

Chapter 4

Detailed Explanation of Program Menu

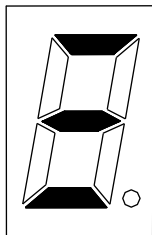
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4.1 7 Display Segment

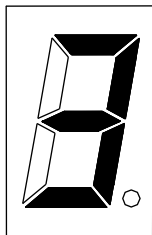
Note that the description displayed in the segment is different depending on the status of Normal operation status or Alarm occurred status

1) Display normal operation status

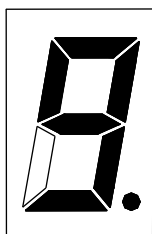


- ← 5V control power supply is fixed with applying AC 200V
- ← Display SV ON status (PWM signal is input to Motor side)
- ← Display the status during motor's running

2) Display alarm status



- ← Display the No. that belongs to the current alarm
ex.) The left alarm here indicates No. 3 alarm.



- ← In case that the appeared alarm exceeds No.10, the last dot is lit.
ex.) The left alarm here indicates No.19 alarm.

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4.2 Program Menu Summary

Menu consists of 9 menu group, and function of each menu is as below.

| Menu. Code | Name of Menu Group | Function |
|--------------------|----------------------|---|
| Pd-001 ~ Pd-020 | Status Menu | Indicate operation status information of Each Servo. |
| PA-101 ~ PA-120 | Alarm Menu | Save & Indicate records of Alarm that is Happened before. |
| PE-201 ~ PE-220 | System Menu | Save information of system construction |
| PE-301 ~ PE-320 | Control Menu | Save set variables that are related to control. |
| PE-401 ~ PE-420 | Analog Menu | Save set variables that are related to analog I/O. |
| PE-501 ~ PE-520 | InOut Menu | Save set variables that are related to I/O contacts. |
| PE-601 ~ PE-620 | Speed Operation Menu | Save set variables that are related to Speed operation |
| PE-701 ~ PE-720 | Pulse Operation Menu | Save set variables that are related to position pulse operation |

From the below menu table, the abbreviation for each mode means ;

P : Used at Position control mode

S : Used at Speed control mode

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1) Operation State Indicating Menu (Refer to chapter 4.3)

| Comm. Code | MENU | | UNIT | INI | Description | App Mode |
|------------|--------|------------------|---------|--------|--|----------|
| | MIN | MAX | | | | |
| 0 | Pd-001 | | - | - | Indicates current operation status. (Normal : nor , Alarm : Alarm No.) | PS |
| | | Current State | - | - | | |
| 1 | Pd-002 | | r/min | 0.0 | Indicates current speed. | PS |
| | | Current Speed | -9999.9 | 9999.9 | | |
| 2 | Pd-003 | | r/min | 0.0 | Indicates current command speed. | S |
| | | Command Speed | -9999.9 | 9999.9 | | |
| 3 | Pd-004 | | - | 0 | Indicates cumulative value of position command Pulse that are input from external device. | P |
| | | Current Pulse | -99999 | 99999 | | |
| 4 | Pd-005 | | - | 0 | Indicates feedback pulse when controlling position. | PS |
| | | Feedback Pulse | -99999 | 99999 | | |
| 5 | Pd-006 | | - | 0 | Indicates remained position pulse that is to be operated. | P |
| | | Pulse Error | 0 | 99999 | | |
| 6 | Pd-007 | | - | 1.000 | Indicates value of electronic gear ratio. | P |
| | | E-Gear | 1.0 | 99.999 | | |
| 7 | Pd-008 | | [%] | 0 | Indicates current command torque | PS |
| | | Command Torque | -999.99 | 999.99 | | |
| 8 | Pd-009 | | [%] | 300 | Indicates torque limit setting value. | PS |
| | | Torque Limit | 0 | 300 | | |
| 9 | Pd-010 | | [%] | 0 | Indicates current load ratio compared to rated. | PS |
| | | Current Load | -99999 | 99999 | | |
| 10 | Pd-011 | | [%] | 0 | Indicates the average load ratio for 5 seconds Compared to rated. | PS |
| | | Average Load | 0 | 99999 | | |
| 11 | Pd-012 | | [%] | 0 | Indicates instantaneous max. load ratio compared to rated. | PS |
| | | Maximum Load | -99999 | 99999 | | |
| 12 | Pd-013 | | Volt | 0.0 | Indicates DC Link voltage of current main power. | PS |
| | | DC Link Voltage | 0.0 | 999.9 | | |
| 13 | Pd-014 | | - | - | Indicates contactsCN1 I/O status. | PS |
| | | I/O SET | - | - | | |
| 14 | Pd-015 | | - | - | Indicates input status that is handled forcibly by external(Handy Loader, PC) (refer to PC-808) | PS |
| | | Input EXT SET | - | - | | |
| 15 | Pd-016 | | - | - | Indicates I/O status that is perceived last (It is perceived and indicated when A contact :ON, B contact: OFF) | PS |
| | | I/O State | - | - | | |
| 16 | Pd-017 | | - | - | Menu that is related to communication. | PS |
| | | Input Logic Set | - | - | | |
| 17 | Pd-018 | | - | - | | |
| | | Input Logic Save | - | - | | |
| 18 | Pd-019 | | - | - | | |
| | | Alarm bit | - | - | | |
| 19 | Pd-020 | | - | - | Indicates the Software Version. | PS |
| | | Software Version | - | - | | |

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

※ Refer to chapter 5-2 when using Handy Loader Display.

2) Alarm state indicating Menu

| MENU | | | UNIT | INI | Description | App Mode |
|-----------------------|-------------|----------------------|------|-----|---|----------|
| Comm. Code | CODE | NAME | MIN | MAX | | |
| Alarm history 01 ~ 20 | | | - | - | Indicates Alarm state that is happened before | PS |
| 20 | PA-101 | Alarm History01 | - | - | | |
| ~ 39 | ~ PA-120 | ~ Alarm History20 | | | | |

Alarm code and details

| COD E | Menu title | Cause | Description | Checking Items |
|-------|------------|------------------|--|---|
| 1 | 1 | Emergency Stop | In case of forced set by communication | PC Comm. Program |
| 2 | 2 | Power Fail | Main power shut off during Servo ON status | Check the wiring of main power supply |
| 3 | 3 | Line Fail | Motor and encoder miswriting | Check set values and CN2 wiring, U,V,W wiring. |
| 4 | 4 | Motor Output | Error of Output (U.V.W) open phase | Check U,V,W wiring and IPM module damage |
| 5 | 5 | Encoder Pulse | No. of encoder pulse set error | Check set value[PE-204] and CN2 wiring. |
| 6 | 6 | Following Error | Position pulse following error | Check the [PE-502] position command pulse set value, wiring and Limit contact, gain set value |
| 7 | 7 | Not Used | Not used | - |
| 8 | 8 | Over Current | Over current | Check the output terminal wiring motor · encoder set value, gain set, Replace drive if O.C. continues. |
| 9 | 9 | Over Load | Over load | Check Load condition, Brake operating condition, wiring, motor · encoder set value. |
| 0. | 10 | Over Voltage | Over voltage | Check input voltage, wiring of braking resistance, damage of braking resistance, excessive regenerative operation |
| 1. | 11 | Over Speed | Over speed | Check encoder set value, encoder wiring, gain set |
| 2. | 12 | Not Used | Not used | - |
| 3. | 13 | EPWR | Hardware error | [PE-203] set error |
| 4. | 14 | Flash Erase Fail | Deleting error of flash ROM data | Replace drive |
| 5. | 15 | Flash Write Fail | Writing error of flash ROM data | Replace drive |
| 6. | 16 | Data Init Error | Error of data initialization | Replace drive |

Motor type and ID

| Model | ID | Watt | Remarks |
|-------|----|------|---------|
| SAR3A | 1 | 30 | |
| SAR5A | 2 | 50 | |
| SA01A | 3 | 100 | |
| | | | |
| SB01A | 11 | 100 | |

| Model | ID | Watt | Remarks |
|-------|----|------|---------|
| SC04A | 21 | 400 | |
| SC06A | 22 | 600 | |
| SC07A | 23 | 750 | |
| | | | |
| | | | |

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| | | | |
|-------|----|-----|--|
| SB02A | 12 | 200 | |
| SB04A | 13 | 400 | |

| | | | |
|--|--|--|--|
| | | | |
| | | | |

3) System Variables Setting Menu (Refer to 4.4.1)

Menus marked with "*" cannot be corrected during Servo-ON

| MENU | | UNIT | INI | Description | Appl. Mode | |
|-----------|---------|-------------------|----------------------|-------------|--|-----|
| Comm Code | CODE | NAME | MIN | | | MAX |
| 40 | *PE-201 | | - | - | Sets Motor ID (Refer 4.4.1), When setting motor ID: Be set automatically from [PE-210] to [PE-217]. | PS |
| | | Motor ID | 0 | 99 | | |
| 41 | *PE-202 | RS232 Comm. speed | [bps] | 0 | Sets RS232 communication speed of "SER" (Applicable after re-power on) 0=9600[bps], 1=19200[bps] 2=38400[bps],3=57600[bps] | PS |
| | | Baud Rate | 0 | 1 | | |
| 42 | *PE-203 | | - | 0 | Sets applied encoder type (0 : A phase lead, 1 : B phase lead, 5 : 9 lines encoder) | PS |
| | | Encoder Type | 0 | 9 | | |
| 43 | *PE-204 | | [p/r] | 2500 | Sets the number of encoder pulse. | PS |
| | | Encoder Pulse | 1 | 99999 | | |
| 44 | PE-205 | | [%] | 300 | Sets torque limit value at CCW. | PS |
| | | CCW TRQ Limit | 0 | 300 | | |
| 45 | PE-206 | | [%] | 300 | Sets torque limit value at CW. | PS |
| | | CW TRQ Limit | 0 | 300 | | |
| 46 | *PE-207 | | - | 0 | Sets drive ID on communication | PS |
| | | System ID | 0 | 99 | | |
| 47 | PE-208 | | - | - | | |
| | | Not Used | - | - | | |
| 48 | PE-209 | | - | - | | |
| | | Not Used | - | - | | |
| 49 | *PE-210 | | gf·cm·s ² | ID | Sets inertia of motor. (Modification is possible when [PE-201] is "0") | PS |
| | | Inertia | 0.01 | 999.99 | | |
| 50 | *PE-211 | | kgf·cm/A | ID | Sets torque constant of motor (Modification is possible then [PE-201] is "0") | PS |
| | | Trq Con | 0.01 | 999.99 | | |
| 51 | *PE-212 | | mH | ID | Sets phase inductance of motor (Modification is possible when [PE-201] is "0") | PS |
| | | Phase Ls | 0.001 | 99.999 | | |
| 52 | *PE-213 | | ohm | ID | Sets phase resistance of motor (Modification is possible when [PE-201] is "0") | PS |
| | | Phase Rs | 0.001 | 99.999 | | |
| 53 | *PE-214 | | A | ID | Sets rated current of motor (Modification is possible when [PE-201] is "0" .) | PS |
| | | Rated Is | 0.01 | 999.99 | | |
| 54 | *PE-215 | | r/min | ID | Sets max. speed of motor (Modification is possible when [PE-201] is "0") | PS |
| | | Max Speed | 0.0 | 9999.9 | | |
| 55 | *PE-216 | | r/min | ID | Sets rated speed of motor (Modification is possible when [PE-201] is "0") | PS |
| | | Rated Speed | 0.0 | 9999.9 | | |
| 56 | *PE-217 | | - | 8 | Sets pole number of motor (Modification is possible when [PE-201] is "0") | PS |
| | | Pole Number | 2 | 98 | | |
| 57 | PE-218 | | - | - | | |
| | | Not Used | - | - | | |
| 58 | PE-219 | | - | - | | |

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| | | | | | | |
|----|--------|----------|---|---|--|--|
| | | Not Used | - | - | | |
| 59 | PE-220 | | - | - | | |
| | | Not Used | - | - | | |

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

4) Control Variables Setting Menu (Refer to chapter 4.4.2)

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

| MENU | | UNIT | INI | Description | Appl. Mode | |
|-----------|--------|------------------|-------|-------------|--|-----|
| Comm Code | CODE | NAME | MIN | | | MAX |
| 60 | PE-301 | | times | 2.0 | Sets inertia ratio of load (Refer to chapter 4.4.2) | PS |
| | | Inertia Ratio | 1.0 | 500.0 | | |
| 61 | PE-302 | | 1/s | 50 | Sets position control proportional gain 1 | P |
| | | Position P Gain1 | 0 | 500 | | |
| 62 | PE-303 | | 1/s | 70 | Sets position control proportional gain 2 | P |
| | | Position P Gain2 | 0 | 500 | | |
| 63 | PE-304 | | [%] | 0 | Sets position feed-forward control ratio | P |
| | | P Feedforward | 0 | 100 | | |
| 64 | PE-305 | | msec | 0 | Sets the time-constant of position feed-forward control filter | P |
| | | P FF FLT TC | 0 | 10000 | | |
| 65 | PE-306 | | msec | 0 | Sets the time-constant of position command filter | P |
| | | P CMD FLT TC | 0 | 10000 | | |
| 66 | PE-307 | | rad/s | 500 | Sets speed proportional gain 1 | PS |
| | | Speed P Gain1 | 0 | 5000 | | |
| 67 | PE-308 | | rad/s | 800 | Sets speed proportional gain 2 | PS |
| | | Speed P Gain2 | 0 | 5000 | | |
| 68 | PE-309 | | msec | 20 | Sets speed integral time constant 1 | PS |
| | | Speed I TC1 | 1 | 10000 | | |
| 69 | PE-310 | | msec | 13 | Sets speed integral time constant 2 | PS |
| | | Speed I TC2 | 1 | 10000 | | |
| 70 | PE-311 | | - | - | | |
| | | Not Used | - | - | | |
| 71 | PE-312 | | msec | 0.5 | Sets speed feed-back filter | PS |
| | | Speed FB FT | 0.0 | 100.0 | | |
| 72 | PE-313 | | r/min | 0.0 | Sets the speed range of zero speed gain | PS |
| | | Zero Speed Gain | 0.0 | 100.0 | | |
| 73 | PE-314 | | [%] | 50.0 | Sets zero speed gain rate which will be applied for the speed lower than that of [PE-313]. | PS |
| | | ZSPD Gain Rate | 1.0 | 100.0 | | |
| 74 | PE-315 | | - | 0 | Sets avoid resonance driving operation (0 : no operation, 1 : operation) | PS |
| | | DE-Resonance | 0 | 1 | | |
| 75 | PE-316 | | Hz | 300 | Sets avoid resonance driving frequency | PS |
| | | Notch Frequency | 0 | 1000 | | |
| 76 | PE-317 | | - | 100 | Sets avoid resonance band width | PS |
| | | Notch Bandwidth | 0 | 1000 | | |
| 77 | PE-318 | | - | 1.1 | Set the time of overload (User is requested not to change it.) | PS |
| | | Overload offset | 0.8 | 1.5 | | |

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| | | | | | | |
|----|--------|---------------------|---|---|--|----|
| 78 | PE-319 | Gain switching mode | - | 0 | Set a switch mode for gain1, gain2 (0: Only gain 1 1: In case that speed command[PE-503] is higher than zero speed, Gain1 is switched to Gain2 2: In case that pulse error[PE-501] is bigger than inpos value, Gain1 is switched to Gain2 | PS |
| | | Gain Conv Mode 0 | 0 | 2 | | |
| 79 | PE-320 | | - | 1 | Automatically switch from speed control to position in case that contacts, 'SPD1' 'SPD2' are ON (0:not used, 1:operation) | PS |
| | | Zero Speed Lock | 0 | 1 | | |

5) Analog I/O variables setting menu (Refer to chapter 4.4.3)

Menus marked with "*" cannot be corrected during Servo-ON

| MENU | | UNIT | INI | Description | App Mode | |
|-----------|--------|-----------------|---------|-------------|--|----|
| Comm Code | CODE | MIN | MAX | | | |
| 80 | PE-401 | | r/min | 2000.0 | Sets analog speeding command of 10[v] Max is max speed of motor. | S |
| | | Analog Speed | 0.0 | max | | |
| 81 | PE-402 | | mV | 0.0 | Sets offset of analog speed. | S |
| | | Speed Offset | -1000.0 | 1000.0 | | |
| 82 | PE-403 | | - | 0 | Sets operation of zero speed clamp | S |
| | | S Clamp Mode | 0 | 1 | | |
| 83 | PE-404 | | mV | 0.0 | Sets operation voltage of zero speed clamp. | S |
| | | S Clamp Volt | 0.0 | 2000.0 | | |
| 84 | PE-405 | | - | 0 | Sets run of speed override. (0 : Not Used, 1 : Override Run) | S |
| | | Speed Override | 0 | 1 | | |
| 85 | PE-406 | | - | - | | |
| | | Not Used | - | - | | |
| 86 | PE-407 | | - | - | | |
| | | Not Used | - | - | | |
| 87 | PE-408 | | - | - | | |
| | | Not Used | - | - | | |
| 88 | PE-409 | | - | - | | |
| | | Not Used | - | - | | |
| 89 | PE-410 | | - | 1 | Sets type of analog output1 for monitoring | PS |
| | | monitor Type1 | 0 | 10 | | |
| 90 | PE-411 | | - | 0 | Sets mode of analog output1 for monitoring (0:mark direction sorting, 1:mark absolute value without direction sort) | PS |
| | | monitor Mode1 | 0 | 1 | | |
| 91 | PE-412 | | - | 1.0 | Sets scale of analog output1 for monitoring | PS |
| | | monitor Scale1 | 0.1 | 9999.0 | | |
| 92 | PE-413 | | mV | 0.0 | Sets offset of analog output1 for monitoring | PS |
| | | monitor Offset1 | -100.0 | 100.0 | | |
| 93 | PE-414 | | - | 3 | Sets type of analog output2 for monitoring | PS |
| | | monitor Type2 | 0 | 10 | | |
| 94 | PE-415 | | - | 0 | Sets mode of analog output2 for monitoring (0:mark direction sorting, 1:mark absolute value without direction sort) | PS |
| | | monitor Mode2 | 0 | 1 | | |
| 95 | PE-416 | | - | 1.0 | Sets scale of analog output2 for monitoring | PS |
| | | monitor Scale2 | 0.1 | 9999.0 | | |

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|---------------|-----------------------|-----------------|--------|-------|--|----|
| 96 | PE-417 | | mV | 0.0 | Sets offset of analog output2 for monitoring | PS |
| | | monitor Offset2 | -100.0 | 100.0 | | |
| 97 | PE-418 | | - | - | | |
| | | Not Used | - | - | | |
| 98 ~ 99 | PE-419 ~ PE-420 | | - | - | | |
| | | Not Used | - | - | | |

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

6) I/O Contacts Variables Setting Menu (Refer to chapter 4.4.4)

| MENU | | UNIT | INI | | Description | App Mode |
|-----------|--------|------------------|-------|--------|--|----------|
| Comm Code | CODE | NAME | MIN | MAX | | |
| 100 | PE-501 | | Pulse | 100 | Sets the output range of position operation completed signal (Refer to chapter 4.4.4) | P |
| | | Inposition | 0 | 99999 | | |
| 101 | PE-502 | | Pulse | 90000 | Sets the output range of position operation follow error signal | P |
| | | Follow Error | 0 | 999999 | | |
| 102 | PE-503 | | r/min | 10.0 | Sets the output range of zero speed signal | PS |
| | | 0 Speed RNG | 0.0 | 9999.9 | | |
| 103 | PE-504 | | r/min | 100.0 | Sets the output range of speed reaching signal | S |
| | | Inspeed | 0.0 | 9999.9 | | |
| 104 | PE-505 | | r/min | 50.0 | Sets the output speed of break operating signal | PS |
| | | Brake SPD | 0.0 | 9999.9 | | |
| 105 | PE-506 | | msec | 10 | Sets the output delay time of break operating signal | PS |
| | | Brake Time | 0 | 10000 | | |
| 106 | PE-507 | | - | 0 | Sets operation reset mode of main power error [0 : reset by hand), 1 : automatic reset | PS |
| | | PowerFail Mode | 0 | 1 | | |
| 107 | PE-508 | | - | 1 | Sets generating brake control operation 0: SVOFF at stop, less than zero speed[PE-503] : Free-run 1: SVOFF at stop, Generating brake function is always operated | PS |
| | | DB Control | 0 | 1 | | |
| 108 | PE-509 | | - | 2 | Sets position pulse clear operating mode 0 : Edge operating 1 : Level operation(response instantly) 2 : Level operation(filter operating) | P |
| | | Pulse Clear Mode | 0 | 2 | | |
| 109 | PE-510 | | - | 1 | Sets divide ratio of encoder signal output -Divide ratio : 1,2,3.....16 | PS |
| | | Pulse Out Rate | 1 | 16 | | |
| 110 | PE-511 | | - | - | | |
| | | Not Used | - | - | | |
| 111 | PE-512 | | - | 1 | Automatically Cancel after ESTOP operation (0 : Reset by manual, 1 : Automatic reset) | PS |
| | | ESTOP Reset | 0 | 1 | | |
| 112 | PE-513 | | - | - | | |
| | | Not Used | - | - | | |
| 113 | PE-514 | | - | - | | |
| | | Not Used | - | - | | |
| 114 | PE-515 | | - | - | | PS |
| | | Not Used | - | - | | |
| 115 | PE-516 | | msec | 0 | Sets the delayed time(PWM-off) when command SV-off | PS |

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|-----|--------|-----------------|----|------|--|----|
| | | PWM off Delay | 10 | 1000 | | |
| 116 | PE-517 | | | 0 | Set No.15 output contact function of CN1 (0 : ZSPD, 1 : BRK) | PS |
| | | ZSPD/BRK Select | 0 | 1 | | |
| 117 | PE-518 | | - | - | | |
| | | Not Used | - | - | | |
| 118 | PE-519 | | - | 25 | Set A/B Logic of input contact (Power supply should be re-input to apply setting) | PS |
| | | Input Logic | 0 | 31 | | |
| 119 | PE-520 | | - | 6 | Set A/B Logic of output contacts | PS |
| | | Output Logic | 0 | 7 | | |

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

7) Speed operation variables setting menu(Refer to chapter 4.4.5)

Menus marked with "*" cannot be corrected during Servo-ON

| MENU | | | UNIT | INI | Description | App Mode |
|------------|---------|-----------------|-------|--------|--|----------|
| Comm. Code | CODE | NAME | MIN | MAX | | |
| 120 | *PE-601 | | - | - | | |
| | | Not Used | - | - | | |
| 121 | PE-602 | | r/min | 3000.0 | Be selected as per the status of speed command input contact [SPD1][SPD2][SPD3] [X]: OFF, [O]: ON | S |
| | | Speed Command1 | -Max | +Max | | |
| 122 | PE-603 | | r/min | 1000.0 | [X][X] : Internal speed command 3 [O][X] : Internal speed command 2 [X][O] : Internal speed command 1 [O][O] : Operation stop | S |
| | | Speed Command2 | -Max | +Max | | |
| 123 | PE-604 | | r/min | 0.0 | | S |
| | | Speed Command3 | -Max | +Max | | |
| 124 | PE-605 | | - | - | | |
| | | Not Used | - | - | | |
| 125 | PE-606 | | - | - | | |
| | | Not Used | - | - | | |
| 126 | PE-607 | | - | - | | |
| | | Not Used | - | - | | |
| 127 | PE-608 | | - | - | | |
| | | Not Used | - | - | | |
| 128 | PE-609 | | msec | 0 | Sets the accelerating time | S |
| | | Accel Time | 0 | 100000 | | |
| 129 | PE-610 | | msec | 0 | Sets the decelerating time | S |
| | | Decel Time | 0 | 100000 | | |
| 130 | *PE-611 | | - | 0 | Sets S type control on speed control (0 : Linear Accel/Decel , 1 : S shape Accel/Decel) | S |
| | | S Type Control | 0 | 1 | | |
| 131 | PE-612 | | r/min | 100.0 | Sets speed 0 at continuous test operation | PS |
| | | Test Run Speed0 | -Max | +Max | | |
| 132 | PE-613 | | r/min | -500.0 | Sets speed 1 at continuous test operation | PS |
| | | Test Run Speed1 | -Max | +Max | | |
| 133 | PE-614 | | r/min | 1000.0 | Sets speed 2 at continuous test operation | PS |
| | | Test Run Speed2 | -Max | +Max | | |

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|-----|--------|-----------------|-------|---------|---|----|
| 134 | PE-615 | | r/min | -2000.0 | Sets speed 3 at continuous test operation | PS |
| | | Test Run Speed3 | -Max | +Max | | |
| 135 | PE-616 | | sec | 5 | Sets speed 0 at continuous test operation | PS |
| | | Test Run Time0 | 1 | 50000 | | |
| 136 | PE-617 | | sec | 5 | Sets speed 1 at continuous test operation | PS |
| | | Test Run Time1 | 1 | 50000 | | |
| 137 | PE-618 | | sec | 5 | Sets speed 2 at continuous test operation | PS |
| | | Test Run Time2 | 1 | 50000 | | |
| 138 | PE-619 | | sec | 5 | Sets speed 3 at continuous test operation | PS |
| | | Test Run Time3 | 1 | 50000 | | |
| 139 | PE-620 | | - | - | | |
| | | Not Used | - | - | | |

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8) Position preration variables setting menu (Refer to chapter 4.4.5)

Menu marked with "*" cannot be corrected during Servo-ON

| MENU | | UNIT | INI | Description | App Mode | |
|-----------------|-----------------------|-----------------|-------|-------------|---|-----|
| Comm Code | CODE | NAME | MIN | | | MAX |
| 140 | *PE-701 | | - | 1 | Sets the input pulse logic of position operation (Refer to chapter 4.4.6) | P |
| | | Pulse Logic | 0 | 5 | | |
| 141 | *PE-702 | | - | 1000 | Sets numerator or electronic gear ratio | P |
| | | Electric Gear N | 1 | 99999 | | |
| 142 | *PE-703 | | - | 1000 | Sets denominator or electronic gear ratio | P |
| | | Electric Gear D | 1 | 99999 | | |
| 143 | PE-704 | | - | - | | |
| | | Not Used | - | - | | |
| 144 | PE-705 | | - | - | | |
| | | Not Used | - | - | | |
| 145 | PE-706 | | - | - | | |
| | | Not Used | - | - | | |
| 146 | PE-707 | | - | - | | |
| | | Not Used | - | - | | |
| 147 | PE-708 | | - | - | | |
| | | Not Used | - | - | | |
| 148 | PE-709 | | - | - | | |
| | | Not Used | - | - | | |
| 149 | *PE-710 | | Pulse | 0 | Sets backlash compensation in position operation (Standard : 4 interpolation pulse) | P |
| | | Backlash | 0 | 10000 | | |
| 150 | PE-711 | | - | - | | |
| | | Not Used | - | - | | |
| 151 | PE-712 | | - | - | | |
| | | Not Used | - | - | | |
| 152 | PE-713 | | - | 0 | Switch the direction by pulse in position operation 0 : Operating in the direction of command 1 : Operating in the counter direction of command | P |
| | | Pulse Dir | 0 | 1 | | |
| 153 | PE-714 | | - | - | | |
| | | Not Used | - | - | | |
| 154 | PE-715 | | - | - | | |
| | | Not Used | - | - | | |
| 155 | PE-716 | | - | - | | |
| | | Not Used | - | - | | |
| 156 ~ 157 | PE-717 ~ PE-718 | | - | - | | |
| | | Not Used | - | - | | |
| 158 | PE-719 | | - | - | | |
| | | Not Used | - | - | | |
| 159 | PE-720 | | - | 1 | Mode to test 7 Segment (0 : No test, 1 : Display as "8") | PS |
| | | 7 Segment Test | 0 | 1 | | |

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

Chapter 4. Detailed explanation of Program menu

4.3 Display Operation State

4.3.1 Display State[Pd-001] (PS)

- Display current operation state.
- “ 0 ” : Normal operation state.(No alarm)
- “1” ~“16” : Display the relative code at alarm occurred.

4.3.2. Display Speed [Pd-002] ~ [Pd-003] (PS)

- Display Current Speed [Pd-002] and current speed command [Pd-003] as [r/min]
- Maximum range is -9999.9 ~ 9999.9

4.3.3 Display Position

① Position command pulse [Pd-004] (P)

Display Counter value of position command pulse that is inputted after Servo ON.

② Position following pulse [Pd-005] (PS)

Display pulse conversion counter value of position following caused by servo's rotation after Servo power is ON

③ Position Pulse remainder [Pd-006] (P)

Difference between command pulse and following pulse, and it displays pulse counter value for the position where Servo will drive on.

④ Electronic gear ratio numerator [Pd-007] (P)

It displays the applied electronic gear ratio to the third decimal place calculating the data on electronic gear ratio, ([PE-702]/[PE-703])

4.3.4 Display Torque and Load

① Current command torque [Pd -008] (PS)

Display the inside torque command that is operated from servo control algorithm compared to rated torque at percentage.

② Torque Limit [Pd -009] (PS)

Display maximum torque that servo motor can generate compared to rated torque at percentage.

③ Current load ratio [Pd-010] (Application Mode : PS)

Display energy (load) that servo motor currently generates compared to rated output at percentage.

④ Average Load ratio [Pd -011] (PS)

Display average energy (load) value for 5 seconds that servo motor generates compared to rated output at percentage.

Chapter 4. Detailed explanation of Program menu

⑤) Maximum instantaneous Load rated [Pd-012] (PS)

Display maximum (peak) load value from the time when it started control up to now after servo ON compared to rated output at percentage.

⑥ Condenser DC Link Voltage [Pd-013] (PS)

- Display servo drive condenser voltage due to regenerative energy from servo motor.
- The maximum DC Link voltage is 405V at standard drive(220V)
 - If DC Link voltage exceeded the limit due to that regenerative energy is large or the capacity of regenerative resistance is small, then over Voltage alarm occurs.
- Proper values are less than 395[V] on regenerative region.

4.3.5 Display I/O State

[Input contact]

| (0) | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
|------|-----------------|----------------|--------|----------------|-----|-----|-----|-----|-----|
| SVON | CCWLIM /SPD1 | CWLIM/ SPD2 | ALMRST | PCLEAR/ DIR | | | | | |
| (10) | (11) | (12) | (13) | | | | | | |
| | | | | | | | | | |

[Output contact]

| (0) | (1) | (2) | (3) | (4) | (5) |
|-------|-------------|------|-----|-----|-----|
| ALARM | INSPD/INPOS | ZSPD | | | |

① CN1 I/O contact state [Pd-014] (PS)

CN1 Connector is ON (Contact ; Short) : The relevant bit No. becomes "1".

CN1 Connector is OFF (Contact ; Open) : The relevant bit No. becomes "0".

② External manipulation Input state [Pd-015] (PS)

- Display state when manipulating the contact state by using external device (PC communication and the like), not in case of using CN1 connector.
- Since the external manipulating input state can not be stored at servo drive ROM, it can be automatically reset when power is turned OFF.

③ I/O contact state [Pd-016] (PS)

Display I/O state by compounding ① and ②

(When normal-A contact : ON, and normal-B contact : OFF, it is recognized and displayed)

Chapter 4. Detailed explanation of Program menu

4.3.6 Display Software version (Application Mode : PS)

40 108 03 08

↑ ↑ ↑ ↑

Standard Version Amp type Exclusive code of Metronix

* Version No. 102 is actually displayed as 1.02 at Handy loader or PC Communication program

| Amp type | Drive type |
|----------|------------|
| 0 | VKR5 |
| 1 | VK01 |
| 2 | VK02 |
| 3 | VK04 |
| 4 | VK08 |

Chapter 4. Detailed explanation of Program menu

4.4 Setting Up Menu

4.4.1 Setting System Variables

① Setting motor constant (Application Mode : PS)

Input ID number to ID menu [PE-201], then motor constant can be automatically set. ID for each model Motor is as below.

Motor type and ID

| Model | ID | Watt | Remarks |
|-------|----|------|---------|
| SAR3A | 1 | 30 | |
| SAR5A | 2 | 50 | |
| SA01A | 3 | 100 | |
| | | | |
| SB01A | 11 | 100 | |
| SB02A | 12 | 200 | |
| SB04A | 13 | 400 | |

| Model | ID | Watt | Remarks |
|-------|----|------|---------|
| SC04A | 21 | 400 | |
| SC06A | 22 | 600 | |
| SC07A | 23 | 750 | |
| | | | |
| | | | |
| | | | |

Chapter 4. Detailed explanation of Program menu

► Setting each motor constant

For setting motor constant individually, individually, input "0" to motor ID menu [PE-201]

Motor constant is as below

| MENU | | | UNIT | INI | Explanation |
|-----------|---------|-------------|----------------------|--------|---|
| Comm Code | CODE | NAME | MIN | MAX | |
| 40 | *PE-201 | | - | - | Sets motor ID : set automatically from [PE-210]to[PE-217] |
| | | Motor ID | 0 | 99 | |
| 49 | *PE-210 | | gf·cm·s ² | ID | Sets inertia of motor. (Modification is possible when [PE-201] is "0") |
| | | Inertia | 0.01 | 999.99 | |
| 50 | *PE-211 | | kgf·cm/A | ID | Sets torque constant of motor.(Modification is possible when [PE-201] is "0") |
| | | Trq Con | 0.01 | 999.99 | |
| 51 | *PE-212 | | mH | ID | Sets phase inductance of motor.(Modification is possible when [PE-201] is "0") |
| | | Phase Ls | 0.001 | 99.999 | |
| 52 | *PE-213 | | ohm | ID | Sets phase resistance of motor. (Modification is possible when [PE-201] is "0") |
| | | Phase Rs | 0.001 | 99.999 | |
| 53 | *PE-214 | | A | ID | Sets rated current of motor. (Modification is possible when [PE-201] is "0") |
| | | Rated Is | 0.01 | 999.99 | |
| 54 | *PE-215 | | r/min | ID | Sets Max. speed of motor. (Modification is possible when [PE-201] is "0") |
| | | Max Speed | 0.0 | 9999.9 | |
| 55 | *PE-216 | | r/min | ID | Sets rated speed of motor. (Modification is possible when [PE-201] is "0") |
| | | Rated Speed | 0.0 | 9999.9 | |
| 56 | *PE-217 | | - | 8 | Sets pole number of motor. (Modification is possible when [PE-201] is "0") |
| | | Pole Number | 2 | 98 | |

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

Chapter 4. Detailed explanation of Program menu

② Setting encoder (PS)

▶ Encoder type [*PE-203]

| No. | Transmission | Signal method | Signal type | Remark |
|-----|--------------|---------------------|-------------|----------|
| 0 | Parallel | A Phase lead at CCW | A,B,Z,U,V,W | Standard |
| 1 | Parallel | B Phase lead at CCW | A,B,Z,U,V,W | |
| 5 | Parallel | A Phase lead at CCW | A,B,Z | 9 lines |

▶ - Encoder pulse [*PE-204]

When encoder signal method uses A,B Signal, set number of pulse per single turn for signal.

In this case, the pulse number of A phase & B phase is same.

③ Setting torque limit (PS)

Can set max. torque limit at CCW[PE-205] and CW[PE-206] respectively

It is displayed at percentage, compared to rated torque and the standard is 300[%]

④ Setting System ID (PS)

When communicating with servo using RS485 or Bus communication, we can give ID to servo. At this time, Option that are related to communication is required.

▶ System ID [*PE-207]

Give inherent ID to servo, and communicate with servo respectively.

▶ Setting communication speed [*PE-202]

Can use it by selecting the Baud Rate that is the communication speed of RS232.

“0” : 9600[bps]

“1” : 19200[bps]

“2” : 38400[bps]

“3” : 57600[bps]

Chapter 4. Detailed explanation of Program menu

4.4.2 Setting Control Variables

① Setting Inertia Ratio[PE-301] (PS)

The inertia ratio is set by calculating the load inertia as per the machinery system and calculating rotor inertia ratio as per the motor specification table.

Setting the inertia ratio for load is a very important control variable for the Servo operation. So, The accurate setting of inertia ratio would be required for the best operation of servo.

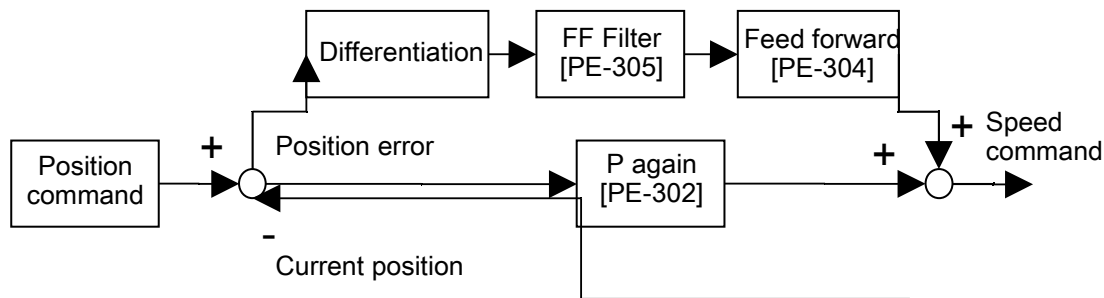
- Followings are the recommended values of control gain that are adequate to the load inertia ratio.

| Motor Flange | Inertia Ratio | | Gain setting range | | |
|--------------|----------------|-----------|--------------------|--------------|------------|
| | Section | [Inertia] | [Pos P Gain] | [Spd P Gain] | [Spd I TC] |
| 40 ~ 80 | Low inertia | 1 ~ 5 | 40 ~ 90 | 400 ~ 1000 | 10 ~ 40 |
| | Medium inertia | 5 ~ 20 | 20 ~ 70 | 200 ~ 500 | 20 ~ 60 |
| | High inertia | 20 ~ 50 | 10 ~ 40 | 100 ~ 300 | 50 ~ 100 |

- * If the calculation of inertia ratio is difficult, then Auto tuning the inertia ratio could be possible at trial operation. Refer to chapter "5.3.1 Gain Tuning"

Chapter 4. Detailed explanation of Program menu

② Position control gain (P)



- Position command : Count the position command pulse from external. And convert it to position command value, and it passes through 1st filter and then it is used as the internal position command.

- Current position : Count the pulse signal from encoder, and convert it to current position by using electrical gear ratio setting and then convert it to the current position value.

- Position proportional gain [PE-302][PE-303] : Multiply position proportional gain by difference between position command and current position and convert it to position command.

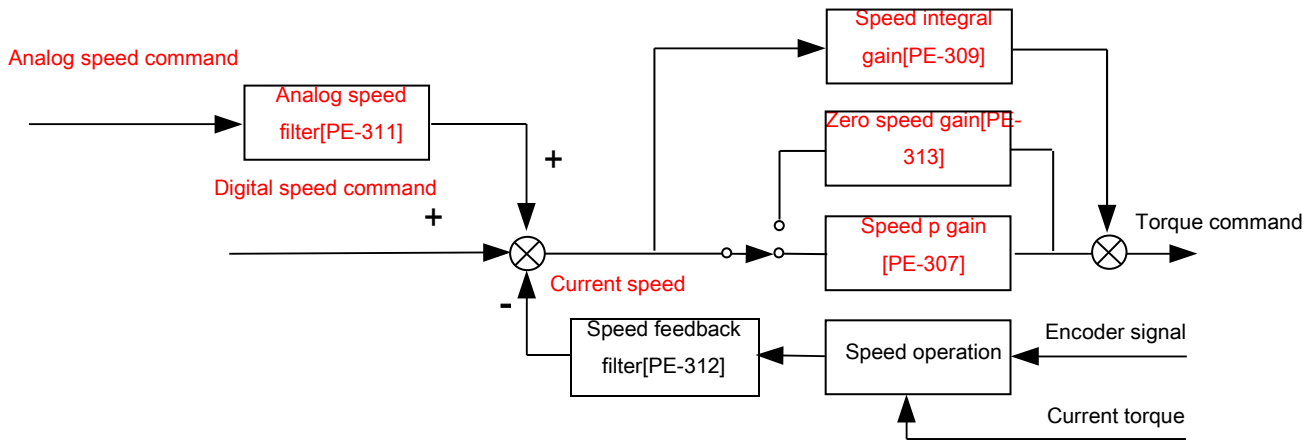
*** Recommend setting value = speed proportional gain[PE-307] / 10**

- Feed forward Gain[PE-304] : Find the slope of position command by differentiation, and shortening the position decision time by adding the speed command to it. If this value is too large, overshoot may be occurred on position control or position control may be unstable, therefore set proper value by increasing from small value watching initial operation state.

- Feed forward filter [PE-305] : If position command is changed suddenly, control is unstable. In that case, remove vibration by setting filter value

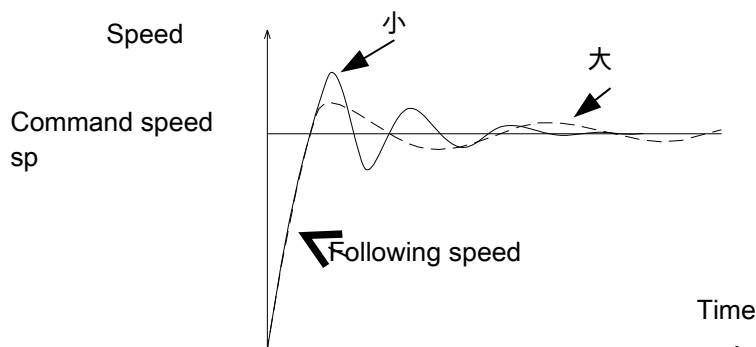
Chapter 4. Detailed explanation of Program menu

③ Speed control gain (PS)



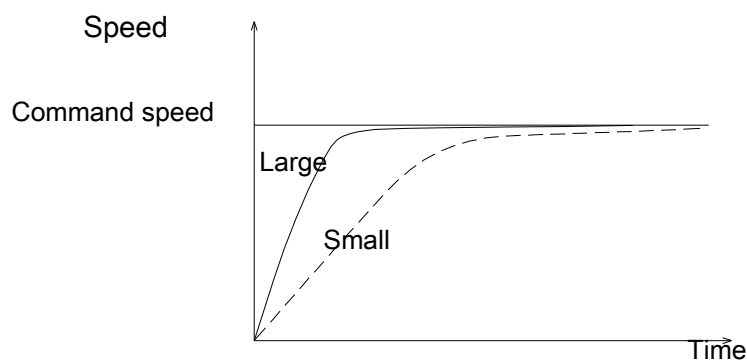
- Speed command : Use digital speed command that are set by [r/min] unit in the internal parameter menu.
- Current speed : Calculate the speed by counting encoder signal as per the time, and the calculated speed is to be used as the current speed after go through the filter. At this time, use an algorithm that follows speed by using current torque & inertia in order to compensate the speed operation error at low speed
- Speed integral gain[PE-309] : Find the integral value of speed error that is the difference between command & current speed and convert it to torque command by multiplying it by integral. If we reduced integral gain, speed following characteristic can be improved as excessive response characteristic is improved. But, if it is too small, overshoot would be occurred. And if it is too large, the excessive response characteristic would be bad, then it is operated by the proportional control characteristic.

* Recommend setting value = $10000 / \text{speed proportional gain [PE-307]}$



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- ▶ **Speed proportional gain [PE-307]** : Convert to torque command by multiplying speed error by proportional gain. Large value could lead good speed response, but too large value could lead vibration. On the other hand small value could lead bad speed response



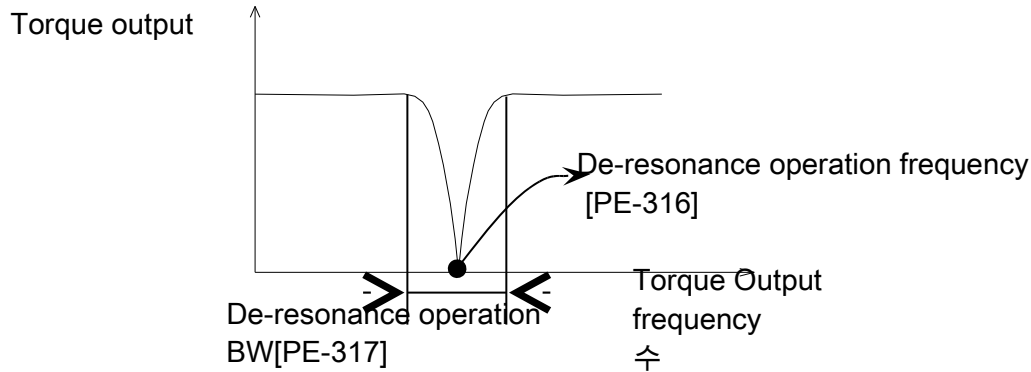
- ▶ **Speed feedback filter [PE-312]** : If the motor is vibrated by the vibration of operating system and vibration occurred by the gain at applying the load the has too large inertia, the vibration controlled by applying filter to speed feedback.

* **Recommend setting value = 0 ~ Speed proportional gain[PE-309]/10**

- ▶ **Zero speed gain [PE-313]** : When controlling vibration with speed feedback gain, system could be unstable by stop vibration. At this time, set the range of zero speed gain, and control the gain within that range to control vibration.
- ▶ **Zero Speed gain ratio:** Set the zero speed gain ration that is to be applied to the speed range which are below the speed range that are set in [PE-314]

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⑤ Setting De-resonance operation (Application Mode : PS)



If vibration is generated due to mechanical resonance from specific frequency, the vibration caused by resonant can be controlled by limiting torque output for this frequency range.

▶ De-resonance operation [PE-315] : It is not operated at “0”.

But, operated at “1”.

⑥ Gain 1, Gain2 Switching Mode[PE-319]

| Setting | Operation method |
|---------|--|
| 0 | Only Gain 1 can be used |
| 1 | Gain 2 is to be used when speed command [PE-503] is higher than “zero speed” at speed controller(Use 50 % of Hysteresis) |
| 2 | Gain 2 is to be used when pulse error [PE-501] is higher than “inposition value at position controller” (Use 50 % of Hysteresis) |

※ If the value of Gain 2 [PE-303] is smaller than the value of Gain 1 [PE-302] [PE-307], [PE-309], it will be applied as Gain 1

⑦ Zero speed torque improvement [PE-320] (PS)

Set whether or not to operate by applying stop torque improvement algorithm at servo OFF

“0” : Not used.

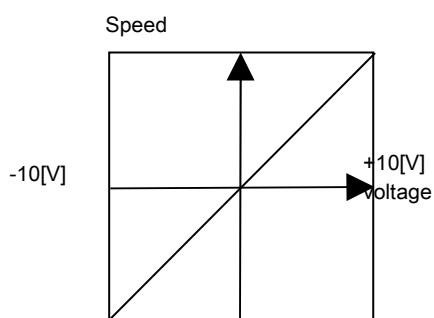
“1” : Operated.

4.4.3 Setting Analog output Variables

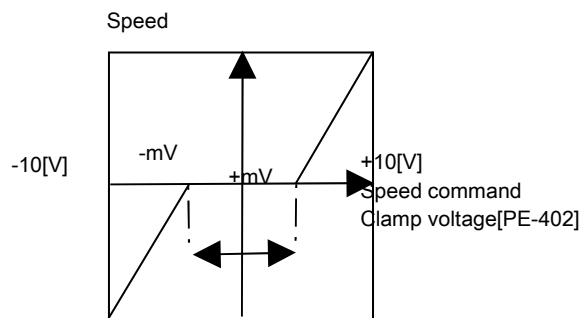
Chapter 4. Detailed explanation of Program menu

① Setting analog speed command (S)

- ▶ Analog speed command [*PE-401] : Sets
- ▶ Speed command offset[PE-402] :
- Setting speed command clamp



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



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

- ▶ Speed override run[PE-405] :

"0" : Not Used.

"1" : Runing override.

- Setting analog output (Application mode: PS)

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Two of output form can be used for analog output. And it is outputted by the data value in period of 400[msec] respectively.

► Analog output form [PE-410], [PE-414]

| Form | Data content | Form | Data content |
|------|----------------|------|-------------------------|
| 0 | Command speed | 4 | Command pulse frequency |
| 1 | Current speed | 5 | Error pulse |
| 2 | Command torque | | |
| 3 | Current torque | | |

► Analog output mode [PE-411], [PE-415]

| Mode | Output method |
|------|----------------------|
| 0 | Output as -5 ~ +5[V] |
| 1 | Output as 0 ~ +5[V] |

► Analog output magnification [PE-412], [PE-416]

If the output value is too much large or small, then magnify or retrench output properly.

Standard magnification of each output data is as below

| Data item | Magnification |
|-------------------------|--|
| Speed | Max. speed of motor [PE-215] |
| Torque | Max. torque of motor [PE-205] |
| Command pulse frequency | 500[Kpps] |
| Error pulse | Position error excessive output [PE-502] |

► Analog output offset [PE-413], [PE-417].

There could be some voltage generated at "0" value output due to problems of Analog circuit. At this time, set offset with the voltage value and compensate it.

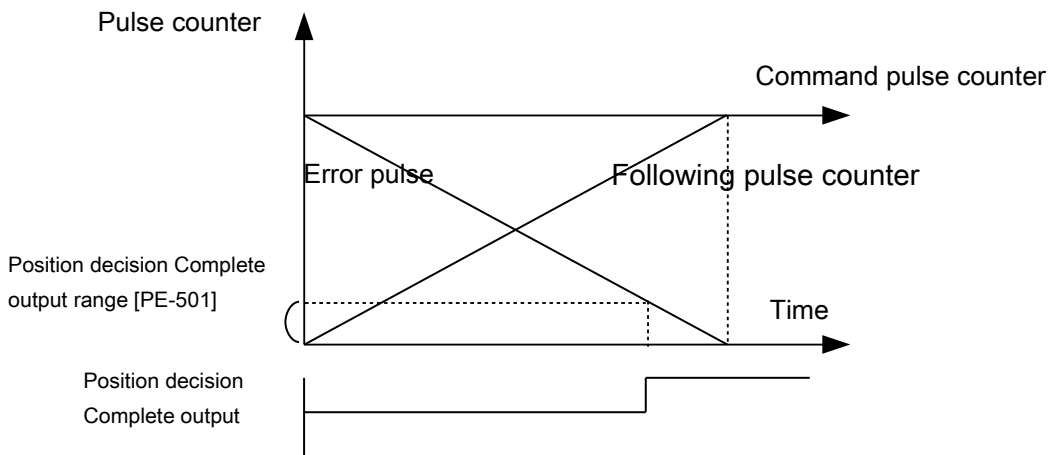
Unit is [mV]

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4.4.4 Setting I/O contact Variables

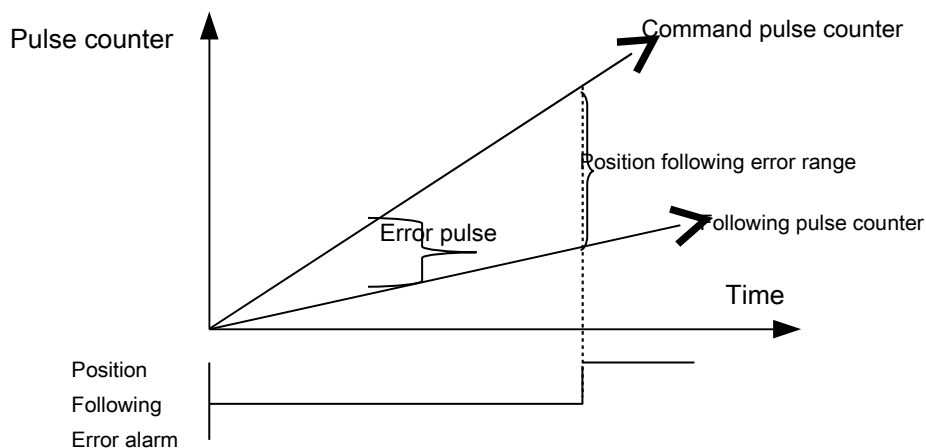
① Setting position operation variables (P)

- ▶ Position decision complete output range [PE-501] : If error pulse value which is the difference between command position pulse and following position pulse is within setting range, position decision complete signal comes out.



If setting value is excessively high, position decision complete signal could be occurred during operation according to position command pulse. Therefore set the value properly

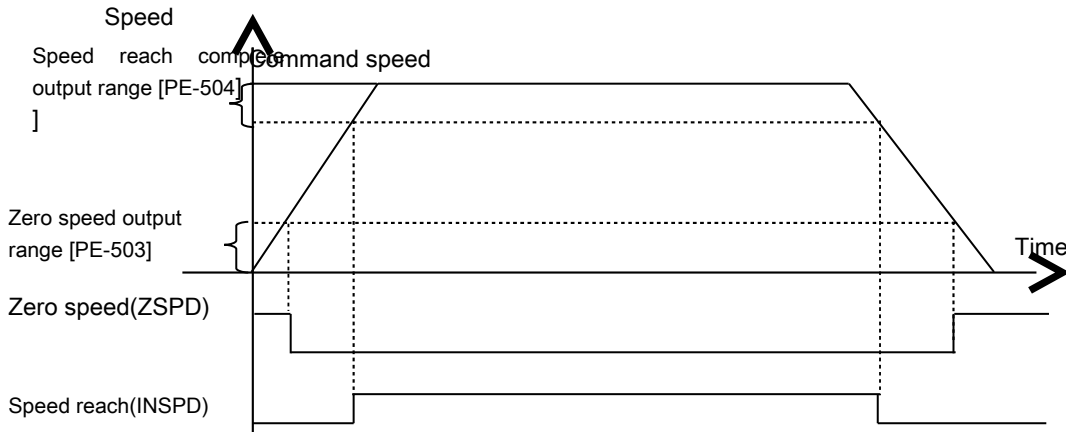
- ▶ Position operation following error range [PE-502]



If the error pulse is larger than following error range set value, Position following error alarm would be occurred.

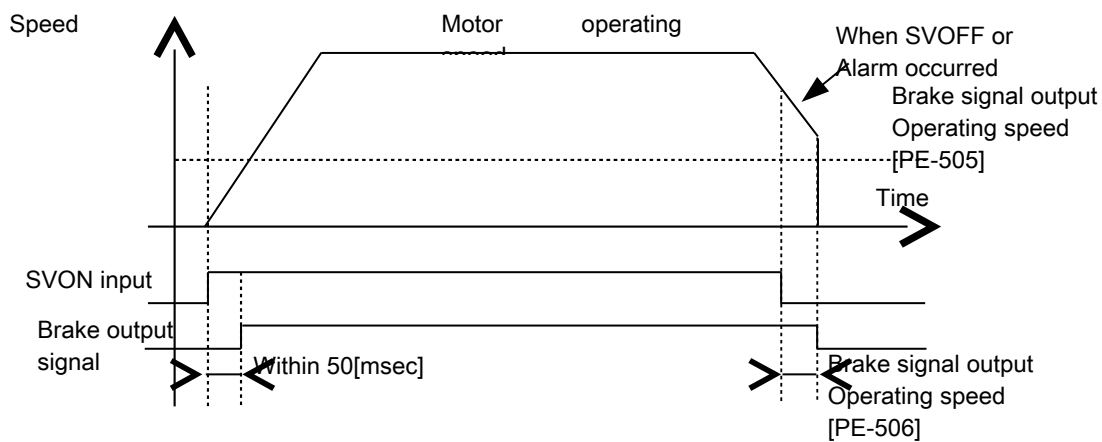
Chapter 4. Detailed explanation of Program menu

② Setting speed operation variables (S)



- ▶ Zero speed output range [PE-503] : If current speed is less than set speed, zero speed signal comes out..
- ▶ Speed reach complete output range [PE-504] : Speed reach complete signal comes out.

③ Setting brake signal output variables (PS)



- ▶ Brake signal output operating speed [PE-505], Brake signal output delay time [PE-506]
- The Servo motor brake that is installed inside is used when a servo drive controls a vertical axis. In other words, a servo motor with brake prevents the movable part from shifting due to the force of gravity when system power goes OFF. When alarm is occurred during operation or when decelerated by SVOFF, the brake signal “OFF” is to be occurred by the signal that satisfies the operation first out of ‘brake signal output operating speed [PE-505]’ or ‘brake signal output delay time [PE-506]’ parameter. Then it prevents the vertical axis from dropping (shifting).

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④ Definition of ZSPD/BRK Output contacts [PE-517] (PS)

- Select No. 15, 16 pin output contacts function of CN1
- 0 : Zero speed(ZSPD) output, 1 : Brake(BRK) output

⑤ Generating brake operation [PE-508] (PS)

- : Set the generating brake operation
- “0” : Free Run on less than zero speed range at SVOFF
- “1” : Always generating brake operation at SVOFF

⑥ Position pulse clear operation [PE-509] (P)

- : Set the operation method of position pulsed clear at position operating mode.

| Setting | Operation method |
|---------|---|
| 0 | Can only be operated at the edge where the contact off->on. (Not operated on the off or on status.) |
| 1 | Contact On : Operated as Level (Instant response) |
| 2 | Contact is On and maintained for more than 0.8[msec] : Operated as Level |

⑦ Encoder pulse division output [PE-510] (PS)

- : When encoder signal comes out from servo, divided output pulse by set division ratio and output.

Division ratio is set by the integral numbers (“1~16”)

EX) In case of the Encoder 3,000[P/R]

Encoder pulse output at setting the dividing ratio “1” : $3,000[P/R] \times 1 = 3,000[P/R]$

Encoder pulse output at setting the dividing ratio “2” : $3,000[P/R] \times 1/2 = 1,500[P/R]$...

⑧ ESTOP automatic reset [PE-512] (PS)

- : When returning to the contacts after ESTOP operation, proceed the alarm cancel operation automatically and return to the normal operation ready state.

“0” : alarm reset by manual.

“1” : automatic alarm reset.

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⑨ Input contact Logic setting[PE-515] (PS)

: Can change the output condition of Current output contact to Normal-A or Normal-B.

Setting range : 0~31, Initial value : 25

(Example)

$$2^4 \quad 2^3 \quad 2^2 \quad 2^1 \quad 2^0 = \text{Setting value}$$

PCLEAR ALMRST CWLIM CCWLIM SVON

Initial value

$$\text{(Current input condition)} \quad 1 \quad 1 \quad 0 \quad 0 \quad 1 = 25$$

$$\text{If change CW/CCWLIM} \quad 1 \quad 1 \quad 1 \quad 1 \quad 1 = 31$$

* Power supply of drive should be re-input to change input contact logic setting.

⑩ Output contact Logic setting [PE-520] (PS)

: Can change output condition of Current output contact to Normal-A or Normal-B.

Setting range : 0~8, Initial value

(Example)

$$2^2 \quad 2^1 \quad 2^0 = \text{Setting value}$$

ZSPD/BRK INPOS ALARM

Initial value

$$\text{(Current output condition)} \quad 1 \quad 1 \quad 0 = 6$$

$$\text{If change ZSPD} \rightarrow \text{TGON} \quad 0 \quad 1 \quad 0 = 2$$

(RUN output)

⑪ **PWM off delayed time setting[PE-516] (PST)** : Set the delayed time that is the real PWM-off when SV-off command is given. That means, when operating the motor with the output contact "BRAKE" signal, there is some time delayed to operate the motor brake("BREAK" signal : off). In order to prevent the motor from dropping in the vertical axis during this delayed time, the real PWM-off(delayed time) needs to be set.

Setting range : 0~1000[msec], Initial value 0

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4.4.5 Setting Speed operation Variables

- ① **Speed command [PE-602]~[PE-604] (S)** : Set the operation speed as [r/min] unit. According to speed command input contact, speed is selected.

| SPD1 | SPD2 | Speed selection |
|------|------|-------------------------|
| X | X | Digital speed command 3 |
| O | X | Digital speed command 2 |
| X | O | Digital speed command 1 |
| O | O | Motor stop (STOP) |

(Note 1) O : "ON", X : "OFF"

② **Acceleration/deceleration time (S)**

- ▶ Acceleration time [PE-609] : Set the time taken for accelerating from the stopped to rated speed of motor as [msec] unit.
- ▶ Deceleration time [PE-610] : Set the time taken for stopping during operation at rated speed of motor as [msec] unit.

- ③ **S-shape operation [PE-611] (S)** : In order to have a smooth acceleration/ deceleration, set the acceleration/deceleration as S-shape.

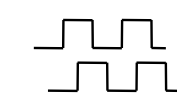
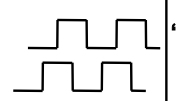
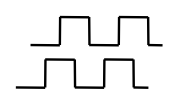
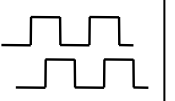
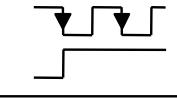
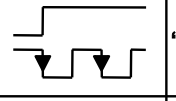
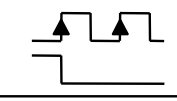
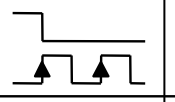
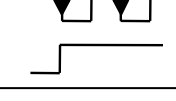
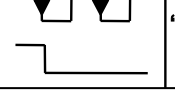
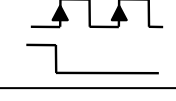
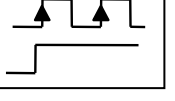
"0" : Linear acceleration/deceleration operation

"1" : S-shape acceleration/deceleration operation

Chapter 4. Detailed explanation of Program menu

4.4.6 Setting Position Operation Variables

① **Input pulse logic [PE-701] (P)** : Set the form of position command input pulse and rotating method for each logic..

| PF +PR | N-logic | | P-logic | | | |
|---------------------|------------------|---|---|------------------|--|---|
| | Forward rotation | Reverse rotation | Forward rotation | Reverse rotation | | |
| A phase +B phase | "0" |  |  | "3" |  |  |
| CCW or CW Pulse | "1" |  |  | "4" |  |  |
| Pulse direction | "2" |  |  | "5" |  |  |

② **Electronic gear ratio[*PE-702]~ [*PE-709] (P)** : Set the relation between 'position command input pulse' and 'encoder pulse(after the 4 times interpolation)' as numerator/denominator. And it should be set not to occur any errors at position operation.

$$\text{* Electronic gear ratio} = \frac{\text{Transferred distance per input pulse} \times \text{Number of pulse per motor rotation}}{\text{Transferred distance per motor rotation}}$$

Example) When deceleration ratio is 1/2 on 1[μm] unit per 1 pulse, ball screw lead is 10[mm], and encoder pulse is 3000pulse,

1) Transferred distance per input pulse = $1 \times 10^{-3} = 0.001[\text{mm}]$

2) Number of pulse per a motor rotation = encoder pulse number $\times 4 = 3000 \times 4 = 12000$

3) Transferred distance per a motor rotation = $10 \times 1/2 = 5[\text{mm}]$

∴ 4) Electronic gear ratio = $12000 \times 10^{-3} / 5 = 12/5$

Therefore, the numerator of electrical gear ratio is "12", denominator is "5".

Note1) In A, B phase encoder signal method, the signal is multiplied by 4 times and controlled.

Therefore 3000 pulse encoder is 12000 pulses per a rotation.

Note2) At this time, motor speed ([r/min]) is

$$\text{Motor speed} = 60 \times \text{electronic gear ratio} \times \text{input pulse frequency} / \text{No. of pulse per a motor rotation}$$

Chapter 4. Detailed explanation of Program menu

③ **Backlash compensation [PE-710] (P)** : Set the backlash amount that is converted to number of pulse when the location is deviated by backlash occurred at position operation.

④ **Switching position pulse direction [*PE-713]** : Switch the operating direction of command pulse

“0” : Operated with command pulse direction

“1” : Operated with reverse direction of command pulse