

II . Operating Software

[Manual Version: 2.3]

Chapter 1

Linear Coordinate Position Operation Type(VP-1.xx)

[Manual Version : 2.3]

[Applied Software : From 1.31 Version]

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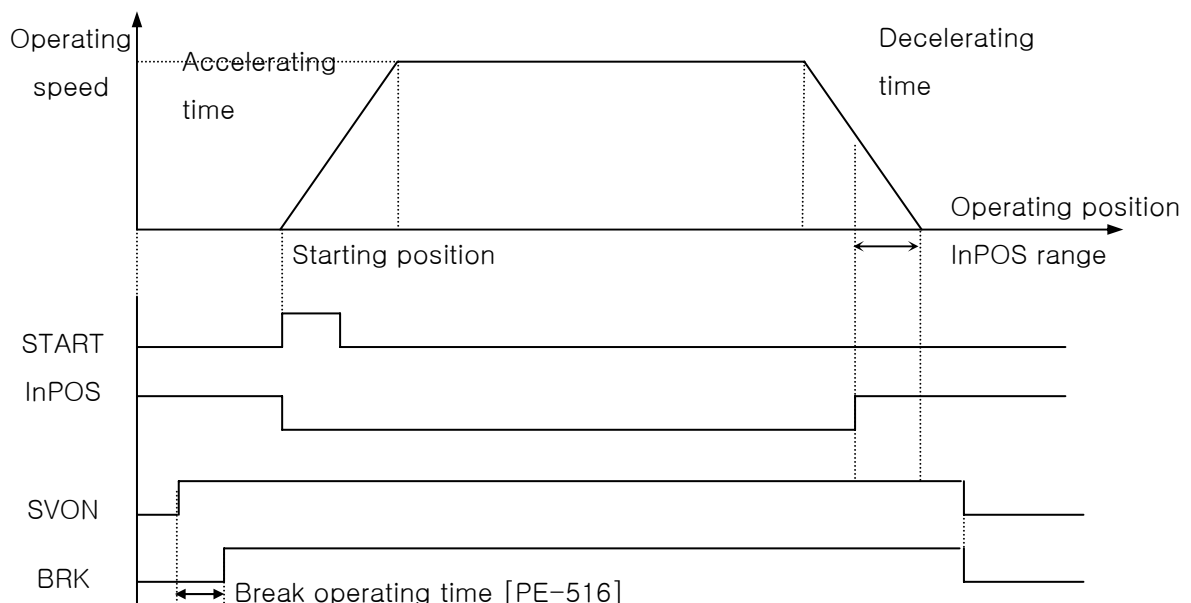
1.1 Major Functions

1.1.1 Operating Mode

Note: After changing the operating mode of [PE-601], maker sure to carry out origin run prior to starting operation.

1) Operating Mode 0~4

Operating Mode	Major Functions
0	– Operate 64 coordinates by using 6 input contacts.
1	– Operate 32 coordinates by using 5 input contacts. – Operate based on external position pulse input. – Restrict drive torque.
2	– Operate 16 coordinates by using 4 input contacts. – Operate based on external position pulse input. – Restrict drive torque. – Output middle position coordinates at contacts.
3	– Operate external pulse synchronization position – Operate 16 coordinates by using 4 input contacts.
4	– Set data by using digital switch
6	– Set digital switch's 4 place, Psel0, Psel1, SPD0 – Operate based on external position pulse input.

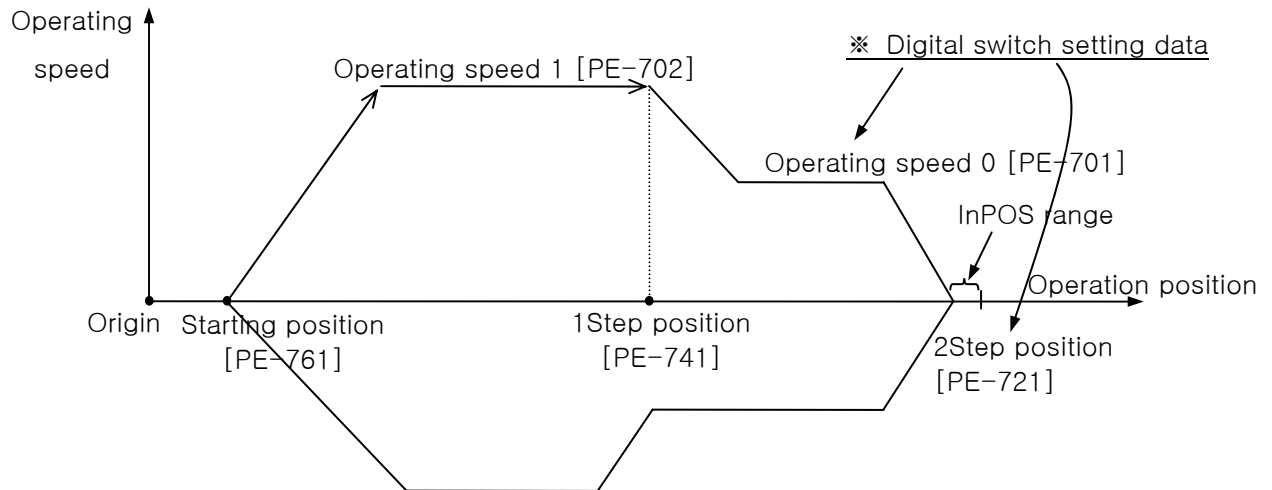


The servo features an ability to set the absolute position coordinates, operating speed and acceleration/deceleration time, and operate by selecting the desired position, speed and the acceleration/deceleration time through the use of PLC or external equipment. It can be used for rectilinear motion systems.

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2) Operating mode 5: 2 Step reciprocating operation

Operating Mode	Major Functions
5	<ul style="list-style-type: none">– 2 Step reciprocating operation– Set Data by using digital switch



- This servo features an ability to engage in reciprocating operation after setting absolute position coordinates [PE-741] and [PE-761], operating speed [PE-701] and [PE-702] and acceleration/deceleration time [PE-709] and [PE-710]
it can be used in feeding system for drilling work.
- Coordinates of [PE-721] are relative to coordinates of [PE-741].
For example, when coordinates are set as [PE-741]=40, [PE-721]=5, the motor runs at an increase of 5 in coordinate toward operating speed 0 (absolute coordinate 45) from coordinate 40 of [PE-741], which is 1 step position.
- The data of 2 Step position and the operating speed 0 can be set using the digital switch.
- The reciprocating operation is executed continuously. When the operation is completed, InPOS is displayed.
- If the machine is restarted after being stopped by the stop contact during operation, it automatically runs over the remaining distance.

1.1.2 Position Operation

1) Setting position coordinates

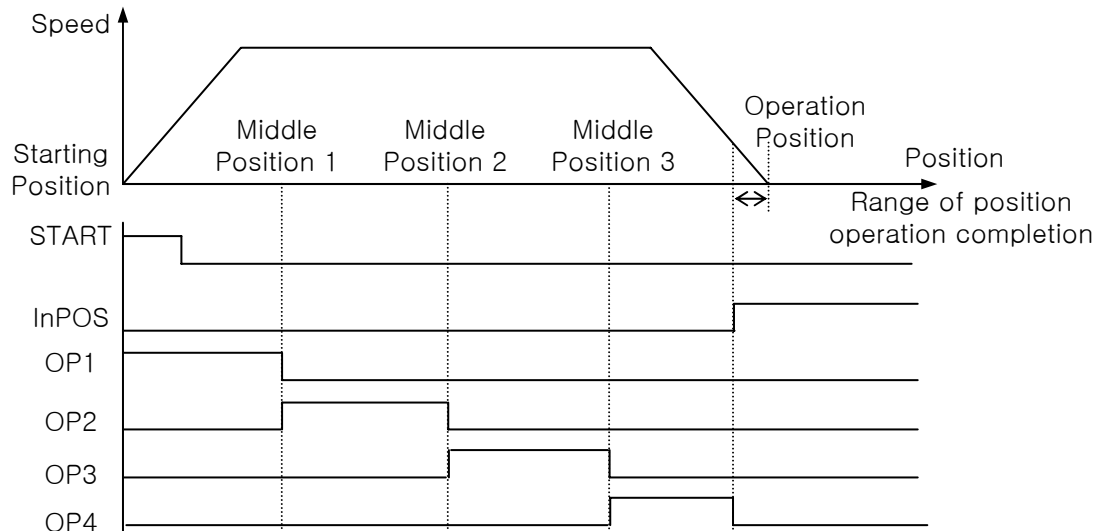
Operating Mode	Position Coordinates	Group Selection		Position Selection	Set Menu
		PSEL4	MPGEN	PSEL0~PSEL3	
0	64 Points (16 points, 4 group)	X	X	16 Points	[PE-721]~[PE-736]
		O	X	16 Points	[PE-741]~[PE-756]
		X	O	16 Points	[PE-761]~[PE-776]
		O	O	16 Points	[PE-781]~[PE-796]
1	64 Points (16 points 2 group)	X		16 Points	[PE-721]~[PE-736]
		O		16 Points	[PE-741]~[PE-756]
2, 3	16 Points	X		16 Points	[PE-721]~[PE-736]
4	1 Points				[PE-721]

Note In Operating Mode 4, the digital switch setting is saved in [PE-721]

2) Position Operation completion signal output

When the position operation is completed, the position operation completion (InPOS) signals are generated contacts.

3) Position operation middle coordinate output



The four areas are output in sequence based on the middle position values set during the position operation. The middle position shall be set based on the absolute position coordinates in respect to the coordinates from the starting position to the operation position.

Example)

	Starting position	Middle position1	Middle position2	Middle position3	Operation Position
If position increases	[PE-721]	[PE-742]	[PE-762]	[PE-782]	[PE-722]
If position decreases	[PE-721]	[PE-781]	[PE-761]	[PE-741]	[PE-722]

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4) Setting operation speed and acceleration/deceleration time

Eight types of operating speed and acceleration/deceleration time can be selected using three input contacts.

Speed selection contacts			Operation speed	Acceleration/Deceleration Time
SPD1	SPD2	SPD3		
X	X	X	PE-701	PE-709
O	X	X	PE-702	PE-710
X	O	X	PE-703	PE-711
O	O	X	PE-704	PE-712
X	X	O	PE-705	PE-713
O	X	O	PE-706	PE-714
X	O	O	PE-707	PE-715
O	O	O	PE-708	PE-716

1.1.3 MPG(Position pluse) Operation

Set the position unit with the number of pulses versus the motor rpm, and enter the pulse train to operate the system. The MPG operation can be activated only in operation mode 1 and 2 and when the MPGEN contact is in ON position. MPG operation is ignored when the MPGEN contact is off position.

1.1.4 Torque Control

The maximum torque of the motor can be restricted during operation. This function is used to apply consistent force of torque, or to limit torque for safety purposes.

1.1.5 Origin Run

Origin Mode	Major Functions
0	Set current coordinates as origin.
1	Set origin by sensor (Dog).
2	Set origin by limit.
3	Set origin by sensor and limit.
4	Set origin by damper torque.

1.1.6 Jog Run

Operating Mode	주요기능
Contact	- Jog run using contact switch
Loader	- Jog run by loader manipulation. - Current coordinates can be set in menu

Chapter 1: Linear Coordinate Position Operation Type

- ① Jog run speed can be set high/low speed with [r/min]unit.

Setting Mode	Menu
Low speed jog run	PE-801
High speed jog run	PE-802

- ② Setting the acceleration/Deceleration time for Jog run[PE-803]

Set the applied acceleration/Deceleration time during jog run.

- ③ Jog run

Ⓐ 'P-JOG' ON : Low speed, CW run

Ⓑ 'N-JOG' ON in the Ⓐcondition('P-JOG' ON) : High speed, CW run

Ⓒ 'N-JOG' OFF in the Ⓑcondition(High speed, CCW run) : Low speed, CW run

Ⓓ 'P-JOG' OFF : Stop

Ⓔ For CCW run, After 'N-JOG' ON all flow is the same as CW run.

1.1.7 Setting operation Data

Setting Mode	Major Function
Menu setting	Edit and set menu using loader
Communication setting	Set data based on communication(CN3).
I/O setting	Set data using BCD code of I/O contacts (PLC, Digital switch)
Analog	Set speed based on analog input

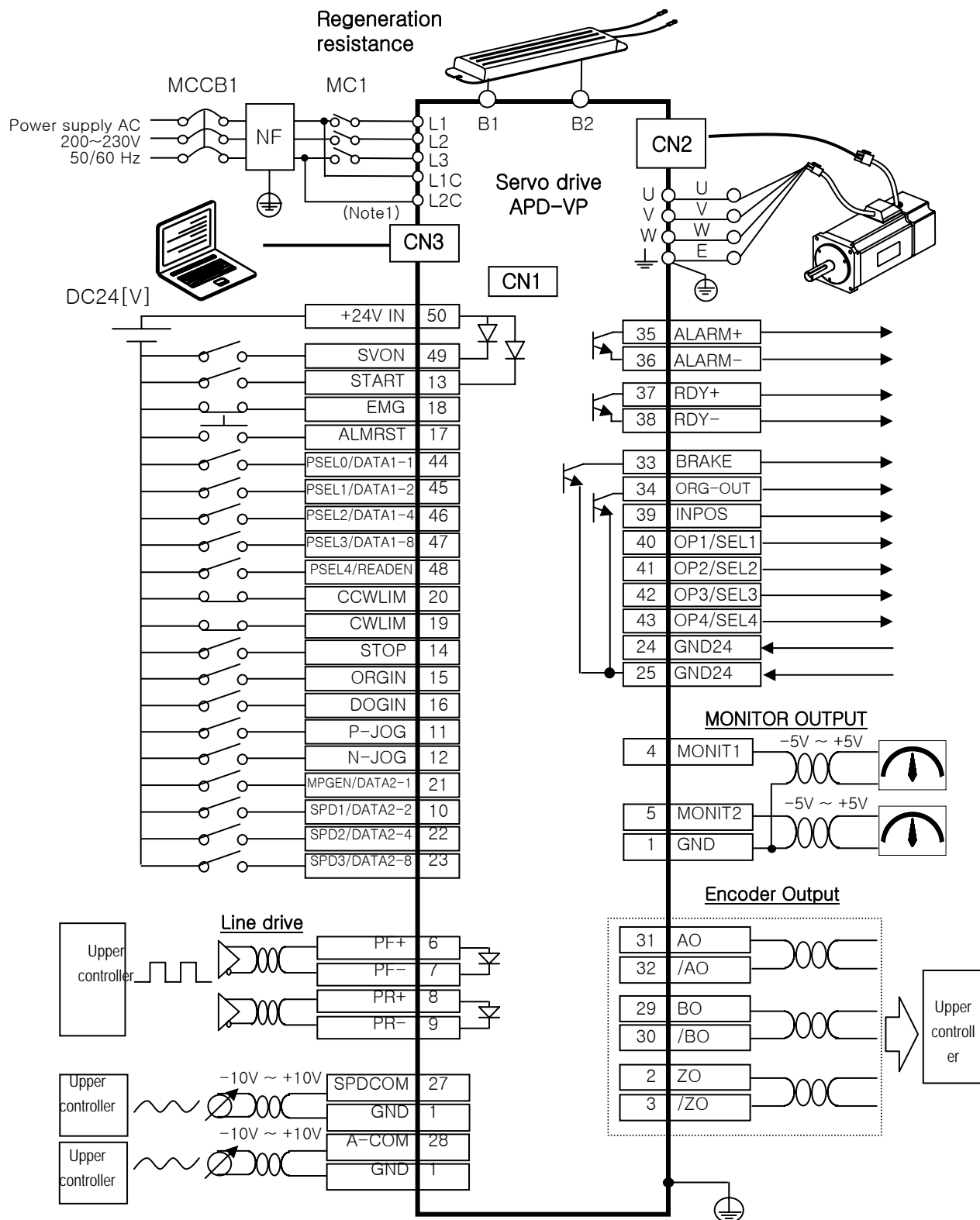
1.1.8 Operation Data Output

Output Mode	Output Details														
Communication out put	Output operation data based on communication (CN3).														
Analog	<p>* Data are output in $\pm 5V$ according to the set scale units, and the following operation data are output according to the output mode.</p> <table> <tr> <th>Output Mode</th><th>Output item</th></tr> <tr> <td>0</td><td>Command speed</td></tr> <tr> <td>1</td><td>Current speed</td></tr> <tr> <td>2</td><td>Command torque</td></tr> <tr> <td>3</td><td>Current torque</td></tr> <tr> <td>4</td><td>Command position</td></tr> <tr> <td>5</td><td>Current position</td></tr> </table>	Output Mode	Output item	0	Command speed	1	Current speed	2	Command torque	3	Current torque	4	Command position	5	Current position
Output Mode	Output item														
0	Command speed														
1	Current speed														
2	Command torque														
3	Current torque														
4	Command position														
5	Current position														

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1.2 System Configuration

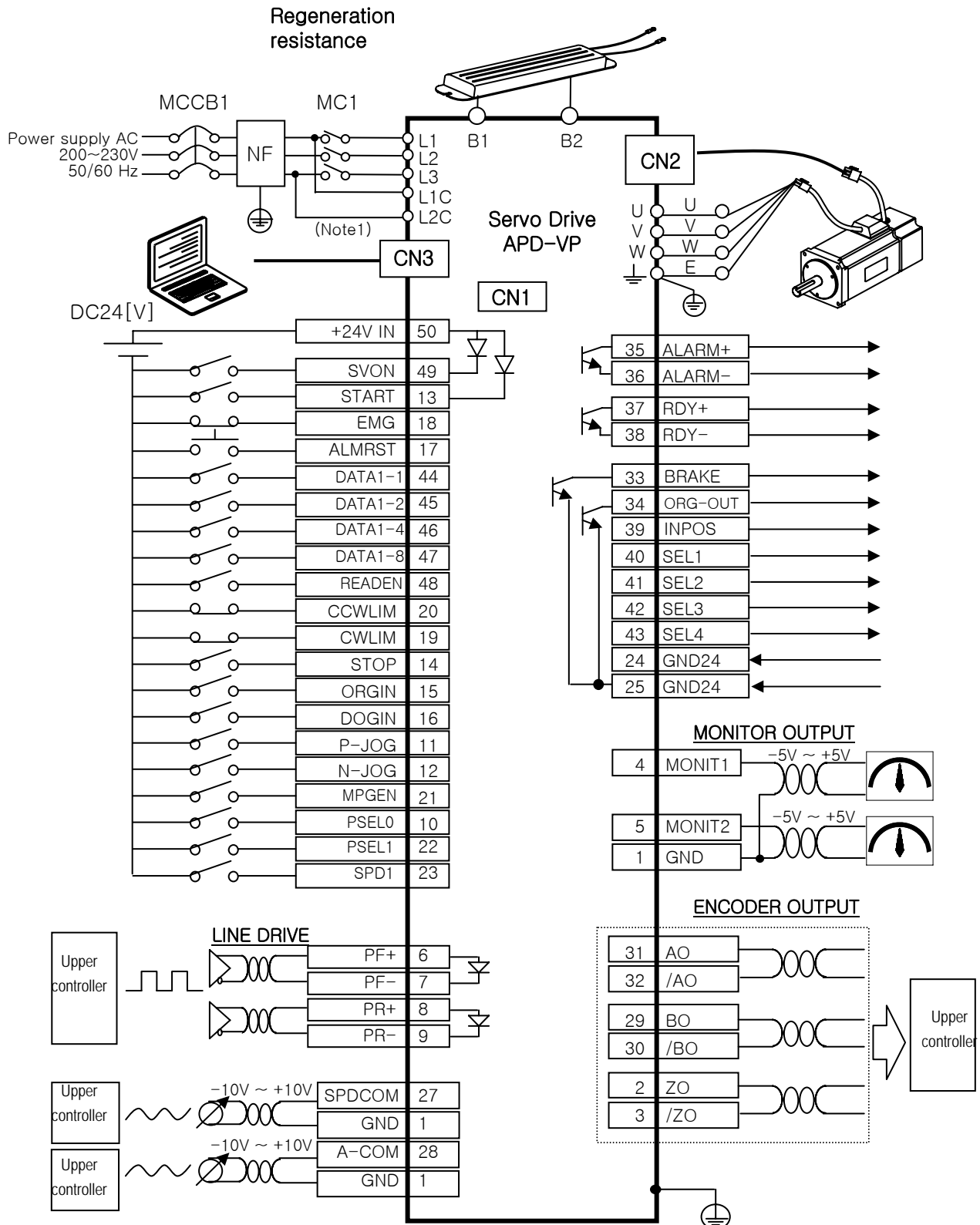
1.2.1 Connection diagram (Linear coordinate position operation type(VP-1)) : Operation Mode 1-5



Note 1) Control power supply terminals (L1C, L2C) are provided in models with capacity equal to or greater than APD-VP05N.

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* Connection diagram (Linear coordinate position operation type(VP-1)) : Operation Mode 6



Note 1) Control power supply terminals (L1C, L2C) are provided in models with capacity equal to or greater than APD-VP05N.

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1.2.2 Control Signal

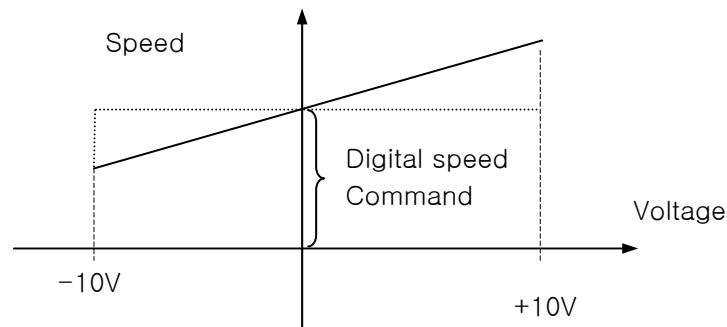
1) Contact input signal

Pin No.	Name	Description		
50	+24V IN			
49	SVON	Servo ON		
13	START	Operation started		
18	EMG	Emergency stop		
17	ALMRST	Alarm reset		
20	CCWLIM	Forward direction(Counterclockwise) running prohibited		
19	CWLIM	Rearward direction(Clockwise) running prohibited		
14	STOP	Operation stop		
15	ORGIN	Origin run started		
16	DOGIN	Origin sensor		
11	P-JOG	Forward direction jog		
12	N-JOG	Rearward direction jog		
Pin No.	Name	Operating Mode 0	Operating Mode1, 2, 3	Operating Mode 4
44	PSEL0/DATA1-1	Position selection 0		Digital Switch1 Data0
45	PSEL1/DATA1-2	Position selection 1		Digital Switch1 Data1
46	PSEL2/DATA1-4	Position selection 2		Digital Switch1 Data2
47	PSEL3/DATA1-8	Position selection 3		Digital Switch1 Data3
48	PSEL4/READEN	Position Group Selection 0		Data Read Enable
21	MPGEN/DATA2-1	Position Group Selection 1	MPGEN/ TRQLIM	Digital Switch2 Data0
10	SPD1/DATA2-2	Speed selection 1		Digital Switch2 Data1
22	SPD2/DATA2-4	Speed selection 2		Digital Switch2 Data2
23	SPD3/DATA2-8	Speed selection 3		Digital Switch2 Data3

2) Analog input signal

Pin NO.	Name	Description
27	SPDCOM	Analog speed command input(−10[V]~+10[V])
28	A-COM	Analog speed command input(−10[V]~+10[V])
1	GND	Analog signal ground

* If the system is operated at an override (overlapping) speed at the analog speed command (menu NO. [PE-717] set to “1”), the system operates at a speed command which is overlapped with the digital speed command.



(Note) If + voltage is applied irrespective of the rotating direction of the motor, speed increases; and speed decreases if – voltage is applied

3) Pulse train input signal

Pin NO.	Name	Description
6	PF+	Line Drive(5V) : F+ Pulse input
7	PF−	Line Drive(5V) : F− Pulse input
8	PR+	Line Drive(5V) : R+ Pulse input
9	PR−	Line Drive(5V) : R− Pulse input

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4) Output contact signal

Pin NO.	Name	Description			
35 /36	ALARM+/ ALARM-	Outputs ALARM status. • ON : Normal mode • OFF : ALARM mode			
37 /38	RDY+ /RDY-	ON : Normal mode (Operation Preparation completed)			
33	BRAKE	Outputs brake operation signal when servo is operating			
34	ORG-OUT	Outputs origin run completion signals			
39	INPOS	Outputs position operation completion signals. Or, Outputs position coordinate OP0 (in case [PE-604]=2).			
		Operating Mode 0	Operating Mode 1	Operating Mode2	Operating Mode4
40	OP1/SEL1		Outputs position coordinates OP1	Middle coordinate area 1	BCD Data Select0
41	OP2/SEL2		OP2	Middle coordinate area 2	BCD Data Select1
42	OP3/SEL3		OP3	Middle coordinate area 3	BCD Data Select2
43	OP4/SEL4		OP4	Middle coordinate area4	BCD Data Select3

5) Monitor output signal and output power supply

Pin NO.	Name	Description
4	MONIT1	Analog monitor output 1(-5[V]~+5[V])
5	MONIT2	Analog monitor output 2(-5[V]~+5[V])
1	GND	Ground for analog output signal
26	+15[V]	+15[V]power output terminal

6) Encoder output signal

Pin NO.	Name	Description
31 32 29 30	AO /AO BO /BO	Outputs encoder signal received from the motor after dividing it according to the frequency dividing ratio set in menu [PE-418] (5V Line drive system).
2 3	ZO /ZO	Outputs encoder Z signal received from the motor (5[V] Line drive system)

1.3 Menu

1.3.1 Operating Mode Menu

MENU			UNIT	INI	Description
NO	CODE	NAME	MIN	MAX	
0	Pd-001	Current State	– –	– –	Displays current operation mode. Normal: nor , Alarm : alarm number
1	Pd-002	Current Speed	r/min –99999	0 99999	Display current operating speed.
2	Pd-003	Command Speed	r/min –99999	0 99999	Display current command speed.
3	Pd-004	Reference Speed	– –99999	0 99999	Display speed command values based on the acceleration/deceleration time during operation.
4	Pd-005	Current Position	– –9999.9	0.0 9999.9	Display current position coordinates.
5	Pd-006	Refer Position	– –9999.9	0.0 9999.9	Display current target position Coordinates.
6	Pd-007	Command Position	– –9999.9	0.0 9999.9	Display operation command position coordinates.
7	Pd-008	Remain Position	– –9999.9	0.0 9999.9	Display the difference between target Position coordinates and current position coordinates.
8	Pd-009	Torque Limit	[%] 0	0 300	Display torque-limit setting.
9	Pd-010	Current Load	[%] –9999.9	0.0 9999.9	Display current load rate versus rated load.
10	Pd-011	Average Load	[%] –9999.9	0.0 9999.9	Display average load rate of 5 seconds versus rated load.
11	Pd-012	Maximum Load	[%] –9999.9	0.0 9999.9	Display maximum instantaneous load rate versus rated load.
12	Pd-013	DC Link Voltage	Volt 0.0	0.0 999.9	Display Condenser's DC voltage value.
13	Pd-014	I/O Set	– –	– –	Display current I/O CN1's input state.
14	Pd-015	Input EXT SET	– –	– –	Display state of externally set input contacts
15	Pd-016	I/O State	– –	– –	Display current operating condition of I/O.
16	Pd-017	Input Logic Set	– –	– –	Menus dedicated to communication.
17	Pd-018	Input Logic Save	– –	– –	
18	Pd-019	Alarm bit	– –	– –	
19	Pd-020	Software Version	– –	– –	Displays software version number.

※ Communication Code is to be used for selecting the menu when using TOUCH or PC Communication

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1.3.2 Alarm Display Menu

MENU			UNIT	INI	Description
NO	CODE	NAME	MIN	MAX	
Alarm History 01 ~ 20			–	–	Display status of alarms occurred in the past.
20	PA-101	Alarm History01	–	–	
~	~	~	–	–	
39	PA-120	Alarm History20			

Alarm codes and Descriptions

CODE	NAME	Description or Causes	Corrective action
nor-oF	Normal svoff	Servo off Normal state	–
nor-on	Normal svon	Servo on Normal state	–
L1.01	L1.01	RS232 Comm. Error, Control circuit operation error	Replace the drive
AL-01	Emergency Stop	EMG input contacts open.	Control signal wiring, external 24V power supply
AL-02	Power Fail	Main power supply turned off	Check the wiring of min power supply
AL-03	Line Fail	Motor and encoder wiring error	Check set values and CN2 & U.V.W wiring
AL-04	Motor Output	Motor drive circuit output error	Check U.V.W wiring or IPM module
AL-05	Encoder Pulse	Encoder pulse number set error	Check set value[PE-204], CN2 wiring
AL-06	Following Error	Position pulse following error	Check the [PE-514]value, Wiring and limit contact, gain set value
AL-07	Limit Direction	Operation in limit direction	Direction of running, limit contacts
AL-08	Over Current	Over current	Wiring, motor, encoder, setting, gain setting, drive replacement
AL-09	Over Load	Over load	Load state, wiring, motor, encoder setting
AL-10	Over Voltage	Over voltage	Input voltage, braking resistance wiring, excessive regeneration operation.
AL-11	Over Speed	Over speed	Encoder Setting, encoder wiring, gain setting
AL-12	Origin Error	Origin run error	Dog sensor signal, limit signal wiring
AL-13	Not Used	Not used	–
AL-14	ABS Data Error	Absolute encoder data transmission error	Initial reset
AL-15	ABS Battery Error	Absolute encoder battery error	Initial reset, battery discharge
AL-16	ABS Multi Error	Absolute encoder multi-running data transmission error	Initial reset
AL-17	ABS Read Fail	Absolute encoder reading error	Check absolute encoder & CN2 wiring
AL-18	Not Used	Not used	–
AL-19	Not Used	Not used	–
AL-20	Flash Erase Fail	Flash ROM data delete error	Replace drive
AL-21	Flash Write Fail	Flash ROM data writing error	Replace drive
AL-22	Data Init Error	Data initialization error	Replace drive
AL-23	EPWR	Hardware error	[PE-203] setting
Err1	Error1	Occurs when attempting to correct menu which cannot be corrected in Servo-on condition	Correct menu after turning off servo
Err2	Error2	Occurs when attempting to enter data which deviate from the setting range	Enter data within the range of setting
Err3	Error3	Occurs when attempting to correct menu after locking menu using [PC-909] (Menu Data Lock).	Correct menu after unlocking [PC-909]

1.3.3 System variable setting Menu

Menus carrying “*” mark cannot be corrected when the servo is on.

MENU			UNIT	INI	Description
NO	CODE	NAME	MIN	MAX	
40	*PE-201	Motor ID	– 0	– 99	Set motor ID. When setting motor ID, ID is automatically set from [PE-210]~[PE-217].
41	*PE-202	Baud Rate	bps 0	0 1	Set baud rate of CN3's RS232. (Reconnection of power supply required.) 0=9600[bps], 1=19200[bps] 2=38400[bps],3=57600[bps]
42	*PE-203	Encoder Type	– 0	0 9	Set type of relevant encoder(0 :PHASE A Lead, 1:PHASE B Lead, 6:Absolute value encoder)
43	*PE-204	Encoder Pulse	p/r 1	– 99999	Set no. of pulses of relevant encoder.
44	PE-205	CCW TRQ Limit	[%] 0	300 300	Set torque limit value of CCW running.
45	PE-206	CW TRQ Limit	[%] 0	300 300	Set torque limit value of CW running.
46	*PE-207	System ID	– 0	0 99	Set drive ID for communication.
47	*PE-208	System Group ID	– 0	0 99	Set drive group ID for communication.
48	PE-209	Start Menu No.	– 1	5 20	Set operating Mode Menu to be displayed After operation begins.
49	*PE-210	Inertia	gf·cm·s ² 0.01	ID 999.99	Set motor Inertia moment.
50	*PE-211	Trq Con	kgf·cm/A 0.01	ID 999.99	Set motor torque constant.
51	*PE-212	Phase Ls	mH 0.001	ID 99.999	Set motor phase inductance.
52	*PE-213	Phase Rs	ohm 0.001	ID 99.999	Set motor phase resistance.
53	*PE-214	Rated Is	A 0.01	ID 999.99	Set motor rated current.
54	*PE-215	Max Speed	r/min 0.0	ID 9999.9	Set motor Max. speed.
55	*PE-216	Rated Speed	r/min 0.0	ID 9999.9	Set motor rated speed.
56	*PE-217	Pole Number	– 2	8 98	Set no. of motor poles.
57	PE-218	Not Used	– –	– –	
58	PE-219 ~ PE-220	Not Used	– –	– –	

※ Communication code is to be used for selecting the menu when using TOUCH or PC Communication

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– Special Large Capacity : APD-VP220,VP300,VP370

Menus marked with “*” cannot be corrected during Servo-On

MENU			UNIT	INI	Description	App Mode
Comm Code	CODE	NAME	MIN	MAX		
40	*PE-201	Motor ID	– 0	– 99	Sets Motor ID (Refer 4.4.1), When setting motor ID: Be set automatically from [PE-210] to [PE-218]	PST
41	*PE-202	RS232 Comm. speed	[bps]	0	Sets RS232 communication speed of CN3	PST
		Baud Rate	0	1	0=9600[bps], 1=19200[bps] 2=38400[bps], 3=57600[bps]	
42	*PE-203	Encoder Type	– 0	0 9	Sets applied encoder type (0 : A phase lead, 1 : B phase lead, 6 : Absolute encoder)	PST
43	*PE-204	Encoder Pulse	[p/r] 1	3000 99999	Sets the number of encoder pulse.	PST
44	PE-205	CCW TRQ Limit	[%] 0	210 210	Sets torque limit value at CCW.	PST
45	PE-206	CW TRQ Limit	[%] 0	210 210	Sets torque limit value at CW.	PST
46	*PE-207	System ID	– 0	0 99	Sets drive ID on communication	PST
47	*PE-208	System Group ID	– 0	0 99	Sets drive group ID on communication	PST
48	PE-209	Start Menu No.	– 1	2 20	Sets the operation status display menu with [Pd-001]~[Pd-020] at power on.	PST
49	*PE-210	Inertia	gf·cm·s ² 0.1	ID 9999.9	Sets inertia of motor. (Modification is possible when [PE-201] is “0”)	PST
50	*PE-211	Trq Con	kgf·cm/A 0.001	ID 99.999	Sets torque constant of motor (Modification is possible then [PE-201] is “0”)	PST
51	*PE-212	Q-axis Inductance	mH 0.001	ID 99.999	Sets Q-axis inductance of motor (Modification is possible when [PE-201] is “0”)	PST
52	*PE-213	D-axis Inductance	mH 0.001	ID 99.999	Sets D-axis inductance of motor (Modification is possible when [PE-201] is “0”)	PST
53	*PE-214	Phase Rs	mΩ 0.001	ID 99.999	Sets phase resistance of motor (Modification is possible when [PE-201] is “0”)	PST
54	*PE-215	Rated Is	A 0.01	ID 999.99	Sets rated current of motor (Modification is possible when [PE-201] is “0” .)	PST
55	*PE-216	Max Speed	r/min 0.0	ID 9999.9	Sets max.speed of motor (Modification is possible when [PE-201] is “0”)	PST
56	*PE-217	Rated Speed	r/min 0.0	ID 9999.9	Sets rated speed of motor (Modification is possible when [PE-201] is “0”)	PST
57	PE-218	Pole Number	– 2	8 98	Sets pole number of motor (Modification is possible when [PE-201] is “0”)	PST
58	PE-219	Ibs Offset Save	A –99.999	0 99.999	Sets current offset of motor (Modification is possible when [PE-201] is “0”)	PST
59	PE-220	Ics Offset Save	A –99.999	0 99.999	Sets current offset of motor (Modification is possible when [PE-201] is “0”)	PST

※ Communcation code is to be used for selecting the menu when using TOUCH or PC Communication.

Chapter 1: Linear Coordinate Position Operation Type

Motor type and ID

Model	ID	Watt	Remark
SAR3A	1	30	
SAR5A	2	50	
SA01A	3	100	
SB01A	11	100	
SB02A	12	200	
SB04A	13	400	
SB03A	14	250	Customized type
HB02A	15	200	Hollow type
HB04A	16	400	Hollow type
SC04A	21	400	
SC06A	22	600	
SC08A	23	800	
SC10A	24	1000	
SC03D	25	300	
SC05D	26	450	
SC06D	27	550	
SC07D	28	650	
SC01M	29		
SC02M	30		
SC03M	31		
SC04M	32		
HC06H	33	600	Only S/T
SC05A	34	450	Only S/S
SC05H	35	500	Only S/S
SC08A	36	750	Only S/S
HB01A	37	100	Hollow type
HC10A	38	1000	Hollow type
HE30A	39	3000	Hollow type
HB03H	40	250	Only Semiconductor
HC03H	41	250	Only Semiconductor

Model	ID	Watt	Remark
SE09A	61	900	
SE15A	62	1500	
SE22A	63	2200	
SE30A	64	3000	
SE06D	65	600	
SE11D	66	1100	
SE16D	67	1600	
SE22D	68	2200	
SE03M	69	300	
SE06M	70	600	
SE09M	71	900	
SE12M	72	1200	
SE05G	73	450	
SE09G	74	850	
SE13G	75	1300	
SE17G	76	1700	
HE09A	77	900	Hollow type
HE15A	78	1500	Hollow type
SE11M	79	1050	Customized type
SE07D	80	650	Customized type
SF30A	81	3000	
SF50A	82	5000	
SF22D	85	2200	
SF35D	86	3500	
SF55D	87	5500	
SF75D	88	7500	
SF12M	89	1200	
SF20M	90	2000	
SF30M	91	3000	
SF44M	92	4400	
SF20G	93	1800	
SF30G	94	2900	
SF44G	95	4400	
SF60G	96	6000	
HC05H	99	500	Customized Type

Motor type and ID

Model	ID	Watt	Remark
SE35D	101	3500	Only DS
SE30D	102	3000	Special type
SF44ML	103	4400	For LG only
SF75G	104	7500	Customized
SE35A	105	3500	Customized
SF55G	106	5500	Customized
SF60M	107	6000	Customized
SG22D	111	2200	
SG35D	112	3500	
SG55D	113	5500	
SG75D	114	7500	
SG110D	115	11000	
SG12M	121	1200	
SG20M	122	2000	
SG30M	123	3000	
SG44M	124	4400	
SG60M	125	6000	
SG20G	131	1800	
SG30G	132	2900	
SG44G	133	4400	
SG60G	134	6000	
SG85G	135	8500	
SG110G	136	11000	
SG150G	137	15000	
SH220G	141	22000	
SH300G	142	30000	
SJ370G	143	37000	

[illegible]

1.3.4 Control Variable Setting Menu

Menus carrying “*” mark cannot be corrected when the servo is on.

MENU			UNIT	INI	Description
NO	CODE	NAME	MIN	MAX	
60	PE-301	Inertia Ratio	㎐	2.0	Set inertia ratio of load.
			1.0	500.0	
61	PE-302	Position P Gain1	1/s	50	Set position control proportional gain1.
			0	500	
62	PE-303	Position P Gain2	1/s	50	Set position control proportional gain2.
			0	500	
63	PE-304	P Feedforward	[%]	0	Set position feed forward control ratio.
			0	100	
64	PE-305	P FF FLT TC	msec	0	Set time constant of position feed Forward control filer.
			0	10000	
65	PE-306	P CMD FLT TC	msec	0	Set time constant of position command filter.
			0	10000	
66	PE-307	Speed P Gain1	rad/s	By type of equipment	Set speed proportional gain1. (APD~VPR5~04:500, VP05~10:300, VP15~50:200)
			0	5000	
67	PE-308	Speed P Gain2	rad/s	By type of equipment	Set speed proportional gain2.
			0	5000	
68	PE-309	Speed I TC1	msec	50	Set speed integration time constant1.
			1	10000	
69	PE-310	Speed I TC2	msec	50	Set speed integration time constant2.
			1	10000	
70	PE-311	Speed IN FLT	msec	0.0	Set speed command filter.
			0.0	100.0	
71	*PE-312	Speed FB FLT	msec	0.5	Set speed feedback filter.
			0.0	100.0	
72	PE-313	Zero Speed Gain	r/min	0.0	Set speed range of zero speed gain.
			0.0	100.0	
73	PE-314	POS. COM FT	msec	10.0	Set analog position command filter.
			0.0	1000.0	
74	PE-315	DE-RESONANCE	—	0	Set de-resonance operation 0 : Not activated, 1 : Activated
			0	1	
75	PE-316	Notch Frequency	Hz	300	Set de-resonance operating frequency.
			0	1000	
76	PE-317	Notch Bandwidth	—	100	Set de-resonance band width.
			0	1000	
77	PE-318	Over load offset	—	1.1	Set the time of overload characteristic. (User is requested not to change it.)
			1.0	3.0	
78	PE-319	Not Used	—	—	
			—	—	
79	PE-320	Not Used	—	—	
			—	—	

※ Communicaion code is to be used for selecting the menu when using TOUCH or PC Communication.

II. Operating Software

1.3.5 I/O variable setting Menu

Menus carrying “*” mark cannot be corrected when the servo is on.

MENU			UNIT	INI	Description
NO	CODE	NAM)	MIN	MAX	
80	*PE-401	Analog Speed	r/min 0.0	100.0 9999.9	Set external analog speed input at 10V.
81	PE-402	Speed Offset	mV -1000.0	0.0 1000.0	Set analog speed input offset.
82	PE-403	S Clamp Mode	- 0	0 1	Set speed clamp operating mode.
83	PE-404	S Clamp Volt	mV -1000.0	0.0 1000.0	Set voltage of speed clamp area.
84	PE-405	Analog Position	- 0	1.0 9999.9	Set position coordinate value at 10V.
85	PE-406	Pos Offset	- -9999.9	0.0 9999.9	Set analog position input offset.
86	PE-407	P Clamp Mode	- 0	0 1	Set position clamp operating mode.
87	PE-408	P Clamp Volt	mV -1000.0	0.0 1000.0	Set position clamp operating voltage.
88	PE-409	Monitor Type1	- 0	0 10	Set type of monitor output 1.
89	PE-410	Monitor Mode1	- 0	0 1	Set mode of monitor output 1.
90	PE-411	Monitor Scale1	- 1.0	1.0 9999.0	Set scale of monitor output 1.
91	PE-412	Monitor Offset1	mV -100.00	0.00 100.00	Set offsets of monitor output 1.
92	PE-413	Monitor Type2	- 0	1 10	Set type of monitor output 2.
93	PE-414	Monitor Mode2	- 0	0 1	Set mode of monitor output 2.
94	PE-415	Monitor Scale2	- 1.0	1.0 9999.0	Set scale of monitor output 2.
95	PE-416	Monitor Offset2	mV -100.00	0.00 100.00	Set offset of monitor output 2.
96	PE-417	Monitor OutPos	- 0	0.0 9999.9	Set coordinate value of analog output position at 5V.
97	PE-418	Pulse Out Rate	- 1	1 16	Set frequency dividing ratio of encoder output signal.
98	PE-419	Not Used	- -	- -	
99	PE-420	PWM delay	msec 0	0 1000	Set the delayed time of PWM output OFF When motor is OFF.

※ Communication code is to be used for selecting the menu when using TOUCH or PC Communication.

Chapter 1: Linear Coordinate Position Operation Type

1.3.6 Common Operation Variable Setting Menu

Menu carrying “*” mark cannot be corrected when the servo is on

MENU			UNIT	INI	Description
NO	CODE	NAME	MIN	MAX	
100	*PE-501	Move Motor	– 1	1 999999	Set system based on machine Movement versus motor rpm.
101	*PE-502	Move Mechanical	– 1	1 999999	
102	*PE-503	Move Polarity	– 0	0 1	Set rotation direction of the motor. (0:Coordinate increases in case of CCW run; 1:Coordinate in case of CW run)
103	PE-504	Not Used	– –	– –	
104	PE-505	InPOS Position	– 0.00	0.01 999.99	Set in-position range. (If data of [PE-502] are changed, increase at the same ratio)
105	PE-506	InPOS Time	msec 0	0 10000	Set time of maintaining in-position output.
106	*PE-507	Software Limit	– 0	0 1	Set limit operation On or Off based on position coordinates.
107	PE-508	Upper Limit	– -9999.9	0.0 9999.9	Set upper limit of position coordinates.
108	PE-509	Lower Limit	– -9999.9	0.0 9999.9	Set lower limit of position coordinates.
109	*PE-510	MPG Pulse Logic	– 0	0 5	Set external pulse input signal mode.
110	*PE-511	MPG Pulse	– 1	100 99999	Set system based on motor rpm versus number of external input signal pulse.
111	*PE-512	Motor Move	– 1	1 99999	
112	PE-513	MPG Speed	r/min 0.0	1000.0 9999.9	Set Max. speed when operating by external input pulses.
113	PE-514	Follow Error	– 0	90000 99999	Set range of output for excessive position following error.
114	PE-515	Brake SPD	r/min 0.0	50.0 9999.9	Set operating speed of built-in brake.
115	PE-516	Brake Time	msec 0	10 10000	Set opening delay time of built-in brake.
116	*PE-517	Power Fail Mode	– 0	By type of equipment 1	Set power failure mode. 0 : VP04 or less, 1 : VP05 or more
117	PE-518	DB Control	– 0	1 1	Set dynamo braking mode.
118	PE-519	Not Used	– –	– –	
119	PE-520	ESTOP Reset	– 0	1 1	This function automatically resets alarm when contact ESTOP returns after activation. (0 : Manual reset 1:Auto reset)

※ Communication code is to be used for selecting the menu when using TOUCH or PC Communication.

II. Operating Software

1.3.7 Private Operation Variable Setting Menu

MENU			UNIT	INI	Description
NO	CODE	NAME	MIN	MAX	
120	*PE-601	Operation Mode	— 0	0 6	Set operating mode. (Always carry out origin run prior to changing operating mode.)
121	PE-602	Not Used	— —	— —	
122	PE-603	Run Torq Limit	[%] 0	0 300	Set ratio of limited torque at operating mode 1,2,3 during torque limited position operation.(changed function : MPGEN→TRQLIM.)
123	PE-604	I/O Mode	— 0	0 3	(0 : Digital Input, 1 : middle coordinate output, 2 : Position Coordinate output OP0~OP4, 3 : Set coordinate with outer encoder
124	PE-605	MPG Dir Mode	— 0	0 1	Set direction of operation with respect to MPG pulse. (0 : pulse direction, 1 : command position direction)
125	PE-606	Pos Override	— 0	0 2	Set analog position command override operation mode.
126	PE-607	Digit Mode	— 0	0 1	Set digital switch input mode. (0 : Digital switch input, 1 : PLC contact input)
127	PE-608	Digit Data Type	— 0	0 1	Set Digital switch Data type. (0 : position 5 figures, speed 3 figures, 1 : position code + 5 figures, speed 2 figures)
128	PE-609	Digit Data Time	msec 0	20 99999	Set digital switch data read delay time.
129	PE-610	Out Define	— 0	0 2	Set output contact RDY function. (0 : RDY output, 1 : Torque Limit output 2 : BUSY output)
130	PE-611	GO Back Mode	— 0	0 1	0 : Original state of Operating Mode 5 1 : Return to operating mode 5(PE-703 speed
131	PE-612	GO Back Auto	— 0	1 1	0 : Return when start signal is entered 1 : Automatic return
132	PE-613	Trq Limit Time	msec 0	0 999999	Set torque limit output delay time. This menu is only applied when [PE-601]is set '1'.
133	PE-614	Trq Limit Distance	— 0	1 999999	Set torque limit output delay distance This menu is only applied when [PE-601]is set '1'.
134	PE-615	Dec FF Rate	— 0	0.0 1.0	Do not change this menu. (Maker's private use only)
135	PE-616	Not Used	— —	— —	
136	PE-617	Not Used	— —	— —	
137	PE-618	Not Used	— —	— —	
138 ~ 139	PE-619 ~ PE-620	Not Used	— —	— —	

※ Communication code is to be used for selecting the menu when using TOUCH or PC Communication.

1.3.8 Operation Program Variable Setting Menu : Speed Variables

MENU			UNIT	INI	Description
NO	CODE	NAME	MIN	MAX	
140	PE-701	Speed Command0	r/min 0	10.0 9999.9	Set operating speed 0.
141	PE-702	Speed Command1	r/min 0	100.0 9999.9	Set operating speed 1.
142	PE-703	Speed Command2	r/min 0	200.0 9999.9	Set operating speed 2.
143	PE-704	Speed Command3	r/min 0	500.0 9999.9	Set operating speed 3.
144	PE-705	Speed Command4	r/min 0	1000.0 9999.9	Set operating speed 4.
145	PE-706	Speed Command5	r/min 0	1500.0 9999.9	Set operating speed 5.
146	PE-707	Speed Command6	r/min 0	2000.0 9999.9	Set operating speed 6.
147	PE-708	Speed Command7	r/min 0	3000.0 9999.9	Set operating speed 7.
148	PE-709	AccDec Time0	msec 0	100 100000	Set acceleration/deceleration time 0.
149	PE-710	AccDec Time1	msec 0	100 100000	Set acceleration/deceleration time 1.
150	PE-711	AccDec Time2	msec 0	100 100000	Set acceleration/deceleration time 2.
151	PE-712	AccDec Time3	msec 0	100 100000	Set acceleration/deceleration time 3.
152	PE-713	AccDec Time4	msec 0	100 100000	Set acceleration/deceleration time 4.
153	PE-714	AccDec Time5	msec 0	100 100000	Set acceleration/deceleration time 5.
154	PE-715	AccDec Time6	msec 0	100 100000	Set acceleration/deceleration time 6.
155	PE-716	AccDec Time7	msec 0	100 100000	Set acceleration/deceleration time 7.
156	PE-717	Speed Override	— 0	0 1	Set speed Override operation.
157	PE-718	Not Used	— —	— —	
158	PE-719	Not Used	— —	— —	
159	PE-720	Not Used	— —	— —	

※ Communication code is to be used for selecting the menu when using TOUCH or PC Communication.

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1.3.9 Operation program Variable setting menu: Position Group 0

MENU			UNIT	INI	Description
NO.	CODE	NAME	MIN	MAX	
160	PE-721	Position0 Com0	- -9999.9	0.0 9999.9	Set coordinate 0 of position group 0.
161	PE-722	Position0 Com1	- -9999.9	1.0 9999.9	Set coordinate 1 of position group 0.
162	PE-723	Position0 Com2	- -9999.9	2.0 9999.9	Set coordinate 2 of position group 0.
163	PE-724	Position0 Com3	- -9999.9	3.0 9999.9	Set coordinate 3 of position group 0.
164	PE-725	Position0 Com4	- -9999.9	4.0 9999.9	Set coordinate 4 of position group 0.
165	PE-726	Position0 Com5	- -9999.9	5.0 9999.9	Set coordinate 5 of position group 0.
166	PE-727	Position0 Com6	- -9999.9	6.0 9999.9	Set coordinate 6 of position group 0.
167	PE-728	Position0 Com7	- -9999.9	7.0 9999.9	Set coordinate 7 of position group 0.
168	PE-729	Position0 Com8	- -9999.9	8.0 9999.9	Set coordinate 8 of position group 0.
169	PE-730	Position0 Com9	- -9999.9	9.0 9999.9	Set coordinate 9 of position group 0.
170	PE-731	Position0 Com10	- -9999.9	10.0 9999.9	Set coordinate 10 of position group 0.
171	PE-732	Position0 Com11	- -9999.9	11.0 9999.9	Set coordinate 11 of position group 0.
172	PE-733	Position0 Com12	- -9999.9	12.0 9999.9	Set coordinate 12 of position group 0.
173	PE-734	Position0 Com13	- -9999.9	13.0 9999.9	Set coordinate 13 of position group 0.
174	PE-735	Position0 Com14	- -9999.9	14.0 9999.9	Set coordinate 14 of position group 0.
175	PE-736	Position0 Com15	- -9999.9	15.0 9999.9	Set coordinate 15 of position group 0.
176	PE-737	Not Used	- -	- -	
177	PE-738	Not Used	- -	- -	
178	PE-739	Not Used	- -	- -	
179	PE-740	Not Used	- -	- -	

※ Communication code is to be used for selecting the menu when using TOUCH or PC Communication.

1.3.10 Operation program variable setting Menu: position Group 1

MENU			UNIT	INI	Description
NO.	CODE	NAME	MIN	MAX	
180	PE-741	Position1 Com0	-	20.0	Set coordinate 0 of position group 1.
			-9999.9	9999.9	
181	PE-742	Position1 Com1	-	21.0	Set coordinate 2 of position group 1.
			-9999.9	9999.9	
182	PE-743	Position1 Com2	-	22.0	Set coordinate 3 of position group 1.
			-9999.9	9999.9	
183	PE-744	Position1 Com3	-	23.0	Set coordinate 4 of position group 1.
			-9999.9	9999.9	
184	PE-745	Position1 Com4	-	24.0	Set coordinate 5 of position group 1.
			-9999.9	9999.9	
185	PE-746	Position1 Com5	-	25.0	Set coordinate 6 of position group 1.
			-9999.9	9999.9	
186	PE-747	Position1 Com6	-	26.0	Set coordinate 7 of position group 1.
			-9999.9	9999.9	
187	PE-748	Position1 Com7	-	27.0	Set coordinate 8 of position group 1.
			-9999.9	9999.9	
188	PE-749	Position1 Com8	-	28.0	Set coordinate 9 of position group 1.
			-9999.9	9999.9	
189	PE-750	Position1 Com9	-	29.0	Set coordinate 10 of position group 1.
			-9999.9	9999.9	
190	PE-751	Position1 Com10	-	30.0	Set coordinate 11 of position group 1.
			-9999.9	9999.9	
191	PE-752	Position1 Com11	-	31.0	Set coordinate 12 of position group 1.
			-9999.9	9999.9	
192	PE-753	Position1 Com12	-	32.0	Set coordinate 13 of position group 1.
			-9999.9	9999.9	
193	PE-754	Position1 Com13	-	33.0	Set coordinate 14 of position group 1.
			-9999.9	9999.9	
194	PE-755	Position1 Com14	-	34.0	Set coordinate 15 of position group 1.
			-9999.9	9999.9	
195	PE-756	Position1 Com15	-	35.0	Set coordinate 16 of position group 1.
			-9999.9	9999.9	
196	PE-757	Not Used	-	-	
			-	-	
197	PE-758	Not Used	-	-	
			-	-	
198	PE-759	Not Used	-	-	
			-	-	
199	PE-760	Not Used	-	-	
			-	-	

※ Communication code is to be used for selecting the menu when using TOUCH or PC Communication.

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1.3.11 Operation program Variable Setting Menu: Position Group 2

MENU			UNIT	INI	Description
NO.	CODE	NAME	MIN	MAX	
200	PE-761	Position2 Com0	- -9999.9	40.0 9999.9	Set coordinate 0 of position group 2.
201	PE-762	Position2 Com1	- -9999.9	41.0 9999.9	Set coordinate 1 of position group 2.
202	PE-763	Position2 Com2	- -9999.9	42.0 9999.9	Set coordinate 2 of position group 2.
203	PE-764	Position2 Com3	- -9999.9	43.0 9999.9	Set coordinate 3 of position group 2.
204	PE-765	Position2 Com4	- -9999.9	44.0 9999.9	Set coordinate 4 of position group 2.
205	PE-766	Position2 Com5	- -9999.9	45.0 9999.9	Set coordinate 5 of position group 2.
206	PE-767	Position2 Com6	- -9999.9	46.0 9999.9	Set coordinate 6 of position group 2.
207	PE-768	Position2 Com7	- -9999.9	47.0 9999.9	Set coordinate 7 of position group 2.
208	PE-769	Position2 Com8	- -9999.9	48.0 9999.9	Set coordinate 8 of position group 2.
209	PE-770	Position2 Com9	- -9999.9	49.0 9999.9	Set coordinate 9 of position group 2.
210	PE-771	Position2 Com10	- -9999.9	50.0 9999.9	Set coordinate 10 of position group 2.
211	PE-772	Position2 Com11	- -9999.9	51.0 9999.9	Set coordinate 11 of position group 2.
212	PE-773	Position2 Com12	- -9999.9	52.0 9999.9	Set coordinate 12 of position group 2.
213	PE-774	Position2 Com13	- -9999.9	53.0 9999.9	Set coordinate 13 of position group 2.
214	PE-775	Position2 Com14	- -9999.9	54.0 9999.9	Set coordinate 14 of position group 2.
215	PE-776	Position2 Com15	- -9999.9	55.0 9999.9	Set coordinate 15 of position group 2.
216	PE-777	Not Used	- -	- -	
217	PE-778	Not Used	- -	- -	
218	PE-779	Not Used	- -	- -	
219	PE-780	Not Used	- -	- -	

※ Communication code is to be used for selecting the menu when using TOUCH or PC Communication.

1.3.12 Operation program Variable Setting Menu: Position Group 3

MENU			UNIT	INI	Description
NO	CODE	NAME	MIN	MAX	
220	PE-781	Position3 Com0	- -9999.9	60.0 9999.9	Set coordinate 0 of position group 3.
221	PE-782	Position3 Com1	- -9999.9	61.0 9999.9	Set coordinate 1 of position group 3.
222	PE-783	Position3 Com2	- -9999.9	62.0 9999.9	Set coordinate 2 of position group 3.
223	PE-784	Position3 Com3	- -9999.9	63.0 9999.9	Set coordinate 3 of position group 3.
224	PE-785	Position3 Com4	- -9999.9	64.0 9999.9	Set coordinate 4 of position group 3.
225	PE-786	Position3 Com5	- -9999.9	65.0 9999.9	Set coordinate 5 of position group 3.
226	PE-787	Position3 Com6	- -9999.9	66.0 9999.9	Set coordinate 6 of position group 3.
227	PE-788	Position3 Com7	- -9999.9	67.0 9999.9	Set coordinate 7 of position group 3.
228	PE-789	Position3 Com8	- -9999.9	68.0 9999.9	Set coordinate 8 of position group 3.
229	PE-790	Position3 Com9	- -9999.9	69.0 9999.9	Set coordinate 9 of position group 3.
230	PE-791	Position3 Com10	- -9999.9	70.0 9999.9	Set coordinate 10 of position group 3.
231	PE-792	Position3 Com11	- -9999.9	71.0 9999.9	Set coordinate 11 of position group 3.
232	PE-793	Position3 Com12	- -9999.9	72.0 9999.9	Set coordinate 12 of position group 3.
233	PE-794	Position3 Com13	- -9999.9	73.0 9999.9	Set coordinate 13 of position group 3.
234	PE-795	Position3 Com14	- -9999.9	74.0 9999.9	Set coordinate 14 of position group 3.
235	PE-796	Position3 Com15	- -9999.9	75.0 9999.9	Set coordinate 15 of position group 3.
236	PE-797	Not Used	- -	- -	
237	PE-798	Not Used	- -	- -	
238	PE-799	Not Used	- -	- -	
239	PE-800	Not Used	- -	- -	

※ Communication code is to be used for selecting the menu when using TOUCH or PC Communication.

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1.3.13 Jog and Origin Run Variable Setting Menu

MENU			UNIT	INI	Description
NO.	CODE	NAME	MIN	MAX	
240	PE-801	Jog Speed0	r/min 0.0	10.0 9999.9	Set jog run speed 0.
241	PE-802	Jog Speed1	r/min 0.0	500.0 9999.9	Set jog run speed 1.
242	PE-803	Jog AccDec Time	msec 0	100 99999	Set jog run acceleration/deceleration time.
243	PE-804	Not Used	— —	— —	
244	PE-805	Not Used	— —	— —	
245	PE-806	Not Used	— —	— —	
246	PE-807	Not Used	— —	— —	
247	PE-808	Not Used	— —	— —	
248	PE-809	Jog Speed Select	— 0	0 1	Select jog run speed. 0 : Select [PE-801], [PE-802] 1 : select [PE-701]~ [PE-708]
249	PE-810	Origin Mode	— 0	1 4	Set Origin run mode.
250	PE-811	Origin polarity	— 0	0 1	Set Origin run direction.
251	PE-812	Origin Dog Stop	— 0	0 1	Set stop(1) or z position 0 When dog sensor turns off during origin run.
252	PE-813	Origin Offset	— -9999.9	0.0 9999.9	Set offset position at which to stop after origin run.
253	PE-814	Origin Position	— -9999.9	0.0 9999.9	Set initial coordinates after origin run.
254	PE-815	Origin AutoRun	— 0	0 1	Set automatic origin run on or off When servo is on.
255	PE-816	Origin Speed0	r/min 0.0	100.0 9999.9	Set origin run speed 0.
256	PE-817	Origin Speed1	r/min 0.0	10.0 9999.9	Set origin run speed 1.
257	PE-818	Origin Torque	[%] 1.0	50.0 300.0	Set torque during damper(Origin run mode4) run.
258	PE-819	Not Used	— —	— —	
259	PE-820	Not Used	— —	— —	

※ Communication code is to be used for selecting the menu when using TOUCH or PC Communication.

1.3.14 Operation Menu

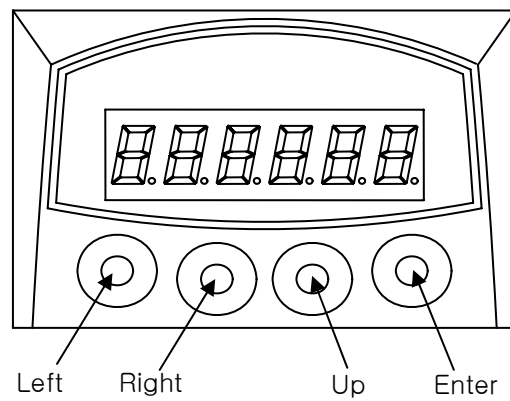
MENU			UNIT	INI	Description
NO	CODE	NAME	MIN	MAX	
260	PC-901	Alarm RESET	— —	— —	Reset alarm
261	PC-902	Alarm HIS Clear	— —	— —	Clear alarm history
262	PC-903	Jog Run	— —	— —	Manipulate jog run (UP key is hit after jog run, the current coordinate are stored in the position coordinate menu currently)
263	PC-904	Origin Run	— —	— —	Carry out origin run.
264	PC-905	Gain Tune Run	— —	— —	Gain is automatically adjusted.
265	PC-906	I/O Logic Set	— —	— —	Set logic of input contacts.
266	PC-907	Input Ext Set	— —	— —	Manipulate input contacts from outside.
267	*PC-908	Menu data Init	— —	— —	If push [Up]key after push [Enter] key, all menu data is initialized. But, System Menu of [PE-201]~[PE-220] does not changed. (Applied after re-starting)
268	PC-909	Menu Data Lock	— —	— —	Activate menu data lock.
269	PC-910	Current Offset	— —	— —	Set drive current feedback offset
270	PC-911	Not Used	— —	— —	
271	PC-912	Not Used	— —	— —	
272	PC-913	Not Used	— —	— —	
273	PC-914	Not Used	— —	— —	
274	PC-915	Not Used	— —	— —	
275	PC-916	Not Used	— —	— —	
276	PC-917	Not Used	— —	— —	
277	PC-918	Not Used	— —	— —	
278 ~ 279	PC-919 ~ PC-920	Not Used	— —	— —	

※ Communication code is to be used for selecting the menu when using TOUCH or PC Communication.

1.4 Detailed Description of Menu

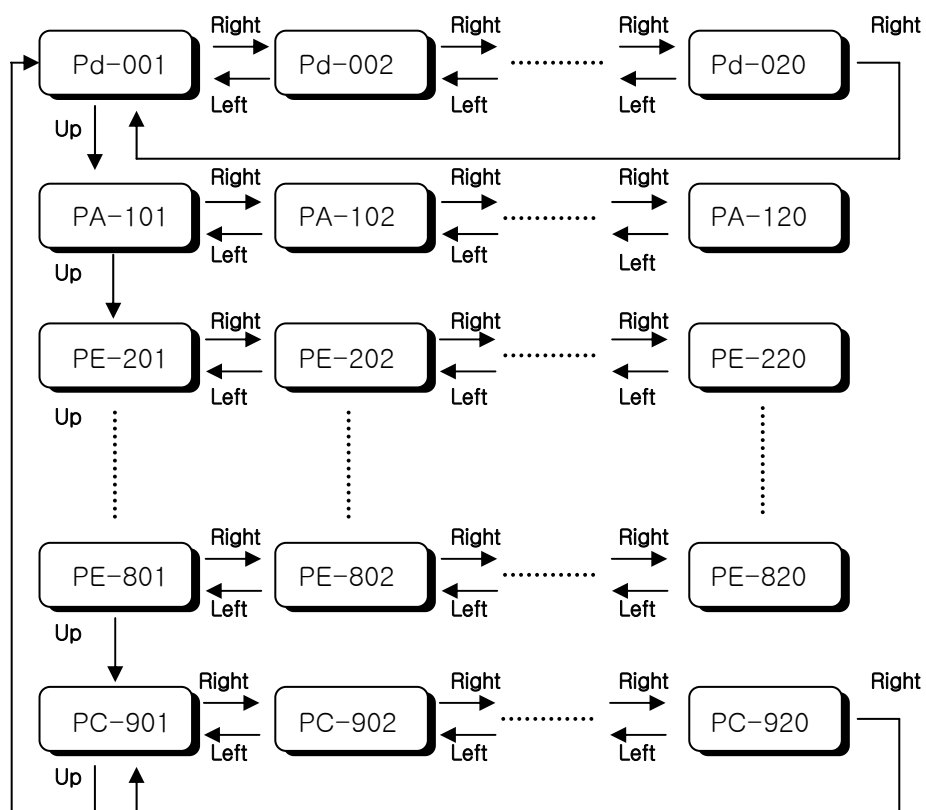
1.4.1 Loader Operation

1) Components

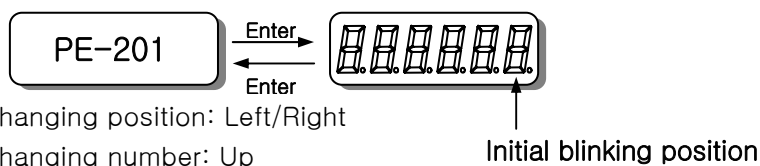


2) Components

① Menu movements



② Menu editing



- * Changing position: Left/Right
 - * Changing number: Up
 - Move to the menu to be edited referring to paragraph ①
 - Press Enter Key to be display menu data “ +9999.9 ”
- The number on the far right starts blinking. The blinking number indicates editing position.
- Press Left or Right to move the figure of number to be edited. The blinking numbers move along accordingly.
 - Press Up key to change numbers(the number increases). If the number is larger than “9”, it will be change to “0”.
 - Upon completion of editing, press enter. The related data are saved, and the screen returns to menu number.

③ Menu editing error

- The following will appear when menu editing error occurs.

Display	Causes
notuSE	Menu which is not used or cannot be edited
Err1	<ul style="list-style-type: none"> - Menu that cannot be edited when servo is on - Editing error of constant related to motor - Number not carrying motor ID have been entered - An attempt is made to edit detailed constant when the motor ID is not “0”
Err2	An attempt is made to set data outside the setting range
Err3	Menu editing is Lock. Menu editing lock should be released.

④ Special operation function

- If menu is used to set I/O status, each key carries independent function. For more details, refer to paragraph1.4.9 “Operating commands.”
- Alarm manipulation menu
- I/O Setting menu
- Jog run menu
- Gain tuning menu
- Origin run menu
- Current offset compensation menu
- Menu-related manipulation menu

1.4.2 Operation Mode display

1) Mode display [Pd-001]

- ① Current operation mode is displayed.
 - * nor: Indicates normal operating mode.
 - * AL-XX: Relevant code is displayed when an alarm occurs.
- ② When alarm is reset after the cause is removed. Details of the menu corresponding to the menu number set in the initial mode screen [PE-209] are displayed.
- ③ If, however, the menu is moved to another menu at this time, the menu will be displayed.

2) Speed display

- ① The current operating speed[Pd-002] and the current command speed[Pd-003] are displayed I the unit of [r/min].
- ② Range: “-9999.9” ~ “9999.9”

3) Position display

- ① The current operation position [Pd-005], current operation target position [Pd-006], and the operation command position[Pd-007] are displayed in user units.

4) Torque and load display

- ① Torque Limit [Pd -009]

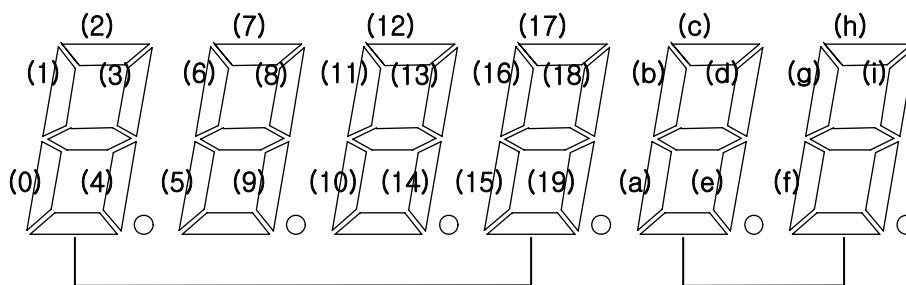
The output torque limit value is displayed in percentage of rated output.
- ② Current load rate [Pd -010]

The energy (load) produced by servo motor is displayed in percentage of the rated output.
- ③ Average load rate [Pd -011]

The average value of the energy (load) produced by servo motor calculated during a period of 5 seconds is displayed in percentage of the rated output.
- ④ Peak instantaneous load rate [Pd -012]

The peak load value from the time the servo power supply is connected to the present is displayed in percentage of the rated output.

5) I/O Mode display



Contact logic display

Input contact operation position display/Output contact logic display

[Input contact: Upper]

(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
SVON	START	EMG	ALMRST	PSEL0	PSEL1	PSEL2	PSEL3	PSEL4	CCWLIM
(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
CWLIM	STOP	ORGIN	DOGIN	P-JOG	N-JOG	MPGEN	SPD1	SPD2	SPD3

[Output contact: Lower]

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)
BRAKE	ORG-OUT	ALARM	RDY	INPOS	OP1	OP2	OP3	OP4

① CN1 I/O contact condition [Pd-014]

When CN1 Connector contact turns on(contact shorted), the lamp operating in the relevant location will turns on; or the lamp will turn off when the connector contact turns off (contact open).

② external operation input condition [Pd-015]

- If the relevant contact condition is manipulated by an external source (PC communication or other equipment) instead of CN1 Connector, the condition of the contact is displayed.
- As the condition of the external input is not stored in the servo drive ROM, the input condition is automatically reset if power supply is turned off.

③ I/O contact condition [Pd-016]

The I/O contact conditions, under which the servo drive is operated by the combination of paragraph ① and ② above, are displayed.

(The I/O contact conditions are recognized and displayed when Normal-A contact is ON and Normal-B contact : OFF is off)

6) Display the state of exchanging information with external equipment(Communication-dedicated menu)

The mode data resulting from communications with upper controllers (touch-screen, PC, Etc.) are displayed.

① Current state of input contact logic [Pd-017]

The current logic value of the input contact is displayed.

If power supply is turned off, this value will be erased.

② Storage state of the input contact logic [Pd-018]

The value saved by the current logic of the input contact is displayed.

But, the storage value will not be erased even if the power supply is turned off.

③ Alarm condition bit [Pd-019]

If an alarm occurs, the bit corresponding to the related alarm number is displayed.

7) Software version display

P 1.31 – 3
↑ ↑ ↑
Position Version Drive type
operation number
type

- The software model applicable to this manual is P

NO	Drive Type
0	VPR5
1	VP01
2	VP02
3	VP04
4	VP05
5	VP10
6	VP15
7	VP20
8	VP35
9	VP50
A	VP75
b	VP110
c	VP110L Specail model(300A)
d	VP150
e	VP220
f	VP300
g	VP370

1.4.3 Setting System Variables

1) Setting motor constant

① Setting motor constant based on ID.

If the ID number is entered in the menu [PE-201], the motor constant is automatically set. The ID numbers of motor are as follows.

Motor models and ID (To be continued to the next page)

Model	ID	Watt	Remark
SAR3A	1	30	
SAR5A	2	50	
SA01A	3	100	
SB01A	11	100	
SB02A	12	200	
SB04A	13	400	
SB03A	14	250	Special type
HB02A	15	200	Hollow shaft type
HB04A	16	400	Hollow shaft type
SC04A	21	400	
SC06A	22	600	
SC08A	23	800	
SC10A	24	1000	
SC03D	25	300	
SC05D	26	450	
SC06D	27	550	
SC07D	28	650	
SC01M	29		
SC02M	30		
SC03M	31		
SC04M	32		
HC06H	33	600	Exclusively for S/T
SC05A	34	450	Exclusively for S/T
SC05H	35	500	Exclusively for S/T
SC08A	36	750	Exclusively for S/T
HB01A	37	100	Hollow shaft type
HC10A	38	1000	Hollow shaft type
HE30A	39	3000	Hollow shaft type

Model	ID	Watt	Remark
HB03H	40	250	Exclusively for semi-conductor
HC03H	41	250	Exclusively for semi-conductor
SE09A	61	900	
SE15A	62	1500	
SE22A	63	2200	
SE30A	64	3000	
SE06D	65	600	
SE11D	66	1100	
SE16D	67	1600	
SE22D	68	2200	
SE03M	69	300	
SE06M	70	600	
SE09M	71	900	
SE12M	72	1200	
SE05G	73	450	
SE09G	74	850	
SE13G	75	1300	
SE17G	76	1700	
HE09A	77	900	Hollow shaft type
HE15A	78	1500	Hollow shaft type
SE11M	79	1050	Special type
SE07D	80	650	Special type
SF30A	81	3000	
SF50A	82	5000	
SF22D	85	2200	
SF35D	86	3500	
SF55D	87	5500	
SF75D	88	7500	

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[illegible][illegible]

Chapter 1: Linear Coordinate Position Operation Type

② Setting individual motor constant

Enter "0" in the motor ID menu[PE-201] to set motor constant individually. The following motor constants shall be set individually.

MENU			UNIT	INI	Description
NO	CODE	NAME	MIN	MAX	
40	PE-201	Motor ID	– 0	– 99	Set ID of applicable. When setting motor ID: [PE-210]~[PE-217] are automatically set.
49	PE-210	Inertia	gf·cm·s ² 0.01	ID 999.99	Set motor inertial moment, If ([PE-201] is entered as "0", correction can be made.)
50	PE-211	Trq Con	kgf·cm/A 0.01	ID 999.99	Set motor torque constant. If ([PE-201] is entered as "0", correction can be made.)
51	PE-212	Phase Ls	mH 0.001	ID 99.999	Set motor phase inductance. If ([PE-201] is entered as "0", correction can be made.)
52	PE-213	Phase Rs	ohm 0.001	ID 99.999	Set motor phase resistance. . If ([PE-201] is entered as "0", correction can be made.)
53	PE-214	Rated Is	A 0.01	ID 999.99	Set motor related current. . If ([PE-201] is entered as "0", correction can be made.)
54	PE-215	Max Speed	r/min 0.0	ID 9999.9	Set motor maximum speed. . If ([PE-201] is entered as "0", correction can be made.)
55	PE-216	Rated Speed	r/min 0.0	ID 9999.9	Set motor rated speed. . If ([PE-201] is entered as "0", correction can be made.)
56	PE-217	Pole Number	– 2	8 98	Set number of motor poles. . If ([PE-201] is entered as "0", correction can be made.)
Only Special-Large Capacity Menu(APD-VS220, VS300, VS370)					
40	*PE-201	Motor ID	– 0	– 99	Sets motor ID : set automatically from [PE-210]to[PE-217]
49	*PE-210	Inertia	gf·cm·s ² 0.01	ID 999.99	Sets inertia of motor. (Modification is possible when [PE-201] is "0")
50	*PE-211	Trq Con	kgf·cm/A 0.01	ID 999.99	Sets torque constant of motor.(Modification is possible when [PE-201] is "0")
51	*PE-212	Phase Lq	mH 0.001	ID 99.999	Sets phase inductance of motor.(Modification is possible when [PE-201] is "0")
52	*PE-213	Phase Ld	mH 0.001	ID 99.999	Sets phase inductance of motor.(Modification is possible when [PE-201] is "0")
53	*PE-214	Phase Rs	ohm 0.001	ID 99.999	Sets phase resistance of motor. (Modification is possible when [PE-201] is "0")
54	*PE-215	Rated Is	A 0.01	ID 999.99	Sets rated current of motor. (Modification is possible when [PE-201] is "0")
55	*PE-216	Max Speed	r/min 0.0	ID 9999.9	Sets Max. speed of motor. (Modification is possible when [PE-201] is "0")
56	*PE-217	Rated Speed	r/min 0.0	ID 9999.9	Sets rated speed of motor. (Modification is possible when [PE-201] is "0")
57	PE-218	Pole Number	– 2	8 98	Sets pole number of motor. (Modification is possible when [PE-201] is "0")

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2) Setting encoder

– Encoder model [PE-203]

No	Transmission Mode	Signal Mode	Signal Type	Remark
0	Parallel	Phase A leads in case of forward running	A,B,Z,U,V,W	Standard
1	Parallel	Phase B leads in case of forward running	A,B,Z,U,V,W	
6	Serial	Absolute value 11/13 bit	A,B,Z,RX	

– Encoder pulse [PE-204]

This is set when the encoder uses signals A and B. The number of pulses per cycle for each signal is set

The number of pulses for phases A and B are the same.

3) Setting torque limits

The limit value [PE-205] of the maximum torque during the forward running and the limit value [PE-206] of maximum torque during backward running can be individually set. Torque limits can be set in percentages of the rated torque. The standard is 300%.

4) Setting system ID

If the system communicates with a servo through the use of BUS communications, an ID may be assigned to the servo. In this case, an option is required in relation to communications.

– System ID [PE-207]

An ID is assigned to the servo and used to individually communicate with the servo.

– System group ID [PE-208]

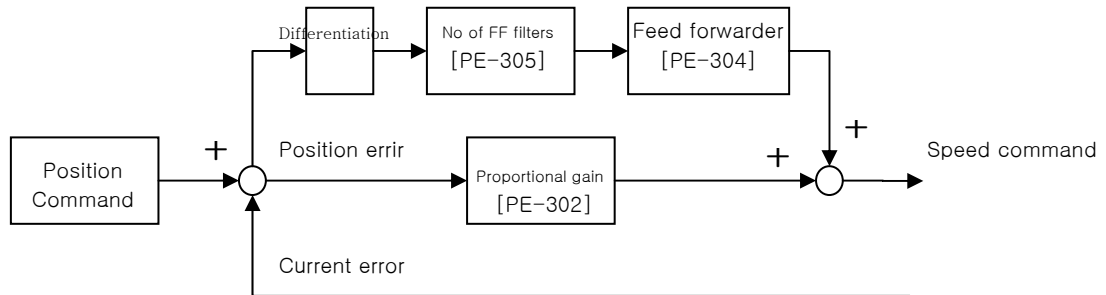
A group ID is set and used when multiple servos are consolidated into a group for communications.

5) Setting mode display when operation is started [PE-209]

Menu that is used at initial period after the servo power supply is turned on can be set. The setting shall be classified into number 1 through 20 from [Pd-001]~[Pd-020] to set the relevant menu numbers.

1.4.4 Setting control variables

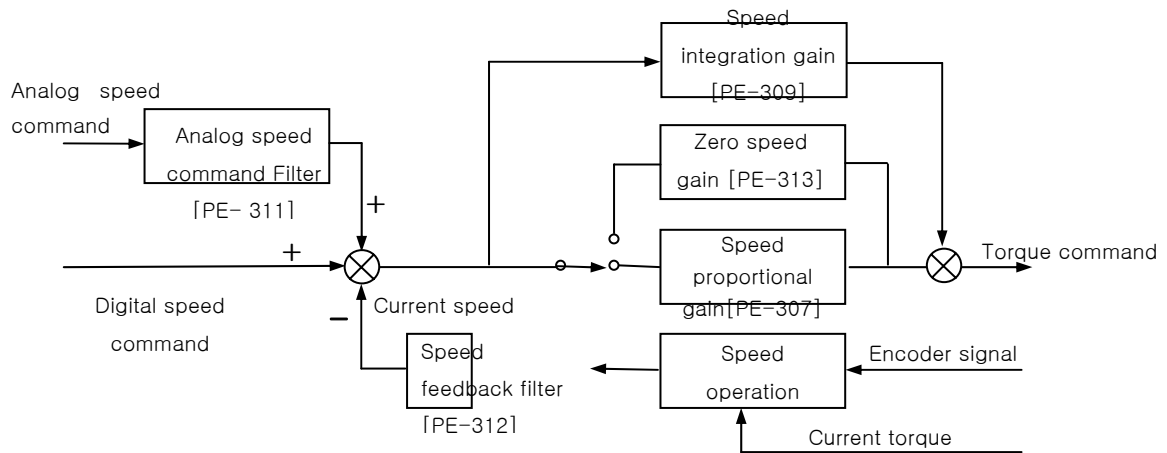
1) Position control gain



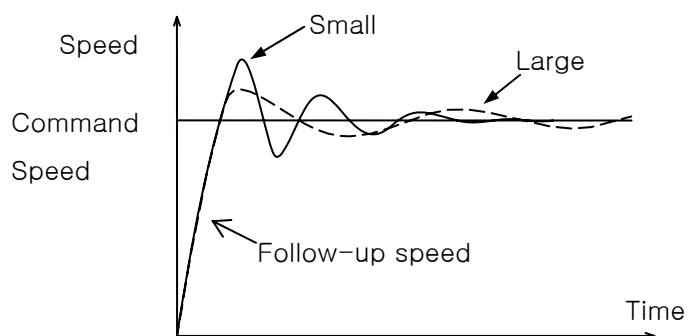
- ① Position Command: The position command pulses received from external sources are counted and converted into the position command value, which goes through the first filter and used as the internal position command.
- ② Current position: The pulse signals received from the encoder are counted and converted into the current position value through the use of the electronic gear ratio setting.
- ③ Position proportional gain [PE-302][PE-303]: The position proportional gain is multiplied by the difference between command position and current position to convert the outcome into a speed command.
- ④ Feed forwarder gain [PE-304]: This is used to obtain gradient in terms of differentiated value with respect to the position command, and reduce the positioning time by adding speed command to the gradient thus acquired. If this value is too high an overshoot may occur on position control or position control may become uncertain. Hence the value shall be gradually increased from a small level while monitoring the condition of trial operation until an appropriate value is obtained.
- ⑤ Feeder forwarder filter[PE-305]: If the position command changes too rapidly, the feed forward control may display a vibration. If this happens, set appropriate level of filter value to remove vibration resulting from rapid changes.

Note: The function of the position proportional gain 2[PE-303] is not supported by the current software version.

2) Speed control gain

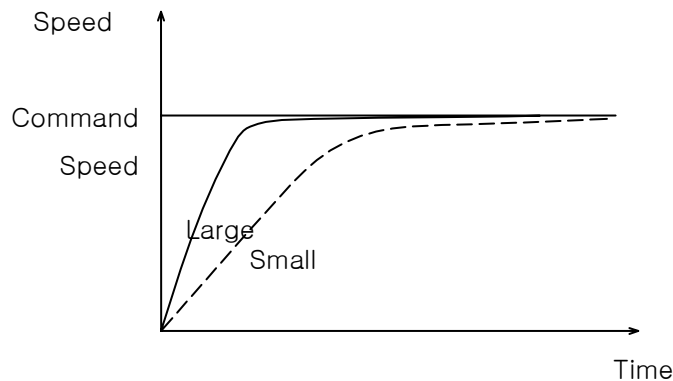


- ① Speed command: The analog speed signals received from external sources are used as the speed command after going through the analog speed command filter[PE-311], or the digital speed command set by the internal menu in the unit of r/min is used.
- ② Current speed: The encoder signals are counted to calculate the speed, and the calculated speed is used as the current speed after going through the filter. In order to compensate for speed calculation error at an extremely low speed, an algorithm, which estimates speed through the use of the current torque and inertia, is used. Accordingly, setting accurate motor constant and the inertia ratio is closely linked with the stability of the motor speed control.
- ③ Speed integration gain[PE-309]: An integrated value of the difference (speed error) between command speed and current speed is obtained, and this value is multiplied by an integrated gain to be converted into a torque command. If the integrated gain is reduced, the excessive response characteristics are improved to enhance the speed follow-up. However, if the gain is too small, an overshoot occurs. On the other hand, if the gain is too large, the excessive response characteristics drop and operation is made based on proportional control characteristics.



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- ④ Speed proportional gain [PE-307]: The speed error is multiplied by proportional gain to convert the error into torque command. If this value is large, the speed response becomes fast enhancing the speed follow-up. If this value is excessively large, vibration occurs. On the other hand, if this value is small, the speed response becomes slow and the follow-up effect drops, causing the servo to become weak.



- ⑤ Speed feedback filter [PE-312]: Motor may shake by the vibration of the drive system, or vibration may occur due to gain in case load with excessively large inertia is applied. Such vibration may be suppressed through the use of speed feedback filter. If the value is excessively large, the speed responsiveness may drop causing the deterioration of the control performance.
- ⑥ Zero speed gain [PE-313]: If a speed feedback filter is used to suppress vibration, the stationary vibration may cause the system to be unstable. If this happens, set the range of speed to which gain is applied, and vibration can be suppressed by adjusting gain within the established speed range.

Note: The functions of the speed proportional gain 2 [PE-308] and the speed integration gain 2 [PE-310] are not supported by the current software version.

3) Setting inertia ratio [PE-301]

Load inertia is calculated for each mechanical system. The rotator's inertia ratio is calculated and set based on the motor characteristics table. Setting the inertia ratio of load is a very important control variable in the servo operation characteristics. Servo can be operated in an optimal condition only if the inertia ratio is accurately set.

- The following table shows recommended values of appropriate control gains for each load inertia ratio.

Motor Flange	Inertia Ratio		Range of Gain Setting		
	Classification	[Inertia]	Position proportional gain [Pgain 1,2]	Speed proportional gain [Sgain 1,2]	Speed integration gain [SITC]
40 ~ 80	Low inertia	1 ~ 5	40 ~ 60	500 ~ 800	20 ~ 40
	Medium inertia	5 ~ 20	20 ~ 40	300 ~ 500	40 ~ 60
	High inertia	20 ~ 50	10 ~ 20	100 ~ 300	60 ~ 100
100 ~ 130	Low inertia	1 ~ 3	40 ~ 60	200 ~ 400	20 ~ 40
	Medium inertia	3 ~ 10	20 ~ 40	100 ~ 200	40 ~ 80
	High inertia	10 ~ 20	10 ~ 20	50 ~ 100	80 ~ 150
180 ~ 280	Low inertia	1 ~ 2	30 ~ 60	150 ~ 250	30 ~ 50
	Medium inertia	2 ~ 4	15 ~ 30	75 ~ 150	50 ~ 100
	High inertia	4 ~ 10	5 ~ 15	20 ~ 75	100 ~ 200

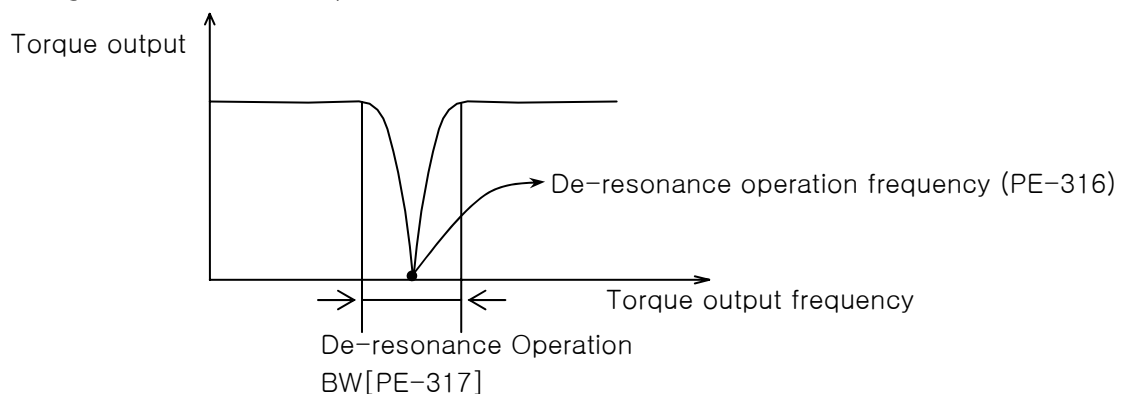
* If it is difficult to calculate inertia ratio, the inertia ratio can be tuned during trial operation.

See “paragraph 1.4.9 “Automatic gain adjustment [PC-905].”

4) Setting analog position command filter [PE-314]

The stability of command signal can be improved by setting a digital filter for analog position command voltage. If an excessively large value is set, the responsiveness to the analog position command drops. Set appropriate value depending on the type of systems used.

5) Setting de-resonance operation

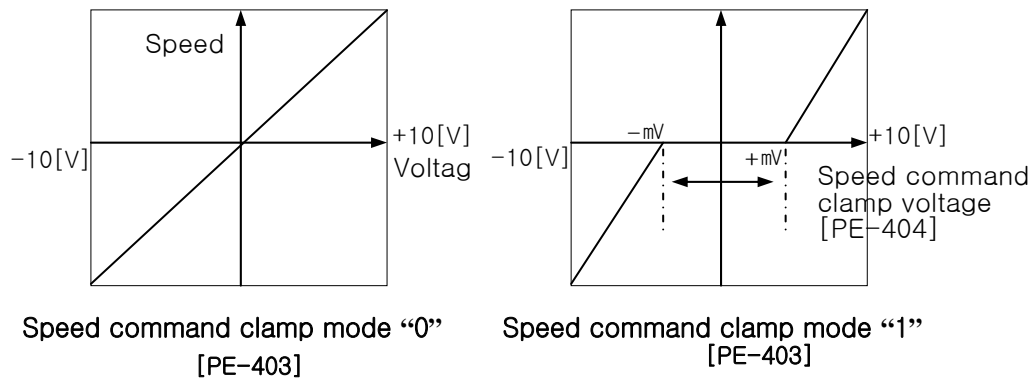


- If vibration occurs due to mechanical resonance generated from certain frequencies, it may be suppressed by limiting torque output for the frequency band.
- De-resonance operation [PE-315]: This will not be activated if “0” is set, but will be activated if “1” is set.

1.4.5 Setting I/O Variables

1) Setting analog speed command

- ① Analog speed command [PE-401]: Set the analog speed command value in the unit of r/min at 10 [V]. The maximum setting will be the motor's maximum speed.
- ② Speed command offset [PE-402]: Sometimes, certain level of voltage exists on the analog signal interface circuit even at zero speed command. This voltage may be compensated by setting equivalent voltage as offset. The voltage unit shall be "mV".
- ③ Setting speed command clamp

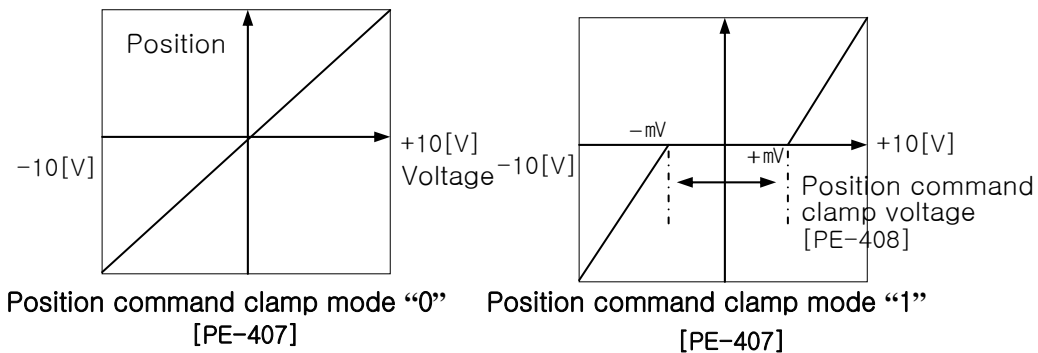


- ④ Speed override operation [PE-717]: Speed command operation can be executed by overriding (overlapping) the analog speed command with the digital speed command.
"0": Override not activated.
"1": Override activated.

2) Setting analog position command

- ① Analog position command [PE-405]: Set analog position command value at 10[V].
- ② Position command offset [PE-406]: Sometimes, certain level of voltage exists due to problems in analog circuit even at zero speed command. This voltage may be compensated by setting equivalent voltage as offset. The voltage unit shall be "mV".

③ Position command clamp



3) Setting analog output

Two analog outputs are available. Values corresponding to the data can be output according to the set conditions at a cycle of 400 [msec] respectively.

① Analog output types [PE-409], [PE-413]

Model	Data	Model	Data
0	Command speed	4	Command position
1	Current speed	5	Current position
2	Command torque		
3	Current torque		

② Analog output modes [PE-410], [PE-414]

Mode	Output Mode
0	Output at -5[V] – +5[V]
1	Output at 0 – +5[V]

③ Analog output magnification [PE-411], [PE-415]. If output data is excessively small or large, the data may be appropriately magnified or reduced. The basic magnification for each output data is as follows:

Data Item	Magnification
Speed	Motor maximum speed [PE-215]
Torque	Motor maximum torque [PE-205]
Command pulse Frequency	500 [Kpps]
Position	Analog position output [PE-417] at 5[V].

* Special-Large capacity(VP220, VP300, VP370)’s Motor speed max [PE-216]

④ Analog output offsets [PE-412], [PE-416].

Certain level of voltage may exist when “0” value is output due to problems in analog circuit. This voltage may be compensated by setting equivalent voltage as offset. The voltage unit shall be “mV”.

⑤ Analog position output [PE-417] at 5V. The position data are set at 5[V] if the analog position output is applied.

4) Encoder output pulse frequency dividing ratio [PE-418]

Encoder pulses may be produced after changing the pulses to the extent of the preset frequency-dividing ratio.

Example: From 3000 [pulse] with the frequency dividing ratio 2 →1500 [pulse]

* The frequency-dividing ratio must be set so that the resulting frequency dividing output pulse comes to be an integer.

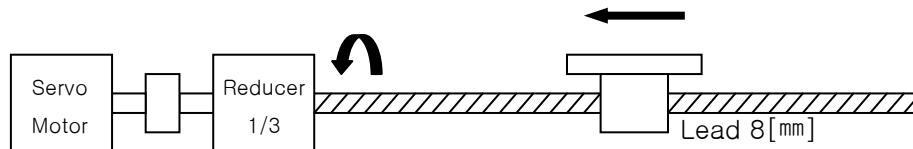
1.4.6 Setting Common Operation Variables

1) Setting operating mechanism

① Setting mechanism feed unit

Set motor revolution unit related to the mechanism feed unit based on the amount of mechanism feed [PE-502] versus the motor rpm [PE-501].

Example: If the reduction ratio is 1/3, and the ball screw lead is 8 [mm].



* Enter “3” for motor rpm [PE-501] and “8” for amount of mechanism feed [PE-502].

② Setting feed direction

Set the direction of feed [PE-503] at + position coordinates according to the mechanism assembly.

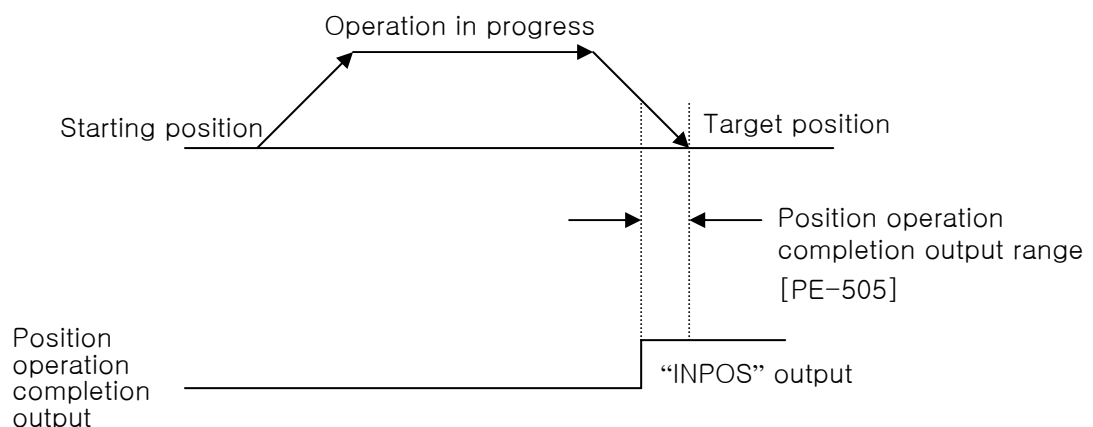
Code	+ Position Coordinates	– Position Coordinates
0	Forward running (CCW)	Backward running (CW)
1	Backward running (CW)	Forward running (CCW)

2) Setting position operation variables

① Position operation completion output range [PE-505]

Data are output within the set range when the target position is reached.

Setting is done in user units.



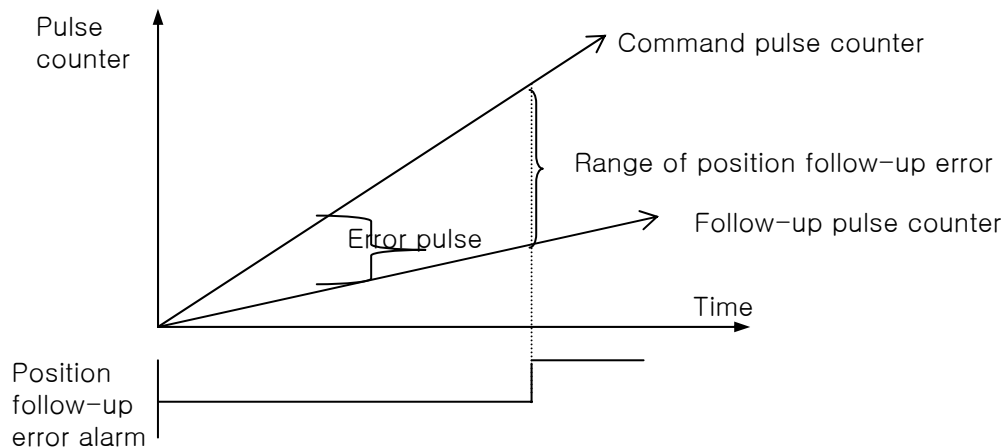
If the amount of mechanism feed [PE-502] or the position coordinate unit [PE-602] is changed, increase the range of position operation completion output [PE-505] in the same ratio. If the setting is too large, the positioning completion output signal may be produced during operation. Set an appropriate value to avoid this.

② Position operation completion output time [PE-506]

The position operation completion signal may be set to appear for a preset duration and disappear irrespective of position.

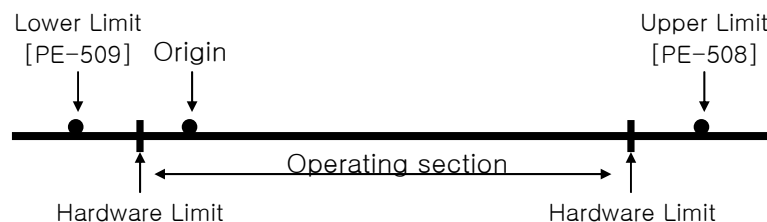
* If the setting is greater than “0”, the system operates; and if the setting is “0”, the system does not operate.

③ Range of position operation follow-up error [PE-514]



If error pulse is greater than the setting of the position operation follow-up error range, a position follow-up error alarm is generated.

3) Setting Software Limit



If hardware limit cannot be used for safety purposes or due to the nature of mechanical structure, software limit may be set.

Unless origin run is carried out, the software limit cannot assume specific position.

Configure the system so that origin run is always carried out prior to operation.

* If the software limit menu [PE-507] is set to “1”, limit is activated.

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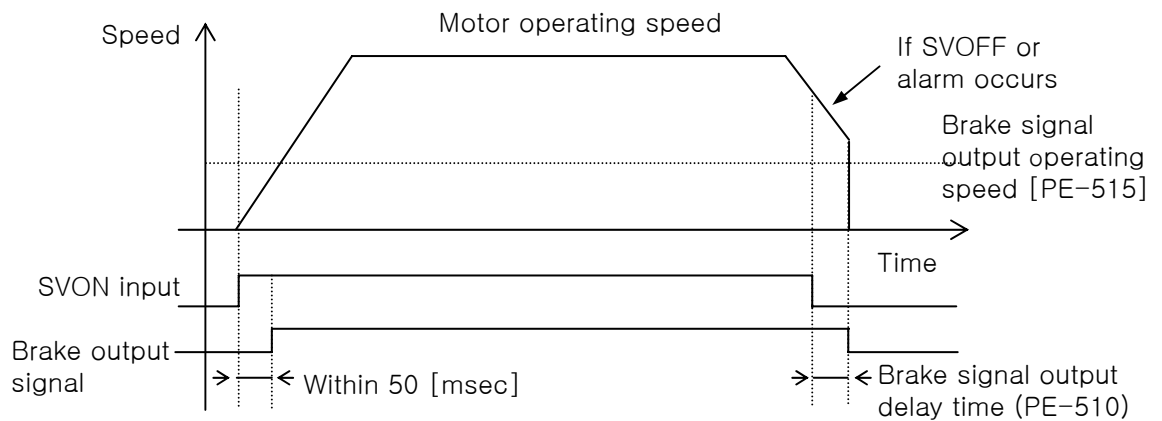
4) Setting external input pulse (MPG) unit

- ① Pulse logic [PE-510]: The following codes are used depending on pulse types.

PF +PR	Positive Logic			Negative Logic		
	Code	Forward Running	Backward Running	Code	Forward Running	Backward Running
PHASE A + PHASE B	0			3		
CCW or CW Pulse	1			4		
Pulse + direction	2			5		

- ② Setting unit: Set motor rpm [PE-512] versus the number of external input signals [PE-511].

5) Setting the brake signal output variables



- ① Brake signal output operating speed [PE-515] and brake signal output delay time [PE-516]

If an alarm occurs while operating the servo motor by applying the built-in brake to the vertical shaft, or if the speed is reduced by SVOFF, the brake signal is stopped by either the brake signal output operating speed (PE-515) or the brake signal output delay time (PE-516) whichever satisfied the operating conditions first. This prevents the vertical shaft from dropping to the motor brake.

6) Dynamo braking [PE-518]

The dynamo braking can be set for drives from VPR5 to VP04.

“0”: The system runs free on or below zero speed range when servo is stopped by SVOFF.

“1”: The system always executes dynamo braking when servo is stopped by SVOFF.

1.4.7 Setting private operation variables

1) Setting operating mode [PE-601]

Note: After changing the operating mode of [PE-601], make sure to carry out origin run prior to starting operation.

① Operating Mode 0

This is composed of four position groups. 16 coordinates are set per group, and a total of 64 coordinates can be operated.

– Selecting position group

Group Number	Input Contact State		Input Contact State
	PSEL4	MPGEN	
0	X	X	[PE-721]~[PE-736]
1	O	X	[PE-741]~[PE-756]
2	X	O	[PE-761]~[PE-776]
3	O	O	[PE-781]~[PE-796]

– Selecting position coordinates

Position Number	Position Coordinates				Position Group			
	Input Contact State							
	PSEL0	PSEL1	PSEL2	PSEL3	0	1	2	3
0	X	X	X	X	PE-721	PE-741	PE-761	PE-781
1	O	X	X	X	PE-722	PE-742	PE-762	PE-782
2	X	O	X	X	PE-723	PE-743	PE-763	PE-783
3	O	O	X	X	PE-724	PE-744	PE-764	PE-784
4	X	X	O	X	PE-725	PE-745	PE-765	PE-785
5	O	X	O	X	PE-726	PE-746	PE-766	PE-786
6	X	O	O	X	PE-727	PE-747	PE-767	PE-787
7	O	O	O	X	PE-728	PE-748	PE-768	PE-788
8	X	X	X	O	PE-729	PE-749	PE-769	PE-789
9	O	X	X	O	PE-730	PE-750	PE-770	PE-790
10	X	O	X	O	PE-731	PE-751	PE-771	PE-791
11	O	O	X	O	PE-732	PE-752	PE-772	PE-792
12	X	X	O	O	PE-733	PE-753	PE-773	PE-793
13	O	X	O	O	PE-734	PE-754	PE-774	PE-794
14	X	O	O	O	PE-735	PE-755	PE-775	PE-795
15	O	O	O	O	PE-736	PE-756	PE-776	PE-796

* Because MPGEN is used as the contact of the position group, external pulse input operation or torque limit operation does not apply.

Chapter 1: Linear Coordinate Position Operation Type

② Operating Mode 1

This is composed of two position groups. 16 coordinates are set per group, and a total of 32 coordinates can be operated.

– Selecting position group

Group Number	Input Contact State PSEL4	Applicable Menu
0	X	[PE-721]~[PE-736]
1	O	[PE-741]~[PE-756]

– Selecting position coordinates

Position Number	Position Coordinates				Position Group	
	Input Contact State					
	PSEL0	PSEL1	PSEL2	PSEL3	0	1
0	X	X	X	X	PE-721	PE-741
1	O	X	X	X	PE-722	PE-742
2	X	O	X	X	PE-723	PE-743
3	O	O	X	X	PE-724	PE-744
4	X	X	O	X	PE-725	PE-745
5	O	X	O	X	PE-726	PE-746
6	X	O	O	X	PE-727	PE-747
7	O	O	O	X	PE-728	PE-748
8	X	X	X	O	PE-729	PE-749
9	O	X	X	O	PE-730	PE-750
10	X	O	X	O	PE-731	PE-751
11	O	O	X	O	PE-732	PE-752
12	X	X	O	O	PE-733	PE-753
13	O	X	O	O	PE-734	PE-754
14	X	O	O	O	PE-735	PE-755
15	O	O	O	O	PE-736	PE-756

– External pulse (MPG) operation / torque limit operation

MPGEN operates as follows according to the setting of torque limit operation [PE-603].

Setting [PE-603]	Input Contact State (MPGEN)	Operation
0	X	Not activated
	O	External pulse input operation applies.
1~300	X	Maximum torque operation
	O	Torque limit operation based on set torque value

II . Operating Software

- Position coordinates output mode [PE-604]

In case [PE-604]=0 and 1: Only InPOS output is available.

In case [PE-604]=2: Position coordinates are output based on position selection contacts (OP0-OP4).

③ Operating Mode 2

A total of 16 position coordinates can be operated.

- Selecting position coordinates

Position Number	Position Coordinates				Position Group
	Input Contact State				
	PSEL0	PSEL1	PSEL2	PSEL3	0
0	X	X	X	X	PE-721
1	O	X	X	X	PE-722
2	X	O	X	X	PE-723
3	O	O	X	X	PE-724
4	X	X	O	X	PE-725
5	O	X	O	X	PE-726
6	X	O	O	X	PE-727
7	O	O	O	X	PE-728
8	X	X	X	O	PE-729
9	O	X	X	O	PE-730
10	X	O	X	O	PE-731
11	O	O	X	O	PE-732
12	X	X	O	O	PE-733
13	O	X	O	O	PE-734
14	X	O	O	O	PE-735
15	O	O	O	O	PE-736

- External pulse (MPG) operation / torque limit operation

Same as Operating Mode 1.

- Middle coordinate output action [PE-604]

Operating position is set at Position Group 0, and the middle coordinate is set at Position Group 1-3.

II . Operating Software

④ Operating Mode 3

A total of 16 coordinates can be operated by synchronized position operation with external position pulses.

– Position coordinates

Position Number	Position Coordinates				Position Group
	Input Contact State				
	PSEL0	PSEL1	PSEL2	PSEL3	0
0	X	X	X	X	PE-721
1	O	X	X	X	PE-722
2	X	O	X	X	PE-723
3	O	O	X	X	PE-724
4	X	X	O	X	PE-725
5	O	X	O	X	PE-726
6	X	O	O	X	PE-727
7	O	O	O	X	PE-728
8	X	X	X	O	PE-729
9	O	X	X	O	PE-730
10	X	O	X	O	PE-731
11	O	O	X	O	PE-732
12	X	X	O	O	PE-733
13	O	X	O	O	PE-734
14	X	O	O	O	PE-735
15	O	O	O	O	PE-736

– External pulse synchronized operation

If MPGEN is on, the system operates synchronizing with external pulse inputs.

If MPGEN is off, the system stops and the pulse inputs are disregarded.

In addition, when the system reaches the command position coordinates, position operation completion output is displayed, and the entered pulses are disregarded.

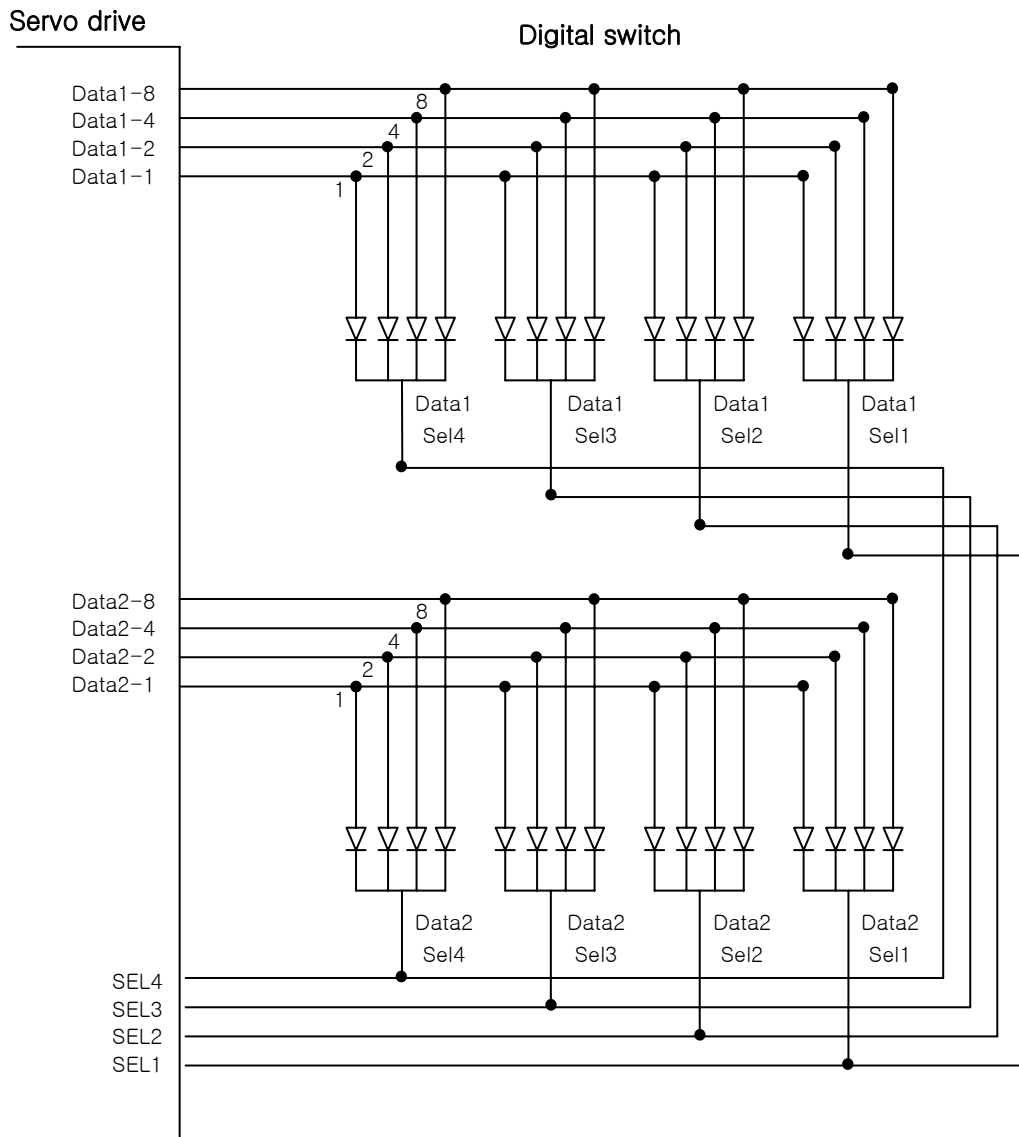
– Setting direction of operation [PE-605]

Setting	Operation
0	Runs forward according to the direction of the external input pulses.
1	Operates synchronizing with the command position coordinates irrespective of the direction of external input pulses.

⑤ Operating Mode 4 and 5

The system can be operated by setting position and speed using the digital switch or PLC contacts. The data set at this time are read only if CN1-48 input contacts (READEN) are turned on. The operating position coordinates are set to [PE-721], and the operating speed to [PE-701].

– Digital switch input wiring



Note 1: Digital Switch specifications: A7PS-207 (OMRON)

II . Operating Software

– Details of data by data mode [PE-608]

Data Mode Setting	0		1	
Data Item	Data1	Data2	Data1	Data2
SEL1	Position Data Unit 0.1	Position Data Unit 1000	Position Data Unit 0.1	Position Data Unit 1000
SEL2	Position Data Unit 1	Speed Data Unit 10	Position Data Unit 1	Position Data Code
SEL3	Position Data Unit 10	Speed Data Unit 100	Position Data Unit 10	Speed Data Unit 100
SEL4	Position Data Unit 100	Speed Data Unit 1000	Position Data Unit 100	Speed Data Unit 1000

Note 1: The position and speed settings apply differently depending on the data mode.
(In the case of position data code 0: +DATA, 1: -DATA)

Note 2: If speed is set with a value greater than the maximum speed, the speed is set to the maximum speed.

Note 3: If the speed input becomes 0, the value set in the existing menu (PE-701) applies. Therefore, if it is desired to enter only the position without setting speed, do not make the wire connection.

– Data mode [PE-607]

Setting	Description
0	Used along with data switch. If Data Read Enable is on, data are continuously set.
1	Used along with PLC. Each time Data Read Enable turns on, SELECT moves by 1 place to read the data. Data are set after reading is finished at OP4.

– Data input time [PE-609]

If SELECT (SEL1-SEL4) turns on, read the data after the set time and move to the next SELECT. If PLC is used, set sufficient time taking into consideration the PLC scan time.

2) Analog position override operating mode [PE-606]

Setting	Description
0	Analog position override operation not executed.
1	Position operation begins according to the analog value based on the position existing as of the moment Start is turned on.
2	If Start is turned on, position operation begins according to the analog value based on “Current position + Current analog voltage position”.

Note: Press Stop to stop the analog position override operation.

The analog position override operation can be executed only when Start input is ON.

1.4.8 Setting jog and origin run variables

1) Setting jog speed

- ① Set jog speed in two types (low speed and high speed) in the unit of “r/min”.

Setting Item	Menu
Low speed jog run	PE-801
High speed job run	PE-802

- ② Setting acceleration/deceleration time [PE-803]

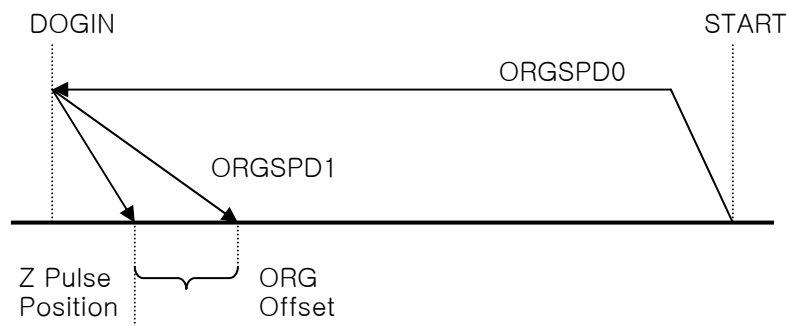
Set acceleration/deceleration time applied in jog run.

2) Origin run

- ① Origin run Mode[PE-810]

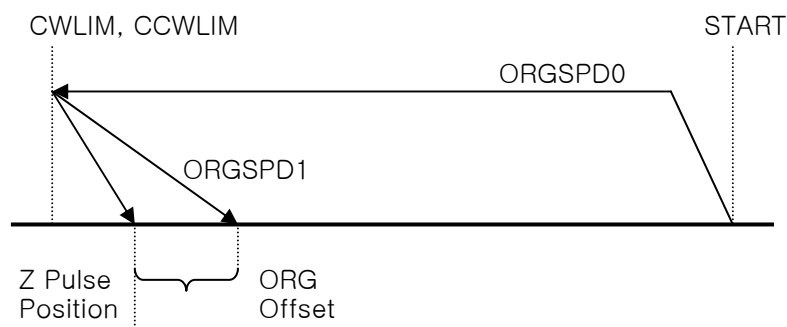
- Mode 0: Set current position as origin.
- Mode 1: Sensor (Dog) type

If the sensor turns on after starting origin run, the system turns in the opposite direction to stop at the Z pulse position, and sets the origin.



- Mode 2: Limit type

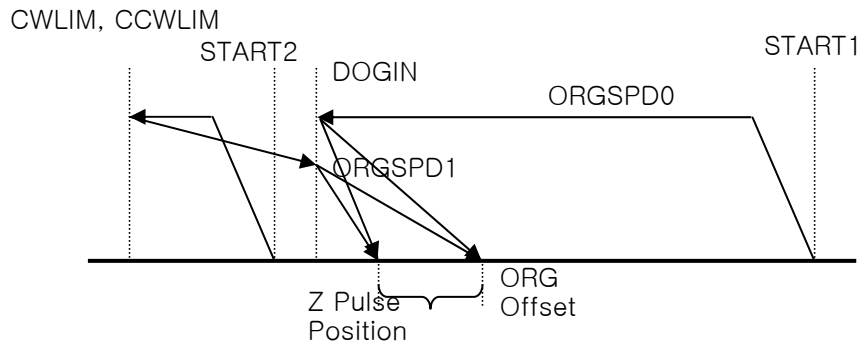
If the limit sensor turns off after starting origin run, the system turns in the opposite direction to stop at the Z pulse position, and sets the origin.



II . Operating Software

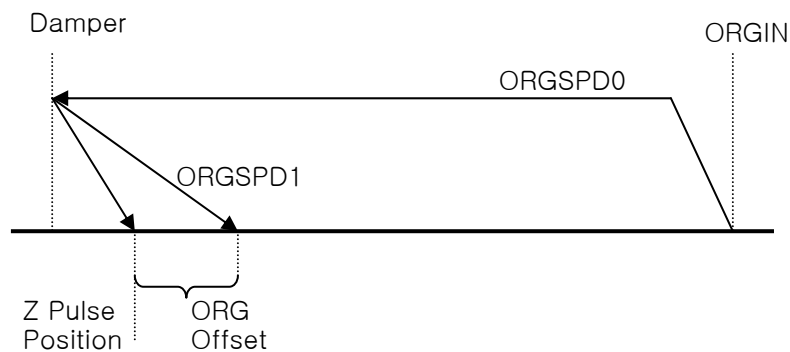
– Mode 3: Limit and sensor (Dog) type

If the system meets the limit after starting origin run, it turns in the opposite direction; and if it meets Z pulse while turning in the opposite direction, it stops at the Z pulse position and sets the origin.



– Mode 4: Damper type

If the system meets damper after starting origin run, and if the load torque increases more than the damper torque, it turns in the opposite direction to stop at the Z pulse position, and sets the origin.



② Origin run direction [PE-811]

Set the operation direction after starting origin run.

③ Origin sensor stop [PE-812]

If an origin sensor is used, the system does not move to the Z pulse position after starting origin run. The moment the sensor is turned On/Off, it stops and sets the origin.

④ Origin offset [PE-813]

In case of stopping after the origin run, the system moves from the Z pulse position to the extent of the offset value before stopping, and sets this coordinate as the origin.

⑤ Origin position [PE-814]

Set the initial value of the stop coordinates when setting the origin.

This means that when the system stops, the coordinate will not be “0” but will be the set position value.

⑥ Automatic origin run [PE-815]

The origin run is automatically executed when the servo turns on first time after power is connected to the servo.

⑦ Changing origin run speed

Set the first operating speed [PE-816] after starting origin run and the operating speed [PE-816] after origin sensor or limit sensor operation, in the unit of “r/min”.

1.4.9 Operating Command

1) Alarm reset [PC-901]

Reset alarm in case it occurs.

2) Alarm history clear [PC-902]

Clear the alarm history information currently in storage.

3) Loader jog run [PC-903]

- ① If Enter is pressed in menu [PC-903], the current position is displayed.
- ② If Left Key is pressed next, the system operates at N-JOG; and if Right Key is pressed, the system operates at P-JOG.
- ③ If Up key is pressed, the current position is saved in the position coordinate chosen by the input contact.
- ④ If Enter is pressed, menu screen appears and jog run stops.

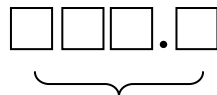
Note: Loader jog run moves at jog speed 0.

4) Loader origin run [PC-904]

If Enter is pressed in menu [PC-904], the origin run starts.

5) Automatic gain adjustment [PC-905]

In “SVON” status, at [PC-805] menu, if press [Enter] key, Automatic gain turning is started and below will be displayed.



Display inertia ratio

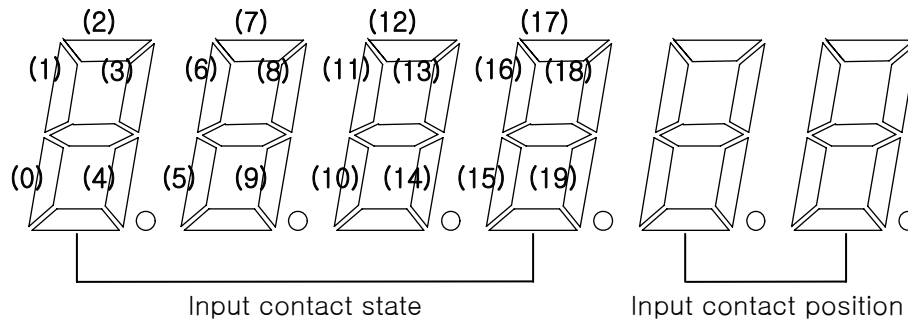
- ① Range of Inertia ration turning is automatically changed from 1 to 50.
- ② If [Up] key is pressed, automatic gain turning operation is started with speed 100 [r/min].
- ③ If [Up] key is pressed continuously, the operating speed is increased 100→300 →>500[r/min] to 200[r/min].

At this time, if speed is increased, the turning time is decreased

- ④ If [Right] key is pressed, operating distance is increased. If [Left] key is pressed operating distance is decreased.
- ⑤ When turning value is not changed the turning is completed.
- ⑥ After completed turning if the inertia ratio is “50”, request the technical support to R&D center. And adjust inertia ratio by hand.
- ⑦ Press [Enter] key, The gain value(completed turning) is set and saved [PE-301].[PE-307],[PE-309] automatically.

And at [PC-805] menu, if RUN/STOP or CW/CCW is operated by contacts with pressed [Enter] key, the inertia ratio will be adjusted continuously.

6) Setting input contact logic [PC-906]



(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
SVON	START	EMG	ALMRST	PSEL0	PSEL1	PSEL2	PSEL3	PSEL4	CCWLIM
(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
CWLIM	STOP	ORGIN	DOGIN	P-JOG	N-JOG	MPGEN	SPD1	SPD2	SPD3

- Use Left/Right Key to increase/decrease the input contact position number.
- As for the contact logic, each time Up Key is pressed, the lamp of the segment corresponding to the current contact position number will be turned ON/OFF.

Segment	Contact Logic
ON	Contact B
OFF	Contact A

- If Enter is pressed after completion of setting, the contact logic is saved, and the screen returns to menu screen.

7) Forced setting of input contacts [PC-907]

- If Enter is pressed in menu [PC-907], the screen appears as in paragraph ⑥.
- Operation procedures are the same. When the segment turns on, the contact established here forcibly turns on related input contact irrespective of I/O.
- If Enter is pressed after completing forced setting of input contact, the relevant contact established here turns on and menu screen is restored.

Note 1: The logic of input contact to be forcibly set must be contact A. Hence, the contact that has been set as contact B in paragraph ⑥ should be converted into contact A before being used.

8) Menu data initialization [PC-908]

- Initialize the set menu data.

9) Menu data lock [PC-909]

- Set prohibition of correcting menu data.
- Each time Enter is pressed, locking and unlocking are alternately repeated.

10) Saving current offset [PC-910]



CAUTION

- Compensate the electric current sensor's offset inside the servo drive. If compensation of the value is incorrect, the servo control becomes unstable.
- The offset value has been adjusted at the time of delivery. Do not make adjustment, if possible.
- If down load is executed to upgrade or change the servo drive software, offset must be set.

- Adjusting offset

- (1) Turn the servo power on.
- (2) Execute operation/stop or forward/backward operation at a slow speed for appropriately 10 seconds.
- (3) Turn the servo power off, and then on again.
- (4) Press Enter in menu [PC-910] to display the offset value.
- (5) Press Up key to save the offset value.
- (6) Repeat steps (2) through (5) (About five times).
- (7) The saved and tuned U-phase offset values are displayed alternately each time Left key is pressed, or the saved and tuned W-phase offset values, each time Right key is pressed.
If there is large difference between these two values, save the tuned value using the Up key.
- (8) Press Enter key to return to menu screen.

Chapter 2

Rotary Coordinate Position Operation type

(VP-2.xx)

[Manual Version : 2.3]

[Applied Software : 2.30 and upper]

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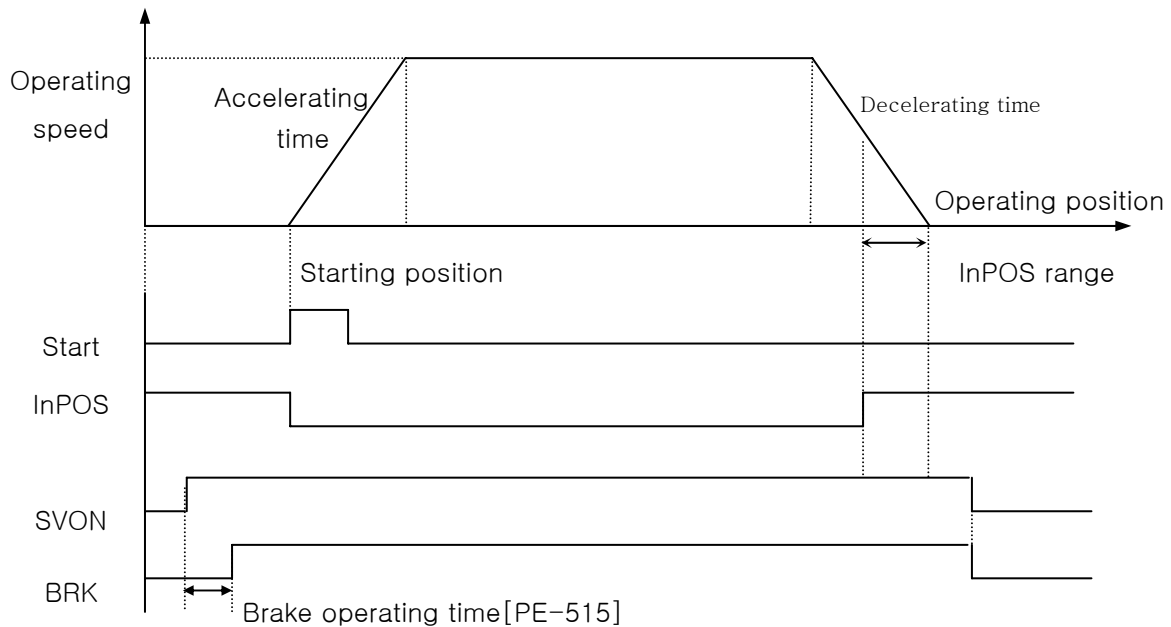
2.3 Menu

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2.1 Major Functions



This servo features an ability to set the absolute position coordinates(“0.00”–“359.99”), operating speed and acceleration/deceleration time, and operate by selecting the desired position, speed and the acceleration/deceleration time through the use of PLC or external equipment. It can be used for rectilinear motion systems.

2.1.1 Operating Mode

Note: After changing the operating mode of [PE-601], make sure to carry out origin run prior to starting operation.

Operating Mode	Major Functions
0	– Select 32 rotary coordinates for operation using 5 input contacts.
1	– Select 32 rotary coordinates set using 5 input contacts, and perform operation by increasing the selected rotary coordinates to the absolute position value . Example) If 15° selected: 0→15°→30°→45°→60°...
2	– Select 32 rotary coordinates set using 5 input contacts, and perform operation by increasing the selected rotary coordinates to the relative position value (Current position to be set as “0”). Example) If 15° is selected : 0→15°, 0→15°, 0→15°...

2.1.2 Position Operation Function

1) Setting position coordinates

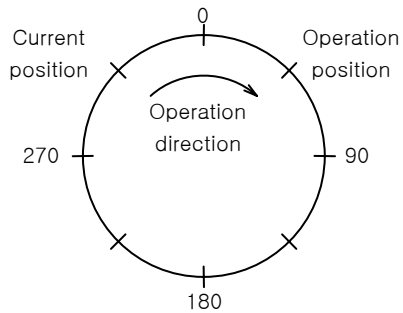
Input Contact State					Menu	Menu Number
PSEL0	PSEL1	PSEL2	PSEL3	PSEL4		
X	X	X	X	X	Position Com0	PE-721
O	X	X	X	X	Position Com1	PE-722
X	O	X	X	X	Position Com2	PE-723
O	O	X	X	X	Position Com3	PE-724
X	X	O	X	X	Position Com4	PE-725
O	X	O	X	X	Position Com5	PE-726
X	O	O	X	X	Position Com6	PE-727
O	O	O	X	X	Position Com7	PE-728
X	X	X	O	X	Position Com8	PE-729
O	X	X	O	X	Position Com9	PE-730
X	O	X	O	X	Position Com10	PE-731
O	O	X	O	X	Position Com11	PE-732
X	X	O	O	X	Position Com12	PE-733
O	X	O	O	X	Position Com13	PE-734
X	O	O	O	X	Position Com14	PE-735
O	O	O	O	X	Position Com15	PE-736
X	X	X	X	O	Position Com16	PE-737
O	X	X	X	O	Position Com17	PE-738
X	O	X	X	O	Position Com18	PE-739
O	O	X	X	O	Position Com19	PE-740
X	X	O	X	O	Position Com20	PE-741
O	X	O	X	O	Position Com21	PE-742
X	O	O	X	O	Position Com22	PE-743
O	O	O	X	O	Position Com23	PE-744
X	X	X	O	O	Position Com24	PE-745
O	X	X	O	O	Position Com25	PE-746
X	O	X	O	O	Position Com26	PE-747
O	O	X	O	O	Position Com27	PE-748
X	X	O	O	O	Position Com28	PE-749
O	X	O	O	O	Position Com29	PE-750
X	O	O	O	O	Position Com30	PE-751
O	O	O	O	O	Position Com31	PE-752

Note: Position coordinates are set and displayed as 0.00–359.99. Accordingly, 360° is automatically changed into 0.0°.

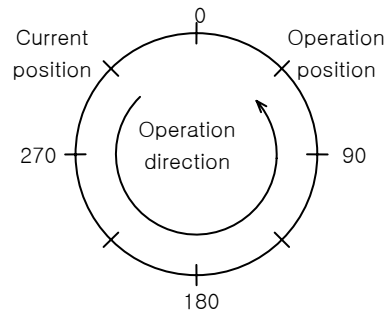
2) Proximity identification operation [PE-603]

The proximity can automatically be identified based on the current position. If [PE-603] is set as “1”, proximity checking starts.

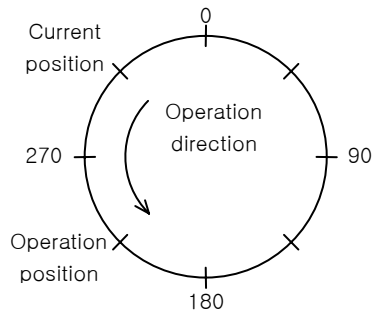
[Proximity operation setting “1”]



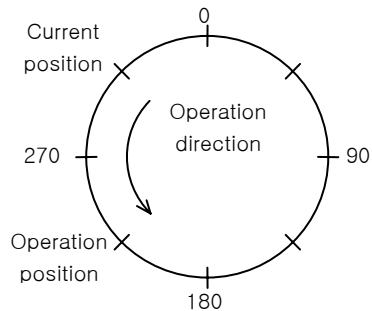
[Proximity operation setting “0”]



[Proximity operation setting “1”]

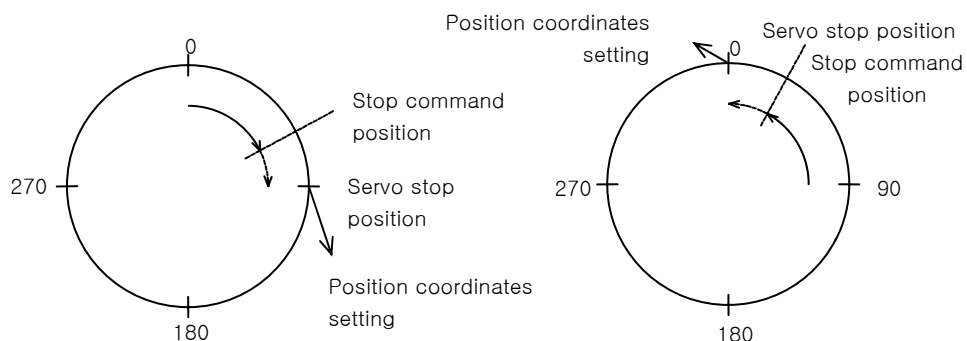


[Proximity operation setting “0”]



3) Stopping of set position coordinates operation [PE-602]

If machine stops by the stop command during normal or jog operation when the mechanical structure carries stoppers, the machine must stop at the designated coordinate. In such case, if menu [PE-602] is set as “1”, the servo can stop after moving to the coordinate designated after stop command is issued.



II . Operating Software

4) Torque limits when stopped [PE-606]

If stoppers are used because of the mechanical structure, the servo may be overloaded due to the position error if the stoppers function after the system stops. In such case, the servo output torque can be restricted to ensure smooth stopper operation.

- If limited torque versus rated torque is set in the menu [PE-606]:

Input Contact (MPGEN)	
X	Operates with up to 300% of the rated torque.
O	Output torque is restricted by the torque set versus the rated torque.

Note: If the setting is “0”, the MPGEN contact shown below will carry out external pulse input operation.

5) Setting direction of rotation [PE-604]

- The system may be operated by setting the direction of rotation only to one side.

[PE-604]	Operation Direction	
	Forward direction	Backward direction
0	Operation possible	Operation possible
1	Operation possible	Operation prohibited
2	Operation prohibited	Operation possible

6) Setting operating speed and acceleration/deceleration time

Eight types of operating speed and acceleration/deceleration time can be selected using three input contacts.

Speed Selection Contacts			Operating Speed	Acceleration/Deceleration Time
SPD1	SPD2	SPD3		
X	X	X	PE-701	PE-709
O	X	X	PE-702	PE-710
X	O	X	PE-703	PE-711
O	O	X	PE-704	PE-712
X	X	O	PE-705	PE-713
O	X	O	PE-706	PE-714
X	O	O	PE-707	PE-715
O	O	O	PE-708	PE-716

2.1.3 MPG (Position pulse) Operation

Set the position unit with the number of pulses versus the motor rpm, and enter the pulse train to operate the system. The MPG operation can be activated only in operation modes 1 and 2 and when the MPGEN contact is in ON position. MPG operation is ignored when the MPGEN contact is in OFF position.

2.1.4 Origin Run

Origin mode	Major Functions
0	Set current coordinates as origin.
1	Set origin by sensor (Dog).
2	Set origin by limit.
3	Set origin by sensor and limit.
4	Set origin by damper torque.

2.1.5 Jog Run

Operation by	Major Functions
Contact	– Jog run using contact switch.
Loader	– Jog run by loader manipulation. – Current coordinates can be set in menu.

- ① Set jog run speed as low/high with unit [r/min].

Setting Mode	Menu
Low jog run	PE-801
High jog run	PE-802

- ② Set Accelerating/Decelerating jog run time [PE-803].

- ③ Jog run

- Ⓐ If 'P-JOG' is ON, run forward direction with low speed.
- Ⓑ In the condition Ⓐ('P-JOG' ON), If 'N-JOG' is "ON", run forward direction with high speed.
- Ⓒ In forward direction with high speed, If 'N-JOG' is "OFF", run forward direction with low speed.
- Ⓓ If 'P-JOG' is "OFF" motor is stop
- Ⓔ For backward direction, First 'N-JOG' is ON and then other is same as forward direction.

2.1.6 Setting Operation Data

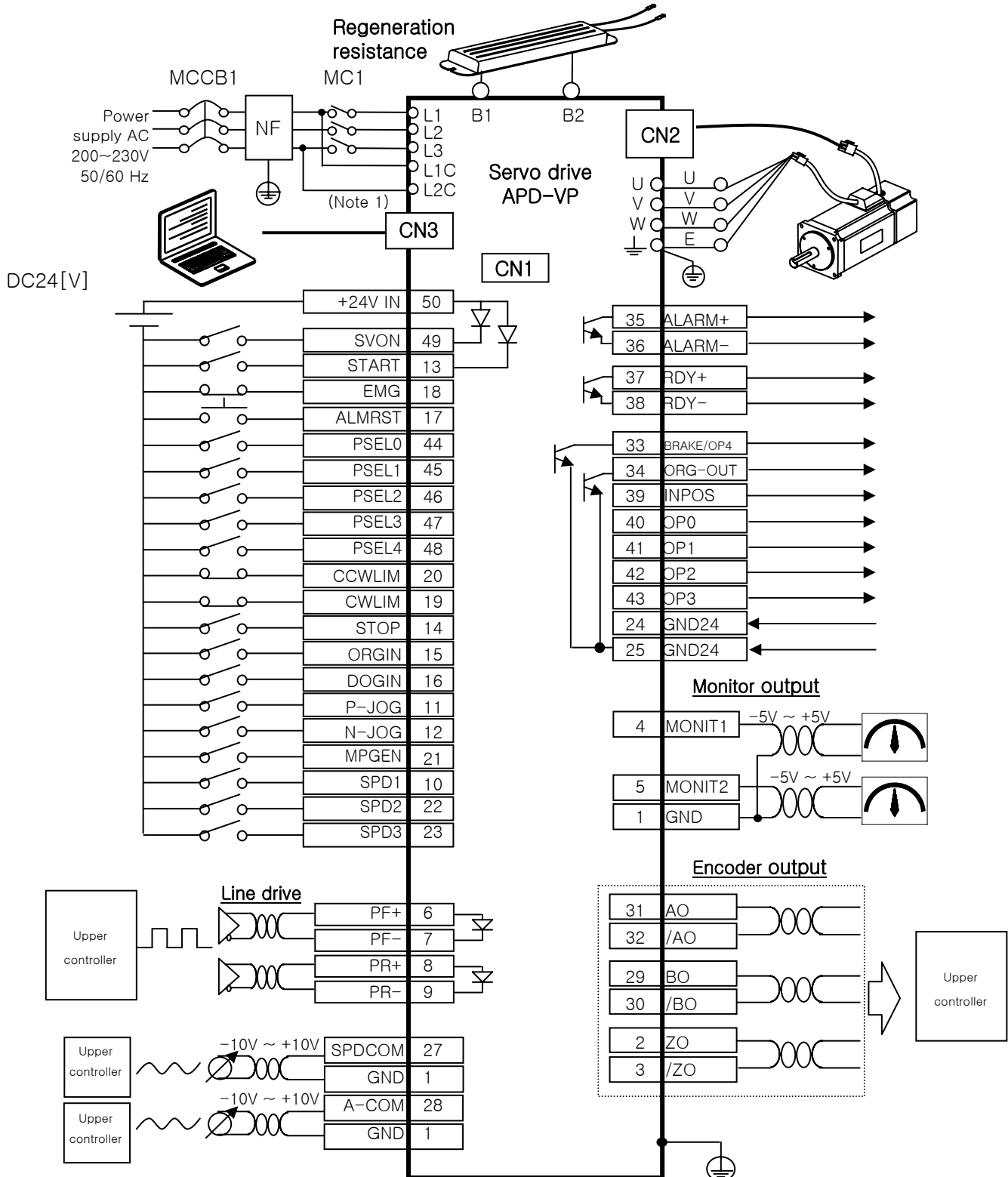
Setting Mode	Major Functions
Menu setting	Edit and set menu using loader.
Communication setting	Set data based on communication (CN3).

2.1.7 Operation Data Output

Output Mode	Output Details										
Communication output	Output operation data based on communication (CN3).										
Analog	<p>* Data are output in $\pm 5V$ according to the set scale units, and the following operation data are output according to the output mode.</p> <table><tr><th>Output Mode</th><th>Output Item</th></tr><tr><td>0</td><td>Command speed</td></tr><tr><td>1</td><td>Current speed</td></tr><tr><td>2</td><td>Command torque</td></tr><tr><td>3</td><td>Current torque</td></tr></table>	Output Mode	Output Item	0	Command speed	1	Current speed	2	Command torque	3	Current torque
Output Mode	Output Item										
0	Command speed										
1	Current speed										
2	Command torque										
3	Current torque										

2.2 System Configuration

2.2.1 Connection Diagram (Rotary coordinate position operation type (VP-2))



Note 1: Control power supply terminals (L1C and L2C) are provided in models with capacity equal to or greater than APD-VP05.

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2.2.2 Control Signal

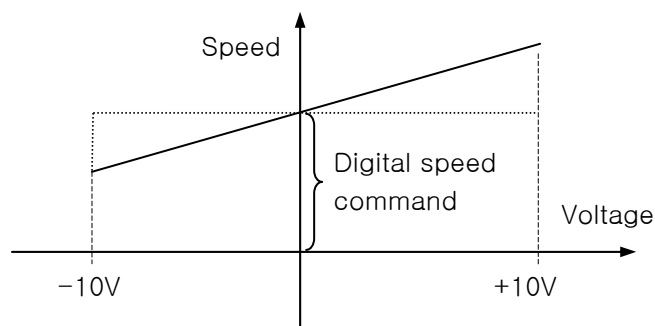
1) Contact input signal

Pin Number	Name	Description
50	+24V IN	
49	SVON	Servo ON
13	START	Operation started
18	EMG	Emergency stop
17	ALMRST	Alarm reset
44	PSEL0	Position selection 0
45	PSEL1	Position selection 1
46	PSEL2	Position selection 2
47	PSEL3	Position selection 3
48	PSEL4	Position group selection 0
20	CCWLIM	Forward direction (Counterclockwise) running prohibited
19	CWLIM	Rearward direction (Clockwise) running prohibited
14	STOP	Operation stop
15	ORGIN	Origin run started
16	DOGIN	Origin sensor
11	P-JOG	Forward direction jog
12	N-JOG	Rearward direction jog
21	MPGEN	MPGEN/TRQLIM
10	SPD1	Speed selection 1
22	SPD2	Speed selection 2
23	SPD3	Speed selection 3

2) Analog input signal

Pin Number	Name	Description
27	SPDCOM	Analog speed command input ($-10[V] - +10[V]$)
28	A-COM	Analog position command input ($-10[V] - +10[V]$)
1	GND	Analog signal ground

* If the system is operated at an override (overlapping) speed at the analog speed command (menu number [PE-717] set to “1”), the system operates at a speed command which is overlapped with the digital speed command.



Note: If + voltage is applied irrespective of the rotating direction of the motor, speed increases; and speed decreases if – voltage is applied.

3) Pulse train input signal

Pin Number	Name	Description
6	PF+	Line drive (5V): F+ Pulse input
7	PF-	Line drive (5V): F- Pulse input
8	PR+	Line drive (5V): R+ Pulse input
9	PR-	Line drive (5V): R- Pulse input

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4) Output contact signal

Pin Number	Name	Description
35/36	ALARM+/ ALARM-	Outputs alarm status. <ul style="list-style-type: none">• ON: Normal mode• OFF: Alarm mode
37/38	RDY+ /RDY-	ON: Normal mode (Operation preparations completed)
33	BRAKE	Outputs brake operation signal when servo is operating./ Operating coordinates output “4”
34	ORG-OUT	Outputs origin run completion signals.
39	INPOS	Outputs position operation completion signals.
40	OP0	Operating coordinates output “0”
41	OP1	Operating coordinates output “1”
42	OP2	Operating coordinates output “2”
43	OP3	Operating coordinates output “3”

5) Monitor output signal and output power supply

Pin Number	Name	Description
4	MONIT1	Analog monitor output 1 (–5[V] – +5[V])
5	MONIT2	Analog monitor output 2 (–5[V] – +5[V])
1	GND	Ground for analog output signal
26	+15[V]	+15[V] power output terminal

6) Encoder output signal

Pin Number	Name	Description
31 32 29 30	AO /AO BO /BO	Outputs encoder signal received from the motor after dividing it according to the frequency dividing ratio set in menu [PE-418] (5V Line drive system).
2 3	ZO /ZO	Outputs encoder Z signal received from the motor (5[V] Line drive system).

2.3 Menu

2.3.1 Operating Mode Menu

MENU			UNIT	INI	Description
NO	CODE	NAME	MIN	MAX	
0	Pd-001	Current State	– –	– –	Displays current operation mode. Normal: nor, Alarm: alarm number
1	Pd-002	Current Speed	r/min –99999	0 99999	Displays current operating speed.
2	Pd-003	Command Speed	r/min –99999	0 99999	Displays current command speed.
3	Pd-004	Reference Speed	– –99999	0 99999	Displays speed command values based on the acceleration/deceleration time during operation.
4	Pd-005	Current Position	– –9999.9	0.0 9999.9	Displays current position coordinates.
5	Pd-006	Refer Position	– –9999.9	0.0 9999.9	Displays current target position coordinates.
6	Pd-007	Command Position	– –9999.9	0.0 9999.9	Displays operation command position coordinates.
7	Pd-008	Remain Position	– –9999.9	0.0 9999.9	Displays the difference between target position coordinates and current position coordinates.
8	Pd-009	Torque Limit	[%] 0	0 300	Displays torque-limit setting.
9	Pd-010	Current Load	[%] –9999.9	0.0 9999.9	Displays current load rate versus rated load.
10	Pd-011	Average Load	[%] –9999.9	0.0 9999.9	Displays average load rate of 5 seconds versus rated load.
11	Pd-012	Maximum Load	[%] –9999.9	0.0 9999.9	Displays maximum instantaneous load rate versus rated load.
12	Pd-013	DC Link Voltage	Volt –999.9	0.0 999.9	Displays condenser's DC voltage value.
13	Pd-014	I/O Set	– –	– –	Displays current I/O CN1's input state.
14	Pd-015	Input EXT SET	– –	– –	Displays state of externally set input contacts.
15	Pd-016	I/O State	– –	– –	Displays current operating condition of I/O.
16	Pd-017	Input Logic Set	– –	– –	Menus dedicated to communication.
17	Pd-018	Input Logic Save	– –	– –	
18	Pd-019	Alarm bit	– –	– –	
19	Pd-020	Software Version	– –	– –	Displays software version number.

※ Communication code is to be used for selecting the menu When using TOUCH or PC Communication.

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2.3.2 Alarm Display Menu

MENU			UNIT	INI	Description
NO	CODE	NAME	MIN	MAX	
Alarm History 01~20			–	–	Displays status of alarms occurred in the past.
20 ~ 39	PA-101 ~ PA-120	Alarm History 01 ~ Alarm History 20	–	–	

Alarm codes and Descriptions

CODE	Name	Description or causes	Items to be checked
nor-oF	Normal svoff	Servo off(Normal state)	–
nor-on	Normal svon	Servo on(Normal state)	–
L1.01	L1.01	RS232Comm. Error. Control circuit Operation error.	Replace the drive
AL-01	Emergency Stop	EMG input contacts open.	Control signal wiring, external 24V power supply
AL-02	Power Fail	Main power supply turned off	Power supply, wiring
AL-03	Line Fail	Motor and encoder wiring error	Setting, wiring
AL-04	Motor Output	Motor drive circuit output error	Wiring or IPM module burned
AL-05	Encoder Pulse	Encoder pulse number set error	Setting
AL-06	Following Error	Position pulse following error	Position command pulse excessive, [PE-514] setting, wiring, limit contact, gain setting
AL-07	Limit Direction	Operation in limit direction	Direction of running, limit contacts
AL-08	Over Current	Overcurrent	Wiring, motor, encoder setting, gain setting, drive replacement
AL-09	Over Load	Overload	Load state, wiring, motor, encoder setting
AL-10	Over Voltage	Overvoltage	Input voltage, braking resistance wiring, excessive regeneration operation.
AL-11	Over Speed	Overspeed	Encoder setting, encoder wiring, gain setting
AL-12	Origin Error	Origin run error	Dog sensor signal, limit signal wiring
AL-13	Not Used	Not used	–
AL-14	ABS Data Error	Absolute encoder data transmission error	Initial reset
AL-15	ABS Battery Error	Absolute encoder battery error	Initial reset, battery discharge
AL-16	ABS Multi Error	Absolute encoder multi-running data transmission error	Initial reset
AL-17	ABS Read Fail	Absolute encoder reading error	Encoder
AL-18	Not Used	Not used	–
AL-19	Not Used	Not used	–
AL-20	Flash Erase Fail	Flash ROM data delete error	Replace drive
AL-21	Flash Write Fail	Flash ROM data writing error	Replace drive
AL-22	Data Init Error	Data initialization error	Replace drive
AL-23	EPWR	Hardware error	[PE-203] setting
Err1	Error1	Occurs when attempting to correct menu which cannot be corrected in Servo-on condition.	Correct menu after turning off servo.
Err2	Error2	Occurs when attempting to enter data which deviate from the setting range.	Enter data within the range of setting.
Err3	Error3	Occurs when attempting to correct menu after locking menu using [PC-909] (Menu Data Lock).	Correct menu after unlocking [PC-909].

2.3.3 System Variable Setting Menu

Menus carrying “*” mark cannot be corrected when the servo is on.

MENU			UNIT	INI	Description
NO	CODE	NAME	MIN	MAX	
40	*PE-201	Motor ID	– 0	– 99	Set motor ID.
41	PE-202	Baud Rate	bps 0	0 1	Set baud rate of CN3's RS232. (Reconnection of power supply required.) 0=9600[bps], 1=19200[bps] 3=38400[bps], 2=57600[bps]
42	*PE-203	Encoder Type	– 0	0 9	Set type of relevant encoder. (0: PHASE A Lead, 1: PHASE B Lead, 6: absolute value encoder)
43	*PE-204	Encoder Pulse	p/r 1	– 99999	Set number of pulses of relevant encoder.
44	PE-205	CCW TRQ Limit	[%] 0	300 300	Set torque limit value for CCW running.
45	PE-206	CW TRQ Limit	[%] 0	300 300	Set torque limit value for CW running.
46	*PE-207	System ID	– 0	0 99	Set drive ID for communication.
47	*PE-208	System Group ID	– 0	0 99	Set drive group ID for communication.
48	PE-209	Start Menu No.	– 1	5 20	Set Operating Mode Menu to be displayed after operation begins.
49	*PE-210	Inertia	gf·cm·s ² 0.01	ID 999.99	Set motor inertia moment.
50	*PE-211	Trq Con	kgf·cm/A 0.01	ID 999.99	Set motor torque constant.
51	*PE-212	Phase Ls	mH 0.001	ID 99.999	Set motor phase inductance.
52	*PE-213	Phase Rs	ohm 0.001	ID 99.999	Set motor phase resistance.
53	*PE-214	Rated Is	A 0.01	ID 999.99	Set motor rated current.
54	*PE-215	Max Speed	r/min 0.0	ID 9999.9	Set motor maximum speed.
55	*PE-216	Rated Speed	r/min 0.0	ID 9999.9	Set motor rated speed.
56	*PE-217	Pole Number	– 2	8 98	Set number of motor poles.
57	PE-218	Not Used	– –	– –	
58	PE-219	Not Used	– –	– –	
59	PE-220	Not Used	– –	– –	

※ Communication code is to be used for selecting the menu When using TOUCH or PC Communication.

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– System variables setting menu (for Special Large Capacity : APD-VP220,VP300,VP370)

Menus marked with “*” cannot be corrected during Servo-On

MENU			UNIT	INI	Description	App Mode
Comm Code	CODE	NAME	MIN	MAX		
40	*PE-201	Motor ID	– 0	– 99	Sets Motor ID (Refer 4.4.1), When setting motor ID: Be set automatically from [PE-210] to [PE-218]	PST
41	*PE-202	RS232 Comm. speed	[bps]	0	Sets RS232 communication speed of CN3	PST
		Baud Rate	0	1	0=9600[bps], 1=19200[bps] 2=38400[bps], 3=57600[bps]	
42	*PE-203	Encoder Type	– 0	0 9	Sets applied encoder type (0 : A phase lead, 1 : B phase lead, 6 : Absolute encoder)	PST
43	*PE-204	Encoder Pulse	[p/r] 1	3000 99999	Sets the number of encoder pulse.	PST
44	PE-205	CCW TRQ Limit	[%] 0	300 300	Sets torque limit value at CCW.	PST
45	PE-206	CW TRQ Limit	[%] 0	300 300	Sets torque limit value at CW.	PST
46	*PE-207	System ID	– 0	0 99	Sets drive ID on communication	PST
47	*PE-208	System Group ID	– 0	0 99	Sets drive group ID on communication	PST
48	PE-209	Start Menu No.	– 1	2 20	Sets the operation status display menu with [Pd-001]~[Pd-020] at power on.	PST
49	*PE-210	Inertia	gf·cm·s ² 0.1	ID 9999.9	Sets inertia of motor. (Modification is possible when [PE-201] is “0”)	PST
50	*PE-211	Trq Con	kgf·cm/A 0.001	ID 99.999	Sets torque constant of motor (Modification is possible then [PE-201] is “0”)	PST
51	*PE-212	Q-axis Inductance	mH 0.001	ID 99.999	Sets Q-axis inductance of motor (Modification is possible when [PE-201] is “0”)	PST
52	*PE-213	D-axis Inductance	mH 0.001	ID 99.999	Sets D-axis inductance of motor (Modification is possible when [PE-201] is “0”)	PST
53	*PE-214	Phase Rs	mΩ 0.001	ID 99.999	Sets phase resistance of motor (Modification is possible when [PE-201] is “0”)	PST
54	*PE-215	Rated Is	A 0.01	ID 999.99	Sets rated current of motor (Modification is possible when [PE-201] is “0” .)	PST
55	*PE-216	Max Speed	r/min 0.0	ID 9999.9	Sets max.speed of motor (Modification is possible when [PE-201] is “0”)	PST
56	*PE-217	Rated Speed	r/min 0.0	ID 9999.9	Sets rated speed of motor (Modification is possible when [PE-201] is “0”)	PST
57	PE-218	Pole Number	– 2	8 98	Sets pole number of motor (Modification is possible when [PE-201] is “0”)	PST
58	PE-219	Ibs Offset Save	A –99.999	0 99.999	Sets current offset of motor (Modification is possible when [PE-201] is “0”)	PST
59	PE-220	Ics Offset Save	A –99.999	0 99.999	Sets current offset of motor (Modification is possible when [PE-201] is “0”)	PST

※ Communcation code is to be used for selecting the menu when using TOUCH or PC

Chapter 2: Rotary Coordinate Position Operation Type

Communication.# Motor Models and ID(To be continued to next pages)

Model	ID	Watt	Remark
SAR3A	1	30	
SAR5A	2	50	
SA01A	3	100	
SB01A	11	100	
SB02A	12	200	
SB04A	13	400	
SB03A	14	250	Special type
HB02A	15	200	Hollow shaft type
HB04A	16	400	Hollow shaft type
SC04A	21	400	
SC06A	22	600	
SC08A	23	800	
SC10A	24	1000	
SC03D	25	300	
SC05D	26	450	
SC06D	27	550	
SC07D	28	650	
SC01M	29		
SC02M	30		
SC03M	31		
SC04M	32		
HC06H	33	600	Exclusively S/T
SC05A	34	450	Exclusively S/S
SC05H	35	500	Exclusively S/S
SC08A	36	750	Exclusively S/S
HB01A	37	100	Hollow shaft type
HC10A	38	1000	Hollow shaft type
HE30A	39	3000	Hollow shaft type
HB03H	40	250	Only Semiconductor
HC03H	41	250	Only Semiconductor

Model	ID	Watt	Remark
SE09A	61	900	
SE15A	62	1500	
SE22A	63	2200	
SE30A	64	3000	
SE06D	65	600	
SE11D	66	1100	
SE16D	67	1600	
SE22D	68	2200	
SE03M	69	300	
SE06M	70	600	
SE09M	71	900	
SE12M	72	1200	
SE05G	73	450	
SE09G	74	850	
SE13G	75	1300	
SE17G	76	1700	
HE09A	77	900	Hollow shaft type
HE15A	78	1500	Hollow shaft type
SE11M	79	1050	Special type
SE07D	80	650	Special type
SF30A	81	3000	
SF50A	82	5000	
SF22D	85	2200	
SF35D	86	3500	
SF55D	87	5500	
SF75D	88	7500	
SF12M	89	1200	
SF20M	90	2000	
SF30M	91	3000	
SF44M	92	4400	
SF20G	93	1800	
SF30G	94	2900	
SF44G	95	4400	
SF60G	96	6000	
HC05H	99	500	Customized type

Model	ID	Watt	Remark
SE35D	101	3500	Exclusively for DS
SE30D	102	3000	Special type
SF44ML	103	4400	For LG only
SF75G	104	7500	Special type
SE35A	105	3500	Special type
SF55G	106	5500	Special type
SF60M	107	6000	Special type
SG22D	111	2200	
SG35D	112	3500	
SG55D	113	5500	
SG75D	114	7500	
SG110D	115	11000	
SG12M	121	1200	
SG20M	122	2000	
SG30M	123	3000	
SG44M	124	4400	
SG60M	125	6000	
SG20G	131	1800	
SG30G	132	2900	
SG44G	133	4400	
SG60G	134	6000	
SG85G	135	8500	
SG110G	136	11000	
SG150G	137	15000	
SH220G	141	22000	
SH300G	142	30000	
SJ370G	143	37000	

[illegible]

2.3.4 Control Variable Setting Menu

Menus carrying “*” mark cannot be corrected when the servo is on.

MENU			UNIT	INI	Description
NO	CODE	NAME	MIN	MAX	
60	PE-301	Inertia Ratio	times	2.0	Set inertia ratio of load.
			1.0	500.0	
61	PE-302	Position P Gain1	1/s	50	Set position control proportional gain 1.
			0	500	
62	PE-303	Position P Gain2	1/s	50	Set position control proportional gain 2.
			0	500	
63	PE-304	P Feedforward	[%]	0	Set position feed forward control ratio.
			0	100	
64	PE-305	P FF FLT TC	msec	0	Set time constant of position feed forward control filter.
			0	10000	
65	PE-306	P CMD FLT TC	msec	0	Set time constant of position command filter.
			0	10000	
66	PE-307	Speed P Gain1	rad/s	By type of equipment	Set speed proportional gain 1. (APD-VPR5-04: 500, VP05-10: 300, VP15-50: 200)
			0	5000	
67	PE-308	Speed P Gain2	rad/s	By type of equipment	Set speed proportional gain 2.
			0	5000	
68	PE-309	Speed I TC1	msec	50	Set speed integration time constant 1.
			1	10000	
69	PE-310	Speed I TC2	msec	50	Set speed integration time constant 2.
			1	10000	
70	PE-311	Speed IN FLT	msec	0.0	Set speed command filter.
			0.0	100.0	
71	*PE-312	Speed FB FLT	msec	0.5	Set speed feedback filter.
			0.0	100.0	
72	PE-313	Zero Speed Gain	r/min	0.0	Set speed range of zero speed gain.
			0.0	100.0	
73	PE-314	Not Used	—	—	
			—	—	
74	PE-315	DE-RESONANCE	—	0	Set de-resonance operation. 0 : Not activated, 1: Activated
			0	1	
75	PE-316	Notch Frequency	Hz	300	Set de-resonance operating frequency.
			0	1000	
76	PE-317	Notch Bandwidth	—	100	Set de-resonance band width.
			0	1000	
77	PE-318	Over load offset	—	1.1	Set the time of overload characteristic. (User is requested not to change it.)
			1.0	3.0	
78	PE-319	Not Used	—	—	
			—	—	
79	PE-320	Not Used	—	—	
			—	—	

※ Communication code is to be used for selecting the menu When using TOUCH or PC Communication.

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2.3.5 I/O Variable Setting Menu

Menus carrying “*” mark cannot be corrected when the servo is on.

MENU			UNIT	INI	Description
NO	CODE	NAME	MIN	MAX	
80	*PE-401	Analog Speed	r/min	100.0	Set external analog speed input at 10V.
			0.0	9999.9	
81	PE-402	Speed Offset	mV	0.0	Set analog speed input offset.
			-1000.0	1000.0	
82	PE-403	SCLamp Mode	-	0	Set speed clamp operating mode.
			0	1	
83	PE-404	SCLamp Volt	mV	0.0	Set voltage of speed clamp area.
			-1000.0	1000.0	
84	PE-405	Not Used	-	-	
			-	-	
85	PE-406	Not Used	-	-	
			-	-	
86	PE-407	Not Used	-	-	
			-	-	
87	PE-408	Not Used	-	-	
			-	-	
88	PE-409	Monitor Type1	-	0	Set type of monitor output 1.
			0	10	
89	PE-410	Monitor Mode1	-	0	Set mode of monitor output 1.
			0	1	
90	PE-411	Monitor Scale1	-	1.0	Set scale of monitor output 1.
			1.0	9999.0	
91	PE-412	Monitor Offset1	mV	0.00	Set offset of monitor output 1.
			-100.00	100.00	
92	PE-413	Monitor Type2	-	1	Set type of monitor output 2.
			0	10	
93	PE-414	Monitor Mode2	-	0	Set mode of monitor output 2.
			0	1	
94	PE-415	Monitor Scale2	-	1.0	Set scale of monitor output 2.
			1.0	9999.0	
95	PE-416	Monitor Offset2	mV	0.00	Set offset of monitor output 2
			-100.00	100.00	
96	PE-417	Pulse Out Rate	-	1	Set frequency dividing ratio of encoder output signal.
			1	16	
97	PE-418	Not Used	-	-	
			-	-	
98	PE-419	Not Used	-	-	
			-	-	
99	PE-420	PWM off delay	msec	0	Set delayed time of PWM output OFF When Servo is OFF.
			0	1000	

※ Communication code is to be used for selecting the menu When using TOUCH or PC Communication.

2.3.6 Common Operation Variable Setting Menu

Menus carrying “*” mark cannot be corrected when the servo is on.

MENU			UNIT	INI	Description
NO	CODE	NAME	MIN	MAX	
100	*PE-501	Move Motor	–	1	Set system based on machine movement versus motor rpm.
			1	999999	
101	*PE-502	Move Mechanical	–	360	
			1	999999	
102	*PE-503	Move Polarity	–	0	Set rotation direction of the motor. (0: Coordinate increases in case of CCW run; 1: Coordinate increases in case of CW run)
			0	1	
103	PE-504	InPosition Mode	–	0	Set position operation completion signal output mode. (0: Inpos, 1: OP0–OP3, 2: OP0–OP4)
			0	2	
104	PE-505	InPosition Value	–	0.500	Set position range of position arrival output signal.
			0.000	99.999	
105	PE-506	InPosition Time	msec	0	Set output time of position arrival output signal.
			0	10000	
106	*PE-507	Software Limit	–	0	Set limit action On or Off based on position coordinates.
			0	1	
107	PE-508	CCW Limit	–	0.00	Set limit action position coordinates during forward running.
			0.00	359.99	
108	PE-509	CW Limit	–	0.00	Set limit action position coordinates during backward running.
			0.00	359.99	
109	*PE-510	MPG Pulse Logic	–	0	Set external pulse input signal mode.
			0	5	
110	*PE-511	MPG Pulse	–	100	Set system based on motor rpm versus number of external input signal pulses.
			1	99999	
111	*PE-512	MPG Move	–	1	
			1	99999	
112	PE-513	Follow Error	–	90000	Set range of output for excessive position following error.
			0	99999	
113	PE-514	Brake Speed	r/min	50	Set operating speed of built-in brake.
			0.0	9999.9	
114	PE-515	Brake Time	msec	10	Set opening delay time of built-in brake.
			0	10000	
115	*E-516	PowerFail Mode	–	By type of equipment	Set power failure mode. 0: VP04 or less, 1: VP05 or more
			0	1	
116	PE-517	DB Control	–	1	Set dynamo braking mode.
			0	1	
117	PE-518	RDY Mode	–	0	Set function of RDY output contacts (0 : RDY function, 1 : RUN function)
			0	1	
118	PE-519	Not Used	–	–	
			–	–	
119	PE-520	ESTOP Reset	–	0	This function automatically resets alarm when contact ESTOP returns after activation. (0: Manual reset, 1: Automatic reset)
			0	1	

※ Communication code is to be used for selecting the menu When using TOUCH or PC Communication.

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2.3.7 Private Operation Variable Setting Menu

MENU			UNIT	INI	Description
NO	CODE	NAME	MIN	MAX	
120	*PE-601	Operation Mode	–	0	Set operating mode. (Always carry out origin run prior to changing mode.)
			0	2	
121	PE-602	Stop Mode	–	0	Set automatic stop of set position checking (“1”) when jog run stops.
			0	1	
122	PE-603	Direction Mode	–	0	Determine whether to execute proximity operation.
			0	1	
123	PE-604	Run Direction	–	0	Set rotation direction.
			0	2	
124	PE-605	Not Used	–	–	
			–	–	
125	PE-606	Stop Torque Lim	(%)	0	Set motor output torque limit operation. (Activated when MPGEN/TRQLIM contacts are turned on.)
			0	300	
126	PE-607	Position Devide		0	Set divided number with respect to 360° at operating mode=1. If operating mode is set as “0”, the system operates at angles set by input contacts PSELO-4.
			0	999999	
127	PE-608	Dec FF Rate	–	0.0	Exclusive Menu for Maker(user do not change it)
			0	1.0	
128	PE-609	Dir Select	–	0	At operation mode 2, ccwLim contacts can be converted to Dir selection function (At this conversion, cwLim is also erased) 0: ccwLim function 1: Dir selection function (When Dir contacts is off run opposite direction)
			0	1	
129	PE-610	Not Used	–	–	
			–	–	
130	PE-611	Not Used	–	–	
			–	–	
131	PE-612	Not Used	–	–	
			–	–	
132	PE-613	Not Used	–	–	
			–	–	
133	PE-614	Not Used	–	–	
			–	–	
134	PE-615	Not Used	–	–	
			–	–	
135	PE-616	Not Used	–	–	
			–	–	
136	PE-617	Not Used	–	–	
			–	–	
137 ~	PE-618 ~	Not Used	–	–	
			–	–	
139	PE-620	Not Used	–	–	

※ Communication code is to be used for selecting the menu When using TOUCH or PC Communication.

2.3.8 Operation Program Variable Setting Menu: Speed Variables

MENU			UNIT	INI	Description
NO	CODE	NAME	MIN	MAX	
140	PE-701	Speed Command0	r/min	10.0	Set operating speed 0.
			0	9999.9	
141	PE-702	Speed Command1	r/min	100.0	Set operating speed 1.
			0	9999.9	
142	PE-703	Speed Command2	r/min	200.0	Set operating speed 2.
			0	9999.9	
143	PE-704	Speed Command3	r/min	500.0	Set operating speed 3.
			0	9999.9	
144	PE-705	Speed Command4	r/min	1000.0	Set operating speed 4.
			0	9999.9	
145	PE-706	Speed Command5	r/min	1500.0	Set operating speed 5.
			0	9999.9	
146	PE-707	Speed Command6	r/min	2000.0	Set operating speed 6.
			0	9999.9	
147	PE-708	Speed Command7	r/min	3000.0	Set operating speed 7.
			0	9999.9	
148	PE-709	AccDec Time0	msec	50	Set acceleration/deceleration time 0.
			0	100000	
149	PE-710	AccDec Time1	msec	50	Set acceleration/deceleration time 1.
			0	100000	
150	PE-711	AccDec Time2	msec	50	Set acceleration/deceleration time 2.
			0	100000	
151	PE-712	AccDec Time3	msec	50	Set acceleration/deceleration time 3.
			0	100000	
152	PE-713	AccDec Time4	msec	50	Set acceleration/deceleration time 4.
			0	100000	
153	PE-714	AccDec Time5	msec	50	Set acceleration/deceleration time 5.
			0	100000	
154	PE-715	AccDec Time6	msec	50	Set acceleration/deceleration time 6.
			0	100000	
155	PE-716	AccDec Time7	msec	50	Set acceleration/deceleration time 7.
			0	100000	
156	PE-717	Speed Override	–	0	Set speed override operation.
			0	1	
157	PE-718	Not Used	–	–	
			–	–	
158	PE-719	Not Used	–	–	
			–	–	
159	PE-720	Not Used	–	–	
			–	–	

※ Communication code is to be used for selecting the menu When using TOUCH or PC Communication.

II . Operating Software

2.3.9 Operation Program Variable Setting Menu

MENU			UNIT	INI	Description
NO	CODE	NAME	MIN	MAX	
160	PE-721	Position Com0	—	0.00	Set position coordinate0.
			0	359.99	
161	PE-722	Position Com1	—	1.00	Set position coordinate1.
			0	359.99	
162	PE-723	Position Com2	—	2.00	Set position coordinate2.
			0	359.99	
163	PE-724	Position Com3	—	3.00	Set position coordinate3.
			0	359.99	
164	PE-725	Position Com4	—	4.00	Set position coordinate4.
			0	359.99	
165	PE-726	Position Com5	—	5.00	Set position coordinate5.
			0	359.99	
166	PE-727	Position Com6	—	6.00	Set position coordinate6.
			0	359.99	
167	PE-728	Position Com7	—	7.00	Set position coordinate7.
			0	359.99	
168	PE-729	Position Com8	—	8.00	Set position coordinate8.
			0	359.99	
169	PE-730	Position Com9	—	9.00	Set position coordinate9.
			0	359.99	
170	PE-731	Position Com10	—	10.00	Set position coordinate10.
			0	359.99	
171	PE-732	Position Com11	—	11.00	Set position coordinate11.
			0	359.99	
172	PE-733	Position Com12	—	12.00	Set position coordinate12.
			0	359.99	
173	PE-734	Position Com13	—	13.00	Set position coordinate13.
			0	359.99	
174	PE-735	Position Com14	—	14.00	Set position coordinate14.
			0	359.99	
175	PE-736	Position Com15	—	15.00	Set position coordinate15.
			0	359.99	
176	PE-737	Position Com16	—	160.00	Set position coordinate16.
			0	359.99	
177	PE-738	Position Com17	—	170.00	Set position coordinate17.
			0	359.99	
178	PE-739	Position Com18	—	180.00	Set position coordinate18.
			0	359.99	
179	PE-740	Position Com19	—	190.00	Set position coordinate19.
			0	359.99	

※ Communication code is to be used for selecting the menu When using TOUCH or PC Communication.

2.3.10 Operation Program Variable Setting Menu

MENU			UNIT	INI	Description
NO	CODE	NAME	MIN	MAX	
180	PE-741	Position Com20	—	200.00	Set position coordinate20.
			0.00	359.99	
181	PE-742	Position Com21	—	210.00	Set position coordinate21.
			0.00	359.99	
182	PE-743	Position Com22	—	220.00	Set position coordinate22.
			0.00	359.99	
183	PE-744	Position Com23	—	230.00	Set position coordinate23.
			0.00	359.99	
184	PE-745	Position Com24	—	240.00	Set position coordinate24.
			0.00	359.99	
185	PE-746	Position Com25	—	250.00	Set position coordinate25.
			0.00	359.99	
186	PE-747	Position Com26	—	260.00	Set position coordinate26.
			0.00	359.99	
187	PE-748	Position Com27	—	270.00	Set position coordinate27.
			0.00	359.99	
188	PE-749	Position Com28	—	280.00	Set position coordinate28.
			0.00	359.99	
189	PE-750	Position Com29	—	290.00	Set position coordinate29.
			0.00	359.99	
190	PE-751	Position Com30	—	300.00	Set position coordinate30.
			0.00	359.99	
191	PE-752	Position Com31	—	310.00	Set position coordinate31.
			0.00	359.99	
192	PE-753	Not Used	—	—	
			—	—	
193	PE-754	Not Used	—	—	
			—	—	
194	PE-755	Not Used	—	—	
			—	—	
195	PE-756	Not Used	—	—	
			—	—	
196	PE-757	Not Used	—	—	
			—	—	
197	PE-758	Not Used	—	—	
			—	—	
198	PE-759	Not Used	—	—	
			—	—	
199	PE-760	Not Used	—	—	
			—	—	

※ Communication code is to be used for selecting the menu When using TOUCH or PC Communication.

II . Operating Software

2.3.11 Jog and Origin Run Variable Setting Menu

MENU			UNIT	INI	Description
NO	CODE	NAME	MIN	MAX	
200	PE-801	Jog Speed0	r/min 0.0	10.0 9999.9	Set jog run speed 0.
201	PE-802	Jog Speed1	r/min 0.0	100.0 9999.9	Set jog run speed 1.
202	PE-803	Jog AccDec Time	msec 0	100 99999	Set jog acceleration/deceleration time.
203	PE-804	Not Used	— —	— —	
204	PE-805	Not Used	— —	— —	
205	PE-806	Not Used	— —	— —	
206	PE-807	Not Used	— —	— —	
207	PE-808	Not Used	— —	— —	
208	PE-809	Not Used	— —	— —	
209	PE-810	Origin Mode	— 0	1 4	Set origin run mode.
210	PE-811	Origin polarity	— 0	0 1	Set origin run direction.
211	PE-812	Origin Dog Stop	— 0	1 1	Set stop (1) or Z position operation 0 when dog sensor turns off during origin run.
212	PE-813	Origin Offset	— 0.00	0.00 359.99	Set offset position at which to stop after origin run.
213	PE-814	Origin Position	— 0.00	0.00 359.99	Set initial coordinates after origin run.
214	PE-815	Origin AutoRun	— 0	0 1	Set automatic origin run ON or OFF when servo is on.
215	PE-816	Origin Speed0	r/min 0.0	100.0 9999.9	Set origin run speed 0.
216	PE-817	Origin Speed1	r/min 0.0	10.0 9999.9	Set origin run speed 1.
217	PE-818	Origin Torque	[%] 1.0	50.0 300.0	Set torque during damper (Origin run mode 4) run.
218	PE-819	Not Used	— —	— —	
219	PE-820	Not Used	— —	— —	

※ Communication code is to be used for selecting the menu When using TOUCH or PC Communication.

2.3.12 Operation Menu

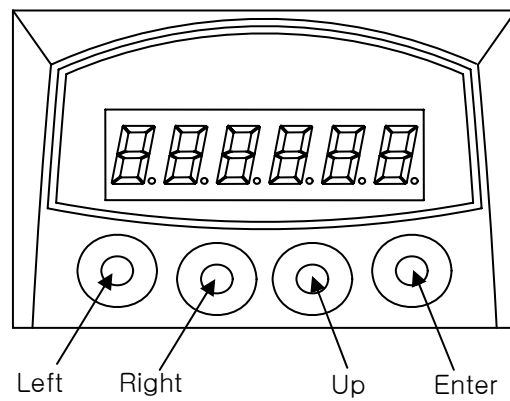
MENU			UNIT	INI	Description
NO	CODE	NAME	MIN	MAX	
220	PC-901	Alarm RESET	— —	— —	Reset alarm.
221	PC-902	Alarm HIS Clear	— —	— —	Clear alarm history.
222	PC-903	Jog Run	— —	— —	Manipulate jog run. (If UP key is hit after jog run, the current coordinates are stored in the position coordinate menu currently selected.)
223	PC-904	Origin Run	— —	— —	Carry out origin run.
224	PC-905	Gain Tune Run	— —	— —	Gain is automatically adjusted.
225	PC-906	I/O Logic Set	— —	— —	Set logic of input contacts.
226	PC-907	Input Ext Set	— —	— —	Manipulate input contacts from outside.
227	PC-908	Menu Data Init	— —	— —	If [Up]key is pressed after [Enter] key was pressed all menu data will be initialized. But System menu([PE-201]~[PE-220]) data is not changed (After Re-connection of power, above initialization is applied)
228	PC-909	Menu Data Lock	— —	— —	Activate menu data lock.
229	PC-910	Current Offset	— —	— —	Set drive current feedback offset.
230	PC-911	Not Used	— —	— —	
231	PC-912	Not Used	— —	— —	
232	PC-913	Not Used	— —	— —	
233	PC-914	Not Used	— —	— —	
234	PC-915	Not Used	— —	— —	
235	PC-916	Not Used	— —	— —	
236	PC-917	Not Used	— —	— —	
237 ~ 239	PC-918 ~ PC-239	Not Used	— — —	— — —	

※ Communication code is to be used for selecting the menu When using TOUCH or PC Communication.

2.4 Detailed Description of Menu

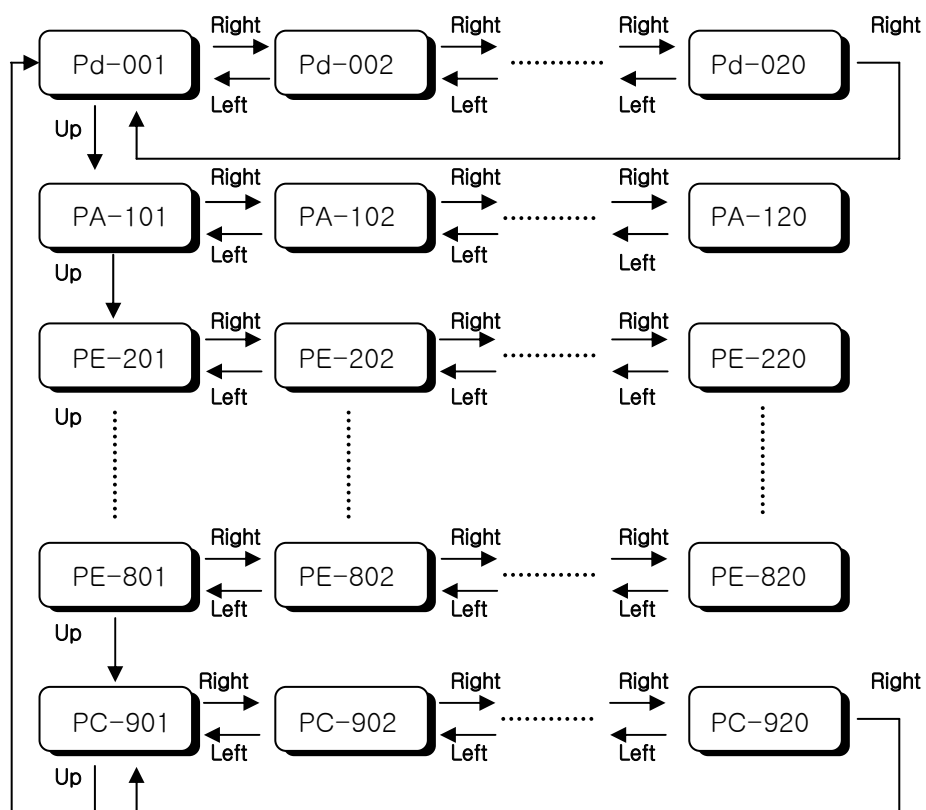
2.4.1 Loader Operation

1) Components



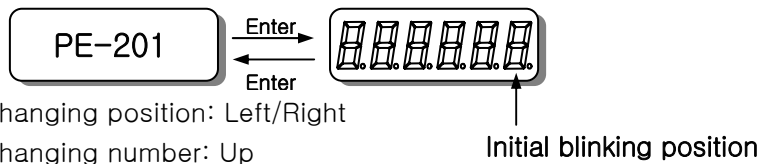
2) Components

① Menu movements



Chapter 2: Rotary Coordinate Position Operation Type

② Menu editing



- * Changing position: Left/Right
 - * Changing number: Up
 - Move to the menu to be edited referring to paragraph ①
 - Press Enter Key to be display menu data “ +9999.9 ”
- The number on the far right starts blinking. The blinking number indicates editing position.
- Press Left or Right to move the figure of number to be edited. The blinking numbers move along accordingly.
 - Press Up key to change numbers(the number increases). If the number is larger than “9”, it will be change to “0”.
 - Upon completion of editing, press enter. The related data are saved, and the screen returns to menu number.

③ Menu editing error

- The following will appear when menu editing error occurs.

Display	Causes
notuSE	Menu which is not used or cannot be edited
Err1	<ul style="list-style-type: none">- Menu that cannot be edited when servo is on- Editing error of constant related to motor- Number not carrying motor ID have been entered- An attempt is made to edit detailed constant when the motor ID is not “0”
Err2	An attempt is made to set data outside the setting range
Err3	Menu editing is Lock. Menu editing lock should be released.

④ Special operation function

- If menu is used to set I/O status, each key carries independent function. For more details, refer to paragraph1.4.9 “Operating commands.”
- Alarm manipulation menu
- I/O Setting menu
- Jog run menu
- Gain tuning menu
- Origin run menu
- Current offset compensation menu
- Menu-related manipulation menu

2.4.2 Operation Mode display

1) Mode display [Pd-001]

- ① Current operation mode is displayed.
 - * nor: Indicates normal operating mode.
 - * AL-XX: Relevant code is displayed when an alarm occurs.
- ② When alarm is reset after the cause is removed. Details of the menu corresponding to the menu number set in the initial mode screen [PE-209] are displayed.
- ③ If, however, the menu is moved to another menu at this time, the menu will be displayed.

2) Speed display

- ① The current operating speed[Pd-002] and the current command speed[Pd-003] are displayed I the unit of [r/min].
- ② Range: “-9999.9” ~ “9999.9”

3) Position display

- ① The current operation position [Pd-005], current operation target position [Pd-006], and the operation command position[Pd-007] are displayed in user units.

4) Torque and load display

- ① Torque Limit [Pd -009]

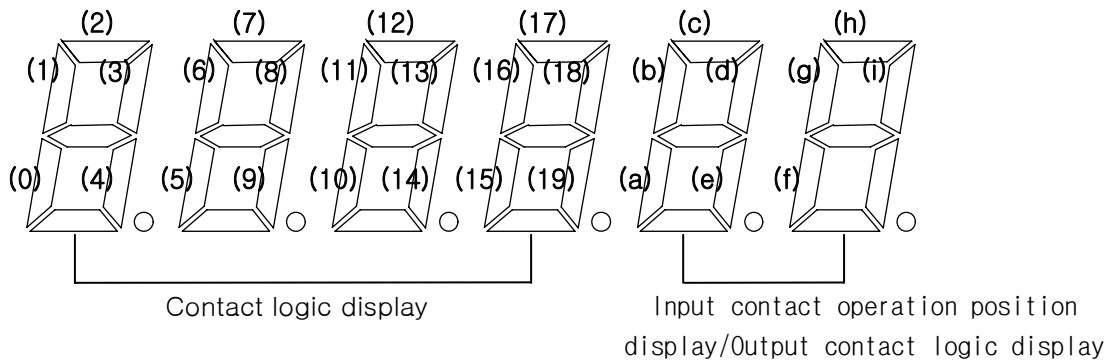
The output torque limit value is displayed in percentage of rated output.
- ② Current load rate [Pd -010]

The energy (load) produced by servo motor is displayed in percentage of the rated output.
- ③ Average load rate [Pd -011]

The average value of the energy (load) produced by servo motor calculated during a period of 5 seconds is displayed in percentage of the rated output.
- ④ Peak instantaneous load rate [Pd -012]

The peak load value from the time the servo power supply is connected to the present is displayed in percentage of the rated output.

5) I/O Mode display



[Input contact: Upper]

(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
SVON	START	EMG	ALMRST	PSEL0	PSEL1	PSEL2	PSEL3	PSEL4	CCWLIM
(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
CWLIM	STOP	ORGIN	DOGIN	P-JOG	N-JOG	MPGEN	SPD1	SPD2	SPD3

[Output contact: Lower]

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)
BRAKE	ORG-OUT	ALARM	RDY	INPOS	OP1	OP2	OP3	OP4

① CN1 I/O contact condition [Pd-014]

When CN1 Connector contact turns on(contact shorted), the lamp operating in the relevant location will turns on; or the lamp will turn off when the connector contact turns off (contact open).

② external operation input condition [Pd-015]

- If the relevant contact condition is manipulated by an external source (PC communication or other equipment) instead of CN1 Connector, the condition of the contact is displayed.
- As the condition of the external input is not stored in the servo drive ROM, the input condition is automatically reset if power supply is turned off.

③ I/O contact condition [Pd-016]

The I/O contact conditions, under which the servo drive is operated by the combination of paragraph ① and ② above, are displayed.

(The I/O contact conditions are recognized and displayed when Normal-A contact is ON and Normal-B contact : OFF is off)

6) Display the state of exchanging information with external equipment(Communication-dedicated menu)

The mode data resulting from communications with upper controllers (touch-screen, PC, Etc.) are displayed.

① Current state of input contact logic [Pd-017]

The current logic value of the input contact is displayed.

If power supply is turned off, this value will be erased.

② Storage state of the input contact logic [Pd-018]

The value saved by the current logic of the input contact is displayed.

But, the storage value will not be erased even if the power supply is turned off.

③ Alarm condition bit [Pd-019]

If an alarm occurs, the bit corresponding to the related alarm number is displayed.

7) Software version display

P 2.31 – 3
↑ ↑ ↑
Position Version Drive type
operation number
type

- The software model applicable to this manual is P

NO	Drive Type
0	VPR5
1	VP01
2	VP02
3	VP04
4	VP05
5	VP10
6	VP15
7	VP20
8	VP35
9	VP50
A	VP75
b	VP110
c	VP110L Specail model(300A)
d	VP150
e	VP220
f	VP300
g	VP370

2.4.3 Setting System Variables

1) Setting motor constant

- ① Setting motor constant based on ID.

If the ID number is entered in the menu [PE-201], the motor constant is automatically set. The ID numbers of motor are as follows.

Motor models and ID (To be continued to the next page)

Model	ID	Watt	Remark
SAR3A	1	30	
SAR5A	2	50	
SA01A	3	100	
SB01A	11	100	
SB02A	12	200	
SB04A	13	400	
SB03A	14	250	Special type
HB02A	15	200	Hollow shaft type
HB04A	16	400	Hollow shaft type
SC04A	21	400	
SC06A	22	600	
SC08A	23	800	
SC10A	24	1000	
SC03D	25	300	
SC05D	26	450	
SC06D	27	550	
SC07D	28	650	
SC01M	29		
SC02M	30		
SC03M	31		
SC04M	32		
HC06H	33	600	Exclusively for S/T
SC05A	34	450	Exclusively for S/T
SC05H	35	500	Exclusively for S/T
SC08A	36	750	Exclusively for S/T
HB01A	37	100	Hollow shaft type
HC10A	38	1000	Hollow shaft type
HE30A	39	3000	Hollow shaft type

Model	ID	Watt	Remark
HB03H	40	250	Exclusively for semi-conductor
HC03H	41	250	Exclusively for semi-conductor
SE09A	61	900	
SE15A	62	1500	
SE22A	63	2200	
SE30A	64	3000	
SE06D	65	600	
SE11D	66	1100	
SE16D	67	1600	
SE22D	68	2200	
SE03M	69	300	
SE06M	70	600	
SE09M	71	900	
SE12M	72	1200	
SE05G	73	450	
SE09G	74	850	
SE13G	75	1300	
SE17G	76	1700	
HE09A	77	900	Hollow shaft type
HE15A	78	1500	Hollow shaft type
SE11M	79	1050	Special type
SE07D	80	650	Special type
SF30A	81	3000	
SF50A	82	5000	
SF22D	85	2200	
SF35D	86	3500	
SF55D	87	5500	
SF75D	88	7500	

[illegible]

Chapter 2: Rotary Coordinate Position Operation Type

② Setting individual motor constant

Enter "0" in the motor ID menu[PE-201] to set motor constant individually. The following motor constants shall be set individually.

MENU			UNIT	INI	Description
NO	CODE	NAME	MIN	MAX	
40	PE-201	Motor ID	– 0	– 99	Set ID of applicable. When setting motor ID: [PE-210]~[PE-217] are automatically set.
49	PE-210	Inertia	gf·cm·s ² 0.01	ID 999.99	Set motor inertial moment, If ([PE-201] is entered as "0", correction can be made.)
50	PE-211	Trq Con	kgf·cm/A 0.01	ID 999.99	Set motor torque constant. If ([PE-201] is entered as "0", correction can be made.)
51	PE-212	Phase Ls	mH 0.001	ID 99.999	Set motor phase inductance. If ([PE-201] is entered as "0", correction can be made.)
52	PE-213	Phase Rs	ohm 0.001	ID 99.999	Set motor phase resistance. . If ([PE-201] is entered as "0", correction can be made.)
53	PE-214	Rated Is	A 0.01	ID 999.99	Set motor related current. . If ([PE-201] is entered as "0", correction can be made.)
54	PE-215	Max Speed	r/min 0.0	ID 9999.9	Set motor maximum speed. . If ([PE-201] is entered as "0", correction can be made.)
55	PE-216	Rated Speed	r/min 0.0	ID 9999.9	Set motor rated speed. . If ([PE-201] is entered as "0", correction can be made.)
56	PE-217	Pole Number	– 2	8 98	Set number of motor poles. . If ([PE-201] is entered as "0", correction can be made.)
Only Special-Large Capacity Menu(APD-VS220, VS300, VS370)					
40	*PE-201	Motor ID	– 0	– 99	Sets motor ID : set automatically from [PE-210]to[PE-217]
49	*PE-210	Inertia	gf·cm·s ² 0.01	ID 999.99	Sets inertia of motor. (Modification is possible when [PE-201] is "0")
50	*PE-211	Trq Con	kgf·cm/A 0.01	ID 999.99	Sets torque constant of motor.(Modification is possible when [PE-201] is "0")
51	*PE-212	Phase Lq	mH 0.001	ID 99.999	Sets phase inductance of motor.(Modification is possible when [PE-201] is "0")
52	*PE-213	Phase Ld	mH 0.001	ID 99.999	Sets phase inductance of motor.(Modification is possible when [PE-201] is "0")
53	*PE-214	Phase Rs	ohm 0.001	ID 99.999	Sets phase resistance of motor. (Modification is possible when [PE-201] is "0")
54	*PE-215	Rated Is	A 0.01	ID 999.99	Sets rated current of motor. (Modification is possible when [PE-201] is "0")
55	*PE-216	Max Speed	r/min 0.0	ID 9999.9	Sets Max. speed of motor. (Modification is possible when [PE-201] is "0")
56	*PE-217	Rated Speed	r/min 0.0	ID 9999.9	Sets rated speed of motor. (Modification is possible when [PE-201] is "0")
57	PE-218	Pole Number	– 2	8 98	Sets pole number of motor. (Modification is possible when [PE-201] is "0")

II . Operating Software

2) Setting encoder

– Encoder model [PE-203]

No	Transmission Mode	Signal Mode	Signal Type	Remark
0	Parallel	Phase A leads in case of forward running	A,B,Z,U,V,W	Standard
1	Parallel	Phase B leads in case of forward running	A,B,Z,U,V,W	
6	Serial	Absolute value 11/13 bit	A,B,Z,RX	

– Encoder pulse [PE-204]

This is set when the encoder uses signals A and B. The number of pulses per cycle for each signal is set

The number of pulses for phases A and B are the same.

3) Setting torque limits

The limit value [PE-205] of the maximum torque during the forward running and the limit value [PE-206] of maximum torque during backward running can be individually set. Torque limits can be set in percentages of the rated torque. The standard is 300%.

4) Setting system ID

If the system communicates with a servo through the use of BUS communications, an ID may be assigned to the servo. In this case, an option is required in relation to communications.

– System ID [PE-207]

An ID is assigned to the servo and used to individually communicate with the servo.

– System group ID [PE-208]

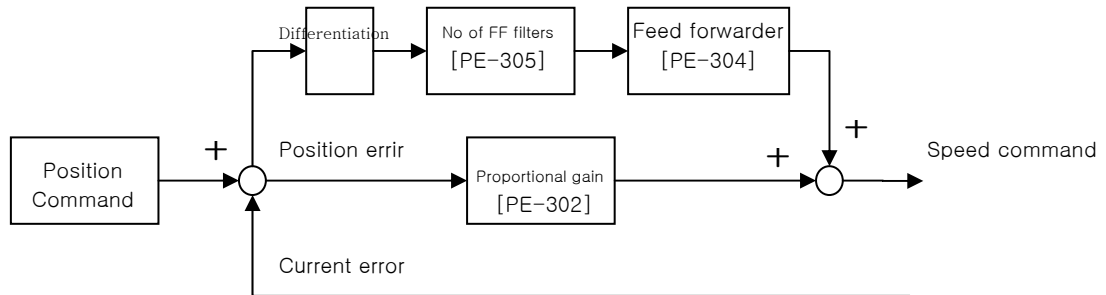
A group ID is set and used when multiple servos are consolidated into a group for communications.

5) Setting mode display when operation is started [PE-209]

Menu that is used at initial period after the servo power supply is turned on can be set. The setting shall be classified into number 1 through 20 from [Pd-001]~[Pd-020] to set the relevant menu numbers.

2.4.4 Setting control variables

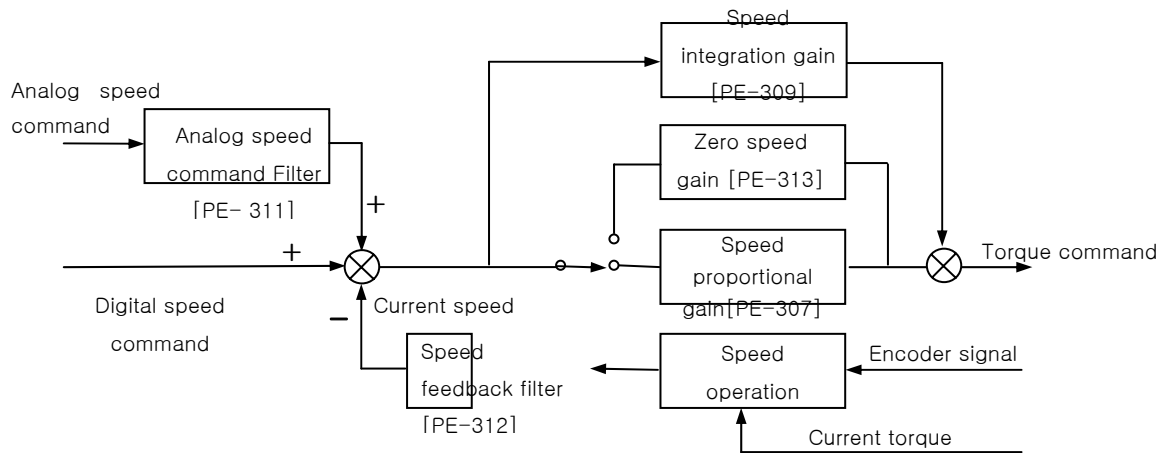
1) Position control gain



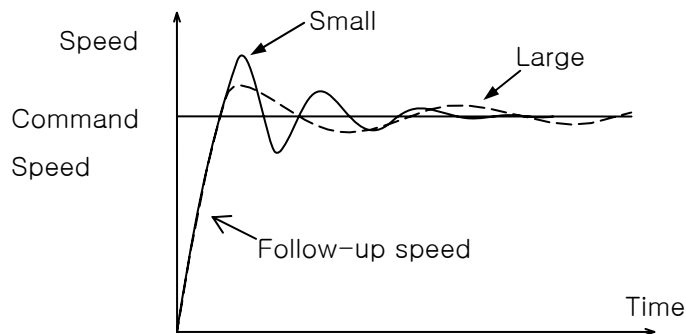
- ① Position Command: The position command pulses received from external sources are counted and converted into the position command value, which goes through the first filter and used as the internal position command.
- ② Current position: The pulse signals received from the encoder are counted and converted into the current position value through the use of the electronic gear ratio setting.
- ③ Position proportional gain [PE-302][PE-303]: The position proportional gain is multiplied by the difference between command position and current position to convert the outcome into a speed command.
- ④ Feed forwarder gain [PE-304]: This is used to obtain gradient in terms of differentiated value with respect to the position command, and reduce the positioning time by adding speed command to the gradient thus acquired. If this value is too high an overshoot may occur on position control or position control may become uncertain. Hence the value shall be gradually increased from a small level while monitoring the condition of trial operation until an appropriate value is obtained.
- ⑤ Feeder forwarder filter[PE-305]: If the position command changes too rapidly, the feed forward control may display a vibration. If this happens, set appropriate level of filter value to remove vibration resulting from rapid changes.

Note: The function of the position proportional gain 2[PE-303] is not supported by the current software version.

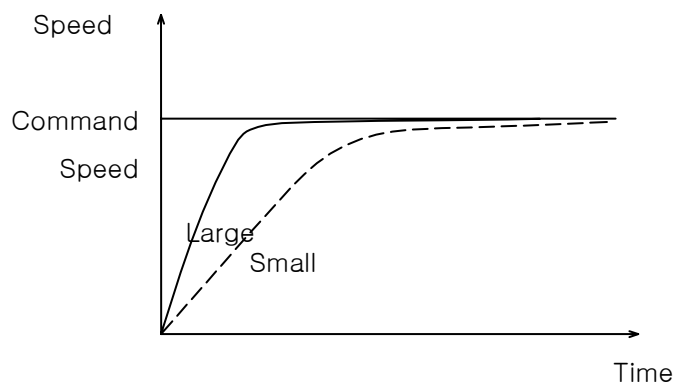
2) Speed control gain



- ① Speed command: The analog speed signals received from external sources are used as the speed command after going through the analog speed command filter[PE-311], or the digital speed command set by the internal menu in the unit of r/min is used.
- ② Current speed: The encoder signals are counted to calculate the speed, and the calculated speed is used as the current speed after going through the filter. In order to compensate for speed calculation error at an extremely low speed, an algorithm, which estimates speed through the use of the current torque and inertia, is used. Accordingly, setting accurate motor constant and the inertia ratio is closely linked with the stability of the motor speed control.
- ③ Speed integration gain[PE-309]: An integrated value of the difference (speed error) between command speed and current speed is obtained, and this value is multiplied by an integrated gain to be converted into a torque command. If the integrated gain is reduced, the excessive response characteristics are improved to enhance the speed follow-up. However, if the gain is too small, an overshoot occurs. On the other hand, if the gain is too large, the excessive response characteristics drop and operation is made based on proportional control characteristics.



- ④ Speed proportional gain [PE-307]: The speed error is multiplied by proportional gain to convert the error into torque command. If this value is large, the speed response becomes fast enhancing the speed follow-up. If this value is excessively large, vibration occurs. On the other hand, if this value is small, the speed response becomes slow and the follow-up effect drops, causing the servo to become weak.



- ⑤ Speed feedback filter [PE-312]: Motor may shake by the vibration of the drive system, or vibration may occur due to gain in case load with excessively large inertia is applied. Such vibration may be suppressed through the use of speed feedback filter. If the value is excessively large, the speed responsiveness may drop causing the deterioration of the control performance.
- ⑥ Zero speed gain [PE-313]: If a speed feedback filter is used to suppress vibration, the stationary vibration may cause the system to be unstable. If this happens, set the range of speed to which gain is applied, and vibration can be suppressed by adjusting gain within the established speed range.

Note: The functions of the speed proportional gain 2 [PE-308] and the speed integration gain 2 [PE-310] are not supported by the current software version.

II . Operating Software

3) Setting inertia ratio [PE-301]

Load inertia is calculated for each mechanical system. The rotator's inertia ratio is calculated and set based on the motor characteristics table. Setting the inertia ratio of load is a very important control variable in the servo operation characteristics. Servo can be operated in an optimal condition only if the inertia ratio is accurately set.

■ The following table shows recommended values of appropriate control gains for each load inertia ratio.

Motor Flange	Inertia Ratio		Range of Gain Setting		
	Classification	[Inertia]	Position proportional gain [Pgain 1,2]	Speed proportional gain [Sgain 1,2]	Speed integration gain [SITC]
40 ~ 80	Low inertia	1 ~ 5	40 ~ 60	500 ~ 800	20 ~ 40
	Medium inertia	5 ~ 20	20 ~ 40	300 ~ 500	40 ~ 60
	High inertia	20 ~ 50	10 ~ 20	100 ~ 300	60 ~ 100
100 ~ 130	Low inertia	1 ~ 3	40 ~ 60	200 ~ 400	20 ~ 40
	Medium inertia	3 ~ 10	20 ~ 40	100 ~ 200	40 ~ 80
	High inertia	10 ~ 20	10 ~ 20	50 ~ 100	80 ~ 150
180 ~ 280	Low inertia	1 ~ 2	30 ~ 60	150 ~ 250	30 ~ 50
	Medium inertia	2 ~ 4	15 ~ 30	75 ~ 150	50 ~ 100
	High inertia	4 ~ 10	5 ~ 15	20 ~ 75	100 ~ 200

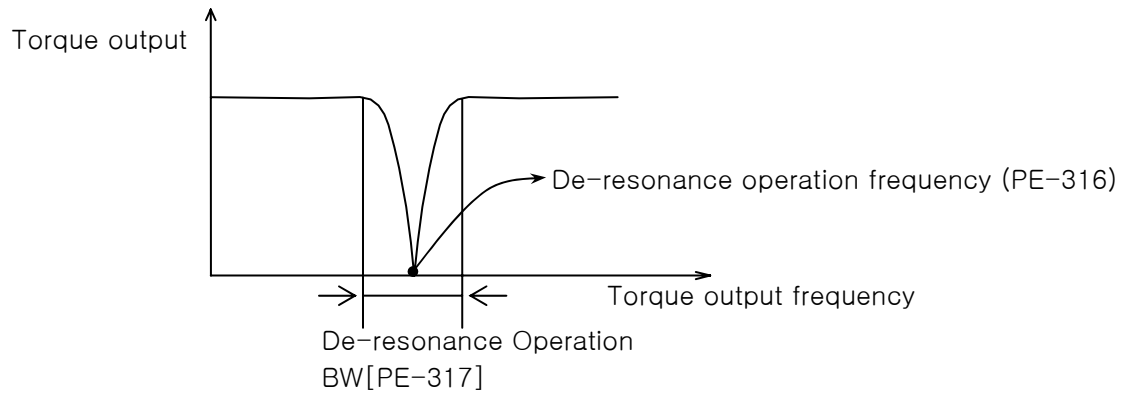
* If it is difficult to calculate inertia ratio, the inertia ratio can be tuned during trial operation.

See “paragraph 1.4.9 “Automatic gain adjustment [PC-905].”

4) Setting analog position command filter [PE-314]

The stability of command signal can be improved by setting a digital filter for analog position command voltage. If an excessively large value is set, the responsiveness to the analog position command drops. Set appropriate value depending on the type of systems used.

5) Setting de-resonance operation

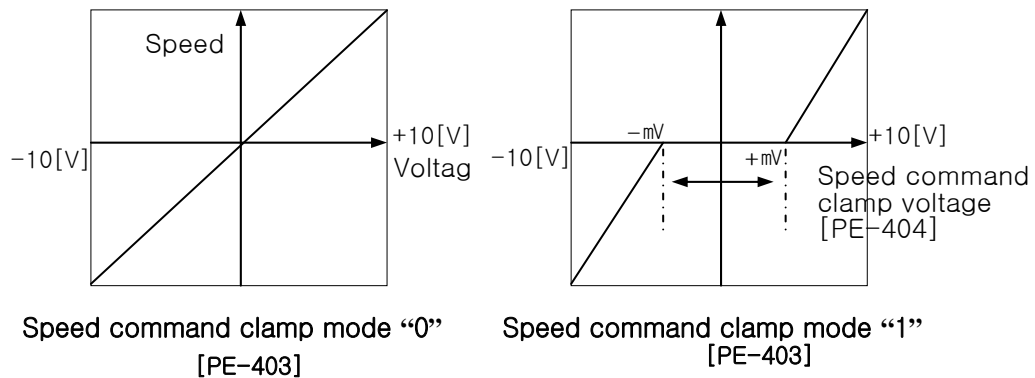


- If vibration occurs due to mechanical resonance generated from certain frequencies, it may be suppressed by limiting torque output for the frequency band.
- De-resonance operation [PE-315]: This will not be activated if “0” is set, but will be activated if “1” is set.

2.4.5 Setting I/O Variables

1) Setting analog speed command

- ① Analog speed command [PE-401]: Set the analog speed command value in the unit of r/min at 10 [V]. The maximum setting will be the motor's maximum speed.
- ② Speed command offset [PE-402]: Sometimes, certain level of voltage exists on the analog signal interface circuit even at zero speed command. This voltage may be compensated by setting equivalent voltage as offset. The voltage unit shall be "mV".
- ③ Setting speed command clamp

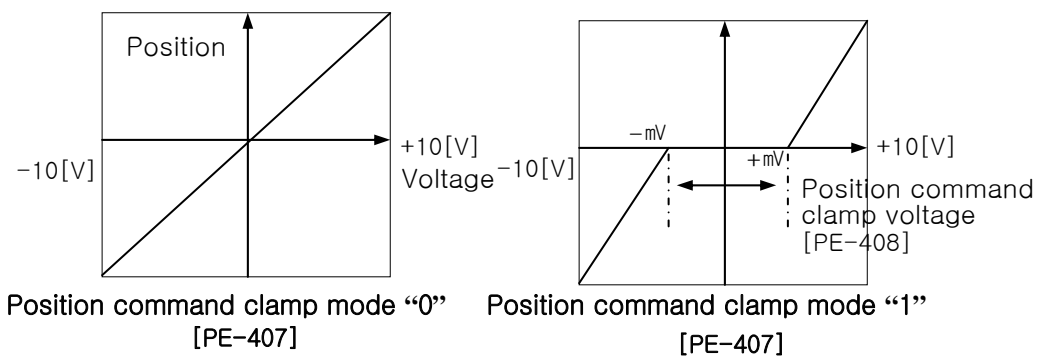


- ④ Speed override operation [PE-717]: Speed command operation can be executed by overriding (overlapping) the analog speed command with the digital speed command.
"0": Override not activated.
"1": Override activated.

2) Setting analog position command

- ① Analog position command [PE-405]: Set analog position command value at 10[V].
- ② Position command offset [PE-406]: Sometimes, certain level of voltage exists due to problems in analog circuit even at zero speed command. This voltage may be compensated by setting equivalent voltage as offset. The voltage unit shall be "mV".

③ Position command clamp



3) Setting analog output

Two analog outputs are available. Values corresponding to the data can be output according to the set conditions at a cycle of 400 [msec] respectively.

① Analog output types [PE-409], [PE-413]

Model	Data	Model	Data
0	Command speed	4	Command position
1	Current speed	5	Current position
2	Command torque		
3	Current torque		

② Analog output modes [PE-410], [PE-414]

Mode	Output Mode
0	Output at -5[V] – +5[V]
1	Output at 0 – +5[V]

③ Analog output magnification [PE-411], [PE-415]. If output data is excessively small or large, the data may be appropriately magnified or reduced. The basic magnification for each output data is as follows:

Data Item	Magnification
Speed	Motor maximum speed [PE-215]
Torque	Motor maximum torque [PE-205]
Command pulse Frequency	500 [Kpps]
Position	Analog position output [PE-417] at 5[V].

* Special-Large capacity(VP220, VP300, VP370)’s Motor speed max [PE-216]

④ Analog output offsets [PE-412], [PE-416].

Certain level of voltage may exist when “0” value is output due to problems in analog circuit. This voltage may be compensated by setting equivalent voltage as offset. The voltage unit shall be “mV”.

⑤ Analog position output [PE-417] at 5V. The position data are set at 5[V] if the analog position output is applied.

4) Encoder output pulse frequency dividing ratio [PE-418]

Encoder pulses may be produced after changing the pulses to the extent of the preset frequency-dividing ratio.

Example: From 3000 [pulse] with the frequency dividing ratio 2 →1500 [pulse]

* The frequency-dividing ratio must be set so that the resulting frequency dividing output pulse comes to be an integer.

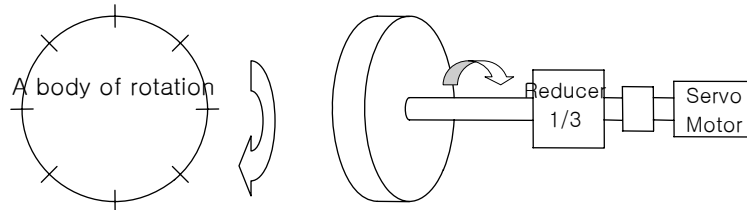
2.4.6 Setting Common Operation Variables

1) Setting operating mechanism

① Setting mechanism feed unit

Set motor revolution unit related to the mechanism feed unit based on the amount of mechanism feed [PE-502] versus the motor rpm [PE-501].

Example: If the reduction ratio is 1/3, and the ball screw lead is 8 [mm].



* Enter “3” for motor rpm [PE-501] and “8” for amount of mechanism feed [PE-502].

② Setting feed direction

Set the direction of feed [PE-503] at + position coordinates according to the mechanism assembly.

Code	+ Position Coordinates	– Position Coordinates
0	Forward running (CCW)	Backward running (CW)
1	Backward running (CW)	Forward running (CCW)

2) Setting position operation variables

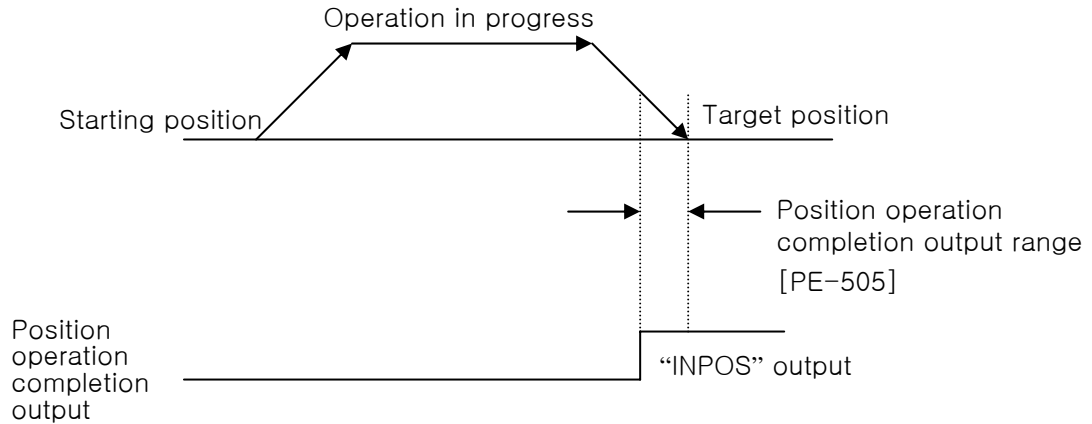
① Position operation completion output mode [PE-504]

Menu setting [PE-504]	Description
0	– InPOS contact output.
1	– InPOS contact output. – Operation completion position coordinate output. Output position coordinates 0–15 using OP0–OP3.
2	– InPOS contact output. – Operation completion position coordinate output. Output position coordinates 0–31 using 5 output contacts, OP0–OP3, and OP4. * Because the brake output is used as OP4 in this mode, sequence must be configured externally when using the brake.

Chapter 2: Rotary Coordinate Position Operation Type

② Position operation completion output range [PE-505]

Data are output within the set range when the target position is reached.
Setting is done in user units.



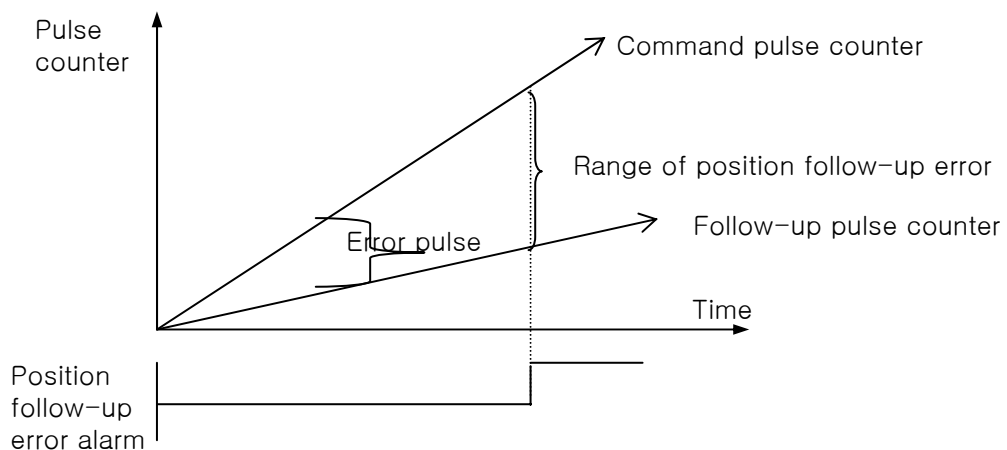
If the setting is too large, the positioning completion output signal may be produced during operation. Set an appropriate value to avoid this.

③ Position operation completion output time [PE-506]

The position operation completion signal may be set to appear for a preset duration and disappear irrespective of position.

★ If the setting is greater than “0”, the system operates; and if the setting is “0”, the system does not operate.

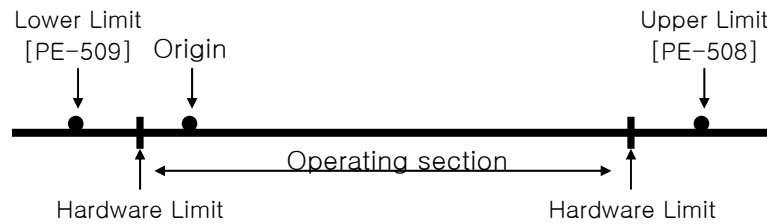
④ Range of position operation follow-up error [PE-514]



If error pulse is greater than the setting of the position operation follow-up error range, a position follow-up error alarm is generated.

II . Operating Software

3) Setting Software Limit



If hardware limit cannot be used for safety purposes or due to the nature of mechanical structure, software limit may be set.

Unless origin run is carried out, the software limit cannot assume specific position.

Configure the system so that origin run is always carried out prior to operation.

* If the software limit menu [PE-507] is set to “1”, limit is activated.

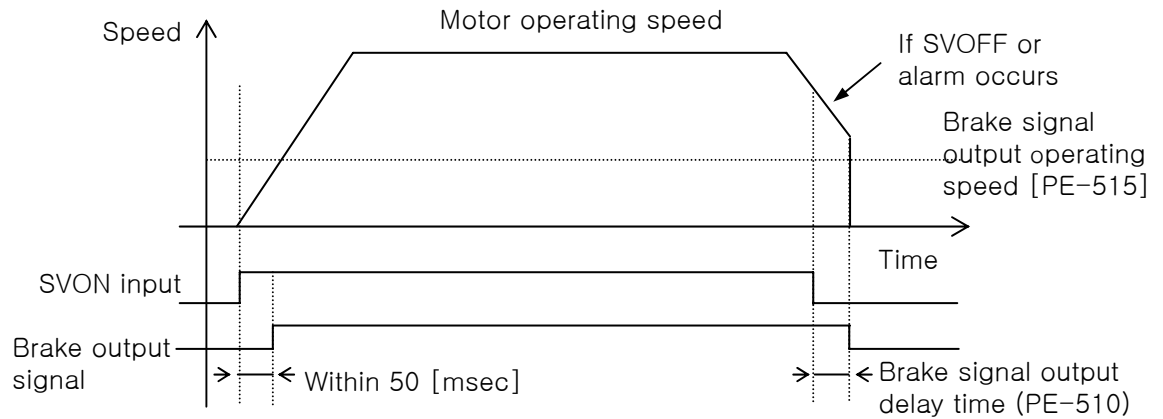
4) Setting external input pulse (MPG) unit

① Pulse logic [PE-510]: The following codes are used depending on pulse types.

PF +PR	Positive Logic			Negative Logic		
	Code	Forward Running	Backward Running	Code	Forward Running	Backward Running
PHASE A + PHASE B	0			3		
CCW or CW Pulse	1			4		
Pulse + direction	2			5		

② Setting unit: Set motor rpm [PE-512] versus the number of external input signals [PE-511].

5) Setting the brake signal output variables



- ① Brake signal output operating speed [PE-515] and brake signal output delay time [PE-516]

If an alarm occurs while operating the servo motor by applying the built-in brake to the vertical shaft, or if the speed is reduced by SVOFF, the brake signal is stopped by either the brake signal output operating speed (PE-515) or the brake signal output delay time (PE-516) whichever satisfied the operating conditions first. This prevents the vertical shaft from dropping to the motor brake.

6) Dynamo braking [PE-518]

The dynamo braking can be set for drives from VPR5 to VP04.

“0”: The system runs free on or below zero speed range when servo is stopped by SVOFF.

“1”: The system always executes dynamo braking when servo is stopped by SVOFF.

2.4.7 Setting private operation variables

1) Setting operating mode [PE-601]

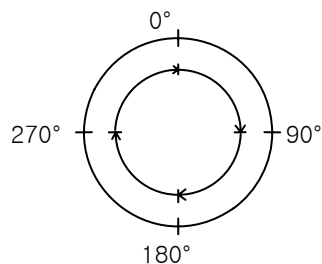
Note: After changing the operating mode of [PE-601], make sure to carry out origin run prior to starting operation.

① Operating mode 0

- If Start is turned on, the system begins to operate the position coordinates selected by the 5 input contacts (PSEL0–PSEL4).
- The operation direction is decided by the absolute position coordinate based on the origin. It varies depending on the proximity operation [PE-603] or prohibited direction of rotation setting [PE-604].
- * Refer to paragraph 1.1.2 “Position operation function (Page 1.4)”.

② Operating mode 1

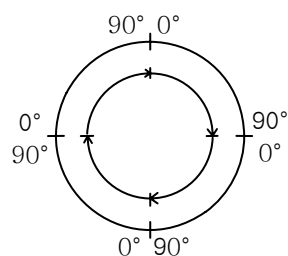
- If Start is turned on, the system begins to operate to the position established by adding coordinates selected by the 5 input contacts (PSEL0–PSEL4) to the current position coordinates.
- Example: If 90° is selected, the system operates by 90° each time Start is turned on, and the coordinate displays absolute position.



- In this operating mode, the automatic proximity identification operation, prohibited direction of rotation setting, and the set coordinate operation stop cannot be activated.

③ Operating mode 2

- If Start is turned on, the system moves to the position coordinate selected by 5 input contacts (PSEL0–PSEL4) after clearing the current position coordinate to “0”.
- Example: If 90° is selected, the system operates by 90° each time Start is turned on, and the coordinate always displays 90° when operation is completed.



- In this operating mode, the automatic proximity identification operation, prohibited direction of rotation setting, and the set coordinate operation stop cannot be activated.

2.4.8 Setting jog and origin run variables

1) Setting jog speed

- ① Set jog speed in two types (low speed and high speed) in the unit of “r/min”.

Setting Item	Menu
Low speed jog run	PE-801
High speed job run	PE-802

- ② Setting acceleration/deceleration time [PE-803]

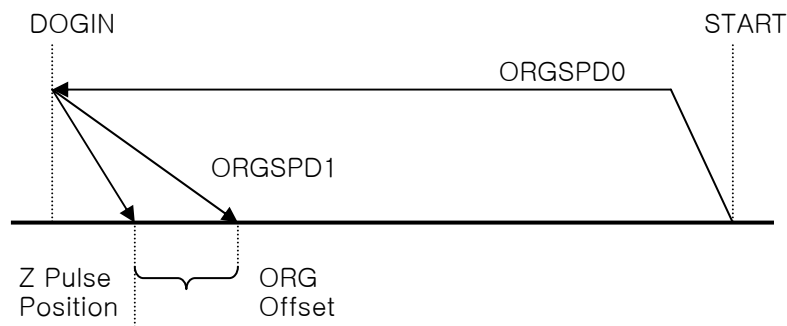
Set acceleration/deceleration time applied in jog run.

2) Origin run

- ① Origin run Mode[PE-810]

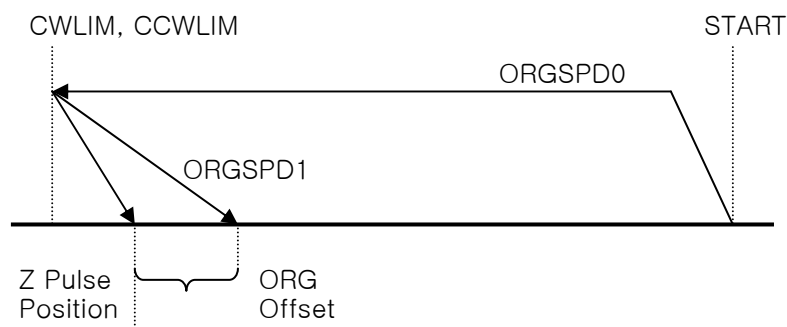
- Mode 0: Set current position as origin.
- Mode 1: Sensor (Dog) type

If the sensor turns on after starting origin run, the system turns in the opposite direction to stop at the Z pulse position, and sets the origin.



- Mode 2: Limit type

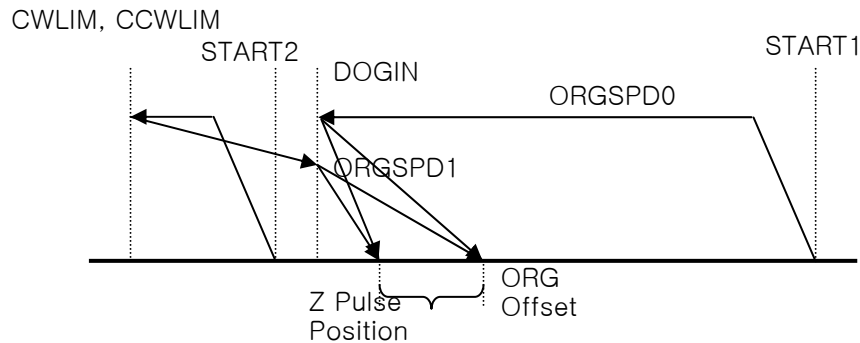
If the limit sensor turns off after starting origin run, the system turns in the opposite direction to stop at the Z pulse position, and sets the origin.



II . Operating Software

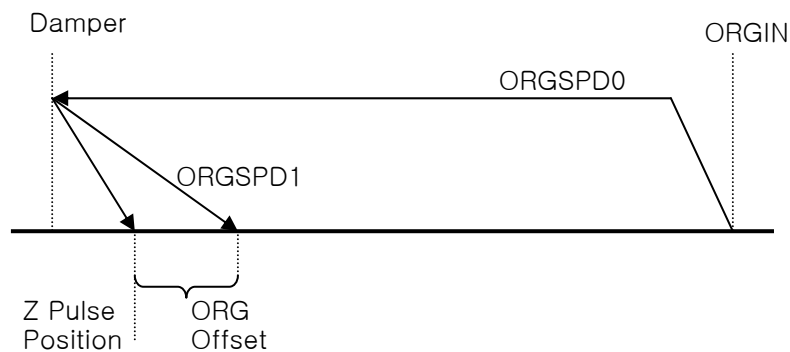
– Mode 3: Limit and sensor (Dog) type

If the system meets the limit after starting origin run, it turns in the opposite direction; and if it meets Z pulse while turning in the opposite direction, it stops at the Z pulse position and sets the origin.



– Mode 4: Damper type

If the system meets damper after starting origin run, and if the load torque increases more than the damper torque, it turns in the opposite direction to stop at the Z pulse position, and sets the origin.



② Origin run direction [PE-811]

Set the operation direction after starting origin run.

③ Origin sensor stop [PE-812]

Set “0”: After Dog sensor, Set the origin position at Z pulse,

Set “1”: After Dog sensor, A moment the sensor is turned On/Off, it stops and sets

Origin position.

④ Origin offset [PE-813]

In case of stopping after the origin run, the system moves from the Z pulse position to the extent of the offset value before stopping, and sets this

coordinate as the origin.

⑤ Origin position [PE-814]

Set the initial value of the stop coordinates when setting the origin.

This means that when the system stops, the coordinate will not be “0” but will be the set position value.

⑥ Automatic origin run [PE-815]

The origin run is automatically executed when the servo turns on first time after power is connected to the servo.

⑦ Changing origin run speed

Set the first operating speed [PE-816] after starting origin run and the operating speed [PE-816] after origin sensor or limit sensor operation, in the unit of “r/min”.

2.4.9 Operating Command

1) Alarm reset [PC-901]

Reset alarm in case it occurs.

2) Alarm history clear [PC-902]

Clear the alarm history information currently in storage.

3) Loader jog run [PC-903]

- ① If Enter is pressed in menu [PC-903], the current position is displayed.
- ② If Left Key is pressed next, the system operates at N-JOG; and if Right Key is pressed, the system operates at P-JOG.
- ③ If Up key is pressed, the current position is saved in the position coordinate chosen by the input contact.
- ④ If Enter is pressed, menu screen appears and jog run stops.

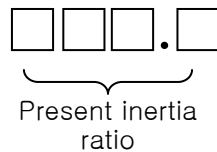
Note: Loader jog run moves at jog speed 0.

4) Loader origin run [PC-904]

If Enter is pressed in menu [PC-904], the origin run starts.

5) Automatic gain adjustment [PC-905]

Press [Enter]key on the menu [PC-805], and followings are displayed then automatic gain turning operation can be conducted.

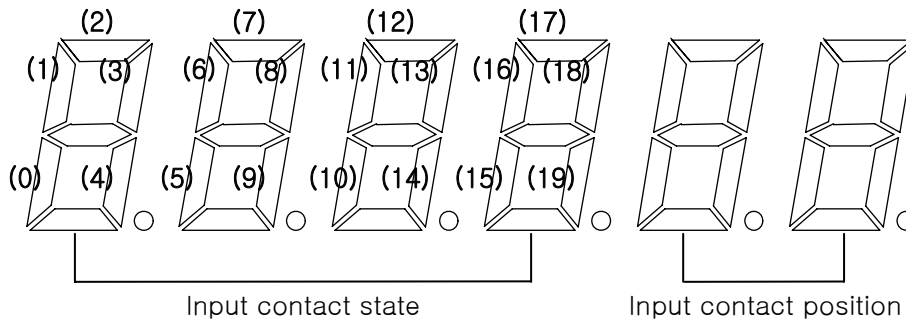


- ① The inertia range is automatically changed from 1 to 50.
- ② When pressing [Up] key, the Auto gain tuning operation is started with the operation speed 100[r/min].
- ③ When keep pressing [Up] key, the operation speed is increased 100→300 →500[r/min]. Increased by 200[r/min]. Turning time is quicker as per the speed.
- ④ When pressing [Right] key, the operating distance is increased. But, when pressing the [Left] key, the operating distance is decreased.
- ⑤ If the turning value is fixed and not changed the turning completed.
- ⑥ If the inertia that was tuned reached “50”, customers are requested to ask Our technical dept. And set it by manual.
- ⑦ Press [Enter] key and the gain that was tuned are saved at [PE-301].

[PE-307],[PE-309] automatically and returned to the menu.

Or Keep pressing [Enter]key on the [PC-805] and doing operation/stop or forward/reverse operation by contacts. Then the inertia ratio can continuously adjusted during the operation.

6) Setting input contact logic [PC-906]



(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
SVON	START	EMG	ALMRST	PSEL0	PSEL1	PSEL2	PSEL3	PSEL4	CCWLIM
(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
CWLIM	STOP	ORGIN	DOGIN	P-JOG	N-JOG	MPGEN	SPD1	SPD2	SPD3

- Use Left/Right Key to increase/decrease the input contact position number.
- As for the contact logic, each time Up Key is pressed, the lamp of the segment corresponding to the current contact position number will be turned ON/OFF.

Segment	Contact Logic
ON	Contact B
OFF	Contact A

- If Enter is pressed after completion of setting, the contact logic is saved, and the screen returns to menu screen.

7) Forced setting of input contacts [PC-907]

- If Enter is pressed in menu [PC-907], the screen appears as in paragraph ⑥.
- Operation procedures are the same. When the segment turns on, the contact established here forcibly turns on related input contact irrespective of I/O.
- If Enter is pressed after completing forced setting of input contact, the relevant contact established here turns on and menu screen is restored.

Note 1: The logic of input contact to be forcibly set must be contact A. Hence, the contact that has been set as contact B in paragraph ⑥ should be converted into contact A before being used.

8) Menu data initialization [PC-908]

- If Press Enter Key, after pressing Up Key, all set menu data are initialized
(When re-start after power off, the data will be initialized.)

9) Menu data lock [PC-909]

- Set prohibition of correcting menu data.
- Each time Enter is pressed, locking and unlocking are alternately repeated.

10) Saving current offset [PC-910]



CAUTION

- Compensate the electric current sensor's offset inside the servo drive. If compensation of the value is incorrect, the servo control becomes unstable.
- The offset value has been adjusted at the time of delivery. Do not make adjustment, if possible.
- If down load is executed to upgrade or change the servo drive software, offset must be set.

- Adjusting offset
 - (1) Turn the servo power on.
 - (2) Execute operation/stop or forward/backward operation at a slow speed for appropriately 10 seconds.
 - (3) Turn the servo power off, and then on again.
 - (4) Press Enter in menu [PC-910] to display the offset value.
 - (5) Press Up key to save the offset value.
 - (6) Repeat steps (2) through (5) (About five times).
 - (7) The saved and tuned U-phase offset values are displayed alternately each time Left key is pressed, or the saved and tuned W-phase offset values, each time Right key is pressed.
If there is large difference between these two values, save the tuned value using the Up key.
 - (8) Press Enter key to return to menu screen.

Chapter 3

Feeder and sensor-input position operation type (VP-3.xx)

[Manual Version: 2.2]

[Applicable software : Higher than 3.30]

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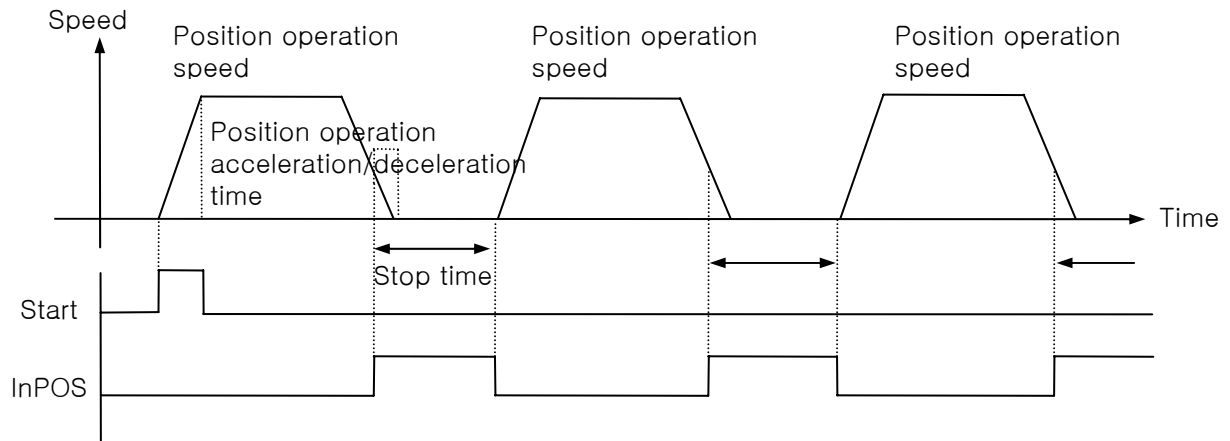
3.4 Detailed Description of Menu

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3.1 Major Functions

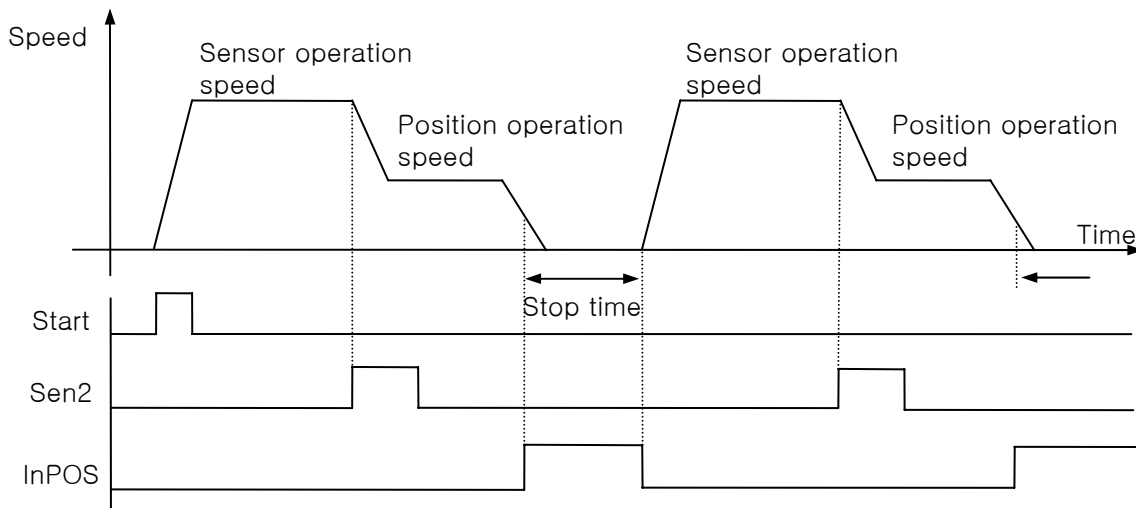
3.1.1 Operating Mode

1) Feeder position operation [Operating Mode 0]



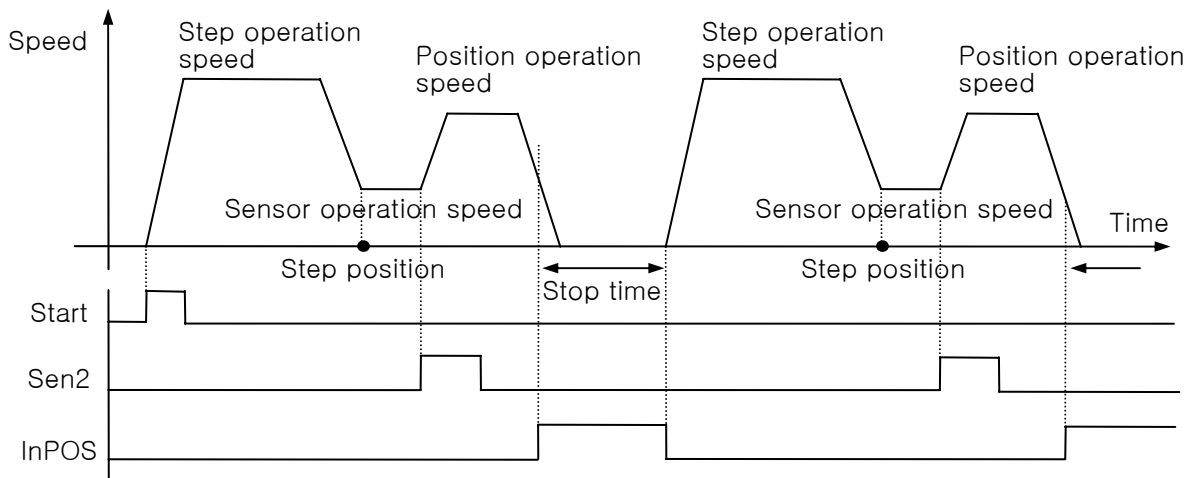
- ① The system performs position operation by increasing the position to the extent of the position operation coordinates selected based on the current point.
- ② If the continuous operation (Automatic) contact is on, the system stops for the duration of the set stop time, and automatically starts again.

2) Sensor (Sen2)-input position operation [Operating Mode 1]



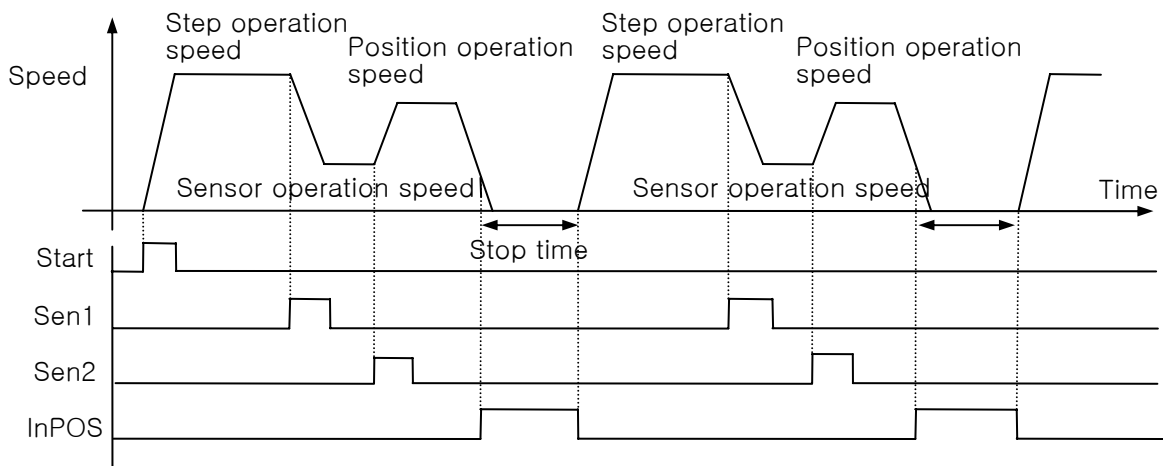
- ① If Start is turned on, infinite operation begins at sensor operation speed.
- ② If the sensor contact is turned on, the system operates at position operation speed to the extent of the position operation coordinate selected based on this point, and stops operation.
- ③ If the continuous operation (Automatic) contact is on, the system stops for the duration of the set stop time, and automatically starts again.
- ④ If maximum operating distance (Pitch distance) is set, the system can automatically stop when the maximum operating distance is reached. The pitch contact turns on at this time.

3) Specific distance (Step position) operation + sensor (SeN2)-input position operation [Operating Mode 2]



- ① If Start is turned on, the system starts operation to the step operation position based on the current coordinate.
- ② If the system reaches the step operation position, it continuously operates at sensor operation speed.
- ③ If the sensor contact is turned on, the system operates at a position operation speed to the extent of the position operation coordinate selected based on this point, and stops operation.
- ④ If the continuous operation (Automatic) contact is on, the system stops for the duration of the set stop time, and automatically starts again.
- ⑤ If maximum operating distance (Pitch distance) is set, the system can automatically stop when the maximum operating distance is reached. The pitch contact turns on at this time.

4) 2 sensor (Sen1, Sen2)-input position operation [Operating Mode 3]



- ① If Start is turned on, the system starts operation at step operation speed based on the current coordinate.
- ② If Sen1 is turned on during operation, the system continuously operates at sensor operation speed.
- ③ If sen2 is turned on, the system operates at position operation speed to the extent of the position operation coordinate selected based on this point, and stops operation.
- ④ If the continuous operation (Automatic) contact is turned on, the system stops for the duration of the set stop time, and automatically starts again.
- ⑤ If maximum operating distance (Pitch distance) is set, the system can automatically stop when the maximum operating distance is reached. The pitch contact turns on at this time.

3.1.2 Position Operation Function

1) Setting position coordinates and stop time

Input Contact State					Operating Distance and Stop Time Menu			
NO	PSEL0	PSEL1	PSEL2	PSEL3	Position operation distance	Step operation distance	Maximum operation distance	Stop time
0	X	X	X	X	PE-701	PE-721	PE-741	PE-761
1	O	X	X	X	PE-702	PE-722	PE-742	PE-762
2	X	O	X	X	PE-703	PE-723	PE-743	PE-763
3	O	O	X	X	PE-704	PE-724	PE-744	PE-764
4	X	X	O	X	PE-705	PE-725	PE-745	PE-765
5	O	X	O	X	PE-706	PE-726	PE-746	PE-766
6	X	O	O	X	PE-707	PE-727	PE-747	PE-767
7	O	O	O	X	PE-708	PE-728	PE-748	PE-768
8	X	X	X	O	PE-709	PE-729	PE-749	PE-769
9	O	X	X	O	PE-710	PE-730	PE-750	PE-770
10	X	O	X	O	PE-711	PE-731	PE-751	PE-771
11	O	O	X	O	PE-712	PE-732	PE-752	PE-772
12	X	X	O	O	PE-713	PE-733	PE-753	PE-773
13	O	X	O	O	PE-714	PE-734	PE-754	PE-774
14	X	O	O	O	PE-715	PE-735	PE-755	PE-775
15	O	O	O	O	PE-716	PE-736	PE-756	PE-776

Note: If digital switch is used, data is set on the No. 0 position menu.

2) Setting operating speed and acceleration/deceleration time

The system can be operated by selecting 4 kinds of operating speed and the acceleration/deceleration time based on the two input contacts.

Input Contact State			Speed and Acceleration/Deceleration Time Setting Menu			
NO	SPD0	SPD1	Item	Operating speed	Step speed	Sensor speed
0	X	X	Speed	PE-621	PE-641	PE-661
			Acceleration time	PE-625	PE-645	PE-665
			Deceleration time	PE-629	PE-649	PE-669
1	O	X	Speed	PE-622	PE-642	PE-662
			Acceleration time	PE-626	PE-646	PE-666
			Deceleration time	PE-630	PE-650	PE-670
2	X	O	Speed	PE-623	PE-643	PE-663
			Acceleration time	PE-627	PE-647	PE-667
			Deceleration time	PE-631	PE-651	PE-671
3	O	O	Speed	PE-624	PE-644	PE-664
			Acceleration time	PE-628	PE-648	PE-668
			Deceleration time	PE-632	PE-652	PE-672

Note : If digital switch is used, data is set on the No.0 position menu.

3.1.3 Jog Run

Operation by	Major Functions
Contact	- Jog run using contact switch.
Loader	- Jog run by loader manipulation. - Current coordinates can be set in menu.

① The speed of jog run shall be set at low/high speed as a unit of [r/min]

Setting Item	Menu
Low speed jog run	PE-801
High speed jog run	PE-802

② Setting acceleration/deceleration time of jog run on the[PE-803]

Setting acceleration/deceleration time applied to jog run

③ Jog run

- a) When 'P-JOG' is turned ON, low-speed forward rotation is to be performed.
- b) When 'N-JOG' is turned ON at the condition of a) ('P-JOG' ON), high-speed forward rotation is to be performed.
- c) When 'N-JOG' is turned "OFF" at the high-speed forward rotation, low speed forward rotation is to be performed.
- d) When 'P-JOG' is turned "OFF", it stops.
- e) In case of reverse rotation, the same way is applied after turning ON 'N-JOG' first

3.1.4 Setting Operation Data

Setting Mode	Major Functions
Menu setting	Edit and set menu using loader.
Communication setting	Set data based on communication (CN3).
I/O setting	Set data using BCD code of I/O contacts (PLC, Digital switch)

3.1.5 Operation Data Output

Output Mode	Output Details										
Communication output	Output operation data based on communication (CN3).										
Analog	<p>* Data are output in $\pm 5V$ according to the set scale units, and the following operation data are output according to the output mode.</p> <table><tr><th>Output Mode</th><th>Output Item</th></tr><tr><td>0</td><td>Command speed</td></tr><tr><td>1</td><td>Current speed</td></tr><tr><td>2</td><td>Command torque</td></tr><tr><td>3</td><td>Current torque</td></tr></table>	Output Mode	Output Item	0	Command speed	1	Current speed	2	Command torque	3	Current torque
Output Mode	Output Item										
0	Command speed										
1	Current speed										
2	Command torque										
3	Current torque										

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3.2.2 Control Signal

1) Contact input signal

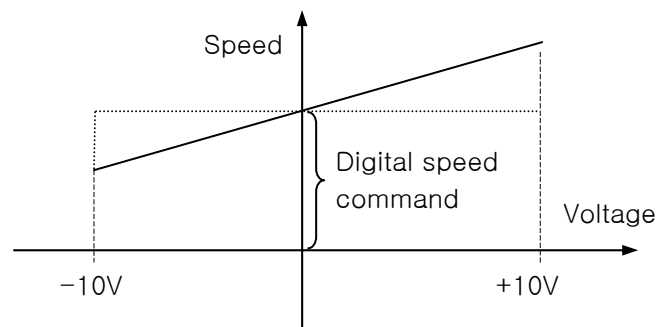
Pin Number	Name	Description	
		General	When digital switch is used
50	+24V IN		
49	SVON	Servo on	
13	START	Operation started	
18	EMG	Emergency stop	
17	ALMRST	Alarm reset	
44	PSEL0/DATA1-1	Position distance selection 0	Digit data 1-1
45	PSEL1/DATA1-2	Position distance selection 1	Digit data 1-2
46	PSEL2/DATA1-4	Position distance selection 2	Digit data 1-4
47	PSEL3/DATA1-8	Position distance selection 3	Digit data 1-8
48	Note1) READEN		Data read enable
20	AUTO	Select auto consecutive operation.	
19	MOVESEL /DIR /PAUSE	Select the below functions with [PE-611] 0 : Select the unit of equipment operation 1 : Select rotating direction 2 : Switching function of Operation mode 0 & Operation mode 2 3 : Select PAUSE function	
14	STOP	Stop during Operation	
15	SEN1	Input sensor 1.	
16	SEN2	Input sensor 2.	
11	P-JOG	Forward direction jog	
12	N-JOG	Reverse direction jog	
21	SPD0/DATA2-1	Speed selection 0	Digit data 2 -1
10	SPD1/DATA-2	Speed selection 1	Digit data 2 -2
22	X/DATA2-4	X	Digit data 2 -4
23	X/DATA2-8	X	Digit data 2 -8

Note1) For READEN input, user is requested to turn it ON for about 1 second only after changing the digital switch value. And after that, Make sure it should be turned OFF. If READEN input remains ON all the time, digital switch value may be misread due to external noise.

2) Analog input signal

Pin Number	Name	Description
27	SPDCOM	Analog speed command input ($-10[V] - +10[V]$)
1	GND	Analog signal ground

* If the system is operated at an override (overlapping) speed at the analog speed command (menu number [PE-605] set to “1”), the system operates at a speed command which is overlapped with the digital speed command.



Note: If + voltage is applied irrespective of the rotating direction of the motor, speed increases; and speed decreases if – voltage is applied.

3) Pulse train input signal

Pin Number	Name	Description
35 /36	ALARM+/ALARM –	Outputs alarm status. • ON: Normal mode • OFF: Alarm mode
37 /38	RDY+/RDY–	ON: Normal mode (Operation preparations completed)
33	BRAKE	Outputs brake operation signal when servo is operating.
34	PITCH	Outputs maximum distance reach signal.
39	INPOS	Outputs position operation completion signals.
40	SEL1	Digital switch input position select 1
41	SEL2	Digital switch input position select 2
42	SEL3	Digital switch input position select 3
43	SEL4	Digital switch input position select 4

4) Monitor output signal and output power supply

Pin Number	Name	Description
4	MONIT1	Analog monitor output 1 (–5[V] – +5[V])
5	MONIT2	Analog monitor output 2 (–5[V] – +5[V])
1	GND	Ground for analog output signal
26	+15[V]	+15[V] power output terminal

5) Encoder output signal

Pin Number	Name	Description
31 32 29 30	AO /AO BO /BO	Outputs encoder signal received from the motor after dividing it according to the frequency dividing ratio set in menu [PE–417] (5V Line drive system).
2 3	ZO /ZO	Outputs encoder Z signal received from the motor (5[V] Line drive system).

3.3 Menu

3.3.1 Operating Mode Menu

MENU			UNIT	INI	Description
NO	CODE	NAME	MIN	MAX	
0	Pd-001	Current State	– –	– –	Displays current operation mode. Normal: nor, Alarm: alarm number
1	Pd-002	Current Speed	r/min –99999	0 99999	Displays current operating speed.
2	Pd-003	Command Speed	r/min –99999	0 99999	Displays current command speed.
3	Pd-004	Reference Speed	– –99999	0 99999	Displays speed command values based on the acceleration/deceleration time during operation.
4	Pd-005	Current Position	– 0.0	0.0 99999.9	Displays current position coordinates. (Displays operation command position coordinates at stop)
5	Pd-006	Refer Position	– 0.0	0.0 99999.9	Displays current target position coordinates.
6	Pd-007	Command Position	– 0.0	0.0 9999.9	Displays operation command position coordinates.
7	Pd-008	Remain Position	– –9999.9	0.0 9999.9	Displays the difference between target position coordinates and current position coordinates.
8	Pd-009	Torque Limit	[%] 0	0 300	Displays torque-limit setting.
9	Pd-010	Current Load	[%] –9999.9	0.0 9999.9	Displays current load rate versus rated load.
10	Pd-011	Average Load	[%] –9999.9	0.0 9999.9	Displays average load rate of 5 seconds versus rated load.
11	Pd-012	Maximum Load	[%] –9999.9	0.0 9999.9	Displays maximum instantaneous load rate versus rated load.
12	Pd-013	DC Link Voltage	Volt 0.0	0.0 999.9	Displays condenser's DC voltage value.
13	Pd-014	I/O Set	– –	– –	Displays current I/O CN1's input state.
14	Pd-015	Input EXT SET	– –	– –	Displays state of externally set input contacts.
15	Pd-016	I/O State	– –	– –	Displays current operating condition of I/O.
16	Pd-017	Input Logic Set	– –	– –	Menus dedicated to communication.
17	Pd-018	Input Logic Save	– –	– –	
18	Pd-019	Alarm bit	– –	– –	
19	Pd-020	Software Version	– –	– –	Displays software version number.

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3.3.2 Alarm Display Menu

MENU			UNIT	INI	Description
NO	CODE	NAME	MIN	MAX	
Alarm History 01~20			—	—	Displays status of alarms occurred in the past.
20 ~ 39	PA-101 ~ PA-120	Alarm History 01 ~ Alarm History 20	—	—	

Alarm codes and Descriptions

CODE	Name	Description or Causes	Items to be Checked
Nor-off	Normal svoid	Servo off Normal status	—
Nor-on	Normal svoid	Servo on Normal status	—
L1. 01	L1. 01	Malfunction of RS232 communication, control circuit	Replacing Drive
AL-01	Emergency Stop	EMG input contacts open.	Control signal wiring, external 24V power supply
AL-02	Power Fail	Main power supply turned off	Power supply, wiring
AL-03	Line Fail	Motor and encoder wiring error	Setting value, CN2 wiring, U, V, W wiring
AL-04	Motor Output	Motor drive circuit output error	U, V, W Wiring or IPM module burned
AL-05	Encoder Pulse	Encoder pulse number set error	Setting value of [PE-204], CN2 wiring
AL-06	Following Error	Position pulse following error	Excessive Position command pulse, [PE-514] setting, wiring, limit contacts, gain setting
AL-07	Limit Direction	Operation in limit direction	Direction of running, limit contacts
AL-08	Over Current	Overcurrent	Wiring, motor, encoder setting, gain setting, drive replacement
AL-09	Over Load	Overload	Load state, wiring, motor, encoder setting
AL-10	Over Voltage	Overvoltage	Input voltage, braking resistance wiring, excessive regeneration operation.
AL-11	Over Speed	Overspeed	Encoder setting, encoder wiring, gain setting
AL-12	Origin Error	Origin run error	Dog sensor signal, limit signal wiring
AL-13	Not Used	Not used	—
AL-14	ABS Data Error	Absolute encoder data transmission error	Initial reset
AL-15	ABS Battery Error	Absolute encoder battery error	Initial reset, battery discharge
AL-16	ABS Multi Error	Absolute encoder multi-running data transmission error	Initial reset
AL-17	ABS Read Fail	Absolute encoder reading error	Absolute Encoder check, CN2 wiring check
AL-18	Not Used	Not used	—
AL-19	Not Used	Not used	—
AL-20	Flash Erase Fail	Flash ROM data delete error	Replacing drive
AL-21	Flash Write Fail	Flash ROM data writing error	Replacing drive
AL-22	Data Init Error	Data initialization error	Replacing drive
AL-23	EPWR	Hardware error	[PE-203] setting
Err1	Error1	Occurs when attempting to correct menu which cannot be corrected in Servo-on condition.	Correct menu after turning off servo.
Err2	Error2	Occurs when attempting to enter data which deviate from the setting range.	Enter data within the range of setting.
Err3	Error3	Occurs when attempting to correct menu after locking menu using [PC-909] (Menu Data Lock).	Correct menu after unlocking [PC-909].

Chapter 3: Feeder and sensor-input position operation type

3.3.3 System Variable Setting Menu

Menus carrying “*” mark cannot be corrected when the servo is on.

MENU			UNIT	INI	Description
NO	CODE	NAME	MIN	MAX	
40	*PE-201	Motor ID	– 0	– 99	Set the applied motor ID.
41	PE-202	RS232 Communication speed	bps	0	Set RS232 communication speed of CN3 (Reconnection of power supply required.) 0=9600[bps], 1=19200[bps] 2=38400[bps], 3=57600[bps]
		Baud Rate	0	1	
42	*PE-203	Encoder Type	– 0	0 9	Set type of relevant encoder. (0: PHASE A Lead, 1: PHASE B Lead, 6: absolute value encoder)
43	*PE-204	Encoder Pulse	P/r 1	– 99999	Set number of pulses of relevant encoder.
44	PE-205	CCW TRQ Limit	[%] 0	300 300	Set torque limit value for CCW running.
45	PE-206	CW TRQ Limit	[%] 0	300 300	Set torque limit value for CW running.
46	*PE-207	System ID	– 0	0 99	Set drive ID for communication.
47	*PE-208	System Group ID	– 0	0 99	Set drive group ID for communication.
48	PE-209	Start Menu No.	– 1	5 20	Set Operating Mode Menu to be displayed after operation begins.
49	*PE-210	Inertia	gf·cm·s ² 0.01	ID 999.99	Set motor inertia moment.
50	*PE-211	Trq Con	kgf·cm/A 0.01	ID 999.99	Set motor torque constant.
51	*PE-212	Phase Ls	mH 0.001	ID 99.999	Set motor phase inductance.
52	*PE-213	Phase Rs	ohm 0.001	ID 99.999	Set motor phase resistance.
53	*PE-214	Rated Is	A 0.01	ID 999.99	Set motor rated current.
54	*PE-215	Max Speed	r/min 0.0	ID 9999.9	Set motor maximum speed.
55	*PE-216	Rated Speed	r/min 0.0	ID 9999.9	Set motor rated speed.
56	*PE-217	Pole Number	– 2	8 98	Set number of motor poles.
57	PE-218	Not Used	– –	– –	
58	PE-219	Not Used	– –	– –	
59	PE-220	Not Used	– –	– –	

Communication code is used to designate the related menu in case of TOUCH or PC Communication.

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– System variables setting menu (for Special Large Capacity : APD-VP220,VP300,VP370)

Menus marked with “*” cannot be corrected during Servo-On

MENU			UNIT	INI	Description	App Mode
Comm Code	CODE	NAME	MIN	MAX		
40	*PE-201	Motor ID	– 0	– 99	Sets Motor ID (Refer 4.4.1), When setting motor ID: Be set automatically from [PE-210] to [PE-218]	PST
41	*PE-202	RS232 Comm. speed	[bps]	0	Sets RS232 communication speed of CN3	PST
		Baud Rate	0	1	0=9600[bps], 1=19200[bps] 2=38400[bps], 3=57600[bps]	
42	*PE-203	Encoder Type	– 0	0 9	Sets applied encoder type (0 : A phase lead, 1 : B phase lead, 6 : Absolute encoder)	PST
43	*PE-204	Encoder Pulse	[p/r] 1	3000 99999	Sets the number of encoder pulse.	PST
44	PE-205	CCW TRQ Limit	[%] 0	300 300	Sets torque limit value at CCW.	PST
45	PE-206	CW TRQ Limit	[%] 0	300 300	Sets torque limit value at CW.	PST
46	*PE-207	System ID	– 0	0 99	Sets drive ID on communication	PST
47	*PE-208	System Group ID	– 0	0 99	Sets drive group ID on communication	PST
48	PE-209	Start Menu No.	– 1	2 20	Sets the operation status display menu with [Pd-001]~[Pd-020] at power on.	PST
49	*PE-210	Inertia	gf·cm·s ² 0.1	ID 9999.9	Sets inertia of motor. (Modification is possible when [PE-201] is “0”)	PST
50	*PE-211	Trq Con	kgf·cm/A 0.001	ID 99.999	Sets torque constant of motor (Modification is possible then [PE-201] is “0”)	PST
51	*PE-212	Q-axis Inductance	mH 0.001	ID 99.999	Sets Q-axis inductance of motor (Modification is possible when [PE-201] is “0”)	PST
52	*PE-213	D-axis Inductance	mH 0.001	ID 99.999	Sets D-axis inductance of motor (Modification is possible when [PE-201] is “0”)	PST
53	*PE-214	Phase Rs	mΩ 0.001	ID 99.999	Sets phase resistance of motor (Modification is possible when [PE-201] is “0”)	PST
54	*PE-215	Rated Is	A 0.01	ID 999.99	Sets rated current of motor (Modification is possible when [PE-201] is “0” .)	PST
55	*PE-216	Max Speed	r/min 0.0	ID 9999.9	Sets max.speed of motor (Modification is possible when [PE-201] is “0”)	PST
56	*PE-217	Rated Speed	r/min 0.0	ID 9999.9	Sets rated speed of motor (Modification is possible when [PE-201] is “0”)	PST
57	PE-218	Pole Number	– 2	8 98	Sets pole number of motor (Modification is possible when [PE-201] is “0”)	PST
58	PE-219	Ibs Offset Save	A –99.999	0 99.999	Sets current offset of motor (Modification is possible when [PE-201] is “0”)	PST
59	PE-220	Ics Offset Save	A –99.999	0 99.999	Sets current offset of motor (Modification is possible when [PE-201] is “0”)	PST

※ Communcation code is to be used for selecting the menu when using TOUCH or PC

Chapter 3: Feeder and sensor-input position operation type

Motor Models and ID (continued in next page)

Model	ID	Watt	Remark
SAR3A	1	30	
SAR5A	2	50	
SA01A	3	100	
SB01A	11	100	
SB02A	12	200	
SB04A	13	400	
SB03A	14	250	Special type
HB02A	15	200	Hollow shaft type
HB04A	16	400	Hollow shaft type
SC04A	21	400	
SC06A	22	600	
SC08A	23	800	
SC10A	24	1000	
SC03D	25	300	
SC05D	26	450	
SC06D	27	550	
SC07D	28	650	
SC01M	29		
SC02M	30		
SC03M	31		
SC04M	32		
HC06H	33	600	Exclusively for S/T
SC05A	34	450	Exclusively for S/S
SC05H	35	500	Exclusively for S/S
SC08A	36	750	Exclusively for S/S
HB01A	37	100	Hollow shaft type
HC10A	38	1000	Hollow shaft type
HE30A	39	3000	Hollow shaft type
HB03H	40	250	For Semi-conductor
HC03H	41	250	For Semi-conductor

Model	ID	Watt	Remark
SE09A	61	900	
SE15A	62	1500	
SE22A	63	2200	
SE30A	64	3000	
SE06D	65	600	
SE11D	66	1100	
SE16D	67	1600	
SE22D	68	2200	
SE03M	69	300	
SE06M	70	600	
SE09M	71	900	
SE12M	72	1200	
SE05G	73	450	
SE09G	74	850	
SE13G	75	1300	
SE17G	76	1700	
HE09A	77	900	Hollow shaft type
HE15A	78	1500	Hollow shaft type
SE11M	79	1050	Special type
SE07D	80	650	Special type
SF30A	81	3000	
SF50A	82	5000	
SF22D	85	3200	
SF35D	86	3500	
SF55D	87	5500	
SF75D	88	7500	
SF12M	89	1200	
SF20M	90	2000	
SF30M	91	3000	
SF44M	92	4400	
SF20G	93	1800	
SF30G	94	2900	
SF44G	95	4400	
SF60G	96	6000	
HC05H	99	500	For customers only

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Motor Models and ID

Model	ID	Watt	Remark
SE35D	101	3500	For DS only
SE30D	102	3000	Special type
SF44ML	103	4400	For LG only
SF75G	104	7500	Special type
SE35A	105	3500	Special type
SF55G	106	5500	Special type
SF60M	107	6000	Special type
SG22D	111	2200	
SG35D	112	3500	
SG55D	113	5500	
SG75D	114	7500	
SG110D	115	11000	
SG12M	121	1200	
SG20M	122	2000	
SG30M	123	3000	
SG44M	124	4400	
SG60M	125	6000	
SG20G	131	1800	
SG30G	132	2900	
SG44G	133	4400	
SG60G	134	6000	
SG85G	135	8500	
SG110G	136	11000	
SG150G	137	15000	
SH220G	141	22000	
SH300G	142	30000	
SJ370G	143	37000	

[illegible]

3.3.4 Control Variable Setting Menu

Menus carrying “*” mark cannot be corrected when the servo is on.

MENU			UNIT	INI	Description
NO	CODE	NAME	MIN	MAX	
60	PE-301	Inertia Ratio	times	2.0	Set inertia ratio of load.
			1.0	500.0	
61	PE-302	Position P Gain1	1/s	50	Set position control proportional gain 1.
			0	500	
62	PE-303	Position P Gain2	1/s	50	Set position control proportional gain 2.
			0	500	
63	PE-304	P Feedforward	[%]	0	Set position feed forward control ratio.
			0	100	
64	PE-305	P FF FLT TC	msec	0	Set time constant of position feed forward control filter.
			0	10000	
65	PE-306	P CMD FLT TC	msec	0	Set time constant of position command filter.
			0	10000	
66	PE-307	Speed P Gain1	rad/s	By type of equipment	Set speed proportional gain 1. (APD-VPR5-04: 500, VP05-10: 300, VP15-50: 200)
			0	5000	
67	PE-308	Speed P Gain2	rad/s	By type of equipment	Set speed proportional gain 2.
			0	5000	
68	PE-309	Speed I TC1	msec	50	Set speed integration time constant 1.
			1	10000	
69	PE-310	Speed I TC2	msec	50	Set speed integration time constant 2.
			1	10000	
70	PE-311	Speed IN FLT	msec	0.0	Set speed command filter.
			0.0	100.0	
71	*PE-312	Speed FB FLT	msec	0.5	Set speed feedback filter.
			0.0	100.0	
72	PE-313	Zero Speed Gain	r/min	0.0	Set speed range of zero speed gain.
			0.0	100.0	
73	PE-314	Not Used	–	–	
			–	–	
74	PE-315	DE-RESONANCE	–	0	Set de-resonance operation. 0 : Not activated, 1: Activated
			0	1	
75	PE-316	Notch Frequency	Hz	300	Set de-resonance operating frequency.
			0	1000	
76	PE-317	Notch Bandwidth	–	100	Set de-resonance band width.
			0	1000	
77	PE-318	Overload offset	–	1.1	Set the characteristics of overload time (Do not change this menu set by Maker)
			1.0	3.0	
78	PE-319	Not Used	–	–	
			–	–	
79	PE-320	Not Used	–	–	
			–	–	

Communication code is used to designate the related menu in case of TOUCH or PC Communication.

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3.3.5 I/O Variable Setting Menu

Menus carrying “*” mark cannot be corrected when the servo is on.

MENU			UNIT	INI	Description
NO	CODE	NAME	MIN	MAX	
80	*PE-401	Analog Speed	r/min	100.0	Set external analog speed input at 10V.
			0.0	9999.9	
81	PE-402	Speed Offset	mV	0.0	Set analog speed input offset.
			-1000.0	1000.0	
82	PE-403	S Clamp Mode	—	0	Set speed clamp operating mode.
			0	1	
83	PE-404	S Clamp Volt	mV	0.0	Set voltage of speed clamp area.
			-1000.0	1000.0	
84	PE-405	Not Used	—	—	
			—	—	
85	PE-406	Not Used	—	—	
			—	—	
86	PE-407	Not Used	—	—	
			—	—	
87	PE-408	Not Used	—	—	
			—	—	
88	PE-409	Monitor Type1	—	0	Set type of monitor output 1.
			0	10	
89	PE-410	Monitor Mode1	—	0	Set mode of monitor output 1.
			0	1	
90	PE-411	Monitor Scale1	—	1.0	Set scale of monitor output 1.
			1.0	9999.0	
91	PE-412	Monitor Offset1	mV	0.00	Set offset of monitor output 1.
			-100.00	100.00	
92	PE-413	Monitor Type2	—	1	Set type of monitor output 2.
			0	10	
93	PE-414	Monitor Mode2	—	0	Set mode of monitor output 2.
			0	1	
94	PE-415	Monitor Scale2	—	1.0	Set scale of monitor output 2.
			1.0	9999.0	
95	PE-416	Monitor Offset2	mV	0.00	Set offset of monitor output 2
			-100.00	100.00	
96	PE-417	Monitor OutPos	—	1	Set frequency dividing ratio of encoder output signal.
			1	16	
97	PE-418	Not Used	—	—	
			—	—	
98	PE-419	Not Used	—	—	
			—	—	
99	PE-420	PWM OFF Delay time	Msec	0	Set the delay time of PWM output OF when servo is off
			0	1000	

Communication code is used to designate the related menu in case of TOUCH or PC Communication.

3.3.6 Common Operation Variable Setting Menu

Menus carrying “*” mark cannot be corrected when the servo is on.

MENU			UNIT	INI	Description
NO	CODE	NAME	MIN	MAX	
100	*PE-501	Move Motor1	– 1	1 99999	Set mechanism system 1 based on mechanism feed versus motor rpm.
101	*PE-502	Move Mechanical1	– 1	1 99999	
102	*PE-503	Move Motor2	– 1	2 99999	Set mechanism system 2 based on mechanism feed versus motor rpm.
103	*PE-504	Move Mechanical2	– 1	1 99999	
104	*PE-505	Move Polarity	– 0	0 1	Set rotation direction of the motor. (0: Coordinate increases in case of CCW run; 1: Coordinate increases in case of CW run)
105	PE-506	InPOS Position	– 0.01	1.00 9999.99	Set in-position range.
106	PE-507	InPOS Time	msec 0	0 10000	Set time of maintaining in-position output.
107	PE-508	Not Used	– –	– –	
108	PE-509	Not Used	– –	– –	
109	PE-510	Not Used	– –	– –	
110	PE-511	Not Used	– –	– –	
111	PE-512	Not Used	– –	– –	
112	PE-513	Not Used	– –	– –	
113	PE-514	Follow Error	– 0	90000 99999	Set range of output for excessive position following error.
114	PE-515	Brake SPD	r/min 0.0	50.0 9999.9	Set operating speed of built-in brake.
115	PE-516	Brake Time	msec 0	10 10000	Set opening delay time of built-in brake.
116	*PE-517	PowerFail Mode	– 0	By type of equipment 1	Set power failure mode. 0: VP04 or less, 1: VP05 or more
117	PE-518	DB Control	– 0	1 1	Set operation mode of generative braking
118	PE-519	Not Used	– –	– –	
119	PE-520	ESTOP Reset	– 0	0 1	This function automatically resets alarm when contact ESTOP returns after activation. (0: Manual reset, 1: Automatic reset)

Communication code is used to designate the related menu in case of TOUCH or PC Communication

II. Operating Software

3.3.7 Private Operation Variable Setting Menu

MENU			UNIT	INI	Description
NO	CODE	NAME	MIN	MAX	
120	*PE-601	Operation Mode	– 0	0 3	Set operating mode.
121	PE-602	Not Used	– –	– –	
122	PE-603	Position Limit	– 0	0 1	Set pitch distance limit operation for sensor–input position operation.
123	PE-604	Stop Mode	– 0	0 1	Set start command action mode after stopping. (0: Re-operation after reset current position, 1: Continuous operation before stop)
124	PE-605	Spd Override	– 0	0 2	“0”: Override operation not executed. “1”: Override operation excluding sensor speed. “2”: Override operation covering all sections.
125	PE-606	Digit Input	– 0	0 1	Set digital switch position input action.
126	PE-607	Digit Mode	– 0	0 1	Set input mode. (0: Digital SW input, 1: PLC contact input)
127	PE-608	Digit Data Type	– 0	0 2	Set digital switch data type. (0: position 5 figures + speed 3 figures. 1: position 6 figures + speed 2 figures 2: position 4 figures + PSEL0-2, SPD1)
128	PE-609	Digit Data Time	msec 0	20 99999	Set delay time from the time the number of figures for the data is selected to the time it is read.
129	PE-610	Digit Speed	r/min 0	0 9999	Select method of setting digital speed under the condition of [PE-601] = 1. 0: Set speed with digital switch. 1 or higher: Set speed with digital switch setting being [%] of the [PE-610] setting. (Speed = [PE-610] × digital switch [%])
130	PE-611	MOVESEL Mode	– 0	0 3	Select the functions of MOVESEL contacts 0: select operation unit of equipment 1: select revolution direction 2: Transfer operation mode 0/2 3: Change into pulse function
131	PE-612	Dec FF Rate	– 0	0.0 1.0	Do not change this menu which is for Maker only
132	PE-613	Not Used	– –	– –	
133	PE-614	Not Used	– –	– –	
134	PE-615	Not Used	– –	– –	
135	PE-616	Not Used	– –	– –	
136 ~ 139	PE-617 ~ PE-620	Not Used	– – –	– – –	

Communication code is used to designate the related menu in case of TOUCH or PC Communication

3.3.8 Operation Program Variable Setting Menu: Speed Variables

MENU			UNIT	INI	Description
NO	CODE	NAME	MIN	MAX	
140	PE-621	Run Speed Com0	r/min 0.0	500.0 9999.9	Set position operating speed 0.
141	PE-622	Run Speed Com1	r/min 0.0	500.0 9999.9	Set position operating speed 1.
142	PE-623	Run Speed Com2	r/min 0.0	500.0 9999.9	Set position operating speed 2.
143	PE-624	Run Speed Com3	r/min 0.0	500.0 9999.9	Set position operating speed 3.
144	PE-625	Run Acc Time0	msec 0	100 100000	Set position operation acceleration time 0.
145	PE-626	Run Acc Time1	msec 0	100 100000	Set position operation acceleration time 1.
146	PE-627	Run Acc Time2	msec 0	100 100000	Set position operation acceleration time 2.
147	PE-628	Run Acc Time3	msec 0	100 100000	Set position operation acceleration time 3.
148	PE-629	Run Dec Time0	msec 0	100 100000	Set position operation deceleration time 0.
149	PE-630	Run Dec Time1	msec 0	100 100000	Set position operation deceleration time 1.
150	PE-631	Run Dec Time2	msec 0	100 100000	Set position operation deceleration time 2.
151	PE-632	Run Dec Time3	msec 0	100 100000	Set position operation deceleration time 3.
152	PE-633	Not Used	— —	— —	
153	PE-634	Not Used	— —	— —	
154	PE-635	Not Used	— —	— —	
155	PE-636	Not Used	— —	— —	
156	PE-637	Not Used	— —	— —	
157	PE-638	Not Used	— —	— —	
158	PE-639	Not Used	— —	— —	
159	PE-640	Not Used	— —	— —	

Communication code is used to designate the related menu in case of TOUCH or PC Communication

II . Operating Software

3.3.9 Operation program variable setting menu: Speed variables

MENU			UNIT	INI	Description
NO	CODE	NAME	MIN	MAX	
160	PE-641	Step Speed Com0	r/min 0.0	1000.0 9999.9	Set step operating speed 0.
161	PE-642	Step Speed Com1	r/min 0.0	1000.0 9999.9	Set step operating speed 1.
162	PE-643	Step Speed Com2	r/min 0.0	1000.0 9999.9	Set step operating speed 2.
163	PE-644	Step Speed Com3	r/min 0.0	1000.0 9999.9	Set step operating speed 3.
164	PE-645	Step Acc Time0	msec 0	100 100000	Set step operation acceleration time 0.
165	PE-646	Step Acc Time1	msec 0	100 100000	Set step operation acceleration time 1.
166	PE-647	Step Acc Time2	msec 0	100 100000	Set step operation acceleration time 2.
167	PE-648	Step Acc Time3	msec 0	100 100000	Set step operation acceleration time 3.
168	PE-649	Step Dec Time0	msec 0	100 100000	Set step operation deceleration time 0.
169	PE-650	Step Dec Time1	msec 0	100 100000	Set step operation deceleration time 1.
170	PE-651	Step Dec Time2	msec 0	100 100000	Set step operation deceleration time 2.
171	PE-652	Step Dec Time3	msec 0	100 100000	Set step operation deceleration time 3.
172	PE-653	Not Used	- -	- -	
173	PE-654	Not Used	- -	- -	
174	PE-655	Not Used	- -	- -	
175	PE-656	Not Used	- -	- -	
176	PE-657	Not Used	- -	- -	
177	PE-658	Not Used	- -	- -	
178	PE-659	Not Used	- -	- -	
179	PE-660	Not Used	- -	- -	

Communication code is used to designate the related menu in case of TOUCH or PC Communication

3.3.10 Operation program variable setting menu: Speed variables

MENU			UNIT	INI	Description
NO	CODE	NAME	MIN	MAX	
180	PE-661	Sen Speed Com0	r/min 0.0	10.0 9999.9	Set sensor operating speed 0.
181	PE-662	Sen Speed Com1	r/min 0.0	10.0 9999.9	Set sensor operating speed 1.
182	PE-663	Sen Speed Com2	r/min 0.0	10.0 9999.9	Set sensor operating speed 2.
183	PE-664	Sen Speed Com3	r/min 0.0	10.0 9999.9	Set sensor operating speed 3.
184	PE-665	Sen Acc Time0	msec 0	100 100000	Set sensor operation acceleration time 0.
185	PE-666	Sen Acc Time1	msec 0	100 100000	Set sensor operation acceleration time 1.
186	PE-667	Sen Acc Time2	msec 0	100 100000	Set sensor operation acceleration time 2.
187	PE-668	Sen Acc Time3	msec 0	100 100000	Set sensor operation acceleration time 3.
188	PE-669	Sen Dec Time0	msec 0	100 100000	Set sensor operation deceleration time 0.
189	PE-670	Sen Dec Time1	msec 0	100 100000	Set sensor operation deceleration time 1.
190	PE-671	Sen Dec Time2	msec 0	100 100000	Set sensor operation deceleration time 2.
191	PE-672	Sen Dec Time3	msec 0	100 100000	Set sensor operation deceleration time 3.
192	PE-673	Not Used	- -	- -	
193	PE-674	Not Used	- -	- -	
194	PE-675	Not Used	- -	- -	
195	PE-676	Not Used	- -	- -	
196	PE-677	Not Used	- -	- -	
197	PE-678	Not Used	- -	- -	
198	PE-679	Not Used	- -	- -	
199	PE-680	Not Used	- -	- -	

Communication code is used to designate the related menu in case of TOUCH or PC Communication

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3.3.11 Operation program variable setting menu: Distance variables

MENU			UNIT	INI	Description
NO	CODE	NAME	MIN	MAX	
200	PE-701	Run Pos Com0	— 0.0	1.0 99999.9	Set position operation distance 0.
201	PE-702	Run Pos Com1	— 0.0	2.0 99999.9	Set position operation distance 1.
202	PE-703	Run Pos Com2	— 0.0	3.0 99999.9	Set position operation distance 2.
203	PE-704	Run Pos Com3	— 0.0	4.0 99999.9	Set position operation distance 3.
204	PE-705	Run Pos Com4	— 0.0	5.0 99999.9	Set position operation distance 4.
205	PE-706	Run Pos Com5	— 0.0	6.0 99999.9	Set position operation distance 5.
206	PE-707	Run Pos Com6	— 0.0	7.0 99999.9	Set position operation distance 6.
207	PE-708	Run Pos Com7	— 0.0	8.0 99999.9	Set position operation distance 7.
208	PE-709	Run Pos Com8	— 0.0	9.0 99999.9	Set position operation distance 8.
209	PE-710	Run Pos Com9	— 0.0	10.0 99999.9	Set position operation distance 9.
210	PE-711	Run Pos Com10	— 0.0	11.0 99999.9	Set position operation distance 10.
211	PE-712	Run Pos Com11	— 0.0	12.0 99999.9	Set position operation distance 11.
212	PE-713	Run Pos Com12	— 0.0	13.0 99999.9	Set position operation distance 12
213	PE-714	Run Pos Com13	— 0.0	14.0 99999.9	Set position operation distance 13.
214	PE-715	Run Pos Com14	— 0.0	15.0 99999.9	Set position operation distance 14.
215	PE-716	Run Pos Com15	— 0.0	16.0 99999.9	Set position operation distance 15.
216	PE-717	Not Used	— —	— —	
217	PE-718	Not Used	— —	— —	
218	PE-719	Not Used	— —	— —	
219	PE-720	RUN OFFSET	— 0	0 999999	Set offset incremental position command when digital switch is operated initially.

Communication code is used to designate the related menu in case of TOUCH or PC Communication

3.3.12 Operation program variable setting menu: Distance variables

MENU			UNIT	INI	Description
NO	CODE	NAME	MIN	MAX	
220	PE-721	Step Pos Com0	– 0.0	10.0 99999.9	Set step operation distance 0.
221	PE-722	Step Pos Com1	– 0.0	11.0 99999.9	Set step operation distance 1.
222	PE-723	Step Pos Com2	– 0.0	12.0 99999.9	Set step operation distance 2.
223	PE-724	Step Pos Com3	– 0.0	13.0 99999.9	Set step operation distance 3.
224	PE-725	Step Pos Com4	– 0.0	14.0 99999.9	Set step operation distance 4.
225	PE-726	Step Pos Com5	– 0.0	15.0 99999.9	Set step operation distance 5.
226	PE-727	Step Pos Com6	– 0.0	16.0 99999.9	Set step operation distance 6.
227	PE-728	Step Pos Com7	– 0.0	17.0 99999.9	Set step operation distance 7.
228	PE-729	Step Pos Com8	– 0.0	18.0 99999.9	Set step operation distance 8.
229	PE-730	Step Pos Com9	– 0.0	19.0 99999.9	Set step operation distance 9.
230	PE-731	Step Pos Com10	– 0.0	20.0 99999.9	Set step operation distance 10.
231	PE-732	Step Pos Com11	– 0.0	21.0 99999.9	Set step operation distance 11.
232	PE-733	Step Pos Com12	– 0.0	22.0 99999.9	Set step operation distance 12.
233	PE-734	Step Pos Com13	– 0.0	23.0 99999.9	Set step operation distance 13.
234	PE-735	Step Pos Com14	– 0.0	24.0 99999.9	Set step operation distance 14.
235	PE-736	Step Pos Com15	– 0.0	25.0 99999.9	Set step operation distance 15.
236	PE-737	Not Used	– –	– –	
237	PE-738	Not Used	– –	– –	
238	PE-739	Not Used	– –	– –	
239	PE-740	Not Used	– –	– –	

Communication code is used to designate the related menu in case of TOUCH or PC Communication

II . Operating Software

3.3.13 Operation program variable setting menu: Distance variables

MENU			UNIT	INI	Description
NO	CODE	NAME	MIN	MAX	
240	PE-741	Max Pos Com0	— 0.0	31.0 99999.9	Set maximum operation distance 0.
241	PE-742	Max Pos Com1	— 0.0	32.0 99999.9	Set maximum operation distance 1.
242	PE-743	Max Pos Com2	— 0.0	33.0 99999.9	Set maximum operation distance 2.
243	PE-744	Max Pos Com3	— 0.0	34.0 99999.9	Set maximum operation distance 3.
244	PE-745	Max Pos Com4	— 0.0	35.0 99999.9	Set maximum operation distance 4.
245	PE-746	Max Pos Com5	— 0.0	36.0 99999.9	Set maximum operation distance 5.
246	PE-747	Max Pos Com6	— 0.0	37.0 99999.9	Set maximum operation distance 6.
247	PE-748	Max Pos Com7	— 0.0	38.0 99999.9	Set maximum operation distance 7.
248	PE-749	Max Pos Com8	— 0.0	39.0 99999.9	Set maximum operation distance 8.
249	PE-750	Max Pos Com9	— 0.0	40.0 99999.9	Set maximum operation distance 9.
250	PE-751	Max Pos Com10	— 0.0	41.0 99999.9	Set maximum operation distance 10.
251	PE-752	Max Pos Com11	— 0.0	42.0 99999.9	Set maximum operation distance 11.
252	PE-753	Max Pos Com12	— 0.0	43.0 99999.9	Set maximum operation distance 12.
253	PE-754	Max Pos Com13	— 0.0	44.0 99999.9	Set maximum operation distance 13.
254	PE-755	Max Pos Com14	— 0.0	45.0 99999.9	Set maximum operation distance 14.
255	PE-756	Max Pos Com15	— 0.0	46.0 99999.9	Set maximum operation distance 15.
256	PE-757	Not Used	— —	— —	
257	PE-758	Not Used	— —	— —	
258	PE-759	Not Used	— —	— —	
259	PE-760	Not Used	— —	— —	

Communication code is used to designate the related menu in case of TOUCH or PC Communication

3.3.14 Operation program variable setting menu: Stop time

MENU			UNIT	INI	Description
NO	CODE	NAME	MIN	MAX	
260	PE-761	Stop Time0	msec	1000	Set stop time 0.
			0	100000	
261	PE-762	Stop Time1	msec	1000	Set stop time 1.
			0	100000	
262	PE-763	Stop Time2	msec	1000	Set stop time 2.
			0	100000	
263	PE-764	Stop Time3	msec	1000	Set stop time 3.
			0	100000	
264	PE-765	Stop Time4	msec	1000	Set stop time 4.
			0	100000	
265	PE-766	Stop Time5	msec	1000	Set stop time 5.
			0	100000	
266	PE-767	Stop Time6	msec	1000	Set stop time 6.
			0	100000	
267	PE-768	Stop Time7	msec	1000	Set stop time 7.
			0	100000	
268	PE-769	Stop Time8	msec	1000	Set stop time 8.
			0	100000	
269	PE-770	Stop Time9	msec	1000	Set stop time 9.
			0	100000	
270	PE-771	Stop Time10	msec	1000	Set stop time 10.
			0	100000	
271	PE-772	Stop Time11	msec	1000	Set stop time 11.
			0	100000	
272	PE-773	Stop Time12	msec	1000	Set stop time 12.
			0	100000	
273	PE-774	Stop Time13	msec	1000	Set stop time 13.
			0	100000	
274	PE-775	Stop Time14	msec	1000	Set stop time 14.
			0	100000	
275	PE-776	Stop Time15	msec	1000	Set stop time 15.
			0	100000	
276	PE-777	Not Used	—	—	
			—	—	
277	PE-778	Not Used	—	—	
			—	—	
278	PE-779	Not Used	—	—	
			—	—	
279	PE-780	Not Used	—	—	
			—	—	

Communication code is used to designate the related menu in case of TOUCH or PC Communication

II . Operating Software

3.3.15 Jog and Origin Run Variable Setting Menu

MENU			UNIT	INI	Description
NO	CODE	NAME	MIN	MAX	
280	PE-801	Jog Speed0	r/min 0.0	10.0 9999.9	Set jog run speed 0.
281	PE-802	Jog Speed1	r/min 0.0	100.0 9999.9	Set jog run speed 1.
282	PE-803	Jog AccDec Time	msec 0	100 99999	Set jog acceleration/deceleration time.
283	PE-804	Not Used	— —	— —	
284	PE-805	Not Used	— —	— —	
285	PE-806	Not Used	— —	— —	
286	PE-807	Not Used	— —	— —	
287	PE-808	Not Used	— —	— —	
288	PE-809	Not Used	— —	— —	
289	PE-810	Not Used	— —	— —	
290	PE-811	Not Used	— —	— —	
291	PE-812	Not Used	— —	— —	
292	PE-813	Not Used	— —	— —	
293	PE-814	Not Used	— —	— —	
294	PE-815	Not Used	— —	— —	
295	PE-816	Not Used	— —	— —	
296	PE-817	Not Used	— —	— —	
297	PE-818	Not Used	— —	— —	
298	PE-819	Not Used	— —	— —	
299	PE-820	Not Used	— —	— —	

Communication code is used to designate the related menu in case of TOUCH or PC Communication

3.3.16 Operation Menu

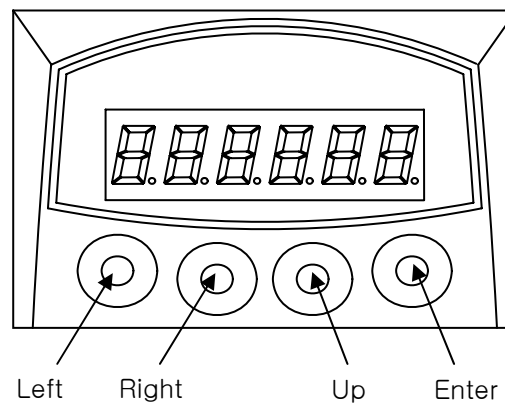
MENU			UNIT	INI	Description
NO	CODE	NAME	MIN	MAX	
300	PC-901	Alarm RESET	— —	— —	Reset alarm.
301	PC-902	Alarm HIS Clear	— —	— —	Clear alarm history.
302	PC-903	Jog Run	— —	— —	Manipulate jog run.
303	PC-904	Not Used	— —	— —	
304	PC-905	Gain Tune Run	— —	— —	Gain is automatically adjusted.
305	PC-906	I/O Logic Set	— —	— —	Set logic of input contacts.
306	PC-907	Input Ext Set	— —	— —	Manipulate input contacts from outside.
307	PC-908	Menu Data Init	— —	— —	If push [UP]key after pushing [Enter]key, Menu data will be automatically changed as initial value. But [PE-201]~[PE-220]'s System menu data is not changed. (When re-supply Power, it is applied)
308	PC-909	Menu Data Lock	— —	— —	Activate menu data lock.
309	PC-910	Current Offset	— —	— —	Set drive current feedback offset.
310	PC-911	Not Used	— —	— —	
311	PC-912	Not Used	— —	— —	
312	PC-913	Not Used	— —	— —	
313	PC-914	Not Used	— —	— —	
314	PC-915	Not Used	— —	— —	
315	PC-916	Not Used	— —	— —	
316	PC-917	Not Used	— —	— —	
317	PC-918	Not Used	— —	— —	
318	PC-919	Not Used	— —	— —	
319	PC-920	Not Used	— —	— —	

Communication code is used to designate the related menu in case of TOUCH or PC Communication

3.4 Detailed Description of Menu

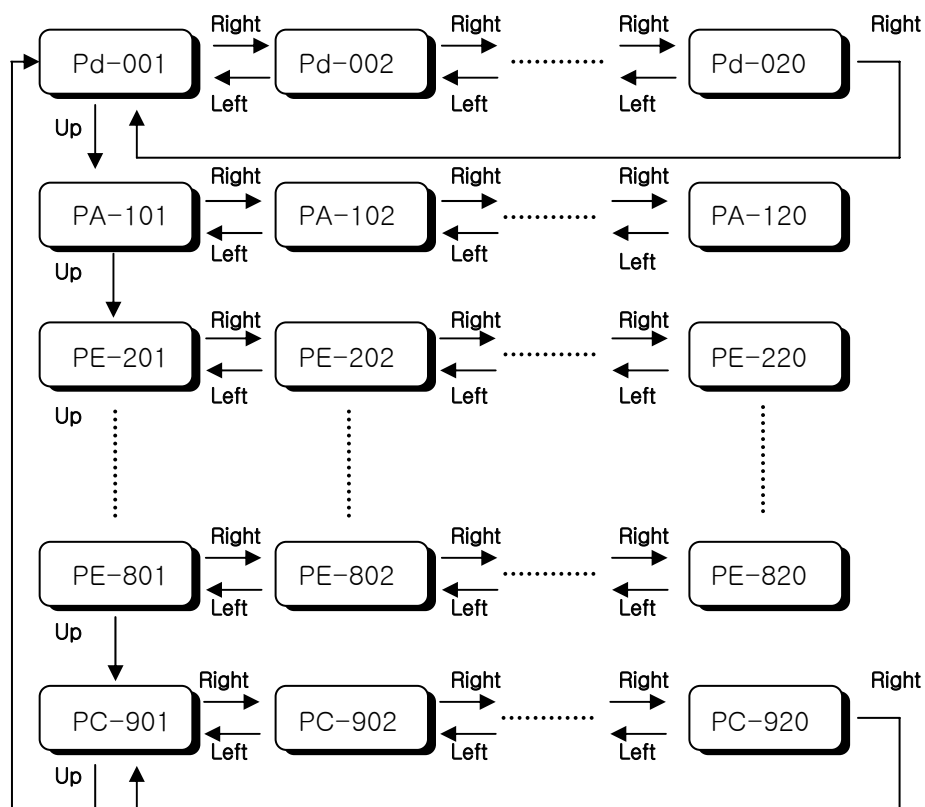
3.4.1 Loader Operation

1) Components



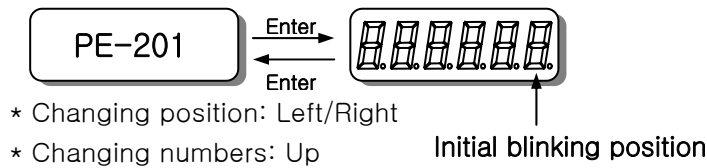
2) Components

① Menu movement



Chapter 3: Feeder and Sensor-Input Position Operation Type

② Menu editing



- Move to the menu to be edited referring to paragraph ①.
- Press Enter Key to display menu data. “ +9999.9 ”
The number on the far right starts blinking. The blinking number indicates editing position.
- Press Left or Right to move the figure of numbers to be edited. The blinking numbers move along accordingly.
- Press Up key to change numbers (the number increases). If the number is larger than “9”, it will change to “0”.
- Upon completion of editing, press Enter. The related data are saved, and the screen returns to menu number.

③ Menu editing error

- The following will appear when menu editing error occurs.

Display	Causes
notuSE	Menu which is not used or cannot be edited.
Err1	<ul style="list-style-type: none">– Menu that cannot be edited when servo is on.– Editing error of constant related to motor.– Numbers not carrying motor ID have been entered.– An attempt is made to edit detailed constant when the motor ID is not 0.
Err2	An attempt is made to set data outside the setting range.
Err3	Menu editing is locked. Menu editing lock should be released.

④ Special operation function

- If menu is used to set I/O status, each key carries independent function. For more details, refer to paragraph 3.4.9. “Operating commands.”
- Alarm manipulation menu
- I/O setting menu
- Jog run menu
- Gain tuning menu
- Current offset compensation menu
- Menu-related manipulation menu

3.4.2 Operating Mode Display

1) Mode display [Pd-001]

- ① Current operating mode is displayed.
 - * nor: Indicates normal operating mode
 - * AL-XX: Relevant code is displayed when an alarm occurs.
- ② When alarm is reset after the cause is removed, details of the menu corresponding to the menu number set in the initial mode screen [PE-209] are displayed.
- ③ If, however, the menu is moved to another menu at this time, the menu as is will be displayed.

2) Speed display

- ① The current operating speed [Pd-002] and the current command speed [Pd-003] are displayed in the unit of r/min.
- ② **Maximum** Range: “-99999” ~ “+99999”

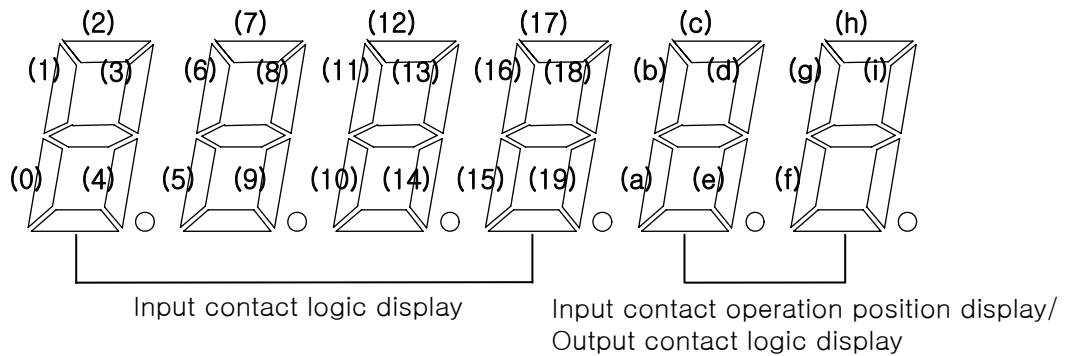
3) Position display

- ① The current operation position [Pd-005], current operation target position [Pd-006], and the operation command position [Pd-007] are displayed in user units.
- ② The user unit may be used by defining [PE-602] decimals in terms of the feed level versus the motor rpm.
Example: If [PE-602] is “0”, “-99999” ~ “+99999” can be entered, and If [PE-602] is “1”, “-9999.9” ~ “+9999.9” can be entered.

4) Torque and load display

- ① Torque limit [Pd -009]
The output torque limit value is displayed in percentage of the rated torque.
- ② Current load rate [Pd -010]
The energy (load) produced by servo motor is displayed in percentage of the rated output.
- ③ Average load rate [Pd -011]
The average value of the energy (load) produced by servo motor calculated during a period of 5 seconds is displayed in percentage of the rated output.
- ④ Peak Instantaneous load rate [Pd -012]
The peak load value from the time the servo power supply is connected to the present is displayed in percentage of the rated output.

5) I/O Mode display



[Input contact: Upper]

(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
SVON	START	EMG	ALMRST	PSEL0	PSEL1	PSEL2	PSEL3	READEN	AUTO
(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
MOVESEL	STOP	SEN1	SEN2	P-JOG	N-JOG	SPD0	SPD1	DATA 2-4	DATA 2-8

[Output contact: Lower]

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)
BRAKE	PITCH	ALARM	RDY	INPOS	SEL1	SEL2	SEL3	SEL4

① CN1 I/O contact condition [Pd-014]

When the CN1 Connector contact turns on (contact shorted), the lamp operating in the relevant location will turn on; or the lamp will turn off when the connector contact turns off (contact open).

② External operation input condition [Pd-015]

- If the relevant contact condition is manipulated by an external source (PC communications or other equipment) instead of the CN1 Connector, the condition of the contact is displayed. As the condition of the external input is not stored in the servo drive ROM, the input condition is automatically reset if power supply is turned off.

③ I/O contact condition [Pd-016]

The I/O contact conditions, under which the servo drive is operated by the combination of paragraph ① and ② above, are displayed.

(The I/O contact conditions are recognized and displayed when Normal-A contact is ON and Normal-B contact is off.)

6) Displaying the state of exchanging information with external equipment (Communication-dedicated menu)

The mode data resulting from communications with upper controllers (touch-screen, PC, etc.) are displayed.

① Current state of input contact logic [Pd-017].

The current logic value of the input contact is displayed.

If power supply is turned off, this value will be erased.

② Storage state of the input contact logic [Pd-018].

The value saved by the current logic of the input contact is displayed.

The stored value will not be erased even if the power supply is turned off.

③ Alarm condition bit [Pd-019]

If an alarm occurs, the bit corresponding to the related alarm number is displayed.

7) Software version display

P 3.30 – 3

↑ ↑ ↑

Position Version Drive type

operation

number

* The software model applicable to this manual is P.

Number	Drive Type
0	VPR5
1	VP01
2	VP02
3	VP04
4	VP05
5	VP10
6	VP15
7	VP20
8	VP35
9	VP50
A	VP75
b	VP110
c	VP110L Special type(300A)
d	VP15
e	VP220
f	VP300
g	VP370

3.4.3 Setting System Variables

1) Setting motor constant

- ① Setting motor constant based on ID.

If the ID number is entered in the menu [PE-201], the motor constant is automatically set. The ID numbers of motor are as follows.

Motor models and ID (Continued in next page)

Model	ID	Watt	Remarks	Model	ID	Watt	Remarks
SAR3A	1	30		HB03H	40	250	For semi-conductor
SAR5A	2	50		HC03H	41	250	For semi-conductor
SA01A	3	100		SE09A	61	900	
SB01A	11	100		SE15A	62	1500	
SB02A	12	200		SE22A	63	2200	
SB04A	13	400		SE30A	64	3000	
SB03A	14	250	Special type	SE06D	65	600	
HB02A	15	200	Hollow shaft type	SE11D	66	1100	
HB04A	16	400	Hollow shaft type	SE16D	67	1600	
				SE22D	68	2200	
SC04A	21	400		SE03M	69	300	
SC06A	22	600		SE06M	70	600	
SC08A	23	800		SE09M	71	900	
SC10A	24	1000		SE12M	72	1200	
SC03D	25	300		SE05G	73	450	
SC05D	26	450		SE09G	74	850	
SC06D	27	550		SE13G	75	1300	
SC07D	28	650		SE17G	76	1700	
SC01M	29			HE09A	77	900	Hollow shaft type
SC02M	30			HE15A	78	1500	Hollow shaft type
SC03M	31			SE11M	79	1050	Special type
SC04M	32			SE07D	80	650	Special type
HC06H	33	600	Exclusively for S/T	SF30A	81	3000	
SC05A	34	450	Exclusively for S/S	SF50A	82	5000	
SC05H	35	500	Exclusively for S/S	SF22D	85	3200	
SC08A	36	750	Exclusively for S/S	SF35D	86	3500	
HB01A	37	100	Hollow shaft type	SF55D	87	5500	
HC10A	38	1000	Hollow shaft type	SF75D	88	7500	
HE30A	39	3000	Hollow shaft type				

[illegible]

Chapter 3: Feeder and Sensor-Input Position Operation Type

② Setting individual motor constant

Enter "0" in the motor ID menu [PE-201] to set motor constant individually. The following motor constants shall be set individually.

MENU			UNIT	INI	Description
NO	Code	Name	MIN	MAX	
40	PE-201	Motor ID	– 0	– 99	Set ID of applicable motor. When setting motor ID: [PE-210] – [PE-217] are automatically set.
49	PE-210	Inertia	gf·cm·s ² 0.01	ID 999.99	Set motor inertial moment. If ([PE-201] is entered as "0", correction can be made.)
50	PE-211	Trq Con	kgf·cm/A 0.01	ID 999.99	Set motor torque constant. If ([PE-201] is entered as "0", correction can be made.)
51	PE-212	Phase Ls	mH 0.001	ID 99.999	Set motor phase inductance. If ([PE-201] is entered as "0", correction can be made.)
52	PE-213	Phase Rs	ohm 0.001	ID 99.999	Set motor phase resistance. If ([PE-201] is entered as "0", correction can be made.)
53	PE-214	Rated Is	A 0.01	ID 999.99	Set motor rated current. If ([PE-201] is entered as "0", correction can be made.)
54	PE-215	Max Speed	r/min 0.0	ID 9999.9	Set motor maximum speed. If ([PE-201] is entered as "0", correction can be made.)
55	PE-216	Rated Speed	r/min 0.0	ID 9999.9	Sets motor rated speed. If ([PE-201] is entered as "0", correction can be made.)
56	PE-217	Pole Number	– 2	8 98	Set number of motor poles. If ([PE-201] is entered as "0", correction can be made.)
Only Special-Large Capacity Menu(APD-VS220, VS300, VS370)					
40	*PE-201	Motor ID	– 0	– 99	Sets motor ID : set automatically from [PE-210] to [PE-217]
49	*PE-210	Inertia	gf·cm·s ² 0.01	ID 999.99	Sets inertia of motor. (Modification is possible when [PE-201] is "0")
50	*PE-211	Trq Con	kgf·cm/A 0.01	ID 999.99	Sets torque constant of motor. (Modification is possible when [PE-201] is "0")
51	*PE-212	Phase Lq	mH 0.001	ID 99.999	Sets phase inductance of motor. (Modification is possible when [PE-201] is "0")
52	*PE-213	Phase Ld	mH 0.001	ID 99.999	Sets phase inductance of motor. (Modification is possible when [PE-201] is "0")
53	*PE-214	Phase Rs	ohm 0.001	ID 99.999	Sets phase resistance of motor. (Modification is possible when [PE-201] is "0")
54	*PE-215	Rated Is	A 0.01	ID 999.99	Sets rated current of motor. (Modification is possible when [PE-201] is "0")
55	*PE-216	Max Speed	r/min 0.0	ID 9999.9	Sets Max. speed of motor. (Modification is possible when [PE-201] is "0")
56	*PE-217	Rated Speed	r/min 0.0	ID 9999.9	Sets rated speed of motor. (Modification is possible when [PE-201] is "0")
57	PE-218	Pole Number	– 2	8 98	Sets pole number of motor. (Modification is possible when [PE-201] is "0")

2) Setting encoder

– Encoder model [PE-203]

No.	Transmission Mode	Signal Mode	Signal Type	Remarks
0	Parallel	Phase A leads in case of forward running	A,B,Z,U,V,W	Standard
1	Parallel	Phase B leads in case of forward running	A,B,Z,U,V,W	
6	Serial	Absolute value 11/13 bit	A,B,Z,RX	

– Encoder pulse [PE-204]

This is set when the encoder uses signals A and B. The number of pulses per cycle for each signal is set.

The numbers of pulses for phases A and B are the same.

3) Setting torque limits

The limit value [PE-205] of the maximum torque during the forward running and the limit value [PE-206] of the maximum torque during backward running can be individually set. Torque limits can be set in percentages of the rated torque. The standard is 300%.

4) Setting system ID

If the system communicates with a servo through the use of Bus communications, an ID may be assigned to the servo. In this case, an option is required in relation to communications.

– System ID [PE-207]

An ID is assigned to the servo and is used to individually communicate with the servo.

– System group ID [PE-208]

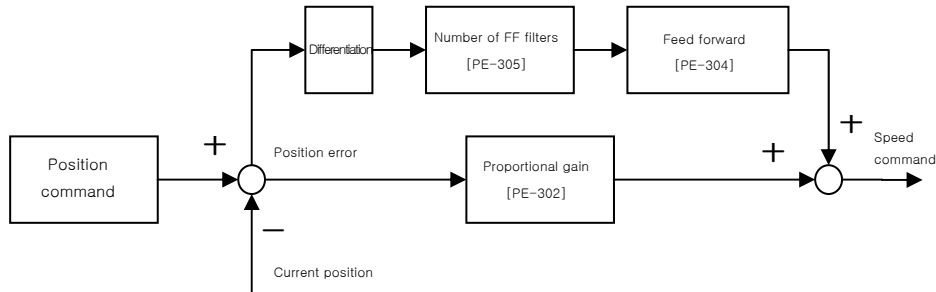
A group ID is set and used when multiple servos are consolidated into a group for communications.

5) Setting mode display when operation is started [PE-209]

Menu that is used at initial period after the servo power supply is turned on can be set. The setting shall be classified into number 1 through 20 from [Pd-001] to [Pd-020] to set the relevant menu numbers.

3.4.4 Setting Control Variables

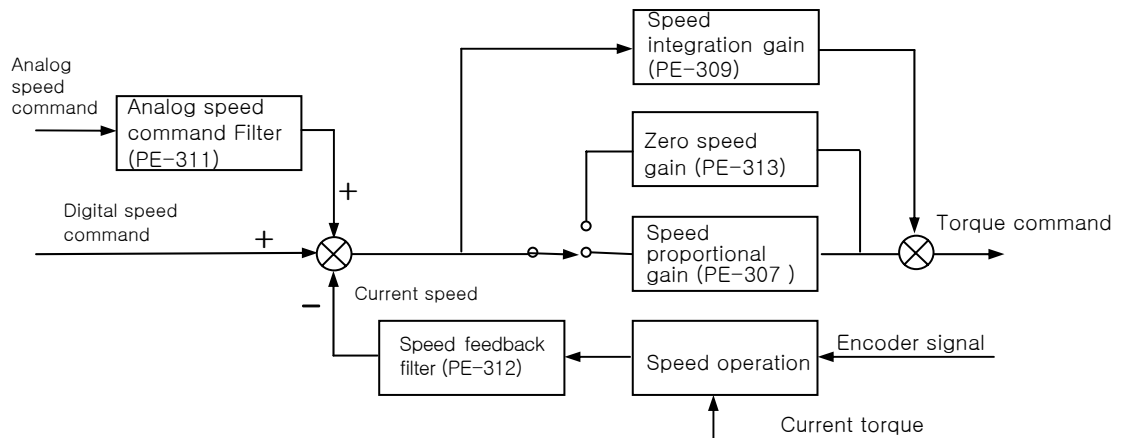
1) Position control gain



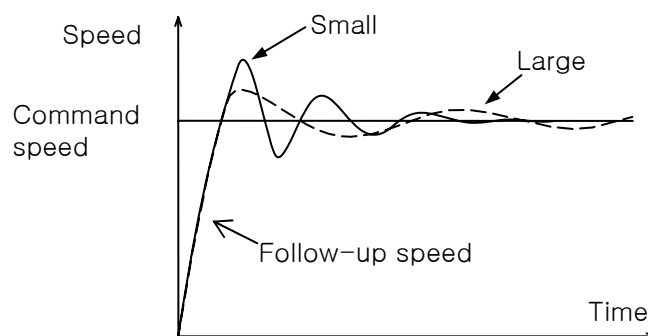
- ① Position command: The position command pulses received from external sources are counted and converted into the position command value, which goes through the first filter and used as the internal position command.
- ② Current position: The pulse signals received from the encoder are counted and converted into the current position value through the use of the electronic gear ratio setting.
- ③ Position proportional gain [PE-302][PE-303]: The position proportional gain is multiplied by the difference between command position and current position to convert the outcome into a speed command.
- ④ Feed forward gain [PE-304]: This is used to obtain gradient in terms of differentiated value with respect to the position command, and reduce the positioning time by adding speed command to the gradient thus acquired. If this value is too high, an overshoot may occur on position control or position control may become uncertain. Hence, the value shall be gradually increased from a small level while monitoring the condition of trial operation until an appropriate value is obtained.
- ⑤ Feed forward filter [PE-305]: If the position command changes too rapidly, the feed forward control may display a vibration. If this happens, set appropriate level of filter value to remove vibration resulting from rapid changes.

Note: The function of the position proportional gain 2 [PE-303] is not supported by the current software version.

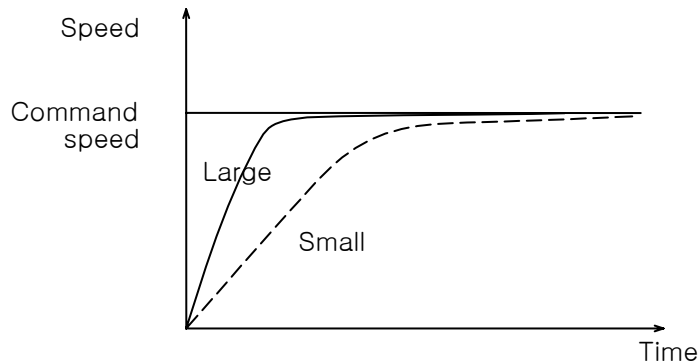
2) Speed control gain



- ① Speed command: The analog speed signals received from external sources are used as the speed command after going through the analog speed command filter [PE-311], or the digital speed command set by the internal menu in the unit of r/min is used.
- ② Current speed: The encoder signals are counted to calculate the speed, and the calculated speed is used as the current speed after going through the filter. In order to compensate for speed calculation error at an extremely low speed, an algorithm, which estimates speed through the use of the current torque and inertia, is used. Accordingly, setting accurate motor constant and the inertia ratio is closely linked with the stability of the motor speed control.
- ③ Speed integration gain [PE-309]: An integrated value of the difference (speed error) between command speed and current speed is obtained, and this value is multiplied by an integrated gain to be converted into a torque command. If the integrated gain is reduced, the excessive response characteristics are improved to enhance the speed follow-up. However, if the gain is too small, an overshoot occurs. On the other hand, if the gain is too large, the excessive response characteristics drop and operation is made based on proportional control characteristics.



- ④ Speed proportional gain [PE-307]: The speed error is multiplied by proportional gain to convert the error into torque command. If this value is large, the speed response becomes fast enhancing the speed follow-up. If this value is excessively large, vibration occurs. On the other hand, if this value is small, the speed response becomes slow and the follow-up effect drops, causing the servo to become weak.



- ⑤ Speed feedback filter [PE-312]: Motor may shake by the vibration of the drive system, or vibration may occur due to gain in case load with excessively large inertia is applied. Such vibration may be suppressed through the use of speed feedback filter. If the value is excessively large, the speed responsiveness may drop causing the deterioration of the control performance.
- ⑥ Zero speed gain [PE-313]: If a speed feedback filter is used to suppress vibration, the stationary vibration may cause the system to be unstable. If this happens, set the range of speed to which gain is applied, and vibration can be suppressed by adjusting gain within the established speed range.

Note: The functions of the speed proportional gain 2 [PE-308] and the speed integration gain 2 [PE-310] are not supported by the current software version.

3) Setting inertia ratio [PE-301]

Load inertia is calculated for each mechanical system. The rotator's inertia ratio is calculated and set based on the motor characteristics table. Setting the inertia ratio of load is a very important control variable in the servo operation characteristics. Servo can be operated in an optimal condition only if the inertia ratio is accurately set.

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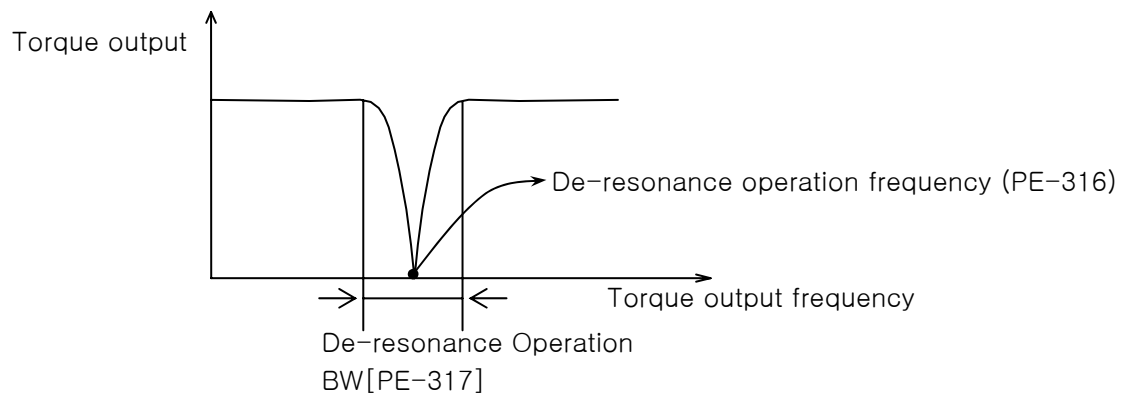
- The following table shows recommended values of appropriate control gains for each load inertia ratio.

Motor Flange	Inertia Ratio		Range of Gain Setting		
	Classification	[Inertia]	Position proportional gain [Pgain 1,2]	Speed proportional gain [Sgain 1,2]	Speed integration gain [SITC]
40 ~ 80	Low inertia	1 ~ 5	40 ~ 60	500 ~ 800	20 ~ 40
	Medium inertia	5 ~ 20	20 ~ 40	300 ~ 500	40 ~ 60
	High inertia	20 ~ 50	10 ~ 20	100 ~ 300	60 ~ 100
100 ~ 130	Low inertia	1 ~ 3	40 ~ 60	200 ~ 400	20 ~ 40
	Medium inertia	3 ~ 10	20 ~ 40	100 ~ 200	40 ~ 80
	High inertia	10 ~ 20	10 ~ 20	50 ~ 100	80 ~ 150
180 ~ 220	Low inertia	1 ~ 2	30 ~ 60	150 ~ 250	30 ~ 50
	Medium inertia	2 ~ 4	15 ~ 30	75 ~ 150	50 ~ 100
	High inertia	4 ~ 10	5 ~ 15	20 ~ 75	100 ~ 200

* If it is difficult to calculate inertia ratio, the inertia ratio can be tuned during trial operation.

See “paragraph 3.4.9 “Automatic gain adjustment [PC-905].”

4) Setting de-resonance operation

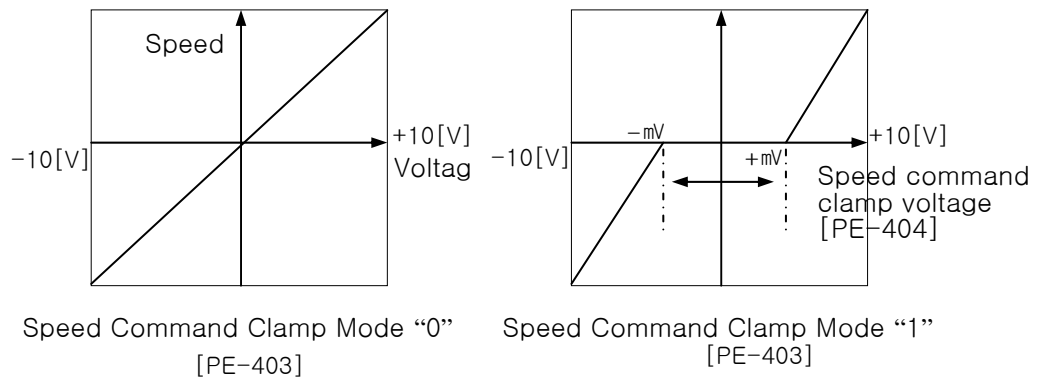


- If vibration occurs due to mechanical resonance generated from certain frequencies, it may be suppressed by limiting torque output for the frequency band.
- De-resonance operation [PE-315]: This will not be activated if “0” is set, but will be activated if “1” is set.

3.4.5 Setting I/O Variables

1) Setting analog speed command

- ① Analog speed command [PE-401]: Set the analog speed command value in the unit of r/min at 10 [V]. The maximum setting will be the motor's maximum speed.
- ② Speed command offset [PE-402]: Sometimes, certain level of voltage exists on the analog signal interface circuit even at zero speed command. This voltage may be compensated by setting equivalent voltage as offset. The voltage unit shall be "mV".
- ③ Setting speed command clamp



- ④ Speed override operation [PE-605]: Speed command operation can be executed by overriding (overlapping) the analog speed command with the digital speed command.
"0": Override not activated.
"1": Override activated.

3) Setting analog output

Two analog outputs are available. Values corresponding to the data can be output according to the set conditions at a cycle of 400 [msec] respectively.

① Analog output types [PE-409], [PE-413]

Model	Data	Model	Data
0	Command speed	4	Command position
1	Current speed	5	Current position
2	Command torque		
3	Current torque		

② Analog output modes [PE-410], [PE-414]

Mode	Output Mode
0	Output at -5[V] - +5[V]
1	Output at 0 - +5[V]

③ Analog output magnifying [PE-411], [PE-415]

If output data is excessively small or large, the data may be appropriately magnified or reduced. The basic magnification for each output data is as follows:

Data Item	Magnification
Speed	Motor maximum speed [PE-215]
Torque	Motor maximum torque [PE-205]
Command pulse Frequency	500 [Kpps]

④ Analog output offsets [PE-412], [PE-416]

Certain level of voltage may exist when “0” value is output due to problems in analog circuit. This voltage may be compensated by setting equivalent voltage as offset. The voltage unit shall be “mV”.

3) Encoder output pulse frequency dividing ratio [PE-417]

Encoder pulses may be produced after changing the pulses to the extent of the preset frequency-dividing ratio.

Example) From 3000 [pulse] with the frequency dividing ratio 2 →1500 [pulse]

* The frequency-dividing ratio must be set so that the resulting frequency dividing output pulse comes to be an integer.

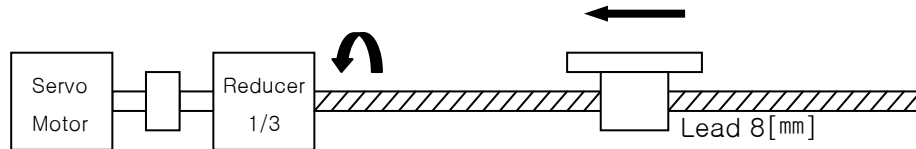
3.4.6 Setting Common Operation Variables

1) Setting operating mechanism

① Setting mechanism feed unit

Set motor revolution unit related to the mechanism feed unit based on the amount of mechanism feed versus the motor rpm.

Example) If the reduction ratio is 1/3, and the ball screw lead is 8 [mm].



* Enter “3” for motor rpm and “8” for amount of mechanism feed.

Input contact (MOVESEL) State	Applicable Menu Number	
	Motor feed amount	Mechanism feed amount
X	PE-501	PE-502
O	PE-503	PE-504

* Selective operation can be executed using input contacts (MOVESEL), after setting the mechanism feed units into two types.

* This is not applicable during operation, but is applicable from the time system starts after stopping.

② Setting feed direction [PE-505]

Set the direction of feed [PE-503] at + position coordinates according to the mechanism assembly.

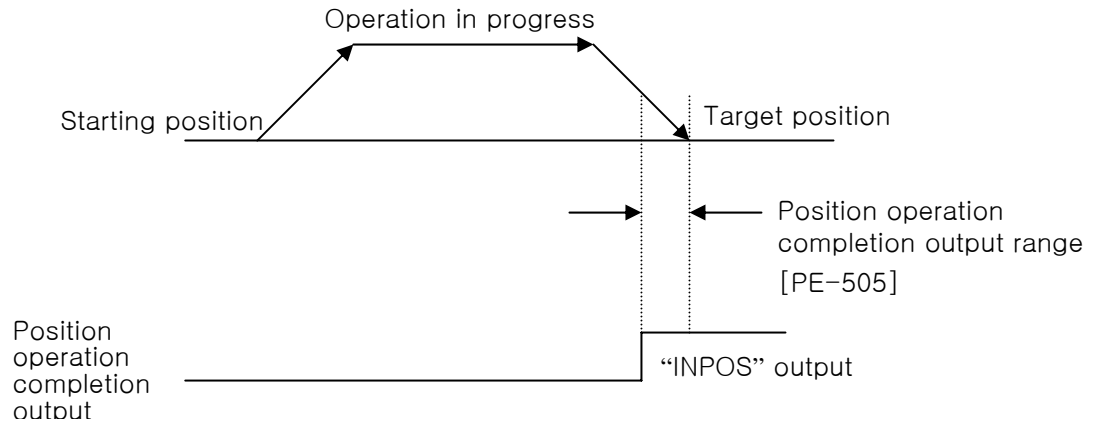
Code	+ Position Coordinates	– Position Coordinates
0	Forward running (CCW)	Backward running (CW)
1	Backward running (CW)	Forward running (CCW)

2) setting position operation variables

① Position operation completion output range [PE-506]

Data are output within the set range when the target position is reached.

Setting is done in user units.



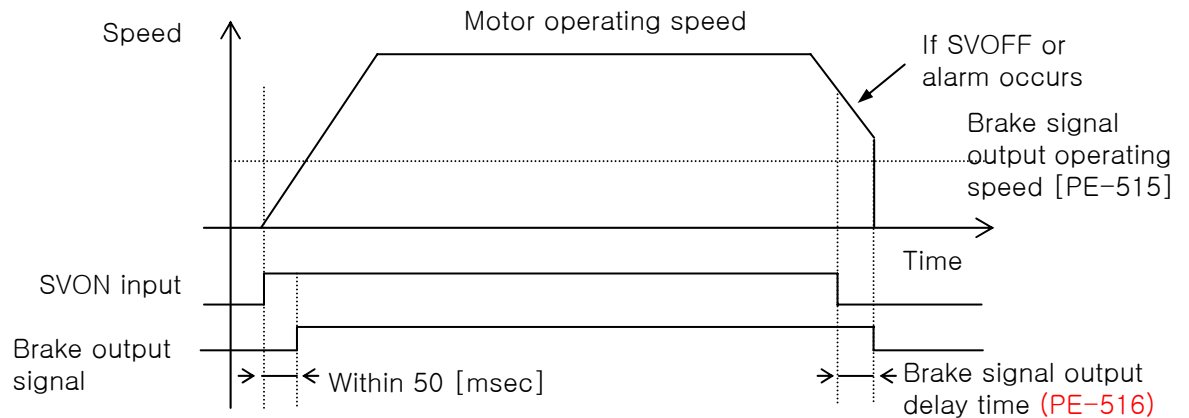
If the setting is too large, the positioning completion output signal may be produced during operation. Set an appropriate value to avoid this.

② Position operation completion output time [PE-507]

The position operation completion signal may be set to appear for a preset duration and disappear irrespective of position.

* If the setting is greater than “0”, the system operates; and if the setting is “0”, the system does not operate.

3) Setting the brake signal output variables



- ① Brake signal output operating speed [PE-515] and brake signal output delay time [PE-516]

If an alarm occurs while operating the servo motor by applying the built-in brake to the vertical shaft, or if the speed is reduced by SVOFF, the brake signal is stopped by either the brake signal output operating speed (PE-515) or the brake signal output delay time (PE-516) whichever satisfied the operating conditions first. This prevents the vertical shaft from dropping to the motor brake.

4) Dynamo braking [PE-518]

The dynamo braking can be set for drives from VPR5 to VP04.

“0”: The system runs free on or below zero speed range when servo is stopped by SVOFF.

“1”: The system always executes dynamo braking when servo is stopped by SVOFF.

3.4.7 Setting private operation variables

1) Setting operating mode [PE-601]

① Feeder operation [Operating Mode 0]

System can be operated by selecting 16 position operation distances with 4 contacts.

– Selecting position distance

Position Number	Input Contact State				Position Operation Distance Menu	Stop Time Menu
	PSEL0	PSEL1	PSEL2	PSEL3		
0	X	X	X	X	PE-701	PE-761
1	O	X	X	X	PE-702	PE-762
2	X	O	X	X	PE-703	PE-763
3	O	O	X	X	PE-704	PE-764
4	X	X	O	X	PE-705	PE-765
5	O	X	O	X	PE-706	PE-766
6	X	O	O	X	PE-707	PE-767
7	O	O	O	X	PE-708	PE-768
8	X	X	X	O	PE-709	PE-769
9	O	X	X	O	PE-710	PE-770
10	X	O	X	O	PE-711	PE-771
11	O	O	X	O	PE-712	PE-772
12	X	X	O	O	PE-713	PE-773
13	O	X	O	O	PE-714	PE-774
14	X	O	O	O	PE-715	PE-775
15	O	O	O	O	PE-716	PE-776

* When position operation is completed during continuous automatic operation (Automatic contact turned on), the system stops for the duration of the set time and automatically starts again. Accordingly, the system will not operate under manual operation (Automatic contact turned off) mode.

* If the position operation distance data are set using digital switch, the set data are saved in menu [PE-701]. (Menu [PE-606] is set as “1”).

– Operating speed selection

Speed Number	Input Contact State		Position Operation Speed Menu	Position Operation Acceleration Time Menu	Position Operation Deceleration Time Menu
	SPD0	SPD1			
0	X	X	PE-621	PE-625	PE-629
1	O	X	PE-622	PE-626	PE-630
2	X	O	PE-623	PE-627	PE-631
3	O	O	PE-624	PE-628	PE-632

* If the position operation speed data are set using digital switch, the set data are saved in menu [PE-621].

Chapter 3: Feeder and Sensor-Input Position Operation Type

② Sensor (SEN2)-input position operation [Operating Mode 1]

System can be operated by selecting 16 position operation distances with 4 contacts.

– Selecting position distance

Position Number	Input Contact State				Position Operation Distance Menu	Maximum Operation Distance Menu	Stop Time Menu
	PSEL0	PSEL1	PSEL2	PSEL3			
0	X	X	X	X	PE-701	PE-741	PE-761
1	O	X	X	X	PE-702	PE-742	PE-762
2	X	O	X	X	PE-703	PE-743	PE-763
3	O	O	X	X	PE-704	PE-744	PE-764
4	X	X	O	X	PE-705	PE-745	PE-765
5	O	X	O	X	PE-706	PE-746	PE-766
6	X	O	O	X	PE-707	PE-747	PE-767
7	O	O	O	X	PE-708	PE-748	PE-768
8	X	X	X	O	PE-709	PE-749	PE-769
9	O	X	X	O	PE-710	PE-750	PE-770
10	X	O	X	O	PE-711	PE-751	PE-771
11	O	O	X	O	PE-712	PE-752	PE-772
12	X	X	O	O	PE-713	PE-753	PE-773
13	O	X	O	O	PE-714	PE-754	PE-774
14	X	O	O	O	PE-715	PE-755	PE-775
15	O	O	O	O	PE-716	PE-756	PE-776

* When position operation is completed during continuous automatic operation (Automatic contact turned on), the system stops for the duration of the set time and automatically starts again. Accordingly, the system will not operate under manual operation (Automatic contact turned off) mode.

* If the position operation distance data are set using digital switch, the set data are saved in menu [PE-701]. (Menu [PE-606] is set as “1”.)

– Operating speed selection

Speed Number	Input Contact State		Sensor Operation Section			Position Operation Section		
	SPD0	SPD1	Speed	Acceleration Time	Deceleration Time	Speed	Acceleration Time	Deceleration Time
0	X	X	PE-661	PE-665	PE-669	PE-621	PE-625	PE-629
1	O	X	PE-662	PE-666	PE-670	PE-622	PE-626	PE-630
2	X	O	PE-663	PE-667	PE-671	PE-623	PE-627	PE-631
3	O	O	PE-664	PE-668	PE-672	PE-624	PE-628	PE-632

* If the position operation speed data are set using digital switch, the set data are saved in menu [PE-621].

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③ Step position operation + sensor (SEN2)-input position operation [Operating Mode 2]

System can be operated by selecting 16 position operation distances with 4 contacts.

– Selecting position distance

Position Number	Input Contact State				Step Operation Distance Menu	Position Operation Distance Menu	Maximum Operation Distance Menu	Stop Time Menu
	PSEL0	PSEL1	PSEL2	PSEL3				
0	X	X	X	X	PE-721	PE-701	PE-741	PE-761
1	O	X	X	X	PE-722	PE-702	PE-742	PE-762
2	X	O	X	X	PE-723	PE-703	PE-743	PE-763
3	O	O	X	X	PE-724	PE-704	PE-744	PE-764
4	X	X	O	X	PE-725	PE-705	PE-745	PE-765
5	O	X	O	X	PE-726	PE-706	PE-746	PE-766
6	X	O	O	X	PE-727	PE-707	PE-747	PE-767
7	O	O	O	X	PE-728	PE-708	PE-748	PE-768
8	X	X	X	O	PE-729	PE-709	PE-749	PE-769
9	O	X	X	O	PE-730	PE-710	PE-750	PE-770
10	X	O	X	O	PE-731	PE-711	PE-751	PE-771
11	O	O	X	O	PE-732	PE-712	PE-752	PE-772
12	X	X	O	O	PE-733	PE-713	PE-753	PE-773
13	O	X	O	O	PE-734	PE-714	PE-754	PE-774
14	X	O	O	O	PE-735	PE-715	PE-755	PE-775
15	O	O	O	O	PE-736	PE-716	PE-756	PE-776

* When position operation is completed during continuous automatic operation (Automatic contact turned on), the system stops for the duration of the set time and automatically starts again. Accordingly, the system will not operate under manual operation (Automatic contact turned off) mode.

* If the position operation distance data are set using digital switch, the set data are saved in menu [PE-701]. (Menu [PE-606] is set as “1”.)

– Operating speed selection

Speed Number	Input Contact State		Step Operation Section			Sensor Operation Section			Position Operation Section		
	SPD0	SPD1	Speed	Acceleration Time	Deceleration Time	Speed	Acceleration Time	Deceleration Time	Speed	Acceleration Time	Deceleration Time
0	X	X	PE-641	PE-645	PE-649	PE-661	PE-665	PE-669	PE-621	PE-625	PE-629
1	O	X	PE-642	PE-646	PE-650	PE-662	PE-666	PE-670	PE-622	PE-626	PE-630
2	X	O	PE-643	PE-647	PE-651	PE-663	PE-667	PE-671	PE-623	PE-627	PE-631
3	O	O	PE-644	PE-648	PE-652	PE-664	PE-668	PE-672	PE-624	PE-628	PE-632

* If the position operation speed data are set using digital switch, the set data are saved in menu [PE-621].

Chapter 3: Feeder and Sensor-Input Position Operation Type

④ 2 sensor (SEN1, SEN2)-input position operation [Operating Mode 3]

System can be operated by selecting 16 position operation distances with 4 contacts.

– Selecting position distance

Position Number	Input Contact State				Position Operation Distance Menu	Maximum Operation Distance Menu	Stop Time Menu
	PSEL0	PSEL1	PSEL2	PSEL3			
0	X	X	X	X	PE-701	PE-741	PE-761
1	O	X	X	X	PE-702	PE-742	PE-762
2	X	O	X	X	PE-703	PE-743	PE-763
3	O	O	X	X	PE-704	PE-744	PE-764
4	X	X	O	X	PE-705	PE-745	PE-765
5	O	X	O	X	PE-706	PE-746	PE-766
6	X	O	O	X	PE-707	PE-747	PE-767
7	O	O	O	X	PE-708	PE-748	PE-768
8	X	X	X	O	PE-709	PE-749	PE-769
9	O	X	X	O	PE-710	PE-750	PE-770
10	X	O	X	O	PE-711	PE-751	PE-771
11	O	O	X	O	PE-712	PE-752	PE-772
12	X	X	O	O	PE-713	PE-753	PE-773
13	O	X	O	O	PE-714	PE-754	PE-774
14	X	O	O	O	PE-715	PE-755	PE-775
15	O	O	O	O	PE-716	PE-756	PE-776

* When position operation is completed during continuous automatic operation

(Automatic contact turned on), the system stops for the duration of the set time and automatically starts again. Accordingly, the system will not operate under manual operation (Automatic contact turned off) mode.

* If the position operation distance data are set using digital switch, the set data are saved in menu [PE-701]. (Menu [PE-606] is set as “1”.)

– Operating speed selection

Speed Number	Input contact state		Step Operation Section			Sensor Operation Section			Position Operation Section		
	SPD0	SPD1	Speed	Acceleration Time	Deceleration Time	Speed	Acceleration Time	Deceleration Time	Speed	Acceleration Time	Deceleration Time
0	X	X	PE-641	PE-645	PE-649	PE-661	PE-665	PE-669	PE-621	PE-625	PE-629
1	O	X	PE-642	PE-646	PE-650	PE-662	PE-666	PE-670	PE-622	PE-626	PE-630
2	X	O	PE-643	PE-647	PE-651	PE-663	PE-667	PE-671	PE-623	PE-627	PE-631
3	O	O	PE-644	PE-648	PE-652	PE-664	PE-668	PE-672	PE-624	PE-628	PE-632

* If the position operation speed data are set using digital switch, the set data are saved in menu [PE-621].

II . Operating Software

2) Setting position unit [PE-602]

Set the number of decimal places of the position distance.

Example: If “1” is set: 00000.0

If “3” is set: 000.000

3) Limiting maximum position distance [PE-603]

If the sensor cannot be turned on when the operating mode is “1” or higher, the system will execute infinite operation. If the sensor cannot be operated, a specific pitch distance may be selected to limit the operating distance.

Setting	Operation
0	Infinite operation
1	<ul style="list-style-type: none">– Maximum distance set: [PE-741]–[PE-756]– When the maximum distance is reached, the pitch contact signal and INPOS contact signal are output simultaneously after system stops.

4) Operation after stopping [PE-604]

Setting	Operation when system starts after stopping
0	Starts again from the beginning after resetting the current position.
1	Current position and operation steps are operated continuously.

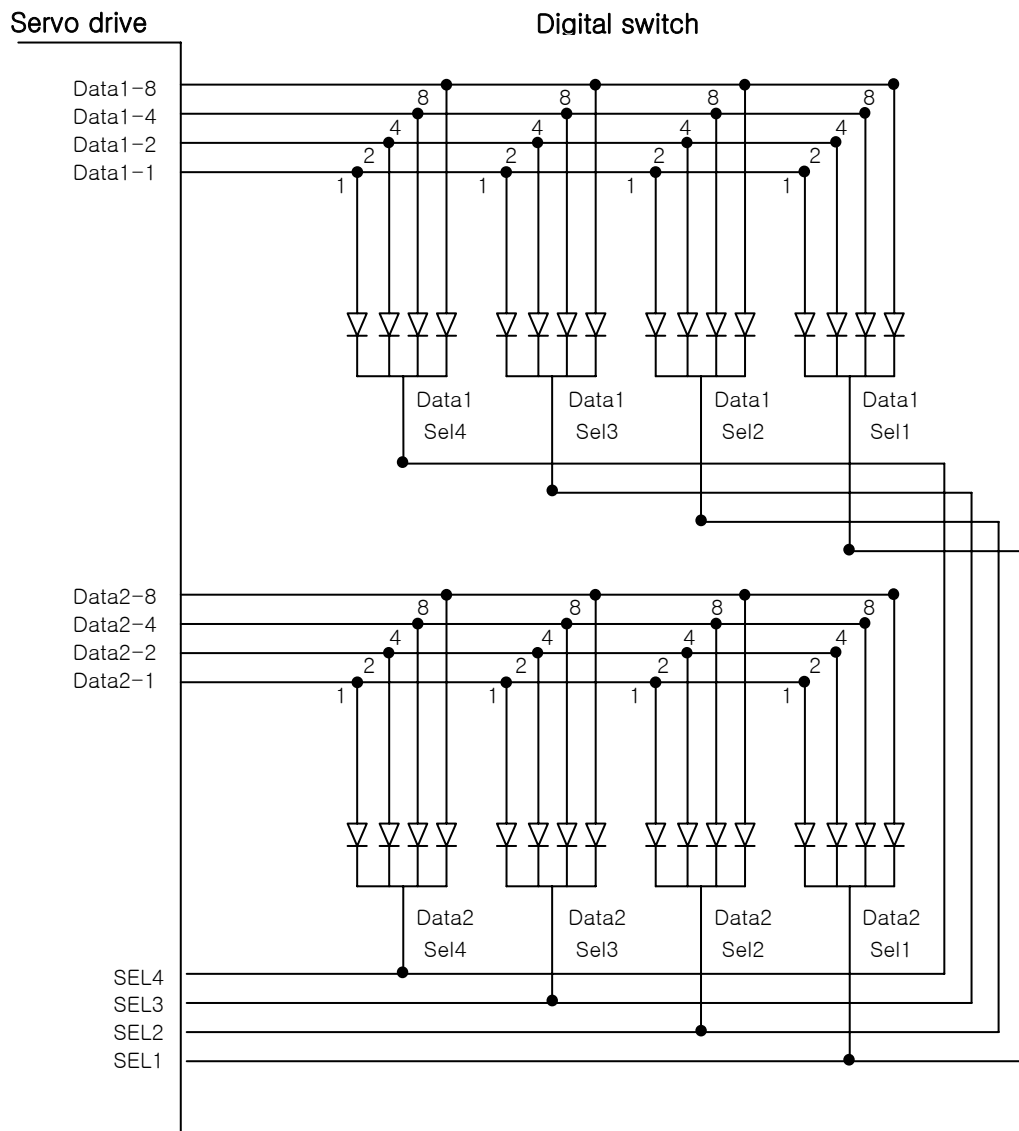
5) Speed override operation [PE-605]

Setting	Operation
0	Override operation not executed.
1	Override operation executed only in the step operation section and the position operation section.
2	Override operation executed in all sections: step operation section, sensor operation section, and position operation section.

6) Digital switch input

System can be operated by setting position and speed. using digital switch or PLC contact. Data can be entered only when the input contact CN1-48 (READEN) are turned on. To execute digital switch input, set menu [PE-606] as “1”. The position operation coordinate is saved in [PE-701], and the position operation speed, in [PE-621].

– Digital switch input wiring



Note 1: Digital Switch specifications: A7PS-207 (OMRON)

II . Operating Software

– Details of data by data mode [PE-608]

Data Mode Setting	0		1	
Data Item	Data1	Data2	Data1	Data2
SEL1	Position Data Unit 0.1	Position Data unit 1000	Position Data unit 0.1	Position Data unit 1000
SEL2	Position Data Unit 1	Speed Data unit 10	Position Data unit 1	Position Data Unit 10000
SEL3	Position Data Unit 10	Speed Data unit 100	Position Data unit 10	Speed Data unit 100
SEL4	Position Data Unit 100	Speed Data unit 1000	Position Data unit 100	Speed Data unit 1000

Note 1: The position and speed settings apply differently depending on the data mode [PE-608].

Note 2: If speed is set with a value greater than the maximum speed, the speed is set to the maximum speed.

Note 3: If the speed input becomes 0, the value set in the existing menu (PE-621) applies. Therefore, if it is desired to enter only the position without setting speed, do not make the wire connection.

– Data mode [PE-607]

Setting	Description
0	Used along with data switch. If Data Read Enable is on, data are continuously set.
1	Used along with PLC. Each time Data Read Enable turns on, SELECT moves by 1 place to read the data. Data are set after reading is finished at OP4.

– Data input time [PE-609]

If SELECT (SEL1–SEL4) turns on, read the data after the set time and move to the next SELECT. If PLC is used, set sufficient time taking into consideration the PLC scan time.

3.4.8 Setting Jog Run Variables

1) Setting jog speed

- ① Set jog speed in two types (low speed and high speed) in the unit of “r/min”.

Setting Item	Menu
Low speed jog run	PE-801
High speed job run	PE-802

- ② Setting acceleration/deceleration time [PE-803]

Set acceleration/deceleration time applied in jog run.

3.4.9 Operating Command

1) Alarm reset [PC-901]

Reset alarm in case it occurs.

2) Alarm history clear [PC-902]

Clear the alarm history information currently in storage.

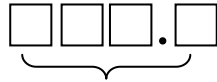
3) Loader jog run [PC-903]

- ① If Enter is pressed in menu [PC-903], the current position is displayed.
- ② If Left Key is pressed next, the system operates at N-JOG; and if Right Key is pressed, the system operates at P-JOG.
- ③ If Enter is pressed, menu screen appears and jog run stops.

Note: Loader jog run moves at jog speed 0.

4) Automatic gain adjustment [PC-905]

If you press [ENTER] key in menu [PC-905], the following menu screen appears and you can perform automatic gain tuning operation.

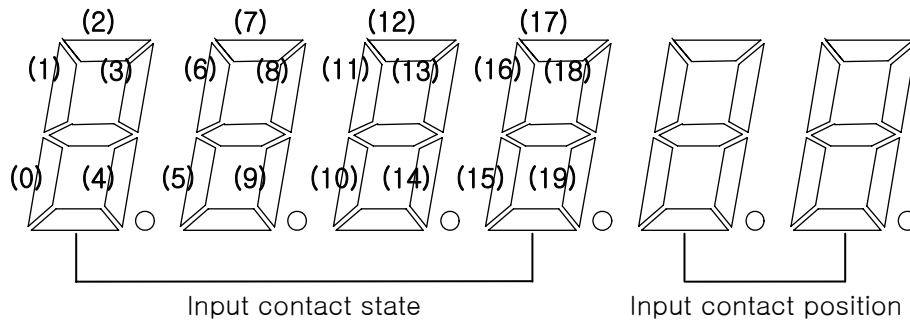


Display inertial ratio

- ① The tuning range of inertial ratio is changed automatically from 1 to 50
- ② If you press [UP] key, automatic gain tuning operation is started at 100[r/min] of operation speed.
- ③ If you keep pressing [UP] key, operation speed is increased by 200[r/min] such as 100 → 300 → 500[r/min], the faster speed is, the faster tuning time.
- ④ If you press [Right] key, operation distance is increased.
If you press [Left] key, operation distance is decreased.
- ⑤ If tuning value is fixed and not changed, that means the tuning is completed.
- ⑥ If the tuned inertial ratio becomes "50", please adjust it by manual inquiring at our Technical dept.
- ⑦ If you press [Enter] key, the tuned gain is saved at [PE-301], [PE-307], [PE-309] automatically and returns to menu.

In case of run/stop or forward/reverse operation by contacts, pressing [Enter] key at [PC-805], inertial ratio is continuously adjusted during operation.

5) Setting input contact logic [PC–906]



(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
SVON	START	EMG	ALMRST	PSEL0	PSEL1	PSEL2	PSEL3	READEN	AUTO
(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
MOVESEL	STOP	SEN1	SEN2	P-JOG	N-JOG	SPD0	SPD1	DATA2-4	DATA2-8

- Use Left/Right Key to increase/decrease the input contact position number.
- As for the contact logic, each time Up Key is pressed, the lamp of the segment corresponding to the current contact position number will be turned ON/OFF.

Segment	Contact Logic
ON	Contact B
OFF	Contact A

- If Enter is pressed after completion of setting, the contact logic is saved, and the screen returns to menu screen.

6) Forced setting of input contacts [PC–907]

- If Enter is pressed in menu [PC–907], the screen appears as in paragraph ⑥.
- Operation procedures are the same. When the segment turns on, the contact established here forcibly turns on related input contact irrespective of I/O.
- If Enter is pressed after completing forced setting of input contact, the relevant contact established here turns on and menu screen is restored.

Note 1: The logic of input contact to be forcibly set must be contact A. Hence, the contact that has been set as contact B in paragraph ⑥ should be converted into contact A before being used.

7) Menu data initialization [PC-908]

- If you pressed Up key after pressing Enter key, the menu data that have been set so far is to be Initialized
(For initialization, Surely turn the power OFF first and then turn it ON.)

8) Menu data lock [PC-909]

- Set prohibition of correcting menu data.
- Each time Enter is pressed, locking and unlocking are alternately repeated.

9) Saving current offset [PC-910]



CAUTION

- Compensate the electric current sensor's offset inside the servo drive. If compensation of the value is incorrect, the servo control becomes unstable.
- The offset value has been adjusted at the time of delivery. Do not make adjustment, if possible.
- If down load is executed to upgrade or change the servo drive software, offset must be set.

- Adjusting offset
 - (1) Turn the servo power on.
 - (2) Execute operation/stop or forward/backward operation at a slow speed for appropriately 10 seconds.
 - (3) Turn the servo power off, and then on again.
 - (4) Press Enter in menu [PC-910] to display the offset value.
 - (5) Press Up key to save the offset value.
 - (6) Repeat steps (2) through (5) (About five times).
 - (7) The saved and tuned U-phase offset values are displayed alternately each time Left key is pressed, or the saved and tuned W-phase offset values, each time Right key is pressed.
If there is large difference between these two values, save the tuned value using the Up key.
 - (8) Press Enter key to return to menu screen.

Chapter 4

Program Operation Type (VP-5.xx)

[Manual Version: 2.1]

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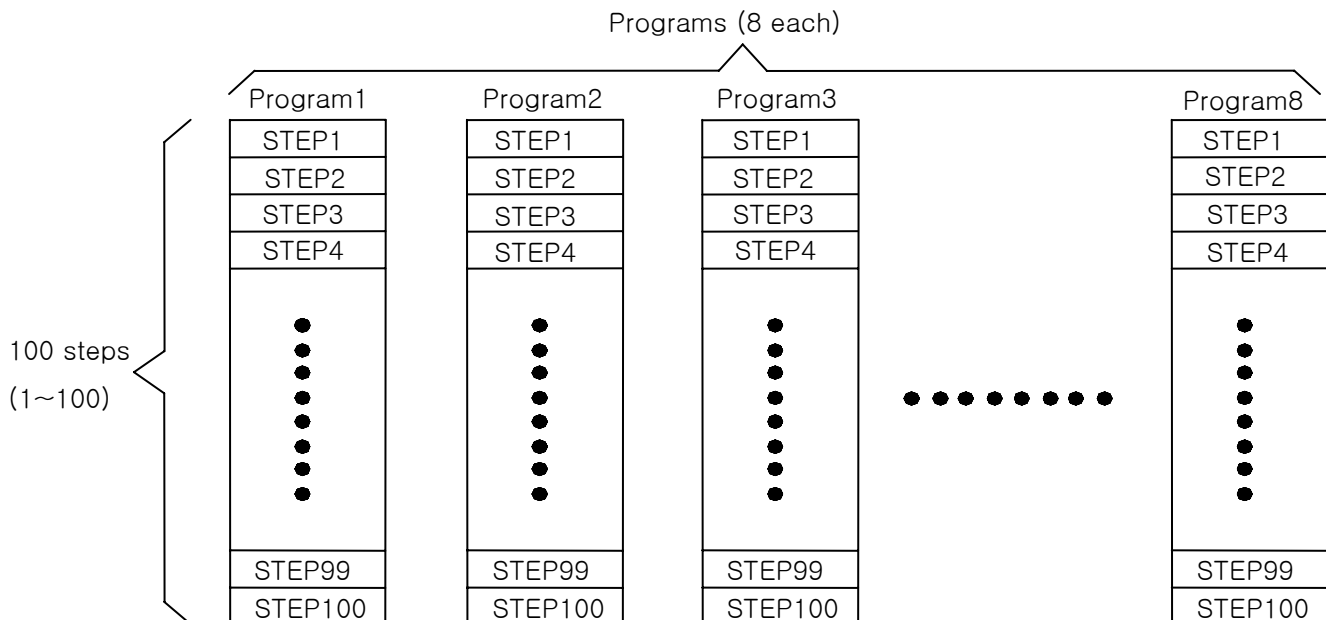
4.1 Outline of program operation

Servo operation is classified into steps so that users can operate the system starting from step 0. The servo is capable of diversified functions depending on the data set in each step.

Program operation is largely divided into programs and steps.

4.1.1 Outline of programs

There are a total of 8 programs, each of which consists of 100 steps. Each program operates independently. Two programs or more cannot be used simultaneously.



The user can edit 8 programs and save related data in the flash ROM embedded in the servo drive. The user can easily retrieve data using communications or contacts.

A program once saved remains in storage continuously. If the program is not saved, it will be deleted when the power is turned off. The program, once entered, must be saved to avoid this.

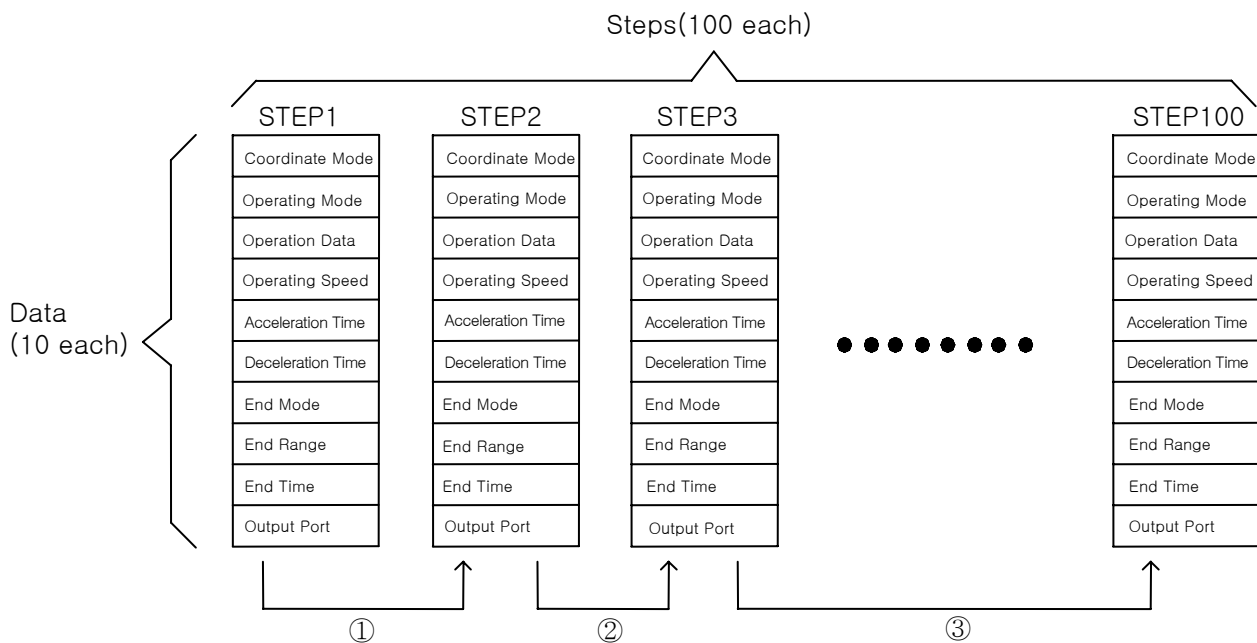
Programs can be saved only by communications.

4.1.2 Outline of steps

Steps are the places where detailed data required for actual program operation are entered.

100 (1–100) steps are available, and the step data can be set only by communications, not by contacts.

Each step has 10 data input columns, and different data can be entered into each step.

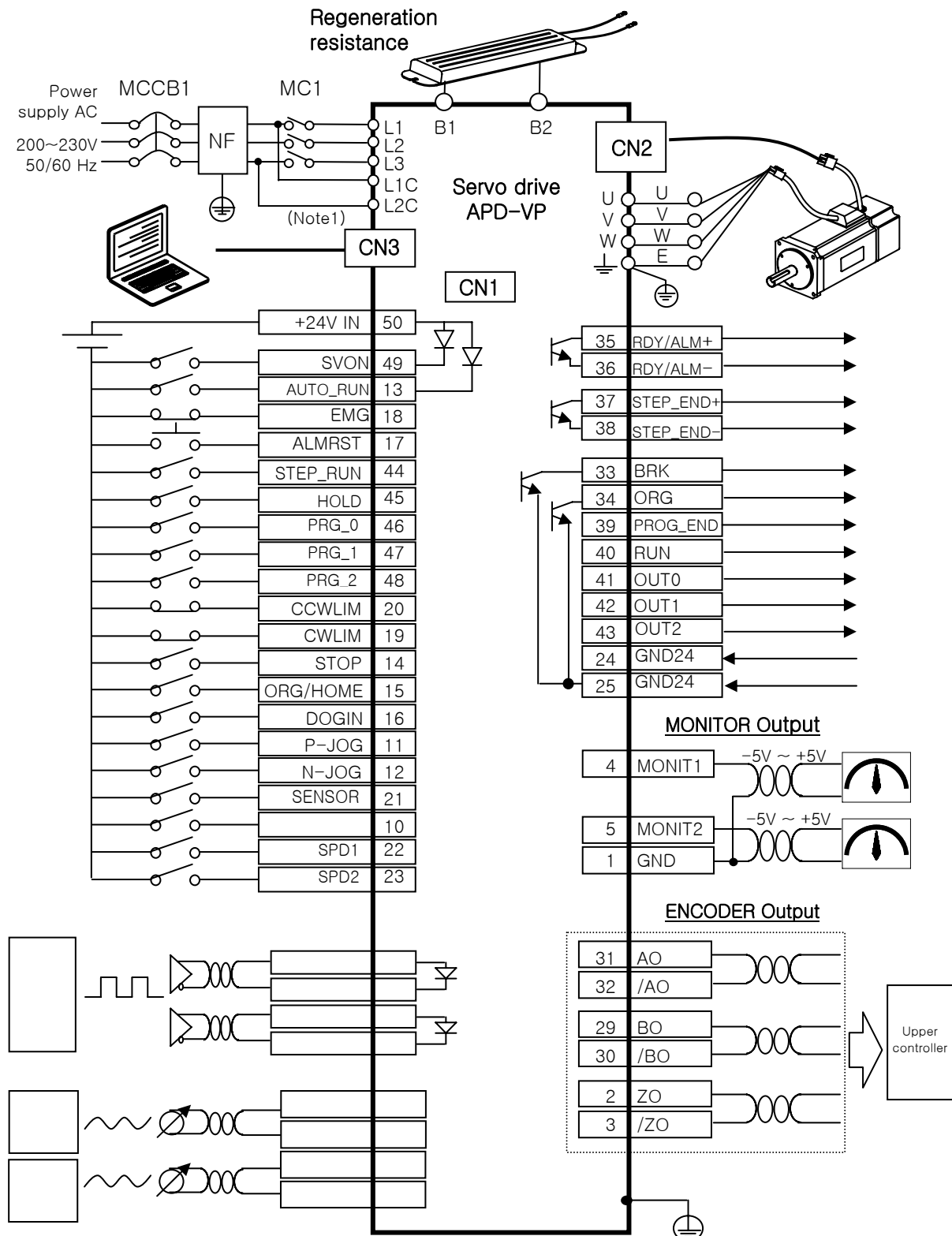


Steps operate from step 1 to step 100 in sequence, and it is not possible to disregard middle steps and skip to the next steps.

If all steps up to step 100 are not used, the required number of steps can be used by activating end mode (0).

4.2 System Configuration

4.2.1 Connection Diagram (Program Operation Type (VP-5))



Note 1 : Control power supply terminals (L1C and L2c) are provided in models with capacity equal to or greater than APD-VP05.

4.2.2 Control Signal

1) Input contact signal

Pin Numbers	Name	Description
50	+24V IN	Input external DC24[V].
49	SVON	Servo on
13	AUTO_RUN	Start program operation .
18	EMG	Emergency stop
17	ALMRST	Alarm reset
20	CCWLIM	Forward (Counterclockwise) rotation is prohibited.
19	CWLIM	Backward (Clockwise) rotation is prohibited.
14	STOP	Stop operation.
15	ORIGIN/HOME	Start origin run and home run. (Initial SVON: Origin run, During operation: Home run)
16	DOGIN	Origin sensor
11	P-JOG	Forward jog
12	N-JOG	Reverse jog
44	STEP_RUN	Start step operation.
45	HOLD	Temporarily stop step operation.
46	PRG_0	Program selection 0 (Set [PE-615])
47	PRG_1	Program selection 1 (Set [PE-615])
48	PRG_2	Program selection 2 (Set [PE-615])
21	SENSOR	Sensor Input.
10		
22	SPD1	Program operation speed ratio 1 (Set [PE-612]–[PE-614])
23	SPD2	Program operation speed ratio 2 (Set [PE-612]–[PE-614])

2) Output contact signal

Pin Numbers	Name	Description
35 /36	RDY/ALM+ RDY/ALM -	The preparation for Servo operation is complete and the signal of Alarm status is output <ul style="list-style-type: none"> • ON : Normal state (The preparation for operation is complete) • OFF : ALARM state
33	BRK	Turn it On when servo is operated with outputting brake operating signal
34	ORG	Output signals indicating the origin run completion.
37 /38	STEP_END+ STEP_END-	Output signals indicating completion of each step..
39	PROG_END	Output signals indicating completion of all operation program
40	RUN	Output signals indicating operation of each step.
41	OUT0	Output signals of output port.
42	OUT1	Output signals of output port.
43	OUT2	Output signals of output port.

3) Monitor output signal and output power supply

Pin Number	Name	Description
4	MONIT1	Analog monitor output 1 (-5[V] - +5[V])
5	MONIT2	Analog monitor output 2 (-5[V] - +5[V])
1	GND	Ground for analog output signal
26	+15[V]	+15[V] power output terminal

4) Encoder output signal

Pin Number	Name	Description
31 32 29 30	AO /AO BO /BO	Outputs encoder signal received from the motor after dividing it according to the frequency dividing ratio set in menu [PE-418] (5V Line driver system).
2 3	ZO /ZO	Outputs encoder Z signal received from the motor (5[V] Line driver system).

4.3 Details of Operation Command

4.3.1 Returning to Home Position

If input contact “ORG/HOME” is turned on while motor is stopped, the motor returns to the home position.

Home return speed [PE-707] and home acceleration/deceleration time [PE-708] can be set.

- ※ If input contact “ORG/HOME” is turned on in SVON mode, the system executes origin run only once, and moves to home position.
- ※ If input contact “ORG/HOME” is turned on when motor is running, this function is disregarded.

4.3.2 HOLD and STOP

The system stops if input contact “HOLD” is turned on. If the system is restarted, it begins operation starting from step 1.

Example:

Current step	Input Contact	Restart Step
STEP 77	HOLD	STEP 77
	STOP	STEP 1

* This function applies to deceleration time of the step in progress.

4.3.3 Step Operation

If it is desired to divide operation into steps, turn on input contact “STEP_RUN”.

Each time this contact is turned on, the system operates by one step.

4.3.4 Torque Control

When position operation is in progress, motor’s maximum torque can be controlled. This function is used to apply constant torque or to restrict torque for safety purposes.

4.3.5 Output Port Function by Step

Output port can be set for each step.

Output port is composed of 3 contacts, and a total of up to 8 ports (0–7) can be set.

(Refer to 5.5 for the details)

4.3.6 Program Selection and Editing

Note: After changing program operating mode, make sure to carry out origin run prior to starting operation.

① Setting program

System can be operated in 100 steps (1~100) by selecting 8 programs.

Program Number	Contact			Communication	Number of Steps
	PRG_0	PRG_1	PRG_2		
1	X	X	X	Program 1	100STEP(1~100)
2	O	X	X	Program 2	100STEP(1~100)
3	X	O	X	Program 3	100STEP(1~100)
4	O	O	X	Program 4	100STEP(1~100)
5	X	X	O	Program 5	100STEP(1~100)
6	O	X	O	Program 6	100STEP(1~100)
7	X	O	O	Program 7	100STEP(1~100)
8	O	O	O	Program 8	100STEP(1~100)

* [PE-615] Programs can be selected using communication or contact depending on the program selection mode.

0 : Communication

1: Contact

② In case of contact mode (1)

Program numbers are determined in accordance with the selected input contacts in the contact mode.

③ In case of communication mode (0), program edit is allowed

Select the program with PC Communication and press “program edit”, the related program is uploaded to PC. If you press “open”, edit is also possible.

[Note]

1. If Program Save is not executed after changing programs, all new data will be deleted. (Existing data are not affected.)
2. Programs can be saved or corrected only by communications.
3. An alarm (AL-13) occurs if the program which has never been saved is selected. (Alarm will not occur if the program is selected after first being saved.)

4.3.7 Setting Initial Program

Starting program at the time of power connection can be set .

This function can be set in [PE-616].

4.3.8 Speed Override

The speed of all programs can be set in percentage.

Contact		Parameter
SPD1	SPD2	
X	X	100 [%]
O	X	25 [%] (Set [PE-612])
X	O	50 [%] (Set [PE-613])
O	O	75 [%] (Set [PE-614])

4.3.9 Origin Run

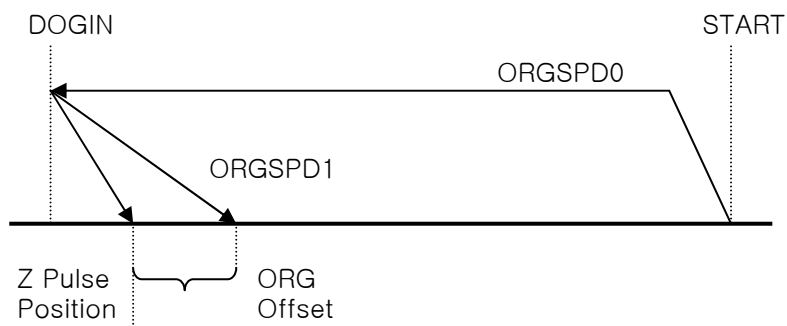
Origin Mode	Major Functions
0	Set current coordinates as origin.
1	Set origin by sensor (Dog).
2	Set origin by limit.
3	Set origin by sensor and limit.
4	Set origin by damper torque.

* If input contact “ORG/HOME” is turned on in SVON mode, the system executes origin run only once, and moves to home position.

① Origin run Mode[PE-810]

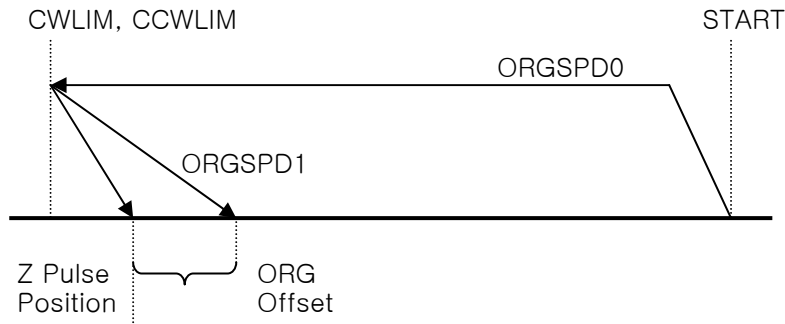
- Mode 0 : Set current position as origin.
- Mode 1 : Sensor (Dog) type

If the sensor turns on after starting origin run, the system turns in the opposite direction to stop at the Z pulse position, and sets the origin.



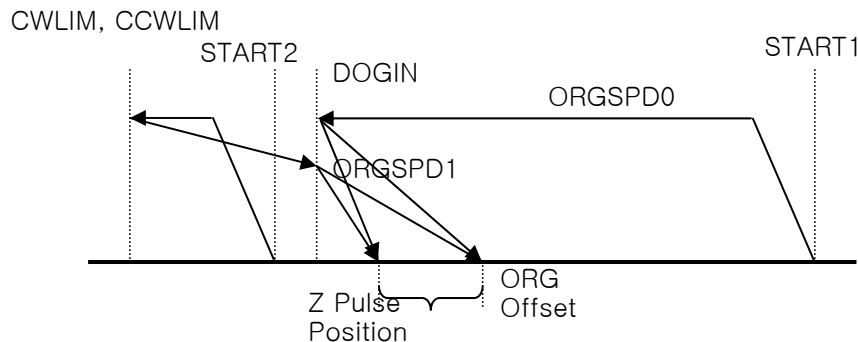
– Mode 2 : Limit type

If the limit sensor turns off after starting origin run, the system turns in the opposite direction to stop at the Z pulse position, and sets the origin.



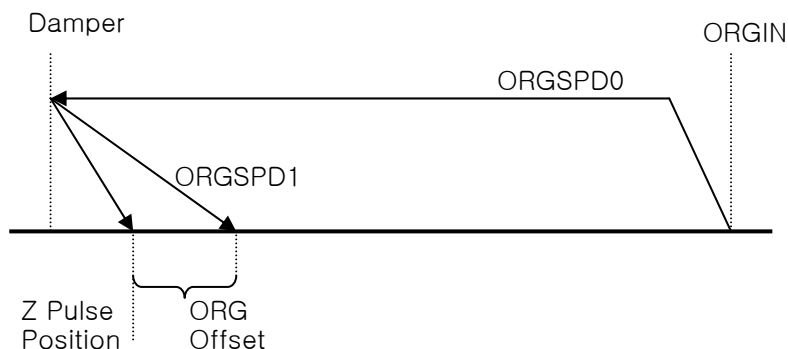
– Mode 3 : Limit and sensor (Dog) type

If the system meets the limit after starting origin run, it turns in the opposite direction; and if it meets Z pulse while turning in the opposite direction, it stops at the Z pulse position and sets the origin.



– Mode 4 : Damper type

If the system meets damper after starting origin run, and if the load torque increases more than the damper torque, it turns in the opposite direction to stop at the Z pulse position, and sets the origin.



II . Operating Software

② Origin run direction [PE-811]

Set the operation direction after starting origin run.

③ Origin sensor stop [PE-812]

If an origin sensor is used, the system does not move to the Z pulse position after starting origin run. The moment the sensor is turned On/Off, it stops and sets the origin.

④ Origin offset [PE-813]

In case of stopping after the origin run, the system moves from the Z pulse position to the extent of the offset value before stopping, and sets this coordinate as the origin.

⑤ Origin position [PE-814]

Set the initial value of the stop coordinates when setting the origin.

This means that when the system stops, the coordinate will not be “0” but will be the set position value.

⑥ Automatic origin run [PE-815]

The origin run is automatically executed when the servo turns on first time after power is connected to the servo.

⑦ Changing origin run speed

Set the first operating speed [PE-816] after starting origin run and the operating speed [PE-817] after origin sensor or limit sensor operation, in the unit of “r/min”.

4.3.10 Jog Run

Operation by	Major Functions
Contact	– Jog run using contact switch.
Loader	– Jog run by loader manipulation. – Current coordinates can be set in menu.

① Set two jog run speeds (low and high) in the unit of “r/min”.

Setting Item	Menu
Low speed jog run	PE-801
High speed jog run	PE-802

② Setting jog run acceleration/deceleration time [PE-803].

Set acceleration/deceleration time used in jog run.

4.3.11 Setting Operation Data

Setting Mode	Major Functions
Menu setting	Edit and set menu using loader.
Communication setting	Set data based on communication (CN3).
I/O setting	Set data using BCD code of I/O contacts (PLC, Digital switch)

4.3.12 Operation Data Output

Output Mode	Output Details														
Communication output	Output operation data based on communication (CN3).														
Analog	<p>* Data are output in $\pm 5V$ according to the set scale units, and the following operation data are output according to the output mode. (Refer to [PE-409] – [PE-417])</p> <table border="1"> <thead> <tr> <th>Output Mode</th><th>Output Item</th></tr> </thead> <tbody> <tr> <td>0</td><td>Command speed</td></tr> <tr> <td>1</td><td>Current speed</td></tr> <tr> <td>2</td><td>Command torque</td></tr> <tr> <td>3</td><td>Current torque</td></tr> <tr> <td>4</td><td>Command position</td></tr> <tr> <td>5</td><td>Current position</td></tr> </tbody> </table>	Output Mode	Output Item	0	Command speed	1	Current speed	2	Command torque	3	Current torque	4	Command position	5	Current position
Output Mode	Output Item														
0	Command speed														
1	Current speed														
2	Command torque														
3	Current torque														
4	Command position														
5	Current position														

4.4 Setting Operation Data

4.4.1 Step Data

Program steps are defined by a total of 10 data.

Step (1–100)	
Coordinate mode	0: Absolute coordinate, 1: Relative coordinate, 2: Infinite coordinate
Operating Mode	0: Position coordinate, 1: Position increment, 2: Time operation, 3: Infinite operation
Operation data	Position and time [ms]
Operating speed	Speed [r/min]
Acceleration time	Time [ms]
Deceleration time	Time [ms]
End mode	0 : PRG end, 1 : STOP, 2 : DWELL, 3 : Continuous, 4 : Sensor
End range	INPOS range
End time	Dwell time [ms]
Output port	0–7 (Output contact: OUT0, OUT1, OUT2)

※ Steps can be set only by communications.

4.4.2 Coordinate Mode

[Setting range : 0–2]

- ① Absolute coordinate [0] : A base point (origin) is established, and position operation is carried out based on the absolute position coordinate with respect to the base point.
- ② Relative coordinate [1] : Current position is used as base point “0” without a separate base point (origin), and position operation is carried out to the extent of the established coordinate.
- ③ Infinite coordinate [2] : A base point (origin) is established, and the coordinate of the prescribed range is repeated while the absolute position coordinate with respect to the base point is used.

Example : Rotary coordinates: 0–360° are repeated.

4.4.3 Operating Mode

[Setting range : 0–3]

- ① Position coordinates [0] : System operates with the position coordinate values with respect to the base point.
- ② Position increment [1] : System operates with the value determined by adding the set position to the current position.
- ③ Time operation [2] : System operates for the designated duration irrespective of the position coordinate.
- ④ Infinite operation [3] : System operates infinitely at set speed.

4.4.4 Operation Data

[Set range : –999999 – +999999]

Set position data if the system is in position operation mode, and time data (msec) if the system is in time operation mode.

Note: Position must be set to –999999 – +999999, and the time to 0 – +999999.

4.4.5 Operating Speed

[Set range : –maximum speed – +maximum speed]

Set operating speed in the unit of “r/min” (–99999 – +99999).

Note 1 : The direction of rotation changes according to codes in the case of time operation.

Note 2 : The direction of rotation is determined by the position coordinate, and an absolute value (0–99999) is used for speed in the case of position operation.

4.4.6 Acceleration Time

[Set range : 0–999999]

Set the time taken to accelerate up to the rated speed in the unit of “msec”.

The actual acceleration time is determined by the operating speed.

Example : If rated speed is 3000 [r/min], operating speed 1000 [r/min] and acceleration time 300 [ms], actual acceleration time will be 100 [ms]
((300/3000)×1000).

4.4.7 Deceleration Time

[Set range : 0–999999]

Set the time taken to decelerate down to the rated speed in the unit of “msec”.

The actual deceleration time is determined by the operating speed.

Example : If rated speed is 3000 [r/min], operating speed 1000 [r/min] and deceleration time 300 [ms], actual deceleration time will be 100[ms]
 $((300/3000) \times 1000)$.

4.4.8 End Mode

[Setting range : 0 – 4]

- ① Program End [0] : Indicates the final end step. System operates program from step 0 in sequence, stops operation at the step carrying end mode “0”, and displays program end. If the system is started again later, operation begins from step 1.
- ② Step operation stop [1] : Operation stops after the current step operation is completed. If Cycle–Start is selected thereafter, operation begins from the next step.
- ③ DWELL [2] : Operation stops after the current step operation is completed. When the set time elapses, the next step is operated.
- ④ Continuous operation [3] : When the current step operation is completed, the system does not stop but continues to the next step operation.
- ⑤ Sensor [4] : When the sensor signal is registered, the current step is stopped, and the next step is operated.

Note : If the end mode is Sensor [4] in step operation and input contact “STEP_RUN” is used, a position error occurs during the period from the time the sensor signal is received to the time input contact “STEP_RUN” is turned on. Do not use STEP–RUN in sensor operation featuring precise position error in the relative coordinate.

4.4.9 End Range

[Set range : 1–999999]

Set step operation completion recognition range.

Step completion or program completion is output at a position (time) determined by subtracting the end range from the position data.

Note : Set position range in position operation mode, and time range (msec) in time operation mode.

4.4.10 End Time

[Set range : 0–999999]

Set dwell time in the unit of “msec” when the end mode is Dwell [2].

4.4.11 Output Port

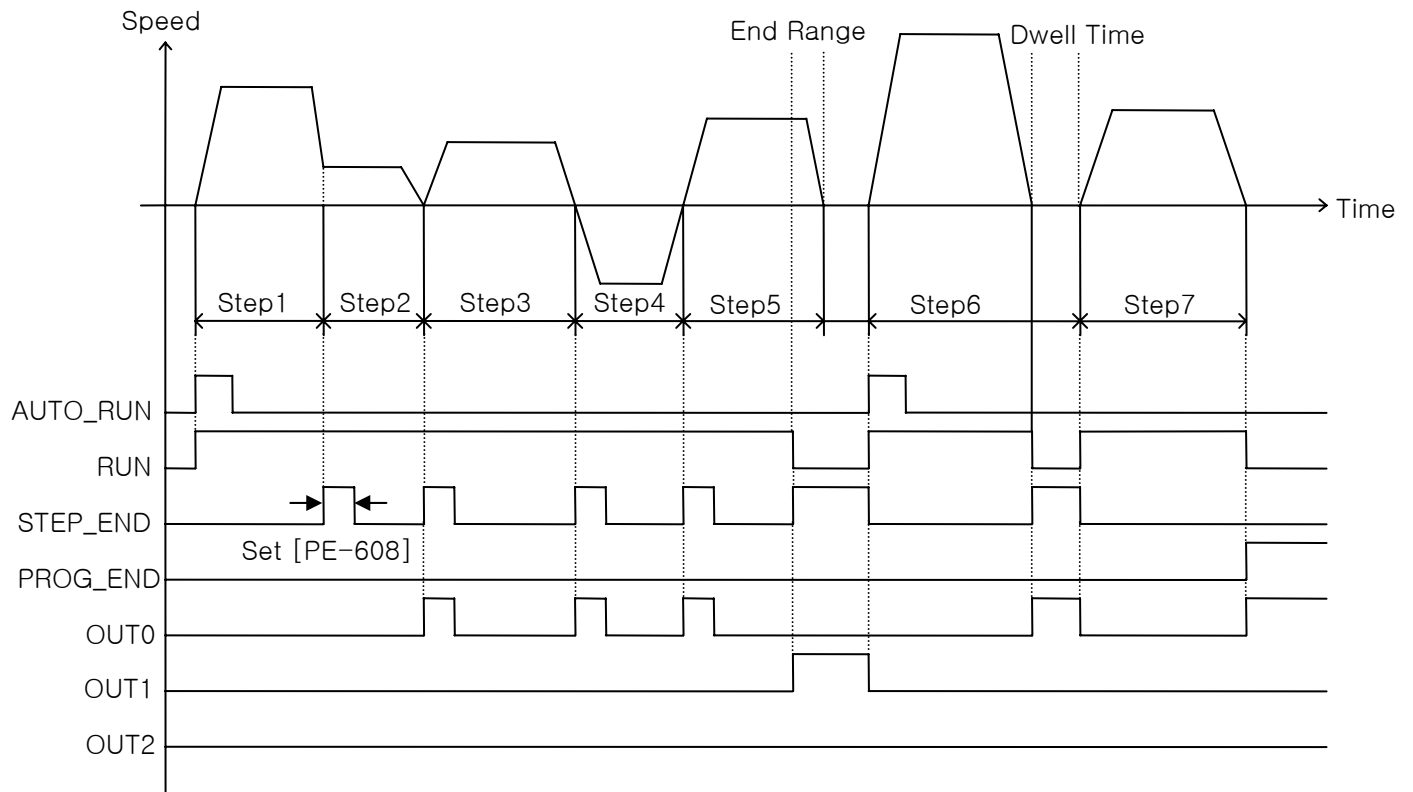
[Set range : 0–7]

When step operation is completed, signal output can be sent to external units.

Output Port	OUT0	OUT1	OUT2	Remarks
0	X	X	X	
1	O	X	X	
2	X	O	X	
3	O	O	X	
4	X	X	O	
5	O	X	O	
6	X	O	O	
7	O	O	O	

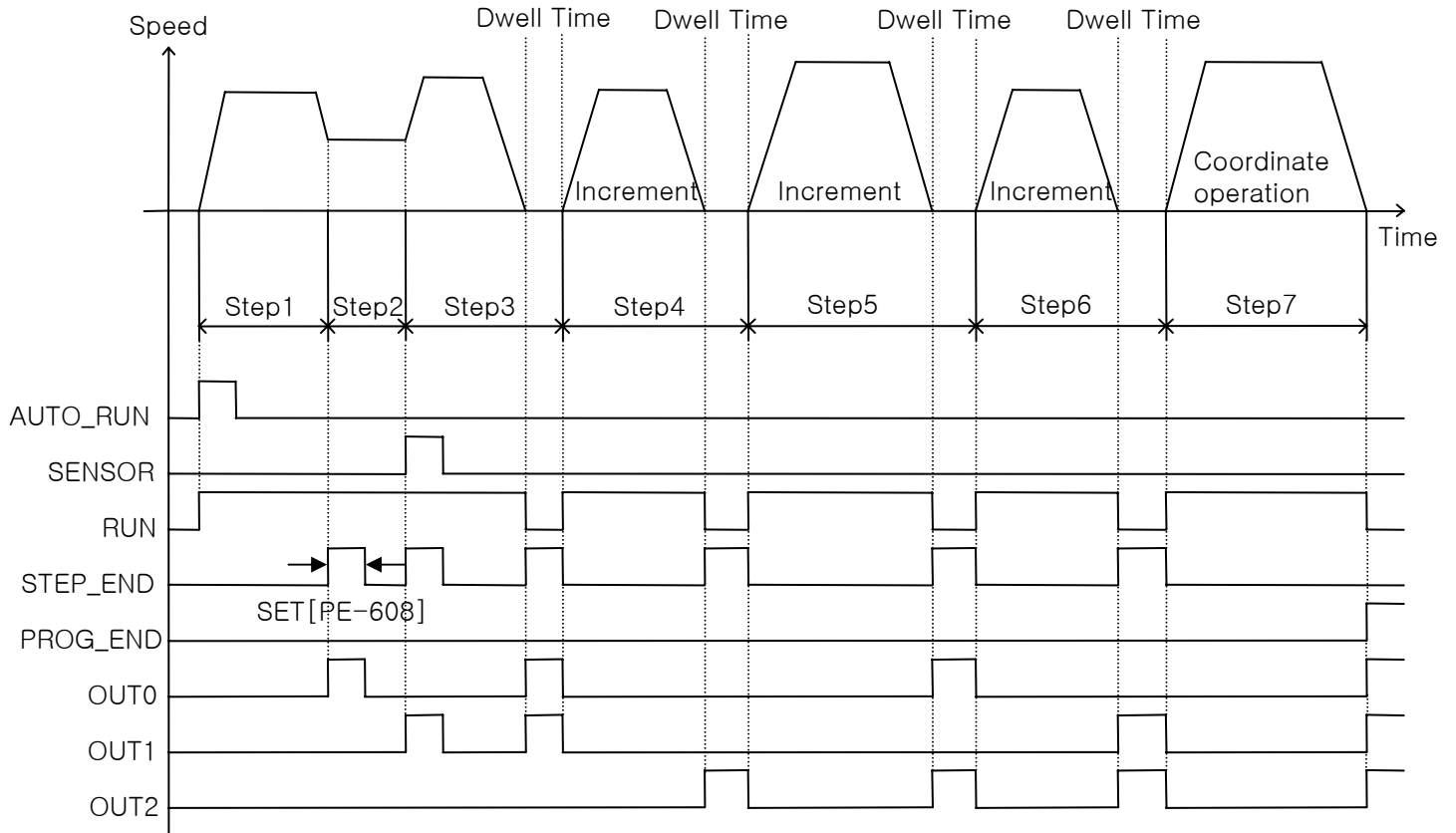
4.5 Program Operation Examples

4.5.1 Example of Absolute Coordinate Position Operation



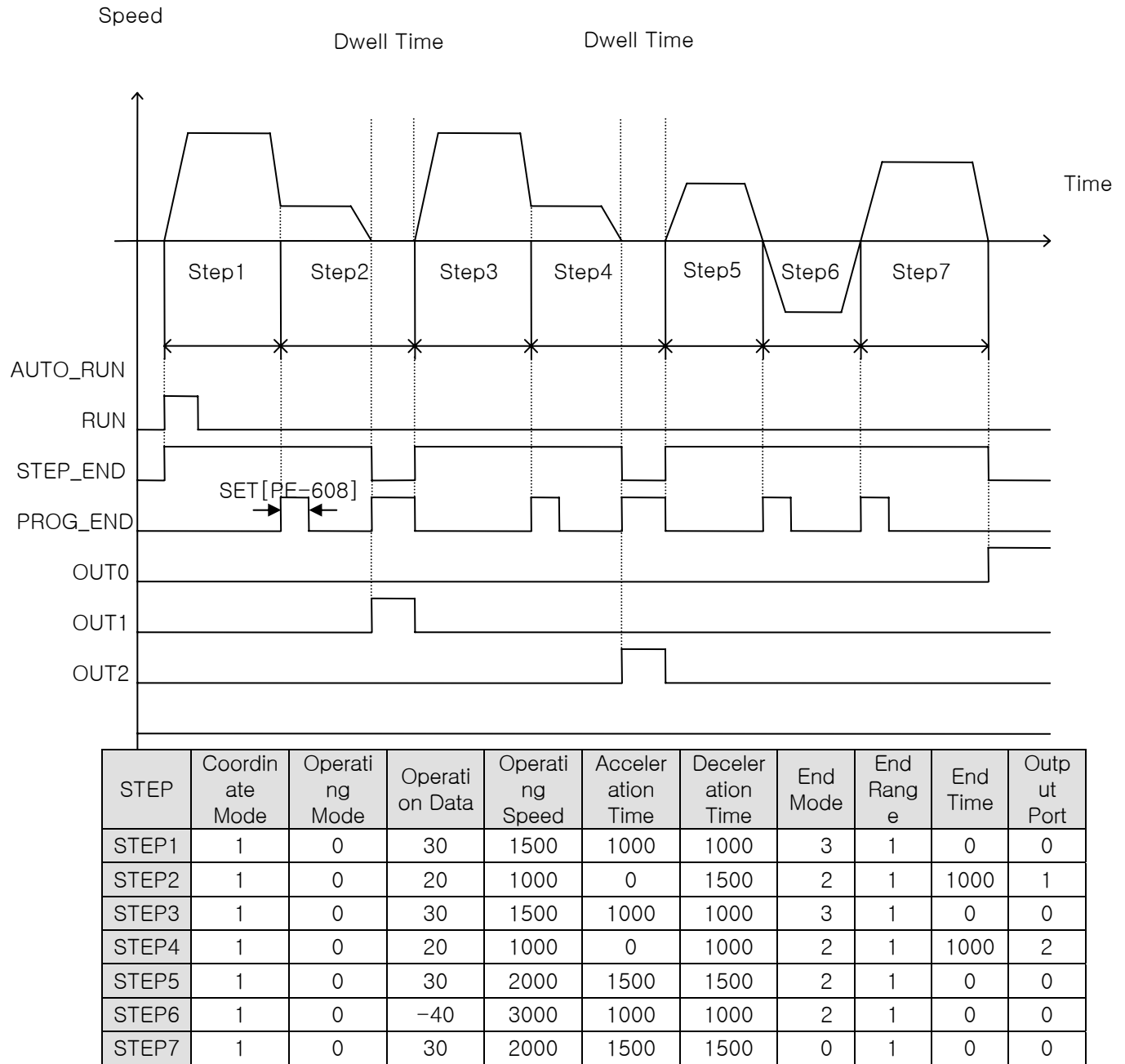
STEP	Coordin ate Mode	Operati ng Mode	Operati on Data	Operati ng Speed	Acceler ation Time	Deceler ation Time	End Mode	End Rang e	End Time	Outp ut Port
STEP1	0	0	20	2000	1000	0	3	1	0	0
STEP2	0	0	30	700	1500	1500	2	1	0	1
STEP3	0	0	40	1000	1000	1000	2	1	0	1
STEP4	0	0	25	1500	1000	1000	2	1	0	1
STEP5	0	0	40	2000	1000	1000	1	10	0	2
STEP6	0	0	55	3000	500	500	2	1	1000	1
STEP7	0	0	70	2000	700	700	0	1	0	1

4.5.2 Example of Absolute Coordinate Incremental Operation

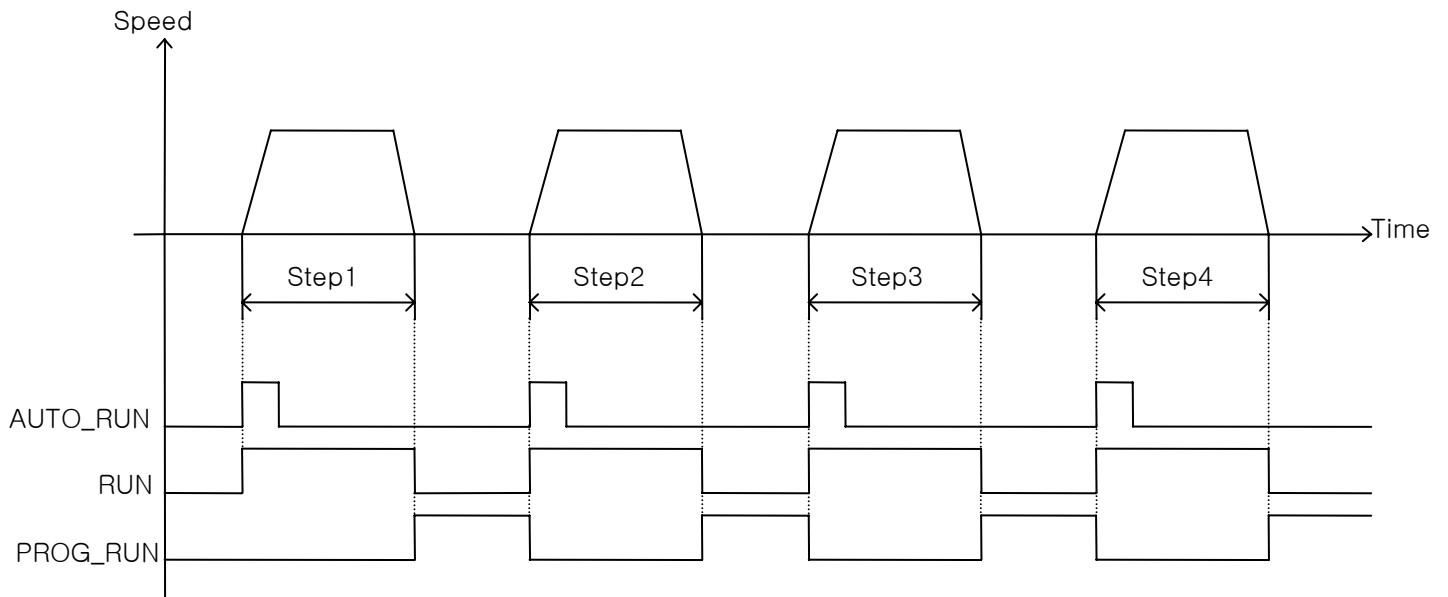


STEP	Coordin ate Mode	Operati ng Mode	Operati on Data	Operati ng Speed	Acceler ation Time	Deceler ation Time	End Mode	End Rang e	End Time	Outp ut Port
STEP1	0	0	20	1500	500	500	3	1	0	1
STEP2	0	3	0	1000	1000	1000	4	1	0	2
STEP3	0	0	500	2000	2000	2000	2	1	2000	3
STEP4	0	1	20	1500	700	700	2	1	1000	4
STEP5	0	1	30	2000	500	500	2	1	1000	5
STEP6	0	1	20	1500	700	700	2	1	1000	6
STEP7	0	0	610	2000	1000	1000	0	1	0	7

4.5.3 Example of Relative Coordinate Position Operation

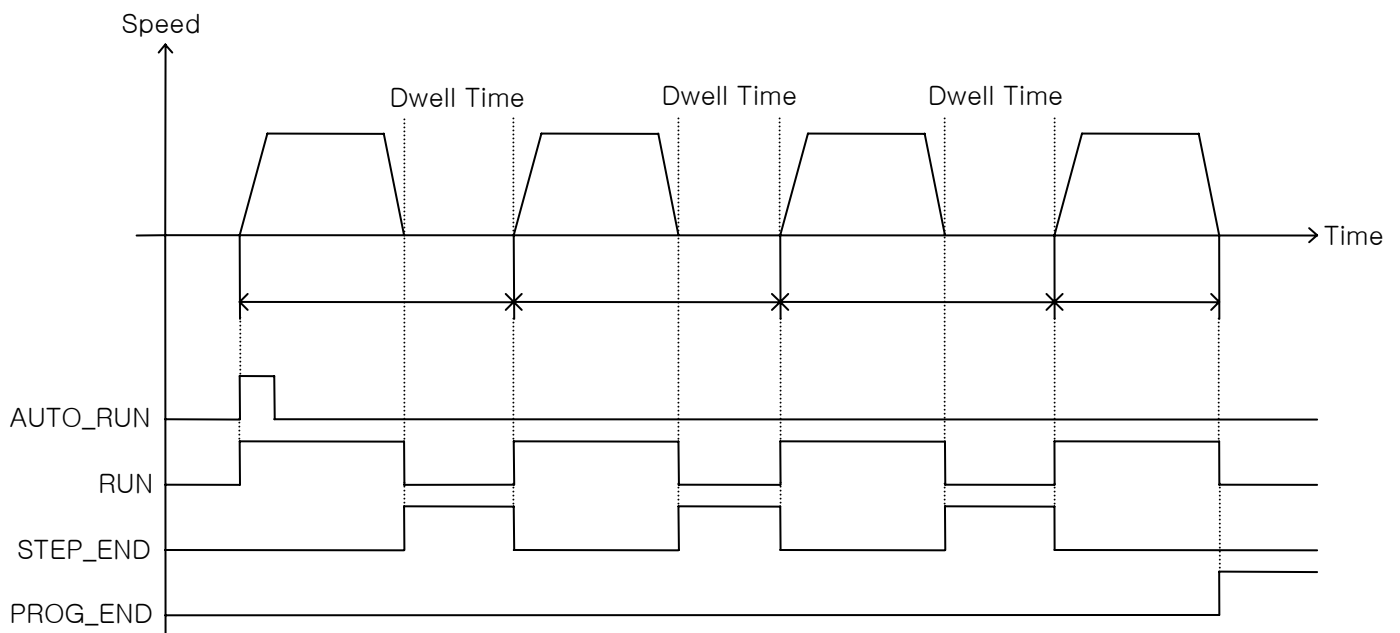


4.5.4 Example of Relative Coordinate Incremental Operation

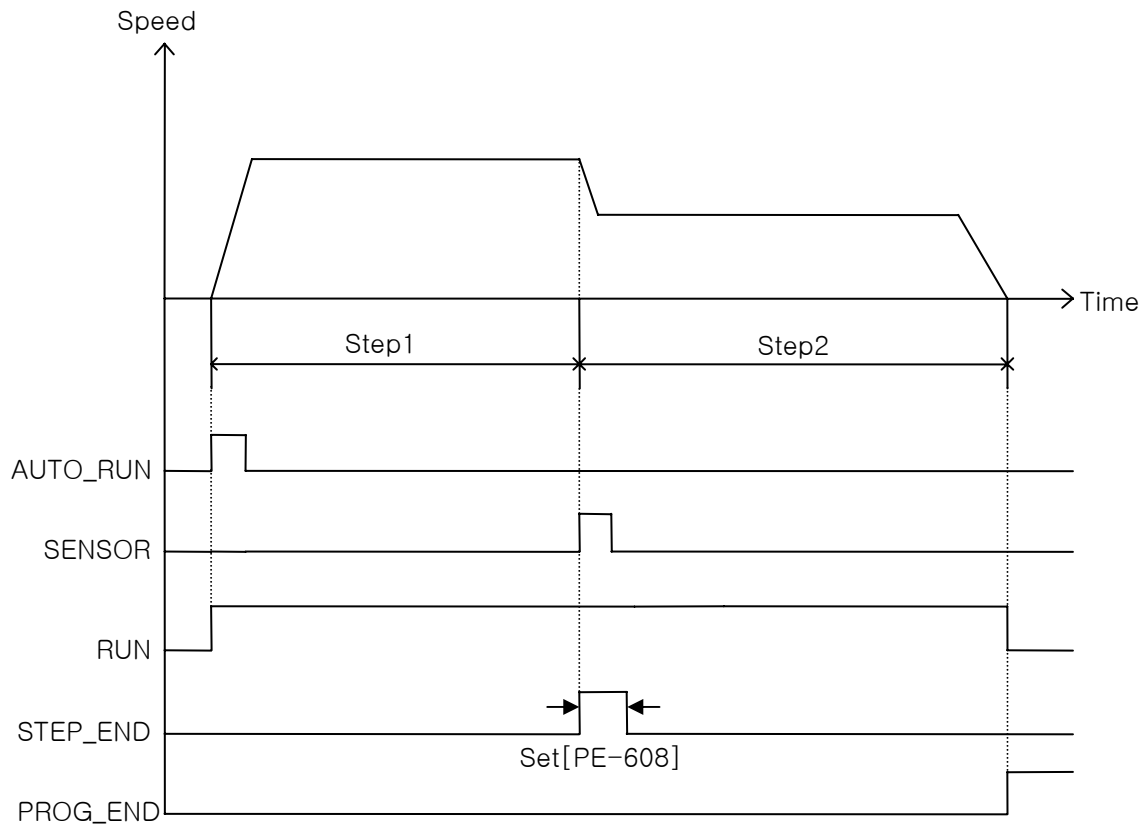


STEP	Coordinate Mode	Operating Mode	Operation Data	Operating Speed	Acceleration Time	Deceleration Time	End Mode	End Range	End Time	Output Port
STEP1	1	1	50	500	50	50	0	1	0	0

The system operates by increasing the position to the extent of the set position coordinate (STEP1) each time input contact “AUTO-RUN” is turned on. If “1” is entered for the end mode and the end time is given in the above example, the system operates as follows: Operation can be repeated as many times as the number of steps (1-100).



4.5.5. Example of Sensor-Input Position Operation

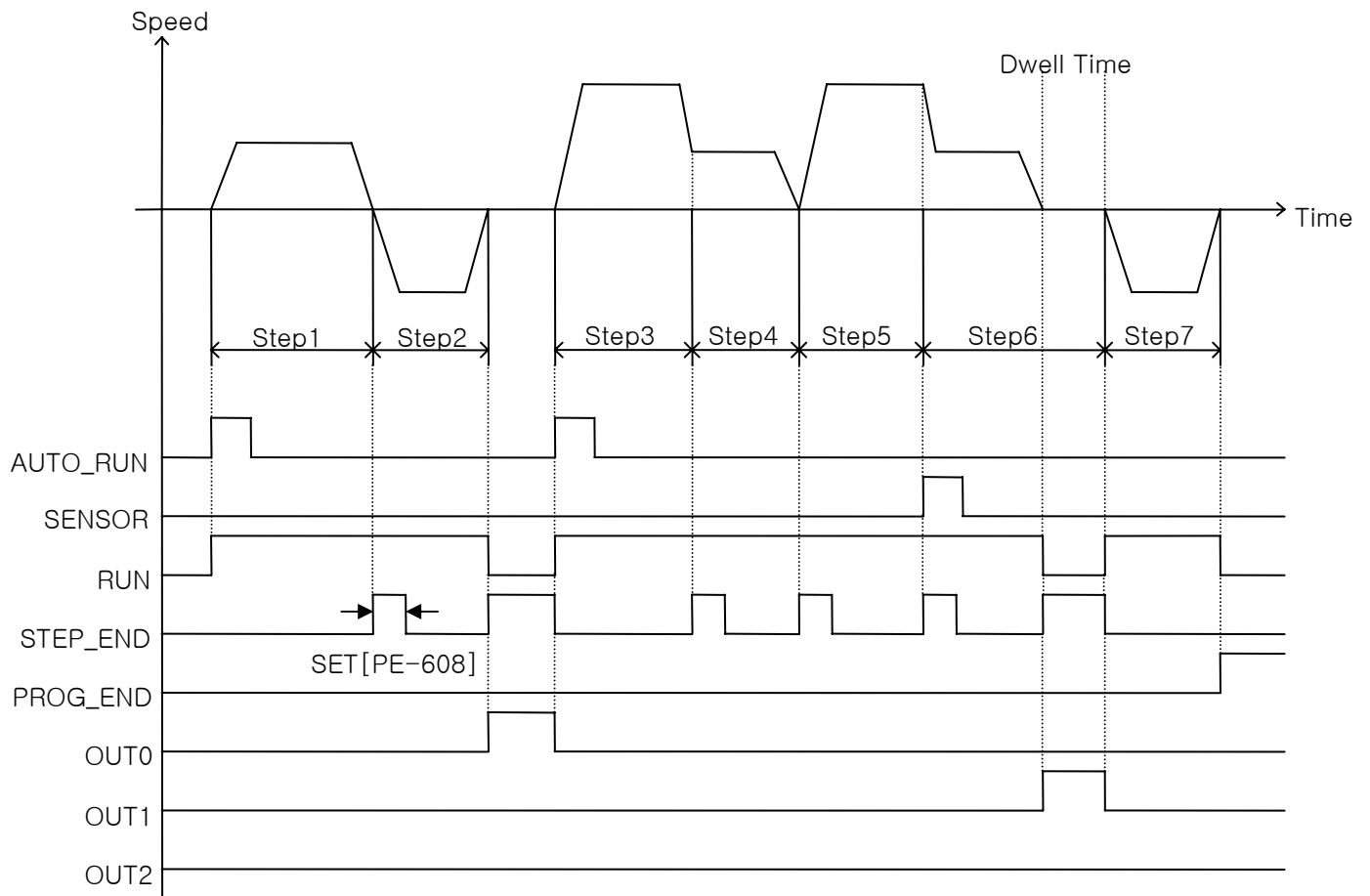


STEP	Coordinate Mode	Operating Mode	Operation Data	Operating Speed	Acceleration Time	Deceleration Time	End Mode	End Range	End Time	Output Port
STEP1	1	3	0	1000	50	50	4	1	0	0
STEP2	1	0	100	500	50	50	0	1	0	0

- ① Infinite operation begins if input contact “AUTO_RUN” is turned on. If the sensor is activated when the system is operated at sensor position operation speed (STEP 1 speed), the set position operation (STEP 2) begins. When all steps are completed, the system stops and displays output signal “PROG_END”.
- ② If input contact “AUTO_RUN” is turned on again, operation begins from STEP 1.

Note : If step operation is executed by using input contact “STEP_RUN” during sensor-input position operation mode, a position error occurs from the time the sensor emits signals at the relative coordinate to the time the input contact “STEP_RUN” is turned on.

4.5.6 Example of Time Operation



STEP	Coordinate Mode	Operating Mode	Operation Data	Operating Speed	Acceleration Time	Deceleration Time	End Mode	End Range	End Time	Output Port
STEP1	1	2	1000	1000	500	500	2	1	0	0
STEP2	1	2	2000	-1000	500	500	1	1	0	1
STEP3	0	2	1000	1500	500	500	3	1	0	0
STEP4	0	2	3000	1000	1500	1500	2	1	0	0
STEP5	0	2	10000	2000	1000	1000	4	1	0	0
STEP6	0	2	4000	1000	500	500	2	1	1000	2
STEP7	0	2	3000	-3000	1000	1000	0	1	0	0

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4.6 Menu

4.6.1 Operating Mode Menu

MENU			UNIT	INI	Description
NO	CODE	NAME	MIN	MAX	
0	Pd-001	Current State	– –	– –	Displays current operation mode. Normal: nor, Alarm: alarm number
1	Pd-002	Current Speed	r/min –99999	0 99999	Displays current operating speed.
2	Pd-003	Command Speed	r/min –99999	0 99999	Displays current command speed.
3	Pd-004	Current Position	– –99999	0 99999	Displays current position coordinates
4	Pd-005	Command position	– –99999	0.0 99999	Displays operation command position coordinates.
5	Pd-006	Remaining Position	– –99999	0.0 99999	Displays the difference between target position coordinates and current position coordinates.
6	Pd-007	Program Selection	– 0	1 8	Displays the number of operating program
7	Pd-008	Operation step No.	– 1	1 100	Displays the current step No.
8	Pd-009	Current Step data	– 0	0 99999	Dedicated to maker.
9	Pd-010	Torque Limit	[%] 0	0 999	Displays torque-limit setting.
10	Pd-011	Current Load	[%] –9999.9	0.0 9999.9	Displays current load rate versus rated load.
11	Pd-012	Maximum Load	[%] –9999.9	0.0 9999.9	Displays maximum instantaneous load rate versus rated load.
12	Pd-013	DC Link Voltage	Volt –999.9	0.0 999.9	Displays condenser's DC voltage value.
13	Pd-014	I/O Set	– 0	– 99999	Displays current I/O CN1's input state. (See 5–38 page for more information)
14	Pd-015	Input A/B Set	– 0	– 99999	Display set conditions of contacts A and B among input contacts. (Contact A = OFF, Contact B = ON)
15	Pd-016	I/O State	– 0	– 99999	Displays current operating condition of I/O.
16	Pd-017	Input Logic Set	– –	– –	Menus dedicated to communication.
17	Pd-018	Input Logic Save	– –	– –	
18	Pd-019	Alarm bit Data	– 0	– 99999	
19	Pd-020	Software Version	– 0	– 999999	Displays software version number.

※ Communication code is used to designate the related menu at TOUCH or PC Communication

4.6.2 Alarm Display Menu

MENU			UNIT	INI	Description
NO	CODE	NAME	MIN	MAX	
Alarm History 01~20			—	—	Displays status of alarms occurred in the past.
20 ~ 39	PA-101 ~ PA-120	Alarm History 01 ~ Alarm History 20	—	—	

Alarm codes and Descriptions

CODE	Name	Description or causes	Items to be checked
Nor	Normal	Normal state	—
L1.01	L1.01	The malfunction of RS232 communication, control circuit	Replacing Drive
AL-01	Emergency Stop	EMG input contacts open.	Control signal wiring, external 24V power supply
AL-02	Power Fail	Main power supply turned off	Power supply, wiring
AL-03	Line Fail	Motor and encoder wiring error	Setting, wiring
AL-04	Motor Output	Motor drive circuit output error	Wiring or IPM module burned
AL-05	Encoder Pulse	Encoder pulse number set error	Setting
AL-06	Following Error	Position pulse following error	Position command pulse excessive, [PE-514] setting, wiring, limit contact, gain setting
AL-07	Limit Direction	Operation in limit direction	Direction of running, limit contacts
AL-08	Over Current	Over current	Wiring, motor, encoder setting, gain setting, drive replacement
AL-09	Over Load	Over load	Load state, wiring, motor, encoder setting
AL-10	Over Voltage	Over voltage	Input voltage, braking resistance wiring, excessive regeneration operation.
AL-11	Over Speed	Over speed	Encoder setting, encoder wiring, gain setting
AL-12	Origin Error	Origin run error	Dog sensor signal, limit signal wiring
AL-13	Not Used	Not Used	—
AL-14	ABS Data Error	Absolute encoder data transmission error	Initial reset
AL-15	ABS Battery Error	Absolute encoder battery error	Initial reset, battery discharge
AL-16	ABS Multi Error	Absolute encoder multi-running data transmission error	Initial reset
AL-17	ABS Read Fail	Absolute encoder reading error	Encoder
AL-18	Not Used	Not used	—
AL-19	Not Used	Not used	—
AL-20	Flash Erase Fail	Flash ROM data delete error	Replace drive
AL-21	Flash Write Fail	Flash ROM data writing error	Replace drive
AL-22	Data Init Error	Data initialization error	Replace drive
AL-23	EPWR	Hardware error	[PE-203] setting
Err1	Error1	Occurs when attempting to correct menu which cannot be corrected in Servo-on condition.	Correct menu after turning off servo.
Err2	Error2	Occurs when attempting to enter data which deviate from the setting range.	Enter data within the range of setting.
Err3	Error3	Occurs when attempting to correct menu after locking menu using [PC-909] (Menu Data Lock).	Correct menu after unlocking [PC-909].

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4.6.3 System Variable Setting Menu

Menus carrying “*” mark cannot be corrected when the servo is on.

MENU			UNIT	INI	Description
NO	CODE	NAME	MIN	MAX	
40	*PE-201	Motor ID	– 0	– 99	Set motor ID. When setting motor ID, ID is automatically set from [PE-210] to [PE-217].
41	*PE-202	Baud Rate	bps 0	0 3	Set baud rate of CN3's RS232. (Reconnection of power supply required.) 0=9600[bps], 1=19200[bps], 2=38400[bps], 3=57600[bps]
42	*PE-203	Encoder Type	– 0	0 9	Set type of relevant encoder. (0: PHASE A Lead, 1: PHASE B Lead, 6: absolute value encoder)
43	*PE-204	Encoder Pulse	– 1	– 99999	Set number of pulses of relevant encoder.
44	PE-205	CCW TRQ Limit	[%] 0	300 300	Set torque limit value for CCW running.
45	PE-206	CW TRQ Limit	[%] 0	300 300	Set torque limit value for CW running.
46	*PE-207	System ID	– 0	0 99	Set drive ID for communication.
47	*PE-208	System Group ID	– 0	0 99	Set drive group ID for communication.
48	PE-209	Start Menu No.	– 1	5 20	Set Operating Mode Menu to be displayed after operation begins.
49	*PE-210	Inertia	gf·cm·s ² 0.01	ID 999.99	Set motor inertia moment.
50	*PE-211	Trq Con	kgf·cm/A 0.01	ID 999.99	Set motor torque constant.
51	*PE-212	Phase Ls	mH 0.001	ID 99.999	Set motor phase inductance.
52	*PE-213	Phase Rs	ohm 0.001	ID 99.999	Set motor phase resistance.
53	*PE-214	Rated Is	A 0.01	ID 999.99	Set motor rated current.
54	*PE-215	Max Speed	r/min 0.0	ID 9999.9	Set motor maximum speed.
55	*PE-216	Rated Speed	r/min 0.0	ID 9999.9	Set motor rated speed.
56	*PE-217	Pole Number	– 2	8 98	Set number of motor poles.
57	PE-218	Not Used	– –	– –	
58	PE-219	Not Used	– –	– –	
59	PE-220	Not Used	– –	– –	

※ Communication code is used to designate the related menu at TOUCH or PC Communication

Motor Models and ID(1)

Model	ID	Watt	Remark
SAR3A	1	30	
SAR5A	2	50	
SA01A	3	100	
SB01A	11	100	
SB02A	12	200	
SB04A	13	400	
SB03A	14	250	Special type
HB02A	15	200	Hollow shaft type
HB04A	16	400	Hollow shaft type
SC04A	21	400	
SC06A	22	600	
SC08A	23	800	
SC10A	24	1000	
SC03D	25	300	
SC05D	26	450	
SC06D	27	550	
SC07D	28	650	
SC01M	29		
SC02M	30		
SC03M	31		
SC04M	32		
HC06H	33	600	Exclusively for S/T
SC05A	34	450	Exclusively for S/S
SC05H	35	500	Exclusively for S/S
SC08A	36	750	Exclusively for S/S
HB01A	37	100	Hollow shaft type
HC10A	38	1000	Hollow shaft type
HE30A	39	3000	Hollow shaft type
HB03H	40	250	For semi-conductor only

Model	ID	Watt	Remark
SE09A	61	900	
SE15A	62	1500	
SE22A	63	2200	
SE30A	64	3000	
SE06D	65	600	
SE11D	66	1100	
SE16D	67	1600	
SE22D	68	2200	
SE03M	69	300	
SE06M	70	600	
SE09M	71	900	
SE12M	72	1200	
SE05G	73	450	
SE09G	74	850	
SE13G	75	1300	
SE17G	76	1700	
HE09A	77	900	Hollow shaft type
HE15A	78	1500	Hollow shaft type
SE11M	79	1050	Special type
SE07D	80	650	Special type
SF30A	81	3000	
SF50A	82	5000	
SF22D	85	3200	
SF35D	86	3500	
SF55D	87	5500	
SF75D	88	7500	
SF12M	89	1200	
SF20M	90	2000	
SF30M	91	3000	
SF44M	92	4400	
SF20G	93	1800	
SF30G	94	2900	
SF44G	95	4400	
SF60G	96	6000	
HC05H	99	500	For customers only

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Motor Models and ID(2)

[illegible][illegible]

4.6.4 Control Variable Setting Menu

Menus carrying “*” mark cannot be corrected when the servo is on.

MENU			UNIT	INI	Description
NO	CODE	NAME	MIN	MAX	
60	PE-301	Inertia Ratio	times	2.0	Set inertia ratio of load.
			1.0	500.0	
61	PE-302	Position P Gain1	1/s	50	Set position control proportional gain 1.
			0	500	
62	PE-303	Position P Gain2	1/s	50	Set position control proportional gain 2.
			0	500	
63	PE-304	P Feedforward	[%]	0	Set position feed forward control ratio.
			0	100	
64	PE-305	P FF FLT TC	msec	0	Set time constant of position feed forward control filter.
			0	10000	
65	PE-306	P CMD FLT TC	msec	0	Set time constant of position command filter.
			0	10000	
66	PE-307	Speed P Gain1	rad/s	By type of equipment	Set speed proportional gain 1. (APD-VPR5-04: 500, VP05-10: 300, VP15-50: 200)
			0	5000	
67	PE-308	Speed P Gain2	rad/s	By type of equipment	Set speed proportional gain 2.
			0	5000	
68	PE-309	Speed I TC1	msec	50	Set speed integration time constant 1.
			1	10000	
69	PE-310	Speed I TC2	msec	50	Set speed integration time constant 2.
			1	10000	
70	PE-311	Speed IN FLT	msec	0.0	Set speed command filter.
			0.0	100.0	
71	*PE-312	Speed FB FLT	msec	0.5	Set speed feedback filter.
			0.0	100.0	
72	PE-313	Zero Speed Gain	r/min	0.0	Set speed range of zero speed gain.
			0.0	100.0	
73	PE-314	Not Used	—	—	
			—	—	
74	PE-315	DE-RESONANCE	—	0	Set de-resonance operation. 0 : Not activated, 1: Activated
			0	1	
75	PE-316	Notch Frequency	Hz	300	Set de-resonance operating frequency.
			0	1000	
76	PE-317	Notch Bandwidth	—	100	Set de-resonance band width.
			0	1000	
77	PE-318	Over load offset	—	1.1	Set the feature of overload time (Do not change this Master setting menu)
			1.0	3.0	
78	PE-319	Not Used	—	—	
			—	—	
79	PE-320	Not Used	—	—	
			—	—	

* Communication code is used to designate the related menu at TOUCH or PC Communication

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4.6.5 I/O Variable Setting Menu

Menus carrying “*” mark cannot be corrected when the servo is on.

MENU			UNIT	INI	Description
NO	CODE	NAME	MIN	MAX	
80	*PE-401	Not Used	— —	— —	
81	PE-402	Not Used	— —	— —	
82	PE-403	Not Used	— —	— —	
83	PE-404	Not Used	— —	— —	
84	PE-405	Not Used	— —	— —	
85	PE-406	Not Used	— —	— —	
86	PE-407	Not Used	— —	— —	
87	PE-408	Not Used	— —	— —	
88	PE-409	Monitor Type1	— 0	1 10	Set type of monitor output 1.
89	PE-410	Monitor Mode1	— 0	0 1	Set mode of monitor output 1.
90	PE-411	Monitor Scale1	— 1.0	1.0 9999.0	Set scale of monitor output 1.
91	PE-412	Monitor Offset1	mV -100.00	0.00 100.00	Set offset of monitor output 1.
92	PE-413	Monitor Type2	— 0	1 10	Set type of monitor output 2.
93	PE-414	Monitor Mode2	— 0	0 1	Set mode of monitor output 2.
94	PE-415	Monitor Scale2	— 1.0	1.0 9999.0	Set scale of monitor output 2.
95	PE-416	Monitor Offset2	mV -100.00	0.00 100.00	Set offset of monitor output 2
96	PE-417	Monitor OutPos	— -99999	500 99999	Set coordinate value of analog output position at 5V.
97	PE-418	Pulse Out Rate	— 1	1 16	Set frequency dividing ratio of encoder output signal.
98	PE-419	Not Used	— —	— —	
99	PE-420	-PWM Off Delaying time -PWM Off Delay	msec 0	0 1000	PWM OFF Delaying time is set in case of Servo OFF

※ Communication code is used to designate the related menu at TOUCH or PC Communication

4.6.6 Common Operation Variable Setting Menu

Menus carrying “*” mark cannot be corrected when the servo is on.

MENU			UNIT	INI	Description
NO	CODE	NAME	MIN	MAX	
100	*PE-501	Not Used	— —	— —	
101	*PE-502	Not Used	— —	— —	
102	*PE-503	Not Used	— —	— —	
103	PE-504	Not Used	— —	— —	
104	PE-505	Brake SPD	r/min 0.0	50.0 9999.9	Set operating speed of built-in brake.
105	PE-506	Brake Time	msec 0	10 10000	Set opening delay time of built-in brake.
106	*PE-507	PowerFail Mode	— 0	By type of equipment 1	Set power failure mode. 0 : VP04 or less, 1 : VP05 or more
107	PE-508	DB Control	— 0	1 1	Set dynamo braking mode.
108	PE-509	ESTOP Reset	— 0	0 1	This function automatically resets alarm when contact ESTOP returns after activation. (0 : Manual reset, 1 : Automatic reset)
109	PE-510	Not Used	— —	— —	
110	PE-511	Not Used	— —	— —	
111	PE-512	Not Used	— —	— —	
112	PE-513	Not Used	— —	— —	
113	PE-514	Not Used	— —	— —	
114	PE-515	Not Used	— —	— —	
115	PE-516	Not Used	— —	— —	
116	*PE-517	Not Used	— —	— —	
117	PE-518	Not Used	— —	— —	
118	PE-519	Not Used	— —	— —	
119	PE-520	Not Used	— —	— —	

※ Communication code is used to designate the related menu at TOUCH or PC Communicati

II . Operating Software

4.6.7 Private Operation Variable Setting Menu

MENU			UNIT	INI	Description
NO	CODE	NAME	MIN	MAX	
120	*PE-601	Operation mode	— 0	0 0	Set operation mode (Perform origin operation in case of modification)
121	*PE-602	Move Motor	— 1	1 999999	Set system based on machine movement versus motor rpm.
122	*PE-603	Move Mechanical	— 1	1 999999	
123	*PE-604	Move Polarity	— 0	0 1	Set rotation direction of the motor. (0 : Coordinate increases in case of CCW run; 1 : Coordinate increases in case of CW run)
124	PE-605	InPOS Position	— 0	1 99999	Set the range of destination position
125	PE-606	Not Used	— —	— —	
126	PE-607	Not Used	— —	— —	
127	PE-608	Out Time	msec 0	0 10000	Set time of maintaining in-position output.
128	PE-609	Software Limit	— 0	0 1	Set limit operation On or Off based on position coordinates
129	PE-610	Upper Limit	— -99999	0 99999	Set upper limits of position coordinates.
130	PE-611	Lower Limit	— -99999	— 99999	Set lower limits of position coordinates.
131	PE-612	Speed Override1	% 1	25 99	Set overall operation speed ratio 1.
132	PE-613	Speed Override2	% 1	50 99	Set overall operation speed ratio 2.
133	PE-614	Speed Override3	% 1	75 99	Set overall operation speed ratio 3.
134	PE-615	Program Select mode	— 0	1 1	Set program selection mode. 0 : Communication (It is possible to edit program at PC) 1 : Contacts
135	PE-616	Program select	— 0	1 8	Select the number of program in case of inputting power supply. 0 : Selecting program with contacts 1~8 : Selecting program with parameter Selecting program with parameter is applied to the case that program selection mode[PE-615] is "1"
136 ~ 139	PE-617 ~ PE-620	Not Used	— — —	— — —	

※ Communication code is used to designate the related menu at TOUCH or PC Communication

4.6.8 Jog and Origin Run Variable Setting Menu

MENU			UNIT	INI	Description
NO	CODE	NAME	MIN	MAX	
140	PE-801	Jog Speed0	r/min	10.0	Set jog run speed 0.
			0.0	9999.9	
141	PE-802	Jog Speed1	r/min	500.0	Set jog run speed 1.
			0.0	9999.9	
142	PE-803	Jog AccDec Time	msec	100	Set jog acceleration/deceleration time.
			0	99999	
143	PE-804	Not Used	—	—	
			—	—	
144	PE-805	Not Used	—	—	
			—	—	
145	PE-806	Not Used	—	—	
			—	—	
146	PE-807	Home Speed	r/min	1000	Set home return speed.
			0.0	9999.9	
147	PE-808	Home AccDec Time	r/min	100	Set acceleration/deceleration time of home return speed.
			0	99999	
148	PE-809	Not Used	—	—	
			—	—	
149	PE-810	Origin Mode	—	1	Set origin run mode.
			0	4	
150	PE-811	Origin polarity	—	0	Set origin run direction.
			0	1	
151	PE-812	Origin Dog Stop	—	0	Set stop (1) or Z position operation 0 when dog sensor turns off during origin run.
			0	1	
152	PE-813	Origin Offset	—	0.0	Set offset position at which to stop after origin run.
			—9999.9	99999	
153	PE-814	Origin Position	—	0.0	Set initial coordinates after origin run.
			—9999.9	99999	
154	PE-815	Origin AutoRun	—	0	Set automatic origin run ON or OFF when servo is on.
			0	1	
155	PE-816	Origin Speed0	r/min	100.0	Set origin run speed 0.
			0.0	9999.9	
156	PE-817	Origin Speed1	r/min	10.0	Set origin run speed 1.
			0.0	9999.9	
157	PE-818	Origin Torque	[%]	50.0	Set torque during damper (Origin run mode 4) run.
			1.0	300.0	
158	PE-819	Not Used	—	—	
			—	—	
159	PE-820	Not Used	—	—	
			—	—	

※ Communication code is used to designate the related menu at TOUCH or PC Communicati

II . Operating Software

4.6.9 Operation Menu

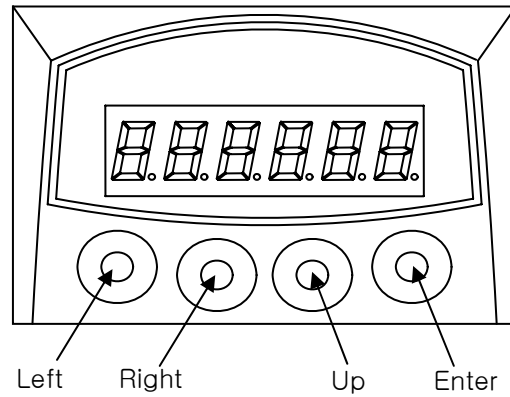
MENU			UNIT	INI	Description
NO	CODE	NAME	MIN	MAX	
160	PC-901	Alarm RESET	— 0	— 1	Reset alarm.
161	PC-902	Alarm HIS Clear	— 0	— 1	Clear alarm history.
162	PC-903	Jog Run	— -99999	— 99999	Manipulate jog run. (If UP key is hit after jog run, the current coordinates are stored in the position coordinate menu currently selected.)
163	PC-904	Origin Run	— 0	— 1	It is impossible to manipulate loader in origin operation (If you want to delete origin operation, you have to re-input power supply)
164	PC-905	Gain Tune Run	— 1.0	— 999.9	Gain is automatically adjusted.
165	PC-906	I/O Logic Set	— 0	— 1	Set logic of input contacts.
166	PC-907	Input Ext Set	— 0	— 1	Manipulate input contacts from outside.
167	PC-908	Menu Data Init	— 0	— 1	Initialize menu data.
168	PC-909	Menu Data Lock	— 0	— 1	Activate menu data lock.
169	PC-910	Current Offset	— -99.999	— 99.999	Set drive current feedback offset.
170	PC-911	Program Run	— -99999	0 99999	Test operation is performed for the selected program
171	PC-912	Not Used	— —	— —	
172	PC-913	Not Used	— —	— —	
173	PC-914	Not Used	— —	— —	
174	PC-915	Not Used	— —	— —	
175	PC-916	Not Used	— —	— —	
176	PC-917	Not Used	— —	— —	
177	PC-918	Not Used	— —	— —	
178	PC-919	Not Used	— —	— —	
179	PC-920	Maker's Private use	— 0	— 9999	Maker's Private use

※ Communication code is used to designate the related menu at TOUCH or PC Communicat

4.7 Detailed Description of Menu

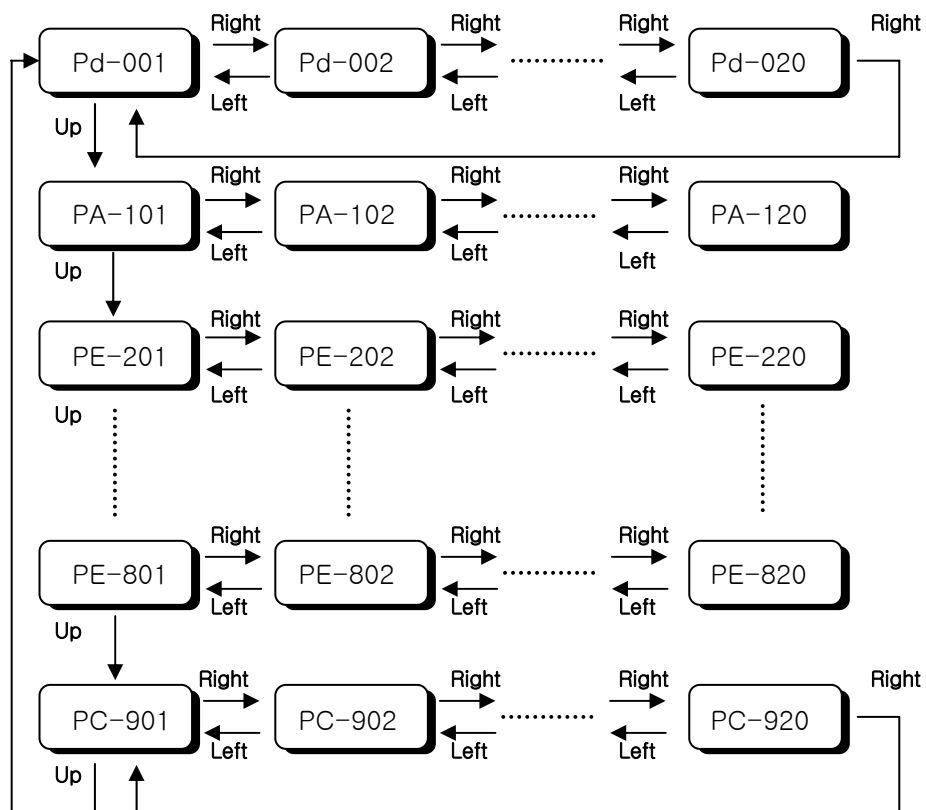
4.7.1 Loader Operation

1) Components



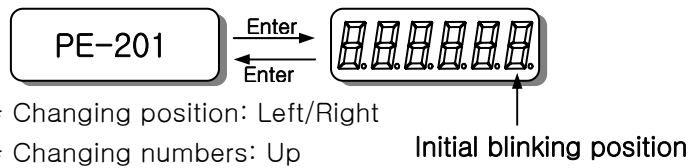
2) Components

① Menu movement



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② Menu editing



- Move to the menu to be edited referring to paragraph ①.
- Press Enter Key to display menu data. “ +9999.9 ”
The number on the far right starts blinking. The blinking number indicates editing position.
- Press Left or Right to move the figure of numbers to be edited. The blinking numbers move along accordingly.
- Press Up key to change numbers (the number increases). If the number is larger than “9”, it will change to “0”.
- Upon completion of editing, press Enter. The related data are saved, and the screen returns to menu number.

③ Menu editing error

- The following will appear when menu editing error occurs.

Display	Causes
notuSE	Menu which is not used or cannot be edited.
Err1	<ul style="list-style-type: none">– Menu that cannot be edited when servo is on.– Editing error of constant related to motor.– Numbers not carrying motor ID have been entered.– An attempt is made to edit detailed constant when the motor ID is not 0.
Err2	An attempt is made to set data outside the setting range.
Err3	Menu editing is locked. Menu editing lock should be released.

④ Special operation function

- If menu is used to set I/O status, each key carries independent function. For more details, refer to paragraph 5.7.7. “Operating commands.”
- Alarm manipulation menu
- I/O setting menu
- Jog run menu
- Gain tuning menu
- Origin run menu
- Current offset compensation menu
- Menu-related manipulation menu

4.7.2 Operating Mode Display

1) Mode display [Pd-001]

- ① Current operating mode is displayed.
 - * nor : Indicates normal operating mode
 - * AL-XX : Relevant code is displayed when an alarm occurs.
- ② When alarm is reset after the cause is removed, details of the menu corresponding to the menu number set in the initial mode screen [PE-209] are displayed.
- ③ If, however, the menu is moved to another menu at this time, the menu as is will be displayed.

2) Speed display

- ① The current operating speed [Pd-002] and the current command speed [Pd-003] are displayed in the unit of r/min.
- ② Range : “-99999” ~ “99999”

3) Position display

- ① The maximum range of current operation position [Pd-005] and current operation target position [Pd-006] ; “-99999” ~ “99999”

4) Torque and load display

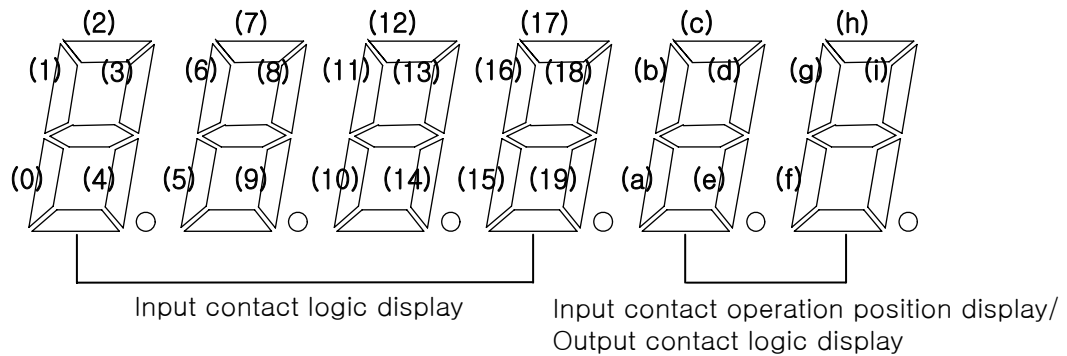
- ① Torque limit [Pd -010]

The output torque limit value is displayed in percentage of the rated torque.
- ② Current load rate [Pd -011]

The energy (load) produced by servo motor is displayed in percentage of the rated output.
- ③ Peak Instantaneous load rate [Pd -012]

The peak load value from the time the servo power supply is connected to the present is displayed in percentage of the rated output.

5) I/O Mode display



[Input contact : Upper]

(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
SVON	ATUO_ RUN	EMG	ALMRST	STEP_ RUN	HOLD	PRG_0	PRG_1	PRG_2	CCWLIM
(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
CWLIM	STOP	ORG/ HOME	DOGIN	P- JOG	N- JOG	SENS OR		SPD1	SPD2

[Output contact : Lower]

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)
BRK	ORG	RDY/AL M	STEP_ END	PROG_ END	RUN	OUT0	OUT1	OUT2

① CN1 I/O contact condition [Pd-014]

When the CN1 Connector contact turns on (contact shorted), the lamp operating in the relevant location will turn on; or the lamp will turn off when the connector contact turns off (contact open).

② Set conditions of input contacts A/B [Pd-015]

- Set conditions of contacts A and B among input contacts of CN1 connector are displayed.
- When contact A is set, the lamp in the relevant location will be turned off; when contact B is set, the lamp will be turned on.

③ I/O contact condition [Pd-016]

The I/O contact conditions, under which the servo drive is operated by the combination of paragraph ① and ② above, are displayed.

(The I/O contact conditions are recognized and displayed when Normal-A contact is ON and Normal-B contact is off.)

6) Displaying the state of exchanging information with external equipment (Communication-dedicated menu)

The mode data resulting from communications with upper controllers (touch-screen, PC, etc.) are displayed.

① Current state of input contact logic [Pd-017].

The current logic value of the input contact is displayed.

If power supply is turned off, this value will be erased.

② Storage state of the input contact logic [Pd-018].

The value saved by the current logic of the input contact is displayed.

The stored value will not be erased even if the power supply is turned off.

③ Alarm condition bit [Pd-019]

If an alarm occurs, the bit corresponding to the related alarm number is displayed.

7) Current progress display [Pd-009] (Maker's private menu)

Progress steps of the current system are displayed.

A number is displayed for each step.

Example : "0" for operation preparation, "1" for position operation, "2" for stop during dwell operation, "3" for stop ...

8) Software version display

P 5.01 — 3
 ↑ ↑ ↑
 Position Version Drive type
 operation number
 type

* The software model applicable to this manual is P.

Number	Drive Type
0	VPR5
1	VP01
2	VP02
3	VP04
4	VP05
5	VP10
6	VP15
7	VP20
8	VP35
9	VP50
A	VP75
b	VP110

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4.7.3 Setting System Variables

1) Setting motor constant

① Setting motor constant based on ID.

If the ID number is entered in the menu (PE-201), the motor constant is automatically set.

The ID numbers of motor are as follows.

Motor models and ID(1)

Model	ID	Watt	Remarks
SAR3A	1	30	
SAR5A	2	50	
SA01A	3	100	
SB01A	11	100	
SB02A	12	200	
SB04A	13	400	
SB03A	14	250	Special type
HB02A	15	200	Hollow shaft type
HB04A	16	400	Hollow shaft type
SC04A	21	400	
SC06A	22	600	
SC08A	23	800	
SC10A	24	1000	
SC03D	25	300	
SC05D	26	450	
SC06D	27	550	
SC07D	28	650	
SC01M	29		
SC02M	30		
SC03M	31		
SC04M	32		
HC06H	33	600	Exclusively for S/T
SC05A	34	450	Exclusively for S/S
SC05H	35	500	Exclusively for S/S
SC08A	36	750	Exclusively for S/S
HB01A	37	100	Hollow shaft type
HC10A	38	1000	Hollow shaft type
HE30A	39	3000	Hollow shaft type
HB03H	40	250	For semi-conductor only

Model	ID	Watt	Remarks
SE09A	61	900	
SE15A	62	1500	
SE22A	63	2200	
SE30A	64	3000	
SE06D	65	600	
SE11D	66	1100	
SE16D	67	1600	
SE22D	68	2200	
SE03M	69	300	
SE06M	70	600	
SE09M	71	900	
SE12M	72	1200	
SE05G	73	450	
SE09G	74	850	
SE13G	75	1300	
SE17G	76	1700	
HE09A	77	900	Hollow shaft type
HE15A	78	1500	Hollow shaft type
SE11M	79	1050	Special type
SE07D	80	650	Special type
SF30A	81	3000	
SF50A	82	5000	
SF22D	85	3200	
SF35D	86	3500	
SF55D	87	5500	
SF75D	88	7500	

Chapter 4: Program Operation Type

Motor models and ID(2)

Model	ID	Watt	Remarks
SF12M	89	1200	
SF20M	90	2000	
SF30M	91	3000	
SF44M	92	4400	
SF20G	93	1800	
SF30G	94	2900	
SF44G	95	4400	
SF60G	96	6000	
HC05H	99	500	Exclusively for Customer
SE35D	101	3500	Exclusively for DS
SE30D	102	3000	Special customized

Model	ID	Watt	Remarks
SG22D	111	2200	
SG35D	112	3500	
SG55D	113	5500	
SG75D	114	7500	
SG110D	115	11000	
SG12M	121	1200	
SG20M	122	2000	
SG30M	123	3000	
SG44M	124	4400	
SG60M	125	6000	
SG20G	131	1800	
SG30G	132	2900	
SG44G	133	4400	
SG60G	134	6000	
SG85G	135	8500	

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② Setting individual motor constant

Enter “0” in the motor ID menu [PE-201] to set motor constant individually. The following motor constants shall be set individually.

MENU			UNIT	INI	Description
NO	CODE	NAME	MIN	MAX	
40	PE-201	Motor ID	–	–	Set ID of applicable motor. When setting motor ID: [PE-210] – [PE-217] are automatically set.
			0	99	
49	PE-210	Inertia	gf·cm·s ²	ID	Set motor inertial moment. If ([PE-201] is entered as “0”, correction can be made.)
			0.01	999.99	
50	PE-211	Trq Con	kgf·cm/A	ID	Set motor torque constant. If ([PE-201] is entered as “0”, correction can be made.)
			0.01	999.99	
51	PE-212	Phase Ls	mH	ID	Set motor phase inductance. If ([PE-201] is entered as “0”, correction can be made.)
			0.001	99.999	
52	PE-213	Phase Rs	ohm	ID	Set motor phase resistance. If ([PE-201] is entered as “0”, correction can be made.)
			0.001	99.999	
53	PE-214	Rated Is	A	ID	Set motor rated current. If ([PE-201] is entered as “0”, correction can be made.)
			0.01	999.99	
54	PE-215	Max Speed	r/min	ID	Set motor maximum speed. If ([PE-201] is entered as “0”, correction can be made.)
			0.0	9999.9	
55	PE-216	Rated Speed	r/min	ID	Sets motor rated speed. If ([PE-201] is entered as “0”, correction can be made.)
			0.0	9999.9	
56	PE-217	Pole Number	–	8	Set number of motor poles. If ([PE-201] is entered as “0”, correction can be made.)
			2	98	

2) Setting encoder

– Encoder model [PE-203]

No.	Transmission Mode	Signal Mode	Signal Type	Remarks
0	Parallel	Phase A leads in case of forward running	A,B,Z,U,V,W	Standard
1	Parallel	Phase B leads in case of forward running	A,B,Z,U,V,W	
6	Serial	Absolute value 11/13 bit	A,B,Z,RX	

– Encoder pulse [PE-204]

This is set when the encoder uses signals A and B. The number of pulses per cycle for each signal is set.

The numbers of pulses for phases A and B are the same.

3) Setting torque limits

The limit value [PE-205] of the maximum torque during the forward running and the limit value [PE-206] of the maximum torque during backward running can be individually set. Torque limits can be set in percentages of the rated torque. The standard is 300[%].

4) Setting system ID

If the system communicates with a servo through the use of Bus communications, an ID may be assigned to the servo. In this case, an option is required in relation to communications.

– System ID [PE-207]

An ID is assigned to the servo and is used to individually communicate with the servo.

– System group ID [PE-208]

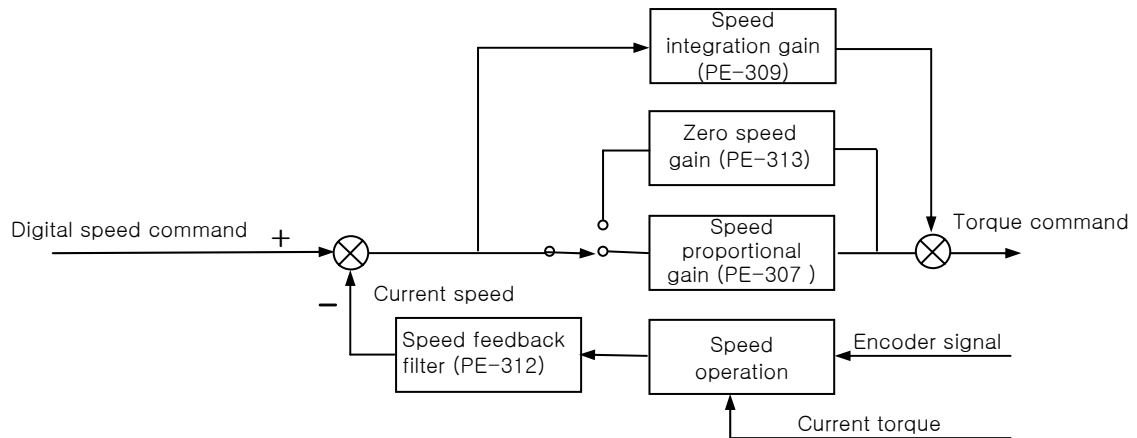
A group ID is set and used when multiple servos are consolidated into a group for communications.

5) Setting mode display when operation is started [PE-209]

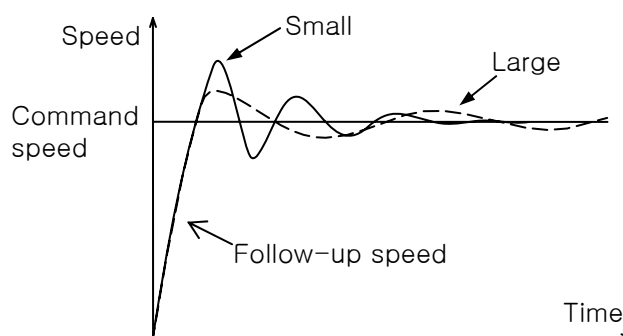
Menu that is used at initial period after the servo power supply is turned on can be set. The setting shall be classified into number 1 through 20 from [Pd-001] to [Pd-020] to set the relevant menu numbers.

4.7.4 Setting Control Variables

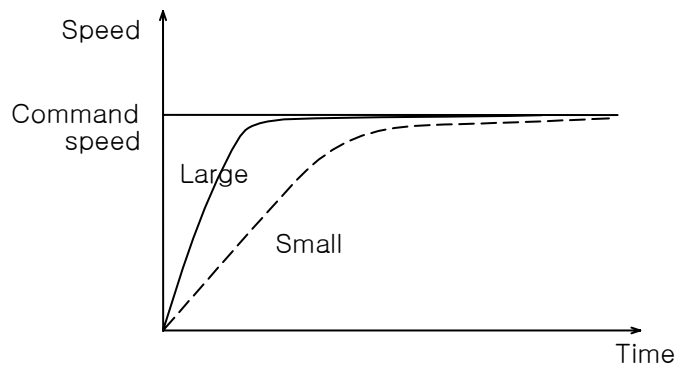
1) Speed control gain



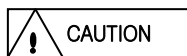
- ① Speed command: Digital speed command set by the internal menu in the unit of r/min is used.
- ② Current speed: The encoder signals are counted to calculate the speed, and the calculated speed is used as the current speed after going through the filter. In order to compensate for speed calculation error at an extremely low speed, an algorithm, which estimates speed through the use of the current torque and inertia, is used. Accordingly, setting accurate motor constant and the inertia ratio is closely linked with the stability of the motor speed control.
- ③ Speed integration gain [PE-309]: An integrated value of the difference (speed error) between command speed and current speed is obtained, and this value is multiplied by an integrated gain to be converted into a torque command. If the integrated gain is reduced, the excessive response characteristics are improved to enhance the speed follow-up. However, if the gain is too small, an overshoot occurs. On the other hand, if the gain is too large, the excessive response characteristics drop and operation is made based on proportional control characteristics.



- ④ Speed proportional gain [PE-307]: The speed error is multiplied by proportional gain to convert the error into torque command. If this value is large, the speed response becomes fast enhancing the speed follow-up. If this value is excessively large, vibration occurs. On the other hand, if this value is small, the speed response becomes slow and the follow-up effect drops, causing the servo to become weak.



- ⑤ Speed feedback filter [PE-312]: Motor may shake by the vibration of the drive system, or vibration may occur due to gain in case load with excessively large inertia is applied. Such vibration may be suppressed through the use of speed feedback filter. If the value is excessively large, the speed responsiveness may drop causing the deterioration of the control performance.
- ⑥ Zero speed gain [PE-313]: If a speed feedback filter is used to suppress vibration, the stationary vibration may cause the system to be unstable. If this happens, set the range of speed to which gain is applied, and vibration can be suppressed by adjusting gain within the established speed range.



The functions of the speed proportional gain 2 [PE-308] and the speed integration gain 2 [PE-310] are not supported by the current software version.

2) Setting inertia ratio [PE-301]

Load inertia is calculated for each mechanical system. The rotator's inertia ratio is calculated and set based on the motor characteristics table. Setting the inertia ratio of load is a very important control variable in the servo operation characteristics. Servo can be operated in an optimal condition only if the inertia ratio is accurately set.

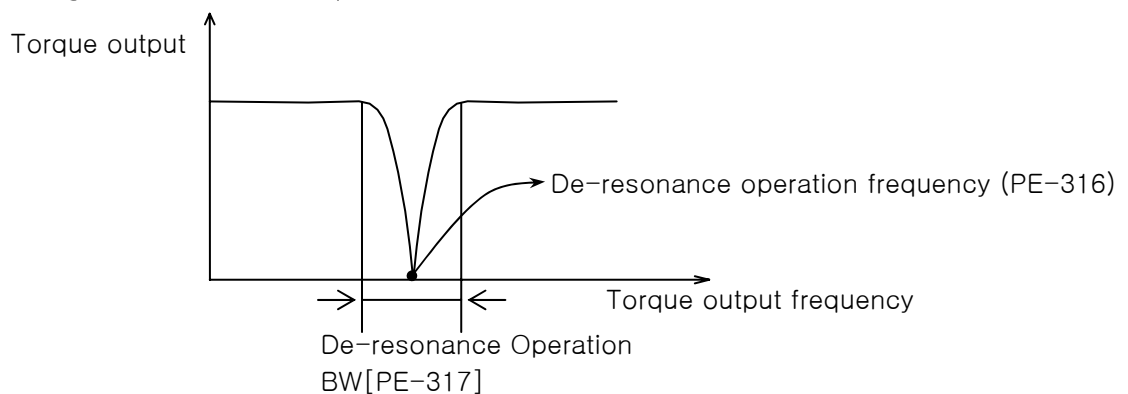
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- The following table shows recommended values of appropriate control gains for each load inertia ratio.

Motor Flange	Inertia Ratio		Range of Gain Setting		
	Classification	[Inertia]	Position proportional gain [Pgain 1,2]	Speed proportional gain [Sgain 1,2]	Speed integration gain [SITC]
40 ~ 80	Low inertia	1 ~ 5	40 ~ 60	500 ~ 800	20 ~ 40
	Medium inertia	5 ~ 20	20 ~ 40	300 ~ 500	40 ~ 60
	High inertia	20 ~ 50	10 ~ 20	100 ~ 300	60 ~ 100
100 ~ 130	Low inertia	1 ~ 3	40 ~ 60	200 ~ 400	20 ~ 40
	Medium inertia	3 ~ 10	20 ~ 40	100 ~ 200	40 ~ 80
	High inertia	10 ~ 20	10 ~ 20	50 ~ 100	80 ~ 150
180 ~ 220	Low inertia	1 ~ 2	30 ~ 60	150 ~ 250	30 ~ 50
	Medium inertia	2 ~ 4	15 ~ 30	75 ~ 150	50 ~ 100
	High inertia	4 ~ 10	5 ~ 15	20 ~ 75	100 ~ 200

* If it is difficult to calculate inertia ratio, the inertia ratio can be tuned during trial operation.

3) Setting de-resonance operation



- If vibration occurs due to mechanical resonance generated from certain frequencies, it may be suppressed by limiting torque output for the frequency band.
- De-resonance operation [PE-315]: This will not be activated if “0” is set, but will be activated if “1” is set.

4.7.5 Setting I/O Variables

1) Setting analog output

Two analog outputs are available. Values corresponding to the data can be output according to the set conditions at a cycle of 400 [msec] respectively.

① Analog output types [PE-409], [PE-413]

Model	Data	Model	Data
0	Command speed	4	Command position
1	Current speed	5	Current position
2	Command torque		
3	Current torque		

② Analog output modes [PE-410], [PE-414]

Mode	Output Mode
0	Output at -5[V] – +5[V]
1	Output at 0 – +5[V]

③ Analog output magnification [PE-411], [PE-415]. If output data is excessively small or large, the data may be appropriately magnified or reduced. The basic magnification for each output data is as follows :

Data Item	Magnification
Speed	Motor maximum speed [PE-215]
Torque	Motor maximum torque [PE-205]
Command pulse Frequency	500 [Kpps]
Position	Analog position output [PE-417] at 5[V].

④ Analog output offsets [PE-412], [PE-416].

Certain level of voltage may exist when “0” value is output due to problems in analog circuit. This voltage may be compensated by setting equivalent voltage as offset. The voltage unit shall be “mV”.

⑤ Analog position output [PE-417] at 5V. The position data are set at 5[V] if the analog position output is applied.

2) Encoder output pulse frequency dividing ratio [PE-418]

Encoder pulses may be produced after changing the pulses to the extent of the preset frequency-dividing ratio.

Example : From 3000 [pulse] with the frequency dividing ratio 2 →1500 [pulse]

- * The frequency-dividing ratio must be set so that the resulting frequency dividing output pulse comes to be an integer.

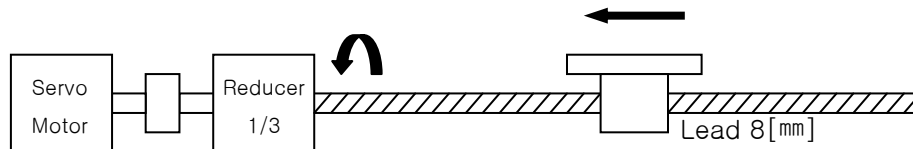
4.7.6 Setting Common Operation Variables

1) Setting operating mechanism

① Setting mechanism feed unit

Set motor revolution unit related to the mechanism feed unit based on the amount of mechanism feed [PE-602] versus the motor rpm [PE-603].

Example : If the reduction ratio is 1/3, and the ball screw lead is 8 [mm].



* Enter “3” for motor rpm [PE-602] and “8” for amount of mechanism feed [PE-603].

② Setting feed direction

Set the direction of feed [PE-604] at + position coordinates according to the mechanism assembly.

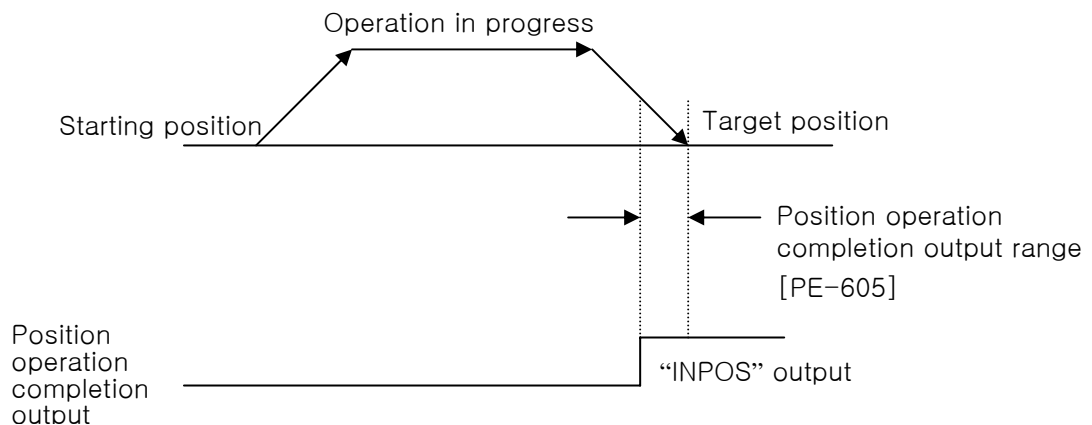
Code	+ Position Coordinates	– Position Coordinates
0	Forward rotation (CCW)	Forward rotation (CW)
1	Reverse rotation (CW)	Reverse rotation (CCW)

2) Setting position operation variables

① Position operation completion output range [PE-605]

Data are output within the set range when the target position is reached.

Setting is done in user units.



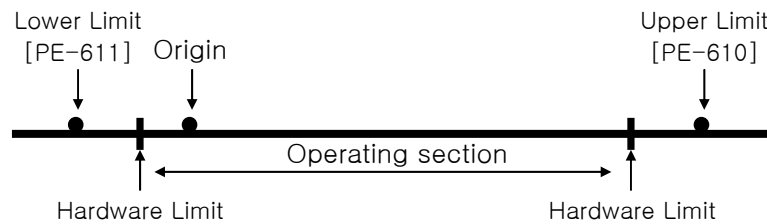
If the setting is too large, the positioning completion output signal may be produced during operation. Set an appropriate value to avoid this.

② Position operation completion output time [PE-608]

The position operation completion signal may be set to appear for a preset duration and disappear irrespective of position.

* If the setting is greater than “0”, the system operates; and if the setting is “0”, the system does not operate.

3) Setting Software Limit



If hardware limit cannot be used for safety purposes or due to the nature of mechanical structure, software limit may be set.

Unless origin run is carried out, the software limit cannot assume specific position. Configure the system so that origin run is always carried out prior to operation.

* If the software limit menu [PE-609] is set to “1”, limit is activated.

4) Dynamo braking [PE-508]

The dynamo braking can be set for drives from VPR5 to VP04.

“0”: The system runs free on or below zero speed range when servo is stopped by SVOFF.

“1”: The system always executes dynamo braking when servo is stopped by SVOFF.

4.7.7 Operating Command

1) Alarm reset [PC-901]

Reset alarm in case it occurs.

2) Alarm history clear [PC-902]

Clear the alarm history information currently in storage.

3) Loader jog run [PC-903]

- ① If Enter is pressed in menu [PC-903], the current position is displayed.
- ② If Left Key is pressed next, the system operates at N-JOG; and if Right Key is pressed, the system operates at P-JOG.
- ③ If Up key is pressed, the current position is saved in the position coordinate chosen by the input contact.
- ④ If Enter is pressed, menu screen appears and jog run stops.

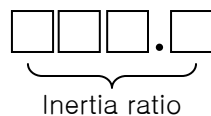
Note: Loader jog run moves at jog speed 0.

4) Loader origin run [PC-904]

If Enter is pressed in menu [PC-904], the origin run starts.

5) Automatic gain adjustment [PC-905]

If you press [Enter] key at [PC-905] menu, the following screen appears and you can perform automatic gain tuning :

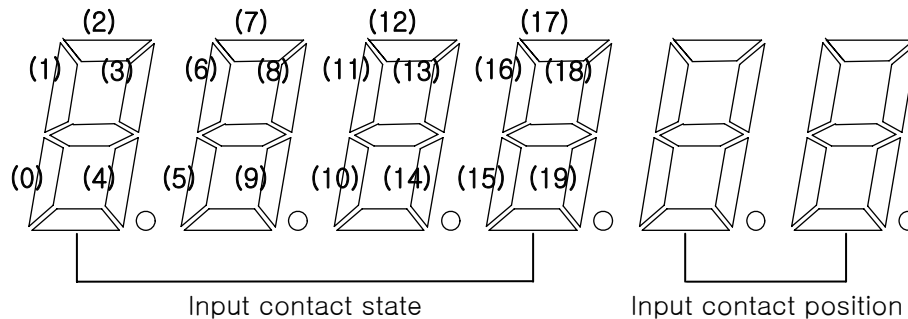


- ① The tuning range of inertia ratio is changed automatically
- ② If you press [Up] key, automatic gain tuning operation is started with 100 [r/min] of operating speed
- ③ If you keep pressing [Up] key, operating speed is increased by 200[r/min] ; 100→ 300 → 500[r/min]. The faster speed is, the faster tuning time is.
- ④ In case of pressing [Right] key, operating distance is increased and in case of pressing [Left] key, the distance is decreased
- ⑤ If the tuning value is not changed, it means the completion of tuning
- ⑥ If the tuned inertia ratio reaches “50”, adjust it by hand inquiring at R&D
- ⑦ If you press [Enter] key, the tuned gain is saved to [PE-301], [PE-307], [PE-309] automatically and is returned to the menu.

In case of operation / stop or forward–reverse operation at [PC-905] menu with

pressing [Enter key], inertia ratio is adjusted during operation.

6) Setting input contact logic [PC-906]



(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
SVON	AUTO_RUN	EMG	ALMR ST	STEP_END	HOLD	PRG_0	PRG_1	PRG_2	CCWLI M
(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
CWLIM	STOP	ORG/HOME	DOGIN	P-JOG	N-JOG	SENSOR		SPD1	SPD2

- Use Left/Right Key to increase/decrease the input contact position number.
- As for the contact logic, each time Up Key is pressed, the lamp of the segment corresponding to the current contact position number will be turned ON/OFF.

Segment	Contact Logic
ON	Contact B
OFF	Contact A

- If Enter is pressed after completion of setting, the contact logic is saved, and the screen returns to menu screen.

7) Forced setting of input contacts [PC-907]

- If Enter is pressed in menu [PC-907], the screen appears as in paragraph 6).
- Operation procedures are the same. When the segment turns on, the contact established here forcibly turns on related input contact irrespective of I/O.
- If Enter is pressed after completing forced setting of input contact, the relevant contact established here turns on and menu screen is restored.

Note 1 : The logic of input contact to be forcibly set must be contact A. Hence, the contact that has been set as contact B in paragraph 6) should be converted into contact A before being used.

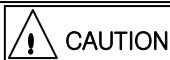
8) Menu data initialization [PC-908]

- Initialize the set menu data.
(In order to change into the initial value, re-input power supply after OFF)

9) Menu data lock [PC-909]

- Set prohibition of correcting menu data.
- Each time Enter is pressed, locking and unlocking are alternately repeated.

10) Saving current offset [PC-910]



CAUTION

- Compensate the electric current sensor's offset inside the servo drive. If compensation of the value is incorrect, the servo control becomes unstable.
- The offset value has been adjusted at the time of delivery. Do not make adjustment, if possible.
- If down load is executed to upgrade or change the servo drive software, offset must be set.

- Adjusting offset
 - (1) Turn the servo power on.
 - (2) Execute operation/stop or forward/backward operation at a slow speed for appropriately 10 seconds.
 - (3) Turn the servo power off, and then on again.
 - (4) Press Enter in menu [PC-910] to display the offset value.
 - (5) Press Up key to save the offset value.
 - (6) Repeat steps (2) through (5) (About five times).
 - (7) The saved and tuned U-phase offset values are displayed alternately each time Left key is pressed, or the saved and tuned W-phase offset values, each time Right key is pressed. If there is large difference between these two values, save the tuned value using the Up key.
 - (8) Press Enter key to return to menu screen.

4.8 Operation Data Variables

4.8.1 Data Variable Codes

Step numbers of the operation data variables are as follows:

Step1		Step2		Step100	
Data variable code	Menu	Data variable code	Menu	Data variable code	Menu
1000	Coordinate mode	1010	Coordinate mode	1990	Coordinate mode
1001	Operating Mode	1011	Operating Mode	1991	Operating Mode
1002	Operation data	1012	Operation data	1992	Operation data
1003	Operating speed	1013	Operating speed	1993	Operating speed
1004	Acceleration time	1014	Acceleration time	1994	Acceleration time
1005	Deceleration time	1015	Deceleration time	1995	Deceleration time
1006	End mode	1016	End mode	1996	End mode
1007	End range	1017	End range	1997	End range
1008	End time	1018	End time	1998	End time
1009	Output port	1019	Output port	1999	Output port

* Note : When setting data using communications, relevant numbers must be designated.

Refer to “Interface” section for details of communication protocol.