Ⅰ .Common Instructions

[Manual Version : 1.3]

Chapter 1

Product Configuration

1.1 Product Configuration

1.1.1 Checking Products..... 1-2
1.1.2 Identifying the Parts..... 1-4

1.1 Product Construction

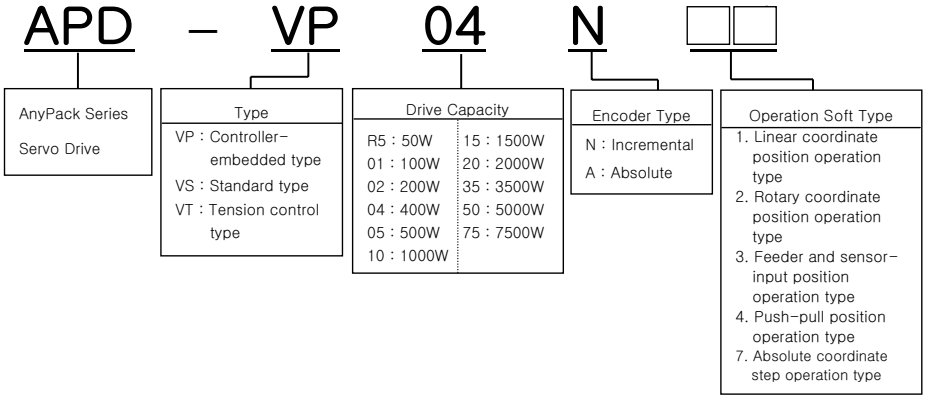
1.1.1 Checking Products

① Check if the products are the ones you ordered.
- Check the types marked in the nameplates of Servo Drive.
- Check the types marked in the nameplates of Servo Motor.

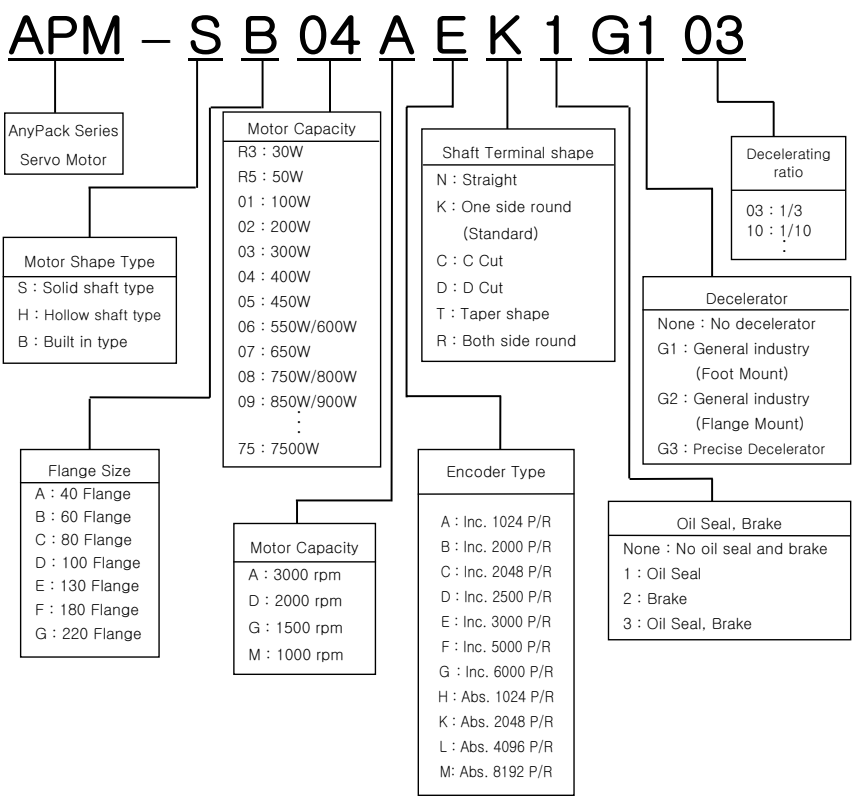
② Check product and option items.
- Check if the cable types and length are right.
- Check if the regenerative resistance is suitables for standard.
- Check if the motor shaft is fine.
- Check if the Oil Seal and Brake is fine.
- Check if the decelerator and decelerating ratio is fine.
- Check if the Encoder type is fine.

③ Check the external appearance.
- Check if there is any foreign material or moisture.
- Check if there is no fading, contamination, damage and disconnection.
- Check screws for looseness.
- Check if there is no noise or excessive friction at rotating.

■ Servo Drive Type Designation



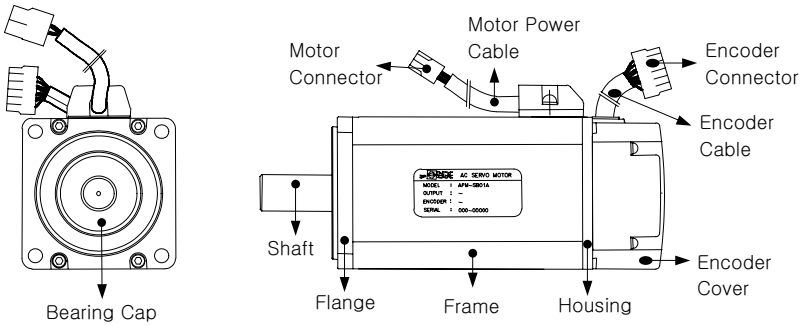
■ Servo Motor Product Type



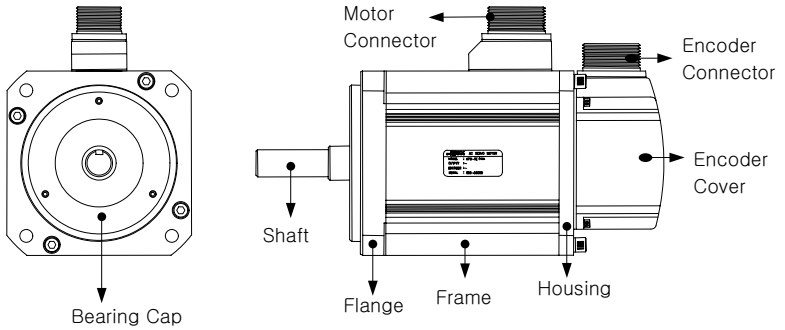
1.1.2 Identifying the Parts

■ Servo Motor

- Less than 80 Flanges

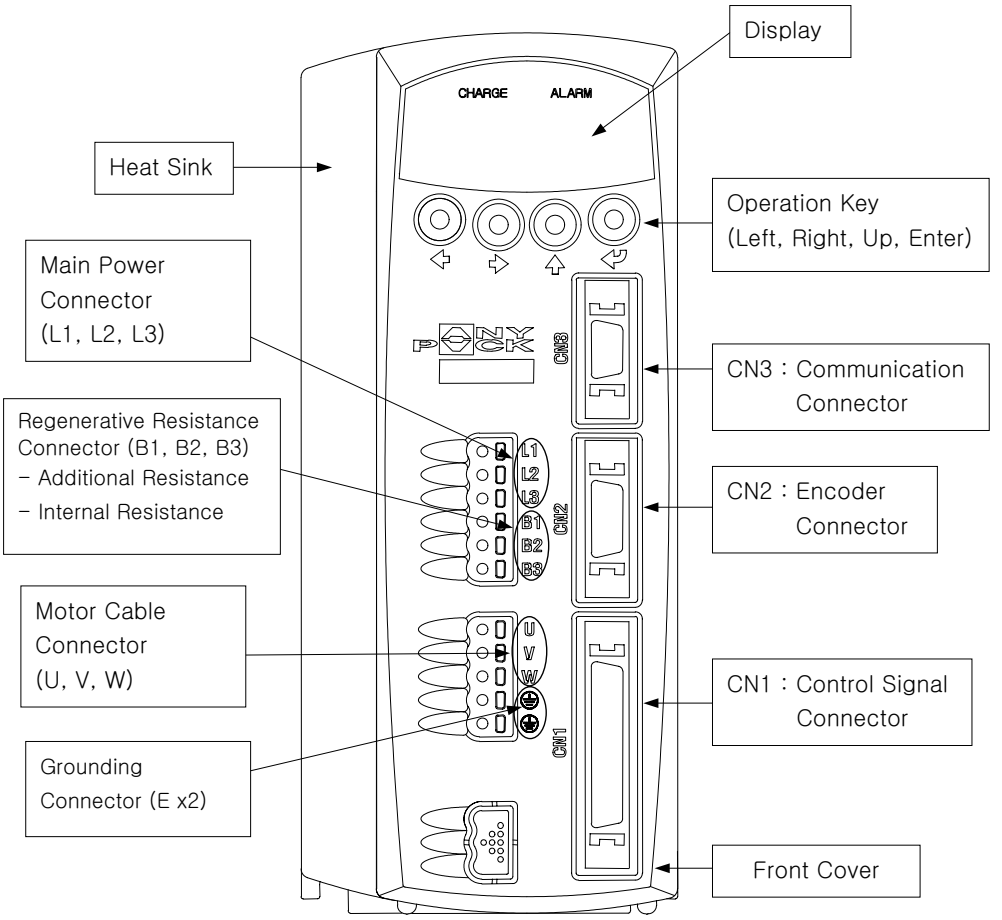


- More than 130 Flanges

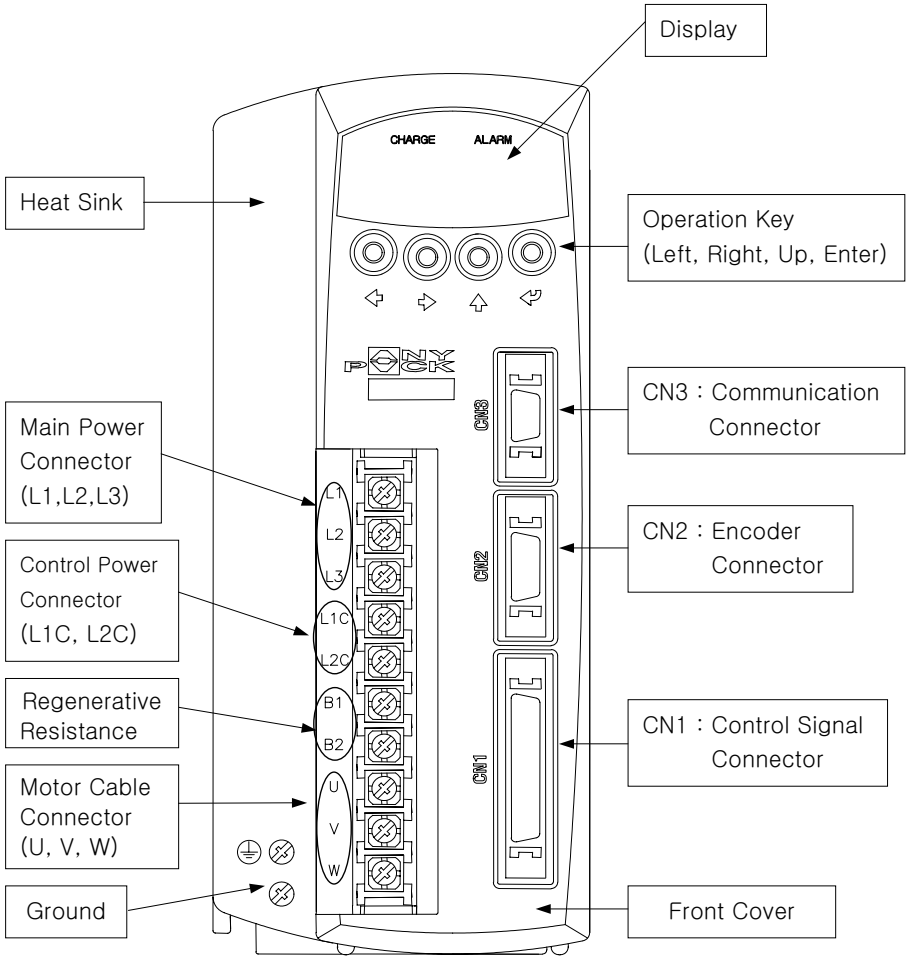


■ Servo Drive

- Small capacity (Less than APD-VP04)



- Medium/Large Capacity (More than APD-VP05)



Chapter 2

Product Specification

2.1 Servo Motor

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2.2 Servo Drive

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2.2.2 External Dimensions 2-17

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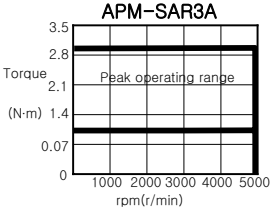
2.1 Servo Motor

2.1.1 Features

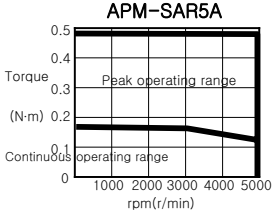
Servo Motor Model (APM-□□□□□)		SAR3A	SAR5A	SA01A	SB01A	SB02A	SB04A
Applicable drive (APD-□□□□)		VPR5		VP01		VP02	VP04
Rated Output	[W]	30	50	100	100	200	400
Rated Torque	[N·m]	0.095	0.159	0.318	0.318	0.637	1.274
	[kgf·cm]	0.97	1.62	3.25	3.25	6.50	13.0
Maximum Instantaneous Torque	[N·m]	0.286	0.477	0.955	0.955	1.912	3.822
	[kgf·cm]	2.92	4.87	9.74	9.74	19.5	39.0
Rated rpm	[r/min]	3,000					
Maximum rpm	[r/min]	5,000					
Inertia	[kg·m^{2}x10^{-4}]	0.011	0.021	0.045	0.114	0.182	0.321
	[gf·cm·s^2]	0.0112	0.0214	0.0459	0.116	0.186	0.327
Allowable load inertia ratio		30 times of motor inertia			20 times of motor inertia		
Rated power rate	[kW/s]	5.57	10.52	23.80	8.92	22.26	50.65
Speed/Position detector	Standard	Incremental 2,048[P/R]			Incremental 3,000[P/R]		
	Option	Absolute, 11/13 bit Manchester communication					
Specification & Features	Structure	Totally enclosed, no-ventilated IP55 (Excluding the shaft-through section and connectors)					
	Rated time	Continuous					
	Ambient temp.	0~+40°C					
	Ambient humidity	20~80% (Avoid freezing)					
	Atmosphere	Avoid direct sunlight, corrosive gas, inflammable gas, oil mist, or dust.					
	E/V	Elevation/Vibration 49[m/s^2](5G)					
Weight	[kg]	0.3	0.4	0.52	0.84	1.11	1.63

♦Speed-Torque Characteristics♦

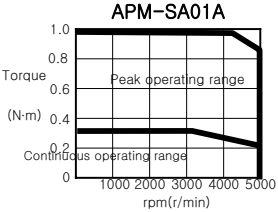
APM-SAR3A



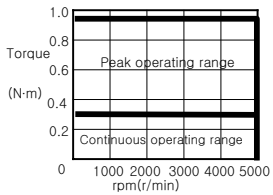
APM-SAR5A



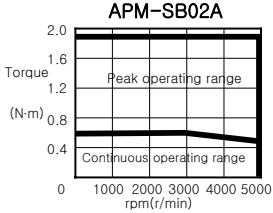
APM-SA01A



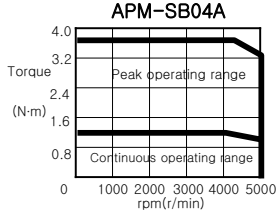
APM-SB01A



APM-SB02A



APM-SB04A

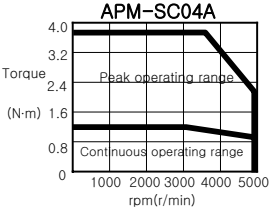


■ Product Features

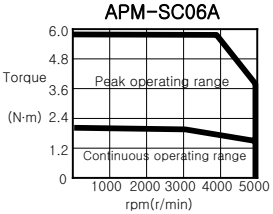
Servo Motor Model (APM-□□□□□)		SC04A	SC06A	SC08A	SC10A	SC03D	SC05D
Applicable drive (APD-□□□□)		VP04		VP05	VP10	VP04	
Rated Output	[kW]	0.4	0.6	0.8	1.0	0.3	0.45
Rated Torque	[N·m]	1.27	1.91	2.55	3.19	1.43	2.15
	[kgf·cm]	13.0	19.5	26.0	32.5	14.6	21.9
Maximum Instantaneous Torque	[N·m]	3.82	5.34	6.88	9.56	4.29	6.44
	[kgf·cm]	39.0	54.5	70.2	97.5	43.8	65.7
Rated rpm	[r/min]	3,000				2,000	
Maximum rpm	[r/min]	5,000				3,000	
Inertia	[kg·m^{2}x10^{-4}]	0.674	1.092	1.509	1.927	0.674	1.092
	[gf·cm·s^2]	0.687	1.114	1.539	1.966	0.687	1.114
Allowable load inertia ratio		15 times of motor inertia				15 times of motor inertia	
Rated power rate	[kW/s]	24.07	33.45	43.02	52.65	30.36	42.19
Speed/Position detector	Standard	Incremental 5[V] Line Drive 3,000[P/R]					
	Option	Absolute, 11/13 bit Manchester communication					
Specification & Features	Structure	Totally enclosed, no-ventilated IP65 (Excluding the shaft-though section and connectors)					
	Rated time	Continuous					
	Ambient temp.	0~+40°C					
	Ambient humidity	20~80% (Avoid freezing)					
	Atmosphere	Avoid direct sunlight, corrosive gas, inflammable gas, oil mist or dust.					
	E/V	Elevation/Vibration 49[49m/s^2] (5G)					
Weight	[kg]	1.85	2.49	3.15	3.80	1.85	2.49

♦Speed-Torque characteristics♦

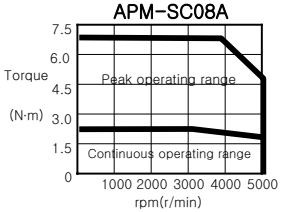
APM-SC04A



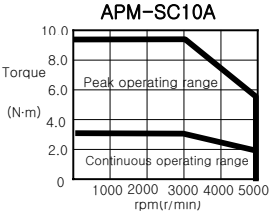
APM-SC06A



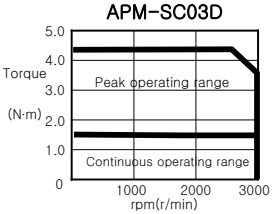
APM-SC08A



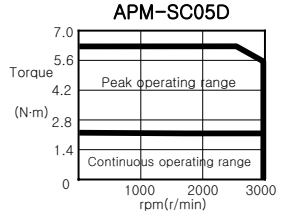
APM-SC10A



APM-SC03D



APM-SC05D

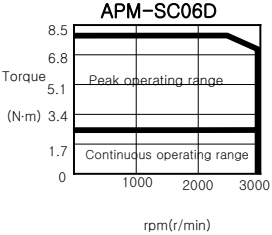


■ Product Features

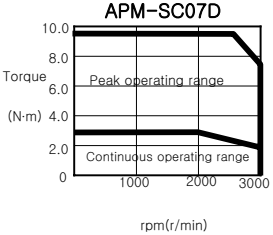
Servo Motor Model (APM-□□□□□)		SC06D	SC07D	SE09A	SE15A	SE22A	SE30A
Applicable drive (APD-□□□□)		VP05		VP10	VP15	VP20	VP35
Rated Output	[kW]	0.55	0.65	0.9	1.5	2.2	3.0
Rated Torque	[N·m]	2.63	3.09	2.86	4.77	7.0	9.55
	[kgf·cm]	26.8	31.6	29.2	48.7	71.4	97.4
Maximum Instantaneous Torque	[N·m]	7.88	9.29	8.59	14.32	21.01	28.65
	[kgf·cm]	80.4	94.8	87.7	146.1	214.3	292.2
Rated rpm	[r/min]	2,000		3,000			
Maximum rpm	[r/min]	3,000		5,000			
Inertia	[kg·m^{2}x10^{-4}]	1.509	1.927	6.659	11.999	17.339	22.679
	[gf·cm·s^2]	1.539	1.966	6.792	12.238	17.685	23.132
Allowable load inertia ratio		15 times of motor inertia		10 times of motor inertia			
Rated power rate	[kW/s]	43.68	47.90	12.31	18.98	28.25	40.17
Speed/Position detector	Standard	Incremental 5[V] Line Drive 3,000[P/R]					
	Option	Absolute, 11/13 bit Manchester communication					
Specification & Features	Structure	Totally enclosed, no-ventilated IP65 (Excluding the shaft-though section and connectors)					
	Rated time	Continuous					
	Ambient temp.	0~+40°C					
	Ambient humidity	20~80% (Avoid Freezing)					
	Atmosphere	Avoid direct sunlight, corrosive gas, inflammable gas, oil mist or dust.					
	E/V	Elevation / Vibration 49[m/s^2] (5G)					
Weight	[kg]	3.15	3.80	5.6	7.2	8.7	10.2

♦Speed – Torque characteristics♦

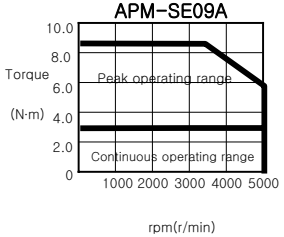
APM-SC06D



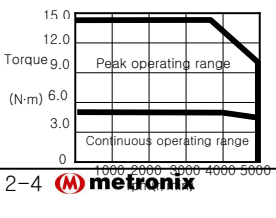
APM-SC07D



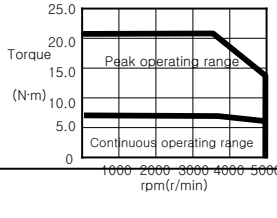
APM-SE09A



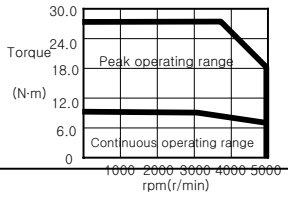
APM-SE15A



APM-SE22A



APM-SE30A

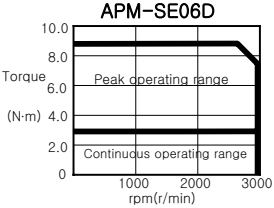


■ Product Features

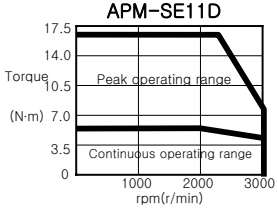
Servo Motor Model (APM-□□□□□)		SE06D	SE11D	SE16D	SE22D	SE03M	SE06M
Applicable drive (APD-□□□□)		VP05	VP10	VP15	VP20	VP04	VP05
Rated Output	[kW]	0.6	1.1	1.6	2.2	0.3	0.6
Rated Torque	[N·m]	2.86	5.25	7.63	10.5	2.86	5.72
	[kgf·cm]	29.2	53.6	77.9	107.1	29.2	58.4
Maximum Instantaneous Torque	[N·m]	8.59	15.75	22.92	31.51	8.59	17.18
	[kgf·cm]	87.7	160.7	233.8	321.4	87.7	175.3
Rated rpm	[r/min]	2,000				1,000	
Maximum rpm	[r/min]	3,000				2,000	
Inertia	[kg·m^{2}x10^{-4}]	6.659	11.999	17.339	22.679	6.659	11.999
	[gf·cm·s^2]	6.792	12.238	17.685	23.132	6.792	12.238
Allowable load inertia ratio		10 times of motor inertia				10 times of motor inertia	
Rated power rate	[kW/s]	12.31	22.97	33.63	48.61	12.31	27.34
Speed/Position detector	Standard	Incremental 5[V] Line Drive 3,000[P/R]					
	Option	Absolute, 11/13 bit Manchester communication					
Specification & Features	Structure	Totally enclosed, no-ventilated IP55 (Excluding the shaft-through section and connectors)					
	Rated time	Continuous					
	Ambient temp.	0~+40°C					
	Ambient humidity	20~80% (Avoid freezing)					
	Atmosphere	Avoid direct sunlight, corrosive gas, inflammable gas, oil mist or dust					
	E/V	Elevation/Vibration 49[m/s^2] (5G)					
Weight	[kg]	5.6	7.2	8.7	10.2	5.6	7.2

♦Speed-Torque characteristics♦

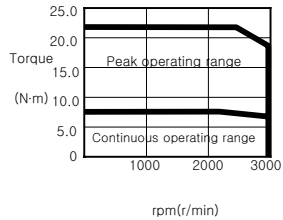
APM-SE06D



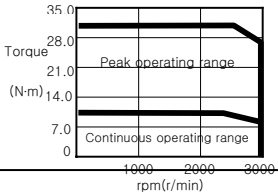
APM-SE11D



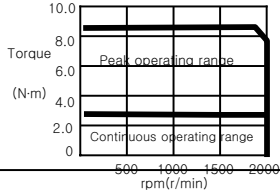
APM-SE16D



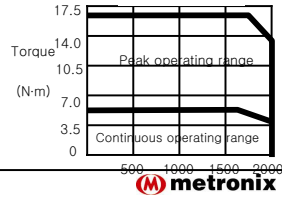
APM-SE22D



APM-SE03M



APM-SE06M

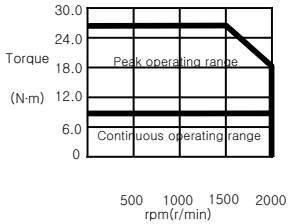


■ Product Features

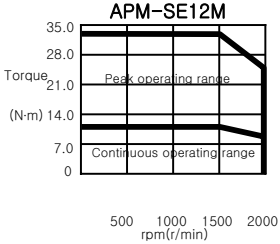
Servo Motor Model (APM-□□□□□)		SE09M	SE12M	SF30A	SF50A	SF22D	SF35D
Applicable drive (APD-□□□□)		VP10	VP15	VP35	VP50	VP20	VP35
Rated Output	[kW]	0.9	1.2	3.0	5.0	2.2	3.5
Rated Torque	[N·m]	8.59	11.46	9.55	15.91	10.5	16.7
	[kgf·cm]	87.7	116.9	97.4	162.3	107.1	170.4
Maximum Instantaneous Torque	[N·m]	25.77	34.22	28.64	47.74	31.5	50.12
	[kgf·cm]	262.9	349.1	292.2	487.0	321.3	511.3
Rated rpm	[r/min]	1,000		3,000		2,000	
Maximum rpm	[r/min]	2,000		5,000		3,000	
Inertia	[kg·m^{2}x10^{-4}]	17.339	22.679	30.74	52.13	30.74	52.13
	[gf·cm·s^2]	17.685	23.132	31.35	53.16	31.35	53.16
Allowable load inertia ratio		10 times of motor inertia		5 times of motor inertia		5 times of motor inertia	
Rated power rate	[kW/s]	42.56	57.85	29.66	48.56	35.88	53.56
Speed/Position detector	Standard	Incremental 5[V] Line Drive 3,000[P/R]					
	Option	Absolute, 11/13 bit Manchester communication					
Specification & Features	Structure	Totally enclosed, no-ventilated IP65 (Excluding the shaft-through section and connectors)					
	Rated time	Continuous					
	Ambient temp.	0~+40°C					
	Ambient humidity	20~80% (Avoid freezing)					
	Atmosphere	Avoid direct sunlight, corrosive gas, inflammable gas, oil mist or dust					
	E/V	Elevation/Vibration 49[m/s^2] (5G)					
Weight	[kg]	8.7	10.2	12.4	17.7	12.4	17.7

♦Speed-Torque characteristics♦

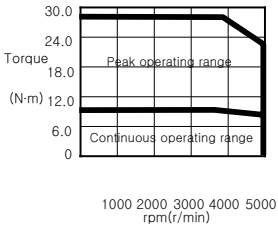
APM-SE09M



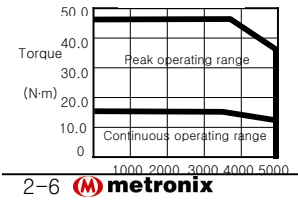
APM-SE12M



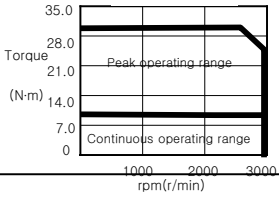
APM-SF30A



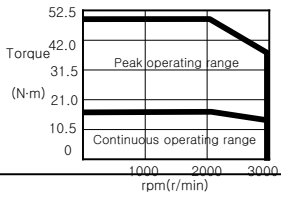
APM-SF50A



APM-SF22D



APM-SF35D

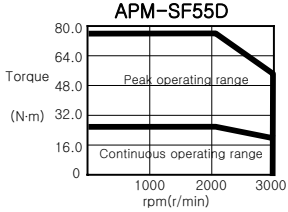


■ Product Features

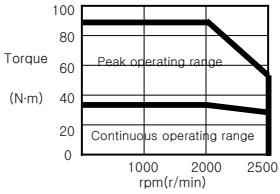
Servo Motor Model (APM-□□□□□)		SF55D	SF75D	SF12M	SF20M	SF30M	SF44M
Applicable drive (APD-□□□□)		VP50	VP75	VP15	VP20	VP35	VP50
Rated Output	[kW]	5.5	7.5	1.2	2.0	3.0	4.4
Rated Torque	[N·m]	26.25	35.81	11.46	19.09	28.64	42.02
	[kgf·cm]	267.8	365.41	116.9	194.8	292.2	428.7
Maximum Instantaneous Torque	[N·m]	78.76	89.53	34.38	57.29	85.94	126.05
	[kgf·cm]	803.4	913.53	350.7	584.4	876.6	1286.2
Rated rpm	[r/min]	2,000		1,000			
Maximum rpm	[r/min]	3,000	2500	2,000			
Inertia	[kg·m^{2}x10^{-4}]	83.60	121.35	30.74	52.13	83.60	121.35
	[gf·cm·s^2]	85.24	123.74	31.35	53.16	85.24	123.74
Allowable load inertia ratio		5 times of motor inertia		5 times of motor inertia			
Rated power rate	[kW/s]	82.56	105.75	42.70	69.96	98.16	145.55
Speed/Position detector	Standard	Incremental 5[V] Line Drive 3,000[P/R]					
	Option	Absolute, 11/13 bit Manchester communication					
Specification & Features	Structure	Totally enclosed, no-ventilated IP65 (Excluding the shaft-through section and connectors)					
	Rated time	Continuous					
	Ambient temp.	0~+40°C					
	Ambient humidity	20~80% (Avoid freezing)					
	Atmosphere	Avoid direct sunlight, corrosive gas, inflammable gas, oil mist or dust.					
	E/V	Elevation/Vibration 49[m/s^2] (5G)					
Weight	[kg]	26.3	35.6	12.4	17.7	26.3	35.6

♦ Speed-Torque characteristics ♦

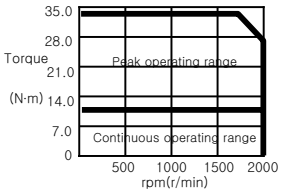
APM-SF55D



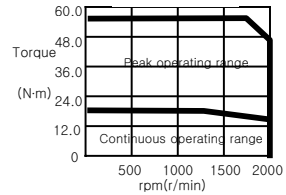
APM-SF75D



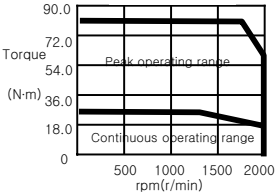
APM-SF12M



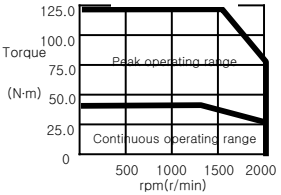
APM-SF20M



APM-SF30M



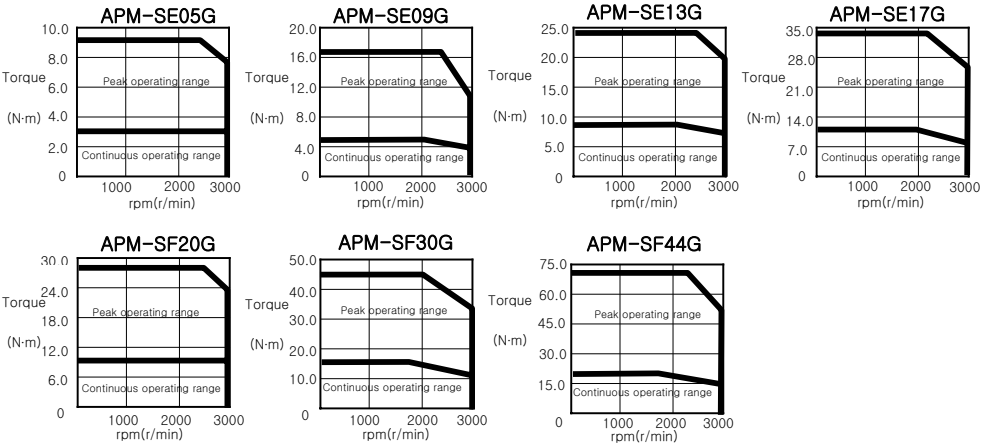
APM-SF44M



■ Product Features

Servo Motor Model (APM-□□□□□)		SE05G	SE09G	SE13G	SE17G	SF20G	SF30G	SF44G
Applicable drive (APD-□□□□)		VP05	VP10	VP15	VP20		VP35	VP50
Rated Output	[kW]	0.45	0.85	1.3	1.7	1.8	2.9	4.4
Rated Torque	[N·m]	2.86	5.41	8.27	10.82	11.45	18.46	28.0
	[kgf·cm]	29.22	55.19	84.41	110.38	116.88	188.3	285.7
Maximum Instantaneous Torque	[N·m]	8.59	16.23	24.82	32.46	34.37	55.38	84.03
	[kgf·cm]	87.66	165.57	253.23	331.14	350.6	564.9	857.1
Rated rpm	[r/min]	1,500						
Maximum rpm	[r/min]	3,000						
Inertia	[kg·m^{2}x10^{-4}]	6.659	11.999	17.339	22.679	30.74	52.13	83.60
	[gf·cm·s^2]	6.792	12.238	17.685	23.132	31.35	53.16	85.24
Allowable load inertia ratio		10 times of motor inertia				5 times of motor inertia		
Rated power rate	[kW/s]	12.28	24.39	39.54	51.61	42.70	65.36	93.84
Speed/Position detector	Standard	Incremental 5[V] Line Drive 3,000[P/R]						
	Option	Absolute, 11/13 bit Manchester communication						
Specification & Features	Structure	Totally enclosed, no-ventilated IP65 (Excluding the shaft-through section and connectors)						
	Rated time	Continuous						
	Ambient temp.	0~+40°C						
	Ambient humidity	20~80% (Avoid freezing)						
	Atmosphere	Avoid direct sunlight, corrosive gas, inflammable gas, oil mist or dust.						
	E/V	Elevation/Vibration 49[m/s^2] (5G)						
Weight	[kg]	5.6	7.2	8.7	10.2	12.4	17.7	26.3

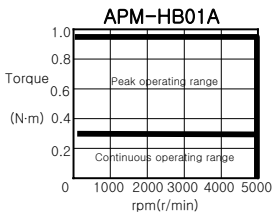
♦Speed-Torque characteristics ♦

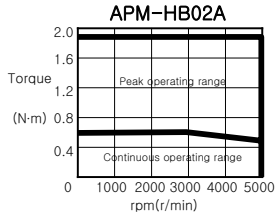


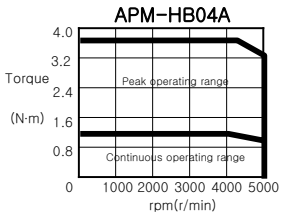
■ Product Features

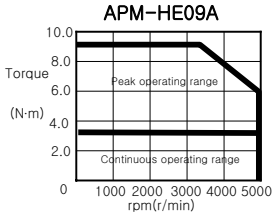
Servo Motor Model (APM-□□□□□)		HB01A	HB02A	HB04A	HE09A	HB15A
Applicable drive (APD-□□□□)		VP01	VP02	VP04	VP10	VP15
Rated Output	[kW]	0.1	0.2	0.4	0.9	1.5
Rated Torque	[N·m]	0.318	0.637	1.274	2.86	4.77
	[kgf·cm]	3.25	6.50	13.0	29.2	48.7
Maximum Instantaneous Torque	[N·m]	0.955	1.912	3.822	8.59	14.32
	[kgf·cm]	9.74	19.5	39.0	87.7	146.1
Rated rpm	[r/min]	3,000			3,000	
Maximum rpm	[r/min]	5,000			5,000	
Inertia	[kg·m^{2}x10^{-4}]	0.269	0.333	0.461	19.558	22.268
	[gf·cm·s^2]	0.274	0.339	0.470	19.943	22.707
Allowable load inertia ratio		20 times of motor inertia			10 times of motor inertia	
Rated power rate	[kW/s]	3.34	11.98	34.47	4.10	10.01
Speed/Position detector		Incremental 5[V] Line Drive 1,024[P/R]			2,048[P/R]	
Specification & Features	Structure	Totally enclosed, no-ventilated IP55 (Excluding the shaft-through section and connectors)				
	Rated time	Continuous				
	Ambient temp.	0~+40°C				
	Ambient humidity	20~80% (Avoid freezing)				
	Atmosphere	Avoid direct sunlight, corrosive gas, inflammable gas, oil mist or dust.				
	E/V	Elevation/Vibration 49[m/s^2] (5G)				
Weight	[kg]	0.89	1.16	1.69	5.82	7.43

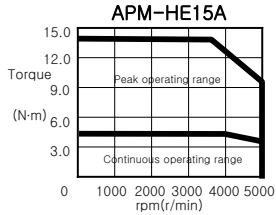
♦ Speed-Torque characteristics ♦





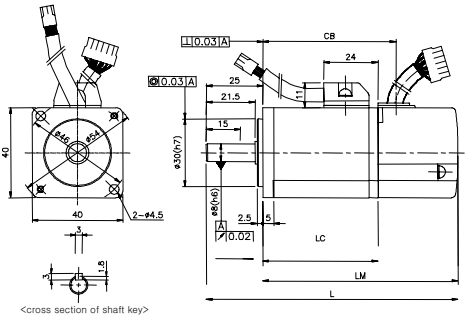






2.1.2 External Dimensions

♦ APM-SAR3A (Standard type), APM-SAR5A (Standard type), APM-SA01A (Standard type)



<cross section of shaft key>

Pin No	Color	Phase
1	Red	U
2	White	V
3	Black	W
4	Green	Ground

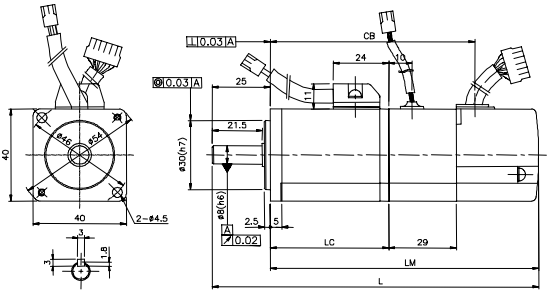
<Connector Pin for Power Supply>

Pin No	Phase	Pin No	Phase
1	A	9	V
2	A	10	V
3	B	11	W
4	B	12	W
5	Z	13	DC+5V
6	Z	14	OV
7	U	15	SHIELD
8	U		

<Encoder Connector Pin>

Model	External Dimensions				Weight (kg)
	L	LM	LC	CB	
SAR3A	104.5	79.5	44	52	0.3
SAR5A	111.5	86.5	51	59	0.4
SA01A	128.5	103.5	68	76	0.52

♦ APM-SAR3A (Brake-attached type), APM-SAR5A (Brake-attached type)
APM-SA01A (Brake-attached type)



Cross section of shaft key

Pin No	Color	Phase
1	Red	U
2	White	V
3	Black	W
4	Green	Ground

<Connector Pin for Power Supply>

Pin No	Color	Phase
1	Red	+
2	White	-

<Brake Connector Pin >

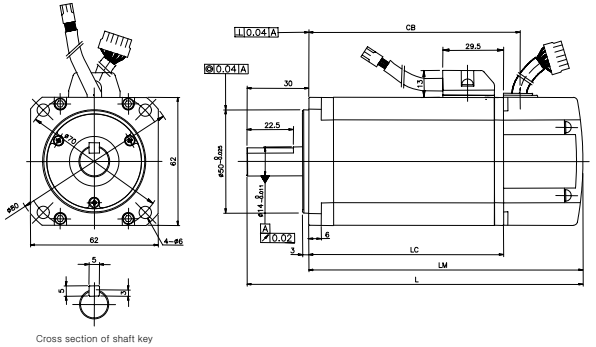
Pin No	Phase	Pin No	Phase
1	A	9	V
2	A	10	V
3	B	11	W
4	B	12	W
5	Z	13	DC+5V
6	Z	14	OV
7	U	15	SHIELD
8	U		

<Encoder Connector Pin>

Model	External Dimensions				Weight (kg)
	L	LM	LC	CB	
SAR3A	133.5	108.5	44	81	0.65
SAR5A	140.5	115.5	51	88	0.75
SA01A	157.5	132.5	68	105	0.87

Note) Use DC24[V] for brake input power supply.

♦ APM-SB01A (Standard type), APM-SB02A (Standard type), APM-SB04A (Standard type)



Plug:172167-1 (AMP)

Pin No	Color	Phase
1	Red	U
2	White	V
3	Black	W
4	Green	Ground

<Connector Pin for Power Supply>

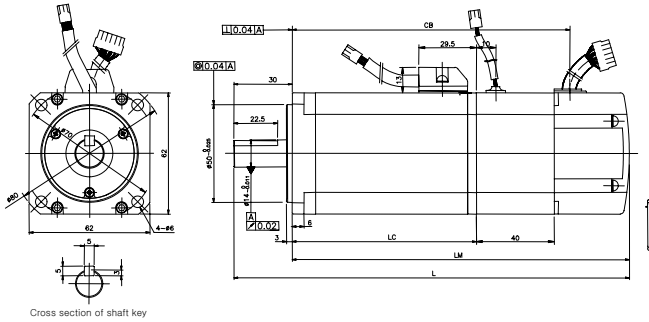
Plug:172171-1 (AMP)

Pin No	Phase	Pin No	Phase
1	A	9	V
2	A	10	V
3	B	11	W
4	B	12	W
5	Z	13	DC+5V
6	Z	14	OV
7	U	15	SHIELD
8	U		

<Encoder Connector Pin>

Model	External Dimensions				Weight (kg)
	L	LM	LC	CB	
SB01A	120.5	90.5	52.5	60.5	0.84
SB02A	134.5	104.5	66.5	74.5	1.11
SB04A	162.5	132.5	94.5	102.5	1.64

♦ APM-SB01A (Brake-attached type), APM-SB02A (Brake-attached type)
APM-SB04A (Brake-attached type)



Plug:172167-1 (AMP)

Pin No	Color	Phase
1	Red	U
2	White	V
3	Black	W
4	Green	Ground

<Connector Pin for Power Supply>

Plug:172165-1 (AMP)

Pin No	Color	Phase
1	Red	+
2	White	–

<Brake Connector Pin >

Plug:172171-1 (AMP)

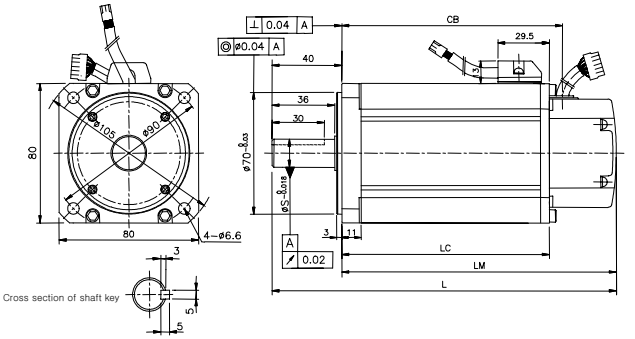
Pin No	Phase	Pin No	Phase
1	A	9	V
2	A	10	V
3	B	11	W
4	B	12	W
5	Z	13	DC+5V
6	Z	14	OV
7	U	15	SHIELD
8	U		

<Encoder Connector Pin>

Model	External Dimensions				Weight (kg)
	L	LM	LC	CB	
SB01A	160.5	130.5	52.5	100.5	1.21
SB02A	174.5	144.5	66.5	114.5	1.49
SB04A	202.5	172.5	94.5	142.5	2.05

Note) Use DC24[V] for brake input power supply.

♦ APM-SC04A, SC03D (Standard type), APM-SC06A, SC05D (Standard type)
APM-SC08A, SC06D (Standard type), APM-SC10A, SC07D (Standard type)



Plug:172167-1 (AMP)

Pin No	Color	Phase
1	Red	U
2	White	V
3	Black	W
4	Green	Ground

<Connector Pin for Power Supply>

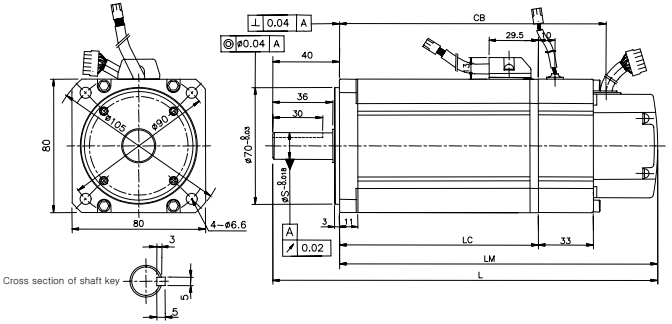
Plug:172171-1 (AMP)

Pin No	Phase	Pin No	Phase
1	A	9	V
2	A	10	V
3	B	11	W
4	B	12	W
5	Z	13	DC+5V
6	Z	14	OV
7	U	15	SHIELD
8	U		

<Encoder Connector Pin>

Model	External Dimensions					Weight (kg)
	L	LM	LC	CB	S	
SC04A,SC03D	158	118	79	86.5	14	1.85
SC06A,SC05D	178	138	99	106.5	16	2.49
SC08A,SC06D	198	158	119	126.5	16	3.15
SC10A,SC07D	218	178	139	146.5	16	3.80

♦ APM-SC04A, SC03D (Brake-attached type), APM-SC06A, SC05D (Brake-attached type)
APM-SC08A, SC06D (Brake-attached type), APM-SC10A, SC07D (Brake-attached type)



Plug:172167-1 (AMP)

Pin No	Color	Phase
1	Red	U
2	White	V
3	Black	W
4	Green	Ground

<Connector Pin for Power Supply>

Plug:172165-1 (AMP)

Pin No	Color	Phase
1	Red	+
2	White	-

<Brake Connector Pin >

Plug:172171-1 (AMP)

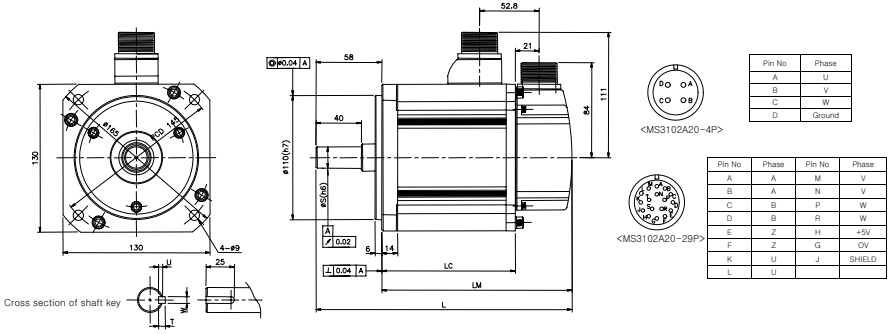
Pin No	Phase	Pin No	Phase
1	A	9	V
2	A	10	V
3	B	11	W
4	B	12	W
5	Z	13	DC+5V
6	Z	14	OV
7	U	15	SHIELD
8	U		

<Encoder Connector Pin>

Model	External Dimensions					Weight (kg)
	L	LM	LC	CB	S	
SC04A,SC03D	191	151	79	119.5	14	2.45
SC06A,SC05D	211	171	99	139.5	16	3.09
SC08A,SC06D	231	191	119	159.5	16	3.75
SC10A,SC07D	251	211	139	179.5	16	4.40

Note) Use DC 24[V] for brake input power supply.

♦ APM-SE09A, SE06D, SE05G, SE03M (Standard type), APM-SE15A, SE11D, SE09G, SE06M (Standard type)
APM-SE22A, SE16D, SE13G, SE09M (Standard type), APM-SE30A, SE22D, SE17G, SE12M (Standard type)

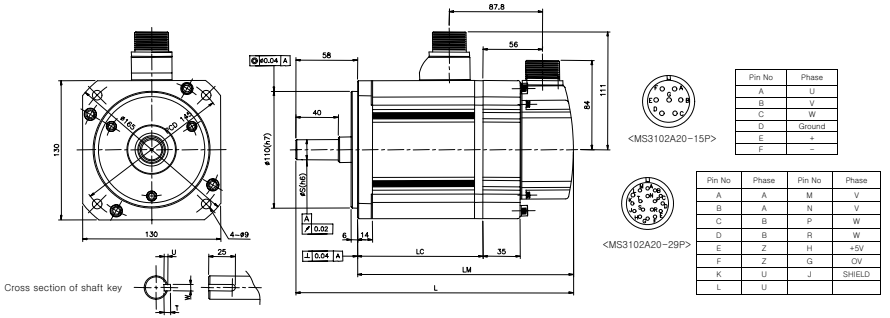


Pin No	Phase
A	U
B	V
C	W
D	Ground

Pin No	Phase	Pin No	Phase
A	A	M	V
B	A	N	V
C	B	P	W
D	B	R	W
E	Z	H	+5V
F	Z	G	0V
K	U	J	SHIELD
L	U		

Model	External Dimensions				Key Dimensions			Weight
	L	LM	LC	S	T	W	U	(kg)
SE09A,SE06D,SE05G,SE03M	202	144	94	19	5	5	3	5.6
SE15A,SE11D,SE09G,SE06M	226	168	118	19	5	5	3	7.2
SE22A,SE16D,SE13G,SE09M	250	192	142	22	6	6	3.5	8.7
SE30A,SE22D,SE17G,SE12M	274	216	166	22	6	6	3.5	10.2

♦ APM-SE09A, SE06D, SE05G, SE03M (Brake-attached type), APM-SE15A, SE11D, SE09G, SE06M (Brake-attached type)
APM-SE22A, SE16D, SE13G, SE09M (Brake-attached type), APM-SE30A, SE22D, SE17G, SE12M (Brake-attached type)



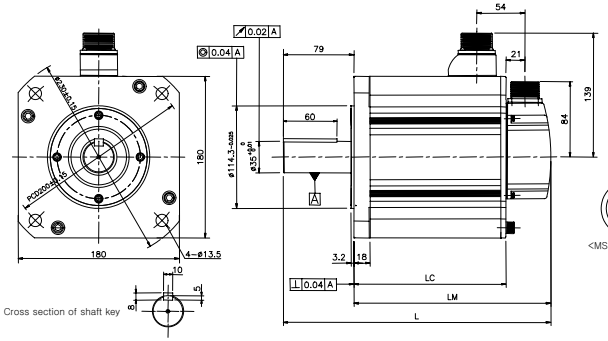
Pin No	Phase
A	U
B	V
C	W
D	Ground
E	+
F	-

Pin No	Phase	Pin No	Phase
A	A	M	V
B	A	N	V
C	B	P	W
D	B	R	W
E	Z	H	+5V
F	Z	G	0V
K	U	J	SHIELD
L	U		

Model	External Dimensions				Key Dimensions			Weight
	L	LM	LC	S	T	W	U	(kg)
SE09A,SE06D,SE05G,SE03M	237	179	94	19	5	5	3	7.4
SE15A,SE11D,SE09G,SE06M	261	203	118	19	5	5	3	9.0
SE22A,SE16D,SE13G,SE09M	285	227	142	22	6	6	3.5	10.5
SE30A,SE22D,SE17G,SE12M	309	251	166	22	6	6	3.5	12.0

Note) Use DC 90[V] for brake input power supply.

♦ APM-SF30A, SF22D, SF20G, SF12M (Standard type), APM-SF50A, SF35D, SF30G, SF20M (Standard type)
APM-SF55D, SF44G, SF30M (Standard type), APM-SF75D, SF44M (Standard type)

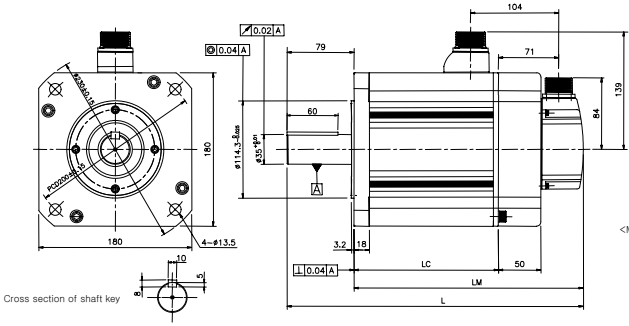


Pin No	Phase
A	U
B	V
C	W
D	Ground

Pin No	Phase	Pin No	Phase
A	A	M	V
B	A	N	V
C	B	P	W
D	B	R	W
E	Z	H	+5V
F	Z	G	OV
K	U	J	SHIELD
L	U		

Model	External Dimensions			Weight (kg)
	L	LM	LC	
SF30A,SF22D,SF20G,SF12M	261.8	182.8	132.8	12.4
SF50A,SF35D,SF30G,SF20M	294.8	215.8	165.8	17.7
SF55D,SF44G,SF30M	344.8	265.8	215.8	26.3
SF75D,SF44M	404.8	325.8	275.8	35.6

♦ APM-SF30A, SF22D, SF20G, SF12M (Brake-attached type), APM-SF50A, SF35D, SF30G, SF20M (Brake-attached type)
APM-SF55D, SF44G, SF30M (Brake-attached type), APM-SF75D, SF44M (Brake-attached type)



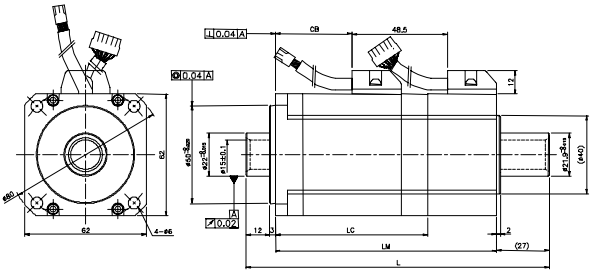
Pin No	Phase
A	U
B	V
C	W
D	Ground

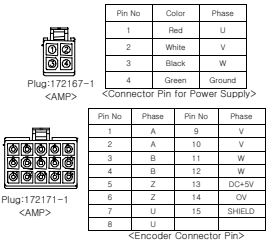
Pin No	Phase	Pin No	Phase
A	A	M	V
B	A	N	V
C	B	P	W
D	B	R	W
E	Z	H	+5V
F	Z	G	OV
K	U	J	SHIELD
L	U		

Model	External Dimensions			Weight (kg)
	L	LM	LC	
SF30A,SF22D,SF20G,SF12M	311.8	232.8	132.8	17.6
SF50A,SF35D,SF30G,SF20M	344.8	265.8	165.8	24.9
SF55D,SF44G,SF30M	394.8	315.8	215.8	33.5
SF75D,SF44M	454.8	375.8	275.8	42.8

Note) Use DC 90[V] for brake input power supply.

♦ APM-HB01A (Hollow shaft type), APM-HB02A (Hollow shaft type), APM-HB04A (Hollow shaft type)





Plug:172167-1
<AMP>

Pin No	Color	Phase
1	Red	U
2	White	V
3	Black	W
4	Green	Ground

<Connector Pin for Power Supply>

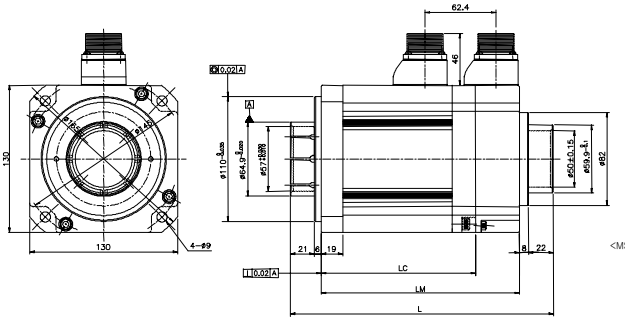
Plug:172171-1
<AMP>

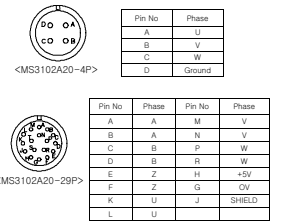
Pin No	Phase	Pin No	Phase
1	A	9	V
2	A	10	V
3	B	11	W
4	B	12	W
5	Z	13	DC+5V
6	Z	14	OV
7	U	15	SHIELD
8	U		

<Encoder Connector Pin>

Model	External Dimensions					Weight (Kg)
	L	LM	LC	CB	Hollow shaft type	
HB01A	140.5	98.5	63.5	25	15	0.89
HB02A	154.5	112.5	77.5	39	15	1.16
HB04A	182.5	140.5	105.5	67	15	1.69

♦ APM-HE09A (Hollow shaft type), APM-HE15A (Hollow shaft type)





<MS3102A20-4P>

Pin No	Phase
A	U
B	V
C	W
D	Ground

<MS3102A20-29P>

Pin No	Phase	Pin No	Phase
A	A	M	V
B	A	N	V
C	B	P	W
D	B	R	W
E	Z	H	+5V
F	Z	G	OV
K	U	J	SHIELD
L	U		

Model	External Dimensions				Weight (Kg)
	L	LM	LC	Hollow shaft type	
HE09A	207	150	111.5	50	5.82
HE15A	231	174	135.5	50	7.43

2.2 Servo Drive

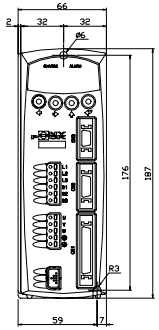
2.2.1 Features

Model		R5	01	02	04	05	10	15	20	35	50	75
Input voltage (Note 1)		3 phases AC 200~230[V]+10[%]-15[%], 50/60[Hz]										
Applicable Motor	Voltage type	3 phases sine wave PWM-driven AC Servo motor										
	Rate current [A]	1.2	1.65	1.65	3.2	4.3	6.4	11	16	21	32	38
	Max. current [A]	3.6	4.95	4.95	9.6	12.9	19.2	33	48	63	96	102
Detector System		Standard: Incremental 5 [V] Linedirve 2,000~10,000 [P/rev] Option: Absolute 11/13 bit										
External Input/ Output	Input/output contact	Input: 20 points, Output: 9 points										
	Position pulse input	Max. input frequency: 500 [kpps] Pulse type: A+B phase, CCW/CW pulse, direction + pulse										
	Analog input	2 channels : DC-10 ~ +10[V]										
	Analog output	2 channels : DC-5 ~ +5[V] (speed, torque, position)										
	Encoder output	A, B, Z phase : Linedrive output (1/1 ~ 1/16 division)										
Set Position Coordinate		Input contact : Max 64 point, digital switch: position 5 figures + speed 3 figures										
Position Operation Type		VP-1: Linear coordinate position operation type										
		VP-2: Rotary coordinate position operation type										
		VP-3: Feeder and sensor-input position operation type										
		VP-4: Push-pull position operation type										
		VP-5: Program position operation type										
		VP-7: Absolute coordinate step operation type										
Built in Function	Generated braking	Standard built in [Operating at servo alarm or servo OFF]										
	Regenerated braking	Option	Standard built in	Standard external								
	Display	Built in 7-segment [6 digits], CHARGE and ALARM-Lamp										
	Protective function	Overcurrent, overload, overvoltage, voltage shortage, overspeed, wrong wiring, encoder error, CPU error, communication error, parameter error										

(Note 1) signal phase AC200~230[V] input is possible; but output may be lower than the rating.

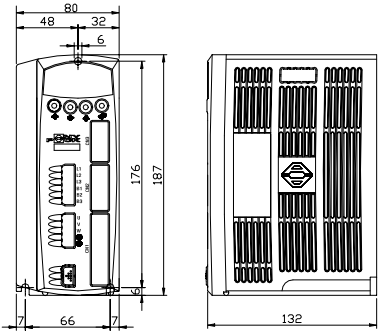
2.2.2 External Dimensions

♦ APD-VPR5N, APD-VP01N, APD-VP02N



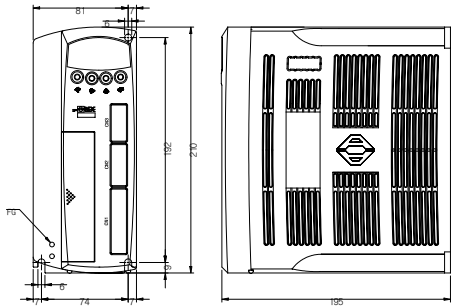
★ Weight: 1.2[kg]

♦ APD-VP04N



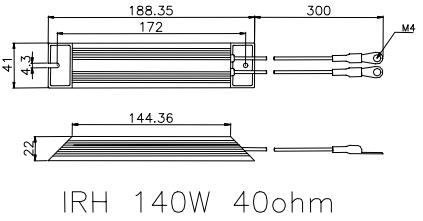
★ Weight: 1.5[kg]

♦ APD-VP05N, APD-VP10N

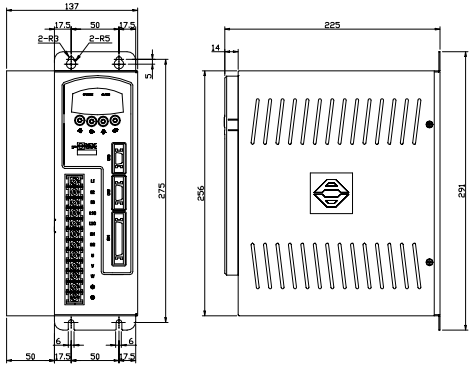


★ Weight: 2.5[kg]

[Stand regenerative braking resistance: MRC 140W 40Ω]

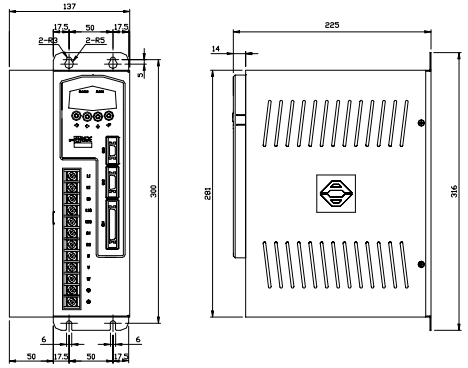


♦ APD-VP15N, APD-VP20N, APD-VP35N, APD-VP50N



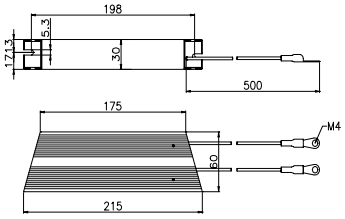
★ Weight: 7.2[kg]
(VP35N~50N: Fan Cooling)

♦ APD-VP75N



★ Weight: 8[kg]
(Fan Cooling)

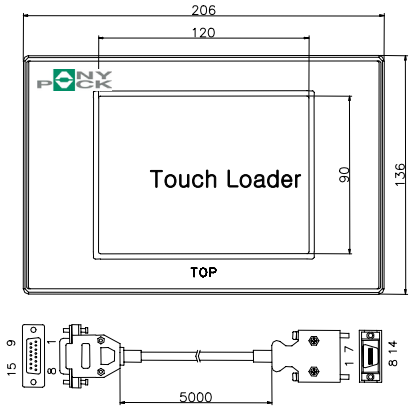
[Stand regenerative braking resistance: IRV 300W 23Ω]



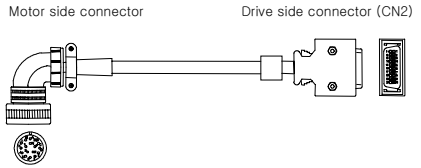
IRV 300W 23ohm

2.3 Options and Peripherals

■ Optional Specifications (Touch Loader)

Classifi-cation	Product Name	Model	Applicable Drive	Specification
Touch Loader	Controller Built-in Type Mono Touch Loader	APC-VPTS3M	APD-VP SERIES All model	 [Touch Loader] Servo Drive CN3] 1. Touch Loader input voltage: DC24[V] 2. Standard cable length: 5[m] (Other lengths available upon request)
	Controller Built-in Type Color Touch Loader	APC-VPTS3T		

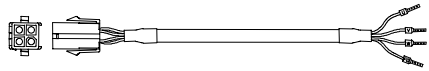
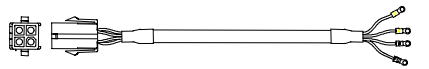
■ Optional Specifications (Cable)

Classifi-cation	Product Name	Model (Note1)	Applicable Motor	Specification
For Signal	Encoder Cable	APC-EAS	APM-SAR3A APM-SAR5A APM-SA01A APM-SB01A APM-SB02A APM-SB04A APM-SC04A APM-SC06A APM-SC08A APM-SC10A APM-SC03D APM-SC05D APM-SC06D APM-SC07D	 1. Motor side connector 1) Cap (15 Position): 172163-1(AMP) 2) Socket: 170361-1(AMP) 2. Drive side connector (CN2) 1) Case: 10320-52A0-008 (3M) 2) Connector: 10120-3000VE (3M) 3. Cable: 7Px0.2SQ (AWG24)
For Signal	Encoder Cable	APC-EBS	APM-SE APM-SF SERIES All model	 1. Motor side connector (MS: Military Standard) 1) Plug: MS3108B (MS3106B) 20-29S 2. Drive side connector (CN2) 1) Case: 10320-52A0-008 (3M) 2) Connector: 10120-3000VE (3M) 3. Cable: 7Px0.2SQ (AWG24)

Note1) □□□ in type name indicates the kinds and length of cable, and declaration is as below.

Cable length (m)	3	5	10	20
Cable for robot	F03	F05	F10	F20
Cable for general use	N03	N05	N10	N20

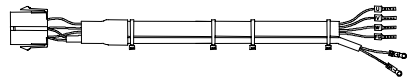
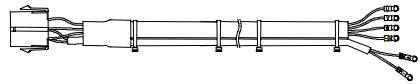
■ Optional Specifications (Cable)

Classifi-cation	Product Name	Model (Note1)	Applicable Motor	Specification
For power Supply	Standard type Power cable	APC-PCS	APM-SAR3A APM-SAR5A APM-SA01A APM-SB01A APM-SB02A APM-SB04A APM-SC04A APM-SC06A APM-SC03D APM-SC05D	Motor side connector Drive side connector  1. Motor side connector 1) Cap (4 Position): 172159-1 (AMP) 2) Socket: 170362-1 (AMP) 2. Drive side connector (U, V, W, FG) 1) PIN: UA-F1512 (Made by Suh-il) 2) Compressor: UA-510A (Made by Suh-il) 3. Cable: 4Cx0.75SQ (AWG18) (0.5SQ is be used for APM-SAR3A,SAR5A,SA01A)
For Power Supply	Standard type Power cable	APC-PDS	APM-SC08A APM-SC10A APM-SC06D APM-SC07D	Motor side connector Drive side connector  1. Motor side connector 1) Cap (4 Position) : 172159-1 (AMP) 2) Socket : 170362-1 (AMP) 2. Drive side connector (U, V, W, FG) 1) Connection terminal : 1.25x3 (KET GP110012) 3. Cable : 4Cx0.75SQ (AWG18)

Note1) □□□ in type name indicates the kinds and length of cable, and declaration is as below.

Cable length (m)	3	5	10	20
Cable for robot	F03	F05	F10	F20
Cable for general use	N03	N05	N10	N20

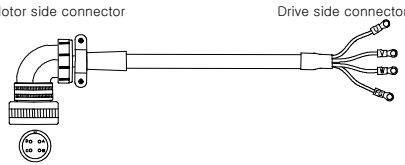
■ Optional Specifications (Cable)

Classifi-cation	Product Name	Model (Note1)	Applicable Motor	Specification
For Power Supply	Brake-type Power Cable	APC-PKB	APM-SAR3A APM-SAR5A APM-SA01A APM-SB01A APM-SB02A APM-SB04A APM-SC04A APM-SC06A APM-SC03D APM-SC05D	Motor side connector — Drive side connector  1. Motor side connector 1) Cap (6 Position): 172160-1 (AMP) 3) Socket: 170362-1 (AMP) 2. Drive side connector (U, V, W, FG) (1) For power supply of motor 1) PIN: UA-F1512 (Made by suh-il) 2) Compressor: UA-510A (Made by suh-il) 3) Cable: 4Cx0.75SQ (AWG18) (0.5SQ is to be used for APM-SAR3A, SAR5A, SA01A) (2) For power supply of brake 1) Connection terminal: 1.25x3 (KET GP110012) 2) Cable: 2Cx0.5SQ (AWG20)
For Power Supply	Brake-type Power Cable	APC-PLB	APM-SC08A APM-SC10A APM-SC06D APM-SC07D	Motor side connector — Drive side connector  1. Motor side connector 1) Cap (4 Position): 172160-1 (AMP) 2) Socket: 170362-1 (AMP) 2. Drive side connector (U, V, W, FG) (1) For power supply of motor 1) Connection terminal: 1.25x4 (KET GP110721) 2) Cable: 2Cx0.75SQ (AWG18) (2) For power supply of brake 1) Connection terminal: 1.25x3 (KET GP110012) 2) Cable: 2Cx0.5SQ (AWG20)

Note1) □□□ in type name indicates the kinds and length of cable, and declaration is as below.

Cable length (m)	3	5	10	20
Cable for robot	F03	F05	F10	F20
Cable for general use	N03	N05	N10	N20

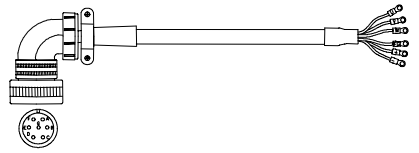
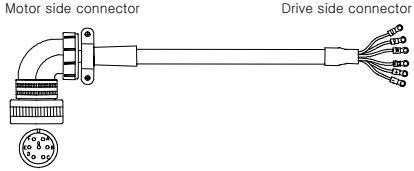
■ Optional Specifications (Cable)

Classifi-cation	Product Name	Model (Note1)	Applicable Motor	Specification
For Power Supply	Standard-type Power Cable	APC-PES	APM-SE09A APM-SE15A APM-SE22A APM-SE30A APM-SE06D APM-SE11D APM-SE16D APM-SE22D APM-SE05G APM-SE09G APM-SF13G APM-SF17G APM-SE03M APM-SE06M APM-SE09M APM-SE12M	Motor side connector Drive side connector 1. Motor side connector (MS: Military Standard) 1) Plug: MS3108B (MS3106B) 20-4S 2. Drive side connector (U, V, W, FG) 1) Connection terminal: 2.5x4 (KET GP110721) 3. Cable: 4Cx2.0SQ (AWG14) Note) Apply UA-F1512 pin for the drive side connector of APM-SE03M cable.
For Power Supply	Standard-type Power Cable	APC-PFS APC-PGS (SF50A,SF55D, SF75D,SF44M)	APM-SF30A APM-SF50A APM-SF22D APM-SF35D APM-SF55D APM-SF75D APM-SF20G APM-SF30G APM-SF44G APM-SF12M APM-SF20M APM-SF30M APM-SF44M	Motor side connector Drive side connector  1. Motor side connector (MS: Military Standard) 1) Plug: MS3108B (MS3106B)22-22S 2. Drive side connector (U, V, W, FG) 1) Connection terminal: 3.5x5 (KET GP110028) 3. Cable: 4Cx3.5SQ (AWG12) (4Cx5.0SQ (AWG10) is to be used for the cable of APM-SF50A, APM-SF55D, APM-SF75D, APM-SF44M)

Note1) □□□ in type name indicates the kinds and length of cable, and declaration is as below.

Cable length (m)	3	5	10	20
Cable for robot	F03	F05	F10	F20
Cable for general use	N03	N05	N10	N20

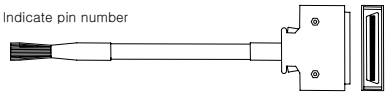
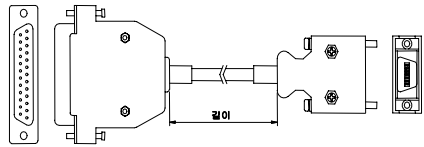
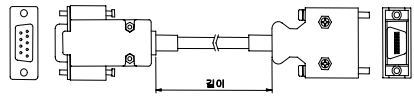
■ Optional Specifications (Cable)

<table>
<tr><th>Classifi-cation</th><th>Product Name</th><th>Model (Note1)</th><th>Applicable Motor</th><th>Specification</th></tr>
<tr><td>For Power Supply</td><td>Brake-type Power Cable</td><td>APC-PMB</td><td>APM-SE09A
APM-SE15A
APM-SE22A
APM-SE30A
APM-SE06D
APM-SE11D
APM-SE16D
APM-SE22D
APM-SE05G
APM-SE09G
APM-SE13G
APM-SE17G
APM-SE03M
APM-SE06M
APM-SE09M
APM-SE12M</td><td>Motor side connector Drive side connector
 
1. Motor side connector (MS: Military Standard)
1) Plug: MS3108B (MS3106B) 20-15S
2. Drive side connector (U, V, W, FG, +, -)
1) Connection terminal: 2.5x4 (KET GP110721)
2) Cable: 6Cx2.0SQ (AWG14)
Note) UA-F1512 Pin is to be applied to the drive side connector of APM-SE03M Series cable.</td></tr>
<tr><td>For Power Supply</td><td>Brake-type Power Cable</td><td>APC-PNB
APC-PPB
(SF50A, SF55D, SF75D, SF44M)</td><td>APM-SF30A
APM-SF50A
APM-SF22D
APM-SF35D
APM-SF55D
APM-SF75D
APM-SF20G
APM-SF30G
APM-SF44G
APM-SF12M
APM-SF20M
APM-SF30M
APM-SF44M</td><td>Motor side connector Drive side connector
 
1. Motor side connector (MS: Military Standard)
1) Plug: MS3108B (MS3106B) 24-10S
2. Drive side connector (U, V, W, FG, +, -)
1) Connection terminal: 3.5x5 (KET GP110028)
2) Cable: 6Cx3.5SQ (AWG12)
(MS3108B (3106B) 24-10S is to be used for the Plug of APM-SF50A, APM-SF55D, APM-SF75D & APM-SF44M and 6Cx5.0SQ (AWG10) is to be used for cable.)</td></tr>
</table>

Note1) □□□ in type name indicates the kinds and length of cable, and declaration is as below.

Cable length (m)	3	5	10	20
Cable for robot	F03	F05	F10	F20
Cable for general use	N03	N05	N10	N20

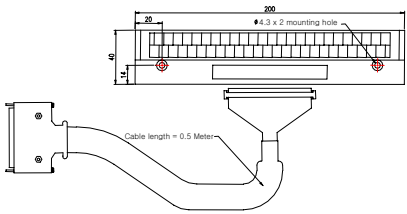
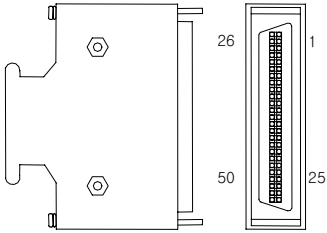
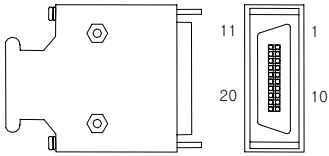
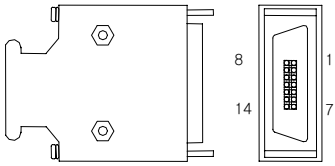
■ Optional Specifications (Cable)

Classifi-cation	Product Name	Model (Note1)	Applicable Motor	Specification
For Signal	Cable for CN1	APC-CN1A	APD-VS APD-VP SERIES All models	[Upper controller] [Drive side connector CN1]  1. Drive side connector (CN1) 1) Case: 10350-52F0-008 (3M) 2) Connector: 10150-3000VE (3M) 3) Cable: ROW-SB0.1Cx50C (AWG 28)
For Signal	Soft Download Cable	APC-CN3S	APD-VS APD-VP SERIES All models	[PC-Parallel Port] [Servo drive CN3] 
For Signal	RS232 Communi-cation Cable	APC-CN3R	APD-VS APD-VP SERIES All model	[PC-Serial Port] [Servo drive CN3] 

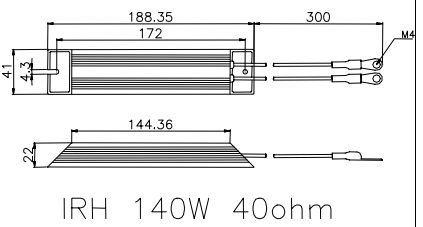
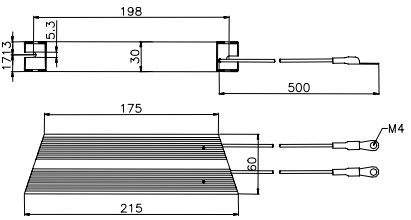
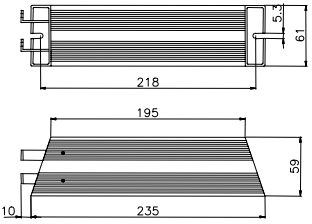
Note1) □□□ in type name indicates the kinds and length of cable, and declaration is as below.

Cable length (m)	1	2	3	5
Declaration	01	02	03	05

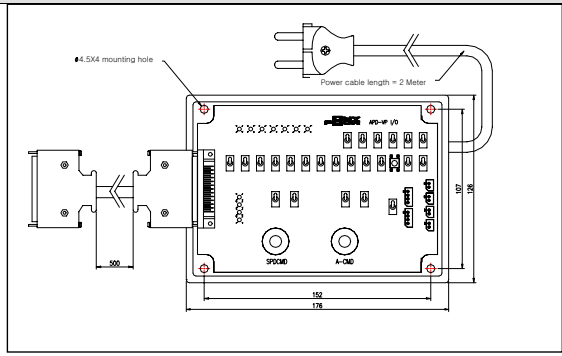
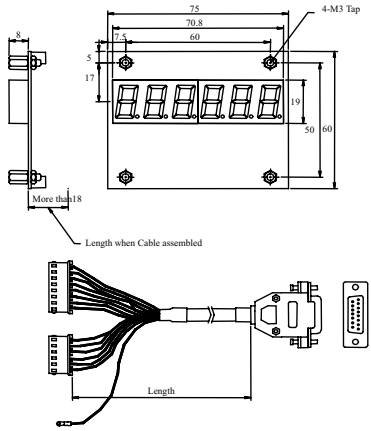
■ Optional Specifications (Connector)

Classifi-cation	Product Name	Model (Note1)	Applicable Motor	Specification
T/B	T/B For CN1	APC-VSCN1T APC-VPCN1T	APD-VS APD-VP SERIES All models	 1. APC-VSCN1T: CN1 T/B expansion type of APD-VS 2. APC-VPCN1T: CN1 T/B expansion type of APD-VP 3. Cable length can be adjusted upon request.
CN	CN1 Connector	APC-CN1NNA	APD-VS APD-VP SERIES All models	 1) CASE: 10350-52A0-008 (Made by 3M) 2) CONNECTOR: 10150-3000VE (Made by 3M)
CN	CN2 Connector	APC-CN2NNA	APD-VS APD-VP SERIES All models	 1) CASE: 10320-52A0-008 (Made by 3M) 2) CONNECTOR: 10120-3000VE (Made by 3M)
CN	CN3 Connector	APC-CN3NNA	APD-VS APD-VP SERIES All models	 1) CASE: 10314-52A0-008 (Made by 3M) 2) CONNECTOR: 10114-3000VE (Made by3M)

■ Optional Specifications (Braking Resistance)

Classifi-cation	Product Name	Model	Applicable Motor	Specification
Resist-ance	Braking Resistance	IRH140W 40Ω or MRC140W 40Ω	APD-VS02 VS04 APD-VP02 VP04	 IRH 140W 40ohm
Resist-ance	Braking Resistance	IRV 300W 23Ω	APD-VS05 VS10 APD-VP05 VP10	 IRV 300W 23ohm
Resist-ance	Braking Resistance	IRV 600S 30Ω	APD-VS15 (2P) VS20 (2P) VS35 (3P) VS50 (3P) APD-VP15 (2P) VP20 (2P) VP35 (3P) VP50 (3P)	 IRV 600S 30ohm

■ Optional Specifications (I/O JIG)

Classifi-cation	Product Name	Model (Note1)	Specification
I/O JIG	Controller Built-in Type I/O JIG	APC-VPIONA	 1. Input voltage: Single phase AC220[V] 2. Controller built-in type (APD-VP) I/O function of Servo drive 3. Cable length can be adjusted upon request
Displayer	Remote Display	APC-DPU□□A	 4. Cable length can be adjusted upon request 5. Place an order with Servo drive (Remote Type) 6. Commonly used for APD-VS/VP

Note1) □□□ in type name indicates the kinds and length of cable, and declaration is as below.

Cable length (m)	1	2	3	5
Declaration	01	02	03	05

Chapter 3

Installation

3.1 Servo Motor

3.1.1 Operating Environment 3-2
3.1.2 Preventing Excessive Impact..... 3-2
3.1.3 Wiring 3-2
3.1.4 Assembling Load System..... 3-3
3.1.5 Cable Installation 3-3

3.2 Servo Drive

3.2.1 Operating Environment 3-4
3.2.2 Installation in a Control Board (Panel)..... 3-5
3.2.3 Wiring 3-6

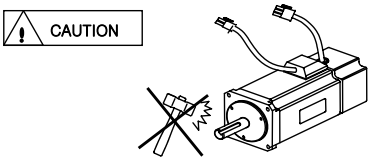
3.1 Servo Motor

3.1.1 Operating Environment

Item	Environment	Remarks
Temp.	0~40℃	In case of out of temp-range, consult with technical department and order separately.
Humidity	Less than 80%RH	There should be no steam.
External Vibration	Vibration Acceleration X, Y direction less than 19.6[㎨]	Excessive vibration may shorten of bearing life.

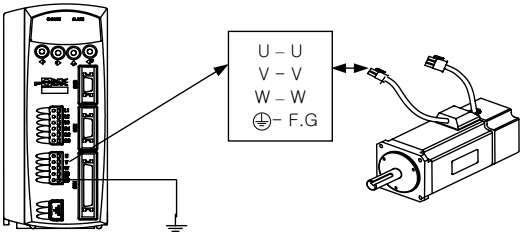
3.1.2 Preventing Excessive Impact

- Impact to the shaft during installation or dropping of the motor may cause damage to the encoder.



3.1.3 Wiring

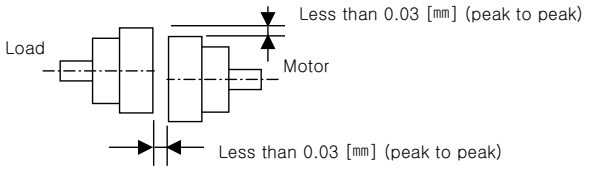
- Connecting commercial power supply directly to motor would cause damage to the motor. Be sure to connect to designated drive.
- Ground terminal of motor should be connected to one of the ground terminals (two) in drive and another terminal should be connected to the 3-class earth ground.



- Match U, V and W terminals of the motor with those of the driver.
- Check for loose connector pins or faulty contacts.
- In case of moisture or condensation on motor, be sure to verity the insulation resistance is more than 10 ㏁ and (500 V) before installing the motor.

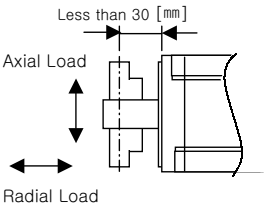
3.1.4 Assembling Load System

- Coupling assembling: Match motor shaft with load shaft within tolerance range.



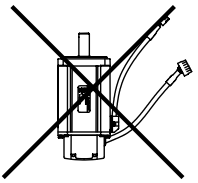
- Pulleys assembling:

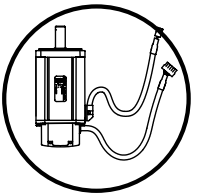
Flange	Radial Load		Axial Load		Reference diagram
	N	kgf	N	kgf	
40	148	15	39	4	
60	206	21	69	7	
80	255	26	98	10	
130	725	74	362	37	
180	1548	158	519	53	



3.1.5 Cable Installation

- In case of vertical installation, prevent oil or water from flowing into joint.





- Keep cable away from stress or scratch.
- When motor is moving, be sure to use movable cables and keep the cables from rolling.

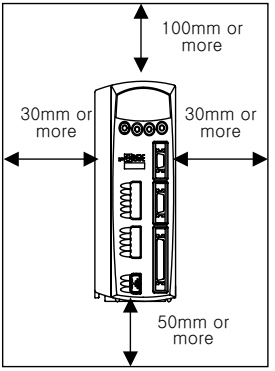
3.2 Servo Drive

3.2.1 Operating Environment

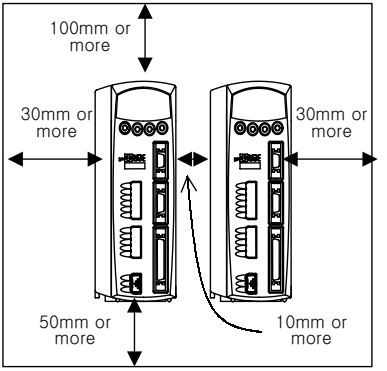
Item	Operating Environment	Remarks
Temp.	0～50℃	CAUTION Avoid heat by installing fans.
Humidity	Less than 90% RH	CAUTION When stopped for long time, drive can be damaged by condensation of freezing. Therefore, operate after removing moisture from drive sufficiently.
External Vibration	Vibration acceleration less than 5.9㎨	Excessive vibration may shorten life and cause malfunction.
Environment	- Avoid direct sunlight. - Avoid corrosive and flammable gas. - Avoid oil mist or dust. - Use ventilation in closed place.	

3.2.2 Installation in a Control Board (Panel)

- Installation clearances shall be as follow:



Installing 1 drive



Installing 2 drives or more

Note 1) Keep heat sources, such as regenerative resistance, away from the driver.

CAUTION

- Exercise caution to prevent chips produced by drilling form getting into the drive when drilling control panels.
- Take appropriate measures to prevent oils, water and metal powder form getting into the driver from openings in the control panels.
- If the drive is used in a place with large amount of toxic gases and dust, protect the drive with air filter.

3.2.3 Wiring

- Check the input voltage, and keep it within allowable range.

CAUTION	Drive may be damaged by over voltage.

- Connecting commercial power supply to the U, V and W terminals of drive may cause damage.
  (Be sure to connect power supply to L1, L2 and L3 terminals)
- Be sure to use standard resistance value for regenerative resistance that is to be connected to B1 and B2 terminals of drive.

Model	Resistance	Standard Capacity	* Remarks
VP02~VP04	50Ω	Internal 50W	CAUTION When expanding regenerative capacity, refer to “2.3 Option and Peripherals” for resistance value.
VP05~VP10	40Ω	External 140W	
VP15~VP20	23Ω	External 300W	
VP35~VP75	11.5Ω	External 300W×2	

- If there is additional control power supply (more than VS05), configure system control power supply (L1C, L2C) is supplied first and then main power supply (L1, L2, L3) is to be supplied. Refer to “Chapter 4. Wiring.

- “High voltage” remains for a while after power is turned off.

WARNING	To Prevent electric shock, carry out wiring work after charge lame is turned off.

- Ground the terminals using the shortest distance.
  Longer distance may cause noise leading to malfunction.

Chapter 4

Wiring

4.1 Internal Block Diagram

4.1.1 Block Diagram (Rated output less than 400[W]) 4-2
4.1.2 Block Diagram (Rated output from 500[W] to 7.5[kW]) 4-3

4.2 Power Board Wiring

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4.3 Timing Diagram

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4.4.3 Analog I/O Signal 4-9
4.4.4 Pulse Input Signal 4-10
4.4.5 Encoder Output Signal 4-10

4.5 Incremental Encoder Signal (CN2) Wiring

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4.5.2 Medium/Large-Size Motor 4-11

4.6 Absolute Encoder Signal (CN2) Wiring

4.6.1 Small-size Motor 4-12
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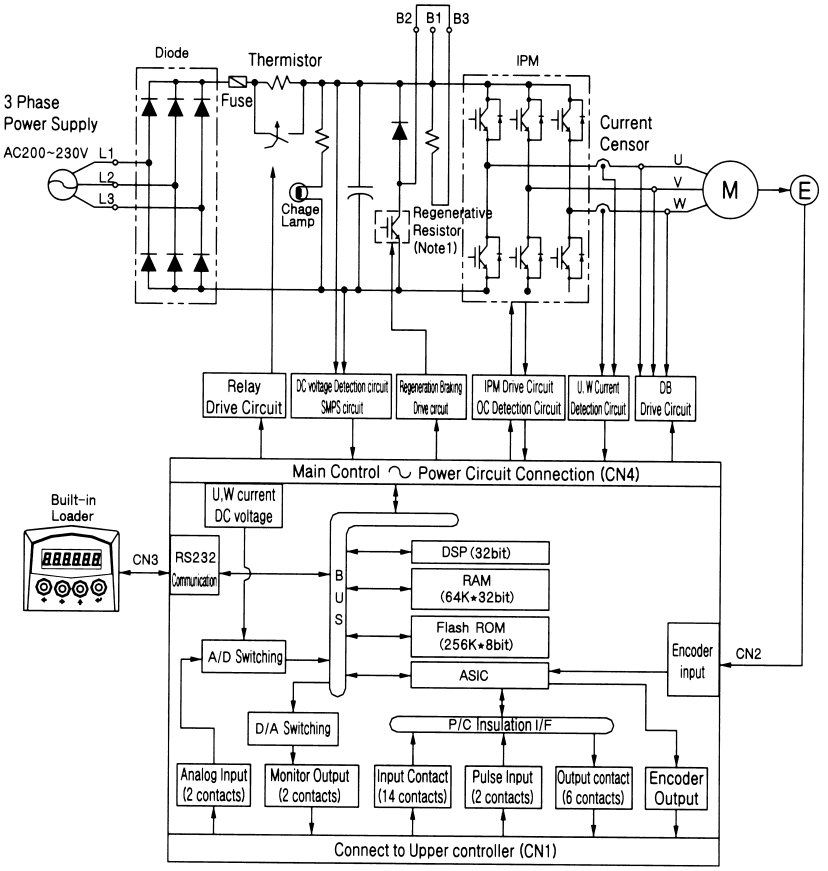
4.7.2 Communication (for O/S Download) 4-14

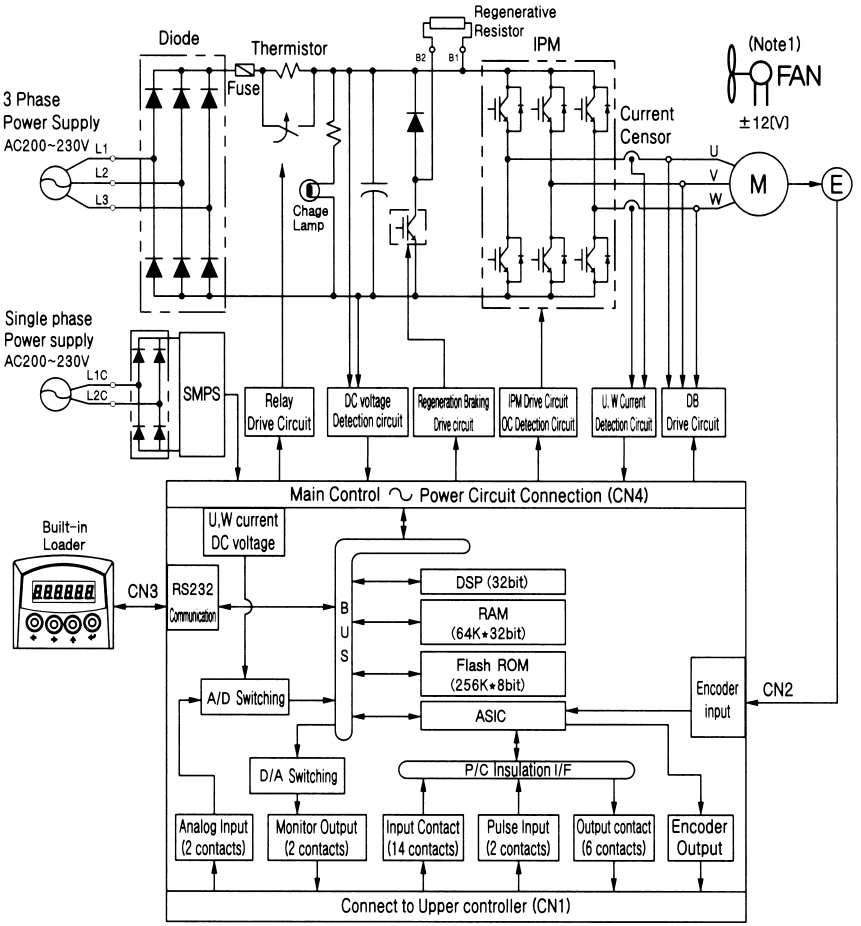
4.1 Internal Block Diagram

4.1.1 Block Diagram (Rated output less than 400[W])



(Note 1) B2-B3 short pin and regenerative resistor are installed in APD-VP02 and VP04 Type only.

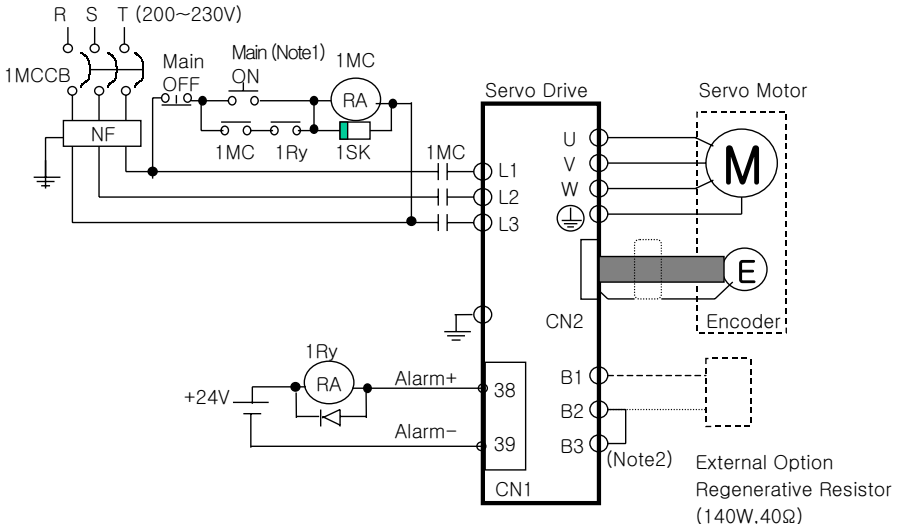
4.1.2 Block Diagram (Rated output from 500[W] to 7.5[kW])



(Note 1) APD-VP35, VP50, VP75 Types are cooled forcibly by DC24[V] cooling fans.

4.2 Power Board Wiring

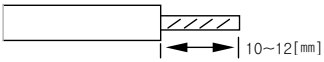
4.2.1 Wiring (Rated output less than 400[W]) [APD-VSR5~APD-VS04]



(Note 1) : It takes approximately 1~2 seconds before alarm signal is activated after power is connected. Press main power on switch for at least 2 seconds or longer.

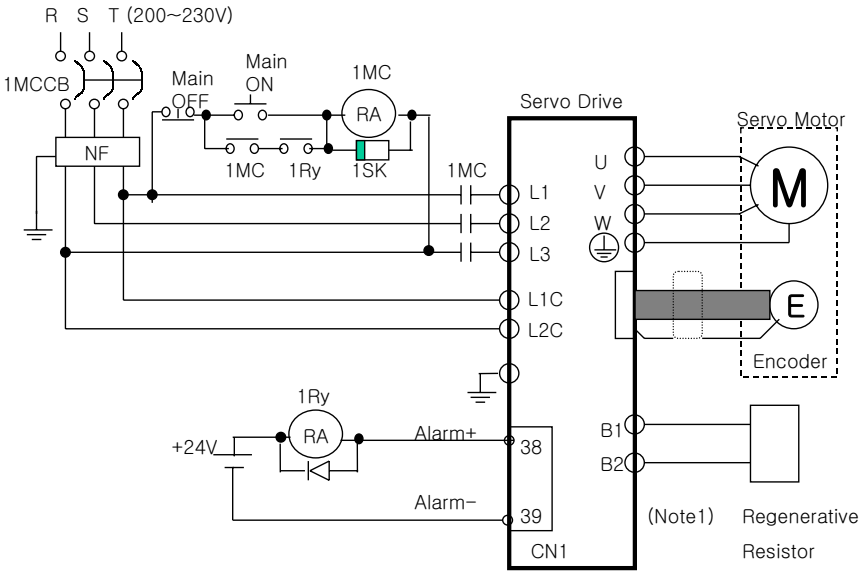
(Note 2) : B2-B3 short pin and regenerative resistor are installed in Apd-VS02, VS04 type (but, there are no regenerative circuit and regenerative resistor in APD-VSR5~01 types.) Open short pin (B2-B3), and connect external regenerative resistor to (B1-B2) in case regenerative capacity is large due to frequent acceleration/deceleration.
At this time, make sure optional brake resistor is 140[W], 40[Ω].

(Note 3) : For the electric wire that is to be used at main circuit power board, strip the wire about 10mm as below and use the exclusive terminal, Ferule UA-F1512 (Made by Suh-il Electronics).



(Note 4): Connect or remove the wiring of main circuit power board after pressing the button (▭) on the terminal.

4.2.2 Wiring (Rated output from 500[W] to 7.5[kW]) [APD-VP05~APD-VP75]



(Note1) : If regenerative capacity is large due to frequent acceleration/deceleration, use regenerative resistor with the same value as, and greater capacity than, the standard resistor provided.
The resistor value of standard regenerative resistor for each capacity of drive is as follows.

4.2.3 Power Circuit Part Specification

Type	R5	01	02	04	05	10	15	20	35	50	75
NFB	SMC-10P				SMC-15P		20P	25P	35P	50P	
NF (Noise Filter)	NFS310					315		320	330	340	
MC	GMC-32 (26A) or equivalent				GMC-40 (35A) or equivalent			GMC-50 (50A) or equivalent			
Power Wire	AWG16 (1.25SQ)				AWG14 (2SQ)		AWG12 (3.5SQ)		AWG10 (5.5SQ)		
Compressed Terminal	UA-F1512, SEOIL (10mm Strip & Twist)				GP110012 KET		GP110721 KET		GP110028 KET		
Regenerative Resistor (Provided)	-		Internal 50Ω (50W)		40Ω (140W)		23Ω (300W)		11.5Ω (300W x 2P)		

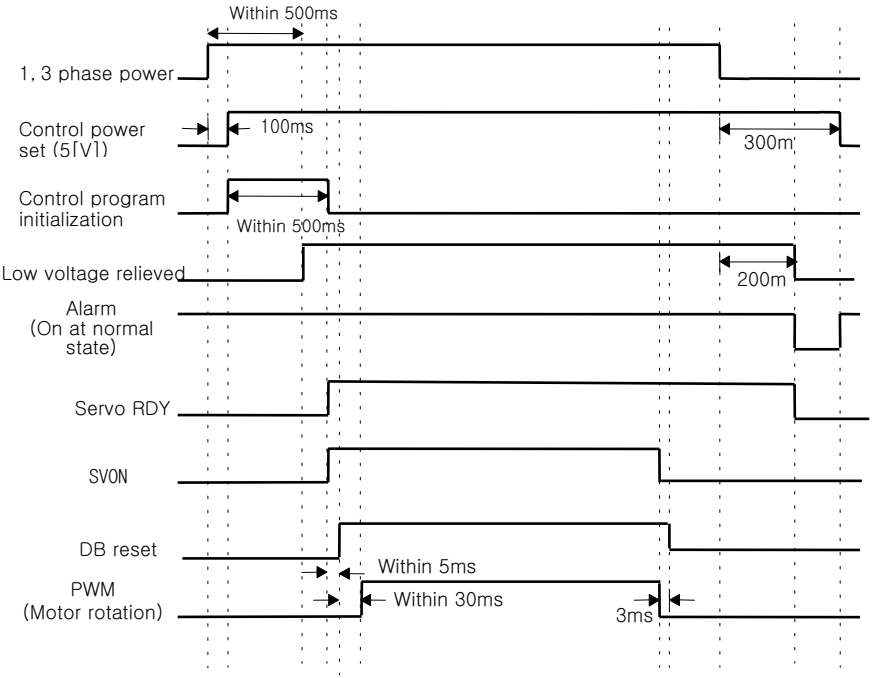
4.3 Timing Diagram

4.3.1 Timing Diagram at the Time of Power Input

In the case of APD-VSR5~VS04, power is supplied to the control circuit if 3-phase power is connected to the L1, L2, L3 terminals.

In the case of APD-VS05~VS75, power is supplied to the control circuit if single-phase power is connected to the L1c, L2C terminals and 3-phase power is connected to the L1, L2, L3 terminals.

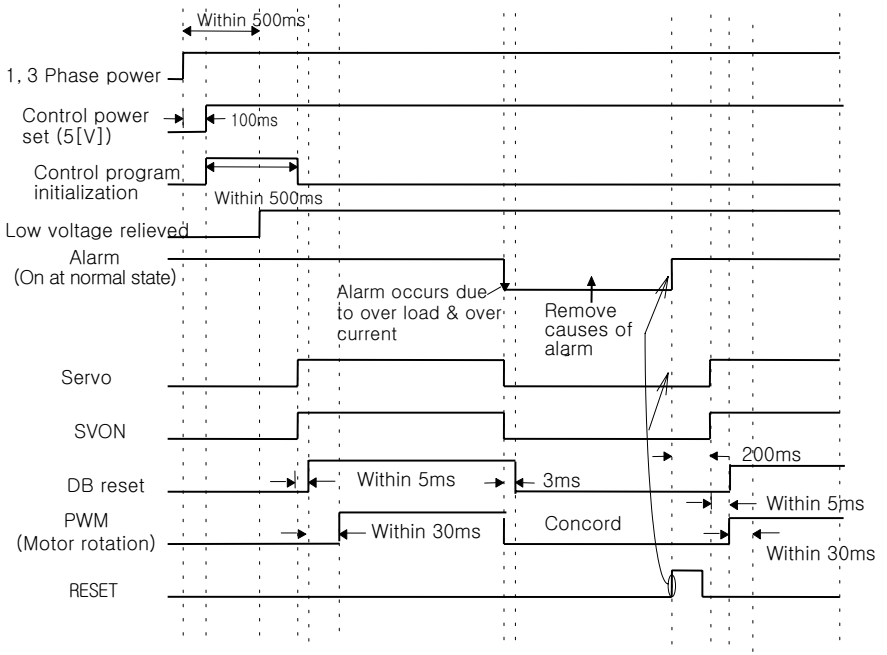
Servo becomes RDY after maximum 500[msec], the time required to initialize the inside of the drive system, and if the servo drive signal is turned on, operation starts 30[msec] later.



4.3.2 Timing Diagram When Alarm Occurs

If alarm occurs on the drive system, PWM is shut off and the motor stops.

CAUTION	Check and remove causes of alarm and turn off the servo motor drive command (SVON) before resetting alarm.

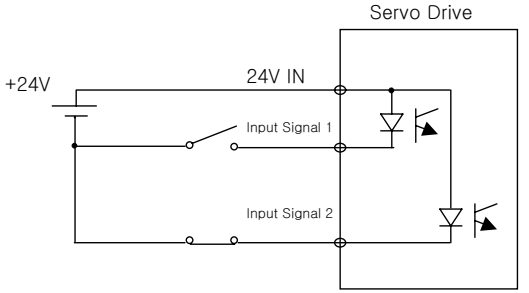


4.4 Wiring of Control Signal

4.4.1 Input Contact Signal

CAUTION

The input contacts are classified into “A” contact and “B” contact depending on the contact characteristics and can be reset by the menu [PC-807]. And special cautions are required because each contact can forcibly be turned ON/OFF.

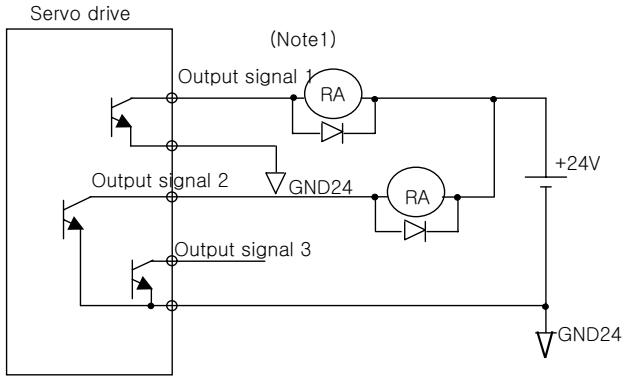


4.4.2 Output Contact Signal

CAUTION

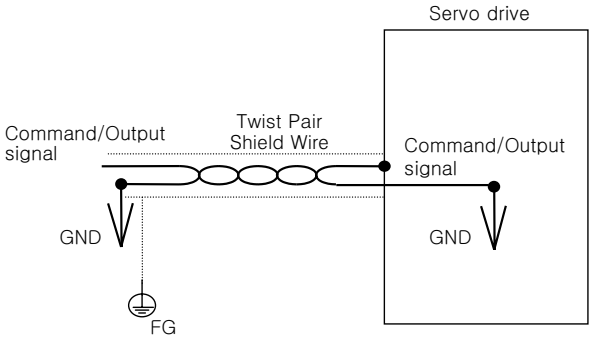
The output contact internally uses transistor switch. Take precautions because overvoltage or overcurrent may cause damage to the system.

- Power supply: DC24[V]±10%, 150[mA]



(Note1) For the output signals of Alarm and Ready, the GND24 terminal is separated.

4.4.3 Analog I/O Signal

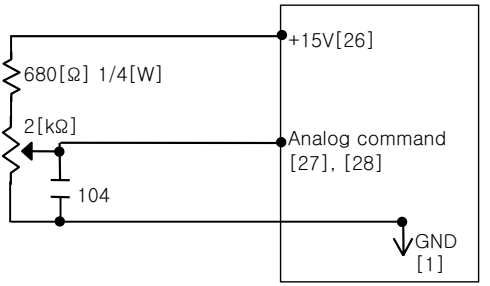


① GND terminal must be 0 [V] of the control power supply.

② Input signal command voltage should be within ±10[V], and input impedance 10[kΩ].

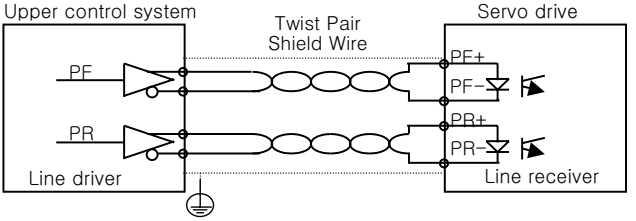
③ Output signal voltage of Monitor 1 (No.28) and, Monitor 2 (No.29) is ±5[V].

In addion, when controlling analog input by variable resistance using power provided by drive, wiring should be as follow:
The output capacity of this power is 30[mA] at maximum. Do not exceed this capacity.



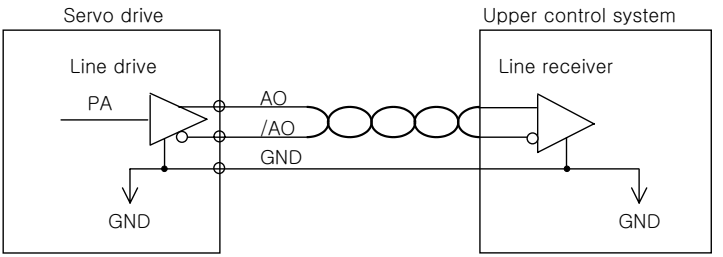
4.4.4 Pulse Input Signal

(1) Line driver (5 [V]) Pulse input



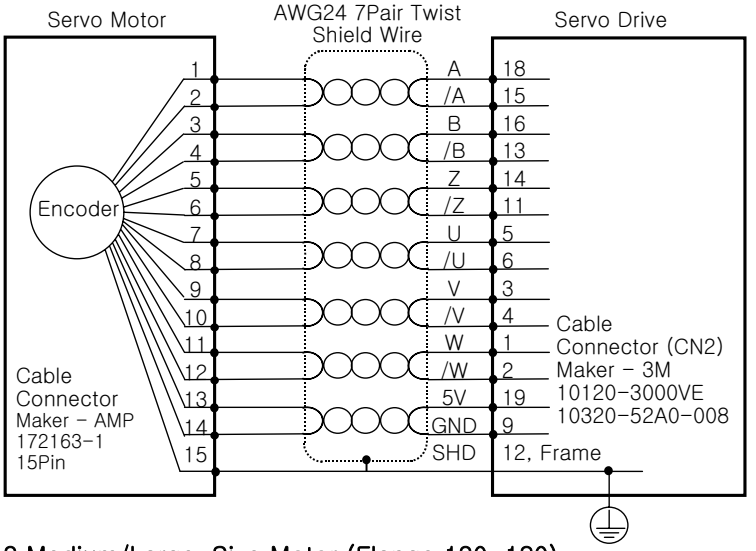
4.4.5 Encoder Output Signal

The encoder signal is produced based on 0 [V] (GND) of control power supply. Connect 0[V] terminal of the circuit which receives this signal from the upper control system to the 'GND' terminal of CN1. Encoder signal is produced in line driver system after the AC servo motor encoder signal received from CN2 is divided according to the frequency dividing ratio set by the menu [PE-510] (Pulse Out Rate). Or in case of Z phase, there is also open collector output.

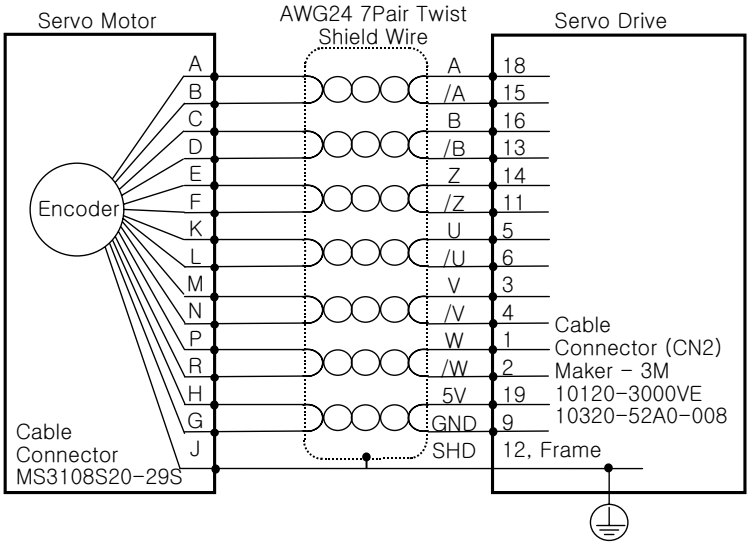


4.5 Wiring of Incremental Encoder Signal (CN2)

4.5.1 Small-Size Motor (Flange 40, 60, 80)

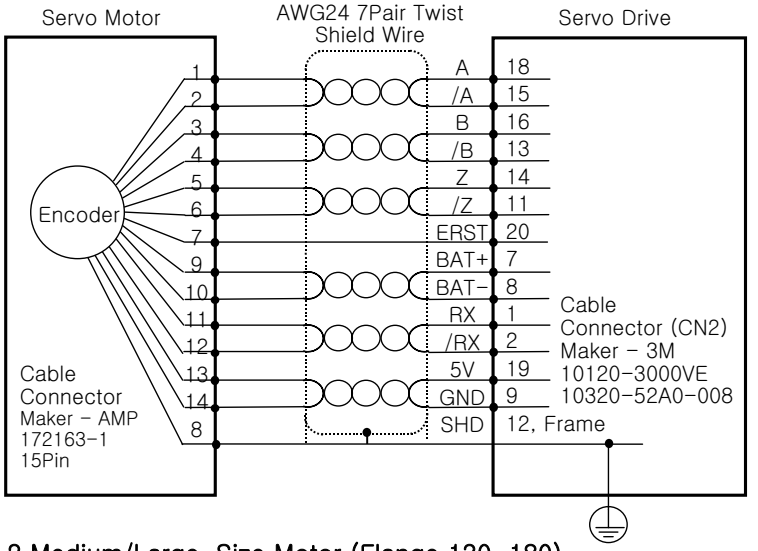


4.5.2 Medium/Large-Size Motor (Flange 130, 180)

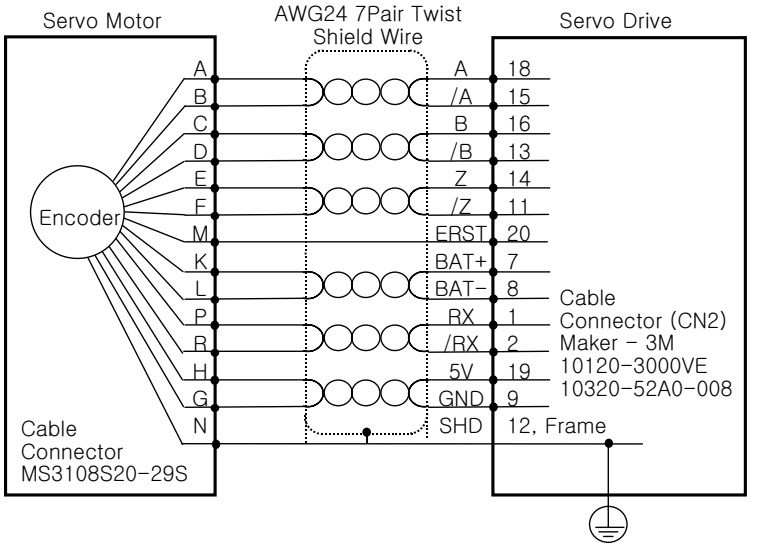


4.6 Wiring of Absolute Encoder Signal (CN2)

4.6.1 Small-Size Motor (Flange 40, 60, 80)



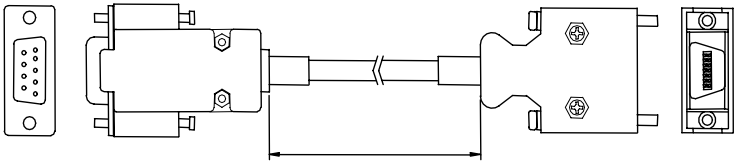
4.6.2 Medium/Large-Size Motor (Flange 130, 180)



4.7 Wiring of Communication (Option) Signal

4.7.1 PC-Communication (for RS232C)

This cable is for only PC-communication option cable to set servo drive menu by serial communicating of servo drive and PC.



[PC- Serial Port] [Servo Drive - CN3]

Content	PC-Serial Port	Servo Drive -CN3
Connector Name	HDEB-9S	10114-3000VE
Case Name	3600-09-G-L	10314-52A0-008
Wiring	No. 2 (RXD)	No. 6 (TXD)
	No. 3 (TXD)	No. 5 (RXD)
	No. 5 (GND)	No. 11, No.12 (GND)
	Case (Shield)	Case (Shield)
Cable length	1, 2, 3, 5[m]	

In Windows98, Serial Port (COM1) setting is as follow:

(Setting > Control panel > System > Device manager > Port > Communication port (COM1) > Port setting)

BPS: 9600[bps] or 19200[bps] (same with menu [PE-202])

Data bit: 8

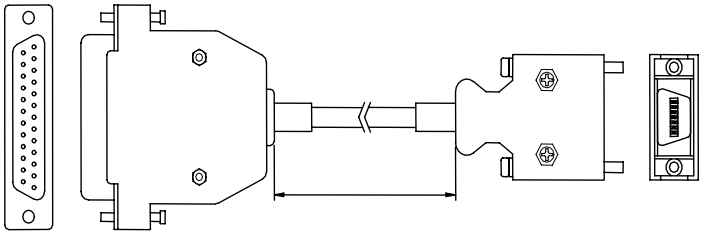
Parity: none

Stop bit: 1

Flow control: Xon/Xoff

4.7.2 Communication for Servo only (for O/S Download)

This cable is servo only communication cable used to upgrade O/S (Operating Software) by parallel communication of servo drive and PC.



[PC-Parallel Port]

[Servo Drive- CN3]

Content	PC-Parallel Port	Servo Drive - CN3
Connector Name	HDBB-25P	10114-3000VE
Case Name	3600-25-G-L	10314-52A0-008
Wiring	No. 15 (ERROR)	No. 1 (DXO)
	No. 8 (DATA6)	No. 2 (FSRX)
	No. 7 (DATA5)	No. 3 (CLKRX)
	No. 9 (DATA7)	No. 4 (CLK)
	No. 16 (INIT)	No. 8 (RESET)
	No. 18 (GND)	No. 9 (INT2/3)
	No. 6 (DATA4)	No. 10 (DRO)
	No. 20 (GND)	No. 11 (GND)
	Case (Shield)	Case (Shield)
Cable length	1, 2, 3, 5 [m]	

In Windows98, Parallel Port (COM1) setting is as follow:

(Setting > Control panel > System > Device manager > Port > Print port (LPT1) > Resource)

Range of I/O: 0378 ~ 037B

Request interrupt: 07

Ⅱ. Operating Software

[Manual Version : 1.2]

Chapter 1

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

[Manual Version: 1.3]

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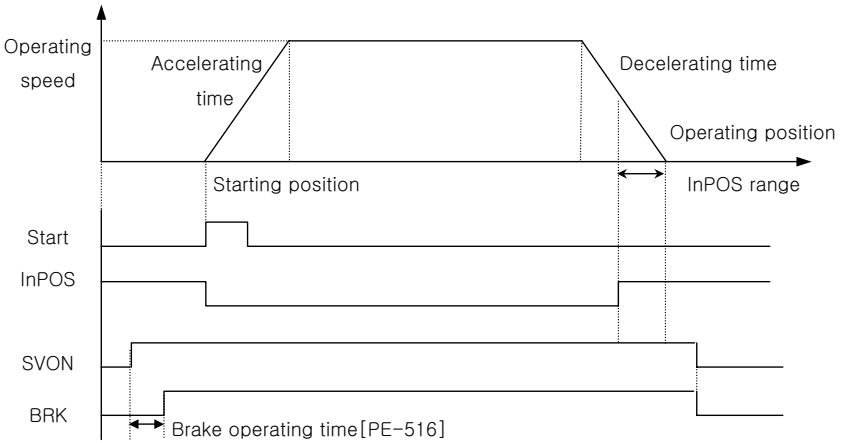
1.1 Major Functions

1.1.1 Operating Mode

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

1) Operating Mode 0-4

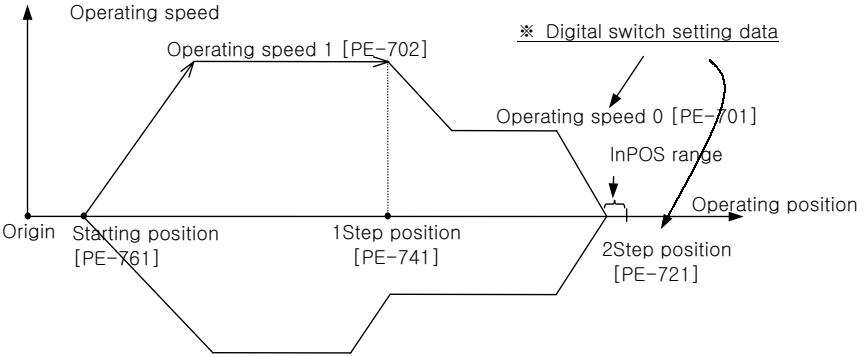
Operating Mode	Major Functions
0	- Operate 64 coordinates by using 6 input contacts.
1	- Operate 32 coordinates by using 5 input contacts. - Operate based on external position pulse input. - Restrict drive torque.
2	- Operate 16 coordinates by using 4 input contacts. - Operate based on external position 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.



This 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.

2) Operating Mode 5: 2-step reciprocating operation

Operating Mode	Major Functions
5	- 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 systems for drilling work.
- **Coordinates of [PE-721] are relative to coordinates of [PE-741].**
  For example, when coordinates are set as [PE-741]=40 and [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 the 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

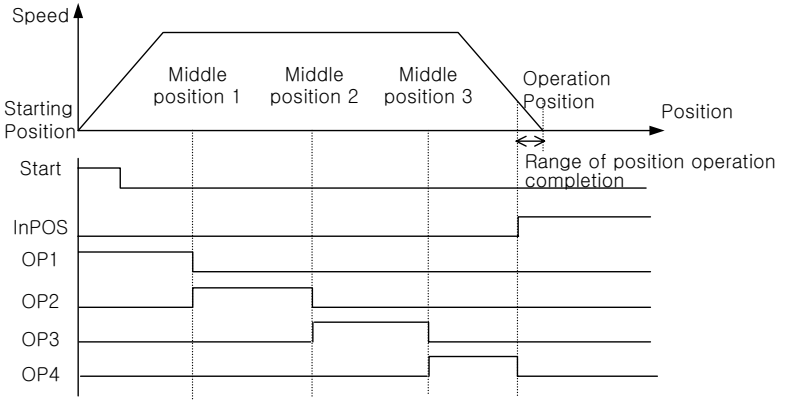
Operating Mode	Position Coordinates	Group Selection		Position Selection	Set Menu
		PSEL4	MPGEN	PSEL0-PSEL3	
0	64 points (16 points, 4 groups)	X	X	16 points	[PE-721]-[PE-736]
		O	X	16 points	[PE-741]-[PE-756]
		X	O	16 points	[PE-761]-[PE-776]
		O	O	16 points	[PE-781]-[PE-796]
1	32 points (16 points, 2 groups)	X		16 points	[PE-721]-[PE-736]
		O		16 points	[PE-741]-[PE-756]
2, 3	16 points			16 points	[PE-721]-[PE-736]
4	1 point				[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 at 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 positions 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 Position 1	Middle Position 2	Middle Position 3	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]

4) 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

1.1.3 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.

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

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

1.1.7 Setting Operation Data

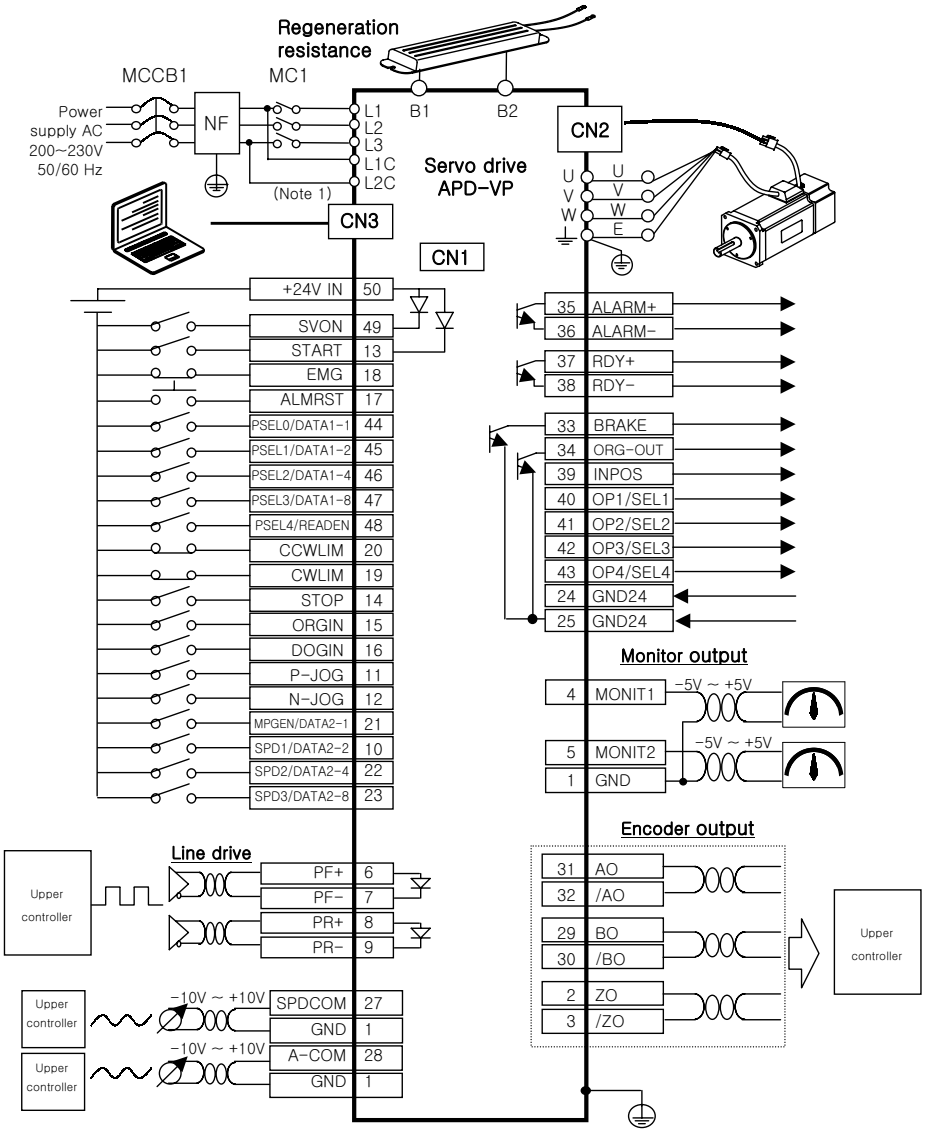
Setting Mode	Major Functions
Menu setting	Edit and set menu using loader.
Communication setting	Set data based on communication (CN3).
I/O setting	Set data using BCD code of I/O contacts (PLC, Digital switch)
Analog	Set speed based on analog input.

1.1.8 Operation Data Output

<table>
<tr><th>Output Mode</th><th>Output Details</th></tr>
<tr><td>Communication output</td><td>Output operation data based on communication (CN3).</td></tr>
<tr><td>Analog</td><td>* Data are output in ±5V according to the set scale units, and the following operation data are output according to the output mode.
<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>
</td></tr>
</table>

1.2 System Configuration

1.2.1 Connection Diagram (Linear coordinate position operation type (VP-1))



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

1.2.2 Control Signal

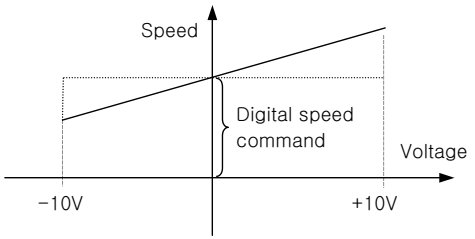
1) Contact input signal

Pin Number	Name	Description		
50	+24V IN			
49	SVON	Servo on		
13	START	Operation started		
18	EMG	Emergency stop		
17	ALMRST	Alarm reset		
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 Number	Name	Operating Mode 0	Operating Mode 1, 2, 3	Operating Mode 4
44	PSEL0/DATA1-1	Position selection 0		Digital switch 1 Data 0
45	PSEL1/DATA1-2	Position selection 1		Digital switch 1 Data 1
46	PSEL2/DATA1-4	Position selection 2		Digital switch 1 Data 2
47	PSEL3/DATA1-8	Position selection 3		Digital switch 1 Data 3
48	PSEL4/READEN	Position group selection 0		Data Read Enable
21	MPGEN/DATA2-1	Position group selection 1	MPGEN/TRQLIM	Digital switch 2 Data 0
10	SPD1/DATA2-2	Speed selection 1		Digital switch 2 Data 1
22	SPD2/DATA2-4	Speed selection 2		Digital switch 2 Data 2
23	SPD3/DATA2-8	Speed selection 3		Digital switch 2 Data 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

4) Output contact 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	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 Mode 2	Operating Mode 4
40	OP1/SEL1		Outputs Position coordinates OP1	Middle coordinate area 1	BCD Data Select 0
41	OP2/SEL2		OP2	Middle coordinate area 2	BCD Data Select 1
42	OP3/SEL3		OP3	Middle coordinate area 3	BCD Data Select 2
43	OP4/SEL4		OP4	Middle coordinate area 4	BCD Data Select 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).

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	0	Displays current operating speed.
			-99999	99999	
2	Pd-003	Command Speed	r/min	0	Displays current command speed.
			-99999	99999	
3	Pd-004	Reference Speed	–	0	Displays speed command values based on the acceleration/deceleration time during operation.
			-99999	99999	
4	Pd-005	Current Position	–	0.0	Displays current position coordinates.
			-9999.9	9999.9	
5	Pd-006	Refer Position	–	0.0	Displays current target position coordinates.
			-9999.9	9999.9	
6	Pd-007	Command Position	–	0.0	Displays operation command position coordinates.
			-9999.9	9999.9	
7	Pd-008	Remain Position	–	0.0	Displays the difference between target position coordinates and current position coordinates.
			-9999.9	9999.9	
8	Pd-009	Torque Limit	[%]	0	Displays torque-limit setting.
			0	300	
9	Pd-010	Current Load	[%]	0.0	Displays current load rate versus rated load.
			-9999.9	9999.9	
10	Pd-011	Average Load	[%]	0.0	Displays average load rate of 5 seconds versus rated load.
			-9999.9	9999.9	
11	Pd-012	Maximum Load	[%]	0.0	Displays maximum instantaneous load rate versus rated load.
			-9999.9	9999.9	
12	Pd-013	DC Link Voltage	Volt	0.0	Displays condenser's DC voltage value.
			-999.9	999.9	
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.
			–	–	

1.3.2 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	Normal	Normal state	–
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	Wring, 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].

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

Motor Models 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	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

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	
HC05H	99	500	For customers only

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	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 peed 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	Not Used	-	-	
			-	-	
78	PE-319	Not Used	-	-	
			-	-	
79	PE-320	Not Used	-	-	
			-	-	

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	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	Analog Position	-	1.0	Set position coordinate value at 10V.
			0	9999.9	
85	PE-406	Pos Offset	-	0.0	Set analog position input offset.
			-9999.9	9999.9	
86	PE-407	PClamp Mode	-	0	Set position clamp operating mode.
			0	1	
87	PE-408	PClamp Volt	mV	0.0	Set position clamp operating voltage.
			-1000.0	1000.0	
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	-	0.0	Set coordinate value of analog output position at 5V.
			0	9999.9	
97	PE-418	Pulse Out Rate	-	1	Set frequency dividing ratio of encoder output signal.
			1	16	
98	PE-419	Not Used	-	-	
			-	-	
99	PE-420	Not Used	-	-	
			-	-	

1.3.6 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	–	1	
			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	Not Used	–	–	
			–	–	
104	PE-505	InPOS Position	–	0.01	Set in-position range. (If data of [PE-502] are changed, increase at the same ratio.)
			0.00	999.99	
105	PE-506	InPOS Time	msec	0	Set time of maintaining in-position output.
			0	10000	
106	*PE-507	Software Limit	–	0	Set limit operation On or Off based on position coordinates.
			0	1	
107	PE-508	Upper Limit	–	0.0	Set upper limits of position coordinates.
			-9999.9	9999.9	
108	PE-509	Lower Limit	–	0.0	Set lower limits of position coordinates.
			-9999.9	9999.9	
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	MPG Speed	r/min	1000.0	Set maximum speed when operating by external input pulses.
			0.0	9999.9	
113	PE-514	Follow Error	–	90000	Set range of output for excessive position following error.
			0	99999	
114	PE-515	Brake SPD	r/min	50.0	Set operating speed of built-in brake.
			0.0	9999.9	
115	PE-516	Brake Time	msec	10	Set opening delay time of built-in brake.
			0	10000	
116	*PE-517	PowerFail Mode	–	By type of equipment	Set power failure mode. 0: VP04 or less, 1: VP05 or more
			0	1	
117	PE-518	DB Control	–	1	Set dynamo braking mode.
			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	

1.3.7 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 operating mode.)
			0	5	
121	PE-602	Position Unit No	-	1	Set number of decimal place of position coordinates.
			0	4	
122	PE-603	Run Torque Limit	[%]	0	Set ratio of limited torque with respect to rated torque during torque limited position operation.
			0	300	
123	PE-604	I/O Mode	-	0	Set middle coordinate output or digital switch data input. (0: Digital input, 1: middle coordinate output, 2: Position coordinate output signal OP0-OP4)
			0	2	
124	PE-605	MPG Dir Mode	-	0	Set direction of operation with respect to MPG pulse. (0: pulse direction, 1: Command position direction)
			0	1	
125	PE-606	Pos Override	-	0	Set analog position command override operation mode.
			0	2	
126	PE-607	Digit Mode	-	0	Set digital switch input mode. (0: Digital SW input, 1: PLC contact input)
			0	1	
127	PE-608	Digit Data Type	-	0	Set digital switch data type. (0: position 5 figures, speed 3 figures, 1: position code + 5 figures, speed 2 figures)
			0	1	
128	PE-609	Digit Data Time	msec	10	Set digital switch data read delay time.
			0	99999	
129	PE-610	Out Define	-	0	Set output contact RDY function. (0: RDY output, 1: Torque Limit output)
			0	1	
130	PE-611	GO Back Mode	-	0	0: Original state of Operating Mode 5 1: Return to Operating Mode 5 [PE-703] speed
			0	1	
131	PE-612	GO Back Auto	-	1	0: Return when start signal is entered 1: Automatic return
			0	1	
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	-	-	
			-	-	
138	PE-619	Not Used	-	-	
			-	-	
139	PE-620	Not Used	-	-	
			-	-	

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 -9999.9	10.0 9999.9	Set operating speed 0.
141	PE-702	Speed Command1	r/min -9999.9	100.0 9999.9	Set operating speed 1.
142	PE-703	Speed Command2	r/min -9999.9	200.0 9999.9	Set operating speed 2.
143	PE-704	Speed Command3	r/min -9999.9	500.0 9999.9	Set operating speed 3.
144	PE-705	Speed Command4	r/min -9999.9	1000.0 9999.9	Set operating speed 4.
145	PE-706	Speed Command5	r/min -9999.9	1500.0 9999.9	Set operating speed 5.
146	PE-707	Speed Command6	r/min -9999.9	2000.0 9999.9	Set operating speed 6.
147	PE-708	Speed Command7	r/min -9999.9	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	- -	- -	

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	-	0.0	Set coordinate 0 of position group 0.
			-9999.9	9999.9	
161	PE-722	Position0 Com1	-	1.0	Set coordinate 1 of position group 0.
			-9999.9	9999.9	
162	PE-723	Position0 Com2	-	2.0	Set coordinate 2 of position group 0.
			-9999.9	9999.9	
163	PE-724	Position0 Com3	-	3.0	Set coordinate 3 of position group 0.
			-9999.9	9999.9	
164	PE-725	Position0 Com4	-	4.0	Set coordinate 4 of position group 0.
			-9999.9	9999.9	
165	PE-726	Position0 Com5	-	5.0	Set coordinate 5 of position group 0.
			-9999.9	9999.9	
166	PE-727	Position0 Com6	-	6.0	Set coordinate 6 of position group 0.
			-9999.9	9999.9	
167	PE-728	Position0 Com7	-	7.0	Set coordinate 7 of position group 0.
			-9999.9	9999.9	
168	PE-729	Position0 Com8	-	8.0	Set coordinate 8 of position group 0.
			-9999.9	9999.9	
169	PE-730	Position0 Com9	-	9.0	Set coordinate 9 of position group 0.
			-9999.9	9999.9	
170	PE-731	Position0 Com10	-	10.0	Set coordinate 10 of position group 0.
			-9999.9	9999.9	
171	PE-732	Position0 Com11	-	11.0	Set coordinate 11 of position group 0.
			-9999.9	9999.9	
172	PE-733	Position0 Com12	-	12.0	Set coordinate 12 of position group 0.
			-9999.9	9999.9	
173	PE-734	Position0 Com13	-	13.0	Set coordinate 13 of position group 0.
			-9999.9	9999.9	
174	PE-735	Position0 Com14	-	14.0	Set coordinate 14 of position group 0.
			-9999.9	9999.9	
175	PE-736	Position0 Com15	-	15.0	Set coordinate 15 of position group 0.
			-9999.9	9999.9	
176	PE-737	Not Used	-	-	
			-	-	
177	PE-738	Not Used	-	-	
			-	-	
178	PE-739	Not Used	-	-	
			-	-	
179	PE-740	Not Used	-	-	
			-	-	

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 1 of Position group 1.
			-9999.9	9999.9	
182	PE-743	Position1 Com2	-	22.0	Set coordinate 2 of position group 1.
			-9999.9	9999.9	
183	PE-744	Position1 Com3	-	23.0	Set coordinate 3 of position group 1.
			-9999.9	9999.9	
184	PE-745	Position1 Com4	-	24.0	Set coordinate 4 of position group 1.
			-9999.9	9999.9	
185	PE-746	Position1 Com5	-	25.0	Set coordinate 5 of position group 1.
			-9999.9	9999.9	
186	PE-747	Position1 Com6	-	26.0	Set coordinate 6 of position group 1.
			-9999.9	9999.9	
187	PE-748	Position1 Com7	-	27.0	Set coordinate 7 of position group 1.
			-9999.9	9999.9	
188	PE-749	Position1 Com8	-	28.0	Set coordinate 8 of position group 1.
			-9999.9	9999.9	
189	PE-750	Position1 Com9	-	29.0	Set coordinate 9 of position group 1.
			-9999.9	9999.9	
190	PE-751	Position1 Com10	-	30.0	Set coordinate 10 of position group 1.
			-9999.9	9999.9	
191	PE-752	Position1 Com11	-	31.0	Set coordinate 11 of position group 1.
			-9999.9	9999.9	
192	PE-753	Position1 Com12	-	32.0	Set coordinate 12 of position group 1.
			-9999.9	9999.9	
193	PE-754	Position1 Com13	-	33.0	Set coordinate 13 of position group 1.
			-9999.9	9999.9	
194	PE-755	Position1 Com14	-	34.0	Set coordinate 14 of position group 1.
			-9999.9	9999.9	
195	PE-756	Position1 Com15	-	35.0	Set coordinate 15 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	-	-	
			-	-	

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	-	40.0	Set coordinate 0 of position group 2.
			-9999.9	9999.9	
201	PE-762	Position2 Com1	-	41.0	Set coordinate 1 of position group 2.
			-9999.9	9999.9	
202	PE-763	Position2 Com2	-	42.0	Set coordinate 2 of position group 2.
			-9999.9	9999.9	
203	PE-764	Position2 Com3	-	43.0	Set coordinate 3 of position group 2.
			-9999.9	9999.9	
204	PE-765	Position2 Com4	-	44.0	Set coordinate 4 of position group 2.
			-9999.9	9999.9	
205	PE-766	Position2 Com5	-	45.0	Set coordinate 5 of position group 2.
			-9999.9	9999.9	
206	PE-767	Position2 Com6	-	46.0	Set coordinate 6 of position group 2.
			-9999.9	9999.9	
207	PE-768	Position2 Com7	-	47.0	Set coordinate 7 of position group 2.
			-9999.9	9999.9	
208	PE-769	Position2 Com8	-	48.0	Set coordinate 8 of position group 2.
			-9999.9	9999.9	
209	PE-770	Position2 Com9	-	49.0	Set coordinate 9 of position group 2.
			-9999.9	9999.9	
210	PE-771	Position2 Com10	-	50.0	Set coordinate 10 of position group 2.
			-9999.9	9999.9	
211	PE-772	Position2 Com11	-	51.0	Set coordinate 11 of position group 2.
			-9999.9	9999.9	
212	PE-773	Position2 Com12	-	52.0	Set coordinate 12 of position group 2.
			-9999.9	9999.9	
213	PE-774	Position2 Com13	-	53.0	Set coordinate 13 of position group 2.
			-9999.9	9999.9	
214	PE-775	Position2 Com14	-	54.0	Set coordinate 14 of position group 2.
			-9999.9	9999.9	
215	PE-776	Position2 Com15	-	55.0	Set coordinate 15 of position group 2.
			-9999.9	9999.9	
216	PE-777	Not Used	-	-	
			-	-	
217	PE-778	Not Used	-	-	
			-	-	
218	PE-779	Not Used	-	-	
			-	-	
219	PE-780	Not Used	-	-	
			-	-	

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	-	60.0	Set coordinate 0 of position group 3.
			-9999.9	9999.9	
221	PE-782	Position3 Com1	-	61.0	Set coordinate 1 of position group 3
			-9999.9	9999.9	
222	PE-783	Position3 Com2	-	62.0	Set coordinate 2 of position group 3.
			-9999.9	9999.9	
223	PE-784	Position3 Com3	-	63.0	Set coordinate 3 of position group 3.
			-9999.9	9999.9	
224	PE-785	Position3 Com4	-	64.0	Set coordinate 4 of position group 3.
			-9999.9	9999.9	
225	PE-786	Position3 Com5	-	65.0	Set coordinate 5 of position group 3.
			-9999.9	9999.9	
226	PE-787	Position3 Com6	-	66.0	Set coordinate 6 of position group 3.
			-9999.9	9999.9	
227	PE-788	Position3 Com7	-	67.0	Set coordinate 7 of position group 3.
			-9999.9	9999.9	
228	PE-789	Position3 Com8	-	68.0	Set coordinate 8 of position group 3.
			-9999.9	9999.9	
229	PE-790	Position3 Com9	-	69.0	Set coordinate 9 of position group 3.
			-9999.9	9999.9	
230	PE-791	Position3 Com10	-	70.0	Set coordinate 10 of position group 3.
			-9999.9	9999.9	
231	PE-792	Position3 Com11	-	71.0	Set coordinate 11 of position group 3.
			-9999.9	9999.9	
232	PE-793	Position3 Com12	-	72.0	Set coordinate 12 of position group 3.
			-9999.9	9999.9	
233	PE-794	Position3 Com13	-	73.0	Set coordinate 13 of position group 3.
			-9999.9	9999.9	
234	PE-795	Position3 Com14	-	74.0	Set coordinate 14 of position group 3.
			-9999.9	9999.9	
235	PE-796	Position3 Com15	-	75.0	Set coordinate 15 of position group 3.
			-9999.9	9999.9	
236	PE-797	Not Used	-	-	
			-	-	
237	PE-798	Not Used	-	-	
			-	-	
238	PE-799	Not Used	-	-	
			-	-	
239	PE-800	Not Used	-	-	
			-	-	

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	10.0	Set jog run speed 0.
			0.0	9999.9	
241	PE-802	Jog Speed1	r/min	500.0	Set jog run speed 1.
			0.0	9999.9	
242	PE-803	Jog AccDec Time	msec	100	Set jog acceleration/deceleration time.
			0	99999	
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	Not Used	-	-	
			-	-	
249	PE-810	Origin Mode	-	1	Set origin run mode.
			0	4	
250	PE-811	Origin polarity	-	0	Set origin run direction.
			0	1	
251	PE-812	Origin Dog Stop	-	0	Set stop (1) or Z position operation 0 when dog sensor turns off during origin run.
			0	1	
252	PE-813	Origin Offset	-	0.0	Set offset position at which to stop after origin run.
			-9999.9	9999.9	
253	PE-814	Origin Position	-	0.0	Set initial coordinates after origin run.
			-9999.9	9999.9	
254	PE-815	Origin AutoRun	-	0	Set automatic origin run ON or OFF when servo is on.
			0	1	
255	PE-816	Origin Speed0	r/min	100.0	Set origin run speed 0.
			0.0	9999.9	
256	PE-817	Origin Speed1	r/min	10.0	Set origin run speed 1.
			0.0	9999.9	
257	PE-818	Origin Torque	[%]	50.0	Set torque during damper (Origin run mode 4) run.
			1.0	300.0	
258	PE-819	Not Used	-	-	
			-	-	
259	PE-820	Not Used	-	-	
			-	-	

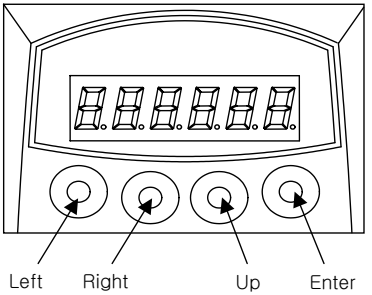
1.3.14 Operation Menu

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. (If UP key is hit after jog run, the current coordinates are stored in the position coordinate menu currently selected.)
			–	–	
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	–	–	Initialize menu data.
			–	–	
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	PC-919	Not Used	–	–	
			–	–	
279	PC-920	Not Used	–	–	
			–	–	

1.4 Detailed Description of Menu

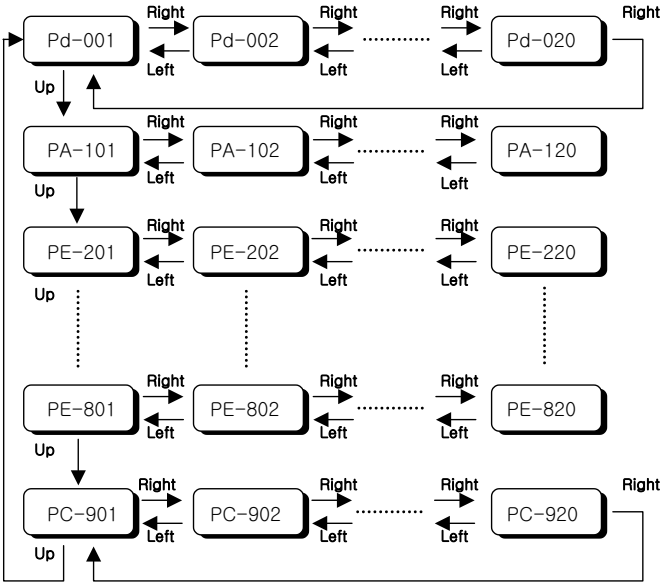
1.4.1 Loader Operation

1) Components

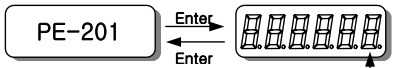


2) Components

① Menu movement



② Menu editing



* Changing position: Left/Right
* Changing numbers: Up

Initial blinking position

- 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	- 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 1.4.9. "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 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: "-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.

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.

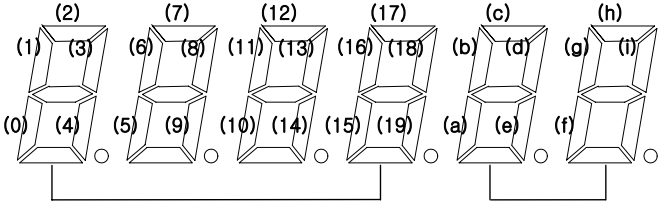
③ Average load rate [Pd -011]

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	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 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].

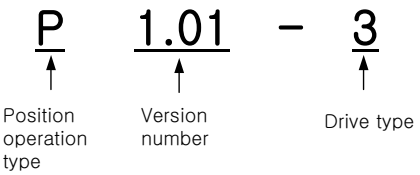
The value saved by the current logic of the input contact is displayed.

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



* 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

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

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

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	

Motor models and ID

Model	ID	Watt	Remarks
SD08A	41	800	To be developed
SD10A	42	1000	To be developed
SD15A	43	1500	To be developed
SD20A	44	2000	To be developed
SD05D	45	500	To be developed
SD08D	46	800	To be developed
SD10D	47	1000	To be developed
SD12D	48	1200	To be developed
SD03M	49	300	To be developed
SD04M	50	400	To be developed
SD05M	51	500	To be developed
SD06M	52	600	To be developed

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	
HC05H	99	500	For customers only

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]

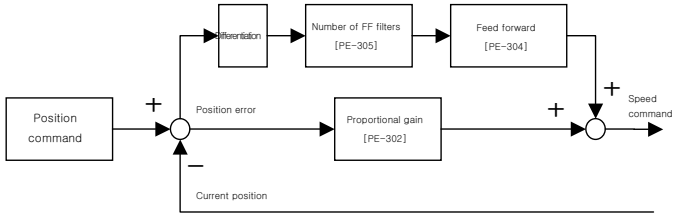
A group ID is set and used when multiple servos are consolidated into a group for communications.

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.

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.

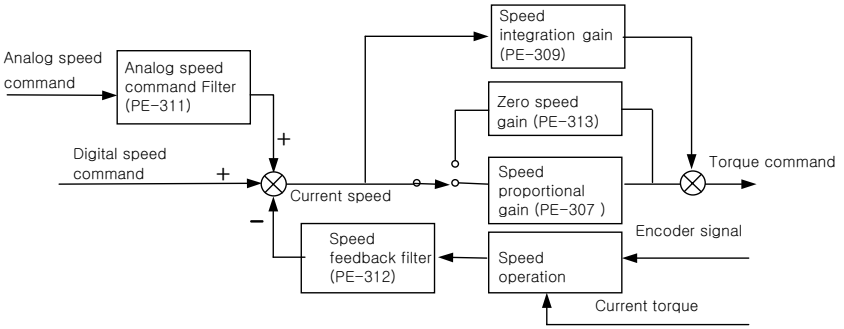
③ Position proportional gain [PE-302][PE-303]: The position proportional gain is multiplied by the difference between command position and current position to convert the outcome into a speed command.

④ Feed 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.

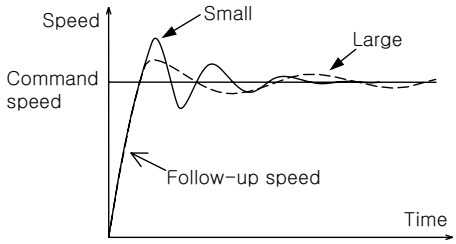
2) Speed control gain



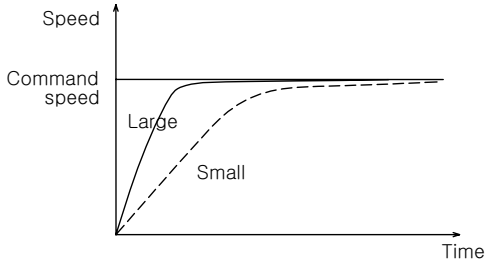
① Speed command: The analog speed signals received from external sources are used as the speed command after going through the analog speed command filter [PE-311], or the digital speed command set by the internal menu in the unit of r/min is used.

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 stationery 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.

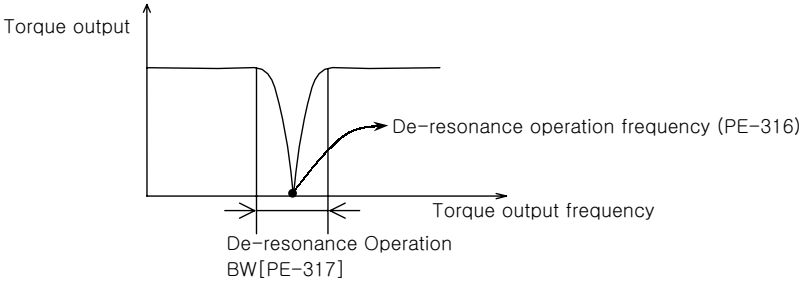
Motor Flange	Inertia Ratio		Range of Gain Setting		
	Classification	[Inertia]	Position proportional gain [Pgain 1,2]	Speed proportional gain [Sgain 1,2]	Speed integration gain [SITC]
40 ~ 80	Low inertia	1 ~ 5	40 ~ 60	500 ~ 800	20 ~ 40
	Medium inertia	5 ~ 20	20 ~ 40	300 ~ 500	40 ~ 60
	High inertia	20 ~ 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 ~ 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 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.

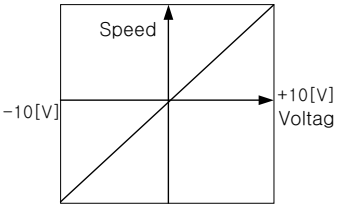
1.4.5 Setting I/O Variables

1) Setting analog speed command

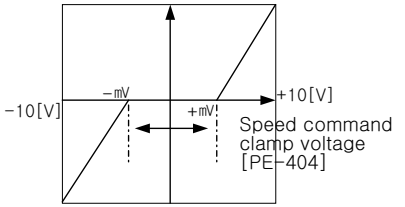
① Analog speed command [PE-401]: Set the analog speed command value in the unit of r/min at 10 [V]. The maximum setting will be the motor's maximum speed.

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 "㎷".

③ Setting speed command clamp



Speed command clamp mode "0"
[PE-403]



Speed command clamp mode "1"
[PE-403]

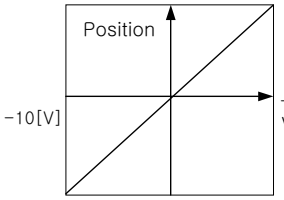
④ Speed override operation [PE-717]: Speed command operation can be executed by overriding (overlapping) the analog speed command with the digital speed command.
"0": Override not activated.
"1": Override activated.

2) Setting analog position command

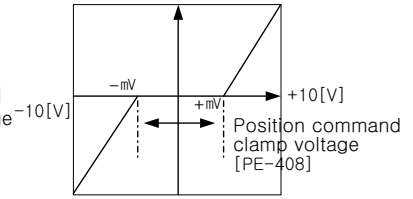
① Analog position command [PE-405]: Set analog position command value at 10[V].

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 "㎷".

③ Position command clamp



Position command clamp mode "0" [PE-407]



Position command clamp mode "1" [PE-407]

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 peed	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-413], [PE-417]. 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.

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.

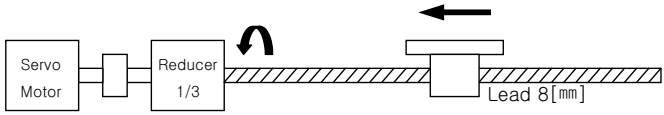
1.4.6 Setting Common Operation Variables

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 [㎜].



* 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.

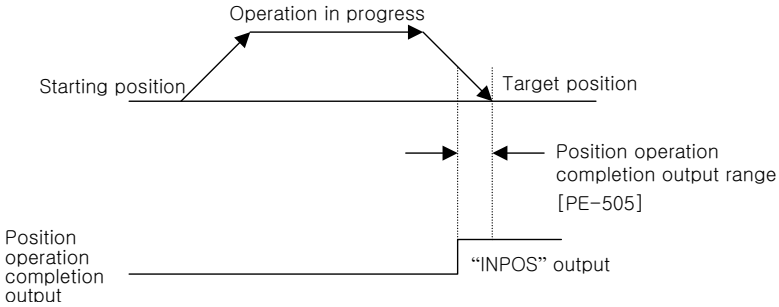
Code	+ Position Coordinates	- Position Coordinates
0	Forward running (CCW)	Backward running (CW)
1	Backward running (CW)	Forward running (CCW)

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.



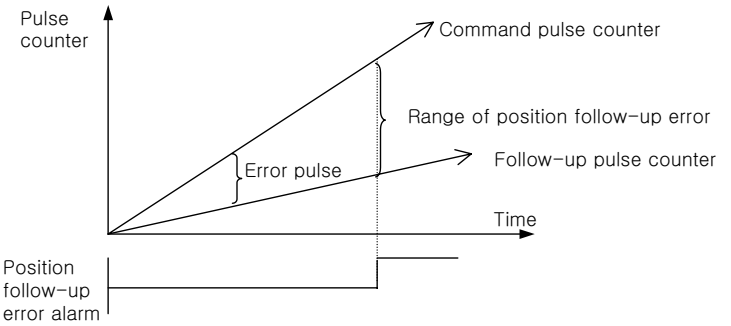
If the amount of mechanism feed [PE-502] or the position coordinate unit [PE-602] is changed, increase the range of position operation completion output [PE-505] in the same ratio. If the setting is too large, the positioning completion output signal may be produced during operation. Set an appropriate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

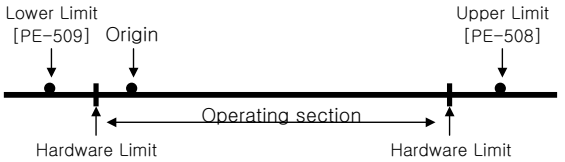
* If the setting is greater than “0”, the system operates; and if the setting Is “0”, the system does not operate.

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



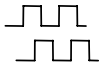
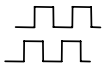
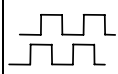
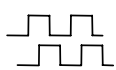
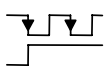
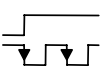
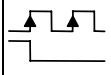
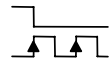
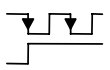
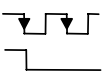
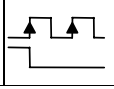
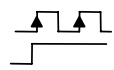
If hardware limit cannot be used for safety purposes or due to the nature of mechanical structure, software limit may be set.

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.

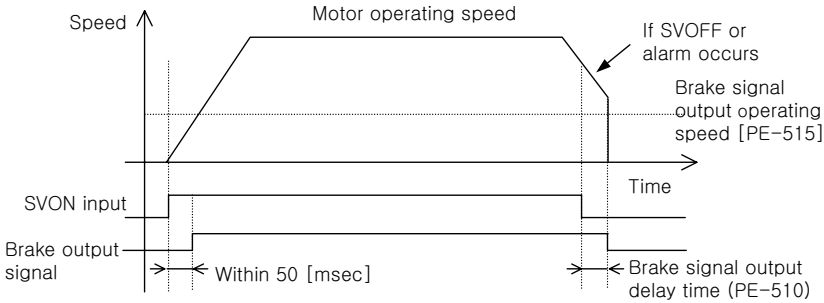
4) Setting external input pulse (MPG) unit

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 Input Contact State				Position Group			
	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.

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

- 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]

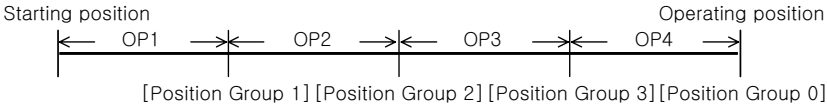
Operating position is set at Position Group 0, and the middle coordinate is set at Position Group 1-3.

■ Middle coordinate output [PE-604]

System operates as follows depending on the I/O mode setting:

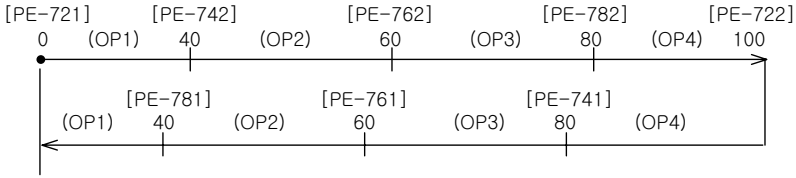
Setting	Operation
0	Digital switch input (In case [PE-601]=4, 5)
1	Middle coordinate output operation
2	Position coordinate output signal OP0-OP4 (in case [PE-601]=1)

* Middle coordinate output operation



During the process of operating from the starting position to the selected position number of the position group 0, the contacts OP1-OP4 are output in the applicable sections based on the settings of position group 1-3. Position group 1-3 must be entered in sequence following the direction of operation from the starting position to the operating position.

Example: If 0 and 100 are inserted in position numbers 0 and 1 respectively,



CAUTION

When using the system by setting the middle coordinate output [PE-604]=1, do not connect digital switch as it may cause malfunction.

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.

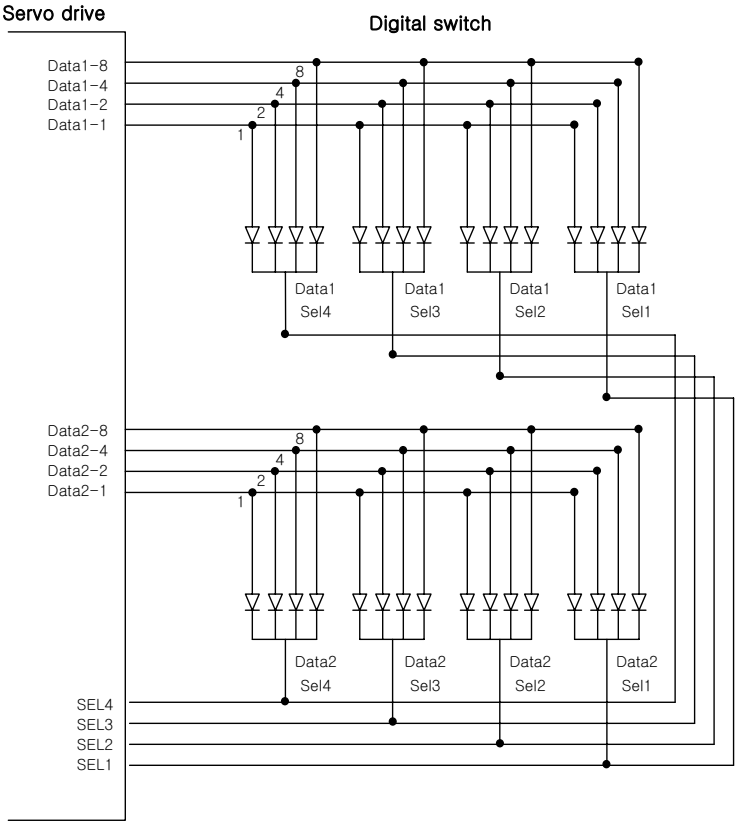
- Setting direction of operation [PE-605]

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)

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

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

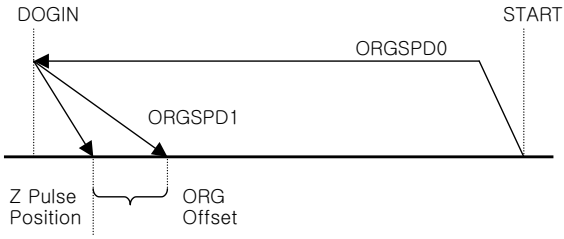
Set acceleration/deceleration time applied in jog run.

2) Origin run

① Origin run Mode[PE-810]

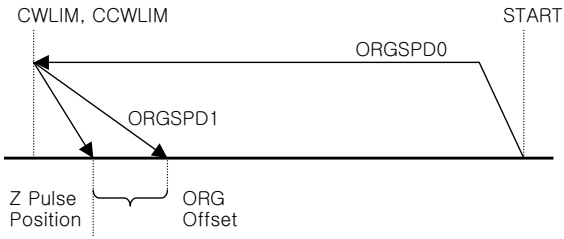
- Mode 0: Set current position as origin.
- Mode 1: Sensor (Dog) type

  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.



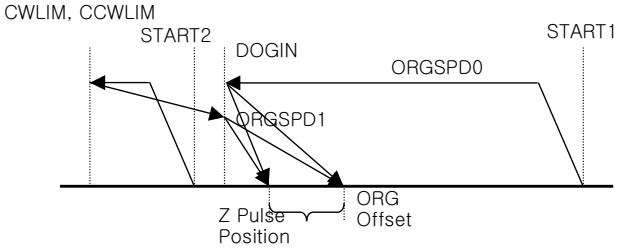
- Mode 2: Limit type

  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.



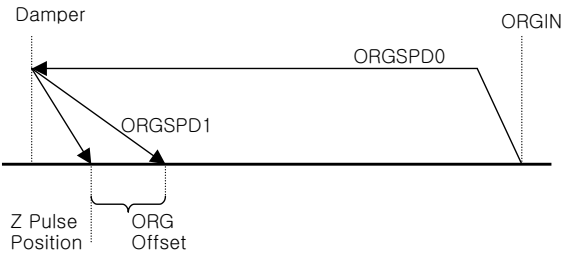
- Mode 3: Limit and sensor (Dog) type

If the system meets the limit after starting origin run, it turns in the opposite direction; and it if 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.

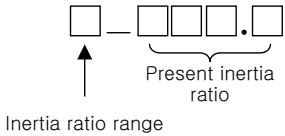
Note: Loader jog run moves at jog speed 0.

4) Loader origin run [PC-904]

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

5) Automatic gain adjustment [PC-905]

① If Enter is pressed in menu [PC-905], the following screen appears:



Inertia Ratio Range	Inertia Ratio
1	1 ~ 5
2	5 ~ 10
3	10 ~ 25
4	25 ~ 50
5	50 ~ 100

② Adjusting manual forward/backward operation

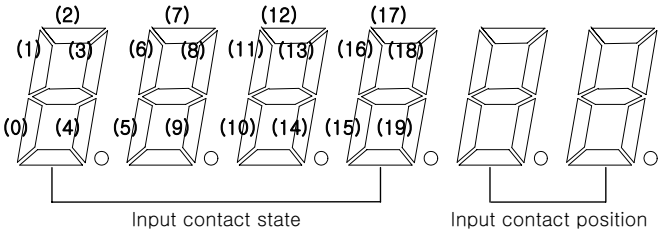
- If the servo is operated/stopped or operated in forward/backward direction by the use of contacts, the current inertia ratio is automatically adjusted.
- If the adjusted inertia ratio maintains maximum value, increase the range of the inertia ratio; and decrease the range of inertia ratio if the adjusted inertia ratio maintains minimum value. If the inertia ratio is maintained between the minimum and maximum values, adjustment is completed.
- The left key (decrease) and the right key (increase) are used to adjust the range of inertia ratio.

③ Automatic adjustment of forward/backward operation

- If Up Key is pressed, the system automatically starts forward/backward operation. The forward/backward operation distance increases each time Up Key is pressed.
- The operation speed is set to jog speed 1 [PE-802].
- If the inertia ratio stays between the maximum and minimum values of the inertia ratio range, adjustment is completed.

④ Press Enter upon completion of adjustment. Then gain is automatically adjusted, and the adjusted gain is saved.

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: 1.3]

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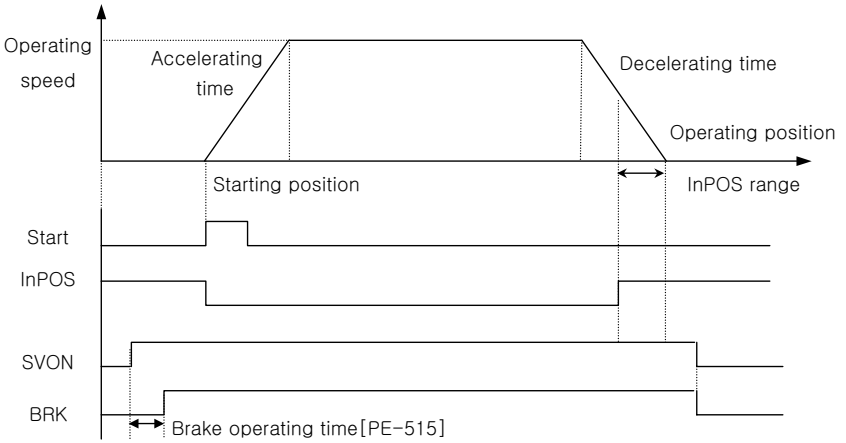
2.1 Major Functions



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°...

2.1.1 Position Operation Function

1) Setting position coordinates

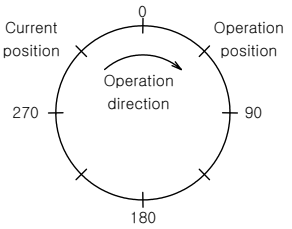
Input Contact State					Menu	Menu Number
PSEL0	PSEL1	PSEL2	PSEL3	PSEL4		
X	X	X	X	X	Position Com0	PE-721
O	X	X	X	X	Position Com1	PE-722
X	O	X	X	X	Position Com2	PE-723
O	O	X	X	X	Position Com3	PE-724
X	X	O	X	X	Position Com4	PE-725
O	X	O	X	X	Position Com5	PE-726
X	O	O	X	X	Position Com6	PE-727
O	O	O	X	X	Position 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°.

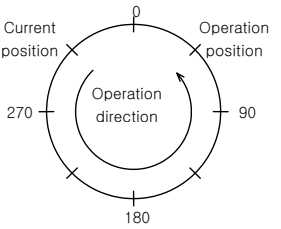
2) Proximity identification operation [PE-603]

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

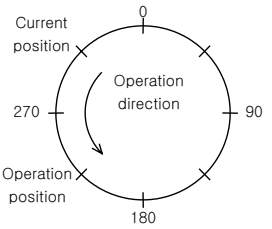
[Proximity operation setting "1"]



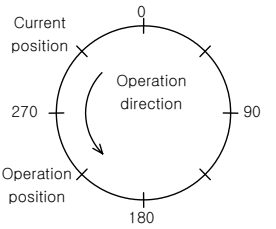
[Proximity operation setting "0"]



[Proximity operation setting "1"]

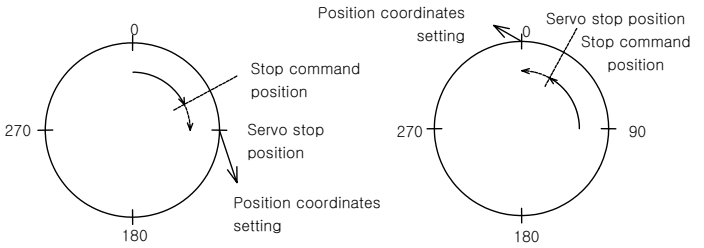


[Proximity operation setting "0"]



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.



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	Acceleration/Deceleration
SPD1	SPD2	SPD3	Speed	Time
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.

2.1.6 Setting Operation Data

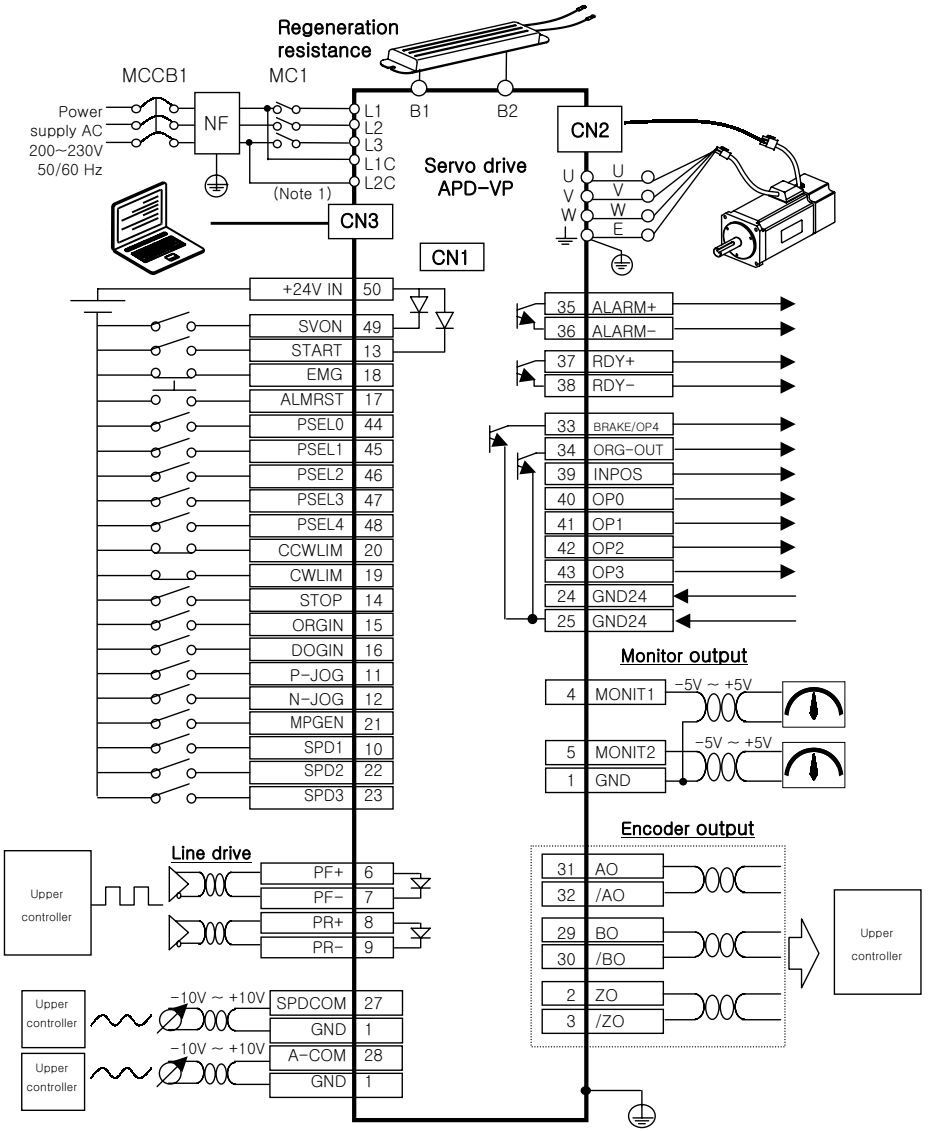
Setting Mode	Major Functions
Menu setting	Edit and set menu using loader.
Communication setting	Set data based on communication (CN3).

2.1.7 Operation Data Output

<table>
<tr><th>Output Mode</th><th>Output Details</th></tr>
<tr><td>Communication output</td><td>Output operation data based on communication (CN3).</td></tr>
<tr><td>Analog</td><td>* Data are output in ±5V according to the set scale units, and the following operation data are output according to the output mode.
<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></td></tr>
</table>

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.

2.2.2 Control Signal

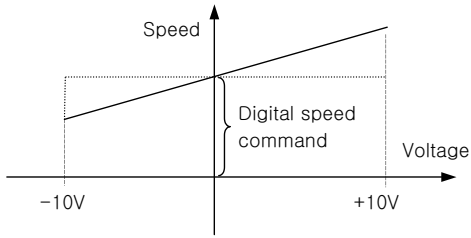
1) Contact input signal

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

4) Output contact 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	ORG-OUT	Outputs origin run completion signals.
39	INPOS	Outputs position operation completion signals.
40	OP0	
41	OP1	
42	OP2	
43	OP3	

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	0	Displays current operating speed.
			-99999	99999	
2	Pd-003	Command Speed	r/min	0	Displays current command speed.
			-99999	99999	
3	Pd-004	Reference Speed	–	0	Displays speed command values based on the acceleration/deceleration time during operation.
			-99999	99999	
4	Pd-005	Current Position	–	0.0	Displays current position coordinates.
			-9999.9	9999.9	
5	Pd-006	Refer Position	–	0.0	Displays current target position coordinates.
			-9999.9	9999.9	
6	Pd-007	Command Position	–	0.0	Displays operation command position coordinates.
			-9999.9	9999.9	
7	Pd-008	Remain Position	–	0.0	Displays the difference between target position coordinates and current position coordinates.
			-9999.9	9999.9	
8	Pd-009	Torque Limit	[%]	0	Displays torque-limit setting.
			0	300	
9	Pd-010	Current Load	[%]	0.0	Displays current load rate versus rated load.
			-9999.9	9999.9	
10	Pd-011	Average Load	[%]	0.0	Displays average load rate of 5 seconds versus rated load.
			-9999.9	9999.9	
11	Pd-012	Maximum Load	[%]	0.0	Displays maximum instantaneous load rate versus rated load.
			-9999.9	9999.9	
12	Pd-013	DC Link Voltage	Volt	0.0	Displays condenser's DC voltage value.
			-999.9	999.9	
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.
			–	–	

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

Motor Models 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	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

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	
HC05H	99	500	For customers only

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 peed 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	Not Used	-	-	
			-	-	
78	PE-319	Not Used	-	-	
			-	-	
79	PE-320	Not Used	-	-	
			-	-	

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	Not Used	-	-	
			-	-	

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	Not Used	–	–	
			–	–	
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	

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	Position Unit No	-	1	Set decimal places of position coordinate displays [Pd-005]-[Pd-007].
			0	2	
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	Not Used	-	-	
			-	-	
128	PE-609	Not Used	-	-	
			-	-	
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	-	-	
			-	-	
138	PE-619	Not Used	-	-	
			-	-	
139	PE-620	Not Used	-	-	
			-	-	

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 -9999.9	10.0 9999.9	Set operating speed 0.
141	PE-702	Speed Command1	r/min -9999.9	100.0 9999.9	Set operating speed 1.
142	PE-703	Speed Command2	r/min -9999.9	200.0 9999.9	Set operating speed 2.
143	PE-704	Speed Command3	r/min -9999.9	500.0 9999.9	Set operating speed 3.
144	PE-705	Speed Command4	r/min -9999.9	1000.0 9999.9	Set operating speed 4.
145	PE-706	Speed Command5	r/min -9999.9	1500.0 9999.9	Set operating speed 5.
146	PE-707	Speed Command6	r/min -9999.9	2000.0 9999.9	Set operating speed 6.
147	PE-708	Speed Command7	r/min -9999.9	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	- -	- -	

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 coordinate 0.
			0.00	359.99	
161	PE-722	Position Com1	–	1.00	Set position coordinate 1.
			0.00	359.99	
162	PE-723	Position Com2	–	2.00	Set position coordinate 2.
			0.00	359.99	
163	PE-724	Position Com3	–	3.00	Set position coordinate 3.
			0.00	359.99	
164	PE-725	Position Com4	–	4.00	Set position coordinate 4.
			0.00	359.99	
165	PE-726	Position Com5	–	5.00	Set position coordinate 5.
			0.00	359.99	
166	PE-727	Position Com6	–	6.00	Set position coordinate 6.
			0.00	359.99	
167	PE-728	Position Com7	–	7.00	Set position coordinate 7.
			0.00	359.99	
168	PE-729	Position Com8	–	8.00	Set position coordinate 8.
			0.00	359.99	
169	PE-730	Position Com9	–	9.00	Set position coordinate 9.
			0.00	359.99	
170	PE-731	Position Com10	–	10.00	Set position coordinate 10.
			0.00	359.99	
171	PE-732	Position Com11	–	11.00	Set position coordinate 11.
			0.00	359.99	
172	PE-733	Position Com12	–	12.00	Set position coordinate 12.
			0.00	359.99	
173	PE-734	Position Com13	–	13.00	Set position coordinate 13.
			0.00	359.99	
174	PE-735	Position Com14	–	14.00	Set position coordinate 14.
			0.00	359.99	
175	PE-736	Position Com15	–	15.00	Set position coordinate 15.
			0.00	359.99	
176	PE-737	Position Com16	–	160.00	Set position coordinate 16.
			0.00	359.99	
177	PE-738	Position Com17	–	170.00	Set position coordinate 17.
			0.00	359.99	
178	PE-739	Position Com18	–	180.00	Set position coordinate 18.
			0.00	359.99	
179	PE-740	Position Com19	–	190.00	Set position coordinate 19.
			0.00	359.99	

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 coordinate 20.
			0.00	359.99	
181	PE-742	Position Com21	-	210.00	Set position coordinate 21.
			0.00	359.99	
182	PE-743	Position Com22	-	220.00	Set position coordinate 22.
			0.00	359.99	
183	PE-744	Position Com23	-	230.00	Set position coordinate 23.
			0.00	359.99	
184	PE-745	Position Com24	-	240.00	Set position coordinate 24.
			0.00	359.99	
185	PE-746	Position Com25	-	250.00	Set position coordinate 25.
			0.00	359.99	
186	PE-747	Position Com26	-	260.00	Set position coordinate 26.
			0.00	359.99	
187	PE-748	Position Com27	-	270.00	Set position coordinate 27.
			0.00	359.99	
188	PE-749	Position Com28	-	280.00	Set position coordinate 28.
			0.00	359.99	
189	PE-750	Position Com29	-	290.00	Set position coordinate 29.
			0.00	359.99	
190	PE-751	Position Com30	-	300.00	Set position coordinate 30.
			0.00	359.99	
191	PE-752	Position Com31	-	310.00	Set position coordinate 31.
			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	-	-	
			-	-	

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	10.0	Set jog run speed 0.
			0.0	9999.9	
201	PE-802	Jog Speed1	r/min	500.0	Set jog run speed 1.
			0.0	9999.9	
202	PE-803	Jog AccDec Time	msec	100	Set jog acceleration/deceleration time.
			0	99999	
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	-	1	Set origin run mode.
			0	4	
210	PE-811	Origin polarity	-	0	Set origin run direction.
			0	1	
211	PE-812	Origin Dog Stop	-	0	Set stop (1) or Z position operation 0 when dog sensor turns off during origin run.
			0	1	
212	PE-813	Origin Offset	-	0.0	Set offset position at which to stop after origin run.
			0.00	359.99	
213	PE-814	Origin Position	-	0.0	Set initial coordinates after origin run.
			0.00	359.99	
214	PE-815	Origin AutoRun	-	0	Set automatic origin run ON or OFF when servo is on.
			0	1	
215	PE-816	Origin Speed0	r/min	100.0	Set origin run speed 0.
			0.0	9999.9	
216	PE-817	Origin Speed1	r/min	10.0	Set origin run speed 1.
			0.0	9999.9	
217	PE-818	Origin Torque	[%]	50.0	Set torque during damper (Origin run mode 4) run.
			1.0	300.0	
218	PE-819	Not Used	-	-	
			-	-	
219	PE-820	Not Used	-	-	
			-	-	

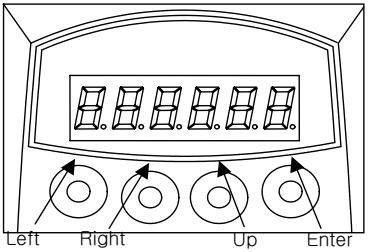
2.3.12 Operation Menu

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	–	–	Initialize menu data.
			–	–	
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	PC-918	Not Used	–	–	
			–	–	
238	PC-919	Not Used	–	–	
			–	–	
239	PC-920	Not Used	–	–	
			–	–	

2.4 Detailed Description of Menu

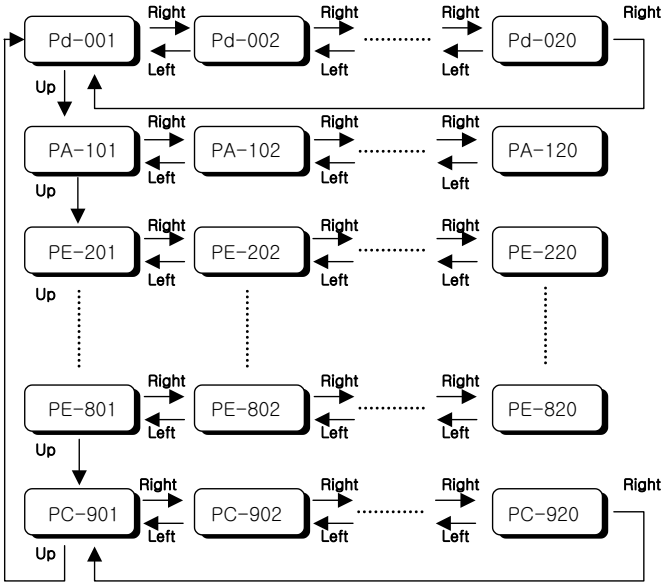
2.4.1 Loader Operation

1) Components

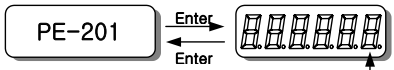


2) Components

① Menu movement



② Menu editing



* Changing position: Left/Right
* Changing numbers: Up

Initial blinking position

- 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	- 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 1.4.9. "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 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: "-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.

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.

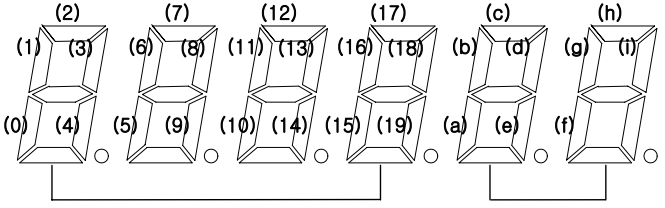
③ Average load rate [Pd -011]

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	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	OP0	OP1	OP2	OP3

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].

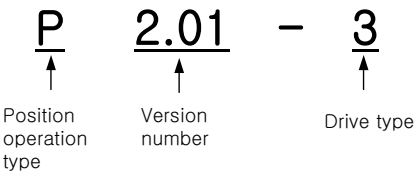
The value saved by the current logic of the input contact is displayed.

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



* 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

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

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 cast 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

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 cast type
SE07D	80	650	Special cast type
SF30A	81	3000	
SF50A	82	5000	
SF22D	85	3200	
SF35D	86	3500	
SF55D	87	5500	
SF75D	88	7500	

Motor models and ID

Model	ID	Watt	Remarks
SD08A	41	800	To be developed
SD10A	42	1000	To be developed
SD15A	43	1500	To be developed
SD20A	44	2000	To be developed
SD05D	45	500	To be developed
SD08D	46	800	To be developed
SD10D	47	1000	To be developed
SD12D	48	1200	To be developed
SD03M	49	300	To be developed
SD04M	50	400	To be developed
SD05M	51	500	To be developed
SD06M	52	600	To be developed

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	
HC05H	99	500	For customers only

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]

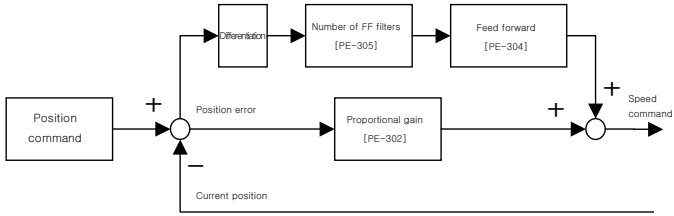
  A group ID is set and used when multiple servos are consolidated into a group for communications.

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.

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.

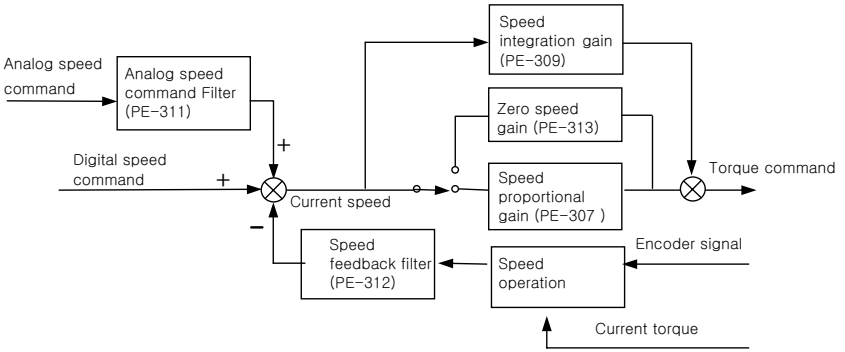
③ Position proportional gain [PE-302][PE-303]: The position proportional gain is multiplied by the difference between command position and current position to convert the outcome into a speed command.

④ Feed 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.

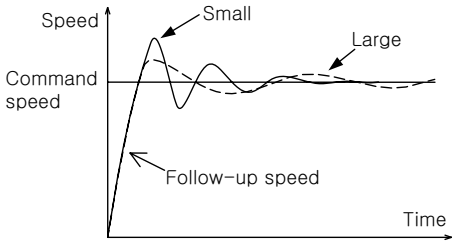
2) Speed control gain



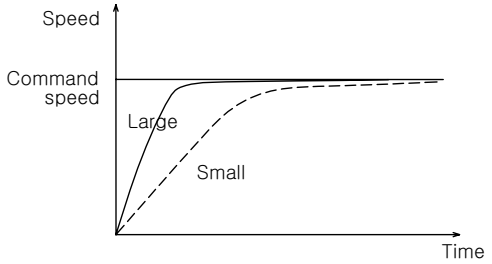
① Speed command: The analog speed signals received from external sources are used as the speed command after going through the analog speed command filter [PE-311], or the digital speed command set by the internal menu in the unit of r/min is used.

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 stationery 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]

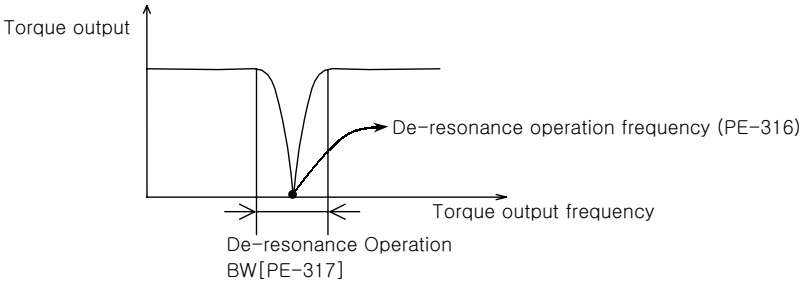
Load inertia is calculated for each mechanical system. The rotator's inertia ratio is calculated and set based on the motor characteristics table. Setting the inertia ratio of load is a very important control variable in the servo operation characteristics. Servo can be operated in an optimal condition 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 ~ 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 2.4.9 “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.

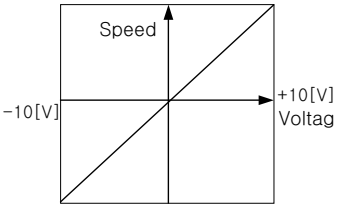
2.4.5 Setting I/O Variables

1) Setting analog speed command

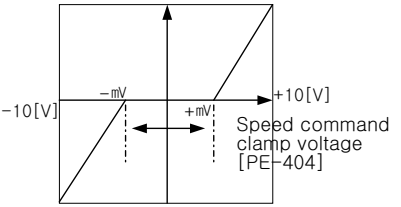
① Analog speed command [PE-401]: Set the analog speed command value in the unit of r/min at 10 [V]. The maximum setting will be the motor's maximum speed.

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 "㎷".

③ Setting speed command clamp



Speed Command Clamp Mode "0"
[PE-403]



Speed Command Clamp Mode "1"
[PE-403]

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 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-410], [PE-414]

Model	Data
0	Command speed
1	Current peed
2	Command torque
3	Current torque

② Analog output modes [PE-411], [PE-415]

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

③ Analog output magnification [PE-413], [PE-417]

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 “㎷”.

3) 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.

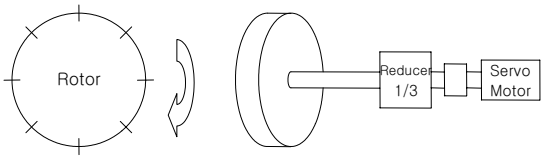
2.4.6 Setting Common Operation Variables

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 1/30 and the machine movement is 360°:



* Enter "3" for motor rpm [PE-501] and "360°" 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)

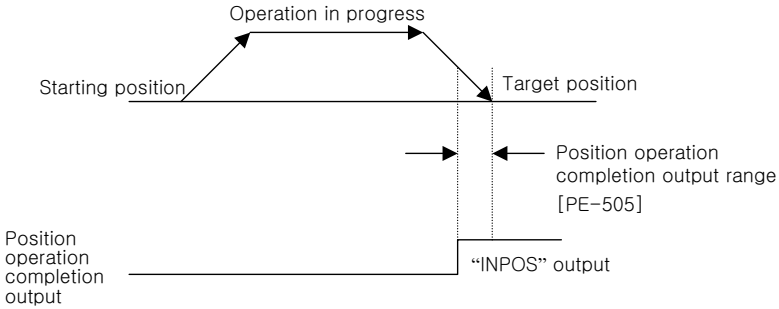
2) Setting position operation variables

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.

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.



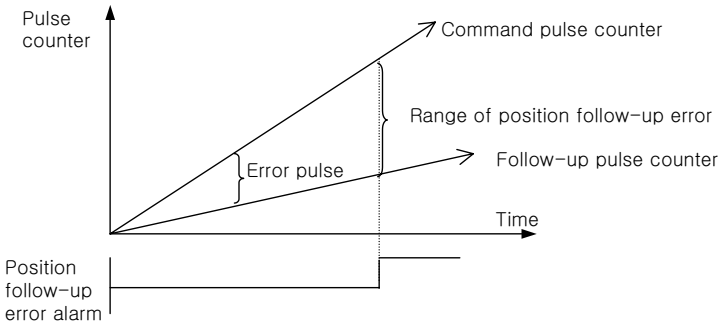
If the setting is too large, the positioning completion output signal may be produced during operation. Set an appropriate value to avoid this.

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.

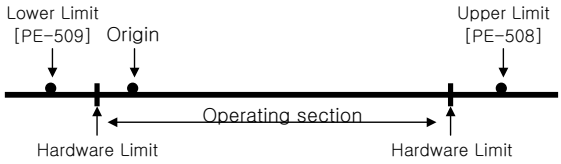
* If the setting is greater than "0", the system operates; and if the setting Is "0", the system does not operate.

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.

3) Setting Software Limit



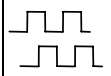
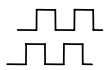
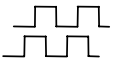
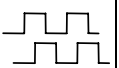
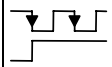
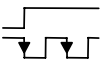
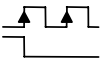
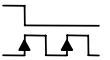
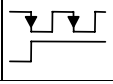
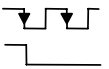
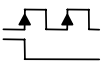
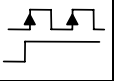
If hardware limit cannot be used for safety purposes or due to the nature of mechanical structure, software limit may be set.

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.

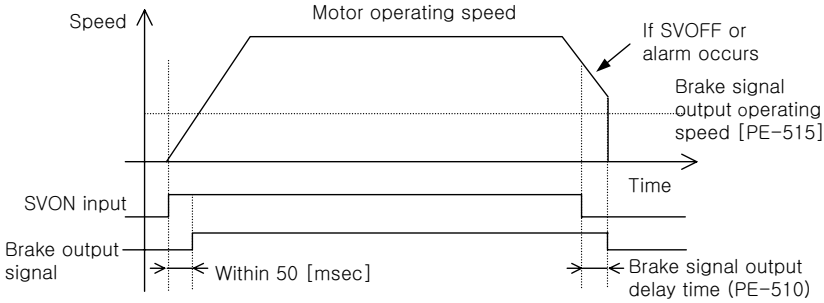
4) Setting external input pulse (MPG) unit

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-514] and brake signal output delay time [PE-515]

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-514) or the brake signal output delay time (PE-515) whichever satisfied the operating conditions first. This prevents the vertical shaft from dropping to the motor brake.

6) Dynamo braking [PE-517]

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

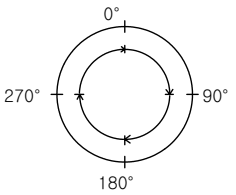
1) Setting operating mode [PE-601]

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].

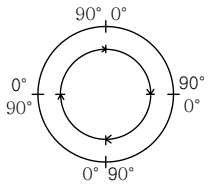
* Refer to paragraph 1.1.2 “Position operation function (Page 1.4)”.

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]

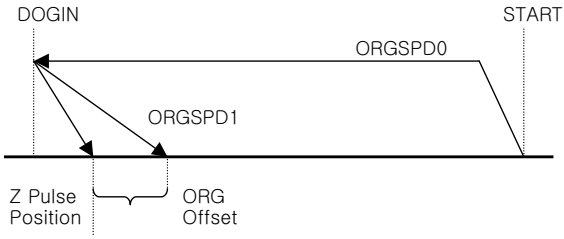
Set acceleration/deceleration time applied in jog run.

2) Origin run

① Origin run Mode[PE-810]

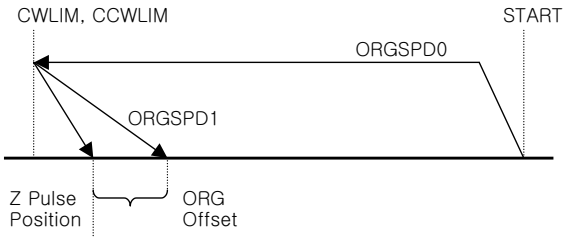
- Mode 0: Set current position as origin.
- Mode 1: Sensor (Dog) type

  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.



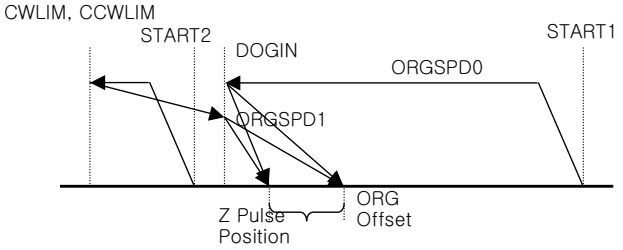
- Mode 2: Limit type

  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.



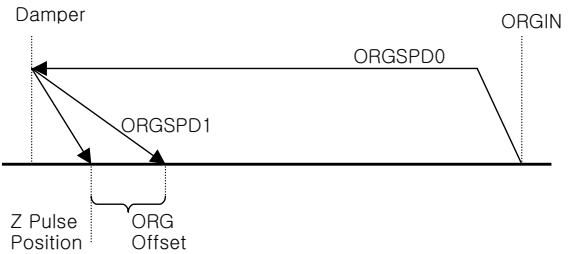
- Mode 3: Limit and sensor (Dog) type

  If the system meets the limit after starting origin run, it turns in the opposite direction; and it if 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”.

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.

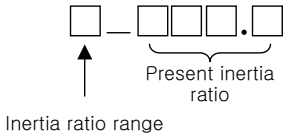
Note: Loader jog run moves at jog speed 0.

4) Loader origin run [PC-904]

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

5) Automatic gain adjustment [PC-905]

① If Enter is pressed in menu [PC-905], the following screen appears:



Inertia Ratio Range	Inertia Ratio
1	1 ~ 5
2	5 ~ 10
3	10 ~ 25
4	25 ~ 50
5	50 ~ 100

② Adjusting manual forward/backward operation

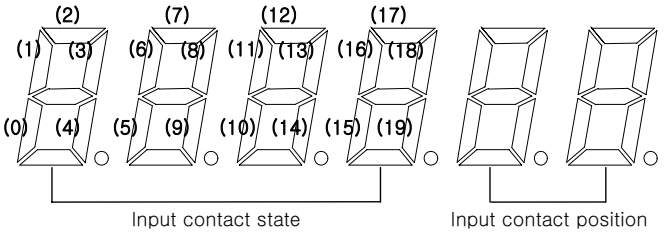
- If the servo is operated/stopped or operated in forward/backward direction by the use of contacts, the current inertia ratio is automatically adjusted.
- If the adjusted inertia ratio maintains maximum value, increase the range of the inertia ratio; and decrease the range of inertia ratio if the adjusted inertia ratio maintains minimum value. If the inertia ratio is maintained between the minimum and maximum values, adjustment is completed.
- The left key (decrease) and the right key (increase) are used to adjust the range of inertia ratio.

③ Automatic adjustment of forward/backward operation

- If Up Key is pressed, the system automatically starts forward/backward operation. The forward/backward operation distance increases each time Up Key is pressed.
- The operation speed is set to jog speed 1 [PE-802].
- If the inertia ratio stays between the maximum and minimum values of the inertia ratio range, adjustment is completed.

④ Press Enter upon completion of adjustment. Then gain is automatically adjusted, and the adjusted gain is saved.

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 3

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

[Manual Version: 1.3]

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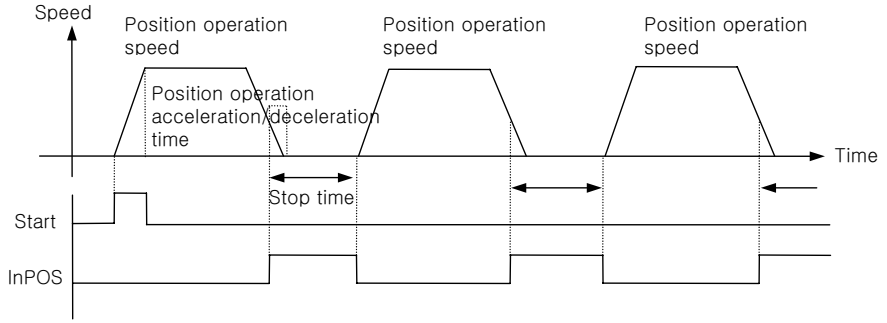
3.1 Major Functions

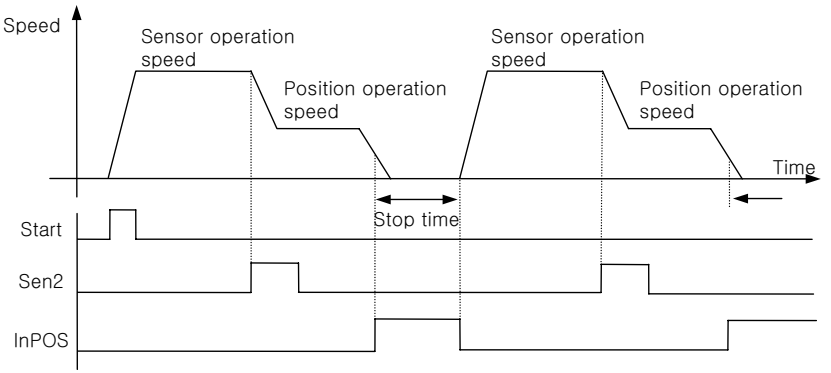
3.1.1 Operating Mode

1) Feeder position operation [Operating Mode 0]



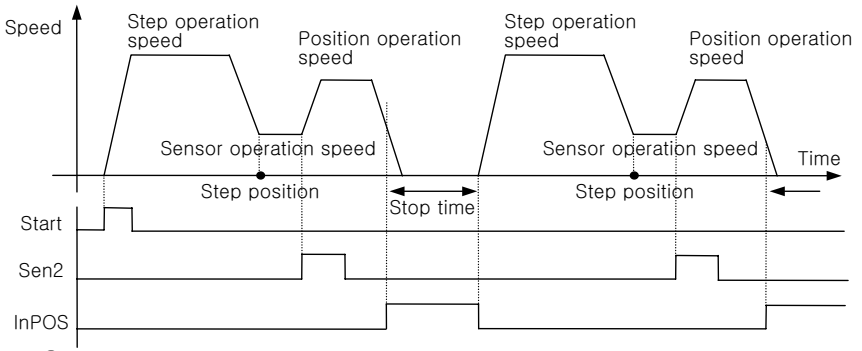
① The system performs position operation by increasing the position to the extent of the position operation coordinates selected based on the current point.
② If the continuous operation (Automatic) contact is on, the system stops for the duration of the set stop time, and automatically starts again.

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



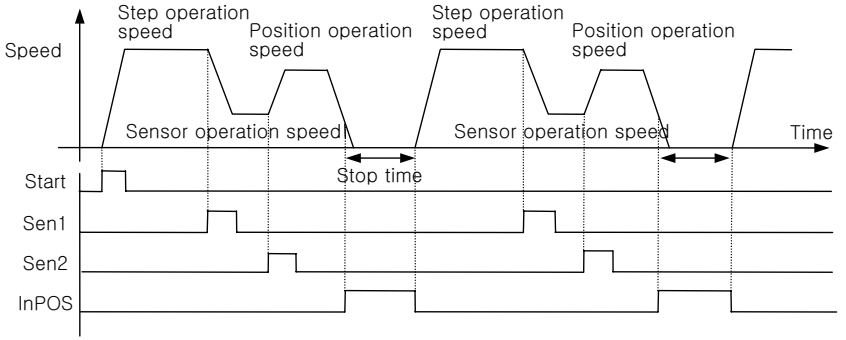
① If Start is turned on, infinite operation begins at sensor operation speed.
② If the sensor contact is turned on, the system operates at position operation speed to the extent of the position operation coordinate selected based on this point, and stops operation.
③ If the continuous operation (Automatic) 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 are 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 are 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.

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)

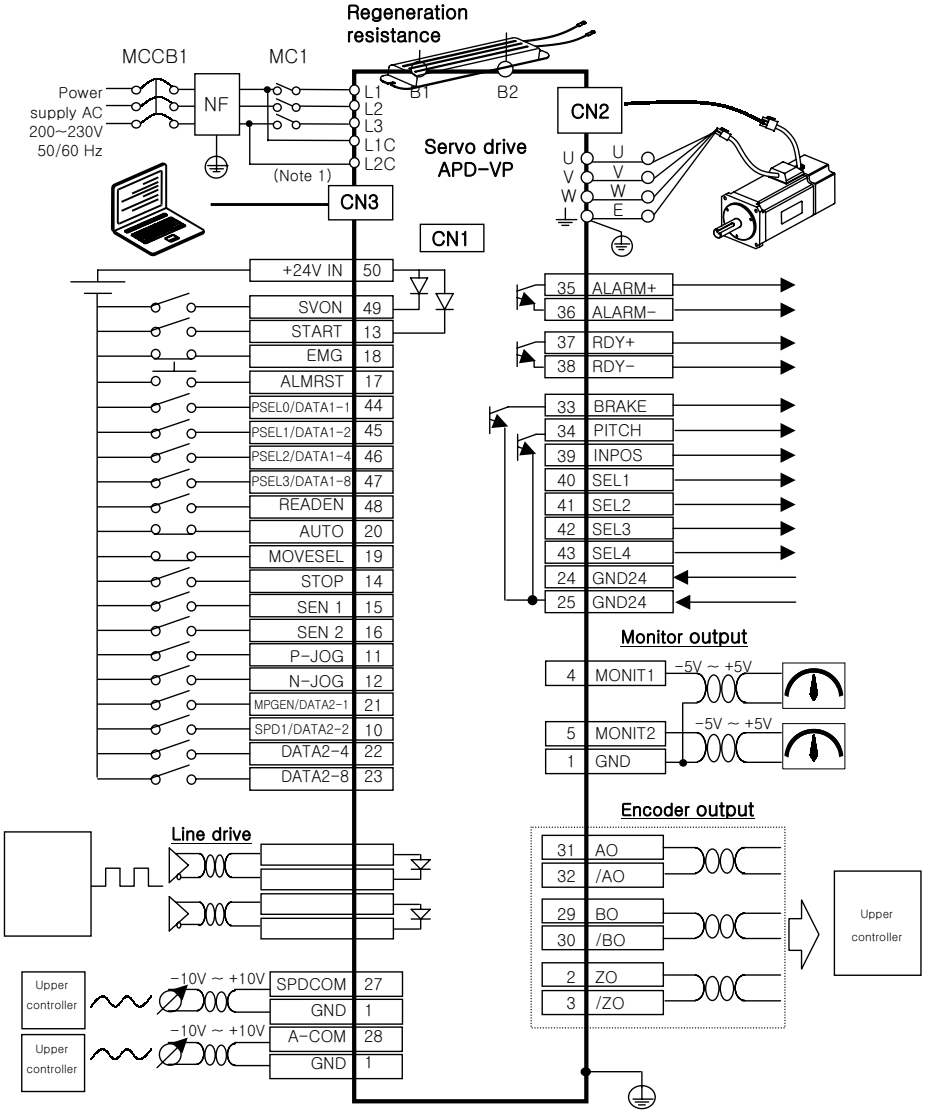
3.1.5 Operation Data Output

Output Mode	Output Details
Communication output	Output operation data based on communication (CN3).
Analog	* Data are output in ±5V according to the set scale units, and the following operation data are output according to the output mode.

Output Mode	Output Item
0	Command speed
1	Current speed
2	Command torque
3	Current torque

3.2 System Configuration

3.2.1 Connection Diagram (Feeder and sensor-input position operation type (VP-3))



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

3.2.2 Control Signal

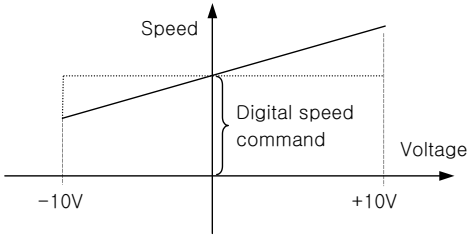
1) Contact input signal

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	READEN		Data read enable
20	AUTO	Select auto consecutive operation.	
19	MOVESEL	Select mechanism operation unit.	
14	STOP	Operation stop	
15	SEN1	Input sensor 1.	
16	SEN2	Input sensor 2.	
11	P-JOG	Forward direction jog	
12	N-JOG	Rearward 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

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-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
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	0	Displays current operating speed.
			-99999	99999	
2	Pd-003	Command Speed	r/min	0	Displays current command speed.
			-99999	99999	
3	Pd-004	Reference Speed	–	0	Displays speed command values based on the acceleration/deceleration time during operation.
			-99999	99999	
4	Pd-005	Current Position	–	0.0	Displays current position coordinates.
			-9999.9	9999.9	
5	Pd-006	Refer Position	–	0.0	Displays current target position coordinates.
			-9999.9	9999.9	
6	Pd-007	Command Position	–	0.0	Displays operation command position coordinates.
			-9999.9	9999.9	
7	Pd-008	Remain Position	–	0.0	Displays the difference between target position coordinates and current position coordinates.
			-9999.9	9999.9	
8	Pd-009	Torque Limit	[%]	0	Displays torque-limit setting.
			0	300	
9	Pd-010	Current Load	[%]	0.0	Displays current load rate versus rated load.
			-9999.9	9999.9	
10	Pd-011	Average Load	[%]	0.0	Displays average load rate of 5 seconds versus rated load.
			-9999.9	9999.9	
11	Pd-012	Maximum Load	[%]	0.0	Displays maximum instantaneous load rate versus rated load.
			-9999.9	9999.9	
12	Pd-013	DC Link Voltage	Volt	0.0	Displays condenser's DC voltage value.
			-999.9	999.9	
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.
			–	–	

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	Normal	Normal state	–
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	wiring, limit contact, gain setting
AL-07	Limit Direction	Operation in limit direction	Direction of running, limit contacts
AL-08	Over Current	Overcurrent	Wring, 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].

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

Motor Models 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	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

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	
HC05H	99	500	For customers only

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 peed range of zero speed gain.
			0.0	100.0	
73	PE-314	POS. COM FT	-	-	
			-	-	
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	Not Used	-	-	
			-	-	
78	PE-319	Not Used	-	-	
			-	-	
79	PE-320	Not Used	-	-	
			-	-	

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	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	Monitor OutPos	-	1	Set frequency dividing ratio of encoder output signal.
			1	16	
97	PE-418	Pulse Out Rate	-	-	
			-	-	
98	PE-419	Not Used	-	-	
			-	-	
99	PE-420	Not Used	-	-	
			-	-	

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	Set mechanism system 1 based on mechanism feed versus motor rpm.
			1	99999	
101	*PE-502	Move Mechanical1	–	1	
			1	99999	
102	*PE-503	Move Motor2	–	2	Set mechanism system 2 based on mechanism feed versus motor rpm.
			1	99999	
103	*PE-504	Move Mechanical2	–	1	
			1	99999	
104	*PE-505	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	
105	PE-506	InPOS Position	–	0.01	Set in-position range.
			0.01	9999.99	
106	PE-507	InPOS Time	msec	0	Set time of maintaining in-position output.
			0	10000	
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	–	90000	Set range of output for excessive position following error.
			0	99999	
114	PE-515	Brake SPD	r/min	50.0	Set operating speed of built-in brake.
			0.0	9999.9	
115	PE-516	Brake Time	msec	10	Set opening delay time of built-in brake.
			0	10000	
116	*PE-517	PowerFail Mode	–	By type of equipment	Set power failure mode. 0: VP04 or less, 1: VP05 or more
			0	1	
117	PE-518	DB Control	–	1	Set dynamo braking mode.
			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	

3.3.7 Private Operation Variable Setting Menu

MENU			UNIT	INI	Description
NO	CODE	NAME	MIN	MAX	
120	*PE-601	Operation Mode	–	0	Set operating mode.
			0	3	
121	PE-602	Position Unit No	–	1	Set number of decimal place of position coordinates.
			0	4	
122	PE-603	Position Limit	–	0	Set pitch distance limit operation for sensor-input position operation.
			0	1	
123	PE-604	Stop Mode	–	0	Set start command action mode after stopping.
			0	1	
124	PE-605	Spd Override	–	0	"0": Override operation not executed. "1": Override operation excluding sensor speed. "2": Override operation covering all sections.
			0	2	
125	PE-606	Digit Input	–	0	Set digital switch position input action.
			0	1	
126	PE-607	Digit Mode	–	0	Set input mode. (0: Digital SW input, 1: PLC contact input)
			0	1	
127	PE-608	Digit Data Type	–	0	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)
			0	2	
128	PE-609	Digit Data Time	msec	10	Set delay time from the time the number of figures for the data is selected to the time it is read.
			0	99999	
129	PE-610	Digit Speed	r/min	0	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 [%])
			0	9999	
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 ~ 139	PE-617 ~ PE-620	Not Used	–	–	
			–	–	

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	500.0	Set position operating speed 0.
			0.0	9999.9	
141	PE-622	Run Speed Com1	r/min	500.0	Set position operating speed 1.
			0.0	9999.9	
142	PE-623	Run Speed Com2	r/min	500.0	Set position operating speed 2.
			0.0	9999.9	
143	PE-624	Run Speed Com3	r/min	500.0	Set position operating speed 3.
			0.0	9999.9	
144	PE-625	Run Acc Time0	msec	100	Set position operation acceleration time 0.
			0	100000	
145	PE-626	Run Acc Time1	msec	100	Set position operation acceleration time 1.
			0	100000	
146	PE-627	Run Acc Time2	msec	100	Set position operation acceleration time 2.
			0	100000	
147	PE-628	Run Acc Time3	msec	100	Set position operation acceleration time 3.
			0	100000	
148	PE-629	Run Dec Time0	msec	100	Set position operation deceleration time 0.
			0	100000	
149	PE-630	Run Dec Time1	msec	100	Set position operation deceleration time 1.
			0	100000	
150	PE-631	Run Dec Time2	msec	100	Set position operation deceleration time 2.
			0	100000	
151	PE-632	Run Dec Time3	msec	100	Set position operation deceleration time 3.
			0	100000	
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	-	-	
			-	-	

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	1000.0	Set step operating speed 0.
			0.0	9999.9	
161	PE-642	Step Speed Com1	r/min	1000.0	Set step operating speed 1.
			0.0	9999.9	
162	PE-643	Step Speed Com2	r/min	1000.0	Set step operating speed 2.
			0.0	9999.9	
163	PE-644	Step Speed Com3	r/min	1000.0	Set step operating speed 3.
			0.0	9999.9	
164	PE-645	Step Acc Time0	msec	100	Set step operation acceleration time 0.
			0	100000	
165	PE-646	Step Acc Time1	msec	100	Set step operation acceleration time 1.
			0	100000	
166	PE-647	Step Acc Time2	msec	100	Set step operation acceleration time 2.
			0	100000	
167	PE-648	Step Acc Time3	msec	100	Set step operation acceleration time 3.
			0	100000	
168	PE-649	Step Dec Time0	msec	100	Set step operation deceleration time 0.
			0	100000	
169	PE-650	Step Dec Time1	msec	100	Set step operation deceleration time 1.
			0	100000	
170	PE-651	Step Dec Time2	msec	100	Set step operation deceleration time 2.
			0	100000	
171	PE-652	Step Dec Time3	msec	100	Set step operation deceleration time 3.
			0	100000	
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	–	–	
			–	–	

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	10.0	Set sensor operating speed 0.
			0.0	9999.9	
181	PE-662	Sen Speed Com1	r/min	10.0	Set sensor operating speed 1.
			0.0	9999.9	
182	PE-663	Sen Speed Com2	r/min	10.0	Set sensor operating speed 2.
			0.0	9999.9	
183	PE-664	Sen Speed Com3	r/min	10.0	Set sensor operating speed 3.
			0.0	9999.9	
184	PE-665	Sen Acc Time0	msec	100	Set sensor operation acceleration time 0.
			0	100000	
185	PE-666	Sen Acc Time1	msec	100	Set sensor operation acceleration time 1.
			0	100000	
186	PE-667	Sen Acc Time2	msec	100	Set sensor operation acceleration time 2.
			0	100000	
187	PE-668	Sen Acc Time3	msec	100	Set sensor operation acceleration time 3.
			0	100000	
188	PE-669	Sen Dec Time0	msec	100	Set sensor operation deceleration time 0.
			0	100000	
189	PE-670	Sen Dec Time1	msec	100	Set sensor operation deceleration time 1.
			0	100000	
190	PE-671	Sen Dec Time2	msec	100	Set sensor operation deceleration time 2.
			0	100000	
191	PE-672	Sen Dec Time3	msec	100	Set sensor operation deceleration time 3.
			0	100000	
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	-	-	
			-	-	

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	–	1.0	Set position operation distance 0.
			0.0	99999.9	
201	PE-702	Run Pos Com1	–	2.0	Set position operation distance 1.
			0.0	99999.9	
202	PE-703	Run Pos Com2	–	3.0	Set position operation distance 2.
			0.0	99999.9	
203	PE-704	Run Pos Com3	–	4.0	Set position operation distance 3.
			0.0	99999.9	
204	PE-705	Run Pos Com4	–	5.0	Set position operation distance 4.
			0.0	99999.9	
205	PE-706	Run Pos Com5	–	6.0	Set position operation distance 5.
			0.0	99999.9	
206	PE-707	Run Pos Com6	–	7.0	Set position operation distance 6.
			0.0	99999.9	
207	PE-708	Run Pos Com7	–	8.0	Set position operation distance 7.
			0.0	99999.9	
208	PE-709	Run Pos Com8	–	9.0	Set position operation distance 8.
			0.0	99999.9	
209	PE-710	Run Pos Com9	–	10.0	Set position operation distance 9.
			0.0	99999.9	
210	PE-711	Run Pos Com10	–	11.0	Set position operation distance 10.
			0.0	99999.9	
211	PE-712	Run Pos Com11	–	12.0	Set position operation distance 11.
			0.0	99999.9	
212	PE-713	Run Pos Com12	–	13.0	Set position operation distance 12
			0.0	99999.9	
213	PE-714	Run Pos Com13	–	14.0	Set position operation distance 13.
			0.0	99999.9	
214	PE-715	Run Pos Com14	–	15.0	Set position operation distance 14.
			0.0	99999.9	
215	PE-716	Run Pos Com15	–	16.0	Set position operation distance 15.
			0.0	99999.9	
216	PE-717	Not Used	–	–	
			–	–	
217	PE-718	Not Used	–	–	
			–	–	
218	PE-719	Not Used	–	–	
			–	–	
219	PE-720	Not Used	–	–	
			–	–	

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	–	10.0	Set step operation distance 0.
			0.0	99999.9	
221	PE-722	Step Pos Com1	–	11.0	Set step operation distance 1.
			0.0	99999.9	
222	PE-723	Step Pos Com2	–	12.0	Set step operation distance 2.
			0.0	99999.9	
223	PE-724	Step Pos Com3	–	13.0	Set step operation distance 3.
			0.0	99999.9	
224	PE-725	Step Pos Com4	–	14.0	Set step operation distance 4.
			0.0	99999.9	
225	PE-726	Step Pos Com5	–	15.0	Set step operation distance 5.
			0.0	99999.9	
226	PE-727	Step Pos Com6	–	16.0	Set step operation distance 6.
			0.0	99999.9	
227	PE-728	Step Pos Com7	–	17.0	Set step operation distance 7.
			0.0	99999.9	
228	PE-729	Step Pos Com8	–	18.0	Set step operation distance 8.
			0.0	99999.9	
229	PE-730	Step Pos Com9	–	19.0	Set step operation distance 9.
			0.0	99999.9	
230	PE-731	Step Pos Com10	–	20.0	Set step operation distance 10.
			0.0	99999.9	
231	PE-732	Step Pos Com11	–	21.0	Set step operation distance 11.
			0.0	99999.9	
232	PE-733	Step Pos Com12	–	22.0	Set step operation distance 12.
			0.0	99999.9	
233	PE-734	Step Pos Com13	–	23.0	Set step operation distance 13.
			0.0	99999.9	
234	PE-735	Step Pos Com14	–	24.0	Set step operation distance 14.
			0.0	99999.9	
235	PE-736	Step Pos Com15	–	25.0	Set step operation distance 15.
			0.0	99999.9	
236	PE-737	Not Used	–	–	
			–	–	
237	PE-738	Not Used	–	–	
			–	–	
238	PE-739	Not Used	–	–	
			–	–	
239	PE-740	Not Used	–	–	
			–	–	

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	-	31.0	Set maximum operation distance 0.
			0.0	99999.9	
241	PE-742	Max Pos Com1	-	32.0	Set maximum operation distance 1.
			0.0	99999.9	
242	PE-743	Max Pos Com2	-	33.0	Set maximum operation distance 2.
			0.0	99999.9	
243	PE-744	Max Pos Com3	-	34.0	Set maximum operation distance 3.
			0.0	99999.9	
244	PE-745	Max Pos Com4	-	35.0	Set maximum operation distance 4.
			0.0	99999.9	
245	PE-746	Max Pos Com5	-	36.0	Set maximum operation distance 5.
			0.0	99999.9	
246	PE-747	Max Pos Com6	-	37.0	Set maximum operation distance 6.
			0.0	99999.9	
247	PE-748	Max Pos Com7	-	38.0	Set maximum operation distance 7.
			0.0	99999.9	
248	PE-749	Max Pos Com8	-	39.0	Set maximum operation distance 8.
			0.0	99999.9	
249	PE-750	Max Pos Com9	-	40.0	Set maximum operation distance 9.
			0.0	99999.9	
250	PE-751	Max Pos Com10	-	41.0	Set maximum operation distance 10.
			0.0	99999.9	
251	PE-752	Max Pos Com11	-	42.0	Set maximum operation distance 11.
			0.0	99999.9	
252	PE-753	Max Pos Com12	-	43.0	Set maximum operation distance 12.
			0.0	99999.9	
253	PE-754	Max Pos Com13	-	44.0	Set maximum operation distance 13.
			0.0	99999.9	
254	PE-755	Max Pos Com14	-	45.0	Set maximum operation distance 14.
			0.0	99999.9	
255	PE-756	Max Pos Com15	-	46.0	Set maximum operation distance 15.
			0.0	99999.9	
256	PE-757	Not Used	-	-	
			-	-	
257	PE-758	Not Used	-	-	
			-	-	
258	PE-759	Not Used	-	-	
			-	-	
259	PE-760	Not Used	-	-	
			-	-	

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	-	-	
			-	-	

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	10.0	Set jog run speed 0.
			0.0	9999.9	
281	PE-802	Jog Speed1	r/min	100.0	Set jog run speed 1.
			0.0	9999.9	
282	PE-803	Jog AccDec Time	msec	100	Set jog acceleration/deceleration time.
			0	99999	
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	-	-	
			-	-	

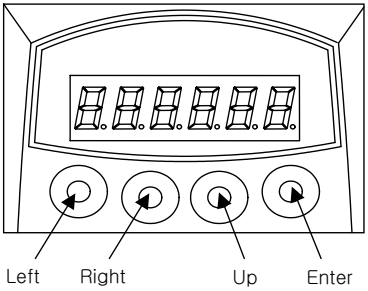
3.3.16 Operation Menu

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	-	-	Initialize menu data.
			-	-	
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	-	-	
			-	-	

3.4 Detailed Description of Menu

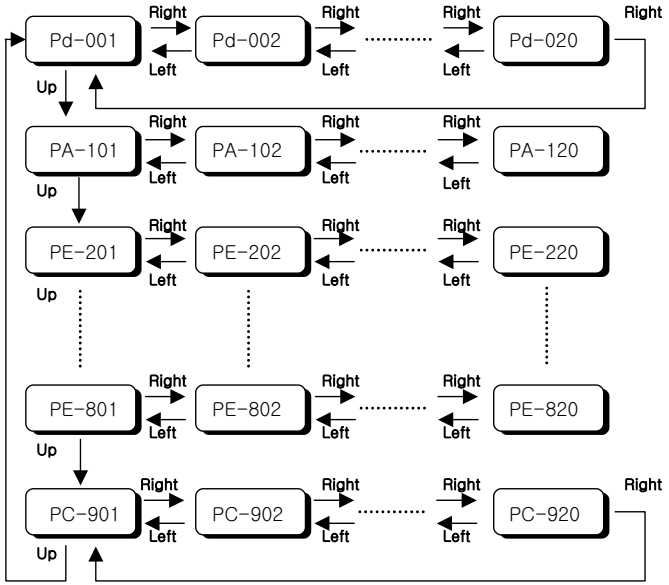
3.4.1 Loader Operation

1) Components

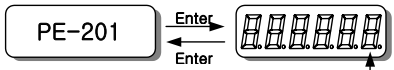


2) Components

① Menu movement



② Menu editing



* Changing position: Left/Right
* Changing numbers: Up

Initial blinking position

- 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	- 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 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.

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.

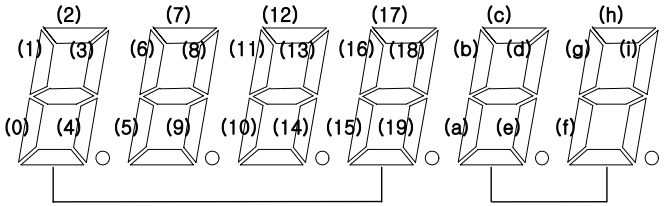
③ Average load rate [Pd -011]

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].

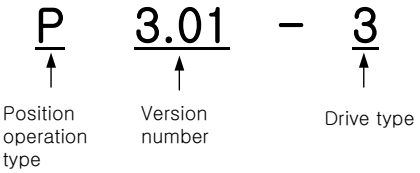
The value saved by the current logic of the input contact is displayed.

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



* 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

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

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

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	

Motor models and ID

Model	ID	Watt	Remarks
SD08A	41	800	To be developed
SD10A	42	1000	To be developed
SD15A	43	1500	To be developed
SD20A	44	2000	To be developed
SD05D	45	500	To be developed
SD08D	46	800	To be developed
SD10D	47	1000	To be developed
SD12D	48	1200	To be developed
SD03M	49	300	To be developed
SD04M	50	400	To be developed
SD05M	51	500	To be developed
SD06M	52	600	To be developed

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	
HC05H	99	500	For customers only

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	$gf \cdot cm \cdot s^2$	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]

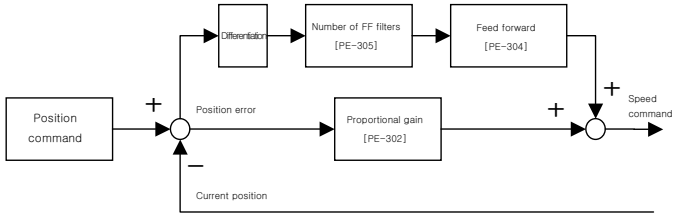
A group ID is set and used when multiple servos are consolidated into a group for communications.

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.

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.

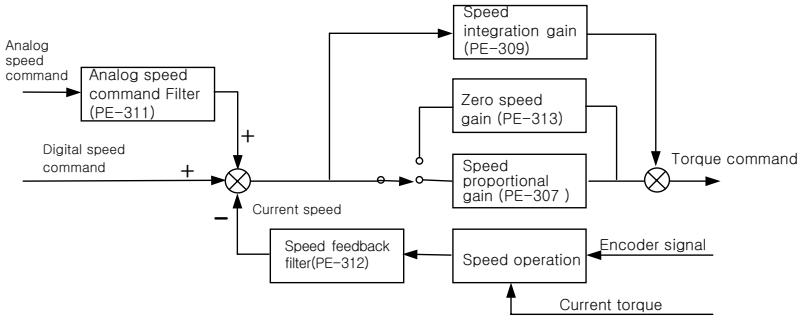
③ Position proportional gain [PE-302][PE-303]: The position proportional gain is multiplied by the difference between command position and current position to convert the outcome into a speed command.

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.

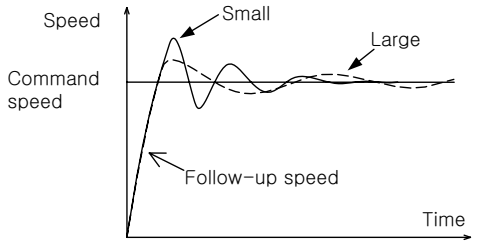
2) Speed control gain



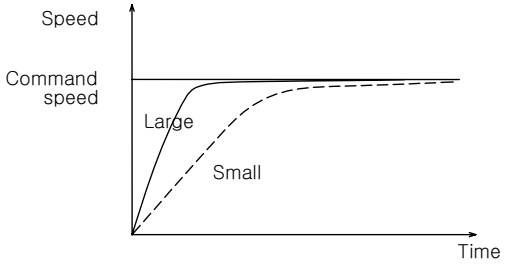
① Speed command: The analog speed signals received from external sources are used as the speed command after going through the analog speed command filter [PE-311], or the digital speed command set by the internal menu in the unit of r/min is used.

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 stationery 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]

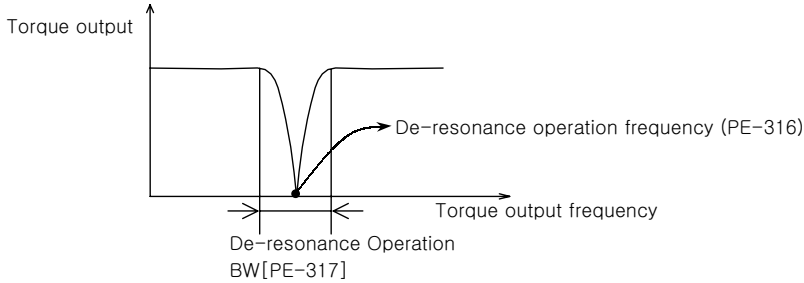
Load inertia is calculated for each mechanical system. The rotator's inertia ratio is calculated and set based on the motor characteristics table. Setting the inertia ratio of load is a very important control variable in the servo operation characteristics. Servo can be operated in an optimal condition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

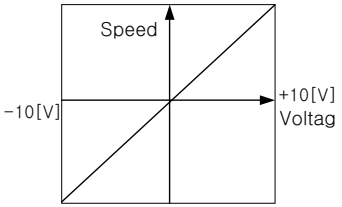
3.4.5 Setting I/O Variables

1) Setting analog speed command

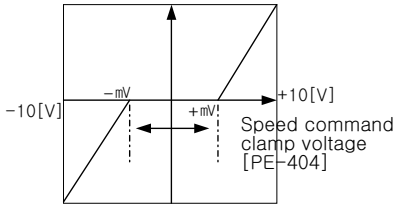
① Analog speed command [PE-401]: Set the analog speed command value in the unit of r/min at 10 [V]. The maximum setting will be the motor's maximum speed.

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



Speed Command Clamp Mode "0"
[PE-403]



Speed Command Clamp Mode "1"
[PE-403]

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.

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 peed	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 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 “㎷”.

3) 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.

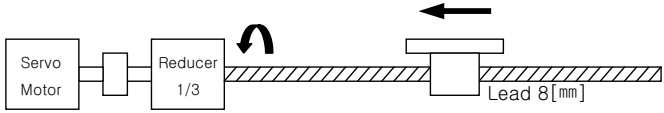
3.4.6 Setting Common Operation Variables

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 [㎜].



* 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

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

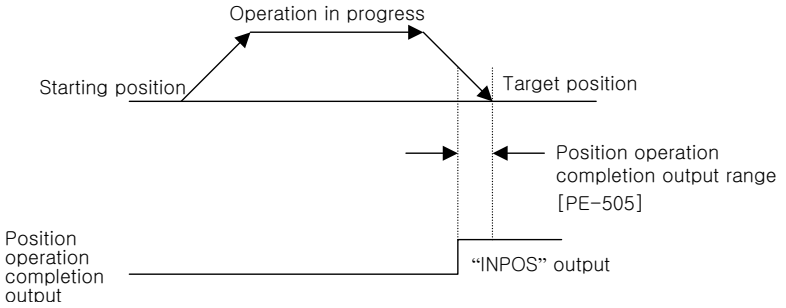
Code	+ Position Coordinates	- Position Coordinates
0	Forward running (CCW)	Backward running (CW)
1	Backward running (CW)	Forward running (CCW)

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.



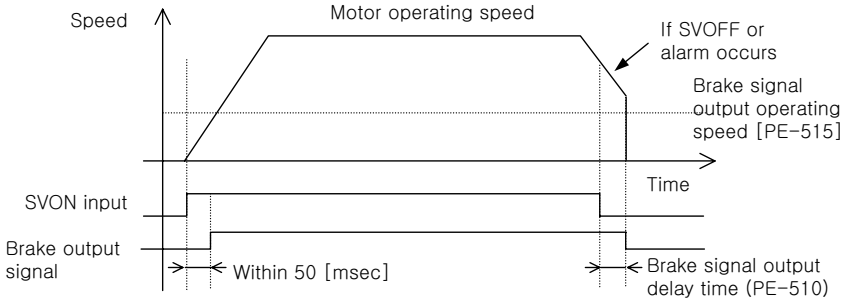
If the setting is too large, the positioning completion output signal may be produced during operation. Set an appropriate value to avoid this.

② Position operation completion output time [PE-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) 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].

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].

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].

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].

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	- 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.

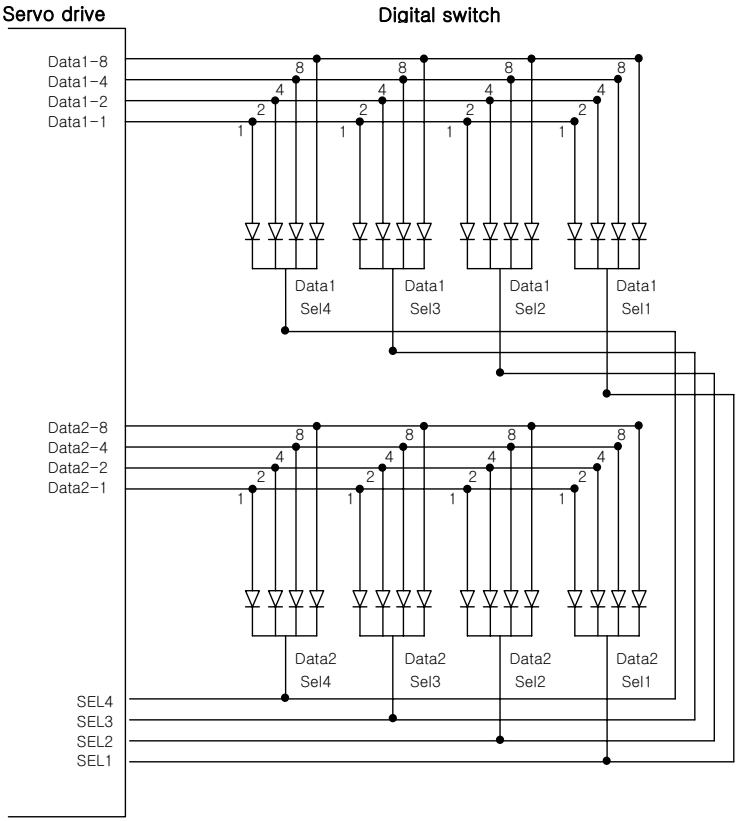
5) Speed override operation [PE-605]

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)

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

Data Mode Setting	0		1	
Data Item	Data1	Data2	Data1	Data2
SEL1	Position Data Unit 1	Position Data unit 10000	Position Data unit 1	Position Data unit 10000
SEL2	Position Data Unit 10	Speed Data unit 10	Position Data unit 10	Position Data Unit 100000
SEL3	Position Data Unit 100	Speed Data unit 100	Position Data unit 100	Speed Data unit 100
SEL4	Position Data Unit 1000	Speed Data unit 1000	Position Data unit 1000	Speed Data unit 1000

Note 1: The position and speed settings apply differently depending on the data mode.

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.

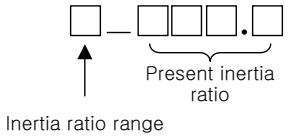
② If Left Key is pressed next, the system operates at N-JOG; and if Right Key is pressed, the system operates at P-JOG.

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]

① If Enter is pressed in menu [PC-905], the following screen appears:



Inertia Ratio Range	Inertia Ratio
1	1 ~ 5
2	5 ~ 10
3	10 ~ 25
4	25 ~ 50
5	50 ~ 100

② Adjusting manual forward/backward operation

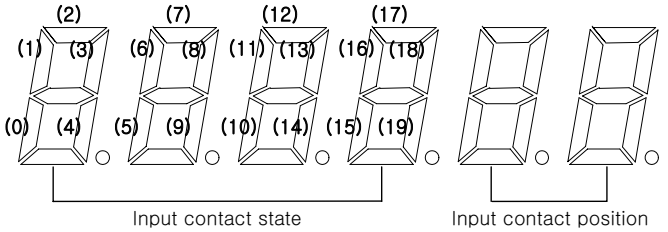
- If the servo is operated/stopped or operated in forward/backward direction by the use of contacts, the current inertia ratio is automatically adjusted.
- If the adjusted inertia ratio maintains maximum value, increase the range of the inertia ratio; and decrease the range of inertia ratio if the adjusted inertia ratio maintains minimum value. If the inertia ratio is maintained between the minimum and maximum values, adjustment is completed.
- The left key (decrease) and the right key (increase) are used to adjust the range of inertia ratio.

③ Automatic adjustment of forward/backward operation

- If Up Key is pressed, the system automatically starts forward/backward operation. The forward/backward operation distance increases each time Up Key is pressed.
- The operation speed is set to jog speed 1 [PE-802].
- If the inertia ratio stays between the maximum and minimum values of the inertia ratio range, adjustment is completed.

④ Press Enter upon completion of adjustment. Then gain is automatically adjusted, and the adjusted gain is saved.

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]

- Initialize the set menu data.

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 5

Program Operation Type (VP-5.xx)

[Manual Version: 1.2]

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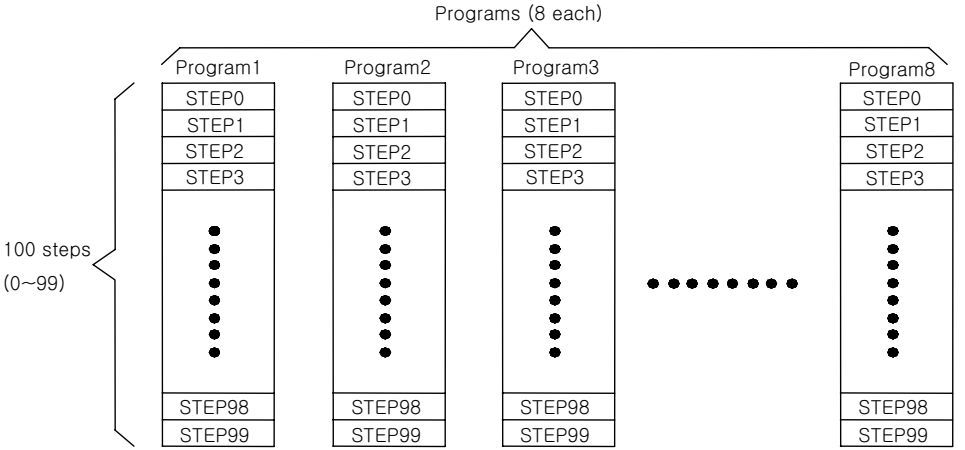
5.1 Outline of program operation

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.

5.1.1 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.

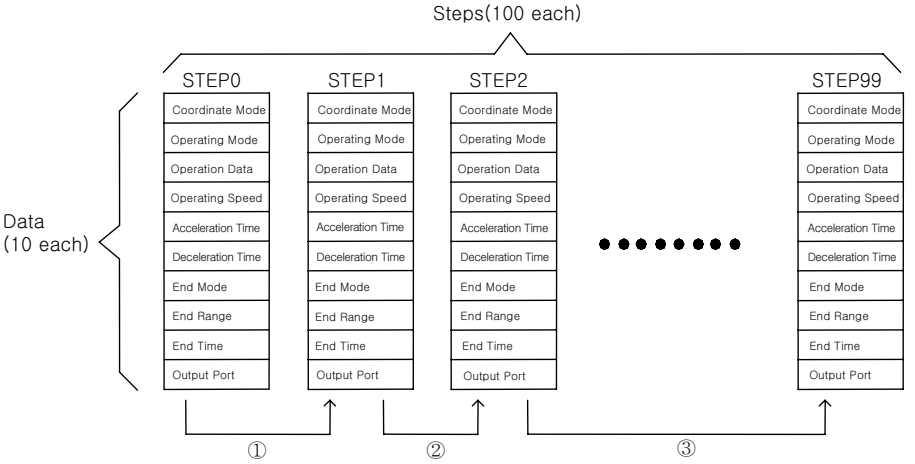
Programs can be saved only by communications.

5.1.2 Outline of steps

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

100 (0-99) 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.

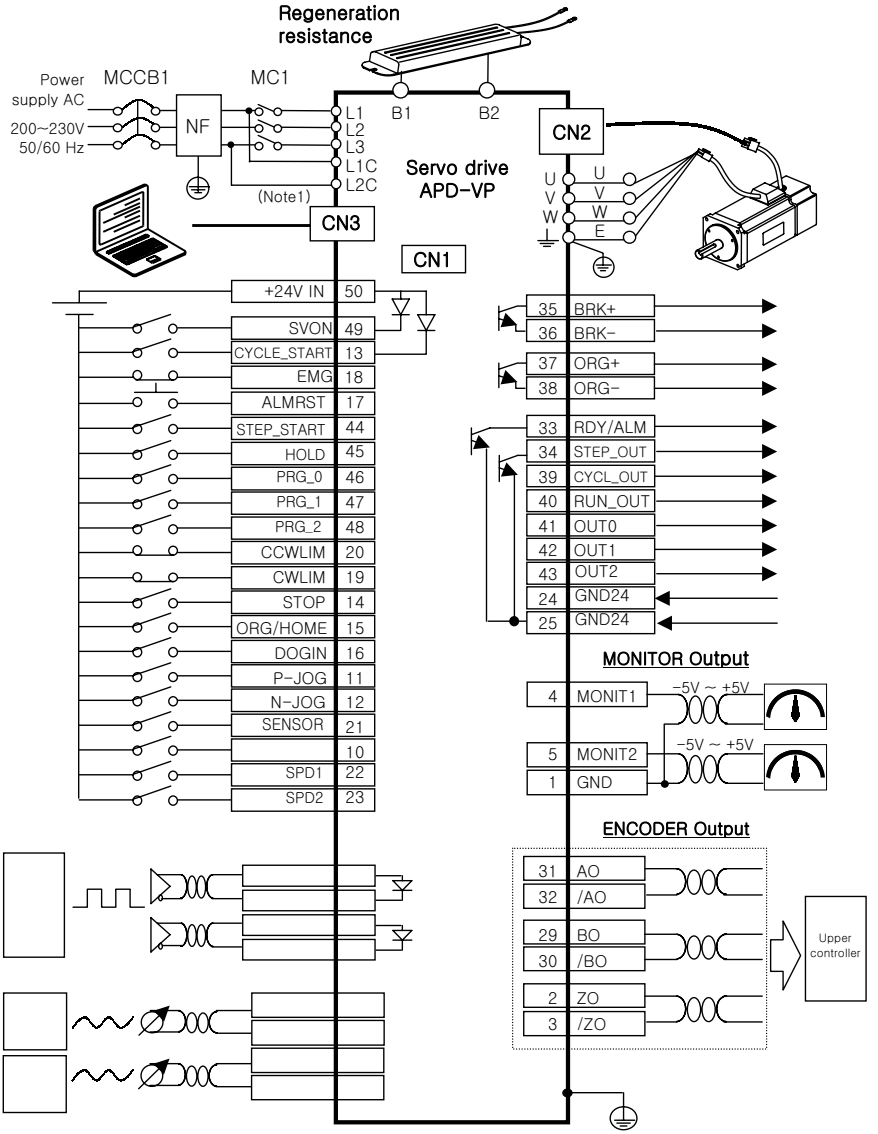


Steps operate from step 0 to step 99 in sequence, and it is not possible to disregard middle steps and skip to the next steps.

If all steps up to step 99 are not used, the required number of steps can be used by activating end mode (-1).

5.2 System Configuration

5.2.1 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.

5.2.2 Control Signal

1) Contact input signal

Pin Numbers	Name	Description
50	+24V IN	Input external DC24[V].
49	SVON	Servo on
13	CYCLE_START	Start program operation .
18	EMG	Emergency stop
17	ALMRST	Alarm reset
20	CCWLIM	Prohibit forward (Counterclockwise) run.
19	CWLIM	Prohibit backward (Clockwise) run.
14	STOP	Stop operation.
15	ORGIN/HOME	Start origin run and home run. (Initial SVON: Origin run, during operation: home run)
16	DOGIN	Origin sensor
11	P-JOG	Forward jog (Set [PC-803])
12	N-JOG	Backward jog (Set [PC-803])
44	STEP_START	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	Enter sensor.
10		
22	SPD1	Program speed ratio 1(Set [PE-612]-[PE-614])
23	SPD2	Program speed ratio 2(Set [PE-612]-[PE-614])

2) Output contact signal

Pin Numbers	Name	Description
35 /36	BRK+/BRK-	This brake operation signal is displayed when the servo is turned on.
33	RDY/ALM	Output signals indicating servo operation preparation completion and alarm state. • ON : Normal state (Operation preparation completed) • OFF : Alarm state
34	STEP_OUT	Output signals indicating completion of each step.
37 /38	ORG+/ORG1-	Output signals indicating origin run completion.
39	CYCL_OUT	Output signals indicating completion of all cycles.
40	RUN_OUT	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 drive system).
2 3	ZO /ZO	Outputs encoder Z signal received from the motor (5[V] Line drive system).

5.3 Details of Operation Command

5.3.1 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.

5.3.2 HOLD and STOP

The system stops if input contact “HOLD” is turned on. If the system is restarted, it begins operation starting from step 0.

Example:

Current step	Input Contact	Restart Step
STEP 77	HOLD	STEP 77
	STOP	STEP 0

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

5.3.3 Step Operation

If it is desired to divide operation into steps, turn on input contact “STEP_START”. Each time this contact is turned on, the system operates by one step.

5.3.4 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.

5.3.5 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.

(For more details, refer to page 5-18.)

5.3.6 Program Selection

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 (0-99) by selecting 8 programs.

Program Number	Contact			Communication (TOUCH)	Number of Steps
	PRG_0	PRG_1	PRG_2		
1	X	X	X	Program 1	100STEP(0~99)
2	O	X	X	Program 2	100STEP(0~99)
3	X	O	X	Program 3	100STEP(0~99)
4	O	O	X	Program 4	100STEP(0~99)
5	X	X	O	Program 5	100STEP(0~99)
6	O	X	O	Program 6	100STEP(0~99)
7	X	O	O	Program 7	100STEP(0~99)
8	O	O	O	Program 8	100STEP(0~99)

* [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 selected according to the chosen contacts in the contact mode.

③ In case of communication mode (0)

Program numbers are selected if the desired program is selected and the program is read out.

[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 a program which has never been saved is selected. (Alarm will not occur if the program is selected after first being saved.)**

5.3.7 Setting Initial Program

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

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

5.3.8 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])

5.3.9 Origin Run

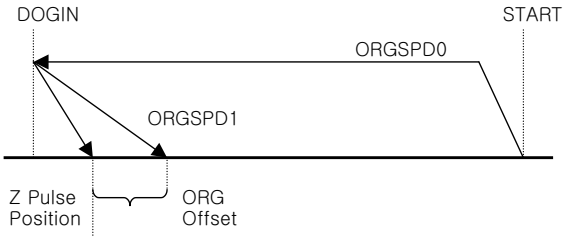
Origin Mode	Major Functions
0	Set current coordinates as origin.
1	Set origin by sensor (Dog).
2	Set origin by limit.
3	Set origin by sensor and limit.
4	Set origin by damper torque.

* 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-710]

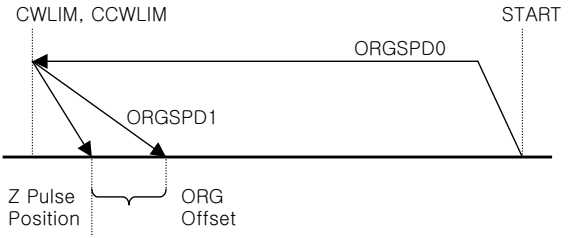
- Mode 0: Set current position as origin.
- Mode 1: Sensor (Dog) type

  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.



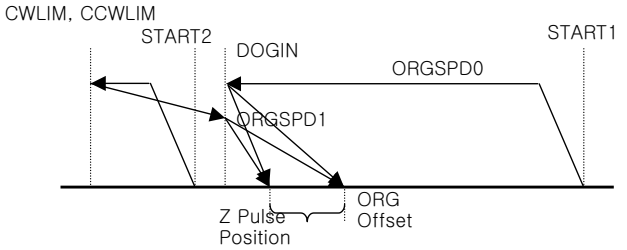
- Mode 2: Limit type

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.



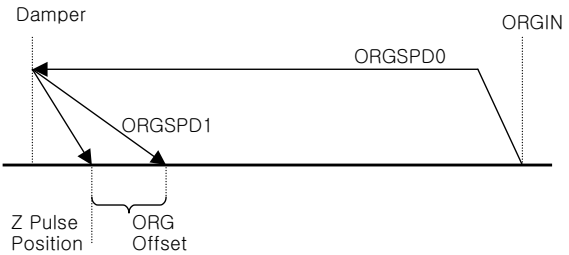
- Mode 3: Limit and sensor (Dog) type

If the system meets the limit after starting origin run, it turns in the opposite direction; and it if 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-711]

Set the operation direction after starting origin run.

③ Origin sensor stop [PE-712]

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-713]

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-714]

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-715]

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-716] after starting origin run and the operating speed [PE-717] after origin sensor or limit sensor operation, in the unit of “r/min”.

5.3.10 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-701
High speed jog run	PE-702

② Setting jog run acceleration/deceleration time [PE-703].

Set acceleration/deceleration time used in jog run.

5.3.11 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)

5.3.12 Operation Data Output

<table>
<tr><th>Output Mode</th><th>Output Details</th></tr>
<tr><td>Communication output</td><td>Output operation data based on communication (CN3).</td></tr>
<tr><td>Analog</td><td>* Data are output in ±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])
<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>
</td></tr>
</table>

5.4 Setting Operation Data

5.4.1 Step Data

Program steps are defined by a total of 10 data.

Step (0-99)	
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	-1: PRG end, 0: Stop, 1: Dwell, 2: Continuous, 3: 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.**

5.4.2 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.

5.4.3 Operating Mode

[Setting range: 0-2]

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.

5.4.4 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.

5.4.5 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.

5.4.6 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).

5.4.7 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)×1000).

5.4.8 End Mode

[Set range: -1 - 3]

① Program End [-1]: Indicates the final end step. System operates program from step 0 in sequence, stops operation at the step carrying end mode “-1”, and displays program end. If the system is started again later, operation begins from step 0.

② Step operation stop [0]: Operation stops after the current step operation is completed. If Cycle-Start is selected thereafter, operation begins from the next step.

③ DWELL [1]: Operation stops after the current step operation is completed. When the set time elapses, the next step is operated.

④ Continuous operation [2]: When the current step operation is completed, the system does not stop but continues to the next step operation.

⑤ Sensor [3]: When the sensor signal is registered, the current step is stopped, and the next step is operated.

Note: If the end mode is Sensor [3] in step operation and input contact “STEP_START” is used, a position error occurs during the period from the time the senor signal is received to the time input contact “STEP_START” is turned on. Do not use STEP-START in sensor operation featuring precise position error in the relative coordinate.

5.4.9 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.

5.4.10 End Time

[Set range: 0-999999]

Set dwell time in the unit of “msec” when the end mode is Dwell [1].

5.4.11 Output Port

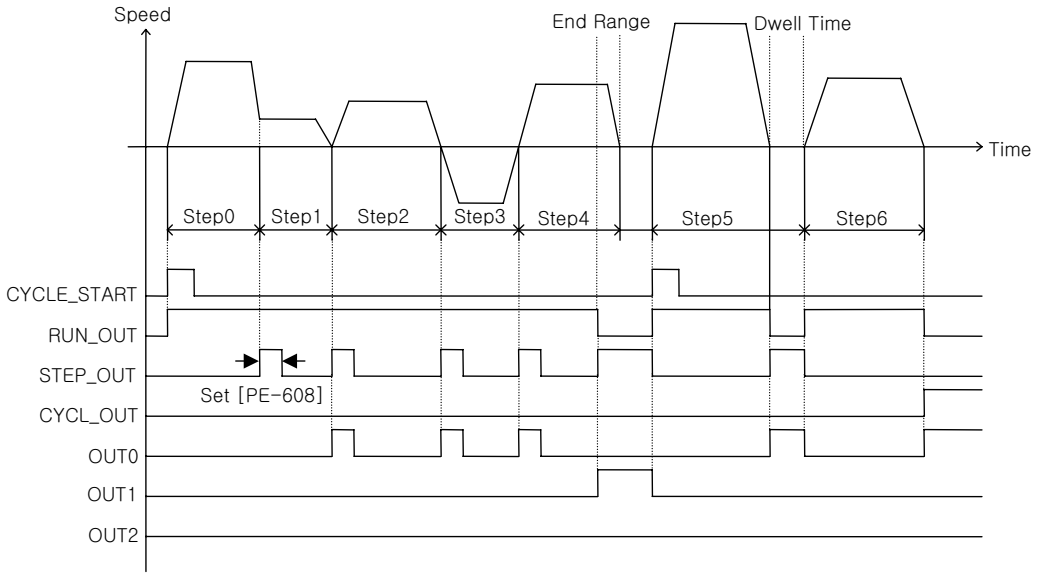
[Set range: 0-7]

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	

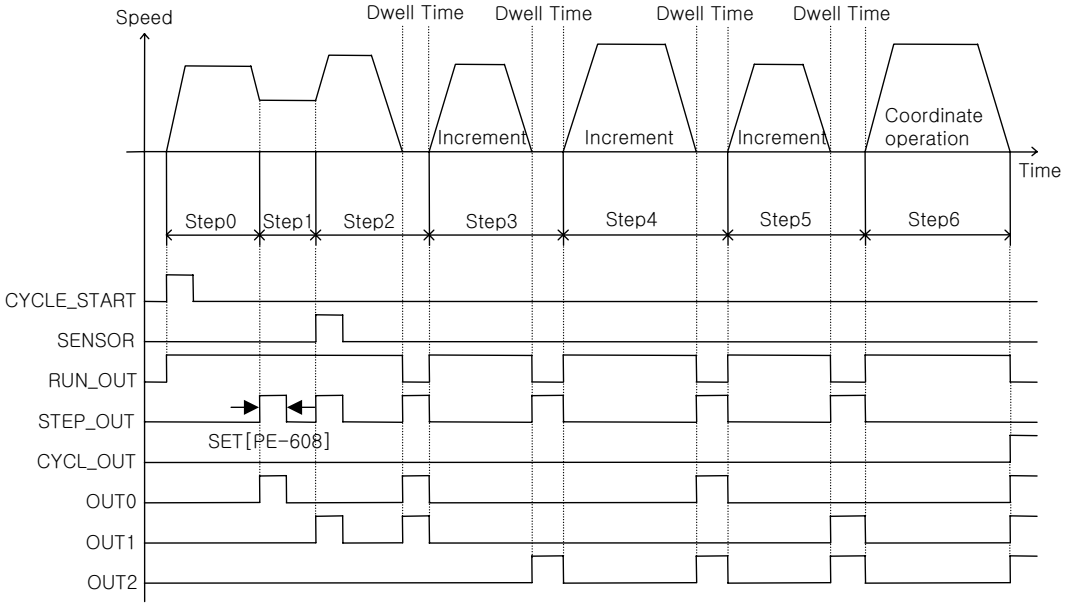
5.5 Program Operation Examples

5.5.1 Example of Absolute Coordinate Position Operation



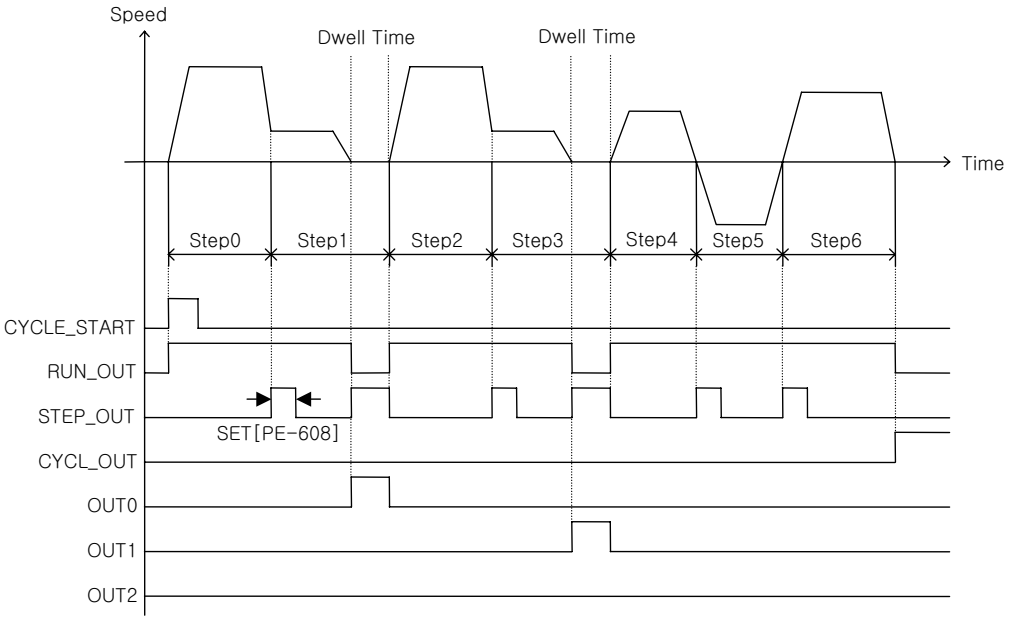
STEP	Coordinate Mode	Operating Mode	Operation Data	Operating Speed	Acceleration Time	Deceleration Time	End Mode	End Range	End Time	Output Port
STEP0	0	0	20	2000	1000	0	2	1	0	0
STEP1	0	0	30	-700	1500	1500	1	1	0	1
STEP2	0	0	40	1000	1000	1000	1	1	0	1
STEP3	0	0	25	1500	1000	1000	1	1	0	1
STEP4	0	0	40	2000	1000	1000	0	10	0	2
STEP5	0	0	55	3000	500	500	1	1	1000	1
STEP6	0	0	70	2000	700	700	-1	1	0	1

5.2.2 Example of Absolute Coordinate Incremental Operation



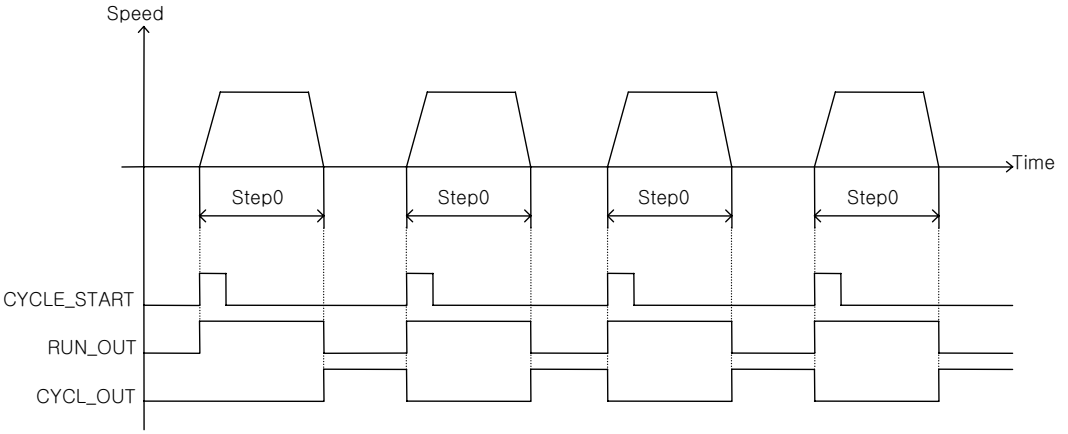
STEP	Coordinate Mode	Operating Mode	Operation Data	Operating Speed	Acceleration Time	Deceleration Time	End Mode	End Range	End Time	Output Port
STEP0	0	0	20	1500	500	500	2	1	0	1
STEP1	0	3	0	1000	1000	1000	3	1	0	2
STEP2	0	0	500	2000	2000	2000	1	1	2000	3
STEP3	0	1	20	1500	700	700	1	1	1000	4
STEP4	0	1	30	2000	500	500	1	1	1000	5
STEP5	0	1	20	1500	700	700	1	1	1000	6
STEP6	0	0	610	2000	1000	1000	-1	1	0	7

5.5.3 Example of Relative Coordinate Position Operation



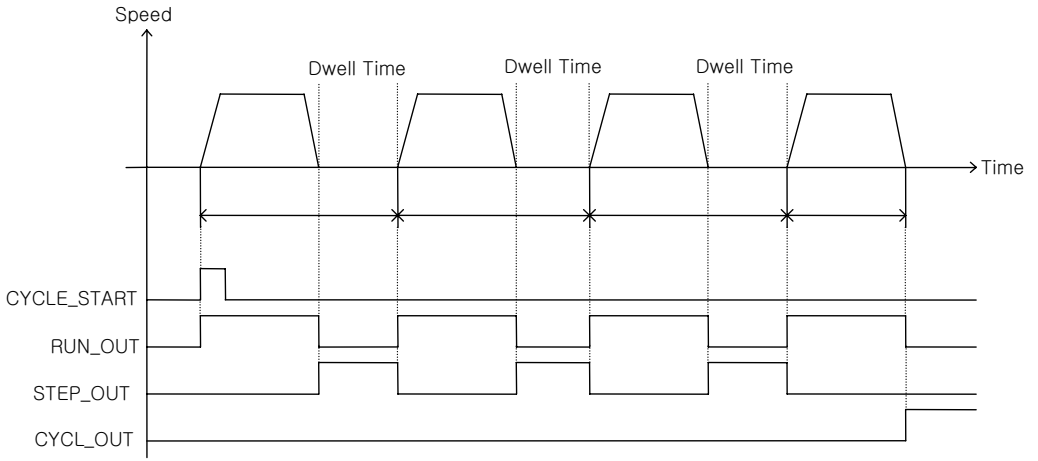
STEP	Coordinate Mode	Operating Mode	Operation Data	Operating Speed	Acceleration Time	Deceleration Time	End Mode	End Range	End Time	Output Port
STEP0	1	0	30	1500	1000	1000	2	1	0	0
STEP1	1	0	20	1000	0	1500	1	1	1000	1
STEP2	1	0	30	1500	1000	1000	2	1	0	0
STEP3	1	0	20	1000	0	1000	1	1	1000	2
STEP4	1	0	30	2000	1500	1500	1	1	0	0
STEP5	1	0	-40	3000	1000	1000	1	1	0	0
STEP6	1	0	30	2000	1500	1500	-1	1	0	0

5.5.4 Example of Relative Coordinate Incremental Operation

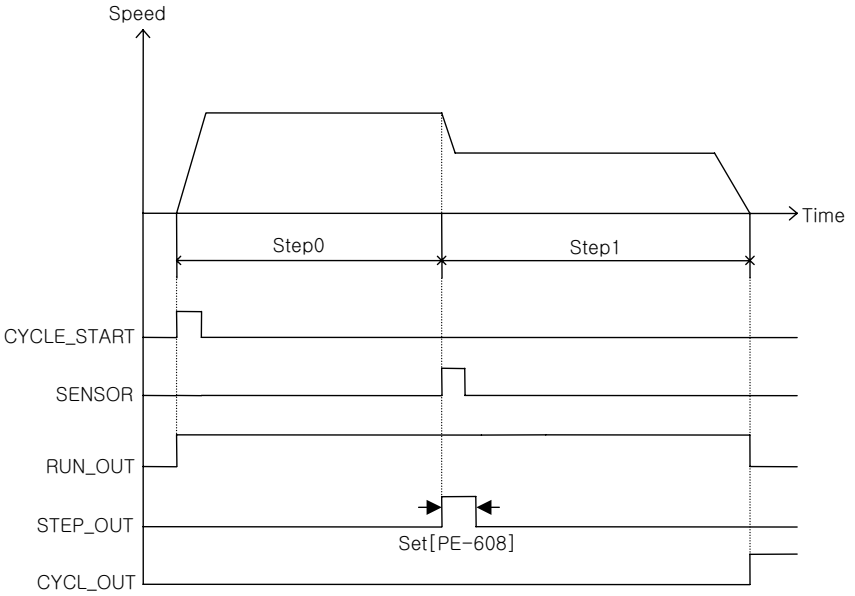


STEP	Coordinate Mode	Operating Mode	Operation Data	Operating Speed	Acceleration Time	Deceleration Time	End Mode	End Range	End Time	Output Port
STEP1	1	0	50	500	50	50	-1	1	0	0

The system operates by increasing the position to the extent of the set position coordinate (STEP0) each time input contact "CYCLE-START" 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 (0-99).



5.5.5. Example of Sensor-Input Position Operation



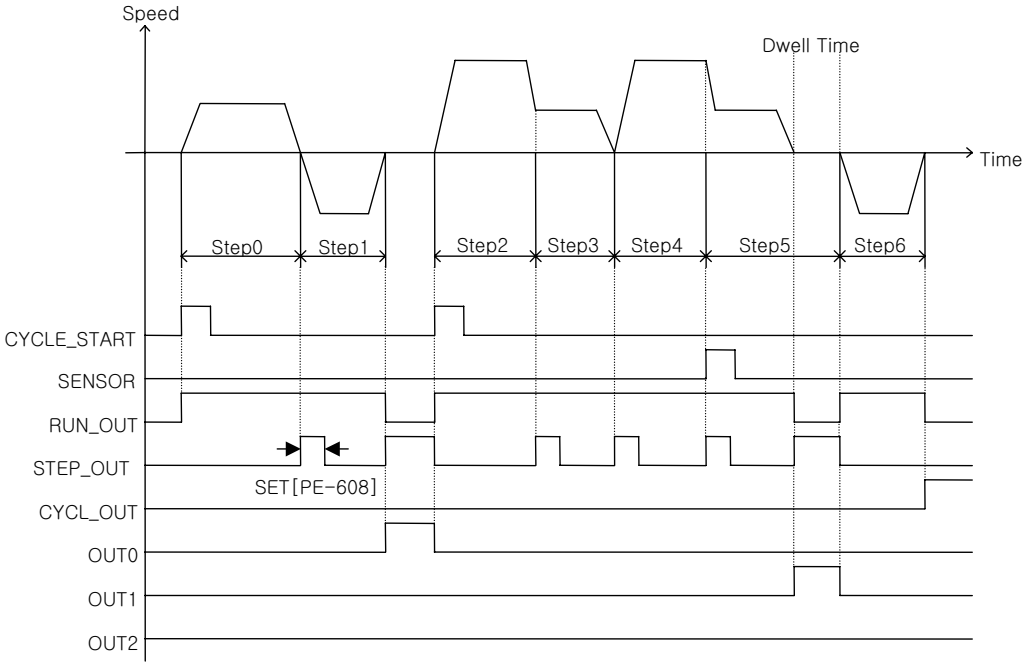
STEP	Coordinate Mode	Operating Mode	Operation Data	Operating Speed	Acceleration Time	Deceleration Time	End Mode	End Range	End Time	Output Port
STEP0	1	3	0	1000	50	50	3	1	0	0
STEP1	1	0	100	500	50	50	-1	1	0	0

① Infinite operation begins if input contact “CYCLE_START” is turned on. If the sensor is activated when the system is operated at sensor position operation speed (STEP 0 speed), the set position operation (STEP 1) begins. When all steps are completed, the system stops and displays output signal “CYCL-OUT”.

② If input contact “CYCLE_START” is turned on again, operation begins from STEP 0.

Note: If step operation is executed by using input contact “STEP_START” 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_START” is turned on.

5.5.6 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
STEP0	1	2	1000	1000	500	500	1	1	0	0
STEP1	1	2	2000	-1000	500	500	0	1	0	1
STEP2	0	2	1000	1500	500	500	2	1	0	0
STEP3	0	2	3000	1000	1500	1500	1	1	0	0
STEP4	0	2	10000	2000	1000	1000	3	1	0	0
STEP5	0	2	4000	1000	500	500	1	1	1000	2
STEP6	0	2	3000	-3000	1000	1000	-1	1	0	0

5.6 Menu

5.6.1 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	0	Displays current operating speed.
			-99999	99999	
2	Pd-003	Command Speed	r/min	0	Displays current command speed.
			-99999	99999	
3	Pd-004	Reference Speed	–	0	Displays speed command values based on the acceleration/deceleration time during operation.
			-99999	99999	
4	Pd-005	Current Position	–	0.0	Displays current position coordinates.
			-99999	99999	
5	Pd-006	Reference Position	–	0.0	Displays current target position coordinates.
			-99999	99999	
6	Pd-007	Command Position	–	0.0	Displays operation command position coordinates.
			-99999	99999	
7	Pd-008	Remain Position	–	0.0	Displays the difference between target position coordinates and current position coordinates.
			-99999	99999	
8	Pd-009	Current Step		0	Dedicated to maker.
			0	99999	
9	Pd-010	Torque Limit	[%]	0	Displays torque-limit setting.
			0	300	
10	Pd-011	Current Load	[%]	0.0	Displays current load rate versus rated load.
			-9999.9	9999.9	
11	Pd-012	Maximum Load	[%]	0.0	Displays maximum instantaneous load rate versus rated load.
			-9999.9	9999.9	
12	Pd-013	DC Link Voltage	Volt	0.0	Displays condenser's DC voltage value.
			-999.9	999.9	
13	Pd-014	I/O Set	–	–	Displays current I/O CN1's input state. (See 5-38 page for more information)
			–	–	
14	Pd-015	Input A/B	–	–	Display set conditions of contacts A and B among input contacts. (Contact A = OFF, Contact B = ON)
			–	–	
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.
			–	–	

5.6.2 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	–
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	Wring, 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	Prog Error	Program set error	Parameter set error, out of range, etc.
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].

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

Motor Models 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	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

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	
HC05H	99	500	For customers only

5.6.4 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 peed 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	Not Used	-	-	
			-	-	
78	PE-319	Not Used	-	-	
			-	-	
79	PE-320	Not Used	-	-	
			-	-	

5.6.5 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	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	–	500	Set coordinate value of analog output position at 5V.
			-99999	99999	
97	PE-418	Pulse Out Rate	–	1	Set frequency dividing ratio of encoder output signal.
			1	16	
98	PE-419	Not Used	–	–	
			–	–	
99	PE-420	Not Used	–	–	
			–	–	

5.6.6 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	50.0	Set operating speed of built-in brake.
			0.0	9999.9	
105	PE-506	Brake Time	msec	10	Set opening delay time of built-in brake.
			0	10000	
106	*PE-507	PowerFail Mode	–	By type of equipment	Set power failure mode. 0: VP04 or less, 1: VP05 or more
			0	1	
107	PE-508	DB Control	–	1	Set dynamo braking mode.
			0	1	
108	PE-509	ESTOP Reset	–	0	This function automatically resets alarm when contact ESTOP returns after activation. (0: Manual reset, 1: Automatic reset)
			0	1	
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	–	–	
			–	–	

5.6.7 Private Operation Variable Setting Menu

MENU			UNIT	INI	Description
NO	CODE	NAME	MIN	MAX	
120	*PE-601	Not Used	-	-	
			-	-	
121	PE-602	Move Motor	-	1	Set system based on machine movement versus motor rpm.
			1	999999	
122	PE-603	Move Mechanical	-	1	
			1	999999	
123	PE-604	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	
124	PE-605	InHOM Position	-	1	Set in-home position range.
			0	99999	
125	PE-606	Not Used	-	-	
			-	-	
126	PE-607	Not Used	-	-	
			-	-	
127	PE-608	Out Time	msec	0	Set time of maintaining in-position output.
			0	10000	
128	PE-609	Software Limit	-	0	Set limit operation On or Off based on position coordinates
			0	1	
129	PE-610	Upper Limit	-	0.0	Set upper limits of position coordinates.
			-99999	99999	
130	PE-611	Lower Limit	-	0.0	Set lower limits of position coordinates.
			-99999	99999	
131	PE-612	Speed Override1	%	25	Set overall operation speed ratio 1.
			1	99	
132	PE-613	Speed Override2	%	50	Set overall operation speed ratio 2.
			1	99	
133	PE-614	Speed Override3	%	75	Set overall operation speed ratio 3.
			1	99	
134	PE-615	Program Select	-	0	Set program selection mode. (0 : Communication 1 : Contacts)
			0	1	
135	PE-616	Start Program NO	-	0	Set start program number.
			1	8	
136	PE-617	Not Used	-	-	
			-	-	
137	PE-618	Not Used	-	-	
			-	-	
138	PE-619	Not Used	-	-	
			-	-	
139	PE-620	Not Used	-	-	
			-	-	

5.6.8 Jog and Origin Run Variable Setting Menu

MENU			UNIT	INI	Description
NO	CODE	NAME	MIN	MAX	
140	PE-701	Jog Speed0	r/min	10.0	Set jog run speed 0.
			0.0	9999.9	
141	PE-702	Jog Speed1	r/min	500.0	Set jog run speed 1.
			0.0	9999.9	
142	PE-703	Jog AccDec Time	msec	100	Set jog acceleration/deceleration time.
			0	99999	
143	PE-704	Not Used	-	-	
			-	-	
144	PE-705	Not Used	-	-	
			-	-	
145	PE-706	Not Used	-	-	
			-	-	
146	PE-707	Home Speed	r/min	1000	Set home return speed.
			0.0	9999.9	
147	PE-708	Home AccDec Time	r/min	100	Set acceleration/deceleration time of home return speed.
			0	99999	
148	PE-709	Not Used	-	-	
			-	-	
149	PE-710	Origin Mode	-	1	Set origin run mode.
			0	4	
150	PE-711	Origin polarity	-	0	Set origin run direction.
			0	1	
151	PE-712	Origin Dog Stop	-	0	Set stop (1) or Z position operation 0 when dog sensor turns off during origin run.
			0	1	
152	PE-713	Origin Offset	-	0.0	Set offset position at which to stop after origin run.
			-9999.9	99999	
153	PE-714	Origin Position	-	0.0	Set initial coordinates after origin run.
			-9999.9	99999	
154	PE-715	Origin AutoRun	-	0	Set automatic origin run ON or OFF when servo is on.
			0	1	
155	PE-716	Origin Speed0	r/min	100.0	Set origin run speed 0.
			-9999.9	9999.9	
156	PE-717	Origin Speed1	r/min	10.0	Set origin run speed 1.
			-9999.9	9999.9	
157	PE-718	Origin Torque	[%]	50.0	Set torque during damper (Origin run mode 4) run.
			1.0	300.0	
158	PE-719	Not Used	-	-	
			-	-	
159	PE-720	Not Used	-	-	
			-	-	

5.6.9 Operation Menu

MENU			UNIT	INI	Description
NO	CODE	NAME	MIN	MAX	
160	PC-801	Alarm RESET	–	–	Reset alarm.
			–	–	
161	PC-802	Alarm HIS Clear	–	–	Clear alarm history.
			–	–	
162	PC-803	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.)
			–	–	
163	PC-804	Origin Run	–	–	Carry out origin run.
			–	–	
164	PC-805	Gain Tune Run	–	–	Gain is automatically adjusted.
			–	–	
165	PC-806	I/O Logic Set	–	–	Set logic of input contacts.
			–	–	
166	PC-807	Input Ext Set	–	–	Manipulate input contacts from outside.
			–	–	
167	PC-808	Menu Data Init	–	–	Initialize menu data.
			–	–	
168	PC-809	Menu Data Lock	–	–	Activate menu data lock.
			–	–	
169	PC-810	Current Offset	–	–	Set drive current feedback offset.
			–	–	
170	PC-811	Not Used	–	–	
			–	–	
171	PC-812	Not Used	–	–	
			–	–	
172	PC-813	Not Used	–	–	
			–	–	
173	PC-814	Not Used	–	–	
			–	–	
174	PC-815	Not Used	–	–	
			–	–	
175	PC-816	Not Used	–	–	
			–	–	
176	PC-817	Not Used	–	–	
			–	–	
177	PC-818	Not Used	–	–	
			–	–	
178	PC-819	Not Used	–	–	
			–	–	
179	PC-820	Not Used	–	–	
			–	–	

5.6.10 Step Mode Display Menu

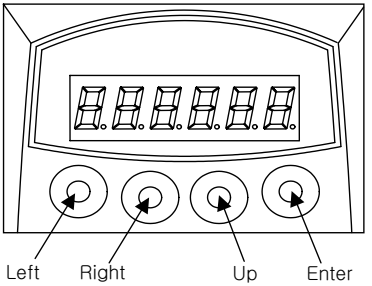
MENU			UNIT	INI	Description
NO	CODE	NAME	MIN	MAX	
180	PC-901	Position Type	–	–	Displays coordinate mode of the set step.
			–	–	
181	PC-902	Run Type	–	–	Displays operating mode of the set step.
			–	–	
182	PC-903	Run Data	–	–	Displays operating data of the set step.
			–	–	
183	PC-904	Run Speed	–	–	Displays operating speed of the set step.
			–	–	
184	PC-905	Acc Time	–	–	Displays acceleration time of the set step.
			–	–	
185	PC-906	Dec Time	–	–	Displays deceleration time of the set step.
			–	–	
186	PC-907	END Type	–	–	Displays end mode of the set step.
			–	–	
187	PC-908	Inpos Position	–	–	Displays end range of the set step.
			–	–	
188	PC-909	Dwell Time	–	–	Displays end time of the set step.
			–	–	
189	PC-910	Out Port	–	–	Displays output port of the set step.
			–	–	
190	PC-911	Not Used	–	–	
			–	–	
191	PC-912	Not Used	–	–	
			–	–	
192	PC-913	Not Used	–	–	
			–	–	
193	PC-914	Not Used	–	–	
			–	–	
194	PC-915	Not Used	–	–	
			–	–	
195	PC-916	Not Used	–	–	
			–	–	
196	PC-917	Not Used	–	–	
			–	–	
197	PC-918	Not Used	–	–	
			–	–	
198	PC-919	Not Used	–	–	
			–	–	
199	PC-920	Not Used	–	–	
			–	–	

※ Press Enter key in menus [PC-901]-[PC-910] and change step number with the Left and Right keys. Press UP key to check the relevant data.

5.7 Detailed Description of Menu

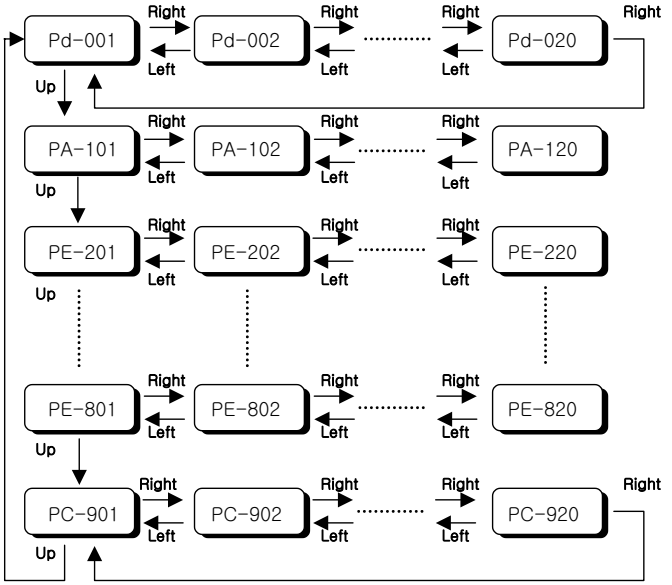
5.7.1 Loader Operation

1) Components

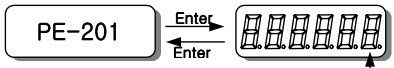


2) Components

① Menu movement



② Menu editing



* Changing position: Left/Right
* Changing numbers: Up

Initial blinking position

- 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	- 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

5.7.2 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: "-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 -010]

The output torque limit value is displayed in percentage of the rated torque.

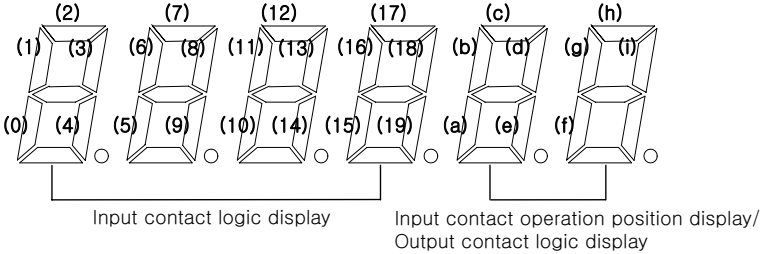
② Current load rate [Pd -011]

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	CYCLE_ START	EMG	ALMRST	STEP_ START	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	SENSOR		SPD1	SPD2

[Output contact: Lower]

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)
RDY/ ALM	STEP-OUT	BRK	ORG	CYCL-OUT	RUN-OUT	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.

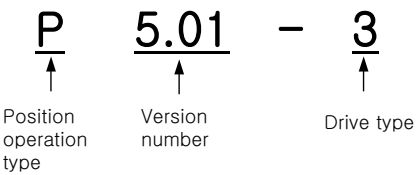
7) Current progress display [Pd-009] (Maker's private menu)

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



* 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

5.7.3 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

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

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	

Motor models and ID

Model	ID	Watt	Remarks
SD08A	41	800	To be developed
SD10A	42	1000	To be developed
SD15A	43	1500	To be developed
SD20A	44	2000	To be developed
SD05D	45	500	To be developed
SD08D	46	800	To be developed
SD10D	47	1000	To be developed
SD12D	48	1200	To be developed
SD03M	49	300	To be developed
SD04M	50	400	To be developed
SD05M	51	500	To be developed
SD06M	52	600	To be developed

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	
HC05H	99	500	For customers only

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.

- Setting communication speed [PE-202]

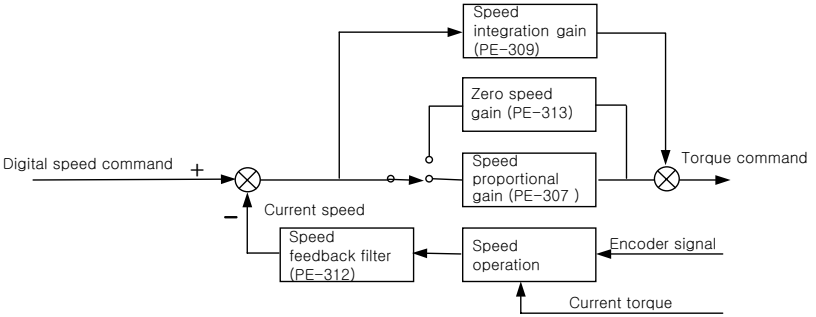
The baud rate, the RS232's communication speed, can be selected from two types (9600 and 19200 [bps]).

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.

5.7.4 Setting Control Variables

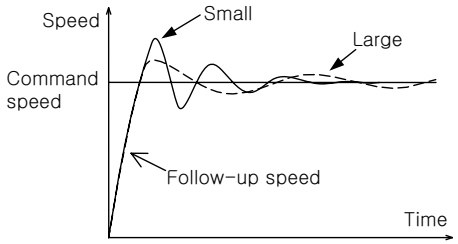
1) Speed control gain



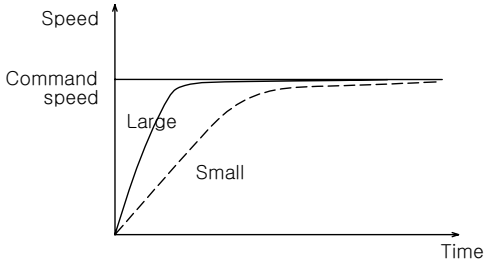
① Speed command: Digital speed command set by the internal menu in the unit of r/min is used.

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 stationery 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.

> **CAUTION**
> 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]

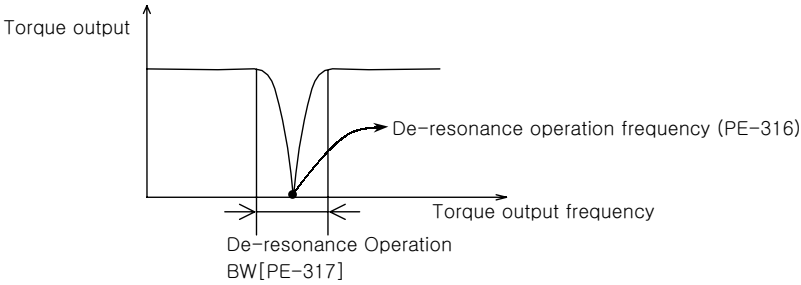
Load inertia is calculated for each mechanical system. The rotator's inertia ratio is calculated and set based on the motor characteristics table. Setting the inertia ratio of load is a very important control variable in the servo operation characteristics. Servo can be operated in an optimal condition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

■ 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 5.7.7 “Automatic gain adjustment [PC-805].”

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.

5.7.5 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 peed	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 “㎷”.

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.

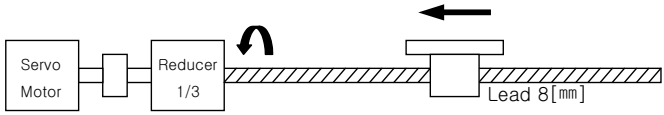
5.7.6 Setting Common Operation Variables

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 [㎜].



* 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.

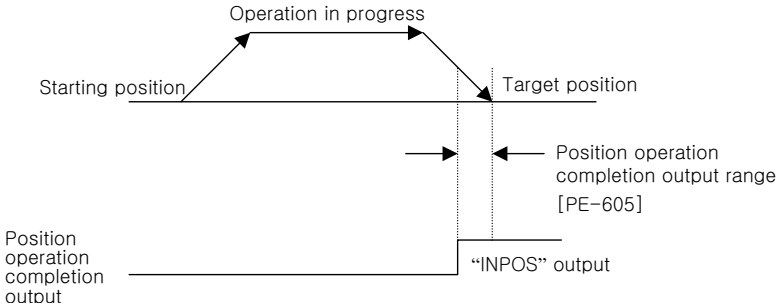
Code	+ Position Coordinates	- Position Coordinates
0	Forward running (CCW)	Backward running (CW)
1	Backward running (CW)	Forward running (CCW)

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.



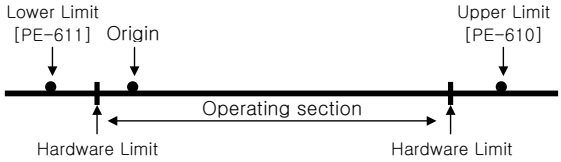
If the setting is too large, the positioning completion output signal may be produced during operation. Set an appropriate value to avoid this.

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.

5.7.7 Operating Command

1) Alarm reset [PC-801]

Reset alarm in case it occurs.

2) Alarm history clear [PC-802]

Clear the alarm history information currently in storage.

3) Loader jog run [PC-803]

① If Enter is pressed in menu [PC-803], 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.

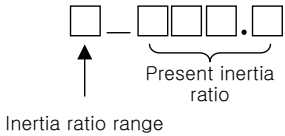
Note: Loader jog run moves at jog speed 0.

4) Loader origin run [PC-804]

If Enter is pressed in menu [PC-804], the origin run starts.

5) Automatic gain adjustment [PC-805]

① If Enter is pressed in menu [PC-805], the following screen appears:



Inertia Ratio Range	Inertia Ratio
1	1 ~ 5
2	5 ~ 10
3	10 ~ 25
4	25 ~ 50
5	50 ~ 100

② Adjusting manual forward/backward operation

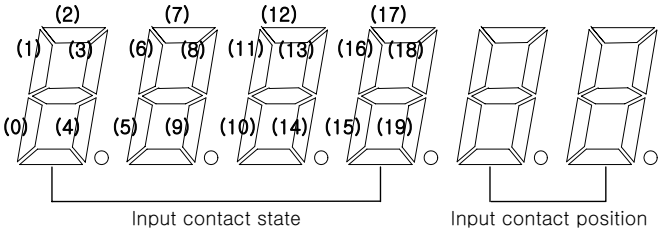
- If the servo is operated/stopped or operated in forward/backward direction by the use of contacts, the current inertia ratio is automatically adjusted.
- If the adjusted inertia ratio maintains maximum value, increase the range of the inertia ratio; and decrease the range of inertia ratio if the adjusted inertia ratio maintains minimum value. If the inertia ratio is maintained between the minimum and maximum values, adjustment is completed.
- The left key (decrease) and the right key (increase) are used to adjust the range of inertia ratio.

③ Automatic adjustment of forward/backward operation

- If Up Key is pressed, the system automatically starts forward/backward operation. The forward/backward operation distance increases each time Up Key is pressed.
- If the inertia ratio stays between the maximum and minimum values of the inertia ratio range, adjustment is completed.

④ Press Enter upon completion of adjustment. Then gain is automatically adjusted, and the adjusted gain is saved.

6) Setting input contact logic [PC-806]



(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
SVON	CYCLE_ START	EMG	ALMRST	STEP_ START	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	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-807]

- If Enter is pressed in menu [PC-807], 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-808]

- Initialize the set menu data.

9) Menu data lock [PC-809]

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

10) Saving current offset [PC-810]

> **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.

5.8 Operation Data Variables

5.8.1 Data Variable Codes

Step numbers of the operation data variables are as follows:

Step0

Data variable code	Menu
1000	Coordinate mode
1001	Operating Mode
1002	Operation data
1003	Operating speed
1004	Acceleration time
1005	Deceleration time
1006	End mode
1007	End range
1008	End time
1009	Output port

Step1

Data variable code	Menu
1010	Coordinate mode
1011	Operating Mode
1012	Operation data
1013	Operating speed
1014	Acceleration time
1015	Deceleration time
1016	End mode
1017	End range
1018	End time
1019	Output port

●●●

Step99

Data variable code	Menu
1990	Coordinate mode
1991	Operating Mode
1992	Operation data
1993	Operating speed
1994	Acceleration time
1995	Deceleration time
1996	End mode
1997	End range
1998	End time
1999	Output port

* Note : When setting data using communications, relevant numbers must be designated.
Refer to “Interface” section for details of communication protocol.

Ⅲ. Interface

[Manual Version : 1.3]

Chapter 1

Communication Protocol

1.1 Outline

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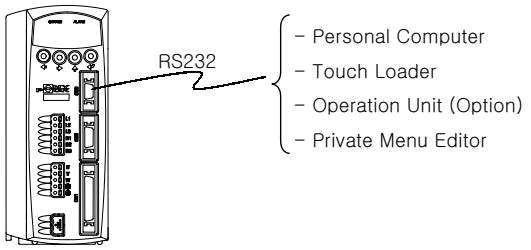
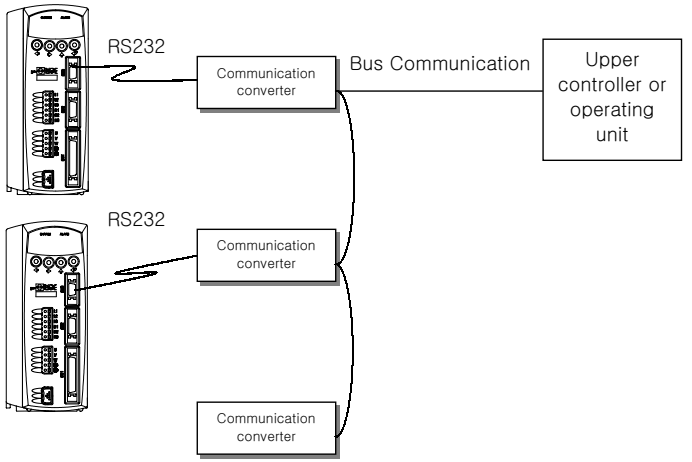
1.1 Outline

1.1.1 RS232-Based Serial Communication Interface



1.1.2 Bus-based parallel communication interface

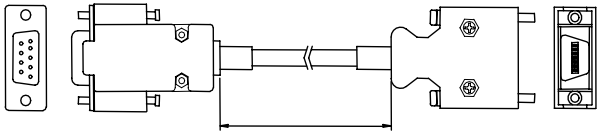


1.2 Communication Specifications

1.2.1 Communication Specifications

Item		Specifications
Communication system		RS-232C Standards
Data type	Data bit	8 bits
	Stop bit	1 bit
	Parity	None
Synchronous system		Asynchronous system
Baud rate		9600 /19200 bps [PE-202] may be selected
Transmission distance		Maximum 15M
Power consumption		100 ㎃ or less

1.2.2 Cable Connection



[PC- Serial Port] [Servo Drive - CN3]

Description	PC - Serial Port	Servo Drive - CN3
Connector name	HDEB-9S	10114-3000VE
Case name	3600-09-G-L	10314-52A0-008
Wiring	No. 2 (RXD)	No. 6 (TXD)
	No. 3 (TXD)	No. 5 (RXD)
	No. 5 (GND)	No. 11, No. 12 (GND)
	Case (Shield)	Case (Shield)
Cable length	1,2,3,5 [m]	

※ Use twist-pair shield cables for communication. Use of inadequate cables may lead to poor communication resulting from noise or may cause malfunction. Take due precautions.

1.3 Protocol

1.3.1 Basic Frame Structure

"Frame" means an arrangement in which incoming and outgoing information in the data communication is configured in a specific form. In addition to data, the communication Frame includes information on segment, synchronous control code, and error detection parity.

- Transmission

ENQ	Prefix	Command	Data	EOT	BCC

ACK or NAK	Prefix	Command	Result of action	ETX	BCC

- Response

① Request Frame (Maximum 256 bytes)

ENQ	Prefix	Command	Command Form	Data area	EOT	BCC

② ACK Response Frame (Maximum 256 bytes)

ACK	Prefix	Command	Command Type	Data area	ETX	BCC

③ NAK Response Frame (Maximum 256 bytes)

NAK	Prefix	Command	Command Type	Error code	ETX	BCC

※ Unless specified otherwise, the data are ASCII codes of hexadecimal values, and applicable data are as follows:

- Prefix
- In case the command is of a data type when the main command begins with R(r) or W(w).
- Space that indicates all sizes of data in the structured data area.
- All details of data

④ Control code

Control code	HEX	Full Spelling	Description
ENQ	0x05	Enquire	Request frame starting code
ACK	0x06	Acknowledge	ACK response frame starting code
NAK	0x15	Not Acknowledge	NAK response frame starting code
EOT	0x04	End of Transmission	Closing code of request frame
ETX	0x03	End of Text	Closing code of response frame

⑤ Frame Error Check (BCC)

BCC is the data used for Frame Error Check. If the main command uses lower case, only 1 lower grade byte of the figure determined by adding one byte of each ASCII code value from the header to the tail, is converted into ASCII and is added to BCC. If the request frame uses lower case command, it responds in the same lower case command.

In other words, if a frame carrying BCC is requested, the servo drive responds with the frame carrying BCC.

The following is an example of BCC calculation where direct variable individual reading frame is used.

- Adding ASCII values:
  05+32+30+72+53+53+30+31+30+36+25+4D+57+31+30+30+04 =H3A4. Thus, if the lower grade byte “A4” is added in ASCII, the answer will be “41/24”.

1.3.2 Reading Individual Menu Variables (RSS/rSS)

This is a function that reads data by designating the servo drive menu number. The RSS COMMAND is of a structure carrying no frame check (BCC), while the rSS command is of a structure carrying frame check (BCC) behind the tail.

① Request Frame (External unit → Servo drive)

Item	Header	Prefix		Command			No. of blocks		Variable Length		Variable Code						Tail	BCC	
											Form			Number					
CODE	ENQ	0	0	Rr	S	S	0	1	0	6	%	M	D	0	0	1	EOT	6	F
ASCII	05	30	30	52 72	53	53	30	31	30	36	25	4D	44	30	30	31	04	36	46

No. of blocks: A total of 4 blocks composed of variable lengths and variable codes can be designated and requested.

Variable length: Space in which the number of the letters of variable code is indicated. Up to 16 letters can be entered.

Variable code form

	ASCII	Description	No of Data	Remarks
%MW	25/4D/57	Requests data in 16 bit Data Form.	2	
%MD	25/4D/44	Requests data in 32 bit Data Form.	4	
%MB	25/4D/42	Requests data in 8 bit Data Form.	1	
%MX	25/4D/58	Requests data in 1 bit Data Form.	1	

- %M: Indicates internal memory device.

Variable code number

%MD: Operation software menu number is used.

%MX: Menu number ×32 + Applicable bit number (0-31)

Example: Third bit of menu number 5: 5 × 32 + 3 = 163

The transmission code is sent in ASCII value with respect to the Hex code of the data number.

Example: 163 (DEC) -> A3 (HEX) -> 41/33 (ASCII)

② ACK Response Frame (Servo drive → External unit)

Item	Header	Prefix		Command			No. of blocks		No. of Data		Data				Tail	BCC	
Contents	A C K	0	0	R r	S	S	0	1							E T X		
ASCII	06	30	30	52 72	53	53	30	31							03		

No. of Data

	No. of Data	Transmission value (ASCII)	Remarks
%MW	2	30 32	
%MD	4	30 34	
%MB	1	30 31	
%MX	1	30 31	

Data

%MD: 8 data are transmitted (4 bit x 8).

Example: 123456789 (DEC) -> 754BCD15 (HEX)

-> 30/37/35/34/42/43/44/31/35 (ASCII)

%MX: 0 bit and 1 bit data are transmitted as 30 and 31.

③ NAK Response Frame (Servo drive → External unit)

Item	Header	Prefix		Command			Error code				Tail	BCC	
Contents	N A K	0	0	R	S	S					E T X		
ASCII	15	30	30	52	53	53					03		

Error Code

	Description	Remarks
0101	The head of the request frame is not ENQ.	
0102	The command is not designated.	
0103	The number of blocks exceeds 4.	
0104	Variable form does not start with %M.	
0105	Variable form is not W, D, B, X.	
0106	The Variable number has deviated from the designated range.	
0107	The tail of the request frame is not EOT.	
0108	CHECKSUM is incorrect.	
0109	The continuous reading and writing exceed the maximum number of bytes (256 bytes).	
010A	The maximum number of transmission buffers is exceeded.	
010B	Variable length exceeds 16 letters.	
0201	The data transmitted from data writing has deviated from the setting range.	
0202	Writing of the data is prohibited when the servo is on.	
0203	Motor parameter writing is prohibited. (This is the case where motor ID is not 001.)	
0204	The motor ID is not registered.	

1.3.3 Reading Continuous Menu Variables (RSB/rSB)

This is a function that designates the servo drive menu number and the number of the data to be continuously read and reads the data. The RSB COMMAND is of a structure carrying no frame check (BCC), while the rSB command is of a structure carrying a frame check (BCC) behind the tail.

① Request Frame (External unit → Servo drive)

Item	Header	Prefix		Command			Variable Length		Variable Code						No. of Data		Tail	BCC	
									Form			Number							
CODE	ENQ	0	0	RR	S	B	0	6	%	M	D	0	0	1	0	5	EOT		
ASCII	05	30	30	52 72	53	42	30	36	25	4D	44	30	30	31	30	35	04		

Note: If the number of data is 05, five data are requested for reading, from Menu number 001 to 005.

② ACK Response Frame (Servo drive → External unit)

Item	Header	Prefix		Command			No. of Data		Data (Maximum 256 Bytes)			Tail	BCC	
Contents	ACK	0	0	RR	S	B	1	4		. . . .		ETX		
ASCII	06	30	30	52 72	53	42	31	34				03		

Note: The number of data is the value determined by multiplying the number of data of the data form by the number of the requested data.

Example: If the request data Form is %MD, the number of data is 4, and the requested number of data is 5. Thus, the number of response data is 5 x 4 = 20 (DEC) -> 14 (HEX).

③ NAK Response Frame (Servo drive → External unit)

Item	Header	Prefix		Command			Error Code				Tail	BCC	
Contents	NAK	0	0	R	S	B					ETX		
ASCII	15	30	30	52	53	42					03		

1.3.4 Writing Individual Menu Variables (WSS/wSS)

This is a function that writes data by designating the servo drive menu number. The WSS COMMAND is of a structure carrying no frame check (BCC), while the wSS command is of a structure carrying a frame check (BCC) behind the tail.

① Request Frame (External unit → Servo drive)

Item	Header	Prefix		Command			No. of Blocks		Variable Length		Variable Code						Data	Tail	BCC
											Form			Number					
CODE	ENQ	0	0	Ww	S	S	0	1	0	6	%	M	D	0	0	1		EOT	
ASCII	05	30	30	57 77	53	53	30	31	30	36	25	4D	44	30 30 31				04	

No. of blocks: A total of 4 blocks composed of variable lengths, variable codes and data can be designated and requested.

Variable length: Space in which the number of the letters of variable code is indicated. Up to 16 letters can be entered.

Variable code form

	ASCII	Description	No of Data	Remarks
%MW	25/4D/57	Requests data in 16 bit Data Form.	2	
%MD	25/4D/44	Requests data in 32 bit Data Form.	4	
%MB	25/4D/42	Requests data in 8 bit Data Form.	1	
%MX	25/4D/58	Requests data in 1 bit Data Form.	1	

- %M: Indicates internal memory device.

Variable code number

%MD: Operation software menu number is used.

%MX: Menu number ×32 + Applicable bit number (0-31)

Example: Third bit of menu number 5: 5 × 32 + 3 = 163

The transmission code is sent in ASCII value with respect to the Hex code of the data number.

Example: 163 (DEC) -> A3 (HEX) -> 41/33 (ASCII)

② ACK Response Frame (Servo drive → External unit)

Item	Header	Prefix		Command			Tail	BCC	
Contents	ACK	0	0	Ww	S	S	ETX		
ASCII	06	30	30	5777	53	53	03		

③ NAK Response Frame (Servo drive → External unit)

Item	Header	Prefix		Command			Error Code				Tail	BCC	
Contents	NAK	0	0	W	S	S					ETX		
ASCII	15	30	30	57	53	53					03		

1.3.5 Writing Individual Menu Variables (WSB/wSB)

This is a function that designates the servo drive menu number and the number of the data to be continuously read and writes data. The WSB COMMAND is of a structure carrying no frame check (BCC), while the wSB command is of a structure carrying a frame check (BCC) behind the tail.

① Request Frame (External unit → Servo drive)

Item	Header	Prefix		Command			Variable Length		Variable Code						No. of Data		Data		Tail	BCC	
									Form			Number									
CODE	ENQ	0	0	Ww	S	B	0	6	%	M	D	0	0	1	0	5	…		EOT		
ASCII	05	30	30	57 77	53	42	30	36	25	4D	44	30 30 31			30	35			04		

Note: If the Number of data is 05, five data are requested for writing, from Menu number 001 to 005. Data of up to 256 bytes can be transmitted.

② ACK Response Frame (Servo drive → External unit)

Item	Header	Prefix		Command			Tail	BCC	
Contents	ACK	0	0	WW	S	B	ETX		
ASCII	06	30	30	57 77	53	42	03		

③ NAK Response Frame (Servo drive → External unit)

Item	Header	Prefix		Command			Error Code				Tail	BCC	
Contents	NAK	0	0	W	S	B					ETX		
ASCII	15	30	30	57	53	42					03		

1.3.6 Monitor Registration (X##/x##)

"Monitor Registration" means to register variables to be read in combination with the reading command. Registered variables are read by the use of monitor execution command.

Up to 32 variables can be registered. As to registration forms, the portion from the command to EOT in the individual reading format and the continuous reading format shall be used.

① RSS/rSS Request Frame (External unit → Servo drive)

Item	Header	Prefix		Registration Command		Registration form											Tail	BCC
						Command			No. of Blocks		Variable block1					2,3,,,,,16		
											Length		Variable Code					
					Number								Form	Number				
CODE	ENQ	0	0	Xx	0-31	R	S	S	1	6							EOT	
ASCII	05	30	30	52 72		52	53	53									04	

Note: Registration number can be any one from 0 to 31 (00-1F). If the registered number is registered again, the latest number is registered.

Note: A total of 16 blocks cab be used in a registration form.

② RSB/rSB Request Frame (External unit → Servo drive)

Item	Header	Prefix		Registration Command		Registration Form									Tail	BCC
						Command			Length		Variable Code			No. of Data		
					Number						Form		Number			
CODE	ENQ	0	0	Xx	0 - 31	R	S	S							EOT	
ASCII	05	30	30	52 72		52	53	53							04	

③ ACK Response Frame (Servo drive → External unit)

Item	Header	Prefix		Registration Command			Tail	BCC	
					Number				
Contents	A C K	0	0	X x			E T X		
ASCII	06	30	30				03		

④ NAK Response Frame (Servo drive → External unit)

Item	Header	Prefix		Registration Command			Error Code				Tail	BCC	
					Number								
Contents	N A K	0	0	R	S	S					E T X		
ASCII	15	30	30	52	53	53					03		

1.3.7 Monitor Execution (Y##/y##)

"Monitor Execution" means requesting execution of registered monitor command (X##,x##).

① Request Frame (External unit → Servo drive)

Item	Header	Prefix		Registration Command			Tail	BCC	
					Number				
Contents	ENQ	0	0	Xx			EOT		
ASCII	06	30	30				04		

② ACK Response Frame with respect to RSS/rSS reading request command (Servo drive → External unit)

Item	Header	Prefix		Registration Command		Data Response Form			Tail	BCC	
					Number	No. of Blocks	No. of Data	Data			
CODE	ENQ	0	0	Xx	0 – 31				ETX		
ASCII	05	30	30						03		

③ ACK Response Frame with respect to RSB/rSB reading request command (Servo drive → External unit)

Item	Header	Prefix		Registration Command		Data Response Form		Tail	BCC	
					Number	No. of Data	Data			
CODE	ENQ	0	0	Xx	0 – 31			ETX		
ASCII	05	30	30					03		

④ NAK Response Frame (Servo drive → External unit)

Item	Header	Prefix		Registration Command			Error Code	Tail	BCC	
					Number					
Contents	NAK	0	0	R	S	S		ETX		
ASCII	15	30	30	52	53	53		03		

Chapter 2

Touch Loader Application

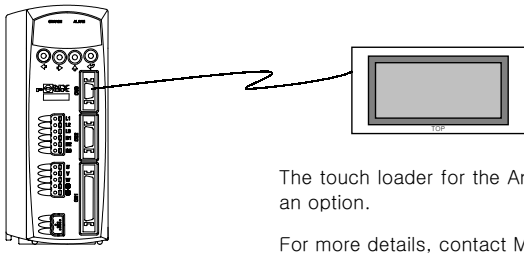
2.1 Touch Loader Series

2.1.1 Serial Interface Interface 2-2

2.1 Touch Loader Series

2.1.1 Serial Interface

1) System Configuration



The touch loader for the AnyPack drive is provided as an option.

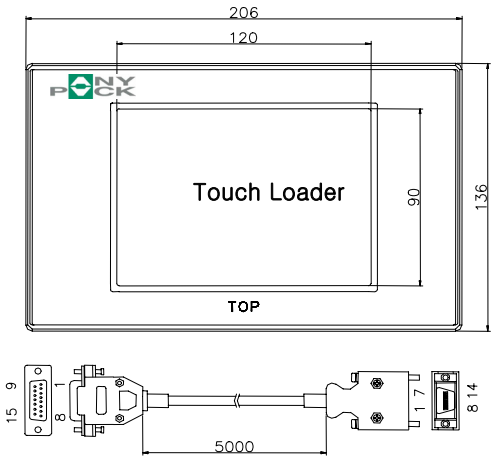
For more details, contact Metronix sales department.

2) Touch Loader type

Two types of Touch Loaders are available: Mono Type and Color type.

① Type name of controller-embedded Mono Touch Loader: APC-VPTS3M
(A 5m-long cable is provided when the product is ordered.)

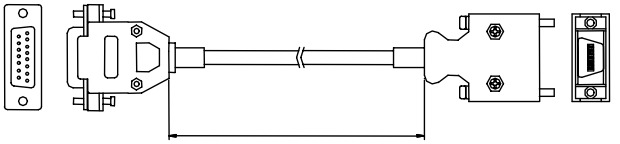
② Type name of controller-embedded Color Touch Loader: APC-VPTS3T
(A 5m-long cable is provided when the product is ordered.)



[Touch Loader] [Servo Drive CN3]

* Touch Loader input voltage: DC24[V]
* Standard Cable length: 5[m] (Length can be changed.)

3) Cable connection



[Touch Loader Port] [Servo Drive - CN3]

Description	Touch Loader Port	Servo Drive - CN3
Connector name	HDAB-15P (Hirose)	10114-3000VE
Case name	HDA-CTF (Hirose)	10314-52A0-008
Wiring	No. 2 (RXD)	No. 6 (TXD)
	No. 3 (TXD)	No. 5 (RXD)
	No. 5 (GND)	No. 11, No. 12 (GND)
	Case (Shield)	Case (Shield)

※ Use twist-pair shield cables for communication. Use of incorrect cables may lead to poor communication resulting from noise or may cause malfunction. Take due precautions.

4) Setting communication

Item	Description
Number of bits/second	9600 /19200 bps [PE-202] – selectable
Data bit	8
Parity	None
Stop bit	1
Flow control	Xon/Xoff

5) Initial setting

Item	Description
Start of Latch	0000 (Minimum)
Edge of Latch	1499 (Maximum)

6) Setting data input/output (I/O)

※ APD servo drive uses a CPU that is capable of 32 bit operation. For this reason, if data are set in the drive in 16 bit data form, the "-" value will be set in an abnormal way. To set "-" value, select MD for word device and set the data size in 32 bits.

※ For more details, refer to Top manual.

Limited Warranty

Date installed		Warranty period	
Model A		Manufacture Number (Serial)	
Model B		Manufacture Number (Serial)	
Model C		Manufacture Number (Serial)	
Model D		Manufacture Number (Serial)	
Customer	Name		
	Address		
	Telephone		
Distributor	Name		
	Address		
	Telephone		

This product has been manufactured under strict quality control and inspection by the technicians of Metronix Co., Ltd. This limited warranty is effective for 12 months from the date of product installation. If installation date has not been notified to Metronix, this warranty shall be effective for 18 months from the date of manufacture. The warranty period may be changed according to the conditions of agreement.

◈ Free service

If any problem occurs under normal operating conditions during the warranty period, contact Metronix distributor or Metronix-designated service center for free service.

◈ Charged service

Service is charged in the following cases:

- ■ Problem has occurred from consumer's intention or fault.
- ■ Problem has occurred due to defective power supply and/or defective connectors.
- ■ Problem is caused by natural disasters (such as fire, flood, gas accident and earthquake).
- ■ The product has been modified or repaired by a party other than Metronix distributor or Metronix-designated service center.
- ■ No Metronix nameplate is attached to the product.
- ■ The warranty period has expired.

※ After installing the servo, fill out this warranty form and send it to the Quality Assurance Department (Service Manager) of Metronix.

Send to: Service Manager, Quality Assurance Department, Metronix Co., Ltd.
Tel: 053- 593-0066 (131) Fax: 053-591-8614