DCS Series On AC Servo Drive System
INSTRUCTION MANUAL

Hangzhou riding technology CO., LTD.

CONTENTS

Safety Instructions

Safety Signs

(1)Do not attempt to install, operate, maintain or inspect the converter unit, servo amplifier (drive unit) and servomotor until you have read through this Instruction Manual, Installation guide, Servo motor Instruction Manual and appended documents carefully and can use the equipment correctly. Do not use the converter unit, servo amplifier (drive unit) and servo motor until you have a full knowledge of the equipment, safety information and instructions. In this Instruction Manual, the safety instruction levels are classified into "WARNING" and "CAUTION".

Warning sign	Description
 WARNING	Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury.
 CAUTION	Indicates that incorrect handling may cause hazardous conditions, resulting in medium or slight injury to personnel or may cause physical damage.

Note that the CAUTION level may lead to a serious consequence according to conditions. Please follow the instructions of both levels because they are important to personnel safety. What must not be done and what must be done are indicated by the following diagrammatic symbols.

(2) Symbol

Use the symbol in order to emphasize key points.

Symbol	Description
	PROHIBITION
	NO TOUCHING
	NO DISMANTLING
	BE CAREFUL OF BURNING

Symbol	Description
	INSTRUCTIONS FOR NORMAL USERS
	MAKE SURE GROUNDING
	BE CAREFUL OF ELECTRIC
	BE CAREFUL OF HIGH TEMPERATURE

Security Matters

1.CAUTION	
	WARNING
	1. Do not touch inside of the servo amplifier. Otherwise, you may be electric shocked.
	2. Servo amplifier and GND terminal of servo motor must be connected to the ground or it may cause electric shock.
	3. Please check wiring at least 5mins later after powered off or it may cause electric shock.
	4. Please do not damage the cable line, cable or impose unnecessary stress, pressure load objects on it. Otherwise, may result in malfunction, damage and electric shock.
	5. During operation, do not touch the rotating part of the servo motor. Otherwise, you may be injured.
	CAUTION
	1. Operate servo motor and servo amplifier under specific order. Otherwise, fire and malfunction may occur.
	2. Do not place the facility in environment which has easy access to splashed water, corrosive gas, flammable gas or flammable materials. Otherwise, fire and fault may occur.
	3. Servo amplifiers, servo motors and peripheral equipment are in high temperature when operated, keep distance or you may be burned.
	4. During a period of time after powered off, the servo amplifier heat radiator, regenerative resistor, servo motor are in a high temperature state. Do not touch it or you may be burned.
	5.During the using of servo motor in final product ,if the surface temperature exceeds 70℃, please tag a label to inform high temperature.

2.Precautions for storage

	PROHIBITION
	1. Do not store the facility where it easily has access to dripping water, harmful liquid or gas. Otherwise, it may be malfunction.
	2. Do not put it in place with great vibration or directly on the ground for storage. Otherwise, it may be malfunction.
	INSTRUCTION
	1. Please keep facility with no direct sunlight and within certain temperature and humidity requirements range (-20℃~ 60℃ 10% ~ 90% RH below, no dewing). Otherwise, it may be malfunction.
	2. When store it after installation, put the film upon the servo motor properly to prevent moisture, oil and water. Please coat the machining surface (shaft, flange surface) with rust inhibitor every 6 months. To prevent rust on bearings, please rotate axis by hands or idling for at least 5mins every month.
	3. If you want to store for a long time, please contact our company.

3.CAUTIONS FOR CARRYING

	CAUTION
	• When transporting, do not hold the cable or the motor shaft by hands. The device may be damaged and people are likely to be hurt.
	Mandatory
	1. When excessive loaded, it may lead to the collapse of the goods, please comply with safety requirements.
	2. Servo motor‘s eyebolt can only be used for transferring. Please do not use it to carry handling equipment. Otherwise, The device may be damaged and people are likely to be hurt.

4.INSTRUCTIONS FOR INSTALLATION

CAUTION

1. Do not sit on the servo motor or put heavy objects on top of it. Otherwise the machine may malfunction and be damaged, or it may cause electric shock and injury.

2. Do not block the exhaust hole and do not let debris enter. Otherwise the machine may cause fire and electric shock accident.

3. Be sure to follow the installation directions. Otherwise the machine may burn and malfunction.

4. Do not apply strong impact. Otherwise the machine may malfunction.

INSTRUCTION

1. As part of the servo motor, shaft is not deal with waterproof and oil proof measures, you must take measures to prevent water and oil entering into the servo motor. Otherwise the machine may malfunction.

2. If the body of servo motor is likely to be splashed by a large number of water and oil, the equipment should be treated with waterproof or oil proof measures. For a small amount of flying oil conditions, the servo motor can be self-treated to protect it.
If you must utilize the facility in the environment full of moisture or mist of oil, please install the wire and connector downwards. Otherwise, it may lead to bad insulation, short circuit or heavy accident.

3. Do not dismantle servo motor. Otherwise, fire and danger may occur.

5. WIRING CAUTION

	CAUTION
	Wire the equipment correctly and securely. Otherwise, the servo motor may operate unexpectedly.
	PROHIBITION
	1. Do not connect servo motor U, V, W terminals with industrial power supply (380V).Otherwise, fire and malfunction may occur.
	2. Connect the servo motor U, V, W terminals with the ground (PE), and do not mistake on order of U, V, W terminals. Otherwise, fire and malfunction may occur.
	3. Do not conduct encoder with voltage and resistance testing. If you want to test the voltage and resistance of servo motor side of U, V, W terminals, please cut off the connection with the servo amplifier.
	4. Do not take the wrong terminal sequence of the encoder. Otherwise, the encoder and the servo amplifier may be damaged.
	INSTRUCTION
	Ground is used to prevent electric shock in case of accidents. For safety reasons, be sure to install the ground.

6. OPERATION AND RUNNING INSTRUCTION

	CAUTION
	1. Excessive adjustments and changes will lead to instability, so do not operate it casually. Otherwise, it could be dangerous.
	2. Please fasten the servo motor and disconnect the mechanical equipment before test running. After confirmation of the operation, you can install motor with equipment. Otherwise, it could be dangerous.
	3. Self-protection arrester brake is not a stop equipment to protect facility. Please install safe stop equipment on side of facility. Otherwise, failure, injury and other accidents may occur.
	4. When servo drive alarming, try to find reasons. Reset alarm and run again only after confirming the security. Otherwise, it could be injured.
	5. Please do not be close to the device after following instantaneous power failure because it may restart again suddenly. (Please consider how to ensure the personal safety of re-start within the mechanical design)Otherwise, it could be injured.
	6. Verify the specifications of power. Otherwise, it may cause fire, failures and injuries.

	PROHIBITION
	Brake inserted in servo motor is used for self-protection, so please do not brake for the normal reason. Otherwise, there may be a problem or injury.
	INSTRUCTION
	Please set the emergency stop circuit externally so as to stop running at any time by cutting off the power. Otherwise it may cause failure, burns and injuries.

7. Precautions for Maintenance, Inspection

	PROHIBITION
	• Do not allow non-professional personnel to dismantle equipment. If you are required to dismantle or fix the facility, please contact your product sales engineer or contact us directly.

CHAPTER 1 OVERVIEW

1.1 Product introduction

Servo system is automatic control systems whose control object is the mechanical parameters. It is a servo system that can response to the change of input automatically, quickly and accurately. AC servo technology is quite mature and there is quite improvement of its performance as it has developed for many years. It is widely used in textile machinery, printing and packaging machines, CNC machine tools, and automated production lines and other fields.

RiDing DAS&DCS series on AC servo drive system, using digital signal processor DSP, large-scale programmable gate array CPLD, and the intelligent integrated power modules IPM with high integration, small size, stable operation. With abundant hardware and software protection alarm, it is easy to determine the risk and avoid failure. Product quality is quite stable with good heat dissipation and low repair rate. Product is simple. After setting the operating parameters, there is no need to conduct other operation or care about its interference with other devices. It has used the optimal PID algorithm, space vector control. It can quickly response and follow good with high precision, high efficiency, have certain advantages over similar products at domestic and abroad.

Basic Specifications

Power	Main power	Phase number	Three-phase or Single-phase
		Voltage frequency	AC220V -15% +10%（Single-phase -10% +10%） 50/60HZ
	Control power	Phase number	Single-phase
		Voltage frequency	AC220V -15% +10% 50/60HZ
Control mode			SVPWM sine wave driver
Feedback			Incremental 2500 line encoder
Function. The	Sequence input (CONT1 ~ 5)		①servo enabled ②+ overtravel ③- overtravel ④Emergency Stop⑤ reset⑥ clear deviation⑦switch control mode ⑧ external regenerative resistor overheating ⑨Multi-speed selection
	Sequence output (OUT1 ~ 4)		①servo ready ②positioning end ③servo alarm detection ④ overtravel detection ⑤emergency stop detection ⑥zero bias

input and output signals			⑦ zero speed ⑧ current limiting detection ⑨Braking time
	Encoder signal frequency dividing output	Frequency dividing setting	Pulse output Settings 16～2500（pulse/rev）
		Signal form	①differential line driver A phase B phase, Z phase②open collector output Z phase
	Position control	Maximum command pulse frequency	Maximum input pulse frequency: differential receiver 500KHZ, open collector 200KHZ
		Input pulse signal form	① RS-422 drive line signal ② open collector signal connection
		Output pulse species	①Command pulse / command sign ② forward pulse / reverse pulse ③ 90°phase difference signal
		Command pulse compensation	Command pulse compensation α, the command pulse compensation α1, the command pulse compensation α2, the command pulse compensation 3 / command pulse compensation β as a position command, can set 4 types of command compensation, and can switch at any time
		Input position control	①Command pulse compensation α selection 1 ② Command pulse compensation α selection 2 ③ clear bias④ prohibition command pulse, the above functions can be assigned to sequence input CONT1 ~ 5
	Speed control	Speed control range	1:5000
		Setting deceleration time	0 ~ 10s Corresponds to 0 ~ maximum speed; acceleration time and deceleration time can be set separately, can be set 2 acceleration / deceleration time and can decelerate with S word
		Input external speed command	Using analog speed control voltage to control speed, from the reference set-10V ~ +10 V input voltage, voltage correspond with speed.
		Set internal speed	You can set 3 internal speeds.

		Input speed control	① Multi-speed selection 1 ② Multi-speed selection 2 ③ Forward ④ Reverse ⑤ Select deceleration time these functions can be assigned to sequence input CONT1 ~ 5
	Torque control	Input external torque command	Using analog torque control voltage to control torque, from the reference set-10V ~ +10 V input voltage, voltage correspond with torque.
		Input torque control	①Forward ②Reverse,the above functions can be assigned to sequence input CONT1 ~ 5
	Regenerative braking		Drive has built-in braking resistor internally, you can add external one.
	Control mode		① position control ② speed control ③ torque control ④ position - speed control ⑤ location - Torque Control ⑥ speed - Torque Control
	Electronic gear ratios		1～32767/1～32767
	Surveillance function		Feedback speed, the command speed, average torque, peak torque, the feedback current position, the command current location, position deviation, the DC bus voltage, heat sink temperature, input voltage, input signal, output signal, the command accumulated pulse, frequency of the input pulse train , the current alarm, alarm recording, sequential mode
	Keyboard, display		Four function keys, 5 bits LED digital display
	Subsidiary function		Zero speed clamp function, it's simple and can be self tuned.
Protection			Over current, over speed, over-voltage, encoder error, memory error, regenerative resistor overheating, overload, undervoltage, overvoltage, deviations beyond tolerance, the amplifier overheating.
		Placed place	Indoor, altitude 1000m below, no dust, no

Operational environment		corrosive gas, no direct sunlight
	Temperature/humidity	0 ~ 40 ° C/1080% non-condensing
	Affordable vibration / Shock	4.9（m/s^2）/19.6（m/s^2）

1.2 Confirm Matters

After products (RIDING servo) arrival, please open the package, confirm the following contents.

Confirm matters
1. Box is intact, check whether the goods are damaged because of transport.
2. Check the drive and servo motor‘s nameplate, confirm your product type and model are right.
3. Check the delivery note, accessories are complete

Complete operational servo components should include:
(1) Servo drive and servo motor.
(2) A power output wiring connecting to motor WUV terminal. (Optional)
(3) An encoder wiring connecting to the motor encoder. (Optional)
(4) the control wiring connecting to the host computer. (Order)
If you find any anomalies, do not hesitate to contact with sale shop where you buy or directly to our company.

1.3 Instruction about DCS series servo drive models

DCS	32	05	—	V	T	1	/	A	A	0
1	2	3		4	5	6		7	8	9

1: Indicates the type of controller, DCS or DAS.
2: Indicates the power supply voltage level, 32 means three-phase 220V, 12 means single-phase 220V.
3: Indicates the rated output current, unit is amperes (A).
4: Indicates the methods of control.
5: Indicates controller type, T represent standard, A represent analog.
6: The derived code ‘1’ represent same controller with different motor, you can consult details from configuration label
7: The derived number.
8: The derived number.
9: Indicate the external package, 0 for steel shell, 1 for plastic shell.

Note: This version of the manual for the DCS series, DAS series interface definition and wiring instructions refer to version V1.2.

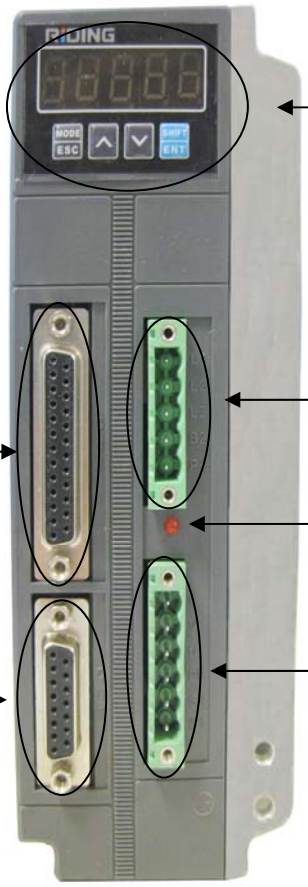
1.4 Servo motor model description

130	ST —	Z	M	050	C	2	A —	I	S /	Z	M
1	2	3	4	5	6	7	8	9	10	11	12

1: Indicates base number.
2: Indicates the code of performance parameters, ST means sine wave-driven permanent magnet synchronous motors.
3: Indicates braking, no brakes if the third digit are default.
4: Indicates the feedback type, ‘M’ for photoelectric encoder, X for rotary transformers, G for tachometer generator.
5: Indicates the output torque × 0.1NM.
6: Indicates rated speed:
A for 1500r/min
B for 2000 r/min
C for 2500r/min
D for 3000r/min
E for 1000r/min
7: Indicates the controller input is 3-phase 220V.
8: Indicates the type of output shaft:
A means straight shaft with key, key width 6mm
B No keys on straight shaft.
C means straight shaft with key, key width 8mm
D means straight shaft with key, key width 5mm
E means straight shaft with key, key width 10mm
9: The derived number.
10: Indicates whether it is equipped with synchronous wheel, S represent equipped with 18 tooth synchronous wheel, NO synchronous wheels if this digit is default.
11. Distinguish differences in the details.
12: The derived number.

1.5 Product Appearance

1) Appearance of the servo drives below 4A



5-digit 7-segment display with four operating keys

Main power terminal, an external braking resistor terminal, connect the external power supply (not directly connected to 380V power supply, otherwise the drive will be destroyed)

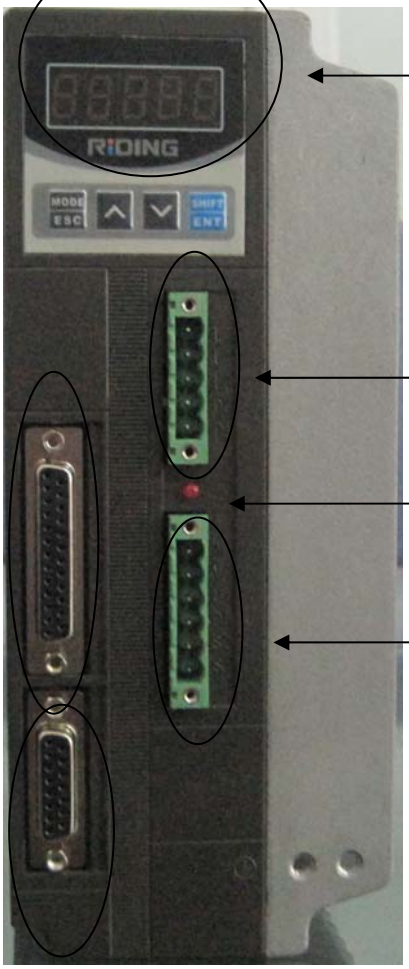
The main power indicator light, it becomes light when the servo drive connects to main power.

Control power and the power output

Connect sequence Input and output signals (DB25)

Connect the servo motor Encoder cable (DB15)

2) 4 ~ 8A servo driver appearance



5-digit 7-segment display with four operating keys

Main power terminal, an external braking resistor terminal, connect the external power supply (not directly connected to 380V power supply, otherwise the drive will be destroyed)

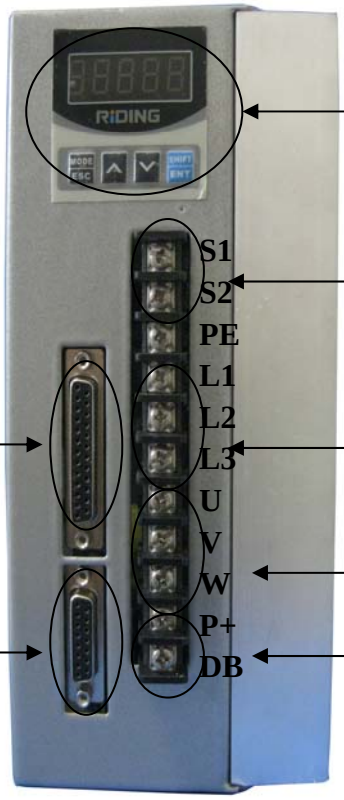
The main power indicator light, it becomes light when the servo drive connects to main power.

Control power and the power output.

Connect sequence Input and output signals (DB25)

Connect the servo motor Encoder cable (DB15)

3) 8 ~ 12A servo driver appearance



5-digit 7-segment display with four operating keys

Control power

Main power terminal, connect an external power supply (not directly connected to 380V power supply, otherwise the drive will be destroyed)

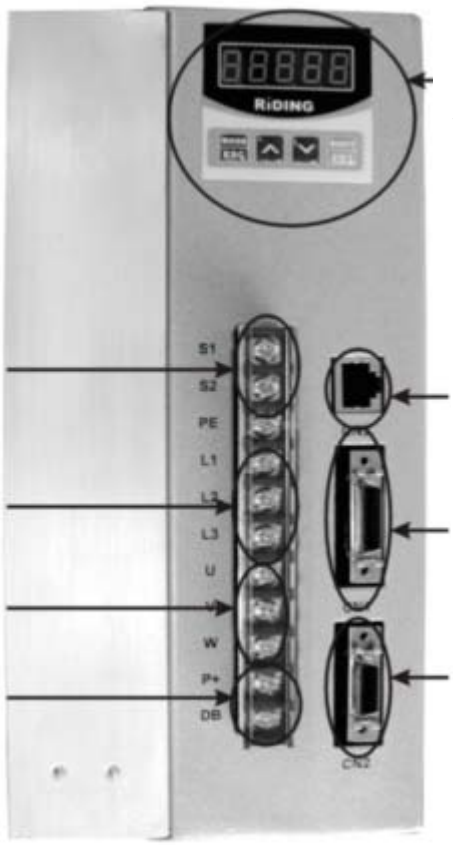
Utility power output

External braking resistor

Connect sequence Input and output signals (DB25)

Connect the servo motor encoder cable (DB15)

4) 12 ~ 30A servo driver appearance



5-digit 7-segment display with four operating keys

Control power

Main power terminal, connect an external power supply (not directly connected to 380V power supply or the drive will be destroyed)

Utility power output

External braking resistor

Communications port (RJ45)

Connect sequence Input and output signals (CT26)

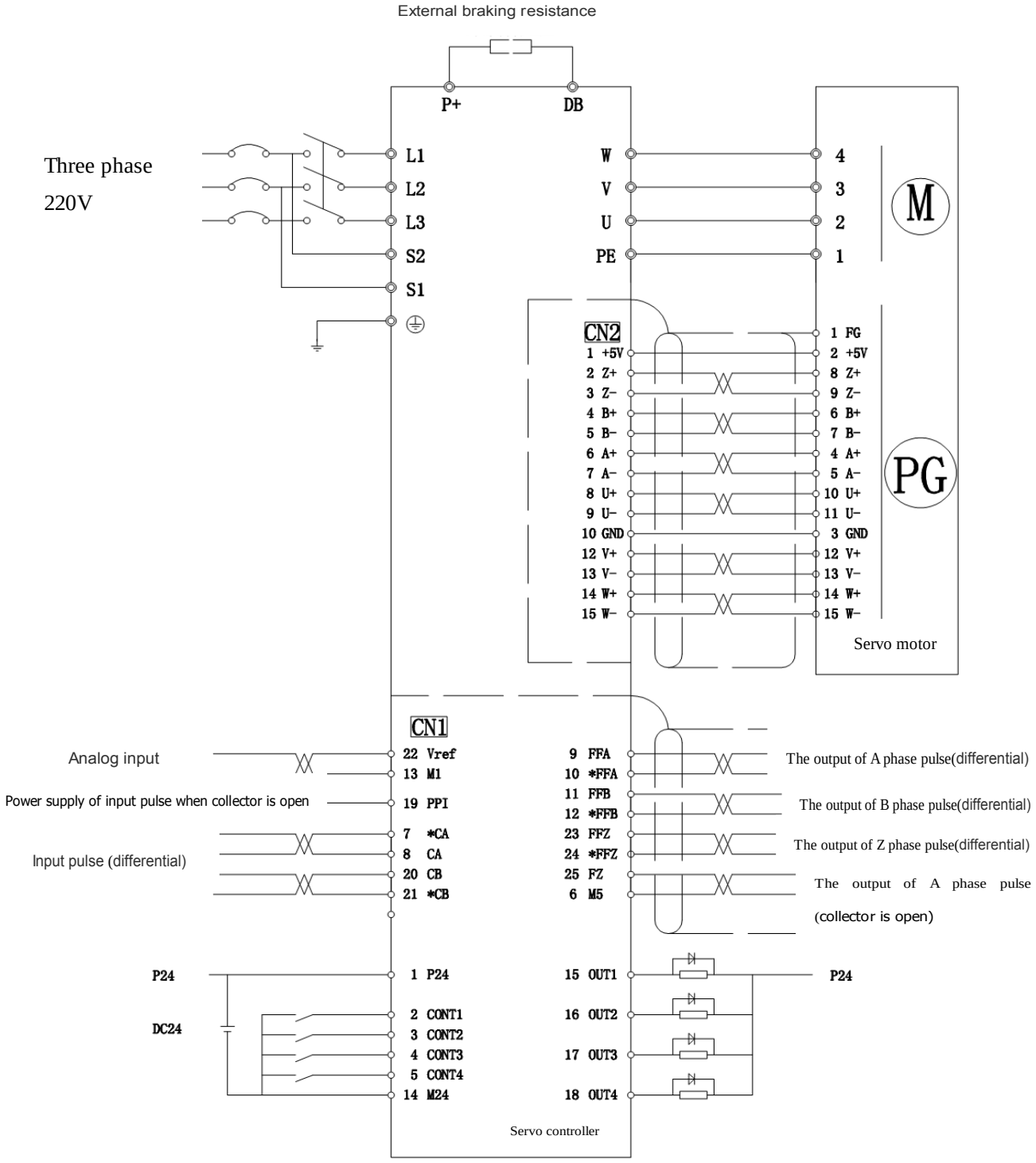
Connect the servo motor Encoder line (CT15)

CHAPTER 2 WIRING AND DETAILED INSTRUCTIONS

2.1 DCS Series Drive Wiring Diagram

Input Power: Single phase 200 ~ 230V or three phase 200 ~ 230V

1-1 Standard drive wiring diagram


External braking resistance
P+
DB
Three phase
220V
L1
L2
L3
S2
S1
W
V
U
PE
4
3
2
1
M
CN2
1 +5V
2 Z+
3 Z-
4 B+
5 B-
6 A+
7 A-
8 U+
9 U-
10 GND
12 V+
13 V-
14 W+
15 W-
1 FG
2 +5V
8 Z+
9 Z-
6 B+
7 B-
4 A+
5 A-
10 U+
11 U-
3 GND
12 V+
13 V-
14 W+
15 W-
PG
Servo motor
CN1
Analog input
22 Vref
13 M1
Power supply of input pulse when collector is open
19 PPI
Input pulse (differential)
7 *CA
8 CA
20 CB
21 *CB
9 FFA
10 *FFA
11 FFB
12 *FFB
23 FFZ
24 *FFZ
25 FZ
6 M5
The output of A phase pulse(differential)
The output of B phase pulse(differential)
The output of Z phase pulse(differential)
The output of A phase pulse
(collector is open)
P24
1 P24
DC24
2 CONT1
3 CONT2
4 CONT3
5 CONT4
14 M24
15 OUT1
16 OUT2
17 OUT3
18 OUT4
P24
Servo controller

Note:

1. The shielded cable which connects CN1, CN2 must be grounded.

2. The control power S1, S2 must correspond to the connection; it can run only after connecting to main source.

3. The upper diagram is just for reference, please follow the user manual when practically connecting.

Power input: single phase 200 ~ 230V or three phase 200 ~ 230V

1-2 Analog special-drive wiring diagram

NOTE:

1. The shielded cable which connects CN1, CN2 must be grounded.
2. The control power S1, S2 must correspond to the connection; it can run only after connecting to main source.
3. The upper diagram is just for reference, please follow the user manual when practically connecting

2.2 Power Supply

Supply to the servo amplifier single-phase 220V or three-phase 220V commercial power. When use one phase electrics, connect to L1, L2. When use three phase electric, connect L1, L2 and L3 terminals. No matter how you supply the power (single-phase or three-phase), L1, L2 must be respectively connect S1, S2. When supplied by three phase. You can choose any two phases to connect with assistant control power supply S1, S2.

Voltage: Single phase 200 ~ 230V -10% ~ +10%, three-phase 200 ~ 230V -15% ~ +10%

Frequency: 50/60Hz

Phase number: Single phase (power supply L1, L2), three-phase (power supply L1, L2, L3) / single-phase (control power s1, s2)

※ If the supply voltage exceeds a given limit value, it will damage the servo amplifier.

2.3The input and output command control sequence (CN1)

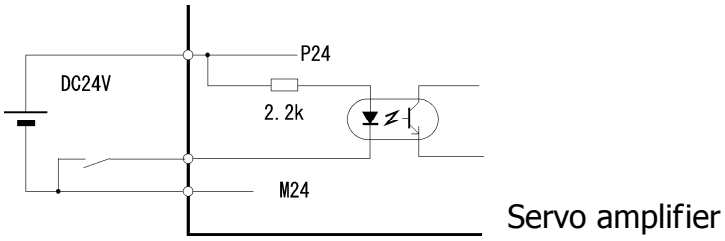
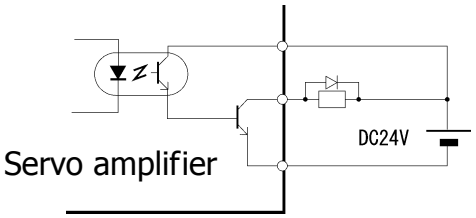
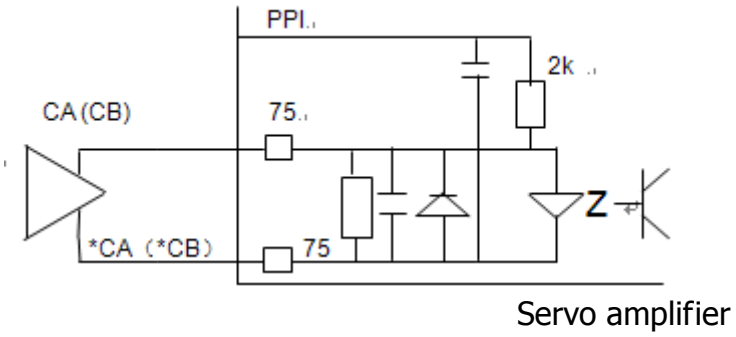
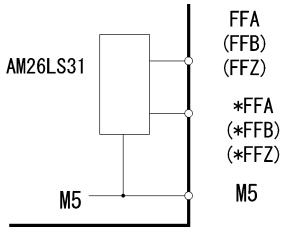
Servo amplifier connector 1 (CN1) connected with the host controller control sign. The signs are defined as table.

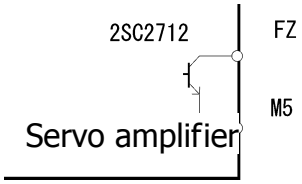
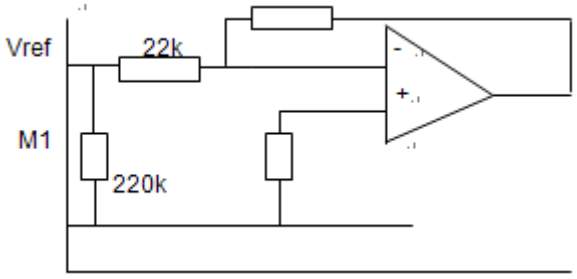
Code	CN1 connector number		Signal name	Function and definition
	Standard	Dedicated analog		
P24 M24	1 14	1 14	Control signal input and output power supply	Control signal input and output signals with input power.(DC24V/0.3A)
CONT1 CONT2 CONT3 CONT4 CONT5	2 3 4 5	2 3 4 5 6	Enter the command control sequence	Enter the command control sequence signal. (DC24V/10mA) CONT1: Servo Enable (RUN) CONT2: (not specified) CONT3: (not specified) CONT4: (not specified) CONT5: (not specified)
OUT1 OUT2 OUT3 OUT4	15 16 17 18	15 16 17 18	Output command control sequence	Output command control sequenceSignal (Maximum DC30V/50mA) OUT1: (not specified) OUT2: (not specified) OUT3: (not specified) OUT4: (not specified)
PPI CA *CA CB *CB	19 8 7 20 21		Differential input (the input pulse train) or open collector input	PPI: Open collector power input (DC24V +5% / -5%) Differential input CA, * CA, CB, * CB: Maximum input frequency 500KHz Open collector input, * CA, * CB: Maximum input frequency 200kHz it has several patterns like command pulse / sign, forward / reverse pulse and 90 degree phase difference of 2-way signal pulse .
FFA *FFA FFB *FFB FFZ *FFZ	9 10 11 12 23 24	9 10 11 12 23 24	Coded disc division frequency signal output	The frequency division output terminal. Output is 90 degree phase difference of 2-way signals which is proportional to the rotate volume of servo motor. (Differential mode output) FZ terminal is open collector output of Z-phase pulse. (Maximum DC30V/50mA) M5: Standard Potential

FZ M5	25 6	25 20		
Vref M1	22 13	22 13	Analog Input	The analog voltage input terminals. Speed command voltage(when input speed control signal)-10 ~ +10 VTorque command voltage (when control Torque). -10 ~ +10 V Standard potential is of M1 terminal.

※ **Terminal symbols M1 do not connect to M5, M24.**

Interface circuit diagram

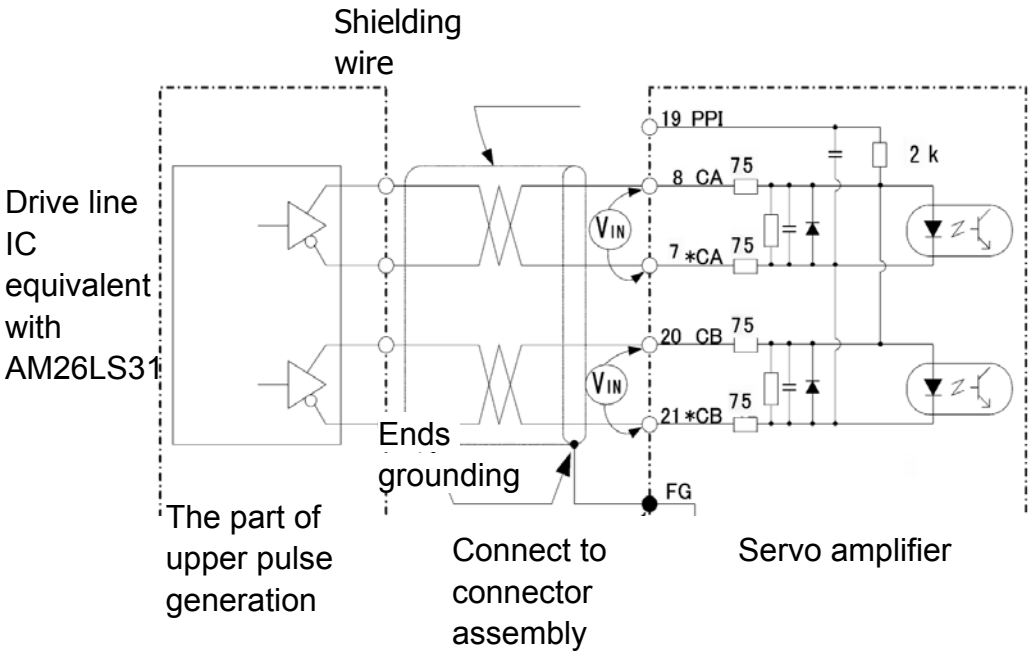
Signal name	Circuit
Input instructions control sequence Interface Specification DC24V/10mA (every point)	
Output instructions control sequence Interface Specification DC30V/50mA (max)	
Input pulse sequence Interface Specification Differential Input (Drive line)	
Output pulse sequence Interface Specification Differential output (Drive line)	

Output pulse sequence (Open collector) Interface Specification DC30V/50mA (max)	
Analog Input Interface Specification Input impedance 20kΩ	 M1 servo amplifier

■ Wiring Example of input pulse sequence

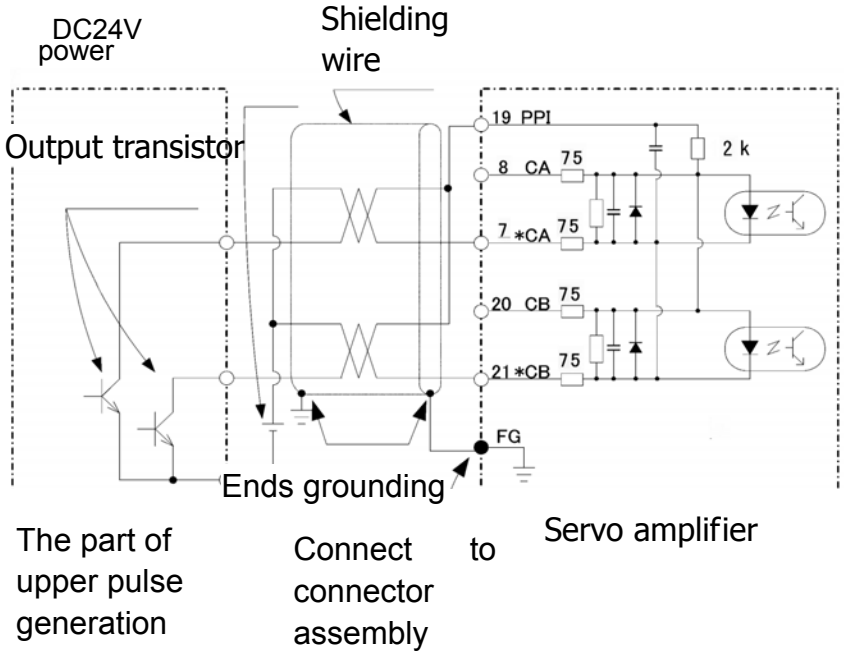
it can be input DC12V but only with the different wiring.

① The case of differential output device



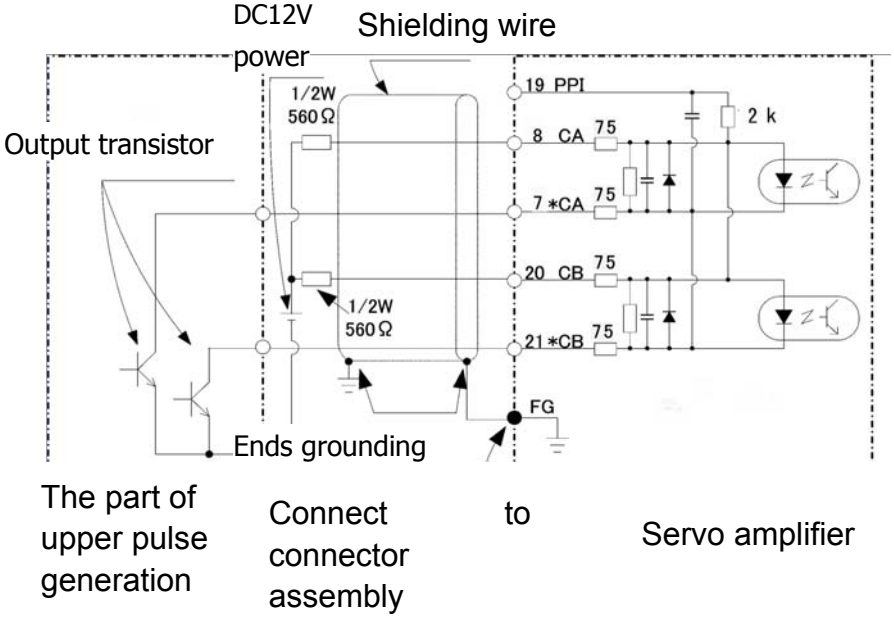
Vin: CA-* CA (CB-* CB) should be between the voltage amplitude Within 2.8V ~ 3.7V. (Over this range, the input pulse may not be accepted sometimes.)

②The case of open collector output device (DC24V input)



DC24V Power supply: power supply voltage range should be within DC24 ± 5% or less.
In addition, the circuit is maximum 40mA demand of power. Ample power must be prepared.

③The open collector output devices (DC12V input)



DC12V Power supply: power supply voltage range should be within DC12 ± 5% or less.
In addition, the circuit is maximum 40mA demand of power. Ample power must be prepared.

2.4 Encoder (CN2)

Connect the servo motor encoder signal to the servo amplifier connector 2 (CN2).
The definition of CN2 port is below.

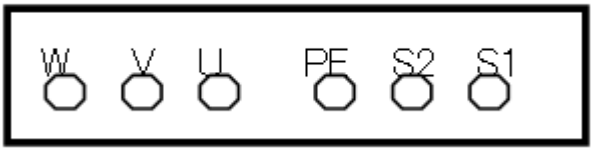
CN2 Terminal No.	Signal name	Function
1	+5V	Optical encoder of servo motor use +5V power supply.
2	Z+	Connect to photoelectric encoder Z + of servo motor
3	Z-	Connect to photoelectric encoder Z - of servo motor
4	B+	Connect to photoelectric encoder B + of servo motor
5	B-	Connect to photoelectric encoder B - of servo motor
6	A+	Connect to photoelectric encoder A + of servo motor
7	A-	Connect to photoelectric encoder A - of servo motor
8	U+	Connect to photoelectric encoder U + of servo motor
9	U-	Connect to photoelectric encoder U - of servo motor
10	GND	Optical encoder of servo motor use the ground.
11	V+	Connect to photoelectric encoder V+ of servo motor
12	V-	Connect to photoelectric encoder V - of servo motor
13	W+	Connect to photoelectric encoder W+ of servo motor
14	W-	Connect to photoelectric encoder W - of servo motor

Anti-load side of the servo motor has been built a 2500 lines encoder; please connect encoder wiring to the servo amplifier wiring connector 2 (CN2) .
The maximum encoder wiring length is 15m, restricted according to electric cables and wiring.
Definition of RiDing servo motor side optical encoder output port.

Encoder Terminal No.	Signal name	Function
1	FG	Shield ground
2	+5V	Connect to servo drives CN2 +5V terminal.
3	GND	Connect to servo drives CN2 GND terminal.
4	A+	Connect to servo drives CN2 A+ terminal.

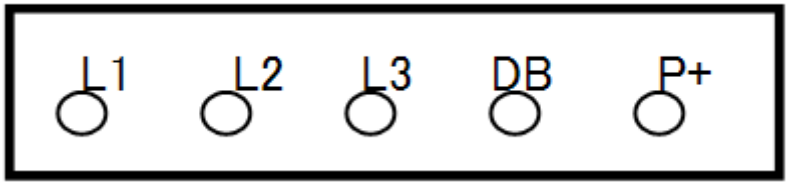
5	A-	Connect to servo drives CN2 A- terminal.
6	B+	Connect to servo drives CN2 B+ terminal.
7	B-	Connect to servo drives CN2 B- terminal.
8	Z+	Connect to servo drives CN2 Z+ terminal.
9	Z-	Connect to servo drives CN2 Z- terminal.
10	U+	Connect to servo drives CN2 U+ terminal.
11	U-	Connect to servo drives CN2 U- terminal.
12	V+	Connect to servo drives CN2 V+ terminal.
13	V-	Connect to servo drives CN2 V- terminal.
14	W+	Connect to servo drives CN2 W+ terminal.
15	W-	Connect to servo drives CN2 W- terminal.

2.5 Control Power and Motive Power



W, V, U, PE corresponding to 4,3,2,1 are the power supply interfaces of servo motor power . S2, S1, the normal operation supply for controller working, is AC 220V auxiliary power supply (-10% ~ +10%), they must be connected to either of the two phases of DC bus L1, L2, L3 so that amplifier can work properly.

2.6. The Main Power and Braking



Resistor

L1, L2, L3,single-phase 200 ~ 230V -10% ~ +10%, three-phase 200 ~ 230V -15% ~ +10%
DB; P+, braking resistance is greater than or equal to 20Ω, greater than or equal to 50 watts 【it has been built at the servo amplifier heat sink (80 watts, 60Ω),if the braking power isn't enough, you can connect additional resistor】

CHAPTER 3： PARAMETERS

3.1 Parameter Settings

Setting method

Use MODE ESC key to select the parameters edit mode, switch to the PN-01,using ∨ / ∧ to select the parameter number. Press SHIFT ENT button for more than 1 second into the parameter setting.

3.2 Parameter List

No.	Definition	Setting range	Initial value	Change
01	Command pulse compensation α	1~32767(1 scale)	4	All the time
02	Command pulse compensation β	1~32767(1 scale)	1	All the time
03	Input pulse train form	0: Command pulse / command sign 2: Forward pulse / reverse pulse 1:90-degree phase difference of 2-way signals	2	Outage
04	Rotation direction switch / output pulse phase switching	0: Positive direction forward (CCW) / B-phase feed 1: Positive direction reverse (CW) / B-phase feed 2: Positive direction forward (CCW) / A-phase feed 3: positive direction reversal (CW) / A-phase feed	0	Outage
05 ~ 08	For manufacturer setting	-	-	-
09	Control mode	0:Position 1: Speed	0	Outage

		2:Torque 3: Position - speed 4: Position - torque 5: Speed - torque		
10	CONT1 Signal distribution	0 ~ 21 (1 scale) 1: Servo start [RUN] 0: not specified 3: + OT 2: Reset [RST] 5: Emergency stop [EMG] 4:-OT 7: Clear bias 8:External regenerative resistor overheating 11:Prohibition command pulse 12:Command pulse α selecting 0 13: Command pulse α selecting 1 14:Control mode switching 15:Manually rotate forward [FWD] 16:Reverse rotate manually [REV] 17: Multi-speed 1 [X1] 18: Multi-speed 2 [X2] 19:Acceleration and deceleration time selection 20:current limit in effective 21: Idle [BX]	1[RUN]	Outage
11	CONT2 signal distribution		0	Outage
12	CONT3 signal distribution		0	Outage
13	CONT4 signal distribution		0	Outage
14	CONT5 signal distribution		0	Outage
15	OUT1 signal distribution	0 ~ 10 (1 scale) 1: Ready [RDY] 0: not specified 3: Alarm detection: a junction 2:Locate finishing [PSET] 7:Forced stop detection 4:Alarm detection: b junction 9: Zero speed 6: OT detection 10:Current limit detection 8: Zero bias 11: Braking time	0	Outage
16	OUT2 signal distribution		0	Outage
17	OUT3 Signal distribution		0	Outage
18	OUT4 Signal distribution		0	Outage
19	Output pulses	16~2500[Pulse](1Scale)	2500	Outage
20	For manufacturer setting	-	-	-
21	Zero tolerance range	1~2000[Pulse](1Scale)	400	All the time

22	Exceeding deviation degree	10~10000[×100 Pulse](1 Scale)	2000	All the time
23	Zero speed range	10~2000[r/min](1 Scale)	50	All the time
24	Time range for locating end	0.000~1.000 Seconds (0.001 Scale)	0.000	All the time
25	Maximum current limit	0~300%(1 Scale)	300	All the time
26	Low voltage alarm	0: No detection, 1: detection	1	Outage
27	Low voltage startup	0: Urgent deceleration stop，1: Idling	1	Outage
28	For manufacturer setting	-	-	-
29	Written arguments against change	0: Can rewrite，1: Prohibit rewrite	0	All the time
30	The initial display for touch panel	0~18(1 Scale)	4	Outage
31	Internal rate of 1	0.1~ Maximum speed [r/min](0.1 Scale)	200.0	All the time
32	Internal rate of 2	0.1~ Maximum speed [r/min](0.1 Scale)	500.0	All the time
33	Internal rate of 3	0.1~ Maximum speed [r/min](0.1 Scale)	1000.0	All the time
34	Maximum speed	0.1~ Maximum speed [r/min](0.1 Scale)	2500.0	All the time
35	Acceleration time 1 (run for test)	0.001~9.999 seconds (0.001 Scale)	0.100	All the time
36	Deceleration time 1 (run for test)	0.001~9.999 seconds (0.001 Scale)	0.100	All the time
37	Acceleration time 2	0.001~9.999 seconds (0.001 Scale)	0.500	All the time
38	Deceleration time	0.001~9.999 seconds (0.001 Scale)	0.500	All the time

	2			
39	Zero speed clamp electric level	0.0~500.0[r/min](0.1 Scale)	0.0	All the time
40	Position controller gain 1	1~400[rad/sec](1 Scale)	25	All the time
41	Speed controller gain 1	1~1000[Hz](1 Scale)	100	All the time
42	Speed regulator integral coefficient	0~4096（1 Scale)	400	All the time
43	S letter time constant	0.0~100.0[msec](0.1 Scale)	2.0	All the time
44	Feed-forward gain	0.000~1.200(0.001 Scale)	0.000	All the time
45	Feed-forward filter time constant	0.00~250.00[msec](0.1 Scale)	1.0	All the time
46	Torque filter time constant	0.00~20.00[msec](0.01 Scale)	0.00	All the time
47	Speed setting filter	0.00~20.00[msec](0.01 Scale)	0.00	All the time
48	Main reason for the gain switch	0: Position deviation (x 10), 1: Feedback speed, 2: Command speed	1	All the time
49	Gain switching level	1~1000（1 Scale）	100	All the time
50	Gain switching time constant	0~100[msec] (1 Scale)	10	All the time
51	Position controller gain 2	1~300%（1 Scale）	100	All the time
52	Speed controller gain 2	1~300%（1 Scale）	100	All the time
53	Speed regulator integral coefficient 2	1~300%（1 Scale）	100	All the time
54	Analog setting filter	0.000~9.999[msec](0.001 Scale)	0.000	All the time
55	For manufacturer setting	-	-	-
56	Deceleration time after lose enable	0.001~9.999[msec](0.001 Scale)	0.001	All the time
57 ～	For manufacturer setting	-	-	-

59				
60	Given location filter coefficient	0~100.00[rad~sec](0.01 Scale)	0.00	All the time
61	Adjusted by the manufacturer	-	-	-
62	Adjusted by the manufacturer			
63	For manufacturer setting	-	-	-
64	Motor rated speed	50~3000[rpm](1 Scale)	2500	Outage
65	Motor rated current	1~20.0[A](0.1 Scale)	5.0	Outage
66	Motor rated voltage	110~230[V](1 Scale)	220	Outage
67	Motor rated torque	1.00~10.00[NM](0.01 Scale)	5.00	Outage
68	Motor pole pairs	1~6(1 Scale)	4	Outage
69	Encoder lines	1000~5000(1 Scale)	2500	Outage
70	Analog command gain	±0.00~±1.50(0.01 Scale)	1.00	All the time
71	Analog command compensation	-2000~+2000	(factory set).	All the time
72 ～ 73	For manufacturer setting	-	-	-
74	CONT is effective all the time 1	0~21	0	Outage
75	CONT is effective all the time 2		0	Outage
76	CONT is effective all the time 3		0	Outage
77	CONT is effective all the time 4		0	Outage

78	Command pulse compensationα1	1~32767(1 Scale)	1	All the time
79	Command pulse compensationα2		1	All the time
80	Command pulse compensationα3		1	All the time
81	Communications protocol	0~8	3	Outage
82	Station Number	1~31	1	Outage
83	Baud rate	0: 38400[bps]、1: 19200[bps]、3: 9600[bps]	1	Outage
84	Easy adjustment: range setting	0.5~200.0[rev](0.1 Scale)	2.0	All the time
85	Easy adjustment: speed setting	10.0~ Maximum speed [r/min](0.1 Scale)	200.0	All the time
86	Easy adjustment: timer setting	0.01~5.00[sec](0.01 Scale)	0.50	All the time
87	Easy adjustment: timer setting	0~1000	10	All the time
88 ~ 90	For manufacturer setting	-	-	-
91	Test current given	0~3.00(times)	1.00	All the time
92	Test speed given method FN-10	0.0~ Maximum speed [r/min]	200.0	All the time
93	Test Run method	0: position 1: speed 2: current	1	All the time
94	Given inching speed FN - 01	0.00~ Maximum speed [r/min]	50.0	All the time
95 ～99	For manufacturer setting	-	-	-

3.3 Parameter Description

Record setting contents of parameters in sequence number.

Pn-01 /Pn-02

No.	Definition	Set range	Initial value	Change
01	Command pulse compensation α	1~32767(1Scale)	4	All the time
02	Command pulse compensation β	1~32767(1Scale)	1	All the time

Valid only in position control.

Use the amount of movement of mechanical system responded to each command pulse as unit to set parameters (electronic gear).

Calculate by the following equations.

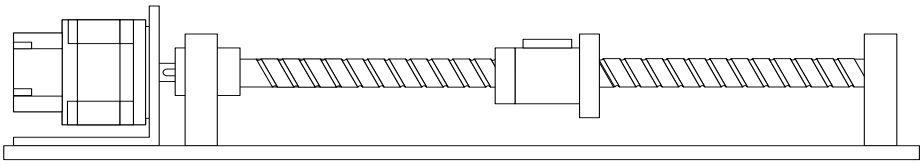
■ Command pulse compensation α / β formula

$$\frac{\text{Amount of movement of mechanical systems for a circle of servo motor)rotation))}}{\text{10000 Pulse/circle}} \times \frac{\text{Command pulse compensation α}}{\text{Command pulse compensation β}} = \text{(Unit volume)}$$

※ Unit volume is for「1」,「0.1」,「0.01」,「0.001」values.

$$\frac{\text{Command pulse compensation α}}{\text{Command pulse compensation β}} = \frac{\text{10,000 pulse/turn}}{\text{(Amount of movement of mechanical systems for a circle of servo motor rotation)}} \times \text{(Unit volume)}$$

The screws on the 10 [mm] wires connected to the servo motor output shaft.
Set 1 / 100 to as unit.

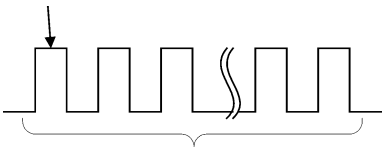


$$\frac{\text{(Amount of movement of mechanical systems for a circle of servo motor rotation)}}{\text{10,000 pulse/turn}} \times \frac{\text{Command pulse compensation } \alpha}{\text{Command pulse compensation } \beta} = \text{(Unit volume)}$$

$$\frac{\text{10mm}}{\text{10,000 pulse/turn}} \times \frac{\text{Command pulse compensation } \alpha}{\text{Command pulse compensation } \beta} = 1/100$$

Therefore, command pulse compensation α=10、Command pulse compensation β=1.

1 pulse 0.01 mm



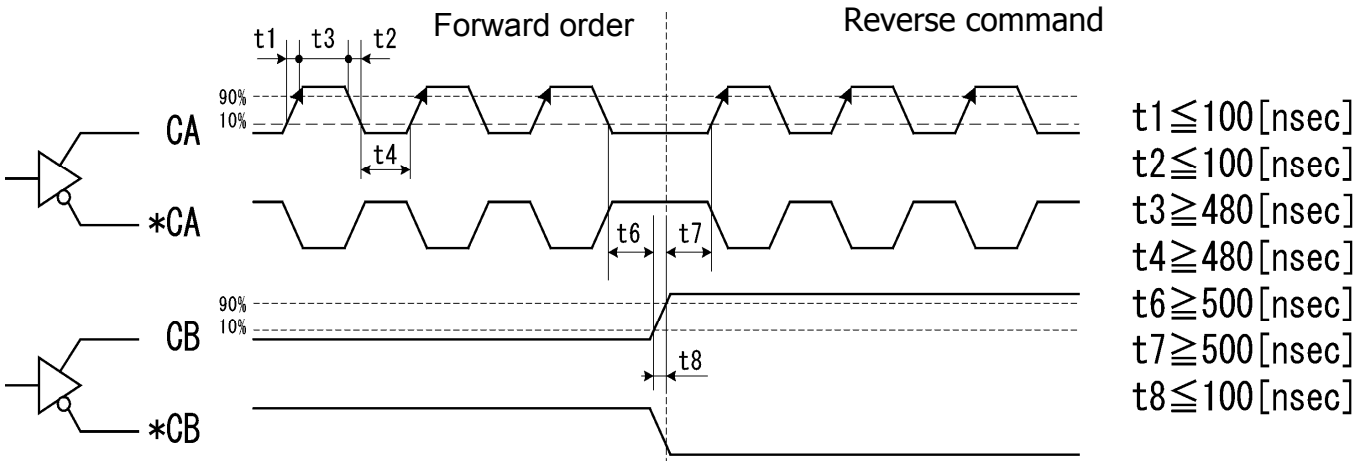
1000 pulse 10mm (motor rotate 1 circle)

Pn-03

No.	Name	Set range	Initial value	Change
03	Input pulse sequence form	0: Command pulse / command sign 2: Forward pulse / reverse pulse 1: 90-degree phase difference 2-ways signals	2	Outage

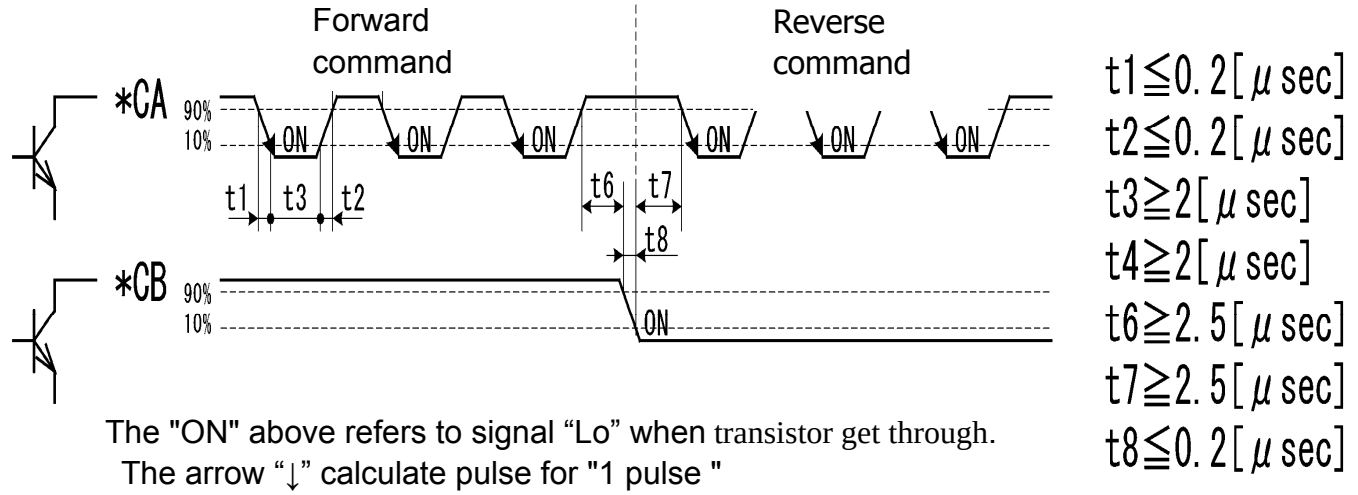
Valid only in position control.
Select the signal form of input pulse train terminal.
Set the pulse train form of the servo amplifier's input pulse train terminal [CA], [* CA], [CB], [* CB].
Maximum input frequency for differential input is 500 [KHz], the open collector input is100 [kHz].
However, please input the various signals to meet the following conditions.
(Signal CA, * CA, CB, * CB share same conditions)
■ Command pulse / command sign (parameter 03 settings: 0)
Use command pulse to represent rotation, use the command sign to represent the direction of rotation.

・ Differential Input



The arrow "↑↓" above calculate pulse as " 1 pulse ".

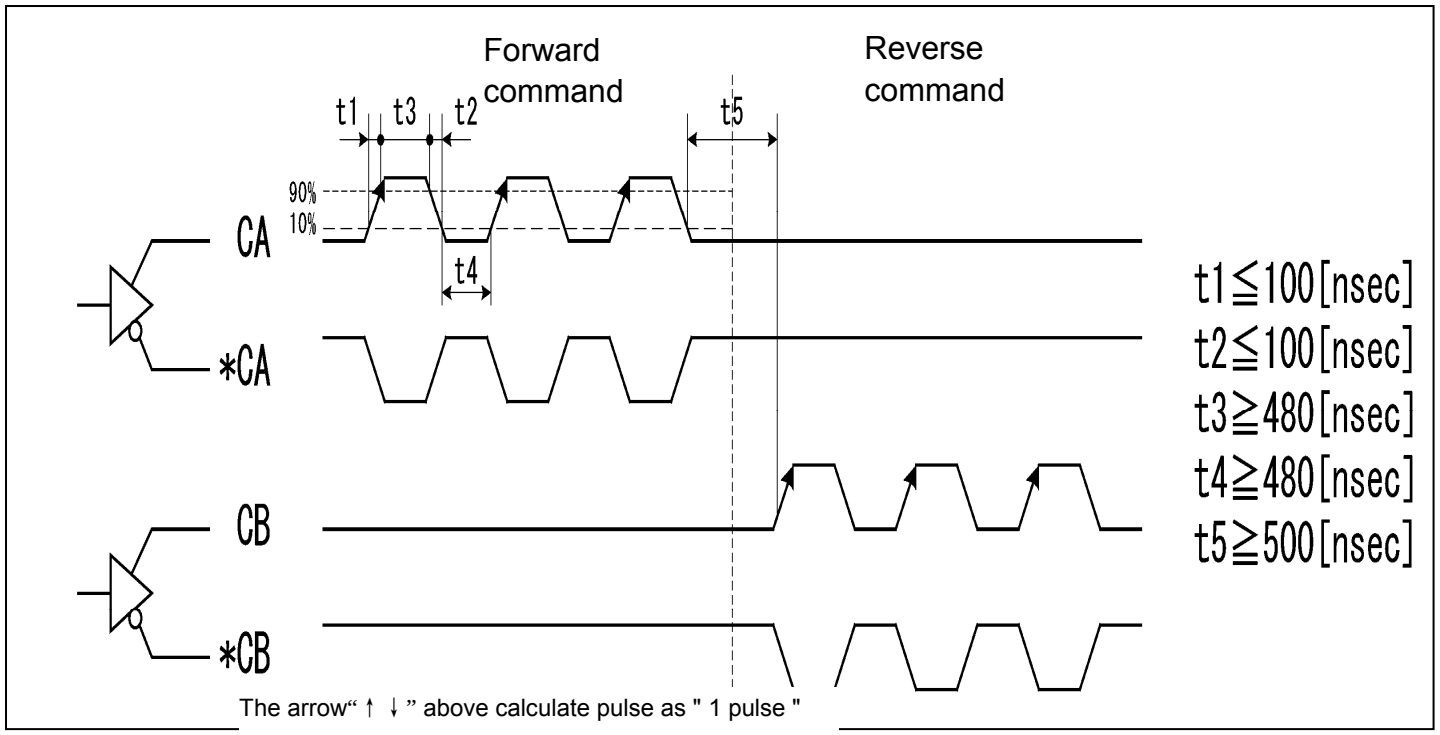
Open collector input

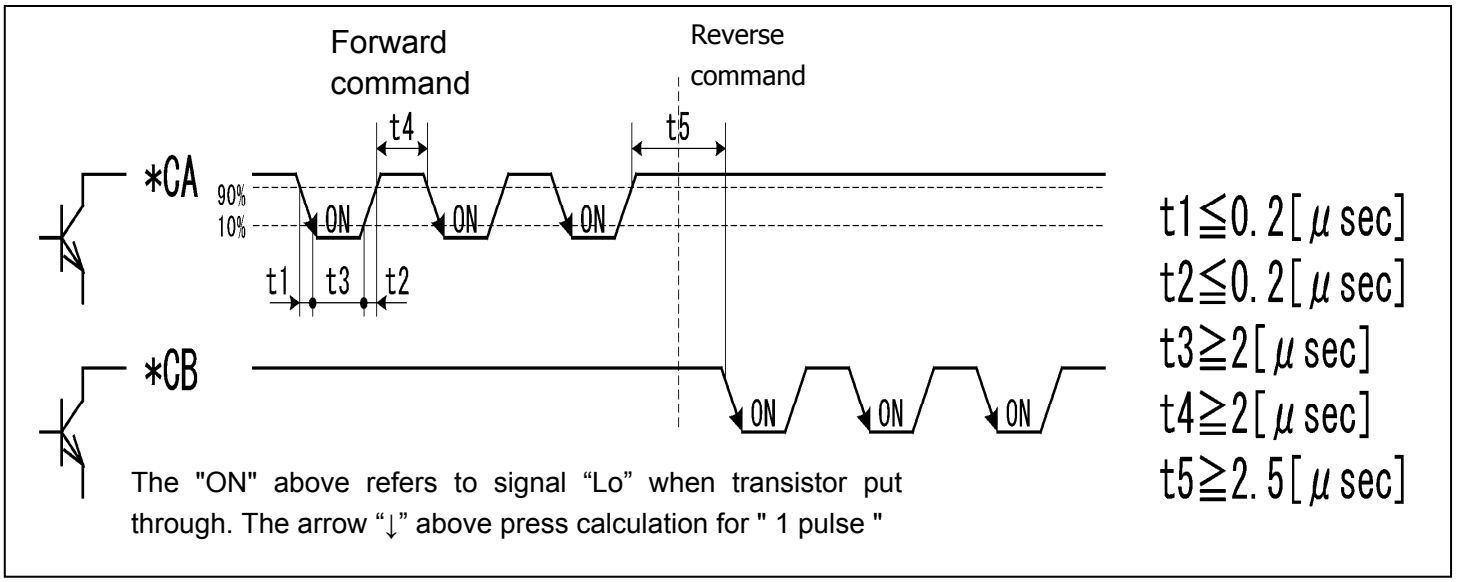


The "ON" above refers to signal "Lo" when transistor get through.
The arrow "↓" calculate pulse for "1 pulse "

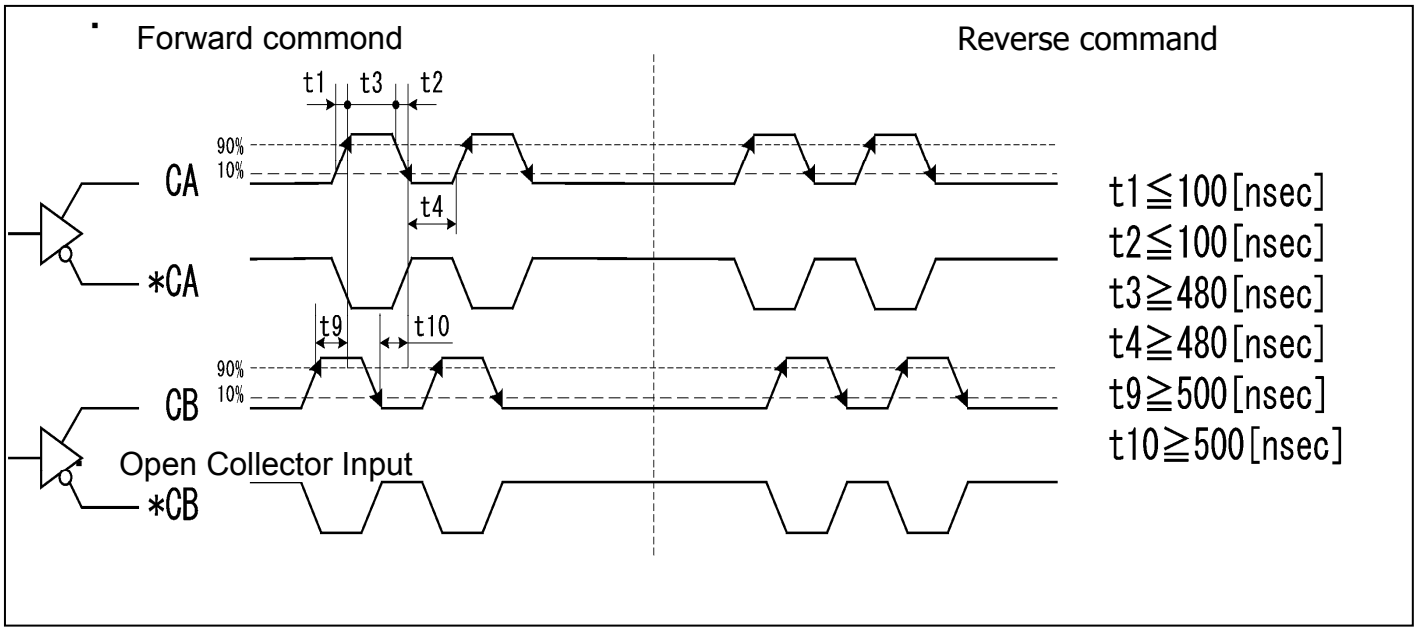
■ Forward pulse / reverse pulse (parameter 03 settings: 2)
Forward pulse represent positive direction, reverse pulse represent opposite direction rotation.

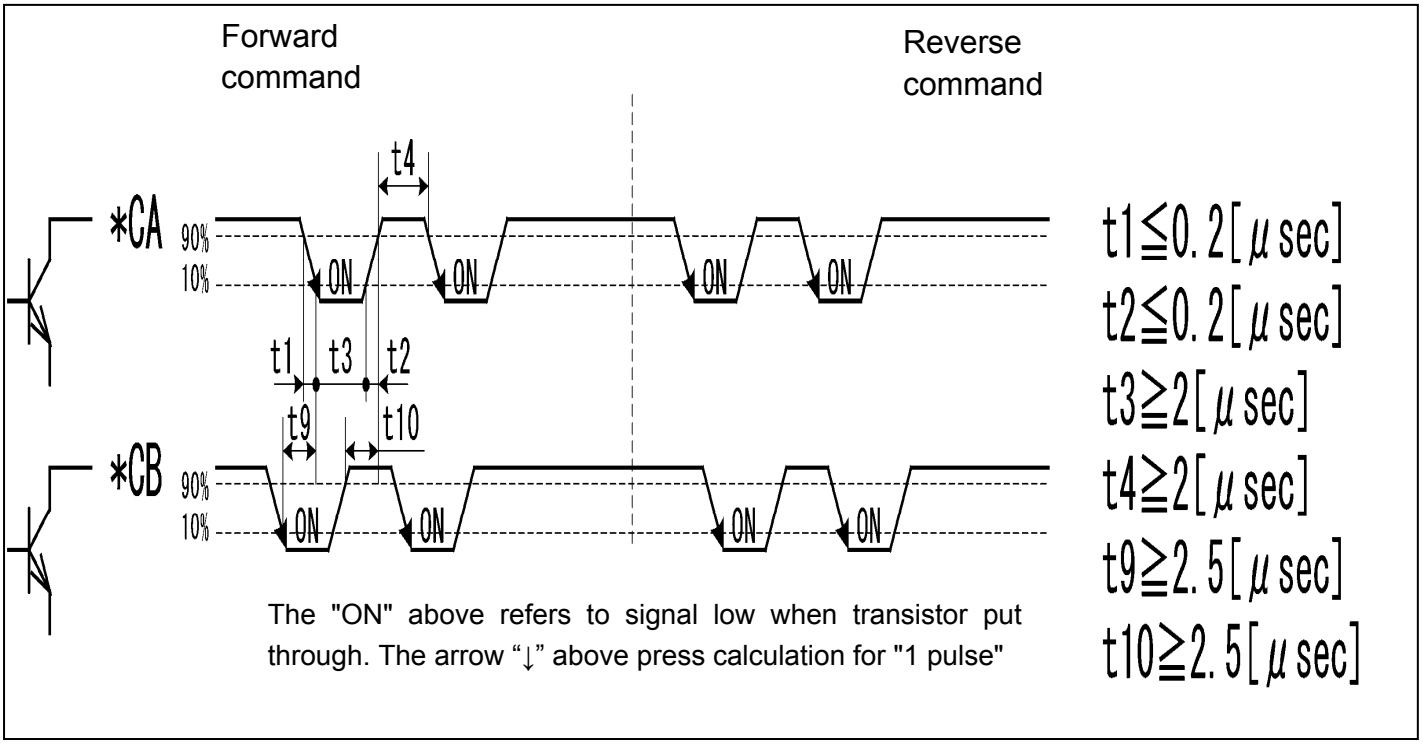
Differential Input





Differential Input





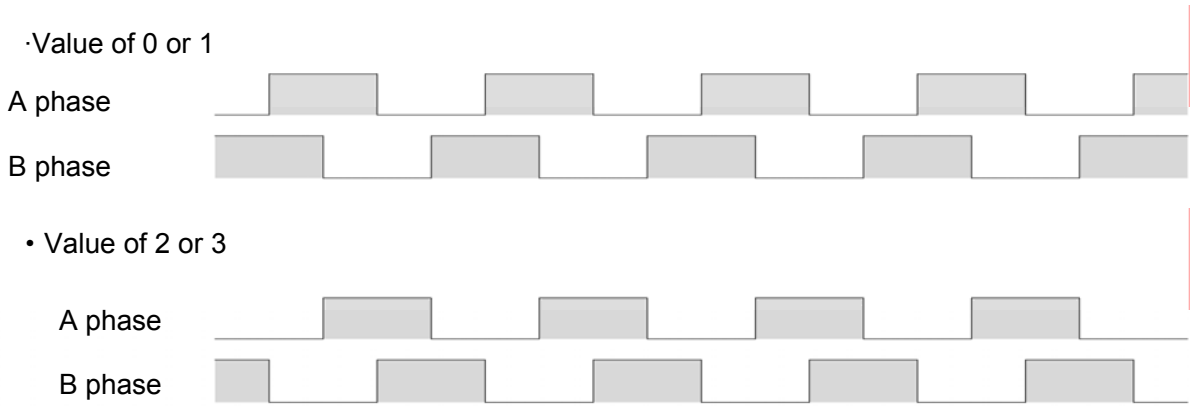
Pn-04

No.	Name	Setting range	Initial value	Change
04	Switch of rotation direction / When CCW (counterclockwise) rotate, Output pulse phase switching	0: Positive direction forward rotate CCW / B-phase feed 1: Positive direction reverse rotate CW (clockwise) / B-phase feed 2: Positive direction forward rotate CCW (counterclockwise) / A-phase feed 3: Positive direction reverse rotate CW (clockwise) / A-phase feed	0	Outage

Servo motor's rotation direction and phase of output pulse must correspond with machine motion direction.

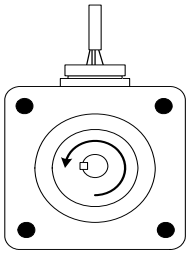
For the forward pulse, define the positive direction as the rotation direction of B phase feeding pulse train when command sign is High electrical level and 2-way signals with 90 phase difference input.

Phase switch of output pulse selects the phase of servo motor rotation when CCW (counterclockwise).



Forward / Reverse

Define the counterclockwise rotation CCW (counterclockwise) of the servo motor's output shaft saw from the front as positive turn, rotate clockwise CW as the reverse.



Forward direction

Pn-09

NO.	Definition	Set range	Initial value	Change
09	Control mode	0: position 1: speed 2: torque 3: position ⇔ speed 4: position ⇔ torque 5: speed ⇔ torque	0	Outage

3 control functions for DAS type

・Position Control

Control the rotation of servo motor's output shaft (pulse train input).

・ Speed control

Control the rotation speed of servo motor's output shaft.

・Torque Control

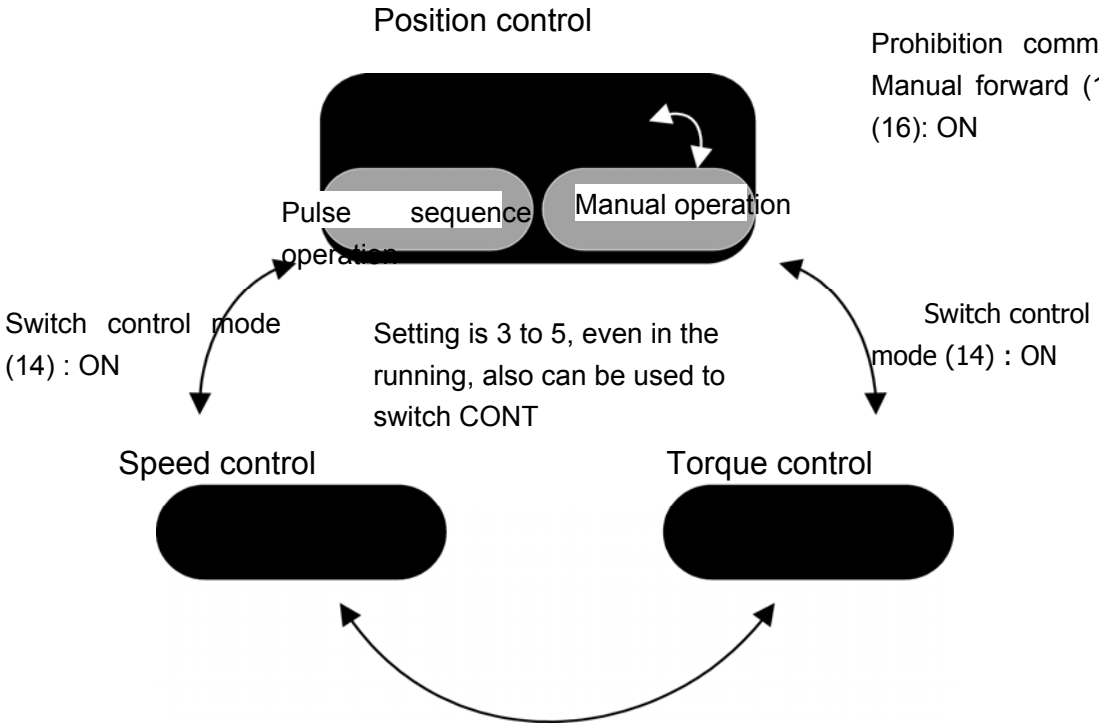
Control the torque of servo motor's output shaft.

■ Methods to switch to various control modes

Use control mode (14) of CONT signal distribution to switch the control mode, choose between the two. You can switch position ⇔ speed, position ⇔ torque, speed ⇔ torque at any time.

Parameters 09,

Parameter setting	Control mode	
	Control mode =OFF	Control mode =ON
0	Position control (fixed)	
1	Speed control (fixed)	
2	Torque control (fixed)	
3	Position control	Speed control
4	Position control	Torque control
5	Speed control	Torque control



■ Position Control

Suitable for pulse train operation, multi-speed operation (3-speed) and the input analog speed command operation.

Prohibition command pulse (11) prohibits with ON.

■ Speed control

Suitable for multi-speed operation (3-speed) and the input analog speed command operation.

■ Torque Control

Suitable for the analog torque command input operation.

Pn-10/ Pn-14

No.	Definition	Set range	Initial value	Change
10	CONT1 signal distribution	0~21(1Scale) 0: not specified 1: Servo start [RUN] 2: reset [RST] 3: + OT 4: - OT 5: Emergency stop [ENG] 7: Clear bias 8: external regenerative resistance overheat 11: Prohibition command pulse 12: Command pulse α selecting 0 13: Command pulse α selecting 1 14: control mode 15: Manually rotate forward [FWD] 16: Reverse rotate manually [REV] 17: Multi-speed 1 [X1] 18: Multi-speed 2 [X2] 19: acceleration or deceleration time selection 20. Current limit take effect 21: idle [BX]	1[RUN]	Outage
11	CONT2 signal distribution		0	Outage
12	CONT3 signal distribution		0	Outage
13	CONT4 signal distribution		0	Outage
14	CONT5 signal distribution		0	Outage

Pn-15/ Pn-18

No.	Definition	Set range	Initial value	Change
15	OUT1 signal distribution	0~11(1Scale) 0: not specified 1: ready [RDY] 2: locate finishing [PSET] 3: detecting alarm: a contact 4: detecting alarm: b contact 6: OT detected 7: detecting mandatory stop 8: a zero bias 9: zero speed 10: detecting current limit	0	Outage
16	OUT2 signal distribution		0	Outage
17	OUT3 signal distribution		0	Outage

18	OUT4 signal distribution		0	Outage

(1) Server start [RUN]

The signal that enables servo motor to rotate

Input command control sequence signal	Run command [RUN] ... the factory assigned to CONT1

■ Function

when the server startup [RUN] signal is in effect, servo motor is in rotatable state.

When the servo start signal is at stop, servo motor powered by the commercial power won't rotate.

If it is cut during rotation, the servo motor will slow down with the greatest capacity to decelerate、stop (it will idle when the speed is lower than the zero speed rotational speed <parameter 23>).

When servo motor has stopped, it won't keep torque.

When the server startup [RUN] is cut off, ignoring all the rotating command.

You can judge it is generally rotatable when the Servo start [RUN], + OT /-OT turn on and mandatory stop [EMG] is put through without warning.

When server startup [RUN] signal is connected, other signal is cut off, it is stopped.

■ Parameter setting

When the server starts [RUN] signal is assigned to the input command sequence terminal, set the value (1) corresponding to parameter.

It will be regarded as OFF when this signal isn't assigned to the command control sequence input terminal.

■ Related

After the compulsory stop signal is connected, motor will stop with greatest capacity.

(2) Reset [RST]

Reset servo amplifier's alarm detection.

Input command control sequence signal	Reset [RST]

■Function

Reset servo amplifier's alarm detection by inputting command control sequence signal (with reset [RST] signal ON).

The alarm that can be canceled by [RST]:| The alarm that can be canceled by repowering:

OC2	Over-current 2	EC	Encoder errors
OS	Over speed	EH	Current sampling circuit damage
OL	Overload	OC1	Over-current 1
LU	Low voltage	HU	Overvoltage
RH1	Regenerative resistance overheat	DE	Memory errors
OF	Deviation beyond	AH	Amplifier overheating

■ Parameter setting

When the reset [RST] signal is assigned to the input command control sequence terminal, it will set the value (2) corresponding to parameter.

It will be regarded as OFF when this signal isn't assigned to the command control sequence input terminal.

■ Related

Any of the following methods can be used to reset the alarm detection.

1) Input command control sequence signals [RST] ON

2) Operate ENT key in the trial operation mode / alarm reset [Fn-04] state,

3) press ENT (for more than 1 second) in alarm detection [Sn-02] status.

4) Cut off and re-supply power.

Alarm records can be initialized in the trial operation mode / alarm recording initialization [Fn-05] mode.

(3) Exceeds the range / over travel detection

You can force it to stop machine movement by using limit switch and other signals.

Input command control sequence signal	Overtravel / Overtravel detection

■ Function

+OT(3)/-OT(4)

It’s OT input of machine movement direction.

Once cut off the input signal, it can conduct the emergency deceleration, stop with the servo motor's greatest capacity ignoring the rotation command for detection of the direction.
You can only operate (b contact) by sequence input from opposite direction of detecting direction or by manual operation (forward command / reverse command) in trial mode.
If it overtravels, the position deviation is cleared.

■ Parameter setting

Set value 3 and value 4 when + OT signal and - OT signal are assigned to the input command control sequence terminal.
It will be regarded as ON when this signal isn’t assigned to the input command control sequence terminal.
Set value 6 when OT detection signal is assigned to the input command control sequence terminal.

■ Related

1) Detecting the direction

Servo motor will detect + OT signal when it rotates in positive direction. The positive direction is the direction set by parameter4.When servo motor rotate in negative direction, it won't stop even if it detects +OT signal.

2) OT detection (6)

If you cut off the input command control sequence + OT (3) /-OT (4), then it will turn into connecting output command control sequence signal.

(4) Mandatory stop / Mandatory stop detection

It is a terminal control sequence using the input command signal to the servo motor to force the signal down.

Input command control sequence / output signal	Mandatory stop / force to stop the detection

■ Function

1) Forced to stop (valid in speed control / position control mode)

Forced the servo motor to stop(b contact) when Mandatory stop(5) is cut off.
This signal is always valid in all control states, so it can be used prior. Mandatory stop (5) is generally safe and has a good detection speed, so it can be connected directly to servo amplifier.

This terminal is always connected to operation disc or other automatic-lock-type the button switch (command switch).

Once detected mandatory stop, the position deviation is cleared.

2) Mandatory stop detection

When mandatory stop (5) signal is cut off, mandatory stop detection (7) is connected, you can notify outside.

■ Parameter setting

When the mandatory stop detection signal is assigned to the input command control sequence terminal, it will set the value (5) corresponding to parameter.

It will be regarded as ON when this signal isn't assigned to the command control sequence input terminal.

When the mandatory stop detection signal is assigned to the output command control sequence terminal, it will set the value (7) corresponding to parameter.

■ Related

1) Ready [RDY]

When the mandatory stop (5) signal is assigned to the input command control sequence terminal, the server starts [RUN] signal is connected. If the mandatory stop (5) is on, the ready [RDY] signal will be connected, the servo motor's output shaft is rotatable.

2) Mandatory stop condition

When the mandatory stop (5) is cut off, the servo start the [RUN] signal is connected , servo motor will stop in zero speed mode (its command speed is 0).

Once connected mandatory stop signal, it turn into a rotatable state.

When servo start [RUN] signal is cut off, motor idles.

3) Rotate command

All rotating command is invalid when the mandatory stop signal is cut off,.

(6) Clear deviation

Clear the differentials between command position and feedback position (position deviation) as 0.

Input command control sequence signal	Clear deviation

■ Function

During it is put through, clear the differentials between command position and feedback position (position deviation) as 0.

Use the feedback current location to be command value of the current position.

■ Parameter setting

When the clear deviation signal is assigned to the input command control sequence terminal, it will set the value (7) corresponding to parameter.

■ Related

During position control mode, when clear the deviation is connected, all of the run command is invalid.

If clear the deviation signal connect to the servo motor when it is running, the pulse command and manual forward mode [FWD] in trial mode is invalid, the servo motor begins to stop.

Set accumulated deviation by the link stopper as 0 in case of the movement deviation when the load is released.

(7) Regenerative resistor overheating

Connect thermal resistor in external regenerative resistor (optional) to the signal. it will cut off the alarm signal according to regenerative resistor overheating, forcing the servo motor to stop.

Input command control sequence signal	Regenerative resistor overheating

■ Function

When the regenerative resistor cut off by overheat, it will force the servo motor to stop (b contact).

If it is cut during rotation, the servo motor will slow down with the greatest speed to stop (it will idle when the speed is lower than the zero speed rotational speed <parameter 23>).

Servo motor can't keep its torque after stop.

■ Parameter setting

When the Regenerative resistor overheating signal is assigned to the input command control sequence terminal, it will set the value (8) corresponding to parameter.

It will be regarded as ON when this signal isn't assigned to the command control sequence input terminal.

(8) Prohibit the command pulse

Select input pulse sequence in position control mode valid / invalid.

Input command control sequence signal	Prohibition command pulse

■ Function

Servo amplifier's manual operation is valid when prohibition command pulse (11) signal is in effective.

Use this signal to switch manual operation and pulse train operation when you operate forward [FWD] or reverse [REV] during position control mode.

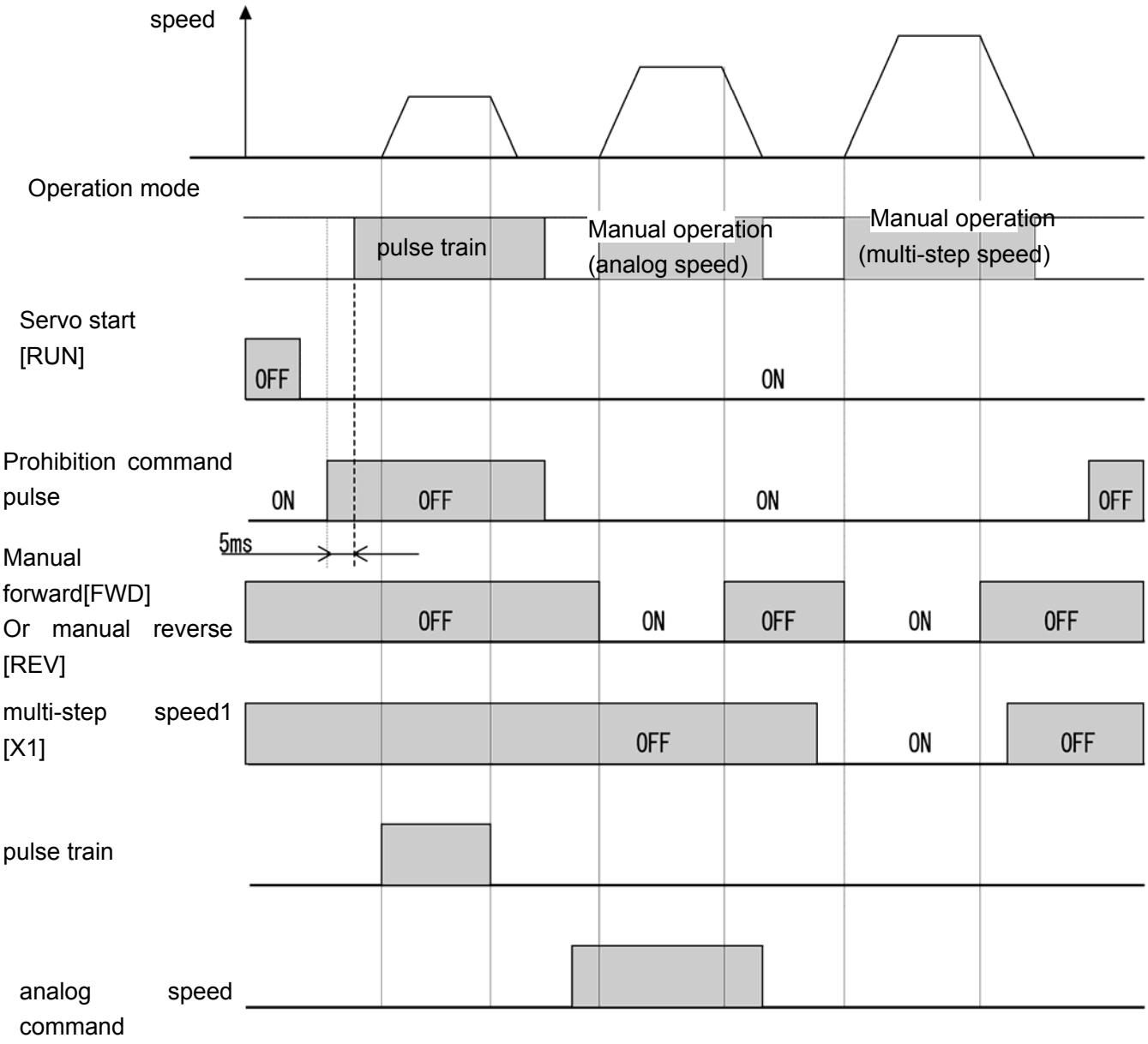
※It will be regarded as OFF when this signal isn't assigned to the command control sequence input terminal.

As far as the server start [RUN] (1) is put through, pulse train input will be in effective.

■ Parameter setting

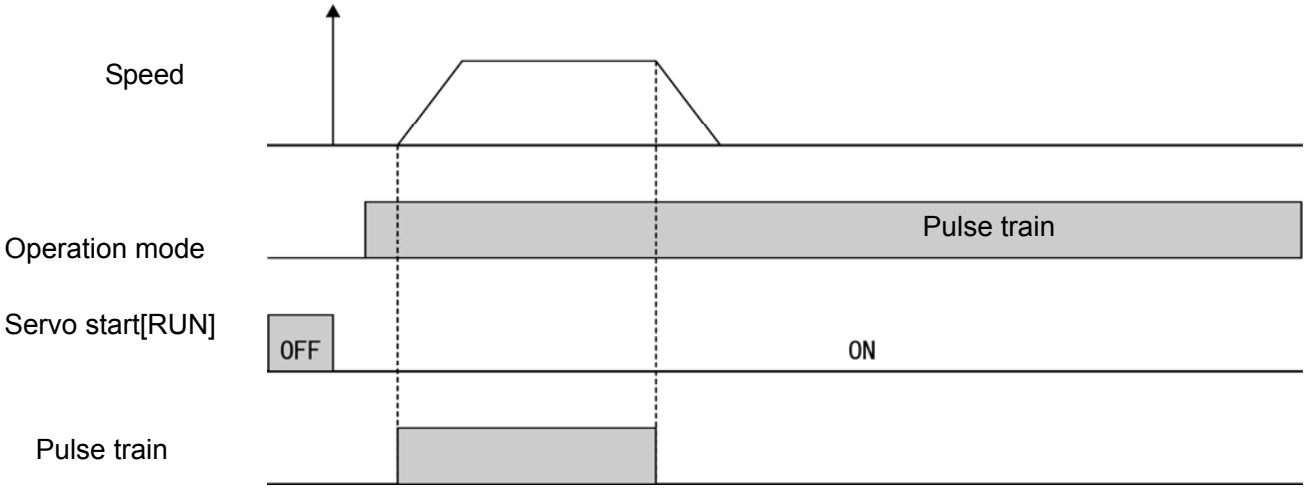
When the Prohibition command pulse signal is assigned to the input command control sequence terminal, it will set the value (11) corresponding to parameter.

■ The manual operation and pulse train operation



■Only run with the pulse train

As shown below, there is no need to prohibit the command pulse (11) distribution.



(9) Command pulse compensation α choose 0 / 1

Change the magnification of the mechanical system movement.

Input command control sequence signal	Command pulse compensation α selecting 0/1

■Function

Choose one of the pulse compensation value by switching command pulse compensation α 0 (12) or command pulse compensation α 1 (13).

■Command pulse compensation

Command pulse compensation α Choose 1	Command pulse compensation α Choose 0	Pulse compensation value
OFF	OFF	Parameter 1
OFF	ON	Parameter 78
ON	OFF	Parameter 79
ON	ON	Parameter 80

■Parameter setting

When the command pulse compensation α 0 and command pulse compensation α1 are assigned to the input command control sequence terminal, it will set the value (12) and the value (13) corresponding to parameter.

(10) Control mode switching

Doing control mode switch.

Input command control sequence signal	Control mode switching

■Function

Through the on / off control mode switch (14) to switch the control mode.

Control mode switching is only valid when parameter 09 is 3, 4 or 5.

■Control mode (parameter 09)

Parameter setting	Control mode switch	Control mode	
		Control mode switch =OFF	Control mode switch =ON
0	Invalid	The position control (fixed)	
1	Invalid	Speed control (fixed)	
2	Invalid	Torque control (fixed)	
3	Effective	Position control	Speed control
4	Effective	Position control	Torque control
5	Effective	Speed control	Torque control

■ Parameter setting

When the control mode switching signal is assigned to the input command control sequence terminal, it will set the value (14) corresponding to parameter.

■ Related

For more details on control mode, refer to parameter No. 09.

(11) Forward command [FWD] / Reverse command [REV]

The servo motor rotation signal.

Input command control sequence signal	Forward command [FWD] / Reverse command [REV]

■ Function

When the servo motor connect to the forward command [FWD] (reverse command [REV]) signal, the servo motor will rotate forward (reverse). ON for acceleration, OFF for deceleration.

1) Speed control

Define the speed with the terminal voltage of analog speed command input [Vref] and selection of multi speed [X1], [X2].

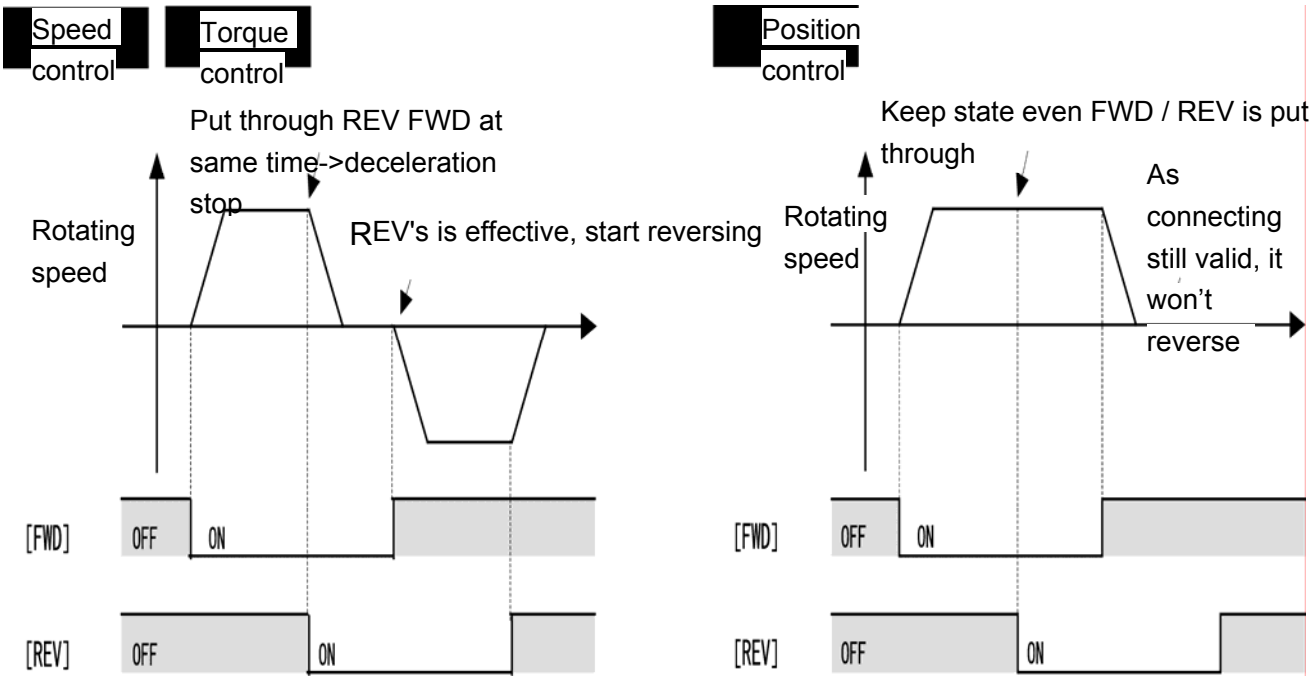
2) Position control

Same as speed control. Motor start running when receive clockwise command [FWD] (reverse command [REV]) signal. During operation, the other [REV] or [FWD] signal is invalid.

3) Torque Control

The servo motor shaft output torque, defined by the torque command voltage,.

Control mode	FWD/REV signal	FWD / REV put through at the same time
Speed control	ON level	Decelerate to stop
Position control	ON Limits	maintain previous action before the action
Torque control	ON level	Deceleration stop



■ Parameter setting

When the forward command [FWD] signal is assigned to the input command control sequence terminal, it will set the value (15)(reverse command [REV] for(16)) corresponding to parameter.

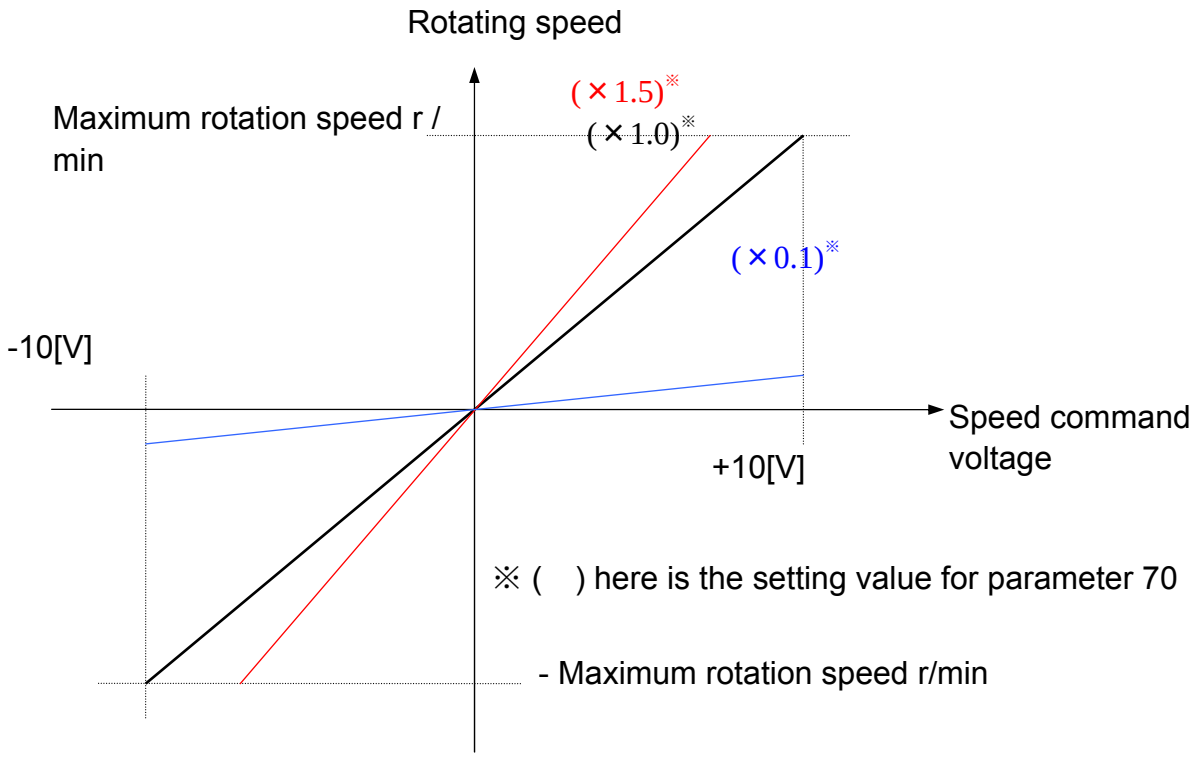
It will be regarded as OFF when no this signal is assigned to the command control sequence input terminal.

■ Related

1) the gain of analog speed command [Vref] input terminal (when speed command):
State set by manufacturer is that motor will rotate at maximum speed for positive direction when +10 [V] of the speed command voltage is input.

1) The forward direction of rotation

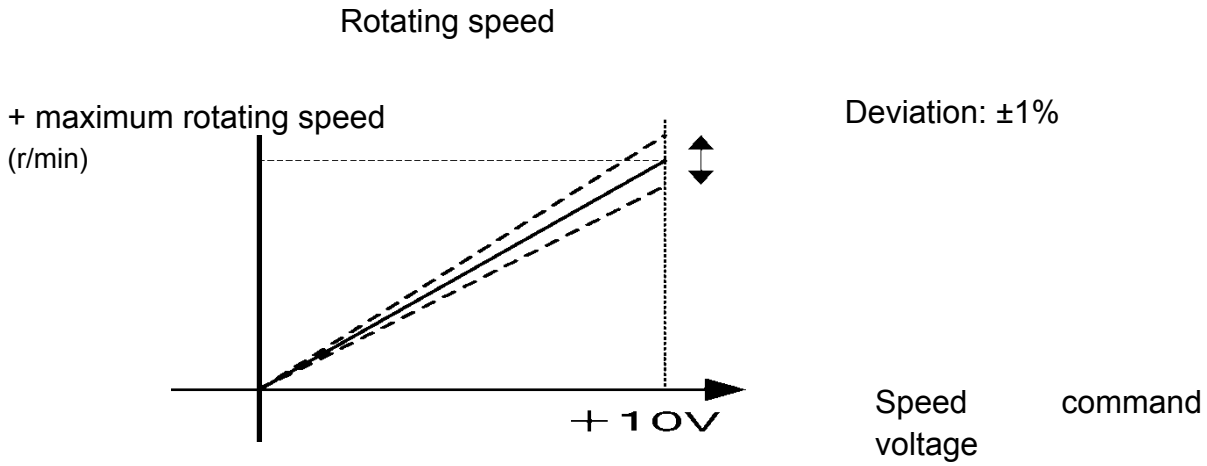
Use parameter 70 value can change the ratio between speed command voltage and the rotation speed. If the parameter 70 setting value is 0.1, compared to +10 [V] of the speed command voltage, rotation speed will be as (maximum rotation speed × 0.1) [r / min].



Note 1) Due to characteristics derivation of each the servo amplifier and servo motor, the actual rotation speed of the motor there is always common difference between actual speed and the ± 10 [V] / ± maximum rotational speed of ± 1% [r / min].

Conduct fine tuning of the rotation speed according to parameters No.70.

130ST motor ... ± 10V / ± 2500 ± 1% [r / min]



2) Decomposition ability of analog speed command input voltage.

Analog speed command input [Vref] terminal could have decomposition ability of 10 bits under full-scale condition.

(12) Multi-speed 1 [X1] / 2 [X2]

Choose manual operation speed.

Input instruction control sequence signal	Multi-speed 1 [X1] / 2 [X2]

■ Function

By switching multi-speed 1 [X1] / 2 [X2] signal, we can choose one from four command pulse compensations.

Multi-speed selection

X2	X1	Rotating speed
OFF	OFF	Analog speed command [Vref] terminal input
OFF	ON	Standard parameter 31
ON	OFF	Standard parameter 32
ON	ON	Standard parameter 33

1) Speed control

Using analog speed command [Vref] the input terminal voltage ,and select appropriate speed from the multi-stage speed [X1], [X2].

2) Position control

Same as the speed control.

■ Parameter setting

When assigning the Multi-speed 1 [X1] and 2 [X2] signal to the terminal of input instruction control sequence, set the parameter values corresponding to (17th) or (18th).

(13) Acceleration and deceleration time selection

Choose acceleration and deceleration time when on the manual operation running.

Input command control sequence signal	Deceleration time selection

■ Function

Select one from two deceleration times by switching the acceleration and deceleration time selection signal.

Set servo motor acceleration time and deceleration time according to parameters from 35th to 38th. The deceleration time and acceleration time can be set separately.

We can set the acceleration time according to the parameter 35th (37th),and do not need to rely on the direction of rotation. Parameters 35 and 37 can be switched by acceleration deceleration time selection signal.

Acceleration and deceleration time

Acceleration and deceleration choice (19)	Acceleration time	Deceleration time
OFF	Parameter 35	Parameter 36
ON	Parameter 37	Parameter 38

■ Parameter setting

When acceleration and deceleration time are assigned to the enter command select signal control sequence terminal, we can set the parameter values corresponding to (19). When the signal is not assigned to the sequence of input commands to control terminals, we deal with it as OFF.

(14) Idling [BX]

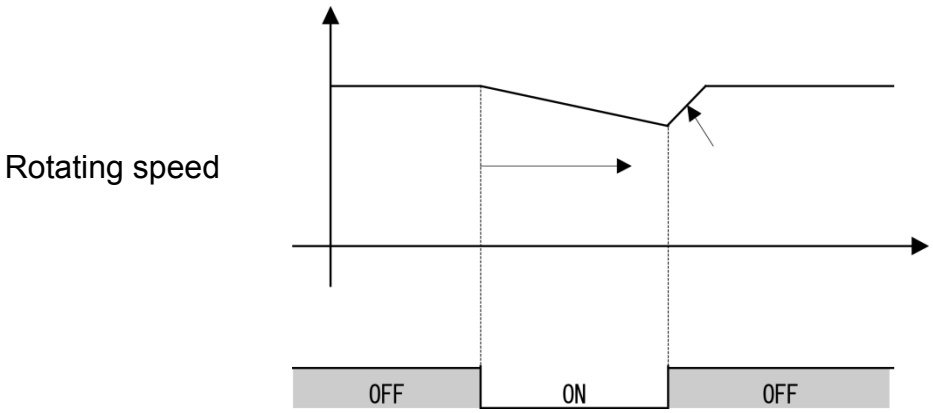
Force the servo motor in idle state.

Input command control sequence signal	Idling [BX]

■ Function

During the idle (BX) signal is connected, cut off the servo amplifier output, and set the servo motor in idle state. Servo motor output shaft use the load torque to decelerate (accelerate); idle signal in all control state (position control, speed control and torque control) is effective. When in the position control model, the signal turned into idle. When use the pulse train to do positioning control, the number of host controller's output pulse is different from the number of servo motor rotation.

During in speed control and torque control model, turn to idle. If cutting off idling signal during deceleration, output the command speed or the command torque.



■ Parameter setting When the idling is assigned to command control sequence terminals, we can set the parameter values corresponding to (21)

■ Related Idling is effective is effective in all control modes.

(15) Ready [RDY]

In the state that the motor can rotate, ready signal can be connected.

Output command control sequence signal	Ready [RDY]

■ Function

Connected when the following conditions.

1) Servo start [RUN] (1) signal connected

2)Forced stop [EMG] (5) signal connected ※

3) Alarm detection: a contact (3) signal off (Alarm detection: b contact (4) signal connected)

4)Regenerative resistor overheat (8) signal connected ※

5) Power supply voltage exceeds 150 [V]

6) Idling [BX] (21) signal is cut off

※ If 2), 4) are not assigned to the CONT terminal, connection is invalid.

By identifying the upper control device is ready [RDY] signal ON / OFF, we can confirm the servo motor in the status of rotation.

■ Parameter setting

When the ready [RDY] signal is assigned to the command control output terminal sequence, we must set the corresponding numerical of parameter (1).

(16) Positioning end [PSET]

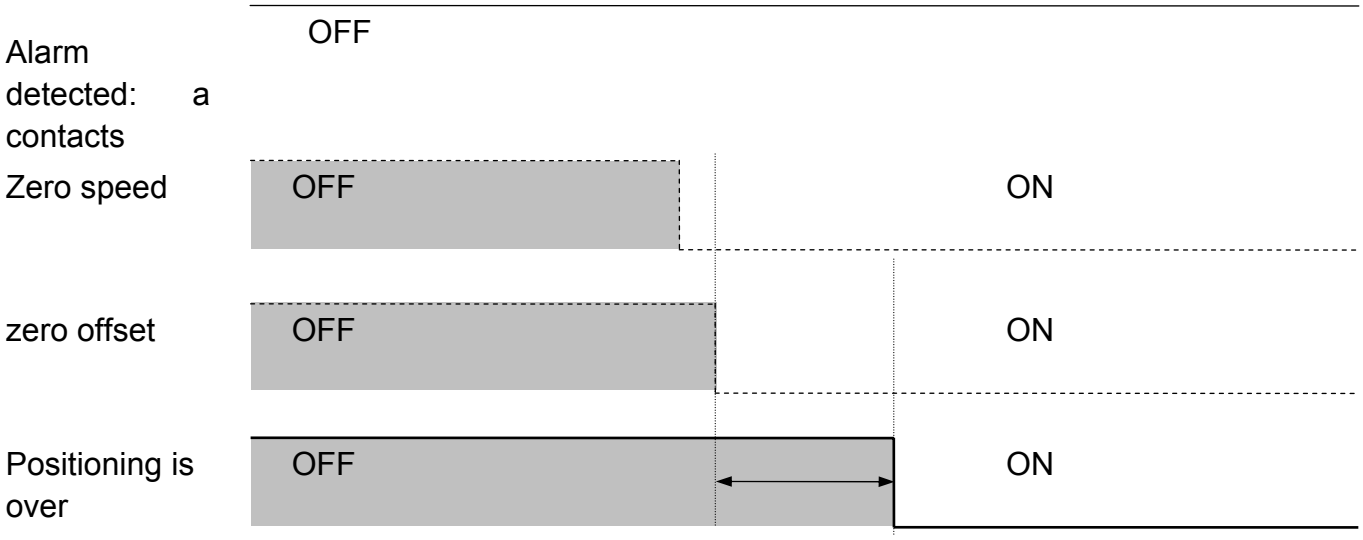
Positioning can be confirmed whether the action completed.

Output command control sequence signal	Positioning end [PSET]

■ Function

Connect when the following conditions:

1) Do not alarm.
2) The speed of rotation speed is lower than the rate of zero (parameter 23th).
3) The deviation is less than zero offset amplitude (parameter 21th).
4) Whether the judge in positioning the end of time (parameter 24th) to the above conditions during the period.



■ Parameter setting

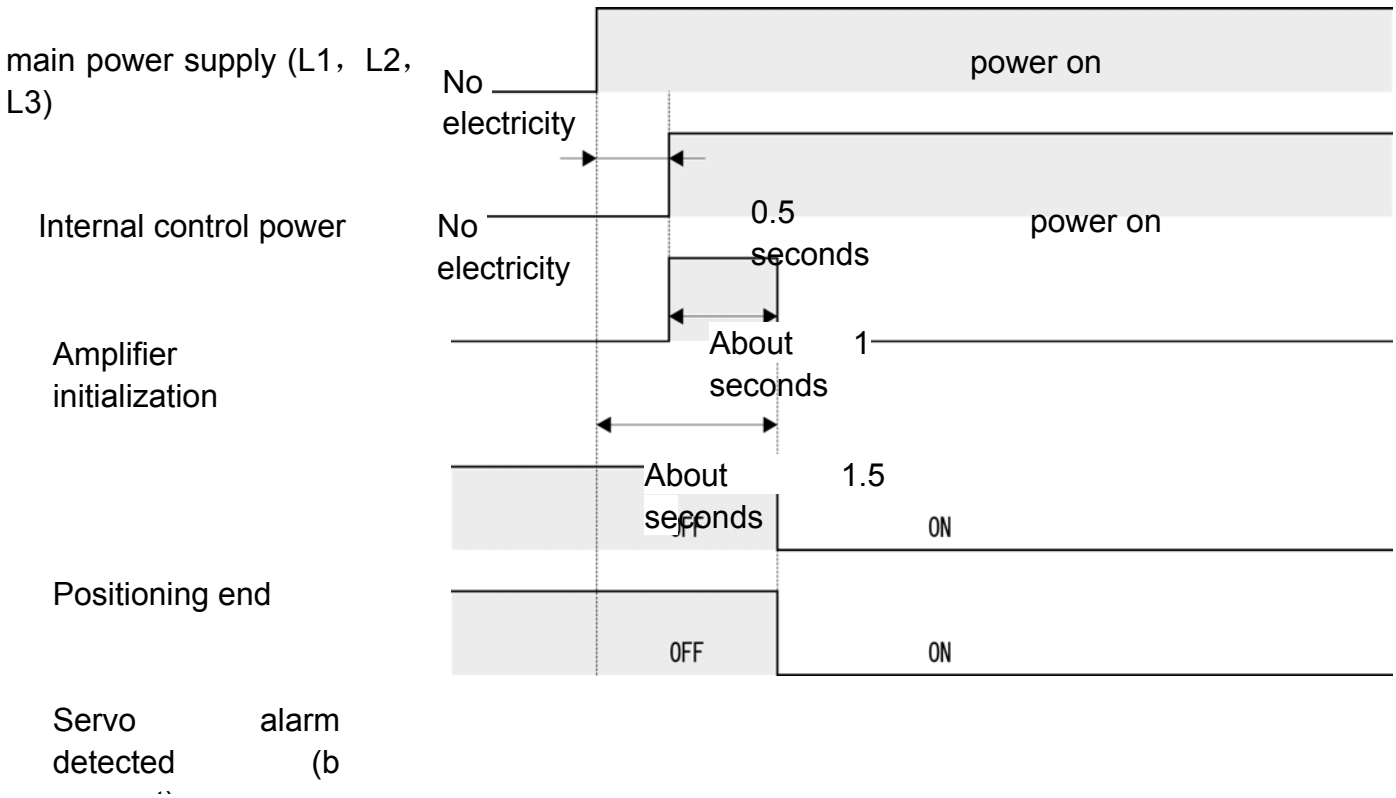
The time determined whether the positioning is over (parameter 24)

When positioning end [PSET] signal is assigned to the command control output terminal sequence, we must set values in the corresponding numerical of parameters(2).

■ Relation

1) when energized

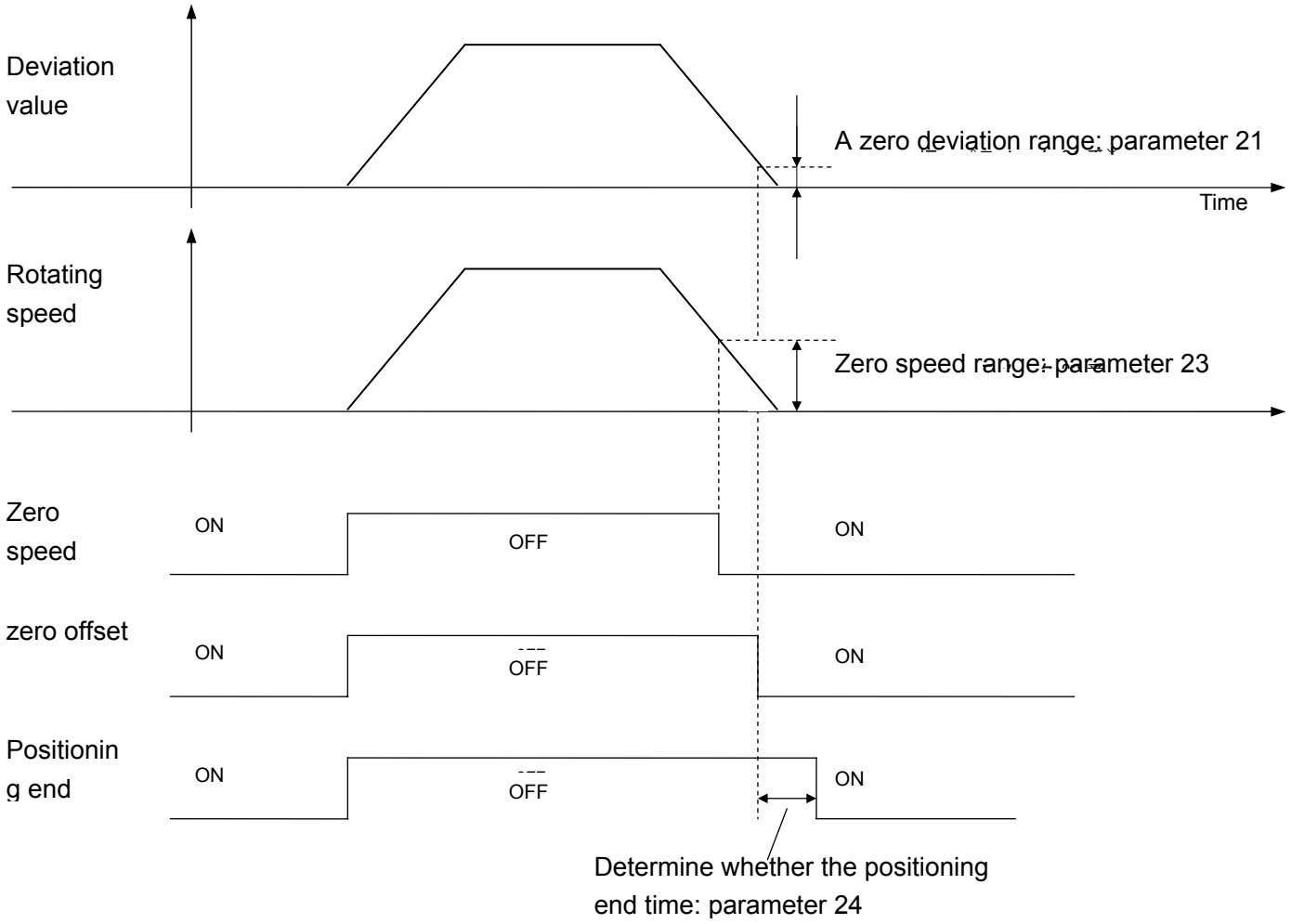
It takes about 1.5 seconds from energized to confirm the position of the servo amplifier management.



About 1.5 seconds after power positioning completing signal is connected

2) Position control

When the input of command position (pulse train) and the location of feedback (deviation) is less than zero error rate (parameter 21), and the rotation speed below the speed range of zero (parameter 23), position control signal will be connected.



Position

3) Position is over following the output of alarm detection (PSET)

Position is over following the alarm detection [PSET]

Cause	Deceleration method	Positioning end signals	Note
Servo start (RUN) OFF	Forced zero speed - based OFF	When stoping,turn on	Ready [RDY] Signal OFF
Compulsory stop [EMG] OFF	Mandatory zero speed	OFF	connect after lifting the forced stopping ,

+OT，-OTdetected	Mandatory zero speed - servo lock	When stoping,turn on	With a pulse train, forward command, reverse run command
Alarm detected (minor fault)	Mandatory zero speed - based OFF	Turn OFF after the alarm is detected	Turn ON after the alarm is reset
Alarm detected (serious fault)	Base OFF	Turn OFF after the alarm is detected	Turn ON after the alarm is reset

Note)

A slight trouble ... beyond deviation (OF), regenerative resistor overheat (rH1), amplifier overheat (AH), under-voltage (Lv)

Serious problems ... detect faults besides minor faults

Forced zero speed ... use the greatest ability to decelerating.

Basis OFF ... Servo motor on the state of driving (idling).

(17) Alarm detection: a junction (b junction)

When the servo amplifier protection action (alarm) is detected, ON (OFF) output.

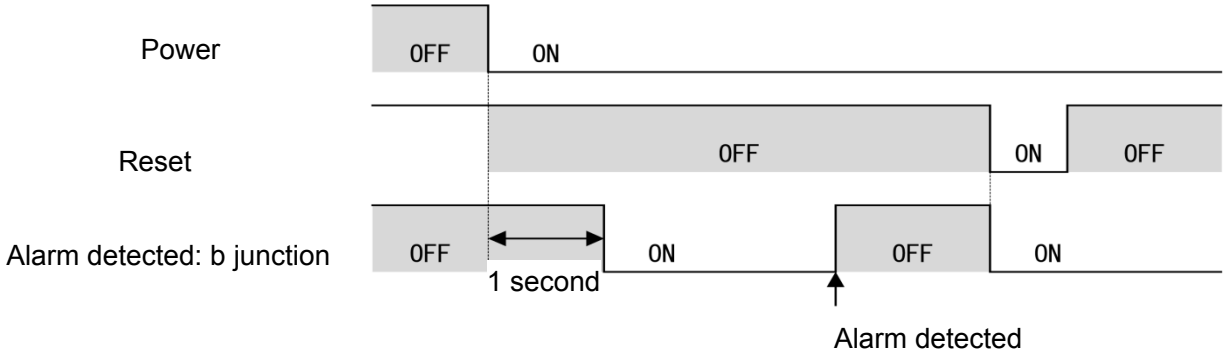
Output command control sequence signal	Alarm detection: a junction Alarm detection: b junction

When the servo amplifier detects alarm, the servo amplifier side will be maintained. Cause of the alarm is solved, the reset signal [RST] is connected, then turn on/off (can running).

Upper control device can confirm the alarm is stop by identifying the ON / OFF signal.

( ) is the alarm detection within: the action of b junction.

<Alarm detection: Notes when using b junction>



After energized, about 1 seconds OFF, please note.

(18) A zero offset

Confirm that the servo motor has reached the commanded position.

Output command control sequence signal	A zero offset

■ Functions

Set the deviation which between feedback current location and the current position (position deviation) in the parameter 21 no more than setting value, then connecting.

Zero offset signals are effective in the position control mode.

All modes are normal connected except position control mode.

The parameter 21 value do not affect the positioning accuracy.

■ Parameter setting

When the zero offset signal is assigned to the command control output terminal sequence, setting the value (8) corresponding to parameter.

(19) Zero speed

When the servo motor speed close to 0 (zero) state, it is connected.

Output command control sequence signal	Zero speed

■ Function

When the actual rotation speed of servo motor is less than the value of parameter 23, it is connected.

■ Parameter setting

When the zero speed signal is assigned to the control output terminal sequence, set the value (9) corresponding to parameter.

Pn-19

No.	Name	Set range	Initial value	Change
19	Output pulse count	16~2500[pulse](1Scale)	2500	Outage

Set the output pulses per a round of servo motor.

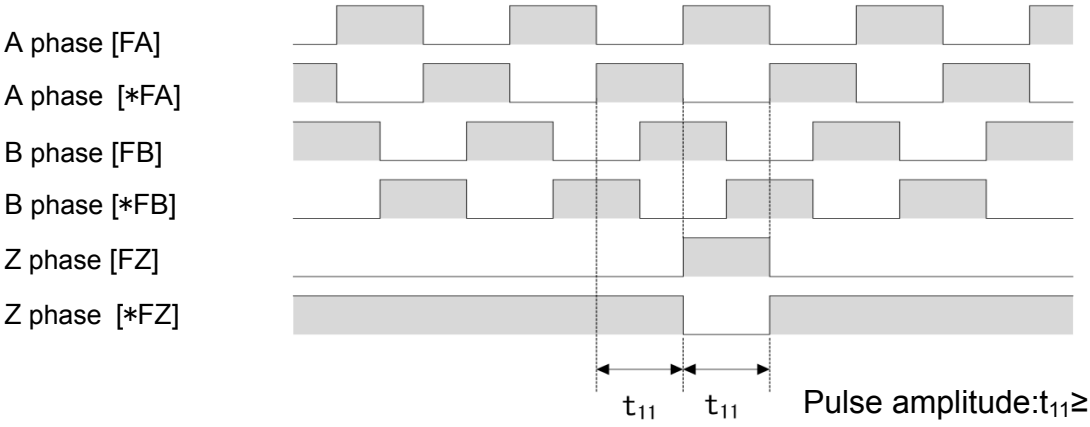
Output is in the form of 90-degree phase difference of 2 signals.

The direction of output shaft of servo motor is positive, the B phase output forward signal. By setting the rotation direction (parameter 4) can switch the phase of the order.

* Parameter 4 = 1 or 2, the counterclockwise rotation is relative to forward of B phase.

* Parameter 4 = 1 or 2, the counterclockwise rotation is relative to forward of A phase.

The output pulse number of the servo amplifier output terminal [FA], [* FA], [FB], [* FB] can be setting.



Pulse amplitude:t_{11}≥1μs (500kHZ)

The signal value of A phase and B phase is 50 [% duty cycle].

Z phase output a pulse per a cycle. Output amplitude depends on the number of output pulses.

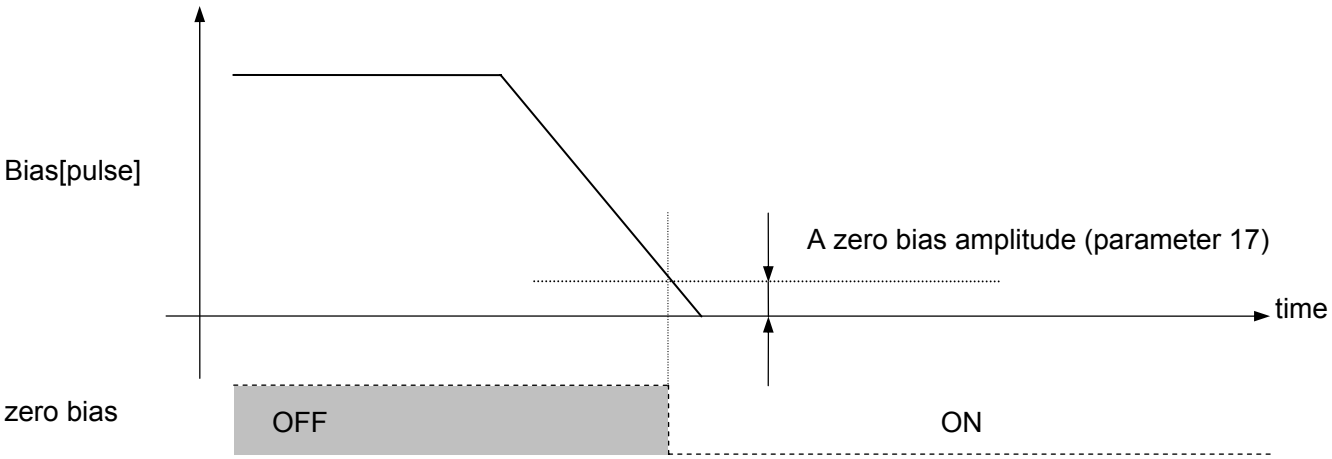
The signal of A and Z phase are synchronous.

Output frequency must be less than 500 [kHz]. Servo amplifier does not limit output frequency.
We can not specify the relationship between output shaft position of the servo motor and the position of Z-phase.

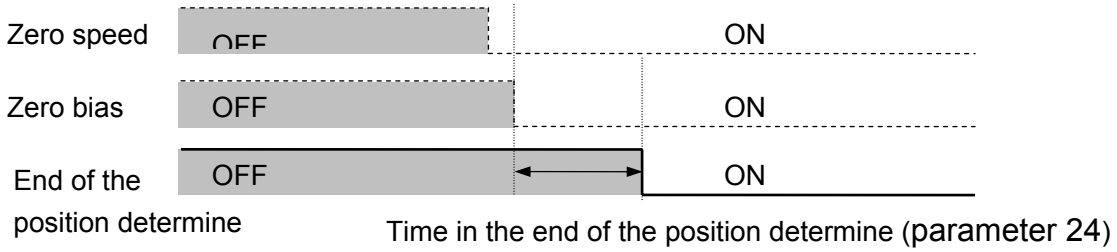
Pn-21

No.	Name	Set range	Initial value	Change
21	Zero bias tolerance range	1~2000[pulse](1Scale)	400	Outage

Valid only in position control.
Set the amplitude of zero bias. Setting value is the number of encoder pulses.
The unit is the encoder feedback pulse (not the command pulse).



If the zero bias signal and the zero speed signal are constantly connected in the end of the position determine (parameter 20), then signal connection is completed.



Pn-22

No.	Name	Set range	Initial value	Change
22	Bias overflow range	10~10000[×100 pulse](1Scale)	2000	All the time

Valid only in position control.

Set the number of bias overflow pulses (alarm detection).

The unit is the encoder feedback pulse (not the command pulse).

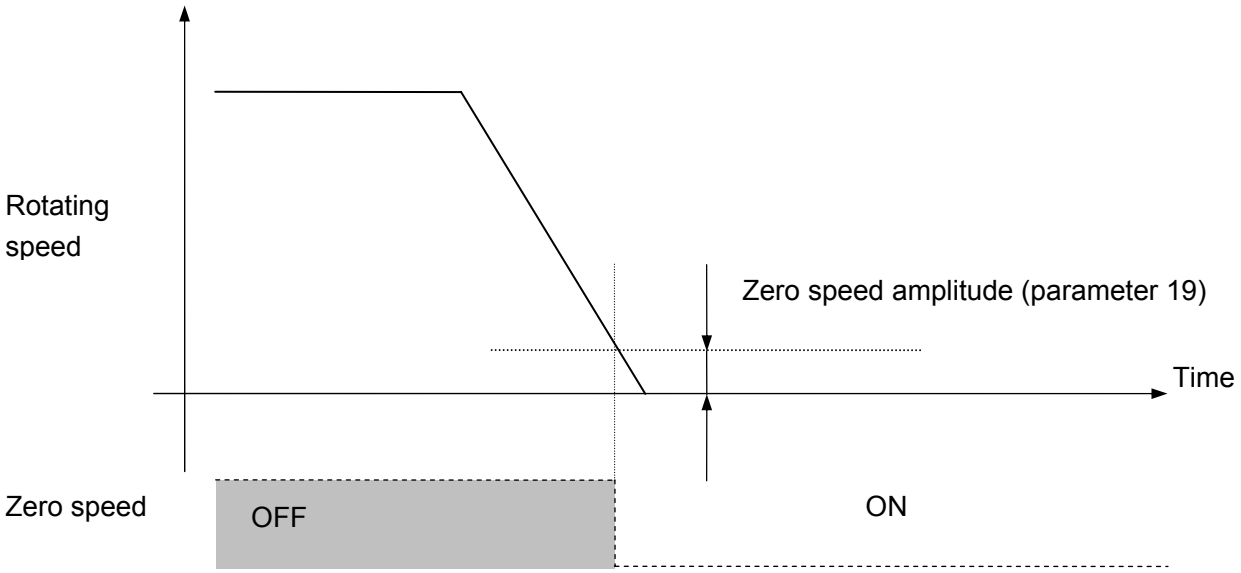
Set the initial value is 2000, bias number is 200,000. When the difference between the command position and the feedback position is equivalent to the servo motor running 15.2 circle, initial value is detected.

Bias overflow range is set for alarm detection.

Pn-23

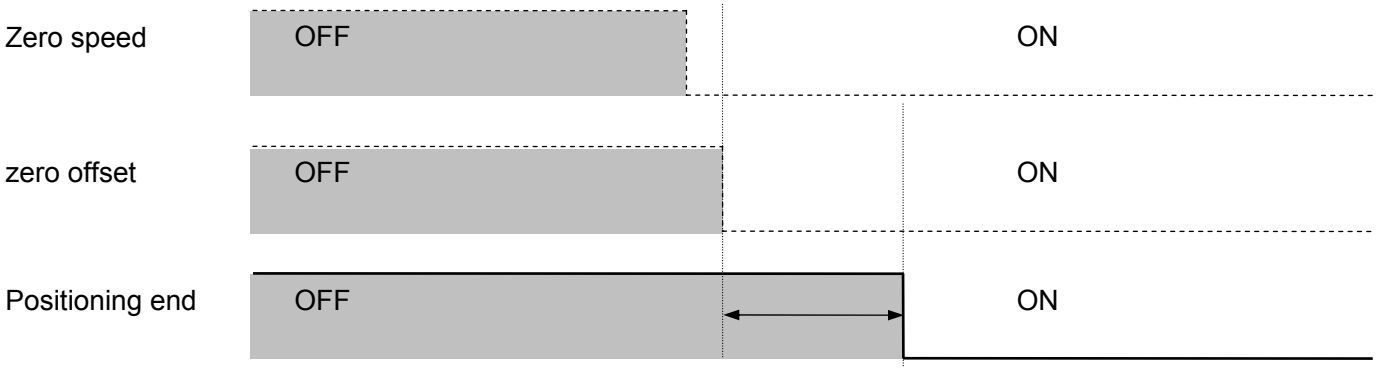
No.	Name	Set range	Initial value	Change
23	Zero speed amplitude	10~2000[r/min](1 Scale)	50	All the time

Determine whether the servo motor is stop. Set the amplitude for zero speed signal



connected rate.

If the zero bias signal (parameter 13) and the zero speed signal (parameter 15) are constantly connected in the end of the position determine (parameter 16), then signal connection is completed.



Determine whether the positioning end of the time (parameter 20)

Pn-24

No.	Name	Set range	Initial value	Change
24	Determine time of the positioning end	0.000~1.000 Seconds (0.001 scale)	0.000	All the time

Valid only in position control.
Set the determine time of the positioning end. If both zero bias signal (parameter 13) and the zero speed signal (parameter 15) are continuous connected during determine positioning end (parameter 16), the positioning end signals turn on.

Pn-25

No.	Name	Set range	Initial value	Change
25	Limitation of maximum current	0~300%(1 scale)	300	All the time

Set the limit value of servo motor output torque.
The setting based on the torque limit signal (20) of input control sequence command signal, the setting state as the following table.

Current limit signal distribution		Content actions
Not Distribute		Has been effective (parameter No. 25 setting)
Distribute	OFF	Maximum torque
	ON	Effective value (parameter 25)

Pn-26

No.	Name	Set range	Initial value	Change
26	Alarm detection when low voltage	0: Do not Checkout， 1: Checkout	1	Outage

Set alarm detection when the servo startup [RUN] signal is turned on and under the state that the power supply voltage is lower.

Pn-27

No.	Name	Set range	Initial value	Change
27	Low voltage start	0: Emergency deceleration stop, 1: Idle	1	Outage

Valid only in the speed control.

Set the servo motor action when connecting the servo start (RUN) signal and detecting the lack of power supply.

Set range	The action when detected low voltage
0:Urgent deceleration stop	Slow down with maximum capacity of the servo motor
1: Idling	In the idling state, decelerate with load torque (growth rate).

Pn-29

No.	Name	Set range	Initial value	Change
29	Parametes rewrite forbidden	0:Rewrite forbidden , 1:Rewrite	0	All the time

Prohibit parameters compile.
Even the parameter 29 have been chose as prohibit rewritten, it can be compiled.

Pn-30

No.	Name	Set range	Initial value	Change
30	The initial display of touch panel	0~18(1Scale)	4	Outage

Set the initial display of touch panel.

Setting value	Corresponding	Display content	Setting	Corresponding	Display content	Setting	Corresponding	Display content
0	SN-01	Sequence mode	7	ON-04	Feedback position	14	ON-11	Input signal
1	SN-02	The current alarm	8	ON-05	Command position	15	ON-12	Output signal
2	SN-03	Alarm record	9	ON-06	Position bias	16	ON-13	Pulse accumulation
3	SN-04	Display station number	10	ON-07	Busbar voltage	17	ON-14	Peak torque
4	ON-01	Operation speed	11	ON-08	Electricity Angle	18	ON-15	Pulse frequency
5	ON-02	Command speed	12	ON-09	Cooling temperature			
6	ON-03	Average torque	13	ON-10	Analogue			

Pn-31/ Pn-33

No.	Name	Set range	Initial value	Change

31	Internal speed 1	0.1~(Maximum speed) [r/min](0.1Scale)	200.0	All the time
32	Internal speed 2	0.1~(Maximum speed) [r/min](0.1 Scale)	500.0	All the time
33	Internal speed 3	0.1~(Maximum speed) [r/min](0.1 Scale)	1000.0	All the time

Valid in position control and speed control.

Set the rotation speed of forward running [FWD] (reverse running [REV]) signal.

Use the X1, X2 signal ON / OFF combinations can change the rotation speed.

Even in the motor rotating state, it can be changed, and the number of parameters and setting value is unconcerned.

Multi-speed selection

X2	X1	Rotating speed
OFF	OFF	Input terminal of analog speed command [Vref]
OFF	ON	Parameters 31
ON	OFF	Parameters 32
ON	ON	Parameters 33

Pn-34

No.	Name	Set range	Initial value	Change
34	Maximum speed	0.1~(Maximum speed)[r/min](0.1Scale)	2500	All the time

Set the maximum speed of servo motor.

In torque control mode, the difference between the set value and the actual rotation speed of the servo motor is about 100 [r / min].

(This is because the speed control is unused)
Setting of the maximum rotation speed is invalid when in the position control mode.

Pn-35 /Pn-38

No.	Name	Set range	Initial value	Change
35	Acceleration time 1	0.000~9.999 Seconds (0.001Scale)	0.100	All the time
36	Deceleration time 1	0.000~9.999 Seconds (0.001 Scale)	0.100	All the time
37	Acceleration time 2	0.000~9.999 Seconds (0.001 Scale)	0.500	All the time
38	Deceleration time 2	0.000~9.999 Seconds (0.001 Scale)	0.500	All the time

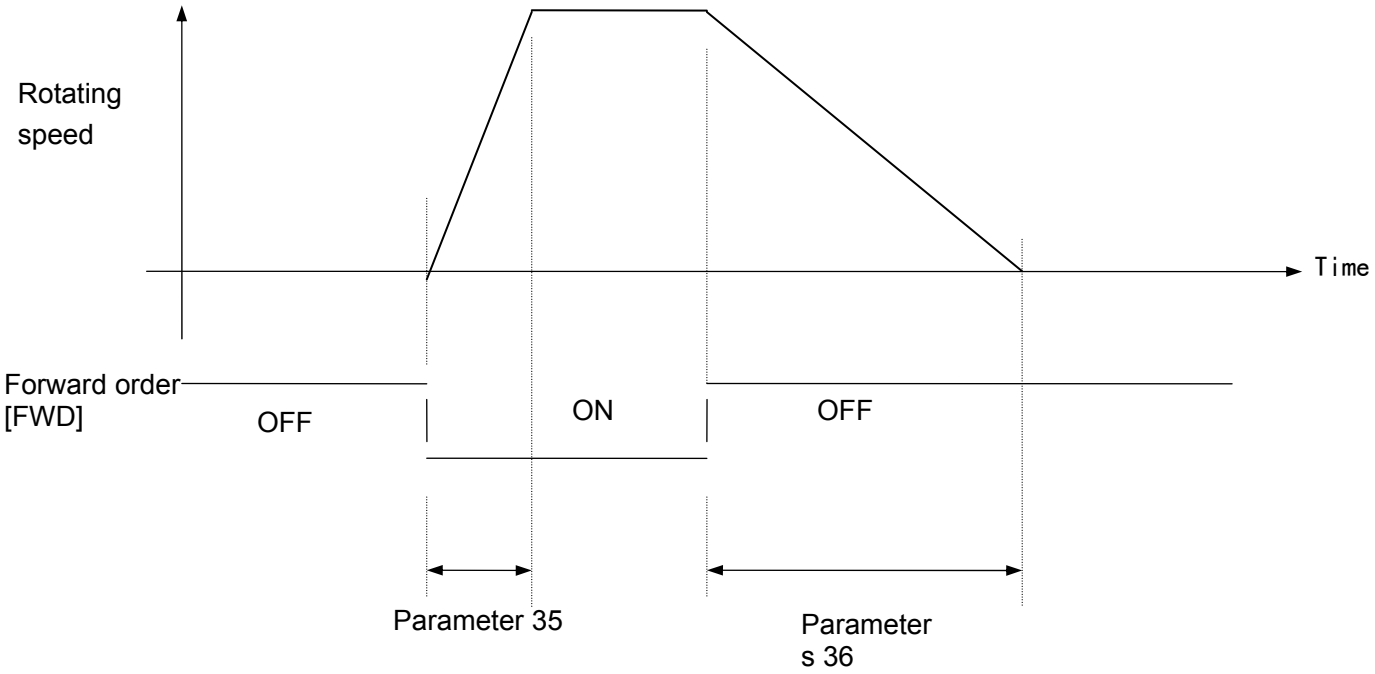
Valid in position control and speed control.
Set the acceleration and deceleration time of servo motor.
On all acceleration and deceleration actions speed control and position control (except for pulse train input) is effective.
The time is set to achieve the 0 ~ 2000 [r / min] required time
Acceleration time 2 and deceleration time 2 is valid when time selection signal is connected.
The ON/OFF of acceleration and deceleration time is valid all the time, and acceleration time / deceleration time also can be changed. Acceleration and deceleration time selection signal is control distribution signal of parameters.
The outside option of acceleration and deceleration time:

Deceleration/acceleration time choosing (19)	Acceleration time	Deceleration time
OFF	Parameters 35	Parameters 36
ON	Parameters 37	Parameters 38

Acceleration time 1 and deceleration time 1 can be set independently, and can only extend

the deceleration time.

According to servo driver and the load, etc., deceleration time can be used flexibly.



When the upper control device output analog speed voltage, and the servo amplifier's frequency dividing output use position control in feedback way, please set the acceleration time and deceleration time in 0.000 seconds.

Pn-39

No.	Name	Set range	Initial value	Change
39	Zero speed clamp electrical level	0.0~500.0[r/min](0.1Scale)	1.0	All the time

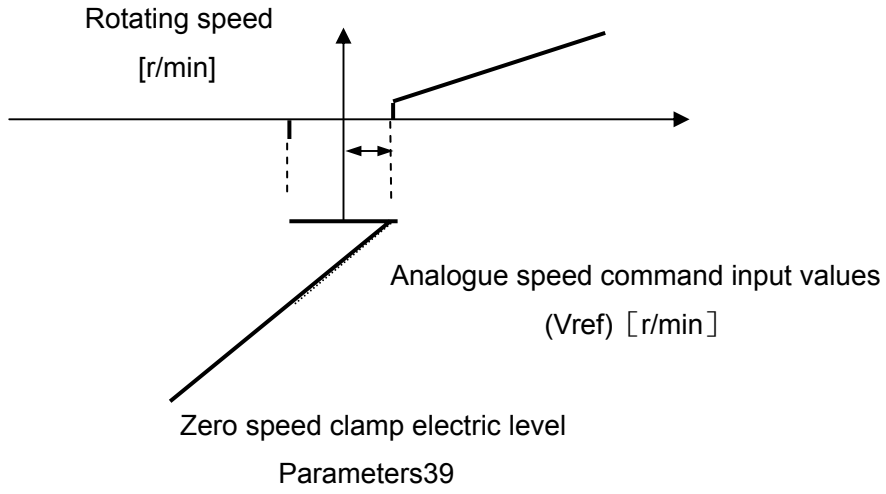
※valid in position control and speed control

Set the servo motor rotation speed of zero speed clamp.

Valid in the input position control and analog speed command of speed control.

If the speed command value of analog speed command (Vref) input terminal is below zero

speed clamp level, it will conduct zero speed clamp to the rotational speed in order to prevent the input value of analog speed command float around zero.



Note: When the analog voltage is near Setting value, "zero ⇔ Settings" and command is instable, sometimes leading to instability of the motor shaft.

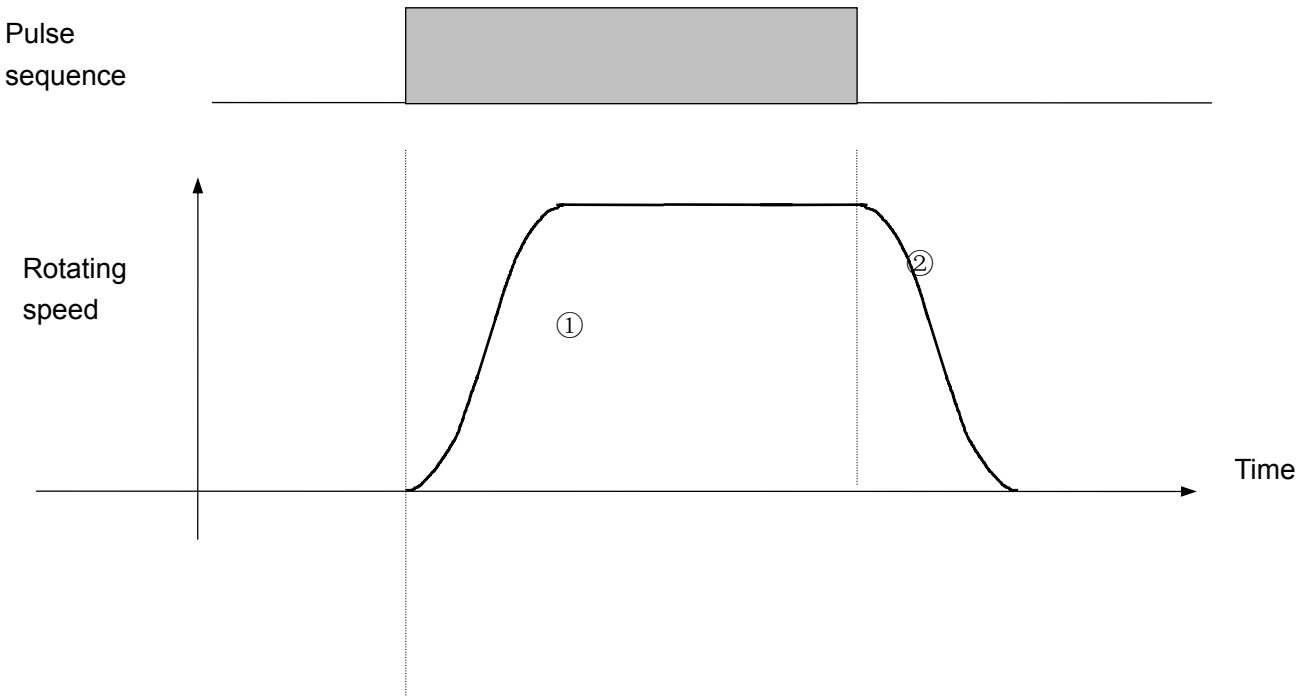
Pn-40/ Pn-42

No.	Name	Set range	Initial value	Change
40	Position controller gain 1	1~400[rad/sec](1Scale)	25	All the time
41	Speed controller gain 1	1~1000[Hz](1 Scale)	100	All the time
42	speed controller integral coefficient 1	0~4096（1 Scale)	400	All the time

Pn-43

No.	Name	Set range	Initial value	Change
43	the S-pattern time constant	0.0~100.0[msec](0.1 Scale)	2.0	All the time

※ Valid in speed control.
Allow servo motors to accelerate / decelerate in S-pattern curve.
Input pulse train with some frequency, it will accelerate / decelerate in time constant set.
Even when the upper controller can not accelerate in a straight line, they can smoothly accelerate / decelerate. Speed control is set for low speed section ①



Pn-44

No.	Name	Set range	Initial value	Change
44	Feedforward gain	0.000~1.200(0.001Scale)	0.000	All the time

Valid only in position control mode.
For machines of low rigidity or high load-inertia ratio, increase the this value.
If set higher value, you can reduce position deviation, improve the response.

Pn-45/ Pn-46

No.	Name	Set range	Initial value	Change
45	Feed-forward filter time constant	0.0~250.0[msec] (0.1Scale)	1.0	All the time
46	Torque filter time	0.00~20.00[msec] (0.01	0.00	All the

	constant	Scale)		time

Valid in position control and speed control

However, 40 and 46 is valid only in position control.

■ Position controller gain 1 (parameter No. 40)

Use to determine the response of position control loop. If you increase the setting value, the location tracking of command can get a good adjustment of the results, but if the setting value is too large, then it may easily lead to excessive regulation.

■ Speed controller gain 1 (parameter No. 41)

Used to set the gain of the speed controller.

Set this parameter to increase the position response to level load disturbance. Higher setting increases the response level. But it is liable to generate vibration and/or noise.

■ Speed controller integral coefficient 1 (parameter 42)

Use to determine the response of the speed control loop. Higher setting increases the response level, but if the setting value is too large, the mechanical system liable to generate vibration and/or noise.

■ Feed-forward filter time constant (parameter 45)

Is the parameter relating to filter control for feed-forward of the position control loop.

If this parameter is reduced, the response speeds up, but prone to torque shocks.

■ Torque filter time constant (parameter No. 46)

Is the parameter related to filter control of torque command.

If parameter increases, it alleviates the mechanical resonance, but sometimes disrupt the stability of the control.

Pn-47

No.	Name	Set range	Initial value	Change
47	Speed setting filter	0.00~20.00[msec](0.01Scale)	0.00	All the time

Valid in position control and speed control

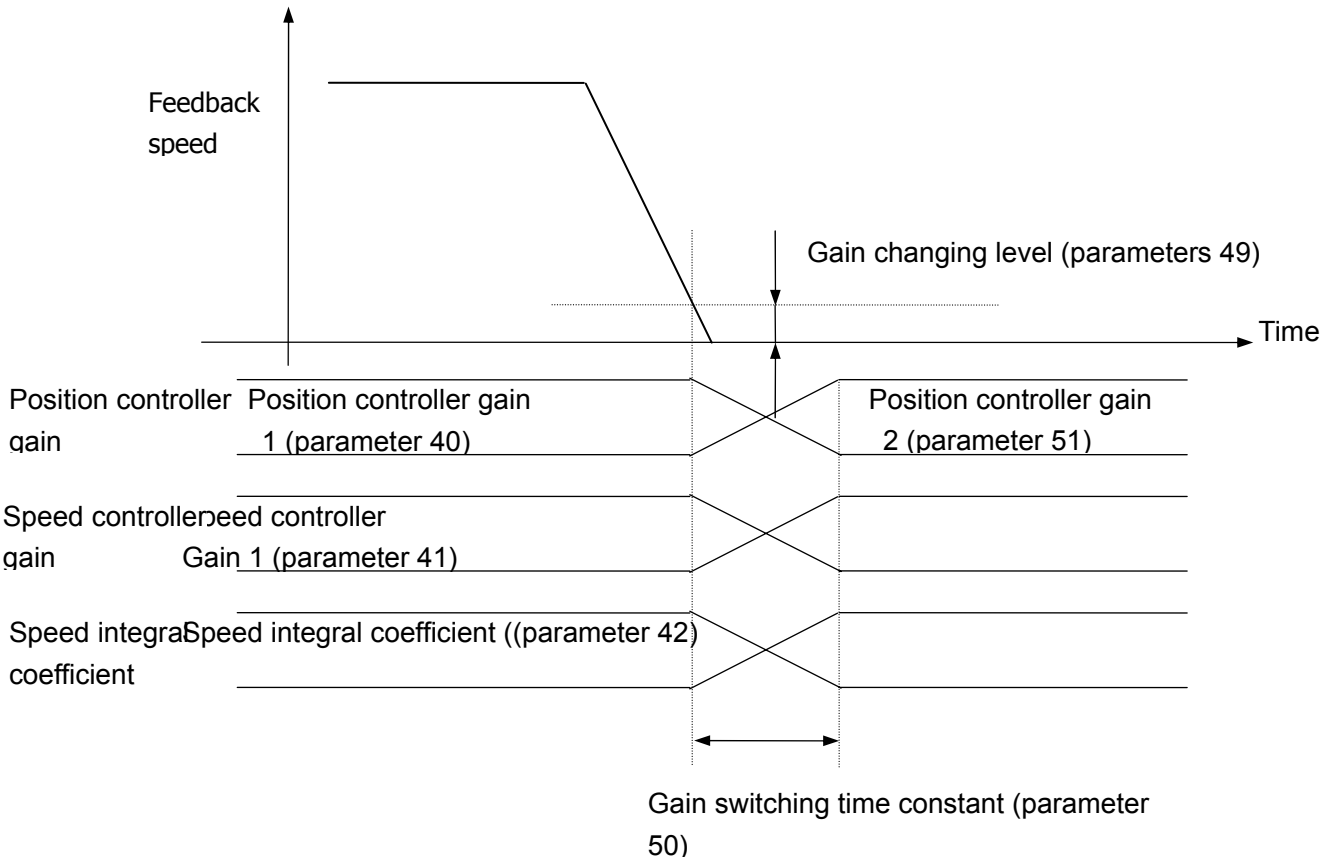
set when you want to filter control the speed command.

PN-48/PN-53

No.	Name	Set range	Initial value	Change
48	Main reason for the gain changing	0: Position deviation (× 10) 1: Speed feedback 2: Command speed	1	All the time
49	Gain changing level	1~1000(1 Scale)	100	All the

				time
50	Gain changing time constant	0~100 [msec] (1 Scale)	10	All the time
51	Position controller gain 2	1~300% (1 Scale)	100	All the time
52	Speed controller gain 2	1~300% (1 Scale)	100	All the time
53	speed controller integral coefficient 2	1~300% (1 Scale)	100	All the time

※valid in position control and speed control mode.



However, only 51 of the position control in effect at the time. When the gain switch cause: PN-48 the current value greater than the gain changing level, we use the second gain. change the gain 1 (parameter No. 40 to 42) when stop to gain 2 (parameter No. 51 to No. 53) can reduce noise, vibration when stop. Gain 2 (parameter No. 51 to No. 53) setting the value

of the unit is%, the ratio of the first gain setting.

Examples)

Speed controller gain 1 (parameter No. 41) is 100 [Hz] If the speed controller gain 2 (parameter 52) set to 100, the actual was 100 [Hz]. If the speed controller gain 2 (parameter 52) is set to 80, the actual is 80 [Hz].

※ Position controller gain 2 (parameter No. 51), the speed controller integral coefficient 2 (parameter No. 53) is the same.

Pn-54

No.	Name	Set range	Initial value	Change
54	Analogue setting filters	0.000~9.999[sec](0.001Scale)	0.000	All the time

It's able to filter control the input voltage of analog torque command terminal [Vref] .

PN-56/PN-57

No.	Name	Set range	Initial value	Change
56	deceleration time after losing enable signal	0．001~9.999[msec]（0.001 Scale)	0.001	All the time
57	Changing time for start acceleration speed	0.1~100.0 [msec] (0.1 Scale)	0.1	All the time

※ Valid in speed control.

Deceleration time after losing enable signal is the deceleration time of the speed when the start signal ON → OFF; set value 9.999 for this parameter is invalid. It's permitted that set the acceleration time from current speed to zero when enable signal changes from valid to invalid in speed control, but it's unable to set the acceleration time from current speed to zero speed when direction signal and speed signal change from valid to invalid.

Pn-60

No.	Name	Set range	Initial value	Change
60	Given location filter coefficient	0~100.00[rad~sec](0.01 Scale)	0.00	All the time

※ Valid in position control

It's the parameter to filter control position signal of position control loop. Reduce the value of this parameter can suppress the overshoot, track ability will improve, it may cause noise when it's too small.

Pn-62

No.	Name	Set range	Initial value	Change
62	-	-	-	-

Pn-64/Pn-69

No.	Name	Set range	Initial value	Change
64	Motor rated speed	50~3000[rpm](1 Scale)	2500	Outage
65	Motor rated current	1~20.0[A](0.1 Scale)	5.0	Outage
66	Motor rated voltage	110~230[V](1 Scale)	220	Outage
67	Rated torque motor	1.00~10.00[NM](0.01 Scale)	5.00	Outage
68	Motor pole pairs	1~6(1 Scale)	4	Outage
69	number of encoder lines	1000~5000(1 Scale)	2500	Outage

Only for manufacturer setting. Do not change these values by any means..

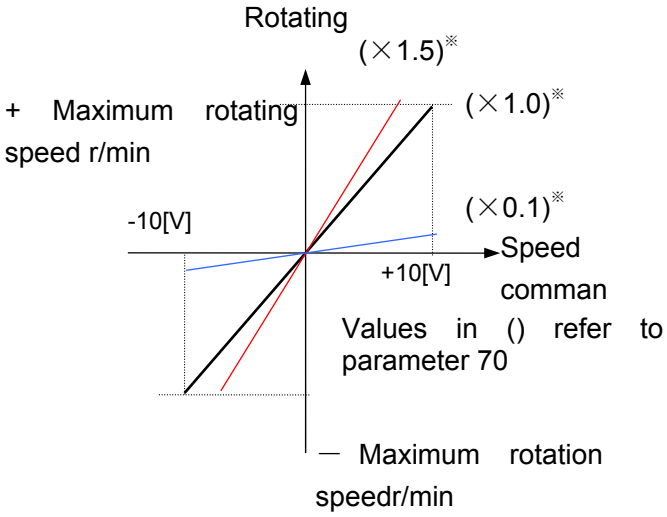
Pn-70/71

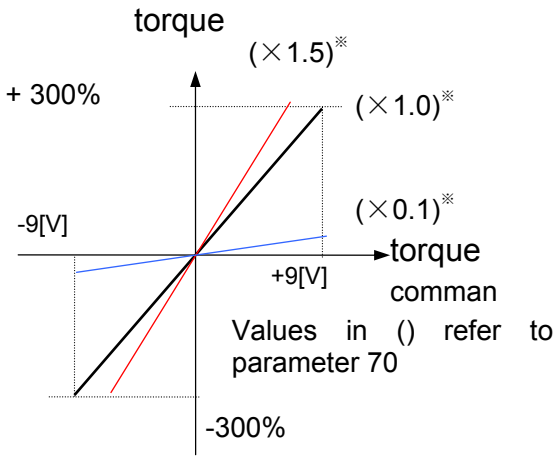
No.	Name	Set range	Initial value	Change
70	Analogcommand gain	±0.00±1.5(0.01 Scale)	1.0	All the time
71	Analogcommand compensation	-2000~+2000	(Factory set)	All the time

Can adjust gain and compensation of input analog speed command [Vref] terminal.

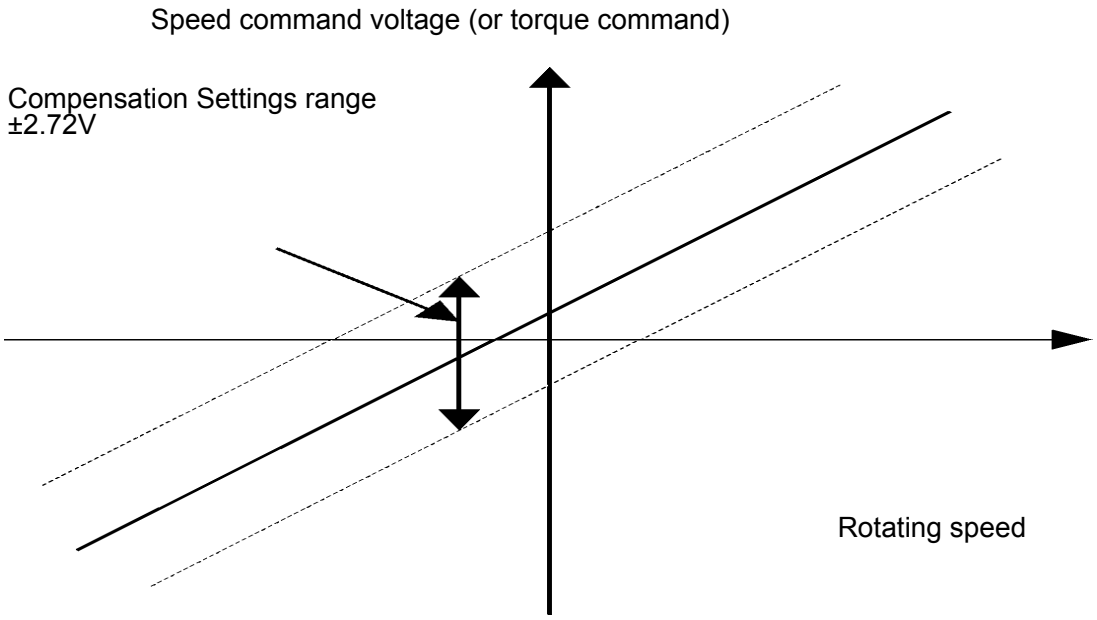
■analog command gain
Can set the range of 0.01 scale within the range of ± 0.00 ± 1.50 .
You can also specify a negative sign in order to reverse the rotation direction.

1) Speed control (speed command voltage) 2) torque control (torque command voltage)





■Compensation for analog command
Can be set to 1 scale within the range of -2000 to 2000. The setting range is [-2.00 ~ [2.00]
The initial value is the factory setting. You can use the test mode of touch panel for automatic compensation adjustment ([Fn-07]).
Adjusted value is reflected in the parameter No. 70.



Pn-74/ Pn-77

No.	Name	Set range	Initial value	Change
74	CONT valid all time 1	0~21(1 Scale)	0	Outage
75	CONT valid all time 2	0~21(1 Scale)	0	Outage
76	CONT valid all time 3	0~21(1 Scale)	0	Outage
77	CONT valid all time 4	0~21(1 Scale)	0	Outage

You can make any signal from control signal sequences of input command valid all the time.
The assignable signal:
1: Servo Start (RUN)
Run command is often valid.
11: Command pulse inhibit (INH)
Often prohibit the command pulse.
Set only when running under manual operation in position control.
(Pulse sequence mode does not set)

15: Manual Forward (FWD), 14: reverse command (REV)
Speed / torque control, it is often valid.
In position control is not always valid.
17: Multi-speed selection 1 (X1), 18: Multi-speed selection 2 (X2)
A particular velocity of multi-speed is in effect.

Pn-78/Pn-80

No.	Name	Set range	Initial value	Change
78	Command pulse compensation α1	1~32767(1 Scale)	1	All the time
79	Command pulse compensation α2	1~32767(1 Scale)	1	All the time
80	Command pulse compensation α3	1~32767(1 Scale)	1	All the time

Valid only in the position control mode.

Assigned by order of the command signal "command pulse compensation α selection 0" and "Command pulse compensation α selection 1" to switch the command pulse compensation α values.

Command pulse compensation α selection 1	Command pulse compensation α choose 0	Command pulse compensation α
OFF	OFF	Parameter 1
OFF	ON	Parameter 78
ON	OFF	Parameter 79
ON	ON	Parameter 80

Pn-81/Pn-83

No.	Name	Set range	Initial value	Change
81	Communication protocol	0~8	3	Outage
82	Station number	1~31(1Scale)	1	Outage
83	Baud rate	0: 38400[bps]、1: 19200[bps]、2: 9600[bps]	0	Outage

■ Communication Protocol

With 0 to 8 set the communication protocol RS485 communication.

■ Station Number

With 1 to 31 set RS485 communication station number of servo amplifier.

■ Baud Rate

Set the baud rate of RS485 communication.

Pn-84/ Pn-85

No.	Name	Set range	Initial value	Change
84	Simple adjustment: rotation setting	0.5~200.0[rev](0.1 Scale)	2.0	All the time
85	Simple adjustment: speed setting	10.0~ Maximum speed [r/min](0.1 Scale)	500.0	All the time
86	Simple adjustment: timer Settings	0.01~5.00[sec](0.01Scale)	0.50	All the time
87	Simple adjustment: counter setting	0~1000	10	All the time

Set simple adjustment.

Pn-91/ Pn-98

No.	Name	Set range	Initial value	Change
91	Test current given	0.00~3.00(times)	1.00	All the time
92	Test speed given FN10	0.00~ Maximum speed [r/min]	200.0	All the time
93	Test operation mode	0：position1：speed 2：current	1	All the time
94	Jog feed speed given FN01	0.00~ Maximum speed [r/min]	50.0	All the time
95	For manufacturer adjustment	-	-	-
96	For manufacturer adjustment	-	-	-
97	For manufacturer adjustment	-	-	-
98	Current controller cut-off frequency	-	-	-
99	Current controller integral time	-	-	-

CHAPTER 4: THE MAIN OPERATION FUNCTIONS OF SERVO

4.1 Introduce Touch Panel

Seven-Segment Display

Key

MODE / ESC Changing MODE (MODE).
Delete (ESC).

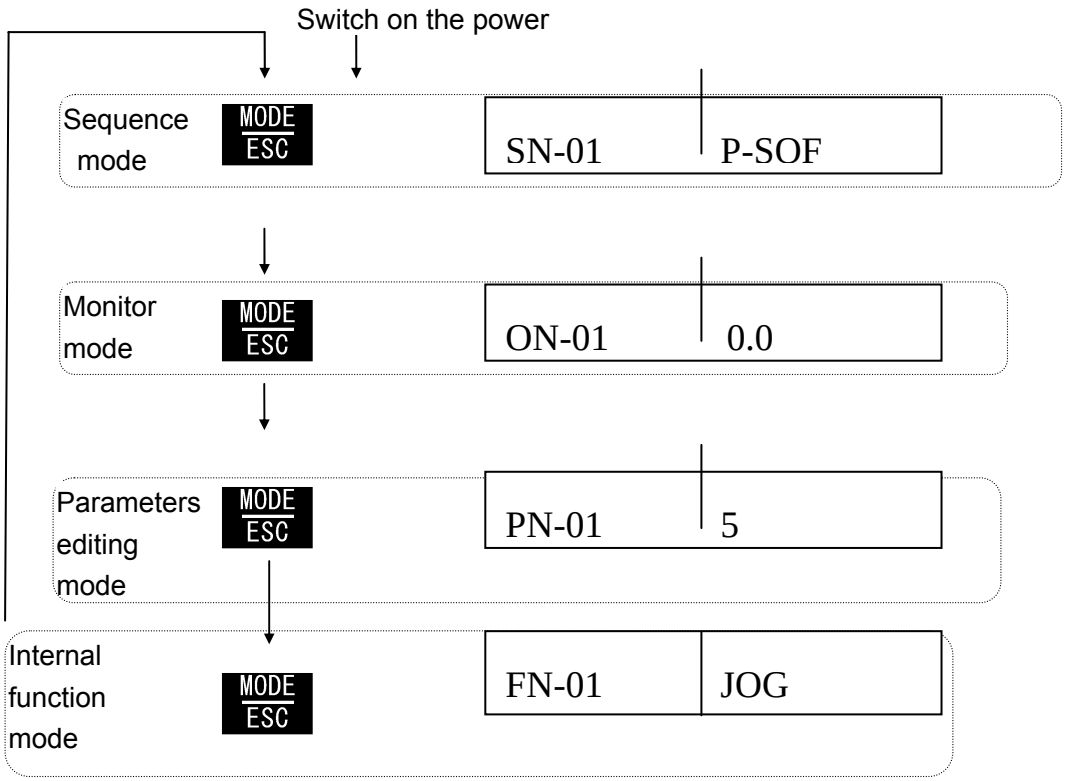
SHIFT / ENT Shift the setting to the right (SHIFT)。
Confirm the model and numerical (ENT)。
Push this button for 1 more than second when confirming。

Choose servo model.
Reduce digital value (-1).

Choose Servo mode.
Add digital value (+1).

4.2 Mode selection

Select mode Select subschema Display proportion



4.3 Function List

Settings can be changed on the model of Parameters compilation and location data compilation.

Mode	Subschema	Select Subschema	Expressions and setting examples
Sequence monitoring mode	Sequence mode	SN-01	P-SOF
	The current alarm	SN-02	EC
	Alarm record	SN-03	1-EC
	Display station number	SN-04	Ad01
	Feedback speed	ON-01	1000

Monitoring mode	Command speed	ON-02	1000
	Average torque	ON-03	1.00
	Feedback current position	ON-04	H0100
	Command the current position	ON-05	L1000
	Position offset	ON-06	10000
	Dc bus voltage	ON-07	100
	Electricity Angle	ON-08	10.0
	Radiator temperature	ON-09	25
	Analogue voltage value	ON-10	10.0
	Input signal	ON-11	10001
	Output signal	ON-12	1001
	Command pulse accumulation	ON-13	10000
	Peak torque	ON-14	3.00
	Pulse sequence input frequency	ON-15	10.0
		ON-16	Spare
	Version number	ON-17	-
		ON-18	Spare
		ON-19	Spare
Parameters edit mode	Parameters editor	PN-01 ～ PN-99	
Trial operation mode	Manual operation	FN-01	JOG
	Clear the current command and feedback pulse	FN-02	PRT
	Clear integrating pulse	FN-03	CPCR
	Alarm reset	FN-04	RT
	Alarm record initialization	FN-05	ALRT
	Parameters initialization	FN-06	PART
	Automatic compensation adjustment	FN-07	OFFT

	Test operation	FN-10	ESY.1
	Mode operation	FN-11	PTN

4.4 Sequence Monitoring Mode

The servo amplifier condition and alarm detection records can be displayed on sequence control mode.

Press the MODE button, display [SnO1], press the ENT key (press more than 1 second), can display input.

SnO1 : Sequence mode
SnO2 : The current alarm
SnO3 : Alarm records
SnO4 : Display station number

4.5 Monitor Mode

The speed of the servo motor and the accumulated value of input pulse can be displayed on monitor mode.

Use the MODE key to display [On01], press the ENT key (more than 1 second) to display content.

On-01: feedback speed
On-02: command speed
On-03: average torque
On-04: feedback current position
On-05: command current position
On-06: position offset
On-07: dc bus voltage
On-08: electricity angle
On-09: radiator temperature
On-10: input voltage
On-11: input signal
On-12: output signal
On-13: command cumulative pulse
On-14: command cumulative pulse
On-15: input pulse sequence frequencies
On-16: spare
On 17: version number of software
On-18: spare
On 19: spare

(1) Feedback speed ----------display digits: 4-bit signed On01

Showing current rotation speed of servo motor.
Even if running beyond the normal speed (mechanical system), it can indicate the correct value.
set 1 [r / min] as the unit for display . Use a negative sign when inverting (turning the motor shaft clockwise direction).
(2)Command speed ----------display digits: 4-bit signed On02
Sent speed command to the current servo motor, including the speed command voltage, multi-speed and pulse sequence.
Set 1 [r / min] as the unit for display. Use a negative sign when inverting (turning the motor shaft clockwise direction).
(3) Average torque---------- display digits: three-bits signed On03
Servo amplifier sent average torque of an command to the servo motor. Rating value is displayed as 100%.
It is displayed as 1% within the range from 0% to maximum torque.
(4) Feedback current position---------- display digits: ten-bit signed On04
Display servo rotation. The show is the rotation of motor shaft rotation encoder (10,000 pulses / rev).
(5) Command the current location---------- display digits: ten-bit signed On05
Servo amplifier is to display the servo motor position (without regarding to pulse compensation).
When it reaches the target position and you cut off the run command, it can’t reflect the correct location in the load (mechanical system) rotating case.
(6) Position deviation---------- display digits: ten-bit signed On06
Displays the command position and deviation of position feedback. The deviation is the conversion value of pulses of the encoder.
See "(4) feedback current location" item about the Show.
(7) The show of bus voltage---------- display digits: three-bit unsigned On07
Display bus voltage,and convert into AC voltage
(8)Electrical angle of the rotor ---------- display digits: four-bit unsigned On08
The magnetic angle of the current rotor
(9) The radiator’s temperature---------- display digits: three-bit unsigned On09
The current radiator’s temperature
(10) Input voltage---------- display digits: three-bit signed On10
Input voltage of analog input [Vref] is displayed with 0.1V as a unit. Negative sign is negative (-) voltage.
The range is-10.0V ~ +10.0 V.
(11) Input signal ----------On11
Show servo amplifier’s input signal ON / OFF. When the input signal is ON, it will display 1.
(12) Output signal---------- On12
Show servo amplifier’s output signal ON / OFF. When the input signal is ON, it will display 1.
(13) Command the value of accumulated pulses---------- display digits: ten-bit unsigned On13
Command the value of the cumulative pulse under the case of RUN .

(14) Peak torque---------- display digits: three-bit unsigned On14
Display the maximum output of torque controller within 2 seconds. Display range: 0% ~ 300%.
(15) Input pulse train frequency---------- display digits: four-bit signed On15
Show the pulse train frequency from the input to input terminal of the pulse train , the smallest unit is 0.1 [kHz].
Display range:-999.9kHz ~ 999.9kHz.

4.6 **Parameter Edit Model**

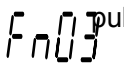
Use parameter compilation model to compile parameters.
Press the MODE key to display [], then select from the ∧ or ∨ key to get compiled parameters' number.
Press ENT key to edit its contents.

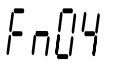
4.7 Internal Functions Mode

In internal function mode, we can operate the servo amplifier and get all kinds of reset through the touch panel key .
Press the MODE key to display [FN-01], press "∧", "∨" can perform the test operation.

 : Manual operation

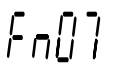
 : Position reset

 : Clear accumulated pulse

 Alarm reset

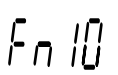
 :Alarm record initialization

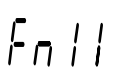
 : Parameters initialization

 Automatic compensation adjustment

 : spare

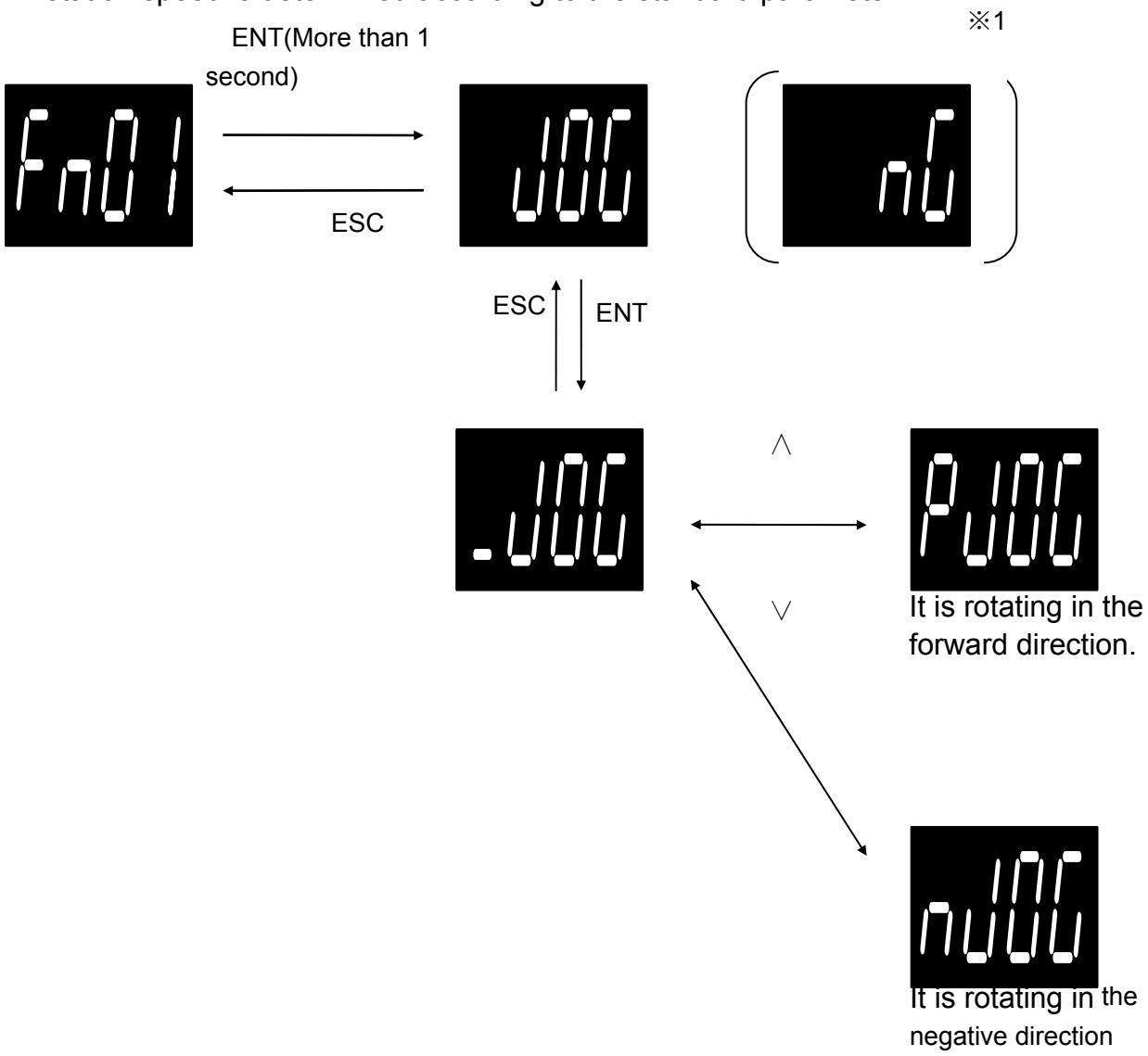
 : spare

 : test operation

 : mode operation

(1) Manual operation

The servo motor can rotate during pressing the button on the touch panel. Servo motor rotation speed is determined according to the standard parameter 1.



When the servo motor is controlled by a command sequence of input and output drive signals, it will display [NG].

※ 1) the reason of NG display

· RUN signal and FWD / REV signal is turned on.

* Motor is rotating

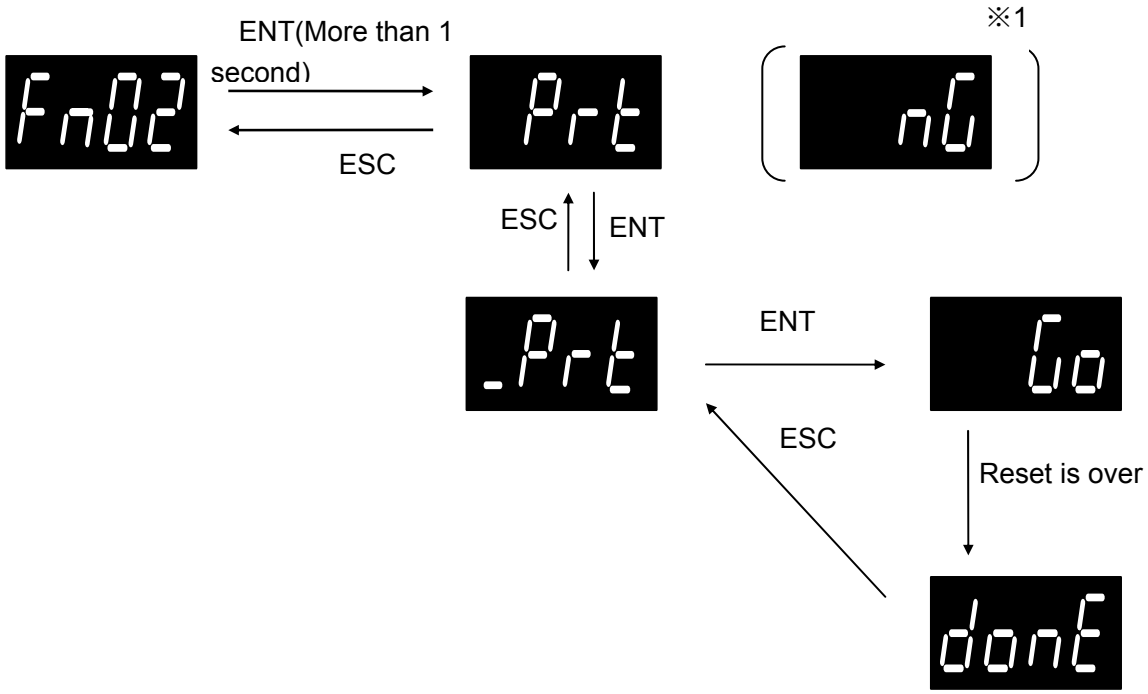
Note

In forced stop, the external regenerative resistor overheating, ± OT idle signal or even test operation, is still valid.

If in test operation motor does not rotate, check the signal above.

(2) Position reset

To reset current position of the servo motor commands and feedback current position.



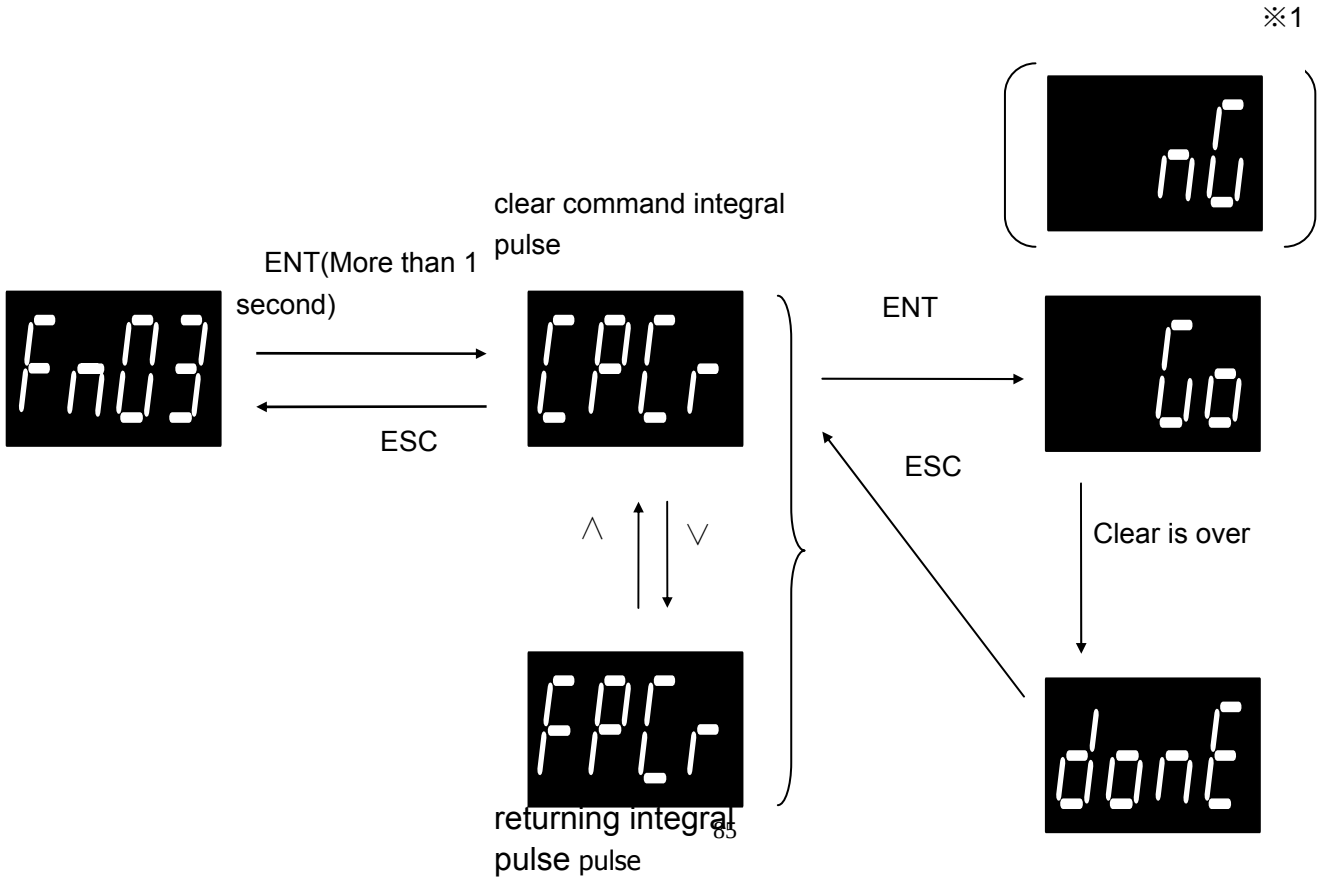
※ 1) The reason of NG display

· RUN signal and FWD / REV signal is turned on

* Motor is rotating

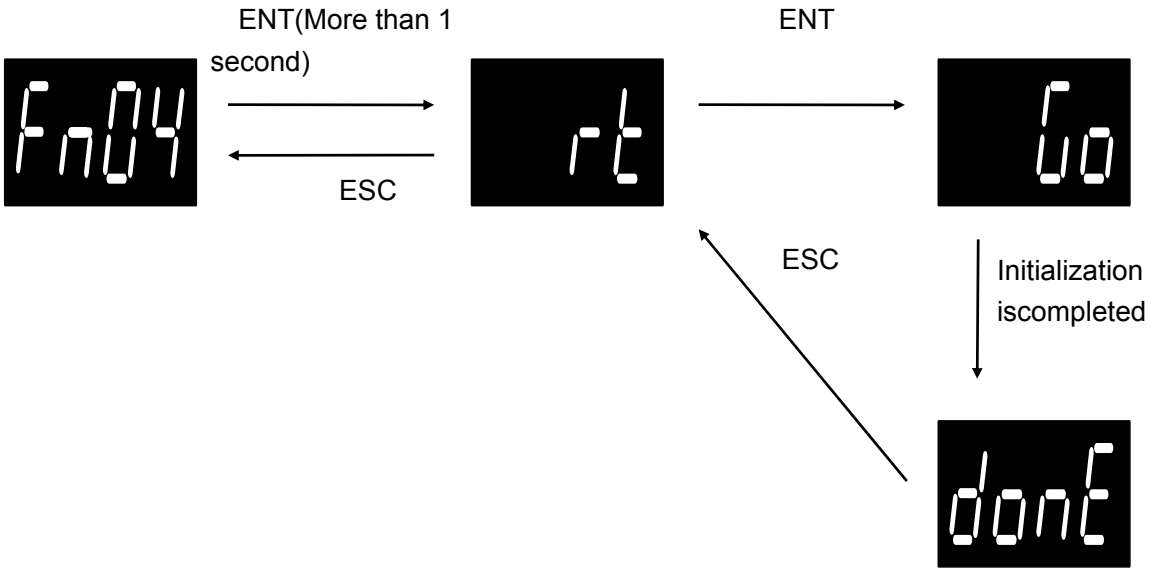
(3) Clear the accumulated pulse

To clear command integral pulse and returning integral pulse of the servo amplifier.



※ 1) The reason of NG display
· RUN signal and FWD / REV signal is turned on
* Motor is rotating

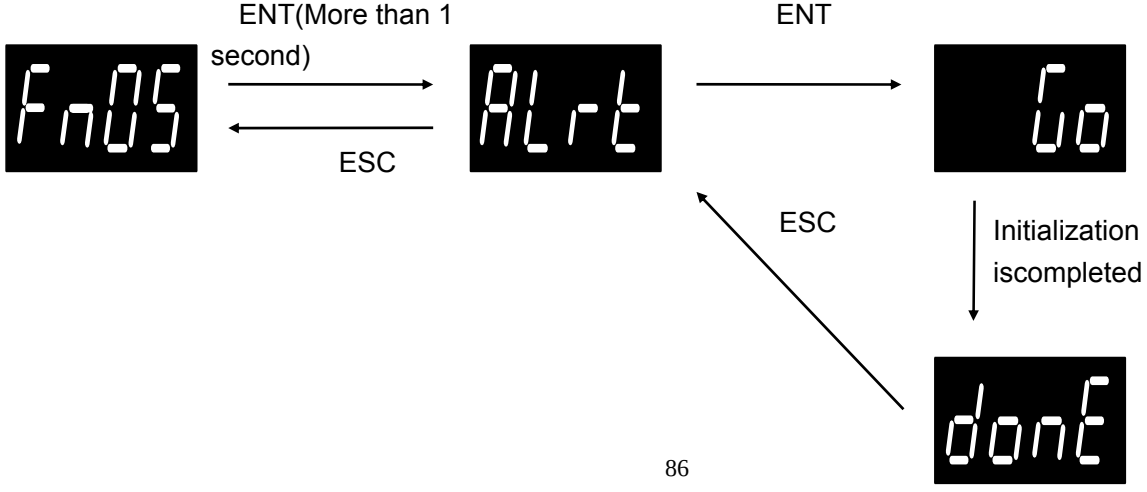
(4) Alarm reset
To reset the current detection alarm of the servo amplifier.



※ Alarm reset sometimes does not deactivated some of the alarm. In this case, you can reset it later by the way of the re-energizing.
The alarm can be deactivated with the alarm reset | Re-energize can deactivate the alarm

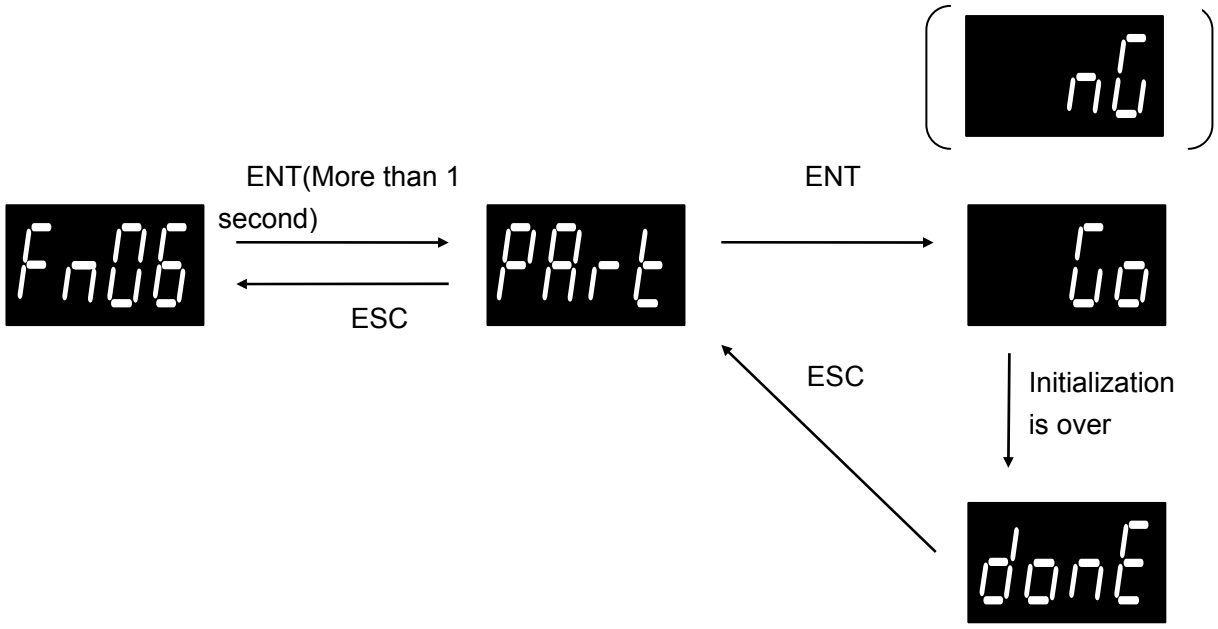
OC2	Over-current 2	EC	Encoder error
OS	Over speed	EH	Current sampling loop damaged.
OL	Overload	OC1	Over-current 1
LU	Voltage inadequate	HU	Overvoltage
RH1	Regenerative resistance overheating	DE	Memory error
OF	deviation beyong the limit.		
AH	Amplifier overheating		

(5) Alarm recording initialization
To clear the alarm detection record for the servo amplifier. Alarm detection record (alarm recording) can be monitored in the sequence mode [Fn04].



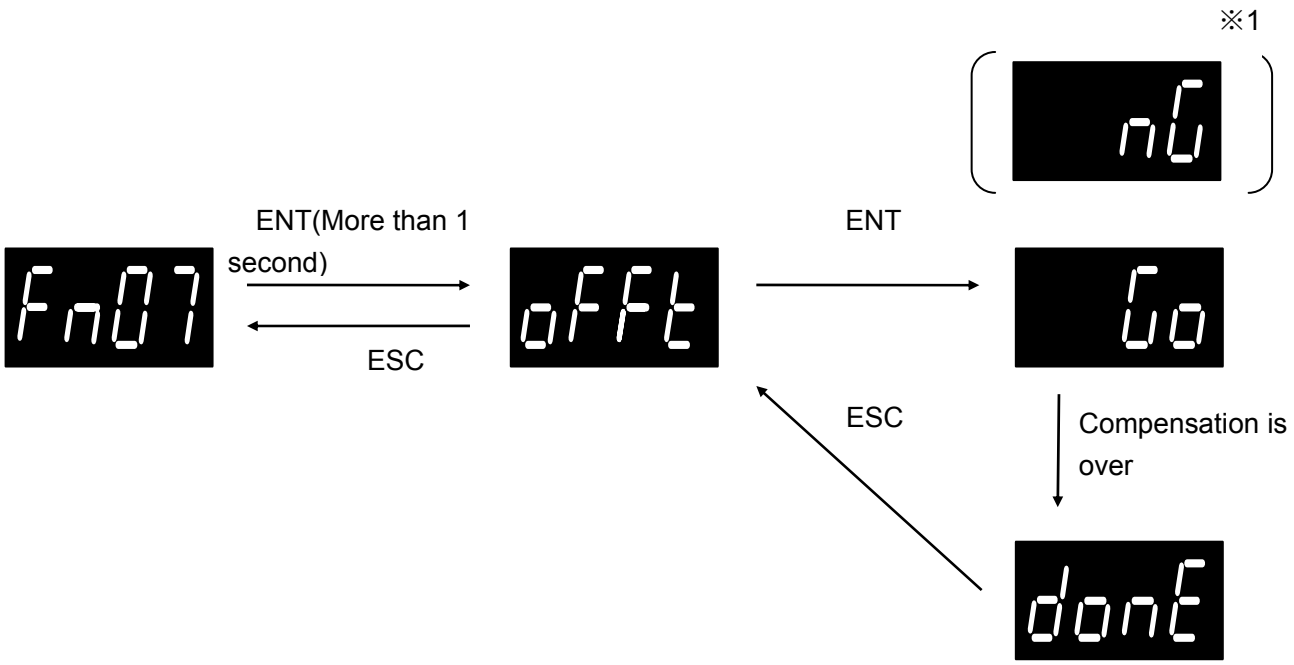
Alarm record will be stored even after power is off.

(6) Parameter Initialization
Initialize the parameters.



※ 1) The reason of NG display
· RUN signal is turned on
• Parameter 29 (parameter rewrite inhibit) is "1: can’t rewrite".

(7) Automatic compensation adjustment
The current input voltage of command control sequence input port [Vref] remains 0V.

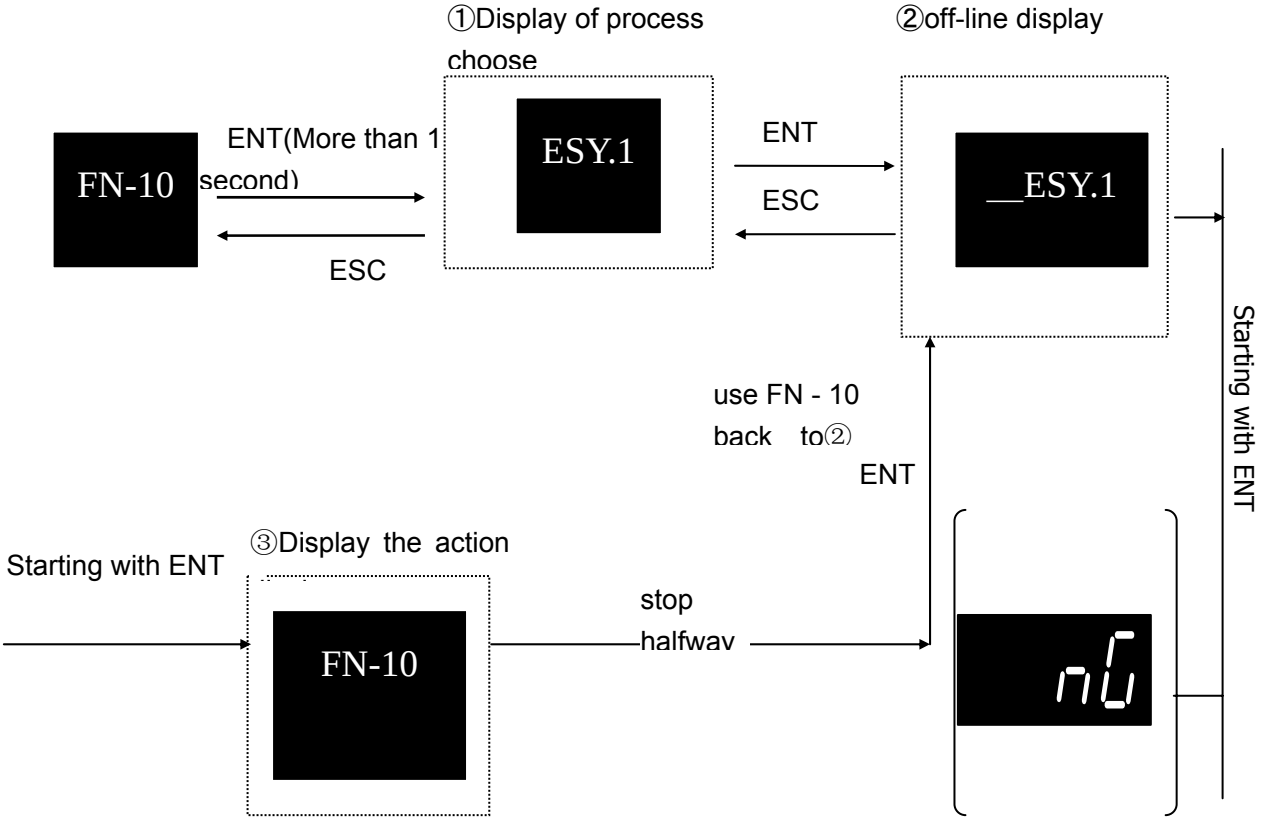


If using FWD (REV) Multi-speed selection signal to cut off the X1 and X2 terminals, the output of servo motor will immediately rotate according to the analog speed command voltage.
When the speed command voltage decreases to 0V, the output of servo motor will rotate a little.
→ If necessary, use the "zero speed clamp."
Adjustment compensation voltage in the following order
① Set 0V to the [Vref] terminal. No matter whether giving the running command or not.
② Use the touch panel to select [FnO7], get self-compensation with ENT.
③ Turn Running command [RUN] signal, confirm that the output shaft of servo motor does not rotate.

(10) Test operation
The user can choose parameter 93, simple operation mode (0: position mode; 1: speed mode, 2: torque mode) position mode, the moving distance for the 84 parameter, movement one time, acceleration time is 35, the deceleration time is 36 .
In Speed mode ,starting speed is set to the parameter 92,the acceleration and deceleration time is same with position mode.
When torque mode, the output of torque should be set to the parameter 91, setting unit is percentage of the rated torque.

In FN10 mode, press ENT, display essy.x (x = 0: position mode; x = 1: speed mode, x = 2: torque mode) press the ENT again, display essy.x, press UP or DWN button to select forward or reverse for the motor running, after operation ,the run mode will jump to the current speed display, position mode will not jump out,but torque mode will jump to the current Output.

Use the keyboard back to FN10, press the ent l to make the motor stop, sliding freely to stop.



(11) Mode operation

Can make the servo motor run continuously. If started, it can run continuously back and forth before stopping.

Even if the wiring is not connected with the upper control device, it can run continuously, therefore, use it when confirming the valid torque

Process name	Mobile distance	Action time	Accelerati time	Deceler ation time	Rotatin g speed	timer	Rotating direction	
							Outlet	loop
Mode operation	Parame ter 84	Infinite	Parame ter 35	Parame ter 36	Paramet er 85	Parame ter 86	CCW (count ercloc kwise)	CW (Clock wise)

CHAPTER 5: SERVO TRIAL OPERATION

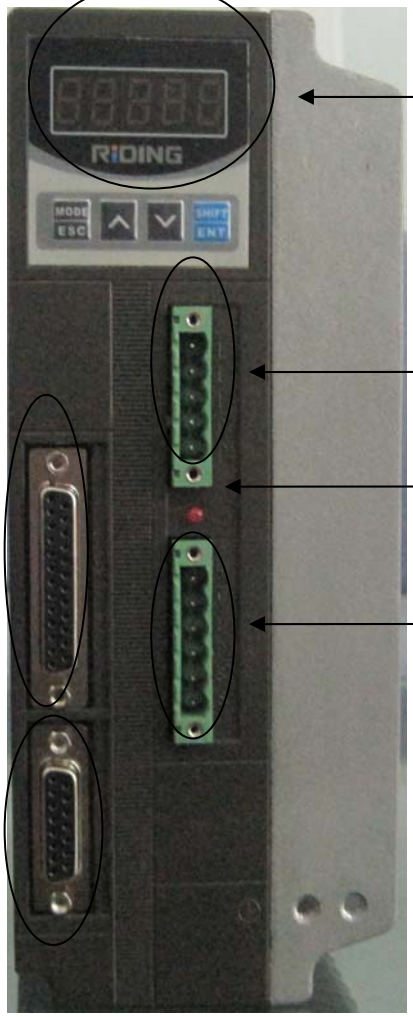
5.1 Turn On Power

● AC servo drive and motor must be grounded, PE terminal must be connect to ground terminal of equipment.
● Recommend that the power of AC servo drive is provided through isolate transformer or power filter,in order to ensure safety and anti-interference.
● Input power of AC servo drive is single-phase / three-phase AC 220V, if the power supply is 380V three-phase,step-down transformer is needed.
● Check the connections carefully before power on.
1) The Chapter 2 provide detailed wiring diagram.
2) The power of AC servo drive is divided into the main power supply (L1, L2, L3) and control power (S1, S2).If the main power is supplied by three-phase, L1, L2, L3 need to be connected; if the main power is supplied by single-phase,connecting any two ports of L1,L2,L3 can make it work.
3) When the control power and main power is on, the main power indicator lights and drive digital display showing the motor in a free state.
4) Turn on/off the power frequently may damage the soft-start circuit and the dynamic braking circuit, so the frequency of turning on/off power should be less than 5 times per hour.

5.2 Motor test Running

1)Check before running
After completion of the installation and connection, check as below before power on.
● Power terminal wiring is correct, the input voltage is reliable, drive maybe burn down if the temperature is too high.
●Confirm that no short-circuit and grounding is correct.
● Confirm that encoder wiring is correct.
●Confirm that control terminals are connected,the polarity and amplitude of DC power is correct.
●Confirm that drive and the motor is installed securely.
●Confirm that motor shaft is loaded.
●Confirm that the servo amplifier and servo motor is working properly.
2)Drive JOG test running
●In order to avoid damage to the machinery,running under the state that servo motor shaft is not connected to the mechanical system.
* Check the parameter 4 (the direction of rotation switch / CCW (counterclockwise) is normal)
The order of test running
(1) Secure the servo motor in order to prevent its lateral tip over.

(2) The wiring between servo amplifier and servo motor is according to Chapter 2 .
If running single test, do not connect to CN1.
(3) Check the servo wiring is correct before power on.
Ⅰ) Check indicator. (Red light is normal)
Ⅱ) Confirm that the touch panel can display.



5 -digit 7-segment display with four operating keys

Main power terminal, an external braking resistor terminals, connect the external power supply (do not directly connected to 380V power supply, the drive will be destroved)

The main power indicator light, if the servo drives power on or internal charging.

Control power

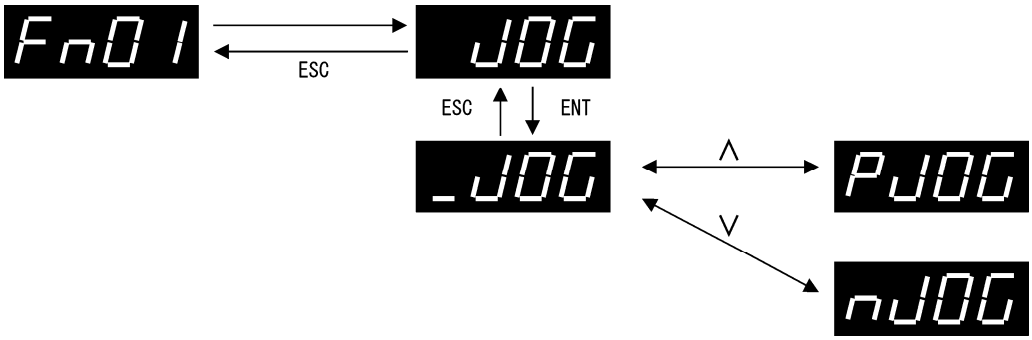
Connection sequence, Input and output signals (DB25)

Connect the servo motor encoder cable (DB15)

※ If alarm detected, please cut off the power, make sure the wiring is correct.

Test running use touch panel

Press MODE button to enter the trial running mode.
Press panel to run the servo motor. Parameter 94th set the rotation speed of servo motor, the acceleration time of jog speed set by parameter 35th; jog stop is free deceleration.



Offline

Positive direction

When press the ∨ and the ∧ key,the motor running, when release the button the motor stops rotating.

Reverse direction

No.	Definition	Set range	Initial value	Change
94	JOG move speed	0.1~ Maximum rotation speed [r/mim](0.1 Scale)	50.0	All the time
35	Acceleration time (include test running)	0.000~9.999 seconds (0.001 Scale)	0.100	All the time

(4)After confirmed the above, please cut off the run command (RUN)and the power.
3)Drive test running

● Under the state that the servo motor shaft is not connected to the mechanical system,in order to avoid damage to the machinery.
The user can choose parameter 93th---simple operation mode (0: position mode; 1: speed mode; 2: torque mode)

1)Under position mode,the parameter 84th sets the moving distance, parameter 35 sets acceleration time, parameter 36th sets deceleration time.
2)Under speed mode,parameter 92th sets the speed, the setting of acceleration and deceleration time is the same with position mode.
3)Under torque mode,parameter 91th sets the output torque,the unit is the percentage of the rated torque.
In FN10 mode, press ENT will display essy.x (x = 0: position mode; x = 1: speed mode;
x = 2: torque mode), press the ENT again will show-essy.x,then press UP or DWN button Select forward or reverse running mode,if under the speed mode,the current speed will display. position mode will not display, torque mode will displays the current output torque.
Use the keyboard to return FN10 mode, press the ent will enable the motor to stop with free deceleration.

Thus, the test running completed.
1 represent enable signal accessing or enable signal setting(check the PN-74 ~ PN-77 values if are set to 1, if yes then set them to 0 and power on again; or if external enable signal is turn on, turn off enable signal)
4) Running under speed mode
(1) CN1 and control signal connection: the servo enabled (RUN), Multi-Speed 1 (X1), Multi-speed 2 (X2), if the multi speed signal is not selected to be input,the analog voltage signal can be instead, ON-10 shows the input voltage, the proportional relationship between input voltage to motor speed can be adjusted through changing the maximum speed (parameter PN-34) or analog gain (parameter PN-70). Positive direction overtravel + OT and reverse direction overtravel + OT are invalid.
(2) Turn on the power of servo drive,the main power indicator lights up, the drive's LED light display. If an alarm signal lights up, please check the wiring carefully.
(3) Set the control mode switching PN-09 parameter to 1, running in speed control mode.
(4) Set the basic parameters of the speed mode:
Input signal distribution (parameter PN-10 ~ PN-14)
Output signal distribution (parameter PN-15 ~ PN-18)
Feedback pulse number of motor encoder(parameter PN-19)

Internal speed of 1 (parameter PN-31)
Internal speed of 2 (parameter PN-32)
Internal speed of 3 (parameter PN-33)
Maximum speed (parameter PN-34)
Acceleration time of 1 (parameter PN-35)
Deceleration time of 2 (parameter PN-36)

(5) Ensure that no alarms and no unusual circumstances,then give the servo enabled (RUN) signal,at the same time give multi-speed selective signal or analog voltage signal, the motor will be running. Changing multi-speed selective signal or changing the analog voltage signal can change the motor speed.

5)Running under position mode
(1)CN1 and control signal connection: the servo enabled (RUN), pulse signals (CA, * CA, CB, * CB). Positive direction overtravel + OT and reverse direction overtravel + OT are invalid.
(2)Turn on the power of servo drives,the main power indicator light, LED light display. If an alarm signal lights up,please check the wiring carefully.
(3)Set the control mode switching PN-09 parameter to 0, run in position control mode.
(4)Set the basic parameters of the speed mode:
Electronic gear ratio (parameter PN-01 ~ PN-02)
Input pulses mode (parameter PN-03)
Rotation direction switch (parameter PN-04)
Input signal distribution (parameter PN-10 ~ PN-13)
Output signal distribution (parameter PN-15 ~ PN-18)
Feedback pulse number of motor encoder (parameter PN-19)
Maximum speed (parameter PN-34)
(5) Ensure that no alarms and no unusual circumstances, then give the servo enabled (RUN) signal and enter the command pulse, the motor will be running.Changing the pulse frequency can change the motor speed.

5.3 Basic Adjustment

● Wrong parameter settings may lead to equipment failure and accidents ,so the correctness of the parameters should be recognized before the start
● Recommend that test the no-load running before testing the load running
1) Basic gain adjustment
● Speed control mode
(1) Speed control mode works in the double-loop system. Inner loop for current , outer loop for speed. Speed loop uses PI control.
(2) Speed proportional gain (parameter PN-41) should be as large as possible in condition of oscillation does not occur and the relatively mechanical vibration is small. In general, the larger the load inertia, the speed proportional gain should be greater.
(3) Speed integral time coefficient (parameter PN-42), according to the given conditions, should be relatively large as possible. When velocity integral time coefficient is larger, the response rate will increase, and can eliminate steady state error, but is prone to oscillation. Therefore, under the conditions of oscillation does not occur, setting should be a bit larger. When velocity integral time coefficient is too small and there is large disturbance in the load, speed has big changes. In general the larger the load inertia, speed integral time coefficient should be smaller.
(4) Set the S word time constant (parameter PN-43) to allow the servo motor accelerate/decelerate in S-shaped curve, the greater the set value, the smoother the motor accelerates and decelerates, but when the set is too large, the motor acceleration and deceleration will be slower.

● Position control mode

(1) position control mode works in three closed-loop system,Inner loop for the current , middle loop for the velocity and outer loopfor the position. Speed loop uses PI control and position loop uses P control.

(2)First according to the above method, set the appropriate speed proportional gain and speed of integration time factor.

(3) position feedforward gain (parameter PN-44) is set to 0.00

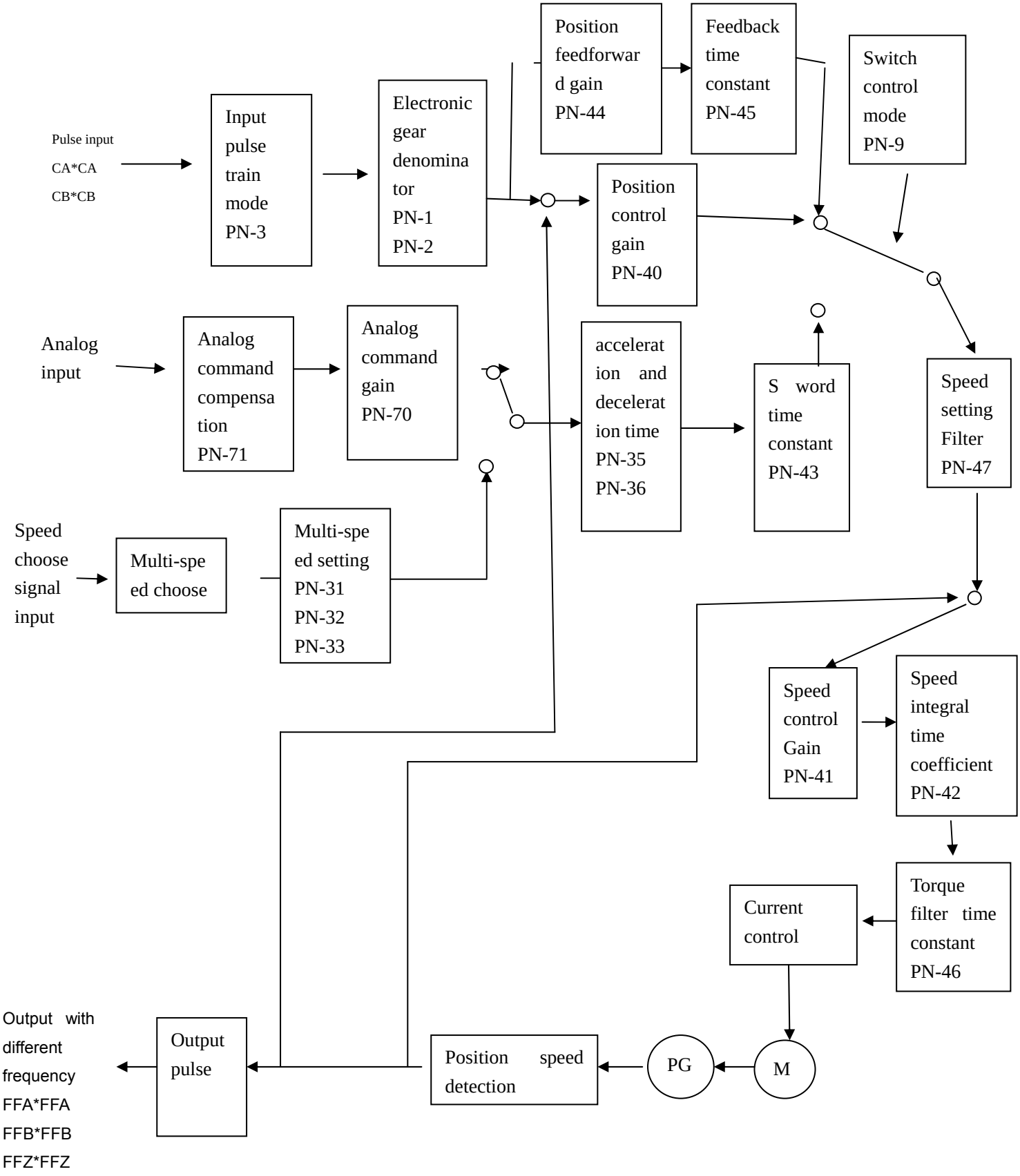
(4) Position proportional gain (parameter PN-40), in a stable range,shoulde be as large as possible.When the position proportional gain is large, the location tracking feature is good,and the hysteresis error is small, but it is prone to occur oscillation in stop position . To ensure that the middle ring adjusts faster than the outer loop,position proportional gain should be smaller than the speed proportional gain.

(5) For the mechines whose stiffness is small and load inertia gain is large, improving the position feed-forward gain (parameter PN-44), can reduce the amount of position deviation and improve response. However, if it is too large, may cause overshoot.

Position proportional gain setting can refer to the following table

Mechanical stiffness	Position PN - 40 percentage gain setting
Low stiffness	10[rad/sec]～30[rad/sec]
in Stiffness	40[rad/sec]～70[rad/sec]
High stiffness	70[rad/sec]～110[rad/sec]

2）Basic parameters adjustment


Pulse input
CA*CA
CB*CB
Input pulse train mode PN-3
Electronic gear denomina tor PN-1 PN-2
Position feedforwar d gain PN-44
Feedback time constant PN-45
Switch control mode PN-9
Position control gain PN-40
Analog input
Analog command compensa tion PN-71
Analog command gain PN-70
accelerat ion and decelerat ion time PN-35 PN-36
S word time constant PN-43
Speed setting Filter PN-47
Speed choose signal input
Multi-spe ed choose
Multi-spe ed setting PN-31 PN-32 PN-33
Speed control Gain PN-41
Speed integral time coefficient PN-42
Torque filter time constant PN-46
Current control
M
PG
Position speed detection
Output pulse
Output with different frequency
FFA*FFA
FFB*FFB
FFZ*FFZ

3) The adjustment of start and stop feature

Start and stop characteristics of the servo system that the acceleration and deceleration time depends on the load inertia and the frequency of the decision, and the servo drive and servo motor itself can also impact on it. Too frequent start and stop, hard acceleration, rapid deceleration, large load inertia will cause the servo drive and servo motor overheating and reduce the life of the servo drive.

In general motor load inertia should be smaller than 5 times of the rotor inertia. In the use of large load, hard acceleration and rapid deceleration may drive abnormal over-voltage alarm or abnormal brake or brake damage. To avoid this, do the following adjustments

(1) Increasing the acceleration and deceleration time (parameters of PN-35, parameters of PN-36), set the value appropriately.

(2) Rduce the drive current limit (parameter PN-25)

(3) Rduce the maximum speed of the motor (parameter PN-34)

(4) Istallation of the external braking device

(5) To use a motor whose inertia and power is a little larger.

CHAPTER 6: SERVO ALARM

6.1 Alarm Content

The contents of the alarm detection

After detection of alarm, the servo amplifier alarm codes flash automatically on the touch panel,.

If there are detections of multiple alarms, the touch panel displays the alarms in the following order of priority.

7 flashing interval on the touch panel is 0.5 seconds.

Priority order	Display	Name
1	OC1	Overcurrent 1
2	OC2	Overcurrent 2
3	OS	Overspeed
4	HU	Overvoltage
5	EH	Current sampling loop damage.
6	DE	Storage error

7	EC	Encoder communication abnormalities
8	RH1	Regeneration resistance overheating
9	OL	Overload
10	OF	Exceed permissible deviation
12	AH	Amplifier overheating

Actions when the alarm be detected
When the alarms are detected, although the servo motor slowing down, different test content should have different actions.
<Alarm occurs when the detection>

• Rear idler detection

Display	Name
OC1	Overcurrent 1
OC2	Overcurrent
OS	Overspeed
HU	Overvoltage
EH	Current sampling loop damage.
DE	Storage error
EC	Encoder communication abnormalities
RH1	Regeneration resistance overheating

The idling after the deceleration cessation with the maximum torque

Display	Name
OL	Overload
LU	undervoltage
OF	Exceed permissible deviation
AH	Amplifier overheating

Be displayed automatically after the alarm detection.

6.2 Alarm Explained

1. Overcurrent

【Display】 【Content detected】

OC1、OC2 Main circuit transistor's output current exceeds the specified value.

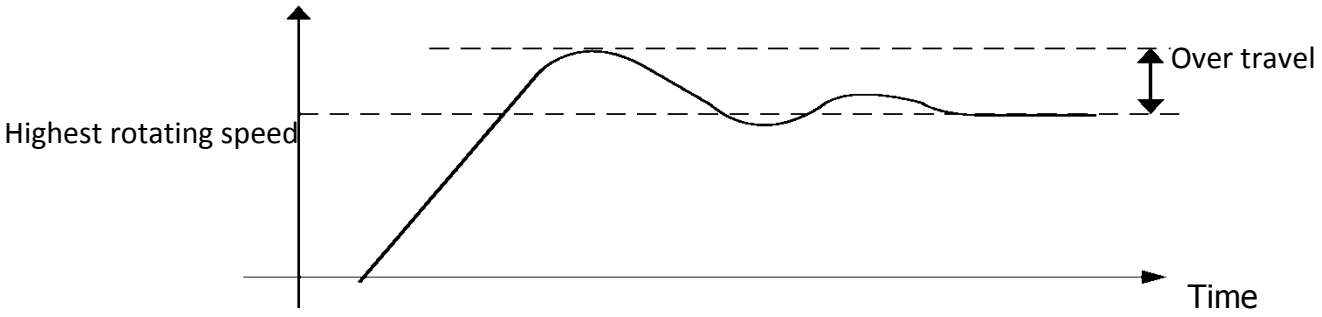
Received power wiring on the servo motor may be grounded or there is a short circuit.
In the ordinary course of events, resistor between the above and the ground should be MΩs, the resistance between the coil should maintain balance.

2. Over speed

【Display】 【Content detected】

OS Servo motor rotation speed exceeds 1.1 of the maximum speed

Motor rotation speed may over travel.



3. Overvoltage

【Display】 【Content detected】

HU Servo amplifier internal DC voltage greater than the upper limit.

4. Current sampling loop damage.

【Display】 【Content detected】

EH Current sampling circuit at the servo motor may be damaged.

5. Storage error

【Display】 【Content detected】

DE Parameters which stored in the internal EEPROM at the servo amplifier contents damage

Please initializing setting the parameters when storage error happened.
If after the implementing of the initialization, there is still detected memory failure, you need to replace the servo amplifier.

6.Abnormal encoder

【Display】	【Content detected】
EC	Assembly in the servo motor encoder and servo amplifier is not normal

Servo motor encoder wiring may be torn off or broken.
Therefore, the encoder cable should use the optional cable or a designated wire.
Encoder wiring for the voltage amplitude of about +5 V, so when laying, please avoid strong magnetic fields or strong electric field.
When encoder wiring laying, you should stay away from the main body of servo amplifier, inverter, and electromagnetic contactor and so on. (100mm or more)

8. Overload

【Display】	【Content detected】
OL	Servo amplifier output torque (command value) practical value is beyond the allowable value of the servo motor .

If detected when constant speed or stop, it would take the correction about the motor capacity.
High frequency operating, lower operating frequency. If didn't detect in this state, the higher the frequency of addition and subtraction may be the reason.
Whatever the case, be sure to do the confirmating the heat value of OL in the servo amplifier touching panel monitor mode.

9. Undervoltage

【Display】	【Content detected】
LU	Power supply voltage provided to the servo amplifier falls below the minimum voltage specification range.

The alarm only when the parameter 26 is set to 1 can be detected.
For the reason caused by Instant power failure, supply voltage may drop. And, there may be not enough power capacity.
The case of a bad power supply environment, the parameter setting of 26 may not be detected undervoltage. At this point if the setting parameter 27 to select idle, then, in an instant power failure, you can continue to run.
Undervoltag can be confirmed by the display on the touch pane.
It can also confirme the DC intermediate voltage in the monitor mode of the touch panel.
Undervoltage detection, the DC intermediate voltage is about 210V.

10. Exceed permissible deviation

【Display】	【Content detected】
OF	Deviation (the difference between the current location of the command and feedback current position) over the deviation beyond the range value of the of parameter 22th settings.

The initial value of standard parameter 22th is 2000 (× 100) pulse.
If deviation is over 2 million pulses, that is, giving the detection alarm of beyond deviation.
The general usage of the servo amplifier,the relation between the deviation with the

rotational speed is proportional, be more.
There are 10,000 pulses when the motor shaft turn a circle.When generated approximately equivalent to the motor shaft at 20 rpm deviation, it could be detected deviation exceeded. When swith on the command [RUN] and detect beyond deviations, the reason may be the change of the servo motor power wiring.

11. Amplifier overheating

【Display】	【Content detected】
AH	The cooling sink of the servo amplifier temperature exceeds 80 ℃.

Please use the servo amplifier when the enviroment temperature is under +55℃. The lifetime of the large-capacity capacitor within servo amplifier is greatly influenced by environmental temperature.

6.3 Alarm Handling

Alarm Code	Alarm name	Running statue	Probable cause	Handling
		When the drive is on power	Drive circuit fault	Replace the driver
			Encoder fault	Replace the servo motor
		When the motor first starts	Excessive load inertia	1. Reduce the load inertia 2. Replace more powerful driver and servo motor
			Encoder zero error	1. Replace servo motor 2.Send back to the manufacturers to re-adjust back to the encoder zero
			Motor U, V, W phase sequence error	Check the wiring and connect the wiring correctly
			Encoder lead error	
		during motor operating	The entered command pulse frequency is too high	Upper computer sets inputted command pulse frequency correctly
			Electronic gear ratio is too large	Set the appropriate electronic gear ratio correctly
			Acceleration and	1. Increase the acceleration and

OS	Over Speed		deceleration time constant is too small, so that exceed constant speed is overshoot (speed controlling)	deceleration time constant (parameter PN-35, PN-36) 2. S word time constant (parameter PN-43) set larger 3. Speed of answer (parameter PN-41) set a little higher
			Encoder fault	Replace servo motor
			Servo system parameters are not adjusted well, causing overshoot	1. Reset the gain related to the regulator 2. If gain is difficult to set a suitable value, replace the suitable motor
HU	Main circuit overvoltage	When only connecte the control power (S1, S2), not connected the main power (L1, L2, L3)	Driver internal circuit board fault	Replace servo amplifer
		When both connected to control power (S1, S2) and the main power (L1, L2, L3)	Driver internal circuit board fault	Replace servo amplifer
			Power supply voltage is too high	View the driver value of ON-07 is greater than the 400Vor not, check the power supply is too large or not.
		during motor operating	Disconnect the brake resistor wiring	Connection again
			Damage to the brake resistor	Under the condition of power off,checking the measurement of the brake resistor is consistent with the label, if judged it's damaged, replace the brake resistor
			Damage to the brake transistor	Replace servo amplifer

			within the driver	
			Damage to the brake circuit within the driver	
			Braking resistor doesn't have enough capacity.	1. Reduce the frequency of start and stop 2. Increase the acceleration / deceleration time constant 3. Reduce the current limit amplitude 4. Reduce the load inertia 5. Reduce speed 6. External braking resistor capacity sufficient
			Servo motor inertia is not enough	Replace servo motor with greater inertia
LU	Main circuit undervoltage	When power is conected	The main power wire contact badly	Terminal driver power between the main power lights is bright, if not bright, check whether connection is right or not
			Unstable power supply, power supply voltage is low	View the driver ON-07 value is less than 150V or not,determine whether the stability of power supply or not
			20ms or more power outages	Check the power supply
			Components within the drive fault	Replace servo amplifer
		during motor operating	Power capacity not enough	Check the power supply
			Power break down instantaneously	
		When connected to control power	Driver circuit board fault	Replace servo amplifer

OF	Position deviation exceeds	When the motor starts	Motor U, V, W down-lead error	Correct wiring
			Encoder Lead error	
			Position percentage gain is too small	Increase the position percentage gain
			Less output torque	1. Check the torque limit value 2. Reduce the load capacity 3. Replace high-power servo amplifer and servo motors
			Pulse command frequency is too high	View ON-15 is less than 500 or not, if not, reduce the pulse frequency
		during motor operating	Driver power circuitry failure	Replace servo amplifer
			Driver parameters are not adjusted well	Increase the position gain
			Pulse command frequency is too high	View ON-15 is less than 500 or not, if not, reduce the pulse frequency
			Input supply voltage is lower	Load voltage drops to below the operating voltage, select the correct transformers and install voltage regulators
AH	Amplifier overheat	Power-on, and the servo drive stopped working 1 hour or more, the ambient temperature is normal	Circuit within the driver fault	Replace servo amplifer
		Motor run-time process	Cooling fan does not work	View ON-09 show temperature, over 50 ° C confirms the coiling fan does not switch on. replace the servo amplifer

			Environment temperature high, heat dissipation can not work well.	To maximize the ventilated effect in the environment
			Renewable electricity can not be consumed.	Extend the deceleration time
EC	Encoder communication error	When turn on the power. During motor operating	Encoder cables error	Check the encoder cable wiring is correct or not, and whether there is broken
			Encoder cable bad contact	Check the encoder cable is good contact
			Encoder damaged	Replace servo motor
			Detection circuit within driver fault	Replace servo amplifer
EH	Current sampling loop damage.	When turn on the power	The current sampling circuit within driver damaged	Replace servo amplifer
DE	Storage error	When turn on the power	Storage devices damaged	Replace servo amplifer
			Communication between storage with the main chip memory abnormal	
OL	Overload	When turn on the power	Circuit board within driver fault	Replace servo amplifer
		During motor operating	Exceed the rated torque operation	1. Check the load 2. Reduce the start-stop frequency 3. Replaced by more powerful drivers and servo motors

			Drive to power lines U, V, W connect wrong	Check the wiring and confirm U, V, W correct wiring
			The motor operates with oscillation and unstable	1. Increase the gain 2. Increase the acceleration and deceleration time 3. Reduce the load inertia
			Servo motor abnormalities	Replace servo motor
OC1	Over-current 1	When turn on the power	Driver internal circuit damage	Replace servo amplifer
		During motor operating	Drive power lines U, V, W It short-circuit	Check power line
			Acceleration and deceleration time is too small	Increase the acceleration and deceleration time （PN-35，PN-36）
			Excessive rigidity of the control loop parameters	Reduce the rigidity, which reduces the position gain (PN-40), speed gain (PN-41)
			Output current is too large	Reduce the maximum current limit parameter PN-25
			Poorly grounded, external interference	Properly grounded
			Driver internal circuit damage, lack of phase,and so on.	Replace driver.
OC2	Over-current 2	During motor operating	Drive fault	Replace drive

6.4 Troubleshooting Non-alarm

Fault phenomenon	Failure reason	Fault treatment
No display or unreadable code after LED powered on	Control power lines S1, S2 bad contact	Using multimeter measure S1, S2 voltage is ends about 220V voltage or not, if not, then make sure the power cord is connected
	Control power supply voltage is too low	Using multimeter measure S1, S2 voltage is lower thanthe 100V or not, and if so, determine the input power voltage is too low
	Driver internal circuit board damaged	Replace servo amplifer
Power-on initial show value is not required one	Initial display parameter have not set	Change the number value parameter PN-30 0 display order mode 1 shows the current alarm 2 shows the alarm history 3 shows the station number 4 shows the motor speed 5 shows the speed command 6 shows the average torque 7 shows the current location of the feedback 8 shows the current location of the command 9 shows the position deviation 10 shows the WB voltage 11 shows the electrical angle 12 shows the heat sink temperature 13 shows the analog voltage value 14 shows the input signal 15 shows the output signal 16 shows the cumulative command pulses 17 shows the peak torque 18 shows the output pulse frequency
The motor does not rotate when give it the instruction	Mechanical reasons, the motor is mechanically stuck (motor stall)	Check the mechanic
	If the motor is brake motor, it may be in lock state	To unlock the brake by powering on the brake motor
	Driver is in fault	View the LED display of the driver show the alarm

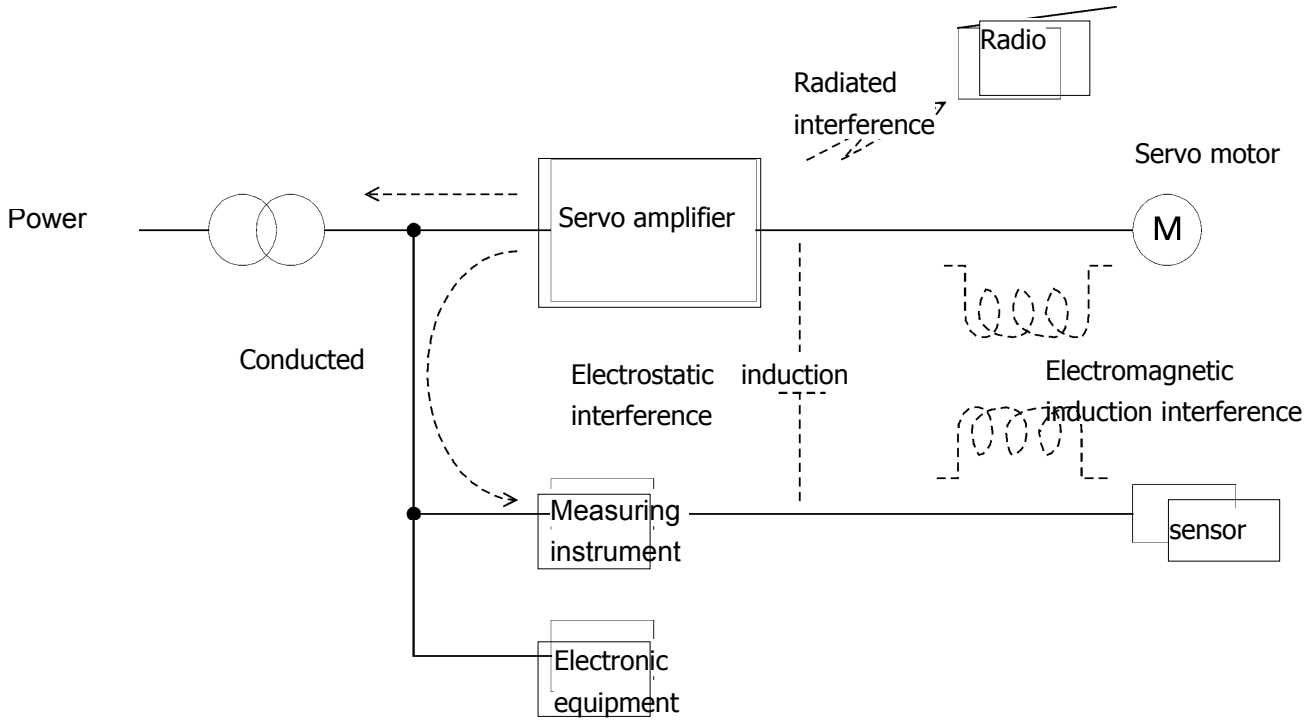
	alarm status	code or not, power reset to clear the alarm, part of the alarm can use FN-04 operation to clear it without power off.
	Control signal cable is correct or bad contacts	Check the ligature and cofirm whether the servo can receive the enable signal and the position of command or speed command Servo enable signal can view the status of the input signal ON-11 Position command pulse can view input pulse frequency can be viewed ON-15 The speed command signal can view input analog voltage signal ON-10
	Servo motor damaged	Replace servo motor
	Driver fault	Replace drivers
Abnormal sound or vibration in motor	Poor installation	Check it suitable with the mechanical drive transmission
	Servo motor damaged	Replace servo motor
	Gain is too high, the speed loop gain PN-41 cause too large oscillations	Reduce the gain, and reduce the value of PN-41parameters
Only rotating in one direction when be given F/R command	Control cable error	Check the control cable is connected wrong
	Parameter is not set well	Pulse mode(PN-03) is select correctly or not. Set it correctly and view whether the input pulse frequency ON-15 have positive and negative changes
	Driver fault	View the input pulse frequency is unsigned changes in ON-15, PC oscilloscope output pulse waveform is normal, replace the driver
	Upper computer fault	View the input pulse frequency is unsigned changes in ON-15, PC oscilloscope output pulse waveform is not normal, consulting the provider of PC
Motor rotation	Zero off-set of the analog voltage	In the absence of instructions given but the motor rotates view the value of ON-10, is more deviated from zero. If so, do the zero setting FN-07 operation, Note: only for the driver running in speed mode

without instruction		
	Servo rigidity is too weak, the rotates motor a little bit	Increase rigidity, and increase position gain PN – 40, speed gain PN - 41
	Although PC to stop action, continues to send pulses	In the absence of instructions, but the motor has rotated, view the input pulse frequency ON-15 is zero or not, if using an oscilloscope found the PC with the output pulse, consulting the host computer provider
	External interference	Properly connected to the shielding line on control line or add magnetic shield
Given instructions to stop the motor does not stop when operating	Servo rigidity is too weak, the rotates motor a little bit	Increase rigidity, and increase position gain PN – 40, speed gain PN - 41.
	Although PC to stop action, continues to send pulses	In the absence of instructions, but the motor has rotated, view the input pulse frequency ON-15 is zero or not, if using an oscilloscope found the PC with the output pulse, consulting the host computer provider

CHAPTER 7: PERIPHERALS

7.1 Power Filter

Servo amplifier is the same as general inverter, process switching action in the high-frequency PWM control circuit; Therefore, radiation and conduction disturbances often impact on the external machine of peripheral devices . As a countermeasure, the following method is very effective.



①servo amplifier is placed in a metal container (control panel) which is grounded,and it can't be close to the computer or instrumentation settings.

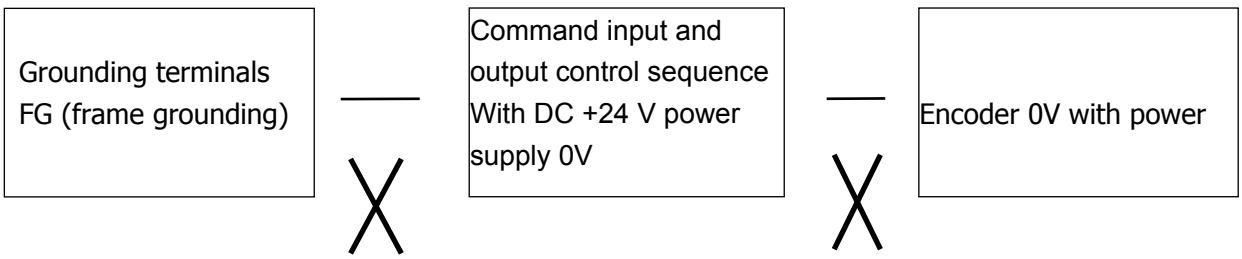
② If servo amplifier impacts on machines of the same power, then set filter(power filter) to the primary side of the servo amplifier.

If servo amplifier impacts on machines of the different power, then use the anti-interference transformer (TRAFY).

③ The wire which connects servo amplifier to a servo motor should be installed into the metal pipe,and the metal pipe is grounded (multipoint earthing is OK).

④ It is best to use stubby ground line; ground wire from each machine is directly to the copper (article) . (The grounding line can't be across the machines)

⑤ The following signals must not be connected to each other.



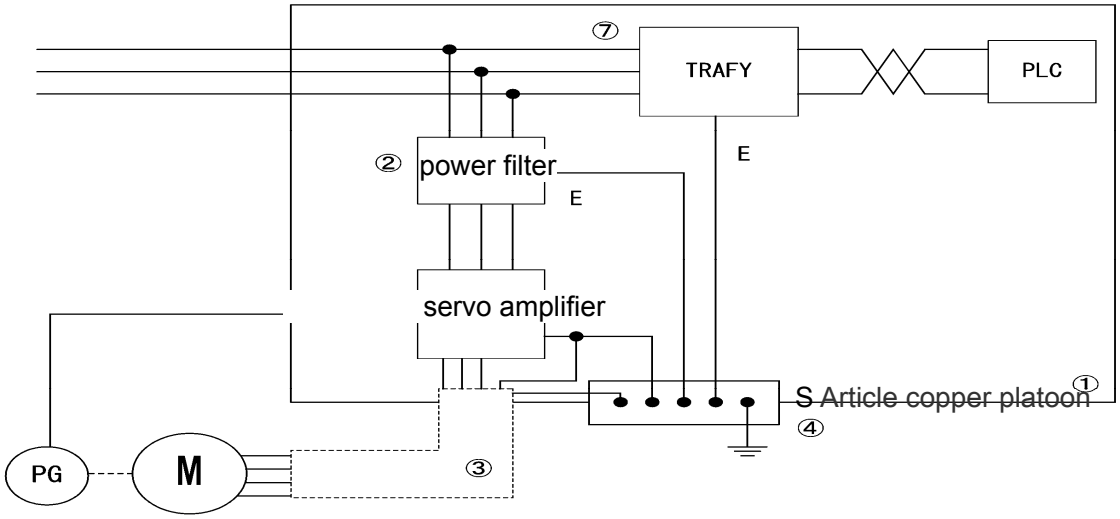
⑥ main circuit and control circuit wiring must not bundle together, nor parallel wiring.

Main circuit: Commercial power supply, servo amplifier and servo motor power wiring

Control circuit: DC +24 V, DC +15 V level signal lines

Servo motor encoder wiring

⑦ PC equipment (programmable controllers, general-purpose computers, etc.) and 220V power supply, should use the anti-jamming transformer (TRAFY).



7.2 AC Reactor

AC reactor must be connected to the primary side of the servo amplifier in following situations.

(1) a larger power capacity

If the power capacity is more than 500kVA, when connect to the power the servo amplifier input current will be high, often damage the internal rectifier diode. (Power capacity meet prescribed specifications for the wires whose length is 20m as standard)

(2) The power voltage imbalance

If power voltage is imbalance, the current focus on the high-voltage phase.

When the voltage imbalance rate is more than 3% AC reactor should be connected.

$$\text{Power imbalances rate} = \frac{\text{（Maximum voltage[V]）- (Minimum voltage[V])}}{\text{(Three-phase average voltage[V])}} \times 100$$

To balance the input current can insert in the reactor. Reactors can also prevent the power voltage drop.

(3) suppression of high harmonic

Since the servo amplifier's capacitance is uesd for input, then generate high harmonic, AC reactor can inhibit the current power system disorders, to prevent machines which connecting to the same system generate interference.

If the power voltage is imbalanced, then the high harmonics increases.

AC reactor should be inserted into the primary side of the servo amplifier. Rated current emits heat if use small size,when use of large, the inhibitory effect decreases.

Connected to AC reactor can meet the high harmonic suppression countermeasure guidelines limit requirements.