S007S003

CE

DAEWOO AC SERVO MOTOR / DRIVE

Pro-Motion

CT-Series

Model : DASD-CT15 (1.5 kWatt)

Operation Manual

Rev. B

DAEWOO HEAVY INDUSTRIES & MACHINERY LTD.

- Contents -

IMPORTANT

Ⅰ. Definition of Symbols for Warning

1) 

Warning : This symbol means if not handled properly, there is possible danger such as electric shock.

2) 

Caution : This symbol means if not handled properly, there is possible danger of acquiring mild to severe injuries or machine damages.

Ⅱ. Warning

1) Do not use in areas near corrosive, inflammable or explosive gas.

2) Take appropriate measures of protection while the servo motor is in operation.

3) While installing and wiring, turn the power switch off, in order to prevent electric shock.

4) Ground the PE terminal block of the front panel terminal block L1(R), L2(S), L3(T) to one-point with the class 3 (below 100Ω) ground circuit, in order to prevent electric shock or other malfunctions. For PE terminal block, use wire 30mm^2 thicker than the electric wire of the terminal L1, L2, L3.

5) Connect the PE terminal block of the servo motor to the PE terminal block U, V, W of the servo driver in order to prevent electric shock. To connect the wire, use wire 30mm^2 thicker than the power line of U, V, W.

6) Take precautions while mounting, dismantling, uninstalling and transferring the servo motor.

7) Cover the terminal block while using the servo driver in order to prevent electric shock.

8) Use SELV for maintenance brake power switch, input and output power switch and input and output signal in order to prevent electric shock.

9) Do not dismantle the servo driver for another 5 minutes after the main power is turned off - charged voltage may still remain inside the driver.

10) This product uses batteries. Take the following precautions while using the battery. If used inappropriately, explosion or fire may occur. The contents of the battery are harmful to the eye.
   ① Do not heat above 100℃ and do not open when there is fire.
   ② Do not take it apart. (The contents are harmful to the eye)
   ③ Do not recharge it.

11) During emergency shut down, stop the servo motor before shutting down the servo driver (terminal L1, L2, L3).

Ⅲ. Caution

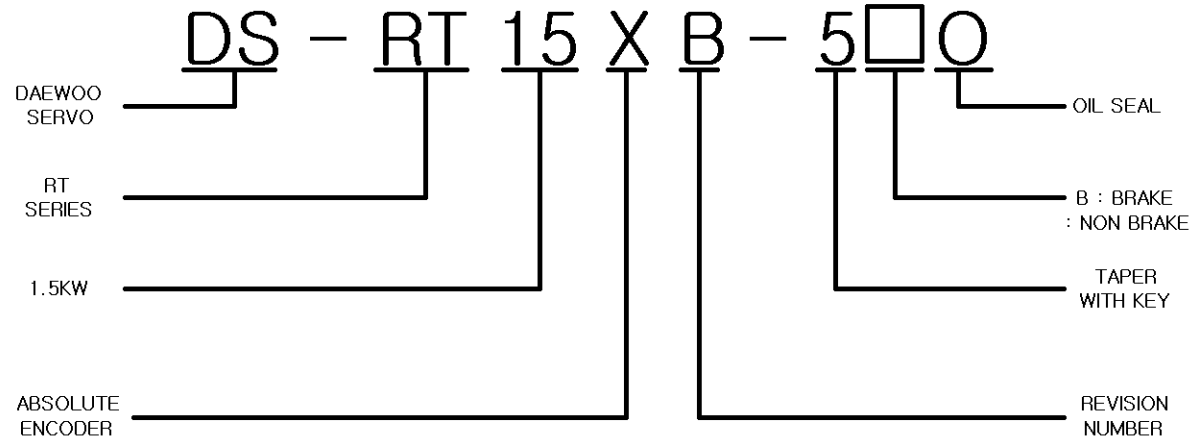
1) To avoid burns, do not touch the heat protecting board or the regenerative resistor of the servo motor and driver while the servo motor is in operation or right after the power switch is turned off. Take appropriate measures of protection.

2) Avoid the following to prevent damages to the servo motor and servo drive.
   ① Do not connect the power directly to the U, V, W terminal block of the servo motor. The servo motor will be damaged.
   ② Avoid external impact such as hammering to the servo motor. The encoder inside the servo motor will be damaged.
   ③ Do not connect the power to the U, V, W terminal block of the servo drive.
   ④ While doing the resisting pressure test or insulation voltage test, disconnect the terminal of the servo drive terminal block or all the connectors and avoid the test voltage from affecting the servo drive. Also avoid the test voltage from affecting the encoder connector terminal of the servo motor.
   ⑤ Do not install the servo motor and the servo driver differently than it should.
   ⑥ Prevent water or oil from directly touching the servo motor. Use in areas free of water or oil to prevent it from touching the main wire of the servo motor.
   ⑦ Do not use the servo motor and driver differently other than stated in this manual.

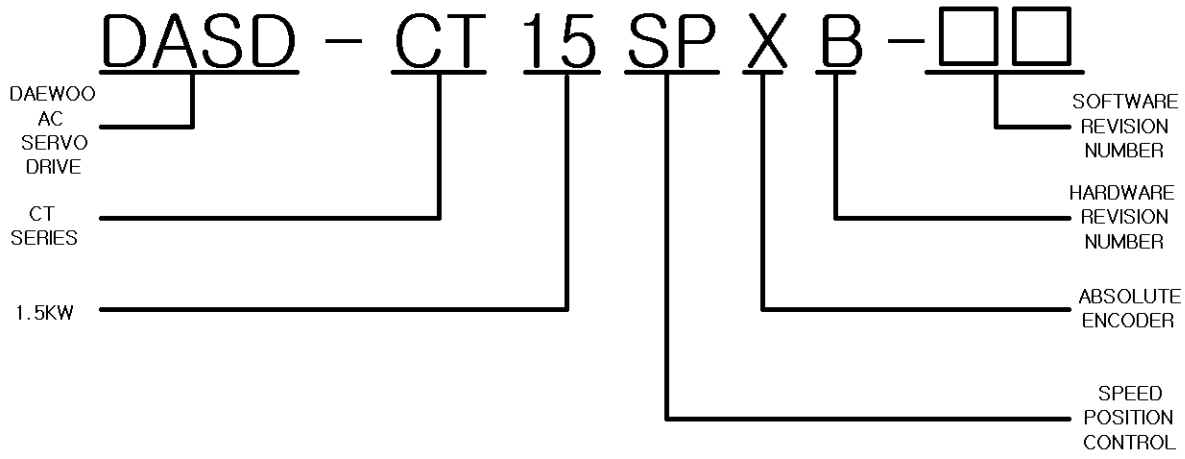
1. Specifications and Structure

1.1. Formal type designation

◆ **Servo Motor**



◆ **Servo Driver**



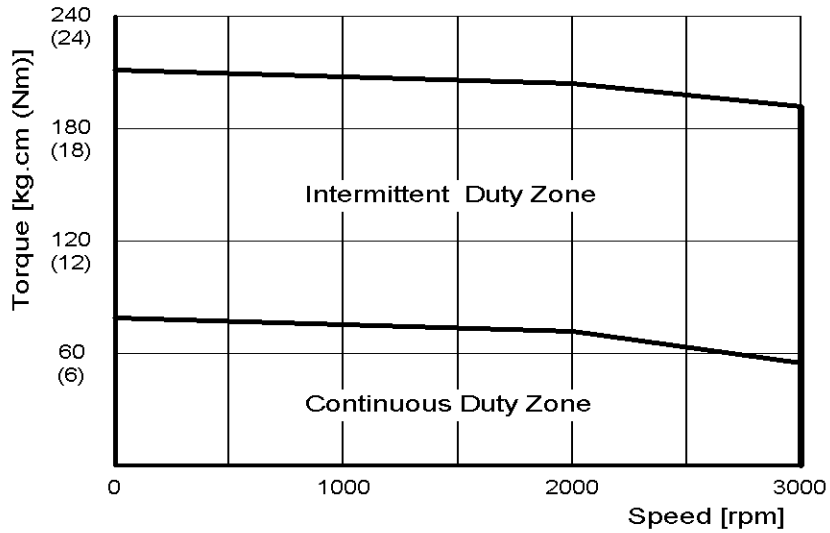
1.2. Specifications for Servo Motor

Items			Specifications
SERVO MOTOR	Rated output	kWatt	1.5
	Rated torque	kgcm	73
		Nm	7.15
	Continuous maximum torque	kgcm	219
		Nm	21.4
	Rated speed	RPM	2000
	Maximum speed	RPM	3000
	Power rate	kW/S	22.7
	Rotor inertia	$GD^2/4(kgcm^2)$	22.5
		$J(gcms^2)$	23.0
	Insulation		F Class
	Detector		Multi-turn Absolute Encoder (11bits/1rotation, rotatiion rate :13bits)
	Protection, Cooling method		Totally closed, self cooled
	Ambient temperature		0~40°C
	Ambient humidity		20~80 %
	Mounting structure		Flange type
	Insulation resistance		DC 500V 50 Mohm
	Insulation grade		AC 1500V one minute
	Vibration		V15

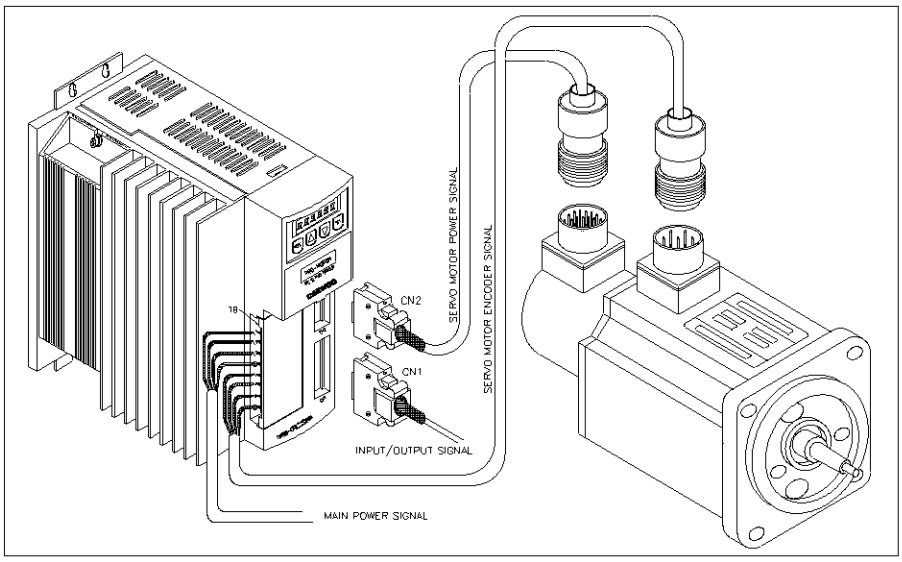
1.3. Specifications for Servo Driver

Items		Specifications
SERVO DRIVE	Rated current [Arms]	10.1
	Maximum current [Arms]	30.3
	Main input voltage	AC 200~230V, +10/-15%, 50/60Hz
	Control method	IPM full wave rectified, transisterized PWM control
	Control mode	position, speed, torque control
	Control signal input	Servo ON, Start, Stop, Reset, Jog+,Jog-
	Position input	7bit position feedback input
	Control signal output	Alarm, Ready, Position command complete
	Position output	7bit current position output
	Protection	Over voltage, under voltage, over current, over speed, over load, encoder error and etc.
	Mounting	Rack Mount Type
	Dimension [mm]	220 x 100 x 203 (W x H x D)

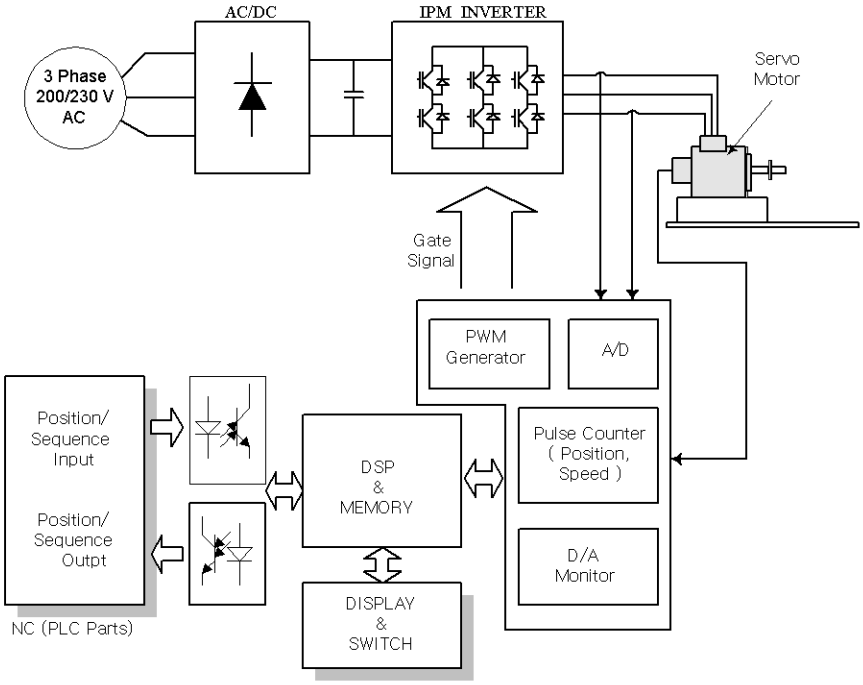
1.4. Torque-Speed Characteristics of Servo Motor



1.5. Coupling of the Servo Motor / Drive



1.6. Inner structure of Servo Drive

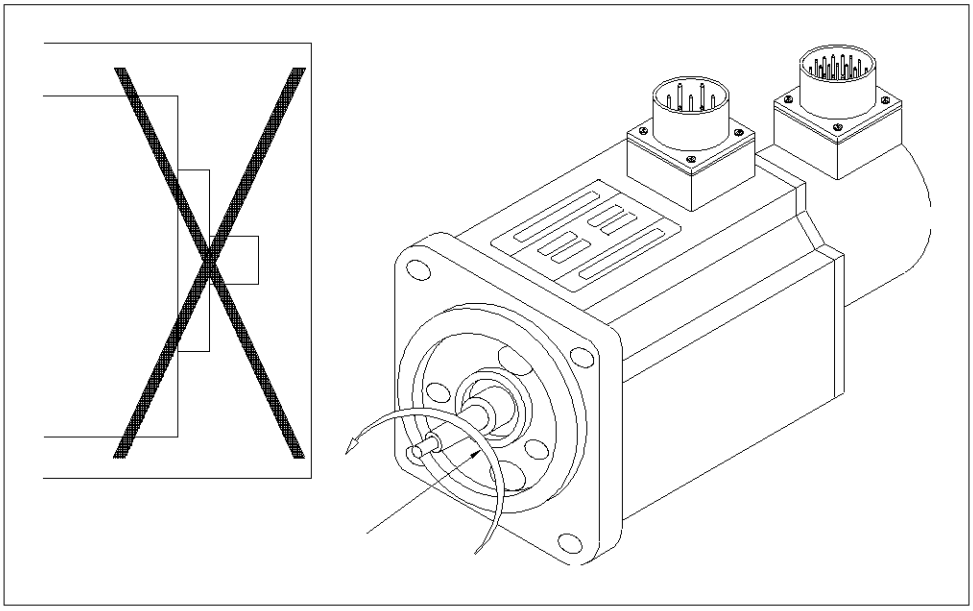


1.7. Direction of the servo motor rotation

▶ ⚠ Caution : The encoder of the servo motor is made of glass.
Take precautions in order to avoid damages to the encoder shaft of the servo motor.

▶ ⚠ Caution : Make sure the rotation of the servo motor is turning in the right direction.

◆ The correct direction of the rotation is shown in the following picture.

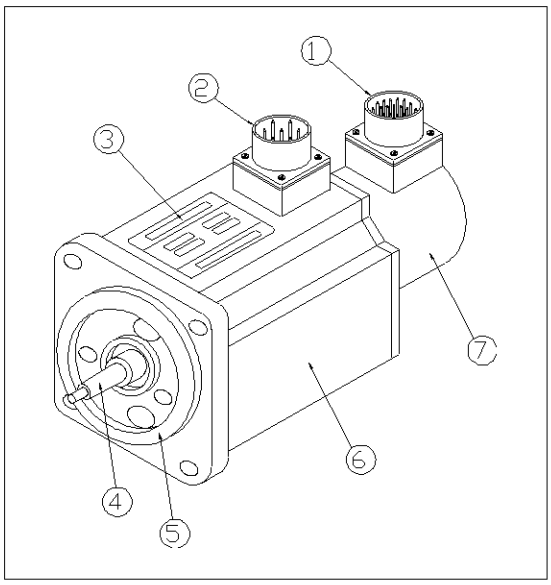


Forward running (CCW)

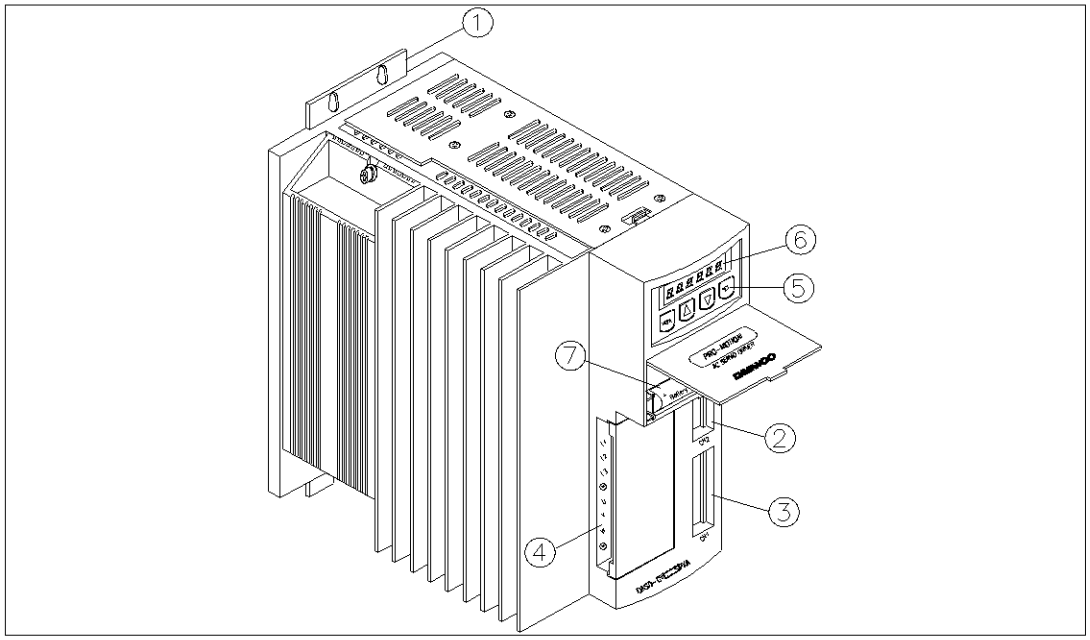
2. Installation and wiring

2.1. Designations

Designations of Daewoo AC Servo Motor and Drive are as follows.



① encoder connector ② power connector ③ name plate ④ shaft ⑤ flange ⑥ frame ⑦ encoder



① setting bracket ② encoder connector ③ controller connector ④ terminal block
⑤ setting key ⑥ operator display ⑦ battery

2.2. Environmental conditions

This product was designed for indoor usage.

⚠ Caution : If used in different circumstances and environment other than stated below, possible damages may occur.

Please use under the following conditions.

	SERVO MOTOR	SERVO DRIVE
Voltage	-	3phase AC 200V~230V +10~-15%, 50/60Hz
Ambient temperature	0 ~ +40 ℃	0 ~ +50 ℃
Storage temperature	-25 ~ +80 ℃	-25 ~ +80 ℃
Humidity	below 80% RH	below 95% RH
Environmental conditions	(1) Use in areas free of corrosive and explosive gas. (2) Use in areas that are well ventilated. (3) Vibrations or tremors nearby may be the cause of poor connection of the connector, electronic connector device and relay.	
Waterproof / Oilproof	(1) The protection level of the servo motor is IP-54. Please put the cover on in areas where there is massive water and oil. (2) While handling the servo motor connector, handle it as instructed.	
Other	Please refer to chapter 2 while assembling and handling the wires.	

2.3. Installation procedure

2.3.1. Assembling the servo motor

▷ ⚠ Warning : While assembling the servo motor, avoid dropping it.

▷ ⚠ Caution : While mounting the servo motor horizontally, the connector should be facing downward.

▷ The servo motor can be mounted horizontally or vertically.

▷ To prevent vibrations, the motor shaft and the loading shaft should be precisely aligned which will allow for the coupling and bearing life to last longer. Use flexible coupling when connecting directly to the load.

① The outer part of the coupling should be measured at four equidistant points, each 90° degrees apart so that the gap between the maximum and the least readings should not exceed 0.03mm.

② The center point of the motor and the loading shaft should be precisely aligned.

▷ Avoid excessive radial and thrust load to the motor shaft and also avoid impact that is more than 10G when mounting the gear, coupling, pulley and etc. at the same time.

▷ A minus load means that while the motor is rotating according to the load, it is successively operating while it is on regenerative brake. The capacity of the regenerative brake is short term rating specification, thus it should not be used in minus load.

▷ The admissible load inertia converted into the motor shaft is within 5 times the inertia of the applied servo motor. If it exceeds this, during deceleration it may cause regenerative malfunction. The following steps should be taken if the load inertia exceeds more than 5 times the inertia of the servo motor.

- Reduce the current limit. - Slow down deceleration time.
- Lower the maximum speed in use.

2.3.2. Setting the servo drive

▷ ⚠ Warning : Turn off the power while mounting or uninstalling.

▷ While installing the panel, take into consideration the size or the panel, cooling and wiring in order to maintain a difference of temperature below 5℃ between the panel temperature and the surrounding temperature.

▷ The surrounding temperature should be maintained below 55℃ at all cases. Proper ventilation should be used.

▷ Should there be vibrations, the driver should be mounted on shock absorbing surface.

▷ Should the servo driver be exposed to corrosive gas for a long time, it may cause damages to connecting devices, thus it should be avoided.

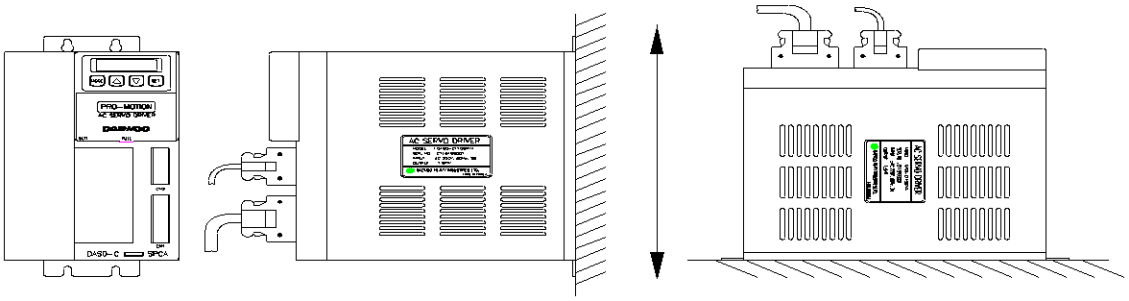
▷ Environmental conditions such as high temperature, high humidity, excessive dust and metal particles should be avoided.

◆ Mounting method

▷ There should be a space wider than 100㎜ below and above the servo drive.

▷ There should be a space wider than 30㎜ on both sides of the servo drive.

▷ Mount the servo drive vertically. Do not use if it is mounted horizontally.



(○) (×)

2.4. Wiring

▶ For signal lines and encoder lines, use twisted lines or multi-core shielded twisted-pair lines.
The length for reference input lines should be a maximum of 3m, and the encoder line should be a maximum of below 10m.
Wiring must be done in shortest distance and the remaining length should be cut.

▶ The ground circuit should be a thick line. Usage of class 3 ground or above (ground resistance 100Ω or less) is recommended. Also, make sure to ground at one-point grounding.

▶ The following precautions should be taken to avoid malfunction due to noise.
- The noise filter should be placed as near as possible.
- Mount a surge absorbing circuit to the coil of the relay, electromagnetic contacts, solenoids and etc.
- The power line (AC input, motor input line) and the signal line should be placed 30 cm apart or more. Do not run them in the same duct or in a bundle.
- When the same power source is used, as for an electric welder or electrical discharge machine or when a high-frequency noise source is present, attach noise filter to the power or the input circuits.
- The cable line for the signal line is only 0.2 ~ 0.3 mm^2, thus excessive force to the line should be avoided to prevent damages.

2.5. Noise treatment

The effect of the switching noise depending on the wiring or the grounding method should be reduced as much as possible. Outside noise should be reduced as much as possible.

▶ Grounding method
The servo driver supplies power to the motor according to the switching of the IPM device. Thus the Cf dv/dt current flows from the power component to the floating capacity of the motor. To prevent the effect of the switching noise, the motor frame terminal should be connected to the PE terminal of the servo driver terminal block and the PE terminal of the servo driver should be directly grounded to standard ground panel.

▶ Noise filter
Noise filter is used in order to prevent noise from the power line. Please refer to the following conditions while installing.

(a) Separate the input and output wiring and do not bundle them together or run them in the same duct.

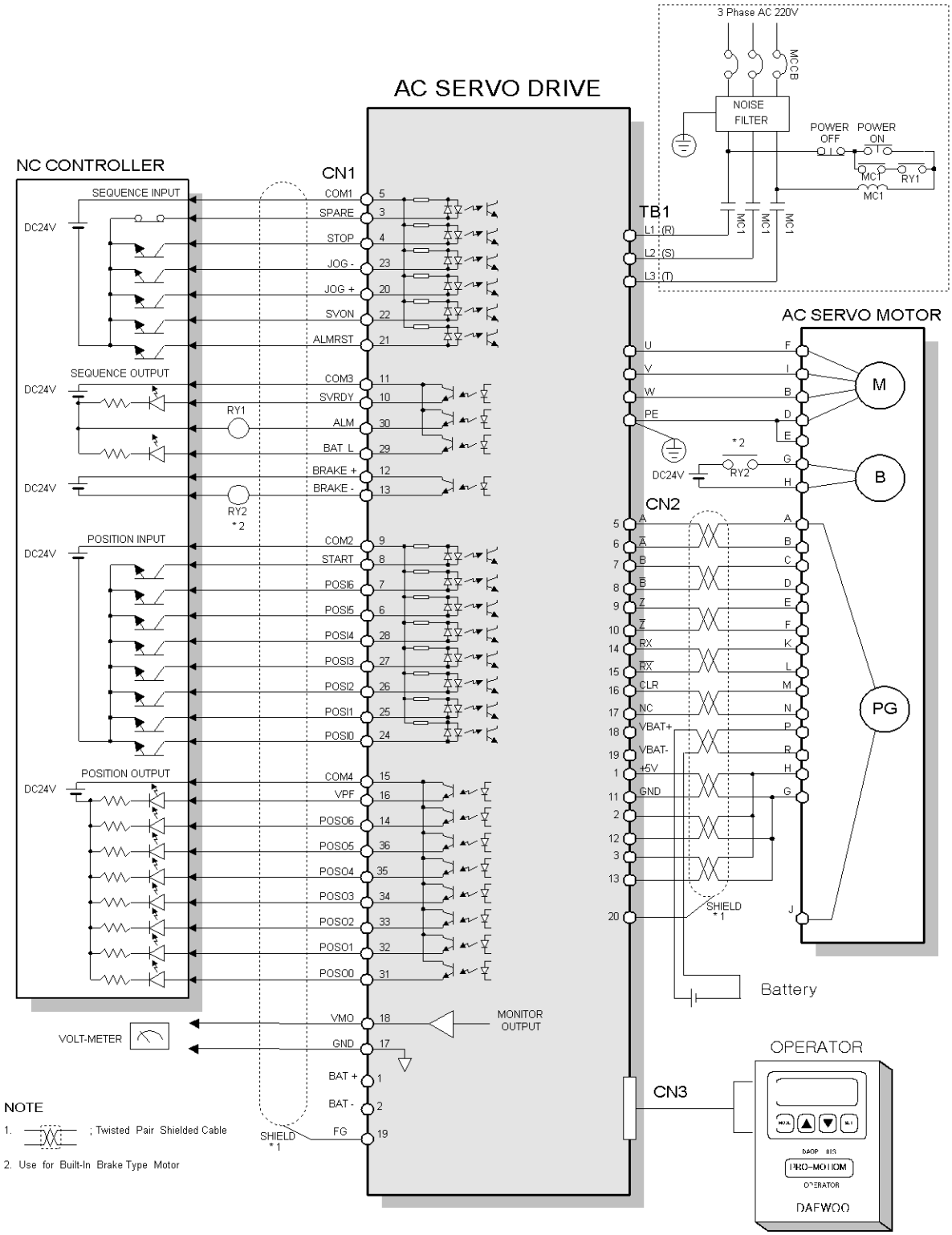
(b) Do not bundle or run the ground wire with the filter output line or other signal lines in the same duct.

(c) The ground lead should be wired singly to the ground panel.

(d) If the unit contains the filter, connect the filter and the equipment ground to the base of the unit.

(e) Please use the following recommended noise filter.

2.6. Outside circuit connection (Sample)



2.7. Layout of driver connector terminal

2.7.1. Layout of connector terminal CN1

Spec : 10236-52A2JL (Housing), 10136-3000VE (Plug), Manufacturer : 3M

19	21	23	25	27	29	31	33	35
PE(FG)	$\overline{\text{ALMRST}}$	$\overline{\text{JOG}-}$	$\overline{\text{POSI1}}$	$\overline{\text{POSI3}}$	BAT_L	POSO0	POSO2	POSO4

20	22	24	26	28	30	32	34	36
$\overline{\text{JOG}+}$	$\overline{\text{SVON}}$	$\overline{\text{POSI0}}$	$\overline{\text{POSI2}}$	$\overline{\text{POSI4}}$	ALM	POSO1	POSO3	POSO5

1	3	5	7	9	11	13	15	17
BAT+	SPARE	COM1	$\overline{\text{POSI6}}$	COM2	COM3	BRAKE−	COM4	GND

2	4	6	8	10	12	14	16	18
BAT−	$\overline{\text{STOP}}$	$\overline{\text{POSI5}}$	START	SVRDY	BRAKE+	POSO6	VPF	VMO

2.7.2. Layout of connector terminal CN2

Spec : 10220-52A2JL (Housing), 10120-3000VE (Plug), Manufacturer : 3M

11	13	15	17	19
DGND	DGND	$\overline{\text{RX}}$	NC	VBAT−

12	14	16	18	20
DGND	RX	CLR	VBAT+	PE

1	3	5	7	9
+5VE	+5VE	PA	PB	PZ

2	4	6	8	10
+5VE	-	$\overline{\text{PA}}$	$\overline{\text{PB}}$	$\overline{\text{PZ}}$

2.8. I/O signal for connector CN1 and its significance

2.8.1. Input signal

Signal	no.	Description	I/O
ALMRST	21	When the alarm goes on, get rid of the cause of the alarm and then turn on the main power. (note 1)	I
SVON	22	This signal makes the motor ready to start operation. When this signal is off, the motor remains free. (In case there is an inner brake, the brake is on.)	I
JOG+(CCW) JOG-(CW)	20 23	According to the fixed value of parameter 3, there are 2 types of modes. - fixed direction signal (fix value of parameter 3 to "0") When the position is moving, the direction of the rotation can be fixed to one direction. CCW signal is OFF : Direction of the rotation is automatically set by short distance. CCW signal is ON : Direction ot the rotation is fixed counter-clock wise. CW signal is ON : Direction of the rotation is fixed clock wise. CCW, CW is ON : Can not be defined. - JOG Operation signal (fix value of parameter 3 to "1") Used for manual jog operation signal. JOG+ signal is ON : When the signal is on, the motor rotates counter-clock wise and when it is off, the motor stops at the nearest POST. JOG- signal is ON : When the signal is on, the motor rotates clock wise, and when it is off, the motor stops at the nearest POST. Rotation speed and Accel/Decel time is the same as when it is operated automatically.	I
STOP/	4	When the signal is ON, the motor stops. The motor starts according to input and runs the rest of the distance.	I
SPARE	3	Reserve	I
COM1	5	COMMON terminal of sequence input signals (When DC 24V is input, the signal turns ON)	I
START/	8	When this signal is ON while SVON signal is ON, the position data (binary code) of the motor moves towards the input POST. Maintain the time it is ON at minimum 50msec.	I
POSI0, POSI1 POSI2, POSI3 POSI4, POSI5 POSI6	24,25 26,27 28,6 7	Input POST to 7bit binary code to set the position data input signal. Input data 10msec before the START signal is ON. (minimum input data is '1'.)	I
COM2	9	COMMON terminal of START, POSI0~POSI6 signals	I

note1. In case of the following alarm signal, turn OFF the power and then turn it ON again.

 (IPM alarm)  (encoder cable error)  (CPU alarm)

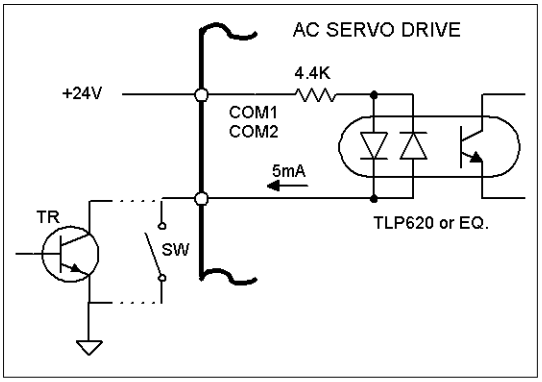
2.8.2 Output signal

Signal	no.	Description	I/O
ALM	30	Alarm signal is on, output is 'OFF' and when it is normal, the output is 'ON'.	O
SVRDY	10	The servo is ready. When the SVON is ON, the driver turns on after parameter 13 is fixed. When SVON is OFF the driver turns off after parameter 15 is fixed.	O
BAT_L	29	When the battery voltage falls below 1.5[V], the signal is 'ON'	O
COM3	11	COMMON terminal of sequence output signals(ALM,SVRDY,SPARE)	O
BRAKE+ BRAKE-	12 13	In case there is an inner brake in the motor, this signal controls the brake. (The current flow capacity is within 30mA due to photo coupler contact point, thus a different relay contact point must be used from that of the actual brake ON/OFF. Design the circuit so that when output contact point is ON, the brake is free, when output contact point is OFF, the brake is ON). This turns on when SVON is ON and after fixed time of parameter 14 and SVRDY is ON after fixed time of parameter 13t. This turns off when SVON is OFF and after fixed time of parameter 14.	O
VPF	16	Position completion signal output. If the pulse error readings while the motor is moving is within the fixed value of parameter 18, the signal turns ON. (This signal is on even after SVON signal is OFF)	O
POSO0, POSO1 POSO2, POSO3 POSO4, POSO5 POSO6	31,32 33,34 35,36 14	As position data output signal, the POST number is sent out in 7 bit binary code. While the motor is rotating, the signal will not be on. It will be on before the VPF turns on. When SVON is OFF, it will output data of the nearest POST number.	O
VMO GND	18 17	Monitor output. It will output data in analog voltage (-10V~+10V) according to the data fixed at parameter 17. The monitor is connected to the inner circuit. Take caution while using.	O

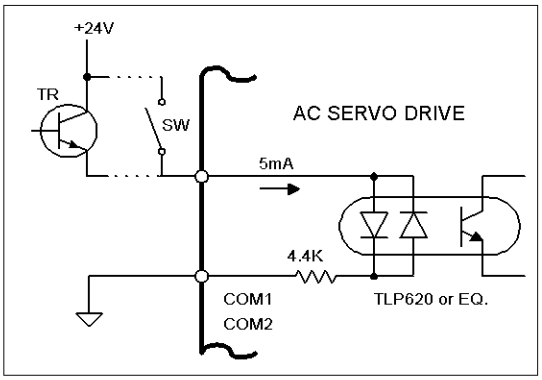
2.9. Structure of driver I/O circuit

① Input

There are ALMRST, SVON, JOG+, JOG-, STOP, SPARE, START, POSI0~POSI6 signals and two types of input circuits are provided (the current is limited to 5mA due to inner resistance.)



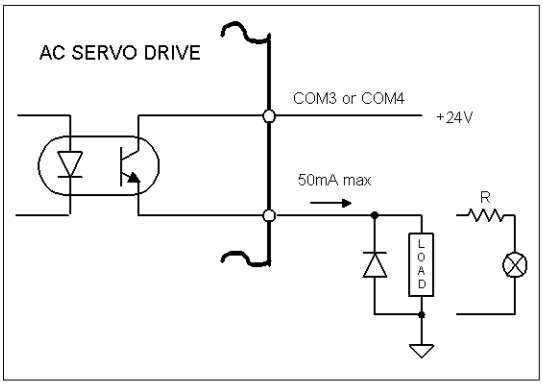
Using VCC(+24V) COMMON



Using GND COMMON

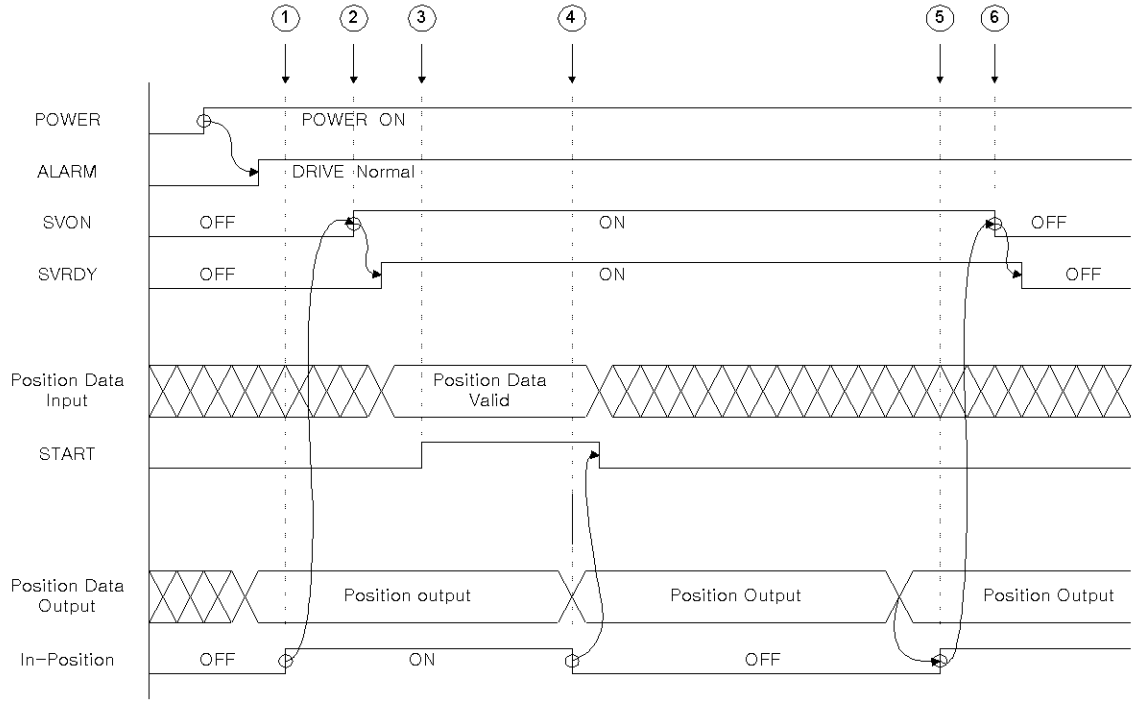
② Output

There are SVRDY, ALM, SPARE, VPF, POSO0~POS06 signals. They are photocoupler output, thus the current is limited to 50mA.



3. Operation

3.1. Automatic operation



① If the drive operates normally (after 500msec) after the POWER is 'ON', the absolute encoder will detect the initial position and output data according to the initial position and the turn on the position completion signal (VPF).

② When SVON signal is ON and after inner GATE is ON, SVRDY will turn ON.

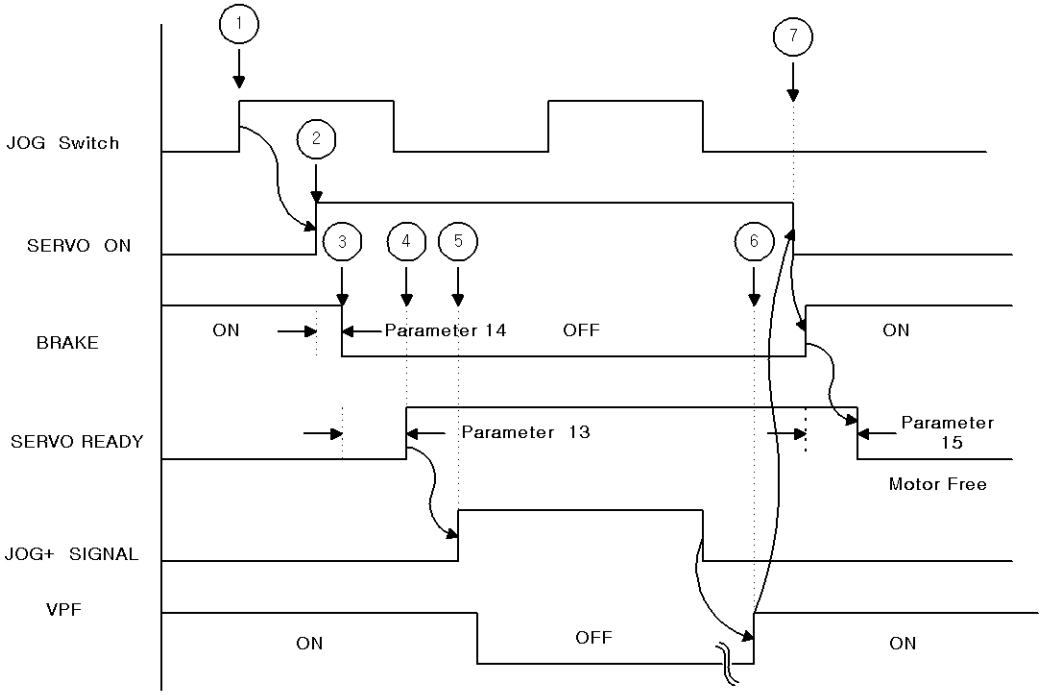
③ When START signal is ON, the servo will move according to the position data.
(Maintain ON status of START signal to about 100msec ~ 200msec)

④ When position is set, VPF(position completion signal) will turn 'OFF'.

⑤ After position movement is completed, the current position data is output and VPF signal will turn 'ON'.

⑥ From external controller, if VPF signal is 'ON', turn 'OFF' the SVON signal.
(Move to the next position after SVRDY signal is OFF)

3.2. Usage of Jog and brake signal



① Turn on the jog switchl.

② The PLC outputs servo on signal to the drive.

③ When the servo on signal is on, after a fixed time in parameter 14, brake off signal is input.

④ After a fixed time in parameter 13, the servo ready signal is output.

⑤ After the servo ready signal is output, the PLC must give JOG+ signal to the servo drive.

⑥ When the command position is fixed, current position data will be output and then turn on the position completion output signal (VPF).

⑦ When the position completion output signal (VPF) is on, the PLC will turn off the servo on signal. The driver will brake on and after a fixed time in parameter 15, turn off the servo ready signal.

* The jog mode can not run more than 4000 rotation continuously. Should there be an input of over 4000 rotation, the motor will stop and it will not rotate. In this case, turn off the JOG+ or JOG- signal and then turn it on again.

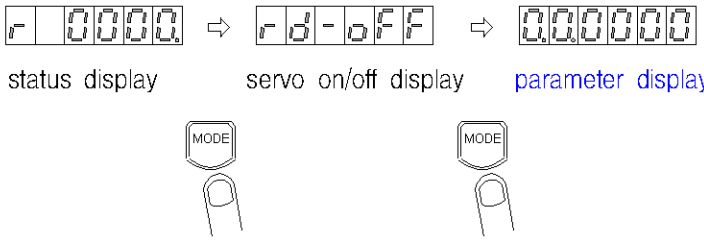
3.3. Machine Home setting method

When assembling the motor for the first time, set the absolute encoder zero-point to the machine Home

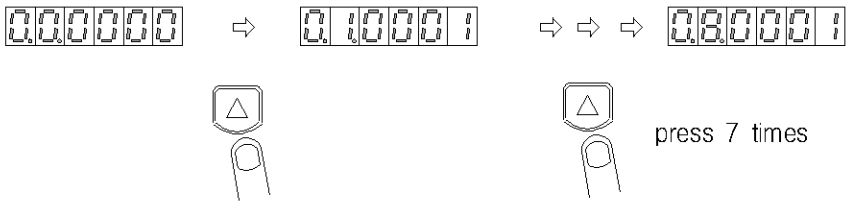
The Setting method is as follows.
(These steps should be done when the external servo 'ON' signal is OFF.)

[1] Turn the machine power supply ON.
[2] Clamp the turret.
[3] Fix parameter 8 to the POST number of the current position.

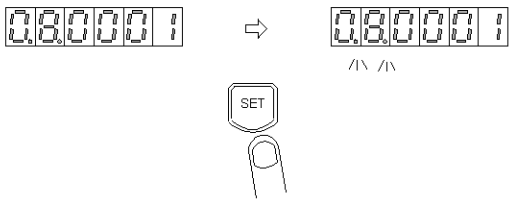
① Press the MODE key and change operating display to parameter fixing mode.



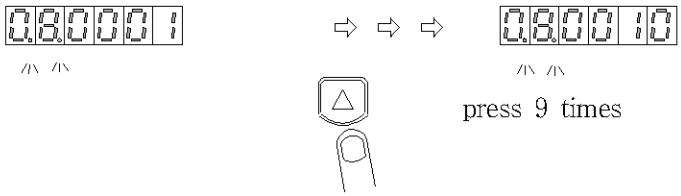
② Press UP key and change display of the first two segments to 08.



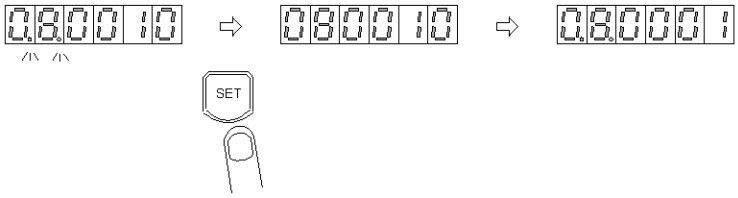
③ Press SET key and the dot below the first two segments will disappear.



④ Press UP or DOWN key to adjust the last 4 segments to the POST number of the current position. (example ; If the current position number is 10, the initial POST will be set to 10.)



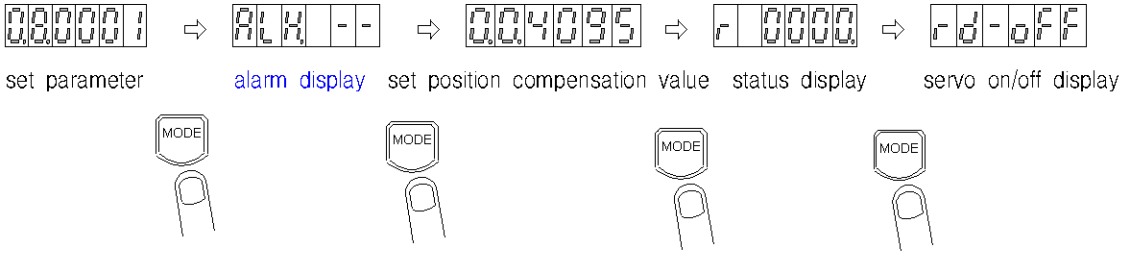
⑤ Press SET key and the dot will appear below the first two segments. The data will be stored and after a while the dot will disappear and the display will turn back to the former status.



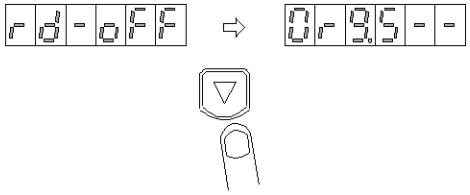
(When power is turned off and then turned on again, it will display the stored data.)

4 Set the zero-point from the zero-point display of the servo ON/OFF display mode.

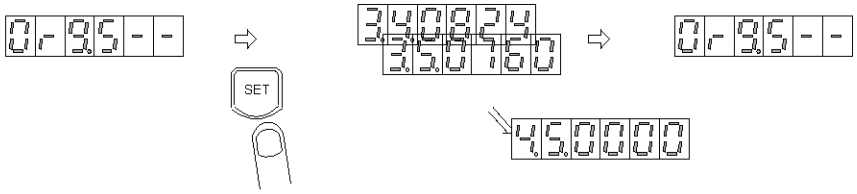
① Press the MODE key and change the display to servo ON/OFF mode.



② Press the DOWN key and change the display to zero-point setting mode.



③ Press SET key for 5 seconds and the display will set the parameter automatically and the turn back the display to zero-point setting mode.



press for 5 secs.

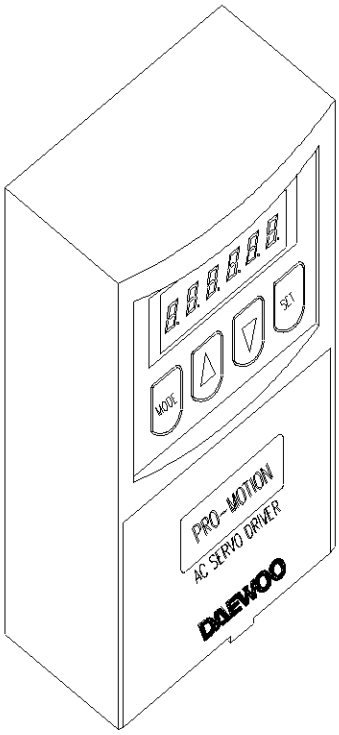
5 Turn the power OFF and then ON again and the setting of the zero-point is now completed.

4. Display / Setting switches

Display / Setting switch is applicable when using the operator (DAOP-01S).

4.1. Functions

The 6 digits 7 segment display in front of the driver indicates parameter setting, position compensation value setting, diagnosis, alarm, and address and the data can be selected by 4 display mode.



(OP Panel Display)

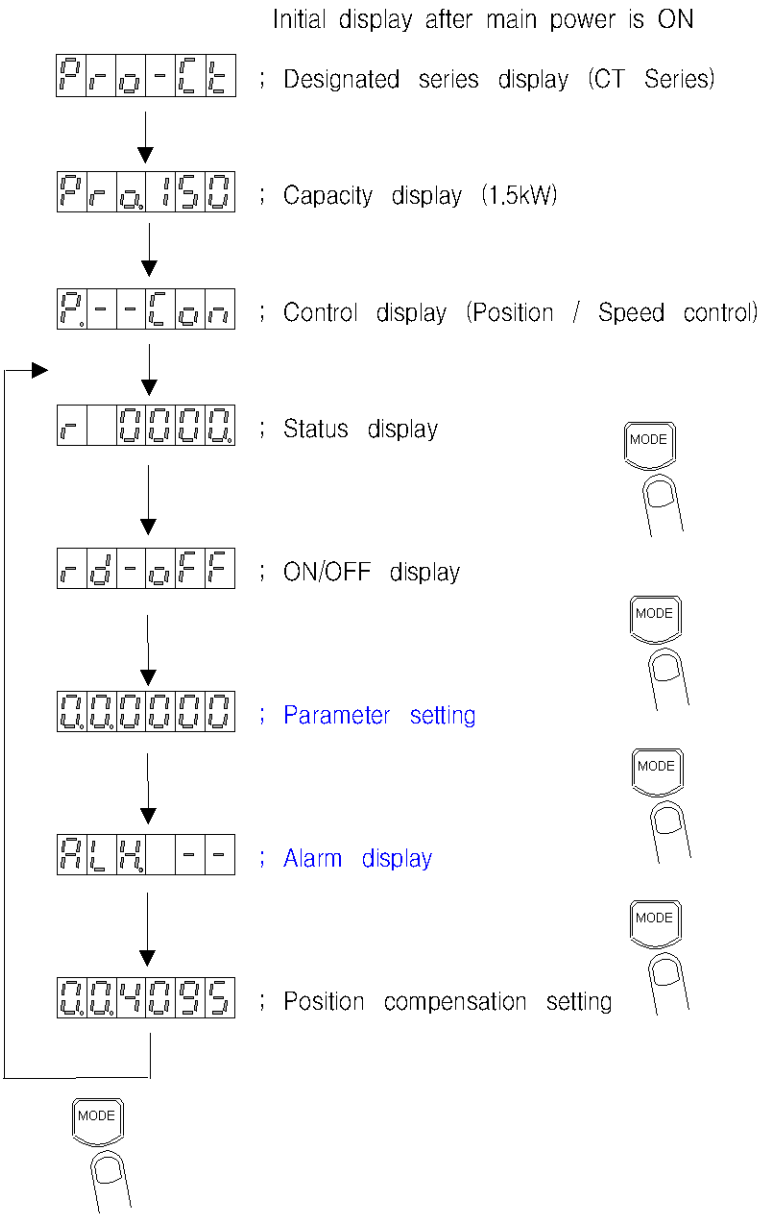
- When power is OFF, pre-set data is stored in the drive.
- Even if the power is turned off when the alarm is on the contents of the alarm is stored and when the power is turned on again, the contents can be verified.

⚠Caution : Turn the power voltage while mounting or dismounting the operator panel.

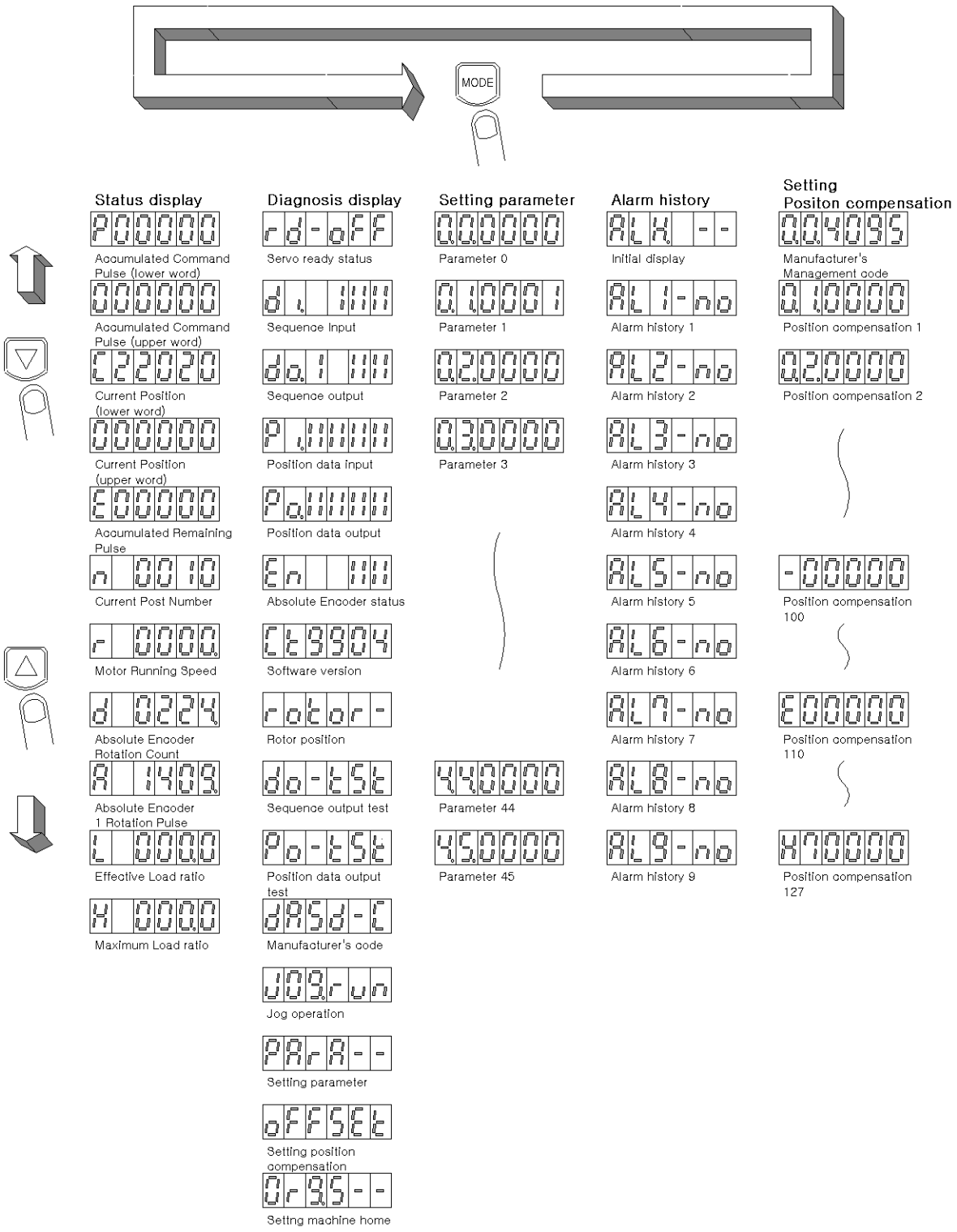
4.2. Operating the display setting switches and display flowchart

4.2.1. Overview

▶ After turning on the main power, 7 segment LED is displayed in status mode and the mode can be selected by pressing the mode button.



4.2.2. Display flowchart

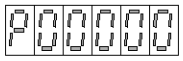


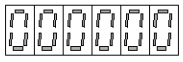
4.3. Status display

- The status display mode verifies the status of the drive.
- The operator panel displays the status and its usage is as status below.
- All position datas are executed according to pulse unit inside the drive. Therefore the status display of the pulse unit is displayed according to the pulse standard of the encoder. (8192 pulse per rotation)

4.3.1. Accumulated command pulse

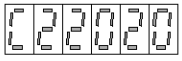
The accumulated command pulse will accumulate the pulse that was counted by the position control device after the START signal is on and it will display in both lower and upper word (16bit). When SVON signal is off, it will resume to '0'.

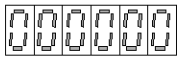

; accumulated command pulse-lower word display range [00000 ~ 65535]


; accumulated command pulse-lower word display range [00000 ~ 65535]

4.3.2. Current position

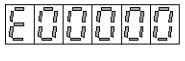
The absolute current position within one turret rotation will be display by pulse counts. It will be displayed in lower and upper word (16 bit). Display range [00000 ~ pulse per turret rotation]

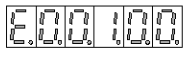

; lower word of current position


; upper word of current position

4.3.3. Remaining pulse

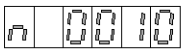
Displays in accumulated pulse unit the deviation of position command and position feedback. If the pulse exceeds the set value of the parameter 19, position deviation overload alarm will appear.
If it is minus pulse, the dot below the segment will appear and when SVON signal turns OFF, it will resume to '0'.


; accumulated remaining pulse display range [6.0.0.0.0.0. ~ 600000]


; minus pulse display (-100)

4.3.4. Current POST number

This displays the current position. The number will change only when the motor has stopped or when SV ON signal is OFF.

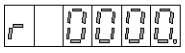


; current POST number display range [1 ~ max POST no.]

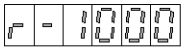
4.3.5. Motor running speed

The running speed of the motor is displayed in RPM unit. The changes of the speed cannot be seen due to inner filtering process. (To view the speed changes, use the monitor output)

In case the motor is running clock wise, a '-' will be displayed.



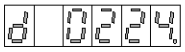
; motor running speed display range [-3000 ~ 3000]



; minus rpm display (-1000rpm)

4.3.6. Absolute encoder rotation count

Displays the running count of the absolute encoder inside the motor. (1 count per rotationt)
The display will change only when SVON signal is OFF.
(When the count exceeds 8191, it will resume to '0').



; absolute encoder running speed count display range [0 ~ 8191]

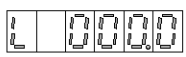
4.3.7. Absolute encoder - one rotation

Displays the pulse count per rotation of the absolute encoder. (2048 count per rotation)
The display will change only when SVON signal is OFF.
(When the count exceeds 2047, it will resume to '0'.)

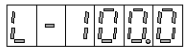
; absolute encoder pulse count per rotation display range [0 ~ 2047]

4.3.8. Effective load ratio

The effective load is displayed in %. If the ratio is in the minus, a '-' will be displayed and it will resume to '0' when the SVON signal is OFF.



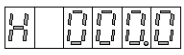
; effective load ratio display range [-300.0 ~ 300.0]



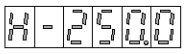
; minus ratio display (-100%)

4.3.9. Maximum load ratio

The maximum load is displayed in %. While the SVON signal is ON, it will always display the maximum ratio and to resume to '0', press the operator SET key. If the ratio is in the minus, a '-' will be displayed and it will resume to '0' when the SVON signal is OFF.



; maximum load ratio display range [-300.0 ~ 300.0]



; minus ration display (-250%)

4.4. Diagnosis display

▶ This display will verify the external sequence status and the condition of the system.

▶ It will display the status as shown below on the OP panel LED display of the drive and the contents are as follows.

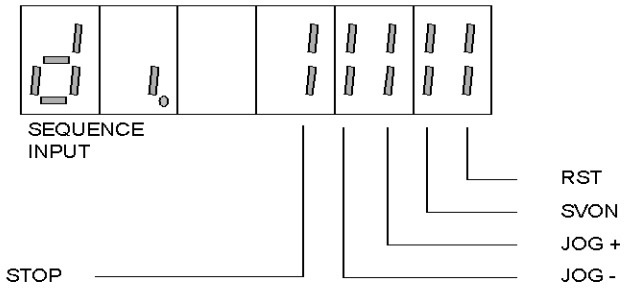
4.4.1. Servo ready status

rd-oFF ; SVON signal is OFF and the motor is in free status.

rd-on- ; SVON signal is ON and the motor is running.

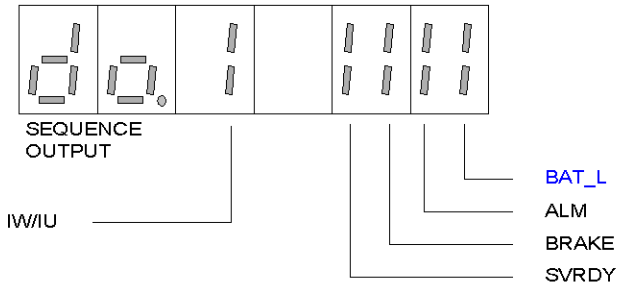
4.4.2. Sequence I/O signal

▷ Displays ON/OFF status of external input signal in 7 segments.



< external input signal >

▷ Displays ON/OFF status of external output signal in 7 segments.

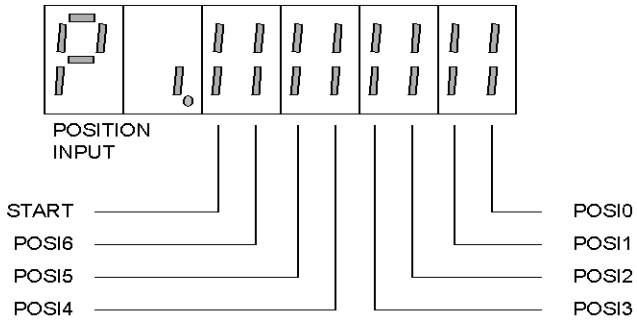


< external output signal >

▶ The I/O display of the 7 segment LED display panel will be displayed when the LED is on and this will verify ON and OFF. (If it is ON, the LED will be on, if it is OFF, the LED will be off.)

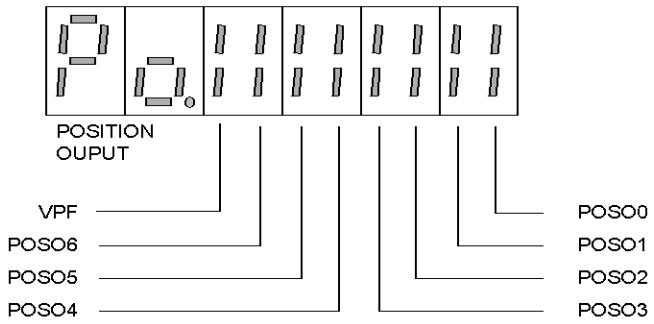
4.4.3. Position data I/O signal

▷ Displays the ON/OFF status of the position data input signal in 7 segments.



< PLC Input Signal >

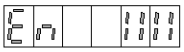
▷ Displays the ON/OFF status of the position data output signal in 7 segments.



< PLC Output Signal >

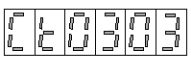
▶ The I/O signal display in the LED panel will verify whether it is ON or OFF.

4.4.4. Absolute encoder status



; Displays the status of the absolute encoder.

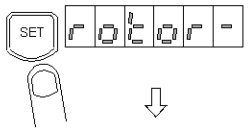
4.4.5. Software version display



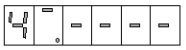
; Used for management by the manufacturer. Displays the software version.

4.4.6. Rotor position display

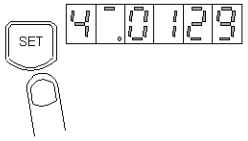
▷ Displays the pulse count of the A, B phase in incremental signals of the absolute encoder by the standards of the Z phase pulse.



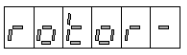
; Press the SET Key and the encoder pulse count will be displayed.



; The pulse count of the A, B, phase will not be displayed before the pulse of the Z phase is counted.



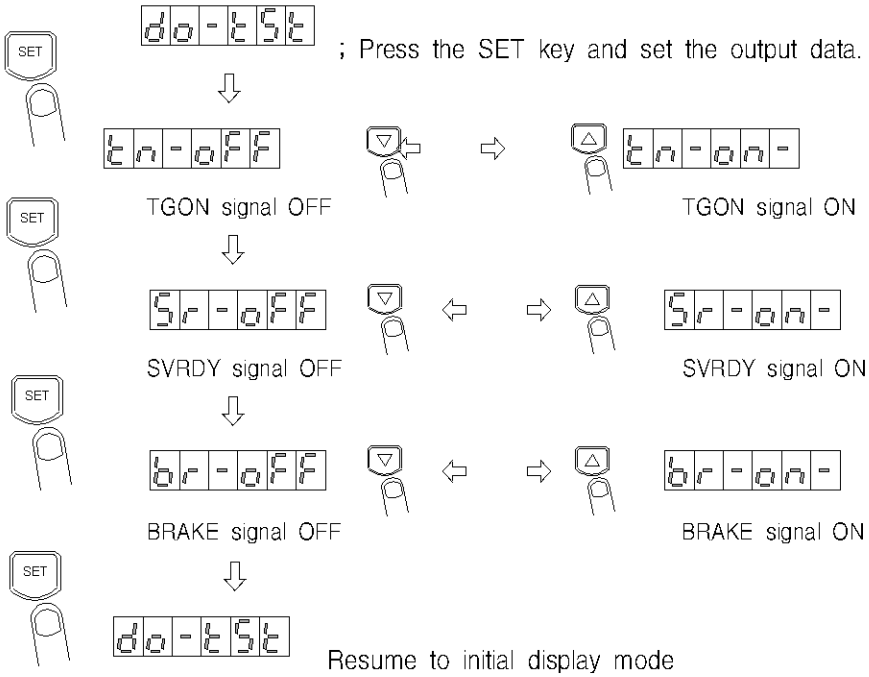
; From the point when the pulse of the Z phase is counted, the pulse count of the A, B phase will be displayed.
Display range [0 ~ 2047]



; Press the SET key and it will resume to initial display.

4.4.7. Sequence output signal test

▷ This makes it possible to test the sequence or the connection by forcing the sequence output signal to be displayed externally.

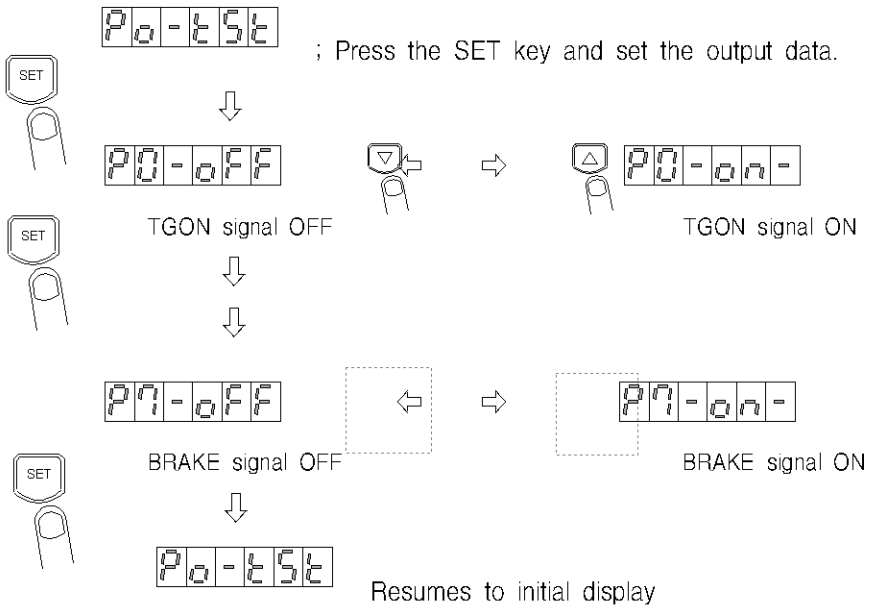


; Press the SET key and set the output data.

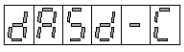
Resume to initial display mode

4.4.8. Position data output signal test

▷ This makes it possible to test the sequence or the connection by forcing the position data output signal to be displayed externally.



4.4.9. Manufacturer's management code

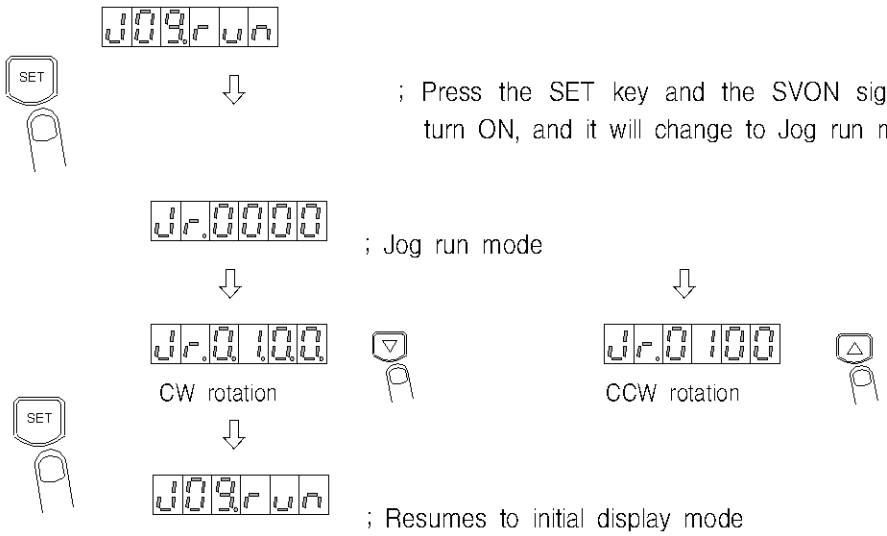


; This is the code managed by the manufacturer.

4.4.10. Jog operation

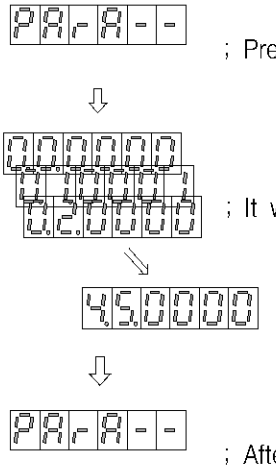
▷ The drive self operates regardless of external signals.

▷ When setting the zero-point, use this to move the POST number to its initial position.
Press the UP or DOWN key and meanwhile the driver will rotate according to the fixed speed of parameter 27.



4.4.11. Initialization of parameter

▷ After resetting the parameter setting value, save initial parameter in EEPROM.
▷ The stored value will be reset by pressing the SET key.
▷ The parameters fixed while setting the zero-point will remain the same.



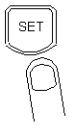
; Press SET key and it will save the parameter.

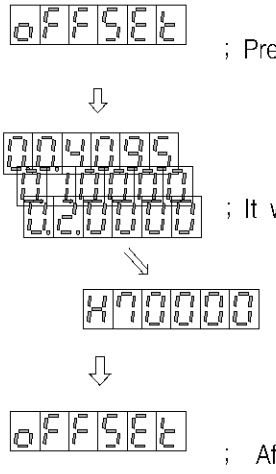
; It will automatically save the parameters from 00 to 45.

; After saving to 45, it will resume to initial mode

4.4.12. Initialization of position compensation

▷ After initializing the position compensation value to '0', save it in EEPROM.
▷ Press the SET key and it will start initializing.





; Press the SET key and it will save the parameter.

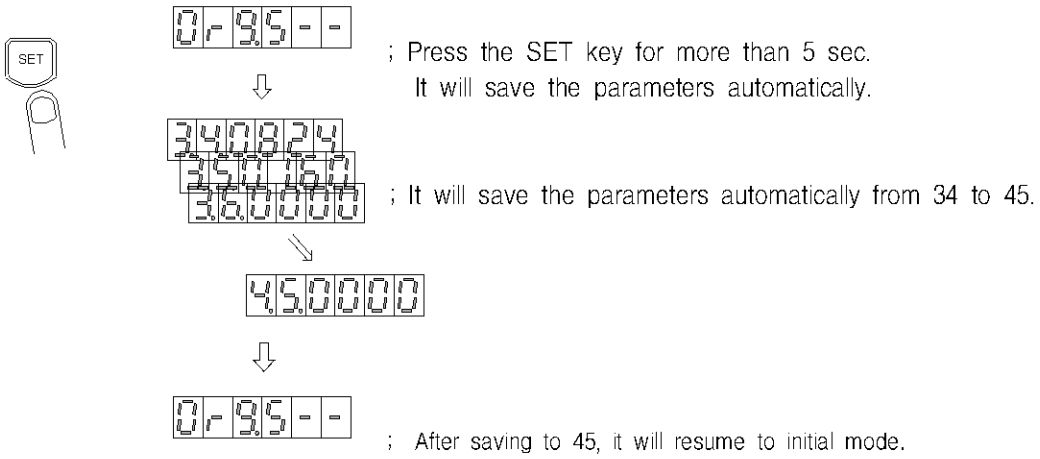
; It will automatically save the parameters from 00 to H7.

; After saving to H7, it will resume to initial mode

4.4.13. Setting machine home

▷ This function will set the current position to machine home. Press the SET key in the zero-point setting mode for 5 seconds and the parameters dealing with zero-point will be automatically set and displayed.

▷ After setting the zero-point, turn the power OFF and then turn it ON in order to complete the setting.

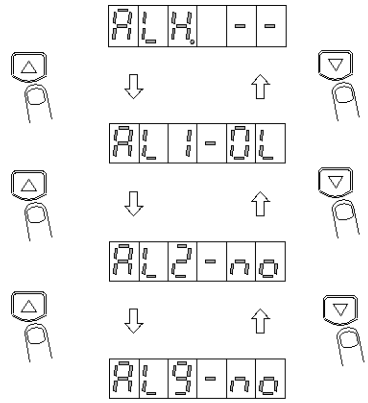


4.5. Alarm history display

4.5.1. Alarm history display

▷ The recent alarm records will be stored and displayed up to 9 times. The records can be verified by pressing the UP or DOWN key.

▷ All records of the alarm will be cleared by pressing the SET key in this mode.



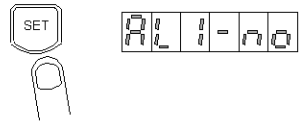
; alarm record display mode

; one time alarm display (ex: in case of over load)

; second time alarm display

; ninth time alarm display

▷ All records will be cleared when the SET key is pressed from the alarm record display mode.



; alarm is cleared.

4.5.2. Driver operation while alarm goes on

▷ When the alarm is on, the photo coupler connection between the ALM terminal of the CN1 connector and the COM3 terminal will be OFF, and the motor will be on free run status. (SVRDY terminal and BRAKE terminal will be OFF as well.)

▷ The detected alarm item will be displayed on the OP panel. If there is no OP panel display, it can be verified by the main board LED display. Also the same binary code as the main board LED code will output data through the position data output terminal (POSO0 ~ POSO3).

▶ Method of dismissing the alarm

- Once the cause of the alarm is resolved, it is possible to rerun the driver by inputting the data of ALMRST (21 of CN1) signal or by switching the power OFF. (If in case of main circuit error, encoder cable error or CPU error, it can only be resolved by power OFF.)

▶ Detection time of over load

- The operation time of the over load alarm detect circuit is as listed below.
  250% ~ ; 1sec, 220% ~ ; 24sec, 200% ~ ; 48sec, 180% ~ ; 96sec,
  160% ~ ; 192sec, 150% ~ ; 384sec, 140% ~ ; 768sec, 130% ~ ; 1536sec

The alarm display and contents of the driver is as following.

main LED	OP Panel LED Display	Alarm type	Corrective actions
1	AL P-UU	**under voltage** : occurs when the voltage is below the standard value.	- check if the input power is low. - check if the motor power cable is open.
2	AL P-OU	**over voltage** : occurs when the voltage is above the standard value.	- check if the input power is high. - check if the operation frequency is above the standard value. - check if regenerative resistor is damaged.
3	AL P-OH	**main circuit error** : occurs when the IPM malfunctions.	- check if the heat protection board is over 100 degrees celsius. - check if the operation frequency is above the standard value.
4	AL P-E 1	**encoder I/F module error** : occurs when encoder I/F module is not correctly assembled.	- check if the encoder I/F module is correctly assebled.
5	AL P-CA	**encoder signal error** : occurs when there is error in A, B, Z signal among the encoder signals.	- check if the encoder cable is missing or if the signal line is open.
6	AL P-OS	**over speed** : occurs when the motor speed exceeds the maximum running count.	- check if the encoder cable is missing or if it correctly assembled.
7	AL P-OL	**over load** : occurs when the over load status continuous for a long time exceeding the standard time.	- check if there is connection error in the motor power cable. - check if the parameter is set correctly.
8	AL P-SE	**CPU error** : occurs when the CPU malfunctions or there is fault with the board.	- check if the parameter is set correctly.
9	AL P-PE	**parameter error** : occurs when the set parameter is not within the range.	- check if the parameter is set correctly.
A	AL P-rP	**excessive position deviation** : occurs during position control when the remaining pulse exceeds the fixed value of parameter 19.	- check if the value of parameter 18 is set too low.
b	AL P-OC	**over current flow** : occurs if the over current flows into the motor.	- check if the accel/decel parameter is set on too low value. - check if the insulation resistor of the motor is correctly displayed.
C	AL P-En	**encoder battery error** : occurs when the backup battery of the encoder is discharged or disconnected.	- change the battery.

▶ When the alarm goes on, the binary code of the main board LED display will output data through position data output signal. Example) under voltage alarm

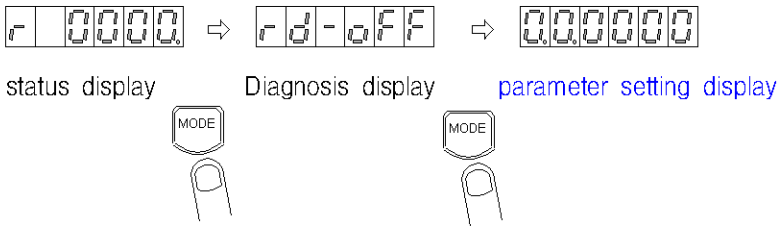
LED display 1	POSO3	POSO2	POSO3	POSO3
	OFF	OFF	OFF	ON

4.6. Setting parameter

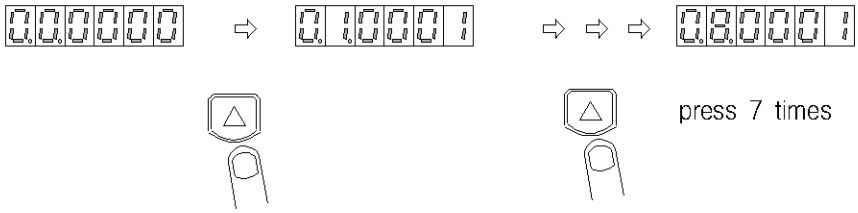
The parameter must be set before the motor operation.

4.6.1. Method of setting parameter

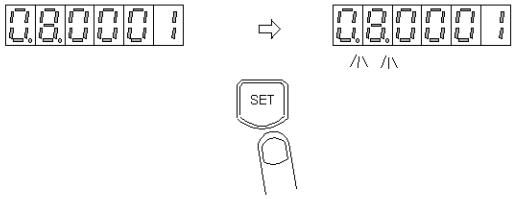
① Press the MODE key and change the operator display to parameter setting display mode.



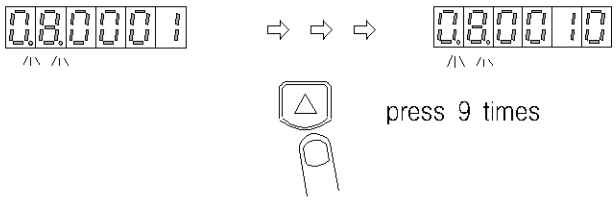
② Press the UP key and set the first two segments to intended setting. (ex. set to 08)



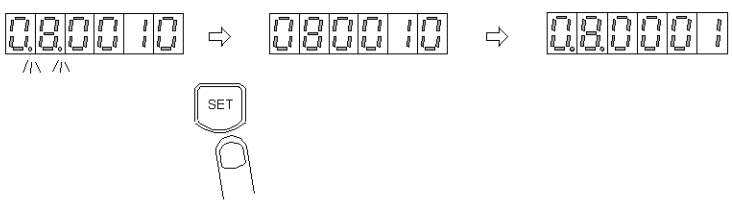
③ Press the SET key and the dot will appear below the first two segments.



④ Press the UP or DOWN key and set the latter 4 segments with the intended data.
(ex ; fix the data to 10)

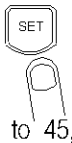


⑤ Press the SET key and the first two segments will have dots appearing below and the data will be saved. After a while, the dot will disappear and it will resume to the initial display before the set up.



From parameter 09 to 33, press the SET key and it will display the set value as the dot below the first two segments is on.

/|\ /|\



From parameter 34 to 45, the home will be set automatically. Do not change this parameter.

4.6.2. Parameter list

N0.	Abbr.	Name	Range	Default	Uint	
00	MPC	motor power capacity	0	0		A,B
01	MRD	motor running direction	0 ~ 1	1		A,B
02	-	reserve parameter	0	0		A,B
03	JFS	fixed direction, jog function selection	0 ~ 1	0		A,B
04	-	reserve parameter	0	0		A,B
05	MPN	maximum POST number	2 ~ 127	12	POST	A,B
06	GR1	gear ratio - motor side	1 ~ 9999	33	Rev	A,B
07	GR2	gear ratio - machine side	1 ~ 9999	12	POST	A,B
08	HSP	POST number of home	1 ~ 127	1		A,B
09		reserve parameter	0	0		A,B
10	PKP	position loop proportional gain	0 ~ 2048	256		B,C
11	VKP	speed loop proportional gain	0 ~ 2048	250		B,C
12	VKI	speed loop integral gain	0 ~ 2048	1		B,C
13	SROT	brake off delay time	0 ~ 40	0	50 msec	B,C
14	BFT	brake off control delay time	0 ~ 40	0	50 msec	B,C
15	BOT	brake on delay time	0 ~ 40	0	50 msec	B,C
16	VTO	monitor offset voltage	-12 ~ 12	0	10/128 V	B,C
17	VTM	monitor selection	0 ~ 3	0		B,C
18	INP	positioning complete range	1 ~ 9999	100	PULSE	B
19	RPA	remaining pulse allowance	1 ~ 6000	6000	100 PULSE	B
20	FFG	position loop feed-forward gain	0 ~ 100	0	%	B
21	FTC	feed-forward filter time constant	0 ~ 100	0	4 msec	B
22	TLP1	positive torque limit 1	0 ~ 300	250	%	B
23	TLN1	negative torque limit 1	0 ~ 300	250	%	B
24	TLP2	positive torque limit 2	0 ~ 300	50	%	B
25	TLN2	negative torque limit 2	0 ~ 300	50	%	B
26	VLS	speed limit	0 ~ 3000	1850	rpm	B
27	JSP	jog speed at set home	1 ~ 1000	100	rpm	B
28	VEL	operation speed	10 ~ 3000	1800	rpm	B
29	ATC	acceleration time	0 ~ 500	50	msec	B
30	DTC	deceleration time	0 ~ 500	80	msec	B
31	MRV	speed monitor output voltage	500~ 5000	3000	2 mV	B
32	MRT	torque monitor output voltage	500~ 5000	1500	2 mV	B
33	ISD	initial status display	0 ~ 10	6		B
34	AOL	encoder coordinates compensation (lower)				D
35	AOM	encoder coordinates compensation (upper)				D
36	HOL	set value of machine zero-point (lower)				D
37	HOM	set value of machine zero-point (upper)				D
38	IKP	current loop proportional gain				D
39	IKI	current loop integral gain				D
40	EPN	encoder pulse per one rotation				D
41	FPL	feedback pulse (lower)				D
42	FPM	feedback pulse (upper)				D
43	ACR	acceleration rate of remaining value				D
44	REM	deceleration rate of remaining value				D
45	-	reserve parameter				D

☞ Note. Adjusted parameter operated as follows.

A	Adjusted parameter is only valid when power is off → on
B	You can adjust the parameters under the servo is off.
C	You can adjust the parameters under the servo is on.
D	You can never adjust the parameters for Maker management.

4.6.3. Detailed explanation of parameter

[0] Motor power capacity

This is the parameter that enables selection of applied motor capacity. Presently only 1.5kW can be selected.

0 : 1.5kW

[1] Motor running direction

This sets the running direction of the motor. Please select accordingly to the structure of the equipment.

0 : The rotating direction of the motor and that of the equipment are the same.
1 : The rotating direction of the motor and that of the equipment are different.

[2] Reserve parameter

[3] Selection of Fix-direction and JOG function

Defines the functions of JOG+ (no. 20) of CN1 connector and JOG-(no. 23) signal.

0 : Defined by set direction signal.

JOG+	JOG-	Rotating direction
OFF	OFF	Detects the shortest distance and rotates.
OFF	ON	The motor always runs clock wise.
ON	OFF	The motor always runs counter-clock wise.
ON	ON	The motor always runs counter-clock wise.

* This is applicable if the parameter 1 is set at '0'. If the parameter is set to '1', it rotates the opposite way.

1 : Defined by JOG operating signal

JOG+	JOG-	Contents
OFF	OFF	Only operates by position data input.
OFF	ON	Step JOG operates towards the direction the POST number decreases.
ON	OFF	Step JOG operates towards the direction the POST number increases.
ON	ON	Can not be defined.

▷ This is applicable if the parameter 1 is set at '0'. If the parameter is set to '1', it rotates the opposite way.
▷ Ignore position data input if JOG+ and JOG- signal is ON.
▷ For more detailed explanation, refer to 'JOG operation' section.

[4] Reserve parameter

[5] Maximum POST number

This sets the maximum POST number. The position data input exceeding the set data is ignored.

Setting range : 2 ~ 127, Outcome value : 12

[6] Gear ratio of motor side

This sets the rotation count when the motor rotates accordingly to the POST data set at parameter 7.

Setting range : 1 ~ 9999, Outcome value : 33

[7] Gear ratio of machine side

This sets the POST data it should move when the motor rotates accordingly to the set data at parameter 6.

Setting range : 1 ~ 9999, Outcome value : 12

Example)

1. The machine is 10 POST turret and if the motor rotates 30.75 turns and should the decelarating ratio be determined so that the turret will rotate 1 time, this is within the 10 POST movement, thus the value will be set as follows.

   Maximum POST data : 10
   Gear ratio of motor side : 3075
   Gear ratio of equipment side : 1000

2. From MCT type machine, it is 41 POST(41 POT) magazine, and if the motor rotates 101 turns, and should the decelerating ratio be determined so that the magazine will move 9 POST, the value will be set as follows.

   Maximum POST data : 41
   Gear ratio of motor side : 101
   Gear ratio of equipment side : 9

[8] POST number of home

Input the POST number that sets the home when setting the machine's zero-point.
Please refer to 'machine home setting method' for more detailed explanation.

Setting range : 1 ~ 127, Outcome value : 1

[9] Reserve parameter

[10] Position loop proportional gain

The proportional gain of the position loop is the parameter which determines the response of position control loop. If the value increases, the mechanical response gets better. However, mechanical impact on the machine may occur when the motor starts or stops. If the value decreases, the mechanical response will get worse and position error increases by remaining pulse. This also relates to speed loop proportional gain.

Setting range = 0 ~ 2048, Outcome value = 256

[11] Speed loop proportional gain

The proportional gain of speed loop is the parameter which determines the response of the speed control loop. For external characteristics, it determines the degree of rigidity. If the value or the proportional gain increases, the rigidity becomes better. Thus, the larger the setting, the better it will be, except it may cause oscillations and hunting. Taking this into consideration, the value should be set as large as possible while under a stable condition.

Setting range = 0 ~ 2048, Outcome value = 250

[12] Speed loop integral gain

The integral gain of the speed loop is a compensatory factor which reduces normal state error and increases rigidity. If the value of integral gain is increased, the rigidity will get better except it may cause oscillations, thus the system may become unstable.

Setting range = 0 ~ 2048, Outcome value = 1

[13] Brake off delay time

In case the motor has an inner brake, this is the delay time it takes for the SVRDY signal to change to ON, after the brake signal is ON.
Set the value higher than the actual time it takes for the brake to release. The unit is 50msec.

Setting range : 0 ~ 40 [x 50msec], Outcome value = 0

[14] Brake off control delay time

In case the motor has an inner brake, this is the delay time it takes for the brake signal to turn ON after SVON signal is input. After this delay, the brake signal turns OFF.

Setting range : 0 ~ 40 [x 50msec], Outcome value = 0

[15] Brake on delay time

In case the motor has an inner brake, this is the delay time it takes for the gate of the power

device to turn OFF after the brake signal turns OFF which is after the SVON signal turns OFF.

Set the value higher than the actual time it takes for the brake to turn on.

Setting range : 0 ~ 40 [x 50msec], Outcome value = 0

16 Monitor offset voltage

In case there is a need to adjust the offset of the monitor terminal (Number 18 of CN1 connector), connect the oscilloscope or the direct current voltmeter which can be moved by (+),(-) while the servo is off. This value should be set to 0V so that the monitor output can be adjusted.

Setting range = -12 ~ 12, [x 10/128 V], Outcome value = 0

17 Monitor selection

This is to select the contents of the output data by monitor terminal.

0 : Output data of speed feedback
1 : Output data of torque feedback
2 : Output data of the current in W phase
3 : Output data of the current in U phase

18 Positioning complete range

In position control, this sets the completion range of the position. If the deviation between the targeted position and the current position is within the set range, the VPF terminal (Number 16 of the CN1 connector) will turn ON. The numerical value unit in pulse is 'encoder × 4 times = pulse and presently it is 8192 pulse per 1 rotation.

Setting range : 1 ~ 9999 [pulse], Outcome value : 100

19 Remaining pulse allowance

In position control, in each position control loop the difference between position command and position feedback is accumulated. Should this difference value exceed the set value, the position deviation overload alarm will appear. The numerical value unit in pulse is 'encoder × 4 times = pulse and presently it is 8192 pulse per 1 rotation.

Setting range : 1 ~ 6000 [x 100 pulse], Outcome value : 6000

20 Position loop feed-forward gain

This can enable to have a response characteristic which shortens the position determining time by using the feed-forward control. However, if the value is set too high, it may cause oscillations in the machine.

Setting range : 1 ~ 100 [%], Outcome value : 0

21 Feed-forward filter time constant

This sets the time constant when the first delay filter is put in the feed-forward position command.

Setting range : 0 ~ 500 [x 4msec], Outcome value : 0

22 Positive torque limit 1

This limits the torque output of the positive (+) polarity in areas other than the positioning complete range. If the value is set at 0%, positive torque will not occur. If the value is set to low, when the motor starts or stops operation, hunting may occur.

Setting range : 0 ~ 300 [%], Outcome value : 250

23 Negative torque limit 1

This limits the torque output of the negative (-) polarity in areas other than the positioning complete range. If the value is set at 0%, negative torque will not occur. If the value is set to low, when the motor starts or stops operation, hunting may occur.

Setting range : 0 ~ 300 [%], Outcome value : 250

24 Positive torque limit 2

This limits the torque output of the positive (+) polarity in areas within the positioning complete range. After position determining is complete, the SVON signal turns ON and in this case a continuous load is put on the machine. By setting a low value overstrain on the equipment or the motor can be avoided.

Setting range : 0 ~ 300 [%], Outcome value : 50

25 Negative torque limit 2

This limits the torque output of the negative (-) polarity in areas within the positioning complete range. After position determining is complete, the SVON signal turns ON and in this case a continuous load is put on the machine. By setting a low value overstrain on the equipment or the motor can be avoided.

Setting range : 0 ~ 300 [%], Outcome value : 50

26 Speed limit

This limits the maximum operation speed.

Even when overshooting and such cases occur while accelerating, this limits the speed within the set value.

Set the value at least 50rpm more than the set value at parameter 28 (operating speed)
Setting range : 0 ~ 3000 [rpm] Outcome value : 1850

27 Jog speed at set home

This sets the speed of the internal jog operation in order to move the turret, magazine and such of the machinery while setting the zero-point.
This is different from step jog speed.

Setting range : 1 ~ 1000 [rpm], Outcome value : 100

28 Operation speed

This is the motor speed while operating automatically or while step jog operating.

Setting range : 10 ~ 3000 [rpm], Outcome value : 1800

29 Acceleration time

This sets the time it takes to get to the speed fixed in parameter 28 from zero movement (motor stops). If the value is set too low, speed overshooting may occur when accelerating.

Setting range : 0 ~ 500 [msec], Outcome value : 50

30 Deceleration time

This sets the time it takes to get to the zero movement (motor stops) from the speed set in parameter 28. If the value is set too low, the time it takes to determine the position may be delayed due to hunting when the motor stops.

Setting range : 0 ~ 500 [msec], Outcome value : 80

31 Speed monitor output voltage

This sets the voltage of the monitor output while rotating when the speed is generated to monitor terminal in rated speed (2000rpm).

Setting range : 1000 ~ 5000 [x 2mV] Outcome value : 3000 (6V when speed is 2000rpm)

32 Torque monitor output voltage

This sets the voltage of the monitor output when the torque outputs data in rated torque (100%) into the monitor terminal.

Setting range : 1000 ~ 5000 [x 2mV] Outcome value : 1500 (3V when torque outputs 100%)

33 Initial status display

Turn the main power switch ON and select the initial status display.

Set value	Initial display content	Set value	Initial display content
00	Accumulated command pulse (lower word)	06	Motor running speed
01	Accumulated command pulse (upper word)	07	Absolute encoder rotation
02	Current position (lower word)	08	Absolute encoder-one rotation
03	Current position (upper word)	09	Effective load ratio
04	Accumulated remaining pulse	10	Maximum load ratio
05	Current POST number		

Outcome value : 06 (Rotation speed of the motor)

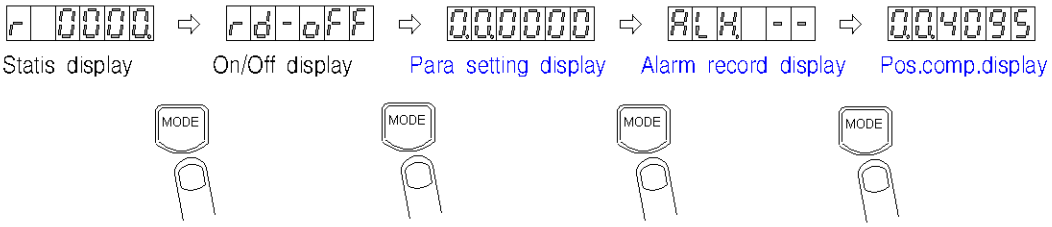
34 ~ 45 Automatic setting and parameter managed by the manufacturer

While setting the machine zero-point, the parameters will be set automatically or else it is for manufacturer's management use. Please do not set it according to the user's purpose. It may cause damages to the device.

4.7. Setting position compensation

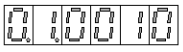
Set the position compensation value for each POST. The unit will be encoder 4 times pulse (8192 pulse per 1 rotation) and the setting range is from -9999 to 9999. The setting method is as follows.

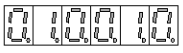
① Press the MODE key and change the mode to position compensation setting mode display.

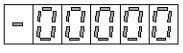


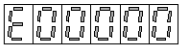
② The rest of the setting method is similar to that of setting the parameter. Please refer to that section.
All setting data can be set while the SVON signal is OFF and is effective right after setting.

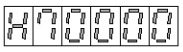
▶ Reference point


; The first two segments are the POST number and the latter 4 segments are the position compensation value.
('00' and '4095' data are set for manufacturer's management.)


; To display the minus value, dots will appear below the latter 4 segments.


; From 100 to 109, there will be a '-' displayed in front of the POST number.

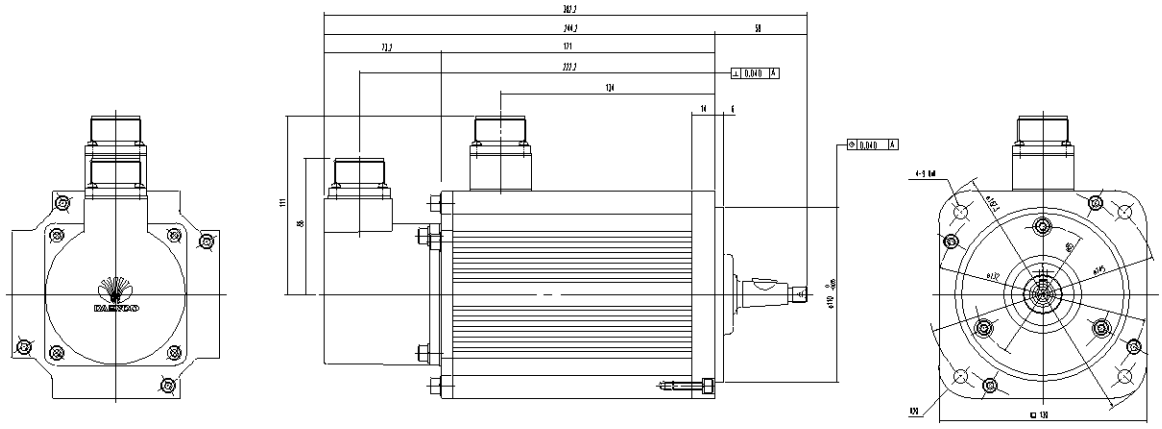

; From 110 to 119, there will be an 'E' displayed in front of the POST number.


; From 120 to 127, there will be an 'H' displayed in front of the POST number.

5. Dimensions of the servo motor / drive

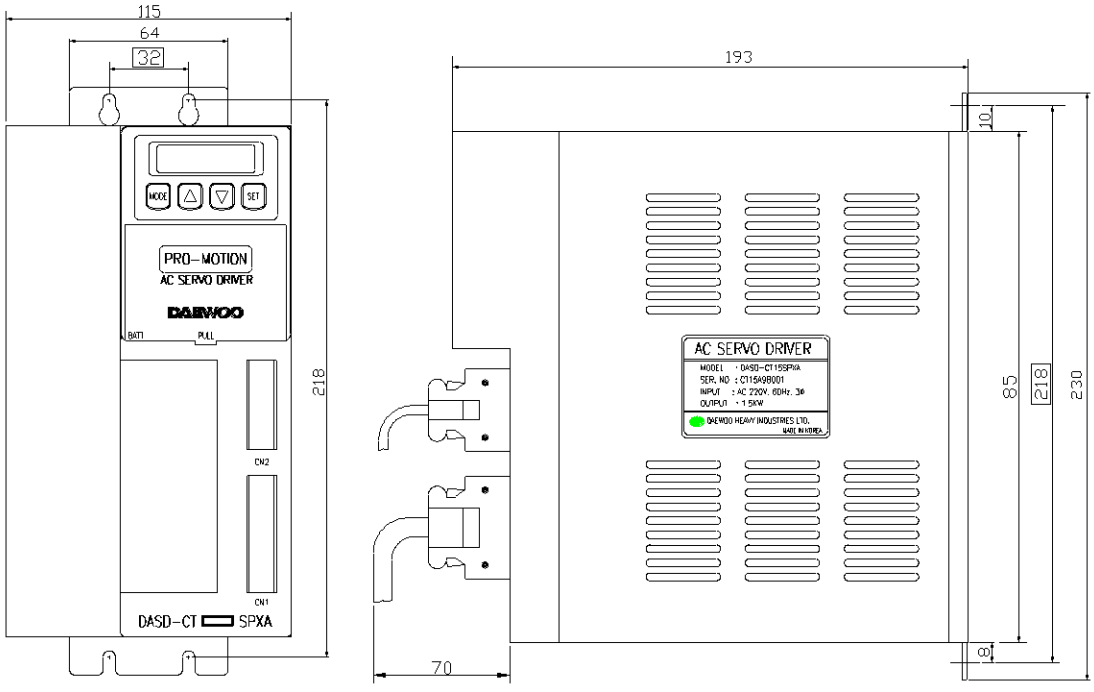
5.1. Dimensions of the servo motor

■ 1.5kW



5.2. Dimensions of the servo drive

■ 1.5kW



Appendix. Fixed parameter table according to the machine type

N0.	Abbr.	Name	Unit	Set value according to machine type					
				P230		P300		AH5P, AH6P	
				10Post	12Post	10Post	12Post	41Pot	61Pot
00	MPC	motor power capacity		0	0	0	0	0	0
01	MRD	motor running direction		1	1	1	1	0	0
02	–	reserve parameter		0	0	0	0	0	0
03	JFS	fix-direction, jog function selection		0	0	0	0	1	1
04	–	reserve parameter		0	0	0	0	0	0
05	MPN	maximum POST number	POST	10	12	10	12	41	61
06	GR1	gear ratio - motor side	rotation	3075	3075	33	33	101	101
07	GR2	gear ratio - machine side	POST	1000	1200	10	12	9	9
08	HSP	POST number of home		1 *	1 *	1 *	1 *	1 *	1 *
09		reserve parameter		0	0	0	0	0	0
10	PKP	position loop proportional gain		256	256	256	256	256	256
11	VKP	speed loop proportional gain		340	340	340	340	250	250
12	VKI	speed loop integral gain		1	1	1	1	1	1
13	SROT	brake off delay time	50 msec	0	0	0	0	10	10
14	BFT	brake off control delay time	50 msec	0	0	0	0	2	2
15	BOT	brake on delay time	50 msec	0	0	0	0	10	10
16	VTO	monitor offset voltage	10/128 V	0	0	0	0	0	0
17	VTM	monitor selection		0	0	0	0	0	0
18	INP	positioning complete range	PULSE	100	100	100	100	200	200
19	RPA	remaining pulse allowance	100 PULSE	6000	6000	6000	6000	6000	6000
20	FFG	position loop feed-forward gain	%	0	0	0	0	0	0
21	FTC	feed-forward filter time constant	4 msec	0	0	0	0	0	0
22	TLP1	positive torque limit 1	%	250	250	250	250	250	250
23	TLN1	negative torque limit 1	%	250	250	250	250	250	250
24	TLP2	positive torque limit 2	%	30	30	30	30	100	100
25	TLN2	negative torque limit 2	%	30	30	30	30	100	100
26	VLS	speed limit	rpm	2050	2050	1850	1850	2050	2050
27	JSP	jog speed at set home	rpm	100	100	100	100	80	80
28	VEL	operation speed	rpm	2000	2000	1800	1800	2000	2000
29	ATC	acceleration time	msec	50	50	50	50	200	200
30	DTC	deceleration time	msec	80	80	80	80	200	200
31	MRV	speed monitor output voltage	2 mV	3000	3000	3000	3000	3000	3000
32	MRT	torque monitor output voltage	2 mV	1500	1500	1500	1500	1500	1500
33	ISD	initial status display		6	6	6	6	6	6
34	AOL	encoder coordinates compensation (lower)		–	–	–	–	–	–
35	AOM	encoder coordinates compensation (upper)		–	–	–	–	–	–
36	HOL	set value of machine zero-point (lower)		–	–	–	–	–	–
37	HOM	set value of machine zero-point (upper)		–	–	–	–	–	–
38	IKP	current loop proportional gain		750	750	750	750	750	750
39	IKI	current loop integral gain		510	510	510	510	510	510
40	EPN	encoder pulse per one rotation		2048	2048	2048	2048	2048	2048
41	FPL	feedback pulse (lower)		–	–	–	–	–	–
42	FPM	feedback pulse (upper)		–	–	–	–	–	–
43	ACR	acceleration rate of remaining value		–	–	–	–	–	–
44	REM	deceleration rate of remaining value		–	–	–	–	–	–
45	–	reserve parameter		–	–	–	–	–	–

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☞ Note. Adjusted parameter operated as follows.

A	Adjusted parameter is only valid when power is off → on
B	You can adjust the parameters under the servo is off.
C	You can adjust the parameters under the servo is on.
D	You can never adjust the parameters for Maker management.

● Replacing the battery

1. Turn Off the main power of the servo drive.
2. Open the protective cover of the servo drive.

3. Remove the battery.

4. Install new battery, arranged according to the polarity(+ and −) diagram in the battery compartment.

5. Close the protective cover of the servo drive.