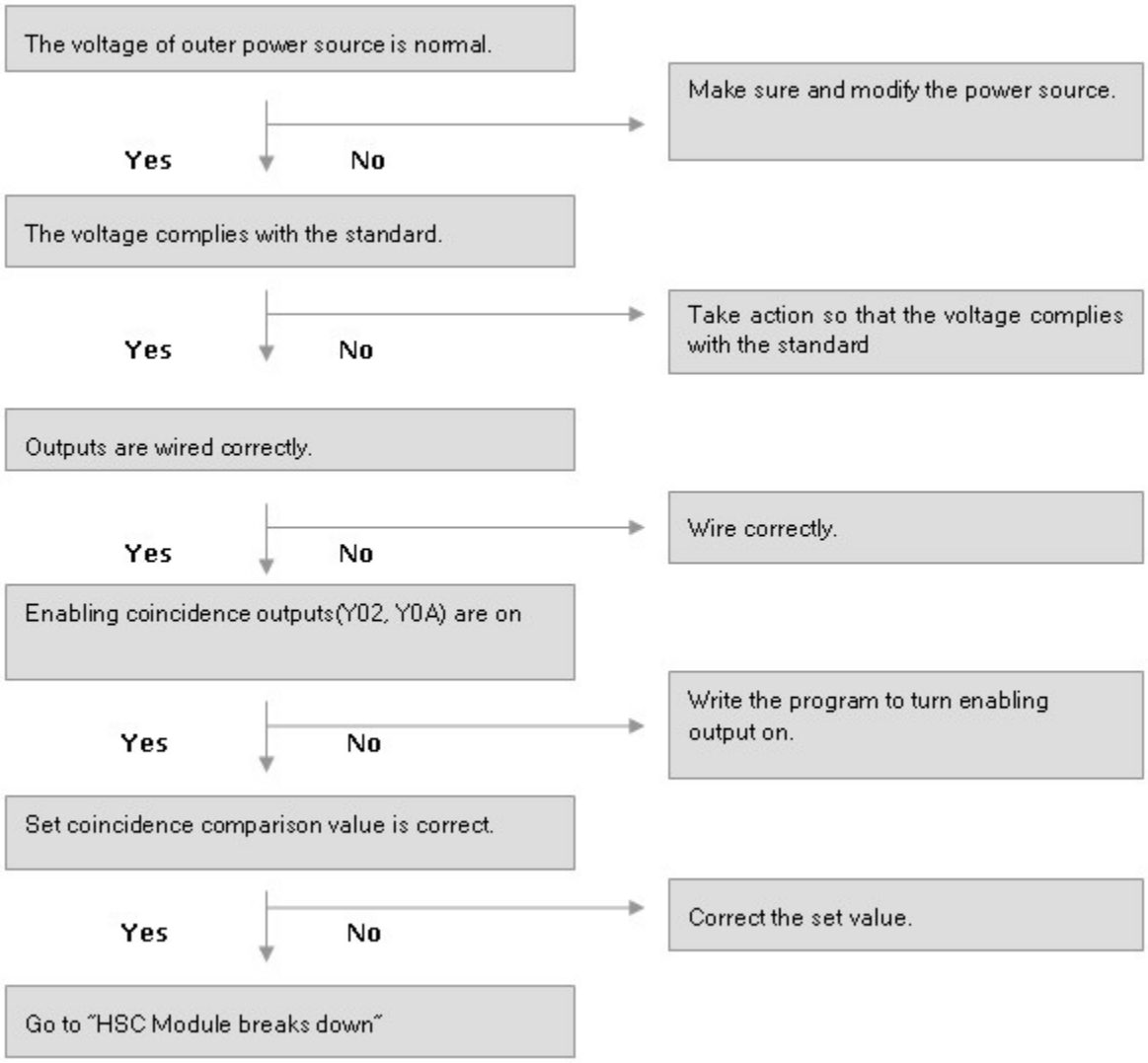
6.10 Positioning

CM1-PSnnX module is a pulse output modules for CP and XP series of CIMON PLCs. PS02A type supports differential driver system pulse output. PSnnX is capable of driving not only servo motor but also stepping motor

Features :

- **Control Axis :** CM1-PS02A provides 2 axis pulse outputs and supports linear/circular interpolation.

6.9.9.3 Error in Output



6.10 Positioning

CM1-PSnnX module is a pulse output modules for CP and XP series of CIMON PLCs. PS02A type supports differential driver system pulse output. PSnnX is capable of driving not only servo motor but also stepping motor

Features :

- **Control Axis :** CM1-PS02A provides 2 axis pulse outputs and supports linear/circular interpolation.

- **Dedicated Instructions :** CP and XP series of CIMON PLCs are embedding several dedicated instructions for PSnnX module. These instructions provide easy and powerful control functions.
- **Manual Operation :** PSnnX module supports various kinds of manual operations, such as jog operation, inching operation. And this module supports external connection of MPG (manual pulse generator).
- **PLC compatibility :** CP and XP CPUs of CIMON PLC supporting PSnnX module.

Contents :

6.10.1 Specifications

See :

- Technical Data
- General Specifications
- Input Signal Specifications
- Output Signal Specification
- Dimensions

6.10.1.1 Technical Data

LED Display

LED	Description	Cause
	LED Status Symbol	-

	Normal	-
	Axis Running	-
	Axis Error	Check error code with CICON. The error can be cleared by setting 1 to the ‘ Error Reset’ area in control memory.
	System Error	Check error code with CICON. The error can be cleared by setting 1 to the ‘ Error Reset’ area of axis 1 in control memory.
	Fatal Defect	Check the mounting condition of module on backplane.

Connector Pin Description

Signal	Pin		Description
	A1	A2	
FP+	12	11	Pulse output
FP-	10	9	
RP+	8	7	
RP-	8	5	
LMT U	40	39	Upper Limit Input
LMT L	38	37	Lower Limit Input
DOG	36	35	Near Point DOG Input
STOP	34	33	External STOP Input
ECMD	32	31	External Command Input
COM1	30 28	29 27	COMMON (LMT U, LMT L, DOG, STOP, ECMD)
RDY	20	19	Ready Signal Input from Driver

COM2	18	17	COMMON (RDY)
ZERO24	26	25	Zero Signal Input (+24V)
ZERO05	24	23	Zero Signal Input (+5V)
COM3	22	21	COMMON (ZERO24, ZERO05)
CLEAR	16	15	Deviation Counter Clear Output
COM4	14	13	COMMON (CLEAR)
MPG A+	3		MPG/ENCODER A+ Input
MPG A-	1		MPG/ENCODER A- Input
MPG B+	4		MPG/ENCODER B+ Input
MPG B-	2		MPG/ENCODER B- Input

Deviation counter clear is an output signal of PSnnX module.

6.10.1.2 General Specification

<table>
<tr><th>Item</th><th colspan="6">Specification</th></tr>
<tr><td>Operating Temperature</td><td colspan="6">-10 ~ 65ºC</td></tr>
<tr><td>Storage Temperature</td><td colspan="6">-25 ~ 80ºC</td></tr>
<tr><td>Operating Humidity</td><td colspan="6">5 ~ 95%RH, Not condensed.</td></tr>
<tr><td>Storage Humidity</td><td colspan="6">5 ~ 95%RH, Not condensed.</td></tr>
<tr><td rowspan="7">Vibration</td><td colspan="6">In case of intermittent vibration</td></tr>
<tr><td>Frequency</td><td colspan="2">Acceleration</td><td>Amplitude</td><td colspan="2">Sweep</td></tr>
<tr><td>10 ≦ f< 57Hz</td><td colspan="2">-</td><td>0.075mm</td><td colspan="2" rowspan="2">10 times in each direction (X,Y,Z)</td></tr>
<tr><td>57 ≦ f < 150 Hz</td><td colspan="2">9.8m/s2 {1G}</td><td>-</td></tr>
<tr><td colspan="6">In case of continuous vibration</td></tr>
<tr><td>Frequency</td><td colspan="2">Acceleration</td><td>Amplitude</td><td colspan="2">Sweep</td></tr>
<tr><td>10 ≦ f < 57Hz</td><td colspan="2">-</td><td>0.035mm</td><td colspan="2" rowspan="2">10 times in each direction (X,Y,Z)</td></tr>
<tr><td>57 ≦ f < 150 Hz</td><td colspan="2">4.9m/s2 {1G}</td><td>-</td></tr>
<tr><td>Shock</td><td colspan="6">• Max. Shock Acc. : 147 m/s2 {15G}
• Time : 11㎳(3 times in X, Y, Z)
• Pulse Wave : Half sine wave pulse</td></tr>
<tr><td rowspan="4">Noise</td><td>Square wave impulse noise</td><td colspan="5">±2000V</td></tr>
<tr><td>Electrostatic discharge</td><td colspan="5">Voltage: 4 kV(Contact discharge)</td></tr>
<tr><td>Radiated electro-magnetic field</td><td colspan="5">27 ~ 500 MHz. 10 V/m</td></tr>
<tr><td>Fast Transient Bust Noise</td><td>Item</td><td>Power Modul</td><td>Digital I/O (24V or more)</td><td colspan="2">Digital I/O(Less than 24V) Analog I/O Comm.</td></tr>
</table>

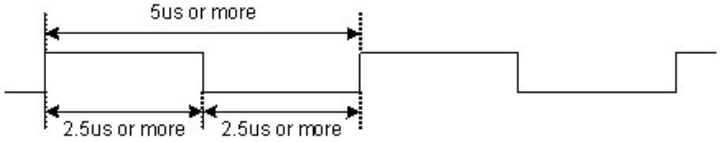
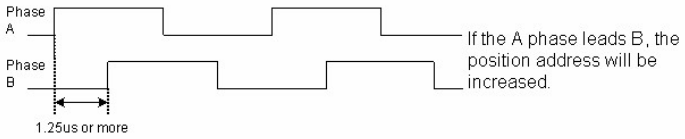
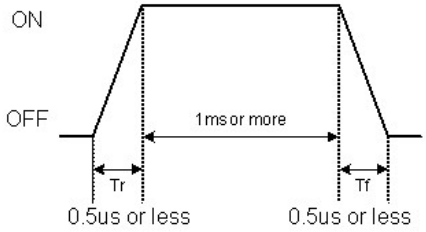
			e		interface
		Voltage	2KV	1KV	0.25KV
Environment	No corrosive gas and no dust.				
Altitude	2,000m or less				
Pollution	Less than 2				
Cooling	Natural Air cooling				

6.10.1.3 Module Specification

Module Name		CM1-PS02A
I/O Occupation		16 Points
Axis		2 Axis
Interpolation		2 Axis Linear/Circular Interpolation
Control Functions		Point to Point, Path, Speed
Control Unit		Pulse, mm, inch, degree
Position Data		600 / Axis
Coordinate		Absolute / Incremental
Backup		Flash Rom Backup (Parameters, Position Data, Block Data, Condition Data)
Positioning	Control Type	Position Control – Absolute Coordinate / Incremental Coordinate Path Control - Absolute Coordinate / Incremental Coordinate
	Coordinate	• Absolute Coordinate -214748364.8 ~ 214748364.7 ㎛ -21474.83648 ~ 21474.83647 inch 0 ~ 359.9999 degree -2147483648 ~ 2147483647 pulse • Incremental Coordinate -214748364.8 ~ 214748364.7 ㎛ -21474.83648 ~ 21474.83647 inch -21474.83648 ~ 21474.83647 degree -2147483648 ~ 2147483647 pulse
	Speed	0.1 ~ 20,000,000.00 (㎜/min) 0.001 ~ 2,000,000.000 (inch/min) 0.001 ~ 2,000,000.000 (degree/min) 1 ~ 1,000,000 (pulse/sec)
	Acc/Dec Type	Trapezoidal / S-Pattern
	Acc/Dec Time	0 ~ 65,535 ms
	Sudden Stop Dec. Time	0 ~ 65,535 ms
External Cabling		40pin Connector
Max. Pulse Output		1 MPPS (Line Driver Pulse Output)
Max. Distance		10 m

Power Consume	240 mA / 5V
Flash ROM Write Count	Max. 100,000 times
Dimension (mm)	32(W) * 109(H) * 93.3(D)
Weight (g)	168

6.10.1.4 Input Signal Specifications

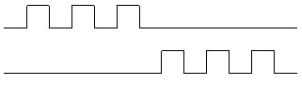
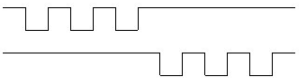
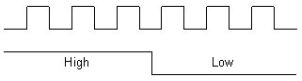
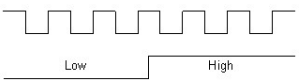
Signal	Rated input voltage / current	Working voltage Range	ON Voltage / Current	OFF Voltage / Current	Input Resistance	Response Time
Near Point DOG Upper Limit (LMTU) Lower Limit (LMTL) Stop (STOP) External Command (ECMD)	24Vdc / 5mA	19.2 ~ 26.4 Vdc	19Vdc / 4mA or more	11Vdc / 1mA	2.7kΩ	
MPG Phase A (MPG A+, MPG A-) Phase B (MPG B+, MPG B-)	5Vdc / 7ma	5Vdc / 7ma	2.5Vdc / 3mA or more	1Vdc / 1mA or less	940Ω	
	①Pulse Width  ② Phase  					
Driver unit ready input (RDY)	24Vdc / 5mA	19.2 ~ 26.4 Vdc	19Vdc / 4mA or more	11Vdc / 1mA	2.8kΩ	
Zero Input (Encoder Z Phase) (ZERO 5) (ZERO 24)	5Vdc / 7ma	4.25 ~ 5.5Vdc	2.5Vdc / 3mA or more	1Vdc / 1mA or less	600Ω	
	24Vdc / 5mA	19.2 ~ 26.4Vdc	19Vdc / 4mA or more	11Vdc / 1mA	2.7kΩ	
	 					

6.10.1.5 Output Signal Specification

<table>
<tr><th>Signal</th><th>Rated Voltage</th><th>Working Voltage</th><th>Max. Current / Inrush Current</th><th>Voltage Drop at ON</th><th>Leakage Current at OFF</th></tr>
<tr><td>Pulse Output (CW/PULSE)

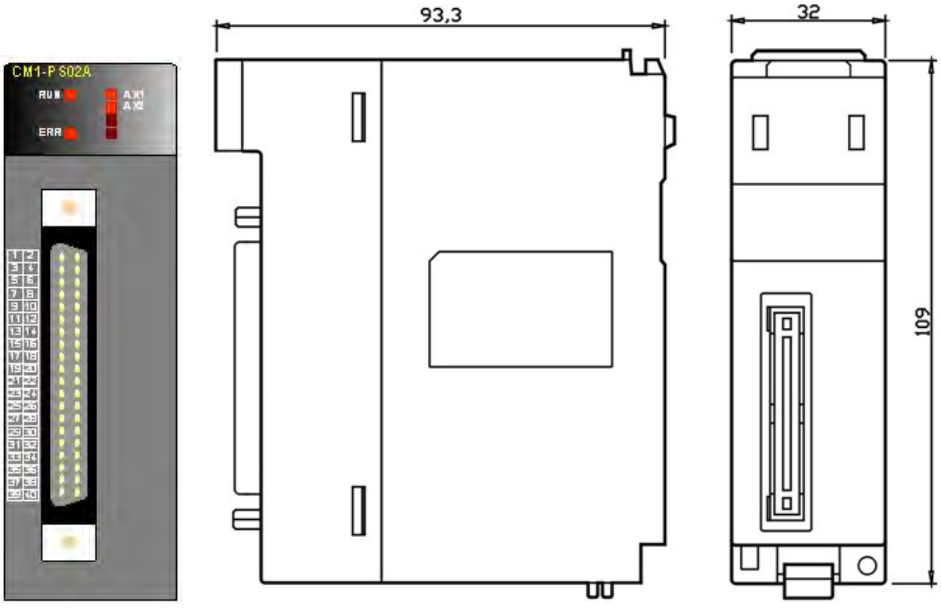
Pulse Sign (CCW/SIGN)</td><td>5 ~ 24 Vdc</td><td>4.75 ~ 26.4 Vdc</td><td>50mA (1 point) / 0.2A (10ms or less)</td><td>0.5Vdc</td><td>0.1mA or less</td></tr>
<tr><td colspan="5">? Differential driver equivalent to AM26C31

? The type of output pulse(CW / CCW, Pulse/Sign) is selected by basic parameter settings

<table>
<tr><td rowspan="2">Pulse Output Mode</td><td colspan="4">Output Signal Level</td></tr>
<tr><td colspan="2">Positive Logic</td><td colspan="2">Negative Logic</td></tr>
<tr><td>Forward</td><td>Reverse</td><td>Forward</td><td>Reverse</td></tr>
<tr><td>CW
CCW</td><td colspan="2">  </td><td colspan="2">  </td></tr>
<tr><td>Pulse
Sign</td><td colspan="2"> 
</td><td colspan="2"> 
</td></tr>
</table>
</td></tr>
<tr><td>Deviation Counter Clear (CLEAR)</td><td>5 ~ 24Vdc</td><td>4.75 ~ 26.4Vdc</td><td>0.1A (1 point) / 0.4A (10ms or less)</td><td>1 Vdc</td><td>0.1mA or less</td></tr>
</table>

6.10.1.6 Dimensions

Unit : mm



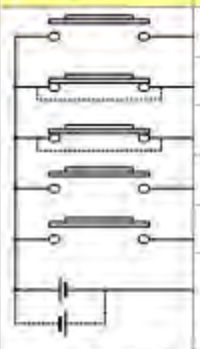
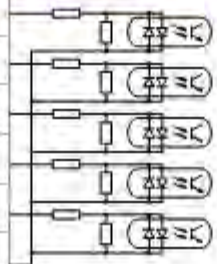
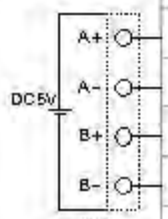
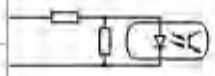
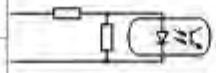
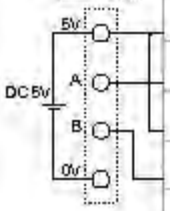
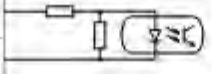
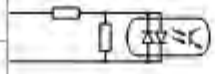
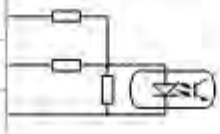
Pin	Function	Pin	Function
1	MPG A-	2	MPG A+
3	MPG B-	4	MPG B+

5	AXIS 2	RP-	6	AXIS 1	RP-
7		RP+	8		RP+
9		FP-	10		FP-
11		FP+	12		FP+
13		CLR COM	14		CLR COM
15		CLR	16		CLR
17		RDY COM	18		RDY COM
19		RDY	20		RDY
21		ZERO COM	22		ZERO COM
23		ZERO 5	24		ZERO 5
25		ZERO 24	26		ZERO 24
27		Y COM	28		X COM
29		Y COM	30		X COM
31		ECMD	32		ECMD
33		STOP	34		STOP
35		DOG	36		DOG
37		LMT L	38		LMT L
39		LMT U	40		LMT U

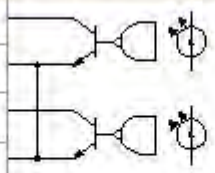
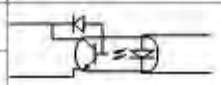
6.10.2 Wiring

Contents :

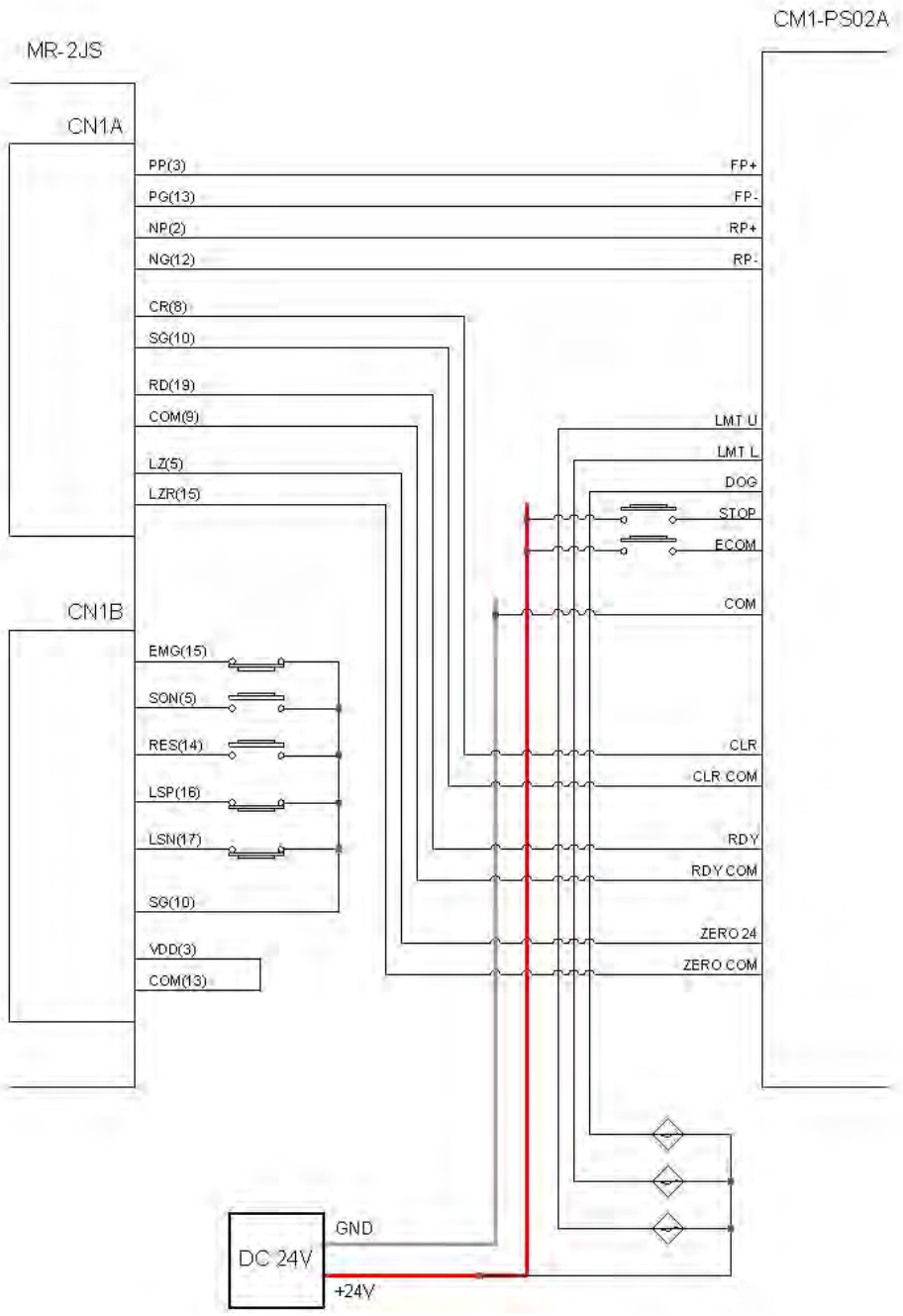
6.10.2.1 Input Signal

Wiring	Pin	Internal Circuit	Signal Name	Remark
	35(36)		DOG	
	39(40)		LMT U	
	37(38)		LMT L	
	33(34)		STOP	
	31(32)		ECMD	
	27,29 (28,30)		COM1	
	4		MPG A+	
	3		MPG A-	
	2		MPG B+	
	1		MPG B-	
	4		MPG A+	
	3		MPG A-	
	2		MPG B+	
	1		MPG B-	
	19(20)		RDY	
	17(18)		COM2	
	25(26)		ZERO24	
	23(24)		ZERO05	
	21(22)		COM3	

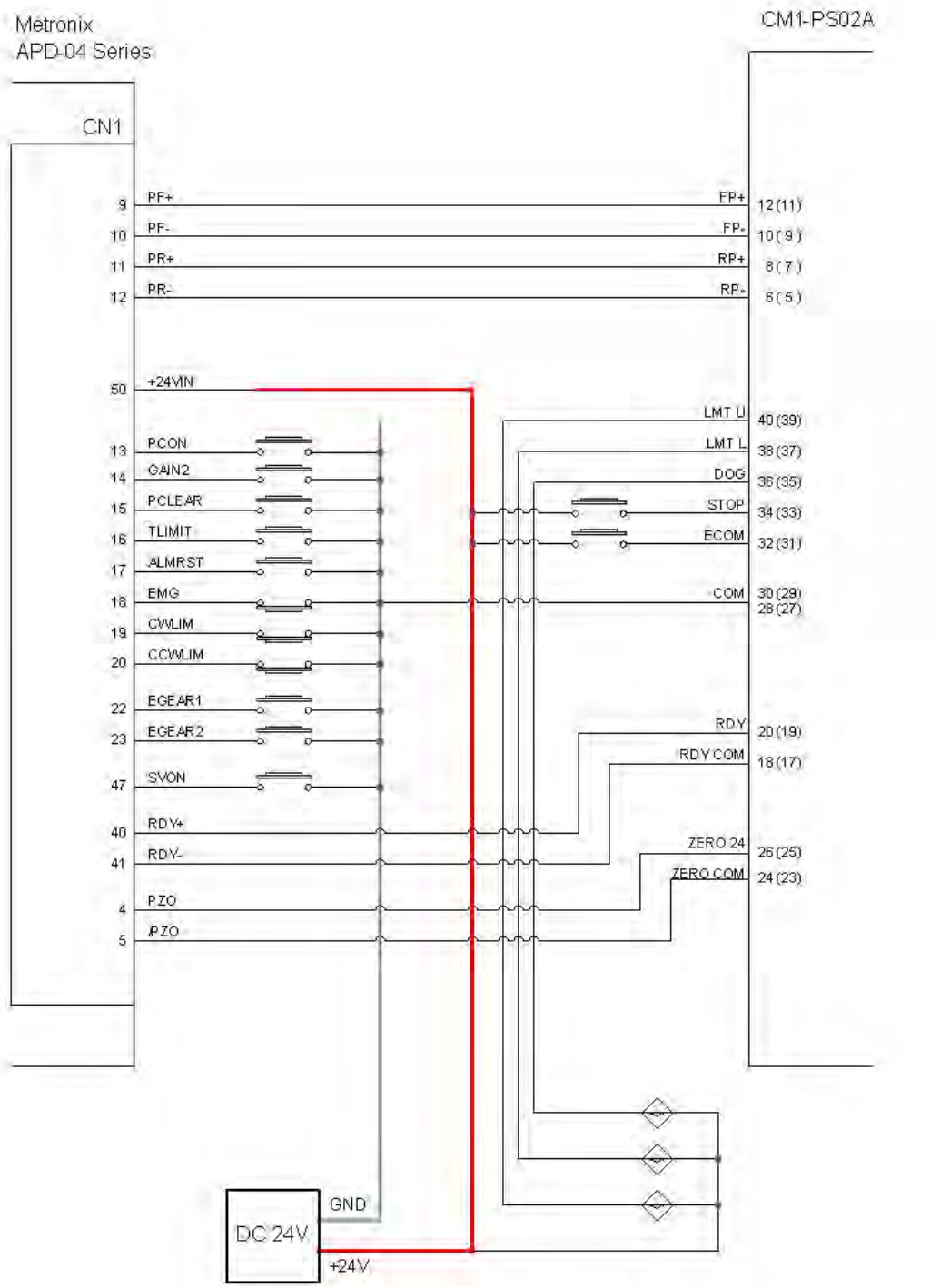
6.10.2.2 Output Signal

Output Signal	Pin	Internal Circuit	Signal Name	Remark
Pulse Output	11(12)		FP+	
	9(10)		FP-	
	7(8)		RP+	
	5(6)		RP-	
Others	15(16)		CLEAR	
	13(14)		COM4	

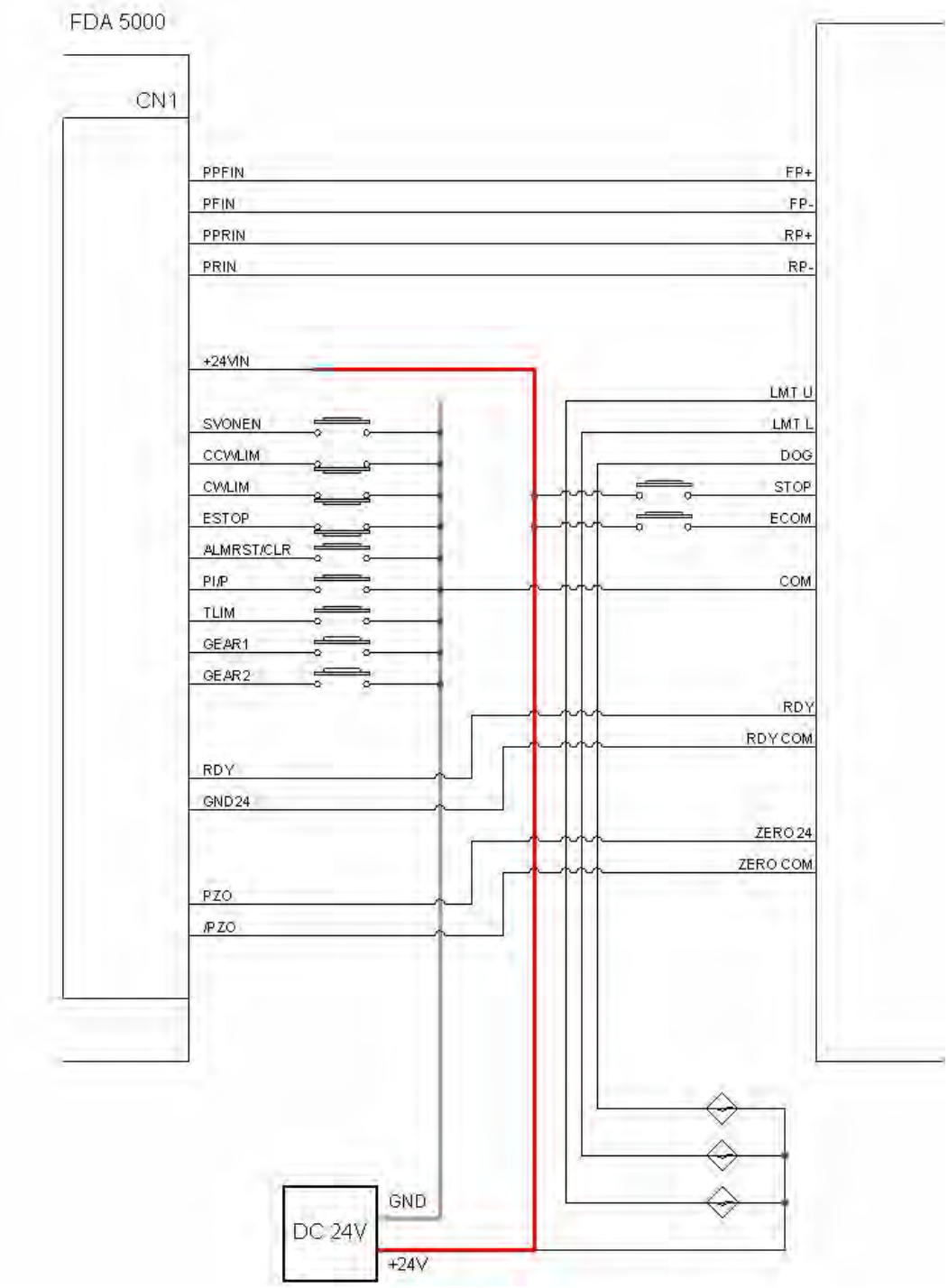
6.10.2.3 Wiring Example "MR-J2S Seres (Mitsubishi)"



6.10.2.4 Wiring Example "APD-VS Series (Metronix)"



6.10.2.5 Wiring Exmaple "FDA5000 Series (LG Otis)"



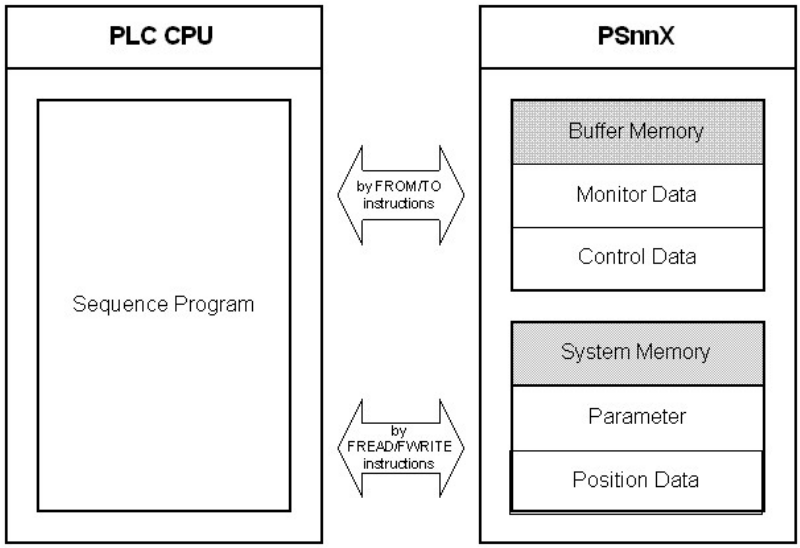
6.10.3 Internal I/O and Shared Memory

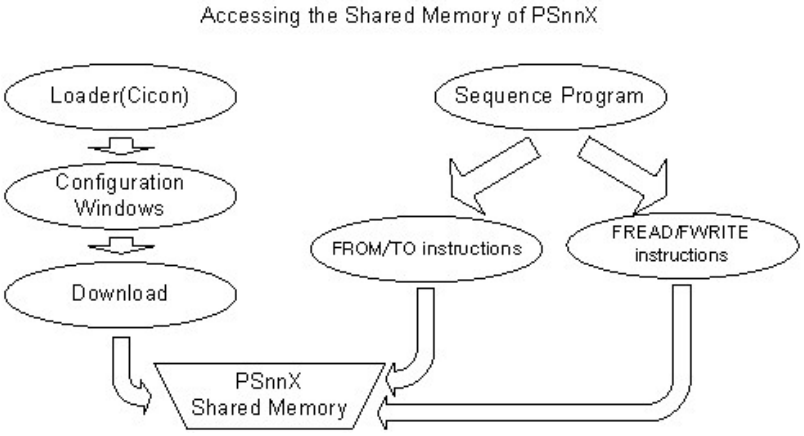
PSnnX module occupies 16 points in PLC I/O space. These I/O points are used for data exchange with CPU module. Direction of input signal is from PSnnX to CPU, and output signal is from CPU to PSnnX.

Direction : CPU?PSnnX		Direction : CPU?PSnnX	
Input	Signal Description	Output	Signal Description
X00	Module Ready	Y00	CPU Ready
X01	Module Error	Y01	
X02		Y02	
X03		Y03	
X04	Command Ack (Axis 1)	Y04	Positioning Start (Axis 1)
X05	Busy (Axis 1)	Y05	MPG Run (Axis 1)
X06	Error (Axis 1)	Y06	Forward JOG (Axis 1)
X07	Positioning Done (Axis 1)	Y07	Reverse JOG (Axis 1)
X08	M code ON (Axis 1)	Y08	Stop (Axis 1)
X09		Y09	
X0A	Command Ack (Axis 2)	Y0A	Positioning Start (Axis 2)
X0B	Busy (Axis 2)	Y0B	MPG Run (Axis 2)
X0C	Error (Axis 2)	Y0C	Forward JOG (Axis 2)
X0D	Positioning Done (Axis 2)	Y0D	Reverse JOG (Axis 2)
X0E	M code ON (Axis 2)	Y0E	Stop (Axis 2)
X0F		Y0F	

6.10.4 Shared Memory Area

PSnnX provides two types of shared memory area. One is buffer memory area and the other is system memory area. These memory areas can be read or written by sequence program of CPU or CICON. Following shows the block diagram of these shared memories.





Contents :

6.10.4.1 Control Data Memory Area

System Memory

The configuration data and position data are stored in this memory. For access this area, the FREAD/ FWRITE instructions must be used in sequence program.

System memory is backed-up by flash memory. Current data of system memory is stored in flash memory by issuing a command with instruction. The number of flash memory writing is restricted to 25 times at every power ON. This restriction is putted for protecting flash memory from the sequence program mistake. The overall lifetime of flash memory is 100,000 times of writing.

Buffer Memory

All the special purposed modules of CIMON PLC have buffer memory. Sequence program of CPU can get or control the module' s useful information through this memory. For this data exchange the FROM/TO instructions are used for data exchange between CPU and the module.
PSnnX provides two kinds of data through the buffer memory. One is a monitor data, and the other is a control data. These two data are explained more precisely as follows.

Monitor Data

Monitor data provides some useful information about the running status of PSnnX module. These data are read-only. Following table shows the data can be monitored.

OFFSET				Description
Axis 1	Axis 2	Axis 3	Axis 4	
0	15	30	45	M Code
1	16	31	46	External Input Status
2	17	32	47	Running Status 1
3	18	33	48	Running Status 2
4	19	34	49	Destination Position Address (Low word)
5	20	35	50	Destination Position Address (High word)
6	21	36	51	Current Position Address (Low word)
7	22	37	52	Current Position Address (High word)
8	23	38	53	Machine Address (Low word)
9	24	39	54	Machine Address (High word)
10	25	40	55	Target Speed (Low word)
11	26	41	56	Target Speed (High word)
12	27	42	57	Current Speed (Low word)
13	28	43	58	Current Speed (High word)
14	29	44	59	Position Data Number
60				Flash Write Counter
61				Reserved
62				Reserved
63				OS Version
64	66	68	70	Warn Code
65	67	69	71	Error Code

Control Data

This memory area is used for controlling the PSnnX module. Before issuing a instruction, the related data have to be set properly.

OFFSET				Description
Axis 1	Axis 2	Axis 3	Axis 4	
72	117	162	207	Position Data Number (1 – 600)
73	118	163	208	Reserved
74	119	164	209	Axis Error Reset
75	120	165	210	Resume Request
76	121	166	211	M code OFF Request
77	122	167	212	External Signal Enable(1) / Disable(0)
78	123	168	213	New Position Address (Low word)
79	124	169	214	New Position Address (High word)
80	125	170	215	Reserved
81	126	171	216	Reserved
82	127	172	217	Reserved
83	128	173	218	Reserved
84	129	174	219	Reserved
85	130	175	220	Reserved
86	131	176	221	New Speed (Low word)
87	132	177	222	New Speed (High word)
88	133	178	223	Speed Change Request (1)
89	134	179	224	Inching Movement Amount
90	135	180	225	JOG Speed (Low word)
91	136	181	226	JOG Speed (High word)
92	137	182	227	OPR Request Flag Reset
93	138	183	228	MPG Multiplier
94	139	184	229	MPG Operation Enable (1) / Disable (0)
95	140	185	230	Reserved
96	141	186	231	Reserved
97	142	187	232	Reserved
98	143	188	233	Reserved
99	144	189	234	Reserved
100	145	190	235	Reserved
101	146	191	236	Target Position Address (Low word)
102	147	192	237	Target Position Address (High word)
103	148	193	238	Target Speed (Low word)
104	149	194	239	Target Speed (High word)
105	150	195	240	Target Address Change Request (1)
106	151	196	241	Simultaneous Start Position Data Number (Axis 1)

107	152	197	242	Simultaneous Start Position Data Number (Axis 2)
108	153	198	243	Simultaneous Start Position Data Number (Axis 3)
109	154	199	244	Simultaneous Start Position Data Number (Axis 4)
110	155	200	245	Step Operation Method
111	156	201	246	Step Operation Enable (1) / Disable (0)
112	157	202	247	Step Operation Command
113	158	203	248	Skip Request (1)
114	159	204	249	Teaching Data
115	160	205	250	Teaching Position Data Number
116	161	206	251	ABS Direction (only for unit of degree)
252				Reserved
253				Reserved
254				Flash Write Request (1)
255				Initialize to Factory Default (1)

6.10.5 Parameter

The parameters must be configured appropriately according to the machine, applicable motors etc.

- Basic Parameters
- Expanded Parameters
- OPR Parameters
- Common Parameters

Basic Parameters

Axis				Description	Initial Value	Remark
1	2	3	4			
0	50	100	150	Speed limit (low word)	200,000	mm [x10-2mm/min] : 1~2,000,000,000 inch [x10-3inch/min] : 1~2,000,000,000 degree [x10-3deg/min] : 1~2,000,000,000 pulse [pulse/sec] : 1~1,000,000
1	51	101	151	Speed limit (high word)		
2	52	102	152	Bias speed (low word)	1	
3	53	103	153	Bias speed (high word)		
4	54	104	154	Acceleration/Deceleration time #0	1,000	0 ~ 65,535 ms
5	55	105	155	Acceleration/Deceleration time #1	1,000	0 ~ 65,535 ms
6	56	106	156	Acceleration/Deceleration time	1,000	0 ~ 65,535 ms

				#2		
7	57	107	157	Acceleration/Deceleration time #3	1,000	0 ~ 65,535 ms
8	58	108	158	Number of pulses per rotation	20,000	1 ~ 65,535 pulse
9	59	109	159	Movement amount per rotation	20,000	1 ~ 65,535 [x10-1 ㎛ x10-5 inch, x10-5 degree, pulse]
10	60	110	160	Pulse Output Mode (Bit 0~ 1)	01	00 = PLS/DIR mode 01 = CW/CCW mode
				Unit setting (Bit 2~ 3)	00	00 = pulse 01 = mm 10 = inch 11 = degree
				Unit magnification (Bit 4~ 5)	00	00 = x 1 01 = x 10 10 = x 100 11 = x 1000
				Rotation direction setting (Bit 6)	0	0 = Increase address at forward rotate 1 = Increase address at reverse rotate

Expanded Parameters

Axis				Description	Initial Value	Remark
1	2	3	4			
11	61	111	161	Software stroke limit upper limit (low word)	2147483647	-2,147,483,648 ~ 2,147,483,647 [x10-1 ㎛ x10-5 inch, x10-5 degree, pulse]
12	62	112	162	Software stroke limit upper limit (high word)		
13	63	113	163	Software stroke limit lower limit (low word)	-2147483647	
14	64	114	164	Software stroke limit lower limit (high word)		
15	65	115	165	Backlash compensation amount	0	0 ~ 65,535 [x10-1 ㎛ x10-5 inch, x10-5 degree, pulse]
16	66	116	166	Positioning complete signal output time	300	0 ~ 65,535 ms
17	67	117	167	S-pattern ratio	100	1 ~ 100 %
18	68	118	168	External command function selection	0	0 = Start 1 = Speed/Position switching 3 = Skip
19	69	119	169	Sudden stop deceleration time	1000	0 ~ 65,535 ms
20	70	120	170	Acceleration/Deceleration pattern (Bit 0)	0	0 = Trapezoidal, 1 = S-Pattern
				M Code ON timing (Bit 1)	0	0 = WITH mode 1 = AFTER mode
				Current feed value during speed control (Bit 2~ 3)	00	00 = Do not update 01 = Update 10 = Update after clear
				Software limit detection during	0	JOG, Inching, MPG

				manual operation (Bit 4)		0 = allow, 1 = forbid
				Software limit coordination (Bit 5)	0	0 = Current Address. 1 = Machine Address
				Speed/Position switching method (Bit 6)	0	0 = by Incremental Coord. 1 = by Absolute Coord.
				Use External command (Bit 7)	0	0 = Not used 1 = Used
				Use External STOP (Bit 8)	0	0 = Not used 1 = Used
				Sudden stop group #1 (Bit 9)	0	0 = Normal Stop 1 = Sudden Stop
				Sudden stop group #2 (Bit 10)	0	
				Sudden stop group #3 (Bit 11)	0	
21	71	121	171	Logical Input selection	Bit 00 : LMT U	0	0 = Low Active 1 = High Active
					Bit 01 : LMT L	0	
					Bit 02 : DOG	0	
					Bit 03 : STOP	0	
					Bit 04 : ECMD	0	
					Bit 05 : RDY	0	
22	72	122	172	JOG speed limit value (low word)		20000	mm [x10-2mm/min] : 1~2,000,000,000 inch [x10-3inch/min] : 1~2,000,000,000 degree [x10-3deg/min] : 1~2,000,000,000 pulse [pulse/sec] : 1~1,000,000
23	73	123	173	JOG speed limit value (high word)			
24	74	124	174	JOG Operation acceleration time selection		0	0 – 3 (Acc/Dec number)
25	75	125	175	JOG Operation deceleration time selection		0	0 – 3 (Acc/Dec number)

OPR Parameters

Axis				Description	Initial Value	Remark
1	2	3	4			
30	80	130	180	OP address (low word)	0	-2,147,483,648 ~ 2,147,483,647 [x10-1 ㎛ x10-5 inch, x10-5 degree, pulse]
31	81	131	181	OP address (high word)		
32	82	132	182	OPR speed (low word)	20,000	mm [x10-2mm/min] : 1~2,000,000,000 inch [x10-3inch/min] : 1~2,000,000,000 degree [x10-3deg/min] : 1~2,000,000,000 pulse [pulse/sec] : 1~1,000,000
33	83	133	183	OPR speed (high word)		
34	84	134	184	Creep speed (low word)	2,000	
35	85	135	185	Creep speed (high word)		
36	86	136	186	OPR method (Bit 0~ 2)	000	0(000) Detect zero after DOG OFF 1(001) Detect zero after deceleration when DOG ON

						2(010) Detect limit and zero signal 3(011) Detect DOG
				OPR direction (Bit 3)	0	0 = forward 1 = reverse
37	87	137	187	OPR Acc/Dec number	0	0 ~ 3 (Acc/Dec number)
38	88	138	188	OPR dwell time	0	0 ~ 65,535 ms
39	89	139	189	OPR compensation (low word)	0	-2,147,483,648 ~ 2,147,483,647 [x10-1 ㎛ x10-5 inch, x10-5 degree, pulse]
40	90	140	190	OPR compensation (high word)		
41	91	141	191	Deviation counter clear signal time	50	1 ~ 65,535 ms

Common Parameters

Axis				Description	Initial Value	Remark
1	2	3	4			
200				Pulse output Logic	0	0 = High Active 1 = Low Active

6.10.5.1 Basic Parameters

IN THIS TOPIC :

Speed Limit

Designate the applicable maximum speed. All the speed in sequence program or position data must be lower than this parameter. Otherwise, the axis error will be issued.

PSnnX module has different speed resolution according to the configuration of this parameter.

Speed Limit	Resolution (pulse)
1 ~ 8,000	1
8,001 ~ 16,000	2
16,001 ~ 40,000	5
40,001 ~ 80,000	10
80,001 ~ 160,000	20

160,001 ~ 400,000	50
400,001 ~ 800,000	100
800,001 ~ 1,000,000	200

This resolution table is applied to all speed data, such as bias speed, positioning command in sequence program, OPR speeds and so on. Speed data must be multiple of resolution value of above table. If the speed value used is not multiple of resolution value, PSnnX will choose automatically the near most value among the multiple of resolution. But, if the selected speed is lower than bias speed, the bias speed will be selected.

Bias Speed

This parameter designates the initial speed of pulse output. The bias speed has to be defined to allow the motor to start smoothly especially when a stepping motor is used. A stepping motor will not start smoothly if a low rotation speed is instructed at the beginning. This speed cannot be set higher than speed limit.

Acceleration / Deceleration Time (0~3)

Acceleration time specifies the time for the speed to increase from zero to the speed limit value. And deceleration time specifies the time for the speed to decrease from the speed limit value to zero. In normal case, the positioning speed is lower than the speed limit value, thus the actual acceleration/deceleration time will be relatively short. The actual time for acceleration/deceleration can be calculated by following formula.

T = V x Ts / Vmax

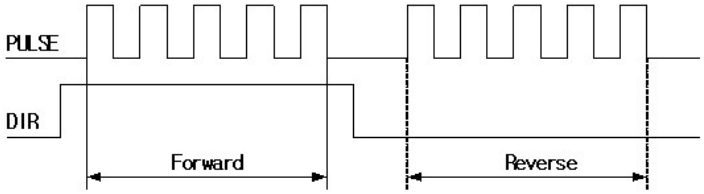
- V : Destination Speed,
- Ts : Acc/Dec time in parameter
- Vmax : Speed limit in parameter

Pulse Output Mode

Set the pulse output mode to match the servo amplifier being used. Pulse output signal is specified by the ‘ pulse output logic’ parameter setting also. Followings are based on ‘ high active’ setting of ‘ pulse output logic’ parameter.

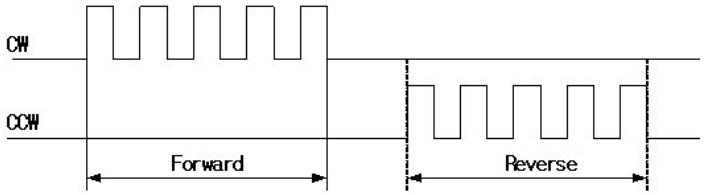
PLS/DIR mode

Forward run and reverse run are controlled with the ON/OFF of the direction sign (SIGN).



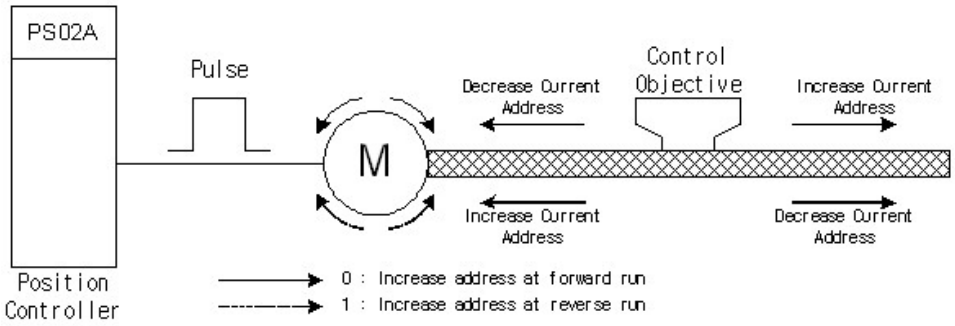
CW/CCW

During forward run, the forward run feed pulse (CW) will be output.
During reverse run, the reverse run feed pulse (CCW) will be output.



Rotation direction setting

Set the relation of the motor rotation direction and current address increment/decrement.

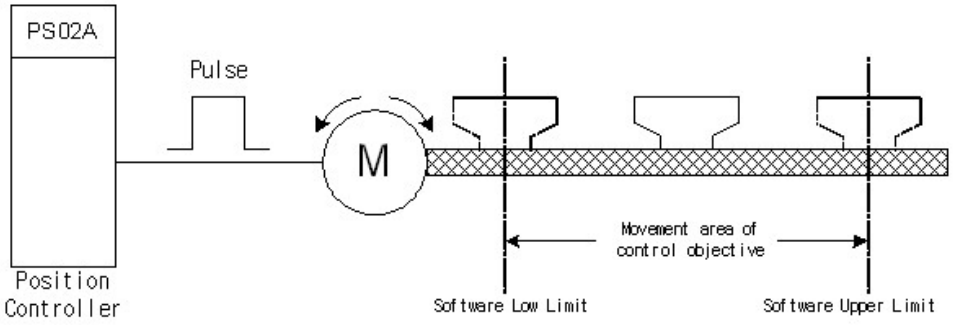


6.10.5.2 Expaned Parameters

IN THIS TOPIC :

Sudden Stop Group (#1 ~ #3)
Logical Input Selection

Software Limits



Set the lower/upper limit for the machine' s movement range during positioning control. The software limit is verified all the time during system running except for following special cases :

- When the unit is ' degree' , the software limit check is invalid during speed control or during manual control.
- During manual operation, software limit checking is performed according to the setting of ' Software limit detection during manual operation'
- To invalidate the software limit, set the setting value to ' upper limit value = lower limit value' . (The setting value can be anything.)

Software limit is verified when the positioning instruction is issued and during running. With the control unit set to ' degree' , the software upper and lower limit values are 0 to 359.99999. To validate the software limit checking, set the lower and the upper limit value in a clockwise direction.

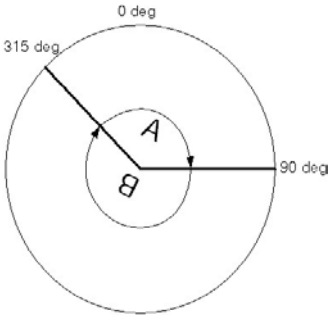
Example

To set the movement range A :

lower limit : 315 upper limit : 90

To set the movement range B :

lower limit : 90 upper limit : 315

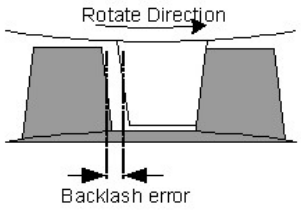


In absolute positioning system with unit of ‘ degree’ , software limit setting influences the actual movement :

- When the software limit checking is allowed : The positioning is carried out in a clockwise/ counterclockwise direction depending on the software limit range setting method. Because of this, positioning with ‘ shortcut control’ may not be possible.
- When the software limit checking is forbidden : Positioning is carried out in the nearest direction to the designated address, using the current value as a reference. This is called ‘ shortcut control’ .

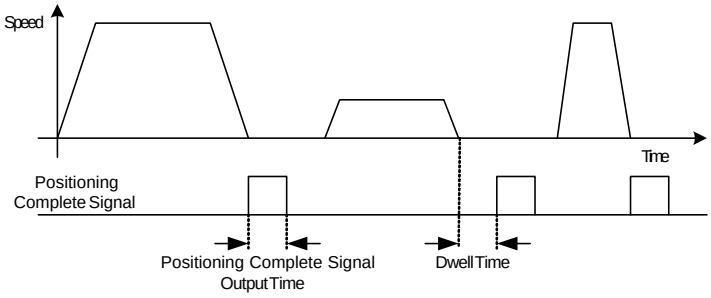
Backlash compensation amount

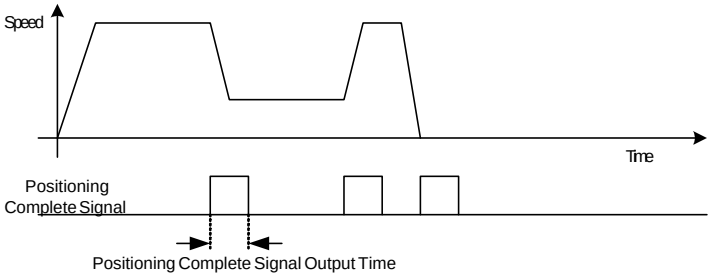
The error that occurs due to backlash when moving the machine via gears can be compensated. When the Backlash compensation amount amount is set, pulses equivalent to the compensation amount will be output each time the direction changes during positioning.



Positioning Complete Signal Output Time

Set the output time of the positioning complete signal output from PSnnX. A positioning completes when the specified dwell time has passed after the PSnnX terminated the output.



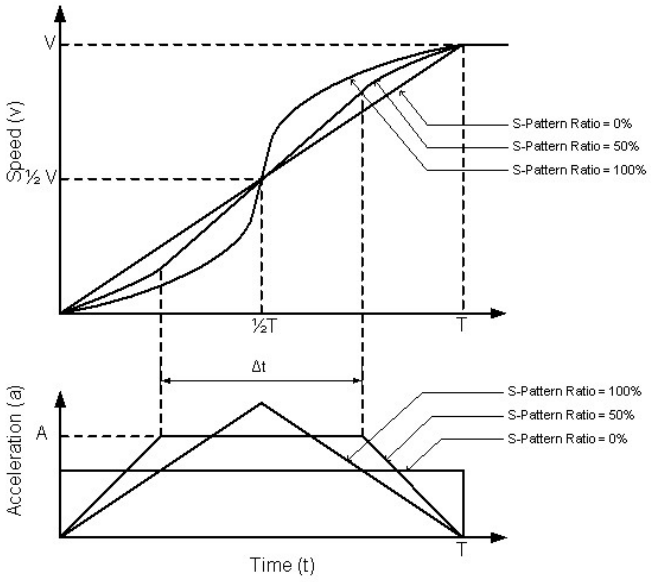


S-Pattern Ratio

This parameter is effective when the ' Acc/Dec pattern' is configured as S-Pattern (1). S-Pattern reduces the burden of motor during starting and stopping. This is a method in which acceleration/deceleration is carried out gradually, based on the acceleration time, deceleration time, speed limit value, and S-Pattern ratio set by the user.

When the stepping motor is used, the S-Pattern acceleration/deceleration processing method cannot be carried out. When using this processing method, ensure to use a servo motor.

Followings explain the concept of S-Pattern ratio. S-Pattern acceleration/deceleration is composed with 3 different acceleration/deceleration stages.



- 1st Stage : Increase the acceleration/deceleration value
- 2nd Stage : retain a constant acceleration/deceleration value
- 3rd Stage : decrease the acceleration/deceleration value

S-Pattern ratio is a time ratio of 2nd stage compared to the total acceleration/deceleration time (T). It can be presented as a following formula.

S-Pattern Ratio (%) = ((T – Δt) / T) x 100

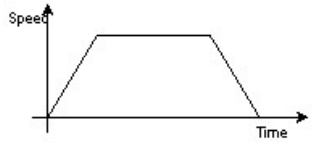
When Δt is ' 0' , the S-Pattern ratio will be 100%. In that case, the 2nd stage will be skipped and as a result, the variation of speed will be large most. When Δt is T, the S-Pattern ratio will be 0%. As a result, the S-Pattern acceleration/deceleration will be the same pattern with the trapezoidal.

Acceleration / Deceleration Pattern

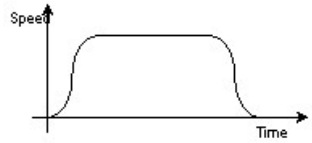
Set whether to use automatic trapezoid acceleration/deceleration or S-Pattern acceleration/deceleration for the acceleration/deceleration process.

Trapezoidal

The acceleration and deceleration are linear.



The acceleration and deceleration follow a sine curve



M Code ON Timing

This parameter sets the M code ON signal output timing. Choose either WITH mode or AFTER mode as the M code ON signal output timing.

- With Mode : An M code is output and the M code ON signal is turned ON when a positioning operation starts.
- After Mode : An M code is output and the M code ON signal is turned ON when a positioning operation completes.

If the M code is set as zero, the M code ON signal will not be issued.

Sudden Stop Group (#1~#3)

Set the method to stop when the stop causes in the following stop groups occur.

- Stop Group 1 : Stop with hardware stroke limit
- Stop Group 2 : PLC Ready Signal OFF
- Stop Group 3 : External stop signal, Stop signal from PLC CPU, Error occurrence such as software limit,

Stop made when the near point DOG signal turns ON in OPR.

Logical Input selection

Set the I/O signal logic that matches the signaling specification of the connected external device. A mismatch in the signal logic will disable normal operation. Be careful of this when you change from the default value.

6.10.5.3 OPR Parameters

OPR is used to return a machine system at any position other than the OP to the OP. For normal operation of OPR, the parameters in this section will be configured properly.

IN THIS TOPIC :

OP Address

Set the address used as the reference point for positioning control. When the machine OPR is completed, the stop position address is changed to this address.

OPR Speed

Set the speed to be used in ‘ Fast OPR’ stage. This speed must be less than ‘ Speed Limit’ value and faster than the ‘ Creep speed’ .

Creep Speed

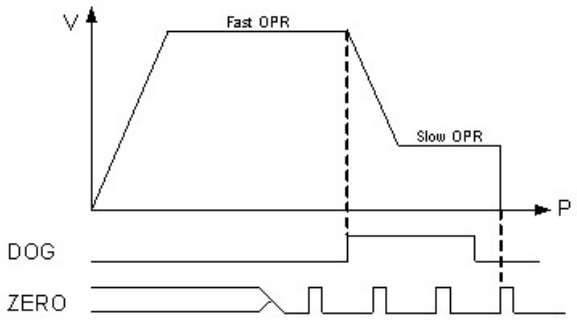
Set the speed to be used in ‘ Creep speed’ stage. This speed must be equal to or faster than the ‘ Bias

Speed' .

OPR Method

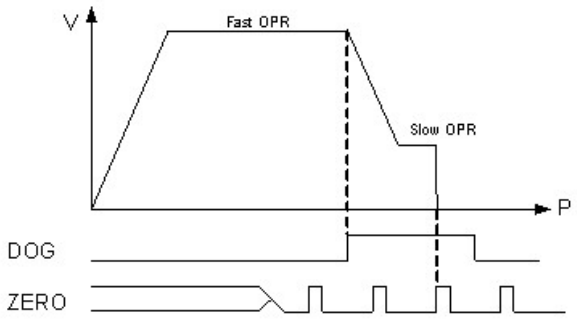
CM1-PSnnX supports 4 types of OPR.

[ZERO Detect after DOG OFF]



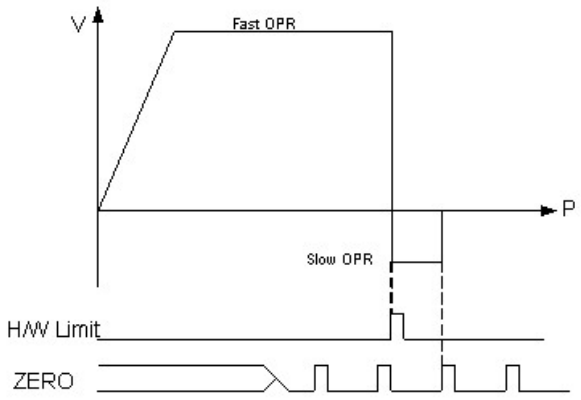
When the OPR instruction is issued, PSnnX performs a fast OPR with the designated direction in ' OPR direction' . When the DOG signal is detected as ON, PSnnX switches the speed to the ' Creep speed' . The ' Creep speed' will be continued until when the first ZERO signal detected after DOG signal OFF.

[ZERO Detect while DOG ON]



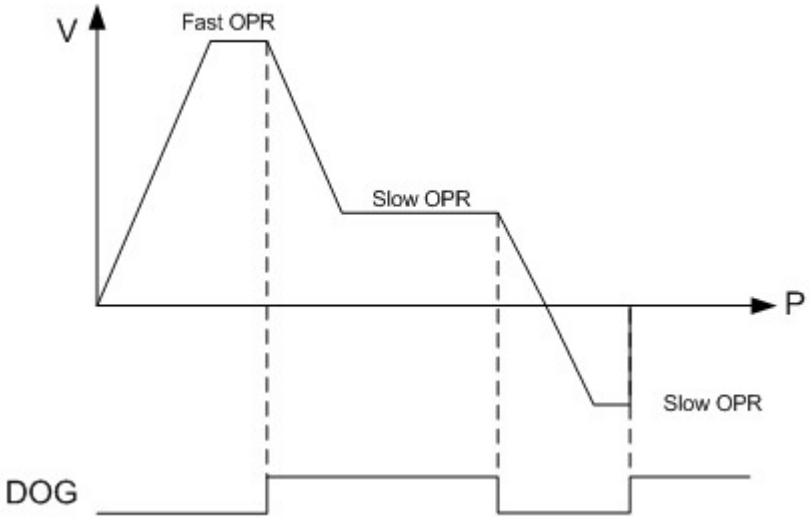
When the OPR instruction is issued, PSnnX performs a fast OPR with the designated direction in ' OPR direction' . When the DOG signal is detected as ON, PSnnX switches the speed to the ' Creep speed' . The ' Creep speed' will be continued until when the first ZERO signal detected while DOG signal is ON.

[ZERO Detect after Hardware Limit Signal]



When the OPR instruction is issued, PSnnX performs a fast OPR with the designated direction in ' OPR direction' . When one of the hardware limit signal is detected as ON, PSnnX changes the direction and move backward with Creep speed. This backward movement will be continued until when the first ZERO signal is detected.

[Only with DOG Signal]



When the OPR instruction is issued, PSnnX performs a fast OPR with the designated direction in 'OPR direction'. When the DOG signal is detected as ON, PSnnX will change the speed to 'Creep Speed'. Forward movement will be continued until when the DOG signal changes from ON to OFF. After the detection of DOG signal OFF, PSnnX will change the movement direction to backward. And this movement will be continued until the DOG signal ON again.

OPR Direction

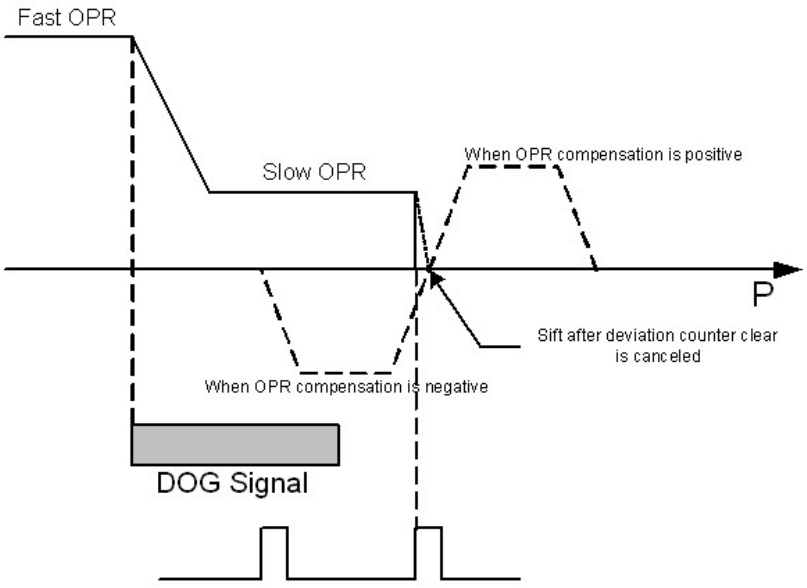
Set the direction to start movement when starting machine OPR.

OPR Dwell Time

This setting is used when the OPR movement is completed. After this time the ‘ OPR complete’ signal will be issued.

OPR Compensation

After returning to the machine OP, this function compensates the position by the designated distance from the machine OP position and sets that position as the OP address. If there is a physical limit to the OP position, such as the near-point dog installation position, use this function to compensate the OP to an optimum position.



6.10.5.4 Common Parameters

Pulse Output Logic

Set the logic of the driver pulse output.

0 : High Active

1 : Low Active

6.10.6 Position Data

What is Position Data

Position data can be defined up to 600 for each axis. Each position data stores the position address, moving method/speed/time and other information about a position control. A position data occupies 10 words of internal flash memory.

Details of Position Data

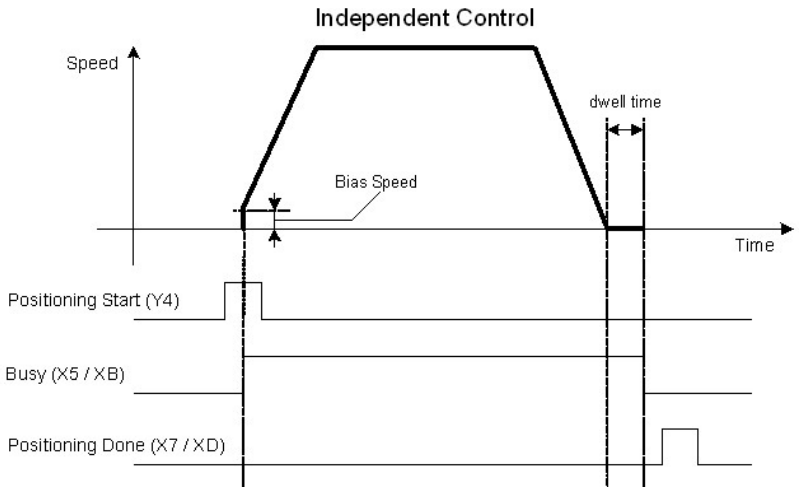
Memory Offset (Axis)				Description	Initial Value	Remark	
1	2	3	4				
500	6500	12500	18500	Control Type (bit 0 ~ 1)	00	00 : Independent 01 : Continuous	Position Data #1
				Interpolation Axes (bit 2 ~ 3)	00	0 : Not interpolation 1 : X 2 : Y	
				Acceleration Number (bit 4 ~ 5)	00	00 : Acc/Dec #1 01 : Acc/Dec #2 10 : Acc/Dec #3 11 : Acc/Dec #4	
				Deceleration Number (bit 6 ~ 7)	00		
				Control Instruction (bit 8 ~ 15)	00	01h : ABS 02h : ABS2 03h : ABS3 04h : ABS4 05h : INC 06h : INC2 07h : INC3 08h : INC4 09h : FEED 0Ah : FEED2 0Bh : FEED3 0Ch : FEED4 0Dh : ACIS 0Eh : ICIS 0Fh : ACW 10h : ICW 11h : ACCW	

						12h : ICCW 13h : FSC 14h : FSC2 15h : FSC3 16h : FSC4 17h : RSC 18h : RSC2 19h : RSC3 1Ah : RSC4 80h : NOP 81h : JUMP 82h : LOOP 83h : LEND 84h : POS	
501	6501	12501	18501	M code	0	0 ~ 65535	
502	6502	12502	18502	Dwell time	0	0 ~ 65535 mS	
503	6503	12503	18503	Reserved	0		
504	6504	12504	18504	Speed (Low word)	0	mm [x10-2mm/min] : 1~2,000,000,000 inch [x10-3inch/min] : 1~2,000,000,000 degree [x10-3deg/min] : 1~2,000,000,000 pulse [pulse/sec] : 1~1,000,000	
505	6505	12505	18505	Speed (High word)			
506	6506	12506	18506	Destination Address or Movement Amount (Low word)	0	-2,147,483,648 ~ 2,147,483,647 [x10-1 ㎛ x10-5 inch, x10-5 degree, pulse]	
507	6507	12507	18507	Destination Address or Movement Amount (High word)			
508	6508	12508	18508	Circular Interpolation Address (Low word)	0	-2,147,483,648 ~ 2,147,483,647 [x10-1 ㎛ x10-5 inch, x10-5 degree, pulse]	
509	6509	12509	18509	Circular Interpolation Address (High word)			
. . .							
6490 - 6499	12490 - 12499	18490 - 18499	24490 - 24499				Position Data #600

6.10.6.1 Control Type

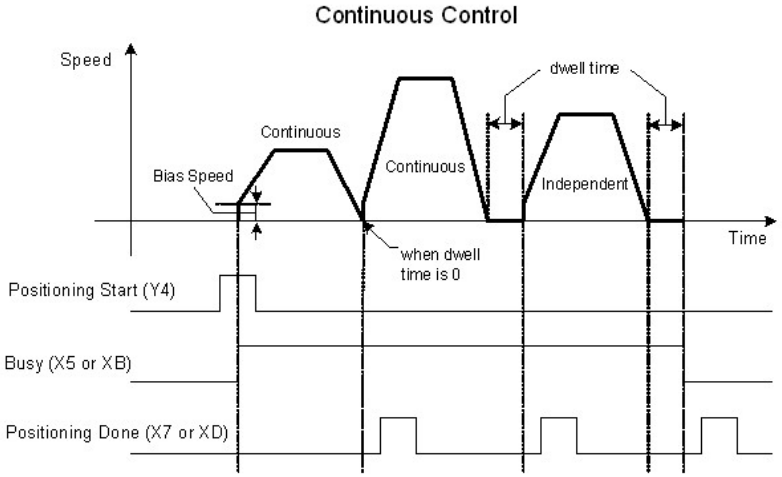
Independent

This control is set when executing only one designated data item of positioning. If a dwell time is designated, the positioning will complete after the designated time expires.
Or if this control is used at the end of positioning data list, this data becomes the end of block data when carrying out block positioning. The positioning will stop after this data.



Continuous

This control is used when a series of positioning control is needed. The last position data of this chain must be designated as independent control type to finish the positioning. The machine always automatically decelerates each time the positioning is completed. Acceleration is then carried out after the speed reaches 0 to carry out the next positioning data operation. If a dwell time is designated, the acceleration is carried out after the designated time expires. In operation by continuous positioning control, the next positioning number is automatically executed.



6.10.6.2 Interpolation Area

Set the axes that is interpolated with current axes. Current axes treated as main axes. This setting is valid only when interpolation instruction is used. If the instruction is non-interpolation type, this setting has no meaning. But when the interpolation instruction is used, this setting must designate the sub axes.

- **Not Interpolation (00) :** Use this setting on non-interpolated control.
- **X (01) :** Use this setting when the Y axis is the main axis and the X axis is sub-axis.
- **Y (10) :** Use this setting when the Y axis is the main axis and the X axis is sub-axis.

6.10.6.3 Acceleration/Deceleration Number

Designate the number of acceleration/deceleration time in basic parameter to be applied.

6.10.6.4 Control Instruction

Control Instruction :

- ABS
- INC
- FEED
- ACIS (absolute address) / ICIS (incremental address)
- ACW (absolute address) / ICW (incremental address)
- ACCW (absolute address) / ICCW (incremental address)
- FSC (forward) / RSC (reverse)
- NOP
- JUMP
- LOOP / LEND
- POS

ABS

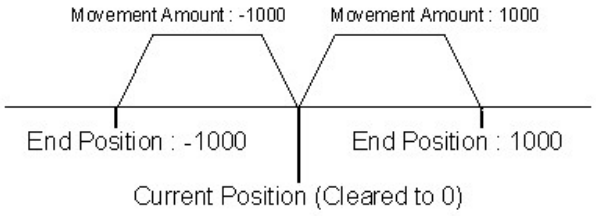
Positioning is carried out from the current stop position to the designated address. The destination positioning address must be absolute address.
All the addresses are based on the address established by machine OPR. The moving direction is decided automatically by comparing the current and the destination position address.

INC

Positioning is carried out from the current stop position by the designated amount of movement. The direction is determined by the sign of the movement amount. If the movement amount is negative value, the direction will be reverse. All the addresses are based on the address established by machine OPR.

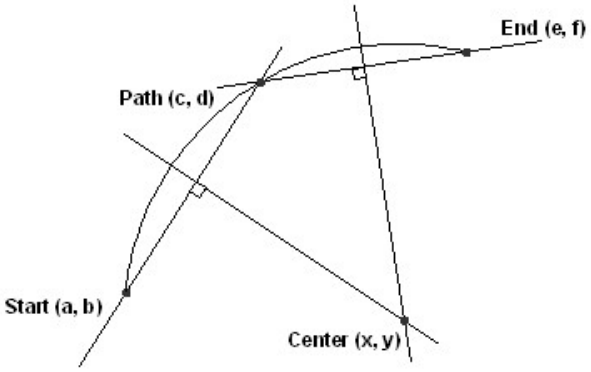
FEED

The address of the current stop position (start point address) is set to ‘ 0’ . Positioning is then carried out to a position designated by movement amount.



ACIS (absolute address) / ICIS (incremental address)

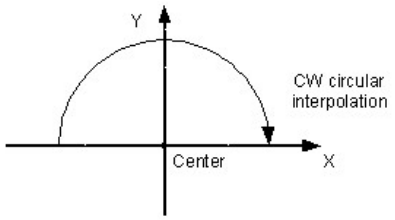
One of the circular interpolation instruction. This instruction needs a point which is located in the path of movement.



For using this circular interpolation instruction, the path point must be defined in ‘ Circular Interpolation Address’ field. The resulting control path is an arc having as its center the intersection point of perpendicular bisectors of a straight line between the start point address and sub point address, and a straight line between the sub point address and end point address.

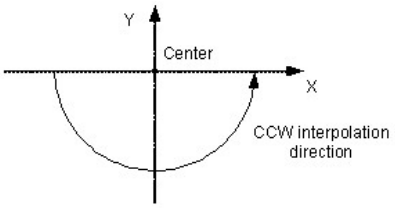
ACW (absolute address) / ICW (incremental address)

This instruction is a kind of circular interpolation, and two motors are used to carry out position control in an arc path having a designated center point, while carrying out interpolation for the direction of clock-wise. The center point must be designated in ‘ Circular Interpolation Address’ field.



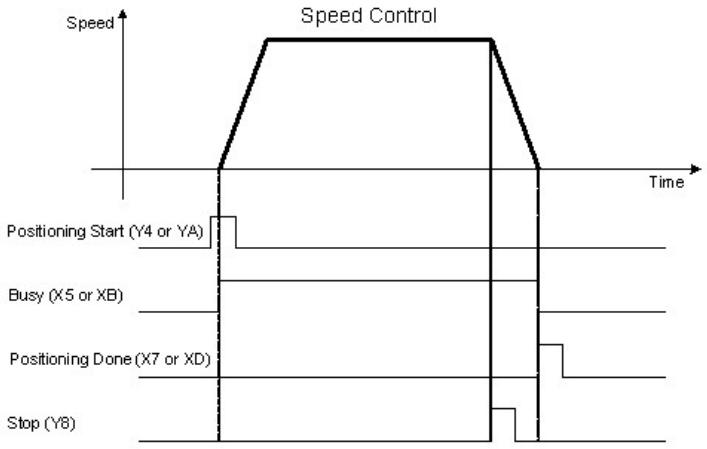
ACCW (absolute address) / ICCW (incremental address)

This instruction is a kind of circular interpolation, and two motors are used to carry out position control in an arc path having a designated center point, while carrying out interpolation for the direction of counter-clockwise. The center point must be designated in ‘ Circular Interpolation Address’ field.



FSC (forward) / RSC (reverse)

This instruction controls the speed. After issuing of this instruction, PSnnX outputs pulse with designated speed until axis stop signal from Y8 or YE. The speed must be designated in the ‘ Speed’ field. During the speed control, current address value update is dependent on the setting of ‘ Current feed value during speed control’ in extended parameter.



NOP

No operation.

JUMP

This instruction is used to change the next positioning data to execute. In continuous control the next number of position data is automatically executed. But, this instruction changes the next position data to execute. The number of position data must be designated in ‘ dwell time’ field.

LOOP / LEND

This instruction is used to execute position data repeatedly. Position data between LOOP and LEND are executed repeatedly for designated times in ‘ M code’ field.

POS

This instruction is used to change the current position address to the designated address in ‘ Destination Address’ field. The machine position address does not affected by this instruction.

6.10.6.5 M Code

Set this item when carrying out sub work (clamp and drill stops, tool replacement, etc.) corresponding to the code number related to the positioning data execution. X8 or XF point is turned ON depending on the configuration of expended parameter ‘ M code ON timing’ . There are two modes for M code ON. During the M code is ON, the next positioning data is not executed. M code can be cleared by sequence program in PLC CPU.

6.10.6.6 Dwewll Time

Set the time the machine dwells after the positioning stop to the output of the positioning done signal.

6.10.6.7 Speed

Set the speed for speed control function.

6.10.6.8 Destination Address / Movement Amount

Set the destination position address (absolute) or movement amount (incremental). In speed control instruction, this setting is ignored.

6.10.6.9 Circular Interpolation Address

Set the path point address or center point address for circular interpolation. This setting is effective only in circular interpolation functions.

6.10.7 Dedicated Instructions for Positioning

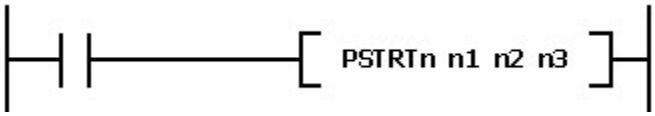
Dedicated Instructions for Positioning :

- PSTRT1 , PSTRT2

- PFWRT
- PINIT
- POSCTRL

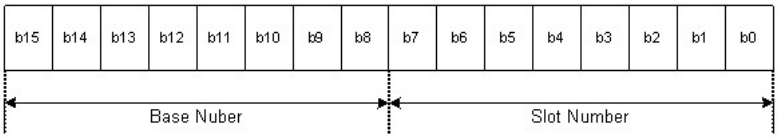
6.10.7.1 PSTRT1, PSTRT2

This instruction starts the positioning control of the designated axis of the PSnnX.



n1 : Base and slot number

This parameter specifies which module the instruction to be issued.



- High Byte : Base Number (00h ~ 10h, 00h : local base)
- Low Byte : Slot Number (00h ~ 0Bh)

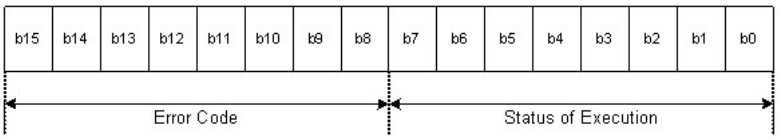
n2 : Number of position data

n2 parameter specifies the position number to be executed. The position data specified by this number must be stored in flash memory of PSnnX.

- 1~600 : Position data number
- 9001 : Machine OPR
- 9002 : Fast OPR
- 9003 : Change the current position address
- 9004 : Multiple axis simultaneous start

n3 : Device memory where the result flags to be stored

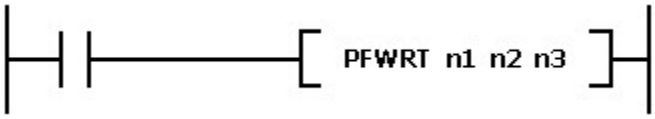
The device memory must be a word. M, L, K, D area can be used with this instruction. After issuing the instruction, the result of execution is stored in this memory as following :



- High Byte : Error code will be stored
- Low Byte : Flags representing execution status are stored.
  a. Bit 0 : Processing the instruction.
  b. Bit 1 : The execution of the instruction is completed.
  c. Bit 2 : Error on execution of the instruction (this flag is set with bit 1)
  d. Bit 3~7 : Reserved

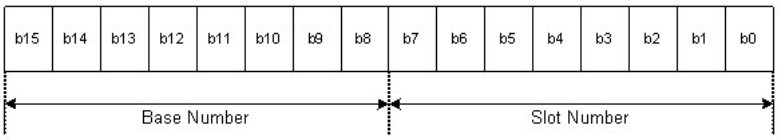
6.10.7.2 PFWRT

This instruction is used to write the PSnnX parameters, positioning data and block data to the flash memory. The flash memory of PSnnX can be rewritten up to 100,000 times. But, PSnnX limits this to 25 times after every power ON. This limitation is for the purpose of protecting the flash memory damage from sequence program mistake.



n1 : Base and slot number

This parameter specifies which module the instruction to be issued.



- High Byte : Base Number (00h ~ 10h, 00h : local base)
- Low Byte : Slot Number (00h ~ 0Bh)

n2 : Data type to be stored

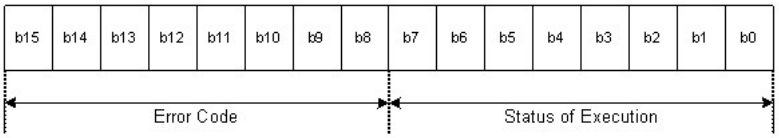
Use one of following codes according to the data type to store

- 0 : All data (parameters, position data)

- 1 : Parameters
- 2 : Position Data

n3 : Device memory where the result flags to be stored

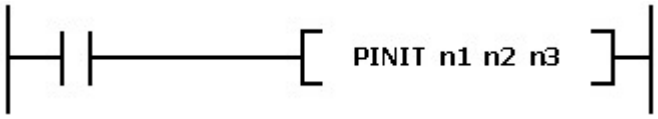
The device memory must be a word. M, L, K, D area can be used with this instruction. After issuing the instruction, the result of execution is stored in this memory as following :



- High Byte : Error code will be stored
- Low Byte : Flags representing execution status are stored.
  a. Bit 0 : Processing the instruction.
  b. Bit 1 : The execution of the instruction is completed.
  c. Bit 2 : Error on execution of the instruction (this flag is set with bit 1)
  d. Bit 3~7 : Reserved

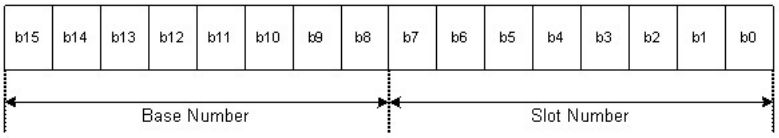
6.10.7.3 PINIT

This instruction is used to initialize the setting data to the factory default. After issuing this instruction, all data in flash memory is cleared to the default.



n1 : Base and slot number

This parameter specifies which module the instruction to be issued.



- High Byte : Base Number (00h ~ 10h, 00h : local base)

- Low Byte : Slot Number (00h ~ 0Bh)

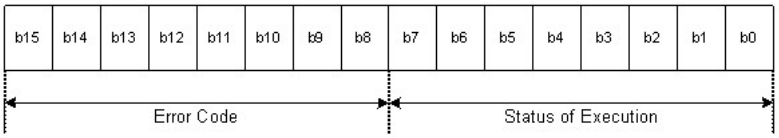
n2 : Data type to be initialized

Use one of following codes according to the data type to initialize

- 0 : All data (parameters, position data)
- 1 : Parameters
- 2 : Position Data

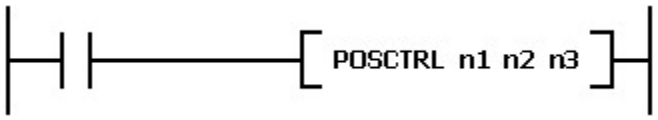
n3 : Device memory where the result flags to be stored

The device memory must be a word. M, L, K, D area can be used with this instruction. After issuing the instruction, the result of execution is stored in this memory as following format.



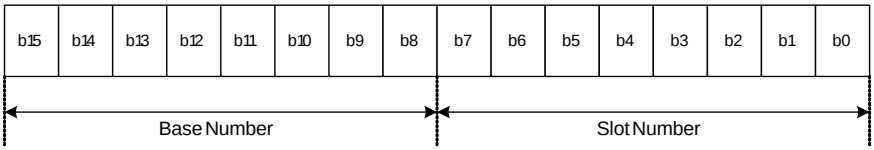
- High Byte : Error code will be stored
- Low Byte : Flags representing execution status are stored.
  a. Bit 0 : Processing the instruction.
  b. Bit 1 : The execution of the instruction is completed.
  c. Bit 2 : Error on execution of the instruction (this flag is set with bit 1)
  d. Bit 3~7 : Reserved

6.10.7.4 POSCTRL



n1 : Base and slot number

This parameter specifies which module the instruction to be issued.



High Byte : Base Number (00h ~ 10h, 00h : local base)
Low Byte : Slot Number (00h ~ 0Bh)

n2 : Control Data

This must be designated with a block of word device. M, L, K, D area can be used as this block. The designated device is the first device memory of 12 or 4 words sized continuous memory block. The precise data for control are stored in this memory block.
A control code is included in this memory block. According to this control code, two different sized memory blocks are used. One is 4 words and the other is 12 words sized block. The 4 words sized block is used at 3 simple controls such as changing position address or speed. The 12 words sized block is used for more complicated control. Following tables show the structures of these two differently sized blocks.

(N2)	Axis Number
(N2+1)	Control Code
(N2+2)	Control Data (Low Word)
(N2+3)	Control Data (High Word)

When the 'Control Code' is other values than 10

(N2)	Axis Number
(N2+1)	Control Code (10)
(N2+2)	Control Command
(N2+3)	M Code
(N2+4)	Dwell Time
(N2+5)	Reserved (0)
(N2+6)	Speed (Low Word)
(N2+7)	Speed (High Word)
(N2+8)	Destination Address (Low)
(N2+9)	Destination Address (High)
(N2+10)	Circular Interpolation Data (Low)
(N2+11)	Circular Interpolation Data (High)

When the 'Control Code' is 10 (Positioning Data)

Axis Number (N2)

Assign the number of axes to control.

- 1 : Axis 1
- 2 : Axis 2

Control Code (N2+1)

Assign one of following codes.

- 1 : Change the current position address. 2 more words must be followed for new position address.
- 2 : Change the current speed. 2 more words must be followed for new speed.
- 6 : Change the destination position address. 2 more words must be followed for new destination position address.
- 9 : Clear the error code. 2 more words must be followed. Each word must be set as 1 and 0.
- 10 : Issue a control by position data. 10 more words must be followed for position data.

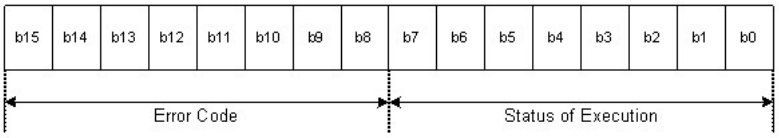
Control Data ([N2+2] ~ [N2+11])

According to the control code, 2 or 10 more words are needed. The detail information of these words are explained as below.

- Control Code 1 : New position address (2 words)
- Control Code 2 : New speed (2 words)
- Control Code 6 : New destination position address (2 words)
- Control Code 9 : The first word must be set as 1 and the second word as 0 (2 words)
- Control Code 10 : 10 more words follow. These words have the same format as position data. The detail information of the position data are described in former section. Refer to that section.

n3 : Device memory where the result flags to be stored

The device memory must be a word. M, L, K, D area can be used with this instruction. After issuing the instruction, the result of execution is stored in this memory as following format.



- High Byte : Error code will be stored
- Low Byte : Flags representing execution status are stored.
  a. Bit 0 : Processing the instruction.
  b. Bit 1 : The execution of the instruction is completed.
  c. Bit 2 : Error on execution of the instruction (this flag is set with bit 1)
  d. Bit 3~7 : Reserved

6.10.8 CICON-The configuration Tool

"CICON" :

- Provides convenient interface to edit program easily.
- Supports link function of various types by using CPU Loader, RS232C/422/485 and Ethernet.
- Enables to diagnose program errors and system by using debug functions easily.

CICON - The configuration Tool :

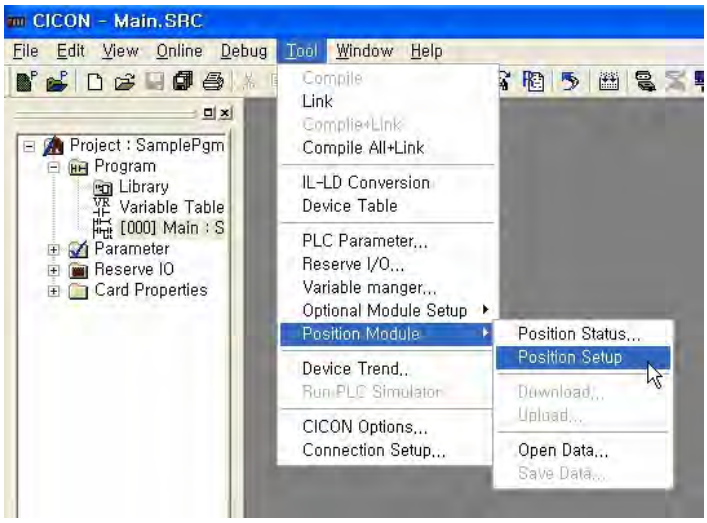
- Open / Create a Configuration Data
- Save a Configuration Data
- Parameter Configuration
- Position data configuration
- Upload from module
- Download module

6.10.8.1 Open / Create a Configuration Data

Create a new configuration data

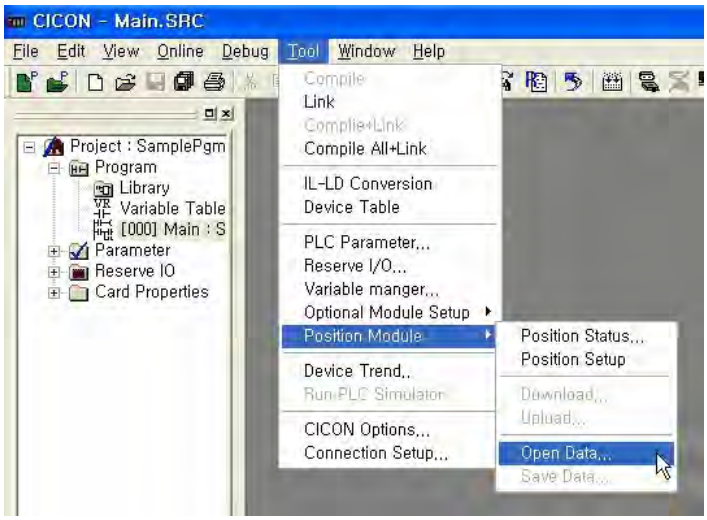
Select the menu ' Tool' - ' Position Module' – ' Position Setup'

A new window will be created and all the configuration can be performed on this window.



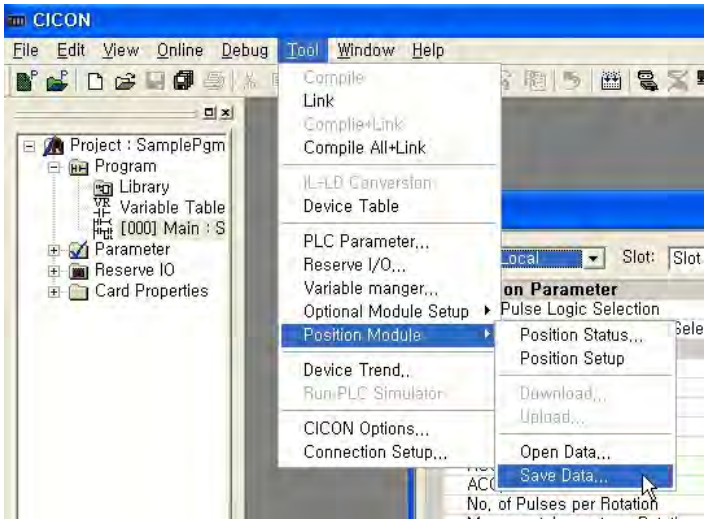
Open a configuration file

The configuration data of position module can be stored as a file. To open the configuration file, select the menu as ' Tool' –' Position Module' –' Open Data' .



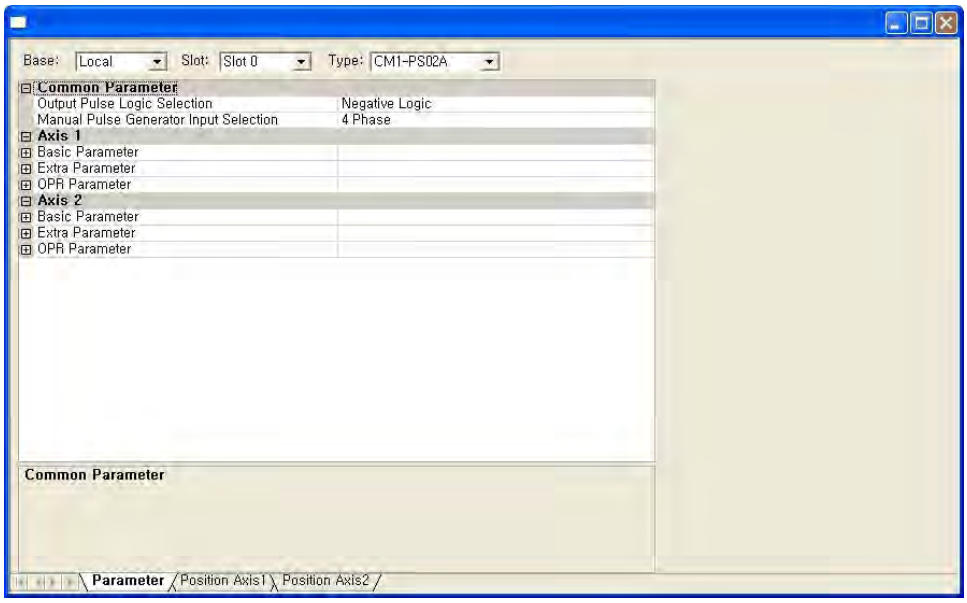
6.10.8.2 Save a Configuration Data

The configuration data can be stored as a file. To save the configuration data, select the menu as ' Tool' – ' Position Module' –' Save Data' .



6.10.8.3 Parameter Configuration

The configuration window has three tab-windows. All parameters can be configured in ' Parameter' tab.



After the configuration, the data can be downloaded to the position module or stored in a file. Use the menu ‘ Tool’ –‘ Position Module’ –‘ Download’ to download the configuration.

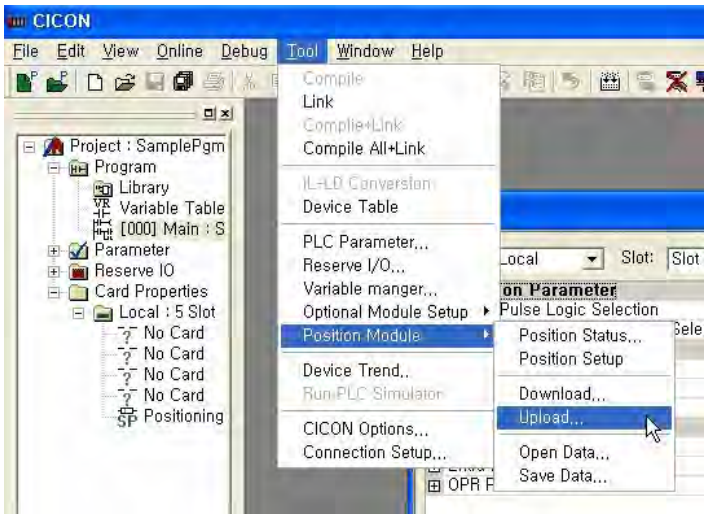
6.10.8.4 Position data configuration

Position data for each axis can be configured at ‘ Position Axis1’ and ‘ Position Axis2’ tab.

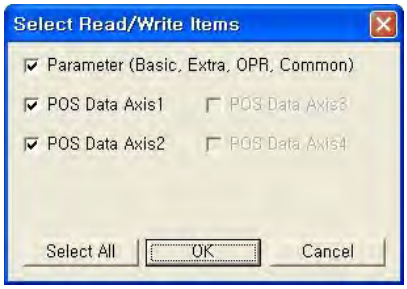
POS Data No.	Operation Pattern	Axis to be Interpolated	ACC Time No.	DEC Time No.	Control System	M code	Dwell time (msec)	Command Speed	Positioning Address	Arc Address	Description
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											

6.10.8.5 Upload from module

All configuration data can be uploaded from the PSnnX module. Use the menu ‘ Tool’ –‘ Position Module’ –‘ Upload’ . For this operation, CICON must be in on-line status with PLC.

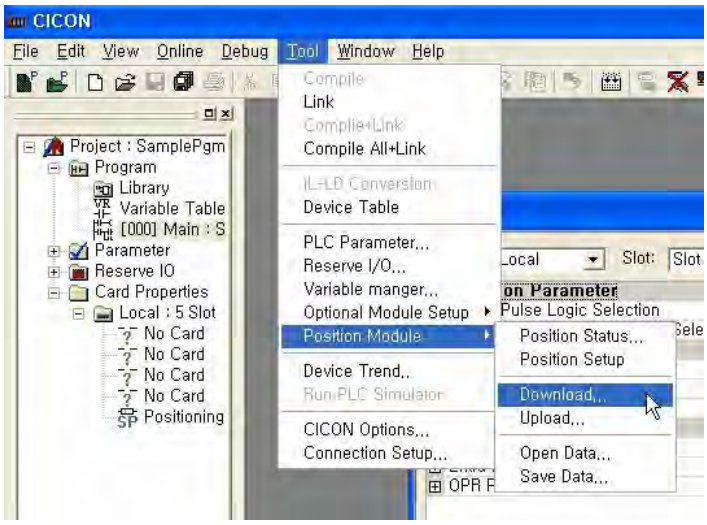


When the upload menu is activated, following dialog box quires about the type of configuration data to be uploaded. Some of configuration data can be skipped to upload by un-checking the item.



6.10.8.6 Download module

All configuration data in configuration window can be downloaded to the PSnnX module. Use the menu ‘ Tool’ – ‘ Position Module’ – ‘ Download’ . For this operation, CICON must be in on-line status.



When the download menu is activated, following dialog box quires about the type of configuration data to be downloaded. Some of configuration data can be skipped to download by un-checking the item.

Check the ' Write to flash memory after download' item to save the configuration data in flash memory of PSnnX. If the data is downloaded without checking this item, the data is stored in RAM only. In that case, all the configuration data will be returned to the original data stored in flash memory after power off and on. It is useful when a number of trials are needed without affecting original configuration data.

6.10.9 Programming Examples

Variable Name	Device
Axis1_Err_Rst	X10
Axis1_For_InchingCmd	X11
Axis1_Rev_InchingCmd	X12
Axis1_ForwardJOG_Cmd	X13
Axis1_ReverseJOG_Cmd	X14
Axis1_OPR_Cmd	X15
Axis1_PosSingle_Cmd	X16
Axis1_PosCont_Cmd	X17
Axis1_Stop_Cmd	X18
Axis1_Restart_Cmd	X19
Axis1_Spd_Chg_Cmd	X1A
Axis1_ForSpdCtrl_Cmd	X1B
Axis1_RevSpdCtrl_Cmd	X1C
Axis1_PosWithMCode	X1D
Axis1_MCodeOff_Req	X1E
Axis1_POSCTRL_Cmd	X1F

The example program in this section assumes that the PLC is equipped with " CPU + PSnnX + XD16A + YR16A" . All input signals are defined as variables as Left :

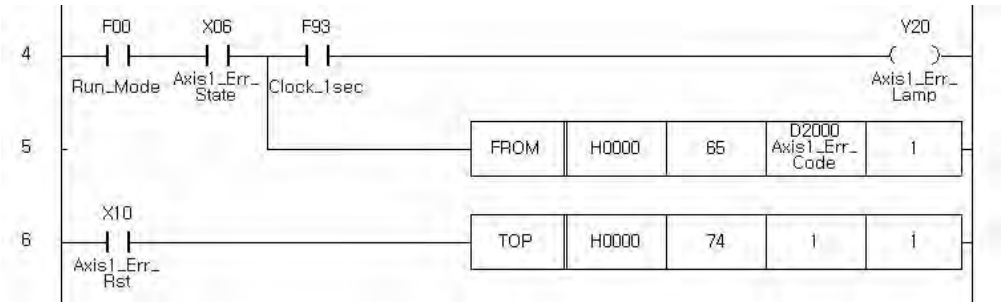
Contents :

6.10.9.1 Making the Module ready

First of all, for proper operation of PSnnX module, the PLC CPU Ready (Y0) signal must be turned ON. After the PSnnX module detects this signal, the module ready signal (X0) of PSnnX is turned ON.

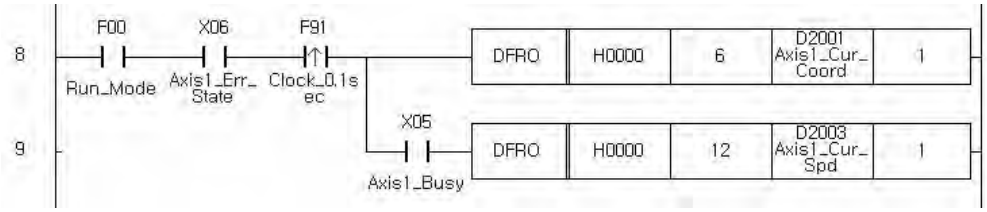
6.10.9.2 Reading the error code and reset

When there is a error in PSnnX module, the error code must be reset for further operation. Following sample program shows how to read the error code and reset it.



6.10.9.3 Reading the current position address

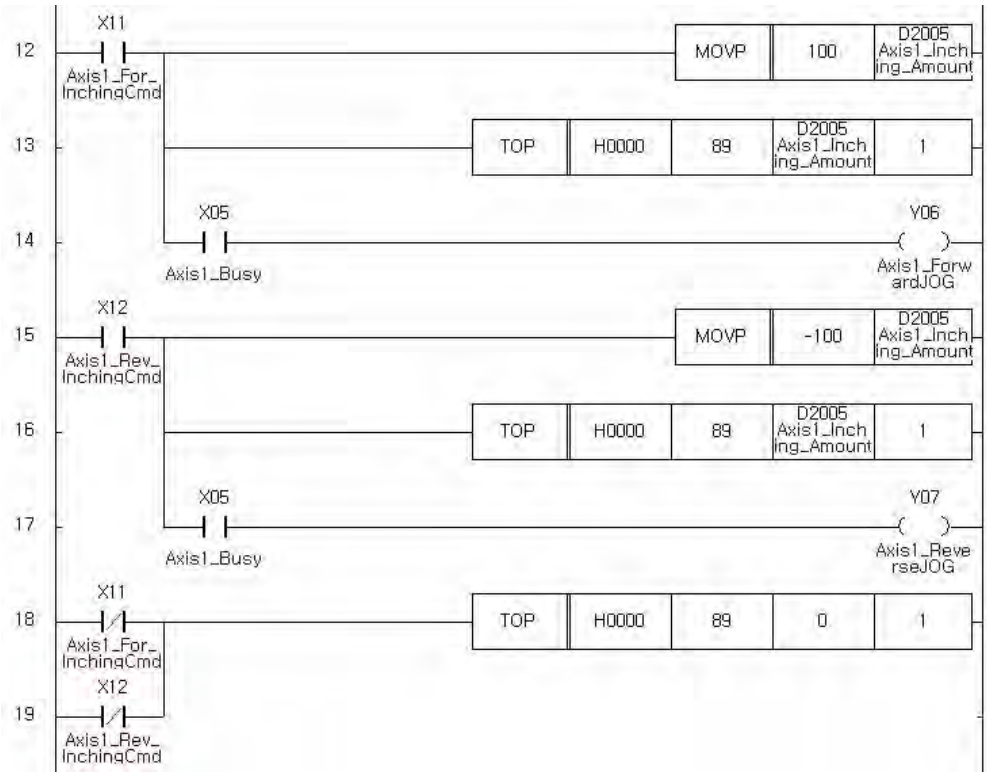
Following example shows how to read the current position address and speed from the monitor data area of PSnnX.



6.10.9.4 Inching/JOG

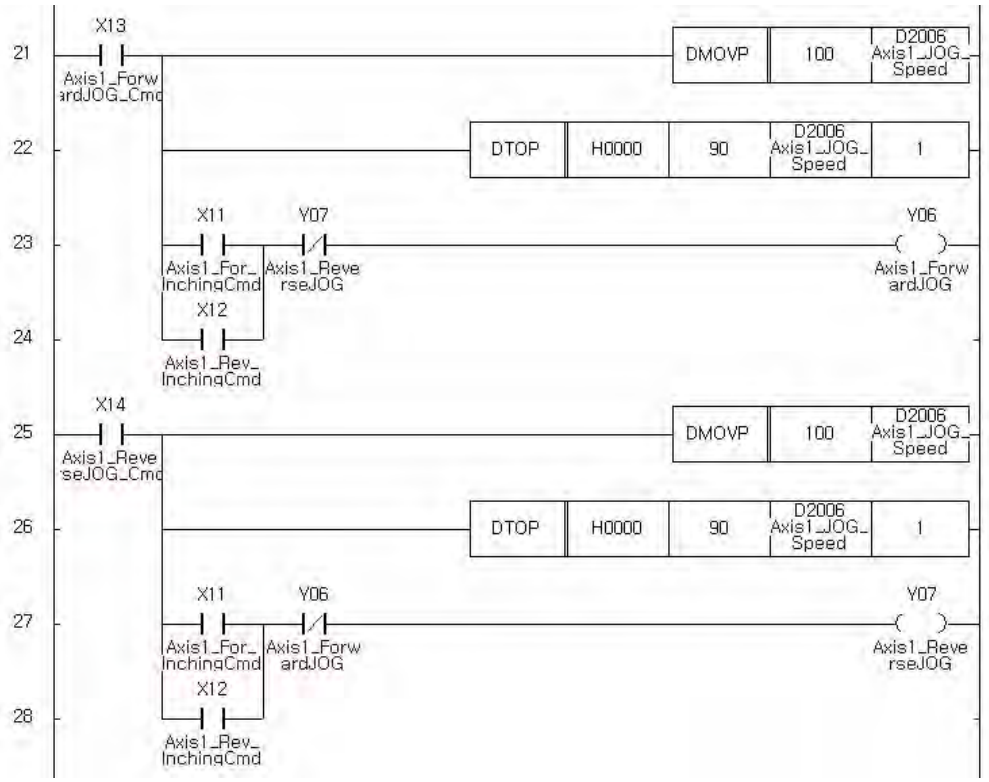
Inching

Following example shows how to set the inching operation. The inching movement amount must be set before JOG output. The movement amount must be cleared to zero when the inching operation does not needed.



JOG

Following example shows hot to set the JOG operation. JOG speed must be set and the inching movement amount must be cleared to zero before the JOG output. Notice that if the movement amount is not zero, the JOG output performs the inching operation regardless of JOG speed setting.



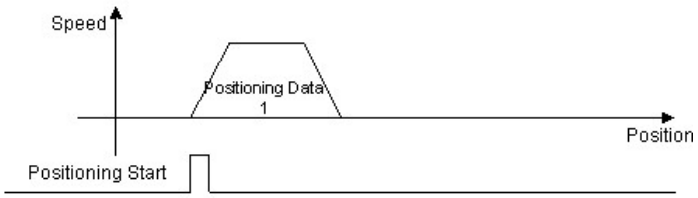
6.10.9.5 OPR

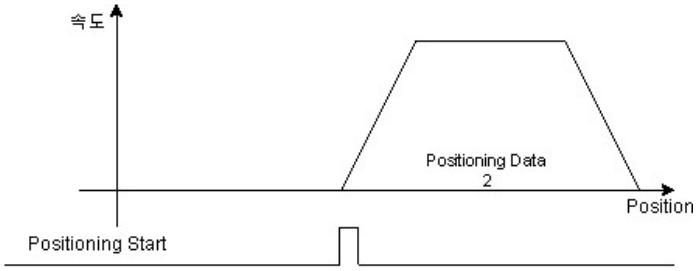
Following example shows how to issue the OPR. This example uses the PSTRT1 instruction for OPR. Ensure that the OPR parameters are configured properly before running this example program.

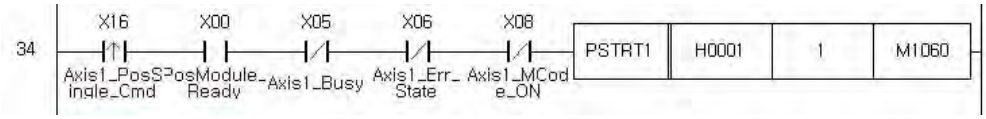
6.10.9.6 Issuing the control with position data

This example performs the positioning with PSTRT1 instruction. PSTRT1 instruction needs the number of position data. The number can be a range of 1 to 600. This example assumes that a position data is configured on No. 1 as following figure.

POS Data No.	Operation Pattern	Axis to be Interpolated	ACC Time No.	DEC Time No.	Control System	M code	Dwell time (msec)	Command Speed	Positioning Address	Arc Address
1	POS STOP	No Interpol...	No.1	No.1	ABS	0	0	500	1000	
2	POS STOP	No Interpol...	No.1	No.1	ABS	0	0	1000	3000	



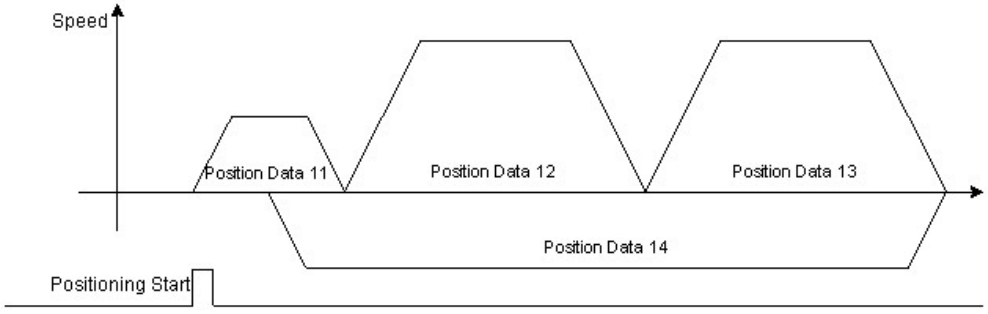




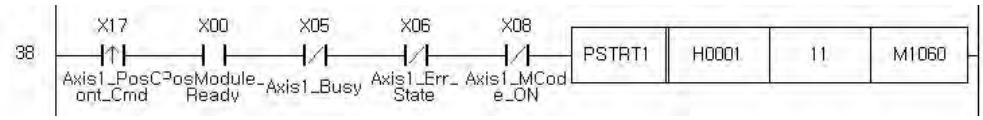
6.10.9.7 Continuous positioning with position data list

This example shows the continuous positioning with multiple position data. A PSTRT1 instruction is used for that operation. This example assumes that the position data is defined as following figure.

POS Data No.	Operation Pattern	Axis to be Interpolated	ACC Time No.	DEC Time No.	Control System	M code	Dwell time (msec)	Command Speed	Positioning Address	Arc Address
11	POS CON	No Interpol...	No. 1	No. 1	ABS	0	0	500	1000	
12	POS CON	No Interpol...	No. 1	No. 1	ABS	0	0	1000	3000	
13	POS CON	No Interpol...	No. 1	No. 1	ABS	0	0	1000	5000	
14	POS STOP	No Interpol...	No. 1	No. 1	ABS	0	0	500	500	



With only one PSTRT1 instruction, all the above position data are executed automatically. Notice that the control type of leading three position data is configured as continuous and the last one is configured as independent type.

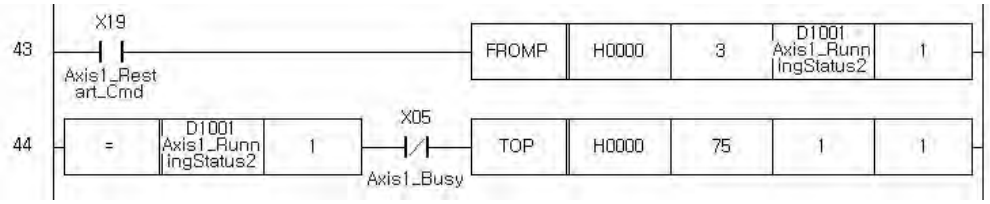


6.10.9.8 Positioning Stop

During the positioning operation, sequence program can issue a forced stop.

6.10.9.9 Resume Positioning

Resume operation is able to issue only when the module is in stopped state. The current state of module can be known from ' running status 2' of monitor data. This example uses TO/TOP instruction. This instruction writes 1 to the ' Resume Request' of control data area for resume operation. Notice that the resume operation cannot be used when the state of module is standby state.

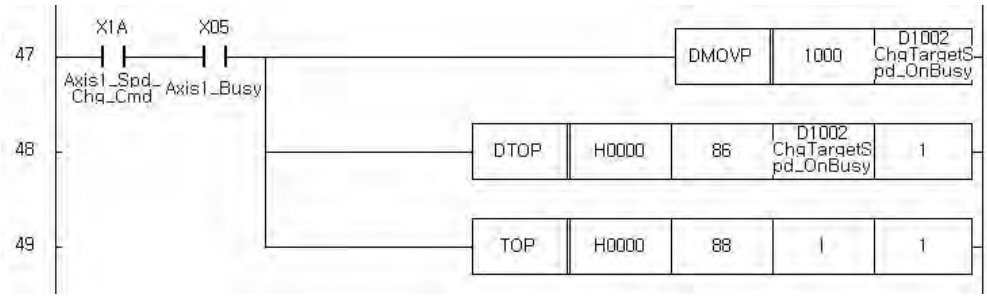


6.10.9.10 Speed Changing

There is two different way to change the current speed of positioning. The choice is dependent on user' s favorite.

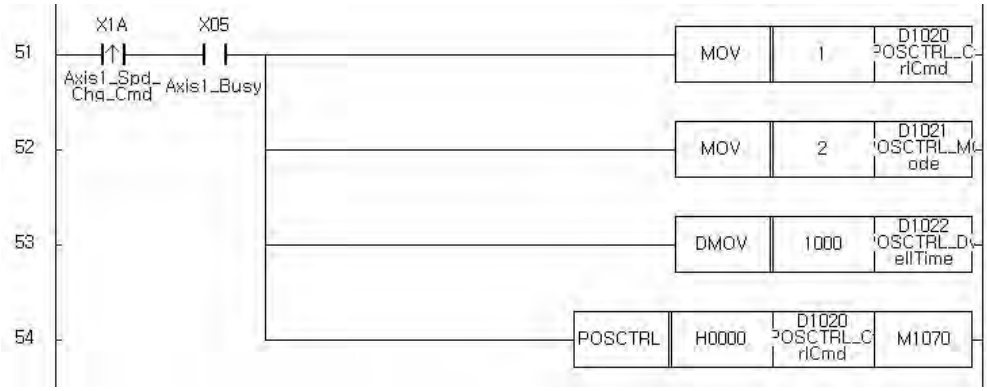
By setting the control data area

Set the ' New speed' and ' Speed change request' fields of PSnnX' s control data memory. The new speed must be written to the ' New speed' field, and then set the ' Speed change request' field as following example program.



By dedicated instruction

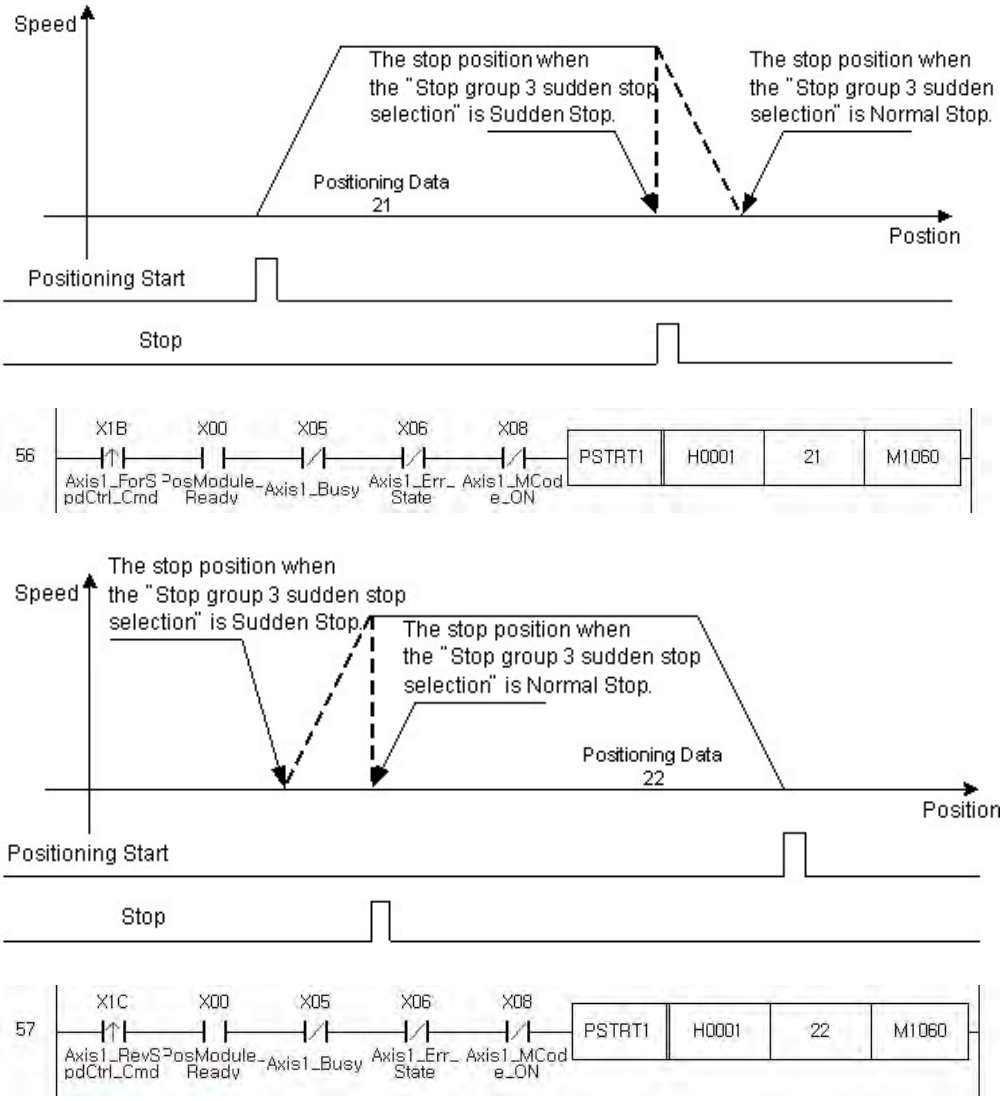
Use the POSCTRL instruction. POSCTRL instruction needs 4 words sized memory which is storing the control code and it' s parameters are designated. For speed change control, use control code 2 as following example.



6.10.9.11 Speed Control

The instruction PSTRT1 can be used for speed control. The position data must be configured in advance. For terminating speed control ' Positioning Stop' signal is used. This is presented at previous example.
Following shows two speed control examples. Each position data was defined as number of 20 and 21. Each speed control will output pulse continuously until the positioning stop signal input.
Notice that the way of stop at stop signal is according to the setting of ' Stop Group 3 Sudden stop selection' . It can be a normal deceleration stop or sudden stop.

POS Data No.	Operation Pattern	Axis to be Interpolated	ACC Time No.	DEC Time No.	Control System	M code	Dwell time (msec)	Command Speed	Positioning Address	Arc Address
21	POS STOP	No Interpol...	No.1	No.1	FSC	0	0	2000		
22	POS STOP	No Interpol...	No.1	No.1	FSC	0	0	2000		



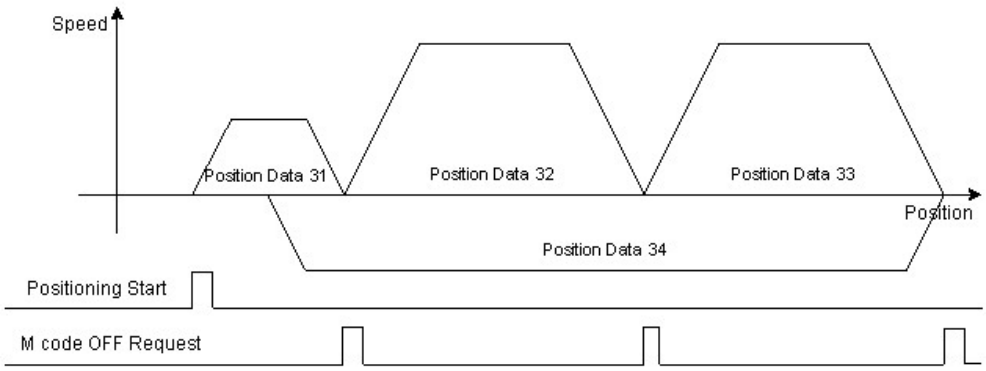
6.10.9.12 Positioning with M Code

This example shows how to use M code in positioning control. Assume following four position data of 31 to 34.

POS Data No.	Operation Pattern	Axis to be Interpolated	ACC Time No.	DEC Time No.	Control System	M code	Dwell time (msec)	Command Speed	Positioning Address	Arc Address
31	POS CON	No Interpol..	No.1	No.1	ABS	1	0	500	1000	
32	POS CON	No Interpol..	No.1	No.1	ABS	2	0	1000	3000	
33	POS CON	No Interpol..	No.1	No.1	ABS	3	0	1000	5000	
34	POS STOP	No Interpol..	No.1	No.1	ABS	4	0	500	500	

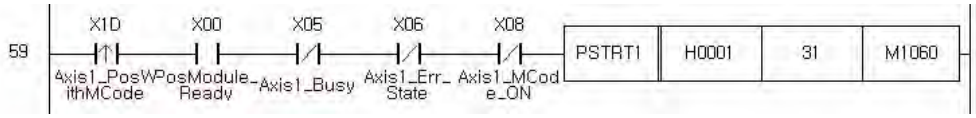
The above position data is configured as 4 steps continuous position. Assume that the M code ON timing is ' After' mode. It that case, the M code will be issued at the end of each positioning, and the next positioning will not be started until the M code is cleared. The M code OFF request control must be issued for clearing M code.

Following chart shows that the entire positioning path with proper M code clear request.



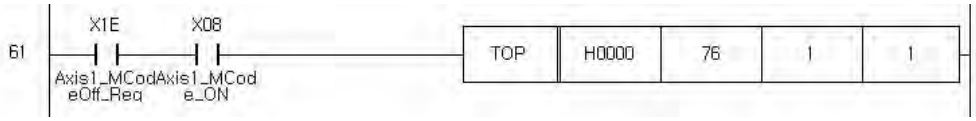
The M code ON state can be read by X8 point of PSnnX module. The continuous positioning control needs only one positioning start signal for the first position data. The other position data are started automatically after M code clear. The following figure shows the start of positioning.

Positioning start



M code Clear

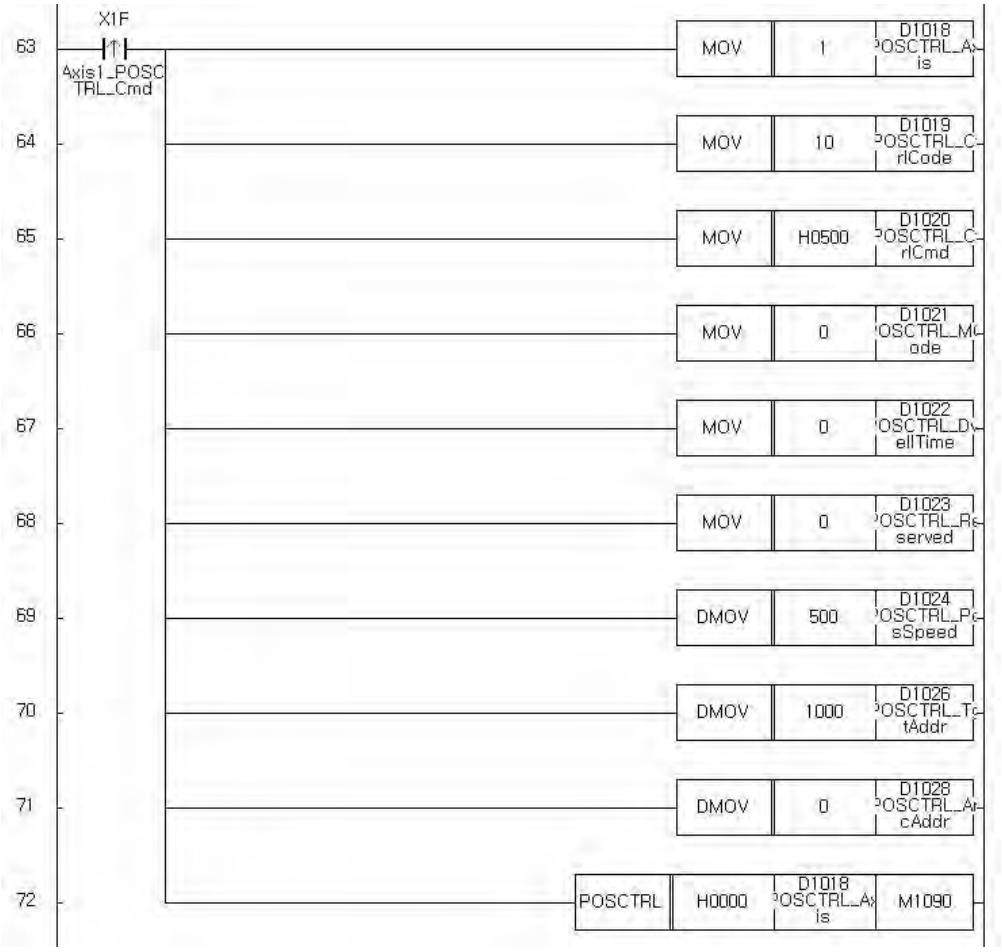
If M code is designated non-zero value, the M code signal is turned on at each positioning control according to the configuration of ' M code ON timing' . The next position data can be started after the preceding M code signal is cleared. For clearing the M code signal ' M code clear request' control must be issued. Following figure shows the example of the clearing the M code signal.



6.10.9.13 Positioning control without position data

All previous examples use the position data for positioning control. The position data was defined in table and the number of position data in table is used in control instructions.
This example shows how to issue a positioning control without position data. The POSCTRL instruction is used.

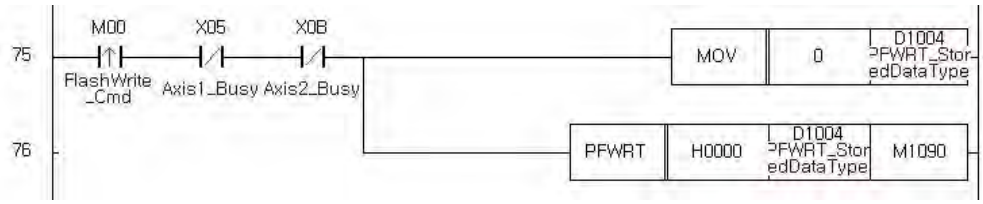
The precise explanation of POSCTRL instruction was described in previous section. This example performs the same positioning control that was used in section "Issuing the control with position data list". Following figure shows the program.



6.10.9.14 Flash Write

This example shows how to store the parameter and position data to the flash memory of PSnnX module. The PFWRT instruction is used. This instruction requires a code which defines the memory type to be stored. There are two kinds of data which can be stored. One is the parameter and the other is position data table. One or all of them can be selectively stored to flash memory. More detailed information about that was described in previous section.

The data stored in flash memory are retained until the next power off and on. PSnnX module limits the number of repeated writing at each power on. It is limited to 25 times. This limitation is settled for protecting the flash memory from the sequence program mistake.



6.10.10 Trouble Shooting

- Error and Warn
- Error Code Details
- Warning Code Details

6.10.10.1 Error and Warn

If PSnnX module has an error, it cannot perform any kind of operation until the error is cleared. But the warn state does not put any restriction on the operation of PSnnX. The error state is visualized by LED.
For clearing the error, the error code must be verified and the trouble source that caused the error must be removed. For clearing the error code of PSnnX, refer to the section "Reading the error code and reset" .

Error on the parameter configuration

PSnnX module checks the parameter when the PLC Ready signal is turned on. If any kinds of error is found such as configuration range overflow, the error will be issued.

Error on the instruction issuing

Error can be occurred when issue the control of positioning, JOG, Inching. Check the related configurations of parameter or the signal from the mechanical part.

Error Classifications

Error Code Range	Description
001 ~ 009	Fatal error
100 ~ 199	Common error
200 ~ 299	Errors on OPR
300 ~ 399	Errors on JOG, Inching
500 ~ 599	Errors on positioning control
800 ~ 899	Errors on external signal interface
900 ~ 999	Errors on parameter configuration

Warnings

The warnings can be issued when invalid set value is found on the control data and position data area. The warning code is cleared by the same method used in error code clearing.

Warning Classifications

Warning Code Range	Description
100 ~ 199	Common Warning
300 ~ 399	Warning on JOG operation
400 ~ 499	Warning on MPG operation
500 ~ 599	Warning on Positioning control

6.10.10.2 Error Code Details

Class	Code	Error Name	Description
-	0	No Error	Normal status
Fatal	1	DPRAM Initialize Error	Troubles in shared memory Check with the CPU module
	2	DPRAM Access Error	
	3	CPU Not Found	
Common	RES	-	
	101	PLC READY OFF	PLC Ready signal (Y0) is turned OFF Turn on the Y0 signal by sequence program or CICON
	102	DRIVER READY OFF	No ready signal from motor driver. Check the cable and the driver.
	RES	-	
	104	Hardware Upper Limit	Hardware limit signal is detected.
	105	Hardware Lower Limit	
	RES	-	
	154	Software stroke limit upper limit	Software limit is detected.
	155	Software stroke limit lower limit	
	RES	-	
OPR	RES	-	
	203	No DOG Signal	DOG signal is not detected during OPR operation. Check the wiring.
	RES	-	
	207	OPR Required	OP is un-known when the OPR operation is issued.

	RES	-	
Manual Operation	300	MPG Error	Check the parameter for JOG, Inching or MPG Operation
	RES	-	
Positioning	RES	-	
	503	Invalid Speed	When the speed is not designated or designated as invalid value
	RES	-	
	516	Path Control Error	Invalid position data for path control.
	RES	-	
	519	Interpolation Axis Busy	The axis for interpolation is busy. Check the timing of the positioning data
	RES	-	
	521	Invalid Interpolation Axis	Not supported axis was assigned as a interpolation
	RES	-	
	525	Invalid Path Point	Designated path point is invalid for circular interpolation
	526	Invalid End Point	Designated end point is invalid for circular interpolation
	RES	-	
	536	Positioning started during M CODE ON	M code by previous positioning control must be cleared.
	537	CPU READY OFF	CPU READY signal (Y0) is not turned on. Check the sequence program
	538	Module READY OFF	Module READY signal (X0) is not turned ON
	RES	-	
	543	Invalid Position Number	Check the position number. Valid range : 1~600, 7000~7004, 9001~9004
	544	Invalid Angle	When the unit is ‘ degree’ , the range must be in 0~359.9999
	545	Invalid Loop Counter	Error on the repeat counter of LOOP instruction
	RES	-	
	547	Nested Loop Error	Nest LOOP is permitted up to 8 levels
	548	Internal Loop Error	Internal error was occurred during the processing loop. Try to change some value of position data.
	549	Unsupported Instruction	Invalid instruction was used in position data
	RES	-	
I/F	RES	-	
	805	Too Many FLASH Writing	Up to 25 times of flash memory writing is permitted at each power on.
	RES	-	
Parameter	900	Invalid Unit	Invalid unit code was assigned. The valid range of unit code is 0 to 3.
	901	Invalid Number of Pulse Per Rotationo	Number of pulse per rotation can be a range of 1~65535
	902	Invalid Movement Amount per Rotation	Movement amount per rotation can be a range of 1~65535.
	903	Invalid Unit Magnification	Unit Magnification can be a range of 0 to 3
	904	Invalid Pulse Output	Pulse output mode can be a 0 or 1

		Mode	
	905	Invalid Rotation Direction	Rotation direction can be a value of 0 or 1
	906	Invalid Bias Speed	Invalid value was assigned to the bias speed configuration.
	RES	-	
	910	Invalid Speed Limit	Invalid value was assigned to the speed limit configuration.
	911	Invalid Acc/Dec time 1	The Acc/Dec time can be a range of 0~65535ms
	912	Invalid Acc/Dec time 2	
	913	Invalid Acc/Dec time 3	
	914	Invalid Acc/Dec time 4	
	RES	-	
	920	Invalid Backlash	The backlash can be a range of 0~65535
	921	Invalid Software stroke limit upper limit	Invalid value was assigned to the software stroke limit upper limit configuration.
	922	Invalid Software stroke limit lower limit	Invalid value was assigned to the software stroke limit lower limit configuration.
	RES	-	
	927	Invalid M Code ON Timing	M code on timing can be a value of 0 or 1
	RES	-	
	956	Invalid JOG Speed Limit	Invalid value was assigned to JOG speed limit value
	957	Invalid JOG Acc/Dec Time	The JOG acc/dec time can be a range of 0~3
	RES	-	
	960	Invalid S-Pattern Ratio	The S-Pattern ratio can be a range of 0~100
	RES	-	
	967	Invalid External command function selection	External command function selection can be 0, 1 or 3
	RES	-	
	980	Invalid OPR method	The OPR method can be a range of 0~3
	981	Invalid OPR Direction	OPR direction can be 0 or 1
	982	Invalid OP Address	Invalid value was assigned to OP address.

6.10.10.3 Warning Code Details

Class	Code	Name	Description
-	0	No Warning	Normal Operation
Common	100	Start Command on Busy	A start command was issued during the operation of a axes. A start command must be issued when the BUSY signal is off.
	RES	-	
	102	Deviation Counter Clear Request on Busy	A deviation counter clear request was issued during the axis busy. The request is ignored.
	RES	-	

	104	Resume Ignored	A resume request was issued when the axes was still in busy or in standby state.
	RES	-	
	109	Teaching Ignored	A teaching command was issued when the axes was still in operation.
	RES	-	
	114	Below Bias Speed	The designated speed is below the bias speed. Actual operation speed is the bias speed.
	RES	-	
	150	Invalid External Command	External command signal is denied according to the expended parameter configuration. This warning can be issued when the ' Use External command' is set as 0 (Not Used).
	RES	-	
JOG	300	Speed change request during deceleration	The speed change request will be ignored when the request is issued during deceleration of continuous positioning control.
	301	JOG Speed Limit Warn	This warning will be issued when the JOG operation is started with above the JOG speed limit value. The actual JOG speed will be the JOG speed limit value.
	RES	-	
Positioning	500	Invalid Bias Speed	Bias speed configuration of basic parameter was assigned invalid value.
	501	Speed Limit Exceeded	When the requested speed during positioning is above the speed limit, this warning will be issued. The actual speed will be the speed limit in basic parameter.
	RES	-	
	503	M Code Signal ON	This warning is issued when the positioning start command is issued during the M code is ON. The positioning start command will be ignored.
	RES	-	
	505	Block Operation Terminated	On block program operation, if all the block is defined as continuous then this warning will be issued at the end of block.
	RES	-	
	509	Insufficient Remaining Distance.	This warning will be issued when there is not enough distance remained to accelerate the speed to the new requested speed. The speed change request will be ignored.
	RES	-	
	512	Illegal External Function	This warning will be issued when the undefined external signal command is turned on. This external command will be ignored.
	513	Insufficient Movement Amount	Remained movement amount is not sufficient to deceleration. When the destination position is reached during the deceleration, the positioning will be stopped by sudden stop.
	514	Out Of Speed Limit	This warning will be issued when the requested speed is above the speed limit configuration. The positioning control will be performed by speed limit in basic parameter.
	RES	-	

	516	Illegal Teaching Data Number	This warning will be issued when the data number for teaching is invalid. The teaching operation will be ignored.
	RES	-	
	518	Impossible to change the Target	If it is impossible to change the target position address, then this warning will be issued. The request for changing target will be ignored.
	RES	-	