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EDC Series AC servo system

User's Manual

Operation of Version V. 2.20



Preface

This manual describes the operation of the Estun servo drive type EDC and is meant for operators who are instructed for operation of the device.

Estun Limited Warranty

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General Precaution

- Power supply voltage should be AC 220V.

The EDC servo system requires a power supply of AC 220V+/-15% voltage.

- Don't connect the servo motor directly to local electric network.

It's prohibited to connect the servo motor directly to local electric network. Otherwise, the servo motor is very likely to get damaged. The servo motor will not rotate without support of servo drive.

- Don't plug in or unplug the connectors when power is ON.

Internal circuit and motor encoder might be damaged if the plug in or unplug operations are performed during power ON. Always turn the power OFF first before plugging in or unplugging the connectors.

- Wait for at least 5 minutes before doing inspection work on the servo system after turning power OFF.

Please be noted that even when the power is turned off, there will still be some electric energy remained in the capacitors of the internal circuit. In order to avoid electrical shock, please make sure inspection work is started 5 minutes after Charge indicator is OFF.

- There should be a space of at least 10mm between the servo drive and any other devices mounted in the electrical cabinet.

The servo drive produces heat during working, heat dissipation should be considered in design of mounting layout. At least 10 mm space in lateral direction and 50 mm space in longitudinal direction are required from servo drive to other equipments when doing installation. Please install the servo drive in an environment which is free from condensation, vibration and shock.

- Noise rejection treatment and grounding.

The noise from signal wires causes easily the mechanical vibration and malfunctions. Please comply with the following rules strictly:

- Route high-voltage power cables separately from low-voltage power cables.
- Make short cable route as possible.
- Single point grounding is required when mounting the servo motor and servo drive, and grounding resistance should be lower than 100Ω.
- It's prohibited to apply power input noise filter between servo drive and servo motor.

- Withstand voltage test of servo drive should meet following conditions:
  - Input voltage: AC 1500Vrms, 1 minute
  - Interrupt/Break current: 100mA
  - Frequency: 50/60Hz
  - Forcing point: Between Terminal R, Terminal T and Terminal E.
- Apply a fast-response leakage protector

It's required to use a fast-response leakage protector or a leakage protector for PWM inverter designated by supplier. Do not use a time delay leakage protector.

- Avoid extreme adjustments or changes

Don't make extreme adjustments or changes to servo drive's parameters, which will cause terrible mechanical vibration and result in unnecessary property loss.

- Don't run the servo motor by switching On/Off the power supply directly.

Frequent power On/Off will cause fast aging to servo's internal components, which will reduce the lifetime of servo drive. It's required to use reference signals to control the running of servo motor.

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Chapter 1

Checking products

1.1 Checking products

The following procedure is used to check the AC servo drivers of EDC series products on delivery.

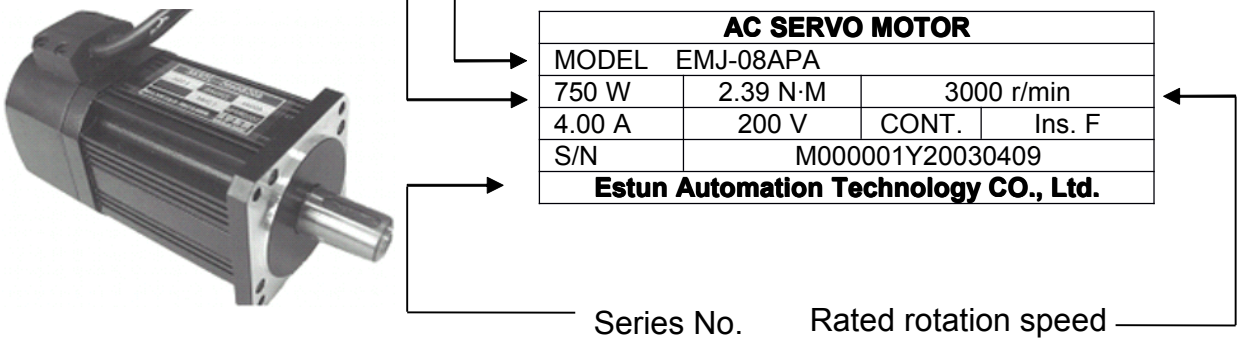
Check Items	Comments
Are the delivered products the ones that were ordered?	Check the model numbers marked on the nameplates on the servo motor and servo drive.
Does the servo motor shaft rotate smoothly?	The servomotor shaft is normal if it can be turned smoothly by hand. Servomotors with brakes, however, cannot be turned manually.
Is there any damage?	Check the overall appearance, and check for damage or scratches that may have occurred during shipping.

If any of above items is faulty or incorrect, contact your dealer from whom you purchased the products or the service personnel of Estun.

1.1.1 Servo motor

■ Nameplate

The following illustration shows an example of the servo motor's nameplate.



■ Identification of motor model

EMJ– 08 A P A 1 1

EMJ Model Servo Motor	Rated Power		Power Voltage		Encoder		Design Sequence		Shaft End		Optional Parts	
	Sign	Spec.	Sign	Spec.	Sign	Spec.	Sign	Spec.	Sign	Spec.	Sign	Spec.
	2	200W	**A**	200Vac	**P**	2500P/R	**A**	Design Sequence	**1**	Flat, without keys	**1**	None
	4	400W									**2**	With Oil Seal
	8	750W							**2**	Flat, with keys, with screw thread	**3**	With brake (DC24V)
	10	1000W									**4**	With oil seal, with brake (DC24V)

1.1.2 Servo drive

■ Nameplate



ESTUN	AC SERVO
MODEL	EDC-08APE
INPUT	1PH 200-230V 50/60Hz 6.8A
OUTPUT	3PH 0-230V 0-240Hz 4.00 A
Serial No	

Operating Ambient Temperature 0-55℃

Hazardous Voltage
Do not touch terminals within 15 minutes after disconnect the power, Risk of electric shock.

High Temperature
Do not touch heatsink when power is ON, Risk of burn.

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■ Identification of drive model

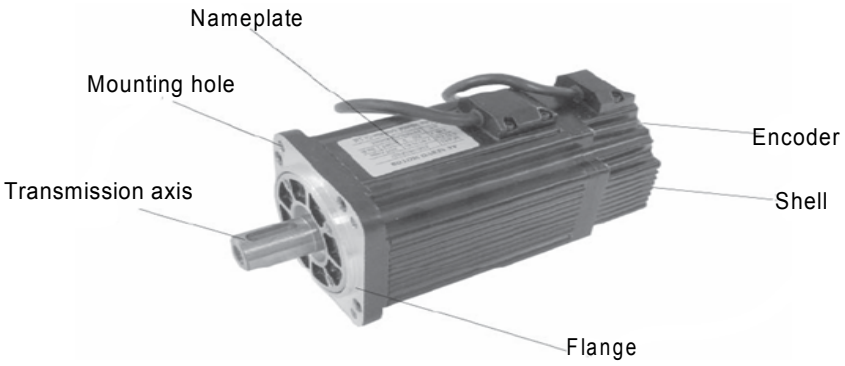
EDC –08 A P E

EDC Servo Drive	Rated Power		Power voltage		Control Style		Design Sequence	
	Sign	Specification	Sign	Specification	Sign	Specification	Sign	Specification
	02	200W	**A**	200VAC	**P**	Position Control	**E**	Design Sequence
	04	400W						
	08	750W						

1.2 Servo components description

1.2.1 Servo motor

Following illustration shows the names of the components of a servo motor without gearbox and brake.



1.2.2 Servo drive

Following illustration shows the names of the components of a servo drive.



Charge indicator
Lights when the main circuit power supply is ON and stays lit as long as the main circuit power supply capacitor remains charged. Therefore, do not touch the servo drive even after the power supply is turned OFF if the indicator is lit.
POWER&ALARM
Lights when power On, and in red when servo drive generates an alarm.
CAN COM ID address selection switch
Set CAN communication address
CANBUS port（CAN）
CAN pin out
RS232 port（COM）
Communicating with a digital palm operator or a computer.
I/O signal connector（1CN）
Used for reference input signals and sequence I/O signals.
Encoder cable terminals（2CN）
To connect between motor and drive.

Servo motor terminals
To connect with the encoder on the servo motor.
Power supply terminals
The terminal to connect the power cable of servo motor.
Power terminal and

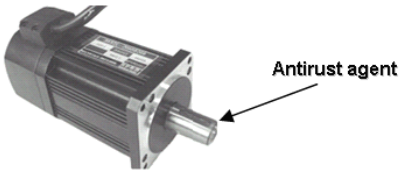
Chapter 2

Installation

2.1 Servo motor

Servomotor can be installed either horizontally or vertically. However, if the servomotor is installed with incorrect mechanical fittings, the servo motor's lifetime will be greatly shortened and unexpected accidents will occur.
Please make installation according to the instructions as below:

Precaution:
There's some antirust agent on the edge of the motor shaft to prevent it from rusting during storage. Please wipe off the agent thoroughly by using a cloth dipped with diluting agent or thinner before installing the motor.
NOTE: The diluting agent should not touch any other parts of the servomotor when wiping the shaft.



2.1.1 Storage temperature

When the servomotor is not in use, it should be kept in a place with an environment temperature between −20°C and +60°C.

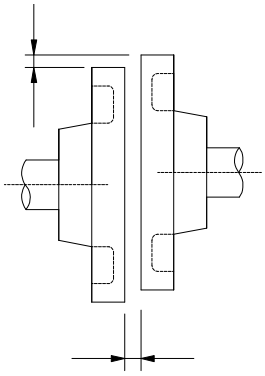
2.1.2 Installation site

Servomotor should be installed indoors, and the environment should meet following conditions:
a) Free from corrosive, inflammable or explosive gases
b) Well ventilated and free from dust and moisture
c) Ambient temperature is between 0°C and 40°C
d) Relative humidity is between 26% and 80% RH (non-condensing)
e) Maintenance and cleaning can be performed easily

2.1.3 Installation concentricity

Use elastic shaft connectors as many as possible for mechanical connections. The axis centers of servo motor and mechanical load should be kept in the same line. If a shaft connector is used when installing servo motor, it has to meet the requirement of concentricity tolerance as shown in the illustration below.

Measure this at four quartering positions of a cycle. The difference between the maximum and minimum measured value must be less than 0.03mm. (Rotate together with shaft connectors)



Measure this at four quartering positions of a cycle. The difference between the maximum and minimum measured value must be less than 0.03mm. (Rotate together with shaft connectors)

Note:

If the concentricity tolerance is too big, mechanical vibration will occur, resulting in damage to the bearings of servo motor

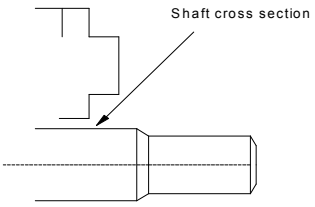
Never strike at the axis direction when installing shaft connectors, this could damage easily the encoder of servo motor.

2.1.4 Installation direction

The servomotors can be installed, horizontally, vertically or in any direction.

2.1.5 Handling oil and water

If the servomotor is installed at a location subject to water, oil, or condensation, the motors require special treatment to meet protection requirements. If the motors are required to meet the protection requirement before leaving the factory, it's necessary to designate the exact motor models with oil seal. Shaft- cross-section means the gap as shown in the following picture:



2.1.6 Cable tension

When connecting the cables, the bending radius shouldn't be too small, do not apply big pulling force to cables.

Please be noted in particular that the diameter of signal cable wires is very small, from 0.2 mm to 0.3 mm, therefore handle the cables with adequate care and do not cause excessive cable tension while doing wiring.

2.2 Servo drive

EDC series of servo drives are all base-mounted. Incorrect mounting will definitely cause problems. Always mount the servo drives according to following installation instructions.

2.2.1 Storage condition

When servo drive is not in use, it should be kept in an environment with a temperature between -20 and +85 ℃.

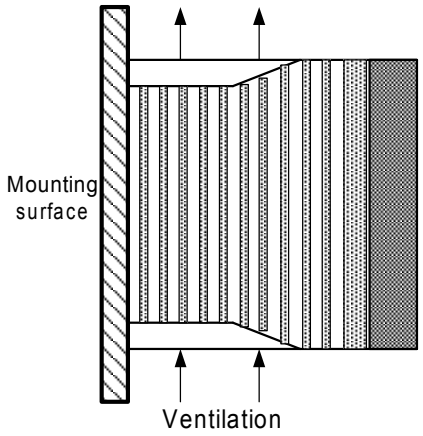
2.2.2 Installation site

The notes on installation of servo drive are as below:

Condition	Safety notes
Installed inside a control cabinet	A unified design for the cabinet size, configuration of servo drive, and the cooling method is required so that the ambient temperature around the servo drive is always below 55 °C.
Installed near a heating unit	Minimize the heat radiating from the heating units by taking advantage of heat dissipation measures such as natural convection current, forced-air cooling, to ensure working temperature around the servo drive is always below 55 °C.
Installed near a vibration source	A vibration isolator should be mounted underneath the base surface to prevent vibration.
Installed at a site exposed to corrosive gases	Appropriate measures should be taken to prevent corrosive from getting in. Corrosive gases does not have immediate influence on the servo drive but they will eventually cause problems on electronic components, which will definitely have influence on the running stability of servo drive.
Other situations	Do not install the servo drive in hot, humid locations or locations subject to excessive dust or powder in the air.

2.2.3 Installation orientation

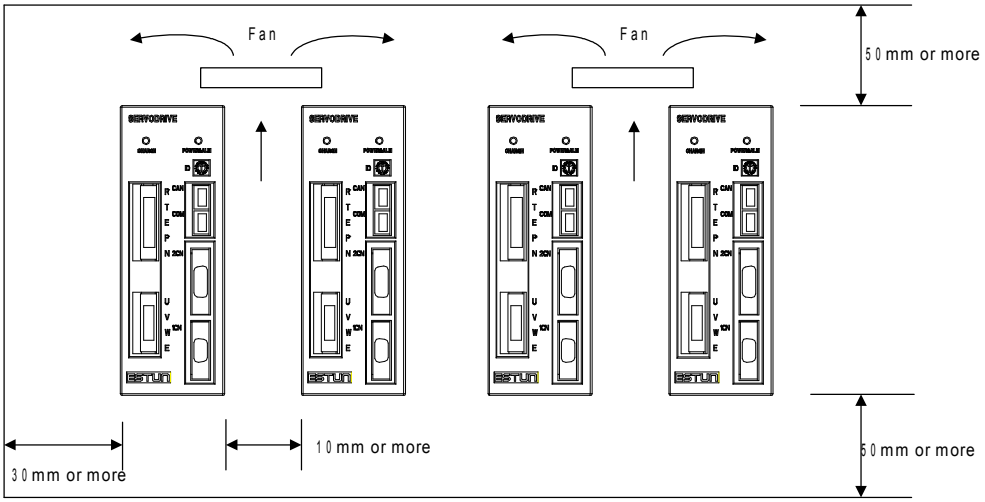
As shown in the following picture, the installation direction should be vertically mounted onto the wall, firmly fixed on the surface with two mounting holes.



A cooling fan can be mounted for forced-air cooling of the servo drive at request.

2.2.4 Installation of several servo drives

When several servo drives are required to be installed side by side inside one control cabinet, installation must be performed according to the gap requirement as shown below :



Installation orientation

Install the servo drive vertically onto the wall so the front panel(connection board side) of servo drive faces the operator.

Cooling

As shown in the illustration above, give sufficient space between each servo drive so that cooling by cooling fans or natural convection is good.

Side-by-side installation

When installing servo drives side by side as shown in the illustration above, reserve at least 10 mm between two horizontal sides and at least 50 mm between two vertical sides. The temperature in the control cabinet needs to be kept evenly distributed, subject to no overheat at any part of servo drive. If necessary, install forced-air cooling fans above the servo drives to avoid excessive temperature rise.

Normal Working Conditions for Servo Drive

1. Ambient Temperature: 0 to 55°C
2. Humidity: 90% RH or less, no condensing
3. Vibration: 4.9 m/s2 or less

To ensure a long term stability of the drive, it's suggested the drive be used in a place with a temperature below 45 °C.

4) Storage condition

When the servo drive is not in use, it should be kept in a place with an environment temperature between −20°C and +85°C.

Chapter 3

Wiring

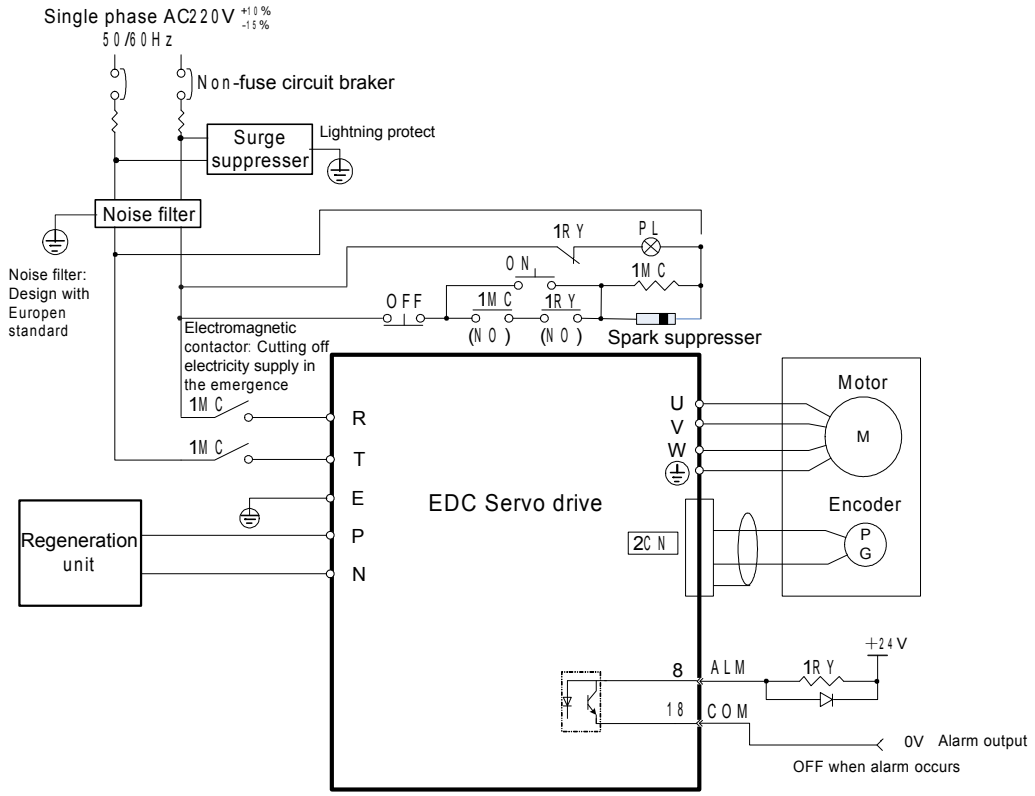
3.1 Wiring and connection

Always comply with the following instructions when making wiring or connection.

Notes:

- Neither run power wires and signal wires in the same conduit pipe nor bind them together. There should be at least 30 cm's space between power wires and signal wires.
- Whole shielded twisted pair wires are required for signal wires and encoder feedback wires, shield layer must be connected to the shell of the plugs.
  Wire length requirement: reference signal input wires are maximum 3 meters, and encoder feedback wires are 20 meters to the maximum.
- Please be noted that even when the power is turned off, there will still be some electric energy remained in the internal circuit. In order to avoid electrical shock, please make sure inspection or wiring work is started five minutes after Charge indicator is OFF.
- Don't turn power ON and OFF frequently. If required, turning power ON and OFF should be controlled under once a minute.
  There are some high capacity capacitors installed in the internal circuit of servo drive, when power is switched on, high charging electric current will flow though the capacitors within several dozen of ms, therefore, frequent power on/off will cause fast aging to servo's internal elements.

3.1.1 Typical main circuit wiring



3.1.2 Names and Functions of Main Circuit Terminals

Terminal	Function	Description
R, T	Main circuit power supply input terminal	Single-phase 220VAC(+10% / -15%) , 50/60HZ
U, V, W	Servo Motor connection terminals	Connects to power supply terminal of servo motor
E	Grounding terminals	Connected individually to power supply grounding terminals and servo motor grounding terminal.
P, N	Connection terminals of external regenerative unit	To connect an external regenerative unit. **Note:** It's prohibited to connect a regenerative resistor directly between P and N.

3.2 I/O signals

3.2.1 Standard connection diagram

3.2.2 Connector terminals

Pin. No.	Name	Comments		Pin. No.	Name	Comments
1	PL	Power supply for open collector circuit		11	PULS	Reference pulse
2	BRK	Remain braking		12	/ PULS	Reference pulse
3	COIN	Positioning complete		13	SIGN	Reference symbol
4	ALM	Alarm		14	/SIGN	Reference symbol
5	COM	I/O common grounding		15	S-ON	Servo enabled
6	ALM_RST	Reset Alarm		16	+24VIN	I/O power supply
7	CLR	Clear		17	ZPS	Zero position signal
8	PAO	Signal A（difference）		18	/PAO	Signal /A（difference）
9	PBO	Signal B（difference）		19	/PBO	Signal /B（difference）
10	PCO	Signal C（difference）		20	/PCO	Signal /C（difference）
				Shell	FG	Connector's shell

Note:

1. Spare terminals can not be used for relay purpose.
2. Connect shielded cable wires of I/O signals to connector shell (frame grounding).

3.2.3 Function list of I/O signals

Signal	Pin no.	Function		Reference
+24VIN	16	Control power supply input for I/O signals: Users need to prepare the +24V power supply. Effective voltage range: +11V ～ +25V		4.2.4
S-ON	15	Servo ON：Servo motor is switched on		4.5.2
ALM-RST	6	Select signal according to Pn051: （1CN-6 input signal selection） 0: ALM_RST, clear servo alarm status signal 1:CLR, clear offset counting in position control 2:P-CON 3:P-OT 4:N-OT		
CLR	7	According to Pn052, meaning as above		4.2.2
ZPS	17	Zero position signal input: zero switch outputs this signal when returning to zero position.		4.1.2
PL	1	Reference open collector power supply: To provide +5VDC power supply when PULS and SIGN reference signals are open collector input signals.		
PULS /PULS SIGN /SIGN	11 12 13 14	Reference pulse input: Line drive or open collector	Input modes: *SIGN + Pulse train *CCW + CW Pulse *2-phase positive pulse (×4)	4.2.2

■ Output signal (1CN)

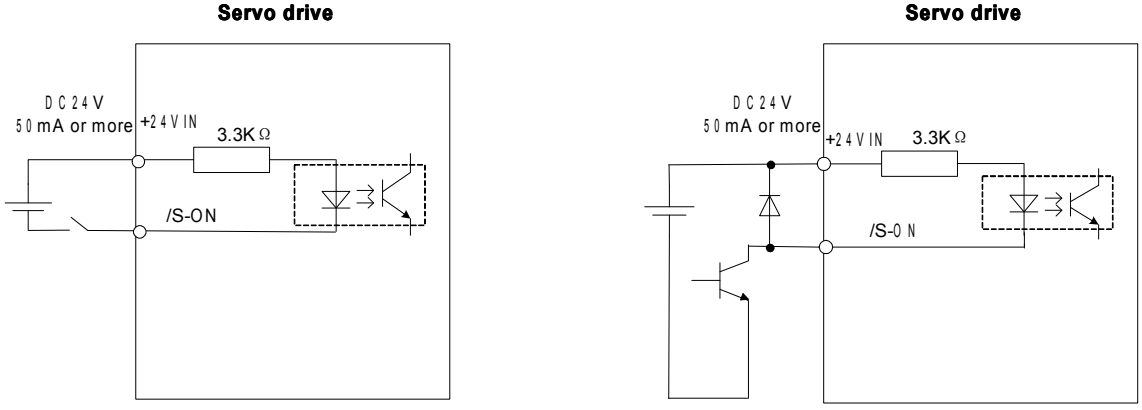
Signal	Pin no.	Function	Reference
ALM	4	Servo alarm: OFF status output is given when the drive detects an error.	4.5.1
COIN	3	The value of Pn050 decides the output signal, see the details as follows: 0: brake interlock(BK) output; positioning complete/same speed detected; in position control method it means positioning is completed(COIN), while in speed control method it means same speed is detected(V-CMP). 1: positioning complete/same speed detected; in position control method it means positioning is completed(COIN), while in speed control method it means same speed is detected(V-CMP) 2: torque limit CLT output: when output torque exceeds the value of Pn026 or Pn027, this signal gives output 3: Servo ready S-RDY output: When servo drive detects no alarm subject to a power supply input, this signal gives output.	
BRK	2	The value of Pn049 decides the output signal, see the details as follows: 0: brake interlock(BK) output; 1: positioning complete/same speed detected; in position control method it means positioning is completed(COIN), while in speed control method it means same speed is detected(V-CMP) 2: torque limit CLT output: when output torque exceeds the value of Pn026 or Pn027, this signal gives output 3: Servo ready S-RDY output: When servo drive detects no alarm subject to a power supply input, this signal gives output.	
COM	5	I/O common grounding	
PAO /PAO	8 18	Differential output of Encoder A signals	
PBO /PBO	9 19	Differential output of Encoder B signals	
PCO /PCO	10 20	Differential output of Encoder C signals	4.5.1
FG	Shell	Connect shielded wires of I/O signal cables to shell of 1CN, that is equal to the connection of the shell and the frame grounding wire.	

3.2.4 Interface circuit example

Following illustrations show the connection of I/O signals of servo drive and host controller:

■ Input interface circuit

Following illustrations show an example of the connection of input signals using relay contact or open collector transistor circuit.



If the relay contact input is used, the relay must be suitable for tiny electric current, otherwise it causes signal receiving faults easily.

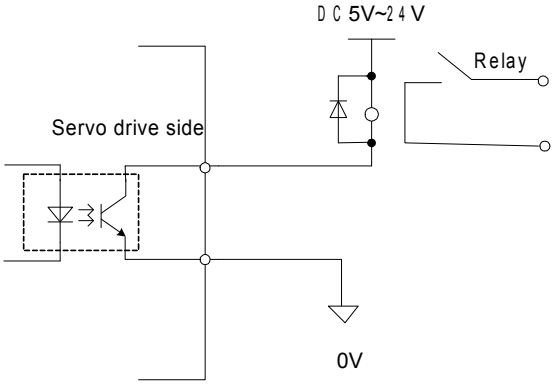
■ Interface of encoder output and drive output

Output signals (PAO,/PAO,PBO,/PBO) of the two phase pulse of the encoder, and origin pulse signal(PCO, /PCO) make outputs by means of BUS drive output circuit. Generally, it's used on the condition that the host controller side forms the position control system. Wire reception circuit should be used when it's by the side of host controller.

See "Encoder wiring" for an example of a practical circuit connection.

■ Interface of sequence output circuit

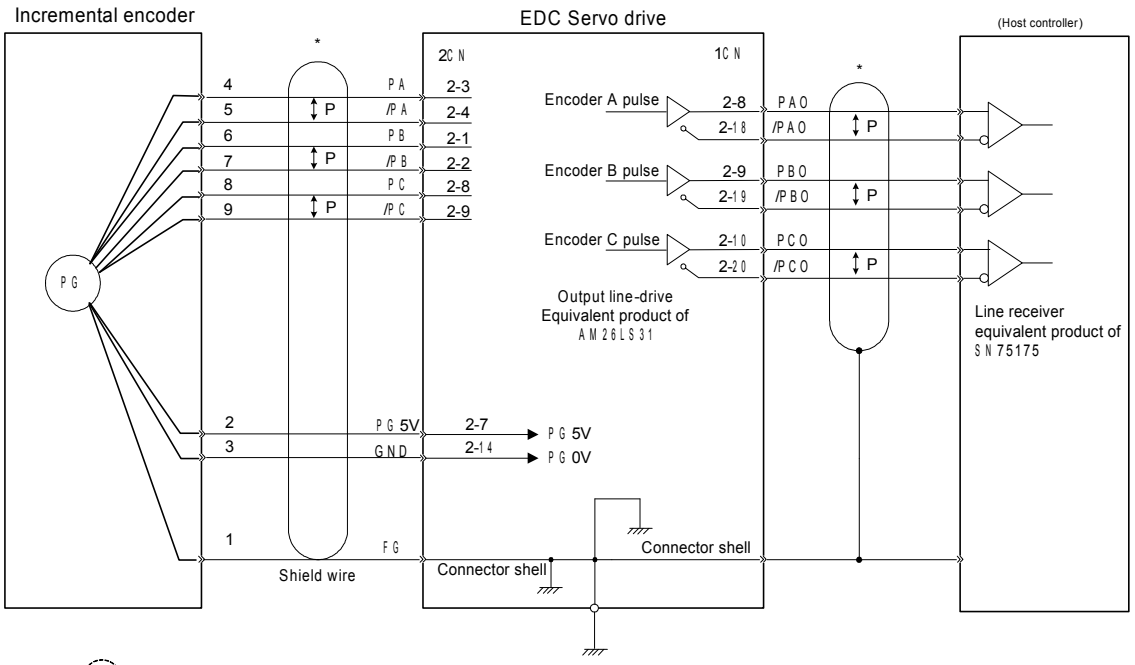
Photo-coupling isolation output is required for output signals of servo alarm , positioning complete and brake interlock.



Note:
Maximum voltage should be no more than 30VDC, and maximum current should be no more than 50mA.

3.3 Encoder wiring

3.3.1 Encoder wiring （2CN）



Note：

1.The sequence No. of encoder pin’s corresponding relation with signal will change because of different types of motors。

2.When the drive connect wire-saving mode encoder motor，just do not connect U,V,W signal

3.3.2 Signal list of connectors (2CN)

See following list for description of 2CN terminals.

Pin No.	Name	Comments		Pin No.	Name	Comments
1	PB	Encoder B ＋ Input		8	PC	Encoder C＋ input
2	/PB	Encoder B － input		9	/PC	Encoder C－ input
3	PA	Encoder A ＋ input		10	-	--
4	/PA	Encoder A － input		11	-	--
5	-	--		12	-	--
6	-	--		13	-	--
7	PG5V	Encoder power supply +5V		14	GND	Encoder power supply grounding
					FG	Connect shielded wires to shell of connectors.

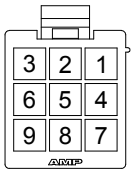
Note:

（1）It's suggested thick wires or multi-core wires are used for power supply and grounding.

（2）Do not connect the U, V and W signal of a wire-saving encoder.

3.4 Motor wiring

3.4.1 Motor encoder terminals



(View from cable side)

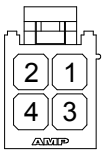
Shell：172169-1 (AMP)
Pin： 170359-3 (AMP)
Incremental type

Pin. No.	Signal	Color
1	A+	Blue
2	B+	Green
3	C+	Yellow
4	A-	Blue/Black
5	B-	Green/Black
6	C-	Yellow/Black
7	PG5V	Red
8	PG0V	Black
9	FG	Shield

Note:
The corresponding relations between pin number of encoder and signal may be different for different types of motors. Refer to motor instructions.

3.4.2 Motor power terminal

Shell：172167-1 (AMP)
Pin： 170360-1 (AMP)

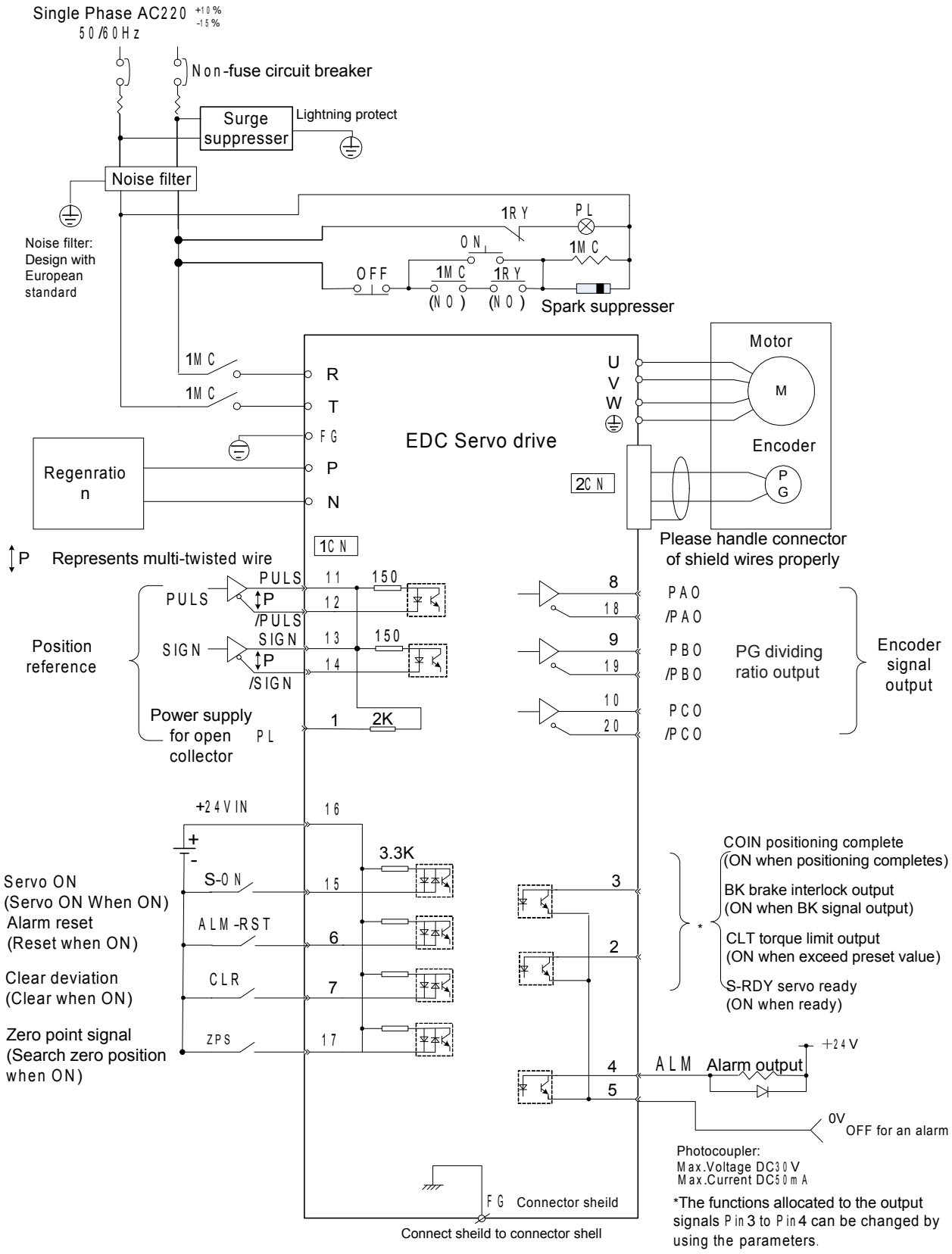


(View from cable side)

Pin NO.	Signal	Color
1	U	Red
2	V	Blue
3	W	White
4	FG	Green/Yellow

Notes:
The corresponding relations between pin number of motor's power wire and signal may be different for different models of motors. Refer to motor instructions.

3.5 Standard connection example



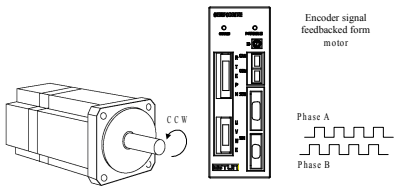
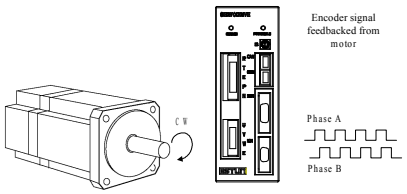
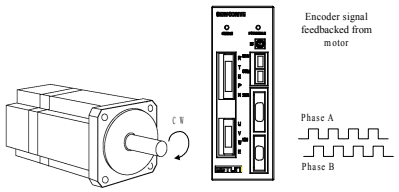
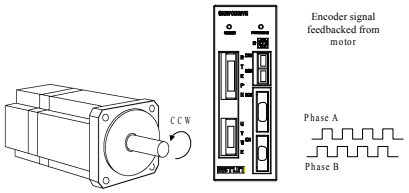
Chapter 4

Function setting and description

4.1 Machine related settings

4.1.1 Servomotor rotation direction Select

With servo drive, a motor can rotate reversely which is called REV mode, with no need to make any changes in motor wiring. The standard setting for “forward rotation” is the counterclockwise as viewed from motor load. REV mode only changes motor’s rotation direction, in this condition, the travel direction(+,-) of shaft reverses, no other changes are made.

	Standard mode	Reverse mode
FWD Run Ref.		
REV Run Ref.		

The encoder signals by motor feedback as shown in above diagrams are the PA,/PA,PB,/PB signals from PG output of servo drive.

■ Set “REV mode”

Rotation direction of motor is selected by setting the parameter as follows.

Para. No..	Name & Comments	Unit	Range	Default
Pn006	Select rotation direction [0] view from side of motor load, CCW direction represents forward direction.（standard mode） [1] view from side of motor load, CW direction represents forward direction.（REV mode）	—	0~1	0

Note:
The change only takes effect when motor power is shut down and re-switched on.

4.1.2 Overtravel

The overtravel limit function forces movable machine parts to stop when they exceed the allowable range of motion.

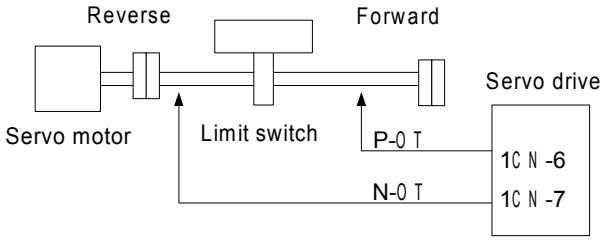
■ Overtravel function setting

Before using overtravel function, please connect correctly the input signals of following overtravel limit switch to corresponding pin numbers of servo drive's 1CN connector.

Input P-OT 1CN-6	Pn001=0,Pn051=3	Forward direction rotation is prohibited
input N-OT 1CN-7	Pn002=0,Pn052=4	Reverse direction rotation is prohibited

EDC servo drive only has one overtravel input signal (1CN-6), so user can only select overtravel limit in single direction. Please be noticed that, when performing first system running, it's required to identify forward and reverse direction before make settings in overtravel parameter.

It's strongly required that user connect the limit switch according to following diagram to avoid possible mechanical damage.



Following table shows the drive status when input signal is ON and OFF.

Signal	Status	Parameter	Input level	Comments
P-OT	ON	Pn001=0 Pn051=3	1CN-6:'L' level	Forward direction driving is allowed. (Normal)
	OFF	Pn001=0 Pn051=3	1CN-6:'H' level	Forward direction driving is OFF. (Reverse direction is available)
N-OT	ON	Pn002=0 Pn052=4	1CN-7:'L' level	Reverse direction drivi is ON. (Normal)
	OFF	Pn002=0 Pn052=4	1CN-7:'H' level	Reverse direction driving is OFF. (Forward direction is available)

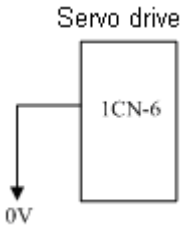
■ Switching between Enable/Disable overtravel input signal

By setting the parameter as in following table, user may select Enable or Disable overtravel input signal. Default is "ON".

Para. No.	Description	Unit	Setting range	Default
Pn001	Enable/Disable input signal prohibited (P-OT) When 1CN-2 is set as PN-OT signal, limiting direction and enabling are selected according to this parameter. [0]disable input signal prohibited [1]enable forward run input signal prohibited [2]enable reverse run input signal prohibited	—	0～1	0
Pn002	Enable/Disable input signal prohibited (N-OT) When 1CN-2 is set as N-OT signal, limiting direction and enabling are selected according to this parameter. [0]enable forward run input signal prohibited [1]enable reverse run input signal prohibited	—	0～1	0

Notes:
1. When motor running is stopped by overtravel in position control mode, there's no pulse lag.
2. Only one overtravel direction can be used, make sure overtravel direction is set before using the function. (subject to actual running)
3. Please be noticed that overtravel signal does not work if motor is running in JOG mode.
4. During mechanical movement, when an overtravel signal occurs, mechanical parts do not stop immediately owing to the action of their own inertia, in this situation, the overtravel signal is canceled and the motor will continue running. Please pay close attention to the duration of overtravel signal, that is, make sure there's some distance for overtravel signal on the machine consideration.

When "P-OT" and "N-OT" are not used, the short circuit wiring as shown in the following diagram will not be required. Another way is to shield this with parameter, use may set Pn001 as 0 or set Pn052.bit=0.



4.1.3 Stop function

■ Select stop mode
When servo is OFF or servo alarm occurs, following "User Constants" should be set according to actual requirements on stopping motor.

Parameter No.	Function	Range	Default
Pn004	Stop modes when servo is on or servo alarm occurs.	0～3	0

Parameter No.	Comments
Pn004	[0] When servo is OFF or alarm occurs, DB is enabled [1] When servo is OFF or alarm occurs, motor coasts to a stop [2] When servo is OFF or alarm occurs, DB is enabled and will not release until motor stops [3] When servo is OFF or alarm occurs, motor coasts to a stop, then DB is enabled.

■ Select motor stop mode when servo is OFF.
EDC series servo drive stop motor running in following situation:
- When /S-ON input signal（1CN-15）turn into OFF
- When alarm is detected
- When power supply is OFF

To select appropriate stop mode, set value of Pn004 according to actual application requirements.

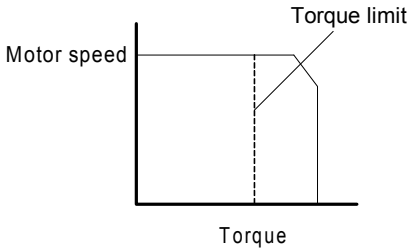
4.1.4 Limiting torque

For protection of mechanical structures, maximum output torque can be limited by setting following parameters to adjust the maximum value of forward/reverse direction torque on the servo drive.

Para. No.	Name & Function	Unit	Range	Default
Pn026	Forward internal torque limit	1%	0~300	250
Pn027	Reverse internal torque limit	1%	0~300	250

- Set maximum torque for forward and reverse direction, it's used when limiting torque is required according to mechanical requirements.
- If value of current torque exceeds motor's maximum allowable torque, follow the maximum torque of motor.

Example to show protection of mechanical structures



Note:
- It's suggested the value of limited torque not exceed motor's maximum torque.
- If limited value is set too low, motor may have insufficient torque during its acceleration/deceleration.

4.2 Settings complying with host controller

Different control modes can be selected by setting Pn041 as described in following table.

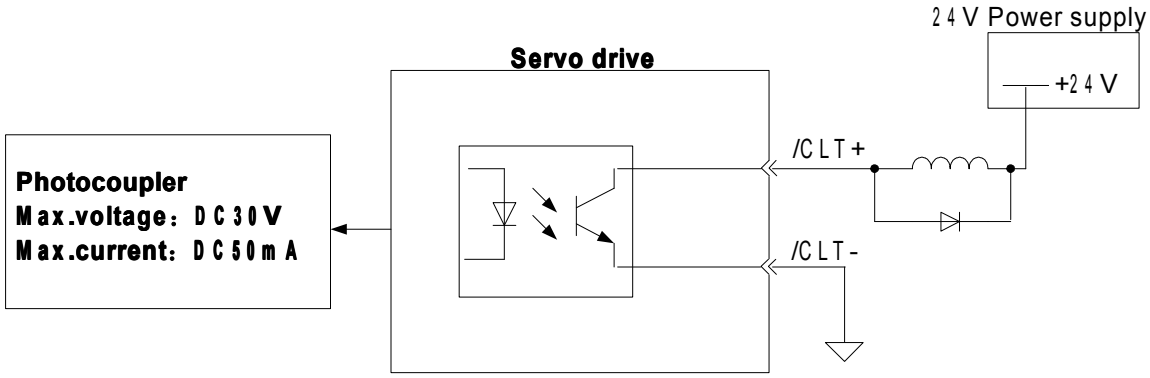
Para. No.	Name	Range	Default	Comment
Pn041	Select control mode [0] position control [1] internal speed control [2] parameter speed control	0~2	0	position control, position contact control, and parameter speed control

Set Pn041 and select a certain control mode.

Pn041 setting	Control mode
0	Position control（pulse reference） Servo drive receives pulse train generated by host controller, and the control of rotation speed and positioning are achieved according to requirements from host controller.
1	contact speed control（I/O reference） Running at set speed is selected by switch on/off input signals.
2	parameter speed control（parameter reference） Run at constant speed as the value in Pn048.

Way to use CLT signals

Following illustration shows the way to use contact output signal/CLT(torque limit test).



->output /CLT	Torque limit detection output	Speed control, torque control, position control

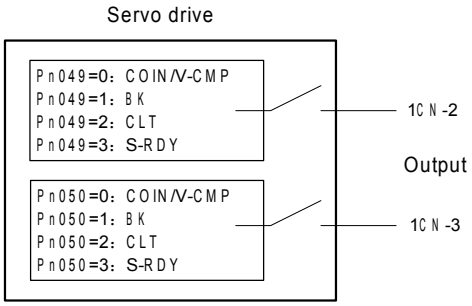
The following signal can be output to indicate the servomotor output torque is being limited or not.

/CLT "L" level when ON	The servomotor output torque is being limited. (internal torque reference is above setting value)
/CLT "H" level when OFF	The servomotor output torque is not being limited. (internal torque reference is below setting value)

The setting value：Pn026（Forward direction torque internal limit）
Pn027（Forward direction torque internal limit）

When /CLT signal is used, the output signal and output pin number are required to be defined according to the user constants in following table.

Para. No.	Name & Description	Range	Default
Pn049	Output signal 1CN-2 pin no. signification	0~3	0
Pn050	Output signal 1CN-3 pin no. signification	0~3	1



Following table shows the pin number definition for Pn049（correspond to pin 1CN-2 output）, Pn050（correspond to pin 1CN-3output）.

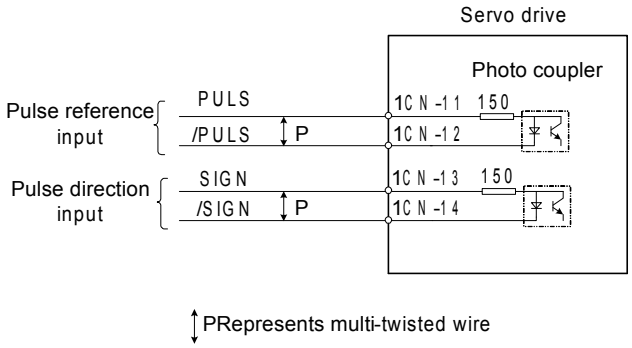
0	BK brake interlock output
1	COIN positioning complete(/V-CMP speed coincidence) output
2	CLT torque limit output
3	S-RDY servo ready output

4.2.1 Position control

In position control mode(Pn041＝0), servo drive make driving servo motor run according to position reference given by host controller. It is required to select optimal style from varies styles according to requirements of host control device.

■ Pulse input

Host device controls the rotation speed and position of servo system by sending a series of pulse trains.

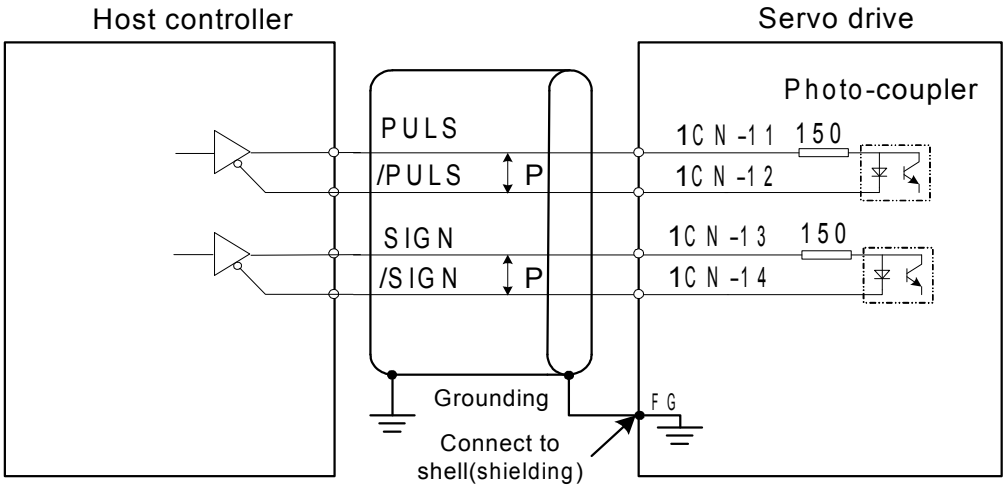


Host control device may give three types of pulse reference as follows:

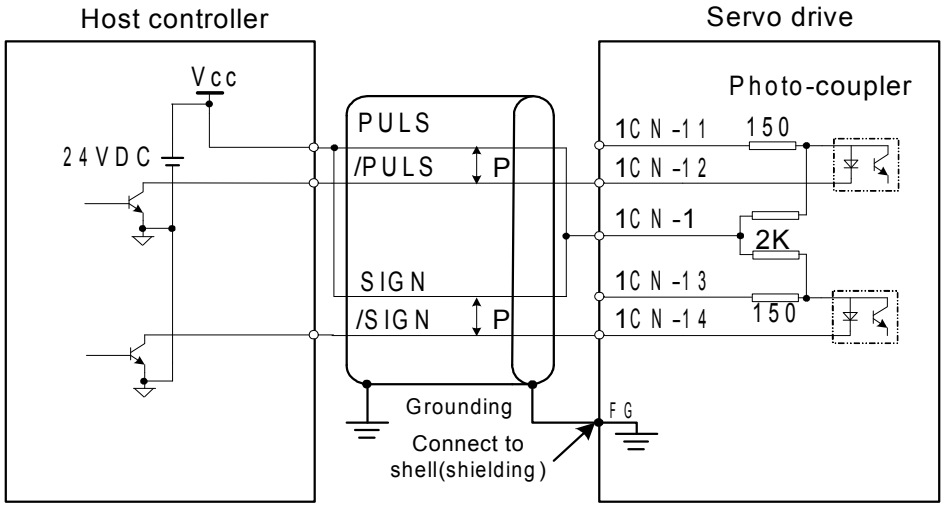
- linear driving output
- +24V open collector output
- +12V and +5V open collector output

Connection example 1（when host controller is linear driving output）

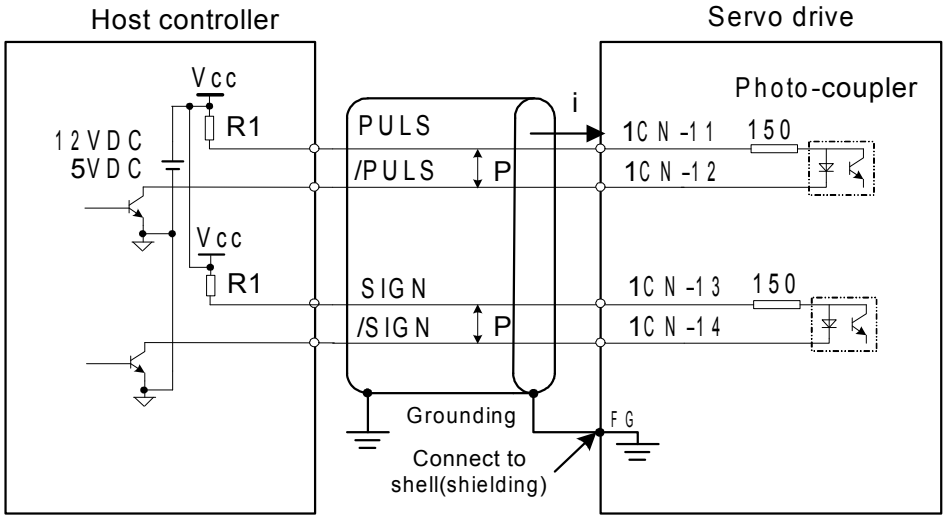
Applicable linear drives（T1 company AM26LS3, SN75174 or MC3487 and other substitutes.）



Example 2（When host device is open collector output subject to 24VDC signal power）



Example 3（When host device is open collector output subject to 12VDC or 5VDC signal power）



The right current limiting resistor R1 should be used according to current requirements（i ＝ 10~15mA）:

When Vcc is 12V, R1=560~820Ω

When Vcc is 5V, R1=82~200Ω

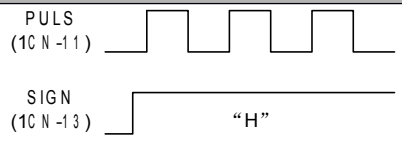
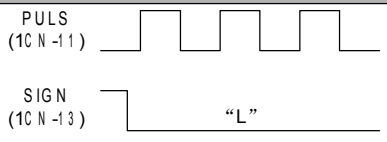
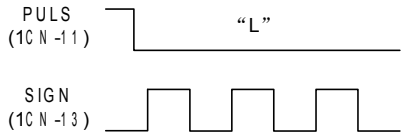
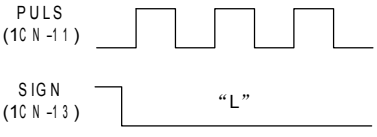
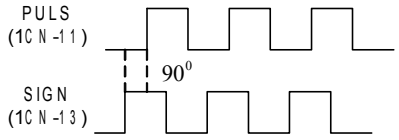
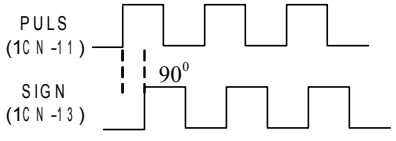
■ Select reference pulse mode

→input PULS 1CN-11	input reference pulse
→input /PULS 1CN-12	input reference pulse
→input SIGN 1CN-13	input reference sign
→input /SIGN 1CN-14	input reference sign

Use parameter “Pn008, Pn009” to select “ reference pulse mode”

Parameter	Code	Comments	Unit	Range	Default
Pn008	--	input pulse mode: [0]SIGN + pulse [1]CW+CCW [2]A+B（perpendicular × 4）	--	0~2	0
Pn009	--	Inverts input pulse [0]:does not invert pulse reference [1]:inverts pulse reference	--	0~1	0

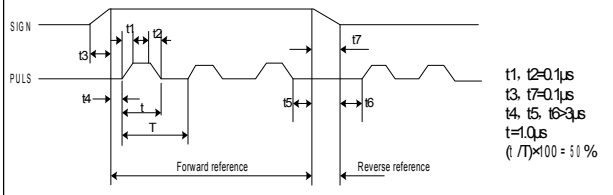
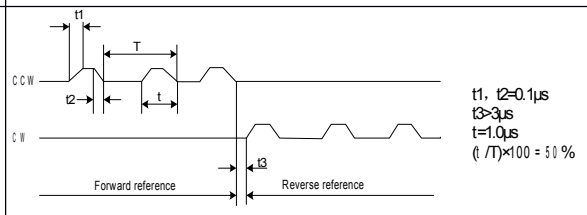
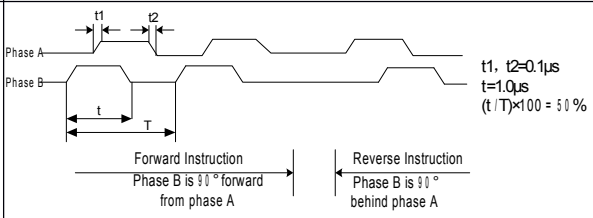
Following are available reference pulse styles, please make the setting according to specification of host controller.

Pn008	Reference style	servomotor forward run reference	servomotor reverse run reference
0	Sign + pulse train		
1	CW pulse + CCW pulse		
2	2 phase perpendicular pulse		

User may select to invert input signal or not by setting Pn009 according to actual requirements.

■ Pulse input sequence

Input of pulse reference must meet following conditions on level and sequence.

Pulse form	Electrical specification	Remark
SIGN+PULS Max. frequency: 500kpps (Open Collector :200kpps)		SIGN H=Forward L=Reverse
CW+CCW Max. frequency：500kpps (Open Collector :200kpps)		
90°phase different signal (A+B) Max. frequency: ×4 multiplier :200kpps		

■ Clear error counter

Follow the steps below to clear "Error counter".

→input CLR 1CN-7	Clear error counter input

When CLR signal is Low level, error counter is cleared.

Way to clear error counter:

- Servo drive's internal error counter is zero(0).
- This signal means "power level active", it's required to retain some time before the signal takes effect. The signal has to be canceled after pulse is cleared, otherwise, the counter is always in the zero Clear status, which will result in no action of servo position loop.

In position control mode, some pulse will remain in error counter when servo is OFF. Therefore, the error counter has to be cleared immediately after servo is re-enabled. With Pn005 setting, pulse signal of error counter can be cleared automatically when servo is OFF.

Parameter No.	Name and comments	Setting range	Default
Pn005	0:When S-OFF, clear error counter 1:When S-OFF, does not clear error counter	0~1	0

■ position reference 1st filter time

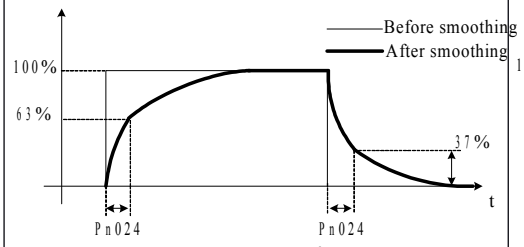
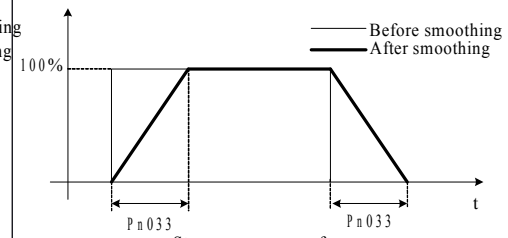
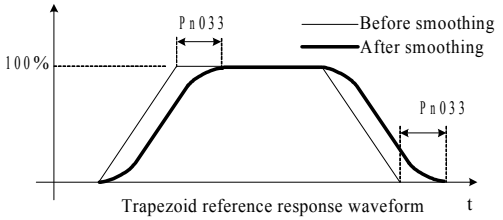
- position reference 1st filter can improve system's respond smoothness to given reference pulse.
- If reference input is comparatively rough, the dividing frequency multiplication is set too large or frequency of pulse input is low, which can implement more smoothly controlling of servo system.
- If position reference 1st filter time constant（that is Pn024）is set too large, servo system's dynamic performance will be depressed.

Parameter No.	Name	Unit	Setting range	Default
Pn024	position reference 1st filter time constant	ms	0~1000	0

■ position reference smoothing filter time

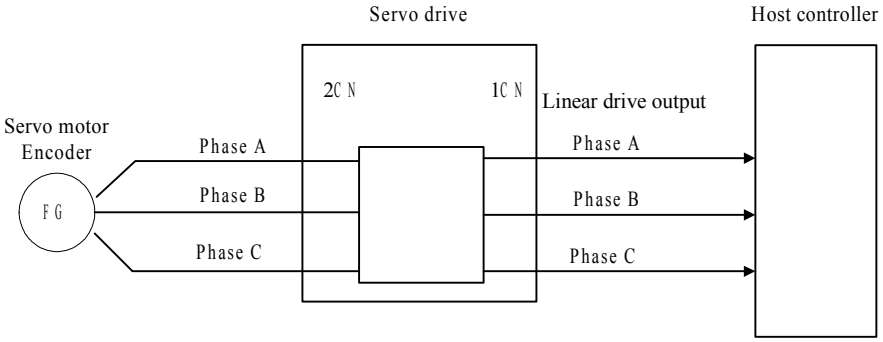
Parameter No.	Name	Unit	Setting range	Default
Pn033	position reference smoothing filter time constant	ms	0~1000	0

Different result between positioning after change.

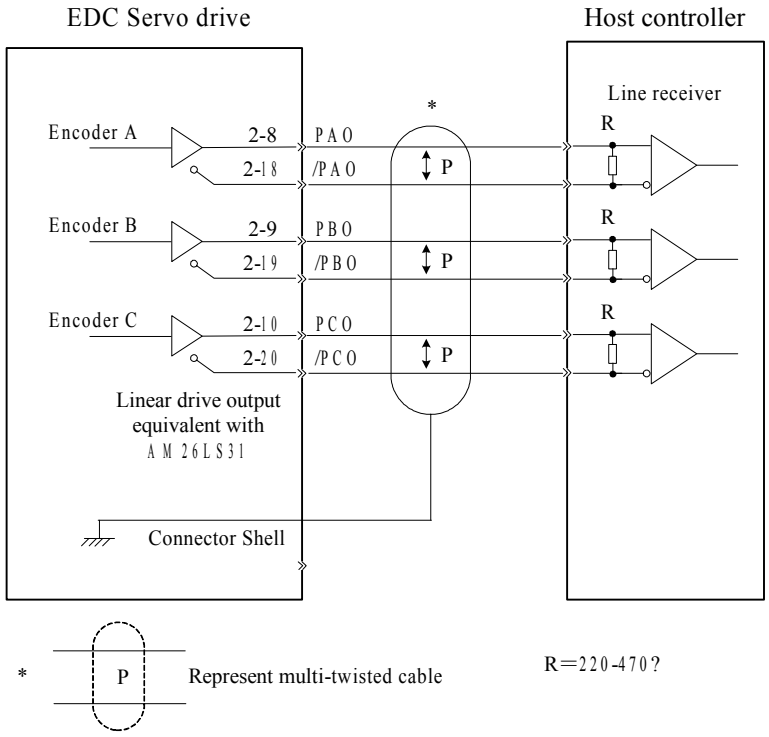
position reference 1st filter time（Pn024）	position reference smoothing filter time （Pn033）
 Step response waveform	 Step response waveform
	 Trapezoid reference response waveform

4.2.2 Encoder signal output

EDC servo drive outputs pulse signal of encoder A/B/C, which facilitate using of host controller.



Output circuit is bus drive output. Make circuit connection with reference to following circuit.



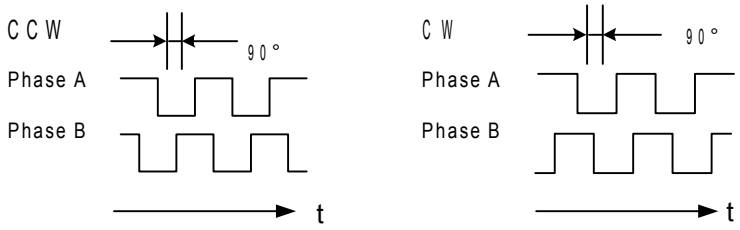
■ Output signal

Output encoder signal after frequency is divided.

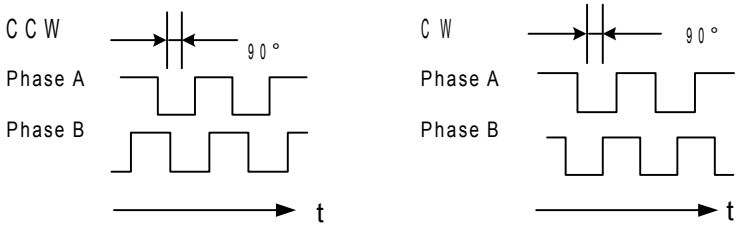
Output → PAO 1CN- 8 Output → /PAO 1CN- 18	A phase pulse differential Output
Output → PBO 1CN- 9 Output → /PBO 1CN- 19	B phase pulse differential Output
Output → PCO 1CN- 10 Output → /PCO 1CN- 20	C phase pulse differential Output

The following illustration shows the style of perpendicular pulse output of Phase A and Phase B .

Parameter Pn011=0：



Parameter Pn011=1：

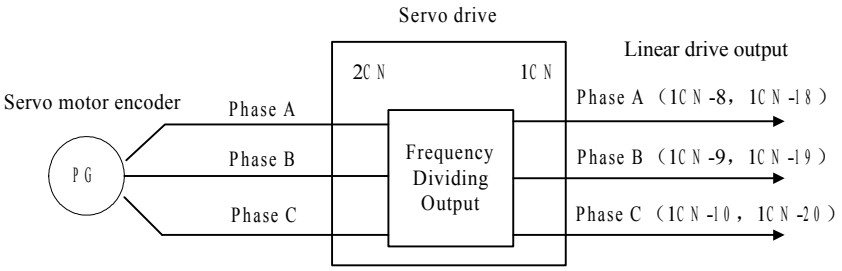


■ Set pulse dividing frequency ratio

Set pulse dividing frequency ratio with following parameters.

Parameter	Meaning	Unit	Range	Default
Pn010	Set PG dividing frequency ratio	2500P/R	1~2500	2500
Pn011	Inverts dividing frequency output phase		0~1	0

Set output pulse numbers of PG output signal（PAO,/PAO,PBO,/PBO）which is transmitted outward subject to servomotor runs for one revolution.



Divide pulse frequency of servomotor encoder(PG) and output according to pulse number setting.

Setting value means the individual output of pulse numbers for PAO, /PAO, PBO and /PBO signal when servomotor runs for one revolution. If Pn010 is set as 1000, it means output of PAO signal is 1000 pulses subject to motor runs for one revolution, so do the /PAO, PBO and /PBO signal output.

Please make setting according to machine and reference unit of controller.

Note:

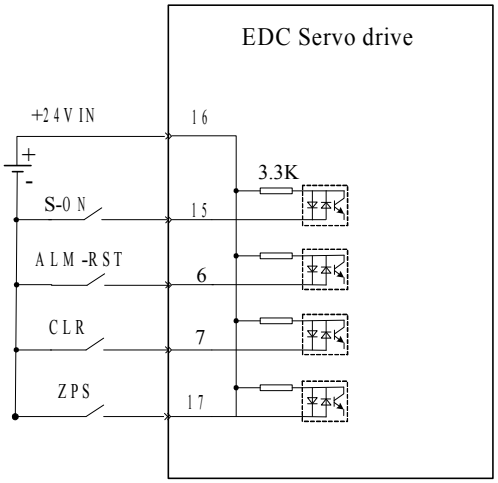
- After parameter changing, turn power OFF and then turn power ON again.

4.2.3 Sequence I/O signal

To control sequence input and output signal of servo drive's movement , please connect according to demand.

■ Connect sequence input signal

Following illustration shows how to connect sequence input signal.

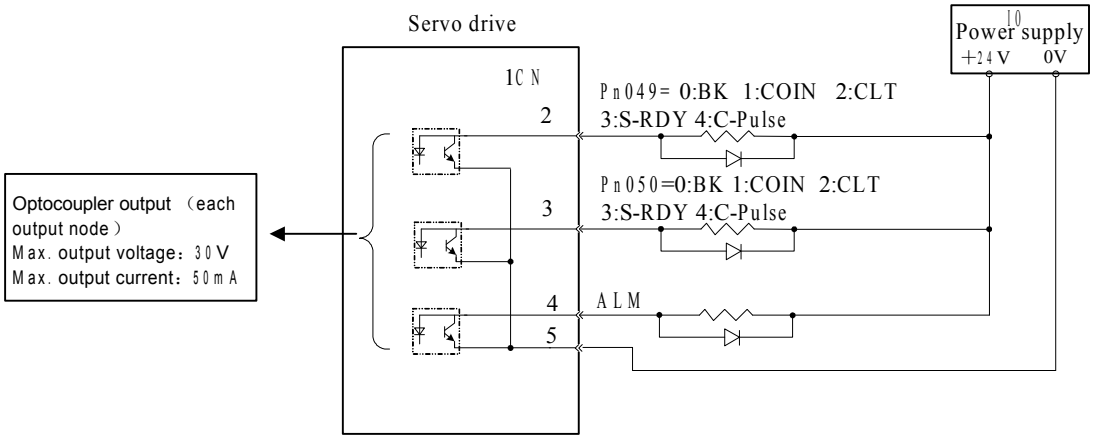


Notes:

- 24V I/O power supply is required, since there is no internal power supply servo drive.
- External power supply specification: DC24V±1V, 500mA higher.
- It's suggested that input circuit and output circuit use the same power supply.
- Voltage range of input circuit is +11V~+25V. If power voltage is low and mechanical joints like relay is used , micro current switch or relay are required to avoid bad contact.
  Always check and confirm the electrical specification of the relay or relevant parts before starting to use.

input +24VIN 1CN- 9	External I/O power input

■ Connect contact point of output signal



■ Handling I/O signal

Input signal is smoothed with filter and then received by servo drive. Set filter time with parameter Pn053. Active power level of input signal is controlled by Pn054, and active power level of output signal is controlled by Pn055.

Following signals are I/O signals subject to default parameters.

Para. no.	Name and meaning	Unit	Setting range	Default
Pn053	input signal filter time	ms	0~1000	100
Pn054	Inverts input signal	—	0~63	0
Pn055	Inverts output signal	—	0~7	0

During filter time of input signal, if signal jump occurs, input signal will not be received by servo drive. Input signal will be received by drive only after it keeps stable for the set time, that is, signal needs to keep on constant level within period of Pn053 before it can be accepted by servo drive. Drive estimates signal validity according to Pn054.

Following table shows operations to invert input signal（Pn054）.

Digit	BIT3				BIT2				BIT1				BIT0			
input signal	ZPS				CLR				ALM-RST				S-ON			
Signal level	H		L		H		L		H		L		H		L	
Pn054	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
Signal active	N	Y	Y	N	N	Y	Y	N	N	Y	Y	N	N	Y	Y	N

In above table,

"H": it means input signal is at high level.

"L": input signal is at low level.

"0": setting value in Pn054. "0" means input signal low is active.

"1": setting value in Pn054. "1" means input signal high is active.

“N”：input signal is inactive.

“Y”：input signal is active.

For example: if CLR at high level and all the rest of signals at low level are required to be active, then it is expressed as 000100 in binary system, it will be 4 if converted into decimal system, that is, Pn054 must be set as 4.

Take similar operation steps to set Output signal.

Digit	BIT2				BIT1				BIT0			
Output Meaning	BRK				COIN				ALM			
Signal meaning	Release braking		braking		arrive		Not arrive		alarm		No alarm	
Pn055	0	1	0	1	0	1	0	1	0	1	0	1
Output Level	low	high	high	low	low	high	high	low	high	low	low	high

Note: When ALM is in normal status, Output level is high, inverts other two signal.

For example:

If output level is required to meet following conditions:

- high when braking signal releases braking
- low when COIN signal is active
- ALM output is high when alarm occurs

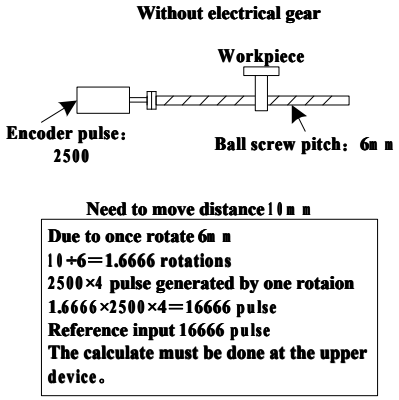
then it will be expressed as 100 in binary system, if it is converted into decimal system it would be 4, that is, Pn055 should be set as 4.

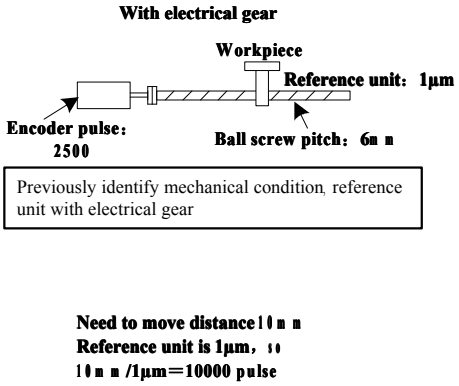
Note：

· The validity of I/O signals mentioned in this manual are all refering to normal situation, that is, active when input signal is at low level, active when BRK、COIN output is at low level, ALM output is at high level.

4.2.4 Electronic gear

With “Electronic gear” function, workpiece movement which is equivalent to input reference pulse can be set to any value. Host controller that sends reference pulse can implement control operation with no need to care for mechanical gear ratio and pulse number of encoder, so control calculation becomes easier.





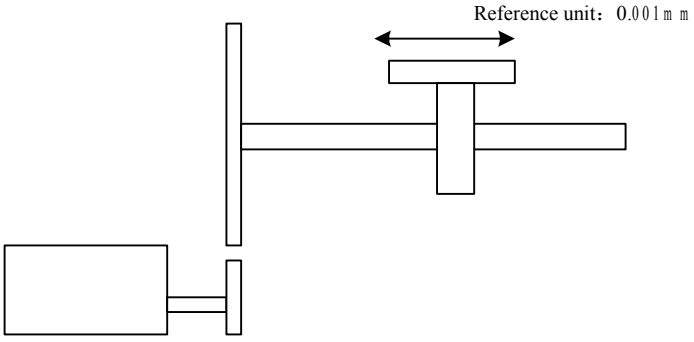
■ Way to set electronic gear

Take following steps to calculate electronic gear ratio（B/A）, and its value is set in Pn022 and Pn023 of user parameter.

1. Mechanical forms related to electronic gear
   · gear ratio
   · ball bearing screw pitch
   · pulley radius
2. Encoder pulse number of servo motor
3. Equivalent pulse (reference unit)

Reference unit refers to the unit of minimum moving distance required by load or the minimum
reference unit of host controller.

Reference move the workpiece by 0.001mm unit

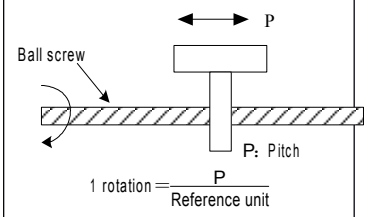
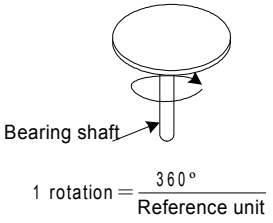
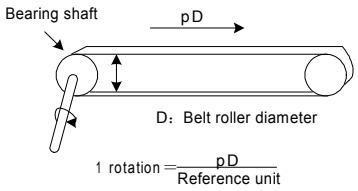


Please decide the reference unit by mechanical form and position precision

For example, reference unit can be 0.01mm, 0.001mm, 0.1°, 0.01 inch, reference of input one pulse, the distance or angle of moving a pulse equivalent.
If pulse equivalent is 1um, input reference pulse 50000, then moving distance will be 50000×1um=50mm

4. With pulse equivalent, load moving distance is calculated subject to load shaft revolves for one revolution.
Moving distance of load (reference unit)= Moving distance of load / pulse equivalent.

If ball bearing screw pitch is 5mm, pulse equivalent is 0.001mm,
5mm/0.001mm = 5000（reference unit）

Ball screw	Rotation table	Belt pulley
		

5. Solve for electronic gear ratio(B/A)
Gear ratio of motor shaft and load shaft is n/m. （Motor revolves for m revolutions, load shaft revolves for n revolutions.
Electronic gear ratio（B/A）= [(encoder pulse number × 4) / moving distance when load shaft finishes one revolution] ×（m/n）
It's suggested the electronic gear set within following range:

0.01≤electronic gear ratio（B/A）≤100

6. Set parameter
Make reduction of（B/A） to get A and B, and select most proximal whole number which is lower than 32767.

Thus, setting of electronic gear ratio is completed.

Parameter	Name	Unit	Range	Default
Pn022	electronic gear B（numerator）	--	1~32767	1
Pn023	electronic gear A（denominator）	--	1~32767	1

Electronic gear ratio（B/A）= Pn022 / Pn023
·B =“Encoder pulse number × 4”×“rotation speed of motor shaft”
·A = reference pulse number of each unit (load movement when load shaft finishes one revolution) ×“ rotation speed of load shaft

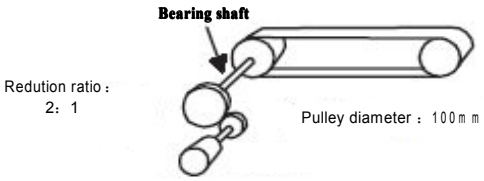
■ Setting example of electronic gear

The following illustrations show the settings for varies kinds of mechanical structures.

Belt + Pulley

Reference unit：0.2mm

Load movement amount of bearing shaft ' s one round rotation $=\frac{3.14\times100mm}{0.2mm}=15700$



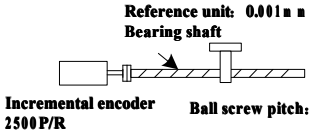
Electrical gear ratio $\left(=\frac{B}{A}\right)=\frac{2500\times4\times2}{15700\times1}=\frac{Pn022}{Pn023}=\frac{200}{157}$

Incremental encoder：2500P/R

Setting value	Pn022	200
	Pn023	157

Ball screw

Load movement amount of bearing shaft one round rotation $=\frac{6mm}{0.001mm}=6000$

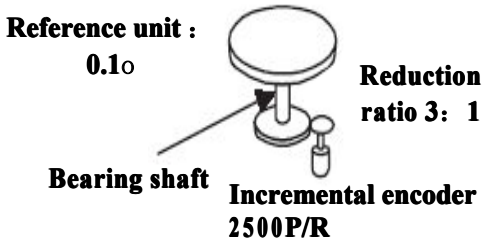


Electrical gear ratio $\left(=\frac{B}{A}\right)=\frac{2500\times4\times1}{6000}=\frac{Pn022}{Pn023}$

Setting value	Pn022	5
	Pn023	3

Platform

Load movement amount of bearing shaft one round rotaion $=\frac{360°}{0.1°}=3600$



Electrical gear ratio $\left(=\frac{B}{A}\right)=\frac{2500\times4\times3}{3600}=\frac{Pn022}{Pn023}$

Setting value	Pn022	75
	Pn023	9

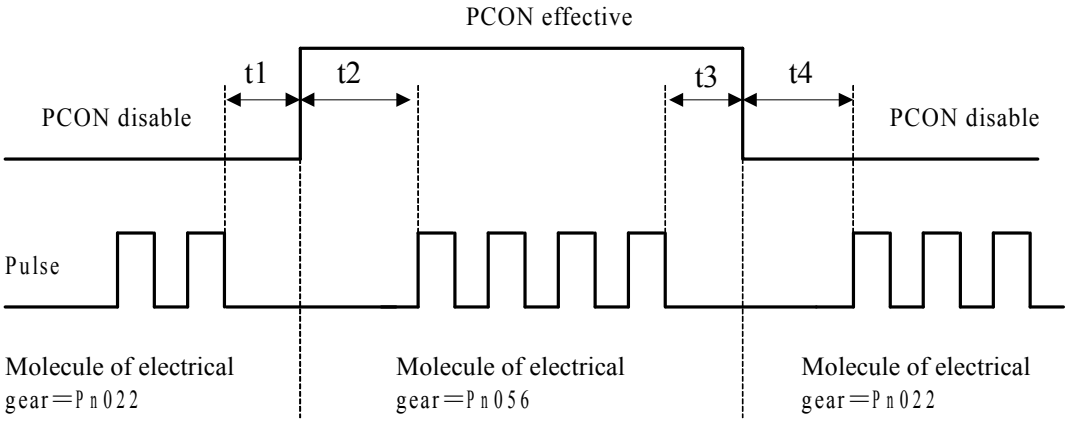
■ Dynamic electronic gear

If system pulse frequency is low and only one electronic gear is used, it's hard to give consideration to both processing efficiency and position resolution. Therefore, EDC servo has a second electronic gear numerator, and both can be switched dynamically.

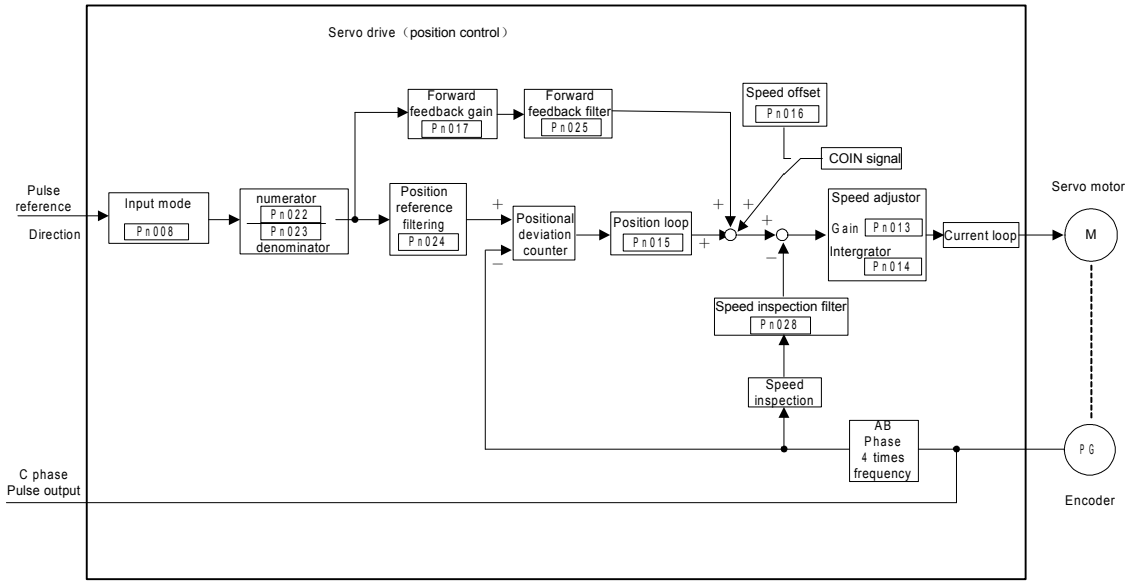
In position control mode (Pn041=0), after 2nd electronic gear is enabled（Pn056=1）, dynamic electronic gear becomes active. Switching electronic gear requires PCON signal (input signal select Pn051's bit1＝1）.

It's better to switch electronic gear without any pulse input, otherwise pulse loss may occur. Since electronic gear will not switch until there's no pulse input within 1ms. Numerator of electronic gear after switching is the value of Pn056.

The sequence is as shown below.



■ Position control diagram



4.2.5 Position contact control

Reference of position control（control modeparameterPn041＝0） comes from pulse input of host controller. Reference of internal speed control (control mode Pn041 ＝1） comes from internal parameter value（Pn080～Pn095）of servo drive.

Parameter （ Pn080, Pn081 ） ～(Pn094, Pn095) are the internal eight groups of position reference register. Programming method can be defined according to Pn070. There are two method: (a) incremental; (b)absolute. It can also co-operate with external I/O(1CN-7 input as PCON signal).

■ Setting of position contact control

1. Set Pn041=1（internal speed control）;
2. Select cycle run or not, whether PCON is used as step change signal or not, programming method, start and stop point of program, etc.

Para. No.	Name and meanings	Setting range	Default	Other
Pn068	Select cycle run [0] multiple cycle run [1] multiple single run	0～1	0	
Pn069	Enable/Disable PCON signal as step change signal [0] delay step change [1]PCON signal step change	0～1	0	When PCON signal is used as step change: 1. Set Pn051 or Pn052 as 2 2.PCON active is generated at the edge of input signal from inactive to active.
Pn070	Programming method [0] incremental [1] absolute	0～1	0	
Pn072	Start point of program	0～7	0	Which of the 8 groups of position data is used as start point.
Pn073	Stop point of program	0～7	1	Which of the 8 groups of position data is used as stop point.

3. Required moving distance of motor is calculated according to actual moving distance, then moving distance data is filled in each contact position register.

Para. No	Name and meanings	Unit	Setting range	Default
Pn080	moving distance 0 revolution	10^4 reference pulse	-30000~30000	0
Pn081	moving distance 0	1 reference pulse	-9999~9999	0
Pn082	moving distance 1 revolution	10^4 reference pulse	-30000~30000	0
Pn083	moving distance 1 low	1 reference pulse	-9999~9999	0
Pn084	moving distance 2 revolutions	10^4 reference pulse	-30000~30000	0
Pn085	moving distance 2 low	1 reference pulse	-9999~9999	0
Pn086	moving distance 3 revolutions	10^4 reference pulse	-30000~30000	0
Pn087	moving distance 3 low	1 reference pulse	-9999~9999	0
Pn088	moving distance 4 revolutions	10^4 reference pulse	-30000~30000	0
Pn089	moving distance 4 low	1 reference pulse	-9999~9999	0
Pn090	moving distance 5 revolutions	10^4 reference pulse	-30000~30000	0
Pn091	moving distance 5 low	1 reference pulse	-9999~9999	0
Pn092	moving distance 6 revolutions	10^4 reference pulse	-30000~30000	0
Pn093	moving distance 6 low	1 reference pulse	-9999~9999	0
Pn094	moving distance 7 revolutions	10^4 reference pulse	-30000~30000	0

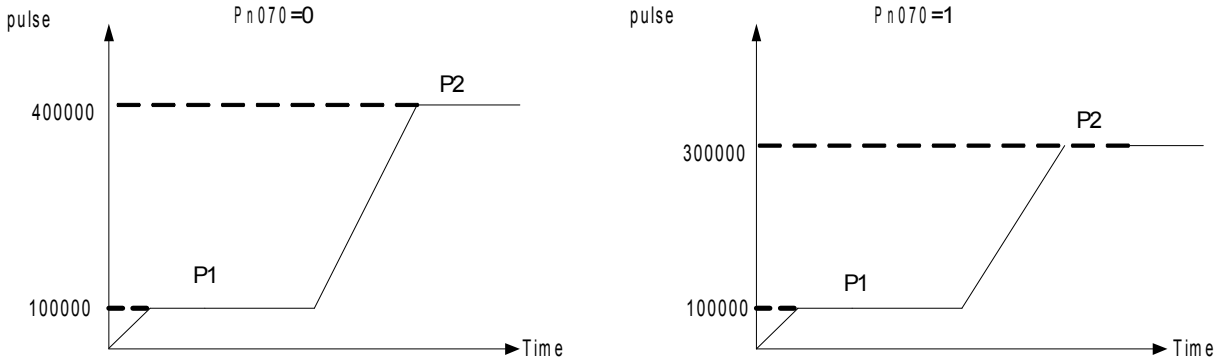
Set parameters like run speed, acceleration/deceleration time, stop time, and so on according to field working situation.

Para. No.	Name and meanings	Unit	Setting range	Default
Pn096	moving distance 0 speed	r/min	0~3000	500
Pn097	moving distance 1 speed	r/min	0~3000	500
Pn098	moving distance 2 speed	r/min	0~3000	500
Pn099	moving distance 3 speed	r/min	0~3000	500
Pn100	moving distance 4 speed	r/min	0~3000	500
Pn101	moving distance 5 speed	r/min	0~3000	500
Pn102	moving distance 6 speed	r/min	0~3000	500
Pn103	moving distance 7 speed	r/min	0~3000	500
Pn104	moving distance 0 first(1st) acceleration/deceleration time constant	ms	0~32767	0
Pn105	moving distance 1 first(1st) acceleration/deceleration time constant	ms	0~32767	0
Pn106	moving distance 2 first(1st) acceleration/deceleration time constant	ms	0~32767	0
Pn107	moving distance 3 first(1st) acceleration/deceleration time constant	ms	0~32767	0
Pn108	moving distance 4 first(1st) acceleration/deceleration time constant	ms	0~32767	0
Pn109	moving distance 5 first(1st) acceleration/deceleration time constant	ms	0~32767	0
Pn110	moving distance 6 first(1st) acceleration/deceleration time constant	ms	0~32767	0
Pn111	moving distance 7 first(1st) acceleration/deceleration time constant	ms	0~32767	0
Pn112	moving distance 0 stop time	50ms	0~30000	10
Pn113	moving distance 1 stop time	50ms	0~30000	10
Pn114	moving distance 2 stop time	50ms	0~30000	10
Pn115	moving distance 3 stop time	50ms	0~30000	10
Pn116	moving distance 4 stop time	50ms	0~30000	10
Pn117	moving distance 5 stop time	50ms	0~30000	10
Pn118	moving distance 6 stop time	50ms	0~30000	10
Pn119	moving distance 7 stop time	50ms	0~30000	10

4. After Servo ON, position contact runs.

Position contact control is like single contact position controller, user can make cycle run operation easily with this function.

As for Pn070, for example, position reference P0(Pn080×10000+Pn081) is ten revolutions, position reference P1（Pn082×10000+Pn083）is thirty revolutions, when running from P1 to P2, the difference between incremental type and absolute type is as below:



Note:
1. In position contact control mode, electronic gear does not work, which can be regarded as the electronic gear ratio is always 1：1.
2. In position contact control mode, all the position control parameters will affect motor running, such as position proportional gain Pn015, feed forward Pn017, position first filter Pn024, feed forward filter Pn025, etc.

4.2.6 Zero adjustment

In position control mode, servomotor is often required to run at a fixed position, this position is normally regarded as Zero position. Some times, after host controller is engergized, zero position adjustment is required before processing operation. After that, this position will be regarded as the reference point for every subsequent running. The zero position adjustment can be done with servo drive.

■ Parameter setting for zero adjustment

1.Select zero adjustment according to practical application.

Para. no.	Name and meanings	Unit	Setting range	Default
Pn071	Return method of origin Z Y X Z=0：disable origin return function Z=1：origin return starts automatically only after first S-ON Z=2 ： origin return starts automatically every time S-ON Y=0 ： search Pulse C after origin has returned Y=1：does not search Pulse C after origin has returned X=0 ： origin returns at forward run direction X=1：origin returns at reverse run direction	—	0～211	0

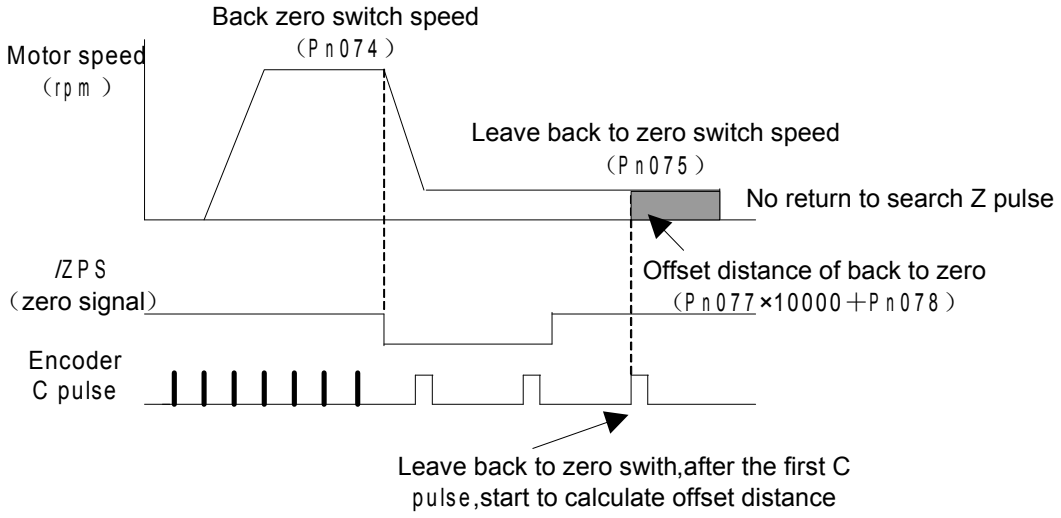
2. Set zero adjustment speed

Para. No.	Name and meanings	Unit	setting range	Default
Pn074	Speed 1 during reference searching（hit position limit switch）	r/min	0~3000	1000
Pn075	Speed 3 during reference searching(after releasing position limit switch)	r/min	0~3000	5
Pn077	Origin return offset revolution	10000 pulse	9999	0
Pn078	Origin return offset pulse number	1 pulse	9999	0

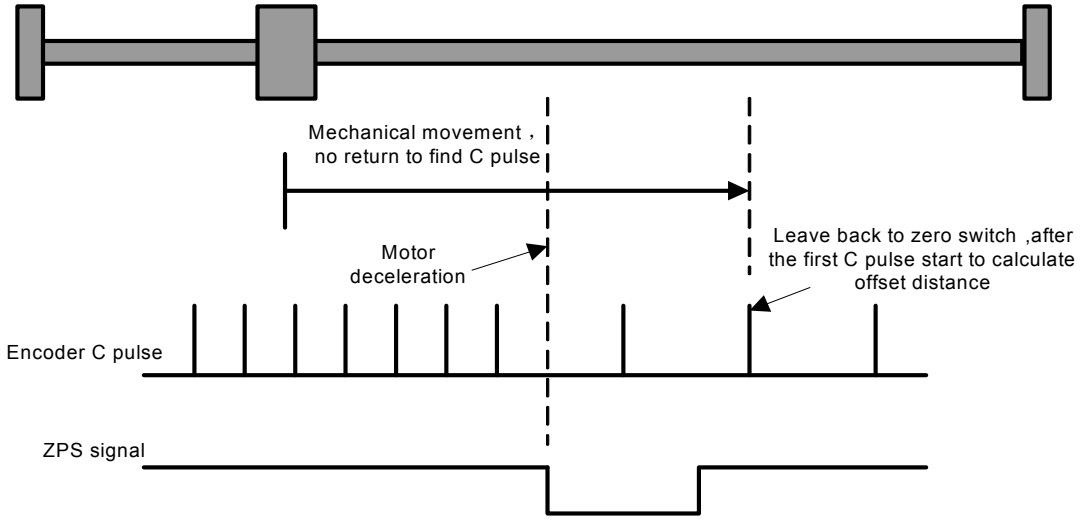
3. Comments

When zero adjustment method is selected according to practical requirements(set Pn071), zero adjustment will be implemented according to setting.

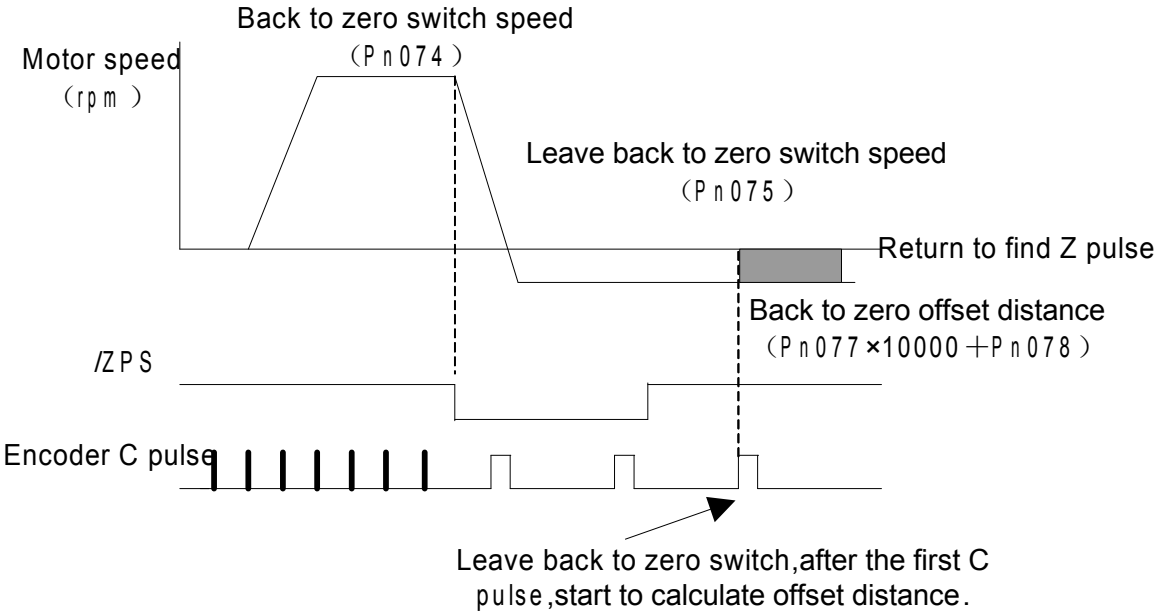
When zero adjustment is started, servomotor will run at the set speed of Pn074.
When ZPS(1CN-17) signal is active, if the parameter setting requires the servo motor to return and search Pulse C, then motor will run reverse at the set speed of Pn075, otherwise, motor will run forward at the set speed of Pn075.
When ZPS signal is inactive, after first Pulse of motor encoder is detected, calculation of zero balance offset pulse is started, motor stops after offset pulse completes. Zero adjustment operation is completed. Motor will not return and search Pulse C after it hits the zero adjustment position limit switch.



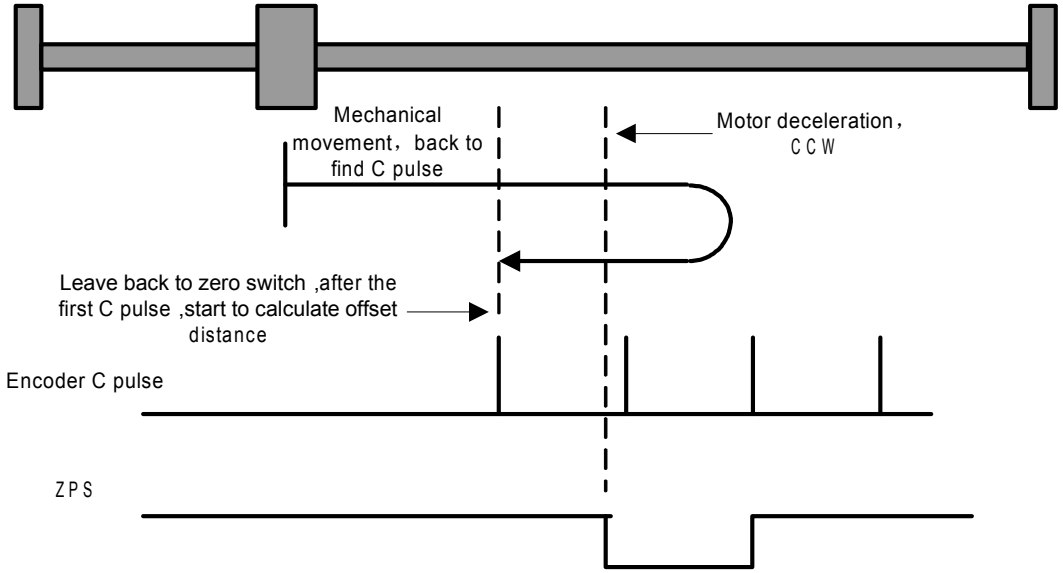
Corresponding position:



Return and search Pulse C after touching zero adjustment switch:

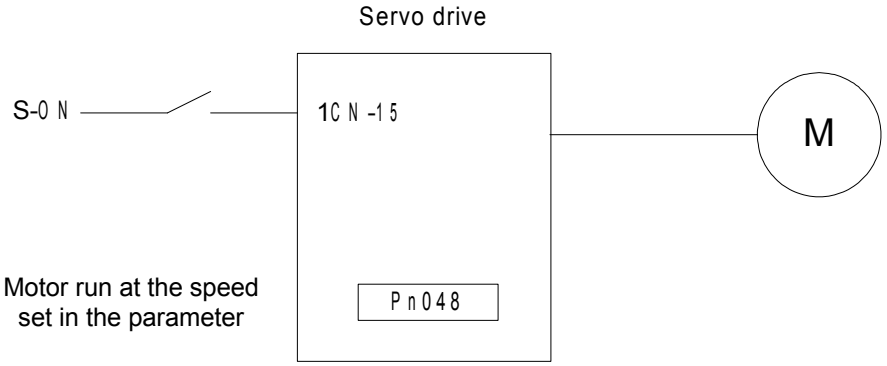


Corresponding position:



4.2.7 Parameter speed control

Being a simple way of speed control, user can preset the running speed as regulated value in "User Constant". When Servo is On, motor will run constantly at the preset speed. Speed change goes along with the value change in Pn048.



■ Set parameter speed

When using “parameter speed control”, take following steps to make the setting.

1. Set Pn041 properly to enable internal speed selection function.

Para. No.	Name and meanings	Setting range	Default	Application cases
Pn041	Control mode selection	0～2	0	Position control and speed control

In internal speed control mode, set Pn041 to 2.

Pn041	Comments
2	Run at regulated speed of Pn048

Note:

1:OFF（input signal is inactive）

0:ON（input signal is active）

2. Set Pn048 to wanted speed value.

Value of Pn048 can be changed manually or via communication, to make motor run at specified speed. If the speed is set over maximum rotation speed, then motor will run at maximum speed instead.

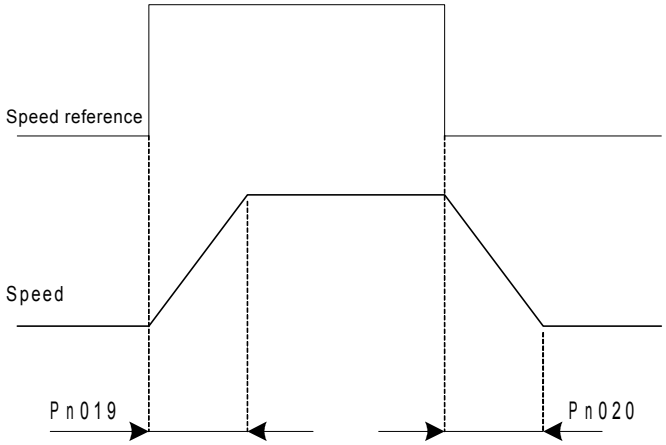
3. Set "soft start time"

Parameter number	Name and meaning	Unit	Setting range	Default
Pn019	Soft start acceleration time	ms	0~10000	100
Pn020	Soft start deceleration time	ms	0~10000	100
Pn021	S shape acceleration /deceleration time	ms	0~1000	0

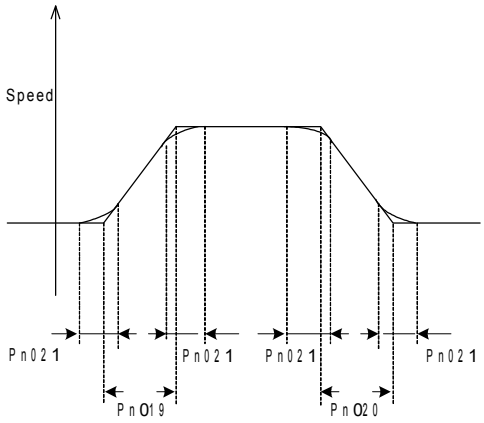
- Servo drive sets internal acceleration and deceleration time and implements control of speed acceleration and deceleration according to these parameters
- Soft start function is available when control mode is internal speed control, parameter speed control and JOG running. In position control mode，soft start function is unavailable.
- When input speed reference is stair stepping, smooth speed control can be implemented by setting "Soft start time". Normally speed control is set to 0.

Meaning of parameter is described below:

- Pn019：the period of time from stop status to a speed of 1000r/min
- Pn020：the period of time from the speed of 1000r/min to stop status



Pn019 and Pn020 are linear acceleration/deceleration time. In the event of rather large impact which may occur because linear acceleration/deceleration time are applied, Pn021 can be selected and set to get a smooth running.



4. Torque limit

Setting Pn026 and Pn027 to limit torque is available in any control mode.

Parameter number	Function	Unit	Setting range	Default
Pn026	forward run torque limit	1%	0～300	250
Pn027	reverse run torque limit	1%	0～300	250

Note:

1. System response may be slowed down if torque limit is set to an undersized value.

4.3 Servo drive settings

4.3.1 JOG speed

JOG speed control is enabled with PC communication or hand held operator.
Set JOG speed with Pn032.

Para. No.	Name and meanings	Unit	setting range	Default
Pn032	JOG speed	r/min	0~3000	500

Note:
1.No matter what value Pn041 is, or whether /S-ON is active or not, JOG running is always possible on the condition that cable connection of servomotor is correct and servo drive has no problem.
2.During JOG running, servo drive will ignore host controller's control signal and status of limit switch and property loss is easily caused due to improper operation. Therefore, JOG must be prohibited during normal production.

4.3.2 Control mode selection

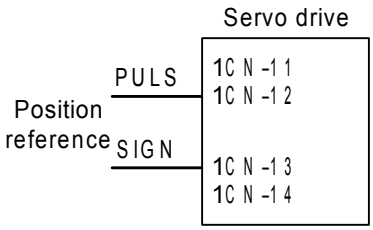
Control modes can be selected with parameter Pn041 as described below.

Para. No.	Description	Range	Default
Pn041	[0]position control [1]internal speed control [2]reference speed control	0～2	0

■ General information of above control methods are introduced as follows:

[0] position control（ pulse train reference）
Servo drive accepts pulse train generated by host controller and speed and positioning are behaving according to host control's demand.
[1] position contact control（internal position reference）
Enable speed control by contact reference. Please refer to 4.2.7“internal speed control” of the manual.
[2] parameter speed control（parameter reference）
Run at constant speed as specified in Pn048.

The following table shows the meaning of some input signals in different modes.

Pn041	Control modes	
0	position control（ pulse train reference） Normally, position control input reference refers to pulse train.	
1	Internal position control （internal position reference） No external input signal is required. Run according to value in internal position register.	
2	parameter speed control（parameter reference） Servo motor rotates according to speed and status specified in Pn048 setting.	

4.4 Stop function settings

4.4.1 Dynamic brake

Set the value of Pn004 to select stop mode of servo motor: DB braking or coast stop.
If dynamic brake is not used, motor stops naturally, with no brake, by using the friction resistance of the motor in operation.

Para. No.	Function	Range	Default
Pn004	Stop mode of servomotor when servo OFF or alarm occurs.	0～3	0

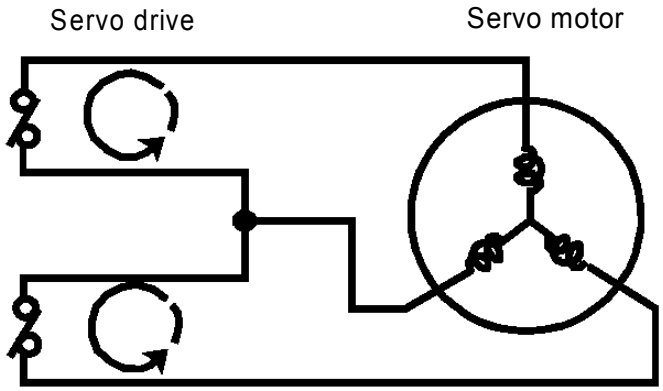
Para. No.	Description
Pn004	[0] When servo OFF or alarm occurs, DB braking active [1] When servo OFF or alarm occurs, coasts to a stop. [2] When servo OFF or alarm occurs, DB braking active and is released after motor stops [3] When servo OFF or alarm occurs, coasts to a stop, DB active after motor stops

In following situation, servo drive will switch off power supply of servo motor.

- When /S-ON（1CN-15）signal is OFF
- When servo alarm occurs
- When power supply is OFF

Note:
Dynamic brake(DB) forces servomotor to stop immediately upon emergency, therefore, following notes must be considered.
（1）Do not start/stop servomotor frequently with power On/OFF switch, this will cause fast aging and reduced performance of the internal elements in the servo drive.
（2）Do not start/stop servomotor frequently with /S-ON(1CN-15), otherwise built-in energy consumption resistor is damaged easily .

"**Dynamic brake（DB）**" is one way to force servomotor to stop immediately upon emergency. By shorting power cable of servo motor to achieve emergency stop of servo motor. This circuit is already built in EDC servo drive.

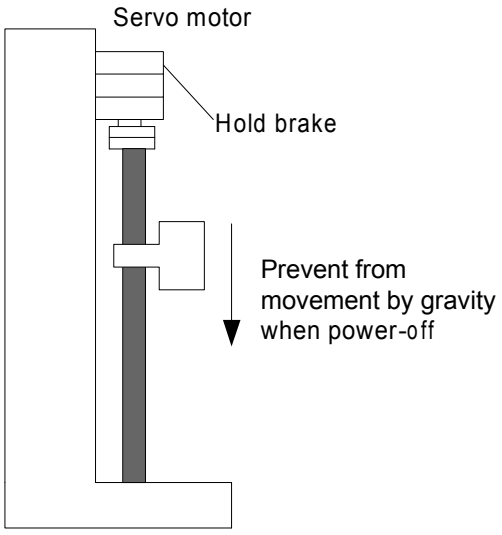


4.4.2 Holding brake

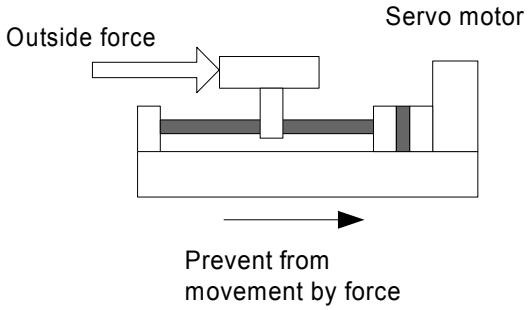
Servo motor with brake sticking(Holding brake) is required on the condition that perpendicular axis(the axis which withstands external force) is used, to prevent non-electrified servo motor from revolving around owing to action of the earth gravity.

The action of brake sticking is controlled by servomotor's brake interlock output signal (/BRK).

●Vertical axis



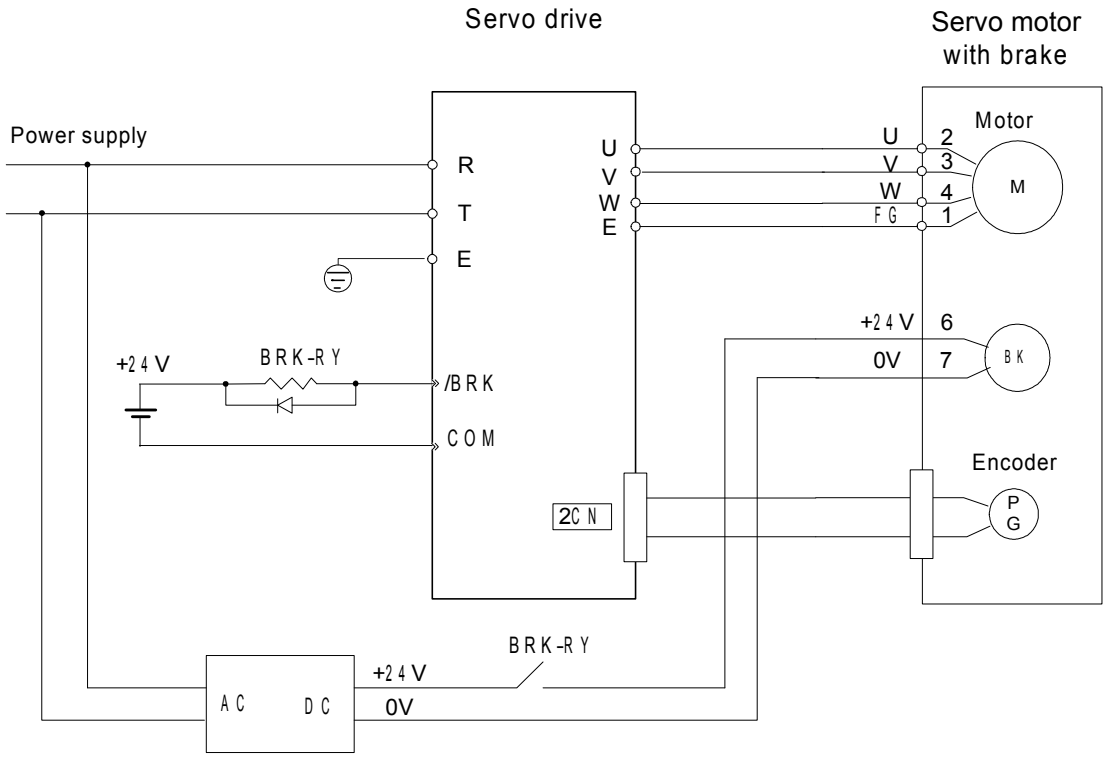
● Forced axis



Make sure servomotor is mechanically separated before confirming action of servomotor and brake sticking(holding brake) . If all the parts are moving well, connect servo motor to the machine.

■ Connection example

/BRK controls Power On/Off of brake sticking, which consists of the control circuit of holding brake. The illustration below shows a typical connection example.



BRK-RY：brake sticking control relay

→ Output /BRK	Brake interlock output	Speed control, position control

/BRK is used to control the status of brake sticking. When brake sticking is not used, the connection is not required.

ON：“L” level	Release brake
OFF：“H” level	Start brake

Note:

If power beak occurs, servo drive will give no output of /BRK signal, and periphery circuit decides the status of brake sticking, which has to be considered when designing and control circuit.

When using /BRK signal, set output with following parameters.

Para. No.	Name and meanings	Setting range	Default
Pn049	output signal1CN-2 pin definition	0~3	0
Pn050	output signal1CN-3 pin definition	0~3	1

Para. No.	Name and meanings	Setting range	Default
Pn055	Inverts output signal	0~7	0

Relevant parameters to Timing sequence are shown below.

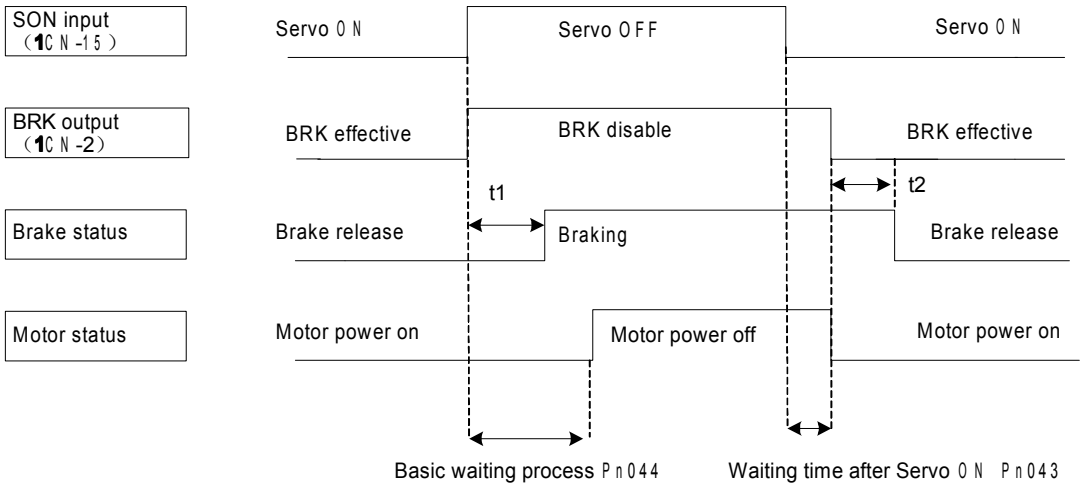
Para。 No.	Name and meanings	unit	Setting range	Default
Pn044	Basic waiting flow	ms	0~5000	10
Pn045	brake waiting speed	R/min	10～300	100
Pn046	brake waiting time	ms	10～1000	500

■ Brake ON/OFF time

During the moment of brake sticking on/off , if servomotor travels for tiny distance owing to external forces like earth gravity, adjust with Pn044 as below.

Para. No.	Name and meanings	Unit	setting range	Default
Pn044	Basic waiting flow （Servo OFF delay time）	ms	0~5000	10

The illustration below shows the timing sequence relation between signal /SON and BRK when motor stops (speed is lower than 30 r/m.)



t1,t2:determined by external relay and brake loop move time

By Default, /S-OFF works with /BRK output at the same time. If load travels for tiny distance owing to action of earth gravity, Pn044 is required to be set so that action of /S-OFF is delayed, normally this unwished movement can be removed.

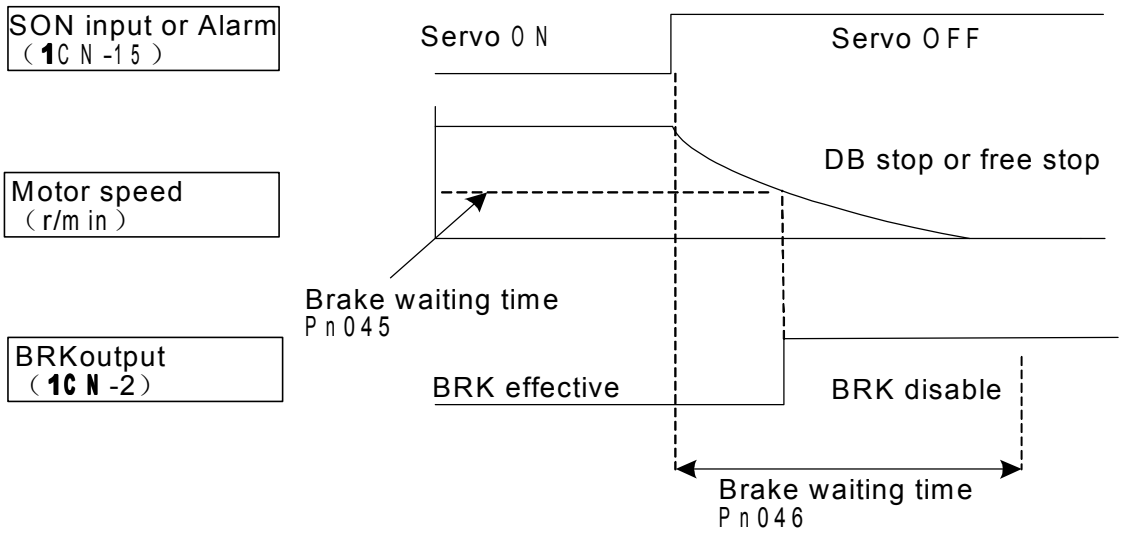
Note:
When alarm occurs, servo drive will switch off main circuit loop of servo motor immediately, meanwhile, machine may move for tiny distance.

■ Brake sticking setting

During motor running, movement setting of brake sticking is controlled by Pn045 and Pn046. By controlling brake sticking's movement timing sequence , brake sticking is started correctly after servomotor stops running.

Para. No.	Name and meanings	Unit	setting range	Default
Pn045	Brake waiting speed	r/min	10～300	100
Pn046	Brake waiting time	ms	10～1000	500

The illustration below shows the timing sequence relation between signal /SON and BRK when motor stops (speed is higher than 30 r/m.)



For a running brake sticking motor, if S-OFF is caused by variation of /S-ON or alarm occurrence , it's required to set brake waiting speed of servomotor or brake waiting time.

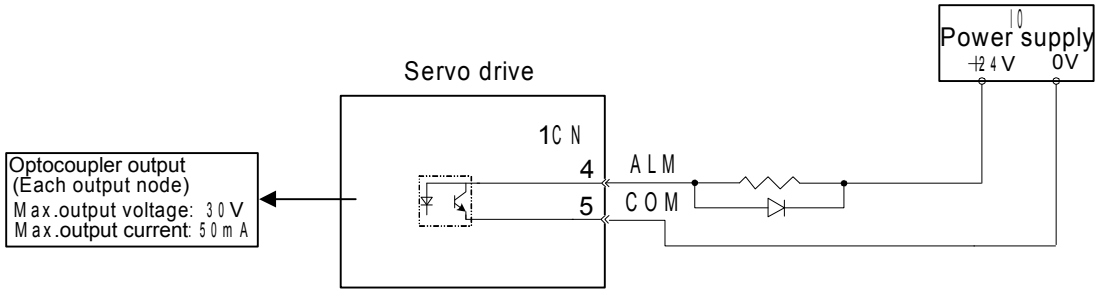
Brake waiting time(Pn046) refers to the period of time delay between motor stops(/S-OFF) and brake sticking takes action. This parameter should be adjusted while observing mechanical movements..

When servo motor is running, if any of following conditions is true, the output signal of /BRK will be ON.
1: After servo OFF, motor speed is lower than setting value of Pn045.
2: After servo OFF, motor speed is higher than setting value of Pn046.

4.5 Protection sequence design

4.5.1 Servo alarm output

The following diagram shows the right way to connect Alarm Output.



External +24V I/O power supply is required, since there is no +24V power supply available inside servo drive.

Output → ALM 1CN- 4	Servo alarm output
COM 1CN- 5	Servo alarm output uses grounding signal

Normally, the external circuit consists of /ALM should be able to switch off power of servo drive.

Signal	Status	Output level	Comments
ALM	ON	1CN-4："L" level	Normal state (output signal is high when alarm occurs)
	OFF	1CN-4："H" level	Alarm state (output signal is high when alarm occurs)

When "servo alarm(ALM)" happens, always remove alarm reasons first , and then turn the input signal "ALM-RST" to ON position to reset alarm status.

→ input ALM-RST 1CN- 6	alarm reset input

Signal	Status	Input level	Comments
ALM-RST	ON	1CN-6："L" level	Reset servo alarm
	OFF	1CN-6："H" level	Does not reset servo alarm

Normally, the external circuit can switch off power supply of servo drive when alarm occurs. When servo drive is re-switched on, it removes alarm automatically, so normally alarm reset signal is not required to be connected.

In addition, reading alarm information and alarm reset are enabled with hand-held operator.

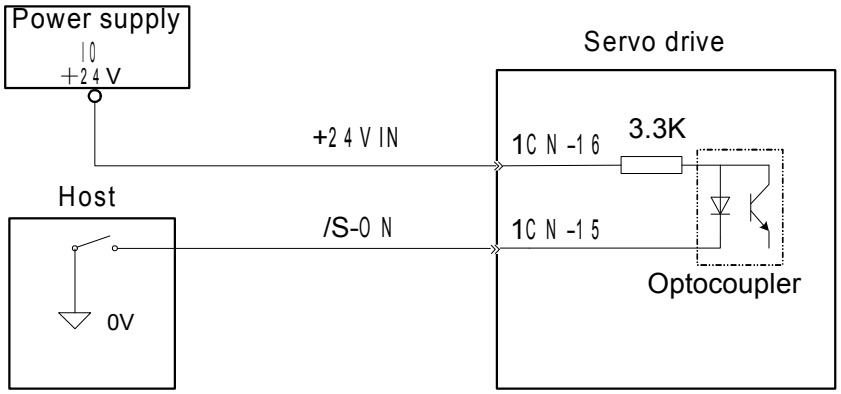
Note：
When alarm occurs， always remove alarm reasons before resetting alarms.

Note:
Only alarms with alarm number being 3,4,13,14,15 and 21 can be removed by /ALM-RST.

4.5.2 /S-ON input

Host controller is used to control enable or disable servo system.

Following illustration shows the way to connect /S-ON.



→ input /S-ON 1CN- 15	Servo On（ON）

Switch servomotor between Power on and Power off. When low level is active.

Signal	Status	input level	Comments
/S-ON	ON	1CN-15：“L” level	Servo ON, servo is energized(run servomotor according to input signal)
	OFF	1CN-15：“H” level	Servo OFF, servo is not energized(can't run)

Pn043 is used to set waiting time during Servo On, which means the period of time from internal relay's action to motor electrification.

Parameter number	Name and meanings	Unit	Setting range	Default
Pn043	Waiting time when servo On	ms	20~2000	100

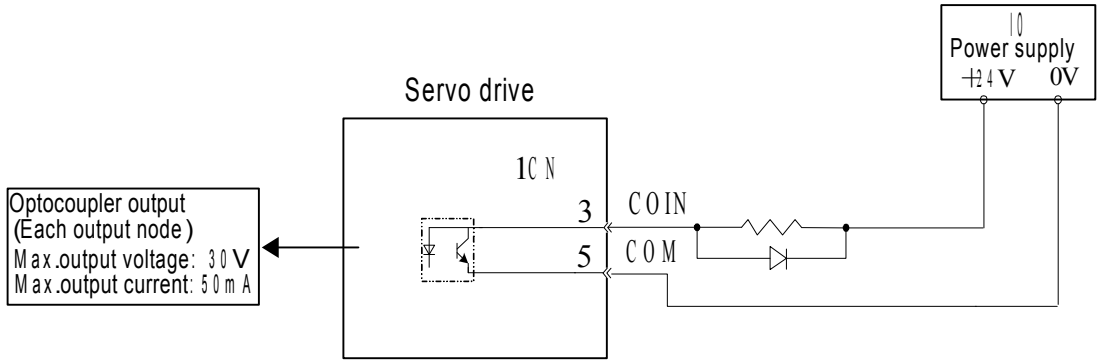
Note:
1. It's not good to start/stop servomotor frequently with “/S-ON” signal. Always use input reference to complete response operation, otherwise servo motor's lifetime will be shortened.
2. When “/S-ON” high is active, if external cable is disconnected, input signal is high, /S-ON will keep active.
3. During deceleration of Servo OFF, /S-ON signal is accepted only when motor speed is lower than 30r/m.

Switch "Enable/Disable" Servo On input signal with the following parameter.

Para. No.	Name and meanings	Unit	Setting range	Default
Pn000	[0] Enable Servo ON input signal（/S-ON） （Decided by 1CN-15 signal) [1] Disable Servo ON input signal（/S-ON） (internal Servo ON, normally is Servo ON, which is equivalent to 1CN-15 being active.)	—	0~1	0

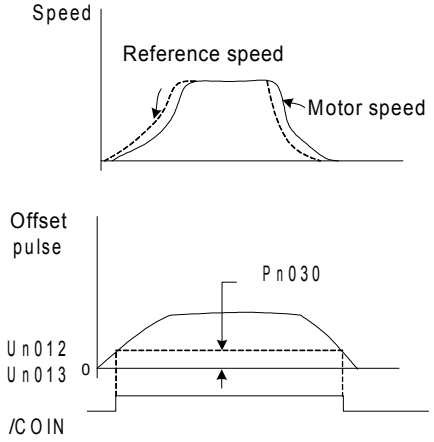
4.5.3 Positioning complete output

Positioning complete"/COIN" signal: output after positioning completes.
Make connection according to the following diagram.



Output → /COIN	Positioning complete Output	position control
Output → COM	Positioning complete Output grounding signal	position control

Host controller can judge if servo action is completed or not with /COIN.



Un012:error pulse counter low position monitoring
Un013:error pulse counter high position monitoring
When output is active at low level:

ON status	COIN: "L" level	Positioning has completed. (Position offset is lower than setting of Pn030.)
OFF status	COIN: "H" level	Positioning is not completed. (Position offset is lower than setting of Pn030.)

Set "In position error" to control output time of /COIN.

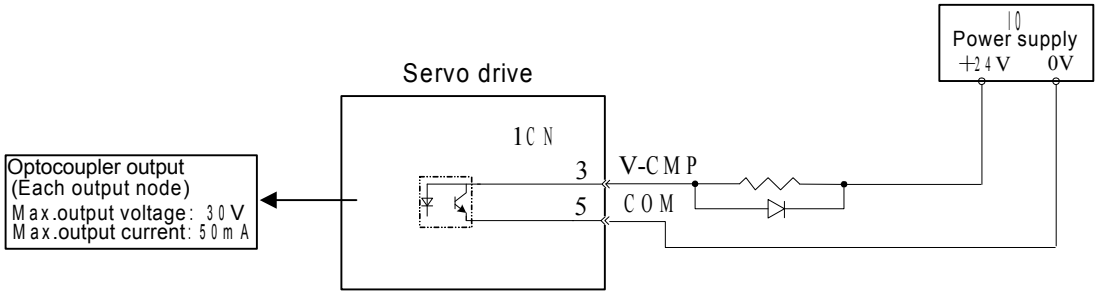
Parameter number	Function	Unit	setting range	Default	Using method
Pn030	In position error	reference unit	0～500	10	position control

Setting of In position error will not affect final accuracy of positioning.

By default, 1CN-3 is used as Positioning complete signal "/COIN" in position control mode, while in speed control mode it's used as the speed coincidence output"V-CMP".

4.5.4 Speed coincidence output

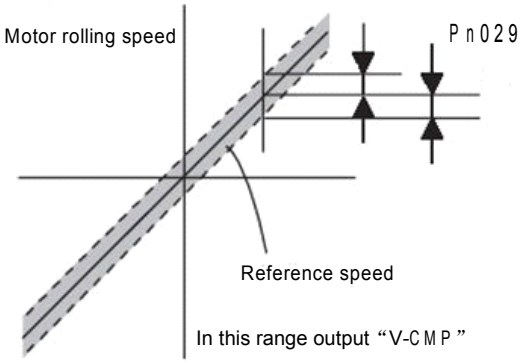
Speed coincidence Output（/V-CMP）signal: photocoupler output signal, referring to output is given when rotation speed of servo motor is the same as reference speed. It can be used as the base of host controller's judgment. Connect and use this signal according to the following diagram:



Output → /V-CMP+	speed coincidence output	Speed control
COM	speed coincidence output grounding signal	Speed control

It refers to output signal of input speed reference and speed coincidence of actual motor rotation. When output status at low is active:

ON status /V-CMP+ “L” level	Speed coincidence（ speed error is under setting value）
OFF status /V-CMP+ “H” level	Speed coincidence fail（ speed error is over setting value）



With the user's constant as below, the range of output /V-CMP can be designated.

Parameter number	Function	Unit	setting range	Default	Control method
Pn029	Speed coincidence eror	r/min	0～100	10	Speed control

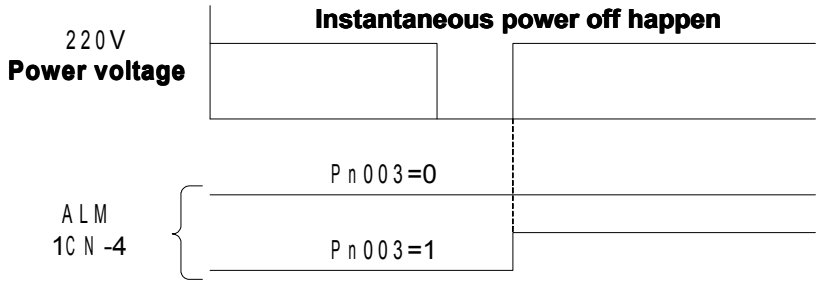
When difference between speed reference and actual motor speed is under setting value, output "/V-CMP" signal.

4.5.5 Handling instant power cut

Select if alarm output is made or not upon a sudden power interruption.

Parameter number	Name and meanings	Unit	setting range	Default
Pn003	Select operations to be made upon power interruption [0] gives no output of servo alarm signal（ALM） [1] Output servo alarm signal（ALM）	—	0~1	0

If power supply of servo drive is interrupted suddenly over 20ms and detected by servo drive. Servo drive will decide if /S-ON and output servo alarm are required according to the value of Pn003



Normally, set Pn003 to zero(0).

4.5.6 Regenerative braking unit

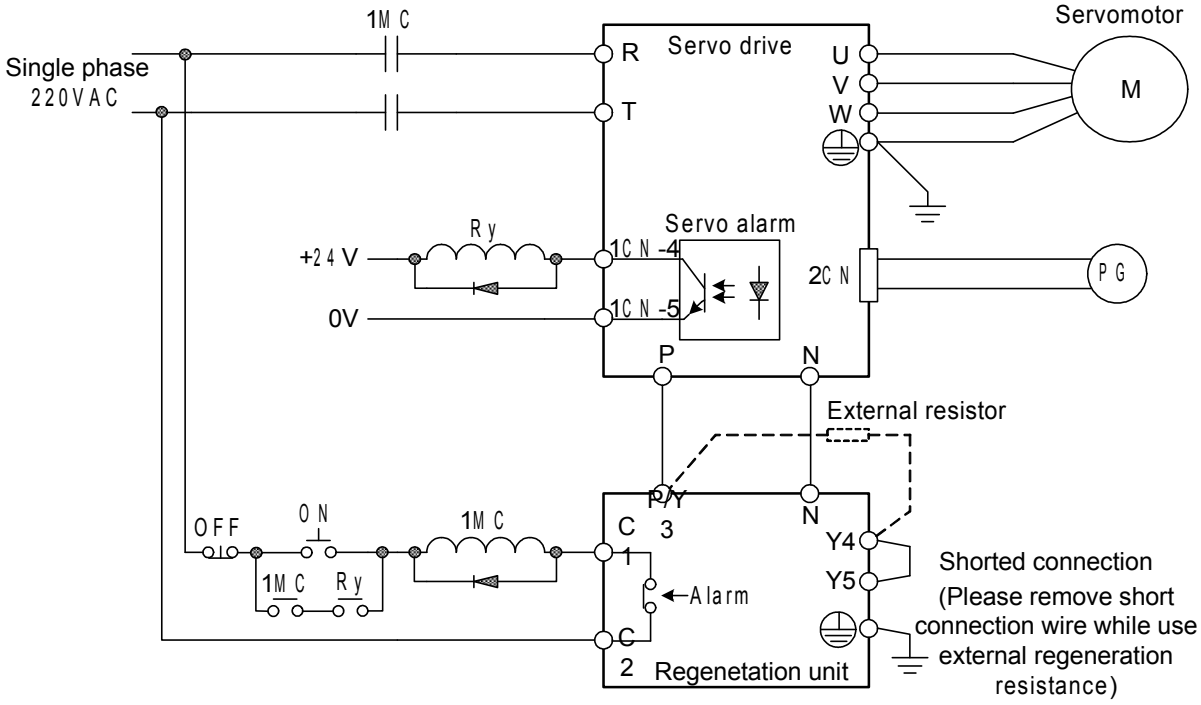
When servo motor runs in dynamo mode, electric power feedback goes to servo drive side, this kind of power is normally called regenerative electric power.

Regenerative electric power is absorbed by means of charging the smoothing capacitor inside servo drive with its power. If the power exceeds the capacity of the smoothing capacitor, additional "Regenerative braking unit" is required to transform regenerative electric power into heat energy consumption of a a bleeder or drain resistor, otherwise servo drive may output overvoltage alarm.

Servo motor runs in dynamo mode subject to following conditions.
· during deceleration to stop
· inertia load on perpendicular axis
· servo motor runs continuously due to load side（negative load）

Note:
1. EDC servo drive does not provide a built-in regenerative resistor, so external regenerative unit must be equipped if required.
2. Terminal P and Terminal N from servo drive are leading to drive's main circuit power(high voltage on DC generatrix), therefore, it's prohibited to be connected directly to bleeder or drain resistor.

■ Connect external regenerative unit according to following diagram.



Note:
Before connection and installation, please refer carefully to all the precautions in the instruction of the regenerative unit which is to be used.

4.6 Smooth running

4.6.1 Smoothing

Servo drive can perform smoothing filtering on " reference pulse" input of certain frequency.

Parameter number	name	unit	Setting range	Default
Pn024	position reference 1st filter	Ms	0~1000	0
Pn025	Feed forward filtering	Ms	0~1000	0

By adjusting the parameters, the smoothing performance of position control can be changed.

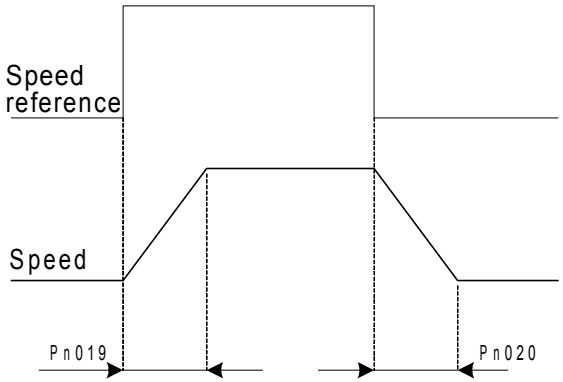
4.6.2 Acceleration/deceleration time

Servo drive can perform acceleration and deceleration on speed reference to have soft start function.

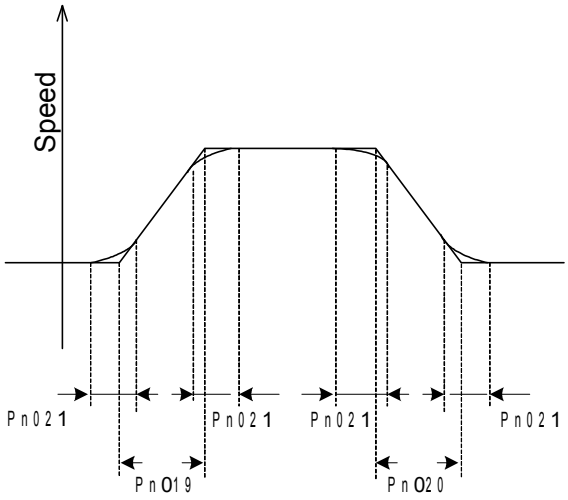
Parameter number	Name	Unit	Setting range	Default
Pn019	Soft start acceleration time	ms	0~10000	100
Pn020	Soft start deceleration time	ms	0~10000	100
Pn021	S-shape acceleration and deceleration time	ms	0~1000	0

- Pn019：time from stop status to speed of 1000r/min
- Pn020：time from speed of 1000r/min to stop status

Pn019 and Pn020 are linear acceleration / deceleration time. When large impact happens because linear acceleration / deceleration is used to start/stop the machine, Pn021 can be set to have smooth running.



Inside servo drive, perform acceleration and deceleration of the set value on speed reference to implement speed control.
When inputs step like speed reference, smooth speed control can be implemented.



4.6.3 Speed detection smoothing time constant

By adjusting "speed checkout filter time constant", mechanical vibration caused by servo system can be removed or eliminated.

Parameter	Name	unit	setting range	Default
Pn028	Speed checkout filter time constant	1%	0~500	0

The smaller the value of constant is, the better control response is shown. Actual situation will be restrained by mechanical structure. If mechanical vibration occurs when default setting is used, adjust this parameter to a larger value, normally the vibration can be restricted effectively.

4.6.4 Torque reference filter time constant

When mechanical vibration is caused by servo drive, "Torque reference filter time constant" can be adjusted to remove or eliminate vibration.

Parameter	Name	unit	setting range	Default
Pn018	Torque reference filter time constant	1%	0~5000	0

The smaller the value of constant is, the better control response is shown. Actual situation will be restrained by mechanical conditions.

If mechanical vibration caused by servo occurs when standard setting is used, adjust this parameter to a larger value, the vibration can also be restricted effectively. The reason of vibration may be by incorrect gain adjustment or machine problems.

4.7 High speed positioning

4.7.1 Servo gain settings

■ Setting speed loop gain

Parameter	name	Unit	Setting range	Default
Pn007	Select speed loop control method		0~1	0

0：ADRC control

1：PI control

Please be noticed when this parameter is changed, corresponding Pn013 and Pn014 will change too. Generally，when Pn007 = 1, value of Pn013 and Pn014 need to be reduced.

■ Speed feed forward

Parameter	name	Unit	Setting range	Default
Pn012	Speed feed forward		0~1	0

0：disable speed feed forward

1：enable speed feed forward

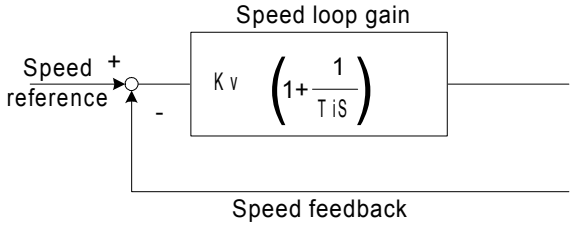
Inertia inspection is required before using this function. With this function, speed response is enhanced and setting time is reduced.

■ Setting speed loop gain

Parameter	name	Unit	Setting range	Default
Pn013	Speed loop gain（Kv）	Hz	1~3000	160
Pn014	Speed loop integral time constant（T i）	ms	1~2000	250

The above information shows internal speed loop gain and integral time constant of servo drive.

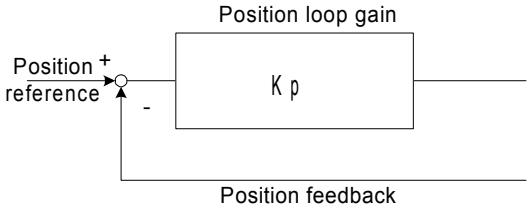
The larger the speed loop gain is set or the smaller the speed loop integral time constant is set, the easier to have fast response speed control and this is limited by mechanical features. The larger the speed loop integral time constant is set, servo has better steady-state performance. But too large value may cause system vibration easily.



■ Setting position loop gain

Parameter	name	Unit	Setting range	Default
Pn015	Position loop gain（Kp）	1/s	1~1000	40

The larger the position loop gain is set, the easier to have position control with high response and small offset and this is limited by mechanical features. Owing to affection of load, vibration and overshoot may occur easily if the gain is set too large.

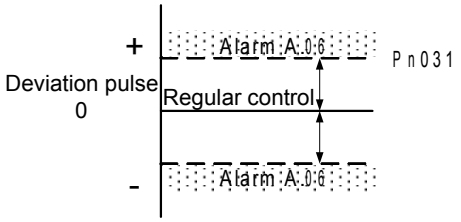


Para.	name	Unit	Setting range	Default
Pn031	overflow range of error counter	256 reference unit	1～32767	1024

This parameter is used to check offset pulse number of overflow alarm（AlarmA.06）.

Para.	Name	Unit	Setting range	Default
Pn047	Enable/Disable alarm when position error pulse overflows [0] no alarm output [1] output alarm		0～1	0

This parameter is used to decide whether offset overflow alarm（alarmA.06）is required or not.



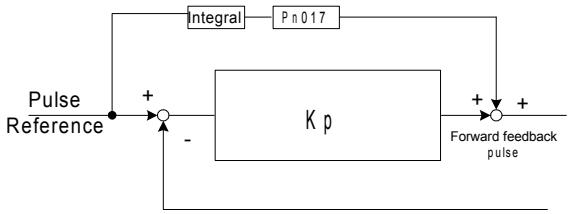
When Pn047 is set to 1, if the range of error counter overflow(Pn031) is set too small, alarm A.06 may occur when running at high speed.

■ Position feed-forward

With feed forward control, positioning time is reduced.

Parameter	Name	Unit	Setting range	Default
Pn017	Position feed forward gain	%	0~100	0

Inside servo unit, feed forward compensation is used for positioning control to reduce positioning time. But if the gain is set too large, overshoot and machine vibration may occur. As for normal machines, please set the gain to 80% or lower.

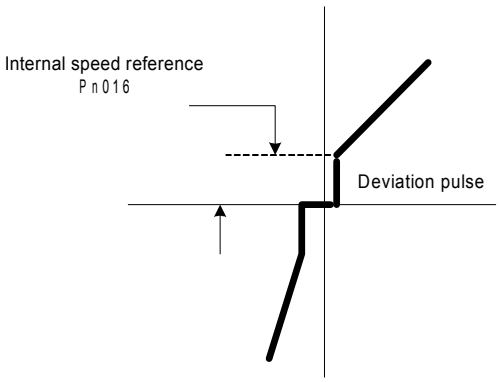


4.7.2 Speed offset settings

By setting internal speed reference offset of servo unit, adjusting time for positioning control can be reduced.

Parameter	Name	Unit	Setting range	Default
Pn016	Speed offset	r/min	0~300	0

Inside servo unit, the specified speed reference offset for positioning control, are used to reduce positioning time. Make the setting according to mechanical conditions.



Note:
When positioning error is set low, while speed offset is set a bit large, overshoot or vibration may occur during system running. Please pay close attention when using this parameter.

Chapter 5

Troubleshooting

5.1 Alarm list

Servo drive will output an alarm when abnormal event is detected.
The LED for POWER&ALM on the front panel of the servo drive will turn red when alarm occur(The LED is green in normal status).meanwhile ,the drive outputs an alarm .If an external hand-held operator is installed ,current alarm code can be displayed on the operator.

Alarm Code	Alarm output	Alarm Name	Meaning
A. 01	×	Parameter breakdown	checksum results of parameters saved in external storage has errors
A. 02	×	Current detection error	internal detection circuit problem
A. 03	×	Overspeed	rotation speed of the motor has exceed 1.1 times of max. speed
A. 04	×	Overloaded	the motor was runing for several seconds under the torque largely exceeding ratings.
A. 05	×	Position error counter overflow	internal position error counter has exceeded the value
A. 06	×	Position error pulse overflow	internal position error pulse has exceeded the value setted in the parameter Pn-031
A. 09	×	Pulse loss of encoder C	PC is disconnected or have interference
A. 10	×	Encoder disconnected	At least one of PA,PB, PC,PU,PV, or PW is disconnected
A. 11	×	Encoder U,V or W code violation	Encoder U,V or W code violation(Pls note that the U,V,W signal of encoder is different from the strong current signal U,V,W which the servo drive connected with the motor)
A. 12	×	Power module error	the current passed on power module is too large or control voltage of VCC4 is too low
A. 13	×	overheat	power module overheat
A. 14	×	Voltage error	overvoltage or undervoltage of main circuit
A. 15P	×	Frequency error of input pulse	Reference pulse frequency is higher than 500kpps.
A. 16	×	Parameter error	parameter saved in external storage has errors
A. 17	×	I/O data error	I/Odataerror,such as ALM,BRK,COIN,Relay,LED lamps ect error
A. 21	×	Power loss error	a power interruption exceeding one cycle occurred in AC power supply.
A. 25	×	Watchdog reset	system reste by watchdog
A. 26 ～ A. 28	×	Program error	Program excute error
A. 42	×	Motor and servo mismatch	Pn042(mode selection)not correct
A. 60 ～ A. 66P*P	×	CAN communicate error	CAN communicate fault
A. 99	○	Not an error	normal status

○:Photo-coupler=ON (ON)　　×:Photo-coupler=OFF(Alarm status)(OFF)

＊：Alarm can be cleared

Clear alarms in following ways when alarm occurs：

●Set 1CN－6 signal active(alarm reset signal ALM_RST).

●Clear alarm with hand-held operator (please see 6.1.2 for reference)

●Through matched PC communication software.

●Turn power OFF and then ON again.

Notes:

1、 When alarm occurs, always find out the alarm reasons and remove alarm failures before clearing alarm.

2、 Only the alarm codes listed below can be cleared:A.03、A.04、A.14、A.15、A.21。

5.2 Alarm reasons and Troubleshooting

Find out the alarm reasons with help of the alarm codes displayed on the hand-held operator or view via the communication software in a PC.

Only the last 8 alarm records are saved in the servo drive which can be viewed via the operator or PC communication software.

The alarm without the sign of are not able to be removed .To clear the alarms, user has to turn power OFF and ON again.

Item	Alarm name	Possible reason	Method
A.01	Parameter breakdown	checksum results of parameters saved in external storage has errors	1.turn on the power supply again to see if it still happen 2.If it still happens, external storage of servo drive has been damaged. Please change a chip.
A.02	Current detection error	internal detection circuit problem	1.check the reference power supply of servo A/D circuit if it is damaged. 2.check the connection between the main board and control board is good. 3.check if the channel of A/D sampling is damaged.
A.03	Overspeed	rotation speed of the motor has exceed 1.1 times of max. speed 1.input reference pulse frequency is too high 2.time constant of acceleration and deceleration is too small which makes the speed overshoot is too large. 3.the electronic gear ratio is too large 4.Pn015 is too small.	Please take the following measures when the motor is overspeed 1.reduce setting speed(reference value) 2.increase the value of Pn024 and Pn015 3.check the electronic gear ratio which should be set under the coverage of the following range: input pulse frequency*electronic gear ratio 500KHZ
A.04	Overloaded	the motor was running for several seconds under the torque largely exceeding ratings. 1.The time for acceleration or deceleration is too short 2.The capacity of servo drive and servo motor is too small	1.increase the time for acceleration or deceleration 2.change large capacity servo system 3.check the load capacity 4.cut down the frequency of start-stop.

		3.overload 4.start stop frequently	
A.05	Position error counter overflow	internal position error counter has exceeded the value 1.the motor is locked by the mechanics 2.input reference pulse is abnormal	1.check if the motor rotated according to the reference pulse 2.check the load mechanics 3.check the reference pulse 4.check the connection of motor encoder.
A.06	Position error pulse overflow	internal position error pulse has exceeded the value set in the parameter Pn-031 1.the motor is locked by the mechanics 2.input reference pulse is abnormal	1.check the load mechanics 2.check the connection of motor encoder. 3.increase the value of Pn015,Pn031 and Pn017 4.check the reference pulse 5.reduce the overload capacity and speed.
A.09	Pulse loss of encoder C	PC is disconnected or have interference 1.cable's problem, disconnected or misconnected 2.power cable shield is not good 3.encoder damaged 4.screen wire ground disconnect 5.interface circuit of encoder fault.	1.Pls check the power cable connection. power cable and encoder signal wire shouldn't be tied together. 2.Pls check the interface circuit of encoder.
A.10	Encoder disconnected	At least one of PA,PB, PC,PU,PV, or PW is disconnected	1.Pls check the connection between encoder and the motor 2.Pls check the encoder signal 3.if the above mentioned is correct, may be the fault of servo drive internal components.
A.11	Encoder U,V or W code violation	Encoder U,V or W code violation(Please note that the U,V,W signal of encoder is different from the strong current signal U,V,W which the servo drive connected with the motor) 1.the connection of encoder is wrong 2.encoder is damaged	please make sure the power supply voltage of encoder is 5V±5% especially the wire is long. power cable and encoder signal wire shouldn't be tied together. 1.pls check the wiring of encoder. 2.change the servo motor

A.12	Power module error	the current passed on power module is too large or control voltage of VCC4 is too low	1.disconnect the U,V,W and electricity, if this status still happen under s-off, it means power module damaged. 2.check if the wiring of U,V,W is correct. Check the resistor between U,V,W and ground. If it is small, it means the insulating property of the motor is lower. Change the motor. 3.check if the capacity of motor is match with the servo drive's. 4.check if the control power of power module VCC4 is normal(It will alarm when it is lower) 5.increase the time of acceleration and deceleration 6.check if the relay of DB is damaged
A.13	overheat	power module overheat 1.bad air flow of radiator or temperature around the servo drive is too high 2.start and stop frequently 3.servo drive operate under over load capacity for a long time	1.change the servo drive match with the load capacity 2.improve environment condition to enhance the ability of convection and ventilation
A.14	Voltage error	overvoltage or undervoltage of main circuit 1.power off for a moment, the voltage of main power supply is too low. 2.the energy of the load is too large which leads to main voltage is too large when stop deceleration. 3.frequency of start-stop is too high.	1.check the input voltage if it is in the cover of rated range. 2.increase the time of deceleration 3.low down the frequency of start-stop.
A.15	Frequency error of input pulse	Reference pulse frequency is higher than 500kpps. 1.pulse input frequency is too high 2.noise mixed in the reference pulse 3.the value of Pn022,Pn023 is not correct	1.pls set reasonable reference pulse frequency 2.take measures to deal with the noise 3.adjust the value of Pn022,Pn023.reference pulse frequency=pulse input frequency*(Pn022/Pn023)
A.16	Parameter error	parameter saved in external storage has errors	1.check carefully if the parameter setting is correct 2.set default value and check if the data is correct. replace chip U3.
A.17	I/O data error	I/O data error, such as ALM, BRK, COIN, Relay, LED lamps etc error	chip U7 fault or chip U15 fault
A.21	Power loss error	a power interruption exceeding one cycle occurred in AC power supply.	check if the voltage of servo drive inlet wire is normal
A.25	Watchdog reset	system reset by watchdog	1.current detect abnormal 2.serial peripheral abnormal
A.99	Not an error	normal status	

5.3 Clear alarm

■ Clear current alarm

When an alarm occurs, press ENTER for seconds in hand-held panel operator's status display mode, then current alarm is deleted. Besides, the alarm can also be cleard by using 1CN-6(ALM_RST) input signal.

Notes:
1. Only current alarms with "＊" sign in 5.2 can be deleted.
2. Eliminate alarm cause first, then input 1CN-6（ALM_RST）signal, current alarm is removed immediately.
3. During effective period of 1CN-6（ALM_RST）signal, motor is in free status, that equals to SERVO OFF status.

■ Clear alarm history

In the auxiliary function mode of panel operator, with Fn000, the latest eight (8) alarms can be deleted. Refer to instructions in 6.2.1.

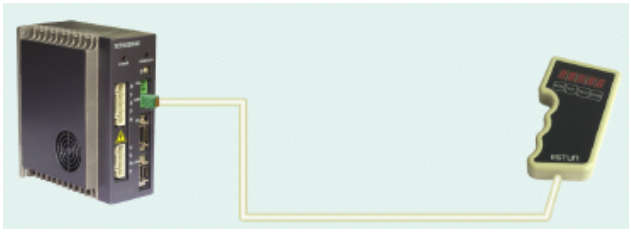
Chapter 6

Panel Operator

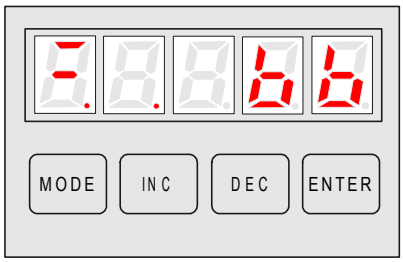
6.1 Basic Function

6.1.1 Function description

An external panel operator as shown below can be connected to EDC series of servo drives to make parameter setup, status monitoring and auxiliary functions.



The description of the keys on the panel operator and their functions are followed by a panel operator on initial display status as an example.



Name	Function
INC key	Press INC key to increase the set value(a long and hold on press will implement fast increasing)
DEC key	Press DEC key to decrease the set value.(a long and hold on press will implement fast decreasing)
MODE key	Press this key to select the status display mode, parameter setup mode, monitor mode, or auxiliary function mode. Press this key to cancel setting when setting the parameters.
ENTER key	Press this key to display the parameter settings and set values.

6.1.2 Reset Servo Alarms

In alarm status display mode of the operator, press ENTER key and hold on for seconds to reset current alarm.
Refer to 5.1 and clear alarm code.
The alarm can also be removed by using 1CN-6(/ALM_RST) input signal.
If the power supply is switched OFF due to a servo alarm, then alarm reset operation is not necessary.

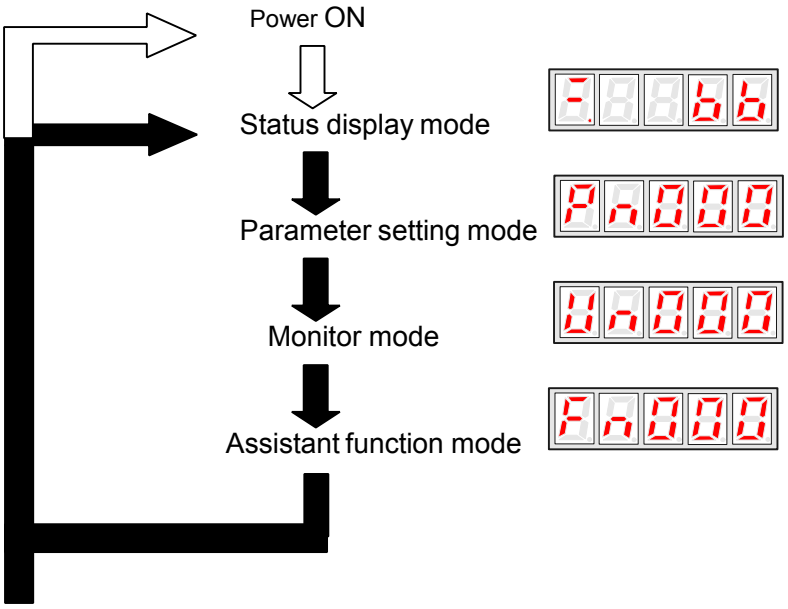
Note:
When any alarm occurs, always remove alarm reasons first before performing alarm reset.

6.1.3 Display mode selection

By toggling among the different basic modes on the panel operator, operations like current running status display and parameter setup can be performed.

The operator consists of following basic modes:
Status display, Parameter setup, Monitor mode and Auxiliary function mode.

Press MODE key to select a display mode in the following order.



6.1.4 Status Display Mode

In status display mode, the digits and simple code are used to show the status of servo drive.

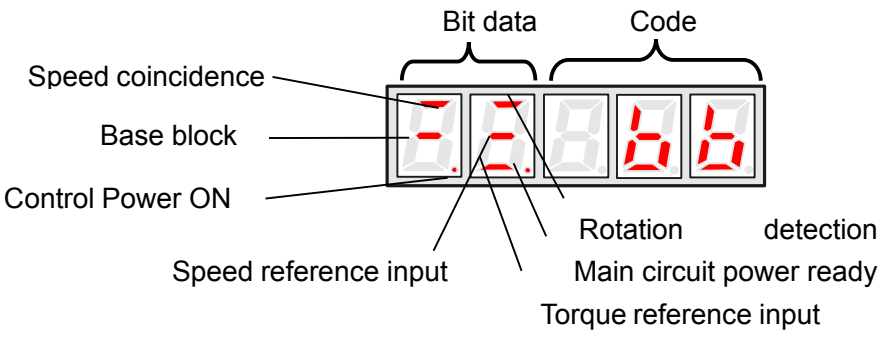
Selection of Status Display Mode

The status display mode is displayed when the power is turned ON.
If current mode is not the status display mode, press MODE key to switch to required mode.

Contents displayed in Status Display Mode

Contents displayed in the mode are different in Position Control Mode and Speed Control Mode.

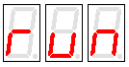
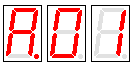
When in Speed Control mode



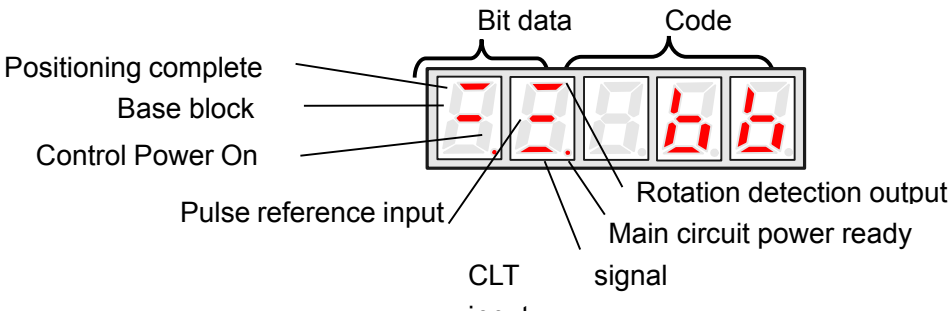
Contents of digit display

Digit data	Description
Control power is ON	Lamp lights on when control power of servo drive is ON
Standby	Lamp lights on when servo is on standby; Lamp extinguishes when servo is ON
Speed coincidence	When offset value between speed reference and actual motor speed is within allowable value, lamp lights on. Allowable value: Pn029 (The standard value is 10 min/r)
Rotation detection output	When motor speed exceeds allowable value, lamp is lit. When motor speed is lower than allowable value, lamp goes extinct. Allowable value: 10% of rated speed
Reference speed input is continuing	When reference speed input exceeds allowable value, lamp is lit. When reference speed input is lower than allowable value, lamp goes extinct. Allowable value: 10% of rated speed
Reference torque input is continuing	When reference torque input exceeds allowable value, lamp is lit When reference torque input is lower than allowable value, lamp is extinct. Allowable value: 10% of rated torque
Main circuit power supply is ready	Lamp is lit when main circuit power supply is OK; Lamp is extinct when main circuit power supply is OFF.

Contents of simple code display

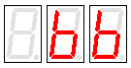
Code	Meaning
	On standby; Servo OFF (Servomotor power is OFF)
	Run Servo ON (motor power is ON)
	Alarm Blinks the alarm number.

When in Position Control mode



Digit data	Description
Control power is ON	Lamp lights on when control power of servo drive is ON
Standby	Lamp lights on when servo is on standby; Lamp extinguishes when servo is ON
Speed coincidence	When offset value between position reference and actual motor position is within allowable value, lamp lights on. Allowable value: Pn030 (The standard value is 10 pulse)
Rotation detection output	When motor speed exceeds allowable value, lamp is lit. When motor speed is lower than allowable value, lamp goes extinct. Allowable value: 10% of rated speed
Reference pulse input is continuing	When reference pulse input is continuing, lamp is lit. When there is no reference pulse input, lamp goes extinct.
Clear signal input is continuing	When clear signal input is continuing, lamp is lit. When there is no clear signal input, lamp goes extinct.
Main circuit power supply is ready	Lamp is lit when main circuit power supply is OK; Lamp is extinct when main circuit power supply is OFF.

Contents of simple code display:

Code	Meaning
	On standby; Servo OFF (motor power is OFF)
	Running; Servo ON (motor power is ON)
	Alarm Status The alarm code is displayed.

6.1.5 Parameter Setting Mode

Parameters related to the operation and adjustment of the servomotor are set in this mode. See the Parameter List in Appendix A for details.

■ Change parameters

Please see the Parameter List in Appendix A to know exactly the range of parameter change. Following is an operational example of changing the data of Pn 019 from 100 to 85.

1. Press MODE key to select parameter setup mode.



2. Press INC key or DEC key to select parameter number.



3. Press ENTER key to display parameter data selected in step 2.



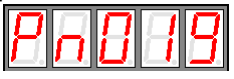
4. Press INC or DEC to change the data to the desired number 85. Hold the button to accelerate the value changing. When the data reaches the max. or Min. value, the value will stay unchanged even if INC/DEC key is pressed.



5. Press ENTER, the data glimmers and then the date is saved.



6. Press ENTER again to go back to parameter number display.



Plus, if Mode key is pressed during step 3 or step 4, parameter setup operation will go directly

to step 6 and no changes will be saved. If the user needs to rechange any data later, just repeats the operation from step 2 to step 6.
If Pn080 needs to be set as -32767, then a decimal point is used on bottom right corner of the top number to show current value is negative. For instance, the value – 32767 is displayed as below:



6.1.6 Monitor Mode

The monitor mode can be used for monitoring the external reference values, I/O signal status and internal status of servo drive. User can make changes in Monitor Mode even if motor is running.

■ Following are the operation steps to use Monitor Mode

The example as below shows the operation steps for monitoring Data 1500 of Un001.

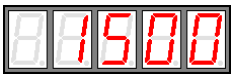
1. Press MODE key to select monitor mode.



2.Press INC key or DEC key to select the monitor number to be displayed.



3.Press ENTER to display the monitored data selected in Step 2.



4.Press ENTER again to return to monitor number display.

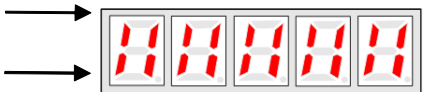


■ Contents of Monitor Mode display

Monitor No.	Contents
Un000	Actual motor speed: r/min
Un001	Input speed reference value: r/min
Un002	Percentage of feedback torque: % (relative rated torque)
Un003	Percentage of input torque: % (relative rated torque)
Un004	Number of pulses of Encoder angles
Un005	I/O signal monitor
Un006	Encoder signal monitor
Un007	Speed given by pulse (when electronic gear ratio is 1:1)
Un008	Current motor position is 5 digits lower (×1 pulse)
Un009	Current motor position is 5 digits higher (×10000 pulse)
Un010	Position reference is 5 digits lower (×1 pulse)
Un011	Position reference is 5 digits higher (×10000 pulse)
Un012	Position offset is 5 digits lower (×1 pulse)
Un013	Position offset is 5 digits higher (×10000 pulse)

Digits to display internal status

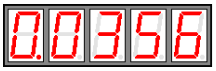
9 8 7 6 5 4 3 2 1 0



Notes:
1.Position pulse value is subject to electronic gear ratio of 1:1.
2.Unit of pulse quantity is the internal pulse unit of servo system. Pulse quantity is represented with 5 digits higher + 5 digits lower, whose calculation method is as below:

Pulse quantity = value of 5 digits higher × 10000 + value of 5 digits lower

Value of pulse quantity will not change any more when it reaches 327679999. The decimal point at top digit of Un 010, Un 012 and Un 014 means the value is negative.
For instance: Un010 is displayed as:



It means the value of Un010 is -3560000.
3. When the speed given by pulse is below electric gear ratio of 1:1, encoder shows the theoretical rotation speed of the gain type 2500 lines of electric motor.
4. Pulse numbers of encoder angles show the rotor's position in relate to stator in one complete revolution, one revolution is regarded as one cycle.
5. As for wire saving encoder motor, its encoder signal only represents the data during power on, the contents of non wire saving encoder signal display is shown in the following table:

Monitor No.	No. of digit	I/O	Contents displayed	Relevant I/O Signals
Un006	0	Input signal	Signal of Encoder W	2CN-12\13(PG-W)
	1		Signal of Encoder V	2CN-5\6(PG-V)
	2		Signal of Encoder U	2CN-10\11(PG-U)

6. Contents of I/O terminal signals are in the following table:

Monitor No.	No. of digits	I/O	Contents displayed	Relevant I/O Signals
Un005	0	Input signal	Servo ON	1CN-15 (/S-ON)
	1		Alarm reset	1CN-6(/ALM_RST)
	2		Clear error counter	1CN-7(/CLR)
	3		Zero position signal	1CN-17(/ZPS)
	4,5,6		No display	No signal
	7	Output signal	Servo alarm	1CN-4 (/ALM)
	8		Positioning complete(speed achieves)	1CN-3 (/COIN)
	9		Mechanical braking released	1CN-2 (/BRK)

The relative LED is lit to show some I/O signal is active.

6.2 Auxiliary functions

In Auxiliary Function Mode, some application operations can be done with the digital operator. The functions details are shown as below:

Function No.	Content	Other
Fn000	Display alarm history	Open operation
Fn001	Restore to Defaults	
Fn002	JOG operation	
Fn003	Automatic offset-signal adjustment of motor current detection	
Fn004	software version of servo	
Fn005	System runtime	
Fn006	Software version of panel operator	Hidden operation
Fn007	Factory test	

Fn008	Inertia inspection	

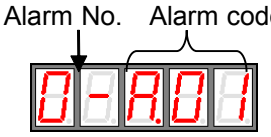
Notes:
1. Open operations refer to the auxiliary functions for general users.
2. Hidden operations:
When the panel operator is in simple code menu, press "××××" and start to use the auxiliary functions.

6.2.1 Alarm history display

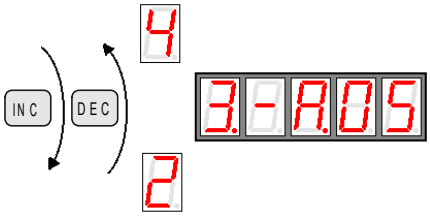
The last ten(10) alarms are displayed in the alarm history library. Take following steps to check the latest alarm.
1. Press MODE key to select auxiliary function mode
2. Press INC or DEC to select function number of alarm history display.



3. Press ENTER key, the latest alarm code is displayed.



4. Press INC or DEC key to display other alarm codes occurred recently.



5. Press ENTER to return to function number display.



If an alarm occurs right now, the alarm codes will be updated immediately. The alarm with a serial number of 0 is the current alarm, and the alarm with a serial number of 9 is the last alarm.
If the user wants to clear all alarm history data, press ENTER key and hold on for one second while alarm codes are being displayed , then all alarm history is deleted.

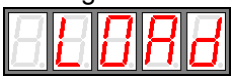


6.2.2 Restore to Defaults

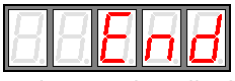
This function is used when returning to the Defaults after changing parameter settings.
1. Press MODE key to select auxiliary function mode.
2. Press INC or DEC key to select function number for restoring to Defaults.



3. Press ENTER to enter parameter restoring mode.



4. Press ENTER key and hold on for one second to restore all the parameters to default values.



5. Release ENTER key to return to function number display.

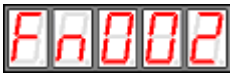


6. In Step 3, the parameter restoring operation can be cancelled and quit current operation by a short press on the ENTER key.

6.2.3 JOG operation

Note:
This mode is not available when servo is on or some alarm occurs.

Take following operation steps to make JOG operation.
1. Press MODE key to select auxiliary function mode.
2. Press INC or DEC key to select JOG Function number.



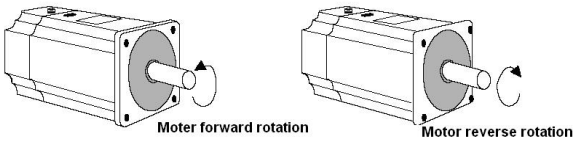
3.Press ENTER key to enter JOG mode, meanwhile, servo is OFF(motor power is OFF)..



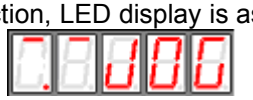
4. Press MODE key to enable Servo ON /S-ON..



5. Press MODE key to turn servo ON and OFF.
   If user wants to run motor, Servo On has to be used.
6. Press INC or DEC key, motor runs when pressing the keys.
   The servomotor will rotate at the present setting speed as below.

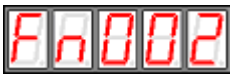


During motor's FWD or REV direction, LED display is as below:

Forward direction 

Reverse direction 

7. Press ENTER to return to function number display. At this moment, servo motor is turned OFF



6.2.4 Automatic offset signals adjustment of motor current detection

The servo drive will check motor current detection signals every time the servo is initializing upon power on and will adjust automatically if required, therefore, user needn't do any manual adjustment in normal situations. If the user thinks the torque is a bit too large by judging from motor current offset, user may manually adjust motor current to lower down the torque further or to get higher running accuracy. This section gives a know-how instruction on the operation steps to make offset signal automatic and manual adjustment.

Note:
The offset signal adjustment of motor current detection is only available when servo is OFF.

■ Adjust motor current detection offset signal automatically

Take following steps to make automatic offset adjustment.
1. Press Mode key to select auxiliary function mode.

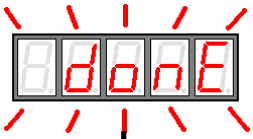
2. Press INC or DEC key to select function number.



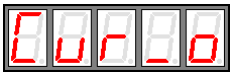
3. Press ENTER key and enter automatic adjusting mode.



4. Press MODE and hold on for one second, donE is displayed and glimmers, the offset signal is then adjusted automatically.



Release the key

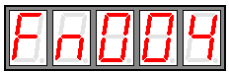


5. Press ENTER key to return to function number display.

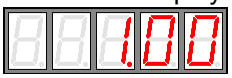


6.2.5 Servo software version display

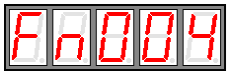
Take following steps to display software version of the servo drive.
1. Press MODE key and select Auxiliary Function Mode;
2. Press INC key or DEC key to select function number of software version display.



3. Press ENTER key, current software version is displayed.

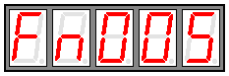


4. Press ENTER key again to return to function number display.



6.2.6 System runtime

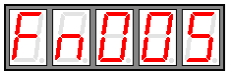
Take following steps to display system runtime.
1. Press MODE key and select Auxiliary Function Mode。
2. Press INC key or DEC key to select function number.



3. Press ENTER key to display system runtime.
Following picture shows system runtime is 1 hour and 28 minutes.



4. Press ENTER key again to return to function number display.

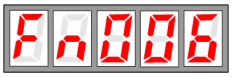


The displayed time is the runtime after system is started up, the date is not refreshed in real time. If user wants to refresh the data, please repeat the operations in Step 3 and Step 4.

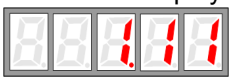
6.2.7 Software version of panel operator

Activate the hidden functions first before making operations in Section 6.2.7, 6.2.8 and 6.2.8.

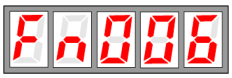
Take following steps to display software version of the panel operator.
1. Press MODE key and select Auxiliary Function Mode;
2. Press INC key or DEC key to select function number..



3. Press ENTER key, current software version is displayed.



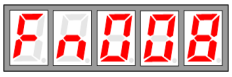
4. Press ENTER key again to return to function number display.



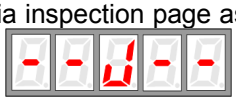
6.2.8 Factory test

6.2.9 Inertia inspection

Take following steps to make inertia inspection.
1. Press MODE key and select Auxiliary Function Mode;
2. Press INC key or DEC key to select function number..

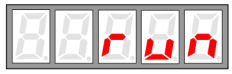


3. Press ENTER key and go into inertia inspection page as shown below:



.

4. Press Mode key again to start inertia detection. Following page is displayed:

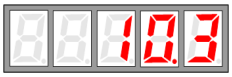


.

If servo alarm occurs or servo is ON, inertia inspection will not be executed, instead, a message “abort” is displayed on the panel operator as below.



If the user wants to cancel the function during inertia inspection or after entering the function menu, just press ENTER key.
5. When inertia inspection completes, inertia value of load and motor are displayed in the unit of 0.1 $Kg \cdot m^2 \times 10^{-4}$.



6. Press ENTER key again to return to function number display page.

Notes:
1. Please be very careful during inertia inspection operation, because motor will run forward and reverse for four(4) revolutions, meanwhile, motor is not controlled by external signals. Make sure the running stroke of load is within required range to avoid possible damage to user’s equipments.
2. This operation is unavailable if servo is on or servo alarm occurs.

Chapter 7

Trial operation

7.1 Inspection and checking before trial operation

To ensure safe and correct trial operation, inspect and checking the following items before starting.

1. Wiring
   All wiring and connections are correct.
   The correct power supply voltage is being supplied to the main circuit and servomotor.
   All groundings are good.
   If trial operation only refers to JOG function, 1CN wiring will not be required. Refer to 3.1.2.
2. Check power supply specification and make sure input voltage is correct.
3. Fix servomotor securely
   Fix servomotor on the base as secure as possible to avoid the risk of danger which is caused by the counterforce coming from motor speed change.
4. Remove motor load
   In case servo drive or moving structures are damaged, or indirect person hurt or injury, make sure motor load is removed, including the connector and its accessories on the motor shaft.

7.2 JOG operation

No other wiring (such as 1CN)is required for trial JOG operation, it's suggested JOG operation is done with low speed.

If motor can run properly in JOG operation, which means motor and servo drive are in good condition, and their connection is correct.

If motor can not run, check connection of UVW and encoder cables. If motor runs improperly, check if the phase order of UVW cables is correct or not.

Notes:

1. Before JOG operation, make sure motor load is removed from 1CN.
2. Load default parameters and initializes user parameters to Defaults.
3. Power On again to start trial running.

With help of panel operator, follow the steps below and startt JOG operation.

1. Turn on servo drive's power supply. Panel operator gives a display as below:



2. Press "MODE" key.



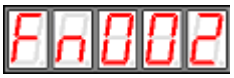
3. Press "MODE" key again.



4. Press "MODE" key a third time to switch onto the menu for auxiliary functions.



5. Press "INC" key and increase the value to 2.



6. Press “ENTER” key and go into JOG operation mode.



7. Press “MODE” key and select Servo On.



8. Press “INC” key, motor runs counterclockwise. Press “DEC” key, motor runs clockwise. Motor speed depends on Pn032 setting. If the above key is released, motor should stop running.

Forward 

Reverse 

9. Press “MODE” key and select Servo OFF.



10. Press “ENTER” key and exit JOG operation.

7.3 Trial operation in position control mode

1. Preparation
   Check if 1CN cable, power cables of servo drive and servomotor, encoder cables are connected in the right way.
2. Operation steps
   1) Set Parameter 008 according to output style of servo drive, set Pn041 as 0, then Power On again.
   2) When Servo On is enabled （/S-On signal becomes active）, motor will keep in excitation status.
   3) A low frequency signal is sent from host controller to servo drive, motor is set to run at low speed.
   4) Check motor speed with panel operator by its Un000 display, or monitor motor speed with host controller. Make sure feedback speed of servomotor agrees with the setting value.
      Inspection: When reference pulse stops, motor should stop running.

Relation between motor speed and pulse frequency input.

Input pulse frequency （Hz） pulse＋direction	**Motor frequency（r/min）**	**other**
500K	3000	Electronic gear ratio is 1:1; Motor encoder is 2500ppr.
250K	1500	
100K	600	
50K	300	

Chapter 8

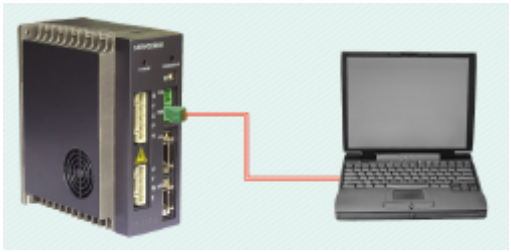
Communication

8.1 RS232 communication hardware structure

EDC servo drive supports RS232 communication. Via the RS232 COM function in its front panel, parameters reading out or writing in and system status monitoring are available.

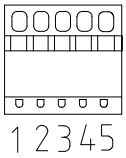
8.1.1 External connection diagram

Following diagram shows external connection between servo drive and PC.



8.1.2 Cable connection

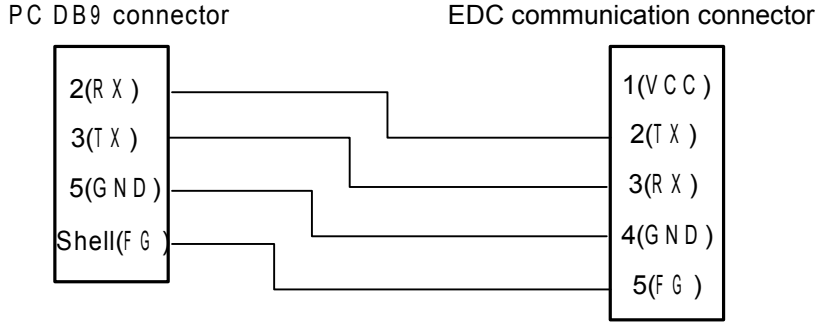
Following illustration shows the plug shape of the RS232 COM port on EDC servo drive.



See the signal definition details in the following table:

Pitch	Signification
1	VCC，internal 5V power supply of servo drive
2	TX，RS232 COM transmission foot
3	RX，RS232 COM receiving foot
4	GND，grounding of internal power supply of servo drive
5	FG，connect the shield layer of COM to the earth.

Following diagram shows how to connect a PC to EDC's COM port.



Notes:
1. Depending on different environment situations and communication speeds, effective communication distance also varies. When communication baudrate exceeds 38400bps, a communication cable within one(1) meter long is required to ensure transmission accuracy.
2. It's suggested shielded cables are used for communication, subject to the two shield layers are connected to their own pitches.
3. When external interface is RS422 or RS485, it's required to use external converting module for connection to servo drive.

8.2 Communication relevant parameters

When the value 0 is selected as the panel shaft number of EDC servo drive, then servo drive is able to communicate with panel operator and PC via Estun company's internal protocol, which has nothing to do with the communication parameters Pn060, Pn061 or Pn062.

When the values in the range of 1～E is selected as the panel shaft numbers, MODBUS communication function should also be enabled, then it's available for EDC servo drive to communicate with ESVIEW software. The selected panel shaft number is the communication address. The speed is set according to Pn061 settings, and the communication protocol is set according to Pn062 settings. Only when the value F is selected as the panel shaft number, shaft number address Pn060 is used by the servo drive.

1、COM address

Parameter	Name	Unit	Setting range	Default
Pn060	COM address	——	1~254	1

When the dial switch on the drive panel is set as F, this parameter is used as the communication address.

2、COM speed

Parameter	Name	Unit	Setting rang	Default
Pn061	RS232 COM speed 0：4800bit/s 1：9600bit/s 2：19200bit/s	bps	0~2	1

When communication function is used, same communication speed between host controller and servo drive is required.

3、COM protocol

Parameter	Name	Unit	Setting rang	Default
Pn062	RS232 COM protocol 0：7，N，2（Modbus,ASCII） 1：7，E，1（Modbus,ASCII） 2：7，O，1（Modbus,ASCII） 3：8，N，2（Modbus,ASCII） 4：8，E，1（Modbus,ASCII） 5：8，O，1（Modbus,ASCII） 6：8，N，2（Modbus,RTU） 7：8，E，1（Modbus,RTU） 8：8，O，1（Modbus,RTU）	-	0~8	5

This parameter decides which COM protocol to be used, the number 7 or 8 means digit numbers of data for data transmission is 7 digits or 8 digits. English alphabet N, E and O means odd or even. N means this digit is disabled, E means 1 digit even, O means 1 digit odd, the number 1 or 2 means stop is 1 digit or 2 digits.
The communication protocol between host controller and servo drive are required to be the same when communication function is used.

4、COM input IO control

When using COM control function, the parameter Pn059 can be used to shield input IO signals if the user does not want external input signals to affect servo drive. When some bit is set as (0)zero, the signal of this bit is then controlled by the external input signal. If the bit is set as 1, then COM control is applied to this bit.

Parameter	Name	Unit	Setting rang	Default
Pn059	COM input IO control	——	0~15	0

This parameter is used to set whether the number input of servo drive is controlled by external IO or by COM. When the parameter is set as zero, it means all numerical IO input pitches are controlled by external signals. When it is set as 15, it means all of the four IO inputs are COM controlled, and all external input signals are ignored.

input signal source is decided by value of Pn059:

Pn059	Comments on every bit
BIT0	Decides SON （1CN-15） source of signal input： 0：controlled by external input signal 1：controlled by COM
BIT1	Decides ALM-RST（1CN-6）source of signal input： 0：controlled by external input signal 1：controlled by COM
BIT2	Decides CLR（1CN-7）source of signal input: 0：controlled by external input signal 1：controlled by COM
BIT3	Decides ZPS （1CN-17） source of signal input： 0：controlled by external input signal 1：controlled by COM

Following are the two ways for COM function to operate on digital input IO signals:
1. Change the value of Pn054 directly, inverts required signal and enables it.
2. Set Pn059 first, to make servo ignore external input signal, then write in corresponding value to the data whose address is 0x0900 when controlling of external input signal is required.
The value of the data whose address is 0x0900 is not saved after a power interruption.
The table below gives an instruction of the value of the data whose address is 0x0900.

Data value of 0x0900	Comments on every bit
BIT0	Decides SON（1CN-15）signal： 0：signal is invalid 1：signal is valid
BIT1	Decides ALM-RST（1CN-6）signal： 0：signal is invalid，S-OFF 1：signal is valid
BIT2	Decides CLR（1CN-7）signal： 0：signal is invalid，S-OFF 1：signal is valid
BIT3	Decides ZPS（1CN-17）signal： 0：signal is invalid，S-OFF 1：signal is valid

For example, when COM is used control IO signals of external input, set Pn059 as 15, which means all external digital input IO are controlled by COM. When servo On is required, write in the value 1 to servo drive's 0x0900 address.

8.3 MODBUS communication protocol

When axis number on front panel of EDC servo drive is not selected as zero, MODBUS protocol is used for communication. There're two modes available in MODBUS communication, that is ASCII Mode（American Standard Code for information interchange） or RTU（Remote Terminal Unit）mode. See pages below for a.simple introduction of these two communication modes.

8.3.1 Code signification

ASCII mode：

Each 8-bit data consists of two ASCII characters. Here's an example of a 1-byte data 64H expressed in hex system, if the data is expressed in ASCII mode, it includes ASCII code of 6（36H）and ASCII code of 4（34H）.

Follow table shows the ASCII code from 0 to 9 and from A to F.

Character sign	‘0’	‘1’	‘2’	‘3’	‘4’	‘5’	‘6’	‘7’
ASCII code	30H	31H	32H	33H	34H	35H	36H	37H
Character sign	‘8’	‘9’	‘A’	‘B’	‘C’	‘D’	‘E’	‘F’
ASCII code	38H	39H	41H	42H	43H	44H	45H	46H

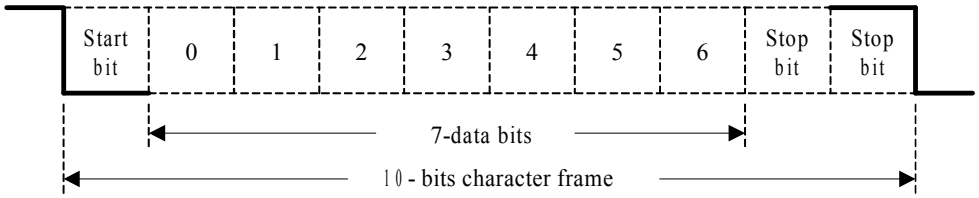
RTU mode：

Each 8-bit data consists of two 4-bit data expressed in hex system. For example, the number 100 in decimal system will be expressed as 64H if RTU data of 1 byte is used.

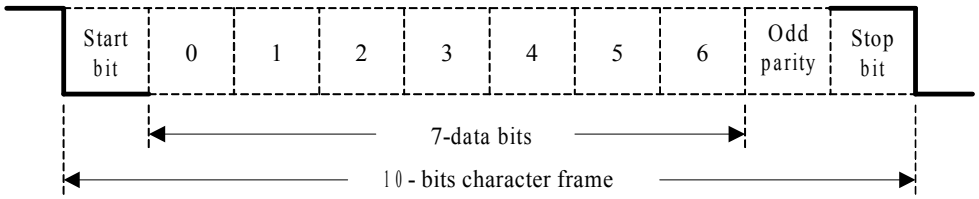
Data structure:

10bit character format（ for 7-bit data）

Pn062=0：7，N，2（Modbus，ASCII）

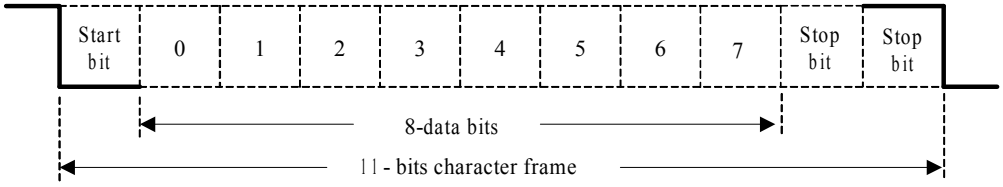


Pn062=2：7，O，1（Modbus，ASCII）

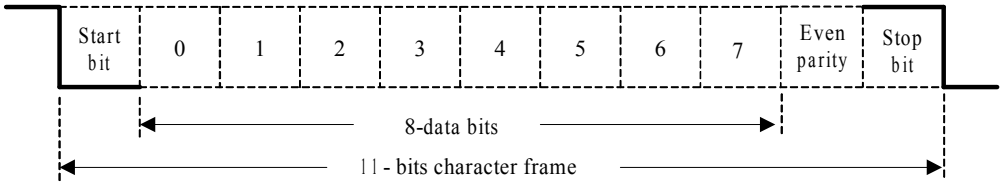


11bit character format（for 8-bit data）

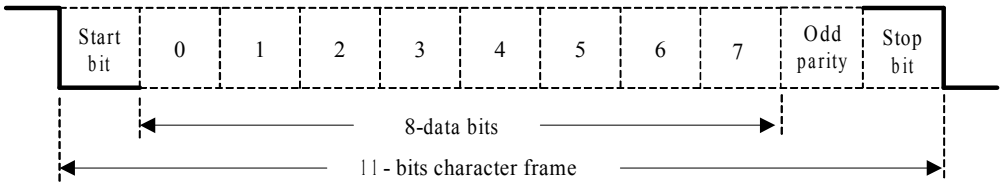
8，N，2（Modbus，ASCII/RTU）



8，E，1（Modbus，ASCII/RTU）



8，O，1（Modbus，ASCII/RTU）



Communication protocol structure：
Data format of communication protocol:

ASCII mode:

STX	Start bit‘：’=＞(3AH)
ADR	COM address=＞1-byte including two ASCII codes
CMD	Reference code=＞1-byte including two ASCII codes
DATA(n-1)	Data contents=＞n-word=2n-byte including four ASCII code, no more than 12
……	
DATA(0)	
LRC	Checkout code=＞1-byte including two ASCII codes
End 1	stop bit1=＞（0DH）（CR）
End 0	stop bit0=＞（0AH）（LF）

RTU mode:

STX	Freeze time for transmission time of over 4 bytes at current transmission speed
ADR	COM address=＞1-byte
CMD	Reference code=＞1-byte
DATA(n-1)	Data content=＞n-word=2n-byte，n is no more than 12
……	
DATA(0)	
CRC	CRC checkout code=＞1-byte
End 1	Freeze time for transmission time of over 4 bytes at current transmission speed

See followings for an introduction on data format of COM protocol.
STX（COM start）
ASCII mode：‘：’byte。
RTU mode：Freeze time for transmission time of over 4 bytes（which varies automatically according to changing of communication speed）

ADR（COM address）
Range of legal COM address: from 1 to 254
The example below shows communication with a servo whose address is 32, if expressed in hex system the address will be 20.
ASCII mode：ADR=‘2’，‘0’=＞‘2’=32H，‘0’=30H
RTU mode：ADR=20H

CMD（Command reference）and DATA（Data）
Data format depends on following command codes:
Command code: 03H, when reading N words, maximum value of N is 20.
For example, read the first two words from start address 0200H from a servo at the address of 01H.

ASCII mode：

Reference information：

STX	“：”
ADR	‘0’
	‘1’
CMD	‘0’
	‘3’
Start information address	‘0’
	‘2’
	‘0’
	‘0’
Information quantity by “word”	‘0’
	‘0’
	‘0’
	‘2’
LRC verify	‘F’
	‘8’
End 1	($0DB_{hB}$)(CR)
End 0	($0AB_{hB}$)(LF)

Response information：

STX	“：”
ADR	‘0’
	‘1’
CMD	‘0’
	‘3’
Information quantity by “byte”	‘0’
	‘4’
Start information address $0200B_{hB}$	‘0’
	‘0’
	‘B’
	‘1’
The second information address $0201B_{hB}$	‘1’
	‘F’
	‘4’
	‘0’
LRC verify	‘E’
	‘8’
End 1	($0DB_{hB}$)(CR)
End 0	($0AB_{hB}$)(LF)

RTU mode：

Reference information：

Response information：

ADR	$01B_{hB}$
CMD	$03B_{hB}$
Start information address	$02B_{hB}$(high)
	$00B_{hB}$(low)
Information quantity by “word”	$00B_{hB}$
	$02B_{hB}$
CRC verify	$C5B_{hB}$(low)
CRC verify	$B3B_{hB}$(high)

ADR	$01B_{hB}$
CMD	$03B_{hB}$
Information quantity by “byte”	$04B_{hB}$
Start information address $0200B_{hB}$	$00B_{hB}$(high)
	$B1B_{hB}$(low)
The second information address $0201B_{hB}$	$1FB_{hB}$(high)
	$40B_{hB}$(low)
CRC verify	$A3B_{hB}$(low)
CRC verify	$D3B_{hB}$(high)

Reference code: 06H, write in one word.
For instance, write 100(0064H) into 01H servo at the address of 0200H.

ASCII mode：

Reference information：

STX	“：”
ADR	‘0’
	‘1’
CMD	‘0’
	‘6’
Start address of information	‘0’
	‘2’
	‘0’
	‘0’
Information	‘0’
	‘0’
	‘6’
	‘4’
LRC verify	‘9’
	‘3’
End 1	$(0DB_{hB})$(CR)
End 0	$(0AB_{hB})$(LF)

Response information：

STX	“：”
ADR	‘0’
	‘1’
CMD	‘0’
	‘6’
Start address of information	‘0’
	‘2’
	‘0’
	‘0’
Start address of information $0200B_{hB}$	‘0’
	‘0’
	‘6’
	‘4’
LRC verify	‘9’
	‘3’
End 1	$(0DB_{hB})$(CR)
End 0	$(0AB_{hB})$(LF)

RTU mode：

Reference information：

ADR	$01B_{hB}$
CMD	$06B_{hB}$
Start information address	$02B_{hB}$(high)
	$00B_{hB}$(low)
Information	$00B_{hB}$(high)
	$64B_{hB}$(low)
CRC verify	$89B_{hB}$(low)
CRC verify	$99B_{hB}$(high)

Response information：

ADR	$01B_{hB}$
CMD	$06B_{hB}$
Start information address	$02B_{hB}$(high)
	$00B_{hB}$(low)
Information	$00B_{hB}$(high)
	$64B_{hB}$(low)
CRC verify	$89B_{hB}$(low)
CRC verify	$99B_{hB}$(high)

Take following steps to calculate value of LRC（ASCII mode）and CRC(RTU mode) .

LRC calculation in ASCII mode

In ASCII mode, LRC（Longitudinal Redundancy Check） is used. LRC value is calculated according to following way: first make a sum result of the values from ADR to contents of a finishing stroke, then the result is divided by 256, later on, take away the part that goes beyond, after that calculate its fill-in number, final result will be the LRC value.
Following example shows the steps to read a word from 01H servo drive at the address of 0201.

Sum ADR's data from beginning to the last data:
01H+03H+02H+01H+00H01H=08H
Take fill-in number of 2 from 08H, therefore LRC is ‘F’，‘8’。

STX	‘：’
ADR	‘0’
	‘1’
CMD	‘0’
	‘3’
Start info. address	‘0’
	‘2’
	‘0’
	‘1’
Info quantity by word	‘0’
	‘0’
	‘0’
	‘1’
LRC verify	‘F’
	‘8’
End 1	$(0DB_{hB})$(CR)
End 0	$(0AB_{hB})$(LF)

CRC calculation in RTU mode

CRC（Cyclical Redundancy Check）error detection value is used in RTU mode.
Take following steps to calculate CRC error detection value.
Step 1: Load in a 16-bit register whose content is FFFFH, which is called CRC register.
Step 2: Make OR calculation of the 1st bit (bit0) of reference information and the low bit (LSB) of 16-bit CRC register, then save the result into CRC register.
Step 3: Check lowest (LSB) of CRC register, if this bit is 0, then move the value to the right for one digit. If this bit is 1， then move the value to the right for one digit, after that, make OR calculation with A001H.
Step 4: Go back to Step3, when knows Step 3 has been done eight times, moves on to Step5.
Step 5: Repeat operations from Step 2 to Step 4 for the next bit of reference information, when knows all bits have been processed in the same way, the wanted CRC error detection value is just the current content in the CRC register.
Instruction:
After CRC error detection value is calculated, it's required to fill in first the low bit of CRC in reference information, then fill in the high bit of CRC. Refers to the example below.
Example:
Read two words from 0101H address of 01H servo drive. Final content of CRC register is calculated and turns to be 3794H by summing the date from ADR to last bit, then its reference information is shown below. Please be noticed 94H should be transmitted before 37H.

ADR	$01B_{hB}$
CMD	$03B_{hB}$
Start info. address	$01B_{hB}$ (High bits)
	$01B_{hB}$ (Low bits)
Info. quantity by word	$00B_{hB}$ (High bits)
	$02B_{hB}$ (Low bits)
CRC Low bits	$94B_{hB}$ (Low bits of checksum)
CRC High bits	$37B_{hB}$ (High bits of checksum)

End1、End0（Communication complete）
ASCII mode：
Communication ends with the character ‘\r’『carriage return』 and （0AH）‘\n’『new line』.

RTU mode：
The freeze time for communication time required by four bytes at a speed exceeding current communication speed means communication comes to an end.

For example：

Use C language to generate CRC value. This function needs two parameters:
unsigned char * data;
unsigned char length;
This function will transmit back CRC value of unsigned integer.

```
unsigned int crc_chk(unsigned char * data, unsigned char length){
    int i,j;
    unsigned int crc_reg = oxFFFF;
    While(length- -){
        crc_ reg ^=*data++;
        for(j=0;j<8;j++){
            If(crc_reg & 0x01){
                crc_reg=( crc_reg >>1)^0xA001;
            }else{
                crc_reg＝crc_reg >>1;
            }
        }
    }
    return crc_reg;
}
```

8.3.2 Communication error handling

Error may occur during communication. Normal error sources are as below:

- When reading and writing parameters, data address is incorrect.
- When reading parameters, data value is higher than this parameter's maximum value or lower than its minimum value.
- Communication is disturbed, data transmission error or checking code error.

When above communication error occurs, it does not affect running of servo drive, meanwhile, the drive will give a feedback of error frame.
The format of error frame is shown in following table.

Data frame of host controller:

start	Slave station address	command	Data address, references, etc.	checkout

Servo drive's feedback of error frame:

start	Slave station address	Response code	Error code	checkout

Comments:
Error frame response code = Command＋80H；
Error code＝00H：communication is good
＝01H：servo drive can't identify requested function
＝02H：given data address in the request does not exist in servo drive
＝03H：given data in the request is not allowed in servo drive（higher than maximum value or lower than minimum value of the parameter）
＝04H：servo drive has started processing the request, but unable to finish this request.

For example:
Let's suppose the axis number of servo drive is 03H, and we want to write data 06H into

Parameter Pn002. Because maximum and minimum value of Pn002 are both zero(0), the data which is to be written in will not be accepted, instead, servo drive will feedback an error frame with error code 03. The frame is as below:

Data frame of host controller:

start	Slave station address	command	Data address, references, etc.	checkout
	03H	06H	0002H 0006H	

Servo drive's feedback error frame:

start	Slave station address	Response code	Error code	checkout
	03H	86H	03H	

Plus, if the slave station address of data frame transmitted by Host controller is 00H, it means this frame of data is broadcasting data, and servo drive will not feedback a frame.

8.3.3 Parameters, servo status data communication address

In MODBUS communication mode, all the communication parameters of EDC servo are shown in the following table:

Data address	Meaning	Comments	Operation
0000~0078H	Parameter area	parameter table	Readable and writable
0806~0814H	Monitored data （consistent with data displayed on handheld operator or drive panel		Read only
0806H	Speed feedback	Unit: r/min	read only
0807H	Input speed reference value	Unit: r/min	read only
0808H	Percentage of Input torque reference	Relatively rated torque	read only
0809H	Percentage of Internal torque reference	Relatively rated torque	read only
080AH	Pulse number of Encoder rotation		read only
080BH	input signal status		read only
080CH	status of encoder signal		read only
080DH	status of output signal		read only
080EH	Pulse given		read only
080FH	Current position low	Unit: 1 reference pulse	read only
0810H	Current position high	Unit: 10000 reference pulse	read only
0811H	error pulse counter low 16 position		read only
0812H	error pulse counter high 16 position		read only
0813H	Given pulse counter low	Unit: 1 reference pulse	read only
0814H	Given pulse counter high	Unit: 10000 reference pulse	read only
0817H	Current alarm		read only
07F1~07FAH	Alarm information storage area	10 History Alarms	read only
0900H	IO signal of ModBus Communication	No saving in case of power interruption	readable and writable
0901H	Drive status		read only
0904H	Runtime of servo drive	Unit: minute	read only
090EH	DSP software version	Version expressed in number	read only
1000H	Drive model	Host controller reads information from servo drive	read only
1021H	Reset History Alarm	01： Reset	readable and writable
1022H	Reset current alarm	01： Reset	readable and writable
1023H	JOG Servo ON	01：enable 00：disable	readable and writable
1024H	JOG forward run	01：forward run 00：stop	readable and writable
1025H	JOG reverse run	01：reverse run 00：stop	readable and writable

Notes:

1.parameter area（COM address is from 0000 to 0078H）

Parameters in related parameter table, for example, parameter with 0000H as COM address is expressed as Pn000, parameter with 0065H as COM address is expressed as Pn101, and read-write of data at 0000H is the same as operating on parameterPn000. If data coming from communication is not within the parameter range, the data will be abandoned and servo drive will feedback a message of operation fail. If the parameter is changed successfully, this parameter will be saved automatically after a power interruption.

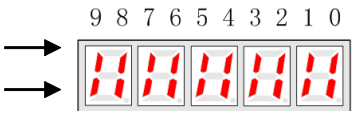
2.Monitoring data area（0806～0814H）

The monitoring data does not correspond totally to display of Un000~Un013on handheld operator. For example, the data that communication reads from address of 0807H is FB16H, then specified speed is -1258 r/min.

Following table shows the meaning of each monitoring data.

Monitored data	Comments
0806H	Actual motor speed: r/min
0807H	Input speed reference value: r/min
0808H	Feedback torque percentage %（Relatively rated torque）
0809H	Input torque percentage %（Relatively rated torque）
080AH	Encoder angle pulse number
080BH	input signal monitor
080CH	Encoder signal monitor
080DH	Output signal monitor
080EH	Pulse given speed （when electronic gear ratio is 1：1）
080FH	Current motor position is 5 digit low （×1 pulse）
0810H	Current motor position is 5 digit high（×10000pulse）
0811H	position error 5 digit low（×1 pulse）
0812H	position error 5 digit high（×10000 pulse）
0813H	Position reference 5 digit low（×1 pulse）
0814H	Position reference 5 digit high（×10000pulse）

Digit of Internal status



Monitoring of I/O signals is shown below:

Monitoring No.	Digit no	IO	Contents	Relative IO signal
080BH	0	input signal	Servo ON	1CN-15 (/S-ON)
	1		alarm reset	1CN-6(/ALM_RST)
	2		Clear error counter	1CN-7(/CLR)
	3		zero position signal	1CN-17(/ZPS)
080DH	0	output signal	servo alarm	1CN-4 (/ALM)
	1		positioning complete （ speed arrives）	1CN-3 (/COIN，etc)
	2		mechanical brake release	1CN-2 (/BRK，etc)

3.Alarm memory block（07F1～07FAH）

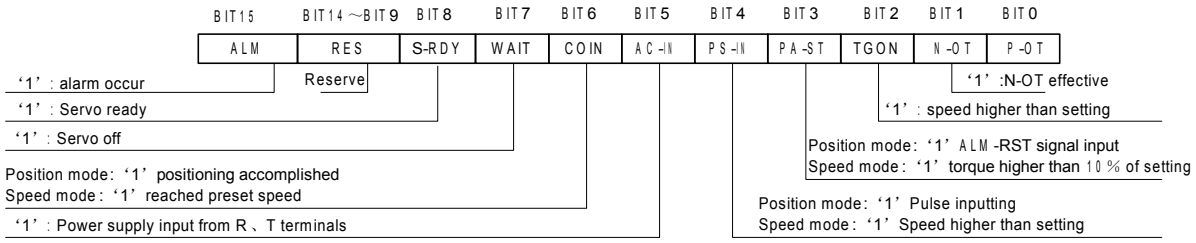
History Alarm No.	Meaning	Address
0	History Alarm 1 （ Latest alarm）	07F1H
1	History Alarm 2	07F2H
2	History Alarm 3	07F3H
3	History Alarm 4	07F4H
4	History Alarm 5	07F5H
5	History Alarm 6	07F6H
6	History Alarm 7	07F7H
7	History Alarm 8	07F8H
8	History Alarm 9	07F9H
9	History Alarm 10 （ longest time）	07FAH

4.ModBus communication IO signal（0900H）

Use communication to control input digital IO signals, the data is not saved after power is interrupted.

5.System status（0901H）

1-word shows current system status.
The following illustration shows the meaning of each digit.



EDC servo drive's default speed is 10% of rated motor speed.

6、Run time（0904H）

It means the run time required from servo power on to read this data. It's expressed in decimal system and the unit is minute. If the read data is 00CDH，and it's expressed as 205 in decimal system, then it means current system has run for 3 hours and 25 minutes.

7、DSP Software Version（090EH）

DSP software version of servo drive is expressed in numbers. If the read data is 00C9H, and it's expressed as 200 in decimal system, then it means the software version is 2.00.

Notes:

1、 After COM address is changed, that is, parameter Pn060 or the dialing switch on drive panel is changed, servo drive will feedback data using current COM address until new COM address is updated and becomes available in around 40ms.
2、 After communication speed is changed, that is, parameter Pn061 is changed, servo drive will feedback data using current communication speed until new speed is updated and becomes available in around 40ms.
3、 After communication protocol is changed, that is, parameter Pn062 is changed, servo drive will feedback data using current communication protocol until new protocol is updated and becomes available in around 40ms.
4、 In RTU communication mode, intervals between data frames are longer than 10ms.

Chapter 9

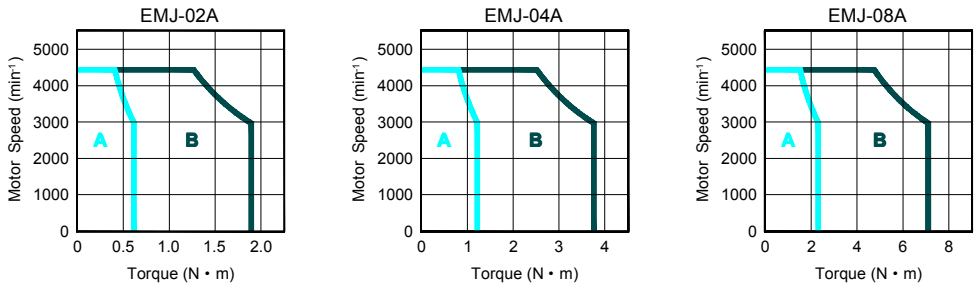
Technical specification and features

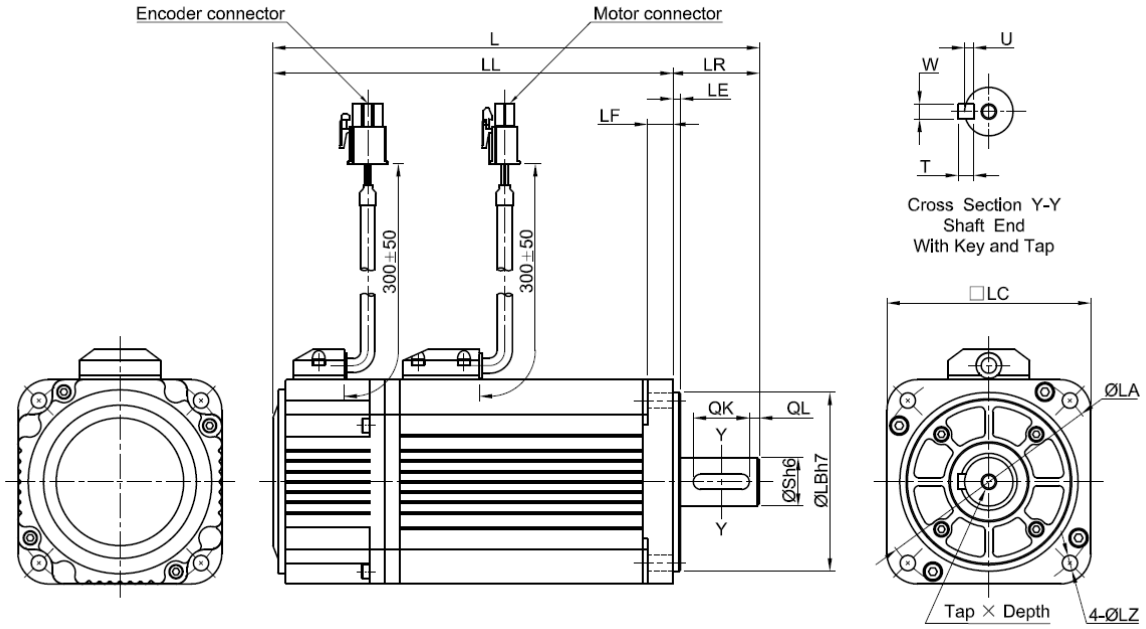
9.1 Servomotor

9.1.1 Technical specification and features

Voltage		200VAC		
Servo Motor Model	**EMJ-**	**02APA**	**04APA**	**08APA**
Rated Output Power	W	200	400	750
Rated Torque	N·m	0.64	1.27	2.39
Instantaneous Peak Torque	N·m	1.91	3.82	7.16
Rated current	Arms	1.3	2.7	4.0
Instantaneous Peak current	Arms	3.9	8.1	12.0
Rated speed	minP^{-1P}	3000		
Max. speed	minP^{-1P}	4500		
Rotor moment of inertia	x10P^{-4P}kg·mP^{2}P	0.19	0.32	1.48
Encoder	Standard	Incremental：2500P/R		
Insulation Class		B		
Ambient temperture		0 to +40℃ (no freezing)		
Ambient humidity		20 to 80% RH (non-condensing)		
Enclosure		Totally Enclosed，Self-cooled，IP65 (Except for shaft opening and connector)		
Vibration		49m/sP^{2P}		

(A: Continuous working area, B: Repeatable working area)

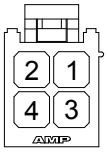




EMJ-	L	LL	Flange							S	Tap×Depth	Key				
			LR	LE	LF	LC	LA	LB	LZ			QK	QL	W	T	U
02APA	153	123	30	3	6	60	70	50	5.5	14	M5x10L	16	4	5	5	3
04APA	183	153	30	3	6	60	70	50	5.5	14	M5x10L	16	4	5	5	3
08APA	191	156	35	3	10	80	90	70	6	19	M6x15L	22	4	6	6	3.5

● Power connector specification:

Shell： 172167-1 (AMP) Pin： 170360-1 (AMP)

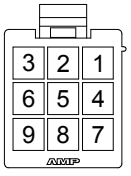


Pin NO.	Signal	Color
1	U	Red
2	V	Blue
3	W	White
4	FG	Green/Yellow

● Encoder connector specification:

Shell： 172169-1 (AMP) Pin： 170359-3 (AMP)

Incremental encoder type



Pin NO.	Signal	Color
1	A+	Blue
2	B+	Green
3	C+	Yellow
4	A-	Blue/Black
5	B-	Green/Black
6	C-	Yellow/Black
7	PG5V	Red
8	PG0V	Black
9	FG	Shield

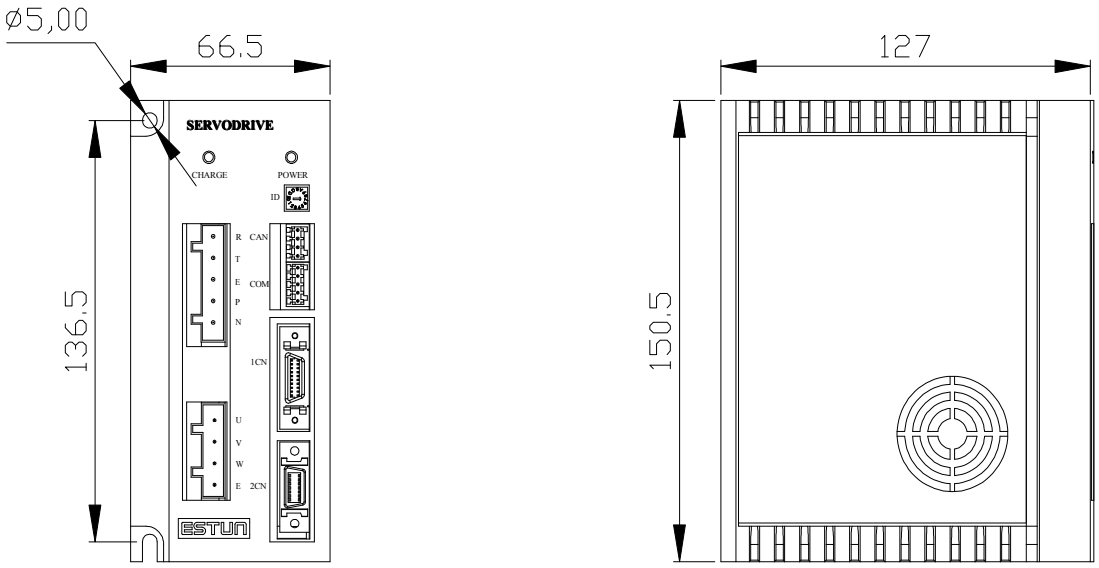
9.2 Servo drive

9.2.1 Technical specification and model

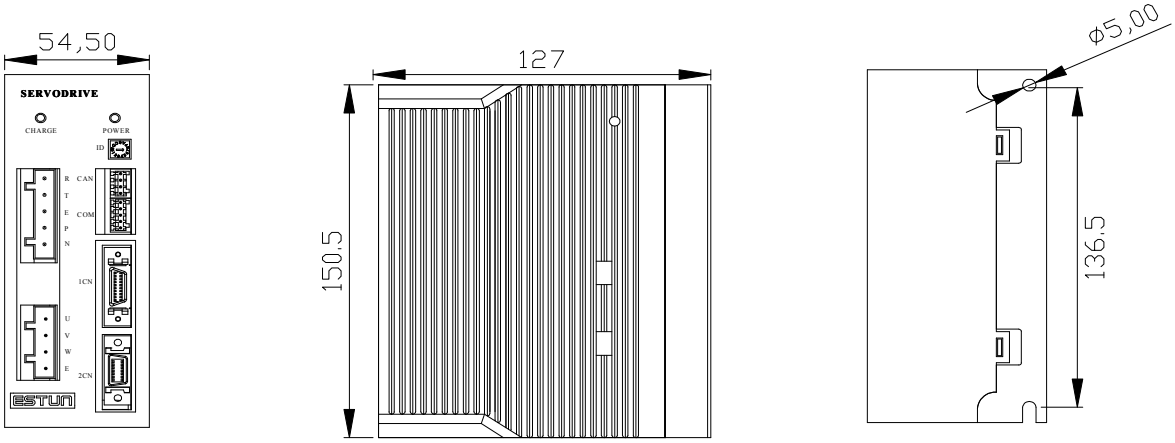
Servo drive model EDC-			01P	02P	05P	08P
Applicable servomotor model EMJ-			01A	02A	05A	08A
Basic data	Power supply		Single phase AC220V $^{+10}_{-15}$ %,50/60Hz			
	Control mode		SVPWM			
	Feedback		Incremental encoder（2500P/R）			
	Working Condition	Operating/ storage temperature	0~55℃/-20~85℃			
		Operating/ storage humidity	Below 90%RH （non-condensing）			
		Shock/vibration resistance	4.9m/s^2/19.6 m/s^2			
	Structure		Base mounted			
	Mass (approximately)		2kg			
Speed control mode	Speed control range		1:5000			
	Speed regulation	Load Regulation	0~100%：0.01% below (at rated speed)			
		Voltage regulation	Rated voltage ±10%：0%(at rated speed)			
		Temperature regulation	0~40℃：0.1% below(at rated speed)			
	Frequency Characteristics		250Hz（when $J_L \leq J_M$）			
Position control mode	Pulse reference	Type	SIGN＋PULSE train, sin. Pulse phase A and phase B，CCW+CW pulse train			
		Pulse Buffer	Line driving（＋5V level），open collector（＋5V、＋12V、＋24V level			
		Pulse Frequency	Max. 500Kpps（difference）/ 200 Kpps（collector）			
	Control signals		CLEAR			
I/O signals	Pulse output signal		Phase A, phase B and phase C: line driving output			
	Sequence control input		Servo ON, Alarm Reset, error counter clear signal, zero clamp signal.			
	Sequence control output		Servo Alarm, positioning complete(speed coincidence), brake release, limiting torque			
Built-in function	Dynamic braking		Built-in			
	Protection		Power module error, overload, overspeed, voltage error, position error counter overflow, encoder disconnected, parameter damaged, etc.			
	COM function		With RS232 interface for communication with host controller's special software, Parameter setting, Run operation and status display can be done in Windows mode. Same functions are enabled using panel operator. Compatible with Modbus communication protocol.			
			CanOpen COM			
	LED display		Charge indicator, Power&ALM indicator, five 7 segment tube（on panel operator）			

9.2.2 Servo drive mounting dimension

With cooling fan



Without cooling fan



Appendix A

Parameter list

Para. No.	Name and Meaning	Unit	Setting range	Default	Remarks
Pn000	Enable/Disable Servo On input signal（/S-ON） [0] Enable Servo ON input signal（/S-ON） [1] Enable internal servo ON（/S-ON）	—	0~1	0	①
Pn001	Enable/Disable input signal prohibited (P-OT) When 1CN-2 is set as PN-OT signal, limiting direction and enabling are selected according to this parameter. [0]disable input signal prohibited [1]enable forward run input signal prohibited [2]enable reverse run input signal prohibited	—	0~2	0	①
Pn002	Enable/Disable input signal prohibited (N-OT) When 1CN-2 is set as N-OT signal, limiting direction and enabling are selected according to this parameter. [0]enable forward run input signal prohibited [1]enable reverse run input signal prohibited	—	0～1	0	①
Pn003	Select operation upon momentary power interruption [0] Servo alarm output is not available（ALM） [1] Servo alarm output is available（ALM）	—	0~1	0	①
Pn004	Stopping method for servomotor after Servo OFF or alarm occurrence [0] Stop the motor by applying DB (dynamic brake) [1] Stop the motor by coasting [2] Stop the motor by applying DB (dynamic brake), then the motor coasts to a stop [3] Stop the motor by coasting without using DB	—	0~3	0	①
Pn005	Clear error pulse signal is turn ON or not after Servo OFF [0] Turned on [1] turned off	—	0~1	0	①
Pn006	Select rotation direction [0] side view from load of servomotor , CCW means forward run [1] side view from load of servomotor, CW means forward run	—	0~1	0	①
Pn007	Speed control mode selection [0] ADRC control [1] PI control	—	0~1	0	

Para. No.	Name and Meaning	Unit	Setting range	Default	Remarks
Pn008	Reference pulse form [0] SIGN + PULSE [1] CW+CCW [2] Phase A + Phase B (×4), positive logic	—	0~2	0	①
Pn009	Reference pulse form [0] does not invert PULSE reference, does not invert SIGN reference [1] does not invert PULSE reference, inverts SIGN reference [2] inverts PULSE reference, does not invert SIGN reference [3] inverts PULSE reference, inverts SIGN reference	—	0~3	0	①
Pn010	PG pulse dividing ratio	P/R	1~2500	2500	①
Pn011	Dividing output phase selection	—	0~1	0	①
Pn012	Speed feedforward selection [0] disable [1] enable	—	0~1	0	
Pn013	Speed loop gain	Hz	1~3000	80	②
Pn014	Speed loop integral time constant	ms	1~2000	180	②
Pn015	Position loop gain	1/s	1~1000	40	
Pn016	Speed error	r/min	0~300	0	
Pn017	Position feedforward	%	0~100	0	
Pn018	Torque reference filter	%	0~5000	0	
Pn019	Soft start acceleration time	ms	0~10000	100	
Pn020	Soft start deceleration time	ms	0~10000	100	
Pn021	S-shaped acceleration and deceleration time	ms	0~1000	0	
Pn022	Electronic gear ratio (numerator)	—	1~32767	1	
Pn023	Electronic gear ratio (denominator)	—	1~32767	1	
Pn024	1st position reference filter	ms	0~1000	0	
Pn025	Feedback filter	ms	0~1000	0	
Pn026	Forward torque limit	%	0~300	250	②
Pn027	Reverse torque limit	%	0~300	250	②
Pn028	Positioning complete detection filter	%	0~500	0	
Pn029	Speed coincidence error	r/min	0~100	10	
Pn030	In position error	Reference unit	0~500	10	
Pn031	Error counter overflow range	256 reference unit	1~32767	1024	
Pn032	JOG speed	r/min	0~3000	500	
Pn033	reserved	—	0	0	
Pn034	reserved	—	0	0	
Pn035	reserved	—	0	0	
Pn036	reserved	—	0	0	
Pn037	reserved	—	0	0	
Pn038	Automatic gain adjustment: [0] without automatic gain adjustment [1]after inertia detection, gain is adjusted automatically	—	0~1	0	
Pn039	P/PI Switching Terms [0] setting torque [1] error pulse [2] acceleration [3] motor speed	—	0~4	0	

Para. No.	Name and Meaning	Unit	Setting range	Default	Remarks
	[4] disable mode switch function				
Pn040	P/PI switching threshold	—	0~5000	200	
Pn041	Control mode selection [0] Position control (pulse train reference) [1] position contact control (internal position reference) [2]Speed control (contact reference)	—	0~2	0	①
Pn042	Reserved	—	0	0	
Pn043	Waiting time for Servo ON	ms	20~2000	200	
Pn044	Basic waiting procedure	ms	0~5000	10	
Pn045	Waiting speed for brake signal	r/min	10~500	100	
Pn046	Waiting time for brake signal	ms	10~1000	500	
Pn047	Position error pulse overflow alarm output [0] disable [1] enable	—	0~1	0	
Pn048	Run speed of programmed speed	r/min	-6000~6000	500	
Pn049	1CN-2output signal selection 0: BK 1:COIN 2:CLT 3:S-RDY	—	0~3	0	
Pn050	1CN-3output signal selection 0: BK 1:COIN 2:CLT 3:S-RDY	—	0~3	1	
Pn051	1CN-6 input signal selection 0: ALM_RST 1:CLR 2:P-CON 3:P-OT 4:N-OT	—	0~4	0	
Pn052	1CN-7 input signal selection 0: ALM_RST 1:CLR 2:P-CON 3:P-OT 4:N-OT	—	0~4	1	
Pn053	Input IO signal filter time	ms	0~10000	100	
Pn054	Inverts input signal	—	0~15	0	
Pn055	Inverts output signal	—	0~7	0	
Pn056	2nd electronic gear numerator	—	1~32767	1	
Pn057	Dynamic electronic gear enable	—	0~1	0	①
Pn058	reserved	—	0	0	
Pn059	RS232 COM input IO contact control	—	0~15	0	
Pn060	RS232 COM address	—	1~254	1	
Pn061	**RS232 COM baudrate** 0：4800bit/s 1：9600bit/s 2：19200bit/s	bit/s	0~2	1	
Pn062	**RS232 COM protocol** 0：7，N，2（Modbus, ASCII） 1：7，E，1（Modbus,ASCII） 2：7，O，1（Modbus,ASCII） 3：8，N，2（Modbus,ASCII） 4：8，E，1（Modbus,ASCII）	—	0~8	5	

Para. No.	Name and Meaning	Unit	Setting range	Default	Remarks
	5：8，O，1（Modbus,ASCII） 6：8，N，2（Modbus,RTU） 7：8，E，1（Modbus,RTU） 8：8，O，1（Modbus,RTU）				
Pn063	CAN COM address	—	1~127	1	
Pn064	**CAN COM baudrate** 0：50K 1：100K 2：125K 3：250K 4：500K 5：1M	Kbit/s	0~5	2	
Pn065	CAN COM selection [0]disable [1]enable	—	0~1	0	
Pn066	Reserved	—	0	0	
Pn067	Reserved	—	0	0	
Pn068	**Select cycle run** [0]multi-point cycle run [1]multi-point single run	—	0~1	0	
Pn069	**Enable/disable P-CON signal as step change signal** [0] Enable delay step change [1] use P-CON signal as step changing signal	—	0~1	0	
Pn070	**Programming method** [0]incremental [1]absolute	—	0~1	0	
Pn071	**Origin searching method** Z Y X Z=0：turn off origin search function Z=1: Power on, after the 1st S-ON, start origin search function automatically. Z=2 ： start origin search function automatically every time after S-ON. Y=0：Search Pulse C after origin search is done Y=1 ： don't search Pulse C after origin search is done X=0：forward run origin search ZPS as origin X=1：reverse run origin search ZPS as origin	—	0～211	0	
Pn072	Start point of program	—	0~7	0	
Pn073	End point of program	—	0~7	1	
Pn074	Speed 1 when searching reference point（hit STROKE /travel distance switch）	r/min	0~3000	1000	
Pn075	Speed 3 when searching reference point（ away from STRKE/travel distance switch）	r/min	0~300	5	
Pn076	reserved	—	0~300	0	
Pn077	Cycle number of origin search offset	10^4 reference pulse	9999	0	
Pn078	Pulse number of origin search offset	1 pulse	9999	0	
Pn079	Reserved	—	0	0	

Para. No.	Name and Meaning	Unit	Setting range	Default	Remarks
Pn080	moving distance 0 revolutions	10^4 reference pulse	-32767~32767	1	
Pn081	moving distance 0	1reference pulse	-9999~9999	0	
Pn082	moving distance 1 revolution	10^4 reference pulse	-32767~32767	2	
Pn083	moving distance 1 low	1 reference pulse	-9999~9999	0	
Pn084	moving distance 2 revolutions	10^4 reference pulse	-32767~32767	3	
Pn085	moving distance 2 low	1 reference pulse	-9999~9999	0	
Pn086	moving distance 3 revolutions	10^4 reference pulse	-32767~32767	4	
Pn087	moving distance 3 low	1 reference pulse	-9999~9999	0	
Pn088	moving distance 4 revolutions	10^4 reference pulse	-32767~32767	5	
Pn089	moving distance 4 low	1 reference pulse	-9999~9999	0	
Pn090	moving distance 5 revolutions	10^4 reference pulse	-32767~32767	6	
Pn091	moving distance 5 low	1 reference pulse	-9999~9999	0	
Pn092	moving distance 6 revolutions	10^4 reference pulse	-32767~32767	7	
Pn093	moving distance 6 low	1 reference pulse	-9999~9999	0	
Pn094	moving distance 7 revolutions	10^4 reference pulse	-32767~32767	8	
Pn095	moving distance 7 low	1reference pulse	-9999~9999	0	
Pn096	moving distance 0speed	r/min	0~3000	500	
Pn097	moving distance 1speed	r/min	0~3000	500	
Pn098	moving distance 2speed	r/min	0~3000	500	
Pn099	moving distance 3speed	r/min	0~3000	500	
Pn100	moving distance 4speed	r/min	0~3000	500	
Pn101	moving distance 5speed	r/min	0~3000	500	
Pn102	moving distance 6speed	r/min	0~3000	500	
Pn103	moving distance 7speed	r/min	0~3000	500	
Pn104	moving distance 0 first(1st) acceleration/deceleration time constant	ms	0~32767	0	
Pn105	moving distance 1 first(1st) acceleration/deceleration time constant	ms	0~32767	0	
Pn106	moving distance 2 first(1st) acceleration/deceleration time constant	ms	0~32767	0	
Pn107	moving distance 3 first(1st) acceleration/deceleration time constant	ms	0~32767	0	
Pn108	moving distance 4 first(1st) acceleration/deceleration time constant	ms	0~32767	0	
Pn109	moving distance 5 first(1st) acceleration/deceleration time constant	ms	0~32767	0	
Pn110	moving distance 6 first(1st) acceleration/deceleration time constant	ms	0~32767	0	

Para. No.	Name and Meaning	Unit	Setting range	Default	Remarks
Pn111	moving distance 7 first(1st) acceleration/deceleration time constant	ms	0~32767	0	
Pn112	moving distance 0stop time	50ms	0~32767	10	
Pn113	moving distance 1stop time	50ms	0~32767	10	
Pn114	moving distance 2stop time	50ms	0~32767	10	
Pn115	moving distance 3stop time	50ms	0~32767	10	
Pn116	moving distance 4stop time	50ms	0~32767	10	
Pn117	moving distance 5stop time	50ms	0~32767	10	
Pn118	moving distance 6stop time	50ms	0~32767	10	
Pn119	moving distance 7stop time	50ms	0~32767	10	
Pn120	Current feed forward compensation	—	0~4096	0	②

⚠ Note:

① After changing the setting, always turn the power OFF, then Power ON again. This makes the new setting valid.

② The parameter may vary for motors of different models.

Appendix B

Alarm list

Alarm Code	Alarm output	Alarm Name	Meaning
A. 01	×	Parameter breakdown	checksum results of parameters saved in external storage has errors
A. 02	×	Current detection error	internal detection circuit problem
A. 03	×	Overspeed	rotation speed of the motor has exceed 1.1 times of max. speed
A. 04	×	Overloaded	the motor was runing for several seconds under the torque largely exceeding ratings.
A. 05	×	Position error counter overflow	internal position error counter has exceeded the value
A. 06	×	Position error pulse overflow	internal position error pulse has exceeded the value set in the parameter Pn-031
A. 09	×	Pulse loss of encoder C	PC is disconnected or have interference
A. 10	×	Encoder disconnected	At least one of PA,PB, PC,PU,PV, or PW is disconnected
A. 11	×	Encoder U,V or W code violation	Encoder U,V or W code violation(note that the U,V,W signal of encoder is different from the strong current signal U,V,W which the servo drive connected with the motor)
A. 12	×	Power module error	the current passed on power module is too large or control voltage of VCC4 is too low
A. 13	×	overheat	power module overheat
A. 14	×	Voltage error	Overvoltage or Undervoltage of main circuit
A. 15	×	Frequency error of input pulse	Reference pulse frequency is higher than 500kpps.
A. 16	×	Parameter error	parameter saved in external storage has errors
A. 17	×	I/O data error	I/O data error, such as ALM, BRK, COIN, Relay, LED lamps etc error
A. 21	×	Power loss error	a power interruption exceeding one cycle occurred in AC power supply.
A. 25	×	Watchdog reset	system reset by watchdog
A. 26 ～A. 28	×	Program error	Program execute error
A. 42	×	Motor and servo mismatch	Pn042(mode selection)not correct
A. 60～A. 66	×	CAN communicate error	CAN communicate fault
A. 99	○	Not an error	normal status

○：Photo-coupler is ON (ON)
×：Photo-coupler is OFF (OFF)

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