



**SYNTEC**

新代科技股份有限公司

# Introduction of axis application

*SYNTEC TECHNOLOGY CO.,LTD*

# Outline

- **AXIS BASIC SETTING**
- **REFERENCE (ZERO) POINT RETURN**
  - Absolute encoder
  - Incremental encoder
- **SOFTWARE STROKE LIMIT**
- **MPG BASIC SETTING**

# AXIS BASIS SETTING

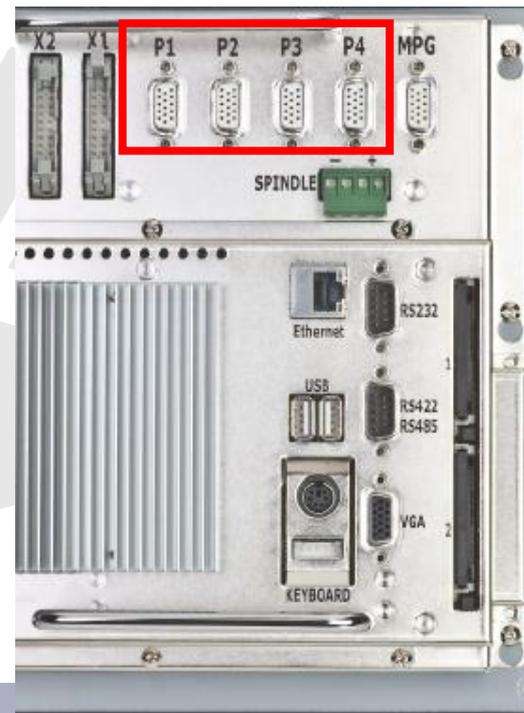
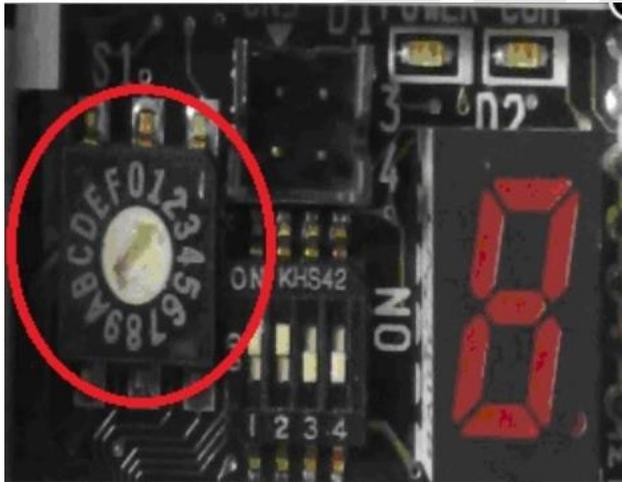
- Introduction
- Parameter
- Setting example
- DDA
- Alarm
- CSR interface

# Introduction

- **Activate new axis**
  - ✓ Setting port number corresponding to each axis.
  - ✓ Define the axis name and other properties.
- **Resolution setting**
  - ✓ With right resolution setting, the controller can send correct command quantity to the servo driver in order to reach the motion and precision we want.

# Parameter- activate axis

- \*Pr 21~40 : port number on servo card (generic controller) or servo motor(serial controller)
- ✓ Set port number on servo card/servo motor corresponding to each axis for the controller command and encoder feedback.



# Parameter- activate axis

• Pr. 221~240 : **axis type**

✓ 0 : linear axis

✓ 1~5 : rotary axis

Setting value	1	2	4	5	3(for special use)
Work piece coordinate display	0~+360°		0~±360000°		0~±360° , over ±360° back to 0°
Machine coordinate display	0~+360°			0~±360000°	0~±360° , over ±360° back to 0°
Absolute command (G90)	Moving by the shortest distance	Use command signal (+ or -) as moving direction	The behavior is the same as linear axis, it moves to command position		Directly move to command position
Incremental Command (G91)	Use command signal (+ or -) as moving direction. Do incremental movement.				
Reference point return	Move to the middle point first, then move back to origin from the middle point.				
Machine coordinate positioning	By the shortest distance			The same as linear axis	Directly move to command position

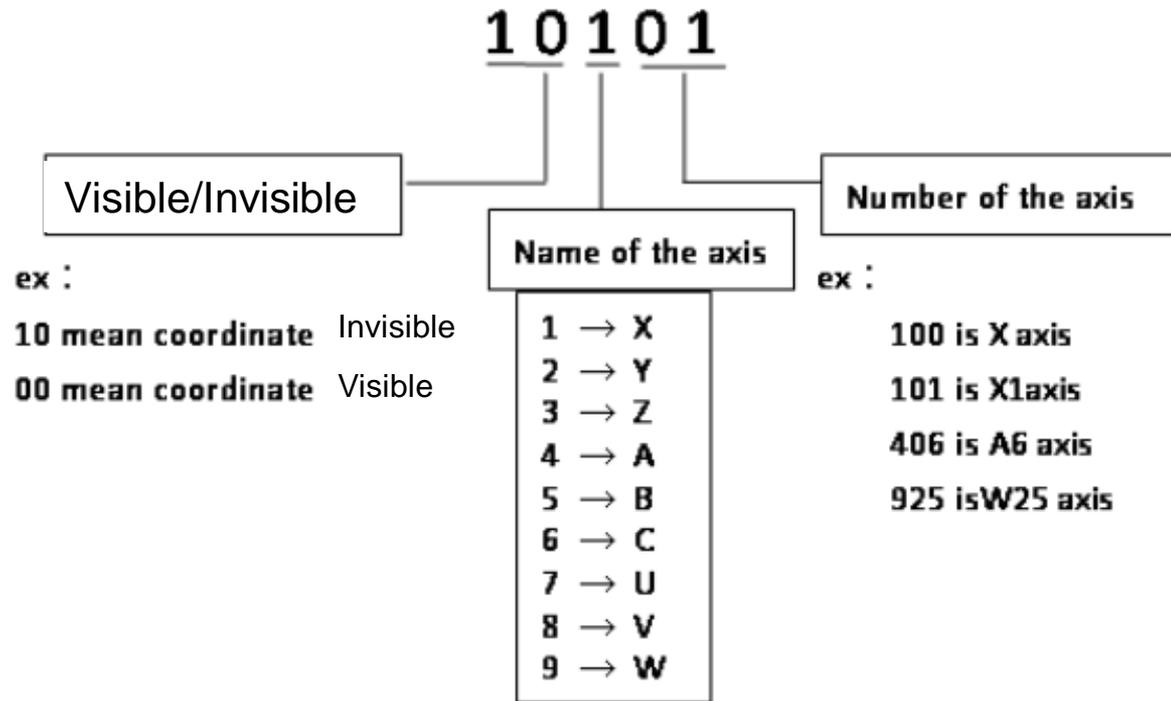
# Parameter- activate axis

- Pr.281~300 : **radius axis or diameter axis**

Ex: G0 G91 X10.

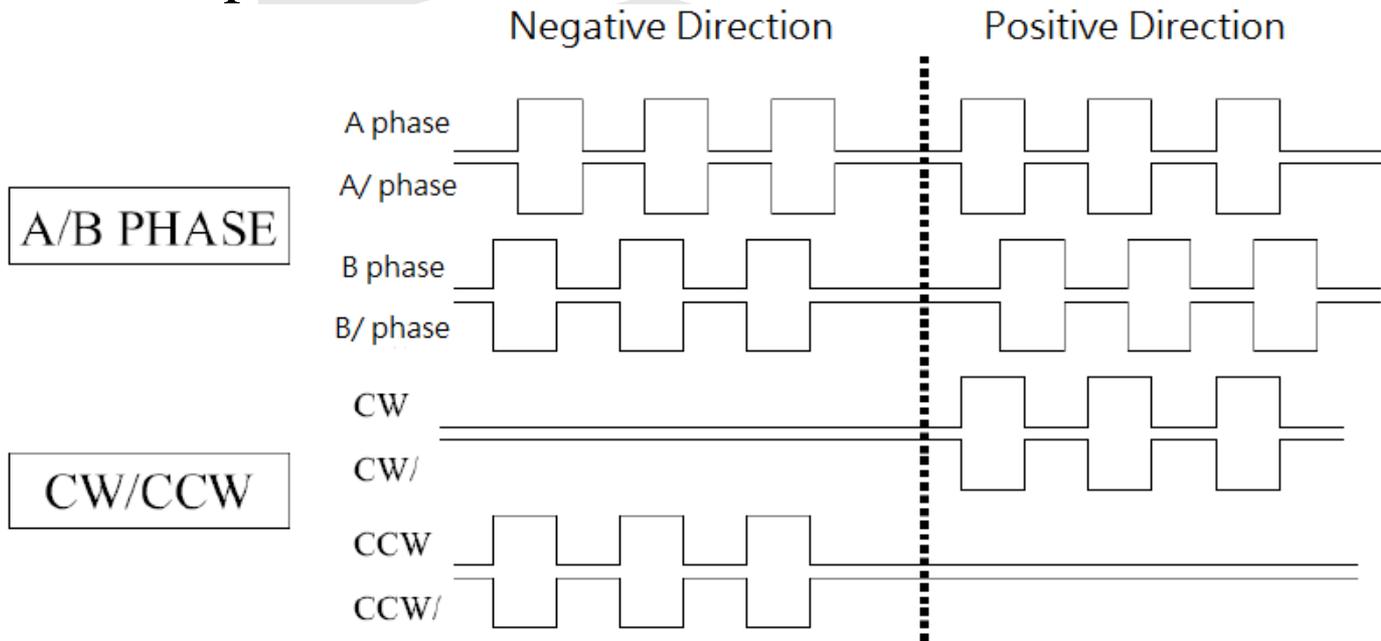
- If Pr.281~=0(radius), X axis incremental moving is 10.
- If Pr.281~=1(diameter), X axis incremental moving is 5. Diameter is used for lathe machine with circle work piece)

- \*Pr 321~340 : **axis name**



# Parameter- activate axis

- \*Pr381~400 : **Axis servo control mode** (for serial controller: no need to set this parameter)
- ✓ 0 : CW/CCW, position control mode
- ✓ 1 : Voltage, position control mode
- ✓ 2 : A/B Phase, position control mode



# Parameter- resolution

- Pr.61~80 : **Axis encoder resolution**
  - ✓ Encoder, unit: Pulse/Rev
  - ✓ Linear encoder, unit : Pulse/mm
  - ✓ Should be single phase resolution before multiplication
  - ✓ For example, a linear encoder resolution is 1um/pulse (1mm/1000 pulse), 4 times multiplication( $Pr8x=4$ ) · we should set Pr.61 as  $1000/4=250$ .

**P.S. It will cause uncontrolled motion if the resolution is wrong.**

- Pr.81~100 : **Resolution multiplication**
  - ✓ One, two or four times.

# Parameter- resolution

- Pr.121~160 : **Gear number at screw side/ motor side**
  - ✓ Set gear ratio of the screw side to motor side.
  - ✓ If screw side gear : motor side gear = 2 : 1  
It means screw speed : motor speed = 1 : 2
- Pr.161~180 : **Pitch of the screw**
  - ✓ Set axis displacement when screw rotates one revolution
  - ✓ Unit: BLU (Basic Length Unit)
  - ✓ Default : 0.0001inch / 0.001mm / 0.001deg (depend on Pr.17)

# Parameter- resolution

- \*Pr.201~220 : Encoder type
  - ✓ 0 : Traditional encoder
  - ✓ 1 : Linear encoder
  - ✓ 2 : No feed back
  - ✓ 3 : Absolute encoder

# Setting Example (generic controller)

- If the pitch of X axis is 10mm, requirement of precision is  $1\mu$ /pulse, gear ratio=2(screw/motor=2), how to set the parameter to meet the requirement ?
- ✓ Pitch=10mm, Pr.161=10000 $\mu$ m
- ✓  $1\mu$ /pulse => set resolution as 10000 pulse  
(Pr.61=2500, Pr.81=4 · Pr.61 x Pr.81=10000)
- ✓ Gear ratio=2, screw side gear=2, motor side gear=1  
(Pr.121=2, Pr.122=1)

# Setting Example (serial controller)

- If the pitch of X axis is 10mm, requirement of precision is  $1\mu$ /pulse, gear ratio=2(screw/motor=2), how to set the parameter to meet the requirement ?

(For serial controller, syntec only support yaskawa motor with resolution 1048576)

- ✓ Pitch=10mm, Pr.161=10000 $\mu$ m
- ✓ Resolution:1048576  
(Pr.61=262144, Pr.81=4 · Pr.61 x Pr.81=1048576)
- ✓ Gear ratio=2, screw side gear=2, motor side gear=1  
(Pr.121=2, Pr.122=1)

# DDA(generic controller only)

- Servo card uses DDA (Digital Differential Analyzer) rule to send all the pulse command averagely in one interpolation time.
- **Interpolation time** is defined by **Pr. 3203**. The limitation is **2047** pulses in one interpolation time. If controller sends pulses more than 2047 in this time, it will occur MOT-05 DDA warning.
- **Interpolation time** = ( Pr3203/1000 ) × hardware basic time.  
Users can check interpolation time on system data No. 4
- Hardware basic time : Super series is 983 usec, 10/11 series:819 usec, 20/21 series refer to Pr3203.

# DDA(generic controller only)

- An axis pitch is 10mm/rev(Pr 161=10000); motor resolution after multiplication is 10000 pulse/rev (Pr 61=2500 & Pr 81=4); interpolation time is 1966usec (Pr 3203=2000, 2 x 983usec). What is the maximum velocity under the DDA limitation?

$$DDA\ Limitation = \frac{2047}{1966 \times 10^{-6}} \frac{pulse}{sec} = \frac{2047}{1966 \times 10^{-6}} \times 60 \frac{pulse}{min}$$

$$V_{max}\ of\ Motor = \frac{DDA\ Limitation}{Resolution} = \frac{2047}{1966 \times 10^{-6}} \times 60 \frac{RPM}{10000}$$

$$\Rightarrow V_{max}\ of\ Feedrate = V_{max}\ of\ Motor \times Pitch = 62.472 \frac{m}{min}$$

# Alarm\_MOT-05 DDA overflow

Alarm ID	MOT-005	Alarm Title	DDA command overflow
Description	Controller sends too many commands. In the one interpolation time interval, if software calculates that the number of commands to be sent is out of 2047 pulses, this alarm will appear		
Possible Cause	<ol style="list-style-type: none"><li>1. DDA software time setting value (interpolation time interval, parameter Pr3203) is too long</li><li>2. Motion velocity is too fast</li><li>3. Servo resolution is set too high</li><li>4. Backlash compensation or pitch compensation is too large</li><li>5. Compensation is enabled before booting</li></ol>		
Solution	<ol style="list-style-type: none"><li>1. Recommend that low interpolation time interval setting (parameter 3203) is not less than 2000</li><li>2. Reduce the velocity to do the test if max rapid travel federate is to high (Pr461-Pr480)</li><li>3. Reduce the servo resolution setting to do test (encoder and CNC Pr61-Pr80)</li><li>4. If mechanical compensation time constant is set (parameter 1401~1420), cancel the mechanical compensation setting to do test and find the best setting.</li><li>5. If system had set feed forward (parameter 581~600), cancel feed forward setting to do test and find the best setting.</li><li>6. Please contact staff of machinery manufacturer to solve problem</li></ol>		
More description	In order to achieve the multi-axis coordinated control, SYNTEC's controller uses DDA (Digital Differential Analyzer), Cycle Time of DDA is set by parameter Pr 3203. In one Cycle time of DDA, every axial is allowed to send maximum 2047 pulses. Once exceeding this value, controller will send alarm		

# Alarm\_MOT-08 Loss Pulse

Alarm ID	MOT-008	Alarm Title	Loss Pulse
Description	One second after sending command, controller will check whether the error of feedback command and sending command is in predetermined error range. If no, controller will send alarm.		
Possible Cause	<ol style="list-style-type: none"> <li>1. Kinematic occurs obstruction phenomenon</li> <li>2. Servo drive occurs unexpected Servo ON / OFF</li> <li>3. CPU board send the data to axis card unsuccessfully (CPU board or axis card has problem, the contact between CPU and axis card is not good)</li> <li>4. The cable that sends command from controller to servo driver has poor quality or is disconnected.</li> <li>5. Controller doesn't set servo drive alarm check, controller continues to send motion command although the drive is abnormal</li> <li>6. Local interference</li> </ol>		
Solution	<ol style="list-style-type: none"> <li>1. Do not shut down the controller when alarm occurs. Please check whether the value of No 8, 9, 10 in diagnose function is zero</li> <li>2. Check whether the mechanical lubrication system is good.</li> <li>3. Open the cover of axial to check whether foreign matter blocks the motion of axial.</li> <li>4. Rotate screw to check whether machine is stuck (loading of driver)</li> <li>5. Check the drive servo-on and the servo-off of power or cable signal</li> <li>6. If the setting value of No 8, 9, 10 in diagnostic function do not change, please take home search action (don't need to reboot), after that check whether parameters 24, 25, 26, 40, 41, 42 are equal to zero, if the parameters 24, 25, 26 are not equal to zero, the feedback loop has problems</li> <li>7. If the parameters 40, 41, 42 are not equal to zero, command transmission from controller to the motor has been lost pulse.</li> <li>8. If all parameters 24, 25, 40, 41, 42 are not zero, then the interference signal is relatively large, specifically in the machining process, the setting value of parameters 8, 9, 10 gradually become large. The reason is the contact point between CPU board and axis card is not good. Try to replace CPU board and axis card</li> </ol>		
More description	Set parameters 561~580 to check the range of loss pulse 8[X axis following error value] 9[Y axis following error value] 10[Z axis following error value] 24[X axis absolute position feedback value] 25[Y axis absolute position feedback value] 26[Z axis absolute position feedback value] 40[X axis absolute position command value] 41[Y axis absolute position command value] 42[Z axis absolute position command value]		

# Alarm\_MOT-19 Following error exceed

Alarm ID	MOT-019	Alarm Title	Following error exceed
Description	Because of the characteristics of servo, servo motor location, there is no way to respond the command of controller immediately, so a slow phenomenon appears, when this latency is not in allowed range, controller will send out the alarm.		
Possible Cause	<ol style="list-style-type: none"> <li>1. Movement mechanism is not smooth</li> <li>2. Contact wire has poor quality</li> <li>3. Setting values of acceleration and deceleration time are too small</li> <li>4. Servo on off Relay is interfered</li> <li>5. Inner loop gain of driver is set too small</li> <li>6. Encoder solution and electric gear ratio is set wrong</li> <li>7. Drive or motor is damaged</li> <li>8. Encoder or line between encoder and controller is abnormal</li> <li>9. On diagnosis screen, number 23 is not equal to 100</li> </ol>		
Solution	<ol style="list-style-type: none"> <li>1. Add lubricating oil to machine</li> <li>2. Use electric meter to check whether wire connecting is correct.</li> <li>3. When controller runs dry run mode, open case to check whether servo on off of relay pulses abnormally.</li> <li>4. Increase acceleration and deceleration time (parameter 401)</li> <li>5. Inner loop gain of driver is set too small. For Mitsubishi driver, check Pr37</li> <li>6. Contact to machinery manufacturers for helping</li> </ol>		
More description	<p>Maximum velocity setting value of G00 and home search is equal to setting parameter divided by Kp. This value multiplied by 2 is setting range of controller.</p> <p>Reasonable following error: <math>F_{err} = \text{speech in command} / \text{setting value of loop gain}</math></p> <p>Alarm allowed values=</p> $\{\max[(\text{velocity of first stage in home search process}), \text{velocity G00 of each axis}] / Kp\} * 2$ <p>For example: Speed 1000mm/min, loop gain 30, precision, 1um,</p> $F_{err} = 1000 * 1000 \div 60 \div 30 = 555$ <p>32[X axis reasonable following error]  33[Y axis reasonable following error]  34[Z axis reasonable following error]</p>		

# Alarm\_MOT-23 Fatal following error exceed

Alarm ID	MOT-023	Alarm Title	Fatal following error exceed
Description	Because of the characteristics of servo, servo motor location, controller cannot respond immediately command, a delay phenomenon will appear, when this delay phenomenon is not in allowed limit, the controller will send alarm.		
Possible Cause	<ol style="list-style-type: none"> <li>1. Servo motor doesn't receive control due to external force</li> <li>2. Parameter of drive - inner loop gain is too small</li> <li>3. Parameters of acceleration and deceleration time is set too short</li> <li>4. Encoder is abnormal or connecting encoder to controller is abnormal</li> </ol>		
Solution	<ol style="list-style-type: none"> <li>1. Check the external motion of machine table</li> <li>2. Check the setting parameter of drive</li> <li>3. Check the acceleration and deceleration setting of each axis, parameters 401, 541-560</li> <li>4. Maintain the connection between encoder and servo drives.</li> </ol>		
More description	<p>Maximum velocity value of G00 and home search is equal to setting parameter divided by Kp. This value multiplied by 4 is setting range of controller.</p> <p>Reasonable following error: <math>F_{err} = \text{speech in command} / \text{loop gain}</math></p> <p>Alarm allowed values=</p> <p><math>\{\max[(\text{velocity of first stage in home search process}), \text{velocity G00 of each axis}] / Kp\} * 4</math></p> <p>32[X axis reasonable following error]</p> <p>33[Y axis reasonable following error]</p> <p>34[Z axis reasonable following error]</p>		

# CSR interface

	X	Y	Z	6 <sup>th</sup> axis	4 <sup>th</sup> axis ~
Jog +/-	C6/C7	C8/C9	C10/C11	C12/C13	C170/C171~
MPG axis selection	C16	C17	C18	C19	C215~
Setting machine coordinate	C25	C26	C27	C28	C230~
Positive / negative limit	C50/C51	C52/C53	C54/C55	C56/C57	C140/C141~
Home dog signal	C79	C80	C81	C82	C200~
Home ok	S16	S17	S18	S19	S140~
Axis machine coordinate	R31	R32	R33	R34	R744~

# Reference point (zero point) return

- Absolute encoder
- Incremental encoder
  - Introduction
  - Parameter
  - Operation step
  - Home grid
  - Alarm
- CSR interface
- **Note: Reference point = zero point = origin = HOME**

# Absolute encoder

- Absolute zero point can be set directly on controller interface (only available for yaskawa motor, controller version 10.114.48 or later)

- Step1: Make sure 4<sup>th</sup> digit is 3- absolute encoder

SGMGV - 03 A D A 2 1

Σ-V Series Servomotor SGMGV

1st+2nd digits   3rd digit   4th digit   5th digit   6th digit   7th digit

4th digit   Serial Encoder

Code	Specifications
3	20-bit absolute
D	20-bit incremental

- Step2: Set controller parameter Pr201~Pr220 = 3, driver parameter Pn002 = 0000
- Step3: Move the desired axis to the desired position to set as zero point.
- Step4: Select controller mode as HOME
- Step5: Move to serial parameter interface and press [F7 absolute zero point setting]

# Absolute encoder

- Step6: Move cursor to the desired axis, press [F1 set machine home]. The status bar will be changed from red color “Unset” to yellow color “set OK”.

The screenshot displays a CNC control interface with the following elements:

- Header:** G54 MDIBLOCK N0 L1 Parameter 2014/8/26 10:21:14 Login
- Table:**

Axes	Status
X	Set OK
Z	Set OK
- Warning Message:**

\*\*\*Warn!  
Changed those setting value would update the machine coordinate.If you don't understand it, please don't change those value.Avoid the serial result.

Explain the step of reset machine home :  
Step1 Please move the axis to the target position which you want to reset home.  
Step2 Verify the pos is the target. Then move the focus on the axis.  
Step3 Press F1 to reset the machine home. In this moment, cnc would record the status that become Set OK .

P.S. A.If Axes are over one page, then you can use PageDown/PageUp to change it.  
B.The explain of status row:  
Set = You have been set it ◦  
Unset = You never set it  
Set Success = You have been update it Success.
- Status Bar:** M2M2M2341234567 ●Ready Home Alarm
- Footer:** Set Machine Home

# Incremental encoder \_ introduction

- Zero point return is required after machine power on
- Users can select different method depends on different feedback types
- Zero point return needs home dog and motor index to execute

# Incremental encoder \_ Parameters

- Pr961~980: Axis home search method
  - 0: By HomeDog sensor, suitable for linear axis or rotary axis with the proportion of motor and pitch is not 1. After HOME, table moved on the machine position which offset had add;
  - 1: Only INDEX, after receiving index signal, motor will **stop on index** position of motor, then system sets machine coordinate to 0. This is used for rotary axis with 1:1 gear ratio.
  - 2: By HomeDog sensor, suitable for linear axis or rotary axis with the proportion of motor and pitch is not 1. After HOME, motor laid on index;
  - 3: By HomeDog sensor, but no encoder index signal. suitable for linear axis or screw and motor gear ratio is not integer for rotary axis. When axis direction find DOG sensor for Home shift processing, direct move to machine coordinate position. After arriving position, clear machine coordinate position to 0, then it is called finish Home search action;

# Incremental encoder \_ Parameters

- Pr881~900 : Axis home offset
  - Pr961~Pr980 set 0 or 1: After receiving index signal, it moves to appointed position according to offset value, and then system sets machine coordinate to 0.
  - Pr961~Pr980 set 2: After receiving index signal, it just stops on index position, and then system modifies machine coordinate according to offset value.
  - Pr961~Pr980 set 3: After leaving dog, it moves to appointed position according to offset value, and then system sets machine coordinate to 0.

# Incremental encoder \_ Parameters

- Pr821~840: Axis homing speed of 1<sup>st</sup> part
  - max. speed of searching for home dog
- Pr841~860: Axis homing speed of 2<sup>nd</sup> part
  - Max. speed of searching for motor index
- Pr861~880: Axis homing direction
  - Set the direction of searching for home dog

# Incremental encoder \_ Parameters

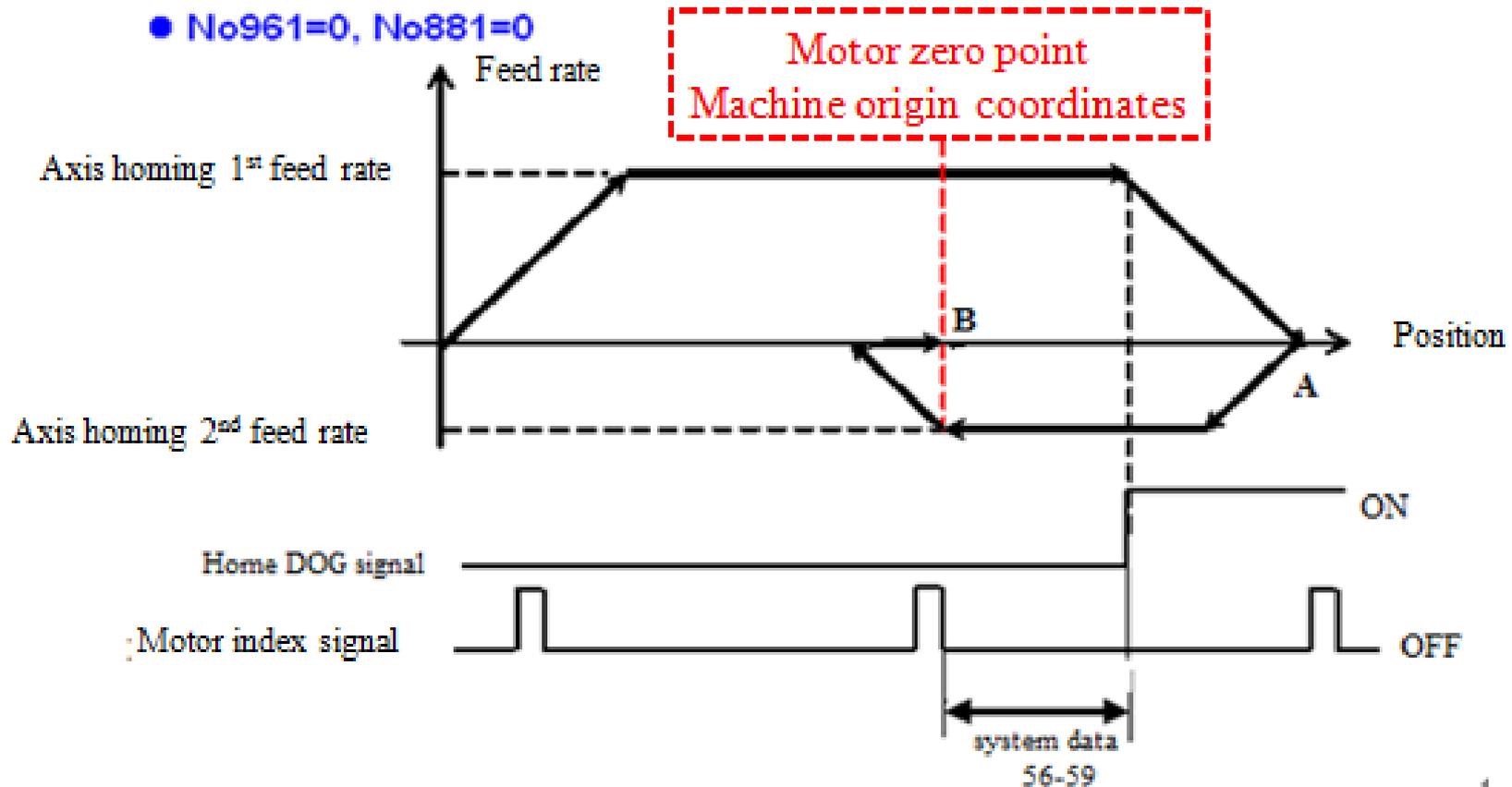
- Pr941~960: Enable axis home grid function
  - 0: OFF
  - 1: ON
- Pr981~1000: Protective revolution of 2nd part
  - During 2nd part process, if the revolution exceeds this value, DOG signal is still active, alarm occurs.
- Pr1001~1020: Axis fast return home(0:OFF, 1:ON)
  - Enable fast return home function. Axis will return home by G00 speed, after 1st home searching.

# Incremental encoder \_ Operation steps

- Step 1: Switch controller to HOME mode (R13 = 7)
- Step 2: Press JOG + / - of desired axis
- Step 3: Motor moves to DOG according to the direction (Pr861~876), and 1st homing speed
- Step 4: When the controller receives DOG signal, it begins to stop.
- Step 5: After the motor stops, it will move backwards with 2nd homing speed
- Step 6: After leaving DOG, controller will search the nearest motor index signal
- Step 7: After receiving motor index signal, controller will move to appointed position according to homing method and offset
- Step 8: Controller initializes machine coordinate according to homing method and offset

# Incremental encoder \_ Operation steps

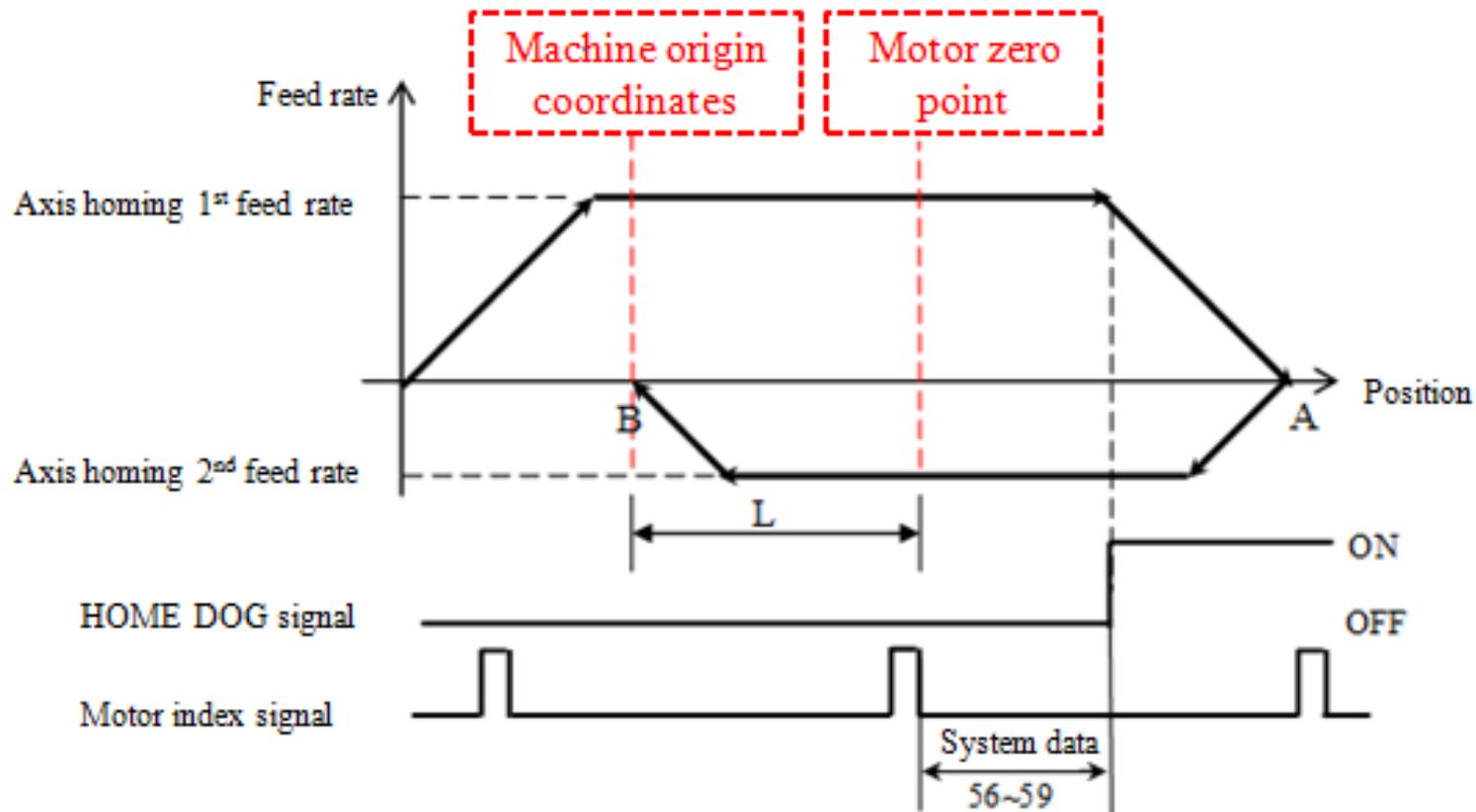
- Speed vs position diagram(Pr961=0, Pr881=0)



# Incremental encoder \_ Operation steps

- Speed vs position diagram(Pr961=0 or 1, Pr881=L)

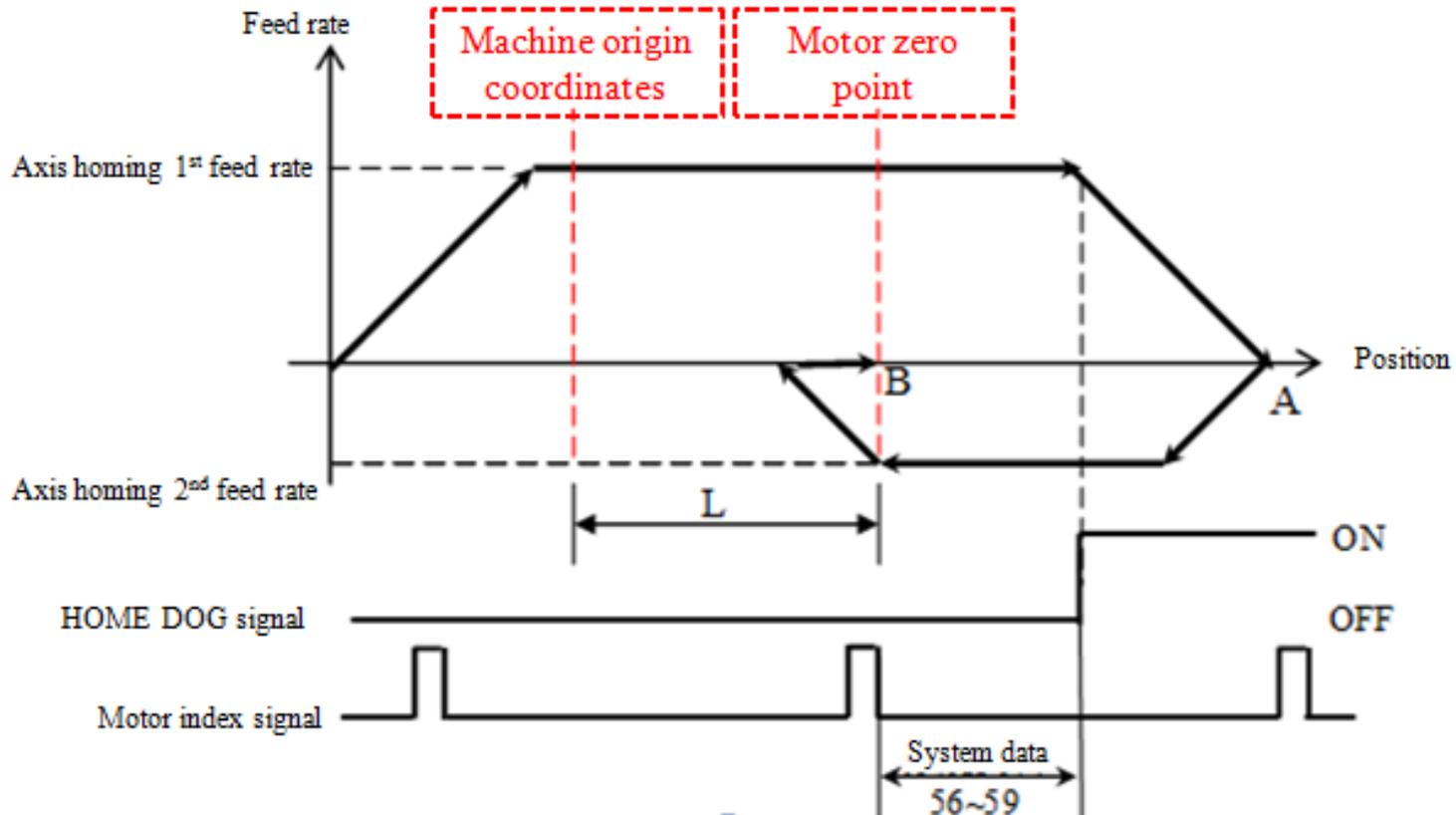
- No961=0 or 1, No881=L



# Incremental encoder \_ Operation steps

- Speed vs position diagram(Pr961=2, Pr881=L)

• No961=2, No881=L



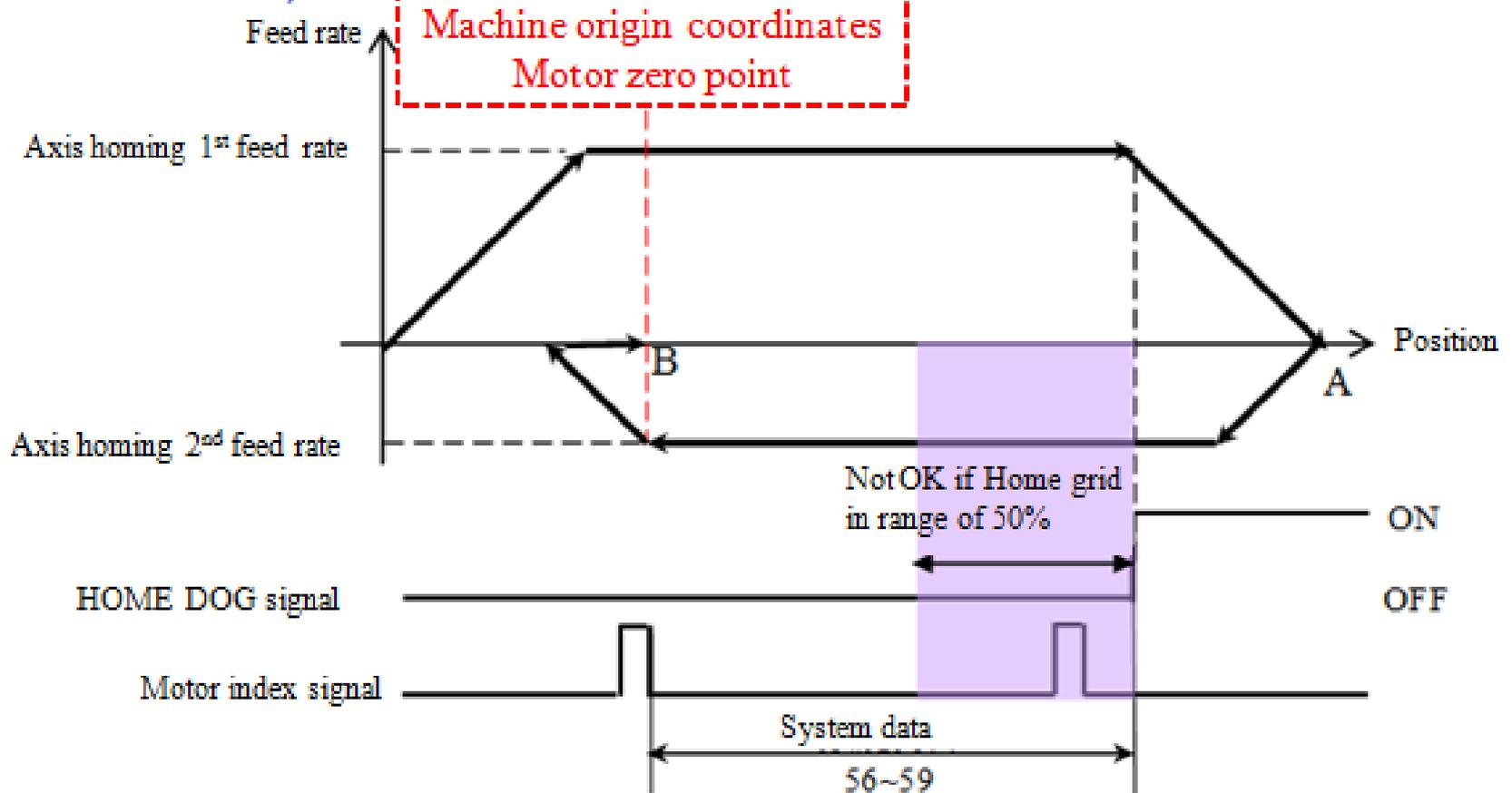
# Incremental encoder \_ Home grid

- **What is home grid?**
  - Revolution between DOG signal and 1st motor index signal is called home grid, and is displayed on system data No. 56~59, the unit is percentage such as 25 equivalent to 1/4 turn and 50 equivalent to half turn.
- **When to use?**
  - While home grid is less than 20 or greater than 80, It is suggested to enable the home grid function. If home DOG and index are too close, the index may be sometimes ignored, and result in incorrect origin.
- **Specification of home grid**
  - When Pr941 ~ 960 set 1, if controller detects that home grid is smaller than 50 (half turn), controller will ignore this index and search for next index.

# Incremental encoder \_ Home grid

- Speed vs position diagram

• No961=0, No881=0



# Incremental encoder \_ Alarm

<b>Alarm ID</b>	<b>MOT-022</b>	<b>Alarm Title</b>	<b>Home position inaccurate</b>
<b>Description</b>	After booting, at the N (N>1) times of searching home, home grid will be compared to the result of the first time searching home, if the error is over 0.1 turn of motor, the controller will send alarm.		
<b>Possible Cause</b>	<ol style="list-style-type: none"><li>1. Homing signal of motor is abnormal</li><li>2. Stopper, coupling or bearings is not locked tightly</li></ol>		
<b>Solution</b>	<ol style="list-style-type: none"><li>1. Move motor in the same direction and observe to check whether position counter index changes normally.</li><li>2. Check whether the mechanism components are fixed properly</li></ol>		

# Incremental encoder \_ Alarm

Alarm ID	MOT-029	Alarm Title	Miss index in homing
Description	When searching home, if motor does not find out motor index signal after leaving Home DOG more than 5 pitches, controller will send this alarm.		
Possible Cause	<ol style="list-style-type: none"><li>1. Can't read the index signal.</li><li>2. The setting of homing 2nd travel feedrate is too fast.</li><li>3. The setting of motor reduction ratio is too big</li><li>4. The distance between index signal and Home Dog is more than 5 pitches</li></ol>		
Solution	<ol style="list-style-type: none"><li>1. Check motor index wire connecting; observe diagnostic screen 48(X), 49(Y), 50(Z) to check whether index signal is read. If no, please check whether connecting wire is correct.</li><li>2. Reduce setting value of the homing 2nd travel federate (Parameter 841~843)</li></ol>		
More description	When searching home, machine will use the velocity setting value of the first stage to move to Home DOG, and stop. After that machine moves backward with velocity of the second stage. After leaving Home DOG to move backward, it start to search the nearest motor index signal. In the second stage, controller will calculate according to resolution of encoder. If controller leaves Home DOG more than 5 pitches and can not find out the index signal. Controller will send alarm.		

# Incremental encoder \_ Alarm

Alarm ID	MOT-030	Alarm Title	Zero speed timeout in homing
Description	When motor touches Home Dog, if motor cannot stop, controller will send this alarm.		
Possible Cause	<ol style="list-style-type: none"><li>1. Setting drive gain is not good, so it makes motor vibrating</li><li>2. Motor running causes resonance phenomenon.</li></ol>		
Solution	<ol style="list-style-type: none"><li>1. Check the position loop gain and velocity loop gain setting of driver</li><li>2. Start the resonance frequency inhibition ability of driver</li><li>3. Contact machinery manufacturers for help.</li></ol>		
More description	<p>When searching home, machine will use the velocity setting value of the first stage to move to Home DOG, and stop once it meets Home DOG. After that machine moves backward with velocity of the second stage. After leaving Home DOG to move backward, it start to search the nearest motor index signal. At the first stage to find the Home DOG, motor will decrease velocity to stop. After 0.1 second command stops, if system data 8(X), 9(Y), 10(Z)-error register receives values bigger than zero speed check window(Pr901~Pr920), controller will send alarm.</p>		

# Incremental encoder \_ Alarm

Alarm ID	MOT-036	Alarm Title	Can't leave Home Dog
Description	When searching home, if motor can't leave HomeDog after moving over 5 pitches, the controller will send this alarm message.		
Possible Cause	Home Dog is damaged		
Solution	Use the electrical multimeter to check whether the sensor of HomeDog is damaged or wiring connection is missing.		
More description	When searching home, machine will use the velocity setting value of the first stage to move to Home DOG, and stop. After that machine moves backward with velocity of the second stage. After leaving Home DOG to move backward, it start to search the nearest motor index signal. In the second stage, controller will calculate according to resolution of encoder. If controller leaves Home DOG more than 5 pitches and cannot find out the index signal, controller will send alarm.		

# CSR interface

- C79~82 : Once IO board receives HOME DOG signal, these C BIT should be ON, so controller could confirm that axis already found HOME DOG
- S16~19: After homing finish, these S bit will be ON
- R13 : mode selection , R13=7 is HOME mode

# Software stroke limit

- 1<sup>st</sup> software stroke limit: after S16~S19 ON, 1<sup>st</sup> software stroke limit is activated automatically
- 2<sup>nd</sup> software stroke limit: after S16~S19 ON, 2<sup>nd</sup> software stroke limit will be enabled/disabled via G22/G23
- 3<sup>rd</sup> software stroke limit: after S16~S19 ON, 3<sup>rd</sup> software stroke limit will be enabled/disabled via C83 ON/OFF
- 2<sup>nd</sup> and 3<sup>rd</sup> software stroke limit just available for 10.116 or later

# 1<sup>st</sup> Software stroke limit & alarm

- 1<sup>st</sup> software stroke limit is set by Pr2401~Pr2440, Password is required.

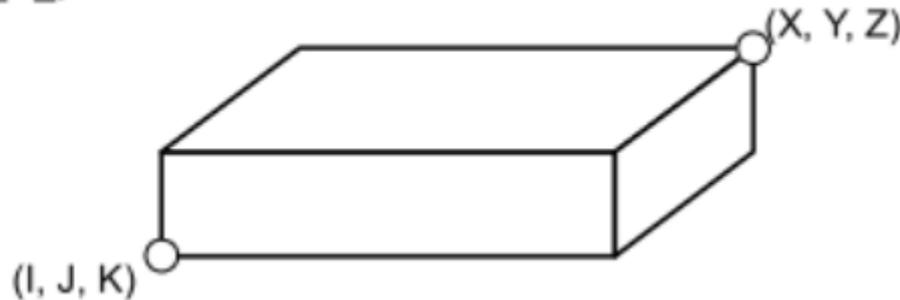
Parameter No	Item	Setting range	Unit	Default value	Effective
2401~2440	Axis pos./neg. coordinate of stroke limit	[-999999999~999999999]	BLU	-999999999 999999999	Reset

- **MOT-17/18 First Positive/ Negative software limit exceed**
  - When machine coordinate of axis is exceeds Pr.2401~2440, this alarm will pop-up
- **COR-40 Exceed software limit or hardware limit**
  - Machining process, system will pre-read to check whether machine coordinate is exceed software limit or not

# 2<sup>nd</sup> Software stroke limit

- G22/G23 can dynamically enable/disable 2<sup>nd</sup> software stroke limit protection set by Pr2501 ~ Pr2540 . If setting value is 0, it means this function is disabled.
- 2<sup>nd</sup> software stroke limit (protection scope) is also set dynamically by XYZIJK arguments in G22 command
- Pr3838 can decide whether G22 is enable automatically after booting controller.
- Pr2542 set protection scope is inside or outside of the set range.

G 22X\_Y\_Z\_I\_J\_K\_;



G22 X\_ Y\_ Z\_ I\_ J\_ K\_ ; // X\_ Y\_ Z\_ : Positive coordinate of stroke limit  
// I\_ J\_ K\_ : Negative coordinate of stroke limit  
G23 // Disable 2<sup>nd</sup> software stroke limit

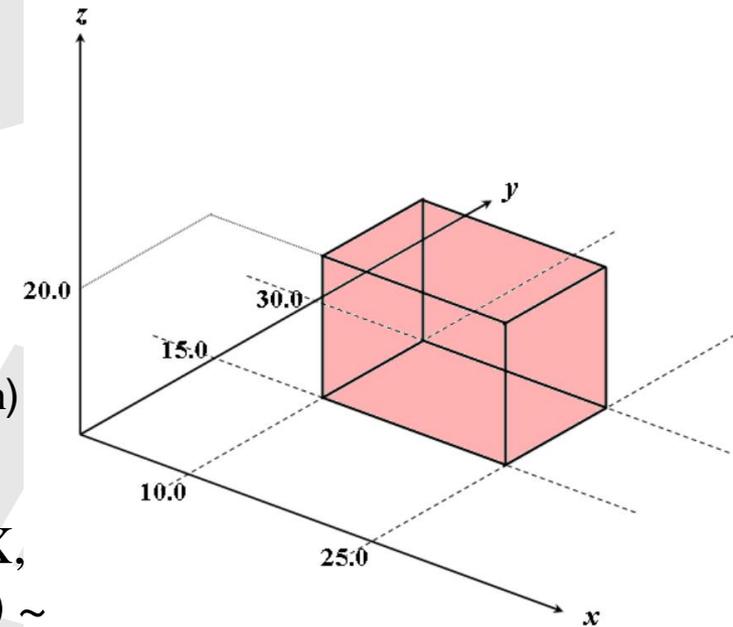
# G22 Description

G code	X	Y	Z	Other axis
G22	Parameter	Parameter	Parameter	Parameter
G22 X_	COR-109 G22 Invalid G22 setting, enable fail			
G22 X_ I_	G code	Parameter	Parameter	Parameter
G22 X_ Y_ Z_ I_ J_ K_	G code	G code	G code	Parameter

- The argument setting value of same group(X \* I, Y \* J, Z & K) can be reversed. For example G22 X100. I200. and G22 X200. I100 are the same. If subtracting value of same group is equal to 0, 2<sup>nd</sup> software stroke limit is disabled.
- Example: G22X0 I0 or G22X10 I10 X-axis 2<sup>nd</sup> software stroke limit is disabled. G22X0 I10 or G22X10 I0 represents that X0 ~ X10 is the 2<sup>nd</sup> software stroke limit of X axis
- When axis group is greater than 1, G22 only is effective on the axis group that G22 is executed
- G22 only support XYZ axis, if axis name is the same and axis number is different, system only protects the axis name that has smaller number. For example, 1<sup>st</sup> axis group has X2 and X3 axis name,G22 only can trigger X2 protect scope

# 2<sup>nd</sup> Software stroke limit

- Example: Setting inside protection, other parameters listed below, the protection scope shown as figure, it is a rectangular, dimensions determined by three sets of parameters
  - Pr2542 = 2(Inside)
  - Pr2501 = 25000, Pr2502 = 10000 (X10.~X25. Prohibited Moving in)
  - Pr2503 = 30000, Pr2504 = 15000 (Y15.~Y30. Prohibited Moving in)
  - Pr2505 = 20000, Pr2506 = 0 (Z0.~Z20. Prohibited Moving in)
- Suppose that Pr2542=2, an axis group has 4 axes X, Y, Z, Z2 in which X0 ~ X100. & Y0 ~ Y100. & Z0 ~ Z100. If Z2 protection scope is set as Z2 = 10. ~ 100., and machining program has command as X50 Y50 Z50 Z2= 0., due to Z2 coordinates is not in protection scope, so controller will not protect XYZ axis



# 2<sup>nd</sup> Software stroke limit - alarm

- **MOT-037/038 Second Positive/Negative software limit exceed**
  - When machine coordinate of axis is exceeds Pr.2501~2540, this alarm will pop-up
- **MOT-044 Enter Second software limit protected region**
  - Axis moves to protection scope defined by Pr2501~Pr2540
- **COR-040 exceed software limit or hardware limit**
  - Machining process, system will pre-read to check whether machine coordinate is exceed software limit or not
- **COR-109 Invalid G22 setting, enable fail**
  - G22 command format wrong, so 2nd software stroke limit protection is fail

# 3<sup>rd</sup> Software stroke limit

- Providing users 3<sup>rd</sup> software stroke limit by using PLC(via C83) to enable/disable, protection scope set by Pr2441 ~ Pr2480
- Users can set protection scope dynamically by using macro to modify value of #1941- #1976 / #1961- #1976,  
.
- Pr2482: Protection scope is inside or outside of the set range.  
Protection mode is set by Pr2481

# 3<sup>rd</sup> Software stroke limit - alarm

- **COR-040 exceed software limit or hardware limit**
  - Machining process, system will pre-read to check whether machine coordinate is exceed software limit or not
- **MOT-041/042 Third Positive/Negative software limit exceed**
  - When machine coordinate of axis is exceeds Pr2441~Pr2480, this alarm will pop-up
- **MOT-045 Enter Third software limit protected region**
  - Axis moves to protection scope defined by Pr2441~Pr2480

# MPG – related parameters

No.	Name	Setting value	Description
661	MPG feedrate	mm/min	Set MPG max feedrate when rotating MPG, if it is set equal to 0, controller will use JOG feedrate (Pr521~Pr540) as MPG feedrate
410	MPG acceleration time	ms	Set the time to get rid of MPG federate (Pr.661 )
2001	MPG 4 <sup>th</sup> scaling factor(Least input unit)	LIU	<ul style="list-style-type: none"> <li>● This parameter is used to specify the 4<sup>th</sup> MPG override, each pulse corresponds to LIU.</li> <li>● LIU is minimum input unit, this unit will be affected by the metric input mode.</li> </ul>
2003	MPG program simulation handwheel No.		Syntec controller can support max 3 MPGs, this parameter decides which MPG is used.
2021	Port no. or register no. for MPG		6 series; EZ : 5 10A/11A : 5 10B/11B : 9 21 series : 20
2031	MPG related to axis ID		Set corresponding axis when MPG rotating. 0: Corresponding axis selected by PLC C16 ~ C19; 1-6: Fixedly corresponding to X, Y, Z, A, B, C-axis, not affected by C16 ~ C19
2041	MPG resolution	Pulse/Rev	



THANKS FOR YOUR  
ATTENTION !