed exceeded over allowable range(bias speed~speed limits)	O	O	O	O	No operation	Change speed values

87	Origin point return speed exceeded over allowable range(bias speed~speed limits). Origin point return low-speed set higher than origin point return high-speed	O	O	O	O	No operation	Change speed values
88	Minor axis speed calculated by linear interpolation exceeded over allowable range	O	X	O	O	No operation	Change speed value operated by minor axis
89	Operation time exceeded overallowable range(Max.65,535 ms)	O	O	O	O	No operation if detected before operation	Stop operation if detected during operation
96	Command input at outputprohibited state	O	O	O	O	No operation	Cancel outputprohibited and perform restart
97	Command input during operation(Busy)	O	O	O	O	Present operation state unchanged	Add protection circuit against execution of the other commands during operation in program
98	Start, origin point return or interpolation operation command input at PLCstop state	O	O	O	X	No operation	Change CPU module state from STOP to RUN and perform restart
99	Inching command unavailable if other axis is in operation(Busy)	X	X	X	O	No operation	Execute inching command while operation of the other axis is at stop
106	Internal computation error (Divide by Zero Error)	O	O	O	O	No operation	
116 (Note 2)	Operation data of which interpolation operation is unavailable	O	X	O	O		
117 (Note 1)	Operation unavailable because operation speed is higher than acceleration/deceleration inclination	X	Δ	X	X		
119	Start command input from position data set to Complete without number change	O	O	X	X		Change operation step No. and then perform restart

Note 1) Valid only in G4F-POPA, V1.0

Note 2) G3F-POPA, V1.1 or later

Chapter 7 Function Blocks

Function Blocks for positioning modules used in GMWIN are described.

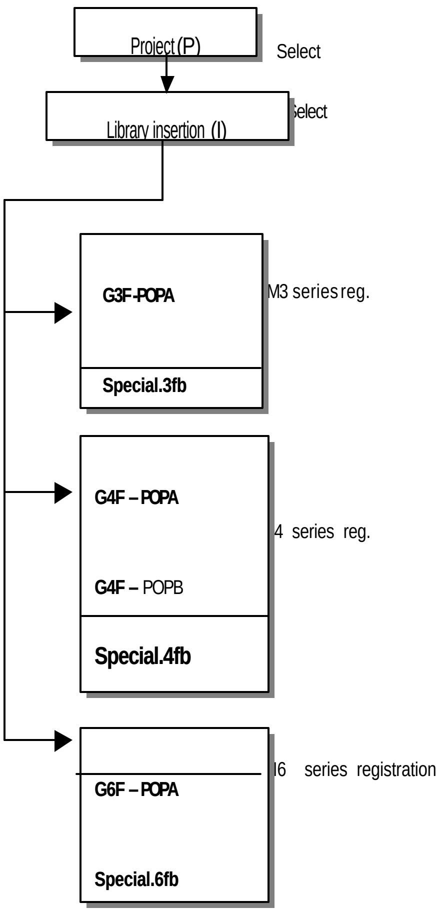
Type of Function Blocks is as follows.

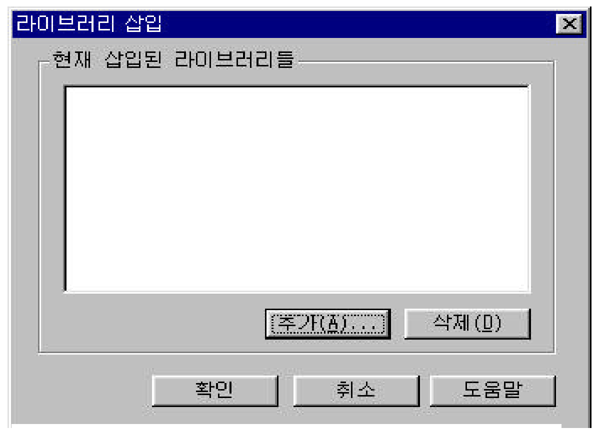
No	Class	G3F-POPA	G4F-POPA	G4F-POPB	G6F-POPA	Description	Remarks
1	For module information	POSP_CRD	POSP_CRD	POSB_CRD	POSP_CRD	Present operation state's code information Read	7.2.1
2		POSP_SRD	POSP_SRD	POSB_SRD	POSP_SRD	Present operation state's bit information Read	7.2.2
3	Auto-Operation	POSP_AST	POSP_AST	POSB_AST	POSP_AST	Start	7.3.1
4		POSP_INT	-	POSB_INT	POSP_INT	Linear interpolation start	7.3.2
5		POSP_ORG	POSP_ORG	POSB_ORG	POSP_ORG	Origin point return operation	7.3.3
6	Manual Operation	POSP_INC	POSP_INC	POSB_INC	POSP_INC	Inching operation	7.4.1
7		POSP_JOG	POSP_JOG	POSB_JOG	POSP_JOG	JOG operation	7.4.2
8		POSP_RTP	POSP_RTP	POSB_RTP	POSP_RTP	Return to prior position to manual operation	7.4.3
9		POSP_MPG	-	POSB_MPG	-	Manual pulse generator operation allowable	7.4.4
10	Teaching	POSP_TEA	POSP_TEA	POSB_TEA	POSP_TEA	Position teaching	7.5.1
11		POSP_VLT	POSP_VLT	POSB_VLT	POSP_VLT	Speed teaching	7.5.2
12	Sub-Operation	POSP_MOF	POSP_MOF	POSB_MOF	POSP_MOF	M code off	7.6.1
13		POSP_VCG	POSP_VCG	POSB_VCG	POSP_VCG	Speed change	7.6.2
14		POSP_NM	POSP_NM	POPB_NM	POSP_NM	Continuous operation	7.6.3
15		POSP_OR	POSP_OR	POPB_OR	POSP_OR	Speed override	7.6.4
16		POSP_SMC	POSP_SMC	POPB_SMC	POSP_SMC	Setting operation step No.	7.6.5
17		POSP_STP*	POSP_STP*	POSB_STP	POSP_STP	Deceleration stop(*:only in V1.0)	7.6.6
18		POSP_TMP	POSP_TMP				
19	Error	POSP_EMG	POSP_EMG	POSB_EMG	POSP_EMG	Internal emergency stop	7.7.1
20		POSP_OFF	POSP_OFF	POSB_OFF	POSP_OFF	Output-prohibited cancellation	7.7.2
21		POSP_RES	POSP_RES	POSB_RES	POSP_RES	Error reset	7.7.3
22	Others	POSP_FLT	POSP_FLT	POSB_FLT	POSP_FLT	Floating point set setting	7.8.1
23		POSP_PRE	POSP_PRE	POSB_PRE	POSP_PRE	Present position preset	7.8.2
24		-	-	-	POSP_PRM	Parameter change	7.8.3

7.1 Function Block registration for positioning module in GMWIN

Function Block can be registered as specified below while GMWIN is being executed.

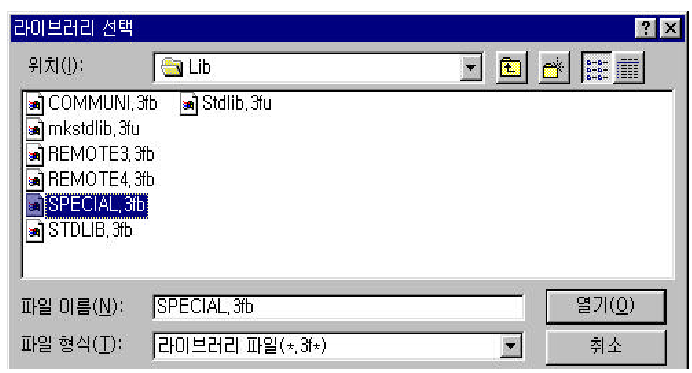
Function Block registration is available only when the project is at open state.





■ Select Add (A) to display the screen below

■ For GMWIN 3.1 or above (Ex. of G3F-POPA)

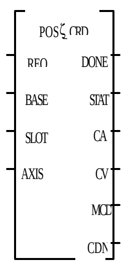


7.2 Function Block for module information Read

7.2.1 Code information Read at present operation state

(Status Code Read G3F-POPA/G4F-POPA/G6F-POPA:POSP_CRD, G4F-POPB:POSB_CRD)

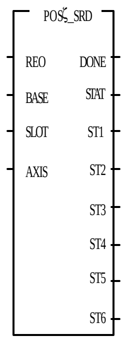
Present position address, operation speed, M code value and operation data No. of the setting axis can be read for monitoring or using as conditions in user program.

Function Block type	Class	Parameter	Data type	Description
	Input	REQ	BOOL	Request area of Function Block execution Function block executed if "0→1" (level detection) with connected condition to this area as composed during program execution.
		BASE	USINT	Base position No. Setting area of base No. positioning module is equipped on Setting range : GM1 series(0 31), GM2 series(0 7), GM3/4 series(0 3), GM6 series(0)
		SLOT	USINT	Slot position No. Setting area of slot No. positioning module is equipped on. Setting range : 0 7
		AXIS	USINT	Assignment area of axis to use If "0", X-axis operates If "1", Y-axis operates
	Output	DONE	BOOL	State displaying area of FunctionBlock execution complete If Function Block execution complete without error, "1" is output as kept until the next execution starts. If error occurs, "0" is output.
		STAT	USINT	Error-state displaying area If error occurs during Function Block execution, error No. is displayed.
		CA	DINT	Present position address displayed.
		CV	UINT	Present operation speed displayed.
		MCD	USINT	Present M code value displayed.
		CDN	UINT	Present operation data No. displayed.

7.2.2 Bit information Read at present operation state

(Status Bit Read G3F-POPA / G4F-POPA / G6F-POPA:POSP_SRD, G4F-POPB:POSB_SRD)

Present operation state of the setting axis can be read for detailed monitoring or using as conditions in user program.

Function Block type	Class	Parameter	Data type	Description
	Input	REQ	BOOL	Request area of Function Block execution Function Block executed if "0→1"(level detection) with connected condition to this area as composed during program execution.
		BASE	USINT	Base position No. Setting area of base No. positioning module is equipped on Setting range : GM1 series(0 31), GM2 series(0 7), GM3/4 series(0 3), GM6 series(0)
		SLOT	USINT	Slot position No. Setting area of slot No. positioning module is equipped on. Setting range : 0 7
		AXIS	USINT	Assignment area of axis to use If "0", X-axis operates If "1", Y-axis operates
	Output	DONE	BOOL	State displaying area of Function Block execution complete If Function Block execution complete without error, "1" is output as kept until the next execution starts. If error occurs, "0" is output.
		STAT	USINT	Error-state displaying area If error occurs during Function Block execution, error No. is displayed.
		ST1	BOOL [ARRAY]	
		ST2	BOOL [ARRAY]	
		ST3	BOOL [ARRAY]	
		ST4	BOOL [ARRAY]	
		ST5	BOOL [ARRAY]	
		ST6	BOOL [ARRAY]	

Remark

1) Contents of output parameters ST1 ST6 in present operation state's bit Read function block are important information surely to apply in program.

Bit No.	ST1	ST2	ST3
[0]	In dwell(Bit:On)	Upper limit detected(Bit:On)	Unused
[1]	In deceleration(Bit:On)	Lower limit detected (Bit:On)	Forward (Bit:Off),Reverse(Bit:On)
[2]	In constant(Bit:On)	Emergency stop detected (Bit:On)	ZONE#1(Bit:On)
[3]	In acceleration(Bit:On)	Pulse -out prohibited(Bit:On)	ZONE#2(Bit:On)
[4]	At stop state(Bit:On)	Inching complete(Bit:On)	ZONE#3(Bit:On)
[5]	In returning to origin point(Bit:On)	Position teaching complete(Bit:On)	Repeated operation complete (Bit:On)
[6]	In positioning(Bit:On)	In JOG low-speed operation(Bit:On)	Positioning operation complete(Bit:On)
[7]	In interpolation operation(not for G4F-POPA)	In JOG high-speed operation(Bit:On)	M code On(Bit:On)

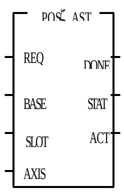
Bit No.	ST4	ST5 (terminal signal)	ST6
[0]	In origin point compensation(Bit:On)	Speed position control switching (only for G6F-POPA)	Unused
[1]	In backlash compensation(Bit:On)(not for G6F-POPA)	External upper limit signal(Bit:Off)	Error
[2]	In next move(Bit:On)	External lower limit signal(Bit:Off)	Position passing
[3]	In speed overriding(Bit:On)	External near zero point signal.(Bit:On)	In operation(Busy)
[4]	Unused	External origin point signal.(Bit:On)	Positioning complete
[5]	In stopping as decelerated & stop complete(Bit:On)	Unused	Origin point return complete
[6]	Speed teaching complete(Bit:On) (valid only in G3F-POPA/G4F -POPA V1.0)	Unused	Origin point undecided
[7]	Speed change complete (Bit:On) (valid only in G3F-POPA/G4F -POPA V1.0)	External emergency stop signal,(Bit Off)	Unused

7.3 Function Block for auto- operation

7.3.1 Start

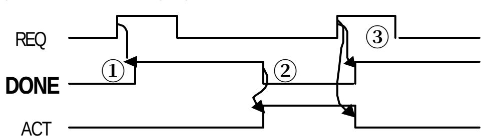
(Auto Start G3F-POPA / G4F-POPA / G6F-POPA:POSP_AST, G4F-POPB:POSB_AST)

Output parameter ACT will be "1" if one positioning is complete by operation start command of positioning module.

Function Block type	Class	Parameter	Data type	Description
	Input	REQ	BOOL	Request area of Function Block execution at rising edge Function Block executed if "0→1"(rising edge) with connected condition to this area as composed during program execution.
		BASE	USINT	Base position No. Setting area of base No. positioning module is equipped on Setting range : GM1 series(0 31), GM2 series(0 7), GM3/4 series(0 3), GM6 series(0)
		SLOT	USINT	Slot position No. Setting area of slot No. positioning module is equipped on. Setting range : 0 7
		AXIS	USINT	Assignment area of axis to use If "0", X-axis operates If "1", Y-axis operates
	Output	DONE	BOOL	State displaying area of Function Block execution complete If Function Block execution complete without error, "1" is output, and if output parameter ACT is "1" with internal processing of Function Block complete, "0" is output.
		STAT	USINT	Error-state displaying area If error occurs during Function Block execution, error No. is displayed.
		ACT	BOOL	Operation axis displaying area Positioning module changes output parameter DONE from "1" to "0" with "1" output after processing Function Block command.

Remark

1)Relation between output parameters, DONE and ACT



① : Function Block execution by 1st REQ

② : Function Block command processed

③ : Function Block execution by 2nd REQ

2) Caution for Function Blocks of auto-operation command used in program

(1) Available only when operation is at stop state.(Busy-Off state)

(2) Available operation modes are single operation, repeated operation, auto-operation, continuous operation, constant operation and positioning constant operation.

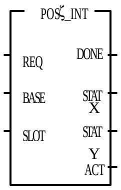
a) If auto-operation is used, continuous operation, constant operation and positioning constant operation are not available for the succeeding operation step No. to auto-operation.

b) If continuous operation is used, auto-operation, constant operation and positioning constant operation are not available for the succeeding operation step No. to continuous operation.

7.3.2 Linear interpolation start

(Linear Interpolation G3F-POPA / G6F-POPA:POSP_INT, G4F-POPB:POSB_INT)

Command for linear interpolation operation in positioning module for 2-axes.

Function Block type	Class	Parameter	Data type	Description
 	Input	REQ	BOOL	Request area of Function Block execution at rising edge Function Block executed if "0→1"(rising edge) with connected condition to this area as composed during program execution.
		BASE	USINT	Base position No. Setting area of base No. positioning module is equipped on Setting range : GM1 series(0 31), GM2 series(0 7), GM3/4 series(0 3), GM6 series(0)
		SLOT	USINT	Slot position No. Setting area of slot No. positioning module is equipped on. Setting range : 0 7
	output	DONE	BOOL	State displaying area of Function Block execution complete If Function Block execution complete without error, "1" is output, and if output parameter ACT is "1" with internal processing of Function Block complete, "0" is output.
		STAT_X	USINT	X-axis error information displayed
		STAT_Y	USINT	Y-axis error information displayed
		ACT	BOOL	Operation axis displaying area Positioning module changes output parameter DONE from "1" to "0" with "1" output after processing Function Block command.

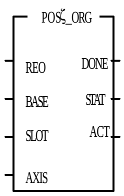
Remark

1) Caution for function blocks of linear interpolation operation command used in program
 (1) Available only when operation is at stop state.(Busy-Off state)
 (2) Available operation modes are interpolation operation, repeated operation and auto-operation.

7.3.3 Start to return to origin point

(Origin G3F-POPA / G4F-POPA / G6F-POPA:POSP_ORG, G4F-POPB:POSB_ORG)

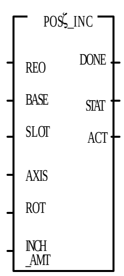
Operation command to find the machine's origin point by origin point return-processing methods with direction, compensation, speed (high/low), address and dwell time set at origin point return-parameters of each axis. If complete signal of origin point return is turned On, origin point return-operation of the machine is complete.

Function Block type	Class	Parameter	Data type	Description
	Input	REQ	BOOL	Request area of Function Block execution at rising edge Function Block executed if "0→1"(rising edge) with connected condition to this area as composed during program execution.
		BASE	USINT	Base position No. Setting area of base No. positioning module is equipped on Setting range : GM1 series(0 31), GM2 series(0 7), GM3/4 series(0 3), GM6 series(0)
		SLOT	USINT	Slot position No. Setting area of slot No. positioning module is equipped on. Setting range : 0 7
		AXIS	USINT	Assignment area of axis to use If "0", X-axis operates If "1", Y-axis operates
	Output	DONE	BOOL	State displaying area of Function Block execution complete If Function Block execution complete without error, "1" is output, and if output parameter ACT is "1" with internal processing of Function Block complete, "0" is output.
		STAT	USINT	Error-state displaying area If error occurs during Function Block execution, error No. is displayed.
		ACT	BOOL	Operation axis displaying area Positioning module changes output parameter DONE from "1" to "0" with "1" output after processing Function Block command.

7.4 Function Block for manual operation

7.4.1 Inching operation

(Inching G3F-POPA / G4F-POPA / G6F-POPA:POSP_INC, G4F-POPB:POSB_INC)

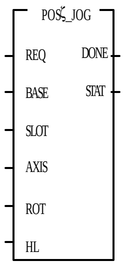
Function Block type	Class	Parameter	Data type	Description
	Input	REQ	BOOL	Request area of Function Block execution at rising edge Function Block executed if "0→1"(rising edge) with connected condition to this area as composed during program execution.
		BASE	USINT	Base position No. Setting area of base No. positioning module is equipped on Setting range : GM1 series(0 31), GM2 series(0 7), GM3/4 series(0 3), GM6 series(0)
		SLOT	USINT	Slot position No. Setting area of slot No. positioning module is equipped on. Setting range : 0 7
		AXIS	USINT	Assignment area of axis to use If "0", X-axis operates If "1", Y-axis operates
		ROT	BOOL	Direction assignment of inching operation If "0", forward operation If "1", reverse operation
		INCH_AMT	USINT	Travel value setting area in inching operation Setting range : 1 99 (Unit:Pulse)
	Output	DONE	BOOL	State displaying area of Function Block execution complete If Function Block execution complete without error, "1" is output, and if output parameter ACT is "1" with internal processing of Function Block complete, "0" is output.
		STAT	USINT	Error-state displaying area If error occurs during Function Block execution, error No. is displayed.
		ACT	BOOL	Operation axis displaying area Positioning module changes output parameter DONE from "1" to "0" with "1" output after processing Function Block command.

7.4.2 JOG operation

(JOG G3F-POPA / G4F-POPA / G6F-POPA:POSP_JOG, G4F-POPB:POSB_ JOG)

As a manual operation function for test, it is used to check system operation, wiring state and teaching position address, whose speed is classified into high and low as required.

Pulse is output by setting value if connection condition of input parameter REQ is ON, and is stopped if OFF.

Function Block type	Class	Parameter	Data type	Description
	Input	REQ	BOOL	Request area of Function Block execution Function Block executed if "0→1"(level detection) with connected condition to this area as composed during program execution.
		BASE	USINT	Base position No. Setting area of base No. positioning module is equipped on Setting range : GM1 series(0 31), GM2 series(0 7), GM3/4 series(0 3), GM6 series(0)
		SLOT	USINT	Slot position No. Setting area of slot No. positioning module is equipped on. Setting range : 0 7
		AXIS	USINT	Assignment area of axis to use If "0", X-axis operates If "1", Y-axis operates
		ROT	BOOL	Direction assignment of JOG operation If "0", forward operation If "1", reverse operation
		HL	BOOL	Speed assignment of JOG operation If "0", low-speed operation (profile without acceleration/deceleration) If "1", high-speed operation (profile with acceleration/deceleration)
	Output	DONE	BOOL	State displaying area of Function Block execution complete If Function Block execution complete without error, "1" is output as kept until the next execution starts. If error occurs, "0" is output with operation stopped.
		STAT	USINT	Error-state displaying area If error occurs during Function Block execution, error No. is displayed.

Remark

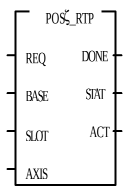
In Function Blocks for JOG start command, input parameter REQ is operated via the level.
It means JOG operation state If connection condition of REQ is On, and JOG output stopped If Off.

7.4.3 Return to prior position to manual operation

(Return To Position G3F-POPA/G4F-POPA / G6F-POPA:POSP_RTP, G4F-POPB:POSB_RTP)

Command used to return to prior position to manual operation when the position has been changed by manual operation after positioning.

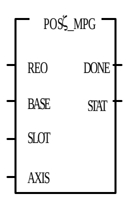
▶Manual operation means inching operation, JOG operation or manual pulse generator operation.

Function Block type	Class	Parameter	Data type	Description
	Input	REQ	BOOL	Request area of Function Block execution at rising edge Function Block executed if "0→1"(rising edge) with connected condition to this area as composed during program execution.
		BASE	USINT	Base position No. Setting area of base No. positioning module is equipped on Setting range : GM1 series(0 31), GM2 series(0 7), GM3/4 series(0 3), GM6 series(0)
		SLOT	USINT	Slot position No. Setting area of slot No. positioning module is equipped on. Setting range : 0 7
		AXIS	USINT	Assignment area of axis to use If "0", X-axis operates If "1", Y-axis operates
	Output	DONE	BOOL	State displaying area of Function Block execution complete If Function Block execution complete without error, "1" is output, and if output parameter ACT is "1" with internal processing of Function Block complete, "0" is output.
		STAT	USINT	Error-state displaying area If error occurs during Function Block execution, error No. is displayed.
		ACT	BOOL	Operation axis displaying area Positioning module changes output parameter DONE from "1" to "0" with "1" output after processing Function Block command.

7.4.4 Operation approval of manual pulse generator

(Manual Pulse Generator G3F-POPA :POSP_MPG, G4F-POPB:POSB_ MPG)

This is used to command position-decision module to be in preparation state of operation performed with outer-equipped manual pulse generator(MPG).

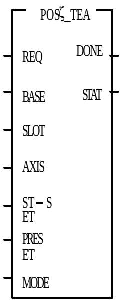
Function Block type	Class	Parameter	Data type	Description
	Input	REQ	BOOL	Request area of Function Block execution at rising edge Function Block executed if "0→1"(rising edge) with connected condition to this area as composed during program execution.
		BASE	USINT	Base position No. Setting area of base No. positioning module is equipped on Setting range : GM1 series(0 31), GM2 series(0 7), GM3/4 series(0 3), GM6 series(0)
		SLOT	USINT	Slot position No. Setting area of slot No. positioning module is equipped on. Setting range : 0 7
		AXIS	USINT	Assignment area of axis to use If "0", X-axis operates If "1", Y-axis operates
	Output	DONE	BOOL	State displaying area of Function Block execution complete If Function Block execution complete without error, "1" is output as kept until the next execution starts. If error occurs, "0" is output with operation stopped
		STAT	USINT	Error-state displaying area If error occurs during Function Block execution, error No. is displayed.

7.5 Teaching Function Block

7.5.1 Position Teaching

(Teaching G3F-POPA/ G4F-POPA/G6F-POPA:POSP_TEA, G4F-POPB:POSB_ TEA)

This is used for user to set random address value to specific operation step No.

Function Block type	Class	Parameter	Data type	Description
	Input	REQ	BOOL	Request area of Function Block execution at rising edge Function Block executed if "0→1"(rising edge) with connected condition to this area as composed during program execution.
	Input	BASE	USINT	Base position No. Setting area of base No. positioning module is equipped on Setting range : GM1 series(0 31), GM2 series(0 7), GM3/4 series(0 3), GM6 series(0)
	Input	SLOT	USINT	Slot position No. Setting area of slot No. positioning module is equipped on. Setting range : 0 7
	Input	AXIS	USINT	Assignment area of axis to use If "0", X-axis operates If "1", Y-axis operates
	Input	ST_SET	UINT	Setting area of operation step No. to execute position Teaching Setting range : 0 299
	Input	PRESET	DINT	Setting area of position address value to execute Position Teaching Setting range : -16,744,447 16,744,447
	Input	MODE [Note1]	BOOL	Selection area of Position Teaching type If "0", RAM Position Teaching If "1", ROM Position Teaching
	Output	DONE	BOOL	State displaying area of Function Block execution complete If Function Block execution complete without error, "1" is output as kept until the next execution starts. If error occurs, "0" is output with operation stopped
	Output	STAT	USINT	Error-state displaying area If error occurs during Function Block execution, error No. is displayed.

Remark

[Note1] Input parameter MODE can be used only in G6F-POPA.

▶ In G3F-POPA and G4F-POPA, Position Teaching command is available only at origin point decided.

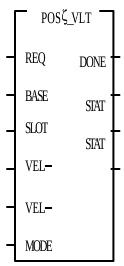
▶ When Position Teaching Function Block has been executed, the operation step No. set at input parameter ST_SET shall be the same as the next operation step No. to be performed.
If input parameter ST_SET setting value differs from the operation step No. to be performed, the operation step No. shall be changed to be identical by operation step No. change command(POS_SMC) Function Block prior to the next operation.

▶ Differences between RAM Position Teaching & ROM Position Teaching
- In RAM Position Teaching, address value is not saved at position data, and the operation if CPU module is powered Off/On will be executed by prior address value.
- In ROM Position Teaching, address value is saved at position data, and the operation even if CPU module is powered Off/On will be maintained.

7.5.2 Speed Teaching

(Velocity G3F-POPA / G4F-POPA / G6F-POPA:POSP_VLT, G4F-POPB:POSB_ VLT)

This is used for user to set random speed value to specific speed data No.

Function Block type	Class	Parameter	Data type	Description
	input	REQ	BOOL	Request area of Function Block execution at rising edge Function Block executed if "0→1"(rising edge) with connected condition to this area as composed during program execution.
		BASE	USINT	Base position No. Setting area of base No. positioning module is equipped on Setting range :GM1 series(0 31), GM2 series(0 7), GM3/4 series(0 3), GM6 series(0)
		SLOT	USINT	Slot position No. Setting area of slot No. positioning module is equipped on. Setting range : 0 7
		VEL_NO	USINT	Setting area of speed data No. to execute Speed Teaching. setting range : 0 127
		VEL_SET	UINT	Setting area of speed value to execute Speecd Teaching setting range : 1 20,000 (Unit : X 10Pulse)
		MODE [Note1]	BOOL	Selection area of Speed Teaching type If "0", RAM Speed Teaching If "1", ROM Speed Teaching
	output	DONE	BOOL	State displaying area of Function Block execution complete If Function Block execution complete without error, "1" is output, and if output parameter ACT is "1" with internal processing of Function Block complete, "0" is output.
		STAT_X	USINT	X-axis error information displayed
		STAT_Y	USINT	Y-axis error information displayed
		ACT	BOOL	Operation axis displaying area Positioning module changes output parameter DONE from "1" to "0" with "1" output after processing Function Block command.

Remark

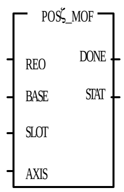
[Note1] Input parameter MODE can be used only in G6F-POPA.

7.6 Auxiliary operation

7.6.1 M code off

(M Code Off G3F-POPA/G4F-POPA/G6F-POPA:POSP_MOF, G4F-POPB:POSB_ MOF)

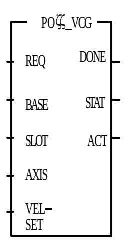
This is used to turn M code signal Off when the signal is On if M code has been set to With or After mode at parameters of each axis.

Function Block type	Class	Parameter	Data type	Description
	Input	REQ	BOOL	Request area of Function Block execution at rising edge Function Block executed if "0→1"(rising edge) with connected condition to this area as composed during program execution.
		BASE	USINT	Base position No. Setting area of base No. positioning module is equipped on Setting range : GM1 series(0 31), GM2 series(0 7), GM3/4 series(0 3), GM6 series(0)
		SLOT	USINT	Slot position No. Setting area of slot No. positioning module is equipped on. Setting range : 0 7
		AXIS	USINT	Assignment area of axis to use If "0", X-axis operates If "1", Y-axis operates
	Output	DONE	BOOL	State displaying area of Function Block execution complete If Function Block execution complete without error, "1" is output as kept until the next execution starts. If error occurs, "0" is output with operation stopped
		STAT	USINT	Error-state displaying area If error occurs during Function Block execution, error No. is displayed.

7.6.2 Speed change

(Velocity Change G3F-POPA / G4F-POPA / G6F-POPA:POSP_VCG, G4F-POPB:POSB_VCG)

It can be used to change operation speed at constant speed during operation.

Function Block type	Class	Parameter	Data type	Description
	Input	REQ	BOOL	Request area of Function Block execution at rising edge Function Block executed if "0→1"(rising edge) with connected condition to this area as composed during program execution.
		BASE	USINT	Base position No. Setting area of base No. positioning module is equipped on Setting range : GM1 series(0 31), GM2 series(0 7), GM3/4 series(0 3), GM6 series(0)
		SLOT	USINT	Slot position No. Setting area of slot No. positioning module is equipped on. Setting range : 0 7
		AXIS	USINT	Assignment area of axis to use If "0", X-axis operates If "1", Y-axis operates
		VEL_SET	UINT	Setting area of present operation speed to new value Setting range : 1 20,000 (Unit : X 10Pulse)
	Output	DONE	BOOL	State displaying area of Function Block execution complete If Function Block execution complete without error, "1" is output as kept until the next execution starts. If error occurs, "0" is output with operation stopped
		STAT	USINT	Error-state displaying area If error occurs during Function Block execution, error No. is displayed.

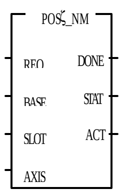
Remark

1) Caution for Function Blocks of speed change command used in program
  (1) Available only at constant speed during operation.(Busy-On state)
  (2) Available operation modes are single operation, repeated operation and auto-operation, with JOG high-speed and origin point return high-speed also usable.
  However, available for constant operation mode in G4F-POPB & G6F-POPA.

7.6.3 Continuous operation

(Next Move   G3F-POPA / G4F-POPA / G6F-POPA:POSP_NM,   G4F-POPB:POSB_NM)

This is used for continuous operation from present operation step No. to the next operation step No. at a random point of time without stop if continuous operation mode is applied.

Function Block type	Class	Parameter	Data type	Description
 	Input	REQ	BOOL	Request area of Function Block execution at rising edge Function Block executed if "0→1"(rising edge) with connected condition to this area as composed during program execution.
		BASE	USINT	Base position No. Setting area of base No. positioning module is equipped on Setting range : GM1 series(0 31), GM2 series(0 7), GM3/4 series(0 3), GM6 series(0)
		SLOT	USINT	Slot position No. Setting area of slot No. positioning module is equipped on. Setting range : 0 7
		AXIS	USINT	Assignment area of axis to use If "0", X-axis operates If "1", Y-axis operates
	output	DONE	BOOL	State displaying area of Function Block execution complete If Function Block execution complete without error, "1" is output, and if output parameter ACT is "1" with internal processing of Function Block complete, "0" is output.
		STAT	USINT	Error-state displaying area If error occurs during Function Block execution, error No. is displayed.
		ACT	BOOL	Operation axis displaying area Positioning module changes output parameter DONE from "1" to "0" with "1" output after processing Function Block command.

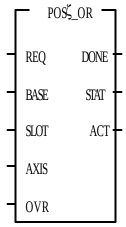
Remark

1) Caution for Function Blocks of continuous operation command used in program
  (1) Available only at constant speed during operation.(Busy-On state)
  (2) Available only for continuous operation mode.
  (3) Continuous command operation by absolute method differs from that by relative method in position data setting.

7.6.4 Speed override

(Override G3F-POPA / G4F-POPA / G6F-POPA:POSP_OR, G4F-POPB:POSB_ OR)

This is used for user to execute operation with speed value as changed at constant speed.

Function Block type	Class	Parameter	Data type	Description
	Input	REQ	BOOL	Request area of Function Block execution at rising edge Function Block executed if "0→1"(rising edge) with connected condition to this area as composed during program execution.
		BASE	USINT	Base position No. Setting area of base No. positioning module is equipped on Setting range : GM1 series(0 31), GM2 series(0 7), GM3/4 series(0 3), GM6 series(0)
		SLOT	USINT	Slot position No. Setting area of slot No. positioning module is equipped on. Setting range : 0 7
		AXIS	USINT	Assignment area of axis to use If "0", X-axis operates If "1", Y-axis operates
		OVR	USINT	Setting area of present operation speed to new value Setting range : 1 15 (Unit: 10%) Ex.) If setting value is 12, operation speed value after changed = operation speed value before changed X 120%
	output	DONE	BOOL	State displaying area of Function Block execution complete If Function Block execution complete without error, "1" is output, and if output parameter ACT is "1"with internal processing of Function Block complete, "0" is output.
		STAT	USINT	Error-state displaying area If error occurs during Function Block execution, error No. is displayed.
		ACT	BOOL	Operation axis displaying area Positioning module changes output parameter DONE from "1" to "0"with "1" output after processing Function Block command.

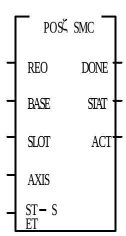
Remark

1) Caution for Function Blocks of speed override command used in program
   (1) Available only at constant speeddurng operation.(Busy-On state)

7.6.5 Assignment of operation step No.

(Set Move Data Number Change G3F-POPA/G4F-POPA/G6F-POPA:POSP_SMC, G4F-POPB:POSB_SMC)

It is used to change operation step No. to be performed by the next command.

Function Block type	Class	Parameter	Data type	Description
	Input	REQ	BOOL	Request area of Function Block execution at rising edge Function Block executed if "0→1"(rising edge) with connected condition to this area as composed during program execution.
		BASE	USINT	Base position No. Setting area of base No. positioning module is equipped on Setting range : GM1 series(0 31), GM2 series(0 7), GM3/4 series(0 3), GM6 series(0)
		SLOT	USINT	Slot position No. Setting area of slot No. positioning module is equipped on. Setting range : 0 7
		AXIS	USINT	Assignment area of axis to use If "0", X-axis operates If "1", Y-axis operates
		ST_SET	UINT	Setting area of operation step No. to be performed by start command Setting range : 0 299
	Output	DONE	BOOL	State displaying area of Function Block execution complete If Function Block execution complete without error, "1" is output, and if output parameter ACT is "1"with internal processing of Function Block complete,"0" is output.
		STAT	USINT	Error-state displaying area If error occurs during Function Block execution, error No. is displayed.
		ACT	BOOL	Operation axis displaying area Positioning module changes output parameter DONE from "1" to "0"with "1" output after processing Function Block command.

Remark

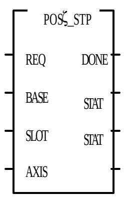
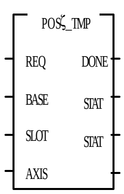
1) Caution for function blocks of operation step No. change command used in program
 (1) Available only at operation stop state.(Busy-Off state)
 (2) Operation step No. is changeable by function block of succeeding operation step No. change command to repeated operation in G3F-POPA, G4F-POPA & G4F-POPB, but not changeable in S/W package.

7.6.6 Deceleration stop

(Temporary G3F-POPA / G4F-POPA:POSP_TMP)

(Stop G3F-POPA / G4F-POPA / G6F-POPA :POSP_STP, G4F-POPB:POSB_STP)

It is used to temporarily stop operation of positioning module as decelerated.

Function Block type	Class	Parameter	Data type	Description
	Input	REQ	BOOL	Request area of Function Block execution at rising edge Function Block executed if "0→1"(rising edge) with connected condition to this area as composed during program execution.
		BASE	USINT	Base position No. Setting area of base No. positioning module is equipped on Setting range : GM1 series(0 31), GM2 series(0 7), GM3/4 series(0 3), GM6 series(0)
		SLOT	USINT	Slot position No. Setting area of slot No. positioning module is equipped on. Setting range : 0 7
		AXIS	USINT	Assignment area of axis to use If "0", X-axis operates If "1", Y-axis operates
	Output	DONE	BOOL	State displaying area of Function Block execution complete If Function Block execution complete without error, "1" is output, and if output parameter ACT is "1" with internal processing of Function Block complete, "0" is output.
		STAT_X	USINT	X-axis error information displayed
		STAT_Y	USINT	Y-axis error information displayed
		ACT	BOOL	Operation axis displaying area Positioning module changes output parameter DONE from "1" to "0" with "1" output after processing Function Block command.

Remark

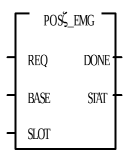
1) Caution for Function Blocks of stop command used in program
 (1) Availble at operation stop state during acceleration, constant and deceleration.(Busy-Off state)
 (2) Function Block POSP_STP of G3F-POPA and G4F-POPA can be used only in ROM V1.0.

7.7 Function Block for error processing

7.7.1 Internal emergency stop

(Emergency G3F-POPA / G4F-POPA / G6F-POPA:POSP_EMG, G4F-POPB:POSB_EMG)

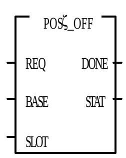
It is used to promptly stop operation in case of emergency.
Since switched over to output -prohibited and origin point-undecided state if once stopped, cancel output -prohibited and re-decide origin point to re-start.

Function Block type	Class	Parameter	Data type	Description
	Input	REQ	BOOL	Request area of Function Block execution at rising edge Function Block executed if "0→1"(rising edge) with connected condition to this area as composed during program execution.
		BASE	USINT	Base position No. Setting area of base No. positioning module is equipped on Setting range : GM1 series(0 31), GM2 series(0 7), GM3/4 series(0 3), GM6 series(0)
		SLOT	USINT	Slot position No. Setting area of slot No. positioning module is equipped on. Setting range : 0 7
	Output	DONE	BOOL	State displaying area of Function Block execution complete If Function Block execution complete without error, "1" is output as kept until the next execution starts. If error occurs, "0" is output with operation stopped
		STAT	USINT	Error-state displaying area If error occurs during Function Block execution, error No. is displayed.

7.7.2 Cancellation of output prohibition

(Pulse Out Inhibit, Off G3F-POPA / G4F-POPA / G6F-POPA:POSP_OFF, G4F-POPB:POSB_OFF)

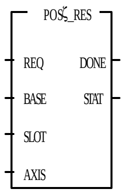
Command to cancel pulse-out prohibited state by external emergency stop, upper/lower limit detection, etc.

Function Block type	Class	Parameter	Data type	Description
	Input	REQ	BOOL	Request area of Function Block execution at rising edge Function Block executed if "0→1"(rising edge) with connected condition to this area as composed during program execution.
		BASE	USINT	Base position No. Setting area of base No. positioning module is equipped on Setting range : GM1 series(0 31), GM2 series(0 7), GM3/4 series(0 3), GM6 series(0)
		SLOT	USINT	Slot position No. Setting area of slot No. positioning module is equipped on. Setting range : 0 7
	Output	DONE	BOOL	State displaying area of Function Block execution complete If Function Block execution complete without error, "1" is output as kept until the next execution starts. If error occurs, "0" is output with operation stopped
		STAT	USINT	Error-state displaying area If error occurs during Function Block execution, error No. is displayed.

7.7.3 Error reset

(Reset G3F-POPA / G4F-POPA / G6F-POPA:POSP_RES, G4F-POPB:POSB_ RSE)

It is used to reset error if occurred during operation or by exceeding parameter setting range.

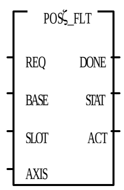
Function Block type	Class	Parameter	Data type	Description
	Input	REQ	BOOL	Request area of Function Block execution at rising edge Function Block executed if "0→1"(rising edge) with connected condition to this area as composed during program execution.
		BASE	USINT	Base position No. Setting area of base No. positioning module is equipped on Setting range : GM1 series(0 31), GM2 series(0 7), GM3/4 series(0 3), GM6 series(0)
		SLOT	USINT	Slot position No. Setting area of slot No. positioning module is equipped on. Setting range : 0 7
		AXIS	USINT	Assignment area of axis to use If "0", X-axis operates If "1", Y-axis operates
	Output	DONE	BOOL	State displaying area of Function Block execution complete If Function Block execution complete without error, "1" is output as kept until the next execution starts. If error occurs, "0" is output with operation stopped
		STAT	USINT	Error-state displaying area If error occurs during Function Block execution, error No. is displayed.

7.8 Other Function Bblock

7.8.1 Floating point set setting

(Floating, Point Set G3F-POPA / G4F-POPA / G6F-POPA:POSP_FLT, G4F-POPB:POSB_FLT)

It is a command used to set present position to origin point compulsorily without origin point return-operation. The assigned address value to origin point return address will be the present position.

Function Block type	Class	Parameter	Data type	Description
	Input	REQ	BOOL	Request area of Function Block execution at rising edge Function Block executed if "0→1"(rising edge) with connected condition to this area as composed during program execution.
		BASE	USINT	Base position No. Setting area of base No. positioning module is equipped on Setting range : GM1 series(0 31), GM2 series(0 7), GM3/4 series(0 3), GM6 series(0)
		SLOT	USINT	Slot position No. Setting area of slot No. positioning module is equipped on. Setting range : 0 7
		AXIS	USINT	Assignment area of axis to use If "0", X-axis operates If "1", Y-axis operates
	Output	DONE	BOOL	State displaying area of Function Block execution complete If Function Block execution complete without error, "1" is output, and if output parameter ACT is "1" with internal processing of Function Block complete, "0" is output.
		STAT	USINT	Error-state displaying area If error occurs during Function Block execution, error No. is displayed.
		ACT	BOOL	Operation axis displaying area Positioning module changes output parameter DONE from "1" to "0" with "1" output after processing Function Block command.

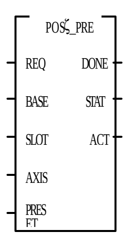
Remark

1) Caution for Function Blocks of floating point set setting command used is program
  (1) Avialable only at operation stop state.(Busy-Off state)

7.8.2 Present position Preset

(Preset G3F-POPA / G4F-POPA / G6F-POPA:POSP_PRE, G4F-POPB:POSB_PRE)

It is a command used to change present position to random position.

Function Block type	Class	Parameter	Data type	Description
	Input	REQ	BOOL	Request area of Function Block execution at rising edge Function Block executed if "0→1"(rising edge) with connected condition to this area as composed during program execution.
		BASE	USINT	Base position No. Setting area of base No. positioning module is equipped on Setting range : GM1 series(0 31), GM2 series(0 7), GM3/4 series(0 3), GM6 series(0)
		SLOT	USINT	Slot position No. Setting area of slot No. positioning module is equipped on. Setting range : 0 7
		AXIS	USINT	Assignment area of axis to use If "0", X-axis operates If "1", Y-axis operates
		PRESET	DINT	Area used to change present position Setting range : -16,744,447 16,744,447
	Output	DONE	BOOL	State displaying area of Function Block execution complete If Function Block execution complete without error, "1" is output, and if output parameter ACT is "1" with internal processing of Function Block complete, "0" is output.
		STAT	USINT	Error-state displaying area If error occurs during Function Block execution, error No. is displayed.
		ACT	BOOL	Operation axis displaying area Positioning module changes output parameter DONE from "1" to "0" with "1" output after processing Function Block command.

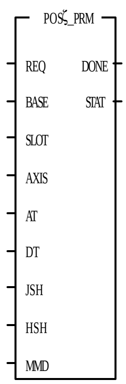
Remark

1) Caution for Function Block of preset command used in program
  (1) Available only at operation stop state.(Busy-Off state)

7.8.3 Parameter change

(Parameter Write G3F-POPA / G4F-POPA / G6F-POPA:POSP_PRM, G4F-POPB:POSB_PRM)

Command used to change acceleration time, deceleration time, JOG high-speed, origin point return high-speed and M code mode at parameters during operation.

Function Block type	Class	Parameter	Data type	Description
	Input	REQ	BOOL	Request area of Function Block execution at rising edge Function Block executed if "0→1"(rising edge) with connected condition to this area as composed during program execution.
		BASE	USINT	Base position No. Setting area of base No. positioning module is equipped on Setting range : GM1 series(0 31), GM2 series(0 7), GM3/4 series(0 3), GM6 series(0)
		SLOT	USINT	Slot position No. Setting area of slot No. positioning module is equipped on. Setting range : 0 7
		AXIS	USINT	Assignment area of axis to use If "0", X-axis operates If "1", Y-axis operates
		AT		Setting area of acceleration time at parameters setting range : 1 999(Unit: 10ms)
		DT		Setting area of deceleration time at parameters setting range : 1 999(Unit: 10ms)
		JSH		Setting area of JOG highspeed at parameters setting range : 1 20,000(Unit: X 10pps)
		HSH		Setting area of origin point return highspeed at parameters setting range : 1 20,000(Unit: X 10pps)
		MMD		Setting area of M code mode at parameters If "0", With If "1", After mode If "2", None mode
	Output	DONE	BOOL	State displaying area of Function Block execution complete If Function Block execution complete without error, "1" is output as kept until the next execution starts. If error occurs, "0" is output with operation stopped
		STAT	USINT	Error-state displaying area If error occurs during Function Block execution, error No. is displayed.

Remark

1) Caution for Function Block of parameter change used in program
  (1) Available only at operation stop state.(Busy-Off state)

7.9 Error codes in Function Block

Error type displayed on output parameter STAT and actions to take against will be described.

Err. code	Description	Pulse-out type				Positioning module operation status	Actions
		G3F-POPA	G4F-POPA	G4F-POPB	G6F-POPA		
0	In normal operation	0	0	0	0		
1	Base position No. exceeded over setting range	0	0	0	0		Set base position within setting range
2	H/W error on applicable base	0	0	0	0		Request base A/S
3	Slot position No. exceeded over setting range	0	0	0	0		Set slot position within setting range
4	Applicable slot not equipped	0	0	0	0		Install positioning module on the applicable slot
5	Different module name of applicable slot	0	0	0	0		Install positioning module on the applicable slot
6	Setting axis No. exceeded over setting range	0	0	0	0		Set correct axis No. of positioning module
7	Command given with CPU module at STOP state	0	0	0	0		Change CPU module states from STOP to RUN
8	Common-used RAM error	0	0	0	0		A/S request
9	Function Block command unavailable to execute due to module in/at operation/stop	0	0	0	0		Set correct command execution conditions
10	New command Function Block executed at the state that prior command is not complete	0	0	0	0		Program change to execute new command after prior command is complete
11	Setting aux. input value exceeded over the range	0	0	0	0		To be in setting range
13	Stop related command or emergency stop input while Function Block is executed						1. Reset error 2. Cancel output-prohibited
14	Continuous operation or speed override command input at other states than constant stage in auto-operation	0	0	0	0		Continuous operation or speed override is available only at constant stage
15	Command given with module origin point undecided	0	0	0	0		Start command after origin point decided
17	H/W error on positioning module	0	0	0	0		Cancel error if powered Off/On
18	Watchdog error	0	0	0	0		Cancel error if powered Off/On
19	Inner memory interface error	0	0	0	0		Cancel error if powered Off/On
20	External emergency stop input	0	0	0	0	Output-prohibited, Start.point undecided	1. Remove cause of external emergency stop 2. Cancel output-prohibited 3. Operate after origin point redecided
21	Internal emergency stop input	0	0	0	0	Output-prohibited, Start.point undecided	1. Remove cause of internal emergency stop 2. Cancel output-prohibited 3. Operate after origin point redecided
22	External lower limit signal input	0	0	0	0	Output-prohibited, Start.point undecided	1. Remove cause of error 2. Perform JOG operation towad upper limit 3. Operate after origin point redecided
23	External upper limit signal input	0	0	0	0	Output-prohibited, Start.point undecided	1. Remove cause of error 2. Perform JOG operation toward lower limit 3. Operate after origin point redecided
24	Present position exceeded over s/w lower limit value set at parameters	0	0	0	0	Output-prohibited, Start.point undecided	1. Change s/w lower limit address range set at parameters 2. Operate after origin point re-decided
25	Present position exceeded over s/w upper limit value set at parameters	0	0	0	0	Output-prohibited, Start.point undecided	1. Change s/w upper limit address range set at parameters 2. Operate after origin point re-decided
36	Next operation mode is incorrect in auto-operation or continuous operation mode	0	0	0	0	No operation at stop state	Do not execute next operation step during operation.
37	Interpolation operation command input in continuous, constant, and positioning constant operation mode	0	0	0	0	Unchanged	Interpolation operation is available only at single, repeated, and auto modes

40	Start command unavailable at M code ON state	X	X	X	O	No operation	1. Turn M code Off and 2. start operation
45	Speed/position control switching unavailable in acceleration of positioning constant operation mode	X	X	X	O	Present operation state unchanged	Change speed/position control switching from acceleration to constant
46 (Note1)	EOM stop or positioning stop command input in constant, positioning constant operation mode	X	Δ	X	X	Present operation state unchanged	
47	Stop command input in origin point return low speed operation	X	O	X	X	Present operation state unchanged	
48	Stop command input while return(RTP) command to prior position to manual operation is executed	O	O	O	O	Present operation state unchanged	Program change needed because stop command is processed as an error if return command to prior position to manual operation is executed.
49	stop command input during dwell time processing or origin point compensation	O	O	O	O	Present operation state unchanged	Program change needed because stop command is unavailable during dwell time processing or origin point compensation
56	Continuous operation(NM), trans. operation(OR), speed change command input at other states than constant stage during operation by start command	O	O	O	O	Present operation state unchanged	Program change needed because continuous operation(NM), trans. operation(OR), speed change command are only available at constant stage
57	Continuous operation(NM) or trans. operation (OR) command input in constant or positioning constant operation mode. Or speed change command input in continuous, constant or positioning constant operation mode	O	O	O	O	Present operation state unchanged	1. Error reset 2. Continuous operation(NM) & trans. operation(OR) unavailable in constant, positioning constant operation mode 3. Speed change unavailable in continuous, constant and positioning constant operation mode 4. Modify program
58	Continuous operation(NM) command input in other operation modes than continuous operation mode	O	O	O	O	Present operation state unchanged	1. Error reset 2. Continuous operation(NM) is available only in continuous operation mode 3. Modify program (operation mode)
59	Override and continuous operation command unavailable in other states than in operation by start command	O	O	O	O	Present operation state unchanged	1. Error reset
60	Override command input in operation step-executed set to override-prohibited	O	O	O	O	Present operation state unchanged	1. Error reset 2. Change to override allowable state
61	Continuous operation(NM) command unavailable in continuous operation whose direction is to be changed	O	O	O	O	Present operation state unchanged	1. Error reset
66	No next operation data to operate at start command. Data No. range exceeded at Position Teaching and Speed Teaching command	O	O	O	O	No operation	1. Error reset 2. Operation step no. Change
67	Overrideing rate exceeded over allowable range(1 ~15)	O	O	O	O	Present operation state unchanged	1. Error reset 2. To be in setting range
68	Inching amount exceeded over allowable range(1 ~ 99)	O	O	O	O	No operation	1. To be in inching setting range
69	Setting position address exceeded over s/w upper limit or s/w lower limit range at present position preset command	O	O	O	O	Output-prohibited, Start.point undecided	1. Error reset 2. Move to operation available area by JOG or manual operation and then perform restart
70	Position data setting value of positioning constant operation mode is too small	X	X	X	O	No operation	1. Change setting value of position data or speed
76	Start command of Absolute Coordinates operation data unavailable at origin point undecided state	O	O	O	O	No operation	Start after origin point decided
77	Position Teaching command input at origin point-undecided state	O	O	O	X	Available after start.point decided	1. Error reset 2. Position Teaching command executed after origin point decided
78	Teaching mode value is not as assigned	X	X	X	O	No operation	To be in setting range
86	Speed exceeded over allowable range(bias speed~speed limits)	O	O	O	O	No operation	Change speed values

87	Origin point return speed exceeded over allowable range(bias speed~speed limits). Origin point return low-speed set higher than origin point return high-speed	O	O	O	O	No operation	Change speed values
88	Minor axis speed calculated by linear interpolation exceeded over allowable range	O	X	O	O	No operation	Change speed value operated by minor axis
89	Operation time exceeded overallowable range(Max.65,535 ms)	O	O	O	O	No operation if detected before operation	Stop operation if detected during operation
96	Command input at outputprohibited state	O	O	O	O	No operation	Cancel outputprohibited and perform restart
97	Command input during operation(Busy)	O	O	O	O	Present operation state unchanged	Add protection circuit against execution of the other commands during operation in program
98	Start, origin point return or interpolation operation command input at PLCstop state	O	O	O	X	No operation	Change CPU module state from STOP to RUN and perform restart
99	Inching command unavailable if other axis is in operation(Busy)	X	X	X	O	No operation	Execute inching command while operation of the other axis is at stop
106	Internal computation error (Divide by Zero Error)	O	O	O	O	No operation	
116 (Note 2)	Operation data of which interpolation operation is unavailable	O	X	O	O		
117 (Note 1)	Operation unavailable because operation speed is higher than acceleration/deceleration inclination	X	Δ	X	X		
119	Start command input from position data set to Complete without number change	O	O	X	X		Change operation step No. and then perform restart

Note 1) Valid only in G4F-POPA, V1.0

Note 2) G3F-POPA, V1.1 or later

Chapter 8 Program

8.1 Prior to program introduction

▶Function Blocks above shall be surely applied to all programs to refer to output parameters of operation state's code information Read[POS■_CRD] and present operation state's bit information Read[POS■_SRD] for detailed information on positioning module operation.

▶Especially, 6 types of output parameters of operation state's code information Read[POS■_CRD] provide operation information of positioning module to be surely used as protection circuits against error when the respective Function Blocks are to be applied.

Function Block	Output parameter		Description	
POS■_CRD	CA		Current Address : present position address displayed	
	CV		Current Velocity : present operation speed displayed	
	MCD		Current M Code Number : present M code value displayed	
	CDN		Current Step Number : present operation data No. displayed	
POS■_SRD	ST1	[0]	In dwelling (Bit:On)	
		[1]	In deceleration (Bit:On)	
		[2]	At constant (Bit:On)	
		[3]	In acceleration (Bit:On)	
		[4]	At stop state (Bit:On)	
		[5]	In returning to origin point (Bit:On)	
		[6]	In positioning (Bit:On)	
		[7]	In interpolation operation (Bit:On) *G4F-POPA unavailable	
	ST2	[0]	S/W upper limit detection (Bit:On)	Information displaying area on signals produced from program or S/W package
		[1]	S/W lower limit detection (Bit:On)	
		[2]	Emergency stop detection (Bit:On)	
		[3]	Pulse output-prohibitedstate (Bit:On)	
		[4]	Inching complete (Bit:On)	
		[5]	Position Teaching complete (Bit:On)	
		[6]	In JOG low-speed operation (Bit:On)	
		[7]	In JOG high-speed operation (Bit:On)	
	ST3	[0]	Unused	
		[1]	Forward (Bit:Off), Reverse (Bit:On)	
		[2]	ZONE#1 (Bit:On)	
		[3]	ZONE#2 (Bit:On)	
		[4]	ZONE#3 (Bit:On)	

		[5]	Repeated operation complete (Bit:On)	
		[6]	Positioning start complete (Bit:On)	
		[7]	M code On (Bit:On)	
	ST4	[0]	In origin point compensation (Bit:On)	
		[1]	In backlash compensation (Bit:On) *G6F-POPA unused	
		[2]	In continuous operation(Next Move) (Bit:On)	
		[3]	In speed overriding (Bit:On)	
		[4]	Unused	
		[5]	At deceleration stop and Stop complete (Bit:On)	
		[6]	Speed teaching complete (Bit:On) * Valid only in G3F-POPA/G4F-POPA V1.0	
		[7]	Speed change complete(Bit:On) * Valid only in G3F-POPA/G4F-POPA V1.0	
	ST5	[0]	Speed position control switching *Only G6F-POPA used	Information displaying area on input signals from outer device to position-decision module.
		[1]	External upper limit signal (Bit:Off)	
		[2]	External lower limit signal (Bit:Off)	
		[3]	External near zero point signal (Bit:On)	
		[4]	External origin point signal (Bit:On)	
		[5]	Unused	
		[6]	Unused	
		[7]	External emergency stop signal (Bit:Off)	
	ST6	[0]	Umused	
		[1]	Error	
		[2]	Position passing	
		[3]	In operation(Busy)	
		[4]	Positioning complete	
		[5]	Origin point return complete	
		[6]	Origin point undecided	
		[7]	Unused	

8.2 Basic program

Refer to Chapter 3 & 5 for the details on basic program.

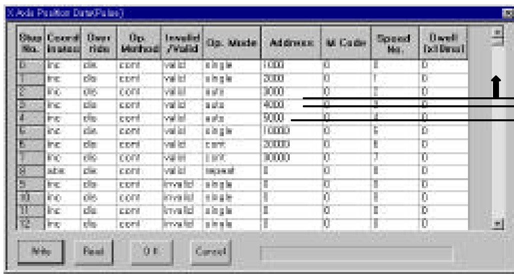
No.	Designation of program	Related page
1	Basic (floating point set setting)	3-2
2	Basic (linear interpolation positioning start floating point set setting)	3-4
3	Deceleration stop(origin point return)	3-7
4	Single operation(origin point return)	3-11
5	Single operation(operation step No. assignment)	3-13
6	Constant operation(operation step No. assignment)	3-17
7	JOG operation	3-28
8	Manual pulse generator	3-29
9	Inching operation	3-30
10	Shift to prior position to manual operation	3-31
11	Speed change	3-32
12	Operation step No. change by continuous operation	3-34
13	Speed override	3-36
14	Present position change	3-39
15	Speed Teaching	3-41
16	Position Teaching	3-42
17	Setting operation step No.	3-43
18	Parameter change	3-44
19	M code mode	5-10
20	Zone setting	5-16

8.3 Application program

8.3.1 Positioning of single operation, repeated operation, auto-operation & continuous operation

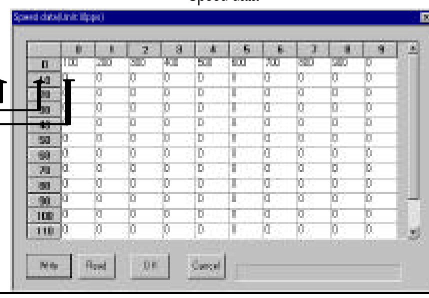
1) Setting in S/W package

Position data



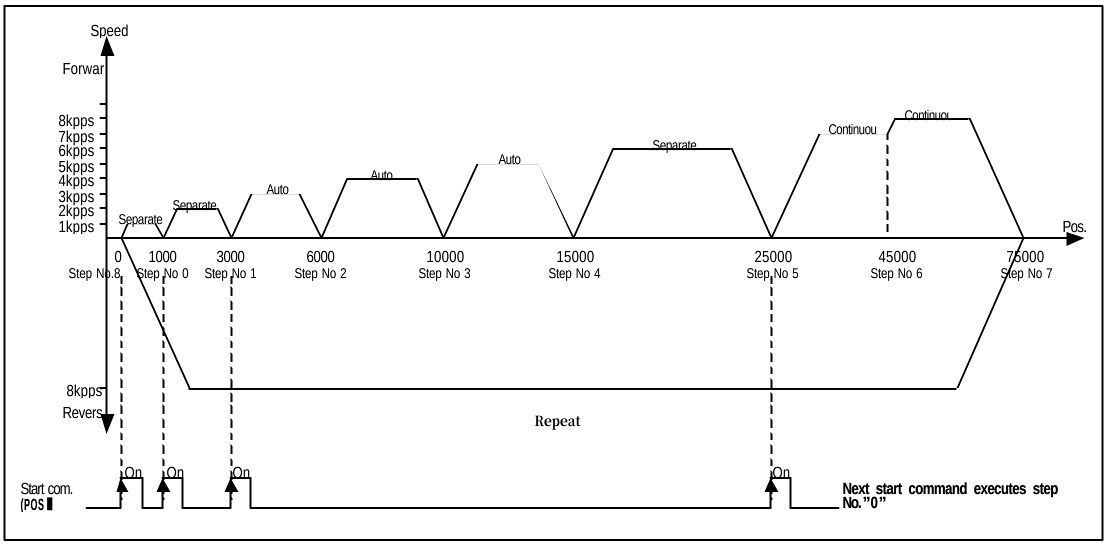
Step No.	Coordinates	Override	Op. Method	Invalid /Valid	Op. Mode	Address	M Code	Speed No.	Dwell (x10ms)
0	inc	dis	cont	valid	single	1000	0	0	0
1	inc	dis	cont	valid	single	3000	0	1	0
2	inc	dis	cont	valid	auto	3000	0	2	0
3	inc	dis	cont	valid	auto	4000	0	3	0
4	inc	dis	cont	valid	auto	5000	0	4	0
5	inc	dis	cont	valid	single	10000	0	5	0
6	inc	dis	cont	valid	cont	20000	0	6	0
7	inc	dis	cont	valid	cont	30000	0	7	0
8	abs	dis	cont	valid	repeat	0	0	8	0
9	inc	dis	cont	invalid	single	0	0	0	0
10	inc	dis	cont	invalid	single	0	0	0	0
11	inc	dis	cont	invalid	single	0	0	0	0
12	inc	dis	cont	invalid	single	0	0	0	0

Speed data



	0	1	2	3	4	5	6	7	8	9
0	100	200	300	400	500	600	700	800	800	0
10	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0
90	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0
110	0	0	0	0	0	0	0	0	0	0

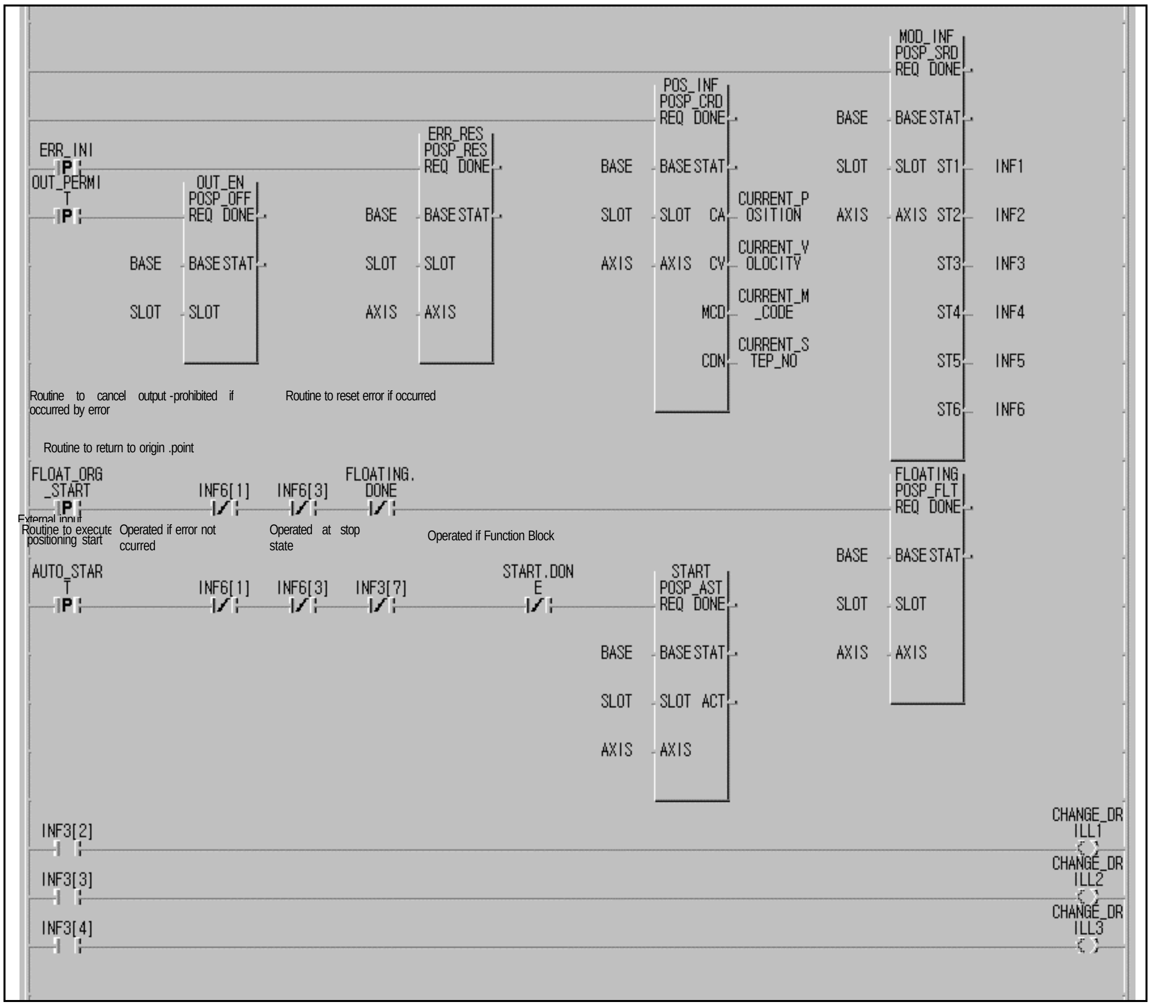
2) Operation pattern



Remark

- ▶In continuous operation mode, an operation pattern with direction switching can' t be used in G3F-POPA & G4F-POPA.
  Accordingly, program shall be surely changed to autooperation instead of continuous operation in G3F-POPA & G4F-POPA.
- ▶Succeeding operation mode to auto-operation is only separate, repeated or autooperation as available.
- ▶Succeeding operation mode to continuous operation is only separate, repeated or continuous operation as available.

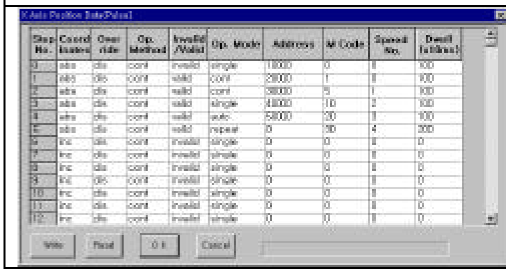
3) Programming example



8.3.2 Positioning with M code (G6F-POPA)

1) Setting in S/W package

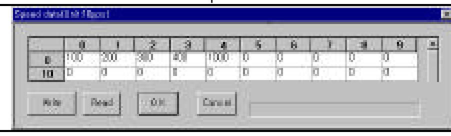
Position data



Step No.	Coordinates	Override	Op. Method	Invalid /Valid	Op. Mode	Address	M Code	Speed No.	Dwell (x10ms)
0	abs	dis	cont	invalid	single	10000	0	0	100
1	abs	dis	cont	valid	cont	20000	1	0	100
2	abs	dis	cont	valid	cont	30000	5	1	100
3	abs	dis	cont	valid	single	40000	10	2	100
4	abs	dis	cont	valid	auto	50000	20	3	100
5	abs	dis	cont	valid	repeat	0	30	4	200
6	inc	dis	cont	invalid	single	0	0	0	0
7	inc	dis	cont	invalid	single	0	0	0	0
8	inc	dis	cont	invalid	single	0	0	0	0
9	inc	dis	cont	invalid	single	0	0	0	0
10	inc	dis	cont	invalid	single	0	0	0	0
11	inc	dis	cont	invalid	single	0	0	0	0
12	inc	dis	cont	invalid	single	0	0	0	0

Write Read O.K Cancel

Speed data

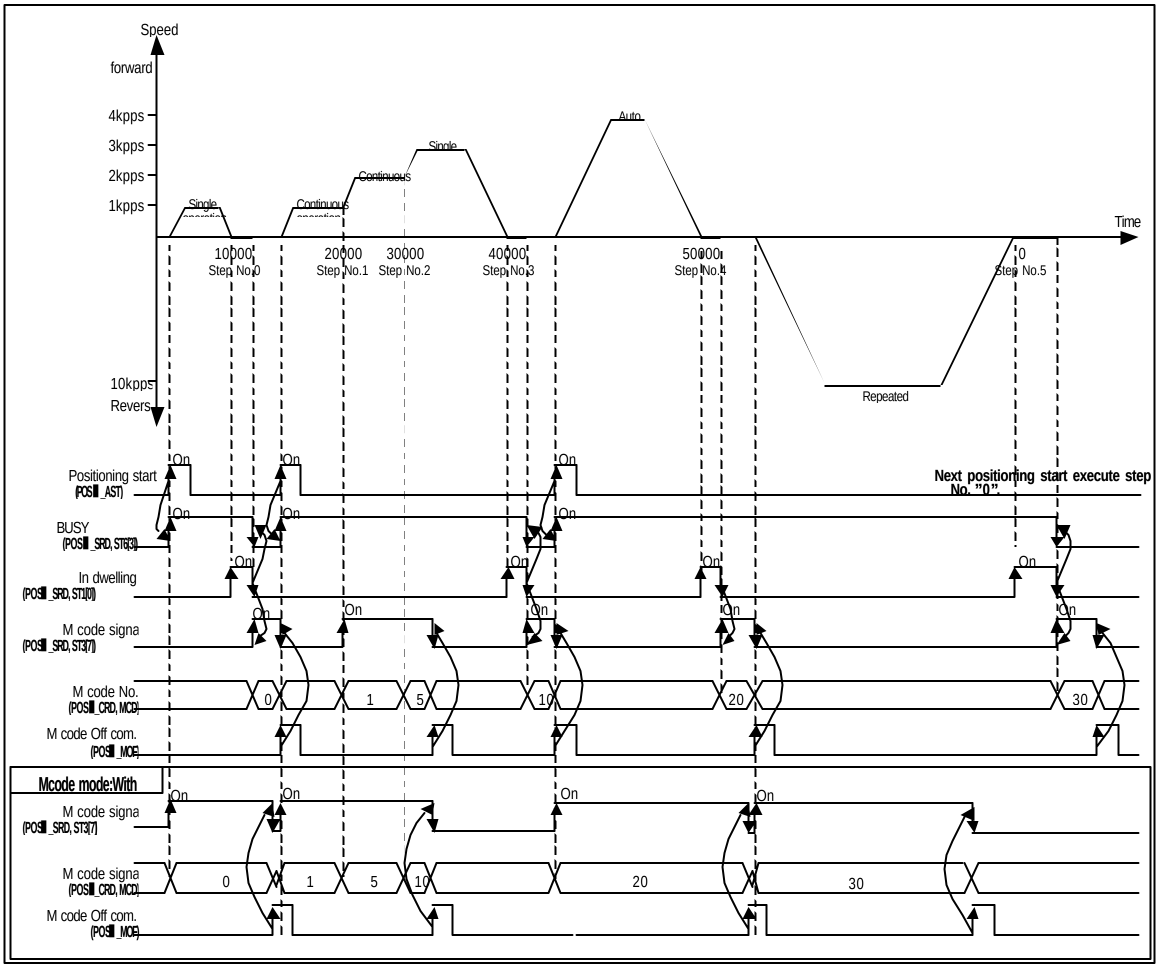


	0	1	2	3	4	5	6	7	8	9
0	100	200	300	400	1000	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0

Write Read O.K Cancel

M code mode

2) Operation pattern

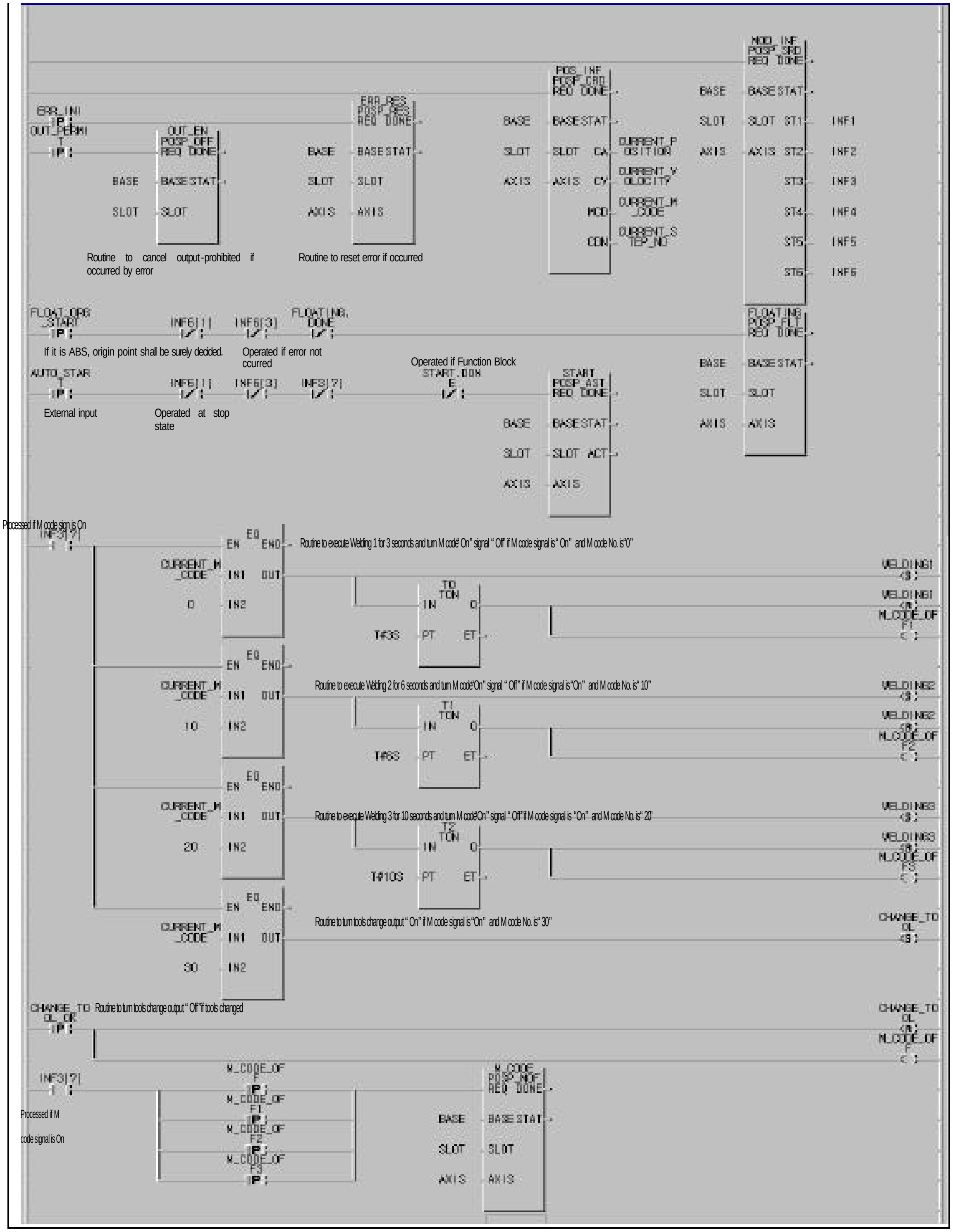


Remark

▶M code signal is changed to the applicable M code No.in continuous operation mode without stop whenever operation step numbers are changed, and the operation is to be continued.

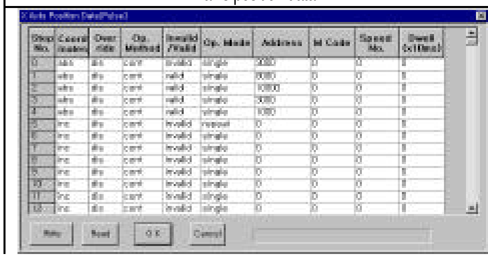
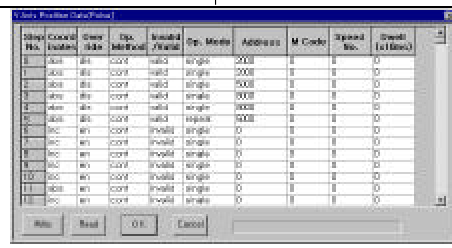
▶In auto-operation mode, M code "On"signal if turned On shall be Off by M code Off command to operate the following operation step No.

3) Programming example

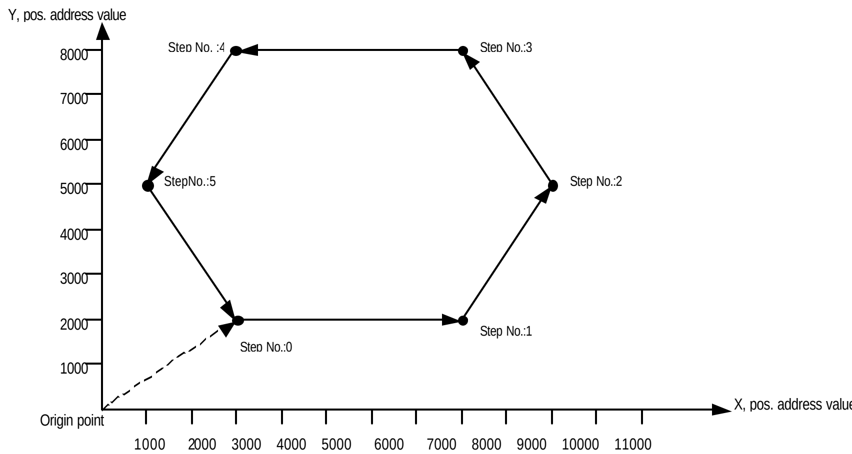


8.3.3 2-axes linear interpolation operation

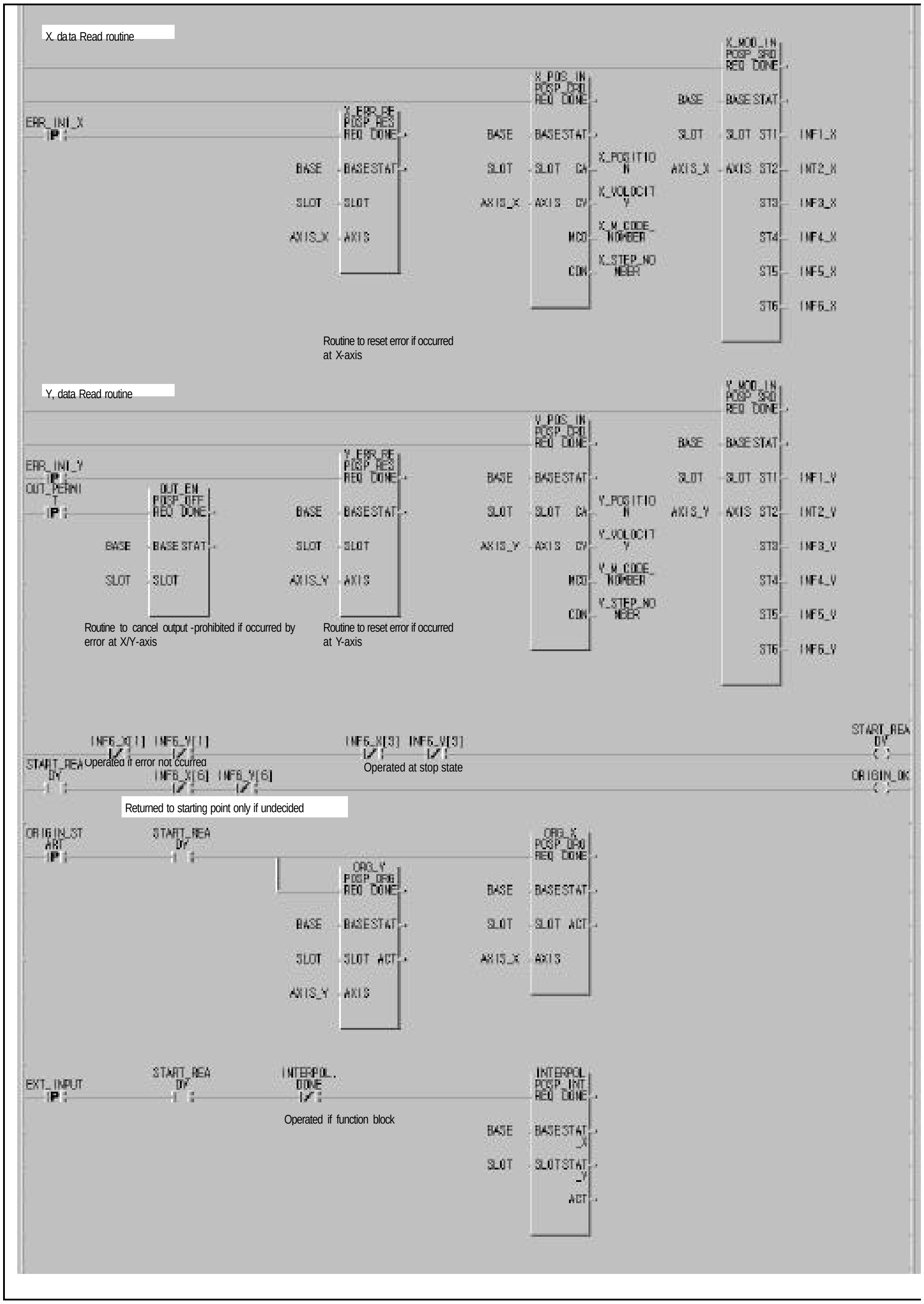
1) Setting in S/W package

X-axis position data	Y-axis position data
	

2) Operation pattern

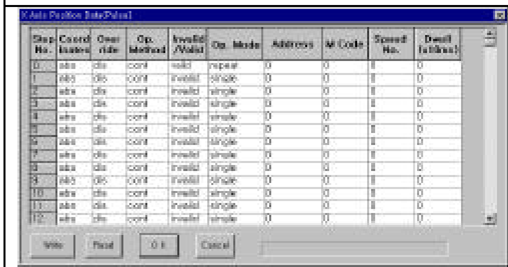
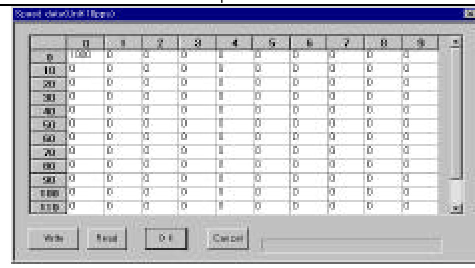


3) Programming example



8.3.4 Position Teaching with MMI

1) Setting in S/W package

Position data	Speed data
	

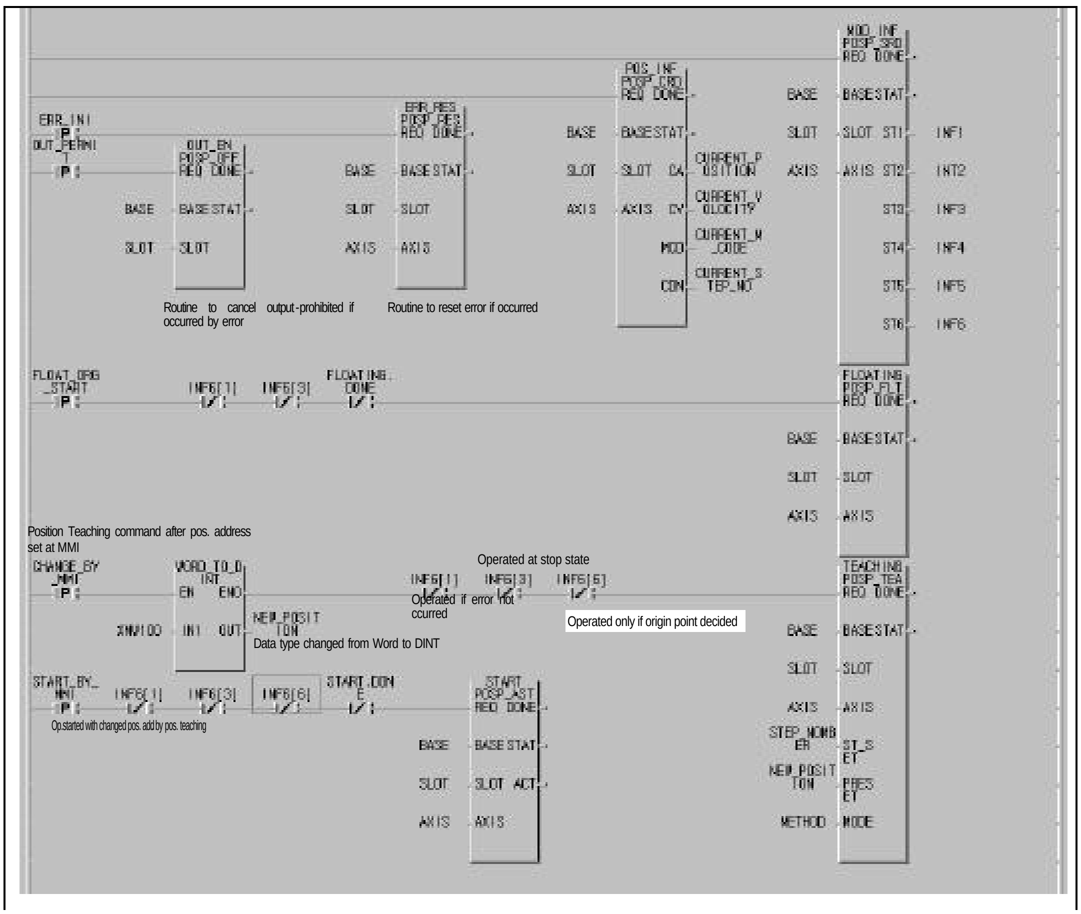
2) Input/output parameters used

(1) To transmit position address value to CPU module with %MW100 at MMI:%MW100

(2) To change position address values: %M0 (position changed at MMI)

(3) To start Position Teaching: %M1(start command of MMI)

3) Programming example



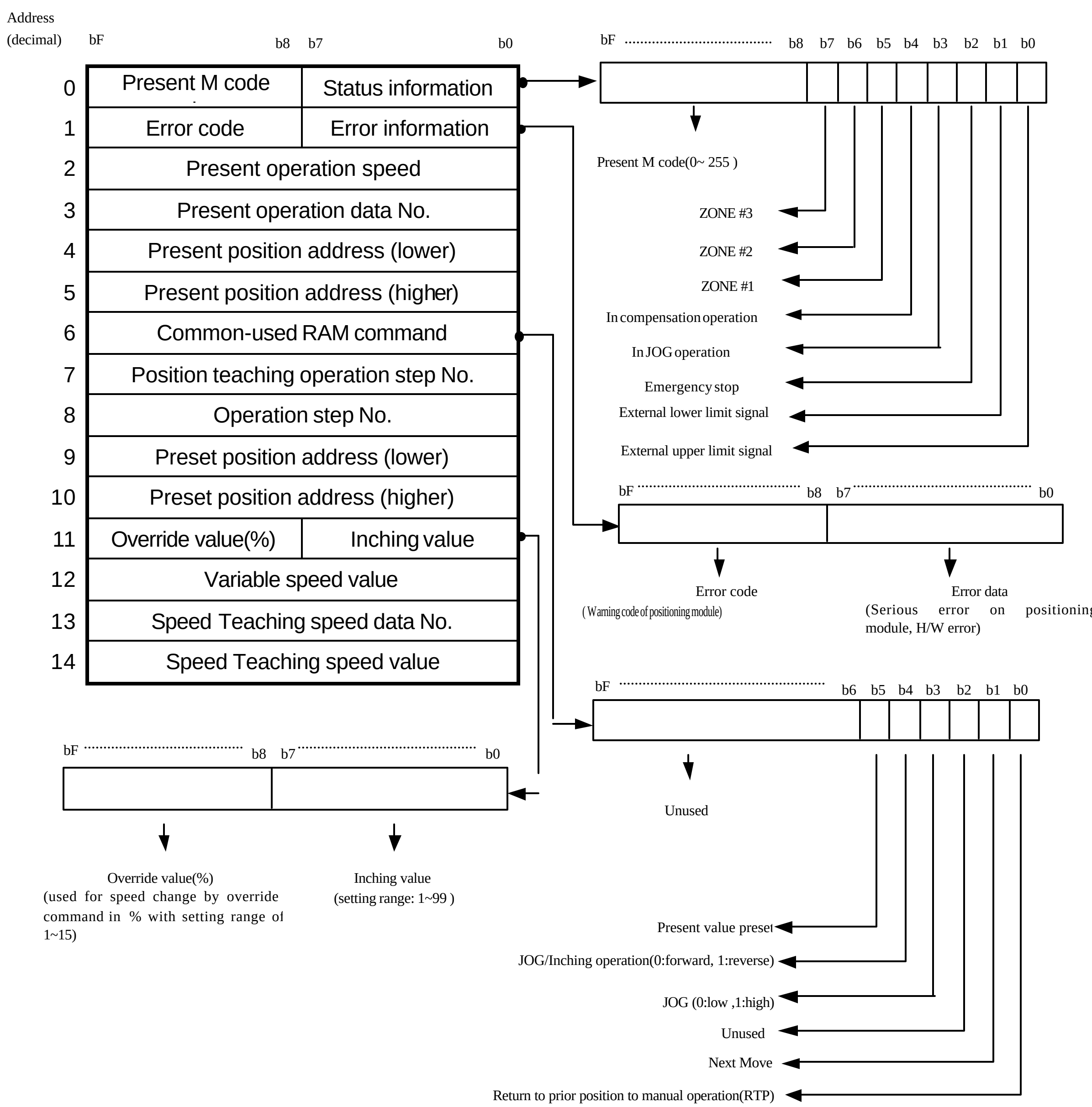
Chapter 9 Buffer Memory and I/O signals

9.1 Buffer Memory

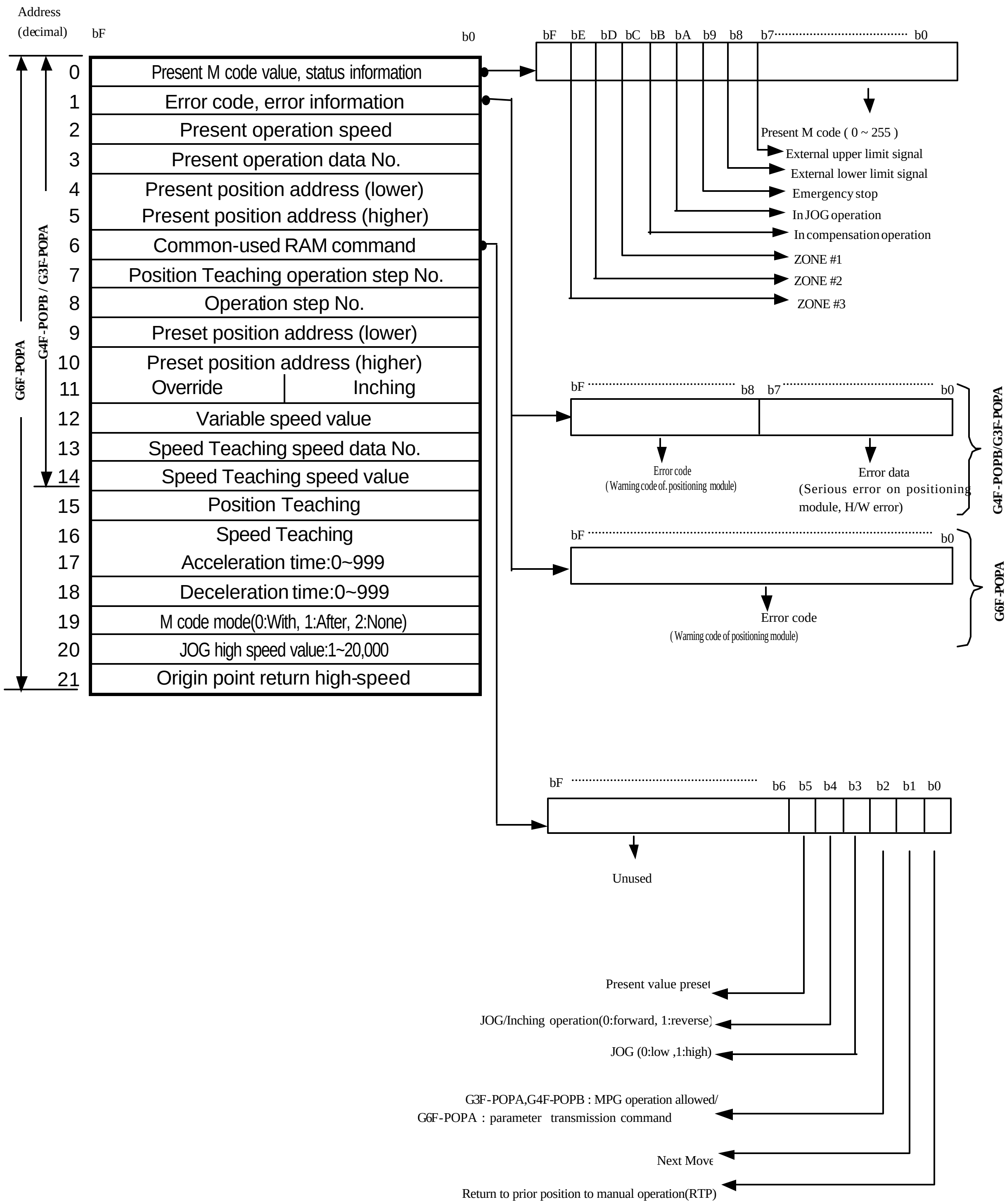
9.1.1 Contents of Buffer Memory

Buffer Memory (common-used RAM) is used to save positioning module and communication data between PLC and CPU.

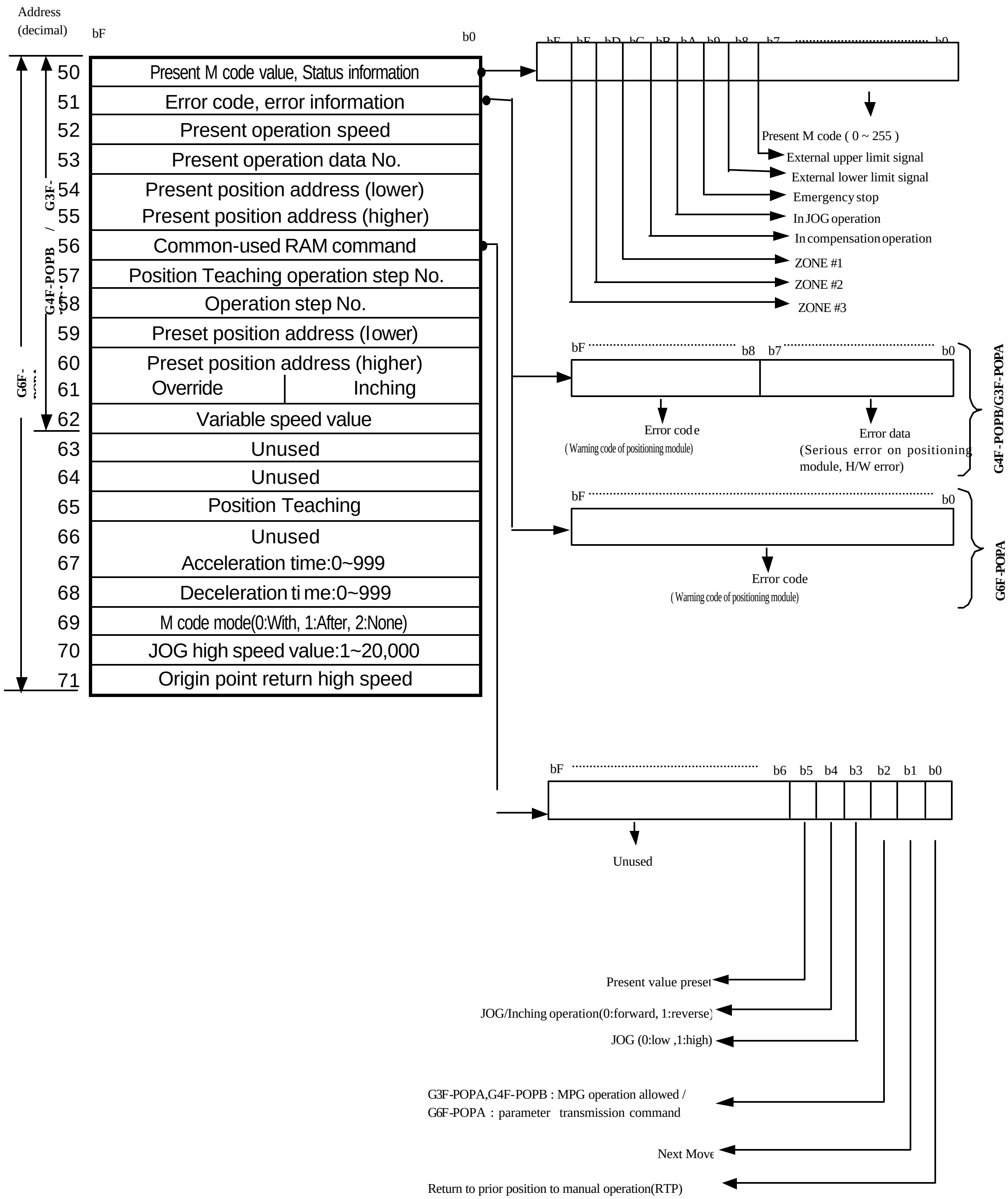
1) Buffer Memory of G4F-POPA (K300S, 1-axis)



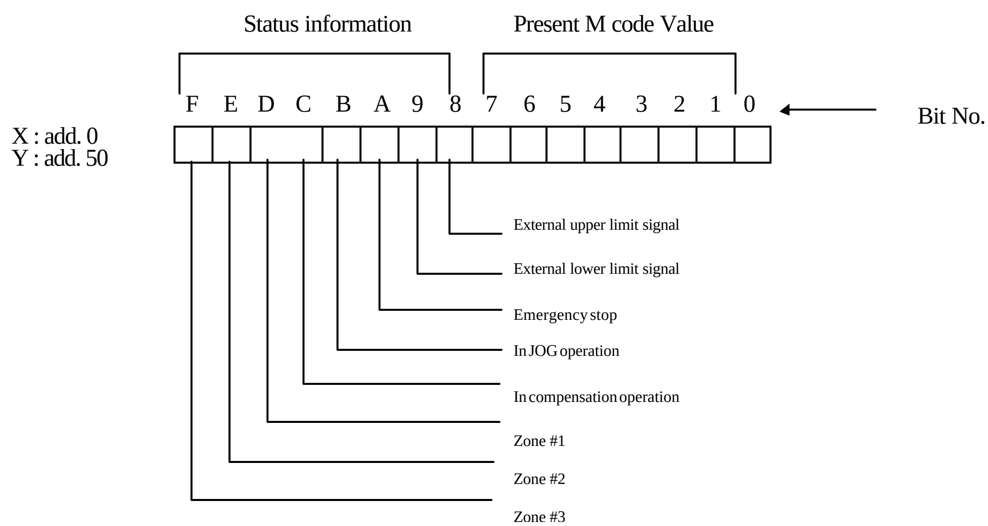
2) Buffer Memory of G3F-POPA/G4F-POPB/G6F-POPA (X-axis)



3) Buffer Memory of G3F-POPA/G4F-POPB/G6F-POPA (Y-axis)



9.1.2 Buffer Memory state



1) External upper/lower limit signal

(1) It is turned On if stroke upper/lower limit is exceeded over.

(2) Pulse output -prohibited state expected.

(3) Turned Off during position adjustment by manual operation (JOG operation) after pulse-out prohibited state is cancelled.

2) Emergency stop

(1) Turned On if stopped by external or internal emergency stop signal since then, leading to pulse-out prohibited state.

(2) Pulse-out prohibited state and all errors are cancelled by cancellation command of pulse-out prohibition.

3) JOG operation

Turned On during JOG low/high operation.

4) In compensation operation

Turned On during backlash compensation and origin point compensation.

5) Zone #1, 2, 3

Turned On respectively if into Zone #1, 2, 3 set to parameters.

6) Present M code value

(1) Present M code value(0~255) set to position data is displayed.

(2) M code value of G4F-POPA is displayed on bit 8~F and that of G3F-POPA,G4F-POPB & G6F-POPA is displayed on bit 0~7 respectively.
(However, G3F-POPA is United O/S V3.0 or above)

(3) If value of buffer memory address 0 is 15 in G4F-POPA, the value to be monitored will be h0F00 or 3840 as displayed.

	Err. code								Err. data								
	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0	
X : add.1 Y : add. 51																	G4F-POPA,G4F-POPB, G3F-POPA

	Err. code																
	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0	
X: add.1 Y: add.51																	G6F-POPA

7) Error data

Error serious on internal CPU of positioning module which is unavailable to use.

8) Error code

Error trivial on positioning module. Refer to troubleshooting list of error codes.

	Present speed
	F E D C B A 9 8 7 6 5 4 3 2 1 0
X: add.2 Y: add.52	0 ~ 200,000

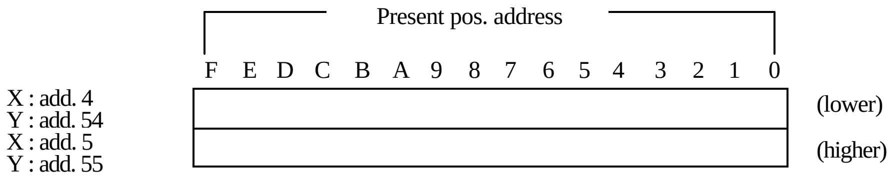
9) Present speed

Speed value presently operated is displyed.

	Present op. data No.
	F E D C B A 9 8 7 6 5 4 3 2 1 0
X: add. 3 Y: add.53	0 ~ 299

10) Present operation data No.

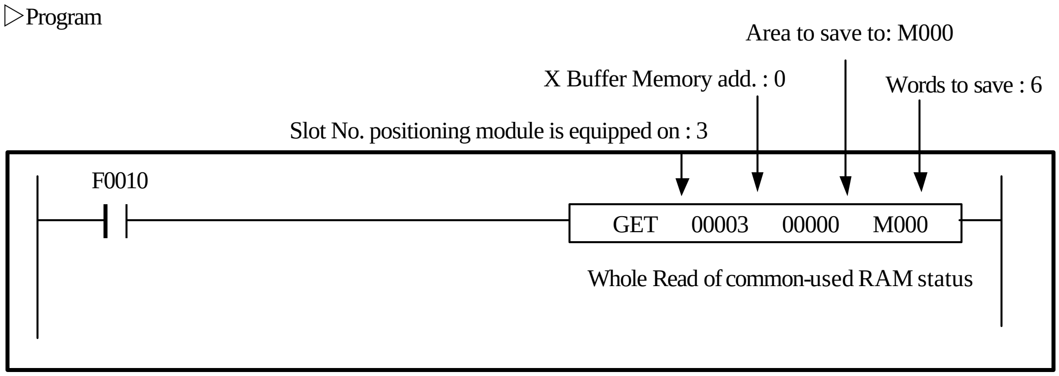
Operation data No.(operation step No.) presently operated is displayed.



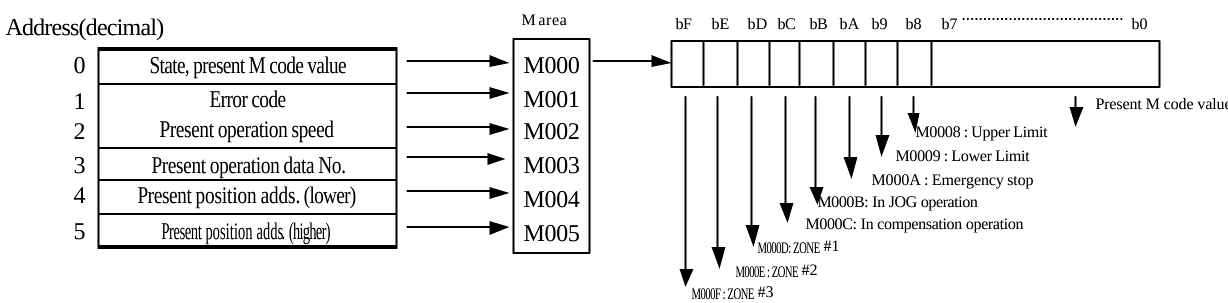
11) Present position address

Position address (-16,744,447 ~ +16,744,447) presently operated is displayed.

▷Program



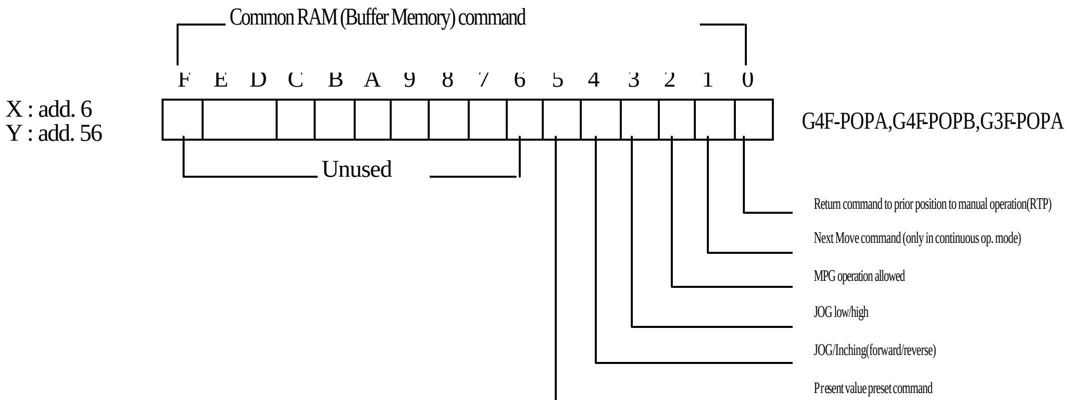
▷Results of program execution(in case of G6F-POPA's buffer memory)

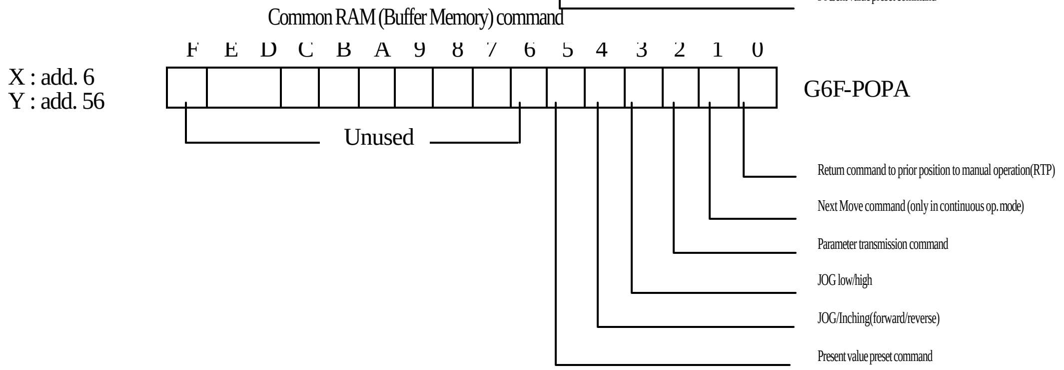


Remark

Since addresses 0 ~ 5 (X-axis) and 50 ~ 55(Y-axis) of positioning module's buffer memory are the area exclusively for Read, Read of positioning module status shall be performed by GET command.

9.1.3 Command of Common-used RAM (Buffer Memory) and data





1) Return (RTP) command to prior position to manual operation
Command used to return to prior position to JOG/Inching operation after JOG/Inching operation.(1 : On, 0 : Off)

2) Next Move command
(1) Command used in continuous operation mode for operation with the operation speed of the next operation data No. as changed.(1 : On, 0 : Off)
(2) Command available only at constant speed.

3) Manual pulse generator operation allowable
(1) Approval command of operation by external manual pulse generator.(1 : allowable, 0 : prohibited)
(2) Available only in G4F-POPB & G3F-POPA.
(3) Approval command of manual pulse generator operation is automatically Off at positioning start and interpolation positioning start

4) Parameter transmission command
(1) Command used to transmit acceleration time, deceleration time, M code mode, JOG high-speed, origin point return high-speed parameters.(1 : On, 0 : Off)
(2) Used to Write parameter value to change on address 17~21 (X-axis) and 67~71(Y-axis) and turn On the parameter transmission command.
(3) Available only in G6F-POPA.
(4) Valid only until powered off because the changed parameters by parameter transmission command are saved in RAM.

5) JOG low-speed/high-speed

Used to decide the speed low or high for JOG operation. (1 : high, 0 : low)

6) JOG/Inching (forward/reverse)

Used to decide the rotation direction forward or reverse for JOG operation or inching operation. (1 : reverse, 0 : forward)

7) Present value preset

As a changing command of present position address, it is used to Write position address value to change on address 9 & 10(X-axis) and 59 & 60(Y-axis) and turn present value preset command On.

Position teaching operation step No.

	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
X: add. 7 Y: add. 57	0 ~ 299															

8) Position teaching operation step No.

Position No.(step No.) setting data for Position teaching.

Position teaching (position address change) is performed by Position teaching command with position addresses, 9 & 10(X-axis) and 59 & 60 (Y-axis).

Operation step No.

	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
X : add. 8 Y : add. 58	0 ~ 299															

9) Operation step No.

Operation step No. value for operation start, which can be used along with change command of operation data No.

Preset pos. add.

	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0	
X : add. 9 Y : add. 59																	(lower)
X : add.10 Y : add. 60																	(higher)

10) Preset position address

Used to change present position address if Preset command of present value is executed, and to change position address of operation step No. assigned at Position teaching operation step No. if Position teaching command is executed.

X : add. 11
Y : add. 61

Override value(%) (F E D C B A 9 8)	Inching value (7 6 5 4 3 2 1 0)
1 ~ 15	1 ~ 99

11) Override value(%)

Speed in % in case that override operation is desired with speed changed at the rate, 10 ~ 150% of operation speed of setting speed data. The setting range is 1 ~ 15(10 ~ 150%).

12) Inching value

Shifting distance if inching command is executed. The setting range is 1 ~ 99.

X : add. 12
Y : add. 62

Variable speed value (F E D C B A 9 8 7 6 5 4 3 2 1 0)
1 ~ 20,000

13) Variable speed value

(1) Speed value when operation speed is desired to change to random set speed during positioning operation.

(2) Speed change command and variable speed value shall be processed under the same conditions during constant operation.

X : add. 13

Speed teaching speed data No. (F E D C B A 9 8 7 6 5 4 3 2 1 0)
0 ~ 127

14) Speed teaching speed data No.

Speed data No. to change at Speed teaching command with setting range of 0~127.

X : add. 14

Speed teaching speed value (F E D C B A 9 8 7 6 5 4 3 2 1 0)
1 ~ 20,000

15) Speed teaching speed value

(1) Speed value to change at speed teaching command.

(2) In case of execution of speed teaching command, speed teaching command, speed teaching speed data No. and speed teaching speed value shall be processed under the same conditions

Position teaching mode

X : add. 15
Y : add. 65

F E D C B A 9 8 7 6 5 4 3 2 1 0

0 : RAM Teaching, 1 : ROM Teaching

Speed teaching mode

F E D C B A 9 8 7 6 5 4 3 2 1 0

X : add. 16

0 : RAM Teaching, 1 : ROM Teaching

16) Teaching mode

(1) Teaching mode setting is available only in G6F-POPA.

(2) If 0 is set to the assigned address of buffer memory, RAM teaching mode will be set and If 1 is set to, ROM teaching mode will be set.

(3) In case position teaching or speed teaching is expected to be frequently executed, the teaching can be performed infinitely If RAM teaching mode is set

Acceleration/deceleration time

F E D C B A 9 8 7 6 5 4 3 2 1 0

X : add. 17, 18
Y : add. 67, 68

0 ~ 999

17) Acceleration/deceleration time

(1) Used satisfactorily to change acceleration or deceleration time by external input.

(2) Available only in G6F-POPA with setting range of 0 ~ 999(×10 ms).

M code mode

F E D C B A 9 8 7 6 5 4 3 2 1 0

X : add. 19
Y : add. 69

0 : With, 1 : After, 2 : None

18) M code mode

(1) To be set to change M code modes. Available only in G6F-POPA.

(2) In case of After Mode, M code and M code On signal are output simultaneously with positioning complete signal.

(3) Error occurs if start command is executed with M code On.

(4) Execution of start command is available after M code is cancelled.

(5) In case of auto-operation mode, M code once generated is standing by until M code is cancelled and then executes the next step operation if M code On signal is Off.

JOG high-speed value

F E D C B A 9 8 7 6 5 4 3 2 1 0

X : add. 20
Y : add. 70

1 ~ 20,000

19) JOG high-speed value

It is used to change operation speed in JOG high-speed operation. Available only in G6F-POPA.

High-speed value of origin point return

	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
X : add. 21 Y : add. 71	1 ~ 20,000															

20) High-speed value of origin point return

It is used to change operation speed at origin point return command.
Available only in G6F-POPA.

Remark

1. Addresses 6 ~ 21(X-axis) and 56 ~ 71(Y-axis) are Read/Write areas of positioning module's buffer memory, where to perform Write and Read through PUT/GET command.
2. Be careful, if Write/Read of other data than set address of positioning module's buffer memory is performed through PUT/GET command, the operation of positioning module may be abnormal.

9.2 I/O signal

9.2.1 Contents of I/O signal

In case positioning module is applied to MASTER-K 200S, 300S & 1000S CPU module, Input Signal and Output Signal are used for data exchange with PLC CPU. The contents and functions are as described below.

See below If I/O Word No. of positioning module equals "n".

The contents of I/O signals of G6F-POPA, G4F-POPB & G3F-POPA are identically 2-axes, 64 points.

1) I/O signal of G4F-POPA (32 points)

Signal direction: PLC CPU ←Positioning module		Signal direction : PLC CPU →Positioning module	
P area No(Input)	Status signal	P area No(output)	Com. signal(P contact command)
P00(n)0	Error	P00(n+1)0	Emergency stop
P00(n)1	In operation	P00(n+1)1	Operation data No. change
P00(n)2	Positioning complete	P00(n+1)2	Floating point set
P00(n)3	Origin Point return complete	P00(n+1)3	Output-prohibited cancellation
P00(n)4	Origin point undecided state	P00(n+1)4	Speed override
P00(n)5	Pulse-out prohibited state	P00(n+1)5	Error reset
P00(n)6	M code On	P00(n+1)6	M code Off
P00(n)7	Command complete	P00(n+1)7	Deceleration stop
P00(n)8	Decel. stopping/complete	P00(n+1)8	Unused
P00(n)9	In constant operation	P00(n+1)9	Positioning start
P00(n)A	In origin point return	P00(n+1)A	Origin Point return operation
P00(n)B	In positioning	P00(n+1)B	Speed change
P00(n)C	Unused	P00(n+1)C	JOG start
P00(n)D	Position Teaching complete	P00(n+1)D	Position Teaching
P00(n)E	Speed Teaching complete	P00(n+1)E	Speed Teaching
P00(n)F	Inching complete	P00(n+1)F	Inching start

2) I/O signal of G3F-POPA/G4F-POPB/G6F-POPA (64 points)

Axis	Signal direction: PLC CPU ←Positioning module		Signal direction: PLC CPU →Positioning module	
	P area No(input)	Status signal	P area No(output)	Com. signal(P contact command)
X-axis	P00(n)0	Error	P00(n+2)0	Emergency stop
	P00(n)1	In operation	P00(n+2)1	Operation data No. Change
	P00(n)2	Positioning complete	P00(n+2)2	Floating point set
	P00(n)3	Origin point return complete	P00(n+2)3	Output-prohibited cancellation
	P00(n)4	Origin point undecided state	P00(n+2)4	Speed override
	P00(n)5	Pulse-out prohibited state	P00(n+2)5	Error reset
	P00(n)6	M code On	P00(n+2)6	M code Off
	P00(n)7	Command complete	P00(n+2)7	Deceleration stop
	P00(n)8	Decel. stopping/complete	P00(n+2)8	Interpolation positioning start
	P00(n)9	In constant operation	P00(n+2)9	Positioning start
	P00(n)A	In origin point return	P00(n+2)A	Origin point return operation
	P00(n)B	In positioning	P00(n+2)B	Speed change
	P00(n)C	In interpolation operation	P00(n+2)C	JOG start
	P00(n)D	Position Teaching complete	P00(n+2)D	Position Teaching
	P00(n)E	Speed Teaching complete	P00(n+2)E	Speed Teaching
	P00(n)F	Inching complete	P00(n+2)F	Inching start
Y-axis	P00(n+1)0	Error	P00(n+3)0	Unused
	P00(n+1)1	In operation	P00(n+3)1	Setting operation data No.
	P00(n+1)2	Positioning complete	P00(n+3)2	Floating point set
	P00(n+1)3	Origin point return complete	P00(n+3)3	Output-prohibited cancellation
	P00(n+1)4	Origin point undecided state	P00(n+3)4	Speed override
	P00(n+1)5	Pulse-out prohibited state	P00(n+3)5	Error reset
	P00(n+1)6	M code On	P00(n+3)6	M code Off
	P00(n+1)7	Command complete	P00(n+3)7	Deceleration stop
	P00(n+1)8	Decel. Stopping/complete	P00(n+3)8	Unused
	P00(n+1)9	In constant operation	P00(n+3)9	Positioning start
	P00(n+1)A	In origin point return	P00(n+3)A	Origin point return operation
	P00(n+1)B	In positioning	P00(n+3)B	Speed change
	P00(n+1)C	In interpolation operation	P00(n+3)C	JOG start
	P00(n+1)D	Position Teaching complete	P00(n+3)D	Position Teaching
	P00(n+1)E	Unused	P00(n+3)E	Unused
	P00(n+1)F	Inching complete	P00(n+3)F	Inching start

9.2.2 Status signal

1) Error

Turned On if error occurred and turned Off by error reset command and cancellation command of pulse output-prohibited.

2) In operation

(1) Turned On at positioning start command and turned Off if start command complete.

(2) Signals "In operation" of X-axis & Y-axis are turned On simultaneously at interpolation operation command and turned Off simultaneously if command complete.

(3) Turned On/Off also at inching command and in JOG operation.

(4) Turned Off at deceleration stop and emergency stop.

(5) Turned On during the dwell time.

3) Positioning complete

(1) Turned Off at operation commands of positioning and origin point return

(2) Turned On if single & repeated operation complete and origin point return complete, and in positioning constant operation after dwell time elapses.

(3) Turned Off at deceleration stop & emergency stop.

(4) Turned On/Off simultaneously at X-axis & Y-axis if in interpolation operation.

(5) Turned Off in auto-operation or continuous operation.

4) Origin point return complete

(1) Turned On if dwell time and origin point compensation are executed after operation command of origin point return.

(2) Turned Off by any other command signals.

5) Origin point undecided

(1) Turned Off if floating point set is set or origin point return is complete.

(2) Turned On if origin point is not decided.

6) Pulse-output prohibited

(1) Turned On at emergency stop or if stroke upper/lower limit is exceeded over.

(2) Turned Off by cancellation command of pulse-out prohibited.

7) M code On

(1) M code value is produced as classified into With/After mode at positioning. Turned On if the value is 1~255.

(2) Turned On in single, repeated, auto & constant operation mode after the dwell time.

(3) Turned On at setting position in continuous operation mode.

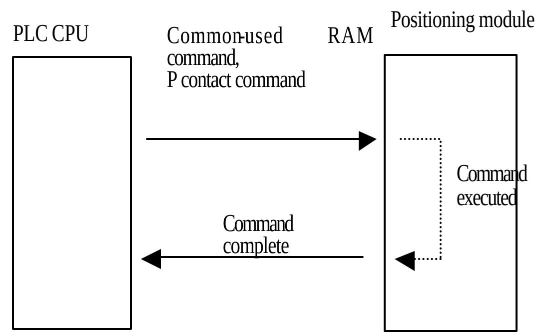
(4) Turned Off by M code Off command.

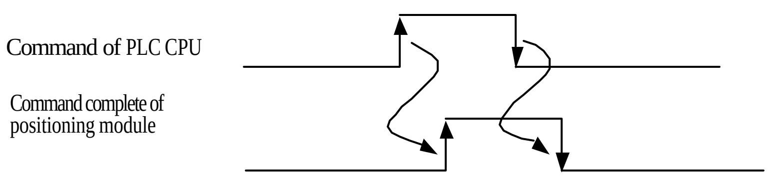
8) Command complete

(1) A signal notifying PLC CPU that the command is normally executed at positioning module when Common-used RAM command or P contact command (output contact command of positioning module) is On, which is turned On if the command is normally executed.

(2) Turned Off immediately if Common-used RAM command or P contact command is Off.

(3) Do not use this command complete signal in JOG operation or at approval command of manual pulse generator.





Remark
1. Command shall be turned Off if command complete signal is On. 2. In PLC CPU, commands 2 or above are not allowed simultaneously on positioning module. Surely apply the next command after the prior command is executed.

9) Deceleration stopping / complete

(1) Turned On until stopped by deceleration stop command.

(2) Turned Off at positioning start, origin point return operation, JOG command and inching command.

10) In constant operation

Turned On only in constant operation. Turned Off in others.(acceleration stage, deceleration stage, dwell time, operation stop, etc.)

11) In origin point return

Turned On at operation command of origin point return and turned Off if origin point return is complete.

12) In interpolation operation

Turned On at interpolation operation command and turned Off if positioning complete.

13) Position teaching complete

(1) Turned On if position teaching complete.

(2) Turned Off in positioning start, origin point return operation and JOG operation.

14) Speed teaching complete

(1) Turned On if speed teaching complete.

(2) Turned Off in positioning start, origin point return operation and JOG operation.

15) Inching complete

(1) Turned On if inching complete.

(2) Turned Off in positioning start, origin point return operation and JOG operation

9.2.3 Command signal (P contact command)

1) Emergency stop

(1) Signal input from the outside of positioning module is called as external emergency stop, and P contact emergency stop is called as internal emergency stop.

(2) Internal emergency stop shall be applied when external emergency stop signal is at normal-wired state(N.C).

(3) Pulse-out prohibited state is expected after this command is executed.

2) Operation data No.change

(1) Function to jump to random operation data No. by this change command of operation data No.

(2) Operation will be executed with operation data No. saved by positioning start command if operation data No. to jump is saved to address 8(X-axis) & 58(Y-axis) of positioning module's buffer memory and the change command of operation data No. is On.

3) Floating point set

(1) Setting command of floating point set shall be applied to find S/W datum point in a system where circle-operating index table or mechanical datum point is not necessary, even though origin point return is a function to find a mechanical datum point in system.

(2) Present position is changed to origin point address set at parameters if setting command of floating point set is executed.

4) Cancellation of pulse-out prohibited

Cancellation function of the state of pulse-out prohibited by stroke upper/lower limit and emergency stop.

5) Override

(1) Function to change operation speed within 10~150%.

(2) Speed change data which is higher byte of address 11(X-axis) & 61(Y-axis) of positioning buffer memory shall be set in the range of h0100~h0F00.

(3) h0100 = 10%, h0200 = 20%, ...h0F00 = 150% respectively.

6) Error reset

Command to settle light error if occurred.

7) M code Off

M code On signal if occurred is let turned Off.

8) Deceleration stop

(1) It temporarily stops positioning & origin point return operation internally if executed.

(2) Position shift is performed as much as travel value by relative position (INC) shift, and as much as the remaining position address by absolute position if positioning start command is executed after execution of deceleration stop.

9) Interpolation operation

(1) Linear interpolation operation is performed at interpolation positioning start.

(2) Arrangement of position data at X-axis & Y-axis shall be set identical.

(3) Target speed, dwell time, M code and other controls shall be operated as based on X-axis.

(4) Override command is not processed.

(5) Bias speed is always regarded as 0.

(6) Operation mode is as based on X-axis

(7) Interpolation operation for others than single, repeated and auto-operation mode is not available but causing error.

(8) Stopped unconditionally at emergency stop.

(9) Processed by signal of either X-axis or Y-axis at deceleration stop and positioning stop.

(10) Refer to 2) 2-axes position control in 3.1.1.

10) Positioning start

(1) If positioning start is executed, operation will be performed upto position address of present operation data No. according to position data.

(2) In single operation mode, operation is performed with incremental operation data No. per execution of positioning start.

(3) In auto-operation or continuous operation mode, operation is performed upto setting operation data No. of single operation mode by one positioning start of positioning.

(4) Refer to 4.2 Operation mode.

11) Origin point return operation

(1) Command to fine the mechanical origin point.

(2) Origin point address assigned by parameter setting will be the present address if origin point return is complete.

(3) 4 methods are available for origin point return. Refer to 3.5 Origin point return for details.

12) Speed change

(1) Function to change operation speed to setting speed up to 10~200Kpps during operation.

(2) Actual setting speed value is 1~20,000 with operation speed range of 10~200,000pps.

(3) Since acceleration/deceleration time is not applied at speed change command, sudden speed change may cause separation if step motor used.

(4) Speed change is available in constant operation.

(5) Speed value to be changed shall be set at address 12 (X-axis) & 62 (Y-axis) of buffer memory and speed change command and speed value shall be programmed to be processed under the same conditions.

13) JOG operation

(1) A manual operation command used for forward and reverse rotation operation at JOG high/low speed as set at parameters.

(2) JOG low-speed shall be set lower than high -speed.

(3) In G6F-POPA, no speed limit error occurs in JOG low-speed operation and the operation is allowed at lower speed than bias setting speed.

14) Position Teaching

(1) Function to change position address of position data to random set value.

(2) Operation data No. of position address to change shall be assigned to address 7 (X-axis) and 57 (Y-axis) of buffer memory and position address value to set shall be assigned to address 9~10 (X-axis) and 59~60(Y-axis) of buffer memory so to be processed as programmed under the same conditions as position teaching command

(4) In G6F-POPA, position teaching is available by position teaching command even if origin point is at undecided state.

15) Speed Teaching

(1) Function to change speed value of speed data.

(2) Speed data No. and speed data to change shall be assigned to address 13 and 14 of buffer memory so to be processed under the same conditions as speed teaching command.

16) Inching

(1) A Manual operation function to operate with pulse amount (1~99) set by user.

(2) Inching operation is performed at fixed shift speed of 50pps.

(3) Used for accurate move in case JOG operation is not available.

Remark

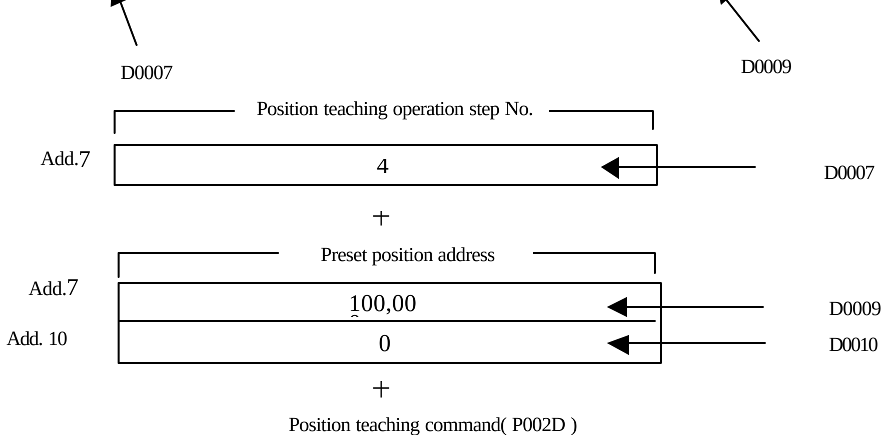
1. Be careful that the application number of RAM Teaching(G6F-POPA) is not limited but the number of ROM Teaching is limited.(available: 100,000 times)
2. To increase the application number (if performed by one step of teaching operation)

1) set 300 operation steps to repeated operation via software package and
2) change start position No. to the next operation step if the teaching count number reaches 99,000 as compared with 100,000 or below(99,000) in PLC program so to
3) use up to teaching times of 99,000X300=29,700,000.

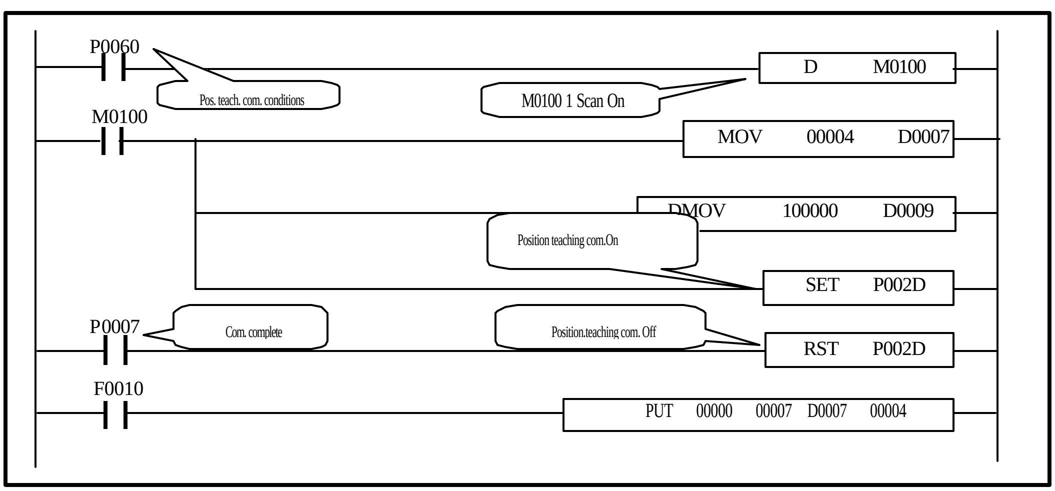
Example of position teaching) For position teaching of 4th step's position address of X-axis with 100,000

Position data of X-axis

Step No.	Coordinates	Override	Operation method	Invalid/valid	Operation mode	Address	M code	Speed No.	Dwell (x10 ms)
0	Absolute	Prohibited	Continuous	Valid	Single	0	0	0	0
1	Absolute	Prohibited	Continuous	Valid	Single	0	0	0	0
2	Absolute	Prohibited	Continuous	Valid	Single	0	0	0	0
3	Absolute	Prohibited	Continuous	Valid	Single	100,000	0	0	0
4	Absolute	Prohibited	Continuous	Valid	Single	150,000	0	0	0



▷Program(If G6F-POPA is installed on 0th slot)



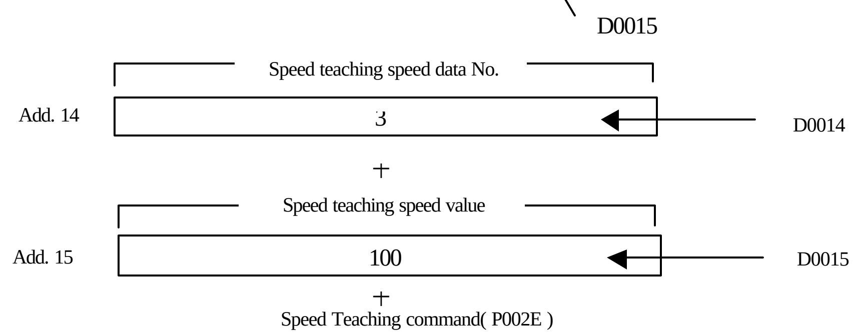
Rematk

Data-accompanied command shall be processed with data and command simultaneously under the same conditions (M0100 in case of the program above). (position teaching, speed teaching, present position preset, parameter transmission, inching start, speed change, speed override, operation data No.change)

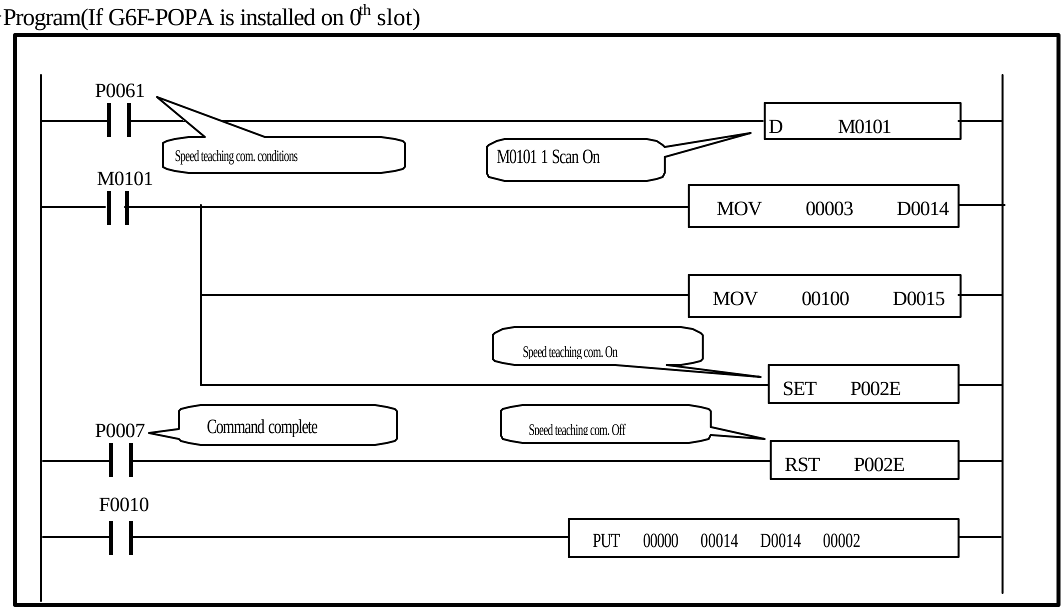
Example of speed teaching) For speed teaching of speed value of speed data No. 3 with 100.

Speed data of X-axis

	0	1	2	3	4	5	6	7	8	9
0	100	200	300	400	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0



▷Program(If G6F-POPA is installed on 0th slot)

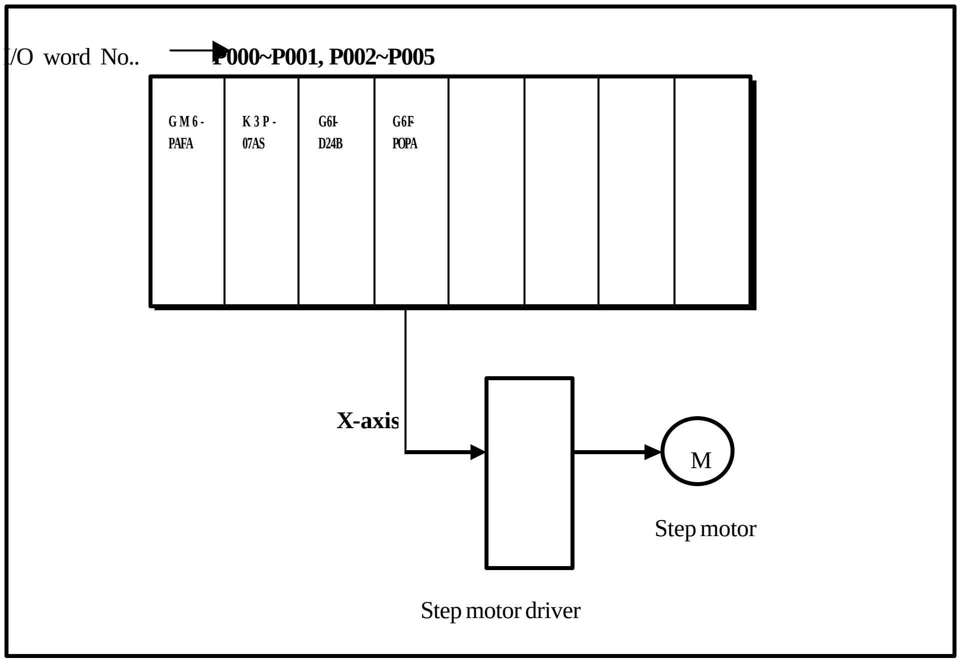


Chapter 10 MK program

Various examples are discribed for operation of positioning module in MASTER-K K200S/300S/1000S series via the PLC program.

Example program is prepared in the system below unless noted otherwise.

I/O contact of G6F-POPA positioning module includes 64 points upto P0020 ~ P004F.



[Fig.10.1] System configuration of basic example program

Fig.10.1 shows G6F-POPA positioning module as installed on slot 1 of K200S CPU.

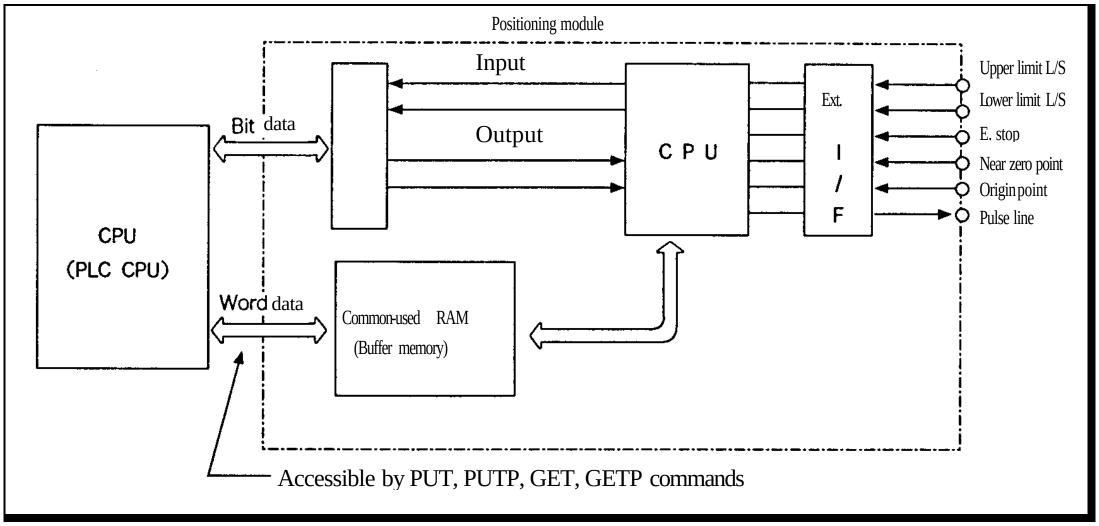
A sequence program shall be composed with I/O word No. as changed for installation on the other slots.

For status information reading to Read/Write common-used RAM (positioning module's buffer memory) data between PLC CPU and positioning module, use GET/ GETP command and for command and data writing, use PUT/PUTP command.

Carefully read 10.2.1 Programming caution for sequence programming with positioning module prior to application.

10.1 Information exchange between positioning module & PLC CPU

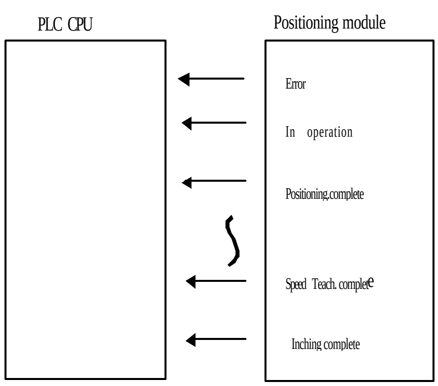
2 types of information classified into bit-unit and word-unit are transmitted/received as exchanged between PLC CPU and positioning module.



【Fig. 10.2】 **Structure of positioning module**

10.1.1 Exchange of I/O signals (bit information)

I/O signals in bit unit are exchanged between PLC CPU and positioning module. The I/O signals original of positioning module, which are different from external I/O are used in PLC. Input signal is P contact status signal and Output signal is P contact command signal.



【Fig.10.3】 Input signal of positioning module

♣Input signal

Input signal used for sequence program is a signal input from positioning module to CPU, which is generated from positioning module side. It is used as a contact point in programming. See the examples below :

① Error signal

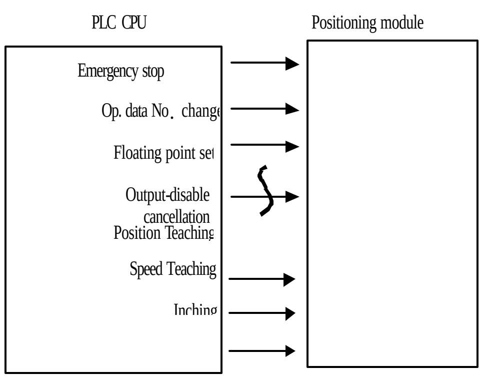
Signal turned On if error occurred in operation

(normal: Off, error: On)

② "In operation" signal

Signal that inputs what is in positioning operation to CPU

♣ Output signal



【Fig. 10.4】 Output of positioning module

SET, RST or OUT used for sequence program is a signal output from CPU to positioning module, as is generated from CPU to be used as coil or contact point of program.

① Positioning start command

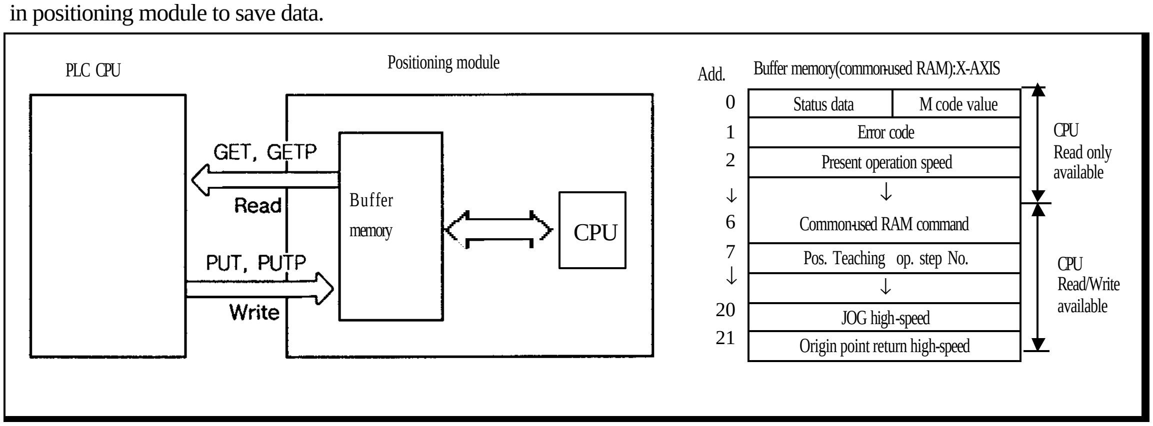
Command to let positioning module find the next position No. to operate

② Origin point return command

Command to find the machine's origin point to operate

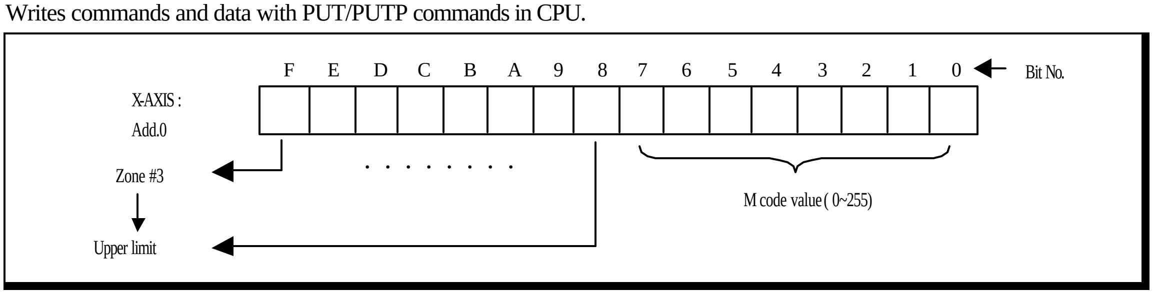
10.1.2 Exchange of word data (word information)

Information of word data is exchanged in 16-bit unit. There is buffer memory (common-used RAM) in positioning module to save data.



【Fig. 10.5】 Buffer memory (common-used RAM)

Buffer memory (common-used RAM) Reads status information with GET/ GETP commands and Writes commands and data with PUT/PUTP commands in CPU.

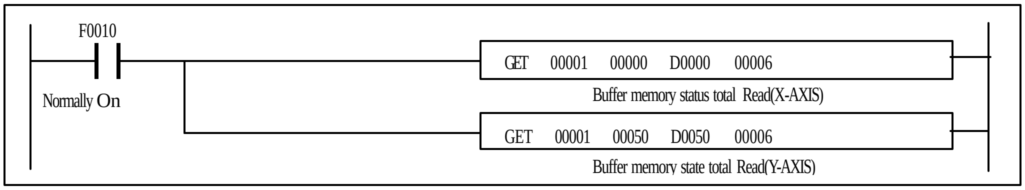


【Fig. 10.6】 Example of buffer memory (common-used RAM)

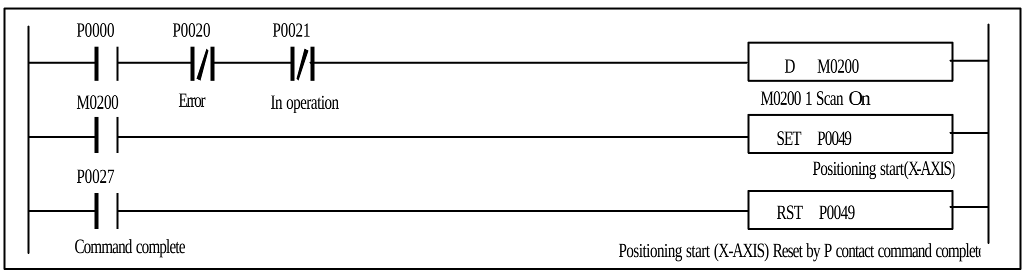
10.2 Programming

10.2.1 Programming Caution

Read the status always prior to execution of command.

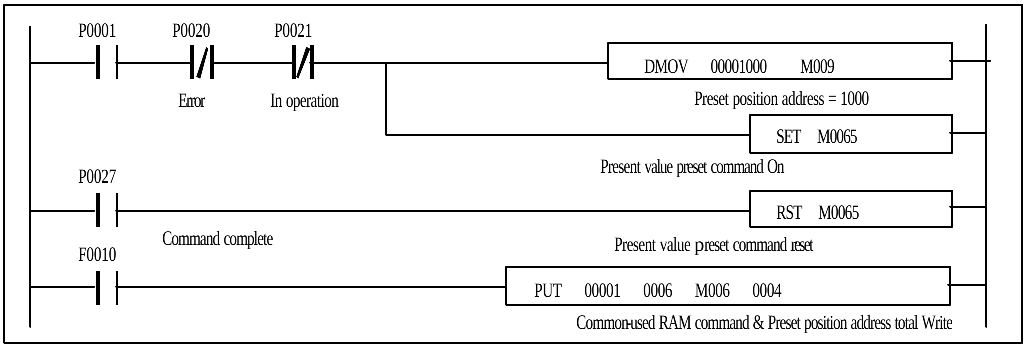


Any other command than error reset, speed change, override, deceleration stop and Next Move command is not allowed to execute during operation or in error. Command Off is to be processed by command complete signal. (P contact command, common-used RAM command)



Data-accompanied command shall be processed simultaneously with data and command under the same conditions, or positioning module may be abnormal in operation.

(Data-accompanied commands : present value preset, start position No. change, override, inching, position teaching, speed teaching)



JOG & MPG approval command is a level command.

Namely, it is operated only when command condition is On. If command condition is Off, the operation stops promptly. Others than 2 commands described above shall be operated with the pulse of command condition.

Override, Next Move and speed change command shall be executed only at constant.

If position data is of Absolute method, other commands shall be executed after execution of origin point return or floating point set command.

Just one command shall be executed. (2 or above commands are not allowed simultaneously)

If powered On, origin point return or floating point set shall be complete first to allow other command, or error 76 occurs in Absolute operation with the command not executable.

Read only area is arranged according to the address of buffer memory (common-used RAM). Never apply PUT command to this area.

(X-axis Read only area : address 0 ~ 5, X-axis Read/Write available area : address 6 ~ 21,

Y-axis Read only area : address 50 ~ 55, Y-axis Read/Write available area : address 56 ~ 71)

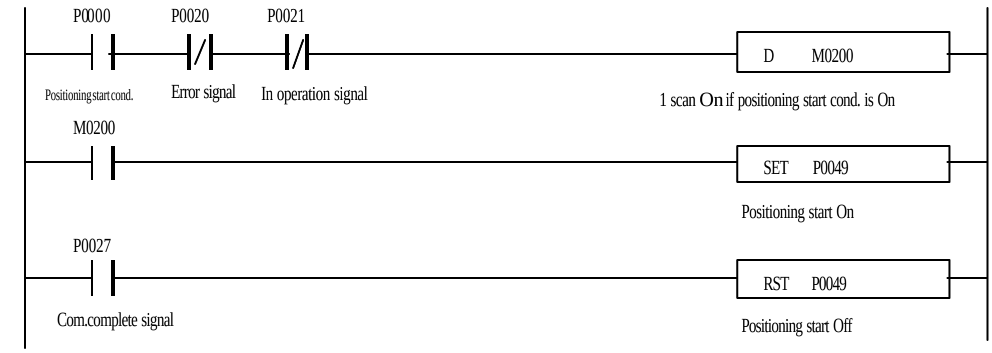
Do not Read/Write on other addresses than assigned at buffer memory when executing PUT/GET commands.

Surely refer to 3.1 Buffer memory because the address of buffer memory differs according to the type of positioning module.

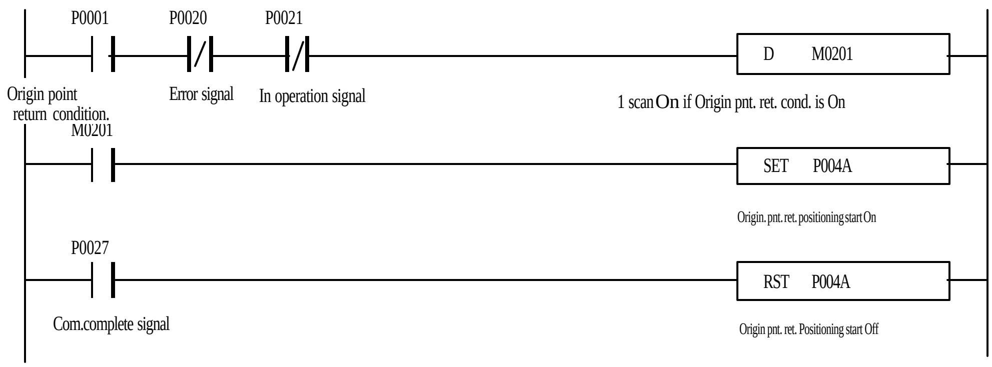
Present position address shall be surely read in 2-word unit simultaneously and preset position address be written in 2-word unit simultaneously also. (PUT/GET commands)

10.2.2 Basic program

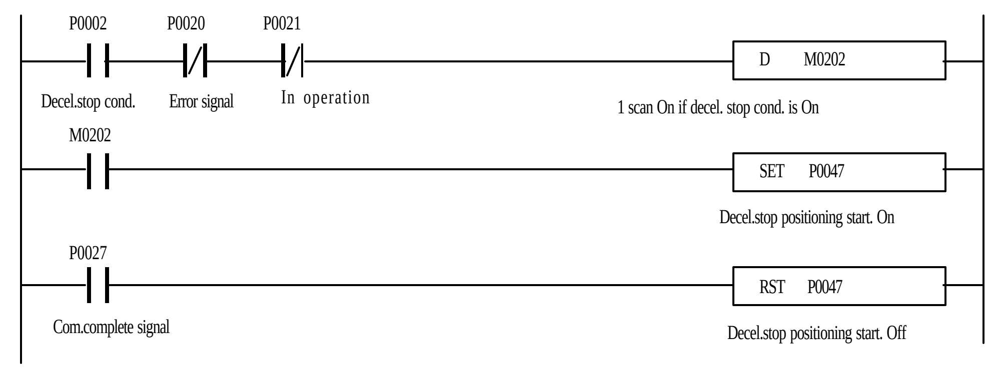
1) Positioning start (AST)



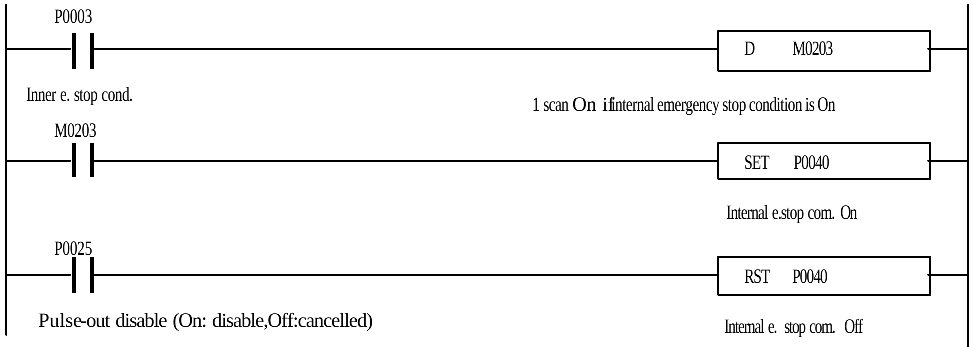
2) Origin point return(ORG)



3) Deceleration stop(STOP)



4) Internal emergency stop



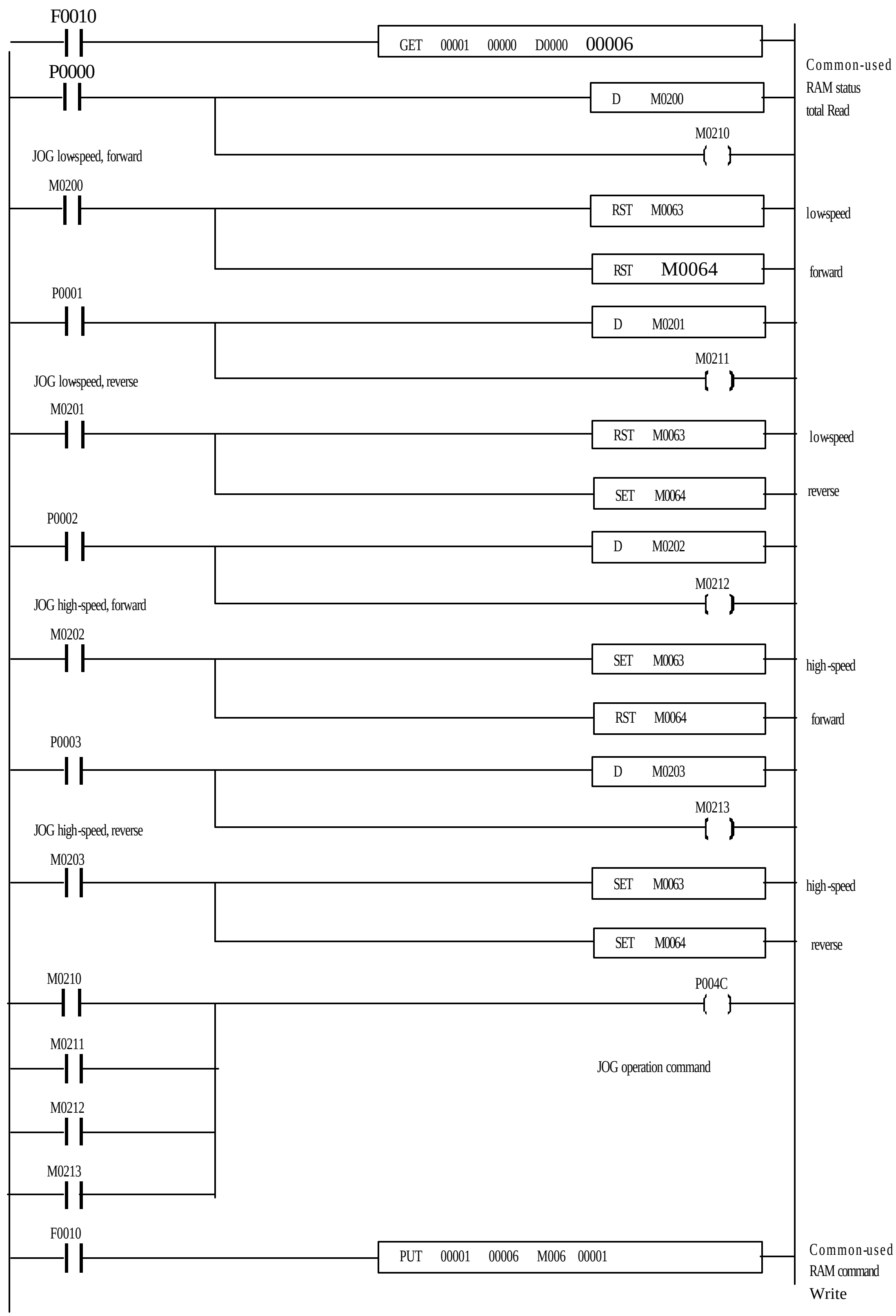
- Internal emergency stop

Emergency stop with NC (B contact) switch or sensor as connected to external connector pin No.19 by program

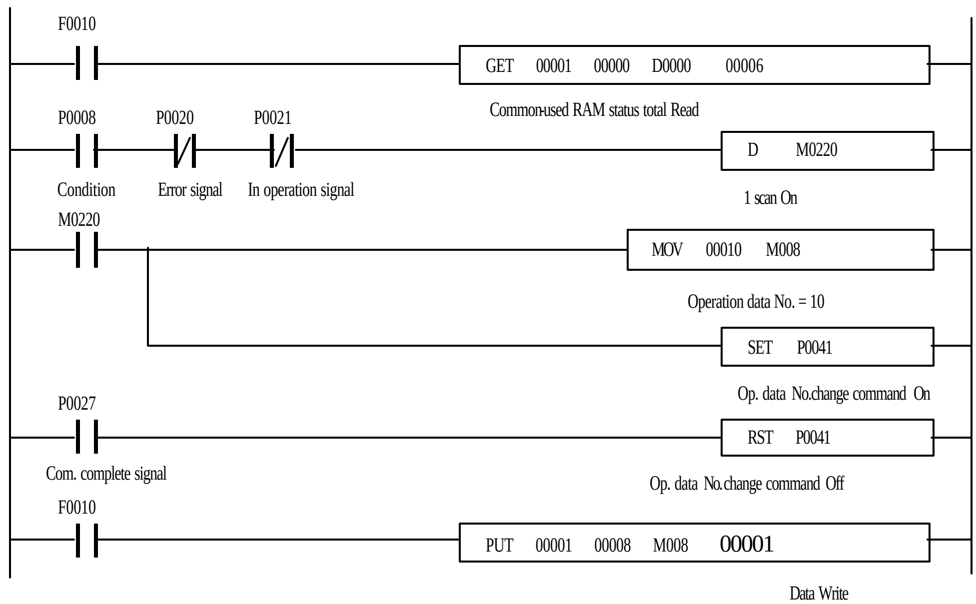
- External emergency stop

Emergency stop with NC (B contact) switch or sensor as connected to external connector pin No.19 irrelevant to program

5) JOG operation(JOG)



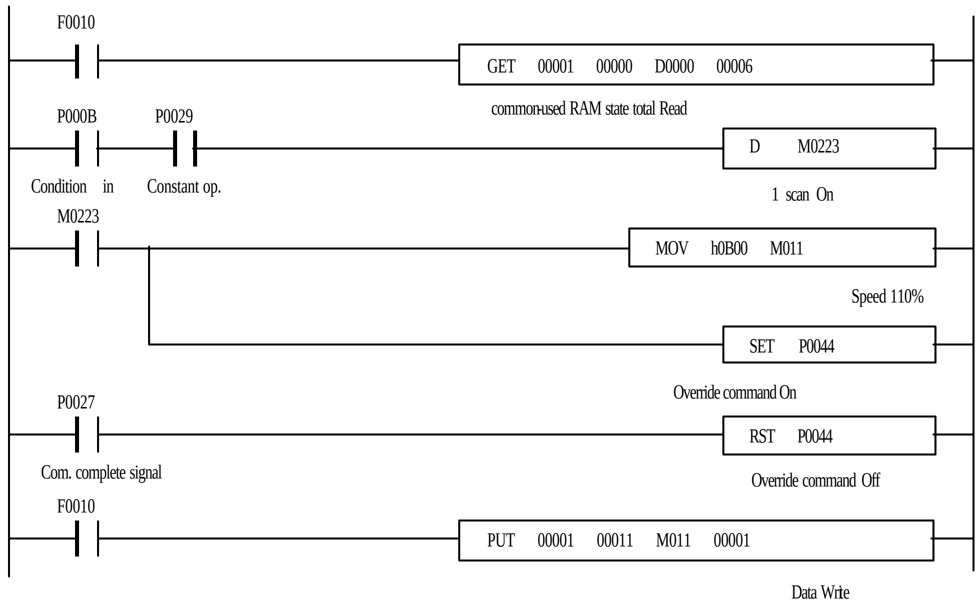
6) Operation data No. change(SMC)



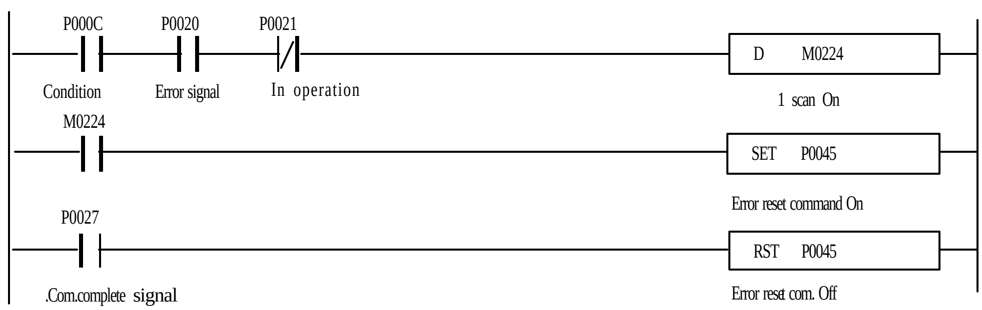
7) Floating point set (FLT)

8) Output-disable cancellation (OFF)

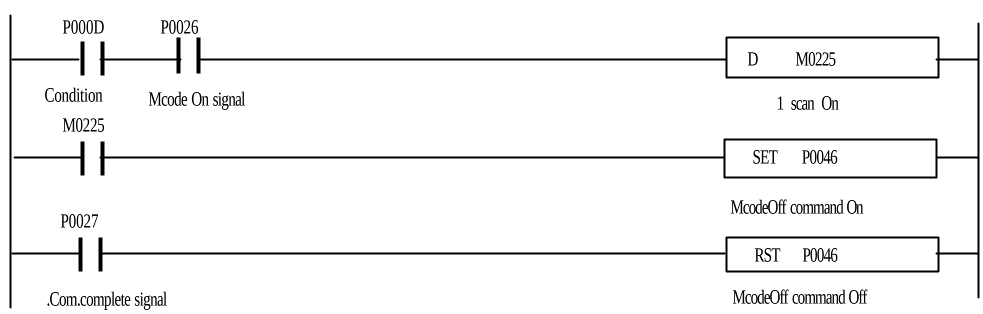
9) Override(OR)



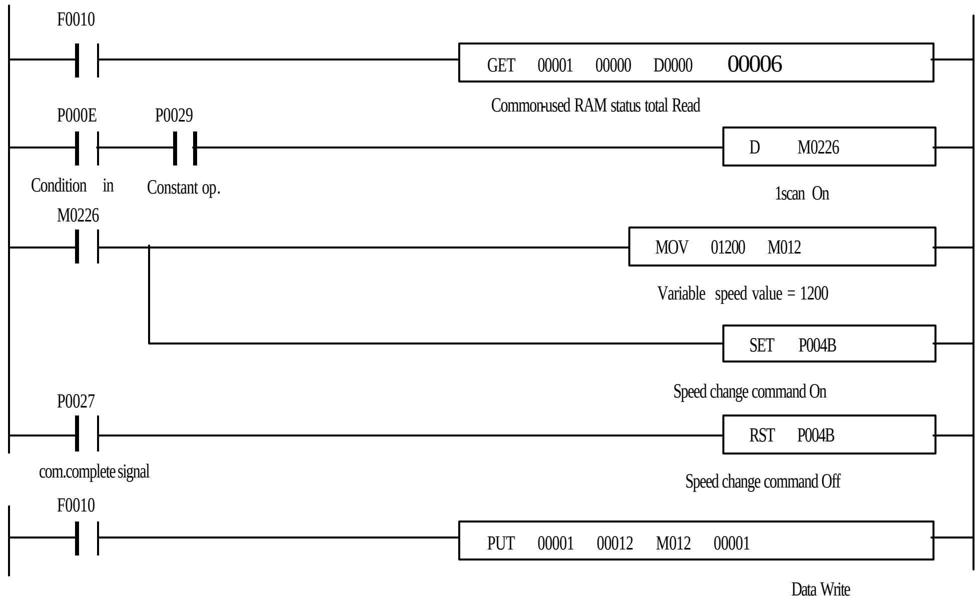
10) Error reset(RES)



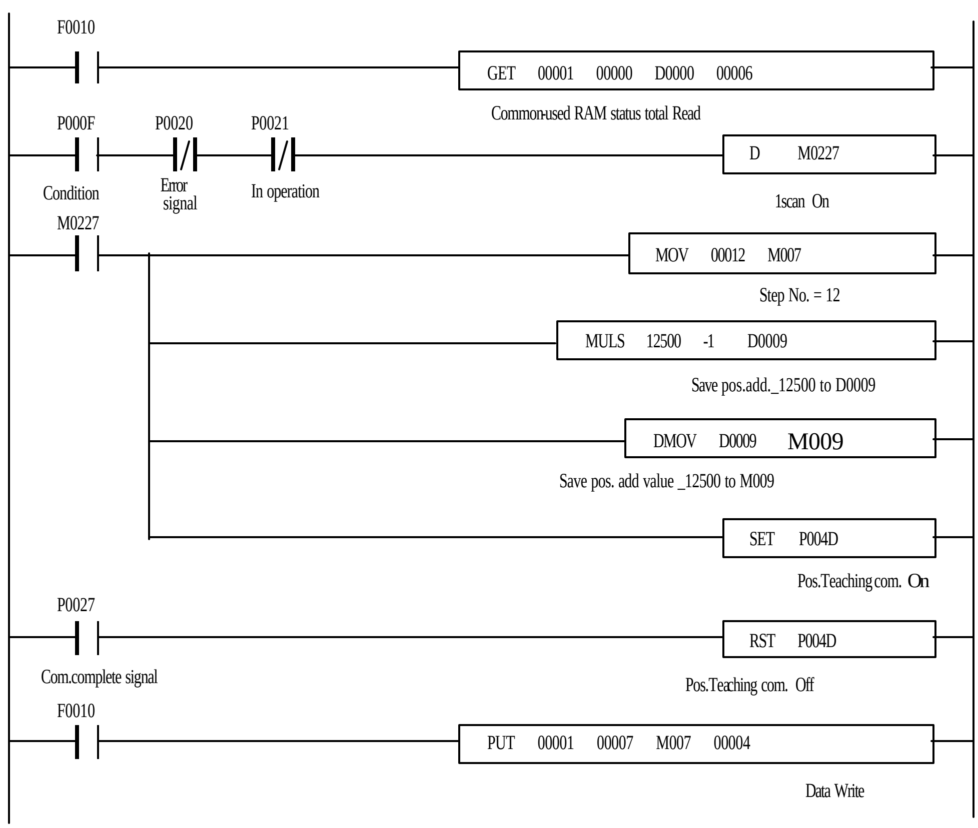
11) M code Off(MOF)



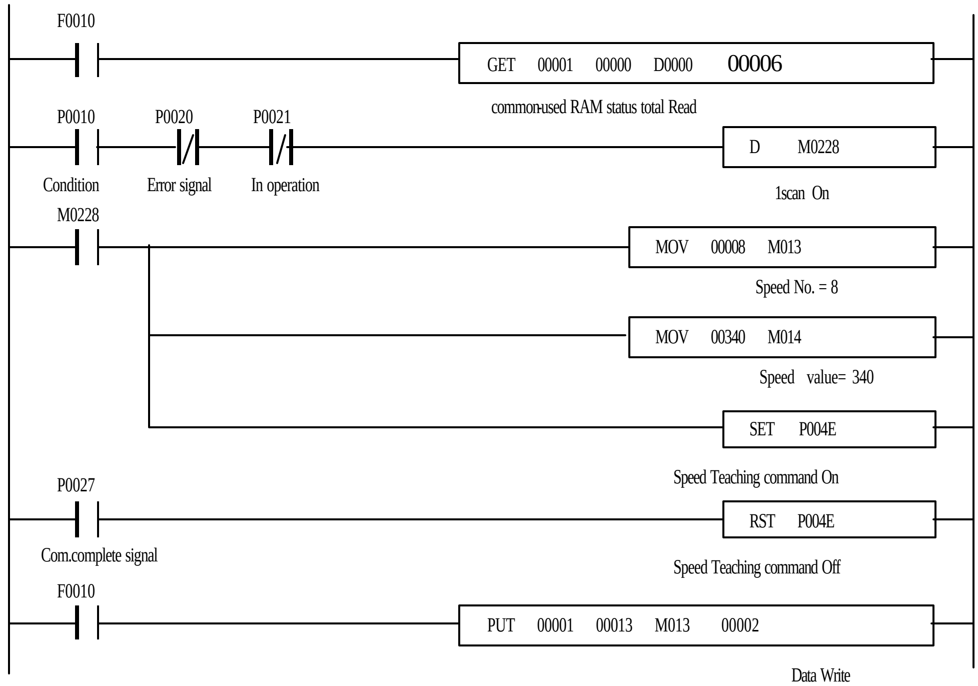
12) Speed change(VCG)



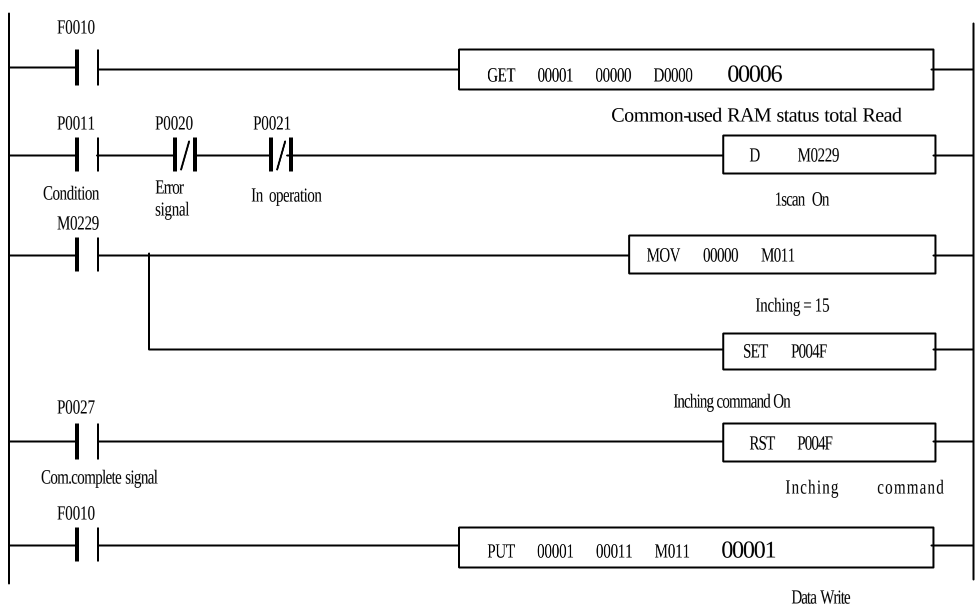
13) Position Teaching(TEA)



14) Speed Teaching(VLT)

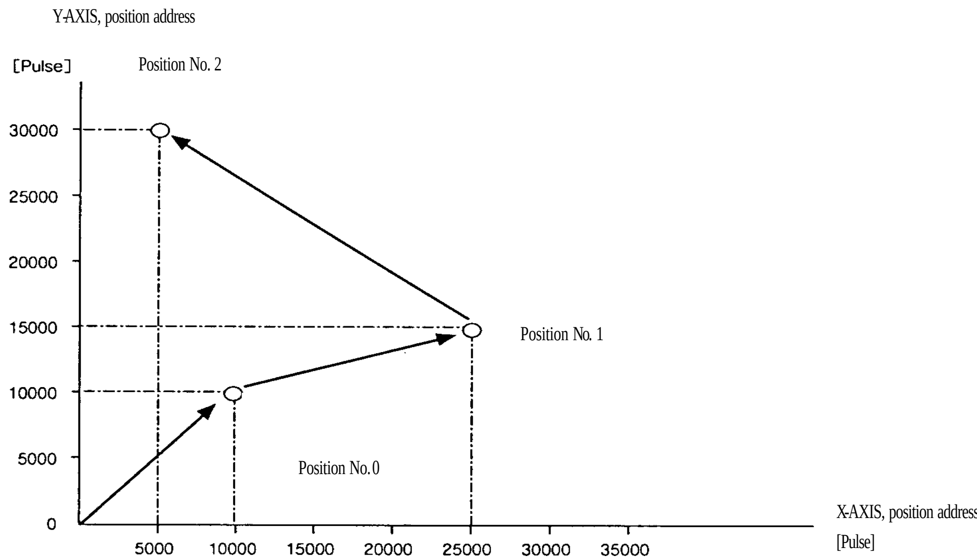


15) Inching(INC)



16) 2-axes interpolation operation

Positioning operation



(2) Position data and speed data

■ X-axis, position data

Step	Coordinates	Override	Operationmethod	Invalid/ Valid	Operation mode	Position address(Pulse)	M code	Speed No.	Dwell Time
0	Absolute	Disable	Continuous	Valid	Single	10,000	0	0	5
1	Absolute	Disable	Continuous	Valid	Single	25,000	0	1	5
2	Absolute	Disable	Continuous	Valid	Single	5,000	0	2	5
3	Absolute	Disable	Continuous	Invalid	Single	0	0	0	0
4	Absolute	Disable	Continuous	Invalid	Single	0	0	0	0

■ Y-axis, position data

Step	Coordinates	Override	Operationmethod	Invalid/ Valid	Operation mode	Position address(Pulse)	M code	Speed No.	Dwell Time
0	Absolute	Disable	Continuous	Valid	Single	10,000	0	0	5
1	Absolute	Disable	Continuous	Valid	Single	15,000	0	1	5
2	Absolute	Disable	Continuous	Valid	Single	30,000	0	2	5
3	Absolute	Disable	Continuous	Invalid	Single	0	0	0	0
4	Absolute	Disable	Continuous	Invalid	Single	0	0	0	0

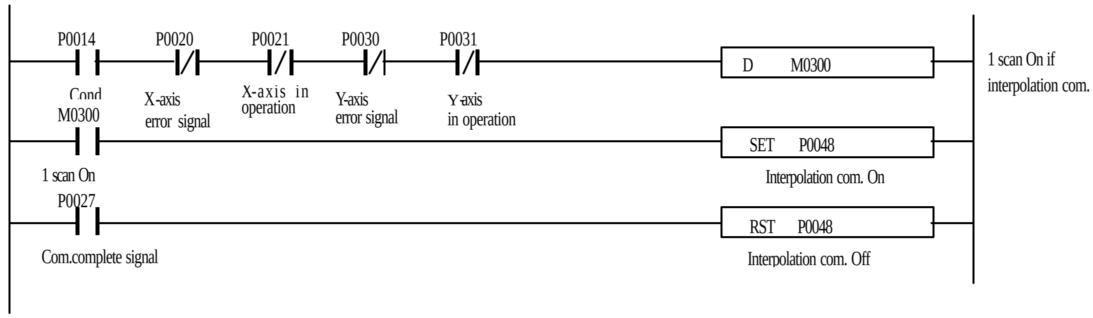
■ Speed data

No.	Data
0	200
1	400
2	600
3	0

(3) System configuration

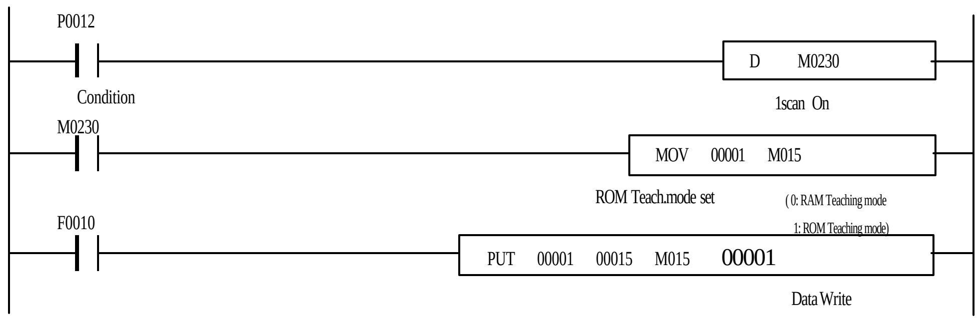
System shall be configured as shown in Fig.10.1 and be connected with the driver with 2 axes of X & Y. The operation shall be with X-axis interpolation command signal to let interpolation command On.

(4) Program



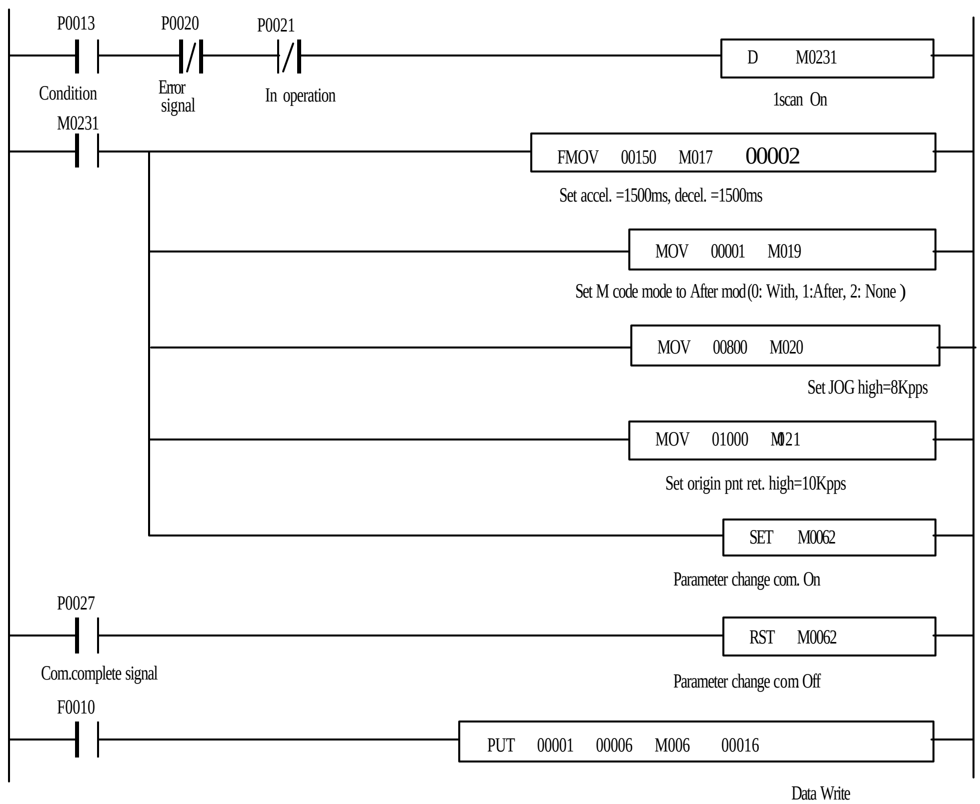
17) Teaching mode change

Available only in positioning module G6F-POPA.



18) Parameter change

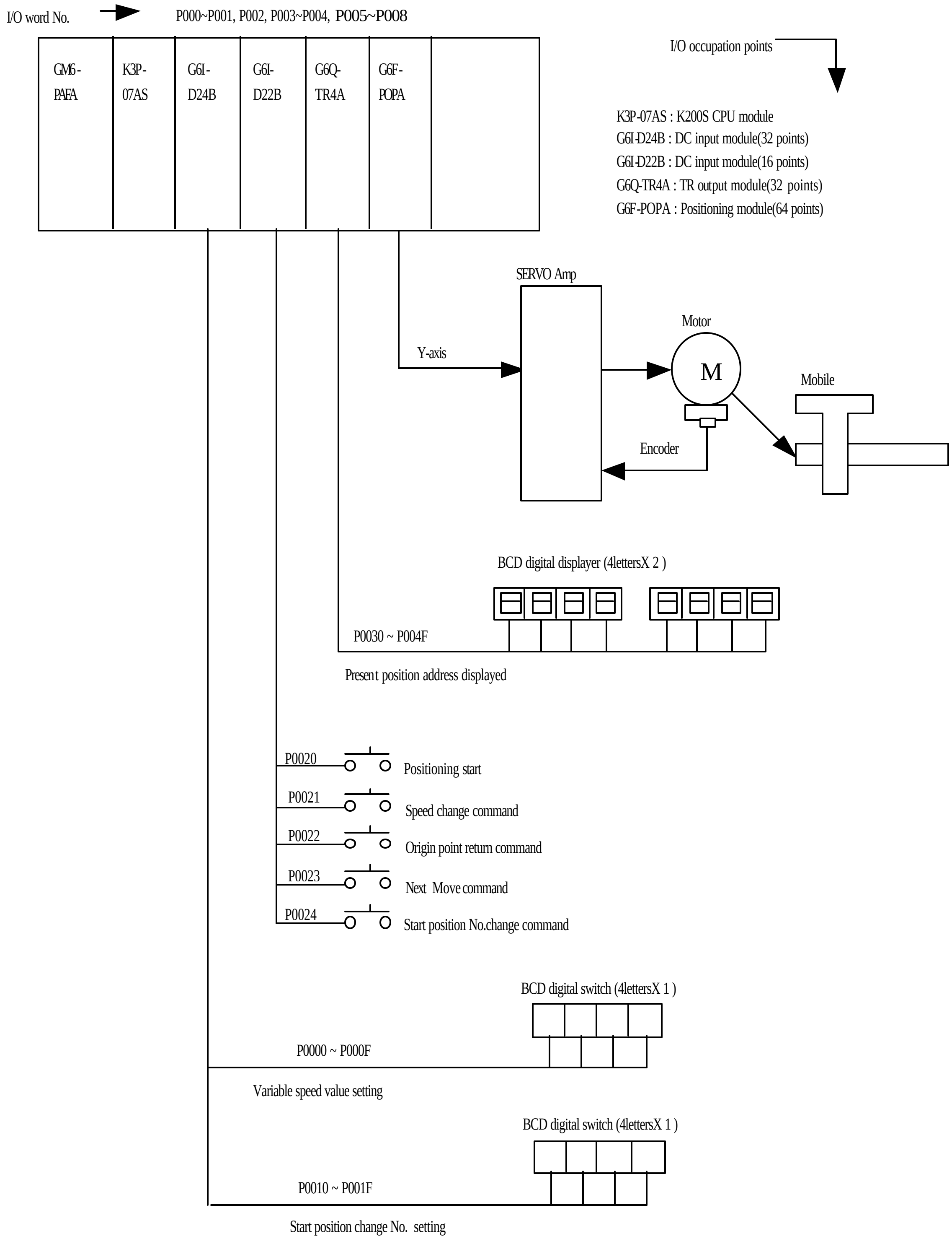
Available only in positioning module G6F-POPA.



10.3 Application program

10.3.1 Speed change, Next move, Change of operation data No.

1) System configuration



2) Data setting and operational description

■ Y-axis position data

* Operation pattern 1

Step	Coordinates	Override	Operation method	Invalid/ Valid	Operation mode	Address (Pulse)	M code	Speed No.	Dwell
0	Absolute	Disable	Continuous	Valid	Single	100,000	0	0	50
1	Absolute	Disable	Continuous	Valid	Single	120,000	0	1	50
2	Absolute	Disable	Continuous	Valid	Single	0	0	0	50
3	Absolute	Disable	Continuous	Invalid	Single	0	0	0	0
4	Absolute	Disable	Continuous	Invalid	Single	0	0	0	0

* Operation pattern 2

Step	Coordinates	Override	Operationmethod	Invalid/ Valid	Operation mode	Address (Pulse)	M code	Speed No.	Dwell
10	Absolute	Disable	Continuous	Valid	Continuous	500,000	0	2	50
11	Absolute	Disable	Continuous	Valid	Continuous	900,000	0	3	50
12	Absolute	Disable	Continuous	Valid	Single	0	0	4	50
13	Absolute	Disable	Continuous	Invalid	Single	0	0	0	0
14	Absolute	Disable	Continuous	Invalid	Single	0	0	0	0

■ Speed data

No.	Data
0	3000
1	5000
2	2000
3	6000
4	4000
5	0
6	0

■ Operational description

Operation Sequence :

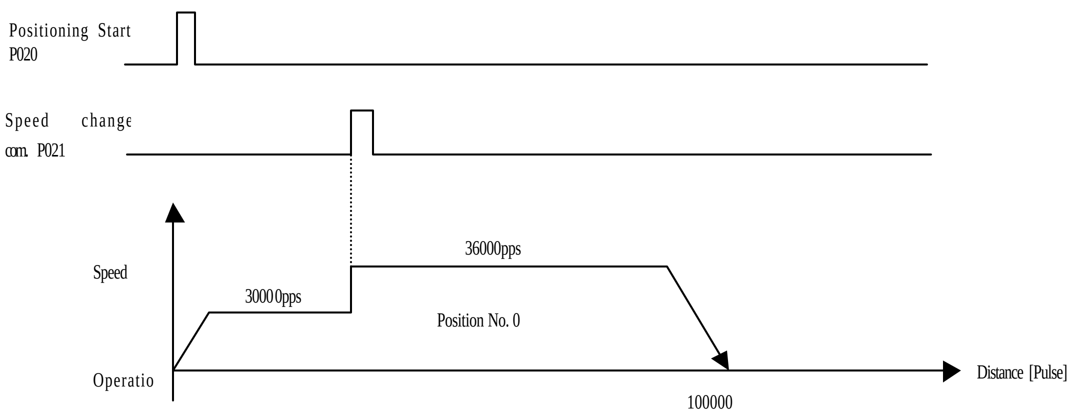
Origin point Return(P022)→Positioning start(P020)→Speed Change(P021)→

Positioning start(P020)→Positioning start(P020)→Operation Data No.Change(P024)→

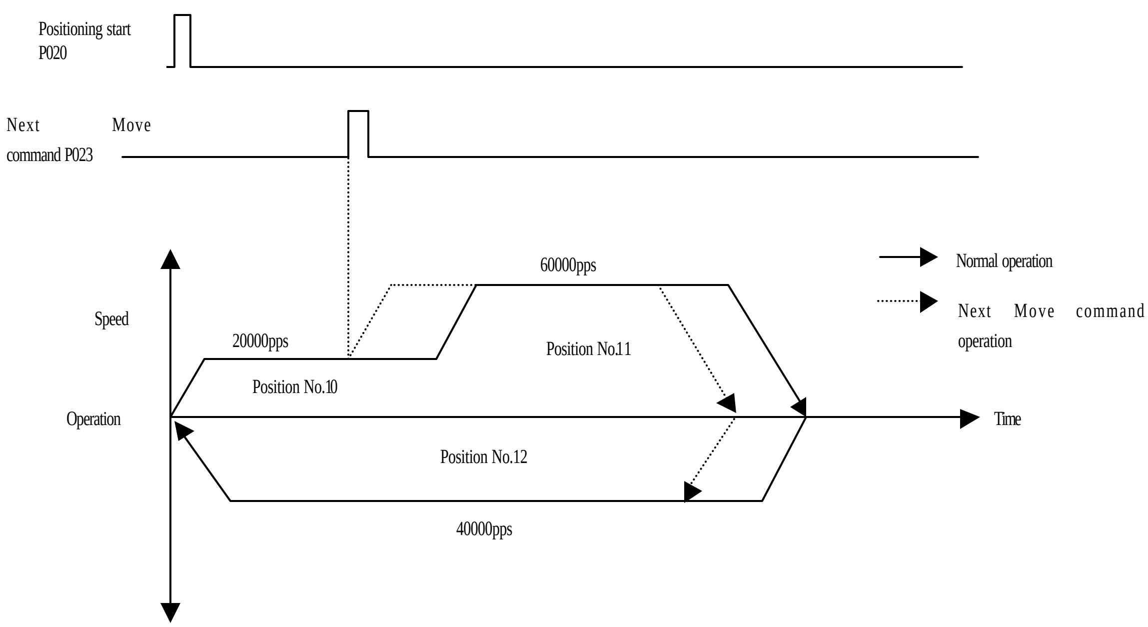
Positioning start(P020)→Next Move(P023)→Operation Data No.Change(P024) →

Positioning start(P020)

■ Speed change operation



■ Next Move operation



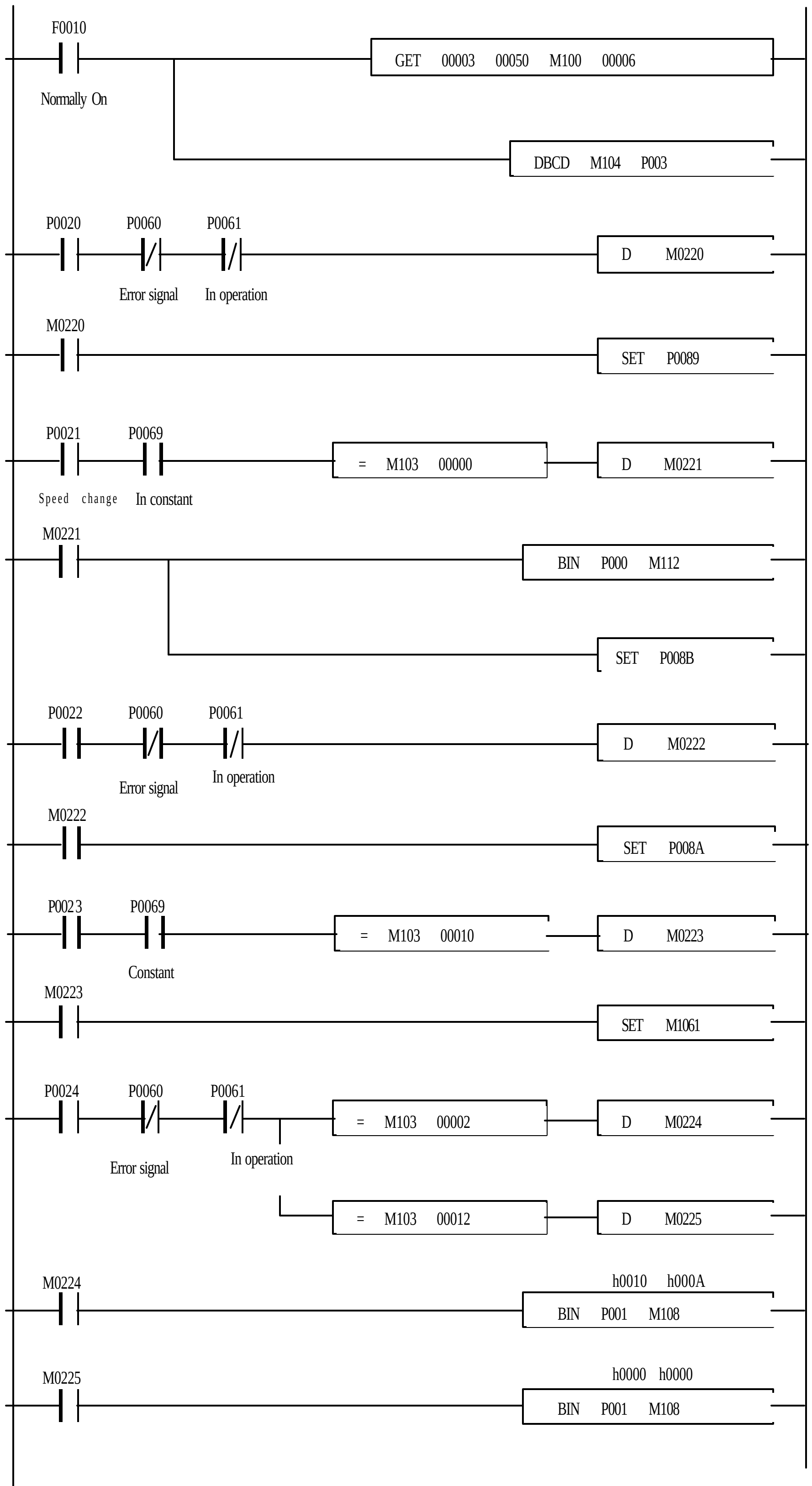
■ Operation of operation data No.change

Pos. No.0 ⇨ Pos.No.1 ⇨ Pos.No.2

⇧ JUMP(change command to operation data No. 0) ⇩ JUMP (change command to operation data No. 10)

Pos. No.12 ⇦ Pos. No.11 ⇦ Pos. No.10

3) Program



Common-used RAM(Buffer memory) state total Read (Y-AXIS)

Present position address displayed on BCD digital displayer

P0020 : Y-AXIS start condition

Y-AXIS positioning start On

Position No. = 0 in progress with constant operation

P0000=h3600->M112=3600

Y-AXIS speed change command

P0022 : Y-AXIS origin point return condition

Y-AXIS origin point return command On

P0023 : Next Move command condition position No. = 10 in progress with constant op.

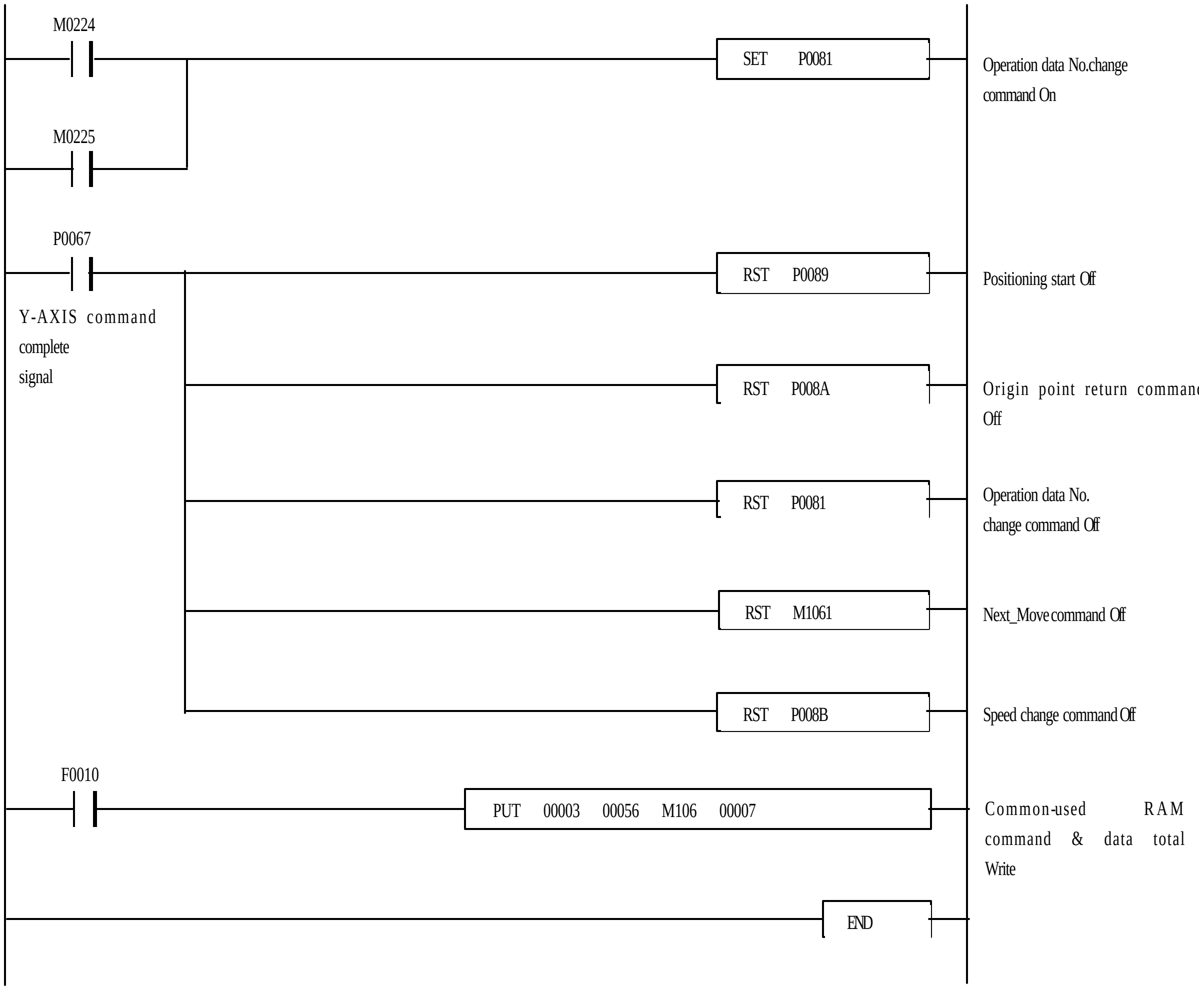
Next_Move command On

P0024 : Operation data No. change

JUMP
Position No.=2→No.=10

JUMP
Position No.=12→No.=0

Continued



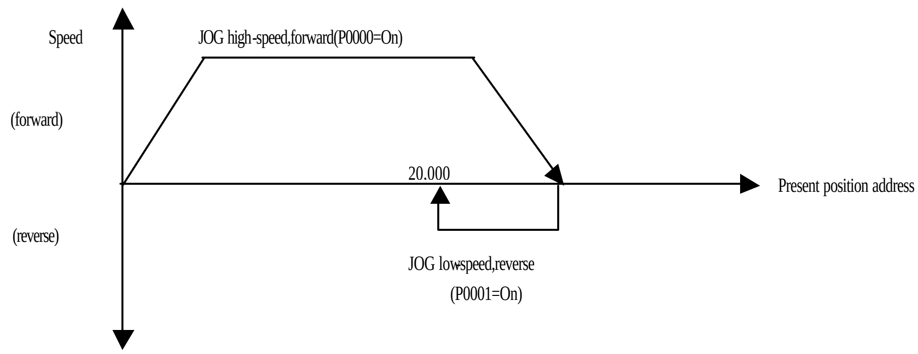
Remark

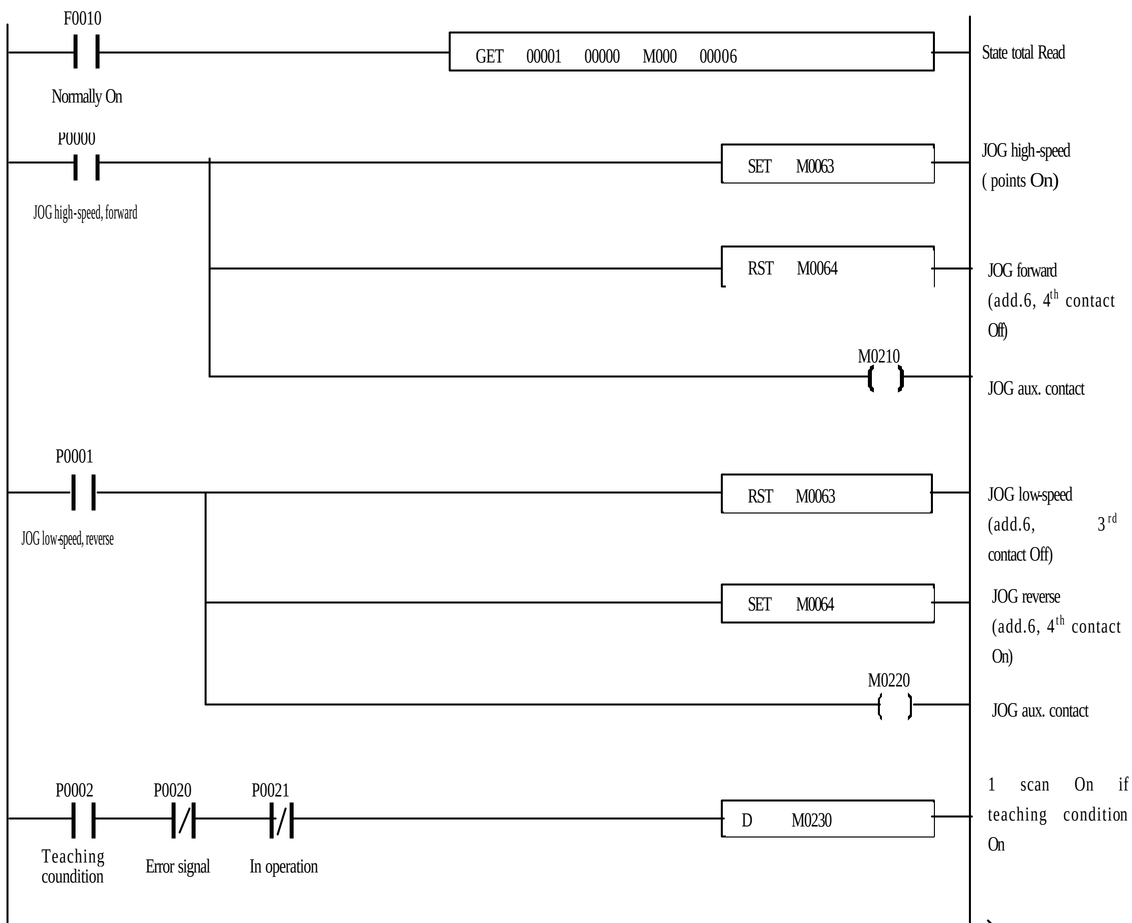
1.The above application program example can be applied in system configuration even if G4F-POPB & G3F-POPA are used as installed on slot No. 3 position where G6F-POPA is equipped.
2.G3F-POPA, G4F-POPB and G6F-POPA all for 2-axes control takes possession of 64 I/O points identically.

10.3.2 Position Teaching by JOG operation

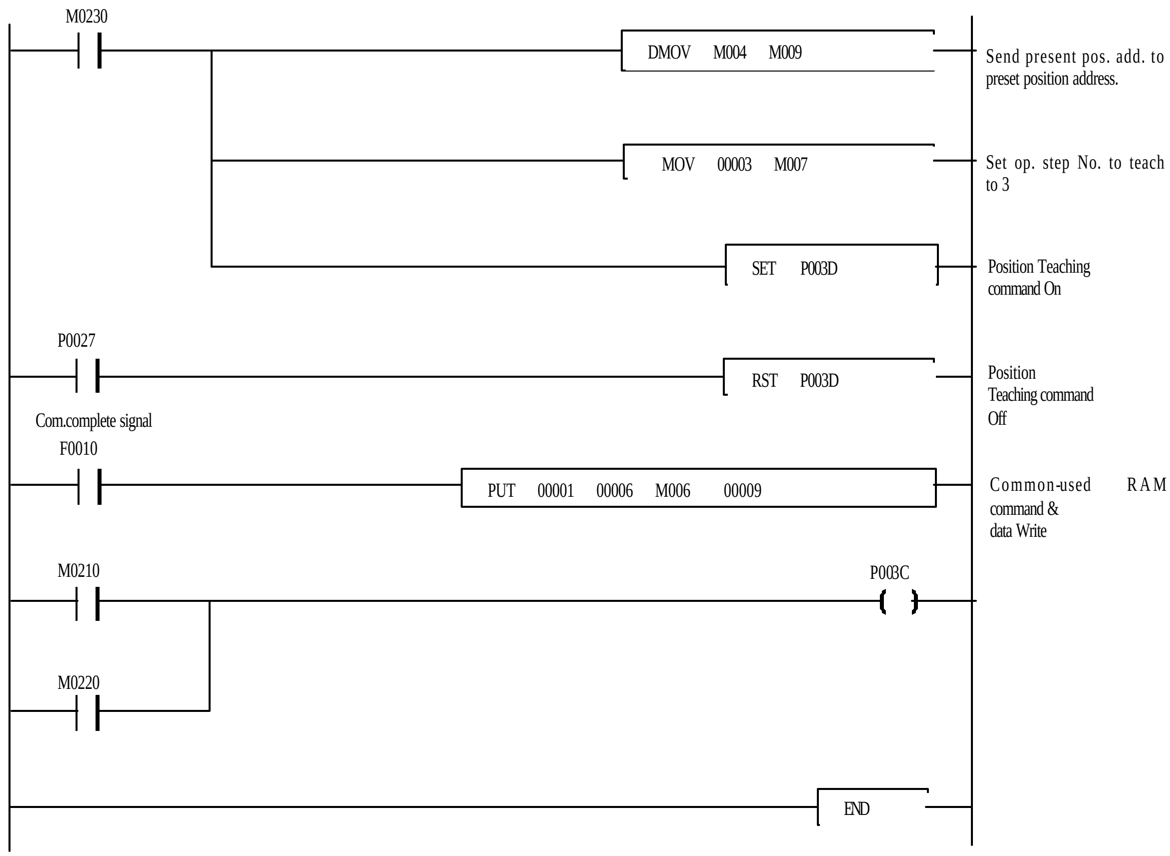
1) The system configuration is as shown in Fig.10.1.

2) It is position teaching program of present position address 20,000 to position No. 3 after rotated forward at JOG high -speed and then moved reverse at JOG low-speed.





Continued


M0230
DMOV M004 M009
Send present pos. add. to preset position address.
MOV 00003 M007
Set op. step No. to teach to 3
SET P003D
Position Teaching command On
P0027
RST P003D
Position Teaching command Off
Com.complete signal
F0010
PUT 00001 00006 M006 00009
Common-used RAM command & data Write
M0210
P003C
M0220
END

10.3.3 Continuous teaching (Position Teaching, Speed Teaching)

— Teaching means a function to assign a position address to move, which is called as Position teaching to be distinguished from speed teaching which assigns speed value.

— Basically just write position address or speed value on positioning module after perparing in S/W Package(PosPack) if not necessary to change after once set. However, position teaching and speed teaching shall be performed in sequence program if position address or speed value is required frequently to change according to input conditions or the product.

1) Example execution results of this section (System is configured as in Fig.8.1)

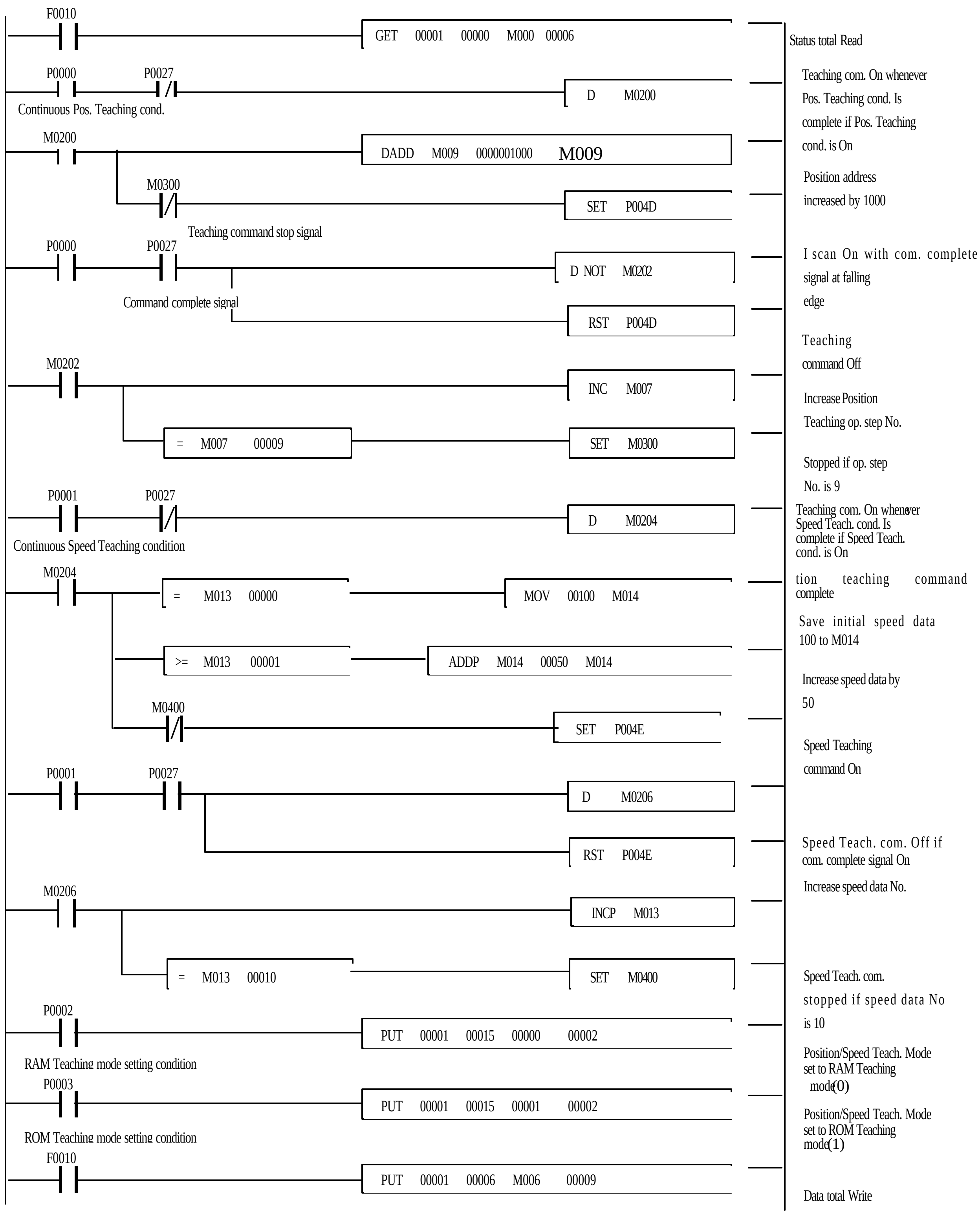
Position No.(STEP)	Position address	
0	1000	Address through Position Teaching
1	2000	
2	3000	
3	4000	
⁝	⁝	
9	10000	
10	0	
11	0	

Speed No.(No.)	Data (Speed value)	
0	100	Speed value through Speed Teaching
1	150	
2	200	
3	250	
⁝	⁝	
9	550	
10	0	
11	0	

— If RAM Teaching mode is set by assignment of position teaching mode/speed teaching mode, the operation is performed with the value through teaching at start after the teaching, which can not be confirmed in S/W Package. If RAM teaching mode is set, teaching is available as unlimited

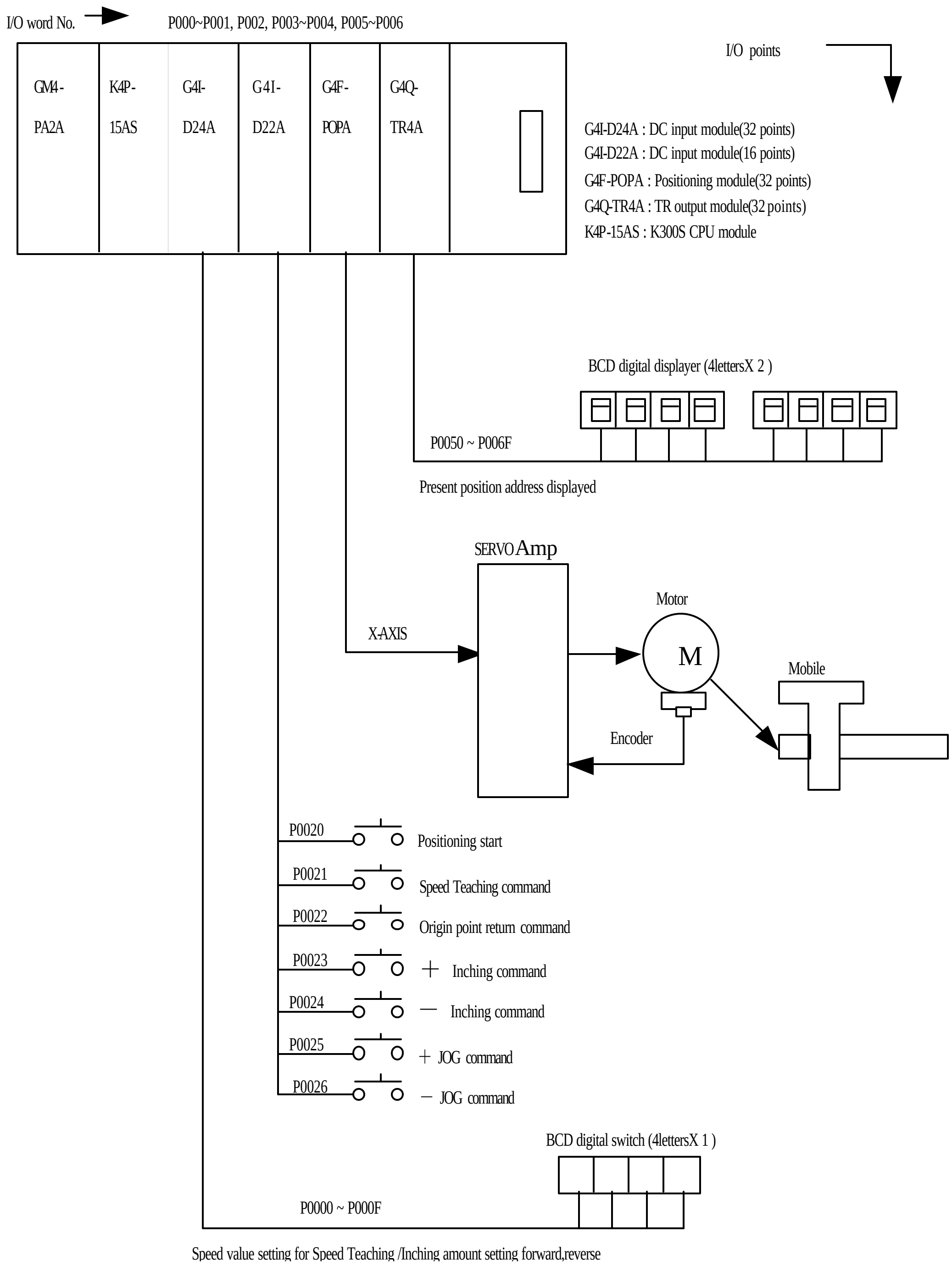
— If ROM Teaching mode is set by assignment of position teaching mode/speed teaching mode, the operation is performed with the value through teaching at start after the teaching, which can be immediately confirmed in S/W Package. If ROM teaching mode is set, teaching is limited upto 100,000 times.

2) Program


F0010
GET 00001 00000 M000 00006
Status total Read
P0000
P0027
D M0200
Continuous Pos. Teaching cond.
Teaching com. On whenever Pos. Teaching cond. Is complete if Pos. Teaching cond. is On
M0200
DADD M009 0000001000 M009
Position address increased by 1000
M0300
SET P004D
Teaching command stop signal
P0000
P0027
D NOT M0202
I scan On with com. complete signal at falling edge
Command complete signal
RST P004D
Teaching command Off
M0202
INC M007
Increase Position Teaching op. step No.
= M007 00009
SET M0300
Stopped if op. step No. is 9
P0001
P0027
D M0204
Teaching com. On whenever Speed Teach. cond. Is complete if Speed Teach. cond. is On
Continuous Speed Teaching condition
M0204
= M013 00000
MOV 00100 M014
tion teaching command complete
Save initial speed data 100 to M014
>= M013 00001
ADDP M014 00050 M014
Increase speed data by 50
M0400
SET P004E
Speed Teaching command On
P0001
P0027
D M0206
RST P004E
Speed Teach. com. Off if com. complete signal On
M0206
INCP M013
Increase speed data No.
= M013 00010
SET M0400
Speed Teach. com. stopped if speed data No is 10
P0002
PUT 00001 00015 00000 00002
RAM Teaching mode setting condition
Position/Speed Teach. Mode set to RAM Teaching mode(0)
P0003
PUT 00001 00015 00001 00002
ROM Teaching mode setting condition
Position/Speed Teach. Mode set to ROM Teaching mode(1)
F0010
PUT 00001 00006 M006 00009
Data total Write

10.3.4 Positioning Start, Speed Teaching, return to origin point, Inching, JOG operation

1) System configuration



2) Data setting and operational description

■ X-axis position data

Step	Coordinates	Override	Op Mode	Valid Invalid	Op Mode	Address	M Code	Speed No	Dwell
0	Incremental	Disable	Continue	Valid	Single	10,000	0	0	50
1	Incremental	Disable	Continue	Valid	Repeat	-10,000	0	0	50
2	Absolute	Disable	Continue	Invalid	Single	0	0	0	0
3	Absolute	Disable	Continue	Invalid	Single	0	0	0	0
4	Absolute	Disable	Continue	Invalid	Single	0	0	0	0

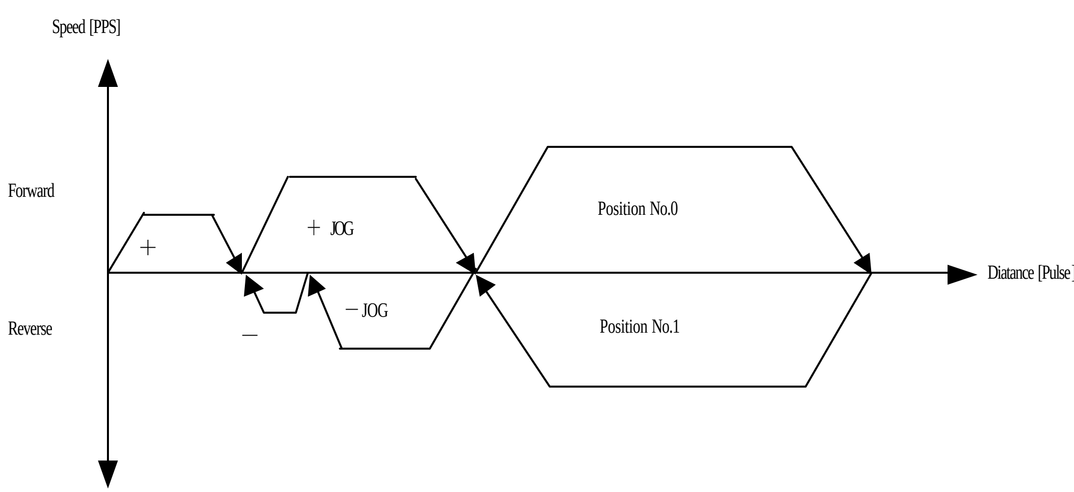
Speed Data

No.	Data
0	3000
1	0
2	0
3	0

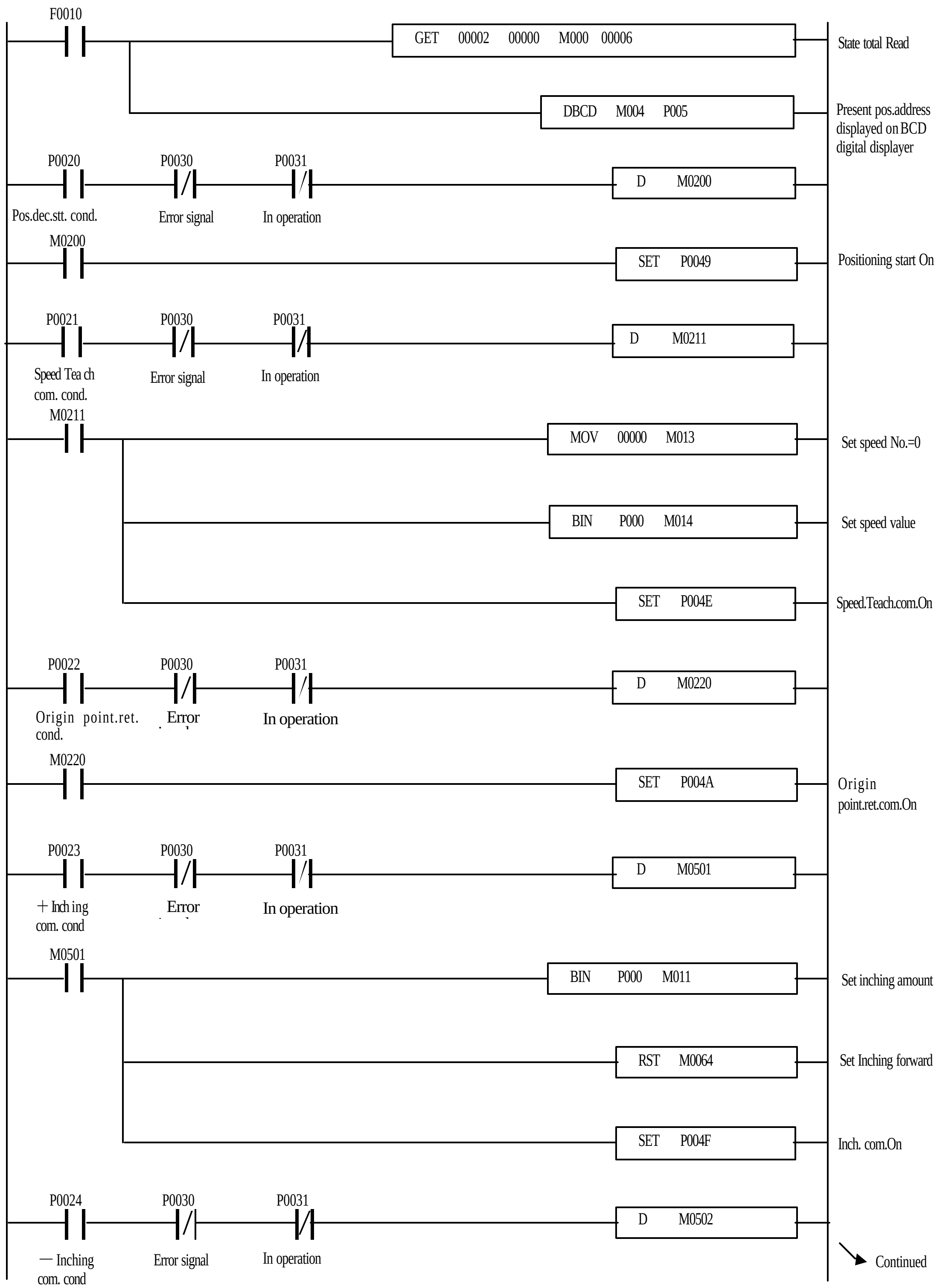
■ Operational description

Operation Sequence :

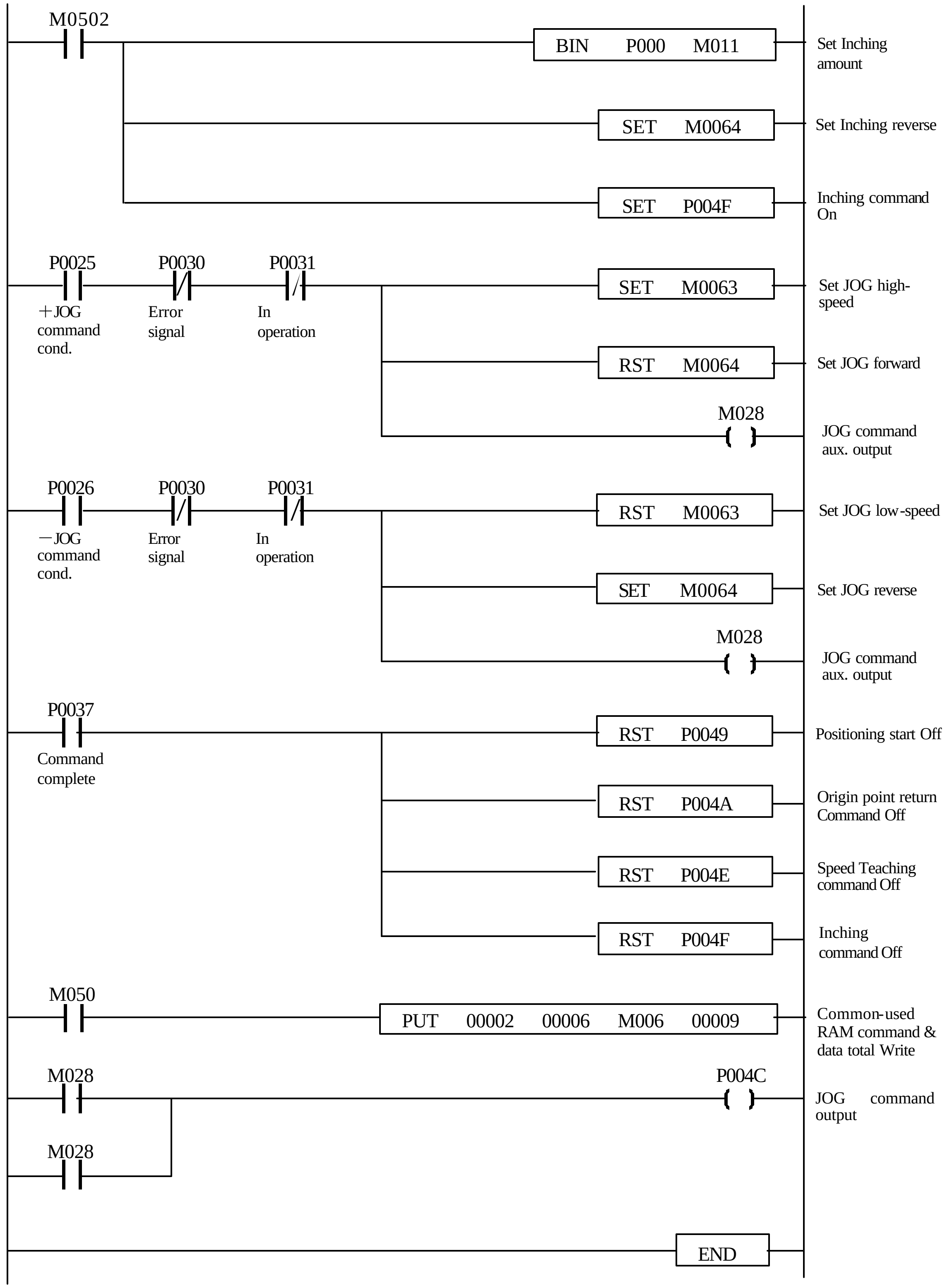
Origin point Return(P0022) → + Inching(P0023) → + JOG(P0025) → Positioning start(P0020) → Positioning start(P0020) → - JOG(P0026) → - Inching(P0024) → Speed Teaching(P0021)



3) Program



F0010
GET 00002 00000 M000 00006
State total Read
DBCD M004 P005
Present pos.address displayed on BCD digital displayer
P0020
P0030
P0031
D M0200
Pos.dec.stt. cond.
Error signal
In operation
M0200
SET P0049
Positioning start On
P0021
P0030
P0031
D M0211
Speed Tea ch com. cond.
Error signal
In operation
M0211
MOV 00000 M013
Set speed No.=0
BIN P000 M014
Set speed value
SET P004E
Speed.Teach.com.On
P0022
P0030
P0031
D M0220
Origin point.ret. cond.
Error
In operation
M0220
SET P004A
Origin point.ret.com.On
P0023
P0030
P0031
D M0501
＋Inch ing com. cond
Error
In operation
M0501
BIN P000 M011
Set inching amount
RST M0064
Set Inching forward
SET P004F
Inch. com.On
P0024
P0030
P0031
D M0502
－Inching com. cond
Error signal
In operation
Continued


M0502
BIN P000 M011
Set Inching amount
SET M0064
Set Inching reverse
SET P004F
Inching command On
P0025
P0030
P0031
+JOG command cond.
Error signal
In operation
SET M0063
Set JOG high-speed
RST M0064
Set JOG forward
M028
JOG command aux. output
P0026
P0030
P0031
−JOG command cond.
Error signal
In operation
RST M0063
Set JOG low-speed
SET M0064
Set JOG reverse
M028
JOG command aux. output
P0037
Command complete
RST P0049
Positioning start Off
RST P004A
Origin point return Command Off
RST P004E
Speed Teaching command Off
RST P004F
Inching command Off
M050
PUT 00002 00006 M006 00009
Common-used RAM command & data total Write
M028
P004C
JOG command output
M028
END

Chapter 11 Operation proceedings & Installation

11.1 Operation proceedings

▶Operation sequence for positioning operation with positioning module is as shown below.

Start

↓

Decide positioning operation method.

Decide origin point return method, coordinates, operation mode, etc. for positioning operation

↓

Install positioning S/W package in the computer.

↓

Prepare positioning data with S/W package.
▶Positioning parameterS (X-AXIS, Y-AXIS)
▶Position data (X-AXIS, Y-AXIS)
▶Speed data (X-AXIS, Y-AXIS)

with S/W package.

↓

Install positioning module on the base

↓

Let positioning module, driver, motor and outer devices connected.

↓

Connect the cable between the computer & positioning module

↓

Let PLC system powered On

When CPU module is at STOP state

↓

Test the system of positioning module

Check by Ready LED of positioning module

↓

Write setting data via positioning module in the computer

with S/W package

↓

Set/change/monitor positioning pre-operation and various data via the computer
▶Set origin point address
▶Set teaching function, JOG operation, positioning data(address, etc.) by MPG operation

Check if setting value of operation positioning parameters, position data and speed data is correct with pre-operation mode of S/W package and let it changed so to save if not correct.

↓

Prepare positioning program

GMWIN or KGL-WIN

↓

Perform positioning operation by CPU module & positioning module

↓

End

11.2 Installation

11.2.1 Installation conditions

Please take precautions to the following items for reliance and safety of the system although the machine is of high reliance regardless of installation conditions.

1) Installation conditions

- To be installed on the control panel waterproof and dustproof.
- Where no continuous impact or vibration is expected.
- Where is not directly exposed to the sunlight.
- Where no condensation is expected due to sudden change of temperature.
- Ambient temperature of 0-55℃ as kept.

2) Installation

- Wiring leftovers shall not be allowed into PLC when screw holes processing or wiring performed.
- To be installed at a position easy to manage.
- Do not install on the same panel as is with high-voltage device installed on.
- The distance from the duct and surrounding modules shall be 50㎜ or above.
- Allow Ground connection where ambient noise condition is normal.

11.2.2 Caution for treatment

Caution for treatment is described covering unpacking of positioning module and installation.

1) Do not let it fall or shocked hard.
2) Do not remove PCB from the case, it may cause error.
3) Do not let foreign substances such as leftovers into the module top during wiring.
   Remove those if ever inserted.
4) Do not remove or attach the module while powered On.

11.3 Wiring

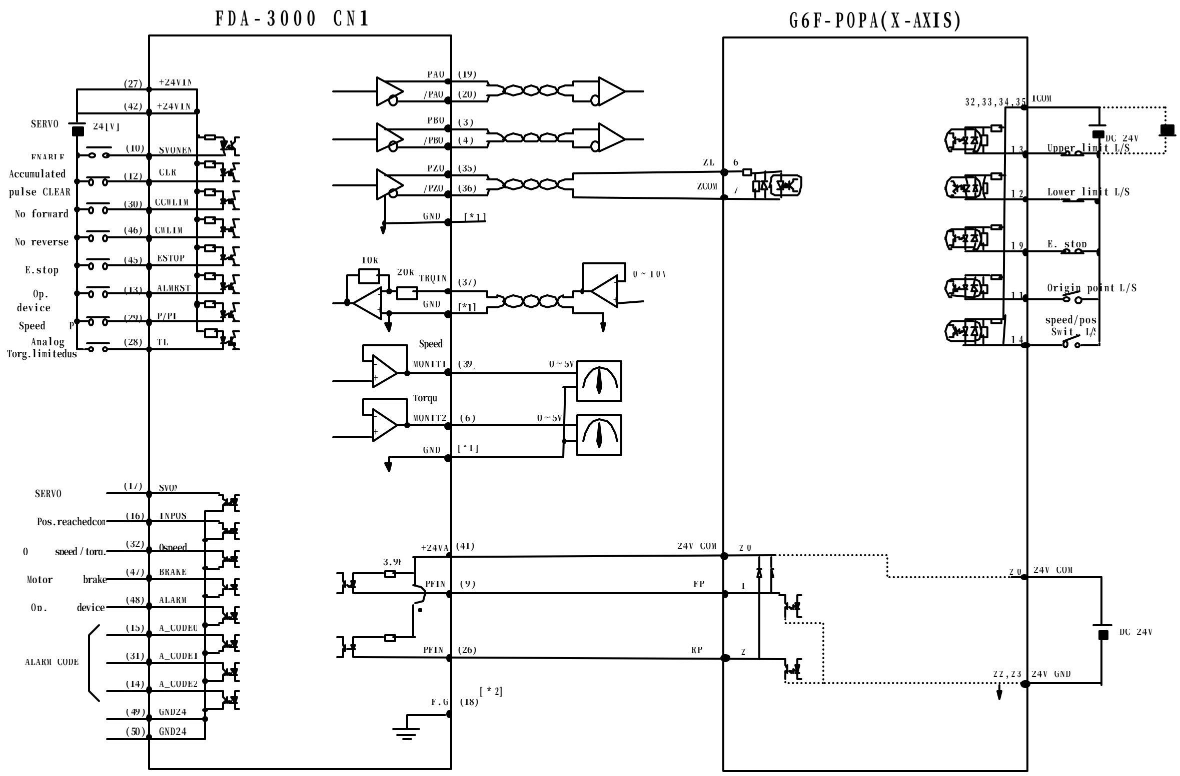
11.3.1 Caution for wiring

1) Cable shall be connected between positioning module and driver as short as possible since its length is just max. 2 m .
2) Let AC and outer I/O signals of positioning module not influenced by surge or induction noise produced at AC side using a separate cable
3) The electric cable shall be selected considering ambient temperature and allowable current with the max. cable size of AWG22 (0.3㎟) or above as recommended.
4) Damage or abnormal operation occurs by short circuit if wired too close to hot devices or materials, or directly on oil for long time.
5) The poles shall be checked before the outer contact signal is approved to the terminal.
6) Abnormal operation or error may be caused by induction error if wired with high-voltage line or power line.
7) Ground connection of the pipe is necessary for piped wiring.
8) The power supplied from the outside (DC 5V, DC24V) shall be stable.
9) If noise seems underlying in wiring between positioning module and driver, the pulse output from positioning module and input to motor driver shall be wired as connected with twisted pair cable or shield cable.

11.3.2 Connection between SERVO and stepping motor drive device

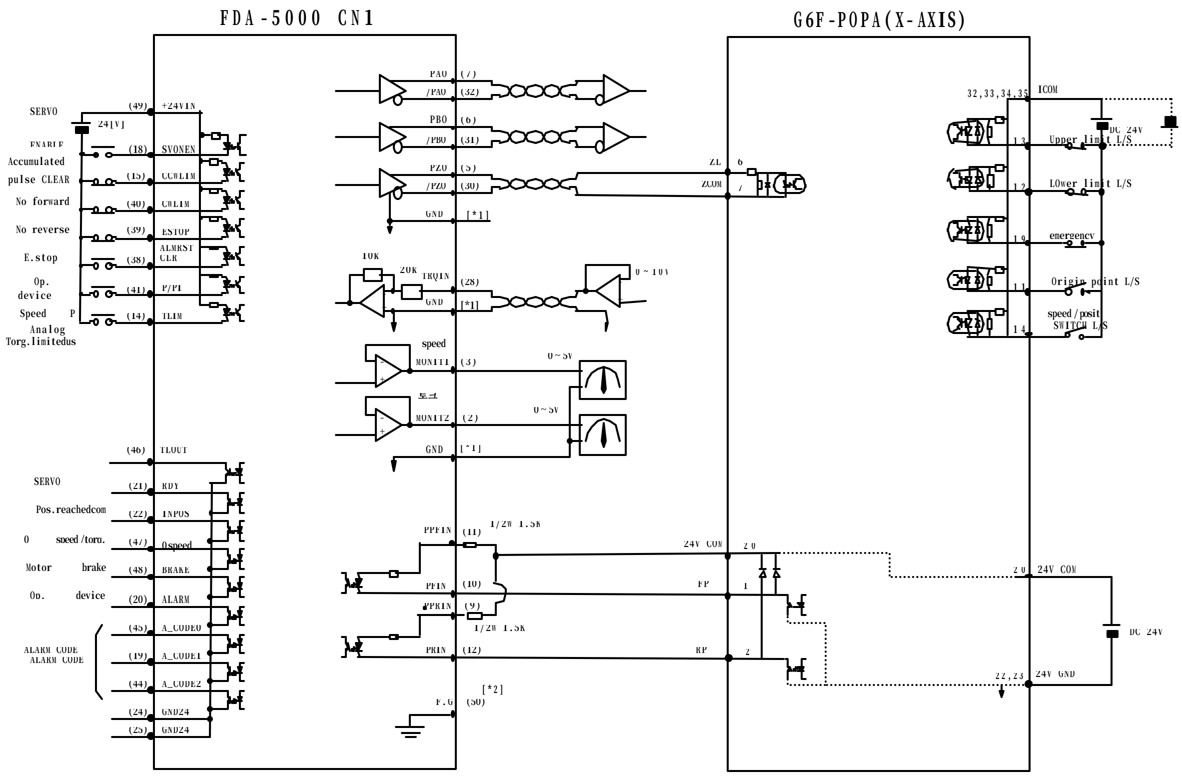
1) Connection with FDA-3000 AC SERVO driver

The wiri ng diagram between FDA-3000 CN1 and G6F-POPA is as shown below if used in position control mode.



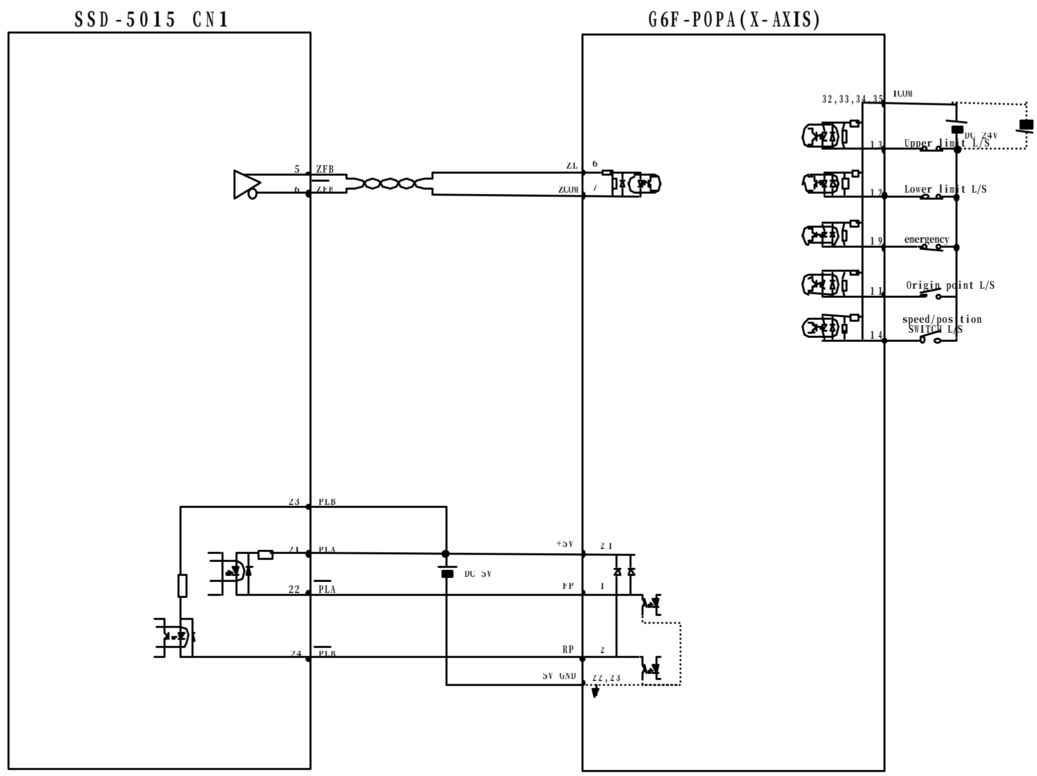
*1 : 1, 2, 33 or 34 shall be used for GND terminal.
*2 : Surely ground-connect the shielded line of CN1 cable with F.G(FRAME GROUND).

2) Connection with FDA-5000 AC SERVO driver



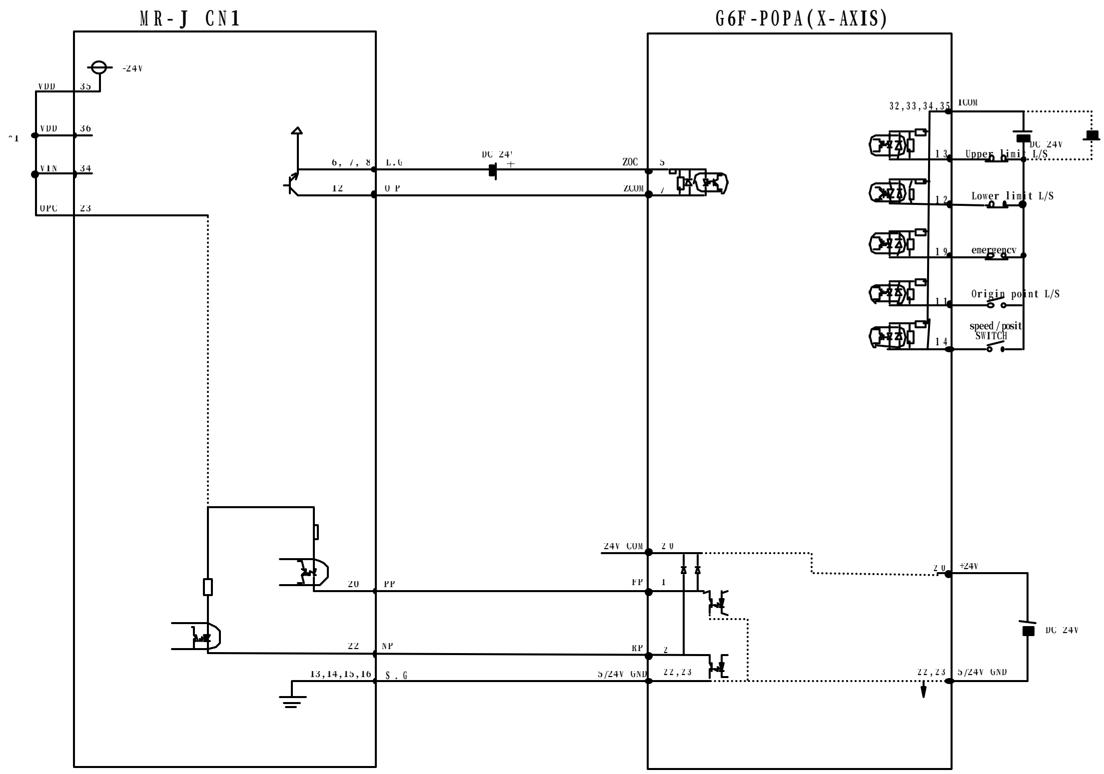
*1 : 1, 2, 33 or 34 shall be used for GND terminal.
*2 : Surely ground-connect the shielded line of CN1 cable with F.G(FRAME GROUND).

3) Connection with Sinnco SSD-5000 type



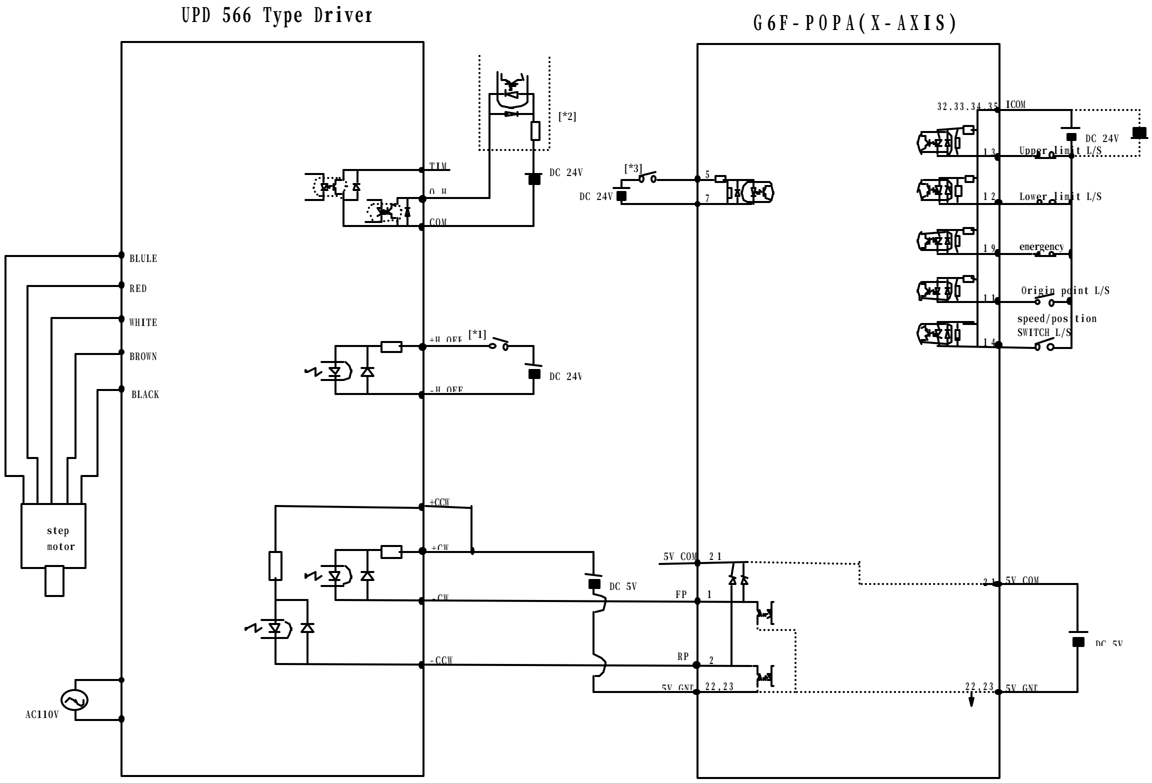
* Refer to the driver manual for the driver pins if not described.

4) Connection with MITSUBISHI MELSERVO-J type



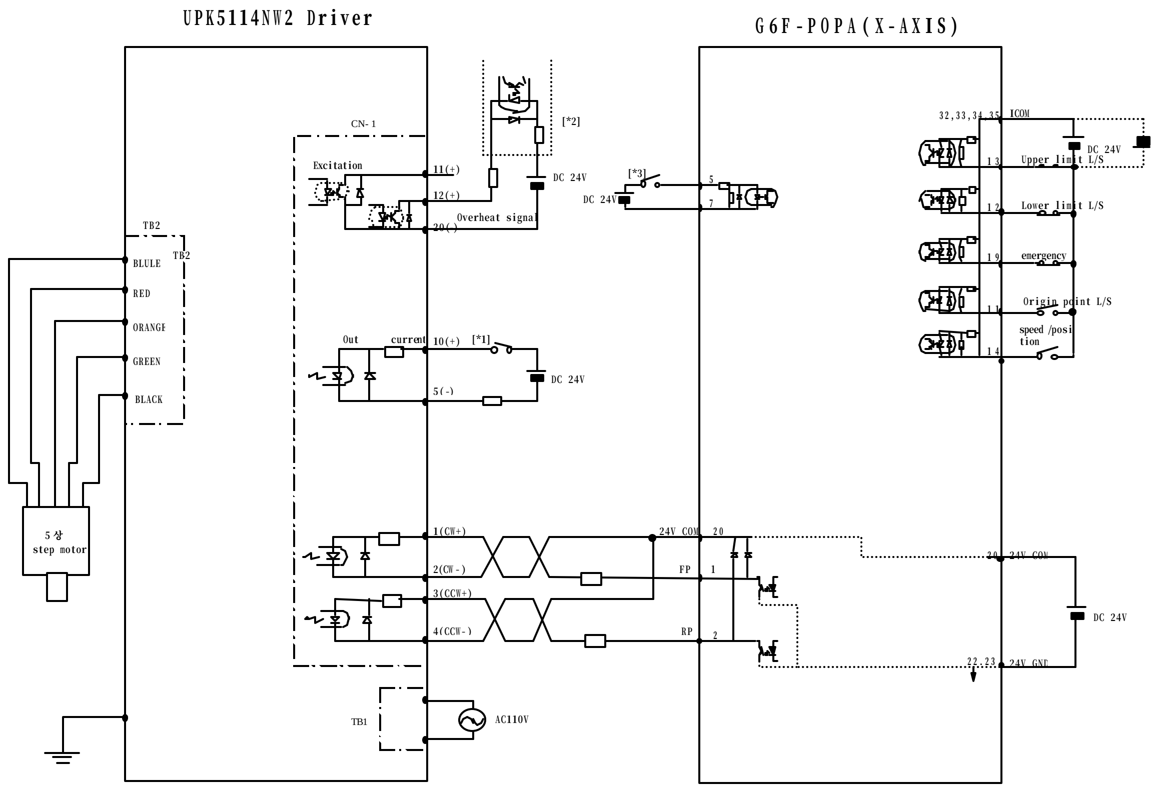
*1 : In case that internal power is used.
※ Refer to the driver manual for the driver pins if not described.

5) Connection with UPD566 (stepping motor driver)



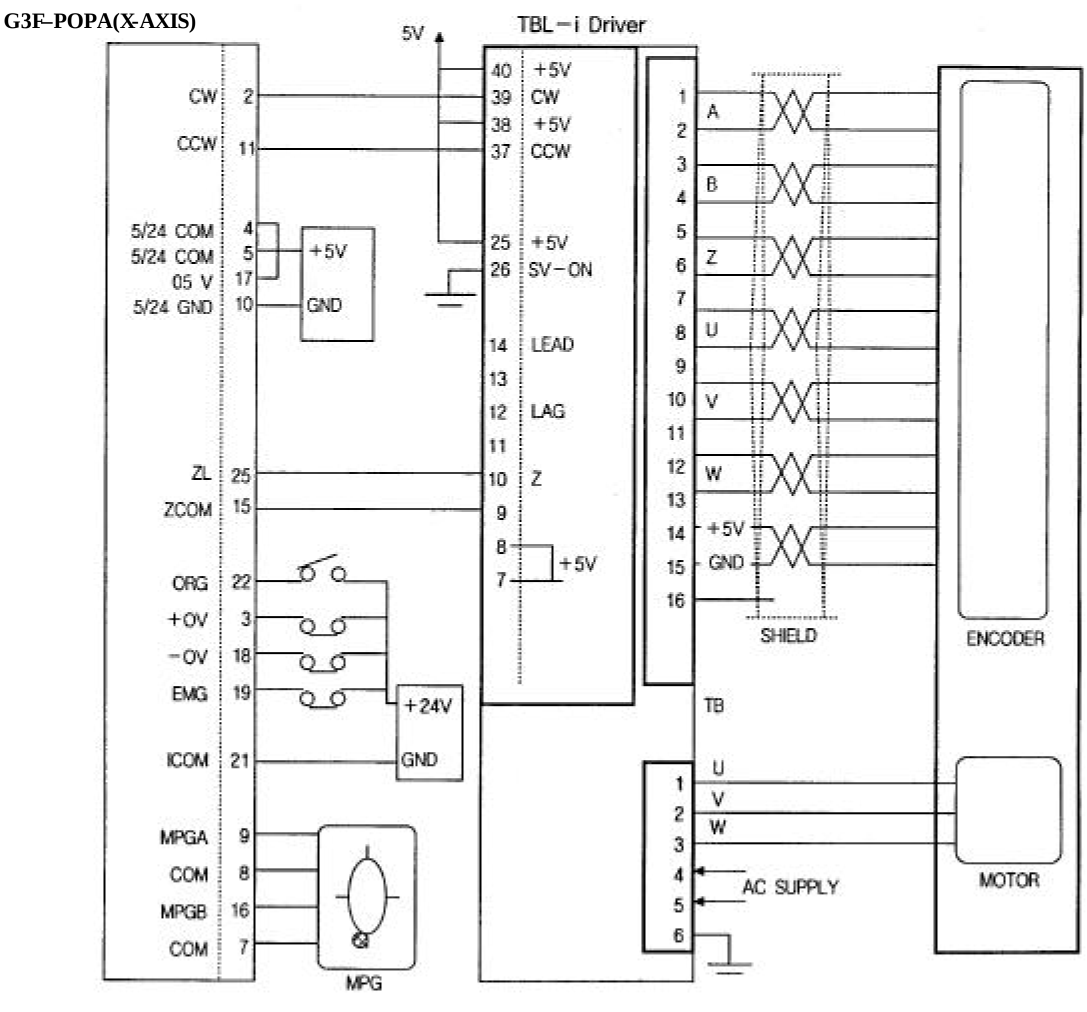
*1 : Controllable by PLC's relay output or transistor's output contact.
*2 : Protection control is available from overheating driver using PLC DC input signal.
*3 : Origin point return is available by making phase Z signal by optical sensor, adjacent sensor or limit switch since the stepping motor has no encoder.

6) Connection with UPK5114NW2 (stepping motor driver)



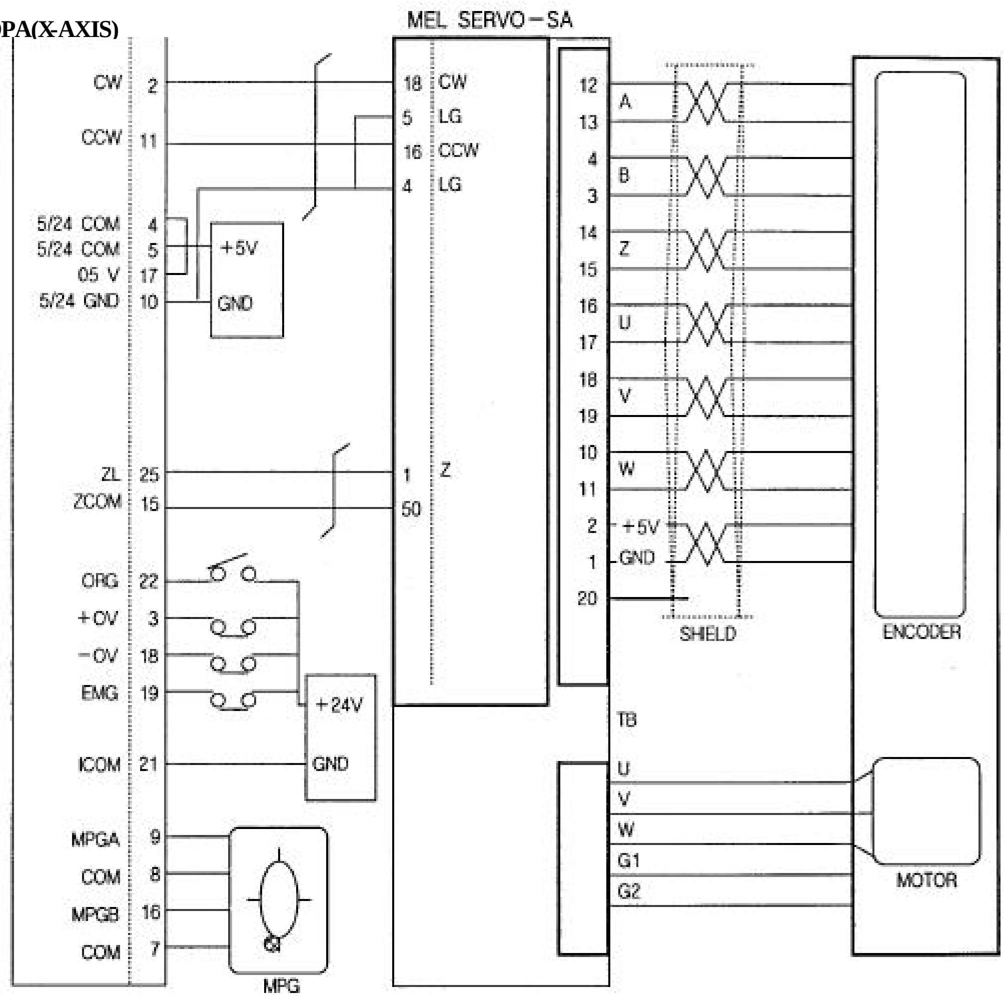
*1 : Controllable by PLC's relay output or transistor's output contact.
*2 : Protection control is available from overheating driver using PLC DC input signal.
*3 : Origin point return is available by making phase Z signal by optical sensor, adjacent sensor or limit switch since the stepping motor has no encoder.

7) Connection with TAMAGAWA TBL–I series



8) Connection with MITSUBISHI MELSERVO – SA type

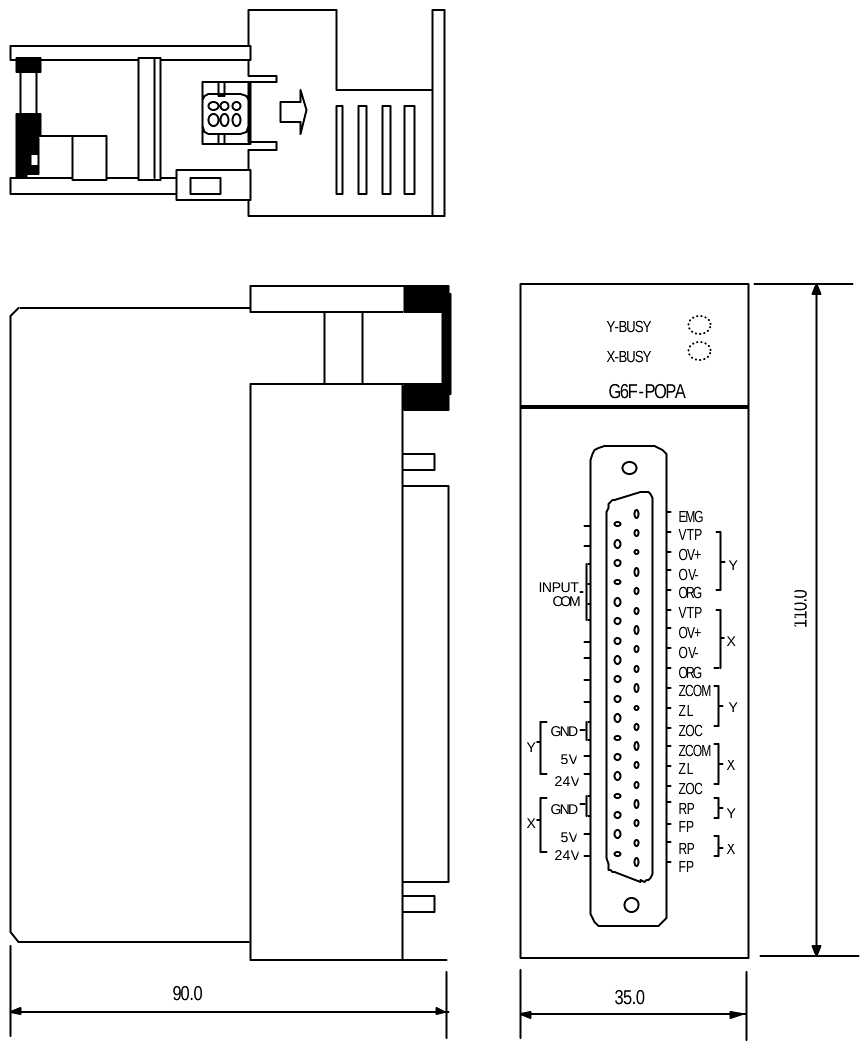
G3F – POPA(X-AXIS)



Chapter 12 External dimensions

12.1 G6F-POPA

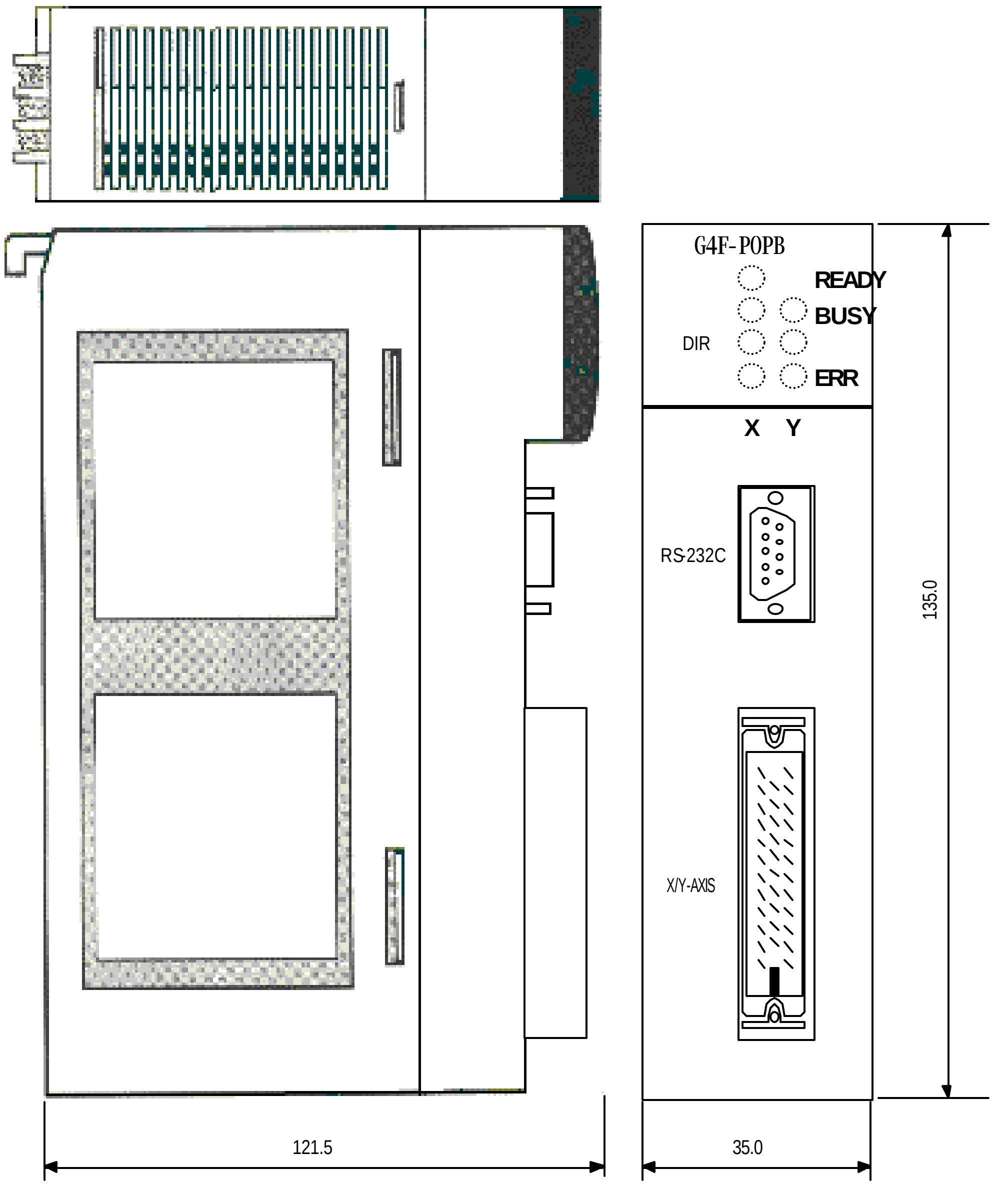
Unit : mm



12.2 G4F-POPA/G4F-POPB

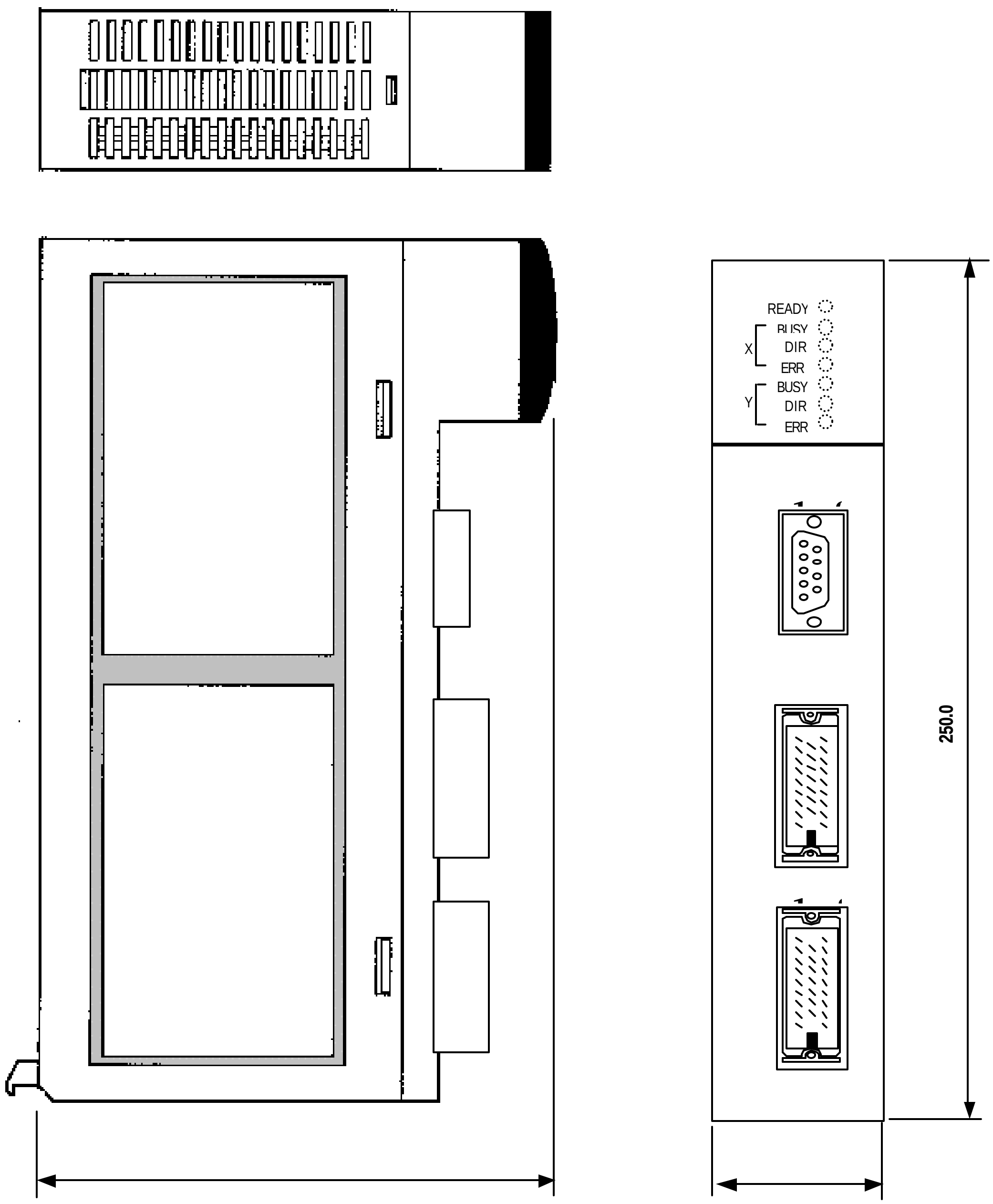
▶ **External dimensions of G4F-POPA is the same as G4F-POPB.**

Unit : ㎜



12.3 G3F-POPA

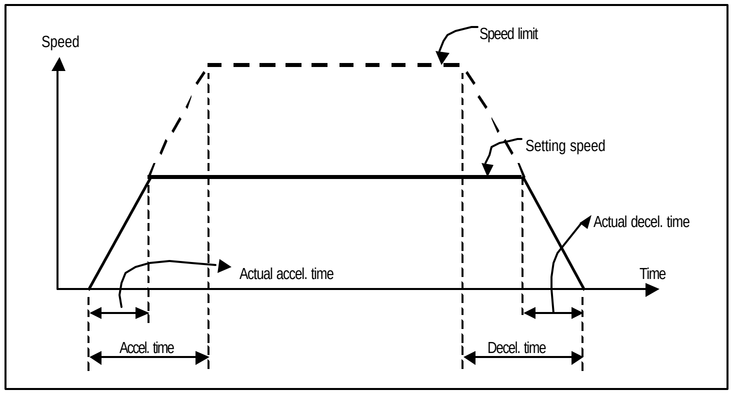
Unit : ㎜



Appendix 1: How to set positioning module parameters for stepping motor drive

1. Setting of speed limit

▶Speed limit decides acceleration/deceleration inclination when operated with acceleration/deceleration time.



Profile example

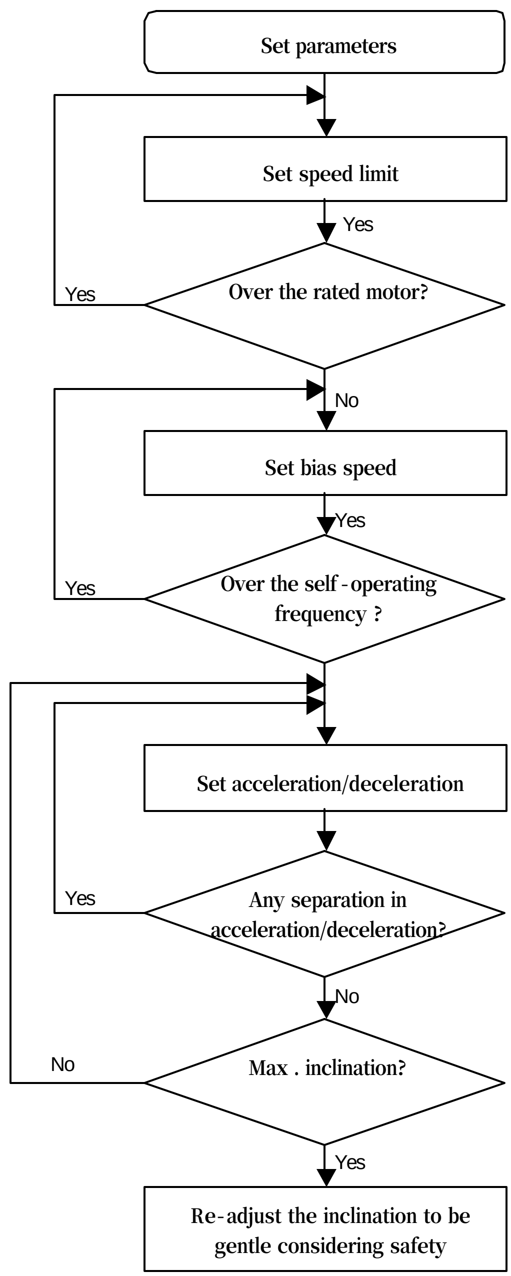
▶First, set the max. frequency available in compliance with load conditions to speed limit referring to the characteristic curve of Torque vs. Frequency of the stepping motor
(Later input speed data shall be set in the range of the value, or error occurs and the operation is not available.)

2. Bias speed setting

▶Bias is to be set to optimize the operation time or to avoid injurious vibration noise the stepping motor has in low frequency band (approx. 100~200pps). Setting is allowed in the value range not exceeding over the self-operating frequency produced by motor load.
Be careful, if the value is set too high it causes impact noise or damage on the machine at initial acceleration and stop point of time.

3. Acceleration/deceleration time setting

▶ If acceleration/deceleration time is set too low for stepping motor, separation may occur. Thus, try to find the max. inclination available with acceleration/deceleration time as changed at load-connected state. At this time, since the characteristics of the motor and driver can be changed if used for long, let the inclination set a little gentle in consideration of safety.



4. Testing example of stepping motor with no load

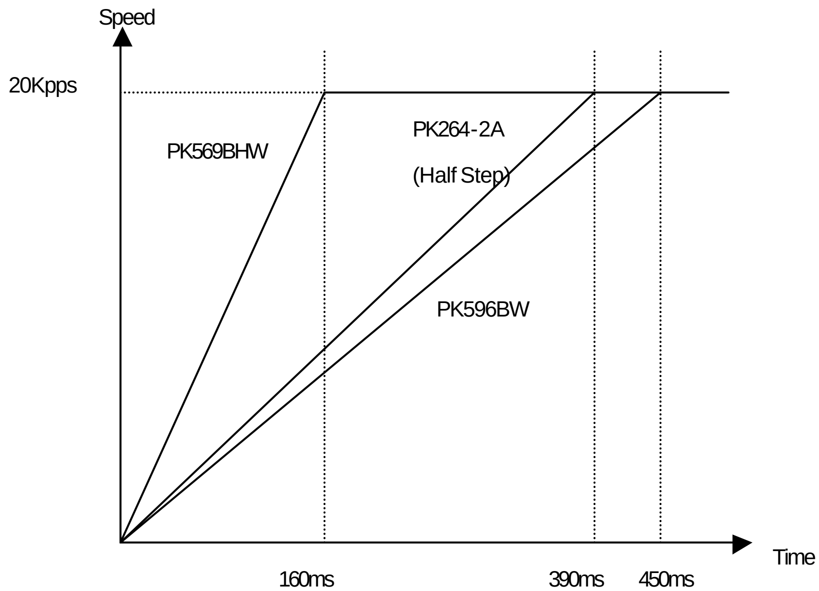


Table1. Testing example of G6F-POPA stepping motor' s max. accel./decel. inclination

Set1 : Motor: PK569BHW, Driver : UDK5128NW2

Max. acceleration/deceleration inclination : 160ms (Operation Speed 20Kpps, Full Step)

Max. speed : 59000pps (speed limit 100000pps, acceleration/deceleration time 5 sec.)

Set2 : Motor : PK596BW, Driver : UDK5114NW2

Max. acceleration/deceleration inclination : 450ms (Operation Speed 20Kpps, Full Step)

Max. speed : 33600pps (speed limit 100000pps, acceleration/deceleration time 5 sec.)

Set3 : Motor : PK264-2A, Driver : CSD2120-P

Max. acceleration/deceleration inclination : 390ms (Operation Speed 20Kpps, Half Step)

Max. speed : 23500pps (speed limit 50000pps, acceleration/deceleration time 1.1 sec.)

Note) The example above resulted from the test with no load, which is subject to change according to characteristics and conditions of the load

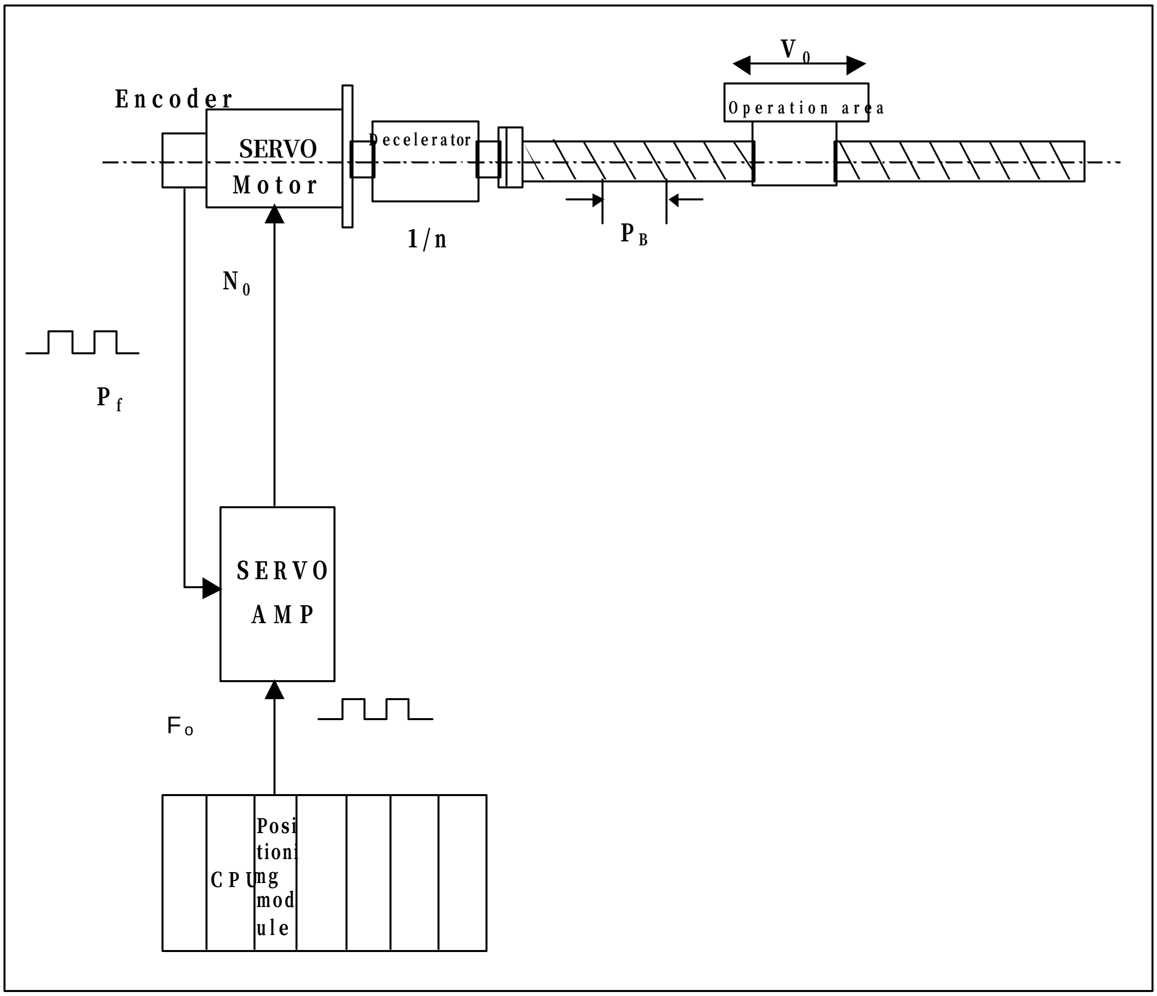
Appendix 2 1 Calculation of travel value per pulse

▶Shifting amount per pulse means the value of the machine gauge used when the positioning module executes position control.

▶Setting shall be performed at the ratio of the pulses number to 1 motor rotation of the machine gauge used, shifting amount to 1 motor rotation and shifting amount to 1 pulse as magnified.

2. 1 Calculation of shifting amount per pulse

1) Specification of the machine gauge



Items necessary to calculate shifting amount per pulse are supposed as described below.

Appendix 2 Calculation Of Travel Value Per Pulse

Items	Abbr.	Unit	
Shifting amount per pulse	$\triangle \ell$	㎜/Pulse	
Speed of the op. area at emergent transfer	V_O	㎜/min	To be set below parameter speed limit
Motor rpm at emergent transfer	N_O	rpm	To be set below servo rated rpm.
Ball screw lead	P_B	㎜/rev	
Deceleration rate	1/n		
Pulses number of encoder	P_f	Pulse/rev	
Output frequency of positioning module	F_o	Pulse	Max. input pulse of the servo
Shifting amount per motor rotation	$\triangle S$	㎜/rev	

▶ Shifting amount per motor rotation: $\triangle S$

$$\triangle S = P_B \times 1/n \ (\text{㎜/rev})$$

▶ Motor rpm : N_O

$$N_O = \frac{V_O}{\triangle S} (\text{rpm}) \leq \text{Rated rpm of the SERVO motor}$$

▶ Shifting amount per pulse: $\triangle \ell$

$$\triangle \ell = \frac{\triangle S}{P_f} (\text{㎜/Pulse}) \times \alpha =$$

α : coefficient of electronic gear rate or P-rate.

▶ Output frequency of positioning module의 : F_o

$$F_o = \frac{V_O}{60 \times \triangle \ell} = \frac{N_O \times \triangle S}{60 \times \triangle \ell} (\text{pps})$$

60 : constant to convert the unit of min. to sec.

Appendix 2 Calculation Of Travel Value Per Pulse

Ex.

Items	Appr.	Unit	Ex.	Results
Shifting amount per pulse	$\triangle \ell$	㎜/Pulse		$\triangle S = P_B \times 1/n$
Speed of the op. area at emergent transfer	V_O	㎜/min		$=12/2 = 6$
Motor rpm at emergent transfer	N_O	rpm		$\triangle \ell = \dfrac{\triangle S}{P_f} \times \alpha$
Ball screw lead	P_B	㎜/rev		
Deceleration rate	1/n		$P_B = 12$ $n = 2$ $P_f = 12000$	$= \dfrac{6}{12000} \times \alpha$
Pulses number of encoder	P_f	Pulse/rev		(if $\alpha = 2$)
Output frequency of positioning module	F_o	Pulse		=0.001(㎜/Pulse)
Shifting amount per motor rotation	$\triangle S$	㎜/rev		Shifting amount per pulse is 0.001(㎜/Pulse)