JSDE2

User Manual

TECO

Driving & Connecting Globally

First of all, thank you for your selection of TECO Motor Servo Drive JSDE2 Series (hereinafter referred to as JSDE2) and Servo Motor.

The JSDE2 can be operated by the digital panel manipulator or through the PC man-machine program, to provide diversified functions and to enable the product to better meet the different application requirements of customers.

Before using JSDE2, please read this Technical Manual, the main contents of this Manual include:

- Inspection, installation and wiring procedures of the Servo System.
- The operating procedures, state display, error alarms and handling counter-measures description of the digital panel manipulator.
- Servo System control function, trial run and adjustment steps.
- Description of all Servo Driver parameters.
- The rated specifications of the standard model.

In order to facilitate routine inspections and maintenance and to understand the cause of the error and the counter-measures, please keep this Manual in a safe place for access at any time.

Note: Please deliver this Manual to the end user for the maximum effectiveness of the Servo Driver.

■ Warnings and Pre-cautions:

Warnings

- **Do not conduct wiring work when power is turned ON.**
- **Do not touch the circuit or replace parts after the input power is turned OFF but before the state of the Servo Driver displays the CHARGE LED light is OFF.**
- **The output terminals U, V, W of the Servo Driver must not be connected to the AC power.**
- **Motor overheat protection is not provided.**

Attention

- **When the servo driver is installed in the control panel, if the ambient temperature is too high, please install a cooling fan.**
- **Do not conduct pressure resistance test on the Servo Driver.**
- **Before the machine starts to operate, confirm whether or not the emergency stop switch can be started at any time to stop the machine.**
- **Before the machine starts to operate, the user parameter setting value must be coordinated with the machine. Failure to adjust to the matched correct setting values may result in a loss of control or failure of the machine.**
- **Before the machine starts to operate, make sure to confirm the parameter Cn030: serial model settings, and select the correct Driver and Motor matching combination! Confirm the parameter Cn001 control mode selection.**

■ **Safety Pre-cautions:**

Please read this Manual thoroughly before installing, operating, maintaining, and checking. Only a professional qualified personnel can perform assembly line work.

The safety pre-cautions in the Manual are divided into two items: "Warnings" and "Pre-cautions".

Warnings : Indicating a dangerous situation that may result in death or serious injury of personnel if ignored.

Pre-cautions : Indicating a possible hazardous situation that may result in a lesser or minor injury of personnel and damage of machinery equipment if not resolved.

Therefore, this Technical Manual shall be read in detail before using this Servo Driver.

Table of Contents

Chap 1 Product Inspection and Installation

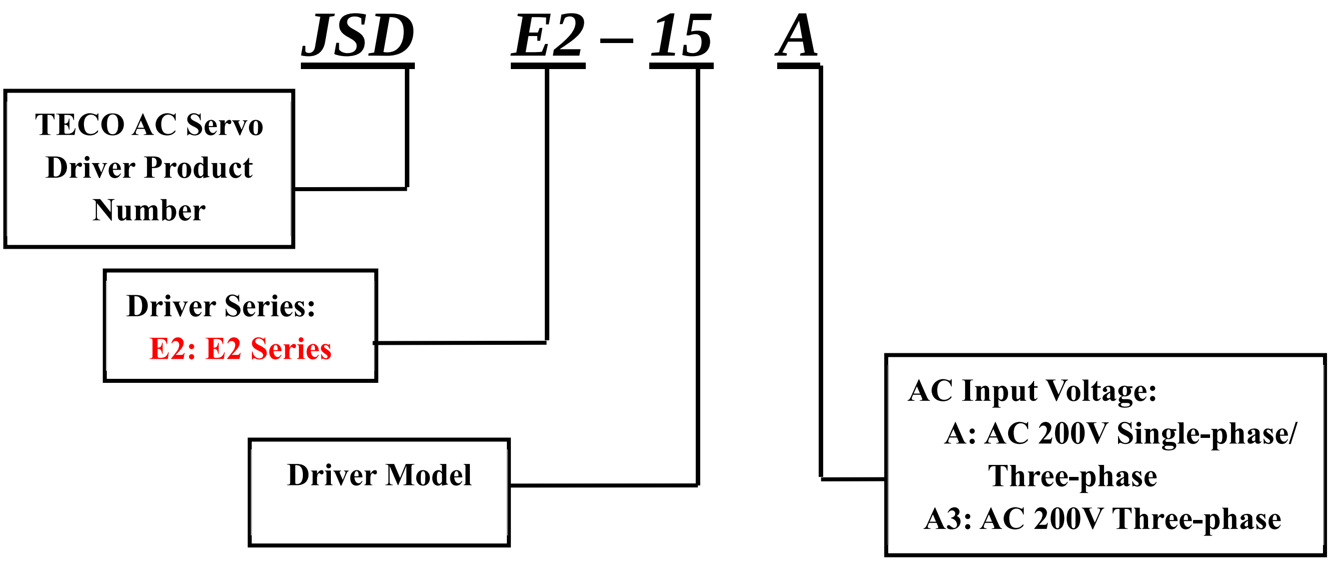
1-1 Product Inspection

This servo product has been completely functional tested before shipping off the factory, to prevent the product from non-conforming caused by negligence during delivery process, please check the following items in detail after unpacking:

- Check the model numbers of servo driver and servo motor are the same as the model ordered. (Please refer to the following chapters for model number description)
- Check whether or not the appearance of servo driver and servo motor are damaged or scratched. (Do not wire or connect to power when there is damage during shipping!)
- Check whether or not there is any poor assembly; loose parts and components in the servo driver and servo motor.
- Check with the hand whether or not the servo motor rotor shaft can rotate smoothly. (Servo motor attached with mechanical brake cannot be rotated directly!)

If there is any failure or abnormal indication mentioned above, please contact TECO Electric & Machinery sales representatives or local distributors immediately whom you have purchased this product.

1-1-1 Servo Driver Model Verification



Driver Model Maximum Output Power Table

200V Class	
10A: 100W	30A: 1KW
15A: 400W	50A3: 2.0KW
20A: 750W	75A3: 3.0KW

1-1-2 Servo Motor Model Verification

JSM A – P U C 04 A 3 K B

JSM – TECO AC Servo Motor Product Number

A – Motor Series
A Series

P – IP67 Rating (except Axis and Joints)

U – Motor Inertia:
- S/U: Ultra low inertia
- L: Low Inertia
- M: Medium Inertia
- H: Medium Inertia
- I: Medium Inertia
- B: High Inertia

C – Motor Rated Speed:
- A：1000 rpm
- B：2000 rpm
- C：3000 rpm
- H：1500 rpm

04 – Motor Rated Power:

P5：50 W	18：1.8 kW
01：100 W	20：2.0 kW
03：300 W	29：2.9 kW
04：400 W	30：3.0 kW
05：550 W	44：4.4 kW
08：750 W	55：5.5 kW
09：850 W	75：7.5 kW
10：1.0 kW	110：11.0 kW
13：1.3 kW	150：15.0 kW
15：1.5 kW	

A – AC Input Voltage:
A：AC 200V

3 – Encoder Specifications:
- 7: 17 bit (incremental)
- 3: 23 bit (incremental)
- 5: 15 bit (absolute type)
- A: 17 bit (absolute type)
- W: 23 bit (absolute type)

K –

Coding	Key slot	Oil seal
□	No	No
K	Yes	No
O	No	Yes
A	Yes	Yes

B – Mechanical Brake:
- □: No Brake
- B: With Mechanical Brake

1-1-3 Servo Driver and Servo Motor Matching Comparison Table

△Attention

- **Before the machine starts to operate, make sure to confirm the parameter Cn030: serial model settings, and select the correct Driver and Motor matching combination! Confirm the parameter Cn001 control mode selection.**

Users can use **dn-08** to examine the driver and motor combination set in the current driver, if the displayed matching combination is different from the actual combination; please re-set the parameter **Cn030** as shown in the following table or contact the local dealer.

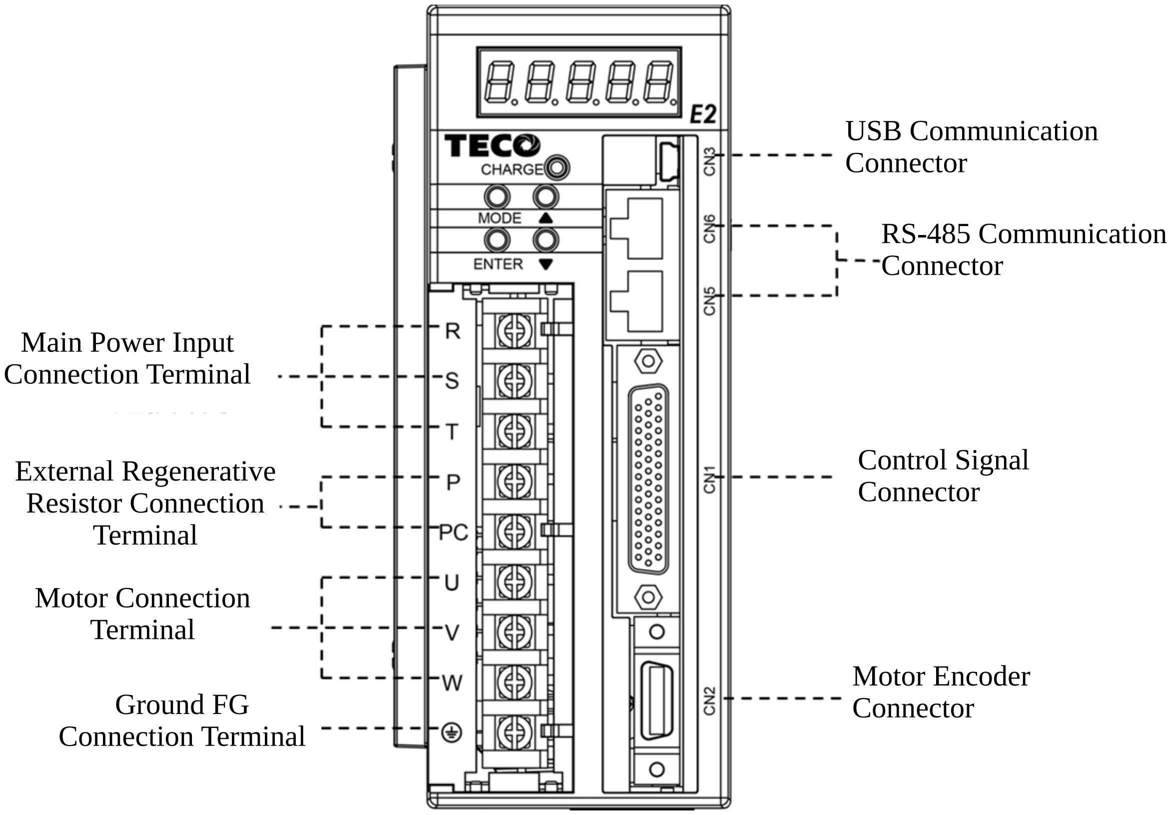
200V Class

JSDE2 Matching Motor		Motor Specifications		dn-08 Displayed Value / Cn030 Set Value
Matching Capacity	**Motor Model** **(The last code represents the difference of encoder specifications)** Incremental: B(2500ppr)/7(17bit) / 3 (23bit) Absolute type: A (17bit)/ W(23bit)	**Power (KW)**	**Speed (rpm)**	**Encoder Specifications** **(The last code represents the difference of encoder specifications)** Incremental: 1(2500ppr)/7(17bit) / C (23bit) Absolute type: A (17bit)/ D(23bit)
10A	JSMA-PSCP5A□	0.05	3000	H101□
	JSMA-PUCP5A□	0.05	3000	H105□
	JSMA-PSC01A□	0.1	3000	H102□
	JSMA-PUC01A□	0.1	3000	H106□
	JSMA-PBC01A□	0.1	3000	H107□
	JSMA-PUC02A□	0.2	3000	H108□
	JSMA-PBC02A□	0.2	3000	H109□
15A	JSMA-PSC01A□	0.1	3000	H111□
	JSMA-PSC02A□	0.2	3000	H113□
	JSMA-PUC02A□	0.2	3000	H119□
	JSMA-PBC02A□	0.2	3000	H11A□
	JSMA-PLC03A□	0.3	3000	H112□
	JSMA-PSC04A□	0.4	3000	H115□
	JSMA-PUC04A□	0.4	3000	H11D□
	JSMA-PBC04A□	0.4	3000	H11E□
20A	JSMA-PSC04A□	0.4	3000	H126□
	JSMA-PBC08A□	0.4	3000	H12E□
	JSMA-PMA05A□	0.55	1000	H124□
	JSMA-PMH05A□	0.55	1500	H125□
	JSMA-PLC08A□	0.75	3000	H121□
	JSMA-PSC08A□	0.75	3000	H123□

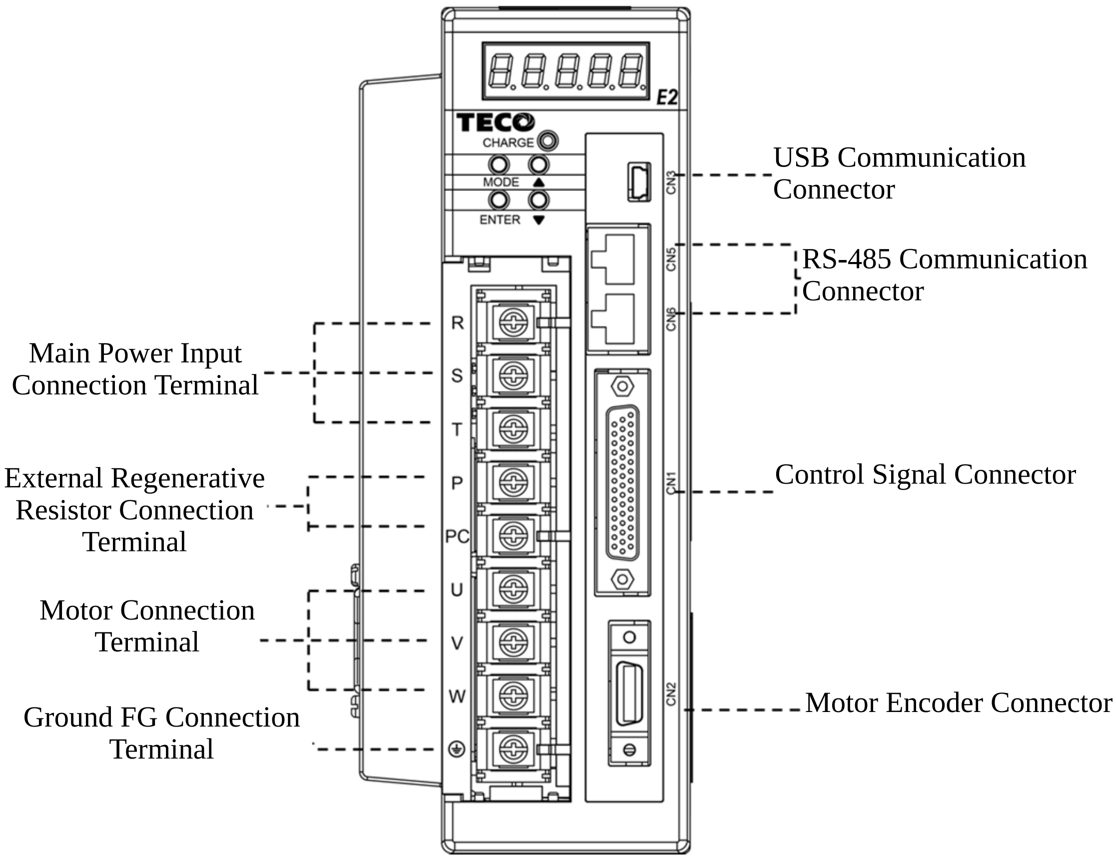
JSDE2 Matching Motor		Motor Specifications		dn-08 Displayed Value / Cn030 Set Value
Matching Capacity	**Motor Model** **(The last code represents the difference of encoder specifications)** Incremental: B(2500ppr)/7(17bit) / 3 (23bit) Absolute type: A (17bit)/ W(23bit)	**Power (KW)**	**Speed (rpm)**	**Encoder Specifications** **(The last code represents the difference of encoder specifications)** Incremental: 1(2500ppr)/7(17bit) / C (23bit) Absolute type: A (17bit)/ D(23bit)
	JSMA-PUC08A□	**0.75**	**3000**	**H12D□**
30A	**JSMA-PSC08A□**	**0.75**	**3000**	**H131□**
	JSMA-PUC08A□	**0.75**	**3000**	**H13B□**
	JSMA-PBC08A□	**0.75**	**3000**	**H13C□**
	JSMA-PBH09A□	**0.85**	**1500**	**H13E□**
	JSMA-PMA10A□	**1.0**	**1000**	**H132□**
	JSMA-PMB10A□	**1.0**	**2000**	**H133□**
	JSMA-PMH10A□	**1.0**	**1500**	**H134□**
	JSMA-PMC10A□	**1.0**	**3000**	**H135□**
50A3	**JSMA-PBH09A□**	**0.85**	**1500**	**H15B□**
	JSMA-PBH13A□	**1.3**	**1500**	**H15C□**
	JSMA-PMA15A□	**1.5**	**1000**	**H151□**
	JSMA-PMB15A□	**1.5**	**2000**	**H152□**
	JSMA-PMC15A□	**1.5**	**3000**	**H153□**
	JSMA-PMB20A□	**2.0**	**2000**	**H154□**
	JSMA-PMC20A□	**2.0**	**3000**	**H155□**
75A3	**JSMA-PBH13A□**	**1.3**	**1500**	**H174□**
	JSMA-PBH18A□	**1.8**	**1500**	**H175□**
	JSMA-PBH18-18A□	**1.8**	**1500**	**H176□**
	JSMA-PMB30A□	**3.0**	**2000**	**H171□**
	JSMA-PMC30A□	**3.0**	**3000**	**H172□**
	JSMA-PMH30A□	**3.0**	**1500**	**H173□**
	JSMA-PIH30A□	**3.0**	**1500**	**H177□**
	JSMA-PMB40A□	**4.0**	**2000**	**H178□**

1-2 Servo Driver Appearance and Panel Description

(1) **JSDE2-10A / 15A / 20A / 30A**



(2) **JSDE2-50A3/ 75A3**



1-3 Servo Driver Operation Mode Introduction

This Driver provides several operating modes that can be selected by the user, the detailed modes are as follows:

Mode Name		Mode Code	Description
Single Mode	Position Mode (External Pulse Command)	Pe	The driver is a position loop and performs positioning control, the external pulse command input mode is to receive the pulse command output by the Supervisory Controller to achieve the positioning function . The position command is input by the CN1 Terminal.
	Position Mode (Internal Position Command)	Pi	The driver is a position loop and performs positioning control, the internal position command mode is that the user sets the position command value in thirty-two sets of command temporary storage, and then plans the digital input contact to switch the relative position command.
	Speed Mode	S	Driver is a speed loop, provides two command input methods, using digital input contact to switch internal preset three-step speed commands and analog voltage (-10V ~ +10V) command signals , to perform speed control.
	Torque Mode	T	The driver is a torque loop, and the torque command performs torque control by external input analog voltage (-10V ~ +10V).
Mixed Mode		Pe-S	Pe and S can be switched via digital input pins.
		Pe-T	Pe and T can be switched via digital input pins.
		Pi-S	Pi and S can be switched via digital input pins.
		Pi-T	Pi and T can be switched via digital input pins.
		S-T	S and T can be switched via digital input pins.
		Pe-Pi	Pe and Pi can be switched via digital input pins.

1-4 Servo Driver Installation Environment Conditions and Methods

1-4-1 Installation Environment Conditions

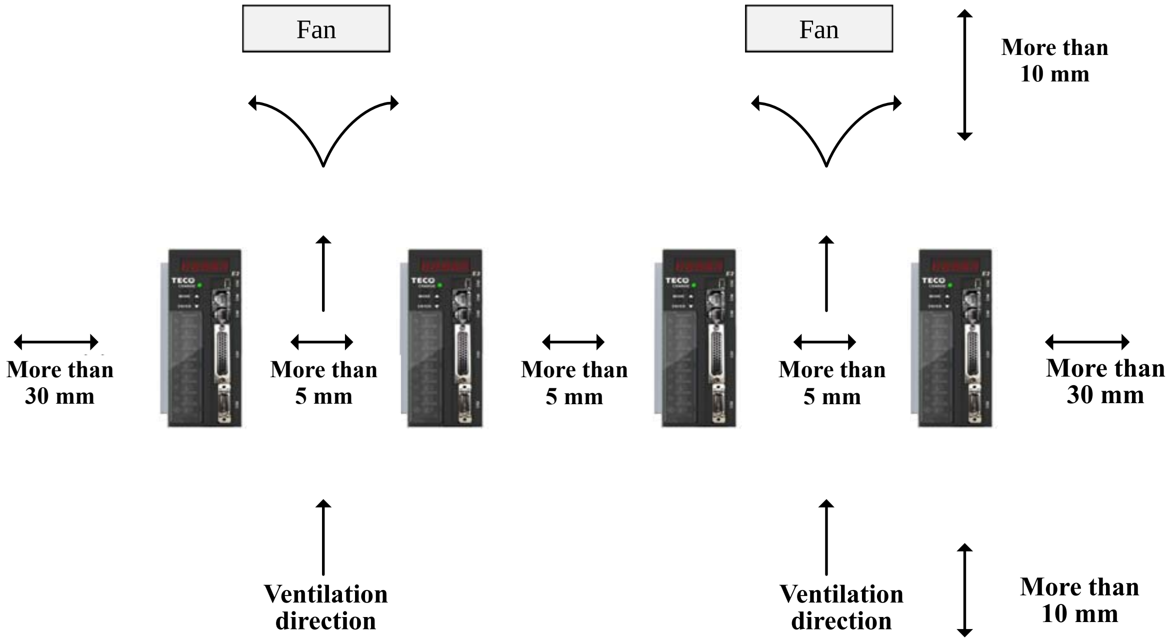
The environment where the servo driver is installed has a direct impact on the normal function of the driver and its service life, therefore, the installation environment of the driver must conform to the following conditions:

- Ambient Temperature: 0 ~ + 50 °C; Ambient Humidity: 90% RH or less (without condensation conditions).
- Storage Temperature: - 20 ~ + 65 °C; Storage Humidity: 90% RH or less (without condensation conditions).
- Vibration: 2G or less.
- Prevent rain dripping or humid environment.
- Avoid direct sunlight.
- Prevent oil mist and salt erosion.
- Prevent corrosive liquids, gas.
- Prevent the intrusion of powder dust, cotton wool or fine metal chips.
- Keep away from radioactive materials and combustibles.
- When several drivers are installed in the control panel, please be careful to keep enough space in the placement position, in order to have sufficient air to help dissipate heat; also, please configure with cooling fan so that the ambient temperature of the servo driver is lower than 50 °C in principle.
- When installing, please mount the driver in the way of vertically standing, with the front facing forward and the top facing up to facilitate cooling.
- When assembling, pay attention to avoid drilling debris and other foreign objects falling into the driver.

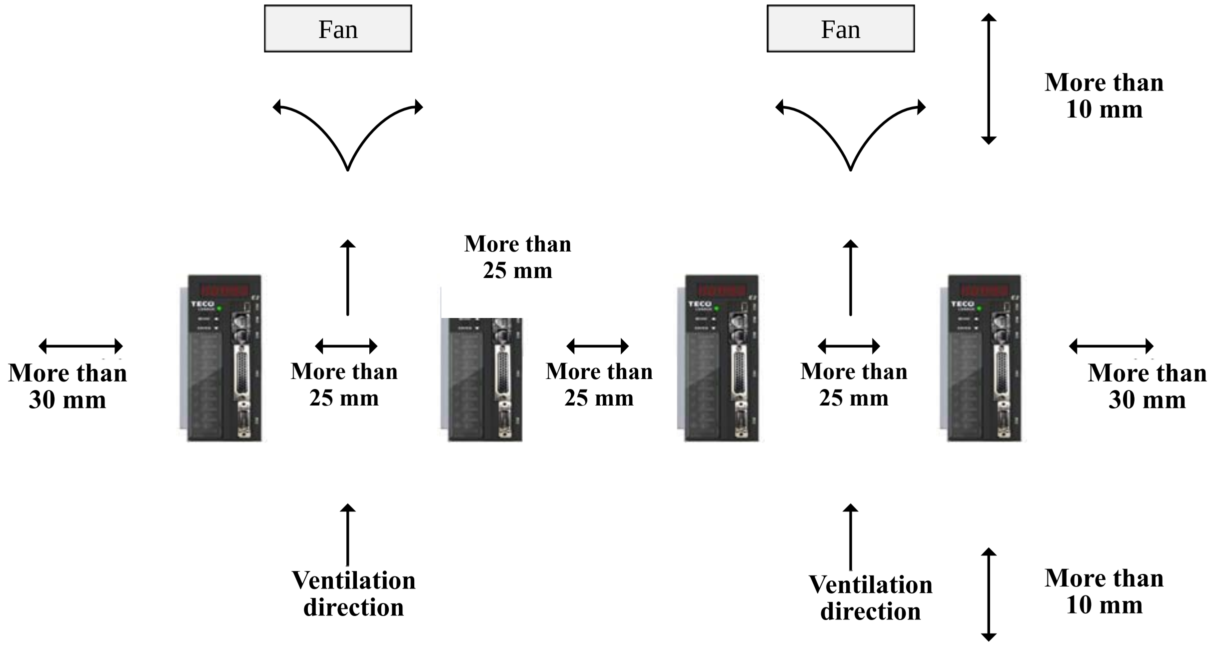
- When installing, make sure to fix with M5 screws.
- When there is a vibration source nearby (punching machine), please use a vibration absorber or install a vibration-proof rubber gasket if the vibration cannot be avoided.
- When there are large magnetic switch, fusion splicer and other noise interference sources near the driver that is easy to cause error operations for the driver due to external interference, at this time, a noise filter needs to be installed. However, the noise filter will increase the leakage of the current, therefore, it is necessary to install an insulation Transformer at the input end of the driver.

1-4-2 Installation Direction and Spacing

JSDE2-10A / 15A / 20A / 30A



JSDE2-50A3 / 75A3



1-5 Servo Motor Installation Environment Conditions and Methods

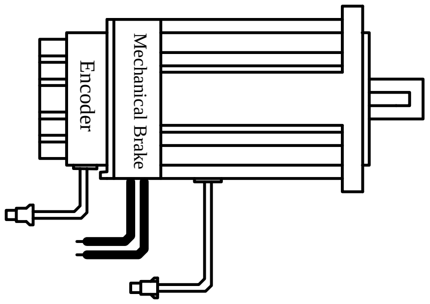
1-5-1 Installation Environment Conditions

- Ambient Temperature: 0 ~ + 40 °C; Ambient Humidity: 90% RH or less (without condensation conditions).
- Storage Temperature: - 20 ~ + 60 °C; Storage Humidity: 90% RH or less (without frosting conditions).
- Vibration: 2.5G or less.
- Places in the area of good ventilation, low moisture and dust.
- Environment without corrosive, pyrophoric gas, oil vapor, cutting fluid, cutting powder, iron powder, etc.
- Area without water vapor and direct sunlight.

1-5-2 Installation Methods

1. Horizontal installation: To prevent water, oil and other liquids from flowing into the motor from the motor outlet wire end; please place under the cable outlet.

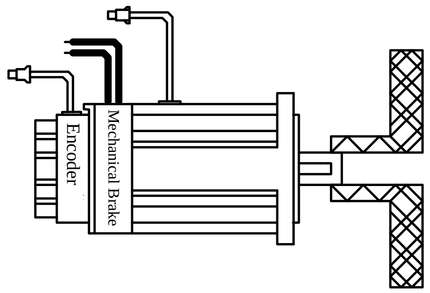
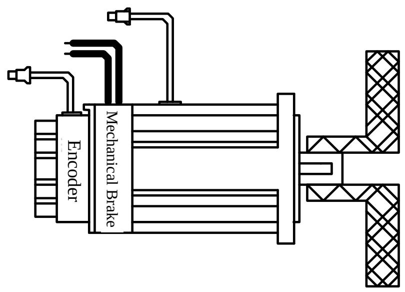
Pre-cautions



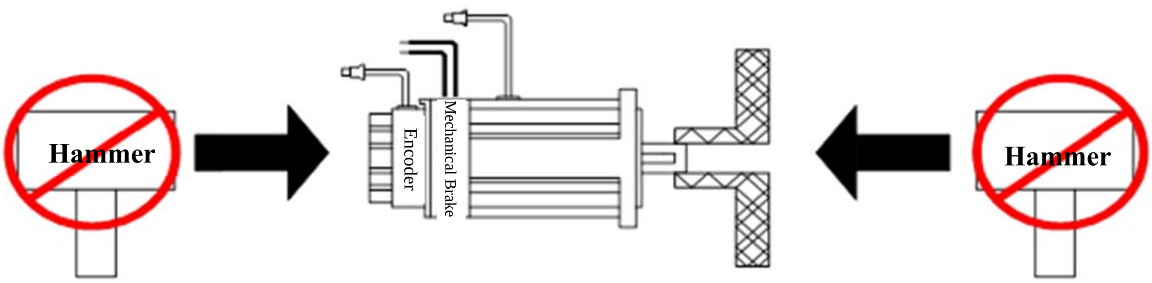
2. Vertical installation: If the motor shaft is installed upwards with the reducer attached, care must be taken to prevent the grease inside the reducer from passing through the motor shaft and into the inside of the motor.

1-5-3 Other Pre-cautions

1. In order to prevent the oil in the reducer from penetrating the inside of the motor through the motor shaft, please use a motor with an oil seal.
2. The connection cable needs to be kept dry.
3. In order to prevent the cable from falling off or breaking due to mechanical movement, the connection cable shall be securely fixed.
4. The shaft extension space must be sufficient, it is easy to cause vibration when the motor moves if the extension space is insufficient.

Wrong Example	Correct Example
	

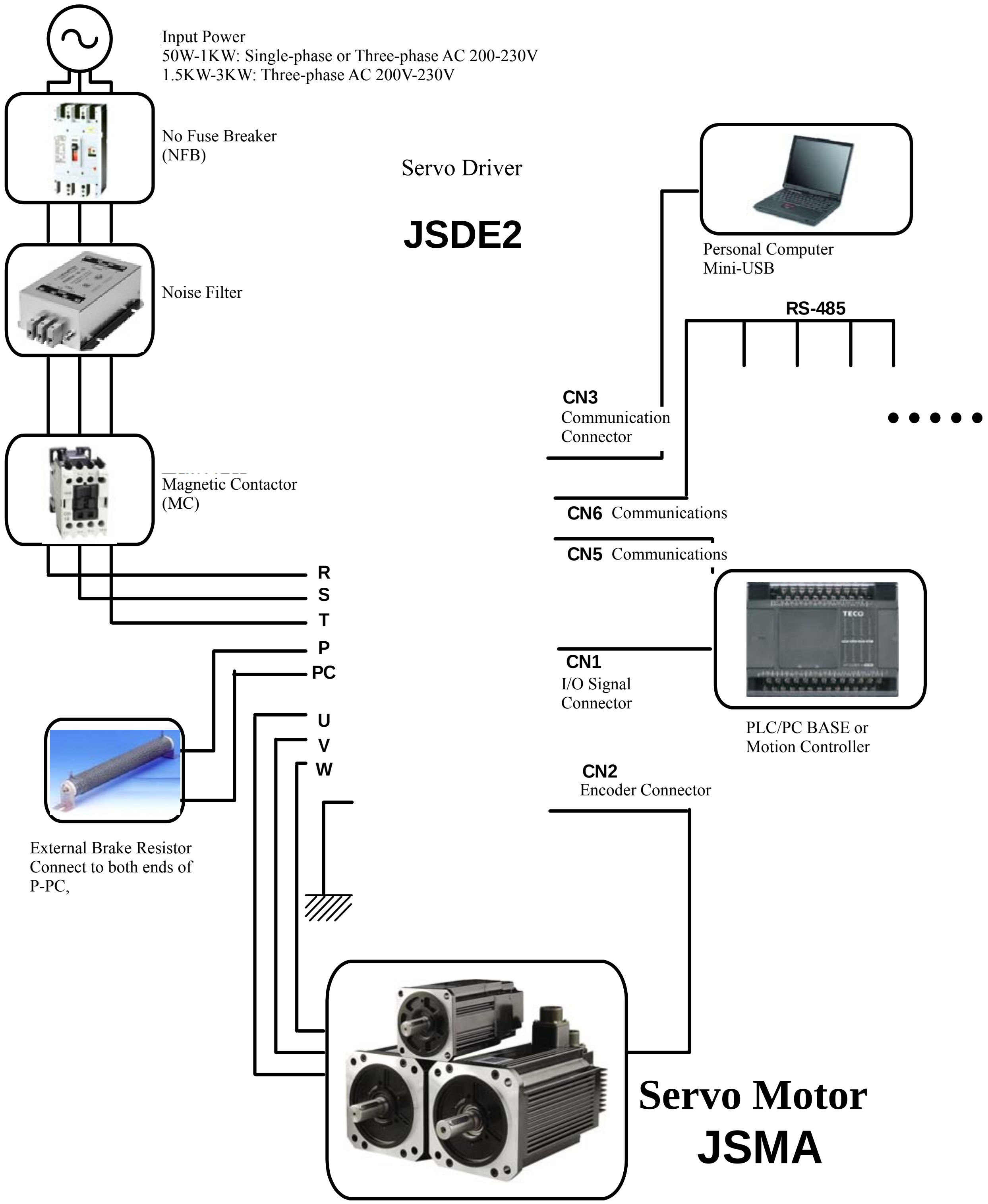
5. When installing and removing the motor, please do not hit the motor with a hammer, otherwise it may cause damage to the motor shaft and the rear encoder.

Pre-cautions


Chap 2 Wiring Preparation

2-1 System Assembly and Wiring

2-1-1 Wiring diagram of Servo Driver Power Supply and Peripheral Devices



2-1-2 Servo Driver Wiring Instructions

- The wiring materials shall be used in accordance with the "Wire Specifications."
- Wiring Length: Within 3 meters of the Command Input Wire.

  Within 20 meters of the Encoder Input Wire.

  Please connect with the shortest distance when wiring.
- Wiring in accordance with the Standard Wiring Diagram, do not connect to the unused signals.
- Please make sure to install IEC-standard or UL-certified circuit breakers and fuses between the input power supply end and the servo driver.
- The maximum short-circuit current capacity at the maximum input voltage must be 5000 Arms or less, if there is any doubt for the power short-circuit current exceeds the specifications, please install a current limiting device (circuit breaker, fuse, transformer) to limit the short-circuit current.
- The servo driver output end (U, V, W motor terminals) must be connected properly. Otherwise, the servo motor will not operate normally.
- The isolation wire must be connected to the FG terminal.
- Please use the third type of grounding (grounding resistance of 100Ω or less) for grounding and must be **single point grounding**. Please ground the motor if between the motor and the machine is to be in insulated state.
- Do not install capacitors or overvoltage (surge) absorbers and noise filters at the servo driver output end.
- For the relay installed in the control output signal, the direction of the diode used for its overvoltage (surge) absorption must be correctly connected; otherwise, it will cause a failure to output the signal and may also affect the protection circuit of emergency stop.
- In order to prevent erroneous operation due to noise, please use the following measures:

  Please add an insulation transformer and noise filter devices on the power supply.

  Please wire the power lines (strong electric circuit such as power cables, motor wire, etc.,) more than 30 cm away from the signal wires and do not place them in the same wiring conduit.

- In order to prevent incorrect operations, an "Emergency Stop Switch" shall be installed to ensure safety.
- After completing the wiring, check the connection status of each connector (such as cold soldering of solder joints, short circuit of solder joints, improper pin sequence, etc.), press the connector to make sure whether or not it is properly connected with the driver and whether or not the screws are tightly fastened, and cannot have any conditions of cable damage, pulling or heavy pressure, etc.

  ※In particular, pay special attention to the polarity of the servo motor connection cable and the encoder connection cable.
- Under normal conditions, it is not necessary to add external regenerative resistors, if there is a need or doubt, please contact the dealer or manufacturer.

2-1-3 Electric Wire Specifications

<table>
<tr><th colspan="3">Connection End</th><th colspan="6">Driver Specifications and Used Wire Specifications mm2 (AWG)</th></tr>
<tr><th>Connection End</th><th>Mark (Symbol)</th><th>Connection End Name</th><th>10A</th><th>15A</th><th>20A</th><th>30A</th><th>50A3</th><th>75A3</th></tr>
<tr><td rowspan="4">TB Terminal Base</td><td>R, S, T</td><td>Main Power Supply Terminal</td><td colspan="3">1.25
(16)</td><td colspan="3">2.0
(14)</td></tr>
<tr><td>U, V, W</td><td>Motor Connection Terminal</td><td colspan="3">1.25
(16)</td><td colspan="2">2.0
(14)</td><td>3.5
(10)</td></tr>
<tr><td>P, Pc</td><td>External Regenerative Resistor Terminal</td><td colspan="3">1.25
(16)</td><td colspan="3">2.0
(14)</td></tr>
<tr><td>FG ⏚</td><td>Ground Wire</td><td colspan="6">2.0(14) or Higher</td></tr>
</table>

Connection End			Used Wire Specifications
Connection End	Pin Number	Pin Name	
CN1 Control Signal Connector	26/43	Speed / Torque Command / Limit (SIC / TIC)	0.2mm ² or 0.3mm ² and analog grounded double twisted pair wire (with isolation wire)
	29,30	Analog Grounding End (AG)	
	1,2,16,17,18 31,32,33	Digital input (DI1~DI8)	0.2mm ² or 0.3mm ² and double twisted pair wire of I/O grounding wire (with isolation wire)
	22,23,24,36 ,37,38	Digital output (DO1~DO6)	
	35	Origin Signal Output (ZO)	
	19/21	Digital Input/Digital Output Common End (DICOM/DOCOM)	
	3,4	24V power supply (IP24)	
	20,34	24V ground end (IG24)	
	7~10	Position Command Input (Pulse, Sing, /Pulse, /Sing)	
	11,12 26,27 40,41	Encoder Signal Output (PA, /PA, PB, /PB, PZ, /PZ)	
	5,6	24V Open Collector Input (EXT1, EXT2)	
CN2 Motor Encoder Connector (Communication Type)	1,2	5V Power Supply Output (+ 5E)	0.2mm ² or 0.3mm ² double twisted pair wire (with isolation wire)
	3,4	Power Supply Output Grounding (GND)	
	13	SD	
	14	/SD	
	11	Battery Power Positive Polarity	
	12	Battery Power Negative Polarity	
CN2 Encoder Connector (Pulse Type)	1,2	5V Power Output Terminal (+5E)	
	3,4	Power Output Grounding Terminal (GND)	
	5~9	Encoder Signal Input terminal (A, /A, B, /B, Z, /Z)	

Connection End			Used Wire Specifications
Connection End	Pin Number	Pin Name	
CN3 Computer Connection Communication Connector	1	VBUS	USB 2.0 A Male-Mini 5P Anti-interference signal Wire (Length of 1.0M or less)
	2	D -	
	3	D +	
	4	ID	
	5	GND	
CN5/ CN6 RS485 Communication Use Connector	3	Ground End (GND)	CAT5E Standard Network Wire
	4	D +	
	5	D -	
	7	Ground End (GND)	
	1,2,6,8	--	

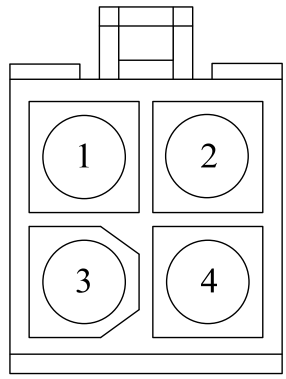
Note: 1. When using multiple drivers, please pay attention to the capacity of non-fuse switch and power filter.
2. CN1 is 44 Pins Dsub Connector.
3. CN2 is 20 Pins SCSI Connector.
4. CN3 is 5 Pins Mini USB Connector.
5. CN5/CN6 is 8 Pins RJ45 Connector.

2-1-4 Motor Terminal Outlet Wire

- **Motor Power Outlet Wire Table**

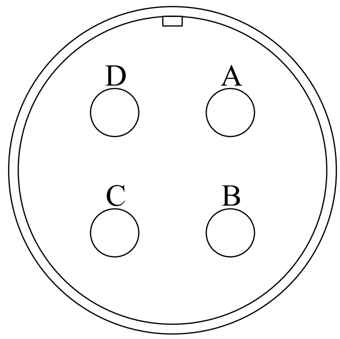
(1) General Connector:

Terminal Symbol	Wire Color	Signal
1	Red	U
2	White	V
3	Black	W
4	Yellow/Green	FG
Mechanical Brake Control Wire	Thin White 1	0V
	Thin White 2	DC +24V



(2) Military Specifications Connector (without Mechanical Brake):

Terminal Symbol	Wire Color	Signal
A	Red	U
B	White	V
C	Black	W
D	Green	FG



(3) Military Specifications Connector (with Mechanical Brake):

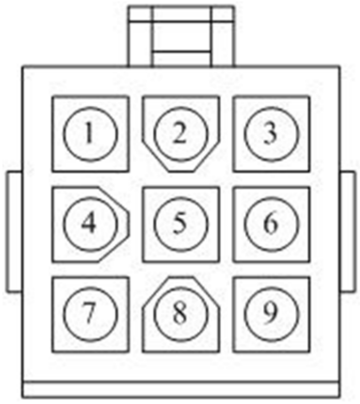
Terminal Symbol	Wire Color	Signal	
B	Red	U	
G	White	V	
E	Black	W	
C	Green	FG	
A	Thin White 1	Mechanical Brake Control Wire	0V
F	Thin White 2		DC +24V

- **Motor Encoder Outlet Wire Table**

  - **Non-communication Encoder:**

(1) General Connector:

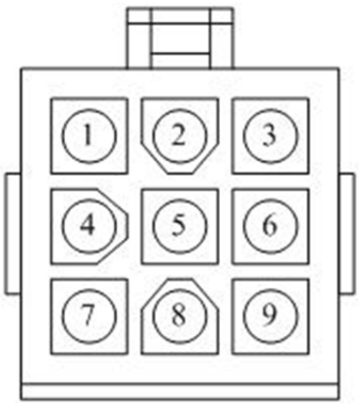
Terminal Symbol	Wire Color	Signal
1	White	+5V
2	Black	0V
3	Green	A
4	Blue	/A
5	Red	B
6	Purple	/B
7	Yellow	Z
8	Orange	/Z
9	Shield	FG



  - **Communication Encoder:**

(1) General Connector:

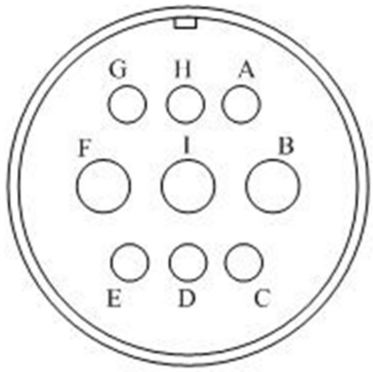
<table>
<tr><th rowspan="2">Terminal Symbol</th><th colspan="2">Wire Color</th><th colspan="2">Signal</th></tr>
<tr><th>Absolute Value</th><th>Incremental</th><th>Absolute Value</th><th>Incremental</th></tr>
<tr><td>1</td><td>Red</td><td>White</td><td>+ 5V</td><td>VCC</td></tr>
<tr><td>2</td><td colspan="2">Black</td><td>0V</td><td>GND</td></tr>
<tr><td>3</td><td>Brown</td><td>--</td><td>VB +</td><td>--</td></tr>
<tr><td>4</td><td>Brown/Black</td><td>--</td><td>VB -</td><td>--</td></tr>
<tr><td>5</td><td colspan="2">Blue</td><td colspan="2">SD</td></tr>
<tr><td>6</td><td>Blue/Black</td><td>Purple</td><td colspan="2">/SD</td></tr>
<tr><td>7</td><td colspan="2">--</td><td colspan="2">--</td></tr>
<tr><td>8</td><td colspan="2">--</td><td colspan="2">--</td></tr>
<tr><td>9</td><td colspan="2">Shield</td><td colspan="2">FG</td></tr>
</table>



TECO

(2) Military Specifications Connector:

Terminal Symbol	Wire Color		Signal	
	Absolute Value	Incremental	Absolute Value	Incremental
B	Red	White	+ 5V	
I	Black		0V	
A	Brown	--	VB +	--
C	Brown/Black	--	VB -	--
H	Blue		SD	
D	Blue/Black	Purple	/SD	
G	--		--	
E	--		--	
F	Shield		FG	

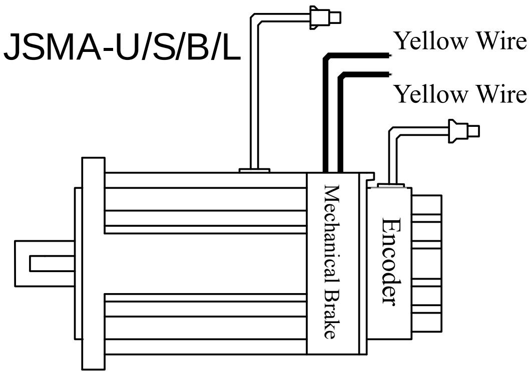


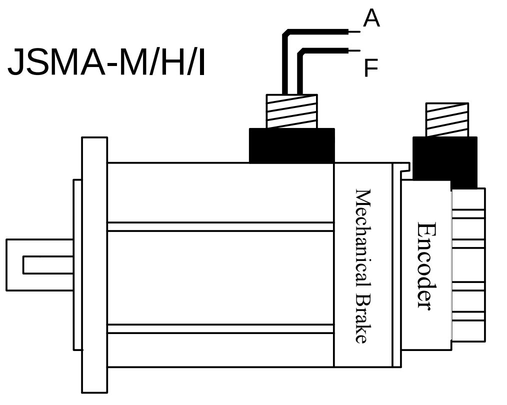
2-1-5 TB Terminal Description

Name	Terminal Symbol	Detailed Description
Main Circuit Power Input End	R	**200V** ➢ Connect External AC Power. ➢ Single / Three Phase 200~230VAC +10 ~ -15% 50/60Hz ±5% **400V** ➢ Connect External AC Power. ➢ Three Phase 380~480VAC ±10% 50/60Hz ±5%
	S	
	T	
External Regenerative Resistor Terminal	P	When using an external regenerative resistor, please refer to **Cn012** Description for the resistance value. The resistance capacity can be increased as required. It is necessary to set the resistance power in **Cn012** after adding the regenerative resistor.
Regenerative Terminal Common Point	PC	
Motor Power Output Terminal	U	Output to motor U phase power, motor terminal wire color is **red**.
	V	Output to motor V phase power, motor terminal wire color is **white**.
	W	Output to motor W phase power, motor terminal wire color is **black**.
Motor casing grounding terminal	FG	The motor casing ground wire contact, motor terminal wire color is **green** or **yellow-green**.

2-1-6 Motor with Mechanical BRAKE Wiring Instructions

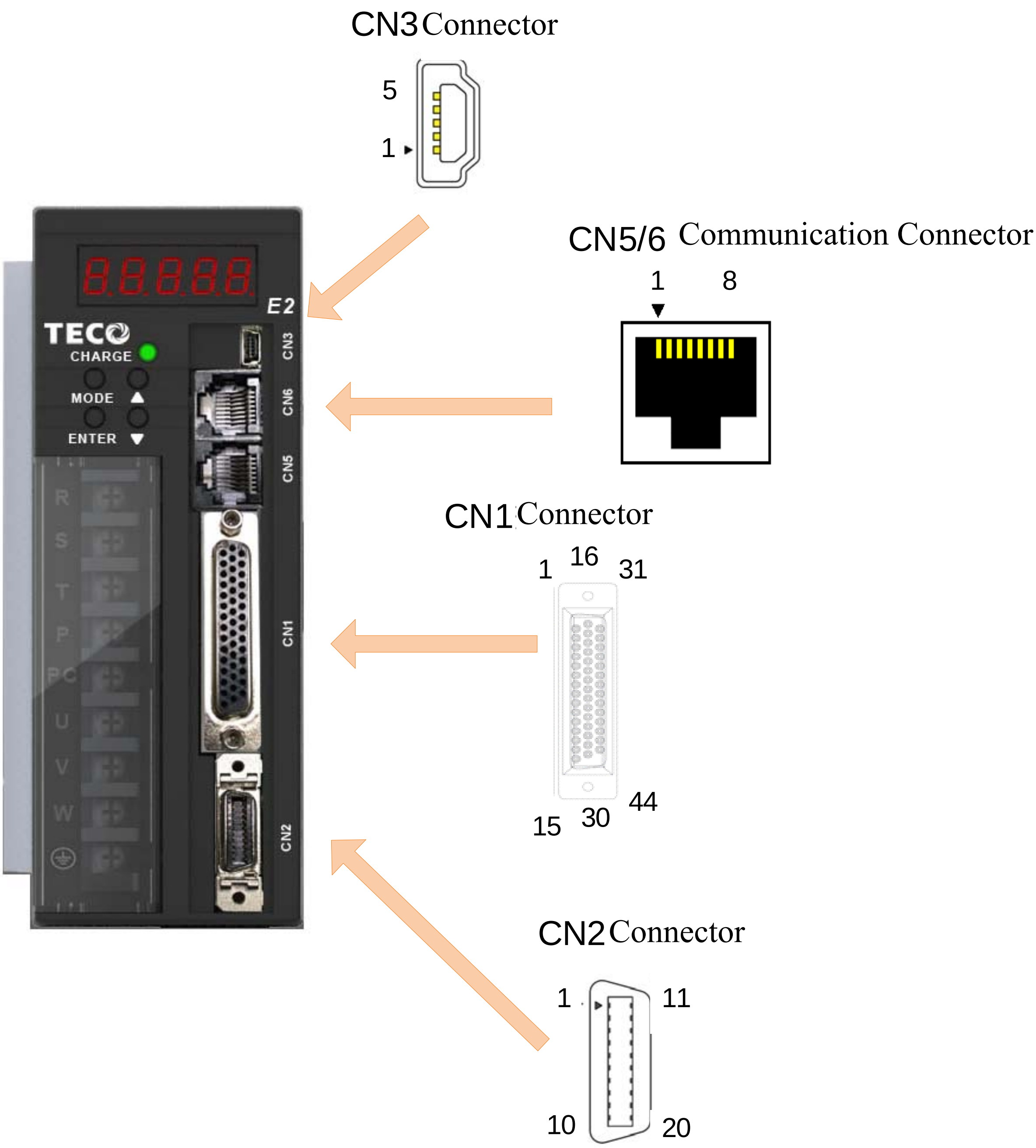
To release the mechanical brake, the JSMA small motor series needs to connect the yellow wire to DC +24V voltage **(Non-Polarity)**, the JSMA medium-large capacity series is output from the "**A**" and "**F**" pins of the **motor power connector**, the servo motor can work normally after it is released.





2-2 I/O Signal Terminal Description

The servo driver provides seven sets of connection terminals, including CN1 control signal connection terminal, CN2 encoder connection terminal, and CN3/CN5/CN6 communication connection terminals. The figure is the pin position diagram of each connection terminal.



2-2-1 CN1 Control Signal Terminal Description

(1) CN1 Terminal Configuration Diagram:

Pin	Name	Function
1	DI-1	Digital input 1
2	DI-2	Digital input 2
3	IP24	+24V Power Output
4	IP24	+24V Power Output
5	EXT1	24V Open Collector Pulse Command Input (Pulse)
6	EXT2	24V Open Collector Sign Command Input (Sign)
7	Pulse	Position Pulse Command Input (+)
8	/Pulse	Position Pulse Command Input (-)
9	Sign	Position Sign Command Input (+)
10	/Sign	Position Sign Command Input (-)
11	PA	Dividing Output Phase A
12	/PA	Dividing Output / Phase A
13	----	-----
14	SIC	Speed Control Speed Command / Torque Control Speed Limit
15	----	-----
16	DI-3	Digital input 3
17	DI-4	Digital input 4
18	DI-5	Digital input 5
19	DICOM	DI Power Common End
20	IG24	+24V Power Ground End
21	DOCOM	DO Power Common End
22	DO-1	Digital output 1
23	DO-2	Digital output 2
24	DO-3	Digital output 3
25	----	-----
26	PB	Dividing Output Phase B
27	/PB	Dividing Output / Phase B
28	----	-----
29	AG	Analog Signal Ground End
30	AG	Analog Signal Ground End
31	DI-6	Speed Control Torque Limit / Torque Control Torque Command
32	DI-7	Analog Signal Ground End
33	DI-8	Analog Monitoring Output 2
34	IG24	+24V Power Ground End
35	ZO	Origin Signal Output
36	DO-4	Digital output 4
37	DO-5	Digital output 5 (LM/A2)
38	DO-6	Digital output 6 (PC/A1)
39	----	-----
40	PZ	Dividing Output Phase Z
41	/PZ	Dividing Output / Phase Z
42	----	-----
43	TIC	Speed Control Torque Limit / Torque Control Torque Command
44	----	-----

Note: 1. For the terminals not used, please do not connect or use as relay terminals.

2. The shielding wire of the I/O signal wire shall be connected with the connector casing.

(2) CN1 Signal Name and Description:

(a) General I/O Signal Description

Signal	Function Code	Pin No.	Wiring Mode	Signal	Function Code	Pin No.	Wiring Mode
Digital input 1~8	**DI1~DI8**	1, 2, 16~18, 31~33	IO1	Digital output 1~8	**DO1~DO6**	22~24 36~38	IO2
DI Power Common End	**DICOM**	19		Origin Signal Output	**ZO**	35	
				DO Power Common End	**DOCOM**	21	
Position Pulse Command Input	**Pulse**	7	IO3	Dividing Output Phase A	**PA**	11	IO4
	/Pulse	8		Dividing Output / Phase A	**/PA**	12	
Position Sign Command Input	**Sign**	9		Dividing Output Phase B	**PB**	26	
	/Sign	10		Dividing Output / Phase B	**/PB**	27	
Open Collector Position Command Power Input	**EXT1**	5		Dividing Output Phase Z	**PZ**	40	
	EXT2	6		Dividing Output / Phase Z	**/PZ**	41	
Speed Control Speed Command / Torque Control Speed Limit	**SIC**	14	IO5	+24V Power Output	**IP24**	3, 4	
Speed Control Torque Limit / Torque Control Torque Command	**TIC**	43		+24V Power Ground End	**IG24**	20,34	
Analog Signal Grounding End	**AG**	29,30					

General I/O Signal Function Description

<table>
<tr><th>Signal Name</th><th>Function Code</th><th>Mode</th><th>I/O Operating Function Description</th></tr>
<tr><td rowspan="2">Position Pulse Command Input</td><td>Pulse</td><td rowspan="4">Pe</td><td rowspan="4">The Driver can receive the following three different types of pulse commands:
・Pulse+Sign
・CCW/CW Pulse
・Phase AB Pulse</td></tr>
<tr><td>/Pulse</td></tr>
<tr><td rowspan="2">Position Sign Command Input</td><td>Sign</td></tr>
<tr><td>/Sign</td></tr>
<tr><td>Open Collector Position Command Power Input</td><td>EXT1
EXT2</td><td>Pe</td><td>When the Position Command uses Open Collector Mode to input, the pins EXT1, EXT2 and IP24 can be shorted, using the internal 24V power supply and resistor.</td></tr>
<tr><td>Speed Control Speed Command</td><td rowspan="2">SIC</td><td>S</td><td>When input contact SPD1=0 and SDP2=0 (Note) using external Speed Command in Speed Mode, for the input voltage range of -10V~+10V, Sn216 can set the motor output speed when the input voltage is ±10V.</td></tr>
<tr><td>Torque Control Speed Limit</td><td>T</td><td>When using in Torque Mode, for the input voltage range of -10~+10V, Tn103 can set the motor speed limit when the input voltage is ±10V.</td></tr>
<tr><td>Speed Control Torque Limit</td><td rowspan="2">TIC</td><td>T</td><td>When input contact SPD1=0 and SDP2=0 (Note) using external Torque Command in Torque Mode, for the input voltage range of 0~+10V, the corresponding torque limit of 10V is Motor Rated Torque.</td></tr>
<tr><td>Torque Control Torque Command</td><td>Pi/Pe
/S</td><td>When input contact TLMT = 1 (Note) using external Torque Command in Non-torque Mode, for the input voltage range of 0~+10V, input 10V will limit the motor CCW torque to 300% of the rated torque.</td></tr>
<tr><td>Dividing Output Phase A</td><td>PA</td><td rowspan="4">ALL</td><td rowspan="4">Output the motor's encoder signal after being processed through the Division Ratio. The number of pulses per revolution can be set in Cn005.
When Cn004 is set to 1, it is a CCW rotation viewed from the motor load end with the Phase A leading the Phase B by 90 degrees.
The Output Signal is with Line Driver Method.</td></tr>
<tr><td>Dividing Output / Phase A</td><td>/PA</td></tr>
<tr><td>Dividing Output Phase B</td><td>PB</td></tr>
<tr><td>Dividing Output / Phase B</td><td>/PB</td></tr>
</table>

Signal Name	Function Code	Mode	I/O Operating Function Description
Dividing Output Phase Z	**PZ**		
Dividing Output / Phase Z	**/PZ**		
Origin Signal Output	**ZO**	ALL	Is the Output Contact of Phase Z Open Collector.
Analog Signal Grounding End	**AG**	ALL	Analog Signal Grounding: The Grounding End of analog voltage **Pin 14, 15, 43, 44 of CN1**.
DI Power Common End	**DICOM**	ALL	Digital Input Power Supply Common End.
DO Power Common End	**DOCOM**	ALL	Digital Output Power Supply Common End.
+24V Power Output	**IP24**	ALL	+24V Power Output End (Max. 0.2A).
+24V Power Ground End	**IG24**	ALL	+24V Power Grounding End

Note: "1": Represents ON (Closed). "0": indicates OFF (Open).

(b) Digital I/O Signals Description:

Due to the requirements of the servo driver application, the digital input/output pin functions used by each operating mode are also different, in order to provide more functions with the limited pins, this driver provides multi-function pin settings, from which the users can conduct function settings for each pin in accordance with the application requirements.

The digital input pin provides 12 programmable pins (DI9~DI12 only for RS-485 communication control) and the digital output pin provides four programmable pins. The following table is the default digital input/output pins and functions , Please refer to 【5-5-1 Input / Output Contact Function Planning】 for the relevant parameter settings.

DI Code	Input Function	0 T	1 S	2 Pe	3 Pe S	4 S T	5 Pe T	6 Pi	7 Pi S	8 Pi T	A Pi Pe
00	NULL										
01	SON	DI1	DI1	DI1	DI1	DI1	DI1	DI1	DI1	DI1	DI1
02	ALRS	DI2	DI2	DI2	DI2	DI2	DI2	DI2	DI2	DI2	DI2
03	PCNT	DI3	DI3	DI3	DI3	DI3	DI3				DI3
04	CCWL	DI4	DI4	DI4	DI4	DI4	DI4				DI4
05	CWL	DI5	DI5	DI5	DI5	DI5	DI5				DI5
06	TLMT		DI6	DI6	DI6						DI6
07	CLR			DI7							DI7
08	LOK		DI8		DI8						
09	EMC										
0A	SPD1										
0B	SPD2										
0C	MDC										
0D	INH			DI8							DI8
0E	SPDINV		DI7		DI7						
0F	G-SEL										
10	GN1										
11	GN2										
12	PTRG							DI8	DI8	DI8	
13	PHOLD										
14	SHOME										
15	ORG										
16	POS1							DI3	DI3	DI3	
17	POS2							DI4	DI4	DI4	
18	POS3							DI5	DI5	DI5	
19	POS4							DI6	DI6	DI6	
1A	TRQINV	DI8				DI8	DI8				
1B	RS1	DI6				DI6	DI6				
1C	RS2	DI7				DI7	DI7				
1D	MDC2										
1E	POS5							DI7	DI7	DI7	
20	VDI										

DO Code	Input Function	0 T	1 S	2 Pe	3 Pe S	4 S T	5 Pe T	6 Pi	7 Pi S	8 Pi T	A Pi Pe
00	NULL										
01	RDY	DO1	DO1	DO1	DO1	DO1	DO1	DO1	DO1	DO1	DO1
02	ALM	DO2	DO2	DO2	DO2	DO2	DO2	DO2	DO2	DO2	DO2
03	ZS		DO3		DO3				DO3		
04	BI										
05	INS	DO4	DO4			DO4					
06	INP			DO4	DO4		DO4	DO4	DO4	DO4	DO4
07	HOME			DO3				DO3			DO3
08	INT	DO3				DO3	DO3			DO3	
0F	OL										
10	BAT										
11	LIT										
12	VDO										

(3) CN1 Interface Circuit and Wiring Mode:

The following will introduce the interface circuit of each CN1 contact and the connection method with the Supervisory Controller.

(a) Digital Input Interface Circuit **(IO1)**:

The Digital Input Interface Circuit can be controlled by relay or open collector transistor circuit. The relay needs to select a low-current relay to avoid poor contact. Use a maximum external voltage up to 24V.

NPN Transistor, (SINK Mode) using Internal Power Supply	**NPN Transistor, (SINK Mode) using External Power Supply**

PNP Transistor, (SOURCE Mode) using Internal Power Supply	**PNP Transistor, (SOURCE Mode) using External Power Supply**

(b) Digital Output Interface Circuit **(IO2)**:

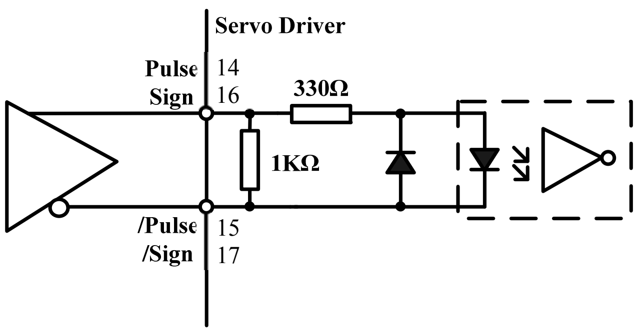
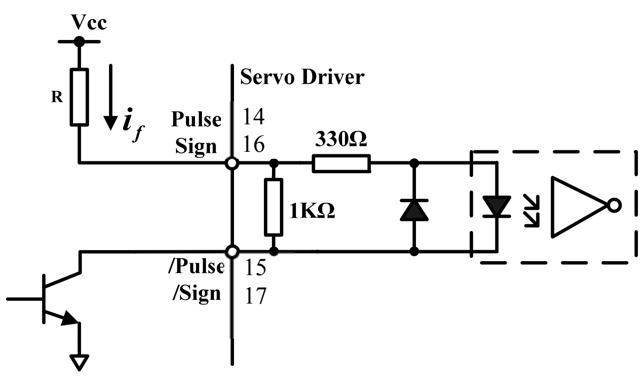
When using an external power supply, pay attention to the polarity of the power supply, reverse polarity will cause damage to the driver. The digital output is an Open Collector method, the maximum external voltage is limited to 24V, and the maximum current is 10mA. In terms of load, when using a relay or other inductive loads, it is necessary to add a diode in parallel with the inductive load, if the polarity of the diode is reversed it will cause damage to the driver.

NPN Transistor, (SINK Mode) using Internal Power Supply	**NPN Transistor, (SINK Mode) using External Power Supply**

PNP Transistor, (SOURCE Mode) using Internal Power Supply	**PNP Transistor, (SOURCE Mode) using External Power Supply**

(c) Pulse Command Input Interface Circuit **(IO3)**:

It is recommended to use the Line Driver Input Method to accurately transmit Pulse Commands; the maximum input command frequency is 4000kpps. The use of Open Collector Input Method will cause the input command frequency to decrease and the maximum input command frequency is 200kpps. The Servo Driver only provides 24V power and other power supplies need to be self-prepared. If the power supply polarity is reversed it will cause damage to the driver. The maximum external power supply (Vcc) is limited to 24V, and the input current is about 8~15mA, please refer to the following examples to select the resistor **R**. Please refer to 【5-4-1 External Pulse Command Mode】 for Pulse Command Input Time Sequence Waveform.

Differential Input Pulse Command (Line Driver)	**Open the Collector Input Pulse Command (use Internal 24V)**
 The maximum input command frequency of Differential Command is 4000kpps	The maximum input command frequency of Open Collector Command is 200kpps
Open Collector Input Pulse Command (use External Power Supply)	**Open Collector Input Pulse Command (use External Power Supply)**
 The maximum input command frequency of Open Collector Command is 200kpps	The maximum input command frequency of Open Collector Command is 200kpps

Vcc=24V Select R=2KΩ	Vcc=12V Select R=750Ω	Vcc=5V Select R=100Ω	

(d) Dividing Output Interface Circuit **(IO4)**:

For the Dividing Output Interface Circuit of Line Drive Input Method, please connect the terminal resistor (R=200-330Ω) to the Line Receiver Input End.

Dividing Output Interface Circuit **(Line Driver)**

Servo Driver

11 PA
26 PB
40 PZ

Controller

R

12 /PA
27 /PB
41 /PZ

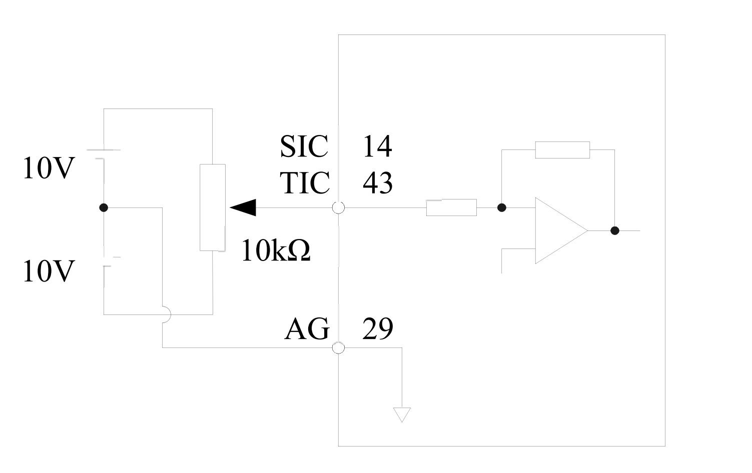
(e) Analog Input Interface Circuit (**IO5**):

Because of the internal power supply of the driver sometimes it will carry a ripple, therefore, use an external power supply as much as possible. When the polarity of the external power supply is reversed, will cause damage to the driver. The maximum external power supply voltage (Vc) shall be 12V or less, the terminal input voltage shall not exceed 10V, excessive input voltage will cause damage to the driver. When using the driver's internal power supply, select the resistor R with a maximum current of 10 mA or less (it is recommended R is 3KΩ or higher).

SIC Input Impedance: 20KΩ

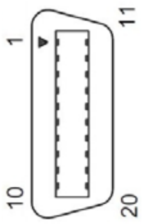
TIC Input Impedance: 20KΩ

Analog Input Interface Circuit



2-2-2 CN2 Encoder Signal Terminal Description

(1) CN2 Terminal Configuration Diagram:



Pin No.	Pin Code	Function	Pin No.	Pin Code	Function	Pin No.	Pin Code	Function	Pin No.	Pin Code	Function
2	Vcc	Power Output End	1	Vcc	Power Output End	12	VB-	Battery Power Negative Polarity	11	VB+	Battery Power Positive Polarity
4	GND	Power Ground End	3	GND	Power Ground End	14	/SD	Serial Data Output Negative Polarity	13	SD	Serial Data Output Positive Polarity
6	/A	Encoder / Phase A	5	A	Encoder Phase A	16	—	——	15	—	——
8	/B	Encoder / Phase B	7	B	Encoder Phase B	18	—	——	17	—	——
10	/Z	Encoder / Phase Z	9	Z	Encoder Phase Z	20	—	——	19	—	——

Note: For the terminals not used, please do not connect any wiring.

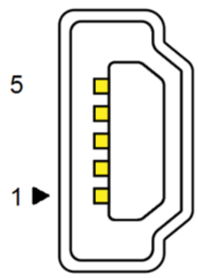
(2) I/O Signal Name and Description:

Pin No.	Signal Name	Function Code	Encoder Output Number and Wire Color: General Connector: Incremental	General Connector: Absolute type	Military Specification Connector: Incremental	Military Specification Connector: Absolute type	Pin Function Description
1 2	Power Output End	+5E	White	Red	White	Red	The encoder uses a 5V power supply (provided by the driver), when the cable is more than 20 meters, two power cables shall be used separately to prevent the encoder voltage from decreasing. When more than 30 meters, please consult with the Supplier.
3 4	Power Ground End	0V	Black	Black	Black	Black	
11	Battery Power Positive Polarity	VB+		Brown		Brown	Battery Power Positive Polarity

12	Battery Power Negative Polarity	VB-		Brown /Black		Brown / Black	Battery Power Negative Polarity
13	Serial Data Output Positive Polarity	SD	Blue	Blue	Blue	Blue	Serial Data Output Positive Polarity
14	Serial Data Output Negative Polarity	/SD	Purple	Blue/ Black	Purple	Blue/ Black	Serial Data Output Negative Polarity

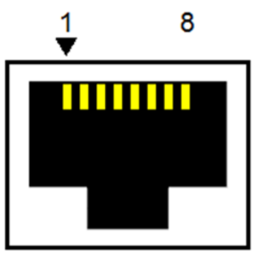
2-2-3 CN3/CN5/CN6 Communication Signal Terminal Description

CN3 Terminal Configuration Diagram:



Pin	Name
1	VBUS
2	D -
3	D +
4	ID
5	GND

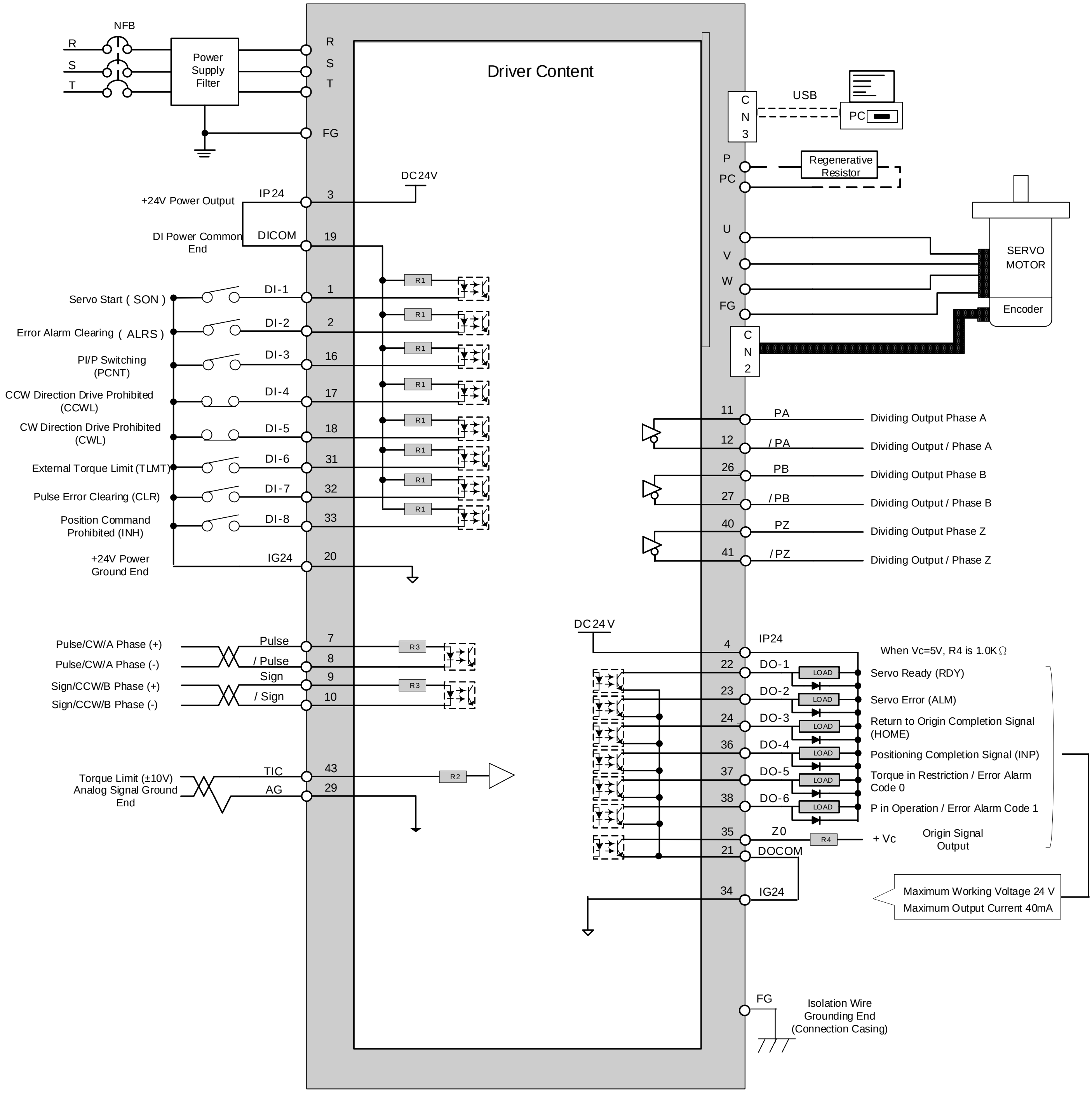
CN5 / CN6 Terminal Configuration Diagram (RS-485 Communication):



Pin	Name
1	-
2	-
3	GND
4	D+
5	D-
6	-
7	GND
8	-

2-3 Control Signal Standard Wiring Diagram

2-3-1 Position Control (Pe Mode) Wiring Diagram (Line Driver)

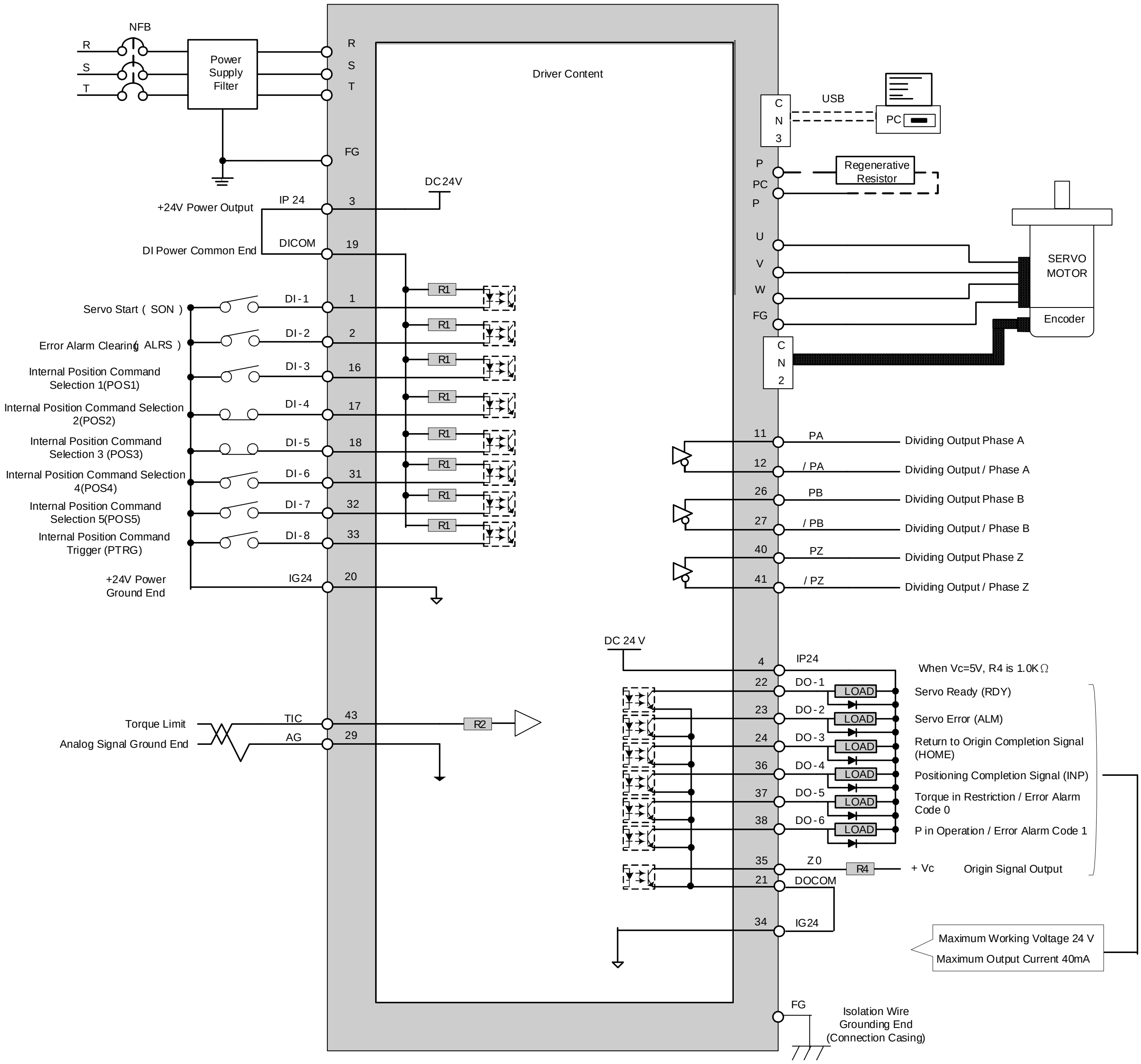


***Note 1: Multi-functions DI1~DI8 can be set for functions by Hn601~Hn608**

***Note 2: Multi-functions DO1~DO4 can be set for functions by Hn613~Hn616**

TECO

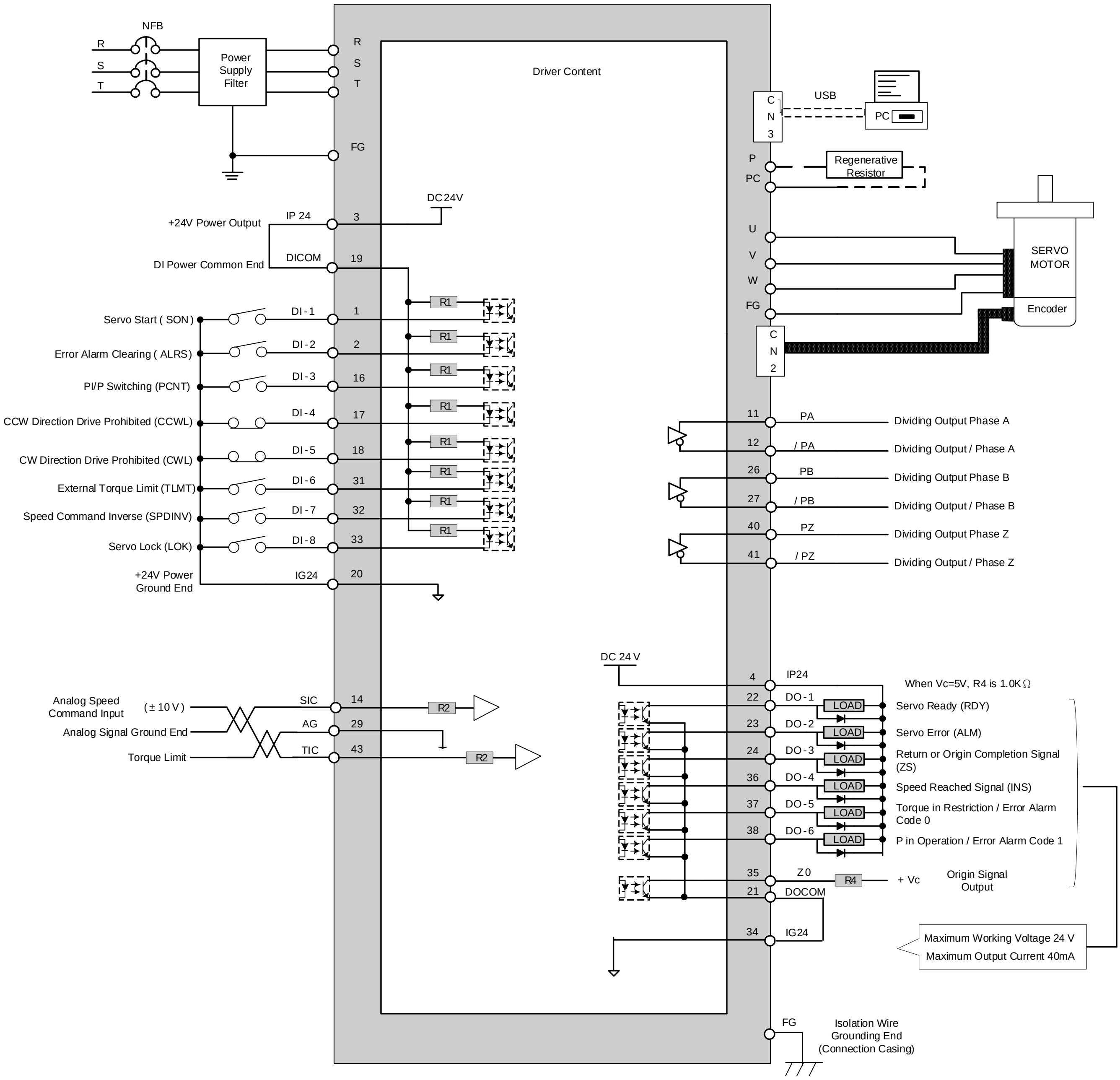
2-3-2 Position Control (Pe Mode) Wiring Diagram (Open Collector)



***Note 1: Multi-functions DI1~DI8 can be set for functions by Hn601~Hn608**

***Note 2: Multi-functions DO1~DO4 can be set for functions by Hn613~Hn616**

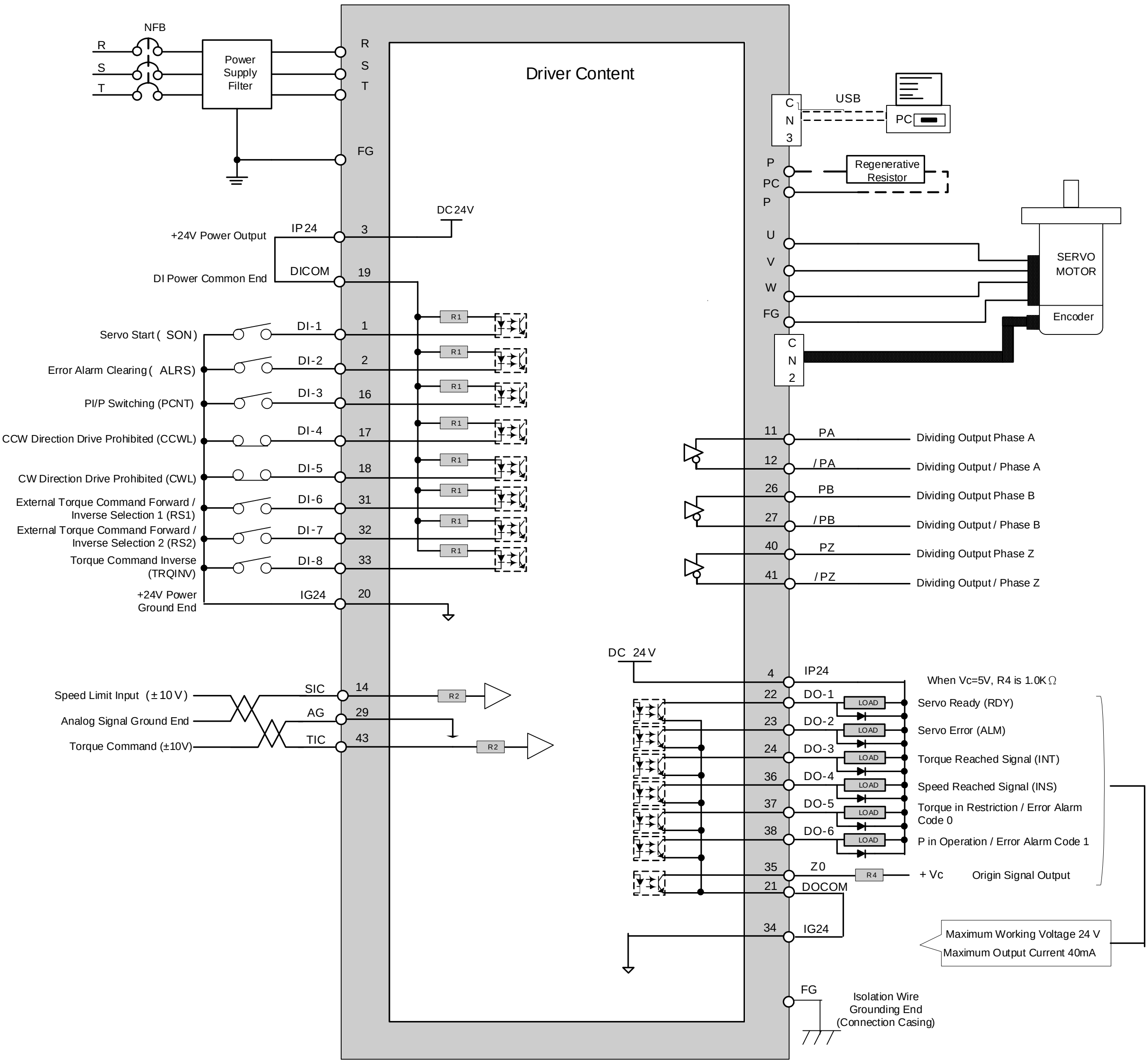
2-3-3 Position Control (Pi Mode) Wiring Diagram



***Note 1: Multi-functions DI1~DI8 can be set for functions by Hn601~Hn608**

***Note 2: Multi-functions DO1~DO4 can be set for functions by Hn613~Hn616**

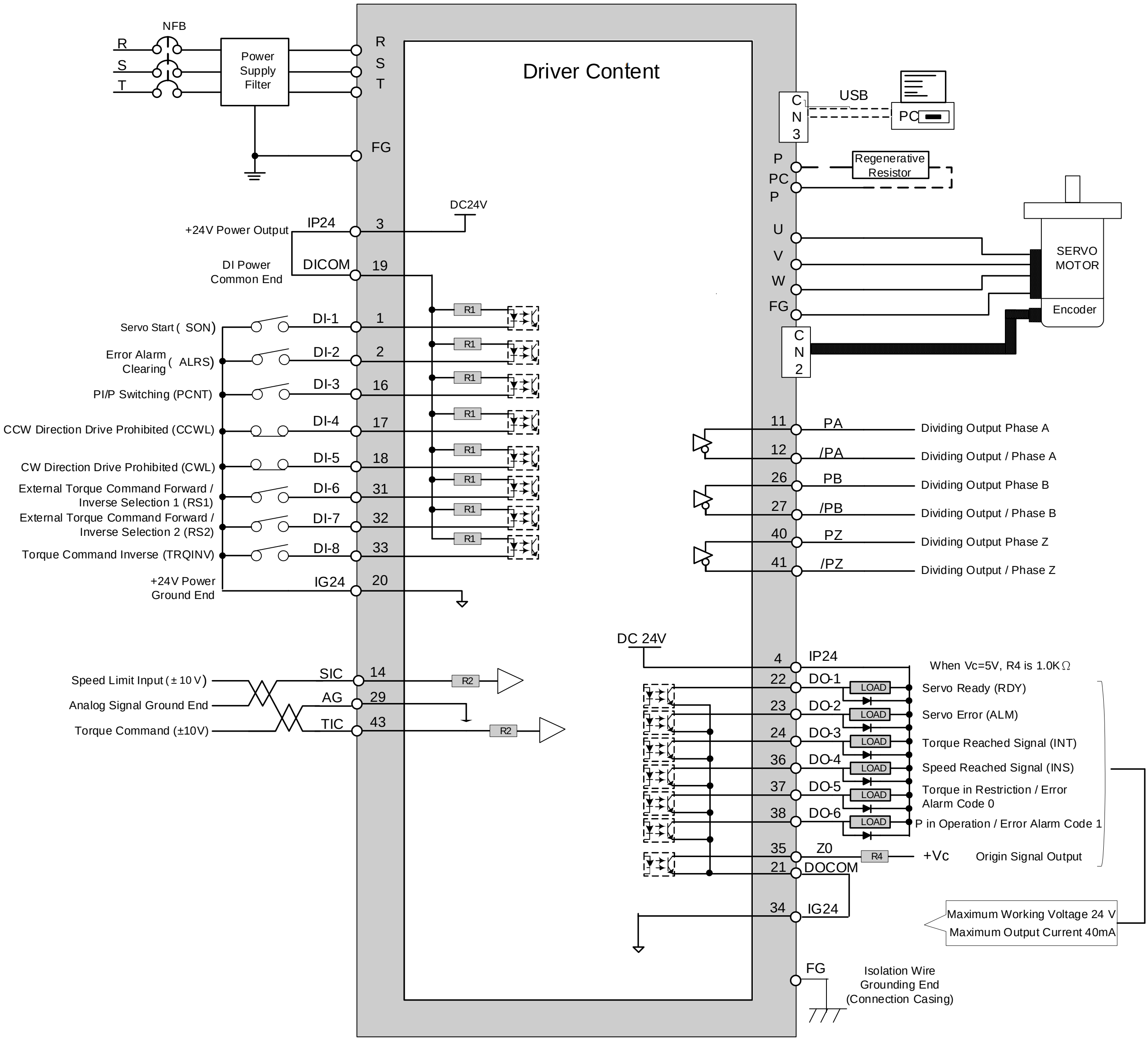
2-3-4 Speed Control (S Mode) Wiring Diagram



***Note 1: Multi-functions DI1~DI8 can be set for functions by Hn601~Hn608**

***Note 2: Multi-functions DO1~DO4 can be set for functions by Hn613~Hn616**

2-3-5 Torque Control (T Mode) Wiring Diagram



***Note 1: Multi-functions DI1~DI8 can be set for functions by Hn601~Hn608**

***Note 2: Multi-functions DO1~DO4 can be set for functions by Hn613~Hn616**

Chap 3 Panel Operating Instructions

3-1 Driver Panel Operating Instructions

This Device contains five LED seven-segment displays, four operating keys and a **CHARGE Indicator**, as shown in the following Figure. When the **CHARGE Indicator (green)** is ON, indicating that the main circuit of the device still has power when the power is turned OFF and the user must wait until the Indicator is completely OFF before the wires can be removed.

Key Symbol	Key Name	Key Function Description
MODE	Mode Selection Key (MODE Key)	1. Select ten parameters provided by this Device, each press will change the parameter in a sequenced cycle. 2. When setting the data screen, click to jump back to the parameter selection screen.
▲	Number Up Key (UP Key)	1, Select each parameter item. 2. Change the number data. 3. Press the ▲ and ▼ keys at the same time to clear the Error Alarm State.
▼	Down Key (DOWN Key)	
ENTER	Data Setting Key (ENTER) Key	1. Data Confirmation; Parameter Item Confirmation. 2. Move left to adjust the number of digits. 3. End the setting data.

When the power is turned on, the ten parameters provided by the Device can be selected with the MODE key, the sequence is as follows:

Steps	Operation Key	LED Display Screen after Operation	Description
1	Turn on Power		When the power is turned on, Enter the **Status Display Screen**.
2	MODE		Press MODE Key once to enter **Status Display Parameters**.
3	MODE		Press MODE Key once to enter **Diagnostic Parameters**.
4	MODE		Press MODE Key once to enter **Error Alarm History Parameters.**
5	MODE		Press MODE Key one time to enter the **System Parameter**.
6	MODE		Press MODE Key once to enter **Torque Control Parameters**.
7	MODE		Press MODE Key once to enter **Speed Control Parameters.**
8	MODE		Press MODE Key once to enter **Position Control Parameters**.
9	MODE		Press MODE Key once to enter **Point to Point Position Control Parameters**.
10	MODE		Press MODE Key once to enter **Shortcut Parameters**.
11	MODE		Press MODE Key once to enter **Multi-Function Contact Planning Parameters**.
12	MODE		Press MODE Key once to enter **Status Display Screen**. Cycle through in sequence.

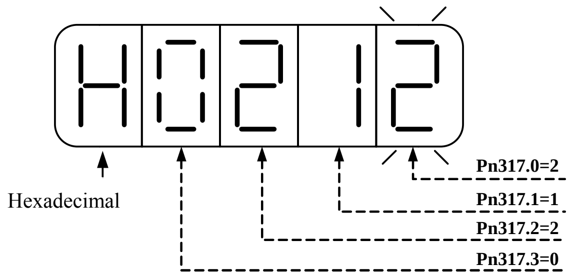
The following provides a setting example. All key functions are used. Users can operate once to understand the function of each key, for example, to set **Sn203** (Internal Speed Command 3) to 100rpm, please follow the steps below:

Steps	Operation Key	LED Display Screen after Operation	Description
1	Turn on Power		When the power is turned on, Enter the **Status Display Screen**.
2	MODE		Press MODE Key 6 times to enter **Speed Control Parameters**.
3	▲		Press UP Key 2 times to select the **Speed Control Parameter** Items.
4	ENTER		After press and hold the ENTER Key for 2 seconds to enter **Sn203** Setting Screen,
5	ENTER		Press ENTER Key 1 time, move left to adjust the number of digits (flashing LED).
6	ENTER		Press ENTER Key 1 time, move left to adjust the number of digits (flashing LED).
7	▼		Press DOWN Key 2 times, to adjust the hundredths digit number 3 downwards to 1.
8	ENTER		Press and hold the ENTER Key for 2 seconds until -SET- appears, indicating the current set value has been saved and after the -SET- appears once, jumps back to the current parameter item selection screen immediately.

When entering the setting screen and don't want to make any setting adjustments, simply press the MODE Key 1 time to jump back to the Parameter Selection Screen.

Steps	Operation Key	LED Display Screen after Operation	Description
1	Turn on Power		When the power is turned on, Enter the **Status Display Screen**.
2	MODE		Press MODE Key 6 times to enter **Speed Control Parameters**.
3	▲		Press UP Key 2 times to select the **Speed Control Parameter** Items.
4	ENTER		After press and hold the ENTER Key for 2 seconds to enter **Sn203** Setting Screen,
5	MODE		Press MODE Key 1 time to jump back to the Parameter Selection Screen.

Some parameters of this Device are displayed in Hexadecimal, if the highest digit of the setting screen shows **H**, indicating that this parameter is set in Hexadecimal. Setting Example Description: Suppose **Pn317 (Return to Origin Mode Setting)=0212**, then the Display Screen is



The Positive / Negative Values of this Device are displayed as follows:

Positive / Negative Sign Display Description	Positive Value Display	Negative Value Display
If the settable value range is less than or equal to 4 digits, the	3000	-3000

TECO

<table>
<tr><td>highest digit will display a negative sign when the negative value is displayed, for example, Sn201 (Internal Speed Command 1).</td><td></td><td></td></tr>
<tr><td rowspan="2">If the settable range is equal to 5 digits, the decimal points of all digits are ON when the negative value is displayed, for example, Pn401 (Internal Position Command 1- Number of Revolutions).</td><td>30000</td><td>-30000</td></tr>
<tr><td></td><td></td></tr>
<tr><td rowspan="4">If the settable range is more than 5 digits, the Enter Key can be used to switch between high and low digits, the decimal points of all digits are ON when the negative value is displayed, for example, Pn402 (Internal Position Command 1 - Number of Pulses).</td><td>30000</td><td>-30000</td></tr>
<tr><td>Higher 5 Digits:

Lower 5 Digits:</td><td>Higher 5 Digits:

Lower 5 Digits:</td></tr>
<tr><td>300000</td><td>-300000</td></tr>
<tr><td>Higher 5 Digits:

Lower 5 Digits:</td><td>Higher 5 Digits:

Lower 5 Digits:</td></tr>
</table>

The negative setting of this Device is explained as follows:

(1) If the settable value range is less than or equal to 4 digits, for example, set **Sn201** (Internal Speed Command 1)=100 to -100

Steps	Operation Key	LED Display Screen after Operation	Description
1	Turn on Power		When the power is turned on, Enter the **Status Display Screen**.
2	MODE		Press MODE Key 6 times to enter **Speed Control Parameters**.
3	ENTER		After pressing, hold the ENTER Key for 2 seconds to enter the **Sn201** setting screen.
4	ENTER		Press the ENTER Key 4 times to move the adjustable digits 4 places to the left, that is, to the highest digit.
5	▲ or ▼		Press the UP Key or DOWN Key 1 time, the negative sign appears. If pressing one more time, then the negative sign disappears.
6	ENTER		Press and hold the ENTER Key for 2 seconds until -SET- appears, indicating the current set value has been saved and after the -SET- appears once, jumps back to the current parameter item selection screen immediately.

(2) If the settable range is equal to 5 digits, for example, set **Pn401** (Internal Position Command 1-Number of Revolutions)=0 to -10000.

Steps	Operation Key	LED Display Screen after Operation	Description
1	Turn on Power		When the power is turned on, Enter the **Status Display Screen**.

2	MODE		Press MODE Key 8 times to enter the **Point to Point Position Control Parameters**.
3	ENTER		After press and hold the ENTER Key for 2 seconds, enter the **Pn401** Setting Screen.
4	ENTER		Press ENTER Key 4 times, to move the adjustable digits 4 places to the left.
5	▼		Press DOWN Key 1 time, to adjust the 10,000th digit down to 1, and the decimal point of all digits is ON, indicating that the current setting value is negative.
6	ENTER		Press and hold the ENTER Key for 2 seconds until -SET- appears, indicating the current set value has been saved and after the -SET- appears once, jumps back to the current parameter item selection screen immediately.

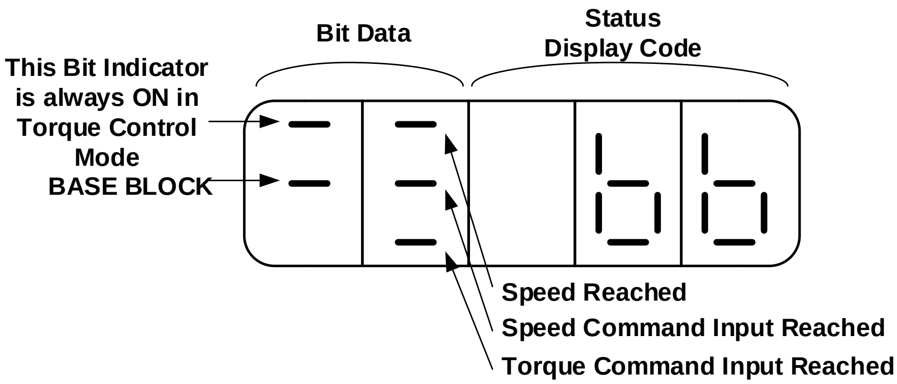
(3) If the settable range is more than 5 digits, for example, set **Pn402** (Internal Position Command 1-Number of Pulses)=0 to -100000.

Steps	Operation Key	LED Display Screen after Operation	Description
1	Turn on Power		When the power is turned on, Enter the **Status Display Screen**.
2	MODE		Press MODE Key 8 times to enter the **Point to Point Position Control Parameters**.
3	▲		Press UP Key 1 time, to select the Item of **Control Parameter Item for Multi-position Control**.
4	ENTER		Press and hold the ENTER Key for 2 seconds, to enter the **Pn402** Setting Screen.
5	ENTER		Press ENTER Key 5 times, to move the adjustable digits 5 places to the left.

6			Press DOWN Key 1 time, to adjust the 10,000th digit down to 1, and the decimal point of all digits is ON, indicating that the current setting value is negative.
7	 ENTER		Press and hold the ENTER Key for 2 seconds until -SET- appears, indicating the current set value has been saved and after the -SET- appears once, jumps back to the current parameter item selection screen immediately.

After the Device is powered ON, the LED Display Status Display Screen will indicate the status of this Device with Bit Data and Status Display Codes, of which the display content definitions of Status Display Screen in Speed and Torque Control Mode and Position Control Mode are different as explained below:

(1) Speed and Torque Control Mode:



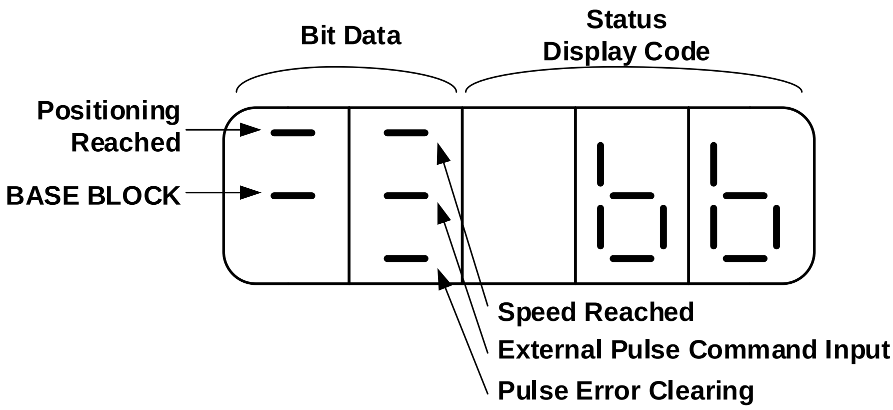
The Display Codes related to Bit Data and Status are described as follows:

Bit Data	Description	
	Bit Indicator ON	**Bit Indicator OFF**
BASE BLOCK	In **Servo OFF** Status	In **Servo ON** Status
Speed Reached (INS)	Motor Speed higher than **Cn007** (Speed Reached Determined Value)	Motor Speed lower than **Cn007** (Speed Reached Determined Value)
Speed Command Input Reached	Speed Command Input Value higher than **Cn007** (Speed Reached Determined Value)	Speed Command Input Value lower than **Cn007** (Speed Reached Determined Value)
Torque Command Input Reached	Torque Command Input Value higher than **10%** of Rated Torque	Torque Command Input Value lower than **10%** of Rated Torque

Status Display Code	Description
	In BASE BLOCK In **Servo OFF** State (Motor in Non-excitation State)
	Servo-excitation in Operation In **Servo ON** State (Motor in Excitation State)
	CCW Direction Drive Prohibited

	Input Contact **CCWL** Operation
	CW Direction Drive Prohibited Input Contact **CWL** Operation

(2) Position Control Mode:



The Display Codes related to Bit Data and Status are described as follows:

Bit Data	Description	
	Bit Indicator ON	Bit Indicator OFF
BASE BLOCK	In **Servo OFF** Status	In **Servo ON** Status
Positioning Completed (INP)	Position Error lower than **Pn307** (Positioning completion Determined Value)	Position Error higher than **Pn307** (Positioning completion Determined Value)
Speed Reached (INS)	Motor Speed higher than **Cn007** (Speed Reached Determined Value)	Motor Speed lower than **Cn007** (Speed Reached Determined Value)
External Pulse Command Input	With External Pulse Command Input	Without External Pulse Command Input
Pulse Error Clearing	Input Contact **CLR** (Pulse Error Clearing) Operating	Input Contact **CLR** (Pulse Error Clearing) Not Operating

Status Display Code	Description
	In BASE BLOCK In **Servo OFF** State (Motor in Non-excitation State)
	Servo-excitation in Operation

	In **Servo ON** State (Motor in Excitation State)
	CCW Direction Drive Prohibited Input Contact **CCWL** Operation
	CW Direction Drive Prohibited Input Contact **CWL** Operation

3-2 State Display Function Description

The user can use the Status Display Parameter to know all information of the current driver and motor operations, please refer to【7-3-11 Monitoring Parameters】for detail description:

Parameter Code	Display Content	Unit	Description	RS-485 Address	Index
Un-01	Actual Motor Speed	rpm	For example: The display of 120 indicates that the current Motor Speed is 120 rpm.	0601H	2801H
Un-02	Actual Motor Torque	%	Expressed by the percentage of Rated Torque. For example: The display of 20 indicates that the Motor Torque Output is now 20% of the Rated Torque.	0602H	2802H
Un-03	Regenerative Load Rate	%	The average percentage of Regenerative Power Output.	0603H	2803H
Un-04	Effective Load rate	%	The average percentage of Power Output.	0604H	2804H
Un-05	Maximum Load Rate	%	The maximum value of Effective Load Rate has ever appeared.	0605H	2805H
Un-06	Speed Command	rpm	For example: The display of 120 indicates that the current Speed Command is 120 rpm.	0606H	2806H
Un-07	Position Error ※ The Range is more than 5 digits	pulse	Difference between Position Command and Position Feedback.	0607H 0608H	2807H
Un-08	Position Feedback (32bit)	pulse	Pulse Accumulation of Motor Encoder.	0609H 060AH	2808H
Un-09	External Analog Voltage Command Value	V	For example: The display of 5.25 indicates that the External Voltage Command is 5.25V.	060BH	2809H
Un-10	Main Circuit (Vdc Bus) Voltage	V	For example: The display of 310 indicates that the Main Circuit Voltage is 310V.	060CH	280AH
Un-11	External Analog Voltage Limit Value	V	For example: The display of 5.25 indicates that the External Voltage Command is 5.25V.	060DH	280BH

Parameter Code	Display Content	Unit	Description	RS-485 Address	Index
Un-12	External CCW Direction Torque Limit Command Value	%	For example: The display of 100 indicates that the current External CCW Direction Torque Limit Command is 100%.	060EH	280CH
Un-13	External CW Direction Torque Limit Command Value	%	For example: The display of 100 indicates that the current External CW Direction Torque Limit Command is 100%.	060FH	280DH
Un-14	Motor Feedback - Number of Pulses in one Rotation ※ The Range is more than 5 digits	pulse	After the power is turned on, the value will return to zero and start displaying the number of pulses in one Motor rotation.	0610H 0611H	280EH
Un-16	Motor Feedback - Number of Rotations ※ The Range is more than 5 digits	rev	After the power is turned on, the value will return to zero and start displaying the number of Motor rotations.	0612H 0613H	2810H
Un-18	Pulse Command - Number of pulses in one rotation ※ The Range is more than 5 digits	pulse	After the power is turned on, the value will return to zero and display the number of pulses in one rotation of Pulse Command Input.	0614H 0615H	2812H
Un-20	Pulse Command - Number of Rotations ※ The Range is more than 5 digits	rev	After the power is turned on, the value will return to zero and display the number of revolutions of Pulse Command Input.	0616H 0617H	2814H
Un-24	Multi-revolution Position Information of the Communication Encoder Feedback	rev	Multi-revolution Absolute Position of the Communication Encoder Motor ※Absolute type: Absolute Number of Revolutions Data ※Incremental: 0	061AH	2818H

Parameter Code	Display Content	Unit	Description	RS-485 Address	Index
Un-25	Single Revolution Position Information of the Communication Encoder Feedback ※ The Range is more than 5 digits	pulse	Single Revolution Absolute Position of the Communication Encoder Motor	061BH 061CH	2819H
Un-27	Communication Encoder Message	–	Feedback Communication Encoder Status	061DH	281BH
Un-28	Torque Command	%	Expressed by the percentage of Rated Torque. For example: The display of 50 indicates that the current Motor Torque Command is 50% of the Rated Torque.	061EH	281CH
Un-29	Load Inertia Ratio	x0.1	Displays the current default Load Inertia Ratio of Cn025.	061FH	281DH
Un-30	Digital Output Contact Status (DO)	–	Displays the Status of Digital Output Contact (DO) in Hexadecimal For example: H00XX (0000 0000 DO-8/7/6/5 DO-4/3/2/1)	0620H	281EH
Un-31	Digital Input Contact Status (D1)	–	Displays the Status of Digital Input Contact (DI) in Hexadecimal For example: HXXXX (0000 DI-12/11/10/9 DI-8/7/6/5 DI-4/3/2/1)	0621H	281FH
Un-43	Motor Electrical Angle	degree	Motor Current Electrical Angle Position	062DH	282BH
Un-44	Motor Model Number Read by the Communication Encoder	–	For example: The display of H1267 indicates that the Motor Cn030 Number is H1267	062EH	282CH
Un-45	OnLine_AutoTuning Inertia Estimation	X0.1	For example: The display of 100 indicates that the Load Inertia Ratio is 10 times.	062FH	282DH
Un-46	OFFLine_Tuning Status	–	OFFLine_Tuning Operating Status	0630H	282EH
Un-47	OFFLine_Tuning Error Code	–	Error Code of OFFLine_Tuning	0631H	282FH
Un-49	Driver Temperature	度	Driver Temperature	0633H	2831H

Parameter Code	Display Content	Unit	Description	RS-485 Address	Index
Un-50	External Encoder Number of Pulses ※ The Range is more than 5 digits	pulse	When using the fully closed loop function of the External Encoder, after the power is turned on, the value will return to zero and start displaying the External Encoder Position.	0634H 0635H	2832H
Un-52	The Error of External Encoder and Motor Encoder ※ The Range is more than 5 digits	pulse	The Error of External Encoder and Motor Encoder When Operating with a Fully Closed Loop Function	0637H 0638H	2834H
Un-53	Current Alarm Number	—	For example: The display of 01 indicates that the current alarm number is AL001	0639H	2835H
Un-54	EtherCAT PDO Packet Loss Counter	—	Monitor the quality of communication is normal and generate AL049 if abnormal	063AH	2836H
Un-55	System Multi-revolution Position	rev	System Multi-revolution Position ※ When conducting the Servo internal Return to Origin operation will clear to 0	063BH	2837H
Un-56	System Single Revolution Position ※ The Range is more than 5 digits	pulse	System Single Revolution Position ※ When conducting the Servo internal Return to Origin operation will clear to 0	063CH 063DH	2838H

3-3 Diagnostic Function Description

The user can use the Diagnostic Parameters to know the current system information, as described below:

Parameter Code	Name and Function	RS-485 Communication Address
dn-01	Current Control Mode Display	0F01H
dn-02	Output Contact Signal Status	0F02H
dn-03	Input Contact Signal Status	0F03H
dn-04	CPU Software Version Display	0F04H
dn-05	Jog Mode Operation	N/A
dn-06	Reserved	N/A
dn-07	External Analog Voltage Offset Automatic Adjustment	0F07H
dn-08	Display Serialized Models	0F08H
dn-09	ASIC Software Version Display	0F09H
dn-11	Automatic Detection of Magnetic Angle Position	0F0BH
dn-14	EtherCAT XML Version Display	0F0EH

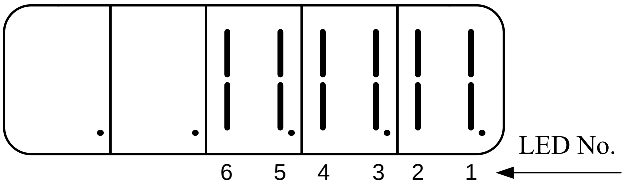
dn-01 (Current Control Mode Display)

The user can use **dn-01** to know the current Control Mode of this Device, Control Mode and Panel Display Comparison Table is as follows:

Cn001	Control Mode	dn-01 (Current Control Mode Display)
0	Torque Control－T	
1	Speed Control－S	
2	Position Control (External Pulse Command)－Pe	
3	External Position / Speed Control Switching －Pe/S	
4	Speed / Torque Control Switching －S/T	
5	External Position / Torque Control Switching －Pe/T	
6	Position Control (Internal Position Command)－Pi	
7	Internal Position / Speed Control Switching －Pi/S	
8	Internal Position / Torque Control Switching －Pi/T	
A	Internal / External Position Switching －Pi/Pe	

dn-02 (Output Contact Signal Status)

The user can use **dn-02** to know the status of the current Output Contact Signal, the Panel Display Description is as follows:



When the Output Contact Signal State is a Low Electric Potential (pin conduction), the LED corresponding to this Contact will light up; when the Output Contact Signal State is High Electric Potential (pin open), then the LED corresponding to this Contact will not light up. The following Table is the LED Number and Output Contact Code Comparison Table, of which, **DO-1~ DO-4** are Multi-function Planning Contacts. Please refer to 【**5-5-1** Input / Output Contact Function Planning】 to set the function, and **DO-5~ DO-6** are Fixed Function Output Contacts.

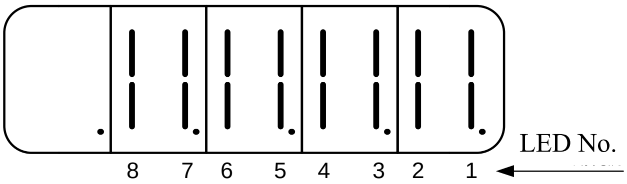
LED No.	Output Contact Code
1	DO-1
2	DO-2
3	DO-3
4	DO-4
5	DO-5
6	DO-6

Note)

- Whether or not the **DO1~DO4** Multi-function Planning Output Contacts are High Potential Operation or Low Potential Operation, please set with Hn613~Hn616 and refer to【**5-5-1** Input / Output Contact Function Planning】 for detail settings.
- The **DO5~DO6** Fixed Function Output Contacts are with Low Electric Potential Operation.

dn-03 (Input Contact Signal Status)

The User can use **dn-03** to know the current Input Contact Signal Status, the Panel Display Description is as follows:



When the Input Contact Signal State is Low Electric Potential (pin shorted), the LED corresponding to this Contact will light up; when the Input Contact Signal State is High Electric Potential (pin open), then the LED corresponding to this Contact will not light up. The following Table is the LED Number and Input Contact Code Comparison Table, of which, **DO-1** ~ **DO-8** are Multi-function Planning Contacts, please set with Hn601~Hn608 and refer to【**5-5-1** Input / Output Contact Function Planning】 for detail settings.

LED No.	Input Contact Code
1	DI-1
2	DI -2
3	DI -3
4	DI -4
5	DI -5
6	DI -6
7	DI -7
8	DI -8

dn-04 (Software Version Display)

The User can use **dn-04** to know the current Software Version of this Device, the Panel Display Description is as follows:

Steps	Operation Key	LED Display Screen after Operation	Description
1	Turn on Power		When the power is turned on, Enter the **Status Display Screen**.
2	MODE		Press MODE Key 2 times to enter **Diagnostic Parameters**.
3	▲		Press UP Key 3 times to select **dn-04** Item.
4	ENTER		Press and hold the ENTER Key for 2 seconds, enter the Display **Software Version** Screen, the Software Version is 2.80.
5	MODE		Press MODE Key 1 time to jump back to the Parameter Selection Screen.

dn-05 (JOG Mode Operation)

△Attention

- **The JOG speed is based on Sn201 (Internal Speed Command 1) to operate, therefore, Sn201 must be set before executing this function.**
- **Regardless of whether or not the Motor uses the Input Contact SON to generate excitation, the Motor will be excited immediately after entering the JOG Mode.**

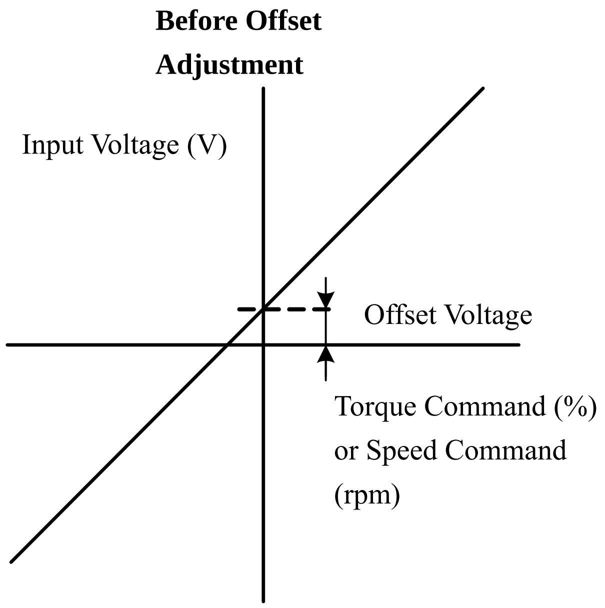
The User can use **dn-05** to operate JOG operation, the operating instructions are as follows:

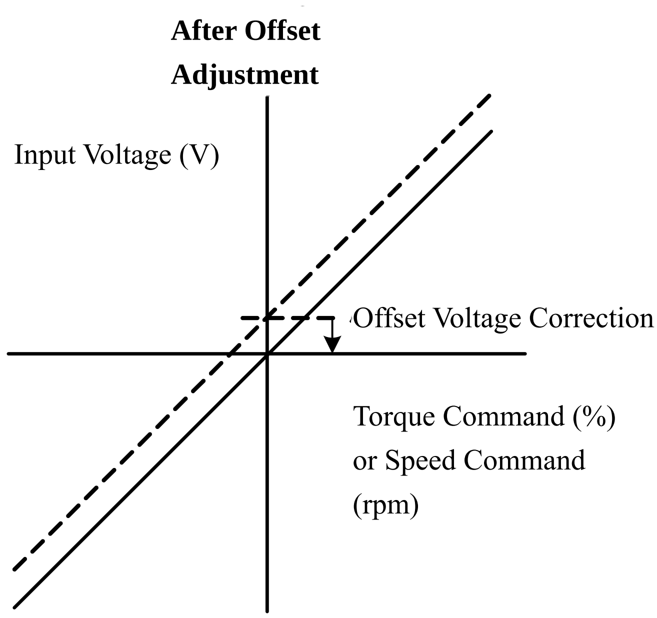
Steps	Operation Key	LED Display Screen after Operation	Description
1	Turn on Power		When the power is turned on, Enter the **Status Display Screen**.
2	MODE		Press MODE Key 2 times to enter **Diagnostic Parameters**.
3	▲		Press UP Key 4 times to select **dn-05** Item.
4	ENTER		Press and hold the ENTER Key for 2 seconds to enter **JOG Mode**, and the Motor is excited immediately.
5	▲		Press and hold the UP Key, the Motor rotates in the currently defined positive direction.
6	▼		Press and hold the DOWN Key, the Motor rotates in the currently defined negative direction.
7	MODE		Press MODE Key 1 time, jump back to the Parameter Selection Screen, the Motor releases excitation.

dn-07 (External Voltage Command Offset Automatic Adjustment)

When the External Torque or Speed Analog Command Input is 0V, the Motor may still rotate slowly, the User can use **dn-07** to automatically adjust and correct the Analog Command Offset, the External Voltage Offset can be checked with **Un-09** and **Un-11** after automatically adjusted, and the Automatic Adjustment Procedure is described as follows:

Steps	Operation Key	LED Display Screen after Operation	Description
1	**Prior to the adjustment, short the Analog Command Contacts SIC(CN1-14), TIC(CN1-43) and the Analog Grounding Contact AG(CN1-29) are short-circuited.**		
2	Turn on Power		When the power is turned on, Enter the **Status Display Screen**.
3	MODE		Press MODE Key 2 times to enter **Diagnostic Parameters**.
4	▲		Press UP Key 6 times to select **dn-07** Item.
5	ENTER		Press and hold the ENTER Key for 2 seconds, enter **dn-07** setting screen.
6	▲		Press UP Key 1 time, the value of 1 represents the Offset Automatic Adjustment to be executed.
7	ENTER		Press and hold the ENTER for 2 seconds until -SET- appears 1 time then jump back to the current parameter item selection screen immediately, the Offset Automatic Adjustment **Sn217 (Analog Speed Command Offset Adjustment)** and **Tn104 (Analog Torque Command Offset Adjustment)** settings are completed at this time.


Before Offset
Adjustment
Input Voltage (V)
Offset Voltage
Torque Command (%)
or Speed Command
(rpm)


After Offset
Adjustment
Input Voltage (V)
Offset Voltage Correction
Torque Command (%)
or Speed Command
(rpm)

dn-08 (Display Serialized Models)

The User can use **dn-08** to inquire the Driver and Motor combination set in the current Driver, if the displayed matching combination is not the same as the actual combination, please refer to【1-1-3 Servo Driver and Servo Motor Matching Comparison Table】to reset the Parameter **Cn030**, or contact with the local dealers

dn-09(ASIC Software Version Display)

The User can use **dn-09** to know the current ASIC Version of this Device, the Panel Display Description is as follows:

Steps	Operation Key	LED Display Screen after Operation	Description
1	Turn on Power		When the power is turned on, Enter the **Status Display Screen**.
2	MODE		Press MODE Key 2 times to enter **Diagnostic Parameters**.
3	▲		Press UP Key 3 times to select **dn-09** Item.
4	ENTER		Press and hold the ENTER Key for 2 seconds, enter the Display **Software Version** Screen, the Software Version is 2.80.
5	MODE		Press MODE Key 1 time to jump back to the Parameter Selection Screen.

dn-11 (Automatic Detection of Magnetic Angle Position)

The Magnetic Angle Detection refers to detecting the electrical angle coordinates (electrical angle phase) of the Servo Motor. If the servo system does not correctly know the servomotor's electric angle coordinate position, the servomotor cannot be controlled normally. For the automatic alignment function of the Encoder Magnetic Angle, the operation steps are as follows:

1. Motor U, V, W are wired in accordance with TECO Phase Sequence
2. Connect the Encoder Wiring

3. Motor No-load Condition

4. After the Driver is powered ON, set the Parameter dn-11=1, it will enter the excitation state automatically at this time, (Display the word of "auto" during the process).

5. After the completed auto-alignment, it will leave the page automatically and dn-11 returns to 0

6. The electrical angle can be confirmed from Un-43, the motor will not move after alignment and the Un - 43 shall be $0 \pm 1°$

Chap 4 Trial Run Operation Instructions

Before executing the Trial Run, must make sure that all wiring operations have been completed. The following describes the three-stage Trial Run Operations and Purpose in sequence, and will describe with the Speed Control Circuit (Analog Voltage Command) and Position Control Circuit (External Pulse Command) when working with the Supervisory Controller.

【4-1 No-load Servo Motor Trial Run】	
A. Servo Driver Wiring and Motor Installation	B. Purpose of Trial Run
Power Supply Servo Motor Work Platform	Confirm that the following items are correct: · Driver Power Supply Wiring · Servo Motor Wiring · Encoder Wiring · Servo Motor Operating Direction and Speed
【4-2 Non-load Servo Motor with Supervisory Controller Trial Run】	
A. Servo Driver Wiring and Motor Installation	B. Purpose of Trial Run
Power Supply **Connect Supervisory Controller** Servo Motor Work Platform	Confirm that the following items are correct: · Control Signal Wiring between the Supervisory Controller and Servo Driver · Servo Motor Operating Direction, Speed and Number of Revolutions · Brake Function, Drive Prohibit Function and
【4-3 Connect the Load Servo Motor with Supervisory Controller Trial Run】	
A. Servo Driver Wiring and Motor Installation	B. Purpose of Trial Run
Power Supply **Connect Supervisory Controller** Servo Motor Work Platform	Confirm that the following items are correct: · Servo motor Operating Direction, Speed and Mechanism Travel · Set Related Control Parameters

4-1 No-load Servo Motor Trial Run

Attention

- **During the Trial Run, make sure to separate the Servo Motor from the Machine, such as Couplers and Belts.**
- In order to avoid damage to the machine during a Trial Run, the Trial Run of the Servo Motor

This stage of the Trial Run can confirm the Driver Wiring, if there is any incorrect wiring, it will cause an error to the Servo Motor during the Trial Run process.

1. Install Servo Motor:

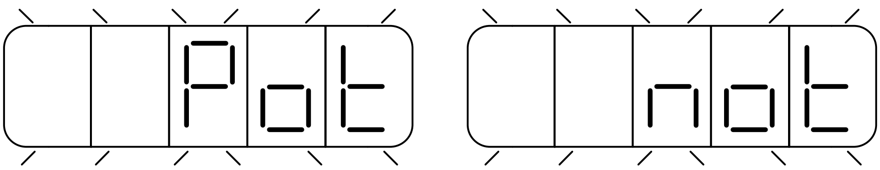
Fix the Servo Motor on the Machine Table, to prevent the Servo Motor from bounding or moving during the Trial Run.

2. Check the Wiring:

Check the Servo Driver Power Wiring, Servo Motor Wiring and Encoder Wiring. At this stage of the Trial Run, no control signal line is used, please remove the Control Signal Wire (CN1).

3. Turn on the Servo Driver Power:

Turn on the Servo Driver Power, if the Driver Panel displays as below:



This is because the Input Contacts **CCWL** and **CWL** are both in operation (as for the high-potential operations or low-potential operations, please set in reference to 【5-5-1 Input / Output Contact Function Planning】). Since after this alarm has occurred, the Servo Driver cannot operate normally, therefore, the Parameter must be set **Cn002.1=1** to temporarily turn off the Drive Prohibited Function during the Trial Run process, until after the Stage 1 Trial Run is completed, then restore the Parameter **Cn002.1=0**.

Setting Operations Description is as follows:

Steps	Operation Key	LED Display Screen after Operation	Description
1	Turn on Power		When the power is turned on, Enter the **Status Display Screen**.
2	MODE		Press MODE Key 4 times to enter the **System Parameters**.
3	▲		Press UP Key 1 time to select **Cn002** Item.
4	ENTER		Press and hold the ENTER Key for 2 seconds to enter **Cn002** Setting Screen.
5	ENTER		Press ENTER Key 1 time, move left to adjust the number of digits (flashing LED).
6	▼		Press the UP Key 1 time to adjust the tenths digit to 1 and set to Not Using Input Contacts **CCWL** and **CWL**.
7	ENTER		Press and hold the ENTER Key for 2 seconds until -SET- appears, indicating the current set value has been saved and after the -SET- appears once, jumps back to the current parameter item selection screen immediately.

After the setting is completed, please re-start the power supply. If there are still other error alarms that indicate the Driver cannot be operated properly, the user needs to resolve the fault in accordance with the【9-2 Countermeasures to Clear Error, then operate the Driver again. If the error alarm message still cannot be cleared, please contact the local dealer to provide further assistance for handling.

4. Release Mechanical Brake:

When using the Servo Motor with Mechanical Brake, please first complete the + 24V wiring to release the mechanical brake. If the brake is not released properly, the Trial Run will be abnormal.

5. Servo Driver Panel Operations:

Use the Servo Driver panel to operate **JOG** operations to confirm whether or not the Servo Motor speed and direction are correct. If the operating speed and direction are abnormal, please confirm whether or not the Speed Control Parameter **Sn201** (internal Speed Command 1) and System Parameter **Cn004** (Motor Rotation Direction Definition) are set correctly. **JOG** Operating Instructions are as follows:

Attention

- **The JOG Speed operates in accordance with Sn201 (Internal Speed Command 1), therefore, set Sn201 before executing this function.**
- **Regardless of whether or not the Motor uses the Input Contact SON to generate excitation, the Motor will be excited immediately after entering the JOG Mode.**

Steps	Operation Key	LED Display Screen after Operation	Description
1	Turn on Power		When the power is turned on, Enter the **Status Display Screen**.
2	MODE		Press MODE Key 2 times to enter **Diagnostic Parameters**.
3	▲		Press UP Key 4 times to select **dn-05** Item.
4	ENTER		Press and hold the ENTER Key for 2 seconds to enter **JOG Mode**, and the Motor is excited immediately.
5	▲		Press and hold the UP Key, the Motor rotates in the currently defined positive direction.
6	▼		Press and hold the DOWN Key, the Motor rotates in the currently defined negative direction.
7	MODE		Press the MODE Key 1 time, to jump back to the Parameter Selection Screen, and the Motor will release excitation immediately. .

4-2 Non-load Servo Motor with Supervisory Controller Trial Run

This Stage of the Trial Run can determine whether or not the Control Signal Wiring between the Servo Driver and the Supervisory Controller is correct and whether or not the control signal electric potential is correct. After completing this stage of the Trial Run, the Servo Motor can be connected to the mechanism.

A. Start Servo Motor:

Please refer to the following to conduct wiring

Speed Control (**Cn001=1**)	Position Control (**Cn001=2**)
Servo Driver Servo Motor	Servo Driver Servo Motor

a. Confirm that there is No Command Signal Input:

In the Speed Control Mode, please input 0V to the Speed Analog Input Contact.

In the Position Control Mode, please short the External Pulse Command Contact, short Pulse and /Pulse, short Sign and /Sign.

b. Start the Servo ON Signal:

Connect the Servo Start Contact **(SON)** to the Low Electric Potential and start the Servo Motor to observe whether or not there is any error signal generated. If there is still an Error Alarm, the user needs to resolve the alarm conditions in accordance with【9-2 Countermeasures to Clear Error】

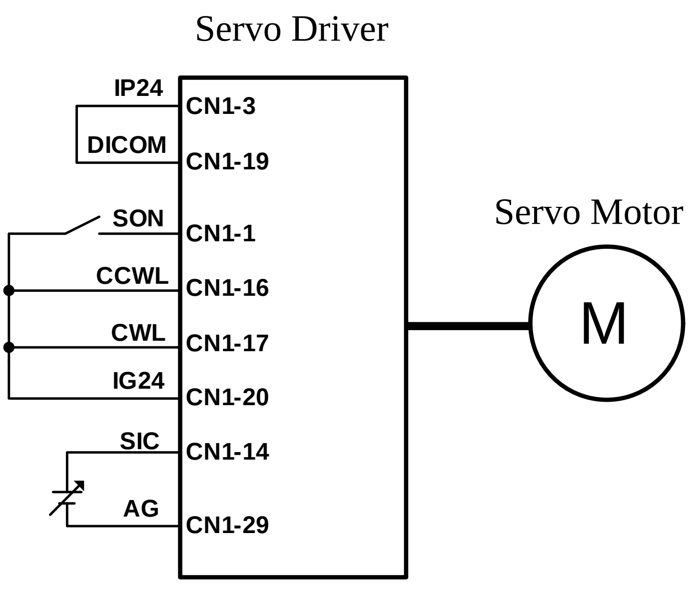
⚠ Attention

- **Please input the Torque Command / Speed Command / Position Command after the Servo Start Contact (SON) Signal is in operation to control the Motor Start or Stop operation!**
- **Please do not use the Servo Start Contact (SON) signal to control the start or stop operation of the motor in the situation of the Torque Command / Speed Command / Position Command has been input! This may cause damage to the internal components of the Driver!**

B. Speed Control Mode Trial Run (Cn001-1):

1. Check the Wiring:

Confirm whether or not the Servo Driver Power Supply and the Control Signal Wiring are correct, and confirm whether or not the Speed Analog Signal Input is 0V. The Wiring Diagram is as follows



2. Start Servo Motor:

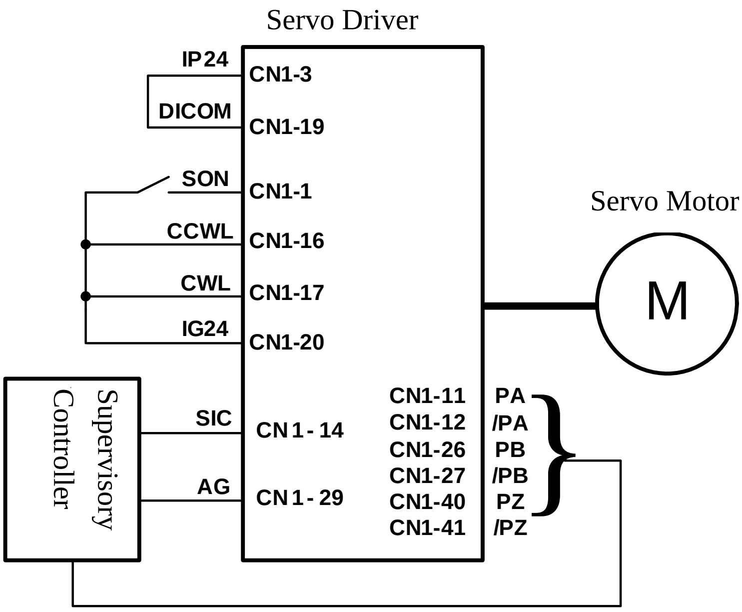
Connect the Servo Start Contact **(SON)** to the Low Electric Potential to start the Servo Motor, if the Servo Motor rotates slowly, please execute **dn-07** Automatic Adjustment / Revision of Analog Command Offset, please refer to【3-2-2 Diagnostic Function Description】.

3. **Confirm the relationship between the Motor Speed and Speed Analog Command Input:**

Gradually increase the Speed Analog Command Voltage, monitor the Motor Actual Speed through the Status Parameter **Un-01**, observe whether or not the Analog Speed Command Proportioner **Sn216**, the analog speed command limit **Sn218** are correct, and confirm whether or not the Motor Rotation Direction is correct, if the Rotation Direction is incorrect, please adjust the System Parameter **Cn004**. After completing the setting, connect the Servo Start Contact **(SON)** to the High Electric Potential and turn off the Servo Motor.

4. **Complete the Wiring with Supervisory Controller:**

Confirm the wiring of Servo Driver and Supervisory Controller, Speed Analog Signal Input **(SIC)**, Division Ratio Output **(PA, /PA, PB, /PB, PZ, /PZ)** and alarm signals. The Wiring Diagram is as follows



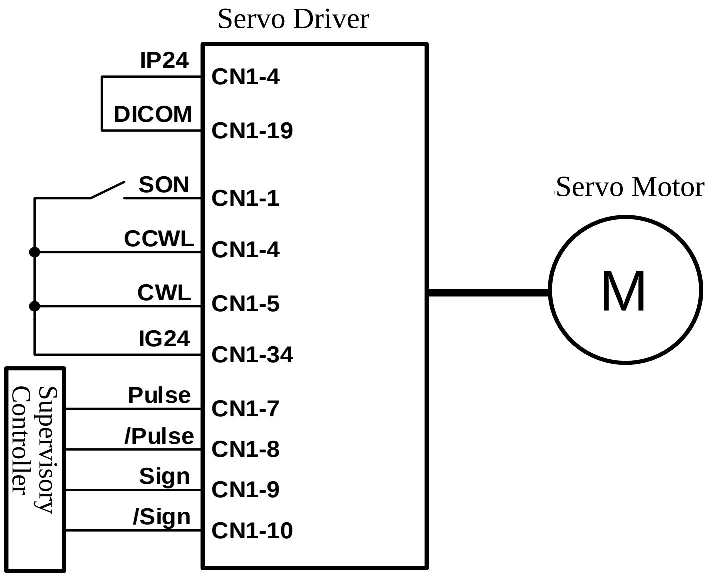
5. **Confirm the Servo Motor Number of Revolutions and Dividing Output:**

Start the Servo Motor, the Supervisory Controller issues Servo Motor Number of Rotations Command, and monitor the motor number of rotations with the Status Parameter **Un-16**, to check whether or not both are the same. If different, please confirm whether or not the System Parameter Encoder Signal Dividing Output **Cn005** is correct. After completing the setting, connect the Servo Start Contact **(SON)** to the High Electric Potential and turn off the Servo Motor.

C. Position Control Mode Trial Run (Cn001=2):

1. Check the Wiring:

Confirm whether or not the Servo Driver Power Supply and the Control Signal Wiring are correct. The Wiring Diagram is as follows



2. Set the Electronic Gear Ratio:

Please set the required Position Control Parameter Electronic Gear Ratio **Pn302~Pn306 or Single-turn Pulse Command Function Pn354** in accordance with the Servo Motor Encoder Specifications and Machine Application Specifications. Please refer to 【5-4-3 Electronic Gear Ratio】.

3. Start Servo Motor:

Connect the Servo Start Contact (**SON**) to the low electric potential to start the Servo Motor.

4. Confirm the Motor Rotation Direction, Speed and Number of Rotations:

The Supervisory Controller outputs Low-speed Pulse Command to allow the Servo Motor operates at low speed, comparing the Status Parameter **Un-14** Motor Feedback Number of Pulses and Status Parameter **Un-18** Number of Pulse Commands. Then, issue the Number of Rotations Command, comparing the Status Parameter **Un-16** Motor Feedback Number of Rotations and Status Parameter **UN-20** Pulse Command Number of Rotations. If the actual Motor Feedback is found to be incorrect, please adjust the Position Control Parameter Electronic Gear Ratio **Pn302~Pn306**. Please confirm repeatedly until it is correct.

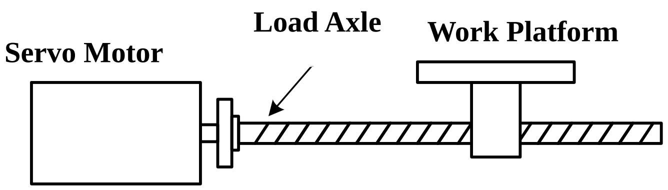
If the motor rotation direction is not correct, please confirm the Position Control Parameter Pulse Command Form selection **Pn301.0** and the Command Direction Definition **Pn314**. After completing the setting, connect the Servo Start Contact **(SON)** to the High Electric Potential and turn off the Servo Motor.

4-3 Connect the Load Servo Motor with Supervisory Controller Trial Run

⚠ Attention
Please connect the load trial run in accordance with the following steps accurately. The Servo Motor operates under the condition of connecting to a machine, if the setting is incorrect, the machine may be damaged or the personnel may be injured.

Before implementing this stage of the trial run, please re-confirm the following:

- Please set the Servo Driver related parameters in accordance with the requirements of the Supervisory Controller and the Machine Operations.
- Check whether or not the Servo Motor rotation direction and speed setting conform to the requirements of the machine.



1. **Make sure the Servo Driver Power is OFF**
2. **Connect Servo Motor and Load Axle:**

   Please refer to 【1-5 Servo Motor Installation Environment Conditions and Methods】for Servo Motor Installation Pre-cautions,
3. **Servo Driver Gain Adjustment:**

   Please refer to【6 Servo Gain Adjustment】 to adjust Servo Gain in accordance with the Load Mechanism.
4. **Supervisory Controller Trial Run:**

The Command is issued by the Supervisory Controller, please observe the movement status in accordance with the Operating Command described in 【**4-2** Non-load Servo Motor with Supervisory Controller Trial Run】. Conduct adjustment in coordination with the Controller.

5. **Repeat the Adjustment and Record the Setting Value:**

   Repeat Steps 3 and 4 until the machine operations conform to the requirements. Record the setting value accurately for the use of future machine maintenance.

Chap 5 Control Functions

5-1 Control Mode Selection

This Device provides control modes for Torque, Speed, External Position, Internal Position and Tool Magazine Automatic Tool Selection , in addition to operating single mode, it can also use mixed modes to switch to the control mode. Following is the description of the Control Mode Parameter Selection

Cn001 Control Mode Selection

Initial Value	Unit	Setting Range	Effective	RS-485 Address
2	--	0-A	Power Re-set	0001H

Setting Description:

Setting	Description
0	Torque Control
1	Speed Control
2	External Position Control (External Pulse Command)
3	External Position / Speed Control Switching
4	Speed / Torque Control Switching
5	External Position / Torque Control Switching
6	Internal Position Control (Internal Position Command)
7	Internal Position / Speed Control Switching
8	Internal Position / Torque Control Switching
9	CNC Tool Magazine Automatic Tool Selection Control
A	Internal / External Position Switching

5-2 Torque Mode

The Torque Mode is used for printing presses, winding machines and injection molding machines that need to perform Torque Control. The user shall set **Cn001** (Control Mode Selection) in accordance with the mode to be used. The setting method is as follows:

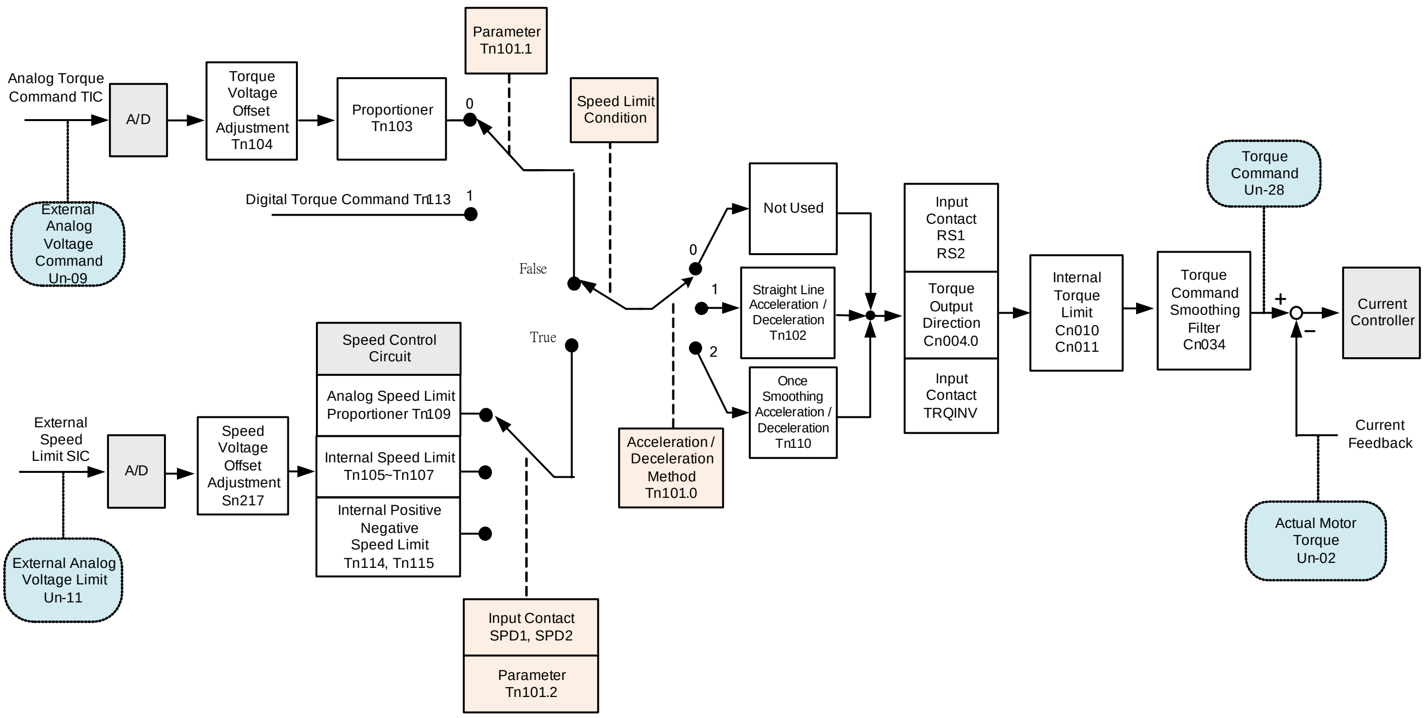
Cn001 Control Mode Selection

Initial Value	Unit	Setting Range	Effective	RS-485 Address
2	--	0-D	Power Re-set	0001H

Setting Description:

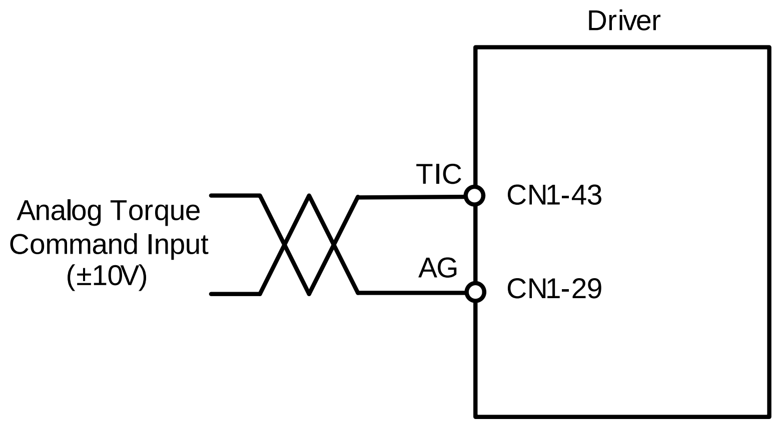
Setting	Description
0	Torque Control
4	Speed / Torque Control Switching
5	External Position / Torque Control Switching
8	Internal Position / Torque Control Switching

Torque Circuit Control Block is as shown in the Figure below:



5-2-1 Analog Torque Command

Use a set of analog voltages to control the Motor Torque. The following Figure is the wiring diagram:



Adjust the slope of the Voltage Command relative to the Torque Command in coordination with the Analog Torque Command Proportioner Tn103.

Attention! It is necessary to confirm the corresponding relationship between TIC (Analog Torque Command Input) and Input Contacts RS1, RS2 (Torque Command Forward and Reverse Selection), refer to [5-2-6 Torque Output Direction Definition].

Tn101.1 Analog and Digital Torque Command Selection

Initial Value	Unit	Setting Range	Effective	RS-485
0	--	0-1	Effective after Set	0101H

Setting Description: When using the Analog Torque Command, please set Tn101.1 = 0

Setting	Description
0	Use Analog TIC Torque Command
1	Use Digital Tn113 Torque Command

Tn103 Analog Torque Command Proportioner

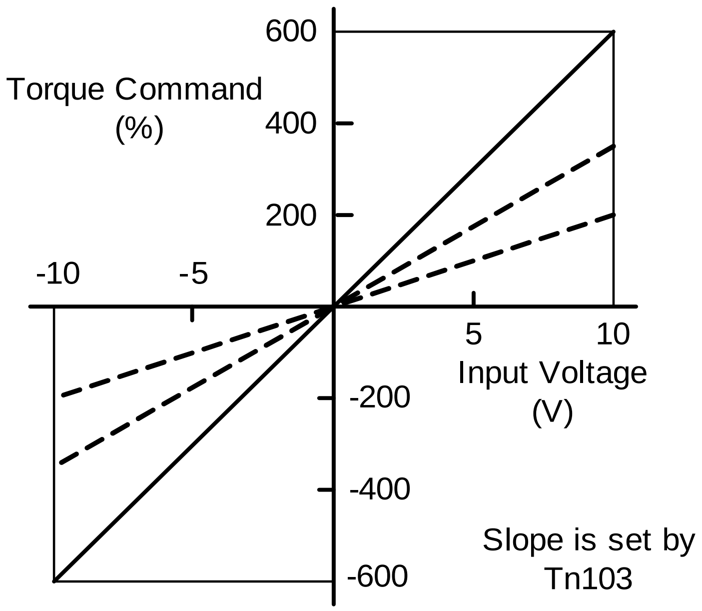
Initial Value	Unit	Setting Range	Effective	RS-485
300	%/10V	0-600	Effective after Set	0103H

Setting Description: Used to adjust the slope of the Voltage Command relative to the Torque Command.

Setting Example:

(1) If **Tn103** is set to 300, indicating that the Input Voltage 10V corresponds to the 300% rated Torque Command; if the Input Voltage is 5V at this time, then it corresponds to the 150% rated Torque Command.

(2) If **Tn103** is set to 200, indicating that the Input Voltage 10V corresponds to the 200% rated Torque Command; if the Input Voltage is 5V at this time, then it corresponds to the 100% rated Torque Command.



5-2-2 Analog Speed Limit Proportioner

Tn109 Analog Speed Limit Proportioner

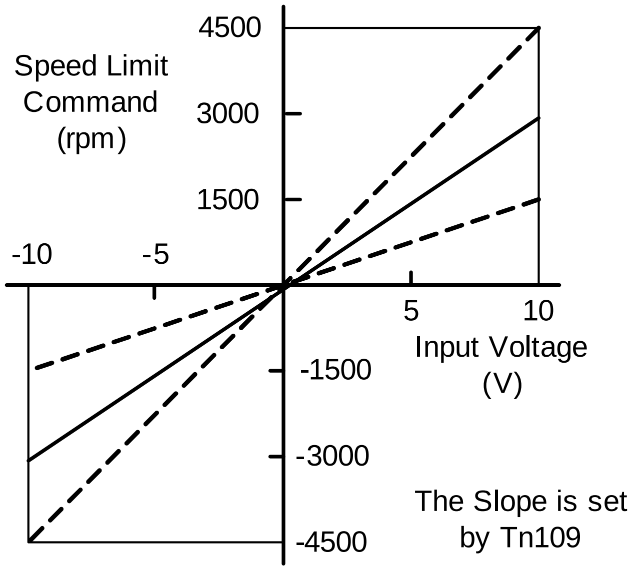
Initial Value	Unit	Setting Range	Effective	RS-485 Address
Rated Speed	rpm	100-2*Rated Speed	Effective after Set	0109H

Setting Description: Used to adjust the slope of the Voltage Command relative to the Speed Limit.

Setting Example:

(1) If **Tn103** is set to 3000, indicating that the Input Voltage 10V corresponds to Speed Limit at 3000 rpm; if the Input Voltage is 5V at this time, then it corresponds to the Speed Limit at 1500 rpm.

(2) If **Tn103** is set to 2000, indicating that the Input Voltage 10V corresponds to Speed Limit at 2000 rpm; if the Input Voltage is 5V at this time, then it corresponds to the Speed Limit at 1000 rpm.



5-2-3 Analog Torque Command Offset Adjustment

Even if the Torque Command is 0V, the Motor may rotate slowly, mainly due to a slight offset of External Analog Voltage, in this case, the user can manually adjust the **Tn104** to correct the offset or use **dn-07** to automatically adjust the offset. Please refer to [3-2-2 Diagnostic Function Description].

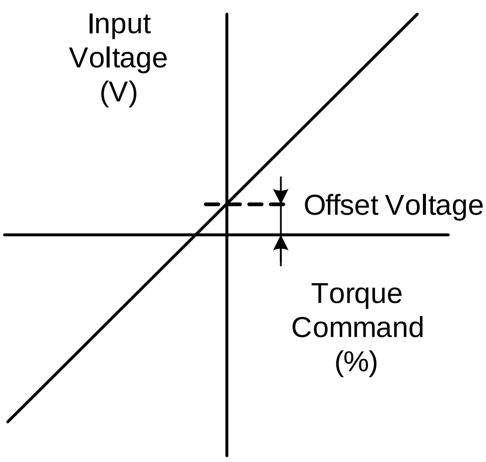
Attention! Please short the Analog Speed Command Contact SIC (CN1-14) and the Analog Grounding Contact AG (CN1-29) before adjustment.

Tn104 Analog Torque Command Offset Adjustment

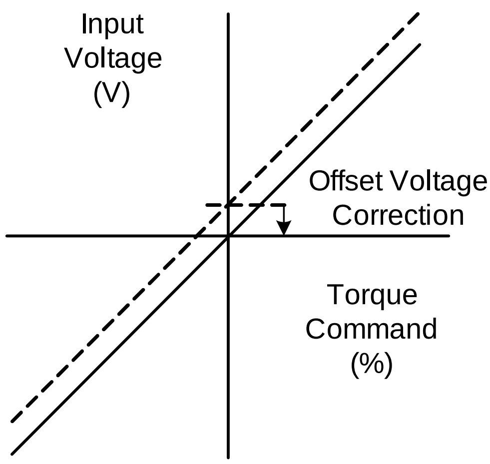
Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	mV	-2500-2500	Effective after Set	0104H

Setting Description: Used to correct offset when the Analog Torque Command Voltage generated offset phenomenon.

Before Offset Adjustment



After Offset Adjustment



5-2-4 Digital Torque Command

Tn101.1 Analog and Digital Torque Command Selection

Initial Value	Unit	Setting Range	Effective	RS-485
0	--	0-1	Effective after Set	0101H

Setting Description: When using Digital Torque Command, please set Tn101.1=1

Setting	Description
0	Use Analog TIC Torque Command
1	Use Digital Tn113 Torque Command

Tn113 Digital Torque Command Value

Initial Value	Unit	Setting Range	Effective	RS-485
0	0.1%	-3000-3000	Effective after Set	010DH

Setting Description: Set Tn101.1=1 to activate Digital Torque Command Functions.

5-2-5 Torque Command Linear Acceleration / Deceleration

If User needs a Smooth Torque Command, **set Tn101.0 to activate the function first.**

Tn101.0 Torque Command Acceleration / Deceleration Method

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0-2	Effective after Set	0101H

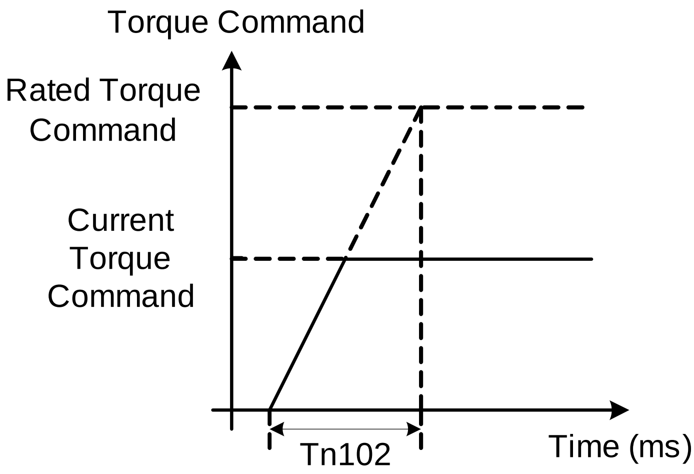
Setting Description:

Setting	Description
0	Do not use Torque Command Linear Acceleration / Deceleration Function
1	Use Torque Command Linear Acceleration / Deceleration Function
2	Use Torque Command One Time Smoothing Acceleration / Deceleration Function

Tn102 Torque Command Linear Acceleration / Deceleration Constant

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1	msec	1-50000	Re-start Power	0102H

Setting Description: The Torque Command Linear Acceleration/Deceleration Constant is defined as the time for the Torque Command to rise from zero linearly to the Rated Torque.



Setting Example:

(1) To reach 50% of Rated Torque output in 10msec, then

$$Tn102 = 10(\text{msec}) \times \frac{100\%}{50\%} = 20(\text{msec})$$

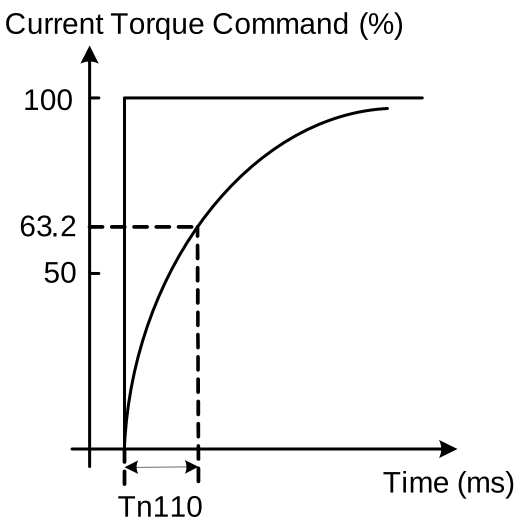
(2) To reach 75% of Rated Torque output in 10msec, then

$$Tn102 = 10(\text{msec}) \times \frac{100\%}{75\%} = 13(\text{msec})$$

Tn110 Torque Command One Time Smoothing Acceleration / Deceleration Constant

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1	msec	1-10000	Effective after Set	010AH

Setting Description: Set Tn101 = 2 to activate the Torque Command One Time Smoothing Acceleration / Deceleration Function. Torque Command One Time Smoothing Acceleration / Deceleration Time Constant is defined as the time for the Torque one time delayed rise from 0% to 63.2% of the current Torque Command.



5-2-6 Torque Output Direction Definition

In the torque mode, the user can use the following three methods to define the Motor Rotation Direction:

(1) Input Contacts **RS1**, **RS2** (Forward and Reverse Selection of Torque Command)

(2) **Cn004.0** (Motor Rotation Direction Definition)

(3) Input Contact **TRQINV** (Reverse of Torque Command)

Attention! The three methods can be used at the same time. The user must confirm the definition of the final Motor Rotation Direction to avoid confusion.

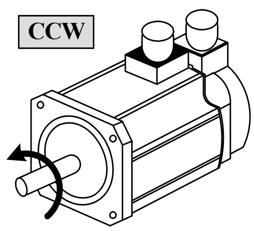
(1) Input Contacts RS1, RS2 (Forward and Reverse selection of Torque Command)

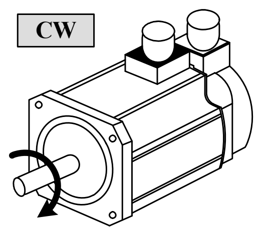
Input Contact		Description	Control Mode
RS2	RS1		
0 (Switch Open)	0 (Switch Open)	No Torque generated	T
0 (Switch in Conduction)	1 (Switch in Conduction)	Rotate in accordance with the current Torque Command Direction	
1 (Switch Open)	0 (Switch Open)	Reverse rotation in accordance with the current Torque Command Direction	
1 (Switch in Conduction)	1 (Switch in Conduction)	No Torque generated	

(2) Cn004.0 Motor Rotation Direction Definition (from the Motor Load End)

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0-3	Effective after Set	0004H

Setting Description: When the Torque or Speed Command is positive, the Rotation Direction Setting from the Motor Load End is as follows





Setting	Description	
	Torque Control	Speed Control
0	Counterclockwise Rotation (CCW)	Counterclockwise Rotation (CCW)
1	Clockwise Rotation (CW)	Counterclockwise Rotation (CCW)
2	Counterclockwise Rotation (CCW)	Clockwise Rotation (CW)
3	Clockwise Rotation (CW)	Clockwise Rotation (CW)

(3) Input Contact TRQINV (Reverse of Torque Command)

Input Contact TRQINV	Description	Control Mode
0 (Switch in Conduction)	Rotate in accordance with the current Torque Command Direction	T
1 (Switch Open)	Reverse rotation in accordance with the current Torque Command Direction	

Note) High Electric Potential Operation or Low Electric Potential Operation, please set in reference to [5-5-1 Input / Output Contact Function Planning].

5-2-7 Internal Torque Limit Setting

In Torque Control, the user can set the Internal Torque Limit value based on the requirements, setting is as follows:

Cn010 CCW Direction Torque Command Limit Value

Initial Value	Unit	Setting Range	Effective	RS-485 Address
200 ~ 300 Note)	%	0-300	Effective after Set	000BH

Setting Description: To limit the Torque Command of CCW direction with two times the Rated Torque, set **Cn010**=200.

Cn011 CW Direction Torque Command Limit Value

Initial Value	Unit	Setting Range	Effective	RS-485 Address
-300 ~ -200 Note)	%	-300-0	Effective after Set	000CH

Setting Description: To limit the Torque Command of CW direction with two times the Rated Torque, set **Cn011**=-200.

Note) The parameters **Cn010/Cn011** have different default values for each Driver model.

5-2-8 Speed Limit of Torque Mode

In Torque Control, the Motor Speed Limit is achieved by using parameter **Tn101.2**, Input Contact **SPD1**, **SPD2** Switching:

Tn101.2	Input Contact SPD2	Input Contact SPD1	Forward Speed Limit	Reverse Speed Limit
0	0 (Switch does not operate)	0 (Switch does not operate)	External Analog Command SIC(CN1-14)	
0	0 (Switch does not operate)	1 (Switch operates)	Internal Speed Limit 1 (Tn105)	
0	1 (Switch operates)	0 (Switch does not operate)	Internal Speed Limit 2 (Tn106)	
0	1 (Switch operates)	1 (Switch operates)	Internal Speed Limit 3 (Tn107)	
1	-	-	Forward Rotation Speed Limit Value (Tn114)	Reverse Rotation Speed Limit Value (Tn115)

Note) High Electric Potential Operation or Low Electric Potential Operation, please set in reference to [5-5-1 Input / Output Contact Function Planning].

Tn105 Internal Speed Limit 1

Initial Value	Unit	Setting Range	Effective	RS-485 Address
100	rpm	0-1.5*Rated Speed	Effective after Set	0105H

Tn106 Internal Speed Limit 2

Initial Value	Unit	Setting Range	Effective	RS-485 Address
200	rpm	0-1.5*Rated Speed	Effective after Set	0106H

Tn107 Internal Speed Limit 3

Initial Value	Unit	Setting Range	Effective	RS-485 Address
300	rpm	0-1.5*Rated Speed	Effective after Set	0107H

Setting Description: In Torque Control, the Input Contact SPD1, SPD2 can be used to switch 3 sets of Internal Speed Limit when set Tn101.2=0.

Tn114 Internal Forward Rotation Speed Limit

Initial Value	Unit	Setting Range	Effective	RS-485 Address
100	rpm	0-1.5*Rated Speed	Effective after Set	010EH

Setting Description: Set Tn101.2=1, set the Forward Speed Limit value in Torque Mode with this parameter.

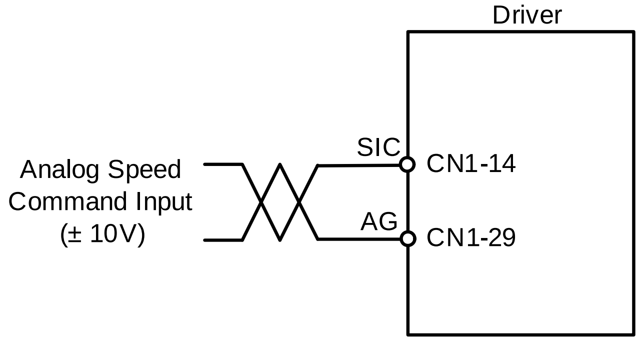
TECO

Tn115 Internal Reverse Rotation Speed Limit

Initial Value	Unit	Setting Range	Effective	RS-485 Address
100	rpm	0-1.5*Rated Speed	Effective after Set	010FH

Setting Description: Set Tn101.2=1, set the Reverse Speed Limit value in Torque Mode with this parameter.

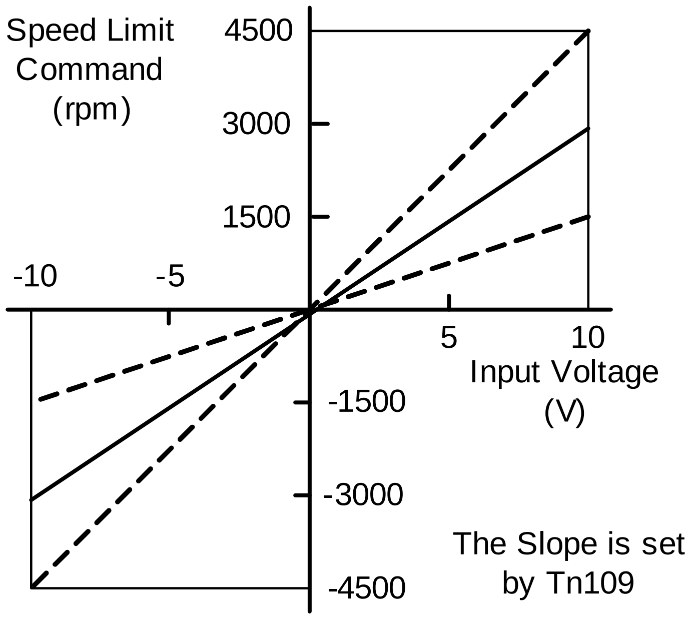
The following figure is External Analog Speed Limit Command Wiring Diagram:



Tn109 Analog Speed Limit Proportioner

Initial Value	Unit	Setting Range	Effective	RS-485 Address
Rated Speed	rpm	100-2*Rated Speed	Effective after Set	0109H

Setting Description: Used to adjust the slope of Voltage Command relative to the Speed Limit Command



5-2-9 Other Torque Control Functions

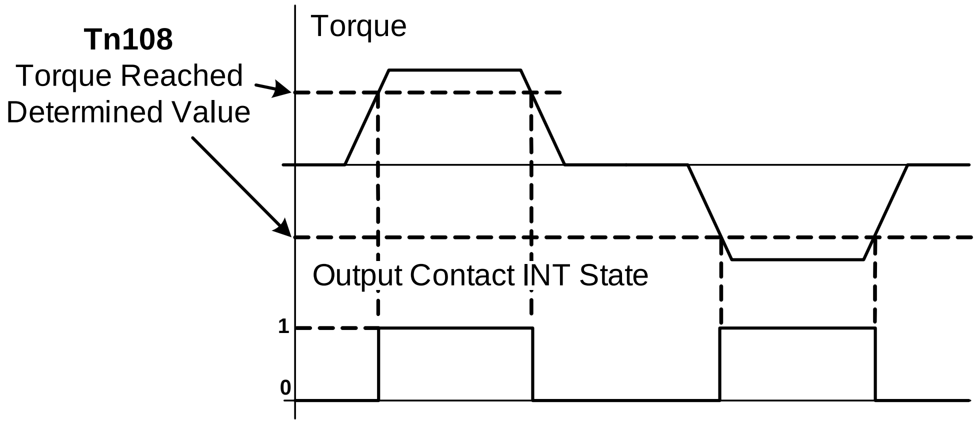
Torque Reached Function

When the Forward or Reverse Torque exceeds the Level set by **Tn108** (Torque Reached Determined Value), the Output Contact **INT** operates as described below:

Tn108 Torque Reached Determined Value

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	%	0-300	Effective after Set	0108H

Setting Description: When the Forward or Reverse Torque exceeds the set level, the Output Contact INT operates.



Torque Command Smoothing Filter

When the system generates sharp vibration noise, **Cn034** (Torque Command Smoothing Filter) can be adjusted to suppress the vibration noise, adding this filter will delay the Servo System Response Speed at the same time.

Cn034 Torque Command Smoothing Filter

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	Hz	0-5000	Effective after Set	0025H

Setting Description: When the system generates a sharp vibration noise, this parameter can be adjusted to suppress the vibration noise, adding this filter will also delay the response speed of the Servo System.

5-3 Speed Mode

Speed Mode is used in situations where precise speed control is required, such as Braiding Machines, Drilling Machines, and CNC Machines. The user shall set **Cn001** (Control Mode Selection) in accordance with the mode to be used. The setting method is as follows:

Cn001 Control Mode Selection

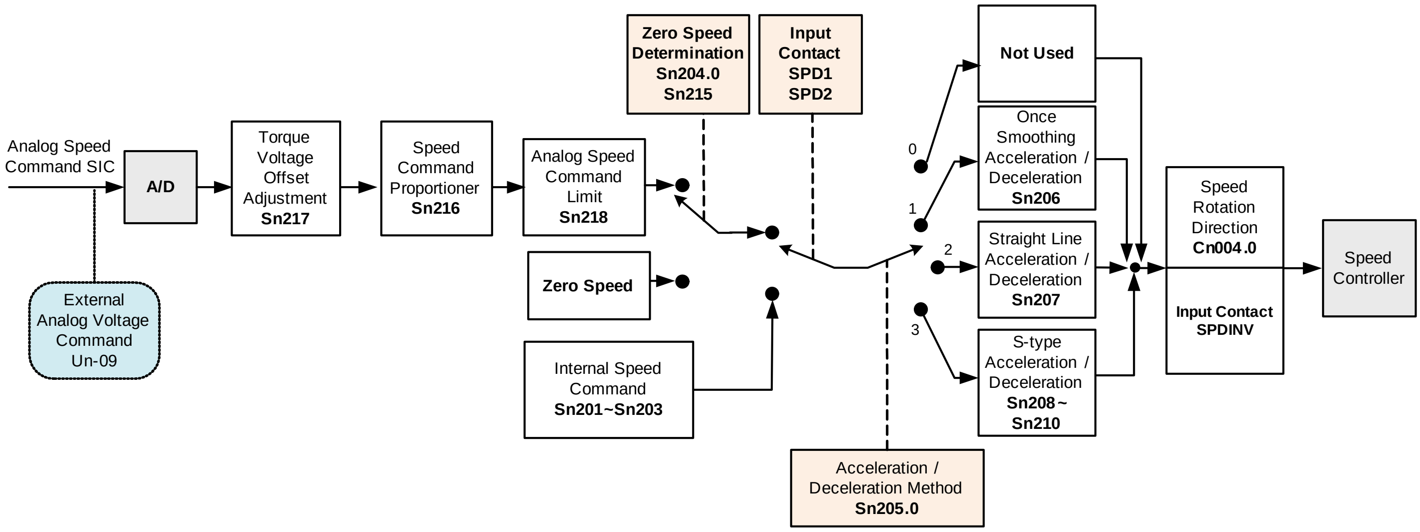
Initial Value	Unit	Setting Range	Effective	RS-485 Address
2	--	0-D	Power Re-set	0001H

Setting Description:

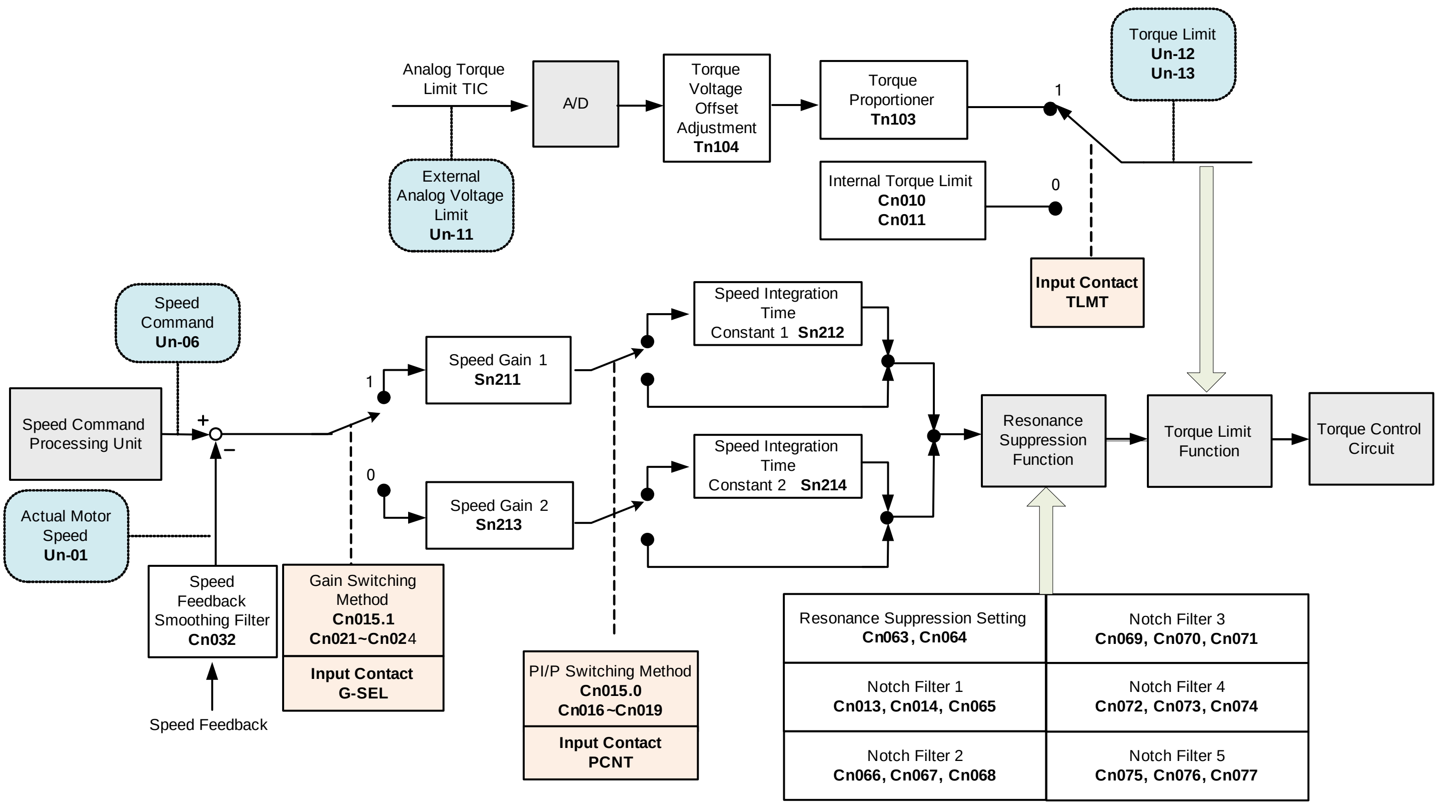
Setting	Description
1	Speed Control
3	External Position / Speed Control Switching
4	Speed / Torque Control Switching
7	Internal Position / Speed Control Switching

The Speed Loop Control Block Diagram is shown in the following two Figures; detailed functions of each block are described in the following Sections.

Speed Command Processing Unit



Speed Controller



5-3-1 Select Speed Command

The Device provides two Input Command Methods, which are achieved by switching Input Contact Points **SPD1**, **SPD2** in the two following methods:

(1) Internal Speed Command: Internal pre-set three-stage Speed Command.

(2) External Analog Command: Use a set of Analog Voltage Command signals input to **SIC (CN1-14)** to control speed.

Please refer to the Table below:

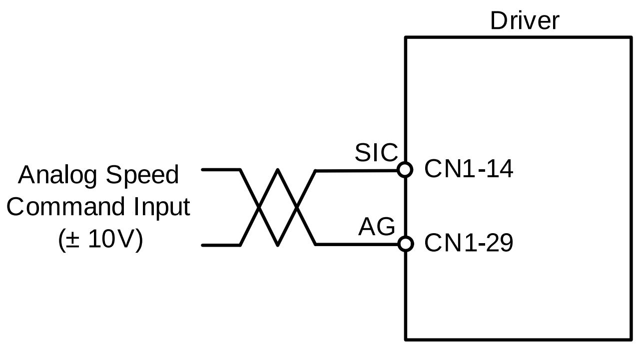
Input Contact	Input Contact	Speed Command	Control Mode
0 (Switch does not operate)	0 (Switch does not operate)	External Analog Command **SIC(CN1-14)**	S
0 (Switch does not operate)	1 (Switch operates)	Internal Speed Command 1 **Sn201**	
1 (Switch operates)	0 (Switch does not operate)	Internal Speed Command 2 **Sn202**	
1 (Switch operates)	1 (Switch operates)	Internal Speed Command 3 **Sn203**	

Note) High Electric Potential Operation or Low Electric Potential Operation, please set in reference to [5-5-1 Input / Output Contact Function Planning].

(1) Internal Speed Command: Internal three-stage Speed Command setting is as follows:

Parameter Code	Name and Function	Default Value	Unit	Setting Range	Control Mode
Sn201	Internal Speed Command 1	100	rpm	-1.5*Rated Speed~1.5*Rated Speed	S
Sn202	Internal Speed Command 2	200			
Sn203	Internal Speed Command 3	300			

(2) External Analog Command: The following Figure is the External Analog Speed Command Wiring Diagram:



5-3-2 Analog Speed Command Proportioner

Adjust the slope of Voltage Command relative to the Speed Command in coordination with the Analog Speed Command Proportioner.

Sn216 Analog Speed Command Proportioner

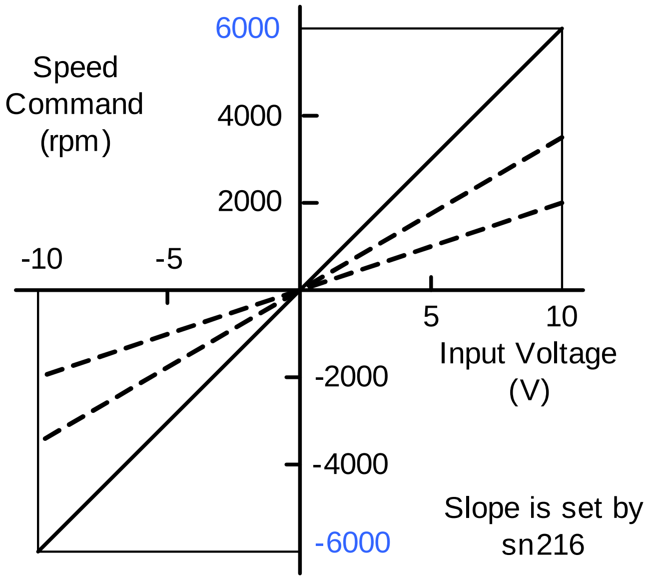
Initial Value	Unit	Setting Range	Effective	RS-485 Address
Rated Speed	rpm/10V	100-2*Rated Speed	Effective after Set	0210H

Setting Description: Used to adjust the slope of Voltage Command relative to the Speed Command.

Setting Example:

(1) If **Sn216** is set to 3000, indicating the Input Voltage 10V corresponds to 3000rpm Speed Command; if the Input Voltage is 5V at this time, then it corresponds to 1500rpm Speed Command.

(2) If **Sn216** is set to 2000, indicating the Input Voltage 10V corresponds to 2000rpm Speed Command; if the Input Voltage is 5V at this time, then it corresponds to 1000rpm Speed Command.



Note: The displayed speed needs to be determined according to the different motors.

5-3-3 Analog Speed Command Offset Adjustment

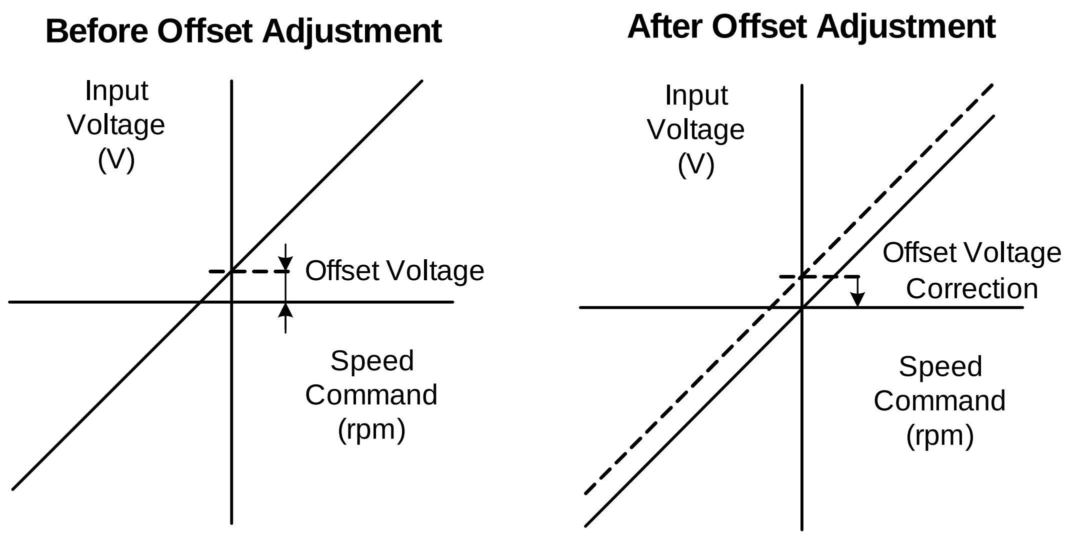
Even if the Analog Speed Command is 0V, the Motor may rotate slowly, mainly caused by the minor Offset of External Analog Voltage, in this case, the user can manually adjust the **Sn217** to correct the offset, or use Automatic Adjustment. Please refer to [3-3 Diagnostic Function Description].

Attention! Please short the Analog Speed Command Contact SIC (CN1-14) and the Analog Grounding Contact AG (CN1-29) before adjustment.

Sn217 Zero Analog Speed Command Offset Adjustment

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	mv	-2500-2500	Effective after Set	0211H

Setting Description: Used to correct offset when the Analog Speed Command Voltage generates the offset phenomenon.



5-3-4 Analog Speed Command Limit

The user can limit the Analog Speed Command, setting is as follows:

Sn218 Analog Speed Command Limit

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1.02* Rated Speed	rpm	100-1.5* Rated Speed	Effective after Set	0212H

Setting Description: The user can set Sn218 to limit the Maximum Speed of the Analog Input.

5-3-5 Speed Command Smoothing

If the Motor overshoots or vibrates due to a sharp change in the Input Command, this Driver can be used to provide three Speed Command Smoothing operations, and the user can decide which smoothing operation to use based on the requirements. **If one of these functions is to be used, Sn205.0 needs to be set up to activate each function.**

Sn205.0 Speed Command Acceleration / Deceleration Method

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	X	0-3	Effective after Set	0205H

Setting Description:

Setting	Description
0	Do not use Speed Command Acceleration / Deceleration Function
1	Use the Speed Command One Time Smoothing Acceleration / Deceleration Function
2	Use the Speed Command Linear Smoothing Acceleration / Deceleration Function
3	Use S-type Speed Command One Time Smoothing Acceleration / Deceleration Function

The following explains three Speed Command Smoothing operations.

(1) Speed Command One Time Smoothing Acceleration / Deceleration:

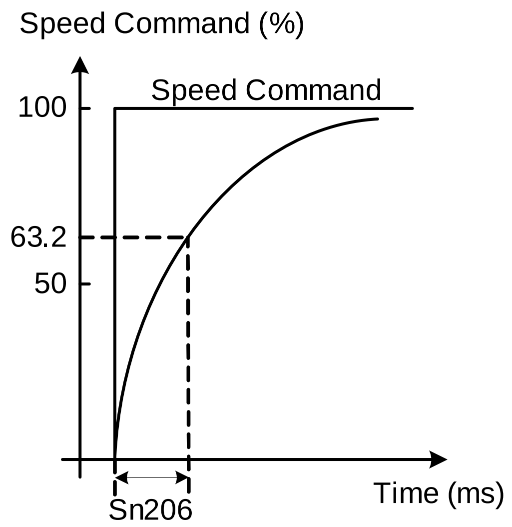
To use this function, **Sn205.0=1** must be set to activate Speed Command One time Smoothing Acceleration / Deceleration Function.

Sn206 Speed Command One Time Smoothing Acceleration / Deceleration Time Constant

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1	msec	1-10000	Effective after Set	0206H

Setting Description: Set Sn205.0=1 to activate Speed Command One time Smoothing Acceleration / Deceleration Function. The definition of Speed Command One Time Smoothing Acceleration / Deceleration Time Constant is the time for the Speed one time delayed rise from Zero Speed to 63.2% of the Speed Command.

The definition of Speed Command One Time Smoothing Acceleration / Deceleration Time Constant is the time for the Speed one time delayed rise from Zero Speed to 63.2% of the Speed Command, the schematic diagram is as follows:



Setting Example:

(1) To reach 95% of Speed Command output in 30msec, then

$$Sn206 = \frac{30(\text{msec})}{-\ln(1-95\%)} = 10(\text{msec})$$

(2) To reach 75% of Speed Command output in 30msec, then

$$Sn206 = \frac{30(\text{msec})}{-\ln(1-75\%)} = 22(\text{msec})$$

Note) ln(x) is the Natural Logarithm Operation symbol

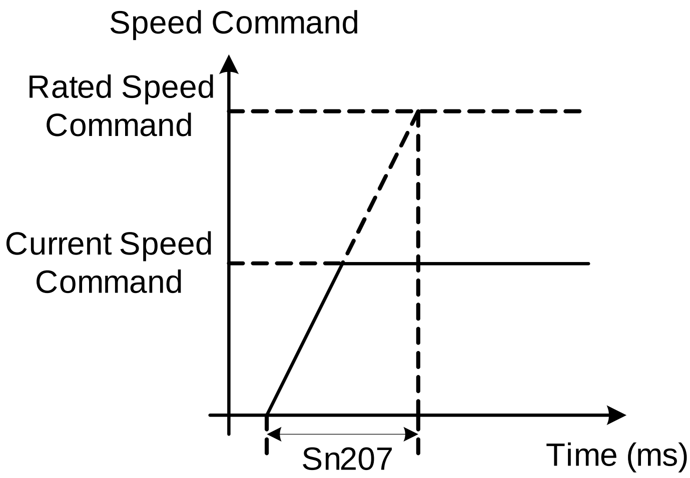
(2) Speed Command Linear Acceleration / Deceleration Function:

To use this function, **Sn205.0=2** must be set to activate Speed Command Linear Acceleration / Deceleration Function.

Sn207 Speed Command One Time Smoothing Acceleration / Deceleration Time Constant

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1	msec	1-50000	Effective after Set	0207H

Setting Description: Set Sn205.0=2 to activate Speed Command Linear Acceleration / Deceleration Function. The definition of Speed Command Linear Acceleration / Deceleration Time Constant is the time of Speed from zero linear rises to Rated Speed. The definition of Speed Command Linear Acceleration / Deceleration Time Constant is the time of Speed from zero linear to rise to Rated Speed, the schematic diagram is as follows:



Setting Example:

(1) To reach 50% of Rated Speed output in 10msec, then

$$Sn207 = 10(\text{msec}) \times \frac{100\%}{50\%} = 20(\text{msec})$$

(2) To reach 75% of Rated Speed output in 10msec, then

$$Sn207 = 10(\text{msec}) \times \frac{100\%}{75\%} = 13(\text{msec})$$

(3) S-type Speed Command Acceleration / Deceleration:

To use this function, **Sn205.0=3** must be set to activate S-type Speed Command Acceleration / Deceleration Function.

Sn208 S-type Speed Command Acceleration / Deceleration Time Setting

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1	msec	1-1000	Effective after Set	0208H

Setting Description: Set Sn205.0=3 to activate S-type Speed Command Acceleration / Deceleration Function. During Acceleration / Deceleration, due to the severe Acceleration / Deceleration Changes when activating Stop that resulted in machine oscillation, adding S-type Acceleration / Deceleration to Speed Command can achieve the function of smooth operations.

Sn209 S-type Speed Command Acceleration Time Setting

Initial Value	Unit	Setting Range	Effective	RS-485 Address
200	msec	0-5000	Effective after Set	0209H

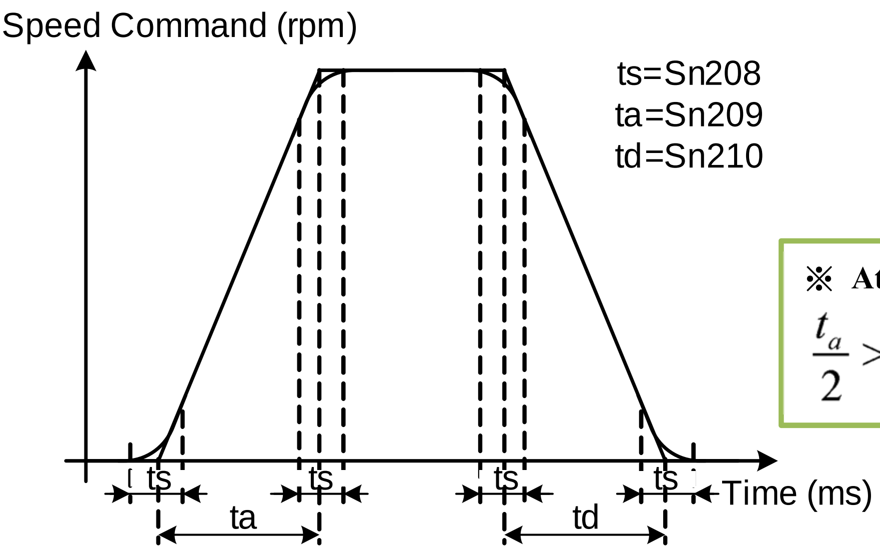
Setting Description: Please refer to Sn208 Description

Sn210 S -type Speed Command Deceleration Time Setting

Initial Value	Unit	Setting Range	Effective	RS-485 Address
200	msec	0-5000	Effective after Set	020AH

Setting Description: Please refer to Sn208 Description

During Acceleration / Deceleration, due to the severe Acceleration / Deceleration Changes when activating Stop that resulted in machine oscillation, adding S-type Acceleration / Deceleration to Speed Command can achieve the function of smooth operations.



※ Attention! Setting Rules:

$$\frac{t_a}{2} > t_s \quad \frac{t_d}{2} > t_s$$

TECO

5-3-6 Speed Rotation Direction Definition

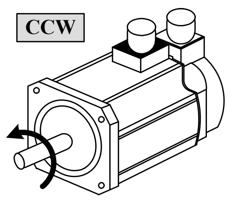
In speed mode, the user can use **Cn004.0** (Motor Rotation Direction Definition) and the Input Contact **SPDINV** to define the Motor Rotation Direction as described below: **Attention！ Both Methods can function simultaneously; the user shall confirm the final motor rotation direction definition to avoid confusion.**

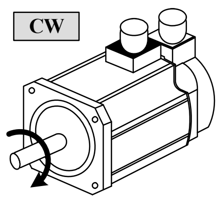
When the user can define the Speed Command as a positive value based on requirements, set the Motor Rotation Direction as follows:

(1) Cn004.0 Motor Rotation Direction Definition (from the Motor Load End)

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0-3	Effective after Set	0004H

Setting Description: When the Torque or Speed Command is positive, the Rotation Direction Setting from the Motor Load End is as follows





Setting	Description	
	Torque Control	Speed Control
0	Counterclockwise Rotation (CCW)	Counterclockwise Rotation (CCW)
1	Clockwise Rotation (CW)	Counterclockwise Rotation (CCW)
2	Counterclockwise Rotation (CCW)	Clockwise Rotation (CW)
3	Clockwise Rotation (CW)	Clockwise Rotation (CW)

(2) Input Contact SPDINV defines the Motor Rotation Direction

Input Contact SPDINV	Description	Control Mode
0 (**Switch does not operate)**	Rotation in accordance with the current Speed Command Direction	S
1 (**Switch operates)**	Reverse Rotation in accordance with the current Speed Command Direction	

Note) High Electric Potential Operation or Low Electric Potential Operation, please set in reference to [5-5-1 Input / Output Contact Function Planning].

5-3-7 Speed Loop Gain

The following are the parameters related to the Speed Control Loop; this Device provides two sets of Speed Controllers that can be used for the Gain Switching Function, please refer to [6-4 Gain Switching Function] to switch.

Sn211 Speed Loop Gain 1

Initial Value	Unit	Setting Range	Effective	RS-485 Address
40	Hz	2-1500	Effective after Set	020BH

Setting Description: The Speed Loop Gain directly determines the Response Bandwidth of the Speed Control Loop. Under the premise of the mechanical system does not generate vibration or noise, increasing the Speed Loop Gain value will speed up the Speed Response. If Cn025 (Load Inertia Ratio) is set correctly, the Speed Loop Bandwidth equals the Speed Loop Gain.

Sn212 Speed Loop Integration Time Constant 1

Initial Value	Unit	Setting Range	Effective	RS-485 Address
2000	x0.01msec	40-50000	Effective after Set	020CH

Setting Description: Adding integration components to the Speed Control Loop can effectively eliminate the speed steady-state error and quickly respond to subtle speed changes. In general, under the premise that the mechanical system does not generate vibration or noise, the speed loop integration time constant is reduced to increase the system rigidity. Please use the following formula to calculate Speed Loop Integration Time Constant:

$$\text{Speed Loop Integration Time Constant} \geq 5 \times \frac{1}{2\pi \times \text{Speed Loop Gain}}$$

Sn213 Speed Loop Gain 2

Initial Value	Unit	Setting Range	Effective	RS-485 Address
40	Hz	2-1500	Effective after Set	020DH

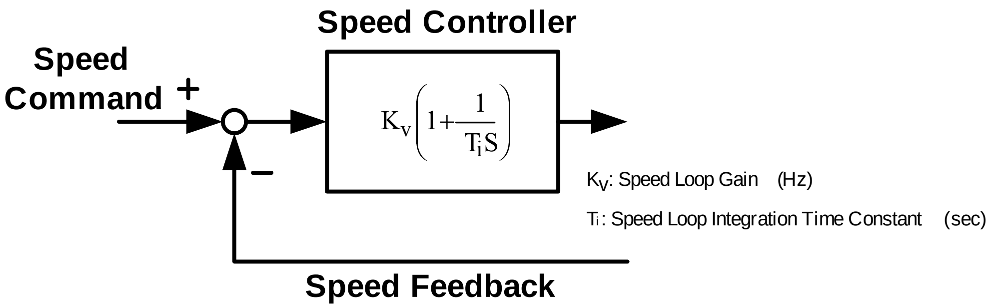
Setting Description: Please refer to Sn211 Description for Setting Method

Sn214 Speed Loop Integration Time Constant 2

Initial Value	Unit	Setting Range	Effective	RS-485 Address
2000	x0.01msec	40-50000	Effective after Set	020EH

Setting Description: Please refer to Sn212 Description for Setting Method

The following is the Speed Controller of this Device when the gain of the speed loop is greater or the speed loop integration time constant is smaller, will increase the speed control response. Please refer to **6-3** for the adjustment method of the speed loop control gain.



5-3-8 Torque Limit of Speed Mode

In Speed Control, the Motor Torque Limit is achieved by using Input Contact **TLMT** to switch to the two following methods:

(1) Internal Torque Limit: Use the internally pre-set **Cn010** (CCW Direction Torque Command Limit Value) and **Cn011** (CW Direction Torque Command Limit Value).

(2) External Analog Command Torque Limit: Use the Analog Voltage Command Signal input to **TIC (CN1-43)** to limit the CCW Direction Torque and CW Direction Torque.

Please refer to the Table below:

Input Contact TLMT	CCW Direction Torque Command Limit Source	CW Direction Torque Command Limit Source
0 (Switch operates)	Cn010	Cn011
1 (Switch does not operate)	External Analog Command TIC(CN1-43)	External Analog Command TIC(CN1-43)

Note) High Electric Potential Operation or Low Electric Potential Operation, please set with reference to [5-5-1 Input / Output Contact Function Planning].

Attention! When using External Analog Torque Command Limit, if this Analog Torque Command Limit is greater than the Internal Torque Command Limit, then the Internal Torque Command Limit is ultimately used.

(1) Internal Torque Limit: The following is the Internal Torque Limit setting description:

Cn010 CCW Direction Torque Command Limit Value

Initial Value	Unit	Setting Range	Effective	RS-485 Address
200 ~ 300 Note)	%	0-300	Effective after Set	000BH

Setting Description: To limit the Torque Command of CCW direction with two times the Rated Torque, set **Cn010**=200.

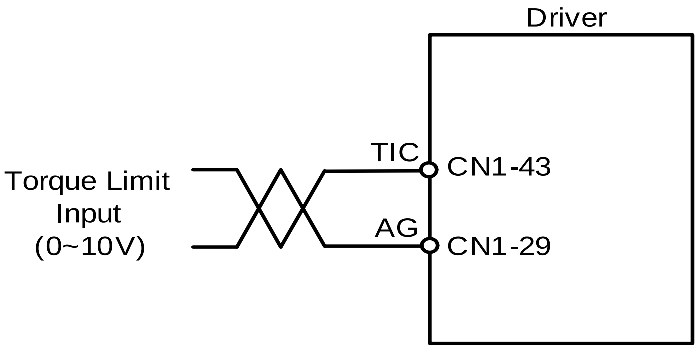
Cn011 CW Direction Torque Command Limit Value

Initial Value	Unit	Setting Range	Effective	RS-485 Address
-300 ~ -200 (Note)	%	-300-0	Effective after Set	000CH

Setting Description: To limit the Torque Command of CW direction with two times the Rated Torque, set **Cn011**=-200.

Note) The parameters **Cn010/Cn011** have different default values for each Driver model.

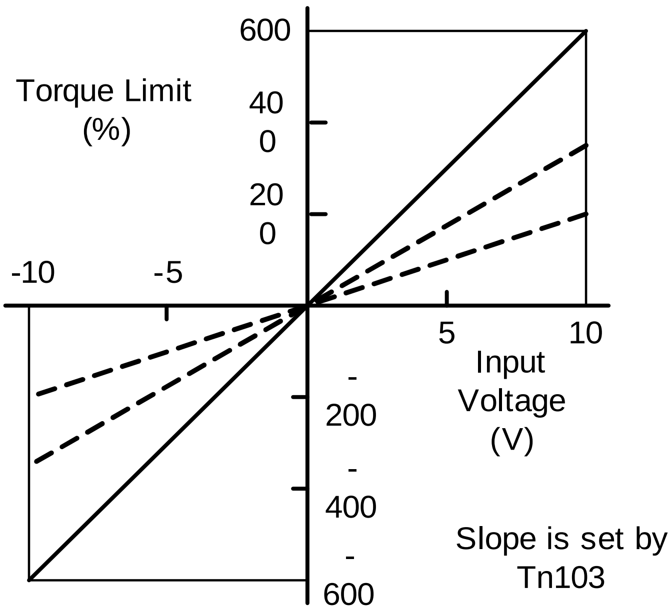
(2) External Analog Command Torque Limit: The following Figure is the External Analog Torque Limit Command Wiring Diagram:



Tn103 Analog Torque Limit Proportioner

Initial Value	Unit	Setting Range	Effective	RS-485 Address
300	%/10V	0-600	Effective after Set	0103H

Setting Description: Used to adjust the slope of Voltage Command relative to the Torque Command



5-3-9 Other Speed Control Functions

This Section explains other functions related to Speed Control.

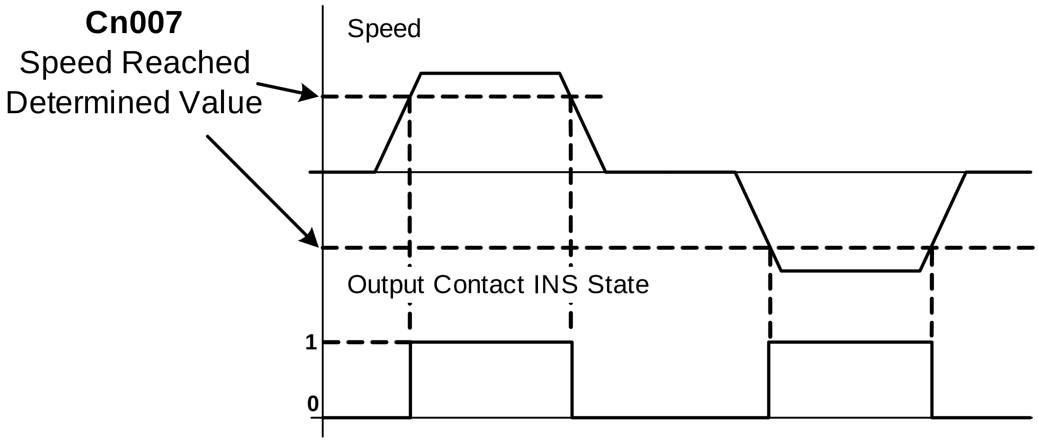
Speed Reached Function

When the Forward or Reverse Speed exceeds the speed set by **Cn007** (Speed Reached Determined Value), the Output Contact **INS** operates, as described below:

Cn007 Speed Reached Determined Value

Initial Value	Unit	Setting Range	Effective	RS-485 Address
Rated Speed x 1/3	%	0-1.5*Rated Speed	Effective after Set	0008H

Setting Description: When the Forward or Reverse Speed exceeds the speed set by Cn007 (Speed Reached Determined Value), the Output Contact INS operates.



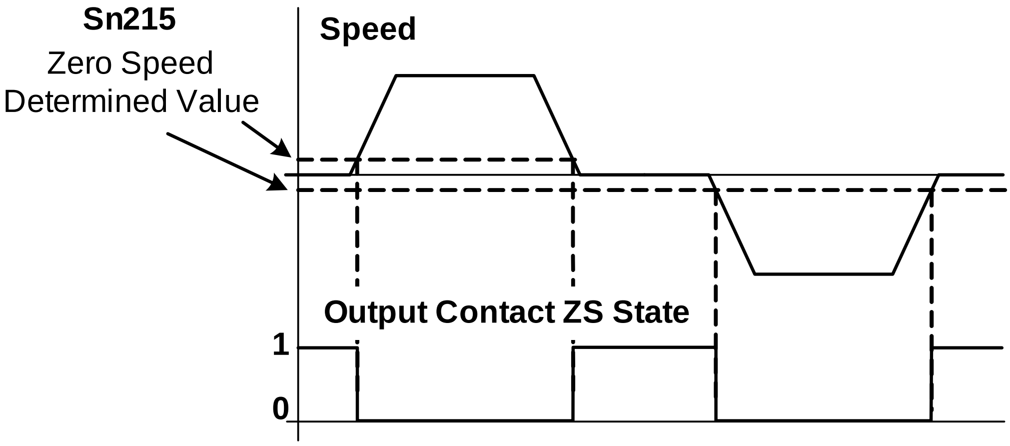
Zero Speed Function

When the Speed is lower than the Speed set by **Sn215** (Zero Speed Determined Value), the Output Contact **ZS** operates, as described below:

Sn215 Zero Speed Determined Value

Initial Value	Unit	Setting Range	Effective	RS-485 Address
50	rpm	0-1.5*Rated Speed	Effective after Set	020FH

Setting Description: When the Speed is lower than the Speed set by Sn215 (Zero Speed Determined Value), the Output Contact ZS operates.



The user can set **Sn204.0** (Zero Speed Determined Operation) to 1, and when the Zero Speed is determined, the Speed Command is treated as Zero, as described below:

Sn204.0 Zero Speed Determined Operation

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0-1	Effective after Set	0204H

Setting Description:

Setting	Description
0	Does not operate
1	Treat Speed Command as Zero Speed

Servo Lock

In the Speed Control Mode, it is used to Stop and Lock the Servo Motor if the Input Voltage Command is not 0V. When the Input Contact **LOK** operates, although this Device is in the Speed Control Mode, it will temporarily change to the Internal Position Control Mode, to fix the Motor Position. To use the Servo Lock Function, please refer to[5-5-1 Input / Output Contact Function Planning]to set the Use Input Contact as **LOK** Function

Speed Feedback Smoothing Filter

When the system produces a sharp vibration noise, **Cn032** (Speed Feedback Smoothing Filter) can be adjusted to suppress the vibration noise, adding this Filter will also delay the Servo System Response Speed.

Cn032 Speed Feedback Smoothing Filter

Initial Value	Unit	Setting Range	Effective	RS-485 Address
500	Hz	0-2500	Effective after Set	0023H

Setting Description: When the system generates a sharp vibration noise, this parameter can be adjusted to suppress the vibration noise, adding this filter will also delay the response speed of the Servo System.

5-4 Position Mode

Position Mode is used in the system that requires precision positioning, such as all types of processing machines, industrial machinery, etc. The Position Mode Command of this Device has two input modes:

1. External Pulse Command Input Mode and Internal Position Command Mode. The External Pulse Command Input Mode is to receive the Pulse Command output by the Supervisory Controller to achieve the Positioning Function.
2. The Internal Position Command Mode is that the User sets the Position Command Value in thirty-two sets of Command Registers (**Pn401~Pn496**), and conduct planning on Input Contacts **POS1~POS5** to switch the relative Position Command.

The user shall set **Cn001** (Control Mode Selection) in accordance with the mode to be used. The setting method is as follows:

Cn001 Control Mode Selection

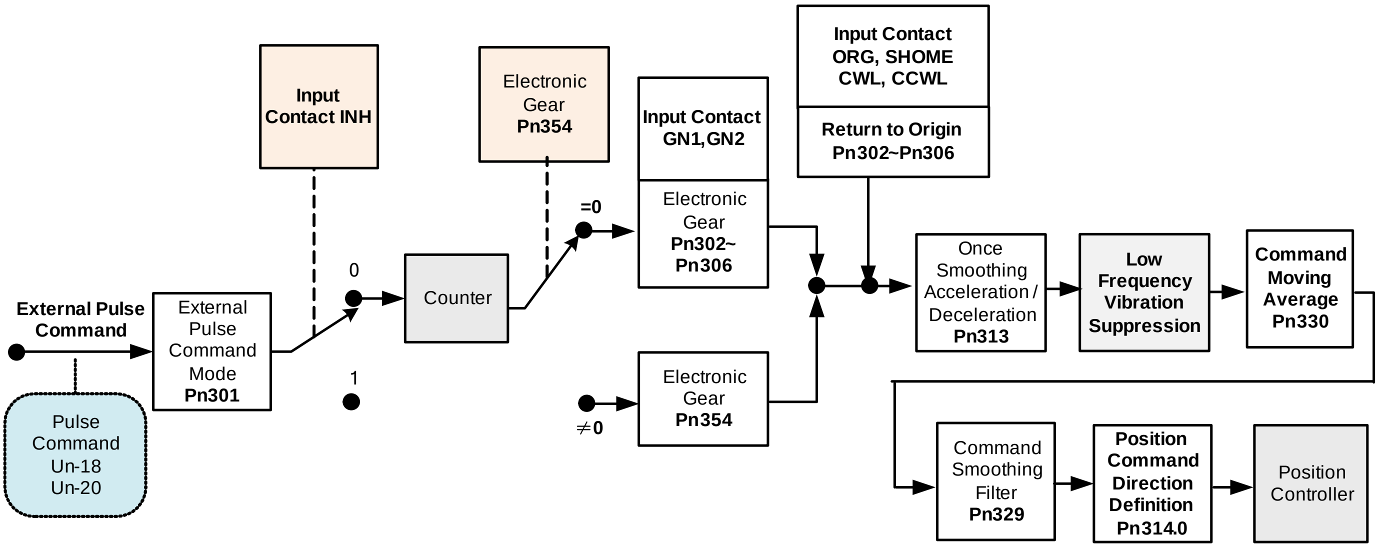
Initial Value	Unit	Setting Range	Effective	RS-485 Address
2	--	0-D	Power Re-set	0001H

Setting Description:

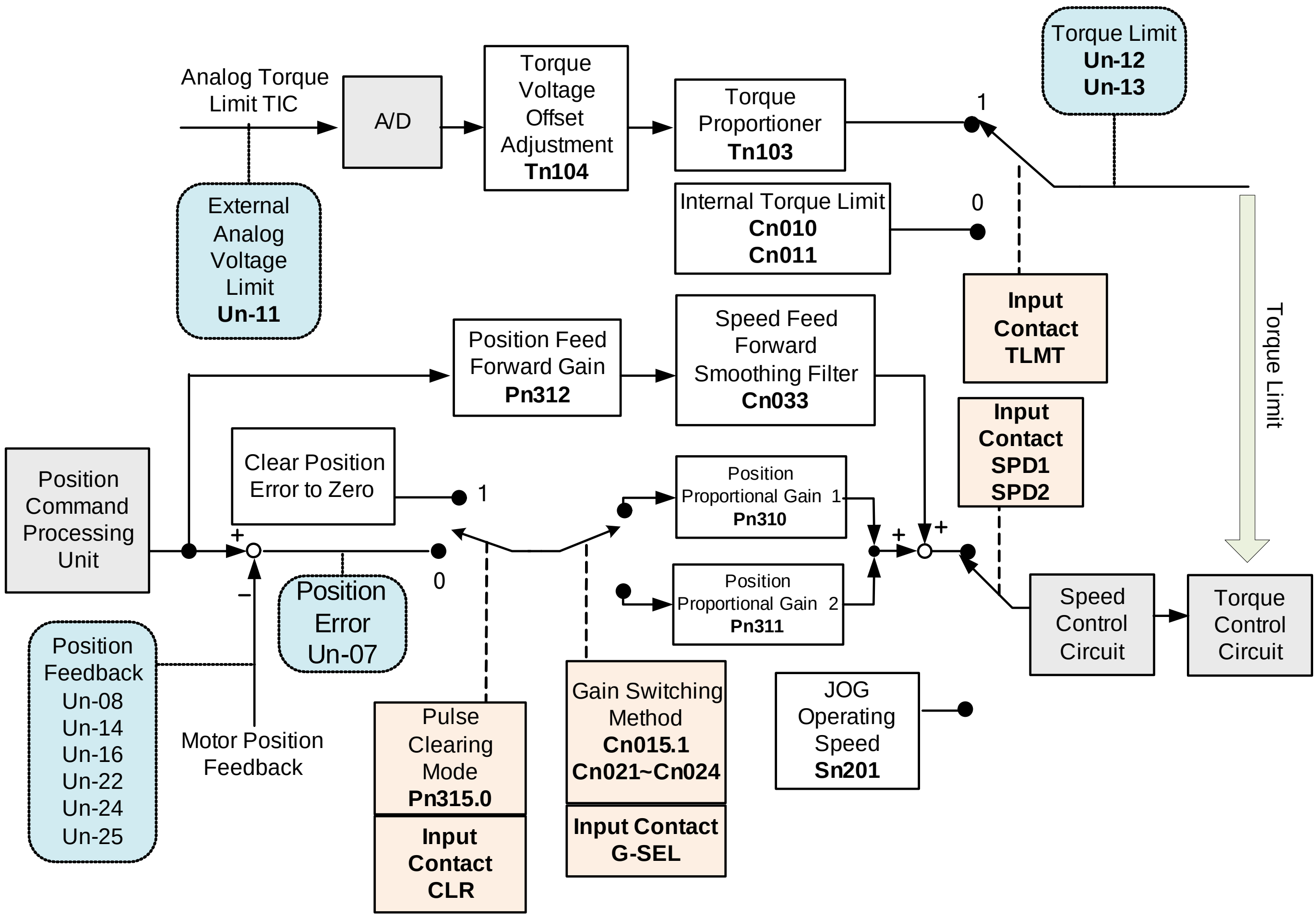
Setting	Description
2	External Position Control (External Pulse Command)
3	External Position / Speed Control Switching
5	External Position / Torque Control Switching
6	Internal Position Control (Internal Position Command)
7	Internal Position / Speed Control Switching
8	Internal Position / Torque Control Switching
A	Internal / External Position Switching

The Position Loop Control Block Diagram is shown in the following Figure; detailed functions of each block are described in the following Sections.

External Position Command Processing Unit



External Position Controller



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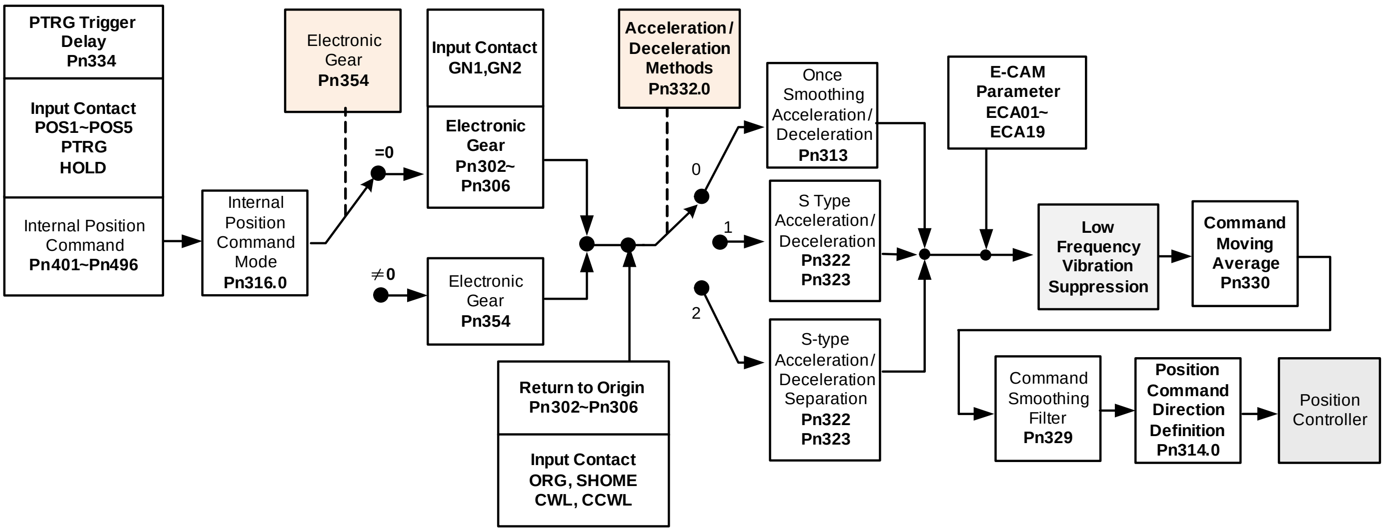
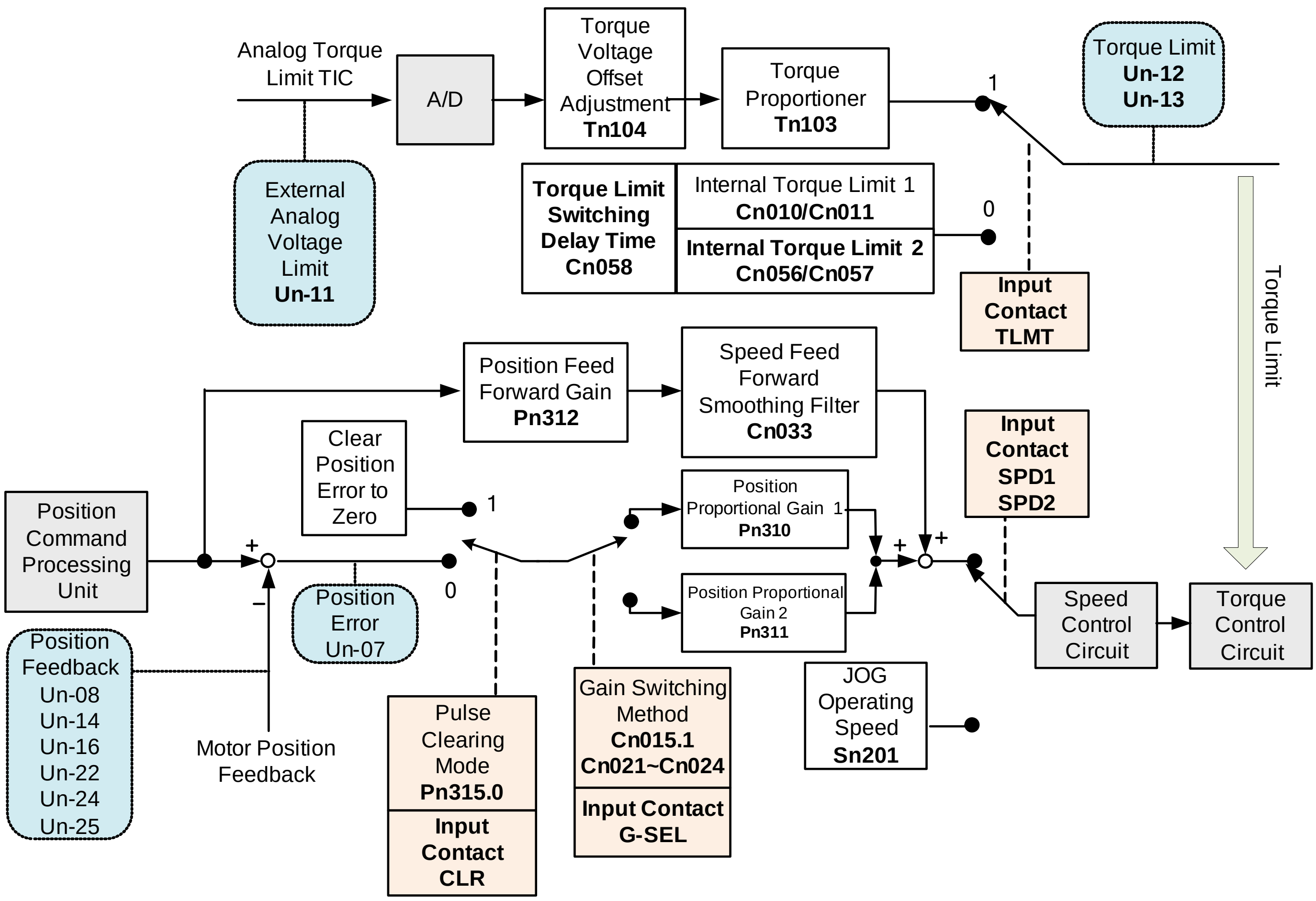
Internal Position Command Processing Unit



Internal Position Controller



TECO

5-4-1 External Pulse Command Mode

The Pulse Command in this Mode is provided by an external device there are three pulse patterns can be selected, each pulse pattern can also be programmed as positive or negative logic. The user sets the corresponding pattern based on the External Input Pulse Command pattern. The setting method is as follows:

Pn301.0 Position Pulse /command Pattern Selection

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	**--**	**0-3**	**Power Re-set**	0301H

Setting Description:

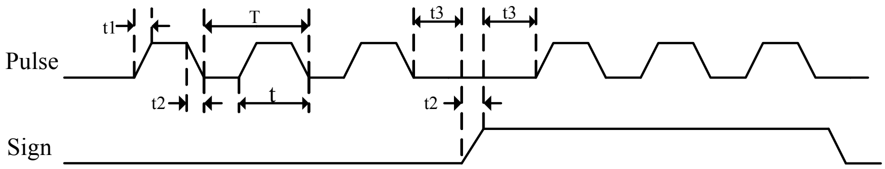
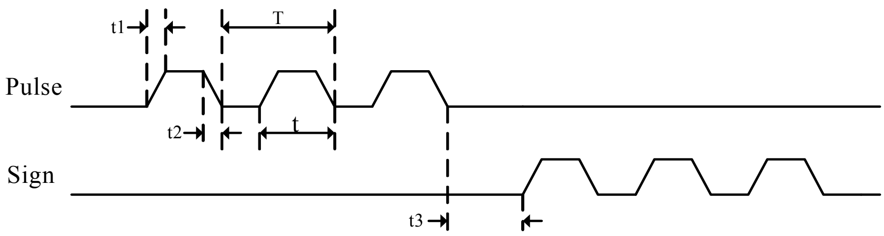
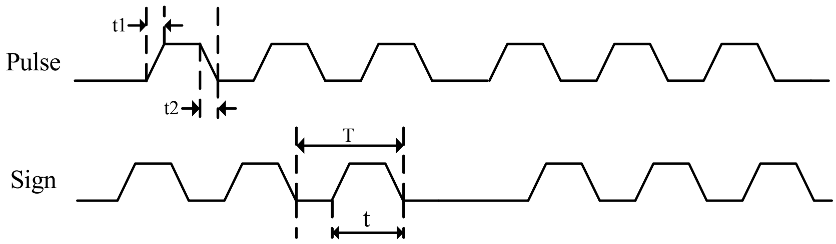
Pn301.0

Setting	Description
0	Pulse+Sign
1	CCW/CW Pulse
2	Phase AB Pulsex2
3	Phase AB Pulsex4

Setting Description: Can select Filter Smoothing Time.

Position Pulse Command Pattern	Positive Logic		Negative Logic	
	CCW Command	CW Command	CCW Command	CW Command
Pulse+ Sign				
CCW/ CW/Pulse				
Phase AB Pulse				

There are two types of Pulse Command Input Interfaces, Open Collector and Line Driver respectively. Please refer to [**2-2-1 CN1 Control Signal Terminal Description]**for the wiring method. Please input the Pulse Command in accordance with the time sequence specifications.

<table>
<tr><th>Pulse Command Pattern</th><th>Pulse command Time Sequence Diagram</th><th>Time Specification</th></tr>
<tr><td rowspan="2">Pulse+ Sign</td><td rowspan="2">
</td><td>Line Driver Input:
t1, t2 ≤ 0.1μs
t3 > 3μs
τ ≥ 1.0μs
(τ/T) ≤ 50%</td></tr>
<tr><td>Open Collector Input:
t1, t2 ≤ 0.2μs
t3 > 3μs
τ ≥ 2.0μs
(τ/T) ≤ 50%</td></tr>
<tr><td rowspan="2">CCW/ CW/Pulse</td><td rowspan="2">
</td><td>Line Driver Input:
t1, t2 ≤ 0.1μs
t3 > 3μs
τ ≥ 1.0μs
(τ/T) ≤ 50%</td></tr>
<tr><td>Open Collector Input:
t1, t2 ≤ 0.2μs
t3 > 3μs
τ ≥ 2.0μs
(τ/T) ≤ 50%</td></tr>
<tr><td rowspan="2">Phase AB Pulse</td><td rowspan="2">
</td><td>Line Driver Input:
t1, t2 ≤ 0.1μs
τ ≥ 1.0μs
(τ/T) ≤ 50%</td></tr>
<tr><td>Open Collector Input:
t1, t2 ≤ 0.2μs
τ ≥ 2.0μs
(τ/T) ≤ 50%</td></tr>
</table>

The Device provides an Input Contact **INH**, the Pulse Command Input is disabled when the Contact operates, indicating that the Device no longer receives any Pulse Command, the description is as follows:

Input Contact INH	Description	Control Mode
0 (Switch does not operate)	Receive Pulse Command normally	Pe
1 (Switch operates)	No longer receives any Pulse Command	

Note) High Electric Potential Operation or Low Electric Potential Operation, please set with reference to [5-5-1 Input / Output Contact Function Planning].

Pn301.1 Position Pulse Command Logic Selection

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0-1	Power Re-set	0301H

Setting Description:

Setting	Description
0	Positive Logic
1	Negative Logic

Pn301.2 Drive inhibits Command Receiving Selection

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0-1	Power Re-set	0301H

Setting Description:

Setting	Description
0	After the Drive Prohibition occurs, continue recording the Position Command Input Quantity.
1	After the Drive Prohibition occurs, ignore Position Command Input Quantity.

Pn301.2 Drive inhibits Command Receiving Selection

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	**--**	**0-1**	Power Re-set	0301H

Setting Description:

Setting	Description
0	After the Drive Prohibition occurs, continue recording the Position Command Input Quantity.
1	After the Drive Prohibition occurs, ignore Position Command Input Quantity.

Pn301.3 Position Pulse Command Filter Width Selection

Initial Value	Unit	Setting Range	Effective	RS-485 Address
3	--	0-7	Power Re-set	0301H

Setting Description:

Setting	Description	Setting	Description
0	4500KHz	4	370KHz
1	2500KHz	5	190KHz
2	1200KHz	6	90KHz
3	750KHz	7	40KHz

5-4-2 Internal Position Command Mode

The Command Source for this Mode is thirty-two sets of Command Register (**Pn401~Pn496**), which are used to switch the corresponding position command according to the planned input contact points **POS1~POS5**. Each position command is set with a moving speed register to set this. The movement speed of the group position command is shown in the following table:

Position Command	POS5	POS4	POS3	POS2	POS1	Position Command Parameter		Moving Speed Parameter
P1	0	0	0	0	0	Number of Revolutions	Pn401	Pn403
						Number of Pulses	Pn402	
P2	0	0	0	0	1	Number of Revolutions	Pn404	Pn406
						Number of Pulses	Pn405	
P3	0	0	0	1	0	Number of Revolutions	Pn407	Pn409
						Number of Pulses	Pn408	
P4	0	0	0	1	1	Number of Revolutions	Pn410	Pn412
						Number of Pulses	Pn411	
P5	0	0	1	0	0	Number of Revolutions	Pn413	Pn415
						Number of Pulses	Pn414	
P6	0	0	1	0	1	Number of Revolutions	Pn416	Pn418
						Number of Pulses	Pn417	
P7	0	0	1	1	0	Number of Revolutions	Pn419	Pn421
						Number of Pulses	Pn420	
P8	0	0	1	1	1	Number of Revolutions	Pn422	Pn424
						Number of Pulses	Pn423	
P9	0	1	0	0	0	Number of Revolutions	Pn425	Pn427
						Number of Pulses	Pn426	
P10	0	1	0	0	1	Number of Revolutions	Pn428	Pn430
						Number of Pulses	Pn429	
P11	0	1	0	1	0	Number of Revolutions	Pn431	Pn433
						Number of Pulses	Pn432	
P12	0	1	0	1	1	Number of Revolutions	Pn434	Pn436
						Number of Pulses	Pn435	
P13	0	1	1	0	0	Number of Revolutions	Pn437	Pn439
						Number of Pulses	Pn438	
P14	0	1	1	0	1	Number of Revolutions	Pn440	Pn442
						Number of Pulses	Pn441	
P15	0	1	1	1	0	Number of Revolutions	Pn443	Pn445
						Number of Pulses	Pn444	
P16	0	1	1	1	1	Number of Revolutions	Pn446	Pn448
						Number of Pulses	Pn447	
P17	1	0	0	0	0	Number of Revolutions	Pn449	Pn451

Position Command	POS5	POS4	POS3	POS2	POS1	Position Command Parameter		Moving Speed Parameter
						Number of Pulses	Pn450	
P18	1	0	0	0	1	Number of Revolutions	Pn452	Pn454
						Number of Pulses	Pn453	
P19	1	0	0	1	0	Number of Revolutions	Pn455	Pn457
						Number of Pulses	Pn456	
P20	1	0	0	1	1	Number of Revolutions	Pn458	Pn460
						Number of Pulses	Pn459	
P21	1	0	1	0	0	Number of Revolutions	Pn461	Pn463
						Number of Pulses	Pn462	
P22	1	0	1	0	1	Number of Revolutions	Pn464	Pn466
						Number of Pulses	Pn465	
P23	1	0	1	1	0	Number of Revolutions	Pn467	Pn469
						Number of Pulses	Pn468	
P24	1	0	1	1	1	Number of Revolutions	Pn470	Pn472
						Number of Pulses	Pn471	
P25	1	1	0	0	0	Number of Revolutions	Pn473	Pn475
						Number of Pulses	Pn474	
P26	1	1	0	0	1	Number of Revolutions	Pn476	Pn478
						Number of Pulses	Pn477	
P27	1	1	0	1	0	Number of Revolutions	Pn479	Pn481
						Number of Pulses	Pn480	
P28	1	1	0	1	1	Number of Revolutions	Pn482	Pn484
						Number of Pulses	Pn483	
P29	1	1	1	0	0	Number of Revolutions	Pn485	Pn487
						Number of Pulses	Pn486	
P30	1	1	1	0	1	Number of Revolutions	Pn488	Pn490
						Number of Pulses	Pn489	
P31	1	1	1	1	0	Number of Revolutions	Pn491	Pn493
						Number of Pulses	Pn492	
P32	1	1	1	1	1	Number of Revolutions	Pn494	Pn496
						Number of Pulses	Pn495	

The Internal Position Command Mode can select two types of Positioning Pattern, Absolute Type and Relative Type according to **Pn316.0**, the setting is as follows:

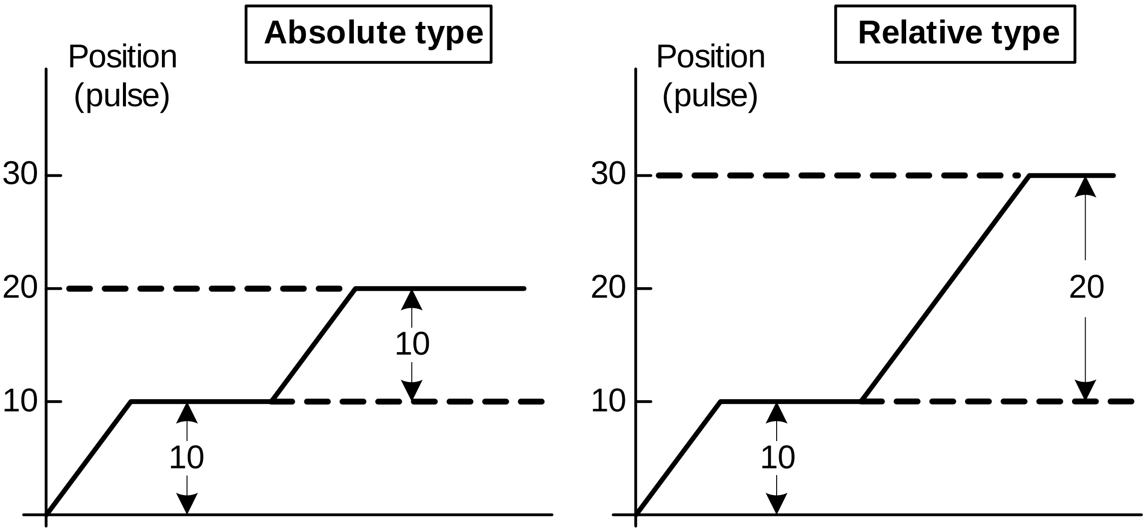
Pn316.0　Internal Position Command Mode

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0-1	Power Re-set	0326H

Setting Description:

Setting	Description
0	Absolute Type Positioning
1	Relative Type Positioning

In the Absolute Type and Relative Type Positioning Mode, after issuing the 10pulse Position Command then issue 20pulse Command separately, the Position Path Differential Diagrams are as follows:



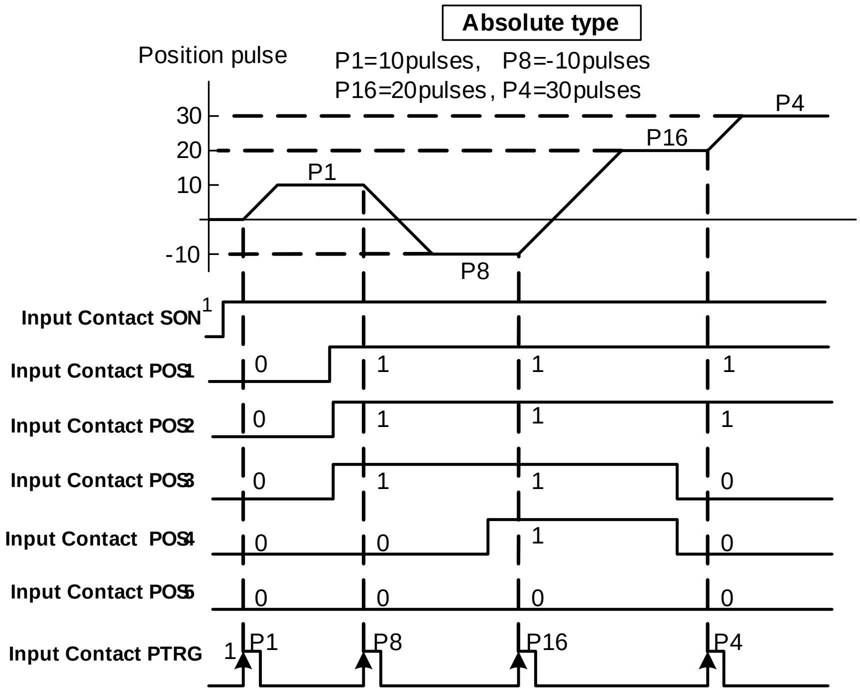
DI – PTRG Function, Trigger Time can also perform Time Delay, the setting is as follows:

Pn334　PTRG Trigger Delay Time Parameter

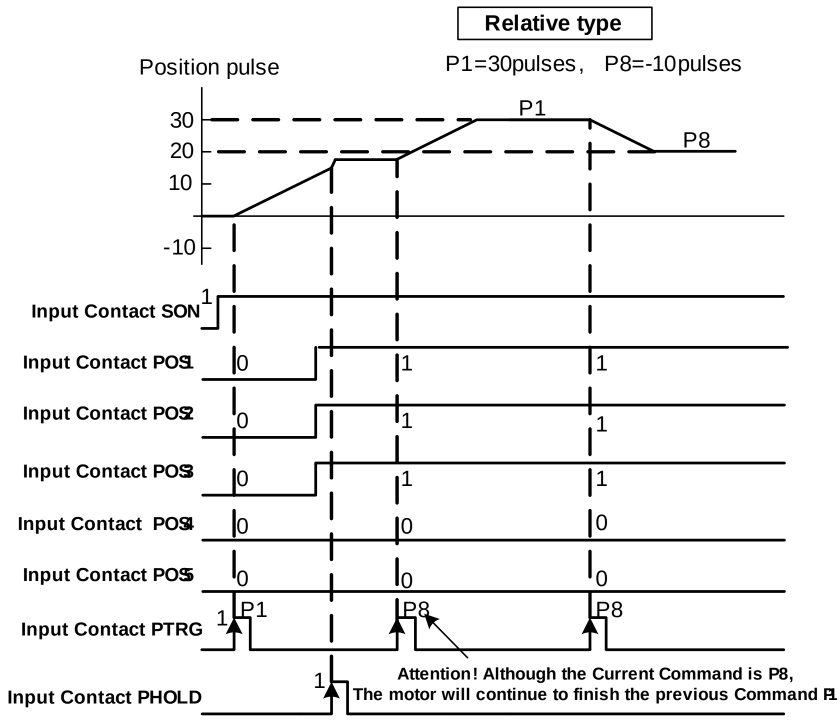
Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	*4ms	0-2500	Effective after Set	032BH

Setting Description: After PTRG is triggered, and after the Delay setting time, the Motor starts rotation.

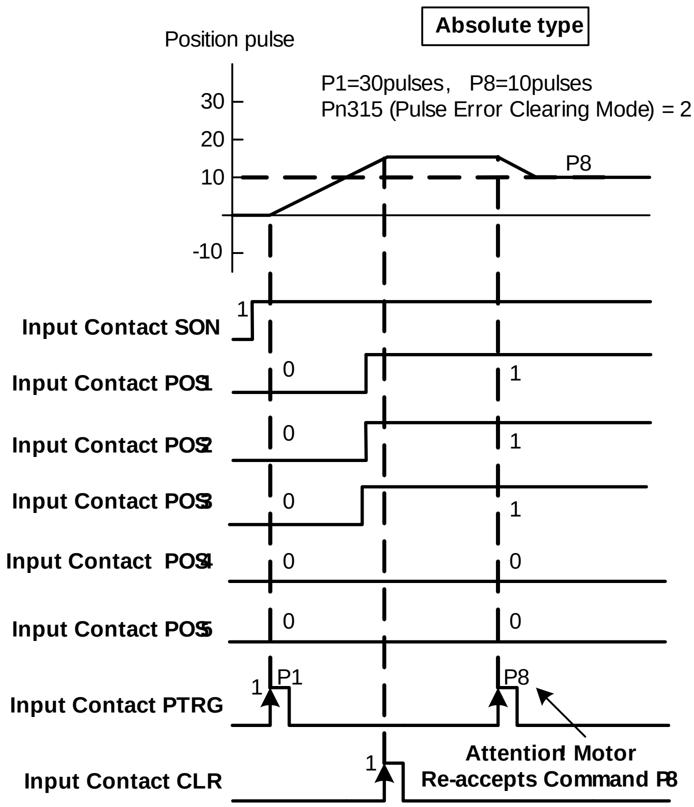
After the User selects the corresponding Position Command using the Input Contacts **POS1~POS5**, the Input Contact **PTRG** must be triggered, this Device will officially accept the Position Command and the Motor starts operation. Please refer to the following Time Sequence Diagram:



When pausing the Motor operation during the position movement process, simply trigger the Input Contact **PHOLD**, the Motor will decelerate to stop, when triggering the Input Contact **PTRG** again, the motor will continue to operate the remaining Pulse Command and reach the targeted position before triggering the Input Contact **PHOLD**, please refer to the following Time Sequence Diagram:



When ignoring this Position Command and stop the Motor during the position movement process, simply trigger the Input Contact **CLR** (**Pn315.0** must be set to **1** or **2**, please refer to[5-4-6 Pulse Error Clearing]setting, the Motor will be stopped immediately, and the incomplete Pulse Command will be cleared, when trigger the Input Contact **PTRG** again, the Motor will operate according to the Position Command selected by **POS1~POS5**, please refer to the following Time Sequence Diagram:



5-4-3 Electronic Gear Ratio

The user can define the Unit Pulse Command input to this Device through the Electronic Gear Ratio to move the Transmission Device by any distance, the Pulse Command generated by the Supervisory Controller does not need to consider the gear ratio, reduction ratio or motor encoder pulses of the Transmission System, the description is as follows:

The following Figure is the Servo Motor Drive Ball Screw Transmission Device, if the work platform is to be moved by 10mm, how many Pulse Commands the Supervisory Controller need to be issued to the Servo Driver?

Without Electronic Gear Ratio Function	With Electronic Gear Ratio Function
1. The work platform will move 5mm with one revolution of the Ball Screw. 2. To move the work platform by 10mm, the Ball Screw needs to be rotated $10mm \div 5mm/rev = 2$ turns · 3. And the 131072 Pulse Command will cause the Motor rotate one turn. 4. Therefore, the Supervisory Controller needs to issue the $131072 pulse/rev \times 2\ rev = 262144$ pulse Command. ➔**Before every move, the Supervisory Control must follow the above steps to calculate the Pulse Command.**	➔**Set the Electronic Gear Ratio first** (Assuming that the Definition One Pulse Command moves 1um, the Electronic Gear Ratio setting method is detailed in the following Sections) 1. Since One Pulse Command moves 1um. 2. To move the work platform by 10mm, the Supervisory Controller needs to issue the $10mm \div 1um/pulse = 10000$ pulse command. ➔ **As long as the One Pulse Command Moving Distance and the Electronic Gear Ratio are defined first, the Supervisory Control can easily determine the Pulse Command.**

TECO Servo provides two methods to set the Electronic Gear Ratio:

(1) Directly Set the number of Pulse Commands of the Single Rotation - Pn354

(2) Use the Numerator of the Electronic Gear Ratio and Denominator of Electronic Gear Ratio — Pn302~Pn306

The two above methods are set and switched by Parameter Pn354, Digital Input Contacts GN1 and GN2:

Pn354	GN1	GN2	Pulse Command Quantity of Single Rotation
Not equal to 0	-	-	Pn354
0	0	0	Encoder Resolution* Pn306 / Pn302
0	0	1	Encoder Resolution * Pn306 / Pn303
0	1	0	Encoder Resolution * Pn306 / Pn304
0	1	1	Encoder Resolution * Pn306 / Pn305

Electronic Gear Ratio Setting Method (1) -
Directly Sets the number of Pulse Commands for a Single Rotation

1. Understand the overall system specifications

Obtain the System Specification first in order to determine the Electronic Gear Ratio, such as: Reduction Ratio, Gear Ratio, the quantity of movement for one revolution of the Load Axis, and the diameter of Roller. Please refer to [1-1-2 Confirmation of Servo Motor Model].

2. Define One Pulse Command Moving Distance

Define the distance that the Transmission Device will move when the Supervisory Controller issues a Pulse Command. For example: When One Pulse Command moves 1um, if the Supervisory Controller issues 2000 Pulse Commands, the Transmission Device will move $2000\text{pulse} \times 1\text{um/pulse} = 2\text{mm}$ (provided that the Electronic Gear Ratio is set correctly).

3. Calculate Single Rotation Pulse Command

※ If the deceleration ratio between the Motor and the Load Shaft is n/m (m represents the number of Motor rotations, n represents the number of Load Shaft rotations), calculate the Single-rotation Pulse Command in accordance with the following formula.

$$\text{Single Rotation Pulse Command} = \frac{\begin{array}{c}\text{The distance of the load movement}\\ \text{by one revolution of the Load Shaft}\end{array}}{\begin{array}{c}\text{The distance of movement}\\ \text{by One Pulse Command}\end{array}} \times \frac{m}{n}$$

Directly input the number of Single Rotation Pulse Commands to Pn354 Single Rotation Pulse Command Function

Pn354 Single Rotation Pulse Command Function

Initial Value	Unit	Setting Range	Effective	RS-485
0	pulse	64~32768 (15bit Encoder) 64~131072 (17bit Encoder) 64~8388608 (23bit Encoder)	Power Re-set	0341H/0342H

Setting Description: The number of pulses corresponding to the External Optical Finger when the Motor rotates one revolution (Encoder resolution of the Fully Closed Loop CN4 connection), **When the setting is a value other than 0, the Single Rotation Pulse Command Function is turned on** , Pn302~Pn306 Electronic Gear Ratio Function is ineffective.

Electronic Gear Ratio Setting Method (2) -
Using the Electronic Gear Ratio Numerator and Electronic Gear Ratio Denominator

1. Understand the overall system specifications

Obtain the System Specifications first in order to determine the Electronic Gear Ratio, such as: Reduction Ratio, Gear Ratio, the quantity of movement for one revolution of the Load Axis, the diameter of the Roller and the Number of Pulses in One Revolution of the Motor Encoder, Please refer to [1-1-2 Confirmation of Servo Motor Model].

2. Define One Pulse Command Moving Distance

Define the distance that the Transmission Device will move when the Supervisory Controller issues a Pulse Command. For example: When One Pulse Command moves 1um, if the Supervisory Controller issues 2000 Pulse Commands, the Transmission Device will move $2000\text{pulse} \times 1\text{um/pulse} = 2\text{mm}$ (provided that the Electronic Gear Ratio is set correctly).

3. Calculate Electronic Gear Ratio

※If the Deceleration Ratio between the Motor and the Load Shaft is n/m (m represents the number of Motor rotations, n represents the number of Load Shaft rotations), the Electronic Gear Ratio formula is as follows:

$$\text{Electronic Gear Ratio} = \frac{\text{The Number of Pulses in One Revolution of Motor Encoder}}{\dfrac{\text{The distance of the load movement}}{\text{by one revolution of the Load Shaft}} \div \dfrac{\text{The distance of movement}}{\text{by One Pulse Command}}} \times \frac{m}{n}$$

※The Communication Encoder 15/17/23bits, the number of Pulses in One Revolution is 2 to the [bits] power.

EX：1. 17bits Encoder's number of Pulses in One Revolution = $2^{17} = 131072$

2. 23bits Encoder's number of Pulses in One Revolution = $2^{23} = 8388608$

4. Electronic Gear Ratio Parameters Setting

Pn354 Single Rotation Pulse Command Function

Initial Value	Unit	Setting Range	Effective	RS-485
0	pulse	64~32768 (15bit Encoder) 64~131072 (17bit Encoder) 64~8388608(23bit Encoder)	Power Re-set	0341H/0342H

Setting Description: If to use the functions of Pn302~Pn305, please set Pn354 = 0.

Pn302 Electronic Gear Ratio Numerator 1

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1	--	1-8388608	Effective after Set	0302H/0303H

Pn303 Electronic Gear Ratio Numerator 2

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1	--	1-8388608	Effective after Set	0304H/0305H

Pn304 Electronic Gear Ratio Numerator 3

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1	--	1-8388608	Effective after Set	0306H/0307H

Pn305 Electronic Gear Ratio Numerator 4

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1	--	1-8388608	Effective after Set	0308H/0309H

Pn306 Electronic Gear Ratio Denominator

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1	--	1-8388608	Power Re-set	030AH/030BH

Setting Description: Set Pn306 (Electronic Gear Ratio Denominator) and input the Electronic Gear Ratio Numerator selected by Input Contact GN1, GN2, the obtained Electronic Gear Ratio must conform to the following conditions, otherwise this Device cannot operate normally.

$$\frac{1}{1000} \leq \text{Electronic Gear Ratio} \leq 4000$$

This Device provides four sets of Electronic Gear Ratio Numerators, using Input Contact **GN1**, **GN2** to switch to the currently required Electronic Gear Ratio Numerators, please refer to the following Table:

Input Contact GN2	Input Contact GN1	Electronic Gear Ratio Numerator	Electronic Gear Ratio Denominator
0 (Switch Open)	0 (Switch Open)	Electronic Gear Ratio Numerator1(Pn302)	Electronic Gear Ratio Denominator (Pn306)
0 (Switch Open)	1 (Switch in Conduction)	Electronic Gear Ratio Numerator2(Pn303)	Electronic Gear Ratio Denominator (Pn306)
1 (Switch in Conduction)	0 (Switch Open)	Electronic Gear Ratio Numerator3(Pn304)	Electronic Gear Ratio Denominator (Pn306)
1 (Switch in Conduction)	1 (Switch in Conduction)	Electronic Gear Ratio Numerator4(Pn305)	Electronic Gear Ratio Denominator (Pn306)

Note) High Electric Potential Operation or Low Electric Potential Operation, please set with reference to [5-5-1 Input / Output Contact Function Planning].

Example of Electronic Gear Ratio Setting Steps

<table>
<tr><th>Transmission System</th><th>Setting Steps</th></tr>
<tr><td rowspan="2">Ball Screw</td><td>Method 1: Directly set the Pulse Command Number of Single Rotation
1. Understand the Overall System Specifications:
Load Axis (Ball Screw) One Revolution Movement=5mm/rev
2. Define One Pulse Command Moving Distance:
One Pulse Command Moving Distance=1um
3. Set Number of Pulses in a Single Rotation
$\text{Single Rotation Pulse Command} = \frac{5mm/rev}{1um/pulse} = 5000\,pulse/rev$</td></tr>
<tr><td>Method 2: Use the Electronic Gear Ratio Numerator and Electronic Gear Ratio Denominator
1. Understand the Overall System Specifications:
Load Axis (Ball Screw) One Revolution Movement=5mm
Number of Pulses in One Revolution of Motor Encoder=131072pulse
2. Define One Pulse Command Moving Distance:
One Pulse Command Moving Distance=1um
3. Calculate Electronic Gear Ratio:
$\text{Electronic Gear Ratio} = \frac{131072\,pulse/rev}{5mm/rev \div 1um/pulse} = \frac{131072}{5000}$
4. Electronic Gear Ratio Parameters Setting:
<table><tr><td>Electronic Gear Ratio Numerator</td><td>131072</td></tr><tr><td>Electronic Gear Ratio Denominator</td><td>5000</td></tr></table></td></tr>
</table>

Transmission System	Setting Steps
Index Plate	**Method 1: Directly set the Pulse Command Number of Single Rotation** **1. Understand Overall System Specification:** Deceleration Ratio=1/5 Load Axis (Index Plate) One Revolution Movement=360º **2. Define One Pulse Command Moving Distance:** One Pulse Command Moving Distance=0.1º **3. Set Number of Pulses in a Single Rotation** $\text{Single Rotation Pulse Command} = \frac{360\deg/rev}{0.1\deg/pulse} \times \frac{5}{1} = 18000\,pulse/rev$
	Method 2: Use the Electronic Gear Ratio Numerator and Electronic Gear Ratio Denominator **1. Understand the Overall System Specifications:** Deceleration Ratio=1/5 Load Axis (Index Plate) One Revolution Movement=360º Number of Pulses in One Revolution of Motor Encoder=131072pulse **2. Define One Pulse Command Moving Distance:** One Pulse Command Moving Distance=0.1º **3. Calculate Electronic Gear Ratio:** $\text{Electronic Gear Ratio} = \frac{131072\,pulse/rev}{360° \div 0.1°/pulse} \times \frac{5}{1} = \frac{262144}{3600}$ **4. Electronic Gear Ratio Parameters Setting:** Electronic Gear Ratio Numerator: 262144 Electronic Gear Ratio Denominator: 3600

<table>
<tr><th>Transmission System</th><th>Setting Steps</th></tr>
<tr><td rowspan="2">Conveyor Belt</td><td>
Method 1: Directly set the Pulse Command Number of Single Rotation

1. Understand Overall System Specification:
Deceleration Ratio=1/8
Load Axis (Roller) One Revolution Movement
$= 3.14 \times 100\,\text{mm} = 314\,\text{mm}$

2. Define One Pulse Command Moving Distance:
One Pulse Command Moving Distance=10um

3. Calculate Electronic Gear Ratio:
$\begin{matrix}\text{Single Rotation}\\ \text{Pulse Command}\end{matrix} = \frac{314mm/rev}{10um/pulse} \times \frac{8}{1} = 251200\,pulse/rev$
</td></tr>
<tr><td>
Method 2: Use the Electronic Gear Ratio Numerator and Electronic Gear Ratio Denominator

1. Understand the Overall System Specifications:
Deceleration Ratio=1/8
Load Axis (Roller) One Revolution Movement
$= 3.14 \times 100\,\text{mm} = 314\,\text{mm}$
Number of Pulses in One Revolution of Motor Encoder=131072pulse

2. Define One Pulse Command Moving Distance:
One Pulse Command Moving Distance=10um

3. Calculate Electronic Gear Ratio:
$\text{Electronic Gear Ratio} = \frac{131072\,pulse/rev}{314mm \div 10um/pulse} \times \frac{8}{1} = \frac{1048576}{31400}$

4. Electronic Gear Ratio Parameters Setting:
Simplify the Electronic Gear Ratio by Reduction of Fraction, to let both Numerator and Denominator are smaller than the integer value of 8388608.

<table>
<tr><td>Electronic Gear Ratio Numerator</td><td>131072</td></tr>
<tr><td>Electronic Gear Ratio Denominator</td><td>3925</td></tr>
</table>
</td></tr>
</table>

5-4-4 Position Command Acceleration / Deceleration Function

Item	Acceleration / Deceleration Function	External Pulse Command Mode	Internal Position Command Mode
(1)	One Time Smoothing Acceleration / Deceleration	Set up is not required, use directly Related Parameter: Pn313	Turn on when Pn332.0=0 Related Parameter: Pn313
(2)	S-type Acceleration / Deceleration	No	Turn on when Pn332.0=1 Related Parameter: Pn322, Pn323
(3)	S-type Acceleration / Deceleration Separation	No	Turn ON when Pn332.0 = 2 Related Parameter: Pn322, Pn323, Pn333
(4)	Command Moving Average	Set up is not required, use directly Related Parameter: Pn330	Set up is not required, use directly Related Parameter: Pn330
(5)	Command Smoothing Filter	Set up is not required, use directly Related Parameter: Pn329	Set up is not required, use directly Related Parameter: Pn329

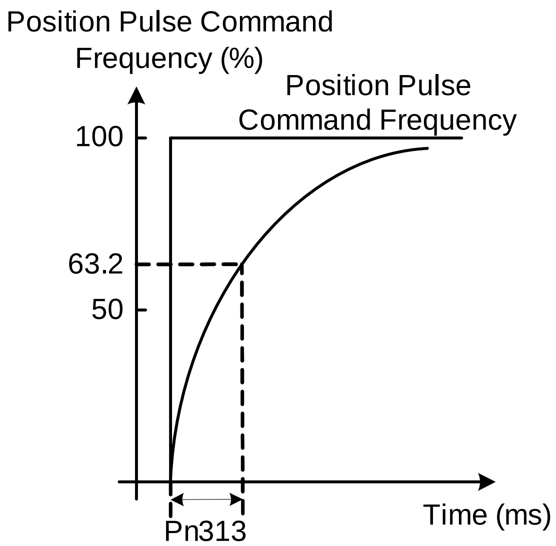
(1) Internal / External Position Command One time Smoothing Acceleration / Deceleration

Use Internal / External Position Command One time Smoothing Acceleration / Deceleration Function will smooth the Internal / External Position Command of originally Fixed Frequency

Pn313 Internal / External Position Command One time Smoothing Acceleration / Deceleration Time Constant

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	msec	0-10000	Power Re-set	0313H

Setting Description: Will smooth the Position Pulse Command of originally fixed frequency. The definition of Internal/External Position Command One Time Smoothing Acceleration / Deceleration Time Constant is the time of the Position Command Frequency starts one time delay rise from zero to 63.2% of the External Position Pulse Command Frequency.



Setting Example:

(1) To reach 95% of Position Pulse Command Frequency Output in 30msec, then

$$Pn313 = \frac{30(msec)}{-\ln(1-95\%)} = 10(msec)$$

(2) To reach 75% of Position Pulse Command Frequency Output in 30msec, then

$$Pn313 = \frac{30(msec)}{-\ln(1-75\%)} = 22(msec)$$

(2) Internal Position Command S-type Smoothing Acceleration / Deceleration

The S-type Smoothing Command Generator provides smoothing processing of movement commands, the generated speed and acceleration are continuous, and the jerkiness of acceleration is also small, which can improve the acceleration / deceleration characteristics of the Motor, and also more smoothing in the operations of the mechanical structure.

The S-type smooth command generator is suitable for the Control Mode when inputting the Internal Position Command, when the Position Command is changed from the External Pulse Signal Input, the input of Speed and Angular Acceleration are already continuous, so the S-type Smoother is not used.

Pn322 Internal Position Command S-type Acceleration / Deceleration Smoothing Constant (TSL)

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	X0.4ms	0-5000	Effective after Set	031DH

Pn323 Internal Position Command S-type Acceleration / Deceleration Constant (TACC)

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1	X0.4ms	1-5000	Effective after Set	031EH

The Input Time Parameters are defined here as TSL and TACC. First, Determine the Acceleration / Deceleration Travel by the input time parameter.

From the following Figure (a), it can be seen that when TACC>TSL, a constant acceleration zone is generated, and the fixed acceleration time is TACC-TSL.

When TACC = TSL, there is no fixed acceleration zone, as shown in Figure (b) below. According to the Definition, TACC<TSL cannot be achieved, Figure (c).

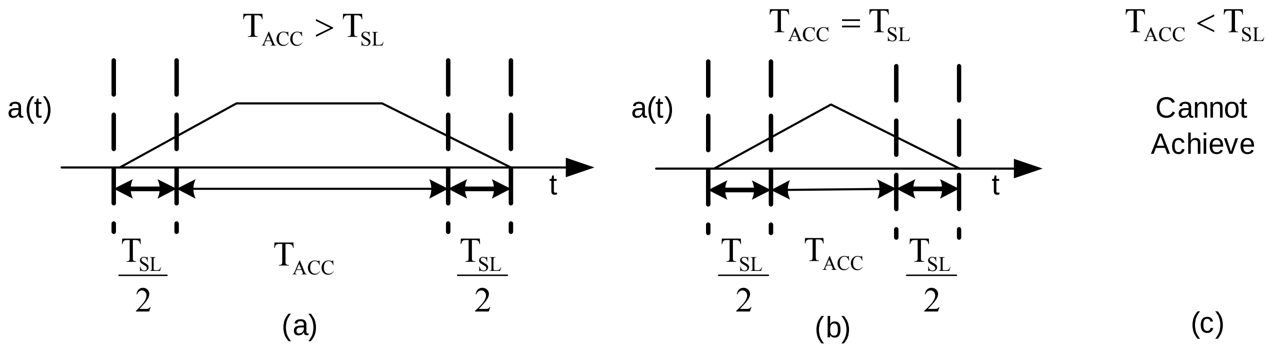


Figure: Definition of Travel Time for S-type Curve.

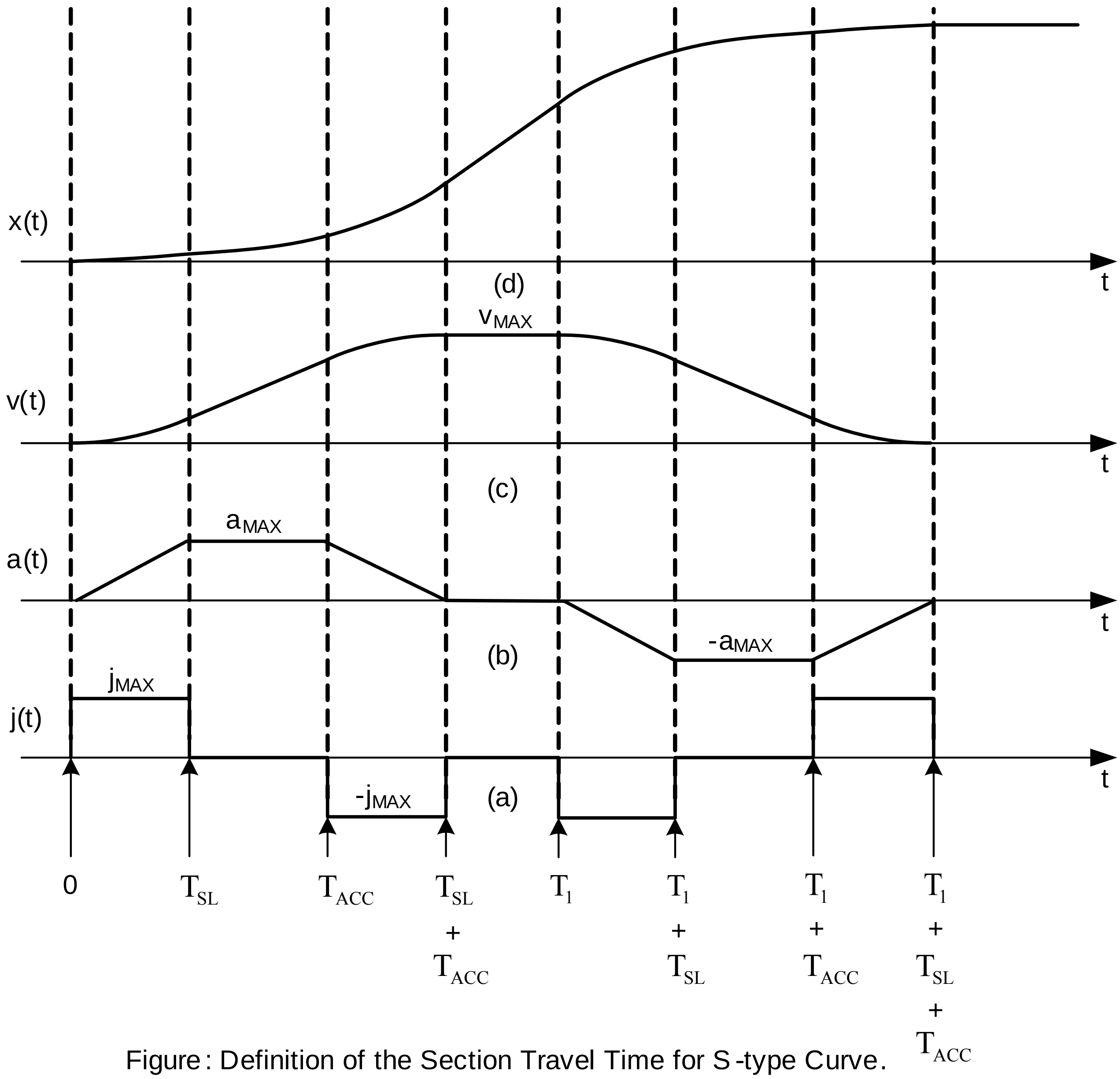


Figure: Definition of the Section Travel Time for S-type Curve.

(3) Internal Position Command S-type Smooth Acceleration / Deceleration Separation

Function is equivalent to (2) Internal Position Command S-type Smooth Acceleration / Deceleration, the difference is in the separation of TACC and TDEC.

Pn322 Internal Position Command S-type Acceleration / Deceleration Smoothing Constant (TSL)

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	X0.4ms	0-5000	Effective after Set	031DH

Pn323 Internal Position Command S-type Acceleration / Deceleration Constant (TACC)

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1	X0.4ms	1-5000	Effective after Set	031EH

Pn333 Internal Position Command S-type Deceleration Constant (TDEC)

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1	*0.4msec	1-5000	Effective after Set	032AH

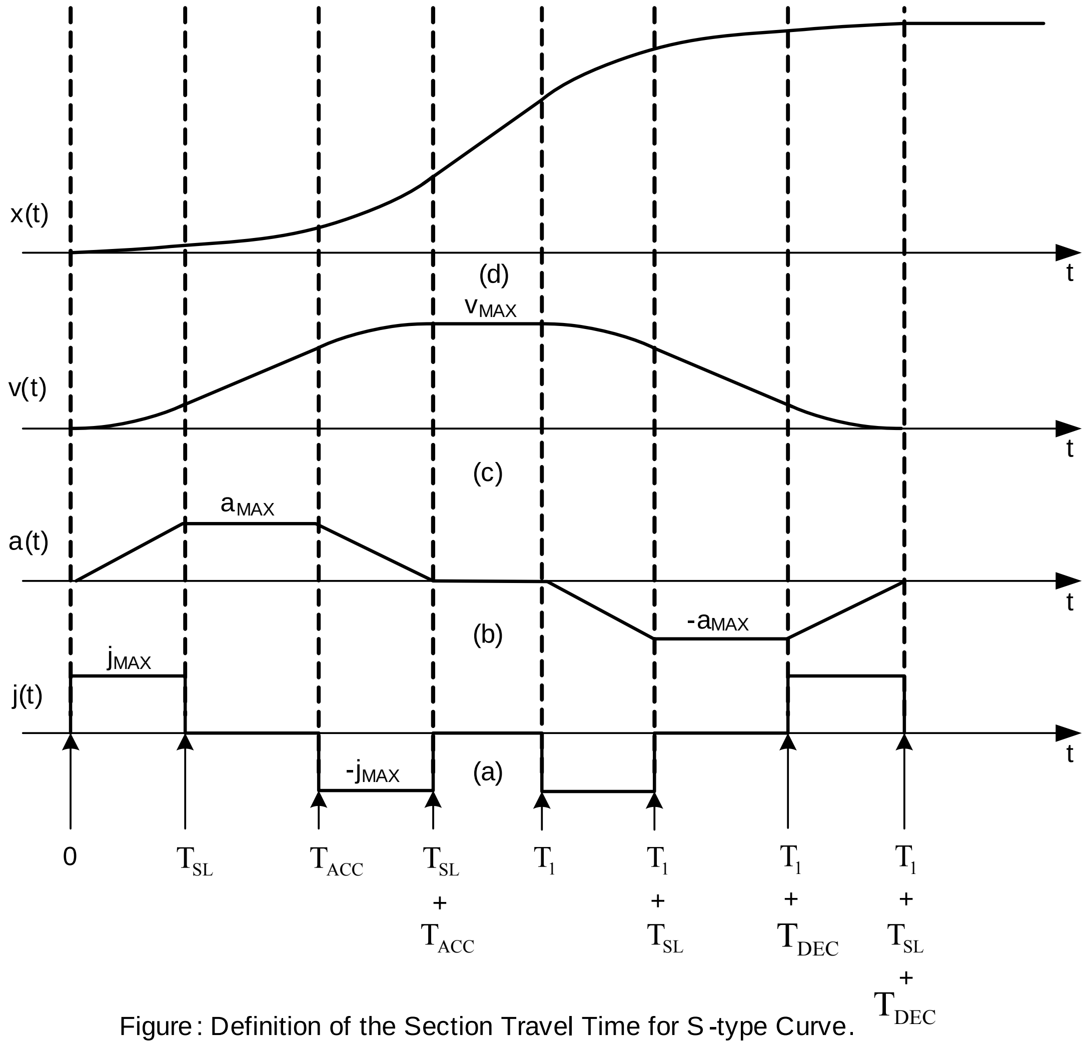


Figure: Definition of the Section Travel Time for S-type Curve.

(4) Pn329 Pulse Command Smoothing Filter

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	X2msec	0-2500	Effective after Set	0325H

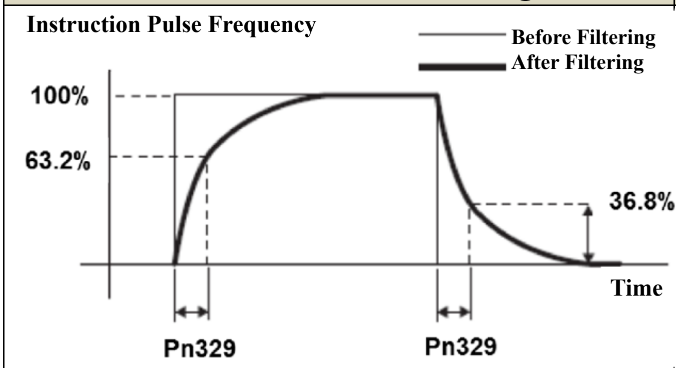
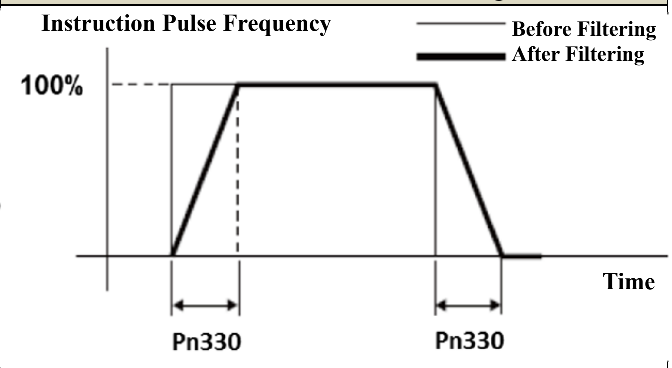
5) Pn330 Pulse Command Moving Filter

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	X0.4msec	0-250	Effective after Set	0326H

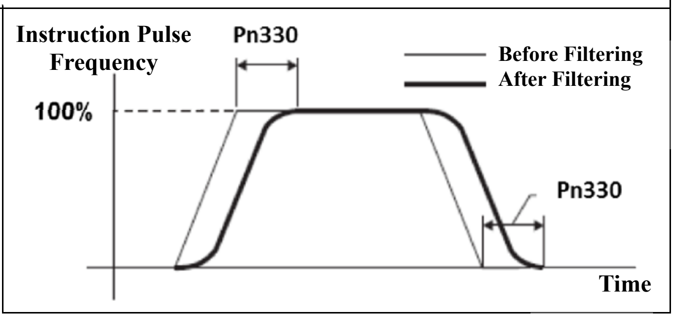
The Pulse Command Smoothing Filter and the Pulse Command Moving Filter add a filter to the Position Instruction to enable the smoothing of Servo Motor Rotation. This function is effective in the following conditions.

• When the Supervisory Device of Instruction Issued cannot accelerate or decelerate

• When the Instruction Pulse Frequency is extremely low.

Pn329 Pulse Command Smoothing Filter	Pn330 Pulse Command Moving Filter
	

※ Please do not change Pn329, Pn330 during the motor is rotating, although the change will not be reflected, the change will become effective after the Motor stops.



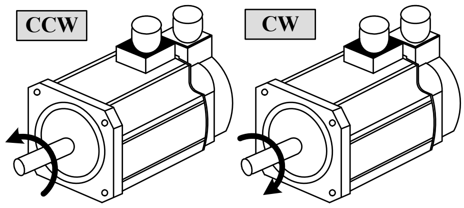
5-4-5 Position Command Direction Definition

In Position Mode, the User can use **Pn314.0** (Position Command Direction Definition) to define the Motor Rotation Direction, the settings are as follows:

Pn314.0 Internal Position Command S-type Acceleration / Deceleration Constant (TACC)

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1	--	0-1	Power Re-set	0314H

Setting Description:



(from the Motor Load End)

Setting	Description
0	Clockwise Rotation (CW)
1	Counterclockwise Rotation (CCW)

5-4-6 Pulse Error Clearing

In the Position Mode, the User can use **Pn315.0** (Pulse Error Clearing Mode) to define the operating method of the Input Contact **CLR**, the settings are as follows:

Pn315.0 Pulse Error Clearing Mode

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0-2	Effective after Set	0315H

Setting Description:

Setting	Description	Use Mode
0	When the Input Contact **CLR** operates, clear the Pulse Error.	Pe
1	When the Input Contact **CLR** triggers, cancel the Position Command to interrupt the Motor operation, re-set the Mechanical Origin, and clear the Pulse Error.	Pe/Pi
2	When the Input Contact CLR triggers, cancel the Position Command to interrupt the Motor operation, and clear the Pulse Error.	Pi

5-4-7 Return to Origin

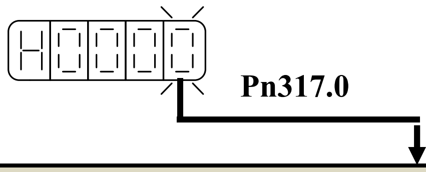
Return to Origin Mode Description

When using the Return to Origin Function, the Input Contact **ORG** (External Detector Input Point), **CCWL**or **CWL** can be used as the Origin Reference Point, and the **Z** Pulse also can be used as the Origin Reference Point, and also can Forward of Reverse Direction to Search; when completed the Return to Origin, Un-55 (Absolute Position of System Multi-number of Rotations) and Un-56 (Absolute Position of System Single-rotation) will be Returned to Zero, detailed description is as follows:

After activated the Pn317.0 Returns to Origin, the Origin Search Direction and Select Origin Reference Point Setting

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	According to Parameters	Effective after Set	0317H

Setting Description:



Setting	Description
0	After activated the Return to Origin, the Motor searches the Origin with first stage Speed in **Forward** Direction, and uses the Input Contact Point CCWL or CWL as the Origin Reference Point. After completing the Return to Origin and positioning, the Input Contact CCWL or CWL becomes the Limit Function again. When using this Function, Pn317.1 cannot be set to 1 or 2. Attention! Cn002.1 (Contact Auxiliary Function - Input Contact CCWL and CWL Function Selection) must be set to 0.
1	After activated the Return to Origin, the Motor searches the Origin with first stage Speed in **Reverse** Direction, and uses the Input Contact Point CCWL or CWL as the Origin Reference Point. After completing the Return to Origin and positioning, the Input Contact CWL or CCWL becomes the Limit Function again. When using this Function, Pn317.1 cannot be set to 1 or 2. Attention! Cn002.1 (Contact Auxiliary Function - Input Contact CCWL and CWL Function Selection) must be set to 0.
2	After activated the Return to Origin, the Motor searches the Origin with first stage Speed in **Forward** Direction, and uses the Input Contact ORG (External Detector Input Point) as the Origin Reference Point. If Pn317.1=2, then the Origin Reference Point is not required and searches for the top edge closest to the Input Contact Point ORG as the Machine Origin and stops according to the method set in Pn317.3.
3	After activated the Return to Origin, the Motor searches the Origin with first stage Speed in **Reverse** Direction, and uses the Input Contact ORG (External Detector Input Point) as the Origin Reference Point. If Pn317.1=2, then the Origin Reference Point is not required and searches for the top edge closest to the Input Contact Point ORG as the Machine Origin and stops according to the method set in Pn317.3.
4	After activated the Return to Origin, the Motor searches the Origin with first stage Speed in **Forward** Direction, the Origin Reference Point is not required and searches for the closest Phase Z Pulse Origin. When using this function, must set Pn317.1=2 (After searched Phase Z Pulse as the Mechanical Origin and stops according to the method set in Pn317.3).
5	After activated the Return to Origin, the Motor searches the Origin with first stage Speed in **Reverse** Direction, the Origin Reference Point is not required and searches for the closest Phase Z Pulse Origin. When using this function, must set Pn317.1=2 (After searched Phase Z Pulse as the Mechanical Origin and stops according to the method set in Pn317.3).

Pn317.1

Setting	Description
0	After finding the Reference Origin, the Motor will **return** with second stage speed to search the closest Phase Z Pulse as the Mechanical Origin and stops according to the method set in Pn317.3.
1	After the Reference Origin is found, the Motor will **continue forward** with second stage speed to search the closest Phase Z Pulse as the Mechanical Origin and stops according to the method set in Pn317.3.
2	When Pn317.0 = 2 or 3, after the top edge of the Input Contact ORG is found as the Mechanical Origin and stops according to the method set in Pn317.3; when Pn317.0=4 or 5, after the Phase Z Pulse is found as the Mechanical Origin and stops according to the method set in Pn317.3.

Pn317.2

Setting	Description
0	Turn Off Return to Origin Function.
1	When the power is turned on, only the first Servo Activation **(Servo ON)** will automatically execute the Return to Origin Function. When the Servo System does not have to repeat executing the Return to Origin Function during operations, this Mode can be used to omit an Input Contact used to execute the Return to Origin Function.
2	Trigger the Return to Origin Function by Input Contact SHOME, in Position Mode, the Input Contact SHOME can be triggered at any time to execute the Return to Origin Function.

Pn317.3

Setting	Description
0	After the Mechanical Origin Signal is found, **record** this position as the Mechanical Origin **(**both Un-14 Encoder Feedback Number of Revolutions, Un-15 Encoder Feedback Number of Pulse are all zero**)**, the Motor decelerates to stop, and after the Motor stopped, **return** moving to the Mechanical Origin Position with second stage speed.
1	After the Mechanical Origin Signal is found, **record** this position as the Mechanical Origin **(**both Un-14 Encoder Feedback Number of Revolutions, Un-15 Encoder Feedback Number of Pulse are all zero**)**, the Motor decelerates to stop.

Return to Origin Mode Setting Comparison Table

The User sets **Pn317** in accordance with different operating requirement，the corresponding setting value must comply with the following table:

Pn317.0 / Pn317.1	0	1	2	3	4	5
0						
1						
2						

of which, ● represents the Normal Operation of Return to Origin; ✕represents the Return to Origin Operation will not be Executed

Other Return to Origin Setting Description

Return to Origin Speed Setting is as follows:

Parameter Code	Name and Function	Default Value	Unit	Setting Range	Control Mode
Pn318	**Return to Origin First Stage High Speed** Set Return to Origin First Stage Moving Speed	100	rpm	1 | Rated Speed	Pi Pe
Pn319	**Return to Origin Second Stage Low Speed** Set Return to Origin Second Stage Moving Speed	50	rpm	1 | Rated Speed	Pi Pe

The User can set the Return to Origin Offset Number of Revolutions / Number of Pulses, after the Motor has found the Mechanical Origin in accordance with **Pn317**(Return to Origin Mode), it will position in accordance with **Pn320**(Return to Origin Offset Number of Rotations)and **Pn321**(Return to Origin Offset Number of Pulses) as the New Mechanical Origin, the setting is as follows:

Pn320 Return to Origin Offset Number of Revolutions

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	Rev	-30000-30000	Effective after Set	031AH

Setting Description: After the Motor has found the Mechanical Origin in accordance with Pn317(Return to Origin Mode), it will position in accordance with Pn320 (Return to Origin Offset Number of Revolutions) and Pn321 (Return to Origin Offset Number of Pulses) as the New Mechanical Origin

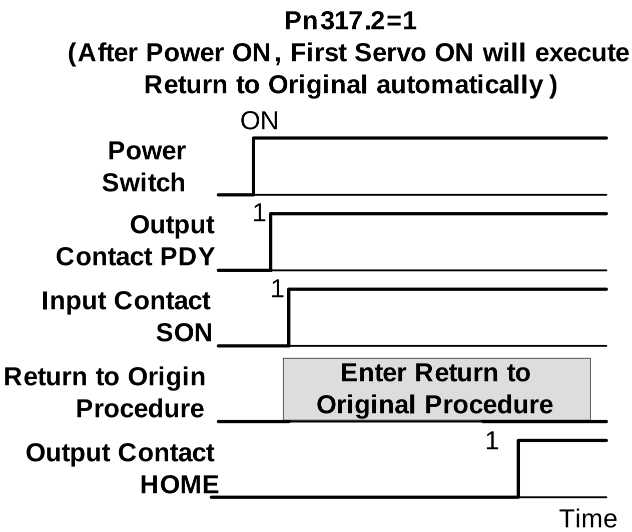
Pn321 Number of Pulse of Return to Origin Offset

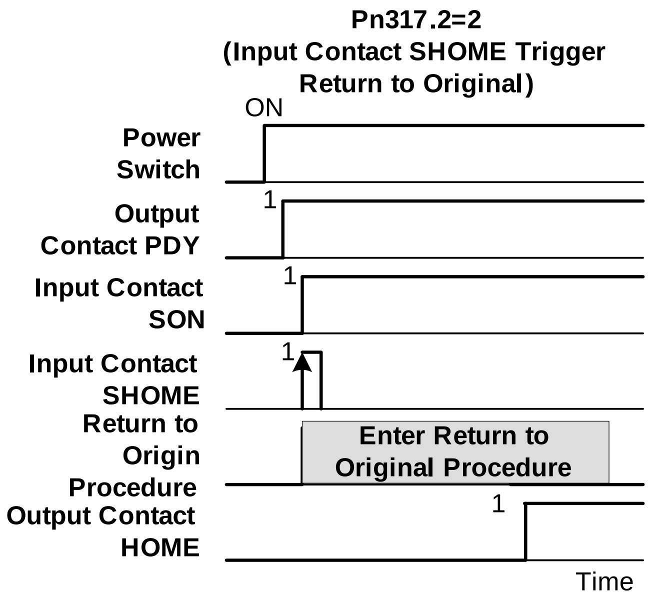
Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	pulse	-8388607~8388607	Effective after Set	031BH/031CH

Setting Description: Return to Origin Offset Position =Pn320 (Number of Revolutions) x Number of Pulses in One Revolution of Encoder x4+Pn321(Number of Pulses)

Return to Origin Activation Mode Time Sequence Diagram

If the Input Contact **SON** (Servo ON) operation is canceled or any alarm is generated in the Return to Origin procedure, the Return to Origin function is discontinued and the Output Contact **HOME** (Complete Return to Origin) does not operate.





Note) Input / Output Contact State 1 represents Switch operates, on the contrary, 0 represents Switch does not operate, as far as it is High Electric Potential Operation or Low Electric Potential Operation, please set in reference to [5-5-1 Input / Output Contact Function Planning].

The Speed / Position of Return to Origin Time Sequence Diagram

The following Table is the Speed / Position Time Sequence Diagram of Return to Origin in comparison with different **Pn317**settings:

Pn317.1 \ Pn317.0	0	1	2	3	4	5
0	(1)	(2)	(1)	(2)		
1			(3)	(4)		
2			(5)	(6)	(7)	(8)

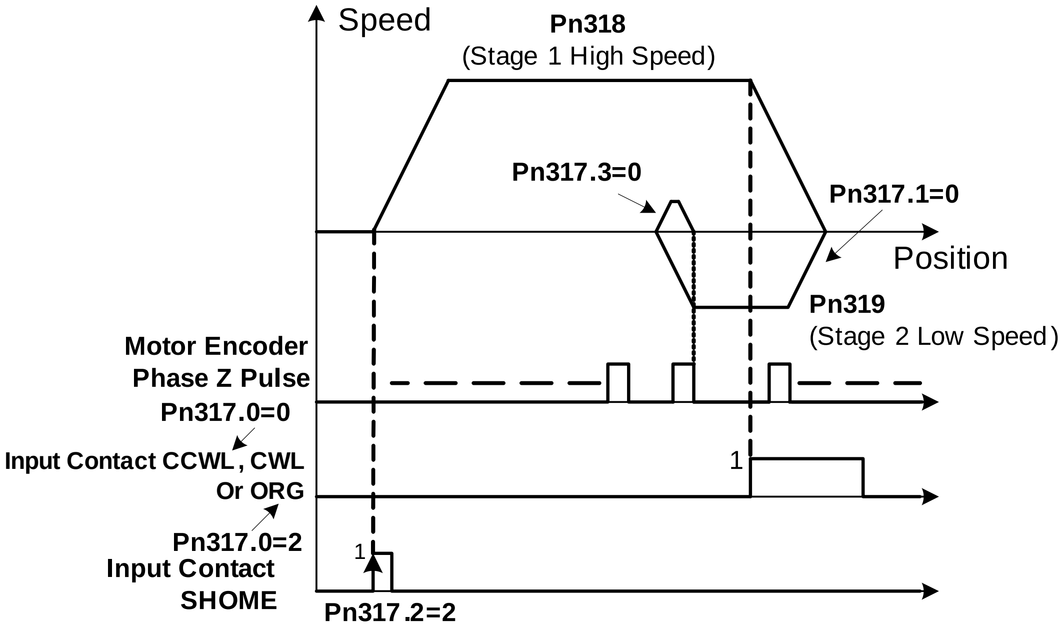
of which, ×indicates that the Return to Origin Operation will not be executed.

(1) Pn317.0=0 or **2** (After activated Return to Origin, use first stage Speed **Forward Rotation** Direction to search the Origin Reference Point **CCWL, CWL** or **ORG**)

Pn317.1=0 (After found the Origin Reference Point, use second stage Speed **Return** to search for the closest Phase Z Pulse to be used as the Mechanical Origin)

Pn317.2=2 (Input Contact SHOME to Activate Return to Origin)

Pn317.3=0 (**Return** to Mechanical Origin)

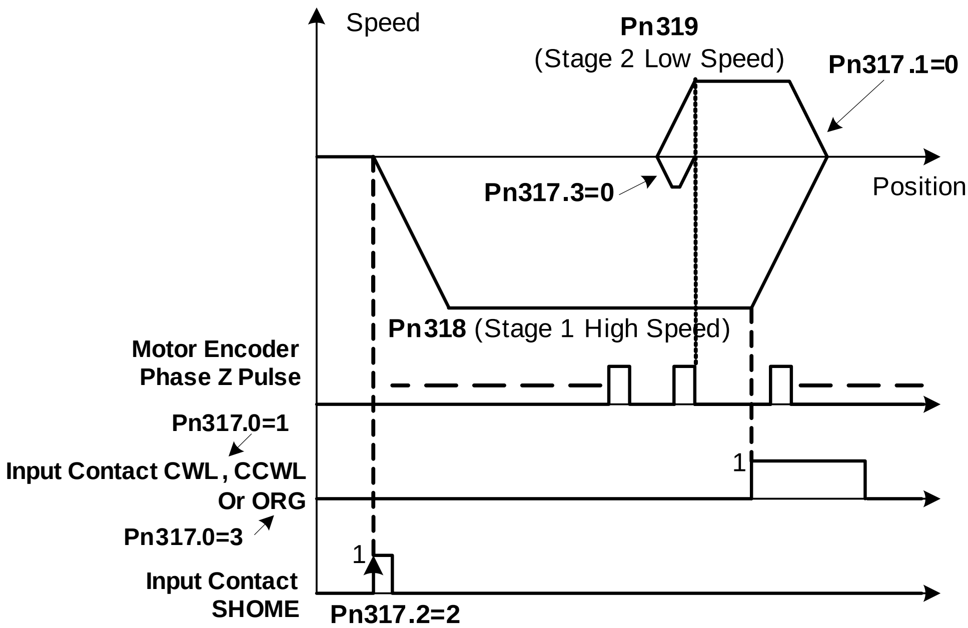


(2) Pn317.0=1 or **3**(After activated Return to Origin, use first stage Speed **Reverse Rotation** Direction to search the Origin Reference Point **CWL, CCWL** or **ORG**)

Pn317.1=0 (After foundthe Origin Reference Point, use second stage Speed **Return** to search the closest Phase **Z** Pulse to be used as the Mechanical Origin)

Pn317.2=2 (Input Contact **SHOME** to Activate Return to Origin)

Pn317.3=0 (**Return** to Mechanical Origin)

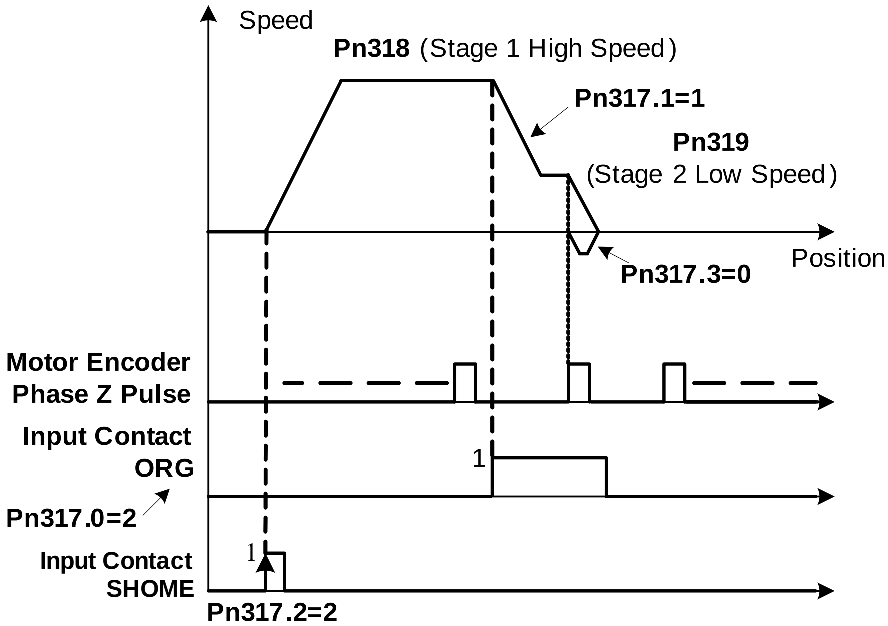


(3) Pn317.0=**2** (After activated Return to Origin, use first stage Speed **<u>Forward Rotation</u>** Direction to search the Origin Reference Point **ORG**)

Pn317.1=**1** (After foundthe Origin Reference Point, use second stage Speed **<u>to continue forward</u>** and search the closest Phase **Z** Pulse to be used as the Mechanical Origin)

Pn317.2=**2** (Input Contact **SHOME** to Activate Return to Origin)

Pn317.3=**0** (**<u>Return</u>** to Mechanical Origin)

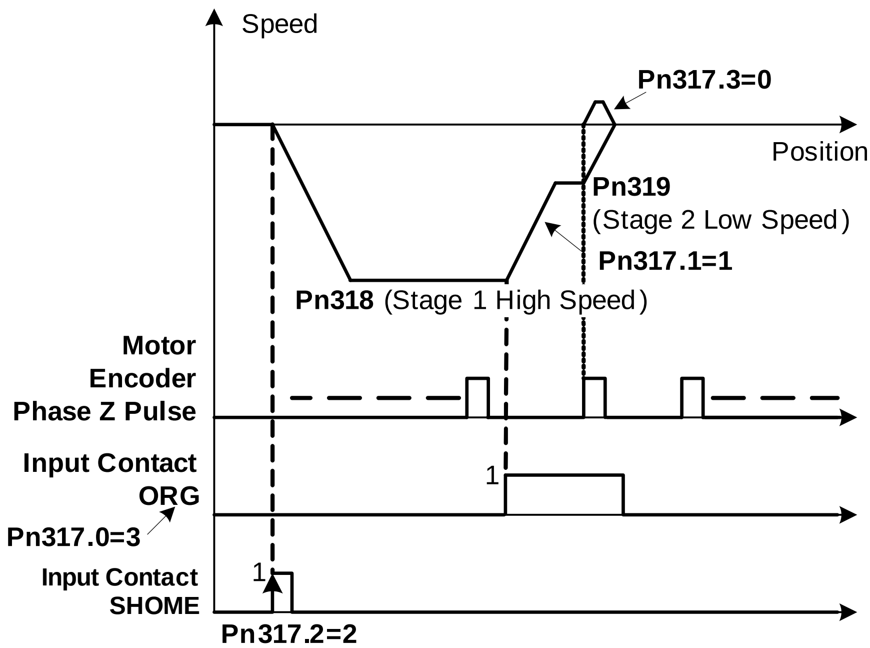


(4) Pn317.0=**3** (After activated Return to Origin, use first stage Speed **<u>Reverse Rotation</u>** Direction to search for the Origin Reference Point **ORG**)

Pn317.1=**1** (After foundthe Origin Reference Point, use second stage Speed **<u>to continue forward</u>** and search the closest Phase **Z** Pulse to be used as the Mechanical Origin)

Pn317.2=**2** (Input Contact **SHOME** to Activate Return to Origin)

Pn317.3=**0** (**<u>Return</u>** to Mechanical Origin)

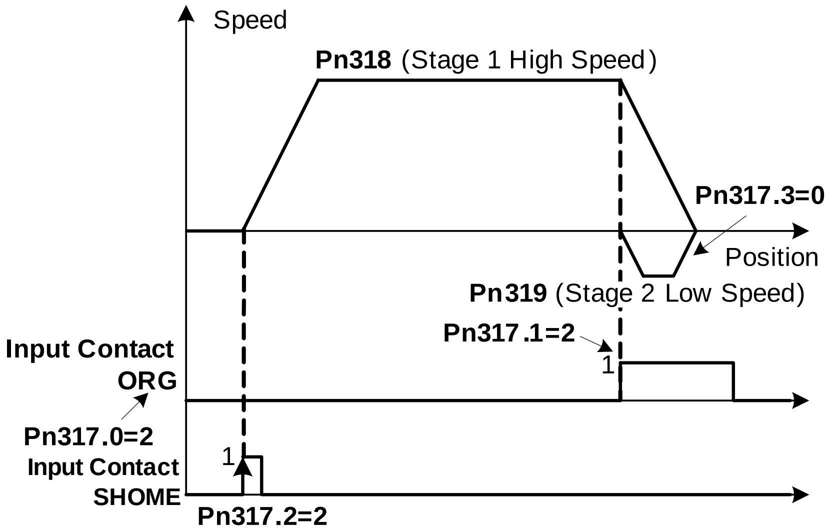


(5) Pn317.0=2 (After activated Return to Origin, use first stage Speed **<u>Forward Rotation</u>** Direction to search for the Origin Reference Point **ORG**)

Pn317.1=2 (Found the Origin Reference Point **ORG** Top Edge to be used as the Mechanical Origin)

Pn317.2=2 (Input Contact **SHOME** to Activate Return to Origin)

Pn317.3=0 (**<u>Return</u>** to Mechanical Origin)

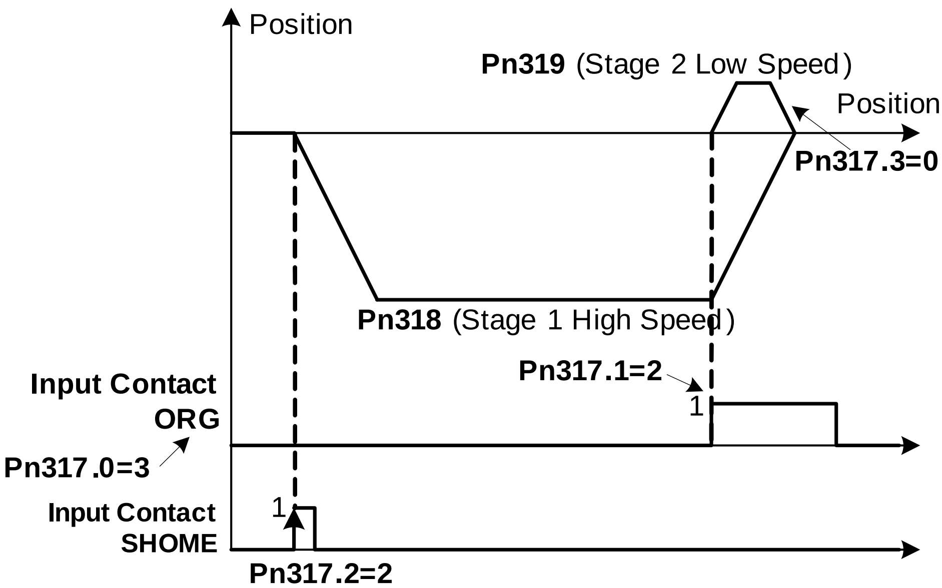


(6) Pn317.0=3 (After activated Return to Origin, use first stage Speed **<u>Reverse Rotation</u>** Direction to search for the Origin Reference Point **ORG**)

Pn317.1=2 (Found the Origin Reference Point **ORG** Top Edge to be used as the Mechanical Origin)

Pn317.2=2 (Input Contact **SHOME** to Activate Return to Origin)

Pn317.3=0 (**<u>Return</u>** to Mechanical Origin)

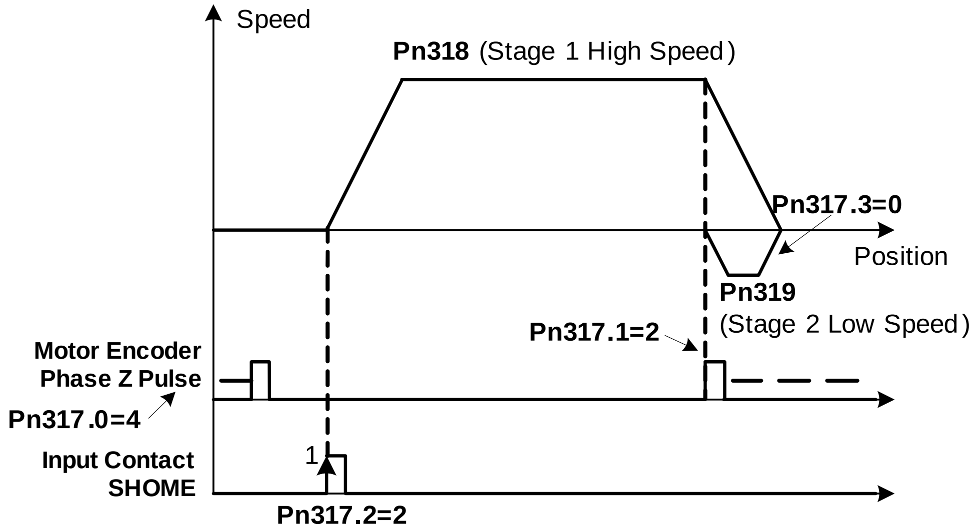


(7) Pn317.0=4 (After activated Return to Origin, use first stage Speed **Forward Rotation** Direction to search for the closest Phase **Z** Pulse Origin)

Pn317.1=2 (Found the Phase **Z** Pulse to be used as the Mechanical Origin)

Pn317.2=2 (Input Contact **SHOME** to Activate Return to Origin)

Pn317.3=0 (**Return** to Mechanical Origin)

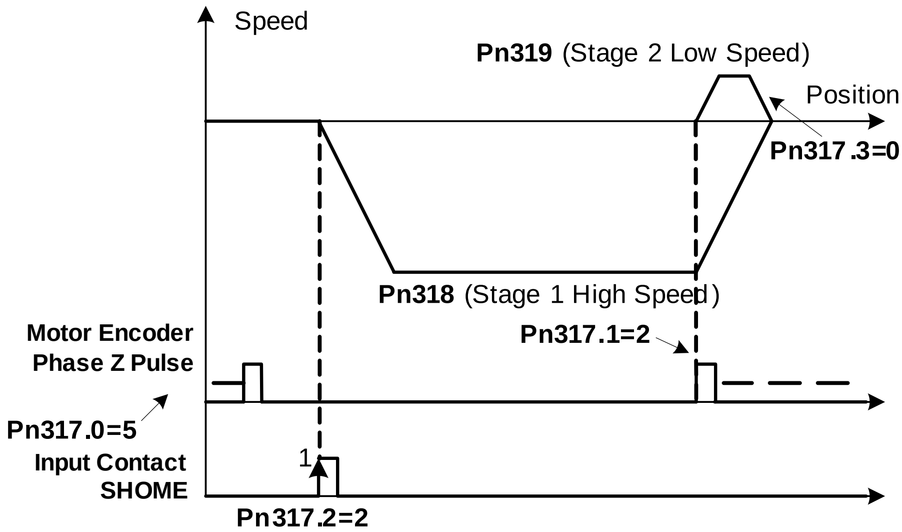


(8) Pn317.0=5 (After activated Return to Origin, use first stage Speed **Reverse Rotation** Direction to search for the closest Phase **Z** Pulse Origin)

Pn317.1=2 (Found the Phase **Z** Pulse to be used as the Mechanical Origin)

Pn317.2=2 (Input Contact **SHOME** to Activate Return to Origin)

Pn317.3=0 (**Return** to Mechanical Origin)



5-4-8 Torque Limit of Position Mode

In Position Control, the Motor Torque Limit is achieved by switching the following two methods using the Input Contact **TLMT**:

(1) Internal Torque Limit: Use internally to set **Cn010**, **Cn056** (CCW Direction Torque Command Limit Value) and **Cn011**, **Cn057** (CW Direction Torque Command Limit Value).
※ External Pulse Command Mode does not have two-stage Torque Limit

(2) External Analog Command: Use Analog Voltage Command Signal Input to **TIC(CN1-43)** to limit CCW Direction Torque and CW Direction Torque.

Please refer to the Table below:

Input Contact TLMT	CCW Direction Torque Command Limit Source	CW Direction Torque Command Limit Source
0 (Switch operates)	External Pulse Command Mode: Cn010 Internal Position Command Mode: Cn010, Cn056	External Pulse Command Mode: Cn011 Internal Position Command Mode: Cn011, Cn057
1 (Switch does not operate)	External Analog Command TIC(CN1-43)	External Analog Command TIC(CN1-43)

Note) High Electric Potential Operation or Low Electric Potential Operation, please set with reference to [5-5-1 Input / Output Contact Function Planning].

Attention! When using External Analog Torque Command Limit, if this Analog Torque Command Limit is greater than the Internal Torque Command Limit, then the Internal Torque Command Limit is ultimately used.

(1) Internal Torque Limit: The following is the Internal Torque Limit setting description:

Cn010/Cn056 CCW Direction Torque Command Limit Value Stage 1 / Stage 2

Initial Value	Unit	Setting Range	Effective	RS-485 Address
200 ~ 300 Note)	%	0-300	Effective after Set	Each Parameter is different

Cn011/Cn057 CW Direction Torque Command Limit Value Stage 1 / Stage 2

Initial Value	Unit	Setting Range	Effective	RS-485 Address
-300 ~ -200 Note)	%	-300-0	Effective after Set	Each Parameter is different

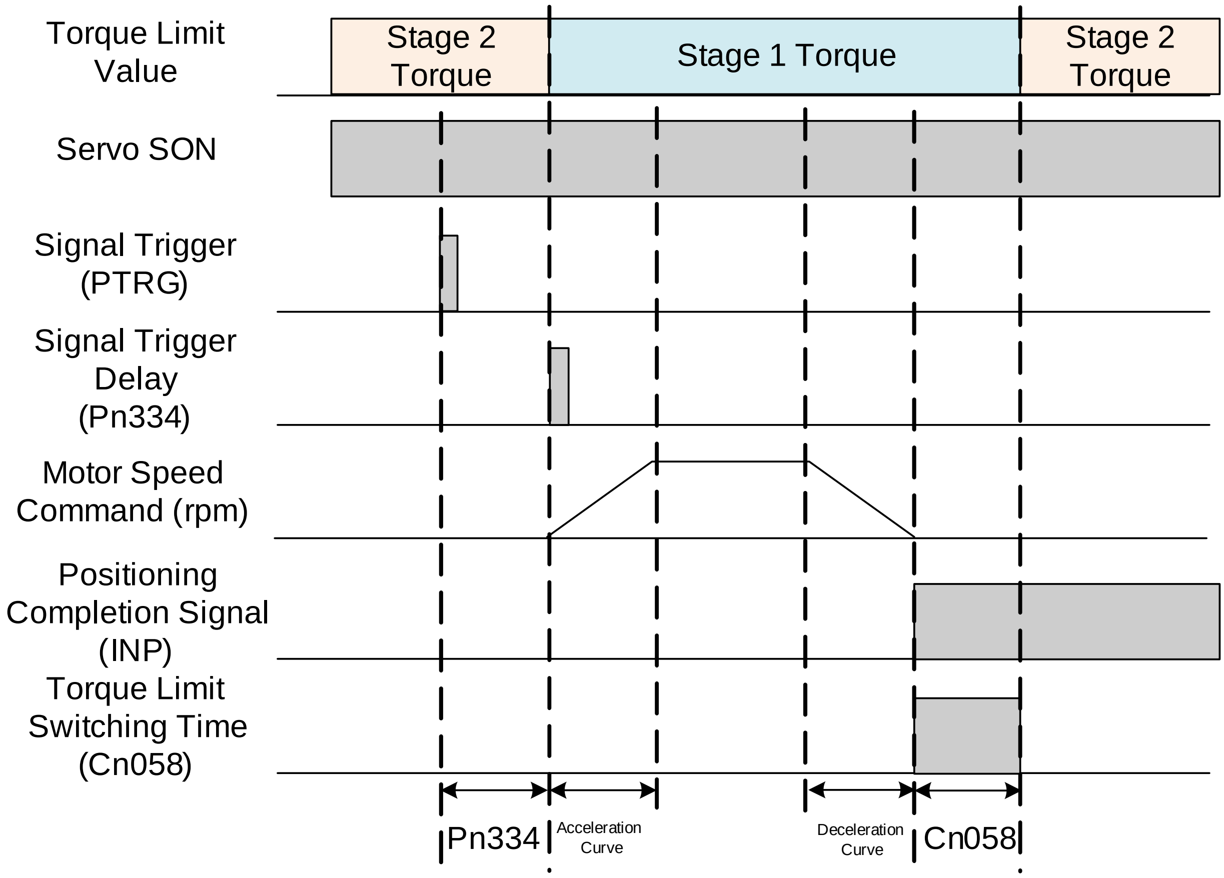
Note) The Parameters **Cn010/Cn056/Cn011/Cn057** has different default values for each Driver Model.

The Delay Time of Cn058 Stage 1 Torque Limit switch to Stage 2 Torque Limit

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	*4ms	0- 32767	--	003DH

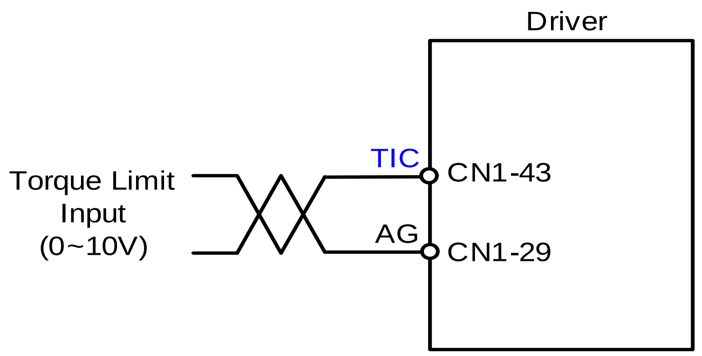
Setting Description: After out the INP signal, the Torque Limit is switched from (Cn010, Cn011) to (Cn056, Cn057) after the time delay set by Cn058, and the Torque Limit is switched from (Cn056, Cn057) to (Cn010, Cn011) after the PTRG operated.

※ External Pulse Command Mode does not have two-stage Torque Limit



TECO

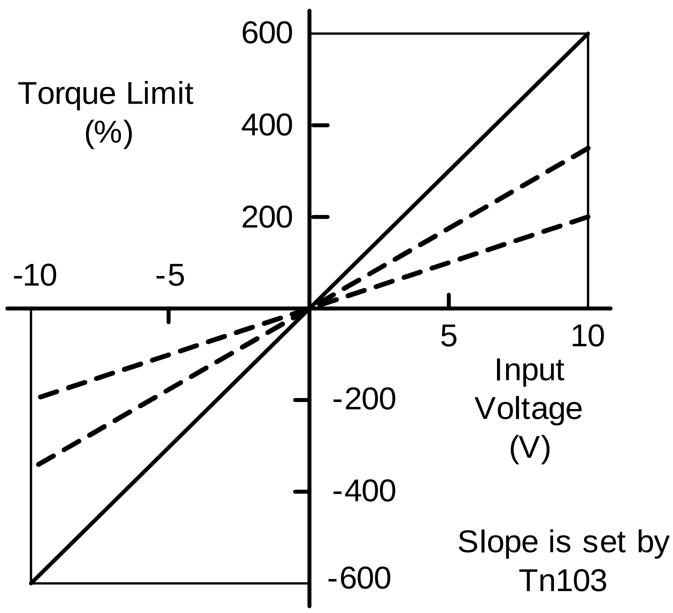
(2) External Analog Command: The following Figure is External Analog Torque Limit Command Wiring Diagram:



Tn103 Analog Torque Limit Proportioner

Initial Value	Unit	Setting Range	Effective	RS-485 Address
300	%/10V	0-600	Effective after Set	0103H

Setting Description: Used to adjust the slope of Voltage Command relative to the Torque Command



5-4-9 Other Position Control Functions

This Section describes other functions related to Position Control.

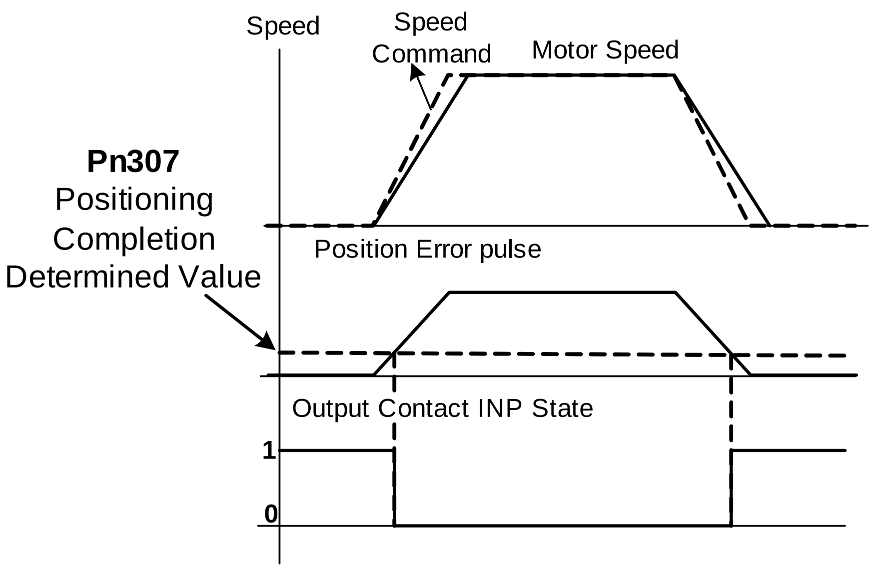
Positioning Completed Function

When the Position Error is lower than the number of Pulses set by **Pn307** (Positioning Completed Determined Value), the Output Contact **INP** operates, as described below:

Pn307 Positioning Completed Determined Value

Initial Value	Unit		Setting Range	Effective	RS-485 Address
One thousandth of a Revolution	pulse		0-41943040	Effective after Set	030CH/030DH

Setting Description: When the Position Error is lower than the number of Pulses set by Pn307 (Positioning Completed Determined Value), the Output Contact INP operates.



Excessive Position Error Warning Function

When the Position Error is higher than the number of Pulses set by **Pn308** (Positive Maximum Position Error Determined Value) or **Pn309** (Negative Maximum Position Error Determined Value), this device generates **AL-11** (Excessive Position Error Alarm), and the setting is as follows:

Pn308 Positive Maximum Position Error Determined Value

Initial Value	Unit	Setting Range	Effective	RS-485 Address
5000	1/1000 of a Revolution	0-50000	Effective after Set	030EH

Setting Description: When the Position Error is higher than the number of Pulses set by Pn308 (Positive Maximum Position Error Determined Value), this device generates AL-11 (Excessive Position Error Alarm).

Pn309 Negative Maximum Position Error Determined Value

Initial Value	Unit	Setting Range	Effective	RS-485 Address
5000	1/1000 of a Revolution	0-50000	Effective after Set	030FH

Setting Description: When the Position Error is higher than the number of Pulses set by Pn309 (Negative Maximum Position Error Determined Value), this device generates AL-11 (Excessive Position Error Alarm).

DI-JOG Function

In the Position Mode, the DI pin function SPD1 and SPD2 can be used to perform JOG speed operation, the control method is shown as follows

SPD1	SPD2	JOG Speed	Function
0 (Switch Open)	0 (Switch Open)	X	No JOG Function
1 (Switch in Conduction)	0 (Switch Open)	Sn201	JOG Excitation_Forward Rotation
0 (Switch Open)	1 (Switch in Conduction)	Sn201	JOG Excitation_Reverse Rotation
1 (Switch in Conduction)	1 (Switch in Conduction)	0	JOG Excitation_Zero Rotation

Sn201 Internal Speed Command 1

Initial Value	Unit	Setting Range	Effective	RS-485 Address
100	rpm	-1.5*Rated Speed~1.5*Rated Speed	--	0201H

5-5 Tool Magazine Specific Mode

The JSDG2S Series provides Turret-specific Mode; please refer to the following Sections for related settings and process.

Attention! The Turret Mode only supports ABS type encoders (Cn030 ended with 5, A, D), if non-ABS type encoders use Turret Mode, will generate AL-40: Turret Mode prohibits use of Non-absolute Type Encoders.

Cn001 Control Mode Selection

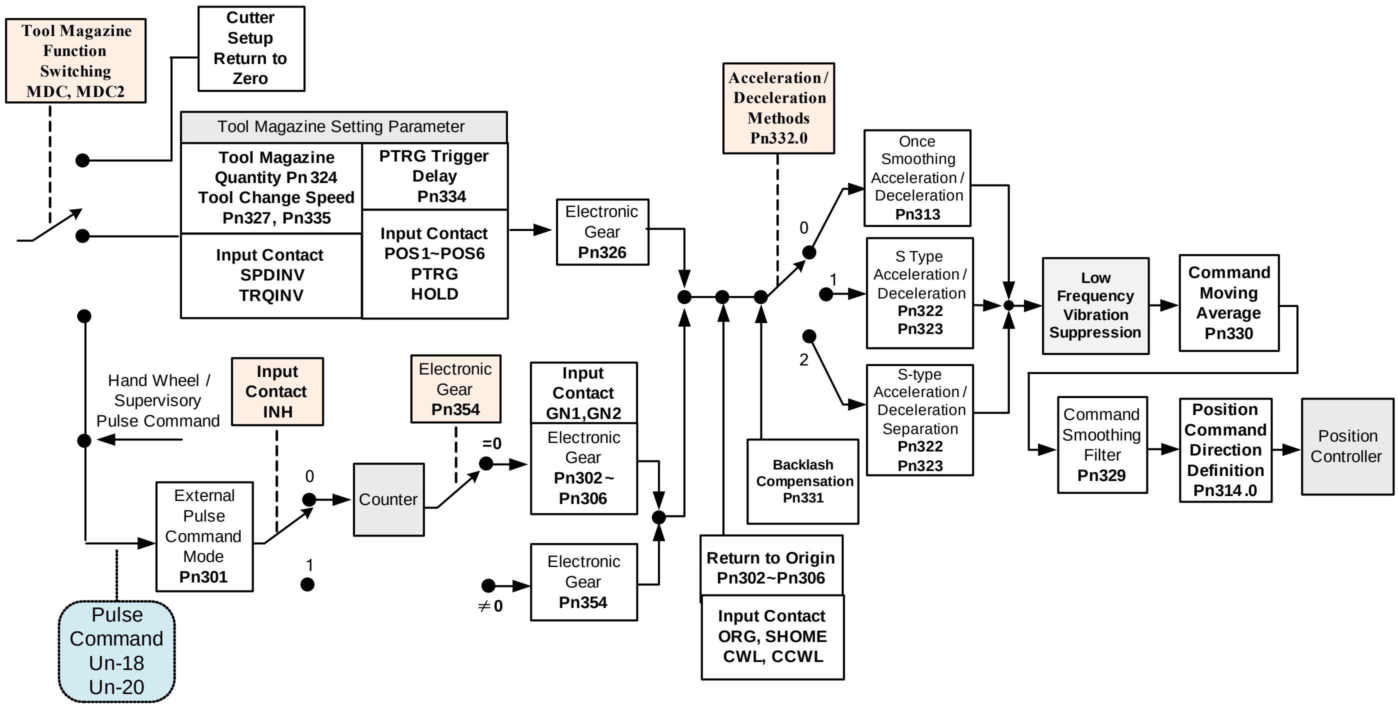
Initial Value	Unit	Setting Range	Effective	RS-485 Address
2	--	0-D	Power Re-set	0001H

Setting Description:

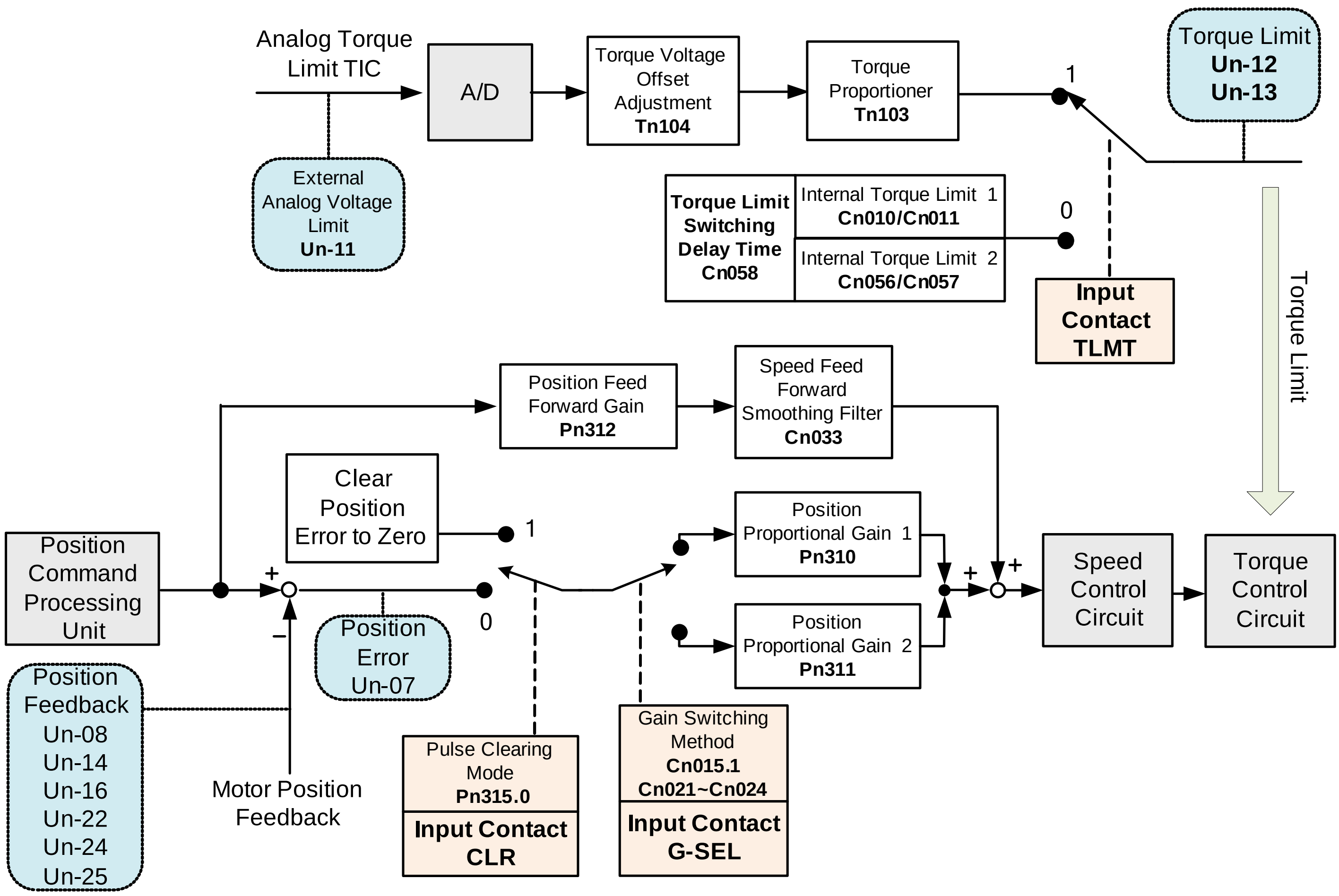
Setting	Description
9	CNC Tool Magazine Automatic Tool Selection Control

The Tool Magazine Loop Control Block Diagram is shown in the Figure below; detailed functions of each Block are described in the following Sections.

Tool Magazine Processing Unit



Tool Magazine Position Controller



5-5-1 Tool Contact Signal Operation Instructions

Servo Driver providesOpen DI/DO Control Interface, can be wired as NPN or PNP connection based on the customer requirements

Input and Output Default Pin Definition Table:

Parameter Code	Name and Function	Setting Value	Code	Contact Operation Function
Cn001	Control Mode Selection	9	Tool Magazine Control (Used with Absolute Value Type Encoder)	
Hn601	DI-1 Pin Function	01	SON	Servo Start
Hn602	DI-2 Pin Function	02	ALRS	Error Alarm Clearing
Hn603	DI-3 Pin Function	16	POS1	Tool Magazine Tool Number Selection 1
Hn604	DI-4 Pin Function	17	POS2	Tool Magazine Tool Number Selection 2
Hn605	DI-5 Pin Function	18	POS3	Tool Magazine Tool Number Selection 3
Hn606	DI-6 Pin Function	19	POS4	Tool Magazine Tool Number Selection 4
Hn607	DI-7 Pin Function	1E	POS5	Tool Magazine Tool Number Selection 5
Hn608	DI-8 Pin Function	13	POS6	Tool Magazine Tool Number Selection 6
Hn609	DI-9 Pin Function	09	EMC	Emergency Stop
Hn610	DI-10 Pin Function	12	PTRG	Internal Position Command Trigger
Hn611	DI-11 Pin Function	1D	MDC2	Control Mode Selection in Tool Magazine Mode
Hn612	DI-12 Pin Function	0C	MDC	Control Mode Switching
Hn613	D0-1 Pin Function	06	INP	Positioning Completion Signal
Hn614	D0-2 Pin Function	02	ALM	Servo Error
Hn615	D0-3 Pin Function	0E	P6	Tool Magazine Mode Selection Tool Position Display6
Hn616	D0-4 Pin Function	0D	P5	Tool Magazine Mode Selection Tool Position Display5
	D0-5 Pin Function		P4	Tool Magazine Mode Selection Tool Position Display4
	D0-6 Pin Function		P3	Tool Magazine Mode Selection Tool Position Display3
	D0-7 Pin Function		P2	Tool Magazine Mode Selection Tool Position Display2
	D0-8 Pin Function		P1	Tool Magazine Mode Selection Tool Position Display1

JSDAP Tool Magazine Function can provide four types of Control Modes through DI switching, the summary of each Mode Description is as follows:

1. Automatic Tool Selection Mode: uses the shortest path to select tool (rotates toward the shortest distance). This judgment is determined by the internal software calculation of the driver and does not require the controller programming.
2. Cutter Setup Return to Zero Mode: The customer can define the position of first tool through contact control according to requirement.

3. Manual Single-step Mode: In this mode, there is no need to control the input of the tool position contact; each trigger of PTRG moves a tool position.
4. External Pulse Mode: used in conjunction with the Cutter Setup Mode, when the Servo Motor and Mechanical Deceleration Mechanism are assembled the first time, the first tool position of the outermost disc may be far away from the actual required position, input the External Pulse Command through the Hand Wheel or other device, directly control the Servo Motor to rotate to the first tool position. If there has ever been a switching to the External Pulse Mode, the Cutter Setup Return to Zero Mode must be re-entered, to reset the First Tool Position or the disconnect the power to the Driver to redefine the Absolute Position in order to select the tool with Automatic Tool Selection Mode or Manual Single-step Mode, otherwise, once the PTRG trigger signal is input, the Servo Driver will jump to AL-11 Alarm.

Operating Mode Comparison Table:

Input Contact / Mode	MDC	MDC2
Automatic Tool Selection Mode	0 (Contact Open)	0 (Contact Open)
Cutter Setup Return to Zero Mode	1 (Contact Closed)	0 (Contact Open)
Manual Single-step Mode	0 (Contact Open)	1 (Contact Closed)
External Pulse Mode	1 (Contact Closed)	1 (Contact Closed)

The Tool Number selection and the current Tool Position can be determined by the binary decoding method through digital input/output signals:

Tool Number Position Contact Input Table:

DI Input / Tool Number	POS6	POS5	POS4	POS3	POS2	POS1
Tool Number 1	0	0	0	0	0	0
Tool Number 2	0	0	0	0	0	1
:	:	:	:	:	:	:
Tool Number 11	0	0	1	0	1	0
Tool Number 12	0	0	1	0	1	1
:	:	:	:	:	:	:
Tool Number 63	1	1	1	1	1	0
Tool Number 64	1	1	1	1	1	1
※ The value of 0 represents Contact Open; the value of 1 represents Contact Closed.						

Absolute Value Type Encoder built-in Position Memory permanently memorizes the position information of each tool number. When start the machine after powered off,, the Driver will automatically output the (DO) status to the controller; the controller performs binary decoding on the signal to obtain the current position of tool number, and does not need to perform the Return to Origin operation. If the 64th tool will be used, the 7th point INP signal must be added with P1~P6 to conduct Output Determination.

When in first tool position, the Digital Output Signals P1~P6 and INP Signal will all be output, when the Digital Output Signals P1~P6 and INP Signal are not all output, indicates the tool number is no longer in the range, and timing of tool number is not in the range:

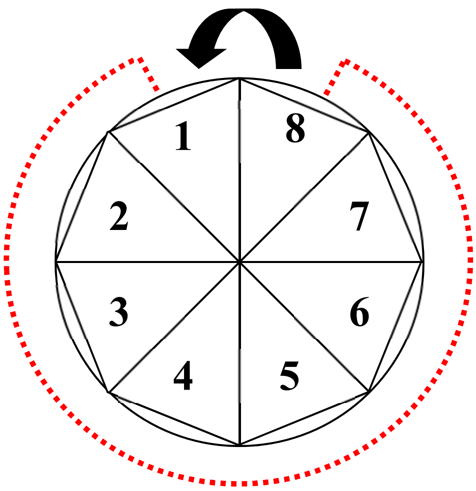
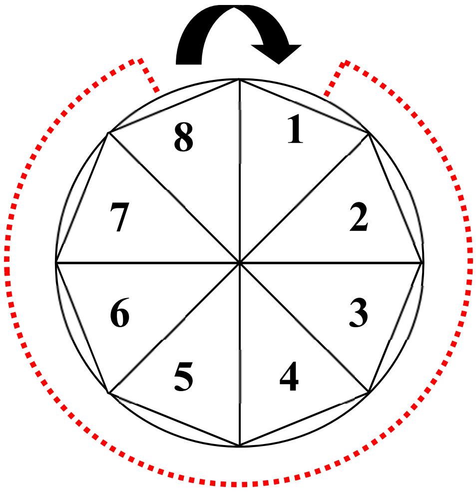
1. First time use of the Tool Magazine Mode; the first time use of the Cutter Setup Return to Zero operation, to be able to operate correctly.
2. Switch back from the External Pulse Mode; make sure to conduct Cutter Setup Return to Zero operation again, to be able to operate correctly.
3. In the Process the Servo Motor moves to the next tool number position.

Tool Number Position Contact Output Table:

DO Output / Tool Number	P6	P5	P4	P3	P2	P1	INP
Not in the Range	0	0	0	0	0	0	0
Tool Number 1	1	1	1	1	1	1	1
Tool Number 2	1	1	1	1	1	0	1
:	:	:	:	:	:	:	1
Tool Number 11	1	1	0	1	0	1	1
Tool Number 12	1	1	0	1	0	0	1
:	:	:	:	:	:	:	1
Tool Number 63	0	0	0	0	0	1	1
Tool Number 64	0	0	0	0	0	0	1
※ The value of 0 represents Contact Open; the value of 1 represents Contact Closed.							

If the rotation direction of the tool holder is opposite to what is required, please set the DI pin SPDINV Function to control the disc rotation reverse operations.

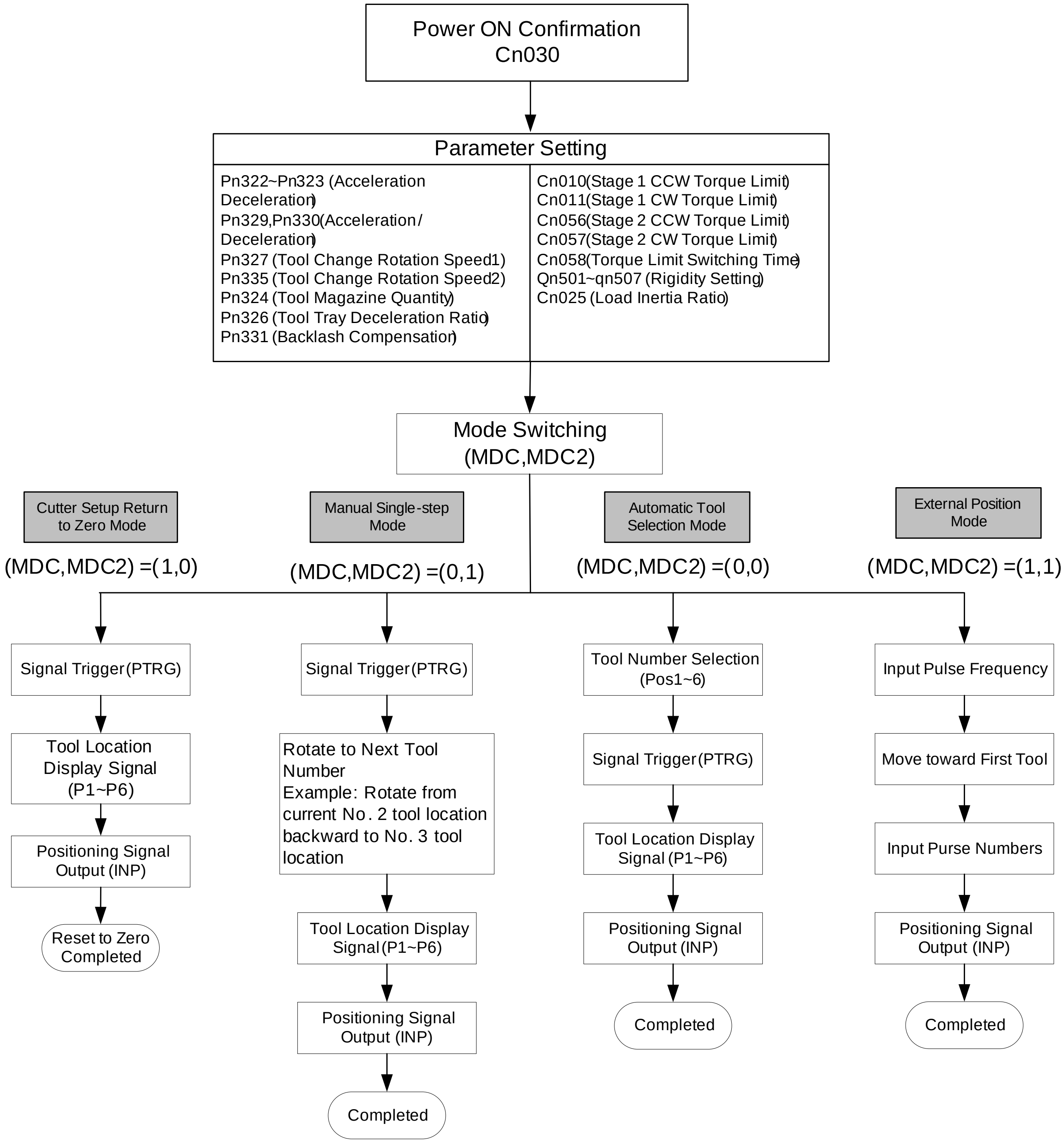
Rotation Direction Definition Table:

<table>
<tr><th>Input Contact
Motor Rotation Direction</th><th>SPDINV</th><th>Tool Number Arrangement Method</th></tr>
<tr><td>Counterclockwise Rotation (CCW)</td><td>0 (Contact Open)</td><td>Tool Number Arranged according to Counterclockwise Order</td></tr>
<tr><td>Clockwise Rotation (CW)</td><td>1 (Contact Closed)</td><td>Tool Number Arranged according to Clockwise Order</td></tr>
<tr><td colspan="2">SPDINV=0</td><td>SPDINV=1</td></tr>
<tr><td colspan="2">
</td><td>
</td></tr>
</table>

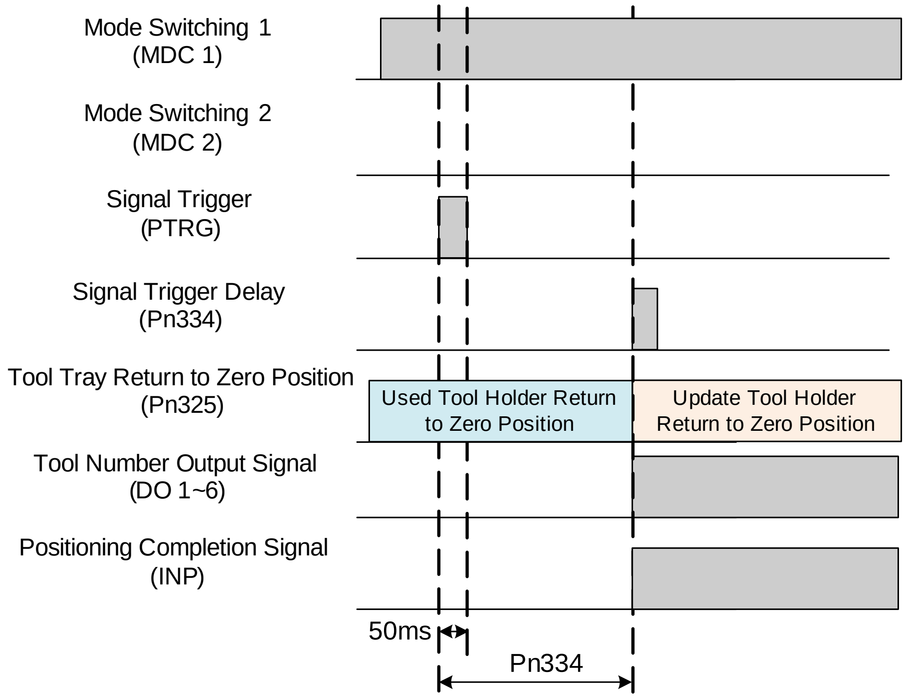
Tool Change Definition Table:

Input Contact TRQINV	Tool Change Speed Parameter
0 (Contact Open)	Pn327 (Tool Change Rotation Speed 1)
1 (Contact Closed)	Pn335 (Tool Change Rotation Speed 2)

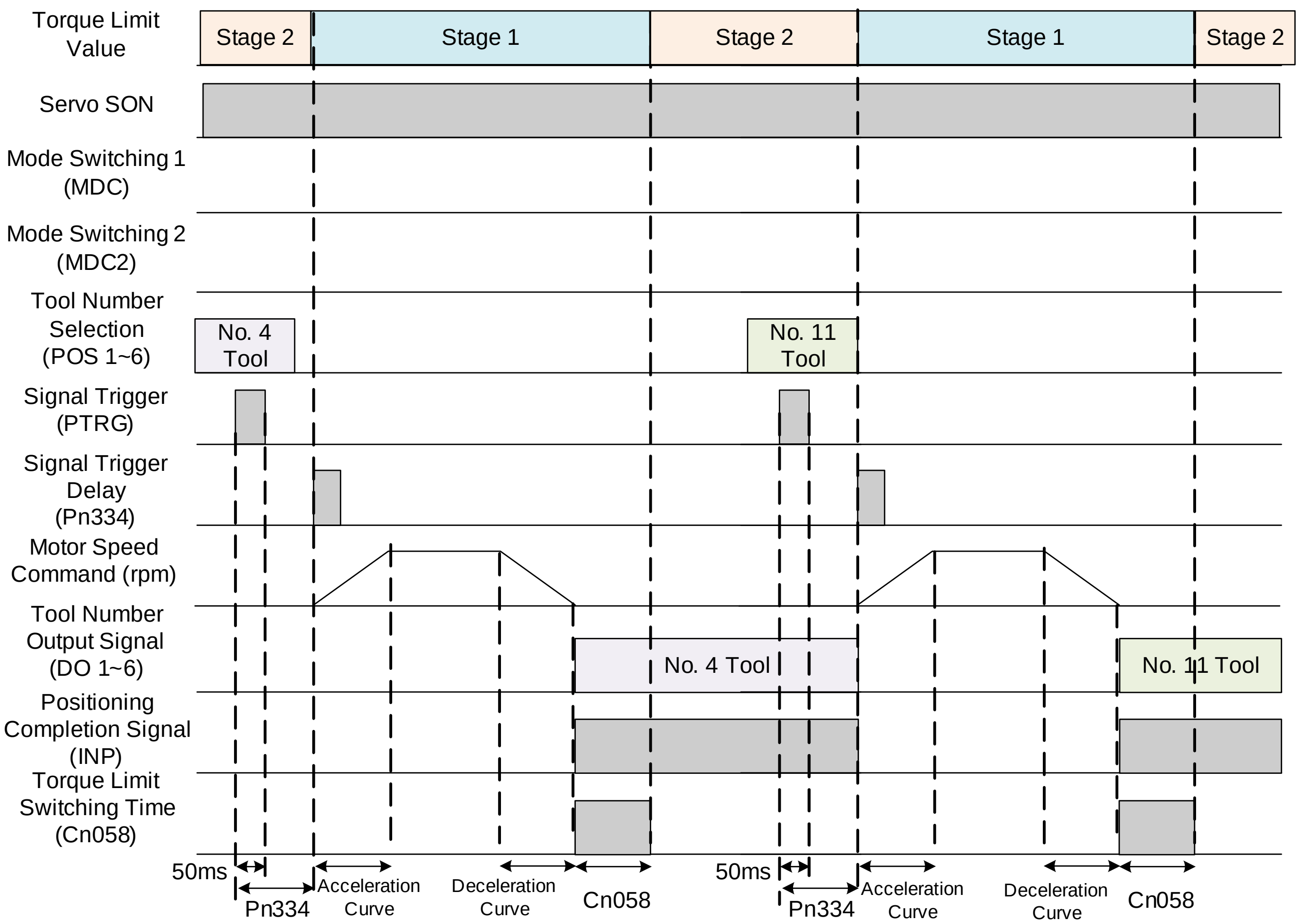
5-5-2 Tool Magazine Dedicated Mode Setting Flow Chart



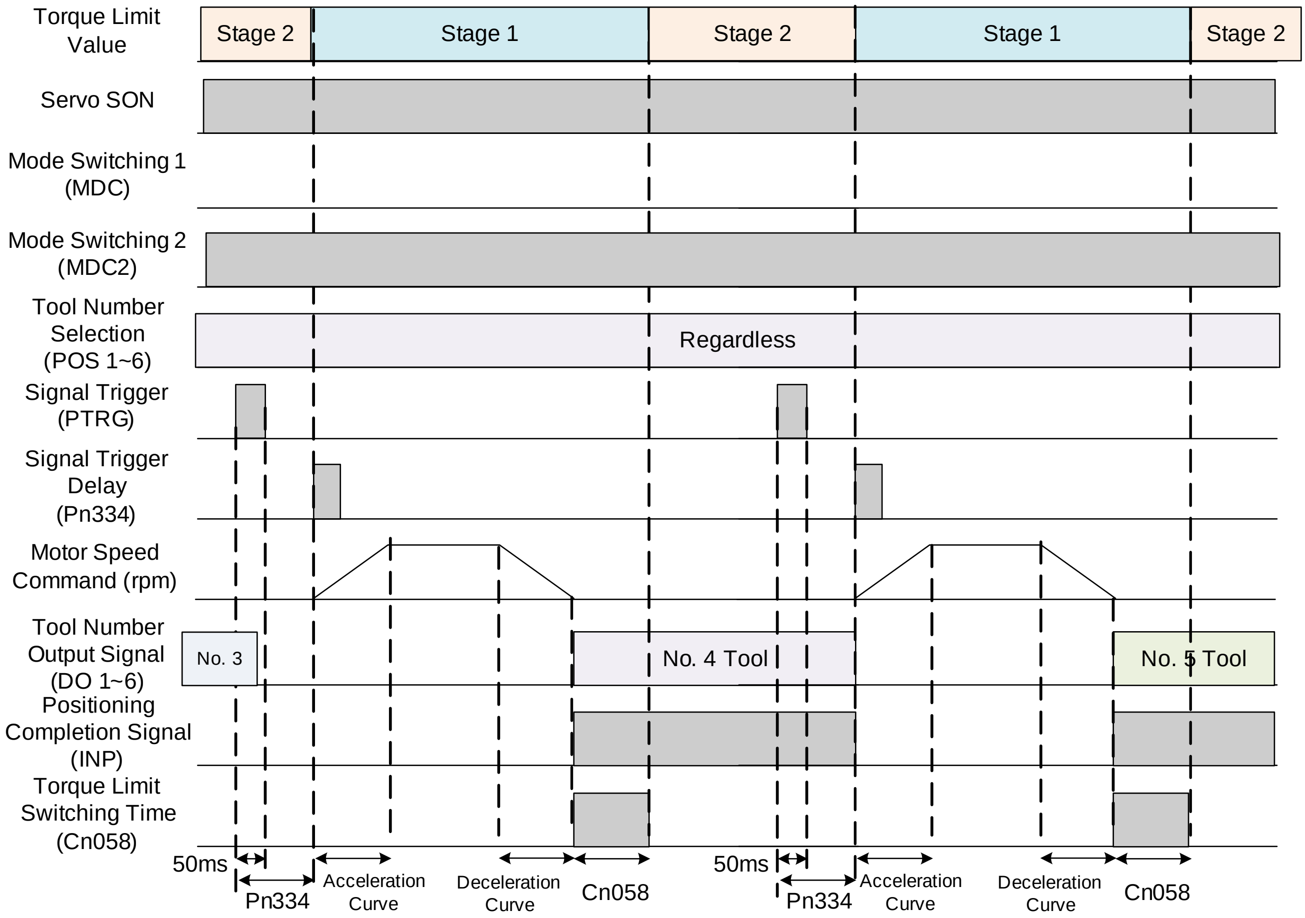
5-5-3 Tool Magazine Cutter Setup Return to Zero Mode Time Sequence Diagram



5-5-4 Tool Magazine Automatic Tool Selection Mode Time Sequence Diagram



5-5-5 Tool Magazine Manual Single Step Time Sequence Diagram



5-5-6 Tool Magazine Parameter Setting

Cn002.0 Contact Auxiliary Functions--Input Contact SON Function Selection

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	**--**	**0-1**	**Power Re-set**	0002H

Setting Description:

Setting	Description
0	Control Servo Activation by Input Contact SON.
1	Control Servo Activation not using Input Contact SON, activate Servo immediately with Power Turned ON

Cn002.1 Contact Auxiliary Functions--Input Contact CCWL and CWL Function Selection

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0-1	Power Re-set	0002H

Setting Description:

Setting	Description
0	Control CCW and CW Drive Prohibit by Input Contacts CCWL and CWL.
1	Control CCW and CW Drive Prohibit not using Input Contacts CCWL and CWL, ignore CCW and CW Drive Prohibit Functions.

Cn002.3 EMC Return Mode Selection

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0-1	Power Re-set	0002H

Setting Description:

Setting	Description
0	After the EMC status is cleared, the AL-09 Display can only be cleared with ALRS Signal in the Servo Off State (SON Contact Open).
	Note) Cannot be cleared in Servo On State (SON Contact Closed).
1	After the EMC status is cleared, the AL-09 Display can be automatically return cleared regardless of the status of Servo On or Servo off.
	! Attention: In Servo On state, before the alarm clears and returns to normal operation, whether the Controller still issues command to the Drive must be confirmed to avoid causing sudden unintended acceleration of the Motor!

Cn010/Cn056 CCW Direction Torque Command Limit Value Stage 1 / Stage 2

Initial Value	Unit	Setting Range	Effective	RS-485 Address
200 ~ 300 Note)	%	0-300	Effective after Set	Each Parameter is different

Cn011/Cn057 CW Direction Torque Command Limit Value Stage 1 / Stage 2

Initial Value	Unit	Setting Range	Effective	RS-485 Address
-300 ~ -200 Note)	%	-300-0	Effective after Set	Each Parameter is different

Note) The Parameters **Cn010/Cn056/Cn011/Cn057** has different default values for each Driver Model.

The Delay Time of Cn058 Stage 1 Torque Limit switch to Stage 2 Torque Limit

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	*4ms	0- 32767	Effective after Confirmed	003DH

Setting Description: After out the INP signal, the Torque Limit is switched from (Cn010, Cn011) to (Cn056, Cn057) after the time delay set by Cn058, and the Torque Limit is switched from (Cn056, Cn057) to (Cn010, Cn011) after the PTRG operated.

Cn025 Load Inertia Ratio

Initial Value	Unit	Setting Range	Effective	RS-485 Address
10	X0.1	0-2000	Effective after Confirmed	001CH

Setting Description:

$$\text{Load Inertia Ratio} = \frac{\text{Switched to Load Inertia of Motor Shaft } (J_L)}{\text{Servo Motor Rotor Inertia } (J_M)} \times 100\%$$

Pn307 Positioning Completed Determined Value

Initial Value	Unit	Setting Range	Effective	RS-485 Address
One thousandth of a Revolution	pulse	0-41943040	Effective after Set	030CH/030DH

Setting Description: When the Position Error is lower than the number of Pulses set by Pn307 (Positioning Completed Determined Value), the Output Contact INP operates.

Pn313 Internal / External Position Command One time Smoothing Acceleration / Deceleration Time Constant

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	msec	0-10000	Power Re-set	0313H

Setting Description: Will smooth the Position Pulse Command of originally fixed frequency. The Definition of External Position Command One Time Smoothing Acceleration / Deceleration Time Constant is the time of External Position Pulse Command Frequency starts one time delay rise from zero to 63.2% of the External Position Pulse Command Frequency.

Pn322 Internal Position Command S-type Acceleration / Deceleration Smoothing Constant (TSL)

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	X0.4ms	0-5000	Effective after Set	031DH

Setting Description: The Position S-type Smoother is suitable for the Control Mode of the Internal Position Command Input, and provides the smoothing process of the motion command. The generated speed and acceleration are continuous, and the jerkiness of the acceleration is smaller, which can improve the characteristics of acceleration / deceleration of the Motor, and more smooth in mechanical structure operations.

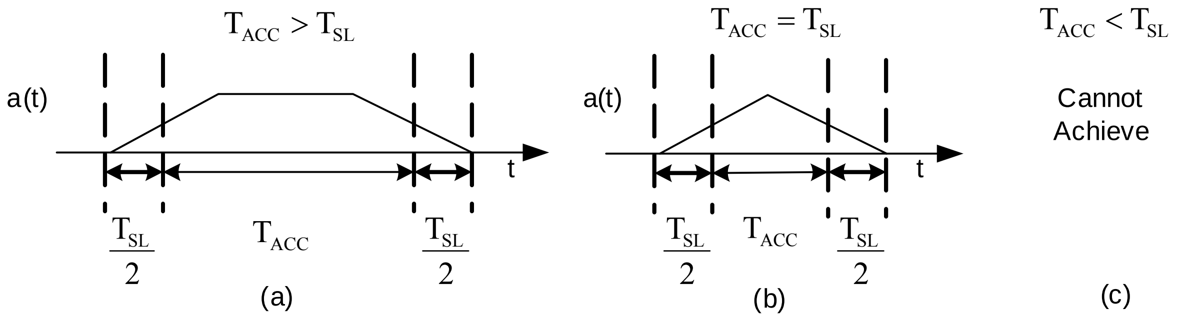


Figure: Definition of Travel Time for S-type Curve.

Pn323 Internal Position Command S-type Acceleration / Deceleration Constant (TACC)

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1	X0.4ms	1-5000	Effective after Set	031EH

Setting Description: Please refer to Pn322 Description.

Pn333 Internal Position Command S-type Deceleration Constant (TDEC)

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1	*0.4msec	1-5000	Effective after Set	032AH

Setting Description: Please refer to Pn322 Description.

Pn324 CNC Tool Magazine Quantity Setting

Initial Value	Unit	Setting Range	Effective	RS-485 Address
12	--	1-64	Effective after Confirmed	031FH

Setting Description: Total Number of Tool Holders on Tool Tray

Pn325 CNC Tool Tray Return to Zero Position

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	pulse	0- 8388607	Effective after Confirmed	0320H/0321H

Setting Description: Set the Zero Tool Position

Pn326 CNC Tool Tray Reduction Ratio

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1	REV	1- 255	Effective after Confirmed	0322H

Setting Description: Tool Tray Reduction Ratio

Pn327 Tool Change Rotation Speed

Initial Value	Unit	Setting Range	Effective	RS-485
100	RPM	1- 2*Rated Speed	Effective after Confirmed	0323H

Setting Description: Tool Change Rotation Speed

Pn329 Pulse Command Smoothing Filter

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	x2msec	0- 2500	Effective after Confirmed	0325H

Setting Description: Can select Filter Smoothing Time.

Pn330 Pulse Command Moving Filter

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	X0.4msec	0- 250	Effective after Confirmed	0326H

Setting Description: Pulse Command Moving Filter

Pn331 Turret Magazine Backlash Compensation Parameters

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	Pulse	-8388607- 8388607	Effective after Confirmed	0327H/0328H

Setting Description: Set Backlash Compensation Value

Pn332.0 Internal Position Command Acceleration / Deceleration Method

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0-2	Effective after Confirmed	0327H/0328H

Setting Description:

Setting	Description
0	Use Position Command One Time Smoothing Acceleration / Deceleration
1	Use Internal Position Command S-type Acceleration / Deceleration
2	Use Internal Position Command S-type Acceleration / Deceleration Separation

Pn333 Internal Position Command S-type Deceleration Constant (TDEC)

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1	*0.4msec	1-5000	Effective after Confirmed	032AH

Setting Description: Please refer to PN322 Description

Pn334 PTRG Trigger Delay Time Parameter

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	*4ms	0-2500	Effective after Confirmed	032BH

Setting Description: After PTRG is triggered, and after the Delay setting time, the Motor starts rotation.

Pn335 Tool Change Second Stage Rotation Speed

Initial Value	Unit	Setting Range	Effective	RS-485 Address
100	rpm	1-Rated Speed	Effective after Confirmed	032CH

Setting Description: Tool Change Second Stage Rotation Speed

5-6 Other Functions

5-6-1 Input / Output Contact Function Planning

This Device has 12 Digital Input Contact Functions and 4 Digital Output Contact Functions can be planned, the description is as follows:

Hn601.0/Hn601.1~ Hn612.0/Hn612.1 DI-1~DI12Pin Functions

Initial Value	Unit	Setting Range	Effective	RS-485 Address
Change with Mode	--	00-20(Hexadecimal)	Power Re-set	Please refer to Parameter Description

Setting Description:

Setting	Description	
	Code	Contact Operation Function
00	NULL	Not Used
01	SON	Servo Start
02	ALRS	Error Alarm Clearing
03	PCNT	PI/P Switching
04	CCWL	CCW Direction Drive Prohibited
05	CWL	CW Direction Drive Prohibited
06	TLMT	External Torque Limit
07	CLR	Pulse Error Clearing
08	LOK	Servo Lock
09	EMC	Emergency Stop
0A	SPD1	Internal Speed Command Selection1 / DI_Jog_1
0B	SPD2	Internal Speed Command Selection2 / DI_Jog_2
0C	MDC	Control Mode Switching
0D	INH	Position Command Prohibited
0E	SPDINV	Speed Command Reverse

Setting	Description	
	Code	Contact Operation Function
0F	G-SEL	Gain Switching
10	GN1	Electronic Gear Ratio Numerator Selection1
11	GN2	Electronic Gear Ratio Numerator Selection2
12	PTRG	Internal Position Command Trigger
13	PHOLD	Internal Position Command Hold
14	SHOME	Start to Return to Origin
15	ORG	External Reference Origin
16	POS1	Internal Position Command Selection1
17	POS2	Internal Position Command Selection2
18	POS3	Internal Position Command Selection3
19	POS4	Internal Position Command Selection4
1A	TRQINV	Torque Command Reverse
1B	RS1	Torque Command Forward Selection
1C	RS2	Torque Command Reverse Selection
1E	POS5	Internal Position Command Selection5
20	VDI	Virtual Contact Digit Input

Hn601.2~ Hn612.2 DI-1~ DI-10 Pin Function Operation Potential

Initial Value	Unit	Setting Range	Effective	RS-485 Address
Change with Mode	--	0-1	Power Re-set	Please refer to Parameter Description

Setting Description:

Setting	Description
0	When the Pin is Low Potential (short circuit with IG24 pin), function operates.
1	When the Pin is High Potential (open circuit with IG24 pin), function operates.

Attention! DI-1~DI-12 Pin Functions can be repeated, but the pin operating potential of repeated function must be the same, otherwise it will generate

AL-07 (5-5-1 Input / Output Contact Function Planning Error Alarm)

Multi-function Planning Digital Input Contact Default Value

DI Code	Input Function	0 T	1 S	2 Pe	3 Pe S	4 S T	5 Pe T	6 Pi	7 Pi S	8 Pi T	A Pi Pe
00	NULL										
01	SON	DI1	DI1	DI1	DI1	DI1	DI1	DI1	DI1	DI1	DI1
02	ALRS	DI2	DI2	DI2	DI2	DI2	DI2	DI2	DI2	DI2	DI2
03	PCNT	DI3	DI3	DI3	DI3	DI3	DI3				DI3
04	CCWL	DI4	DI4	DI4	DI4	DI4	DI4				DI4
05	CWL	DI5	DI5	DI5	DI5	DI5	DI5				DI5
06	TLMT		DI6	DI6	DI6						DI6
07	CLR			DI7							DI7
08	LOK		DI8		DI8						
09	EMC	DI9	DI9	DI9	DI9	DI9	DI9	DI9	DI9	DI9	DI9
0A	SPD1	DI10	DI10		DI10	DI10	DI10		DI10		
0B	SPD2	DI11	DI11		DI11	DI11	DI11		DI11		
0C	MDC	DI12	DI12	DI12	DI12	DI12	DI12		DI12	DI12	DI12
0D	INH			DI8							DI8
0E	SPDINV		DI7		DI7						
0F	G-SEL										
10	GN1										
11	GN2										
12	PTRG							DI8	DI8	DI8	
13	PHOLD							DI12			
14	SHOME			DI10				DI10			DI10
15	ORG			DI11				DI11			DI11
16	POS1							DI3	DI3	DI3	
17	POS2							DI4	DI4	DI4	
18	POS3							DI5	DI5	DI5	
19	POS4							DI6	DI6	DI6	
1A	TRQINV	DI8				DI8	DI8				
1B	RS1	DI6				DI6	DI6			DI10	
1C	RS2	DI7				DI7	DI7			DI11	
1D	MDC2										
1E	POS5							DI7	DI7	DI7	
20	VDI										

Multi-function Planning Digital Input Function Description

This explains that except for the default value of CCWL and CWL is high-potential operation; the other pins are low-potential operation.

<table>
<tr><th>Signal Name</th><th>Function Code</th><th>Mode</th><th>I/O Operating Function Description</th></tr>
<tr><td>No Function Setting</td><td>NULL</td><td>ALL</td><td>No Function Setting</td></tr>
<tr><td>Servo Start</td><td>SON</td><td>ALL</td><td>When SON ON, enter Servo ON State
※ Attention! Make sure that the Input Contact SON (Servo Start) does not operate before turning Power on to avoid danger.</td></tr>
<tr><td>Abnormality Reset</td><td>ALRS</td><td>ALL</td><td>When ALRS is ON, the Stop State caused by abnormality is released.
※ However, Alarms such as Encoder Error, Memory Error will issue the same alarm again, please re-set the power after resolving the cause of Error.</td></tr>
<tr><td>PI/P Switching</td><td>PCNT</td><td>Pi/Pe/S</td><td>PCNT ON will convert the Speed Loop Control from Proportional Integration Control to Proportional Control.</td></tr>
<tr><td>CCW Direction Drive Prohibited</td><td>CCWL</td><td>ALL</td><td>Connect to CCW Over Travel Detector, when normal, CCWL ON, OFF indicates CCW Overall Travel occurred.</td></tr>
<tr><td>CW Direction Drive Prohibited</td><td>CWL</td><td>ALL</td><td>Connect to CW Over Travel Detector, when normal, CWL ON, OFF indicates CW Overall Travel occurred.</td></tr>
<tr><td>External Torque Limit</td><td>TLMT</td><td>Pi/Pe/S</td><td>When TLMT ON, will limit the Motor Output Torque to the Command Voltage range of the Torque Limit Pin (TIC) input.</td></tr>
<tr><td>Pulse Error Clearing</td><td>CLR</td><td>Pi/Pe</td><td>When CLR ON, clear the number of pulses accumulated in the Position Error Counter.</td></tr>
<tr><td>Servo Lock</td><td>LOK</td><td>S</td><td>When LOK ON, switch the Speed Control Mode to Position Control Mode to lock the Motor in the last position.</td></tr>
<tr><td>Emergency Stop</td><td>EMC</td><td>ALL</td><td>When EMC ON, entering Emergency Stop State, immediately Servo OFF to exit the operation state, and the Cn008 determines whether or not the Dynamic Brake operates.</td></tr>
<tr><td>Internal Speed Command/ Limits Selection 1/ DI_Jog_1

Internal Speed Command/ Limits Selection 2/ DI_Jog_2</td><td>SPD1
SPD2</td><td>S/T/Pi/Pe</td><td>Internal Speed Setting and Limits Description:
<table>
<tr><th>SPD2</th><th>SPD1</th><th>In Speed Mode (Speed Command)</th><th>In Torque Mode (Speed Limits Commend)</th><th>In Position Mode (DI JOG)</th></tr>
<tr><td>0</td><td>0</td><td>External Speed Command (SIC)</td><td>Internal Speed Command (SIC)</td><td>No JOG Function</td></tr>
<tr><td>0</td><td>1</td><td>Sn201</td><td>Tn105</td><td>JOG Excitation_Forward Rotation</td></tr>
<tr><td>1</td><td>0</td><td>Sn202</td><td>Tn106</td><td>JOG Excitation_Reverse Rotation</td></tr>
<tr><td>1</td><td>1</td><td>Sn203</td><td>Tn107</td><td>JOG Excitation_Zero Rotation</td></tr>
</table></td></tr>
<tr><td>Control Mode Switching</td><td>MDC</td><td>ALL</td><td>When MDC is ON, it will change the current Control Mode to the pre-determined Control Mode, please refer to Cn001.</td></tr>
</table>

<table>
<tr><th>Signal Name</th><th>Function Code</th><th>Mode</th><th>I/O Operating Function Description</th></tr>
<tr><td>Position Command Prohibited</td><td>INH</td><td>Pe</td><td>When INH is ON, the Position Command Input is invalid (Externally delivered Pulse Command is not accepted).</td></tr>
<tr><td>Speed Command Reverse</td><td>SPDINV</td><td>S</td><td>Speed Mode: When SPDINV is ON, the set rotation speed becomes the reverse rotation speed.</td></tr>
<tr><td>Gain Switching</td><td>G-SEL</td><td>Pi/Pe/S</td><td>When G-SEL is ON, the first stage Control Gain is switched to the second stage Control Gain</td></tr>
<tr><td>Electronic Gear Ratio Numerator Selection 1~2</td><td>GN1
GN2</td><td>Pi/Pe</td><td>Electronic Gear Ratio Numerator Selection Description:
<table>
<tr><th>GN2</th><th>GN1</th><th>Electronic Gear Ratio Numerator</th></tr>
<tr><td>0</td><td>0</td><td>Pn302</td></tr>
<tr><td>0</td><td>1</td><td>Pn303</td></tr>
<tr><td>1</td><td>0</td><td>Pn304</td></tr>
<tr><td>1</td><td>1</td><td>Pn305</td></tr>
</table></td></tr>
<tr><td>Internal Position Command Trigger</td><td>PTRG</td><td>Pi</td><td>When PTRG is ON (top edge trigger), the Motor will select the corresponding Position Command in accordance with the contact points POS1~POS5 to operate.</td></tr>
<tr><td>Internal Position Command Hold</td><td>PHOLD</td><td>Pi</td><td>When PHOLD is ON (top edge trigger), the Motor will decelerate to stop.</td></tr>
<tr><td>Start to Return to Origin</td><td>SHOME</td><td>Pi/Pe</td><td>When SHOME is ON (top edge trigger), triggers the Return to Origin Function.</td></tr>
<tr><td>External Reference Origin</td><td>ORG</td><td>Pi</td><td>When ORG is ON (top edge trigger), the Servo Driver will use this as the External Reference Point of Return to Origin.</td></tr>
<tr><td>Internal Position Command Selection 1~5</td><td>POS1
~
POS5</td><td>Pi</td><td>Internal Position Mode: POS1~POS5 represent Internal Position Command Selection 1~5 respectively, please refer to[5-4-2 Internal Position Command Mode] for details</td></tr>
<tr><td>Torque Command Reverse/ Turret Second Stage Speed</td><td>TRQINV</td><td>T</td><td>Torque mode: When using Torque Mode, when TRQINV ON, the set Torque Command Output Direction becomes Reverse Output.</td></tr>
<tr><td>External Torque Command Forward / Reverse Selection</td><td>RS1
RS2</td><td>T</td><td>External Torque Command Forward / Reverse Selection Setting Description:
<table>
<tr><th>RS2</th><th>RS1</th><th>Description</th></tr>
<tr><td>0</td><td>0</td><td>No Torque generated</td></tr>
<tr><td>0</td><td>1</td><td>Rotate in accordance with the current Torque Command Direction</td></tr>
<tr><td>1</td><td>0</td><td>Reverse rotation in accordance with the current Torque Command Direction</td></tr>
<tr><td>1</td><td>1</td><td>No Torque generated</td></tr>
</table></td></tr>
<tr><td>Virtual Contact Digit Input</td><td>VDI</td><td>ALL</td><td>Virtual Contact Digital Input, When VDI ON, the set Digital Output DVO will follow ON.</td></tr>
</table>

Note: Note: "1": indicates ON (Closed). "0": indicates OFF (Open).

Hn613.0/Hn613.1~Hn616.0/Hn616.1 DO-1~ DO-4 Pin Function

Initial Value	Unit	Setting Range	Effective	RS-485 Address
Change with Mode	--	00-12	Power Re-set	050DH

Setting Description:

Setting	Description	
	Code	Contact Operation Function
00	NON	Not Used
01	RDY	Servo Ready
02	ALM	Servo Error
03	ZS	Zero Speed Signal
04	BI	Mechanical Brake Signal
05	INS	Speed Reached Signal
06	INP	Positioning Completion Signal

Setting	Description	
	Code	Contact Operation Function
07	HOME	Return to Origin Completion Signal
08	INT	Torque Reached Signal
0F	OV	Motor Overload Signal
10	BAT	Encoder Battery Abnormality Signal
11	LIT	Left and Right Limit Signal
12	VDO	Virtual Point Digital Output

Hn613.2~ Hn616.3 DO-1~ DO-4 Pin Function Operational Potential

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0-1	Power Re-set	050DH

Setting Description: Please refer to Hn601 Description for the Setting Method.

Setting	Description
0	When the Function operates, the Pin is at Low Potential (short circuit with IG24 Pin).
1	When the Function operates, the Pin is at High Potential (open circuit with IG24 Pin).

Multi-function Planning Digital Output Function Description

Signal Name	Function Code	Mode	I/O Operating Function Description
Servo Ready	**RDY**	ALL	Main Power Supply, When the Control Power Input is normal without Error Alarm State, the Pin **RDY** ON
Servo Error	**ALM**	ALL	In Normal condition, the Pin **ALM** OFF. After the Driver occurred with Error Alarm, the Protection Function operates, ALM ON.
Zero Speed Signal	**ZS**	S	When the Motor speed is lower than the speed set by **Sn215**, pin **ZS** ON
Mechanical Brake Signal	**BI**	ALL	When **Cn008** is set to 1, when the Servo starts, when pin and **BI** ON Servo do not have excitation OFF. (Normal use of this pin is connected to the relay of Mechanical Brake to control the Motor).
Speed Reached Signal	**INS**	S	When the Motor Speed reaches the Speed set by **Cn007**,

Signal Name	Function Code	Mode	I/O Operating Function Description
			the pin **INS** is ON.
Positioning Completion Signal	**INP**	Pi/Pe	When the value of Offset Counter is smaller than the Position Positioning Range set by **Pn307**, the pin **INP** ON.
Return to Origin Completion Signal	**HOME**	Pi/Pe	After being completed Return to Origin, Pin **HOME** is ON.
Torque Reached Signal	**INT**	ALL	When the Motor Output Torque reaches the Torque Reached Determined Value set by **Tn108**, the pin **INT** is ON.
Motor Overload Signal	**OL**	ALL	When Motor Overload reaches the Determined Value, the pin **OL** is ON
Encoder Battery Abnormality Signal	**BAT**	ALL	When the Battery is abnormal (no power or disconnected), the pin **BAT** is ON
Positive and Negative Limit Signals	**LIT**	ALL	When the Mechanism touches the Positive and Negative Limits, the pin **LIT** is ON
Virtual Point Digital Output	**VDO**	ALL	When VDI ON, the set Digital Output VDO will follow ON.

Fixed Digital Output Function Description

Signal Name	Function Code	Mode	I/O Operating Function Description
Torque in Restriction / Error Alarm Code 0	**LM/A0**	Pi/Pe/S/T	When the Motor Output Torque is limited by Internal Torque Limit Values (**Cn010 & Cn011**) or External Torque Limit Command (**PIC&NIC**), pin **LM/A0** is ON. When the Error Alarm occurs, this pin is the Error Alarm Code Output **A0**.
P in Operation / Error Alarm Code 1	**PC/A1**	Pe/Pi/S/T	When the Speed Loop is proportional (P) control, pin **PC/A1 is** ON. When the Error Alarm occurs, this pin is the Error Alarm Code Output **A1**.

Note: "1": indicates ON (Closed); "0": indicates OFF (Open).

Attention! DO-1~DO-4 Pin Function cannot be repeated; otherwise AL-07 (5-5-1 Input / Output Contact Function Planning Error Alarm) will be generated.

DO Code	Input Function	0	1	2	3	4	5	6	7	8	A
		T	S	Pe	Pe S	S T	Pe T	Pi	Pi S	Pi T	Pi Pe
00	NULL										
01	RDY	DO1	DO1	DO1	DO1	DO1	DO1	DO1	DO1	DO1	DO1
02	ALM	DO2	DO2	DO2	DO2	DO2	DO2	DO2	DO2	DO2	DO2
03	ZS		DO3		DO3				DO3		
04	BI										
05	INS	DO4	DO4			DO4					
06	INP			DO4	DO4		DO4	DO4	DO4	DO4	DO4
07	HOME			DO3				DO3			DO3
08	INT	DO3				DO3	DO3			DO3	
0F	OL										
10	BAT										
11	LIT										
12	VDO										

Hn617 Digital Input Contact Control Method Selection

Initial Value	Unit	Setting Range	Effective	RS-485 Address
H0F00	--	H0F00-H0FFF(Hexadecimal)	Effective after Confirm Key	0511H

Setting Description: The 12-bit Digital Input Contact is determined by Bit Setting Method with external terminal or communication control (DI-9~DI12 only uses communication control); correspond the Digital Input Contacts DI-1 ~ DI-12 to the binary first 0 ~ 11 bits first, then set after converted the planned binary bits to hexadecimal.

Binary Bit Representation: 0: Digital Input Contact is controlled by an External terminal.

1: Digital Input Contacts is controlled by communications.

Example: To set the Digital Input Contacts DI-1, DI-3, and DI-6 to use communication control, the remaining Contacts are controlled by the External Terminals; the corresponding binary bits of the Digital Input Contacts are: [0000 1111 0010 0101]; and can be set as 〔H 0 F 2 5〕after converted to hexadecimal

Hn618 Communication Control Digital Input Contact Status

Initial Value	Unit	Setting Range	Effective	RS-485 Address
H0000	--	H0000 ~ H0FFF (Hexadecimal)	Effective after Confirm Key	0512H

Setting Description: Determine the Contact State when the 12-bit Digital Input Contact uses communication control by the Bit Setting Method; please refer to Hn617 Description for Bit Setting Method.

Binary bit representation: 0: Digital Input Contact OFF

1: Digital Input Contact ON

Set the parameter to H0000 represents that all communication control Digital Input Contacts are Open. When set to H0FFF represents all communication control Digital Input Contacts are in Conduction.

Note) The use of this function must coordinate with the setting of parameter Hn617.

5-6-2 Control Mode Switching

The user can use the Input Contact **MDC** to switch the Control Mode set by **Cn001**, the setting is as follows:

Cn001 Control Mode Selection

Initial Value	Unit	Setting Range	Effective	RS-485 Address
2	--	0-D	Power Re-set	0001H

Setting Description:

Setting	Description
3	External Position / Speed Control Switching
4	Speed / Torque Control Switching
5	External Position / Torque Control Switching
7	Internal Position / Speed Control Switching
8	Internal Position / Torque Control Switching
A	Internal / External Position Switching

●This parameter is not subject to Cn029 Factory Re-set.

Note) The Input Contact is High Electric Potential Operation or Low Electric Potential Operation; please set in reference to [5-5-1 Input / Output Contact Function Planning].

5-6-3 Contact Auxiliary Function

The User can select whether or not to start the corresponding function for the Input Contacts **SON**, **CCWL** and **CWL**, the setting is as follows:

Cn002.0 Contact Auxiliary Functions--Input Contact SON Function Selection

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0-1	Power Re-set	0002H

Setting Description:

Setting	Description
0	Control Servo Activation by Input Contact SON.
1	Do not use Input Contact SON to control Servo Start, power is turned to immediately Start Servo.

Cn002.1 Contact Auxiliary Functions--Input Contact CCWL and CWL Function Selection

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1	--	0-1	Power Re-set	0002H

Setting Description:

Setting	Description
0	Control CCW and CW Drive Prohibit by Input Contacts CCWL and CWL.
1	Control CCW and CW Drive Prohibit not using Input Contacts CCWL and CWL, ignore CCW and CW Drive Prohibit Functions.

5-6-4 Brake Mode

Cn008.0 Brake Mode

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0-1	Effective after Confirm Key	0009H

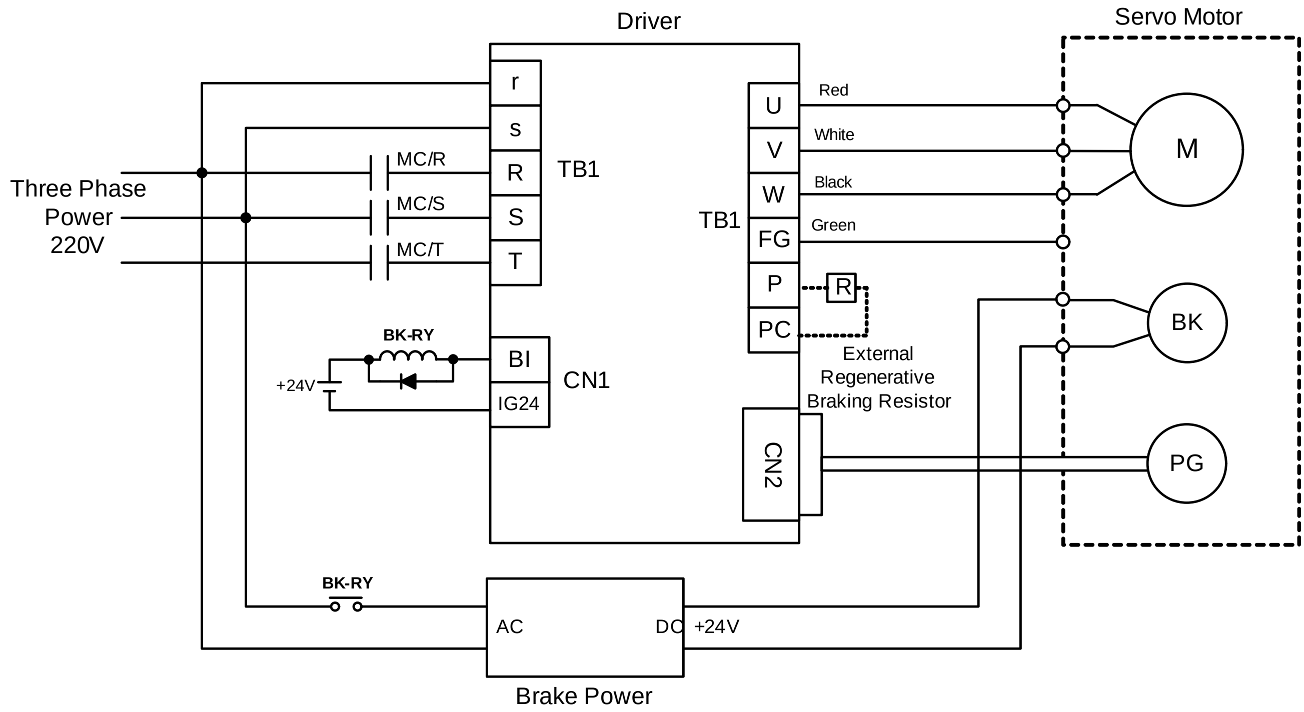
Setting Description: The Brake Combination of Servo off, Emergency Stop (EMC), and when CCW/CW Drive is Prohibited.

Setting	Description	
	Dynamic Brake	Mechanical Brake
0	No	No
1	No	Yes

5-6-5 Mechanical Brake Time Sequence

When the Servo System is vertically loaded, in order to prevent the load from being displaced due to gravity when the power is OFF, the Servo Motor with Mechanical Brake will be used, in general. This Device provides Output Contact **BI** to control whether or not the mechanical brake is operating, and then cooperate with **Cn003** (Mechanical Brake Signal Output Time) to control the Mechanical Brake Time Sequence, the description is as follows:

Wiring Diagram



Mechanical Brake Time Sequence

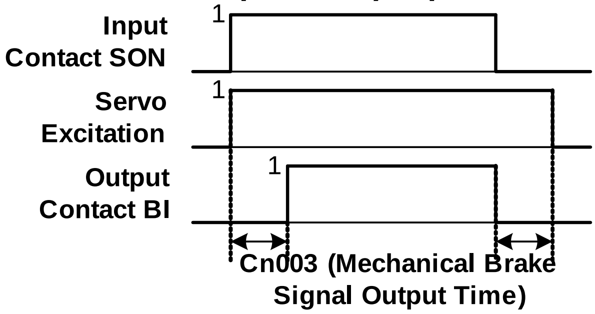
Cn003 Mechanical Brake Signal Output Time

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	msec	-2000-2000	Effective after Confirm Key	0003H

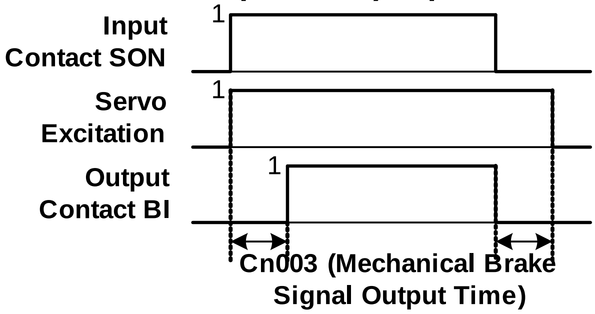
Setting Description: The Time Sequence Diagram is as follows

Note) Before using this function, a Mechanical Brake Signal (**BI**) output pin must be planned; and in the Time Sequence Diagram, the Input / Output Contact State 1 representing the Contact operates, and 0 representing the Contact does not operate.

Cn003 (Mechanical Brake Signal Output Time) is positive



Cn003 (Mechanical Brake Signal Output Time) is positive



Attention! Cn008.0 (Brake Mode) must be set to 1.

When the Servo System is vertical load, please set Cn003 to a positive value.

(1) **Cn003**(Mechanical Brake Signal Output Time) is **positive value** :

When the Input Contact **SON** operates, the Servo excites immediately, until after the **Cn003** setting Time is exceeded, then the Output Contact **BI** operates (Release Mechanical Brake);

When Input Contact **SON** does not operate , Output Contact **BI** does not operate (Start Mechanical Brake) either, until after the **Cn003**setting Time is exceeded, then the Servo Excitation is released.

(2) **Cn003** (Mechanical Brake Signal Output Time) is **negative value** :

When the Input Contact **SON** operates, the Output Contact **BI** operates immediately (Release Mechanical Brake), until after the **Cn003** setting time is exceeded, then Servo Excites;

When Input Contact **SON** does not operate , the servo excitation is released immediately, until after the **Cn003**setting time is exceeded, the Output Contact **BI** does not operate (Start Mechanical Brake).

5-6-6 CW/CCW Drive Prohibited Method

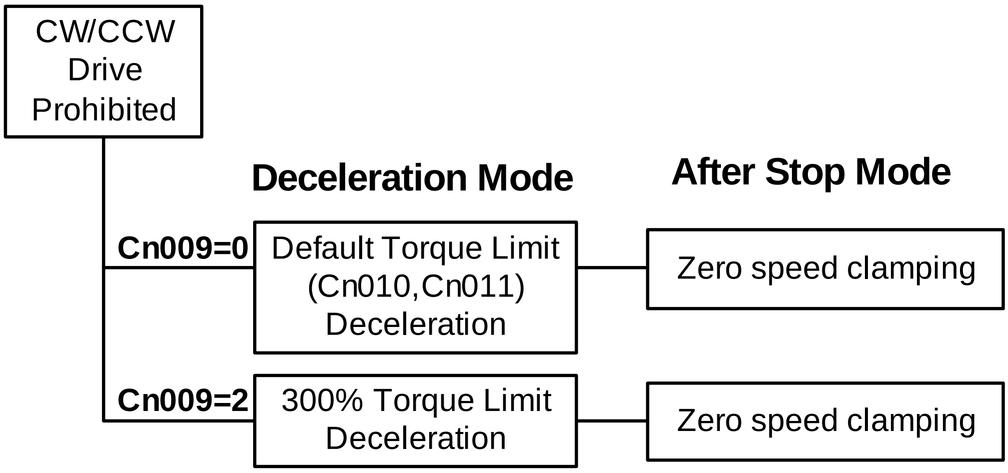
When CW/CCW Drive is prohibited, the Motor Deceleration Stop Mode setting is as follows:

Cn009 CW/CCW Drive Prohibited Method

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0, 2	Power Re-set	000AH

Setting Description:

Setting	Description
0	Use the pre-set Torque Limit (**Cn010**, **Cn011**) to decelerate, and in Zero Speed Clamping State after stopped.
2	Use ±300% Torque Limit to decelerate, and in Zero Speed Clamping State after stopped.



5-6-7 Selection of External Regenerative Resistor

When the Servo Motor is operating in the Generator Mode, the Electrical Energy will flow from the Motor to the Driver, which is called Regenerative Power. The following conditions will enable the Servo Motor to operate in the Generator (Regeneration) Mode:

(1) The period from deceleration to stop when the Servo Motor is operating in Acceleration / Deceleration.

(2) When used to vertically load.

(3) When the Load End drives the Servo Motor in operation.

This regenerative power will be absorbed by the main circuit filter capacitor of the Driver, but when there is excessive regenerative power and cannot be supported by the Filter Capacitor, Regenerative Resistor must be used to consume excess regenerative power.

External Regenerative Resistor Power Setting

When using External Regenerative Resistor, the power of the selected Regenerative Resistor must be set correctly in **Cn012**.

Cn012 External Regenerative Resistor Power Setting

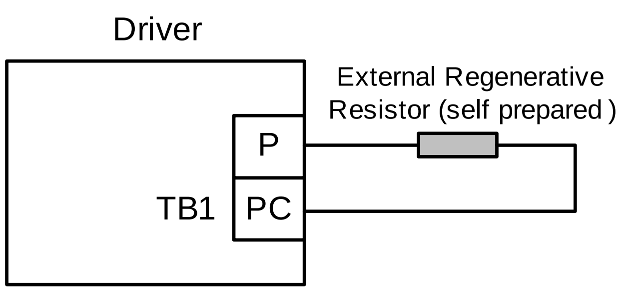
Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	%	0-10000	Effective after Confirmed	000DH

Setting Description: Please set the selected external resistor power value correctly in Cn012.

External Regenerative Resistor Wiring

The user must prepare the Regenerative Resistor and then connect the Regenerative Resistor in series between the **P1** Contact and the **PC** Contact, based on safety considerations; it is recommended to use the Resistor with a Thermal Switch.

The wiring diagram is as follows:



Since the Regenerative Resistor will generate temperature higher than 100°C when consuming regenerative power, be sure to use heat-resistant, non-flammable wire material when connecting Regenerative Resistor, and make sure that the Regenerative Resistor does not make contact with any items.

5-6-8 Fan Operation Settings

The User can set the fan operation state according to the requirements, the setting is as follows:

Cn031.0 Fan Operation Settings (Only Suitable to the Models equipped with Fan)

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0-3	Effective after Confirmed	0022H

Setting Description:

Setting	Description
0	Temperature Sensing Automatic Operation
1	Operates when Servo starts
2	Continuous Operation
3	Stop Operation

5-6-9 Low Voltage Protection Automatic Reset Selection

The User can set the Low Voltage Protection Automatic Reset Function according to the requirements, the setting is as follows:

Cn031.1 Low Voltage Protection (AL-01) Automatic Reset Selection

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	**--**	**0-3**	**Effective after Confirmed**	0022H

Setting Description: This parameter can set Low Voltage Protection (AL-01) Reset Method

Setting	Description
0	When the SON status displays run, AL-01 Low Voltage Error Alarm is immediately displayed when a low voltage is detected; and it must be re-set in Soff status after the Error is resolved.
1	When the SON status displays run, BB status is immediately displayed when a low voltage is detected; and automatically resets to SON status and displays run after the Error is resolved.

5-6-10 Absolute Value Encoder Battery Error Alarm Output

When the Absolute Value Encoder Battery is abnormal, the User can set the panel display and abnormal contact status with this parameter, setting is as follows:

Cn031.2 Absolute Value Encoder Battery Error Alarm Output

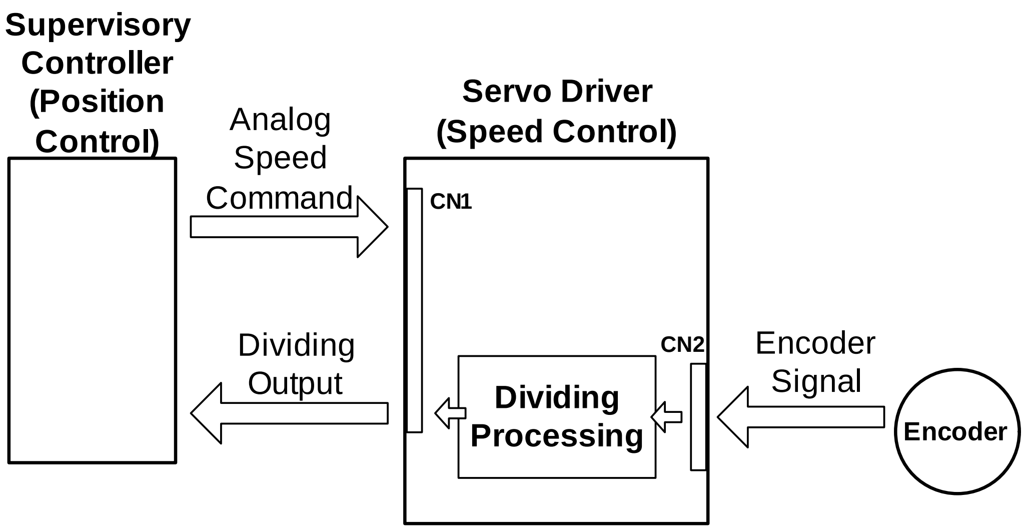
Initial Value	Unit	Setting Range	Effective	RS-485 Address
0: ABS Encoder 1: IN Encoder	--	0-1	Effective after Confirmed	0022H

Setting Description: This parameter can set Low Voltage Protection (AL-01) Reset Method

Setting	Description
0	When the battery is abnormal after power is turned ON, the panel displays AL-16 and the DO Abnormal Contact outputs, the Motor can still operate normally, but the multi-revolution address cannot be memorized after the power is turned OFF.
1	When the battery is abnormal after power is turned ON, the panel displays no abnormality and the DO Abnormal contact does not output, the Motor can still operate normally, but the multi-revolution address cannot be memorized after the power is turned OFF.

5-6-11 Encoder Signal Dividing Output

The Encoder Signal of Motor can be dividing processed by this Device, then output to the Supervisory Control to form a Position Control Loop, the schematic diagram is as follows:



Dividing Processing means the number of pulse signals generated with one revolution of the Motor Encoder that is converted into number of pulse signals pre-set by **Cn005**.

Cn005 Encoder Signal Dividing Output

Initial Value	Unit	Setting Range	Effective	RS-485 Address
Determined by the Encoder 8192: 15bit 32768: 17bit, 23bit	Pulse	16-2097152	Re-start Power	0005H/0006H

Setting Description: Dividing Process means the number of pulse signals generated with one revolution of Motor Encoder that are converted into number of pulse signals preset by **Cn005**. Example: The Motor Encoder is a 131072 pulse output with one revolution, if to obtain a 1000 pulse dividing output, please set **Cn005**=1000 directly.

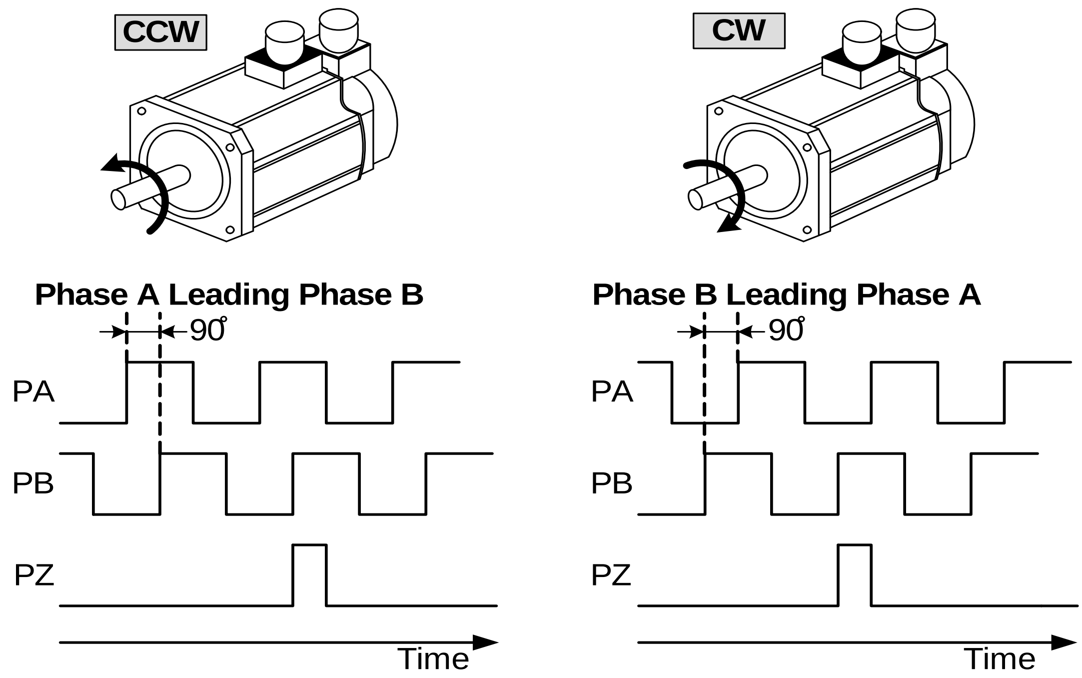
★ The power must be re-started for the setting value to be valid, and the dividing output and speed have a certain relationship limit.

Lower limit (ppr)	Upper limit (ppr)	Setting Unit	PPR4				Maximum Speed
			10000	32768	131072	8388608	
16	2048	1	Suitable	Suitable	Suitable	Suitable	6000
2049	16384	1	Suitable	Suitable	Suitable	Suitable	6000
16386	32768	2	-	-	Suitable	Suitable	6000
32772	65536	4	-	-	-	Suitable	3000
65544	131072	8	-	-	-	Suitable	1500
131088	262144	16	-	-	-	Suitable	750
262176	524288	32	-	-	-	Suitable	375
524352	1048576	64	-	-	-	Suitable	188
1048704	2097152	128	-	-	-	Suitable	94

Attention! The Setting Range cannot exceed the Number of Pulses in One Revolution of Motor Encoder.

Dividing Output Pulse Signal Definition is as follows:

Pin Code	Name	Pin Number	Control Mode
PA	Encoder Dividing Output Phase A Signal	CN1-11	ALL
/PA	Encoder Dividing Output Phase /A Signal	CN1-12	
PB	Encoder Dividing Output Phase B Signal	CN1-26	
/PB	Encoder Dividing Output Phase /B Signal	CN1-27	
PZ	Encoder Dividing Output Phase Z Signal	CN1-40	
/PZ	Encoder Dividing Output Phase /Z Signal	CN1-41	



5-6-12 Parameter Reset

This Function can be used to return all parameters to Factory Default Values. When set to **1**, the Power must be restarted to reset the parameters as follows:

Cn029 Parameter Reset

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0-1	Power Re-set	0020H

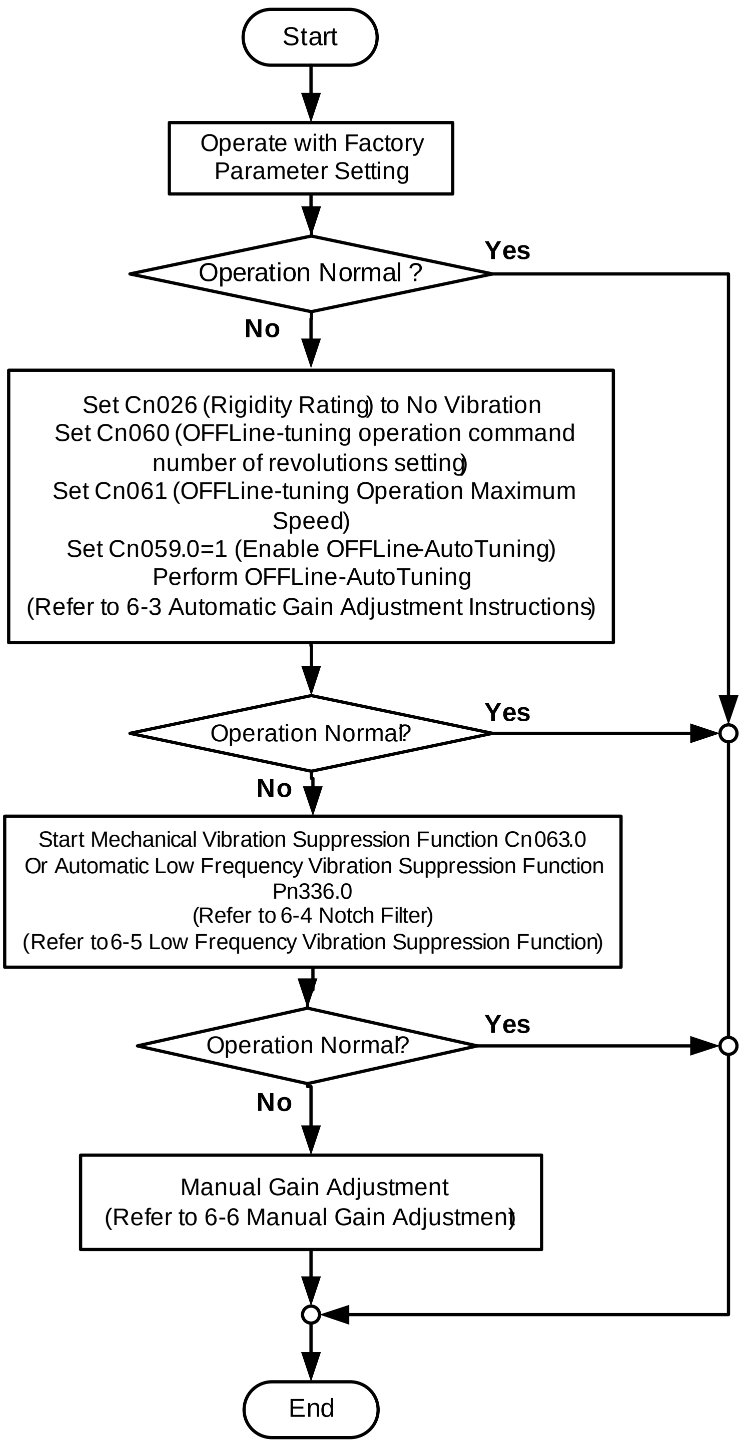
Setting Description:

Setting	Description
0	Not Functioning
1	All Parameters returned to Factory Default Value

Chap 6 Servo Gain Adjustment

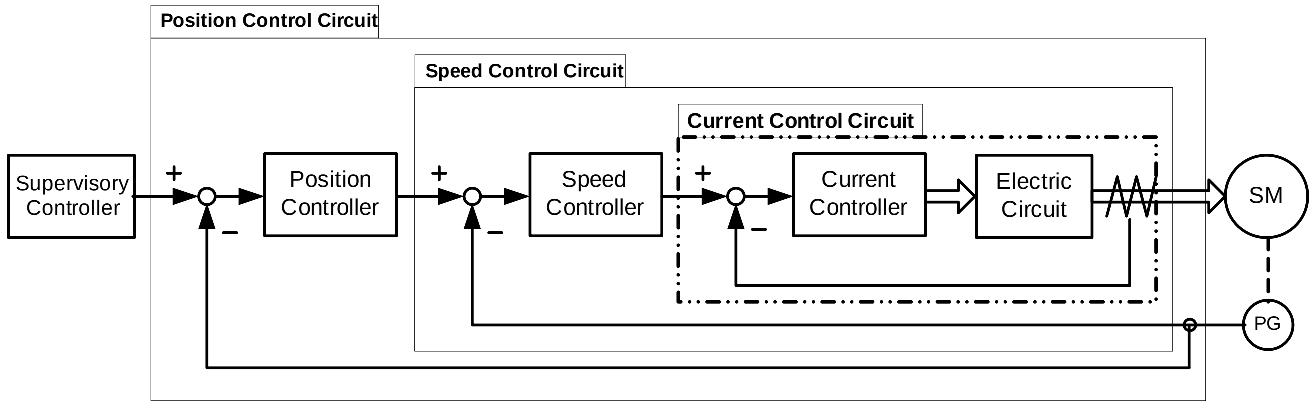
6-1 Servo Gain Adjustment Flowchart

Adjustment is a function to improve the responsiveness by adjusting the Servo Gain of the Servo Unit. The basic Adjustment Procedure is as shown in the following flowchart. Please make the appropriate adjustments after considering the mechanical conditions or operating conditions used.



6-2 Servo Gain Adjustment Parameter Description

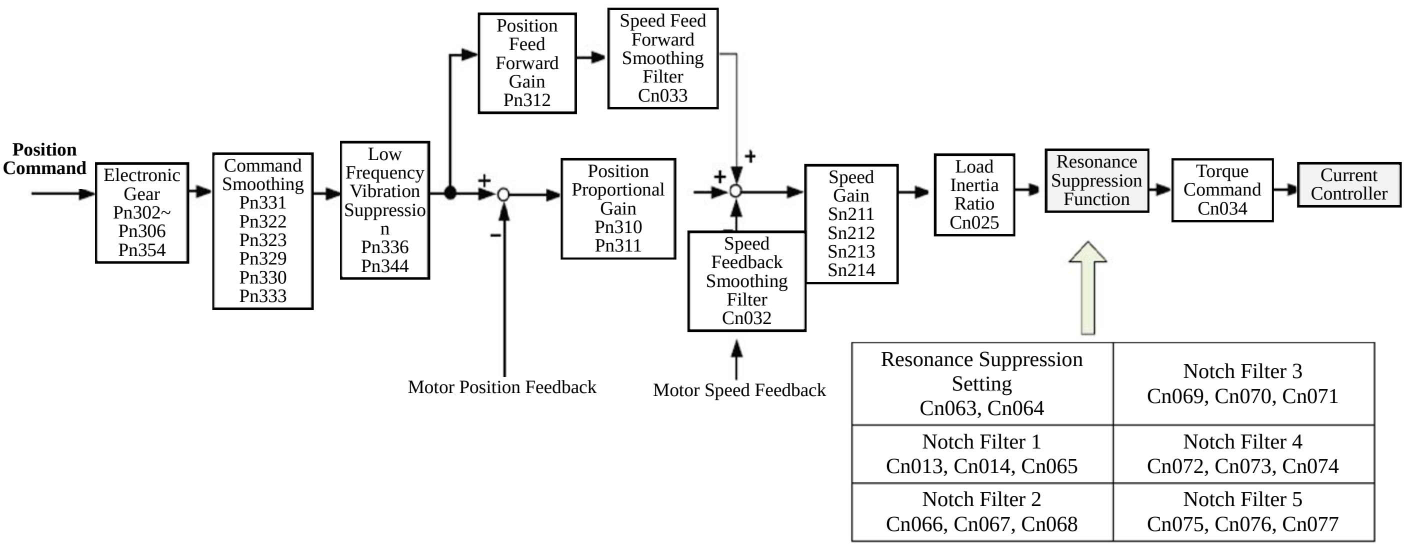
This Device includes three Circuits of Current Control, Speed Control and Position Control. The block diagram is as follows:



In theory, the Control Loop Bandwidth of the Inner Layer must be higher than the Outer Layer, otherwise, the entire Control System will be unstable and cause vibrations or poor response, therefore, the relationships between these three Control Loop Bandwidths are as follows:

Current Control Loop Bandwidth (the innermost layer) > Speed Control Loop Bandwidth (the middle layer) > Position Control Loop Bandwidth (the outermost layer)

Since this Device has adjusted the Current Control Loop Bandwidth to the best state, the User only needs to adjust the Speed and Position Control Loop Gain; the following describes the Gain Adjustment related parameters.



Load Inertia Ratio

Cn025 Load Inertia Ratio

Initial Value	Unit	Setting Range	Effective	RS-485
10	X0.1	0-2000	Effective after Set	001CH

Setting Description:

$$\text{Load Inertia Ratio} = \frac{\text{Convert to the Load Inertia of the Motor Shaft } (J_L)}{\text{Servo Motor Rotor Inertia } (J_M)} \times 100\%$$

Current Control Loop Bandwidth (the innermost layer)

Cn034 Torque Command Smoothing Filter

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	Hz	0-5000	--	0025H

Setting Description: When the system generates a sharp vibration noise, this parameter can be adjusted to suppress the vibration noise, adding this filter will also delay the response speed of the Servo System.

Speed Control Loop Bandwidth (middle layer)

Sn211 Speed Loop Gain 1

Initial Value	Unit	Setting Range	Effective	RS-485 Address
40	Hz	2-1500	Power Re-set	033CH

Setting Description: The Speed Loop Gain directly determines the Response Bandwidth of the Speed Control Loop. Under the premise of the mechanical system does not generate vibration or noise, increasing the Speed Loop Gain value will speed up the Speed Response. If Cn025 (Load Inertia Ratio) is set correctly, the Speed Loop Bandwidth equals the Speed Loop Gain.

Sn212 Speed Loop Integration Time Constant 1

Initial Value	Unit	Setting Range	Effective	RS-485 Address
2000	x0.01ms	40-50000	Power Re-set	020CH

Setting Description: Adding integration components to the Speed Control Loop can effectively eliminate the speed steady-state error and quickly respond to subtle speed changes. In general, under the premise that the mechanical system does not generate vibration or noise, the speed loop integration time constant is reduced to increase the system rigidity. Please use the following formula to calculate Speed Loop Integration Time Constant:

Sn213 Speed Loop Gain 2

Initial Value	Unit	Setting Range	Effective	RS-485 Address
40	Hz	2-1500	**Power Reset**	020DH

Setting Description: Please refer to Sn211 Description

Sn214 Speed Loop Gain 2

Initial Value	Unit	Setting Range	Effective	RS-485 Address
2000	x0.01ms	40-50000	Power Re-set	020EH

Setting Description: Please refer to Sn212 Description

Cn032 Speed Feedback Smoothing Filter

Initial Value	Unit	Setting Range	Effective	RS-485 Address
500	Hz	0-2500	--	0023H

Setting Description: When the system generates a sharp vibration noise, this parameter can be adjusted to suppress the vibration noise, adding this filter will also delay the response speed of the Servo System.

Position Control Loop Bandwidth (outermost layer)

Pn310 Position Loop Gain 1

Initial Value	Unit	Setting Range	Effective	RS-485 Address
40	Rad/s	1-2000	Effective after Set	0310H

Setting Description: Under the premise that the mechanical system does not generate vibration or noise, increasing the Position Loop Gain value will speed up the Speed Response, shorten the Position Time. In general, the Position Loop Bandwidth cannot be higher than the Speed Loop Bandwidth. The recommended formula is as follows:

$$\text{Position Loop Gain} \leq 2\pi \times \frac{\text{Speed Loop Gain}}{5}$$

Pn311 Position Loop Gain 2

Initial Value	Unit	Setting Range	Effective	RS-485 Address
40	Rad/s	1-2000	Effective after Set	0311H

Setting Description: Please refer to Pn310 Description for the Setting Method

Pn312 Position Loop Feed Forward Gain

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	%	0-100	Effective after Set	0312H

Setting Description: It can reduce the tracking error of the position control and speed up the reaction, if the feed forward gain is too large, it may cause a speed overshoot and the output contact INP (positioning completion signal) is repeatedly turned on and off.

Cn033 Speed Forward Feed Smoothing Filter

Initial Value	Unit	Setting Range	Effective	RS-485 Address
500	Hz	0-1000	Effective after Set	0024H

Setting Description: Smoothing Process the Speed Feed Forward Command

Torque Command Smoothing Filter

When the system produces a sharp vibration noise, Cn034 (Torque Command Smoothing Filter) can be adjusted to suppress the vibration noise, adding

This Filter will also delay the Servo System Response Speed.

Speed Loop Gain

The Speed Loop Gain directly determines the Response Bandwidth of the Speed Control Loop. Under the premise that the mechanical system does not generate vibration or noise, increasing the Speed Loop Gain value will speed up the Speed Response.

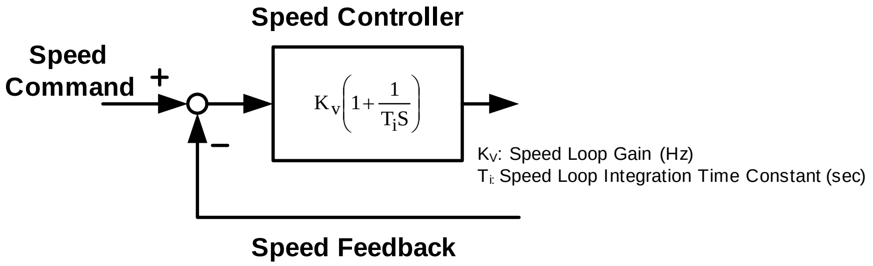
If **Cn025** (Load Inertia Ratio) is set correctly, the **Speed Loop Bandwidth** equals to **Sn211** (Speed Loop Gain 1) or **Sn213** (Speed Loop Gain 2).

※Load Inertia Ratio (Ratio of comparing between the Motor Moment of Inertia and Load Moment of Inertia) is the standard parameter when performing gain adjustment, so it is necessary to set the correct value as possible.

Speed Loop Integration Time Constant

Adding integration components to the speed control loop can effectively eliminate the speed steady-state error and quickly respond to subtle speed changes. In general, under the premise that the mechanical system does not generate vibration or noise, the speed loop integration time constant is reduced to increase the system rigidity. If the Load Inertia Ratio is large or there is a resonance factor in the mechanical system, the Speed Loop Integration Time Constant must be confirmed to be large enough; otherwise, the mechanical system generates resonance easily. Please use the following formula to calculate Speed Loop Integration Time Constant:

$$\textbf{Sn212}\ (\text{Speed Loop Integration Time Constant 1}) \geq 5 \times \frac{1}{2\pi \times \textbf{Sn211}\ (\text{Speed Loop Gain 1})}$$



Setting Example:

If **Cn025** (Load Inertia Ratio) is set correctly, and expect the Speed Loop Bandwidth reaches 100Hz, then set

Sn211(Speed Loop Gain 1)=100(Hz)

$$\textbf{Sn212}\ (\text{Speed Loop Integration Time Constant 1}) \geq 5 \times \frac{1}{2\pi \times 100} = 8\text{msec} = 800\ (\times 0.01\text{msec})$$

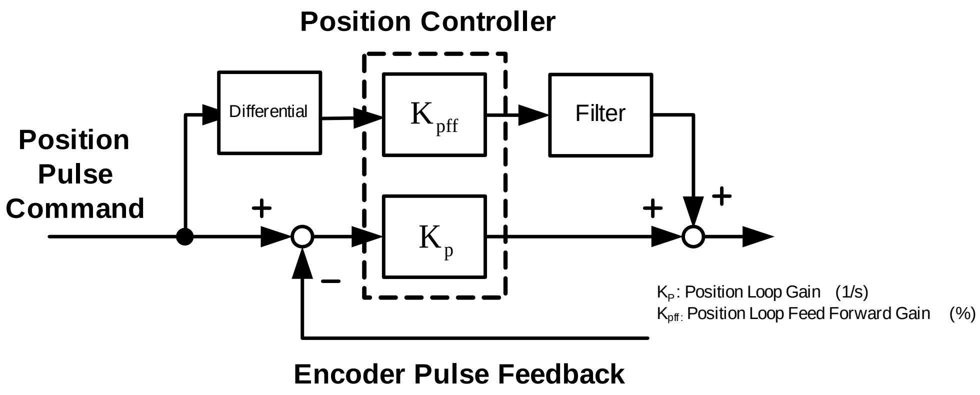
Position Loop Gain

The Position Loop Gain directly determines the reaction speed of Position Loop, under the premise that the Mechanical System does not generate vibration or noise, increasing the Position Loop Gain value to speed up the reaction speed and shorten the positioning time.

$$\text{Position Loop Gain} \leq 2\pi \times \frac{\text{Speed Loop Gain}}{5}$$

Position Loop Feed Forward Gain

Using the Position Loop Feed Forward Gain can speed up the reaction speed, if the feed forward gain is too large, it may cause speed overshoot and the Output Contact **INP** (Positioning Completion Signal) turned on and off repeatedly, therefore, the speed waveform and Output Contact **INP** (Positioning Completion Signal) must be observed when adjusting, slowly increase the Feed Forward Gain Value and when the Position Loop Gain is too large, the effect of the Feed Forward Function is not obvious.



Gain Adjustment Shortcut Parameter

The Device provides Gain Adjustment Shortcut Parameter, centralizes the Gain Adjustment related parameters in the Shortcut Parameter to facilitate the user operations during Manual Gain Adjustment and increase the convenience of machine tuning. When the user enters the Shortcut Parameter to change the value of the parameter, the value will be **written into storage and be effective immediately**, without having to press the Enter key again to store. Gain Adjustment Shortcut Parameter is shown as follows:

Parameter Code	Name and Function	Default Value	Unit	Setting Range
qn501	**Speed Loop Gain1** Same as Sn211	40	Hz	2 ~ 1500
qn502	**Speed Loop Integration Time Constant1** Same as Sn212	100	0.01ms	40 ~ 50000
qn503	**Speed Loop Gain2** Same as Sn213	40	Hz	2 ~ 1500
qn504	**Speed Loop Integration Time Constant2** Same as Sn214	100	0.01ms	40 ~ 50000
qn505	**Position Loop Gain1** Same as Pn310	40	1/s	1 ~ 2000
qn506	**Position Loop Gain2** Same as Pn311	40	1/s	1 ~ 2000
qn507	**Position Loop Feed Forward Gain** Same as Pn310	0	%	0 ~ 100

6-3 Automatic Gain Adjustment (Off-line tuning) Instructions

Automatic gain adjustment refers to the Servo Driver that can be automatically operated (Forward and Reverse reciprocating motions) without Commands issued by the Supervisory Device, and the function of performing adjustment function in coordination with the mechanical system characteristics during operations. The following are the parameters that will be automatically adjusted:

Parameter Code	Name and Function	Initial Value	Unit	Setting Range
Cn025	Load Inertia Ratio	10	X0.1	0-2000
Cn034	Torque Command Smoothing Filter	0	Hz	0-5000
Sn211	Speed Loop Gain1	40	Hz	2-1500
Sn212	Speed Loop Integration Time Constant 1	2000	x0.01msec	40-50000
Pn310	Position Loop Gain1	40	Rad/s	1-2000
Cn013	Notch Filter First Set	0	Hz	0-2000
Cn066	Notch Filter Second Set	0	Hz	0-2000
Pn339	First Set Low Frequency Vibration Suppression Frequency	1000	0.1Hz	10-1000

Automatic Gain Adjustment Pre-cautions

The Automatic Gain Adjustment is a function that accompanies the Motor Operation, please pay special attention to the following points:

(1) The Automatic Gain Adjustment will be adjusted using the set Load Inertia Ratio (Cn025) as the standard. If the system cannot operate steadily when the adjustment is started, correct adjustments cannot be performed. Please increase the Load Inertia Ratio (Cn025) until after the system can run steadily, and then perform the adjustment.

(2) The Automatic Gain Adjustment will be adjusted using the set System Rigidity (Cn026) as the standard. If vibration occurs at the beginning of the adjustment, correct adjustments cannot be performed. Please decrease the System Rigidity (Cn026) until no vibration occurs, and then perform the adjustment.

(3) The Automatic Gain Adjustment function performs automatic operations with vibrations, please execute in the situation of Emergency Stop (Power OFF) that can be done at any time during execution. In addition, since the two-way rotation is performed within the set movement range, please confirm the movement range and directions.

Rigidity Table Setting

When using Automatic Gain Adjustment Function, the Rigidity level needs to be set in accordance with the required gain of the application situation, the rigidity setting range corresponding to all types of application situations is shown in the table below.

Setting	Description		
	Position Loop Gain	Speed Loop Gain	Speed Loop Integration Time Constant
	Pn310 [1/s]	Sn211 [Hz]	Sn212 [x0.01msec]
1	2	2	28000
2	3	3	19000
3	6	6	9000
4	9	9	6000
5	12	12	6000
6	15	15	6000
7	20	20	4500
8	30	30	3000
9	40	40	2000
10	50	50	1200
11	60	60	1500
12	70	70	1000
13	85	85	1000
14	100	100	800
15	120	120	800
16	140	140	600
17	160	160	600
18	180	180	500
19	200	200	500
20	225	225	400
21	250	250	400

Automatic Gain Adjustment Use Limit

The following are the limits when using Automatic Gain Adjustment:

(1) The System cannot be executed

- When the Mechanical System can only operate in a single direction
- When the Mechanical System's rotating range is less than 3 revolutions

(2) The System cannot be executed correctly

- When the appropriate movement range cannot be obtained
- When the Load Inertia Ratio changes greatly
- When the Rigidity of the Mechanical System is too low
- When the System uses P/PI Switching Mode
- When the System uses two stages of Gain Switching
- When the System uses Position Loop Feed Forward

Confirmations before execution of Automatic Gain Adjustment

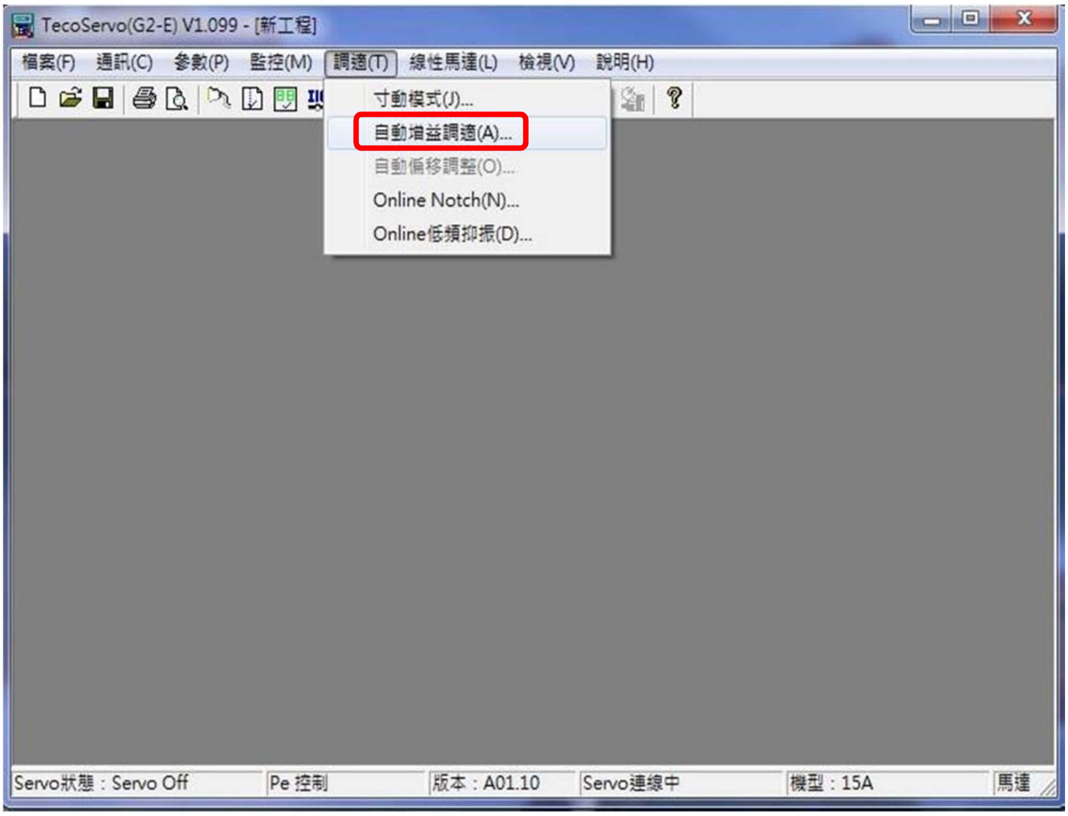
When executing Automatic Gain Adjustment, please be sure to confirm the followings

- The Main Power Circuit is ON
- Servo Driver is in OFF State
- System Control Mode is not Torque Control
- It is not in Motor Testing Mode (JOG Function)
- It is not in On-line tuning Function
- No Alarm occurred
- If the Speed Control is used to execute Automatic Gain Adjustment, it will automatically switch to Position Control during adjustment, and automatically switch back to Speed Mode after the adjustment is completed

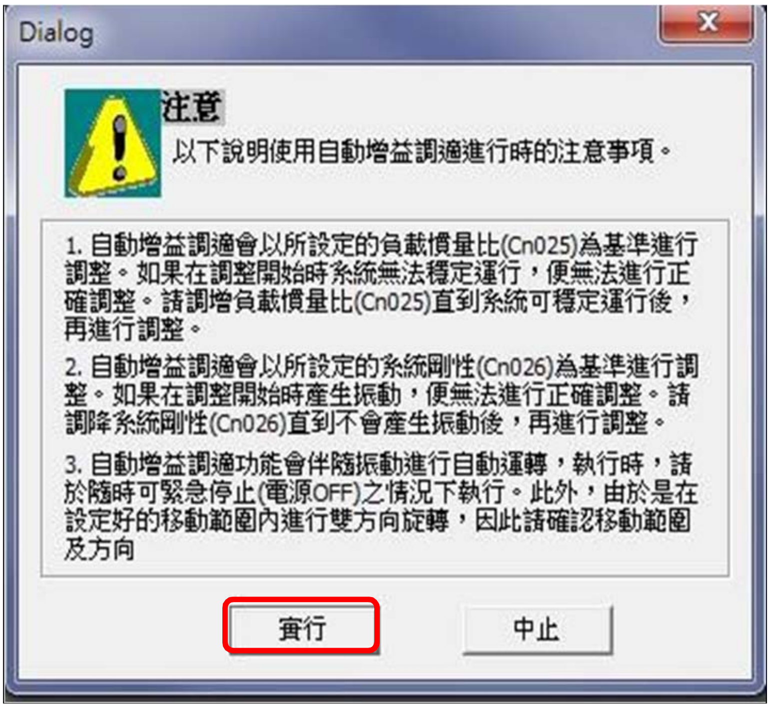
Automatic Gain Adjustment Operating Procedure

The following is the Operating Procedure when using Automatic Gain Adjustment. The Procedure is described with the PC-link Automatic Gain Adjustment page.

1. On Tool Bar, click on "Tuning **(T)**" and select the "Off-line tuning" option



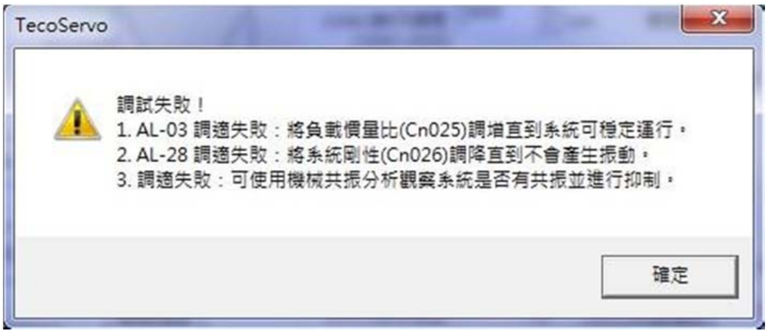
2. On the Precautions Page, please click on "Execute" to perform Off-line tuning.



3. Off-line tuning Page, can perform parameter setting. Completed parameter setting, click on "Parameter Write" Followed by clicking on "Start Tuning," the Motor starts rotation to conduct adjustment. The parameter setting method can click on "Parameter Description" part to understand. Click on "Parameter Write," "Parameter Write Successful" will appear if successful; if Writing failed, need to confirm all parameters are within the range.

4. Current tuning status can be known from the light indicator during execution. The Tuning Completion status will display a green light; current status of tuning will display a yellow light.

5. When Tuning fails and generates an Alarm, adjustment can be performed according to the handling guidelines. When completed tuning, you can select whether or not to Write Parameter. In the end, click on "Exit" to complete Off-line tuning



Automatic Gain Adjustment Alarm and Handling Actions

When an error occurs in the Automatic Gain Adjustment process, adjustments can be made through the following counter-measures:

AL-03 Motor Overload

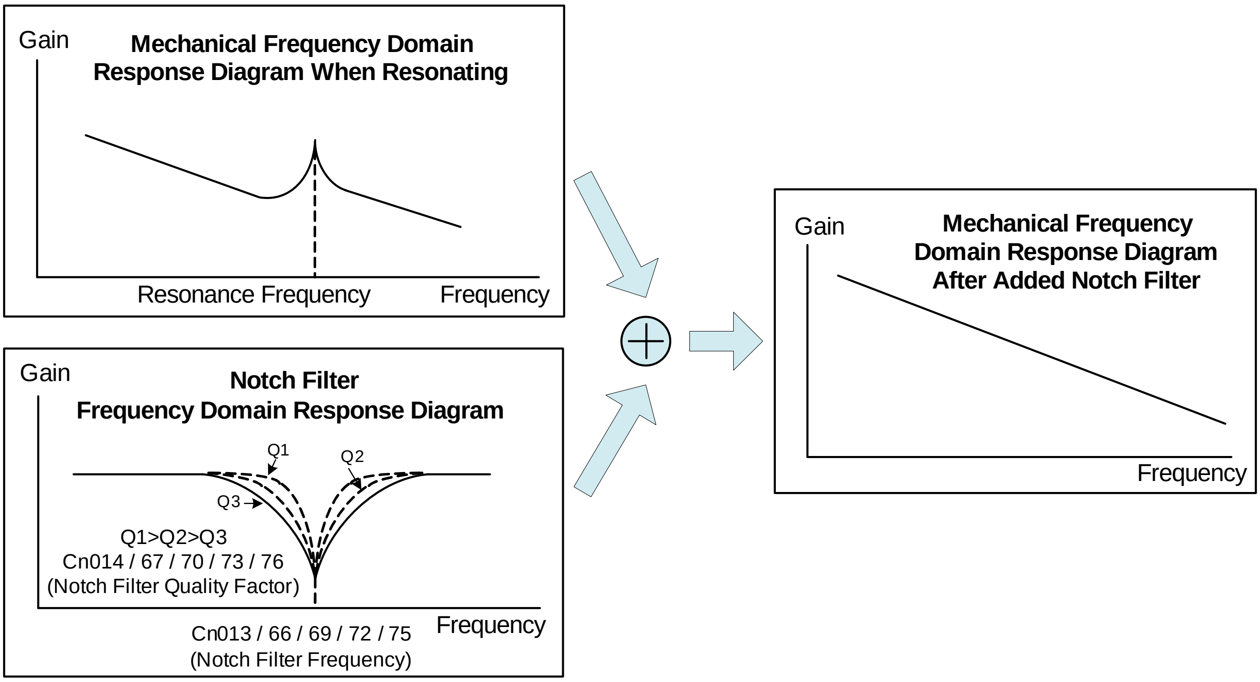
Cause	Counter-measure
The system generates large amplitude vibrations	Increase the Load Inertia Ratio (Cn025) until the System can operate steadily

AL-35 Tuning Failed

Cause	Counter-measure
The System generates Vibration Resonance or Acoustic Resonance	Increase the System Rigidity (Cn026) until the System can operate steadily
	Execute PC-Link Mechanical Characteristics Analysis Function Observation to observe if resonance exists with the system and suppress it

6-4 Notch Filter

When the machine rigidity is low and the machine can no longer increase the Controller Gain due to vibration or noise caused by the bearing twisting or other resonances, this Device provides a Notch Filter to eliminate this phenomenon.



There are two methods used for this Device Resonance Suppression:

(1) Use **Cn063.0** (Automatic Mechanical Vibration Suppression Enabling Selection) to automatically search the frequency to be suppressed.

When resonance occurs, set **Cn063.0** (Automatic Mechanical Vibration Suppression Enabling Selection) = 1~5, enable the automatic detection of mechanical vibration frequency, set **Cn064** (Mechanical Vibration Detection Level) according to requirements; after the Resonance Point is found, will be automatically stored in the Driver, and returns **Cn063.0** to 0 (Disable Automatic Detection of Mechanical Vibration Frequency) automatically; if the Resonance Point cannot be found, after searching for Resonance Frequency for a period of time, **Cn063.0** automatically return to 0 (Disable Automatic Detection of Mechanical Vibration Frequency).

Cn063 Automatic Mechanical Vibration Suppression Enabling Selection

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0-5	Effective after Set	0042H

Setting Description:

Setting	Description
0	Disable Automatic Detection of Mechanical Vibration Frequency
1	Enable Automatic Detection of First Set Mechanical Vibration Frequency
2	Enable Automatic Detection of Second Set Mechanical Vibration Frequency
3	Enable Automatic Detection of Third Set Mechanical Vibration Frequency
4	Enable Automatic Detection of Fourth Set Mechanical Vibration Frequency
5	Enable Automatic Detection of Firth Set Mechanical Vibration Frequency

Cn064 Mechanical Vibration Detection Level

Initial Value	Unit	Setting Range	Effective	RS-485 Address
50	--	1-1000	Effective after Set	0043H

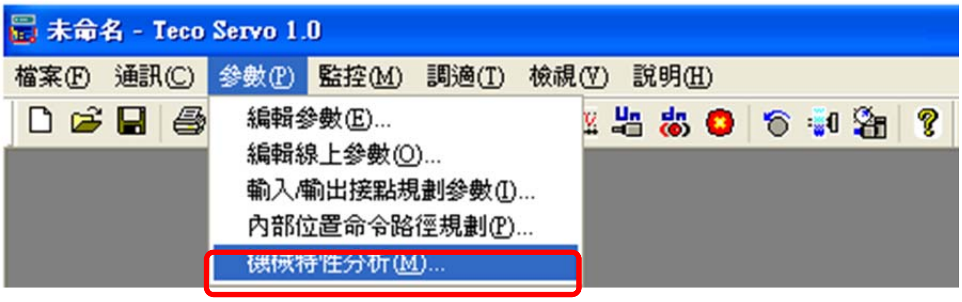
Setting Description: The automatic detection level when executing Automatic Mechanical Vibration Suppression (Cn063=1), the lower the value is, the more likely the noise is determined incorrectly, the recommended setting is 50 or higher.

(2) Use PC-Link to search for Resonance Frequency and set the Resonance Parameters **Cn013, Cn066, Cn069, Cn072, Cn075**

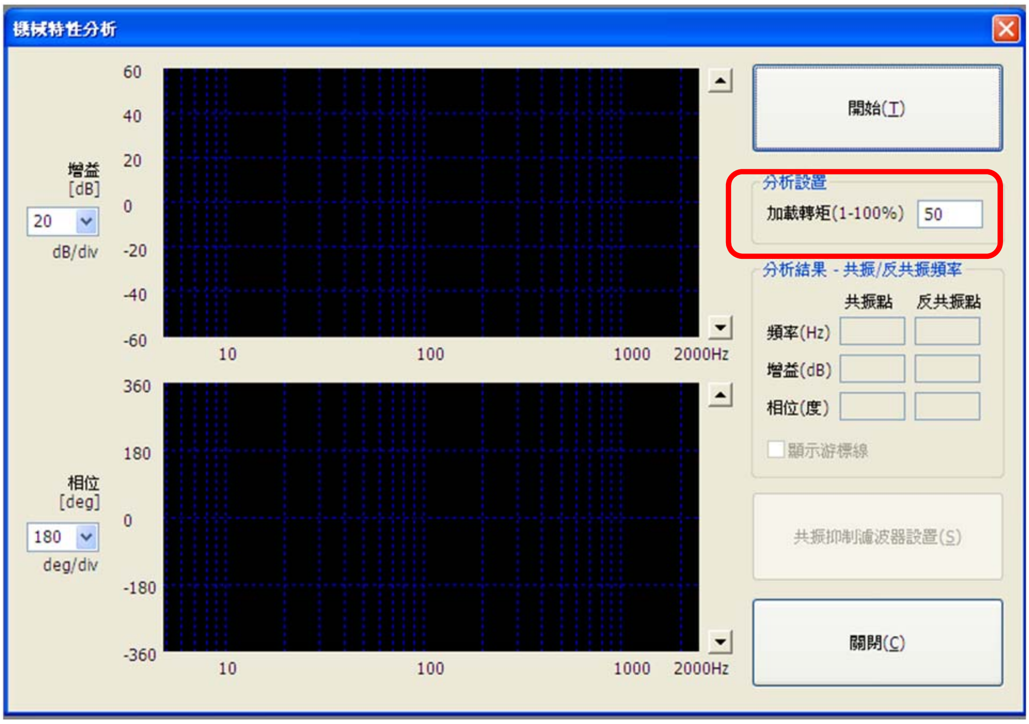
In addition to Automatic Search, the PC-Link Mechanical Characteristic Analysis can also be used to analyze the Resonance Frequency, and manually set **Cn013** (First Set Notch Filter Frequency) the frequency when vibration occurs, then in coordination with **Cn014** (First Set Notch Filter Quality Factor) to adjust the Frequency Range to be suppressed. The smaller the **Cn014** value is, the wider the frequency range of suppression, followed by in coordination with **Cn065** (First Set Notch Filter Depth) to adjust the Depth Range to be suppressed, the User can adjust according to actual condition. If there are multi-point resonances on the platform, please adjust the second to the fifth point Resonance Suppression Parameters of **Cn066~Cn077** in accordance with the setting method of the First Set.

※Attention! When Cn013, Cn066, Cn069, Cn072, Cn075 is set to zero, indicating the Notch Filter is not used.

1. On Tool Bar, click "Parameter(P)", and select "Mechanical Characteristics Analysis" option

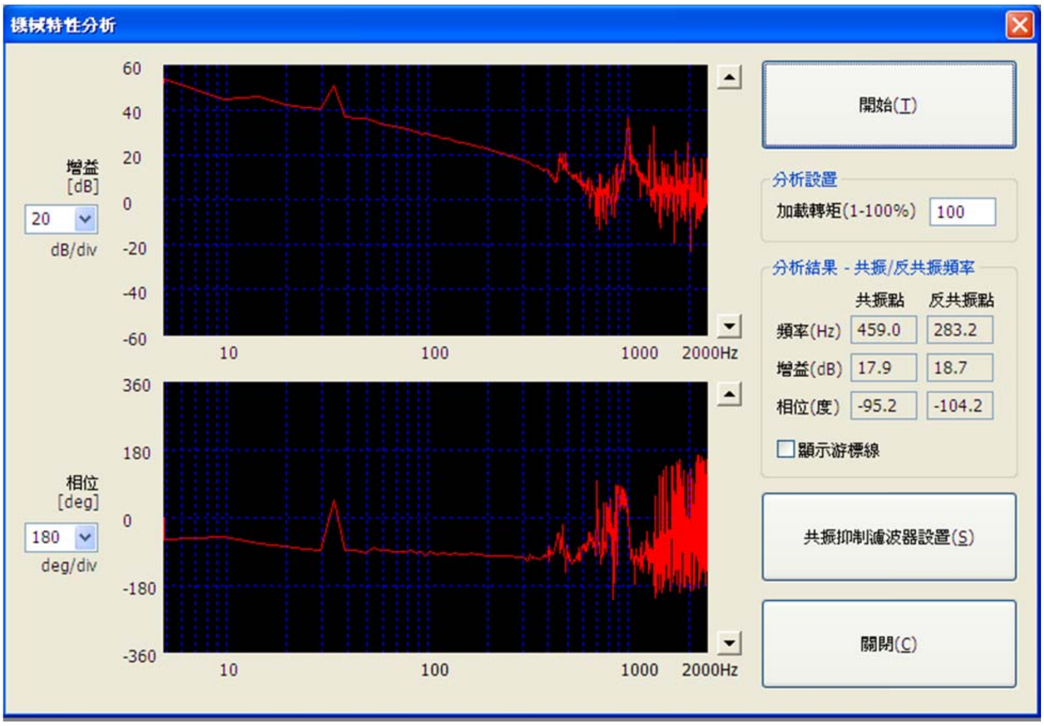


2. In the Mechanical Characteristic Analysis screen, Loading Torque can be selected, and the setting range is 1%~100%. The User can search in different Torque to increase the accuracy of search; the Loading Torque is based on not damaging the Machine as the standard, to estimate with different Loading Torques, and the Loading Torque too low may not enable the Machine to excite resonance, the variation in the Motor Current Feedback Signal Change is not large enough, causing the software unable to calculate the accurate vibration frequency correctly. The error setting of Resonance Frequency will cause the noise of the Machine to become more severe. It is recommended that the User can search for more than four times for each different Loading Torque, to increase the accuracy and judgment of the Frequency search.



3. After completing the setting of the Loading Torque, press **"Start"** and the Driver will issue a high frequency signal to the Motor to capture the Mechanical Characteristics.

   The following Figure illustrates with an Example: In the Curve Diagram, it can be found that there is a Resonance Point around 34 Hz and there seems to be a Resonance Point at 459 Hz. The Resonance Frequency found can be input to the Servo Driver First Set and Second Set Notch Filters Frequency **Cn013, Cn066**.



There are five sets of Resonance Suppression that can be set for JSDE2, each set can be set at the Filter Frequency, Quality Factor and Depth, the parameter setting is as follows:

Cn013/Cn066/Cn069/Cn072/Cn075Notch Filter Frequency First/Second/Third/Fourth/Fifth Set

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	Hz	0 ~ 2000	Effective after Set	Each Parameter is different

Setting Description: When to eliminate the vibration or noise caused by Resonance, please input the Frequency when vibration occurs in Cn013/066/069/072/075, setting of 0 represents that the Notch Filter is not used.

Cn014/Cn067/Cn070/Cn073/Cn076Notch Filter Quality Factor First/Second/Third/Fourth/Fifth Set

Initial Value	Unit	Setting Range	Effective	RS-485 Address
7	--	1 ~ 100	Effective after Set	Each Parameter is different

Setting Description: Used to adjust the frequency range to be suppressed, the smaller value of Cn014/067/070/73/076, the wider the frequency range of suppression, the User can adjust according to the actual situation.

Cn065/Cn068/Cn071/Cn074/Cn077Notch Filter Depth First/Second/Third/Fourth/Fifth Set

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0 ~ 1000	Effective after Set	Each Parameter is different

Setting Description: Used to adjust the frequency depth to be suppressed, the smaller the value of the Cn065/068/071/074/077, the deeper the frequency depth of suppression, the User can adjust according to the actual situation.

6-5 Low Frequency Vibration Suppression Function

Machine Tools Equipment are low-flexibility or rigid, which can easily cause the front end Low-frequency Vibration of the workpiece when the Motor in rapid acceleration / deceleration. This Device provides low-frequency vibration suppression function to eliminate this phenomenon, and the low-frequency vibration suppression is mainly used to perform vibration suppression on the vibration frequency below 100 Hz.

This Driver has two methods of using Low Frequency Vibration Suppression:

(1) Use **Pn336.0** (Automatic Low Frequency Vibration Suppression Enabling Selection)=1~3 to search the Low Frequency Vibration Frequency to be suppressed automatically

When the machine stops, the front end of workpiece vibrates, set **Pn336.0** (Automatic Low Frequency Vibration Suppression Enabling Selection)=1~3, enable Automatic Detection of Low Frequency Vibration Frequency, set **Pn337** (Automatic Low Frequency Vibration Suppression Delay) to adjust the Automatic Capture of Suppression Frequency Delay Time, and set **Pn338** (Low Frequency Swinging Detection Level) according to the equipment requirements. When the Low Frequency Vibration Frequency, the Low Frequency Vibration Frequency will be automatically saved into the Driver parameters, and **Pn336.0** returns to 0 (Disable Automatic Detection of Low Frequency Vibration Frequency) automatically; if the Low Frequency Vibration Frequency is not found, after searching for Low Frequency Vibration Frequency for a period of time, **Pn336.0** returns to 0 (Disable Automatic Detection of Low Frequency Vibration Frequency) automatically.

⚠ Attention
1. For the Automatic Low Frequency Suppression Function to be used, the Stop Time needs to be 1.5 Seconds + Time of Pn337. **2. When Pn340, Pn342, Pn344 are set to zero, this indicates the Low Frequency Suppression is not used.**

Pn336.0 Automatic Low Frequency Vibration Suppression Enabling Selection

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0 ~ 3	Effective after Set	032DH

Setting Description:

Setting	Description
0	Disable Automatic Detection of Low Frequency Vibration Frequency
1	Enable Automatic Detection of Low Frequency Vibration Frequency1
2	Enable Automatic Detection of Low Frequency Vibration Frequency2
3	Enable Automatic Detection of Low Frequency Vibration Frequency3

Pn337 Automatic Low Frequency Vibration Suppression Delay

Initial Value	Unit	Setting Range	Effective	RS-485 Address
100	1ms	0 ~ 1000	Effective after Set	032EH

Setting Description: Automatically detects the Delay Time of Low Frequency Vibration Frequency

Pn338 Low Frequency Swinging Detection Level

Initial Value	Unit	Setting Range	Effective	RS-485 Address
50	0.1 %	1 ~ 1000	Effective after Set	032FH

Setting Description: The detection level when executing automatic low frequency vibration suppression (Pn336=1~3), this value setting method is used to set the percentage of the positioning completion determined value (Pn307), adjusting the low frequency swinging detection level (Pn338) can adjust the detection sensitivity, and the lower the setting the easier for the noise to be determined incorrectly.

(2) Manually set Low Frequency Resonance Frequency Parameters **Pn339~Pn344**

In addition to automatic searches, the **Pn339** (First Set Low Frequency Vibration Suppression Frequency) can also be manually, set the frequency when it vibrates, and then use **Pn340** (First Set Low Frequency Vibration Suppression Parameter) to adjust the frequency range to be suppressed. If there are multiple low frequency vibrations on the platform, adjust **Pn341~344** the second to third Low Frequency Suppression Parameters according to the setting method of the First Set.

Pn339 / Pn341 / Pn343 Low Frequency Vibration Suppression Frequency First/Second/Third Set

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1000	0.1 Hz	10 ~ 1000	Effective after Set	0330H

Setting Description: Used to eliminate the Low Frequency Vibration generated by insufficient mechanism rigidity. When Pn340, Pn342, Pn344 are set to zero, this indicates the Low Frequency Suppression is not used.

Pn340 / Pn342 / Pn344 Low Frequency Vibration Suppression Parameter First/Second/Third Set

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0 ~ 30	Effective after Set	0331H

Setting Description: Used to adjust the frequency range to be suppressed, greater the value, wider the frequency range of suppression is, the recommended setting is 10.

6-6 Manual Gain Adjustment

Speed Control Mode Manual Gain Adjustment

Step 1: Set the Rigidity Level and receive correct Load Inertia Ratio, can refer to [6-3 Automatic Gain Adjustment Instructions] and [6-9 Online-Auto Tuning (Inertia Only Displays)] to obtain Load Inertia Ratio.

Step 2: If this Device (Speed Control) forms position control with the Supervisory Controller, set the Position Loop Gain of the Supervisory Controller to a relatively low value.

Step 3: Manually adjust **Sn211** (Speed Loop Gain 1):

First set the **Sn212** (Speed Loop Integration Time Constant 1) higher than the value after being adjusted by automatic gain, and then increase the speed loop gain until no vibration or noise is generated. Then, adjust the speed loop gain slightly and increase the position loop gain of the supervisory controller until no vibration or noise is generated.

Step 4: Manually adjust **Sn212** (Speed Loop Integration Time Constant 1):

Decrease the Speed Loop Integral Time Constant under the premise of no mechanical vibration is generated and shortens the settling time.

Step 5: Finally, slowly fine tune the Speed Loop Gain, Position Loop Gain of the Supervisory Controller and the Speed Loop Integration Time Constant to adjust the system operation to the optimum response.

Position Control Mode Manual Gain Adjustment

Step 1: Set the Rigidity Level and receive correct Load Inertia Ratio, can refer to [6-3 Automatic Gain Adjustment Instructions] and [6-9 Online-Auto Tuning (Inertia Only Displays)] to obtain Load Inertia Ratio.

Step 2: Set **Pn310** (Position Loop Gain 1) to the value lower than the value after being adjusted by automatic gain, and set **Sn212** (Speed loop integral time constant 1) to a relatively high value.

Step 3: Manually adjust **Sn211** (Speed Loop Gain 1):

Increase the Speed Loop Gain until no vibration or noise is generated.

Step 4: Manually adjust **Pn310** (Position Loop Gain 1):

Then, adjust the speed loop gain slightly, and increase the position loop gain until no vibration or noise is generated.

Step 5: Manually adjust **Sn212** (Speed Loop Integration Time Constant 1):

Decrease the Speed Loop Integral Time Constant under the premise of no mechanical vibration is generated and shortens the settling time.

Step 6: Finally, slowly fine tune the Speed Loop Gain, Position Loop Gain as well as the Speed Loop Integration Time Constant to adjust the system operations to the optimum response.

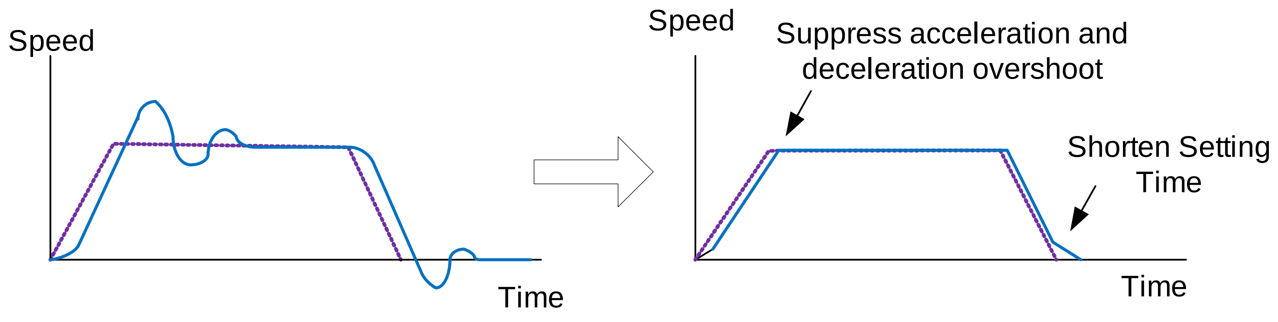
6-7 Gain Switching Function

The Gain Switching Function of this Device can be divided into two types of Speed Loop Gain PI/P Switching and Two-stage Gain Switching. The purposes of the function are as follows:

(1) In Speed Control, suppress the Acceleration / Deceleration overshoot.

(2) In Position Control, suppress the amplitude of oscillations caused by positioning and shortens the settling time.

(3) Can reduce the use of the Servo Lock function that causes a harsh noise.



6-7-1 PI/P Switching Mode

Before using the PI/P Switching Mode, select **Cn015.0** (PI/P Mode Switching Determination Type Selection) first, and set the switching condition of PI/P Mode in the relative parameters, the description is as follows:

Cn015.0 PI/P Mode Switching Determination Type Selection

Initial Value	Unit	Setting Range	Effective	RS-485 Address
4	--	0 ~ 4	Effective after Confirmed	0010H

Setting Description:

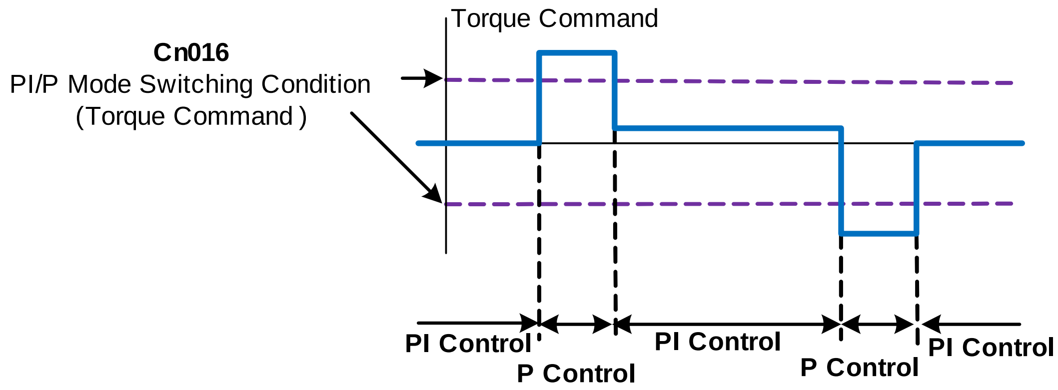
Setting	Description
0	Determine if the Torque Command is greater than Cn016
1	Determine if the Speed Command is greater than Cn017
2	Determine if the Acceleration Command is greater than Cn018
3	Determine if the Position Error is greater than Cn019
4	Use Input Contact PCNT to switch

<u>(1) Determine the Torque Command to switch PI/P Mode</u>

When the Torque Command is smaller than the **Cn016** Switching Condition, it is PI control; when the Torque Command is greater than the **Cn016** Switching Condition, then switch to only P Control, the schematic diagram is as follows:

Cn016 PI/P Mode Switching Condition (Torque Command)

Initial Value	Unit	Setting Range	Effective	RS-485 Address
200	%	0 ~ 399	Effective after Confirmed	0011H

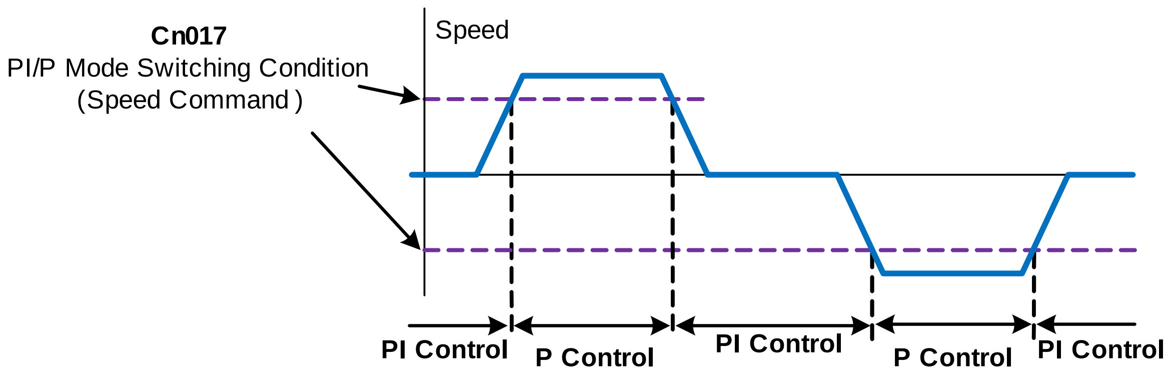


<u>(2) Determine the Speed Command to switch to PI/P Mode</u>

When the Speed Command is smaller than the **Cn017** Switching Condition, it is PI control; when the Speed Command is greater than the **Cn017** Switching Condition, then switch to only P Control, the schematic diagram is as follows:

Cn017 PI/P Mode Switching Condition (Speed Command)

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	rpm	0 ~ 1.5*Rated Speed	Effective after Confirmed	0012H

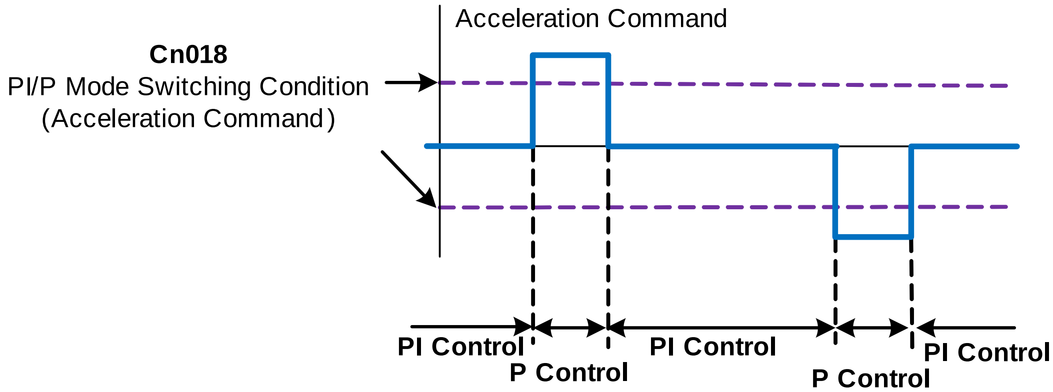


(3) Determine the Acceleration Command to switch to PI/P Mode

When the Acceleration Command is less than the **Cn018** switching condition, it is PI control; when the Acceleration Command is greater than the **Cn018** switching condition, then switch to P control only, the schematic diagram is as follows:

Cn018 PI/P Mode Switching Condition (Acceleration Command)

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	rps/s	0 ~ 18750	Effective after Confirmed	0013H

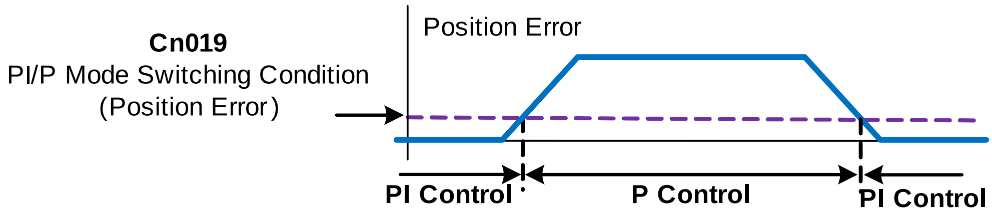


(4) Determine the Position Error to switch to PI/P Mode

When the Position Error is less than the **Cn019** switching condition, it is PI control; when the Position Error is greater than the **Cn019** switching condition, then switch to P control only, the schematic diagram is as follows:

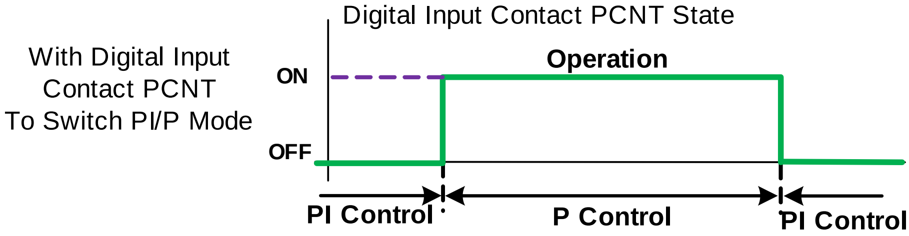
Cn019 PI/P Mode Switching Condition (Position Error)

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	pulse	0 ~ 41943040	Effective after Confirmed	0014H/0015H



(5) Use Digital Input Contact **PCNT** to switch PI/P Mode

When the Digital Input Contact **PCNT** does not operate, it is PI Control, when the Digital Input Contact **PCNT** operates, then switch to P Control only, the schematic diagram is as follows:



Note) Please refer to [5-6-1 Input / Output Contact Function Planning] to set the Driver Effective Logic.

6-7-2 Two Stage Gain Switching Mode

Before using the Two Stage Gain Switching Mode, select **Cn015.1** (Two Stage Gain Mode Switching Determination Type Selection), and set the switching condition of the Two Stage Gain Mode in the relative parameters. The difference of this mode from the PI/P Switching Mode is the addition of the capability to set the Switching Delay Time and Switching Time, the description is as follows:

Cn015.1 Two Stage Gain Mode Switching Determination Type Selection

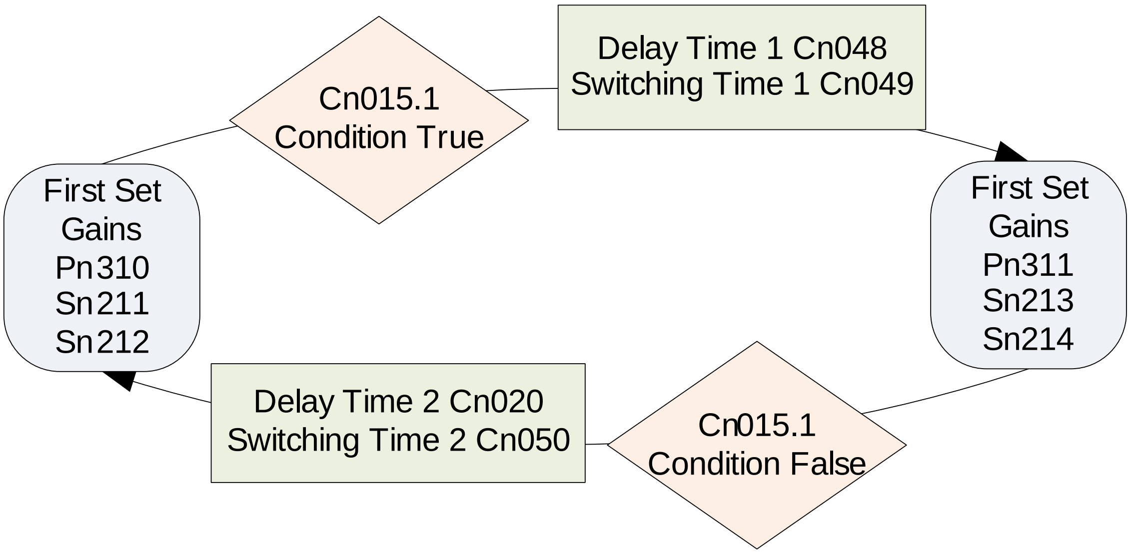
Initial Value	Unit	Setting Range	Effective	RS-485 Address
4	--	0 ~ 4	Effective after Confirmed	0010H

Setting Description:

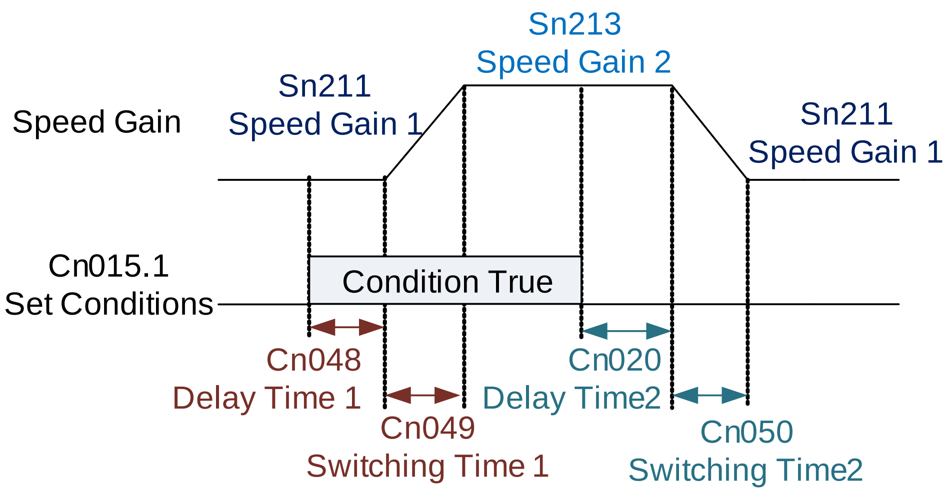
Setting	Description
0	Determine if the Torque Command is greater than Cn021
1	Determine if the Speed Command is greater than Cn022
2	Determine if the Acceleration Command is greater than Cn023
3	Determine if the Position Error is greater than Cn024
4	Use Input Contact G-SEL to switch

Switch Gain Combination

Switch Gain	Position Loop Gain	Speed Loop Gain	Speed Integration Time Parameter
First Gain	Pn310	Sn211	Sn212
Second Gain	Pn311	Sn213	Sn214



The relationship between Delay Time and Switching Time when switching gains:



Cn020 Two Stage Gain Mode Switching Delay Time 2

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	0.2ms	0 ~ 10000	Effective after Confirmed	0016H

Setting Description: When using the Two Stage Gain Mode, the Delay Time from the Second Stage Gain to the First Stage Gain can be set.

Cn048 Two Stage Gain Mode Switching Delay Time 1

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	0.2ms	0 ~ 10000	Effective after Confirmed	0033H

Setting Description: When using the Two Stage Gain Mode, the Delay Time from the First Stage Gain to the Second Stage Gain can be set.

Cn049 Two Stage Gain Mode Switching Time 1

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	0.2ms	0 ~ 10000	Effective after Confirmed	0034H

Setting Description: When using Two Stage Gain Mode, the Conversion Time from the First Stage Gain to the Second Stage Gain can be set.

Cn050 Two Stage Gain Mode Switching Time 2

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	0.2ms	0 ~ 10000	Effective after Confirmed	0035H

Setting Description: When using Two Stage Gain Mode, the Conversion Time from the Second Stage Gain to the First Stage Gain can be set.

(1) Determine Torque Command to Switch to the Two Stage Gain Mode

When the Torque Command is less than the **Cn021** switching condition, use the first stage to gain control; when the Torque Command is greater than the **Cn021** switching condition, then switch to the second stage gain control. If the Torque Command is less than the **Cn021** switching condition again, it will switch to the first stage gain control.

Cn021 Two Stage Gain Mode Switching Condition (Torque Command)

Initial Value	Unit	Setting Range	Effective	RS-485 Address
200	%	0 ~ 399	Effective after Confirmed	0017H

(2) Determine Speed Command to Switch Two Stage Gain Mode

When the Speed Command is less than the **Cn022** switching condition, use the first stage gain control; when the Speed Command is greater than the **Cn022** switching condition, then switch to the second stage gain control. If the Speed Command is less than the **Cn022** switching condition again, it will switch to the first stage gain control.

Cn022 Two Stage Gain Mode Switching Condition (Speed Command)

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	rpm	0 ~ 1.5*Rated Speed	Effective after Confirmed	0018H

(3) Determine Acceleration Command to Switch Two Stage Gain Mode

When the Acceleration Command is less than the **Cn023** switching condition, use the first stage gain control; when the Acceleration Command is greater than the **Cn023** switching condition, then switch to the second stage gain control. If the Acceleration Command is less than the **Cn023** switching condition again, it will switch to the first stage gain control.

Cn023 Two Stage Gain Mode Switching Condition (Acceleration Command)

Initial Value	Unit	Setting Range	Effective	RS-485
0	rps/s	0 ~ 18750	Effective after Confirmed	0019H

(4) Determine Position Error to Switch Two Stage Gain Mode

When the Position Error is less than the **Cn024** switching condition, use the first stage gain control; when the Position Error is greater than the **Cn024** switching condition, then switch to the second stage gain control. If the Position Error is less than the **Cn024** switching condition again, it will switch to the first stage gain control.

Cn024 Two Stage Gain Mode Switching Condition (Position Error)

Initial Value	Unit	Setting Range	Effective	RS-485
0	pulse	0 ~ 41943040	Effective after Confirmed	001AH/001BH

(5) Use Digital Input Contact **G-SEL** to switch to the Two-stage Gain Mode

When the Digital Input Contact **G-SEL** does not operate, use the first stage gain control; when the Digital Input Contact **G-SEL** operates, then switch to the second stage gain control. If the Digital Input Contact **G-SEL** does not operate again, it will switch to the first stage gain control.

6-8 Improved Response Characteristics

The Server provides gain switching function and position loop feed forward gains to improve system response. Attention! These two functions must be used correctly to improve the response characteristics, otherwise the response will deteriorate. Description as follows:

Gain Switching Function

The Gain Switching Function of this Device can be divided into two types of Speed Loop Gain PI/P Switching and Two Stage Gain Switching. The purpose of this function is as follows:

(1) In Speed Control, suppress the Acceleration / Deceleration overshoot.

(2) In Position Control, suppress the amplitude of oscillations caused by positioning and shortens the settling time.

(3) Can reduce the use of the Servo Lock function that causes a harsh noise.

Please refer to [6-7 Gain Switching Function] for detailed description.

Position Loop Feed Forward Gain

The use of Position Loop Feed Forward Gain can reduce the Position Control following error and speed up the reaction speed. If the Position Loop Gain is large enough, the effect of this function is not significant, therefore, it is suitable to be used in the system that it cannot adjust the Position Loop Gain high enough and wants to increase the response speed.

Adjust Steps are as follows:

Step 1: Adjust Speed and Position Loop in accordance with the steps specified in [6-6 Manual Gain Adjustment].

Step 2: Slowly increase **Pn312** (Position Loop Feed Forward Gain), and observe the Output Contact **INP** (Positioning Completion Signal) at the same time to enable rapid output and shorten the settling time. Pay attention to the Position Loop Feed Forward Gain cannot be too high. The excessive Feed Forward Gain can cause a speed overshoot and the Output Contact **INP** (Positioning Completion Signal) is repeatedly turned on and off.

6-9 OnLine-AutoTuning (Inertia Only Displays)

If the User does not understand the Actual Inertia Ratio, the OnLine-AutoTuning (Inertia only Displays) function can be used. In case of supervisory controller issues Motion Control, the Driver will perform the Inertia evaluation and generate the Inertia Ratio result to Un-45 [OnLine_AutoTuning Inertia Estimation]

Cn059.0 AutoTuning Enabling Selection

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0-2	--	003EH

Setting Description:

Setting	Description
0	Disable AutoTuning
1	Enable OFFLine-AutoTuning
2	Enable OnLine-AutoTuning (Inertia Only Displays)

Chap 7 Parameter Function

7-1 Parameter Group Description

The parameters of this Device are divided into ten categories, the definition is as follows: **Note)** xx represents the item number of this Parameter Group.

■ Parameter Group

Code	Description	Code	Description
Un-xx	Status Display Parameter	dn-xx	Diagnostic Parameter
AL-xx	Error Alarm History Parameter	Cn-xx	System Parameter
Tn1xx	Torque Control Parameter	Sn2xx	Speed Control Parameter
Pn3xx	Position Control Parameter	Pn4xx	Point to Point Position Control Parameter
qn5xx	Shortcut Parameter	Hn6xx	Multi-function Contact Planning Parameter

■ Control Mode

Code	Description	Code	Description
ALL	All Types of Control	S	Speed Control
Pi	Position Control (Internal Position Command)	T	Torque Control
Pe	Position Control (External Pulse Command)		

■ Parameter Effective Method

Code	Description
★	Must turn on power supply again, the setting value can be effective.
◆	Pressing the Enter Key is not required, effective immediately after the setting value is set.
●	This parameter does not accept Cn029 Factory Re-set.
▲	Parameter can be effective after Servo Off

7-2 Parameter Function List

System Parameter (Cn0□□)

	Parameter Code	Name and Function	Unit	RS485
★	Cn001	Control Mode Selection	-	0001H
★	Cn002.0	Auxiliary Function - Input Contact SON Function Section	-	0002H
★	Cn002.1	Auxiliary Function - Input Contact CCWL and CWL Function Section		
★	Cn002.3	EMC Re-set Mode Selection		
	Cn003	Mechanical Brake Signal Output Time	msec	0003H
	Cn004.0	Motor Rotation Direction Definition (from the Motor Load End)	-	0004H
★	Cn005	Encoder Signal Dividing Output	pulse	0005H/0006H
	Cn007	Speed Reached Determined Value	rpm	0008H
	Cn008.0	Brake Mode	-	0009H
★	Cn009.0	CW/CCW Drive Prohibited Method	-	000AH
	Cn010	CCW Direction Torque Command Limit Value	%	000BH
	Cn011	CW Direction Torque Command Limit Value	%	000CH
	Cn012	External Regenerative Resistor Power Setting	W	000DH
	Cn013	First Set Notch Filter Frequency	Hz	000EH
	Cn014	First Set Notch Filter Quality Factor	-	000FH
	Cn015.0	Switching Determination Type Selection of PI/P Mode	-	0010H
	Cn015.1	Switching Determination Type Selection of Two Stage Gain Mode		
	Cn016	Switching Condition of PI/P Mode (Torque Command)	%	0011H
	Cn017	Switching Condition of PI/P Mode (Speed Command)	rpm	0012H
	Cn018	Switching Condition of PI/P Mode (Acceleration Command)	rps/s	0013H
	Cn019	Switching Condition of PI/P Mode (Position Error Command)	pulse	0014H/0015H
	Cn020	Switching Delay Time 2 of Two Stage Gain Mode	2msec	0016H
	Cn021	Switching Condition of Two Stage Gain Mode (Torque Command)	%	0017H
	Cn022	Switching Condition of Two Stage Gain Mode (Speed Command)	rpm	0018H
	Cn023	Switching Condition of Two Stage Gain Mode (Acceleration Command)	rps/s	0019H
	Cn024	Switching Condition of Two Stage Gain Mode (Position Error Command)--32bit	pulse	001AH/001BH
	Cn025	Load Inertia Ratio	0.1	001CH
	Cn026	Rigidity Setting	-	001DH
★	Cn029	Parameter Reset	-	0020H
★●	Cn030	Serialized Model Setting	-	0021H
	Cn031.0	Fan Operation Setting (only applicable to models equipped with fan)	-	0022H
	Cn031.1	Low-voltage Protection (AL-01) Automatic Reset Selection		
●	Cn031.2	Absolute Value Encoder Battery Error Alarm Output		
●	Cn031.3	Motor Series Selection		
	Cn032	Speed Feedback Smoothing Filter	Hz	0023H
	Cn033	Speed Forward Feed Smoothing Filter	Hz	0024H
	Cn034	Torque Command Smoothing Filter	Hz	0025H
	Cn035	Panel Status Display Content Selection	-	0026H

	Parameter Code	Name and Function	Unit	RS485
★	Cn036	RS-485 ID Setting	-	0027H
★	Cn037.0	RS-485 Communication Transmission Rate	-	0028H
★	Cn037.2	RS-485 Communication Write Selection		
★	Cn038	RS-485 Communication Protocol	-	0029H
★	Cn039	RS-485 Communication Timeout Setting	sec	002AH
★	Cn040	RS-485 Communication Response Delay Time	0.5msec	002BH
	Cn041.0	Absolute Type Encoder Multiple Number of Revolution Clearing Function	-	002CH
	Cn048	Switching Delay Time 1 of Two Stage Gain Mode	2msec	0033H
	Cn049	Switching Time 1 of Two Stage Gain Mode	2msec	0034H
	Cn050	Switching Time 2 of Two Stage Gain Mode	2msec	0035H
	Cn051	Low Voltage Protection Level	V	0036H
	Cn052	Low Voltage Protection Alarm Delay Time	250msec	0037H
	Cn053.0	Current Offset Automatic Correction (can be used only in Servo Off)	-	0038H
	Cn054	Driver Warning Setting (AL-1-16)	-	0039H
	Cn055	Driver Warning Delay Trigger Alarm Time	10msec	003AH
	Cn056	Second Stage CCW Direction Torque Command Limit Value	%	003BH
	Cn057	Second Stage CW Direction Torque Command Limit Value	%	003CH
	Cn058	Delay Time of Switch Stage 1 Torque Limit to Stage 2 Torque Limit	4ms	003DH
	Cn059.0	AutoTuning Enabling Selection	-	003EH
	Cn060	OFFLine-tuning Operation Command Number of Revolutions Setting	Rev	003FH
	Cn061	OFFLine-tuning Operation Maximum Speed	rpm	0040H
	Cn063.0	Automatic Mechanical Vibration Suppression Enabling Selection	-	0042H
	Cn064	Mechanical Vibration Detection Level	-	0043H
	Cn065	Notch Filter Depth	-	0044H
	Cn066	Second Set Notch Filter Frequency	Hz	0045H
	Cn067	Second Set Notch Filter Quality Factor	-	0046H
	Cn068	Second Set Notch Filter Depth	-	0047H
	Cn069	Third Set Notch Filter Frequency	Hz	0048H
	Cn070	Third Set Notch Filter Quality Factor	-	0049H
	Cn071	Third Set Notch Filter Depth	-	004AH
	Cn072	Fourth Set Notch Filter Frequency	Hz	004BH
	Cn073	Fourth Set Notch Filter Quality Factor	-	004CH
	Cn074	Fourth Set Notch Filter Depth	-	004DH
	Cn075	Fifth Set Notch Filter Frequency	Hz	004EH
	Cn076	Fifth Set Notch Filter Quality Factor	-	004FH
	Cn077	Fifth Set Notch Filter Depth	-	0050H

Torque Control Parameter (Tn1□□)

	Parameter Code	Name and Function	Unit	RS485
▲	Tn101.0	Torque Command Acceleration / Deceleration Method	-	0101H
▲	Tn101.1	Analog and Digital Torque Command Selection		
▲	Tn101.2	Speed Limit Value Switching Function		
▲	Tn102	Torque Command Linear Acceleration / Deceleration Constant	msec	0102H
	Tn103	Analog Torque Command Proportioner	%/10V	0103H
	Tn104	Analog Torque Command Offset Adjustment	mV	0104H
	Tn105	Internal Speed Limit 1	rpm	0105H
	Tn106	Internal Speed Limit 2	rpm	0106H
	Tn107	Internal Speed Limit 3	rpm	0107H
	Tn108	Torque Reached Determined Value	%	0108H
	Tn109	Analog Speed Limit Proportioner	rpm	0109H
▲	Tn110	Torque Command One Time Smoothing Acceleration / Deceleration Constant	msec	010AH
	Tn113	Digital Torque Command Value	0.1%	010DH
	Tn114	Forward Rotation Speed Limit Value	rpm	010EH
	Tn115	Reverse Rotation Speed Limit Value	rpm	010FH

Speed Control Parameter (Sn2□□)

	Parameter Code	Name and Function	Unit	RS485
	Sn201	Internal Speed Command 1	rpm	0201H
	Sn202	Internal Speed Command 2	rpm	0202H
	Sn203	Internal Speed Command 3	rpm	0203H
	Sn204.0	Operation of Zero Speed Determination Established	-	0204H
	Sn205.0	Speed Command Acceleration / Deceleration Method	-	0205H
	Sn206	Speed Command One Time Smoothing Acceleration / Deceleration Time Constant	msec	0206H
	Sn207	Speed Command Linear Acceleration / Deceleration Time Constant	msec	0207H
	Sn208	S-type Speed Command Acceleration / Deceleration Time Setting	msec	0208H
	Sn209	S-type Speed Command Acceleration Time Setting	msec	0209H
	Sn210	S-type Speed Command Deceleration Time Setting	msec	020AH
	Sn211	Speed Loop Gain 1	Hz	020BH
	Sn212	Speed Loop Integration Time Constant 1	0.01msec	020CH
	Sn213	Speed Loop Gain 2	Hz	020DH
	Sn214	Speed Loop Integration Time Constant 2	0.01msec	020EH
	Sn215	Zero Speed Determined Value	rpm	020FH
	Sn216	Analog Speed Command Proportioner	rpm/10V	0210H
	Sn217	Analog Speed Command Offset Adjustment	mV	0211H
	Sn218	Analog Speed Command Limit	rpm	0212H

Position Control Parameter (Pn3□□)

	Parameter Code	Name and Function	Unit	RS485
★	Pn301.0	Position Pulse Command Type Selection	-	0301H
★	Pn301.1	Position Pulse Command Logic Selection		
★	Pn301.2	Drive Prohibited Command Receiving Selection		
★	Pn301.3	Position Pulse Command Filter Width Selection		
	Pn302	Electronic Gear Ratio Numerator 1	-	0302H/0303H
	Pn303	Electronic Gear Ratio Numerator 2	-	0304H/0305H
	Pn304	Electronic Gear Ratio Numerator 3	-	0306H/0307H
	Pn305	Electronic Gear Ratio Numerator 4	-	0308H/0309H
★	Pn306	Electronic Gear Ratio Denominator	-	030AH/030BH
	Pn307	Positioning Completion Determined Value	pulse	030CH/030DH
	Pn308	Positive Maximum Position Error Determined Value	0.0001rev	030EH
	Pn309	Negative Maximum Position Error Determined Value	0.0001rev	030FH
	Pn310	Position Loop Gain 1	rad/s	0310H
	Pn311	Position Loop Gain 2	rad/s	0311H
	Pn312	Position Loop Feed Forward Gain	%	0312H
★	Pn313	External Position Command One time Smoothing Acceleration / Deceleration Time Constant	Msec	0313H
★	Pn314.0	Position Command Direction Definition (from the Motor Load End)	-	0314H
	Pn315.0	Pulse Error Clearing Mode	-	0315H
★	Pn316.0	Internal Position Command Mode	-	0316H
★	Pn316.1	Internal Position Command Hold (PHOLD) Procedure Selection		
★	Pn316.2	Encoder Signal Dividing Output Phase Sequence		
★	Pn316.3	Encoder Signal Dividing Output Frequency Elimination		
	Pn317.0	After activated Return to Origin, the Origin Search Direction and Select Origin Reference Point Setting	-	0317H
	Pn317.1	After Found Origin Reference Point, the Moving Method of Search Mechanical Origin Setting		
	Pn317.2	Return to Origin Activation Mode Setting		
	Pn317.3	Stop Mode after Found Mechanical Origin Setting		
	Pn318	Return to Origin First Stage High Speed	rpm	0318H
	Pn319	Return to Origin Second Stage Low Speed	rpm	0319H
	Pn320	Return to Origin Offset Number of Revolutions	rev	031AH
	Pn321	Return to Origin Offset Number of Pulses	pulse	031BH/031CH
	Pn322	Internal Position Command S-type Acceleration / Deceleration Smoothing Constant (TSL)	0.4ms	031DH
	Pn323	Internal Position Command S-type Acceleration / Deceleration Constant (TACC)	0.4ms	031EH
	Pn329	Pulse Command Smoothing Filter	2msec	0325H
	Pn330	Pulse Command Moving Filter	0.4msec	0326H
	Pn332.0	Internal Position Command S-type Acceleration / Deceleration Method	-	0329H
	Pn333	Internal Position Command S-type Deceleration Constant (TDEC)	-	032AH
	Pn334	PTRG Trigger Delay Time Parameter	0.4ms	032BH
	Pn336.0	Automatic Low Frequency Vibration Suppression	-	032DH
	Pn337	Automatic Low Frequency Vibration Suppression	1ms	032EH

	Parameter Code	Name and Function	Unit	RS485
	Pn338	Low Frequency Swinging Detection Level	0.1%	032FH
	Pn339	First Set Low Frequency Vibration Suppression Frequency	0.1Hz	0330H
	Pn340	First Set Low Frequency Vibration Suppression Parameter	-	0331H
	Pn341	Second Set Low Frequency Vibration Suppression Frequency	0.1Hz	0332H
	Pn342	Second Set Low Frequency Vibration Suppression Parameter	-	0333H
	Pn343	Third Set Low Frequency Vibration Suppression Frequency	0.1Hz	0334H
	Pn344	Third Set Low Frequency Vibration Suppression Parameter	-	0335H
★	Pn354	Single Revolution Pulse Command Function	pulse	0341H/0342H

Multiple Stage Position Control Parameters (Pn4□□)

	Parameter Code	Name and Function	Unit	RS485
	Pn401	Internal Position Command 1-Number of Revolution	rev	0701H
	Pn402	Internal Position Command 1-Number of Pulses	pulse	0702H/0703H
	Pn403	Internal Position Command 1-Moving Speed	rpm	0704H
	Pn404	Internal Position Command 2-Number of Revolution	rev	0705H
	Pn405	Internal Position Command 2-Number of Pulses	pulse	0706H/0707H
	Pn406	Internal Position Command 2-Moving Speed	rpm	0708H
	Pn407	Internal Position Command 3-Number of Revolution	rev	0709H
	Pn408	Internal Position Command 3-Number of Pulses	pulse	070AH/070BH
	Pn409	Internal Position Command 3-Moving Speed	rpm	070CH
	Pn410	Internal Position Command 4-Number of Revolution	rev	070DH
	Pn411	Internal Position Command 4-Number of Pulses	pulse	070EH/070FH
	Pn412	Internal Position Command 4-Moving Speed	rpm	0710H
	Pn413	Internal Position Command 5-Number of Revolution	rev	0711H
	Pn414	Internal Position Command 5-Number of Pulses	pulse	0712H/0713H
	Pn415	Internal Position Command 5-Moving Speed	rpm	0714H
	Pn416	Internal Position Command 6-Number of Revolution	rev	0715H
	Pn417	Internal Position Command 6-Number of Pulses	pulse	0716H/0717H
	Pn418	Internal Position Command 6-Moving Speed	rpm	0718H
	Pn419	Internal Position Command 7-Number of Revolution	rev	0719H
	Pn420	Internal Position Command 7-Number of Pulses	pulse	071AH/071BH
	Pn421	Internal Position Command 7-Moving Speed	rpm	071CH
	Pn422	Internal Position Command 8-Number of Revolution	rev	071DH
	Pn423	Internal Position Command 8-Number of Pulses	pulse	071EH/071FH
	Pn424	Internal Position Command 8-Moving Speed	rpm	0720H
	Pn425	Internal Position Command 9-Number of Revolution	rev	0721H
	Pn426	Internal Position Command 9-Number of Pulses	pulse	0722H/0723H
	Pn427	Internal Position Command 9-Moving Speed	rpm	0724H
	Pn428	Internal Position Command 10-Number of Revolution	rev	0725H
	Pn429	Internal Position Command 10-Number of Pulses	pulse	0726H/0727H
	Pn430	Internal Position Command 10-Moving Speed	rpm	0728H
	Pn431	Internal Position Command 11-Number of Revolution	rev	0729H
	Pn432	Internal Position Command 11-Number of Pulses	pulse	072AH/072BH
	Pn433	Internal Position Command 11-Moving Speed	rpm	072CH
	Pn434	Internal Position Command 12-Number of Revolution	rev	072DH

	Parameter Code	Name and Function	Unit	RS485
	Pn435	Internal Position Command 12-Number of Pulses	pulse	072EH/072FH
	Pn436	Internal Position Command 12-Moving Speed	rpm	0730H
	Pn437	Internal Position Command 13-Number of Revolution	rev	0731H
	Pn438	Internal Position Command 13-Number of Pulses	pulse	0732H/0733H
	Pn439	Internal Position Command 13-Moving Speed	rpm	0734H
	Pn440	Internal Position Command 14-Number of Revolution	rev	0735H
	Pn441	Internal Position Command 14-Number of Pulses	pulse	0736H/0737H
	Pn442	Internal Position Command 14-Moving Speed	rpm	0738H
	Pn443	Internal Position Command 15-Number of Revolution	rev	0739H
	Pn444	Internal Position Command 15-Number of Pulses	pulse	073AH/073BH
	Pn445	Internal Position Command 15-Moving Speed	rpm	073CH
	Pn446	Internal Position Command 16-Number of Revolution	rev	073DH
	Pn447	Internal Position Command 16-Number of Pulses	pulse	073EH/073FH
	Pn448	Internal Position Command 16-Moving Speed	rpm	0740H
	Pn449	Internal Position Command 17-Number of Revolution	rev	0741H
	Pn450	Internal Position Command 17-Number of Pulses	pulse	0742H/0743H
	Pn451	Internal Position Command 17-Moving Speed	rpm	0744H
	Pn452	Internal Position Command 18-Number of Revolution	rev	0745H
	Pn453	Internal Position Command 18-Number of Pulses	pulse	0746H/0747H
	Pn454	Internal Position Command 18-Moving Speed	rpm	0748H
	Pn455	Internal Position Command 19-Number of Revolution	rev	0749H
	Pn456	Internal Position Command 19-Number of Pulses	pulse	074AH/074BH
	Pn457	Internal Position Command 19-Moving Speed	rpm	074CH
	Pn458	Internal Position Command 20-Number of Revolution	rev	074DH
	Pn459	Internal Position Command 20-Number of Pulses	pulse	074EH/074FH
	Pn460	Internal Position Command 20-Moving Speed	rpm	0750H
	Pn461	Internal Position Command 21-Number of Revolution	rev	0751H
	Pn462	Internal Position Command 21-Number of Pulses	pulse	0752H/0753H
	Pn463	Internal Position Command 21-Moving Speed	rpm	0754H
	Pn464	Internal Position Command 22-Number of Revolution	rev	0755H
	Pn465	Internal Position Command 22-Number of Pulses	pulse	0756H/0757H
	Pn466	Internal Position Command 22-Moving Speed	rpm	0758H
	Pn467	Internal Position Command 23-Number of Revolution	rev	0759H
	Pn468	Internal Position Command 23-Number of Pulses	pulse	075AH/075BH
	Pn469	Internal Position Command 23-Moving Speed	rpm	075CH
	Pn470	Internal Position Command 24-Number of Revolution	rev	075DH
	Pn471	Internal Position Command 24-Number of Pulses	pulse	075EH/075FH
	Pn472	Internal Position Command 24-Moving Speed	rpm	0760H
	Pn473	Internal Position Command 25-Number of Revolution	rev	0761H
	Pn474	Internal Position Command 25-Number of Pulses	pulse	0762H/0763H
	Pn475	Internal Position Command 25-Moving Speed	rpm	0764H
	Pn476	Internal Position Command 26-Number of Revolution	rev	0765H
	Pn477	Internal Position Command 26-Number of Pulses	pulse	0766H/0767H
	Pn478	Internal Position Command 26-Moving Speed	rpm	0768H
	Pn479	Internal Position Command 27-Number of Revolution	rev	0769H
	Pn480	Internal Position Command 27-Number of Pulses	pulse	076AH/076BH
	Pn481	Internal Position Command 27-Moving Speed	rpm	076CH
	Pn482	Internal Position Command 28-Number of Revolution	rev	076DH

	Parameter Code	Name and Function	Unit	RS485
	Pn483	Internal Position Command 28-Number of Pulses	pulse	076EH/076FH
	Pn484	Internal Position Command 28-Moving Speed	rpm	0770H
	Pn485	Internal Position Command 29-Number of Revolution	rev	0771H
	Pn486	Internal Position Command 29-Number of Pulses	pulse	0772H/0773H
	Pn487	Internal Position Command 29-Moving Speed	rpm	0774H
	Pn488	Internal Position Command 30-Number of Revolution	rev	0775H
	Pn489	Internal Position Command 30-Number of Pulses	pulse	0776H/0777H
	Pn490	Internal Position Command 30-Moving Speed	rpm	0778H
	Pn491	Internal Position Command 31-Number of Revolution	rev	0779H
	Pn492	Internal Position Command 31-Number of Pulses	pulse	077AH/077BH
	Pn493	Internal Position Command 31-Moving Speed	rpm	077CH
	Pn494	Internal Position Command 32-Number of Revolution	rev	077DH
	Pn495	Internal Position Command 32-Number of Pulses	pulse	077EH/077FH
	Pn496	Internal Position Command 32-Moving Speed	rpm	0780H

Shortcut Parameters (qn5□□)

	Parameter Code	Name and Function	Unit	RS485
◆	qn501	Speed Loop Gain1	Hz	0401H
◆	qn502	Speed Loop Integration Time Constant 1	x0.01msec	0402H
◆	qn503	Speed Loop Gain2	Hz	0403H
◆	qn504	Speed Loop Integration Time Constant 2	x0.01msec	0404H
◆	qn505	Position Loop Gain1	rad/s	0405H
◆	qn506	Position Loop Gain2	rad/s	0406H
◆	qn507	Position Loop Feed Forward Gain	%	0407H

Multi-function Contact Planning Parameters (Hn6□□)

	Parameter Code	Name and Function	Unit	RS485
★	Hn601	DI-1Pin Function Planning	-	0501H
★	Hn602	DI-2Pin Function Planning	-	0502H
★	Hn603	DI-3Pin Function Planning	-	0503H
★	Hn604	DI-4Pin Function Planning	-	0504H
★	Hn605	DI-5Pin Function Planning	-	0505H
★	Hn606	DI-6Pin Function Planning	-	0506H
★	Hn607	DI-7Pin Function Planning	-	0507H
★	Hn608	DI-8Pin Function Planning	-	0508H
★	Hn609	DI-9Pin Function Planning	-	0509H
★	Hn610	DI-10Pin Function Planning	-	050AH
★	Hn611	DI-11Pin Function Planning	-	050BH
★	Hn612	DI-12Pin Function Planning	-	050CH
★	Hn613	DO-1Pin Function Planning	-	050DH
★	Hn614	DO-2Pin Function Planning	-	050EH
★	Hn615	DO-3Pin Function Planning	-	050FH
★	Hn616	DO-4Pin Function Planning	-	0510H
	Hn617	Digital Input Contact Control Method Selection	-	0511H
	Hn618	Communication Control Digital Input Contact Status	-	0512H

7-3 Parameter Function Detail description

7-3-1 System Parameters (Cn0□□)

Cn001 Control Mode Selection

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
2	--	0-D	★	--

RS-485 Communication Position	Pi	Pe	S	T
0001H	O	O	O	O

Setting Description:

Setting	Description	Setting	Description
0	Torque Control	5	External Position / Torque Control Switching
1	Speed Control	6	Internal Position Control (Internal Position Command)
2	External Position Control (External Pulse Command)	7	Internal Position / Speed Control Switching
3	External Position / Speed Control Switching	8	Internal Position / Torque Control Switching
4	Speed / Torque Control Switching	A	Internal / External Position Switching

Cn002.0 Contact Auxiliary Function - Input Contact SON Function Selection

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0-1	★	--

RS-485 RS-485 Communication Position	Pi	Pe	S	T
0002H	O	O	O	O

Setting Description:

Setting	Description
0	Control Servo Activation by Input Contact SON.
1	Control Servo Activation not using Input Contact SON, activate Servo immediately with Power Turned ON

Cn002.1 Contact Auxiliary Functions--Input Contact CCWL and CWL Function Selection

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
1	--	0-1	★	--

RS-485 Communication Position	Pi	Pe	S	T
0002H	O	O	O	O

Setting Description:

Setting	Description
0	Control **CCW** and **CW** Drive Prohibit by Input Contacts CCWL and CWL.
1	Control **CCW** and **CW** Drive Prohibit not using Input Contacts CCWL and CWL, ignore **CCW** and **CW** Drive Prohibit Functions.

Cn002.3 EMC Return Mode Selection

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0-1	★	--

RS-485 Communication Position	Pi	Pe	S	T
0002H	O	O	O	O

Setting Description:

Setting	Description
0	After the **EMC** status is cleared, the AL-09 Display can only be cleared with ALRS Signal in the **Servo Off** State (SON Contact Open).
	Note) Cannot be cleared in **Servo On** State (SON Contact Closed).
1	After the EMC status is cleared, the AL-09 Display can be automatically return cleared regardless of the status of Servo On or Servo off.
	! Attention: In Servo On state, before the alarm clears and returns to normal operation, whether the Controller still issues command to the Drive must be confirmed to avoid causing sudden unintended acceleration of the Motor!

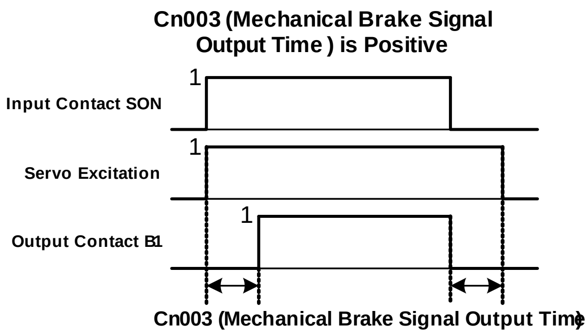
Cn003 Mechanical Brake Signal Output Time

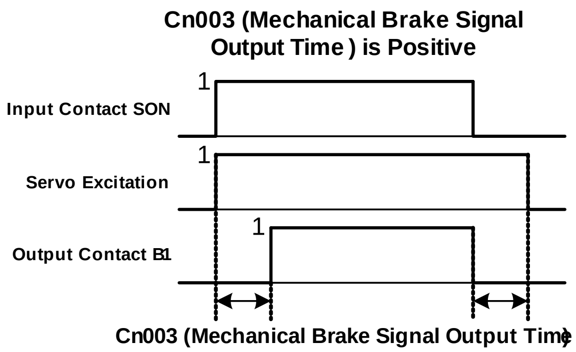
Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	msec	-2000-2000	--	--

RS-485 Communication Position	Pi	Pe	S	T
0003H	O	O	O	O

Setting Description: The Time Sequence Diagram is as follows

Note) Before using this function, a Mechanical Brake Signal (**BI**) output pin must be planned first;



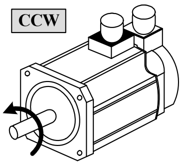


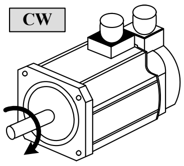
Cn004.0 Motor Rotation Direction Definition (from the Motor Load End)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0-3	--	--

RS-485 Communication Position	Pi	Pe	S	T
0004H	-	-	O	O

Setting Description: When the Torque or Speed Command is positive, the Rotation Direction Setting from the Motor Load End is as follows





Setting	Description	
	Torque Control	Speed Control
0	Counterclockwise Rotation (CCW)	Counterclockwise Rotation (CCW)
1	Clockwise Rotation (CW)	Counterclockwise Rotation (CCW)
2	Counterclockwise Rotation (CCW)	Clockwise Rotation (CW)
3	Clockwise Rotation (CW)	Clockwise Rotation (CW)

Cn005 Analog Speed Command Limit

Initial Value	**Unit**	**Setting Range**	**Effective**	**Cn029 Reset**
Determined by the Encoder 2500: 2500ppr 8192: 8192ppr, 15bit 32768: 17bit, 23bit	Pulse	16-2097152	★	--

RS-485 Communication Position	**Pi**	**Pe**	**S**	**T**
0005H/0006H	O	O	O	O

Setting Description: Dividing Process means the number of pulse signals generated with one revolution of Motor Encoder that are converted into number of pulse signals preset by **Cn005**. Example: The Motor Encoder is a 2000 pulse output with one revolution, if to obtain a 1000 pulse dividing output, please set **Cn005**=1000 directly.

★ The power must be re-started for the setting value to be valid, and the dividing output and speed have a certain relationship limit.

<Setting Limit>

Lower Limit Value (ppr)	Upper Limit Value (ppr)	Setting Unit	PPR4				Maximum Speed
			10000	32768	131072	8388608	
16	2048	1	Suitable	Suitable	Suitable	Suitable	6000
2049	16384	1	Suitable	Suitable	Suitable	Suitable	6000
16386	32768	2	-	-	Suitable	Suitable	6000
32772	65536	4	-	-	-	Suitable	3000
65544	131072	8	-	-	-	Suitable	1500
131088	262144	16	-	-	-	Suitable	750
262176	524288	32	-	-	-	Suitable	375
524352	1048576	64	-	-	-	Suitable	188
1048704	2097152	128	-	-	-	Suitable	94

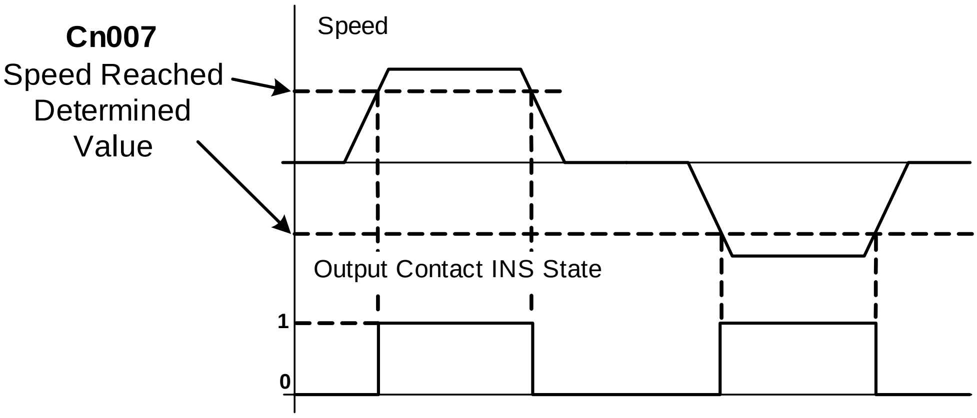
Attention! The Setting Range cannot exceed the Number of Pulses in One Revolution of Motor Encoder.

Cn007 Speed Reached Determined Value

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
Rated Speed x 1/3	%	0-1.5*Rated Speed	--	--

RS-485 Communication Position	Pi	Pe	S	T
0008H	-	-	O	O

Setting Description: When the Forward or Reverse Speed exceeds the speed set by Cn007 (Speed Reached Determined Value), the Output Contact INS operates.



Cn008.0 Brake Mode

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0-5	--	--

RS-485 Communication Position	Pi	Pe	S	T
0009H	O	O	O	O

Setting Description: The Brake Combination of Servo off, Emergency Stop (EMC), and when CCW/CW Drive is Prohibited.

Setting	Description	
	Dynamic Brake	Mechanical Brake
0	No	No
1	No	Yes

Cn009.0 CW/CCW Drive Prohibited Method

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0-2	★	--

RS-485 Communication Position	Pi	Pe	S	T
000AH	O	O	O	O

Setting Description:

Setting	Description
0	Use the pre-set Torque Limit (**Cn010**, **Cn011**) to decelerate, and in Zero Speed Clamping State after stopped.
2	Use ±300% Torque Limit to decelerate, and in Zero Speed Clamping State after stopped.

Cn010 CCW Direction Torque Command Limit Value

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
300/280/260/250 /240/220/200	%	0-300	--	--

RS-485 Communication Position	Pi	Pe	S	T
000BH	O	O	O	O

Setting Description: To limit the Torque Command of CCW direction with two times the Rated Torque, set **Cn010**=200.

Note) The parameters Cn010/Cn011 have different default values for each Driver model.

Cn011 CW Direction Torque Command Limit Value

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
-300/-280/-260/-250 -240/-220/-200220/200	%	-300-0	--	--

RS-485 Communication Position	Pi	Pe	S	T
000CH	O	O	O	O

Setting Description: To limit the Torque Command of CW direction with two times the Rated Torque, set Cn011=-200.

Note) The parameters Cn010/Cn011 have different default values for each Driver model.

Cn012 External Regenerative Resistor Power Setting

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	W	0-10000	--	--

RS-485 Communication Position	Pi	Pe	S	T
000DH	O	O	O	O

Setting Description: Please set the selected external resistor power value correctly in Cn012.

Cn013 Notch Filter Frequency First Set

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	Hz	0-2000	--	--

RS-485 Communication Position	Pi	Pe	S	T
000EH	O	O	O	-

Setting Description: Please input the Frequency when vibration occurs in Cn013 to eliminate vibrations or noises caused by resonance, etc.

Cn014 Notch Filter Quality Factor First Set

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
7	--	1-100	--	--

RS-485 Communication Position	Pi	Pe	S	T
000FH	O	O	O	-

Setting Description: Used to adjust the frequency range to be suppressed, the smaller the Cn014 value is, the wider the frequency range of suppression is, and the user can adjust according to actual conditions.

Cn015.0 PI/P Mode Switching Determination Type Selection

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
4	--	0-4	--	--

RS-485 Communication Position	Pi	Pe	S	T
0010H	O	O	O	-

Setting Description:

Setting	Description
0	Determine if the Torque Command is greater than **Cn016**
1	Determine if the Speed Command is greater than **Cn017**
2	Determine if the Acceleration Command is greater than **Cn018**
3	Determine if the Position Error is greater than **Cn019**
4	Use Input Contact **PCNT** to switch

Cn015.1 Two Stage Gain Mode Switching Determination Type Selection

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
4	--	0-4	--	--

RS-485 Communication Position	Pi	Pe	S	T
0010H	O	O	O	-

Setting Description:

Setting	Description
0	Determine if the Torque Command is greater than **Cn021**
1	Determine if the Speed Command is greater than **Cn022**
2	Determine if the Acceleration Command is greater than **Cn023**
3	Determine if the Position Error is greater than **Cn024**
4	Use Input Contact **G-SEL** to switch

Cn016 PI/P Mode Switching Condition (Torque Command)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
200	%	0-399	--	--

RS-485 Communication Position	Pi	Pe	S	T
0011H	O	O	O	-

Setting Description: First set Cn015.0=0, When the Torque Command is smaller than the Cn016 Switching Condition, it is PI control; when the Torque Command is greater than the Cn016 Switching Condition, then switch to only P Control.

Cn017 PI/P Mode Switching Condition (Speed Command)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	rpm	0-1.5*Rated Speed	--	--

RS-485 Communication Position	Pi	Pe	S	T
0012H	O	O	O	-

Setting Description: First set Cn015.0=1, When the Speed Command is smaller than the Cn017 Switching Condition, it is PI control; when the Speed Command is greater than the Cn017 Switching Condition, then switch to only P Control.

Cn018 PI/P Mode Switching Condition (Acceleration Command)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	rps/s	0-18750	--	--

RS-485 Communication Position	Pi	Pe	S	T
0013H	O	O	O	-

Setting Description: First set Cn015.0=2, When the Acceleration Command is smaller than the Cn018 Switching Condition, it is PI control; when the Acceleration Command is greater than the Cn018 Switching Condition, then switch to only P Control.

Cn019 PI/P Mode Switching Condition (Position Error)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	pulse	0-41943040	--	--

RS-485 Communication Position	Pi	Pe	S	T
0014H/0015H	O	O	O	-

Setting Description: First set Cn015.0=3, When the Position Error is smaller than the Cn019 Switching Condition, it is PI control; when the Position Error is greater than the Cn019 Switching Condition, then switch to only P Control.

Cn020 Two Stage Gain Mode Switching Delay Time

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	x0.2msec	0-10000	--	--

RS-485 Communication Position	Pi	Pe	S	T
0016H	O	O	O	-

Setting Description: When using the Two Stage Gain Mode, the Delay Time from the Second Stage Gain to the First Stage Gain can be set.

Cn021 Switching Condition of Two Stage Gain Mode (Torque Command)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
200	%	0-399	--	--

RS-485 Communication Position	Pi	Pe	S	T
0017H	O	O	O	-

Setting Description: Set Cn015.1=0 first, when the Torque Command is less than the Cn021 switching condition, use the first stage gain control; when the Torque Command is greater than the Cn021 switching condition, then switch to the second stage gain control. If the Torque Command is less than the Cn021 switching condition again, it will switch to the first stage gain control in accordance with Cn020 Switching Delay Time.

Cn022 Switching Condition of Two Stage Gain Mode (Speed Command)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	rpm	0-1.5*Rated Speed	--	--

RS-485 Communication Position	Pi	Pe	S	T
0018H	O	O	O	-

Setting Description: Set Cn015.1=1 first, when the Speed Command is less than the Cn022 switching condition, use the first stage gain control; when the Speed Command is greater than the Cn022 switching condition, then switch to the second stage gain control. If the Speed Command is less than the Cn022 switching condition again, it will switch to the first stage gain control in accordance with Cn020 Switching Delay Time.

Cn023 Switching Condition of Two Stage Gain Mode (Acceleration Command)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	rps/s	0-18750	--	--

RS-485 Communication Position	Pi	Pe	S	T
0019H	O	O	O	-

Setting Description: Set Cn015.1=2 first, when the Acceleration Command is less than the Cn023 switching condition, use the first stage gain control; when the Acceleration Command is greater than the Cn023 switching condition, then switch to the second stage gain control. If the Acceleration Command is less than the Cn023 switching condition again, it will switch to the first stage gain control in accordance with Cn020 Switching Delay Time.

Cn024 Two Stage Gain Mode Switching Condition (Position Error)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	pulse	0- 41943040	--	--

RS-485 Communication Position	Pi	Pe	S	T
001A/001BH	O	O	O	-

Setting Description: Set Cn015.1=3 first, when the Position Error is less than the Cn024 switching condition, use the first stage gain control; when the Position Error is greater than the Cn024 switching condition, then switch to the second stage gain control. If the Position Error is less than the Cn024 switching condition again, it will switch to the first stage gain control in accordance with Cn020 Switching Delay Time.

Cn025 Load Inertia Ratio

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
10	X0.1	0-2000	--	--

RS-485 Communication Position	Pi	Pe	S	T
001CH	O	O	-	-

Setting Description:

$$\text{Load Inertia Ratio} = \frac{\text{Convert to the Load Inertia of the Motor Shaft } (J_L)}{\text{Servo Motor Rotor Inertia } (J_M)} \times 100\%$$

Cn026 Rigidity Setting

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
9	--	1-21	--	--

RS-485 Communication Position	Pi	Pe	S	T
0001DH	O	O	O	O

Setting Description:

Setting	Description			Setting	Description		
	Position Loop Gain **Pn310 [1/s]**	Speed Loop Gain **Sn211 [Hz]**	Speed Loop Integration Time Constant **Sn212 [x0.2msec]**		Position Loop Gain **Pn310 [1/s]**	Speed Loop Gain **Sn211 [Hz]**	Speed Loop Integration Time Constant **Sn212 [x0.2msec]**
1	2	2	1400	**12**	70	70	50
2	3	3	950	**13**	85	85	50
3	6	6	450	**14**	100	100	40
4	9	9	300	**15**	120	120	40
5	12	12	300	**16**	140	140	30
6	15	15	300	**17**	160	160	30
7	20	20	225	**18**	180	180	25
8	30	30	150	**19**	200	200	25
9	40	40	100	**20**	225	225	20
10	50	50	80	**21**	250	250	20
11	60	60	75	-	-	-	-

Cn029 Parameter Reset

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0-1	★	--

RS-485 Communication Position	Pi	Pe	S	T
0020H	O	O	O	O

Setting Description:

Setting	Description
0	Not Functioning
1	All Parameters returned to Factory Default Value

Cn030 Serialized Model Setting

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
Factory Setting	--	--	★	●

RS-485 Communication Position	Pi	Pe	S	T
0021H	O	O	O	O

Setting Description: The setting value of this parameter is the same as the dn-08 display value, please refer to [3-3 dn-08 Driver and Motor Matching Table]for the detailed setting method.

! Attention: Before the machine starts to operate, make sure to confirm the parameter setting value is the correct Driver and Motor matching combination!

Cn031.0 Fan Operation Settings (Only Suitable to the Models equipped with Fan)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0-3	--	--

RS-485 Communication Position	Pi	Pe	S	T
0022H	O	O	O	O

Setting Description:

Setting	Description
0	Temperature Sensing Automatic Operation
1	Operates when Servo starts
2	Continuous Operation
3	Stop Operation

Cn031.1 Low Voltage Protection (AL-01) Automatic Reset Selection

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0-3	--	--

RS-485 Communication Position	Pi	Pe	S	T
0022H	O	O	O	O

Setting Description: This parameter can set Low Voltage Protection (AL-01) Reset Method

Setting	Description
0	When the SON status displays run, AL-01 Low Voltage Error Alarm is immediately displayed when a low voltage is detected; and it must be re-set in Soff status after the Error is resolved.
1	When the SON status displays run, BB status is immediately displayed when a low voltage is detected; and automatically resets to SON status and displays run after the Error is resolved.

Cn031.2 Absolute Value Encoder Battery Error Alarm Output

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0: ABS Encoder 1: IN Encoder	--	0-1	--	--

RS-485 Communication Position	Pi	Pe	S	T
0022H	O	O	O	O

Setting Description: This parameter can set Low Voltage Protection (AL-01) Reset Method

Setting	Description
0	When the battery is abnormal after power is turned ON, the panel displays AL-16 and the DO Abnormal Contact outputs, the Motor can still operate normally, but the multi-revolution address cannot be memorized after the power is turned OFF.
1	When the battery is abnormal after power is turned ON, the panel displays no abnormality and the DO Abnormal contact does not output, the Motor can still operate normally, but the multi-revolution address cannot be memorized after the power is turned OFF.

Cn031.3 Motor Series Selection

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0-1	--	●

RS-485 Communication Position	Pi	Pe	S	T
0022H	O	O	O	O

Setting Description:

Setting	Description
0	Select VARITRONIX identical model Motor parameter
1	Select VARITRONIX Identical model Motor parameter with brake
2	Reserved

Cn032 Speed Feedback Smoothing Filter

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
500	Hz	0-2500	--	--

RS-485 Communication Position	Pi	Pe	S	T
0023H	O	O	O	-

Setting Description: When the system generates a sharp vibration noise, this parameter can be adjusted to suppress the vibration noise, adding this filter will also delay the response speed of the Servo System.

Cn033 Speed Forward Feed Smoothing Filter

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
500	Hz	0-1000	--	--

RS-485 Communication Position	Pi	Pe	S	T
0024H	O	O	-	-

Setting Description: Smooth the Speed Feed Forward Command.

Cn034 Torque Command Smoothing Filter

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	Hz	0-5000	--	--

RS-485 Communication Position	Pi	Pe	S	T
0025H	O	O	O	O

Setting Description: When the system generates a sharp vibration noise, this parameter can be adjusted to suppress the vibration noise, adding this filter will also delay the response speed of the Servo System.

Cn035 Panel Status Display Content Selection

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0-Un Parameter Maximum Value	--	--

RS-485 Communication Position	Pi	Pe	S	T
0026H	O	O	O	O

Setting Description:

Setting	Description
This Parameter can set the panel state display content after power is turned on as shown in the following Table:	
0	Display bit data and status code, please refer to [3-1 Driver Panel Operation Instructions]
1-Maximum Value	Display Un Status Display parameter content, Please refer to [7-3-11 Monitoring Parameters]. Example: When set Cn035=1, the panel will display actual Motor Speed (Un-01 content) after power is turned on.

Cn036 ID Setting

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
1	--	0-254	★	--

RS-485 Communication Position	Pi	Pe	S	T
0027H	O	O	O	O

Setting Description: When using the Modbus Communication Interface, each set of Drivers needs to set different IDs in this parameter in advance; if the IDs are set repeatedly, it will result in communication not being operated normally.

Cn037.0 Modbus RS-485 Communication Transmission Rate

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
1	Bps	0-5	★	--

RS-485 Communication Position	Pi	Pe	S	T
0028H	O	O	O	O

Setting Description:

Setting	Description	Setting	Description
0	4800	3	38400
1	9600	4	57600
2	19200	5	115200

Cn037.2 RS-485 Communication Write Selection

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
1	--	0-1	★	--

RS-485 Communication Position	Pi	Pe	S	T
0028H	O	O	O	O

Setting Description:

Setting	Description
0	RS-485 Communication Write to EEPROM
1	RS-485 Communication Write to SRAM

Cn038 Communication Protocol

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0-8	★	--

RS-485 Communication Position	Pi	Pe	S	T
0029H	O	O	O	O

Setting Description:

Setting	Description	Setting	Description
0	7 , N , 2 (Modbus , ASCII)	5	8 , O , 1 (Modbus , ASCII)
1	7 , E , 1 (Modbus , ASCII)	6	8 , N , 2 (Modbus , RTU)
2	7 , O , 1 (Modbus , ASCII)	7	8 , E , 1 (Modbus , RTU)
3	8 , N , 2 (Modbus , ASCII)	8	8 , O , 1 (Modbus , RTU)
4	8 , E , 1 (Modbus , ASCII)	-	

Cn039 Communication Timeout Setting

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	Sec	0-20	★	--

RS-485 Communication Position	Pi	Pe	S	T
002AH	O	O	O	O

Setting Description: If the setting value is greater than 0, the Communication Timeout Function is turned on immediately and must conduct communication within the set time, otherwise, a communication error will appear; if the setting value is 0, then indicates this function is turned off.

Cn040 Communication Response Delay Time

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	0.5msec	0-255	★	--

RS-485 Communication Position	Pi	Pe	S	T
002BH	O	O	O	O

Setting Description: Delay the communication time of Driver responding to Supervisory Control Unit.

Cn041.0 Absolute Type Encoder Multiple Number of Revolutions Clearing Function

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0-2	--	--

RS-485 Communication Position	Pi	Pe	S	T
002CH	O	O	O	O

Setting Description:

Setting	Description
0	Not Functioning
1	Clear the Encoder Internal Status
2	Clear the Encoder Internal Status and Number of Revolutions

Cn048 Two Stage Gain Mode Switching Delay Time

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	0.2msec	0-10000	--	--

RS-485 Communication Position	Pi	Pe	S	T
0033H	O	O	O	-

Setting Description: When using the Two Stage Gain Mode, the Delay Time from the first stage gain to the second stage gain can be set.

Cn049 Two Stage Gain Mode Switching Time

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	0.2msec	0-10000	--	--

RS-485 Communication Position	Pi	Pe	S	T
0034H	O	O	O	-

Setting Description: When using the Two Stage Gain Mode, the Conversion Time from the first stage gain to the second stage gain can be set.

Cn050 Two Stage Gain Mode Switching Time

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	0.2msec	0-10000	--	--

RS-485 Communication Position	Pi	Pe	S	T
0035H	O	O	O	-

Setting Description: When using the Two Stage Gain Mode, the Conversion Time from the second stage gain to the first stage gain can be set.

Cn051 Low Voltage Protection Level

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
190	Volt	170-190	--	--

RS-485 Communication Position	Pi	Pe	S	T
0036H	O	O	O	O

Setting Description: When the Driver input power supply voltage is less than Cn051, after delaying the Cn052 setting time, trigger the Low Voltage Protection Alarm.

Cn052 Low Voltage Protection Alarm Delay Time

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
4	250msec	0-100	--	--

RS-485 Communication Position	Pi	Pe	S	T
0037H	O	O	O	O

Setting Description: When the Driver input power supply voltage is less than Cn051, after delaying the Cn052 setting time, trigger the Low Voltage Protection Alarm.

Cn053.0 Current Offset Automatic Correction (only can be used in the servo off)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0-1	--	--

RS-485 Communication Position	Pi	Pe	S	T
0038H	O	O	O	O

Setting Description: The Driver executes the Current Offset Correction after setting to 1, and clear the setting to 0 automatically after the completed correction.

Setting	Description
0	Does not execute Current Offset Correction
1	Execute Current Offset Correction

Cn054 Driver Alarm Setting (AL1-16)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0-FFFF	--	--

RS-485 Communication Position	Pi	Pe	S	T
0039H	O	O	O	O

Setting Description: Cn054 is a 16-bit parameter, each bit represents each Alarm separately. Setting the corresponding bit of the Alarm to 1 is the Warning Mode. When the alarm occurs, the Driver issues a warning first, and triggers the Alarm after continuous operation for the time set by Cn055.

Example: To set the low voltage and over speed alarms as warnings, and to trigger the alarm one second after the warning, the Cn054 is required to be set to 0801H, and each bit setting status is 0000100000000001, and then set Cn055 to 100.

Cn055 Driver Warning Delay Triggering Alarm Time

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	10msec	0-300	--	--

RS-485 Communication Position	Pi	Pe	S	T
003AH	O	O	O	O

Setting Description: Cn054 is a 16-bit parameter, each bit represents each Alarm separately. Setting the corresponding bit of the Alarm to 1 is the Warning Mode. When the alarm occurs, the Driver issues a warning first, and triggers the Alarm after continuous operation for the time set by Cn055.

Example: To set the low voltage and over speed alarms as warnings, and to trigger the alarm one second after the warning, the Cn054 is required to be set to 0801H, and each bit setting status is 0000100000000001, and then set Cn055 to 100.

Cn56 Second Stage CCW Direction Torque Command Limit Value

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
300/280/260/250 /240/220/200	%	0-300	--	--

RS-485 Communication Position	Pi	Pe	S	T
003BH	O	O	O	O

Setting Description: Description is the same as Cn010

Cn057 Second Stage CW Direction Torque Command Limit Value

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
-300/-280/-260/-250 -240/-220/-200220/200	%	-300-0	--	--

RS-485 Communication Position	Pi	Pe	S	T
003CH	O	O	O	O

Setting Description: Description is the same as Cn011

Cn058 The Delay Time of Stage 1 Torque Limit switch to Stage 2 Torque Limit

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	*4ms	0- 32767	--	--

RS-485 Communication Position	Pi	Pe	S	T
003DH	O	-	-	-

Setting Description: Description is the same as Cn011

Cn059.0 AutoTuning Enabling Selection

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0-2	--	--

RS-485 Communication Position	Pi	Pe	S	T
003EH	O	O	-	-

Setting Description:

Setting	Description
0	Disable AutoTuning
1	Enable OFFLine-AutoTuning
2	Enable OnLine-AutoTuning (Inertia Only Displays)

Cn060 OFFLine-tuning Operation Command Number of Revolutions Setting

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
3	rev	3-1024	--	--

RS-485 Communication Position	Pi	Pe	S	T
003FH	O	O	-	-

Setting Description: Set to 10 represents that the Process Command of tuning command will be within 10 revolutions

Cn061 OFFLine-tuning Operation Maximum Speed

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
2/3*Rated Speed	Rpm	1/3~ 1 x Rated Speed	--	--

RS-485 Communication Position	Pi	Pe	S	T
0040H	O	O	-	-

Setting Description: OFFLine_Tuning Maximum Operation speed

Cn063.0 Automatic Mechanical Vibration Suppression Enabling Selection

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0-5	--	--

RS-485 Communication Position	Pi	Pe	S	T
0042H	O	O	O	-

Setting Description:

Setting	Description
0	Disable Automatic Detection of Mechanical Vibration Frequency
1	Enable Automatic Detection of First Set Mechanical Vibration Frequency
2	Enable Automatic Detection of Second Set Mechanical Vibration Frequency
3	Enable Automatic Detection of Third Set Mechanical Vibration Frequency
4	Enable Automatic Detection of Fourth Set Mechanical Vibration Frequency
5	Enable Automatic Detection of Firth Set Mechanical Vibration Frequency

Cn064 Mechanical Vibration Detection Level

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
50	--	1-1000	--	--

RS-485 Communication Position	Pi	Pe	S	T
0043H	O	O	O	-

Setting Description: The automatic detection level when executing Automatic Mechanical Vibration Suppression (Cn063=1), the lower the value is, the more likely the noise is determined incorrectly, the recommended setting is 50 or higher.

Cn065 Notch Filter Depth

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0-1000	--	--

RS-485 Communication Position	Pi	Pe	S	T
0044H	O	O	O	-

Setting Description: Used to adjust the frequency depth to be suppressed, the smaller the Cn068 value is, the deeper the frequency depth to be suppressed, and the User can adjust according to the actual conditions.

Cn066 Second Point Notch Filter Frequency

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	Hz	0-2000	--	--

RS-485 Communication Position	Pi	Pe	S	T
0045H	O	O	O	-

Setting Description: When to eliminate the vibration or noise caused by resonance, etc., please input the frequency when vibration occurs in Cn066.

Cn067 Second Point Notch Filter Quality Factor

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
7	--	1-100	--	--

RS-485 Communication Position	Pi	Pe	S	T
0046H	O	O	O	-

Setting Description: Used to adjust the frequency range to be suppressed, smaller the Cn067 value is, wider the frequency range of suppression, and can be adjusted according to actual conditions.

Cn068 Second Point Notch Filter Depth

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0-1000	--	--

RS-485 Communication Position	Pi	Pe	S	T
0047H	O	O	O	-

Setting Description: Used to adjust the frequency depth to be suppressed, the smaller the Cn068 value is, the deeper the frequency depth to be suppressed, and the User can adjust according to the actual conditions.

Cn069 Third Point Notch Filter Frequency

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	Hz	0-2000	--	--

RS-485 Communication Position	Pi	Pe	S	T
0048H	O	O	O	-

Setting Description: Used to adjust the frequency depth to be suppressed, the smaller the Cn069 value is, the deeper the frequency depth to be suppressed, and can be adjusted according to actual conditions.

Cn070 Third Point Notch Filter Quality Factor

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
7	--	1-100	--	--

RS-485 Communication Position	Pi	Pe	S	T
0049H	O	O	O	-

Setting Description: Used to adjust the frequency range to be suppressed, the smaller the Cn070 value is, the wider the frequency range of suppression, and the User can adjust according to the actual conditions.

Cn071 Third Point Notch Filter Depth

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	1-1000	--	--

RS-485 Communication Position	Pi	Pe	S	T
004AH	O	O	O	-

Setting Description: Used to adjust the frequency depth to be suppressed, the smaller the Cn071 value is, the deeper the frequency depth to be suppressed, and the User can adjust according to the actual conditions.

Cn072 Fourth Point Notch Filter Frequency

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	Hz	0-200	--	--

RS-485 Communication Position	Pi	Pe	S	T
004BH	O	O	O	-

Setting Description: When to eliminate the vibration or noise caused by resonance, etc., please input the frequency when vibration occurs in Cn072.

Cn073 Fourth Point Notch Filter Quality Factor

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
7	---	1-100	--	--

RS-485 Communication Position	Pi	Pe	S	T
004CH	O	O	O	-

Setting Description: Used to adjust the frequency range to be suppressed, the smaller the Cn073 value is, the wider the frequency range of suppression, and the User can adjust according to actual conditions.

Cn074 Fourth Point Notch Filter Depth

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	---	0-1000	--	--

RS-485 Communication Position	Pi	Pe	S	T
004DH	O	O	O	-

Setting Description: Used to adjust the frequency depth to be suppressed, the smaller the Cn074 value is, the deeper the frequency depth to be suppressed, and the User can adjust according to actual conditions.

Cn075 Fifth Point Notch Filter Frequency

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	Hz	0-2000	--	--

RS-485 Communication Position	Pi	Pe	S	T
004EH	O	O	O	-

Setting Description: When to eliminate the vibration or noise caused by resonance, etc., please input the frequency when vibration occurs in Cn075.

Cn076 Fifth Point Notch Filter Quality Factor

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
7	--	1-100	--	--

RS-485 Communication Position	Pi	Pe	S	T
004FH	O	O	O	-

Setting Description: Used to adjust the frequency range to be suppressed, the smaller the Cn076 value is, the wider the frequency range of suppression, and the User can adjust according to the actual conditions.

Cn077 Fifth Point Notch Filter Depth

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0-1000	--	--

RS-485 Communication Position	Pi	Pe	S	T
0050H	O	O	O	-

Setting Description: Used to adjust the frequency depth to be suppressed, the smaller the Cn074 value is, the deeper the frequency depth to be suppressed, and the User can adjust according to actual conditions.

7-3-2 Torque Control Parameters (Tn1□□)

Tn101.0 Torque Command Acceleration / Deceleration Method

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0-2	▲	--

RS-485 Communication Position	Pi	Pe	S	T
0101H	-	-	-	O

Setting Description:

Setting	Description
0	Do not use Torque Command Linear Acceleration / Deceleration Function
1	Use Torque Command Linear Acceleration / Deceleration Function
2	Use Torque Command One Time Smoothing Acceleration / Deceleration Function

Tn101.1 Analog and Digital Torque Command Selection

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0-1	▲	--

RS-485 Communication Position	Pi	Pe	S	T
0101H	-	-	-	O

Setting Description:

Setting	Description
0	Use Analog TIC Torque Command
1	Use Digital Tn113 Torque Command

Tn101.2 Analog and Digital Torque Command Selection

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0-1	▲	--

RS-485 Communication Position	Pi	Pe	S	T
0101H	-	-	-	O

Setting Description:

Setting	Description
0	Use SPD1, SPD2 to switch Speed Limit Value
1	Switch Tn114, Tn115 Positive and Negative Speed Limit Values by Positive and Negative Torque

Tn102 Torque Command Linear Acceleration / Deceleration Constant

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
1	msec	1-50000	▲	--

RS-485 Communication Position	Pi	Pe	S	T
0102H	-	-	-	O

Setting Description: The Torque Command Linear Acceleration/Deceleration Constant is defined as the time for the Torque Command to rise from zero linearly to the Rated Torque.

Tn103 Analog Torque Command Proportioner

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
300	%/10V	0-600	--	--

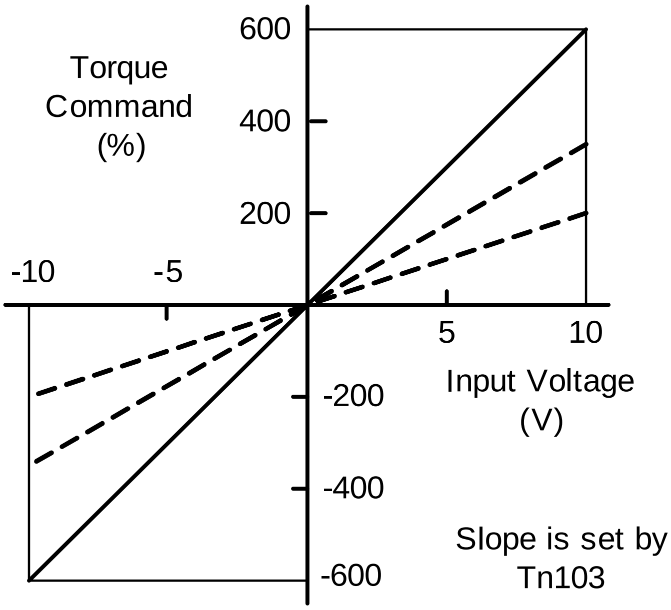
RS-485 Communication Position	Pi	Pe	S	T
0103H	-	-	-	O

Setting Description: Used to adjust the slope of the Voltage Command relative to the Torque Command.

Setting Example:

(1) If Tn103 is set to 300, indicating the Input Voltage 10V corresponds to 300% rated Torque Command; if the Input Voltage is 5V at this time, then it corresponds to 150% rated Torque Command.

(2) If Tn103 is set to 200, indicating the Input Voltage 10V corresponds to 200% rated Torque Command; if the Input Voltage is 5V at this time, then it corresponds to 100% rated Torque Command.

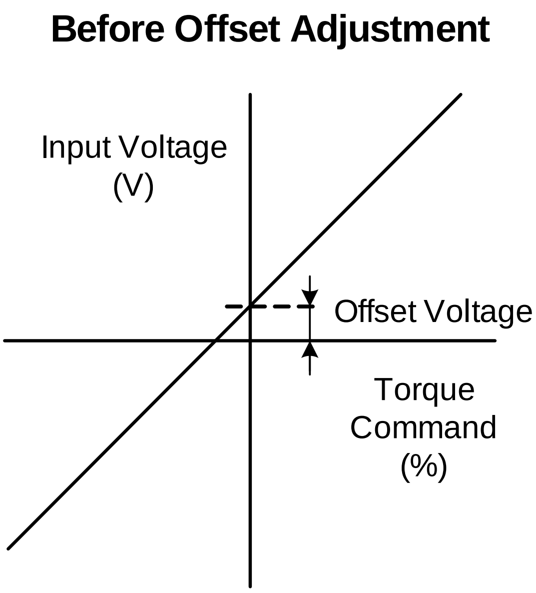


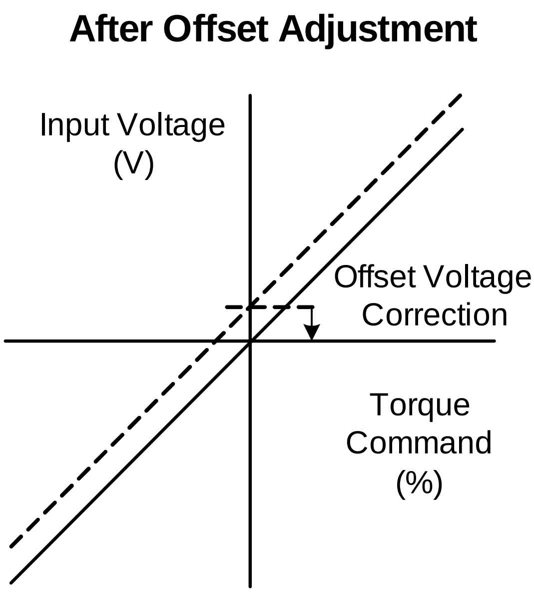
Tn104 Analog Torque Command Offset Adjustment

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	mV	-2500-2500	--	--

RS-485 Communication Position	Pi	Pe	S	T
0104H	-	-	-	O

Setting Description: Used to correct offset when the Analog Torque Command Voltage generated offset phenomenon.





Tn105 Internal Speed Limit 1

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
100	rpm	0-1.5*Rated Speed	--	--

RS-485 Communication Position	Pi	Pe	S	T
0105H	-	-	-	O

Setting Description: In Torque Control, the Input Contact SPD1, SPD2 can be used to switch 3 sets of Internal Speed Limit. When using Internal Speed Limit 1, the Input Contact SPD1, SPD2 states are as the following combination:

Input ContactSPD2	Input ContactSPD1
0	1

Tn106 Internal Speed Limit 2

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
200	rpm	0-1.5*Rated Speed	--	--

RS-485 Communication Position	Pi	Pe	S	T
0106H	-	-	-	O

Setting Description: In Torque Control, the Input Contact SPD1, SPD2 can be used to switch 3 sets of Internal Speed Limit. When using Internal Speed Limit 1, the Input Contact SPD1, SPD2 states are as the following combination:

Input ContactSPD2	Input ContactSPD1
1	0

Tn107 Internal Speed Limit 3

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
300	rpm	0-1.5*Rated Speed	--	--

RS-485 Communication Position	Pi	Pe	S	T
0107H	-	-	-	O

Setting Description: In Torque Control, the Input Contact SPD1, SPD2 can be used to switch 3 sets of Internal Speed Limit. When using Internal Speed Limit 1, the Input Contact SPD1, SPD2 states are as the following combination:

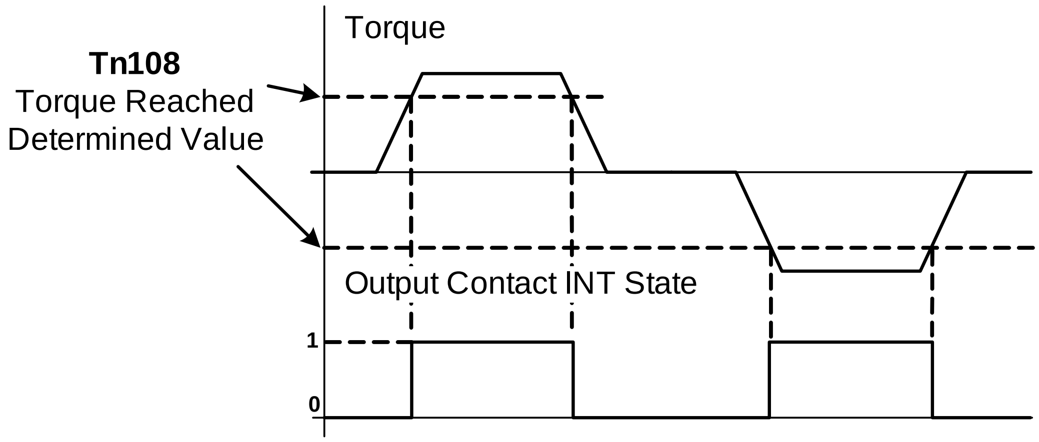
Input ContactSPD2	Input ContactSPD1
1	1

Tn108 Torque Reached Determined Value

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	%	0-300	--	--

RS-485 Communication Position	Pi	Pe	S	T
0108H	O	O	O	O

Setting Description: When the Forward or Reverse Torque exceeds the set level, the Output Contact INT operates.



Tn109 Analog Speed Limit Proportioner

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
Rated Speed	rpm	100-2*Rated Speed	--	--

RS-485 Communication Position	Pi	Pe	S	T
0109H	-	-	-	O

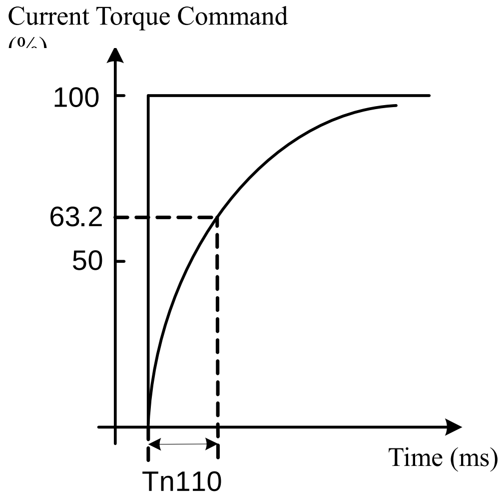
Setting Description: Used to adjust the slope of the Voltage Command relative to the Speed Limit. ***Remarks: This parameter is the same as Sn216, with different functions in different modes.**

Tn110 Torque Command One Time Smoothing Acceleration / Deceleration Constant

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
1	msec	1-10000	▲	--

RS-485 Communication Position	Pi	Pe	S	T
010AH	-	-	-	O

Setting Description: Set Tn101 = 2 to activate the Torque Command One Time Smoothing Acceleration / Deceleration Function. Torque Command One Time Smoothing Acceleration / Deceleration Time Constant is defined as the time for the Torque one time delayed rise from 0% to 63.2% of the current Torque Command.



Tn113 Digital Torque Command Value

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	0.1%	-3000-3000	--	--

RS-485 Communication Position	Pi	Pe	S	T
010DH	-	-	-	O

Setting Description: Set Tn101.1=1 to activate Digital Torque Command Functions.

Tn114 Forward Rotation Speed Limit Value

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
100	rpm	0-1.5*Rated Speed	--	--

RS-485 Communication Position	Pi	Pe	S	T
010EH	-	-	-	O

Setting Description: Set Tn101.2=1, switch the Forward Reverse Speed Limit value by Positive and Negative Torques.

Tn115 Negative Speed Limit Value

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
-100	rpm	-1.5*Rated Speed-0	--	--

RS-485 Communication Position	Pi	Pe	S	T
010FH	-	-	-	O

Setting Description: Set Tn101.2=1, switch the Forward Reverse Speed Limit value Speed Control Parameter by Positive and Negative Torques.

7-3-3 Speed Control Parameters (Sn2□□)

Sn201 Internal Speed Command 1

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
100	rpm	-1.5*Rated Speed~1.5*Rated Speed	--	--

RS-485 Communication Position	Pi	Pe	S	T
0201H	-	-	O	-

Setting Description: In Speed Control, the Input Contact SPD1, SPD2 can be used to switch 3 sets of Internal Speed Limit. When using Internal Speed Limit 1, the Input Contact SPD1, SPD2 states are as the following combination:

Input ContactSPD2	Input ContactSPD1
0	1

Sn202 Internal Speed Command 2

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
200	rpm	-1.5*Rated Speed~1.5*Rated Speed	--	--

RS-485 Communication Position	Pi	Pe	S	T
0202H	-	-	O	-

Setting Description: In Speed Control, the Input Contact SPD1, SPD2 can be used to switch 3 sets of Internal Speed Limit. When using Internal Speed Limit 1, the Input Contact SPD1, SPD2 states are as the following combination:

Input ContactSPD2	Input ContactSPD1
1	0

Sn203 Internal Speed Command 3

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
300	rpm	-1.5*Rated Speed~1.5*Rated Speed	--	--

RS-485 Communication Position	Pi	Pe	S	T
0203H	-	-	O	-

Setting Description: In Speed Control, the Input Contact SPD1, SPD2 can be used to switch 3 sets of Internal Speed Limit. When using Internal Speed Limit 1, the Input Contact SPD1, SPD2 states are as the following combination:

Input ContactSPD2	Input ContactSPD1
1	1

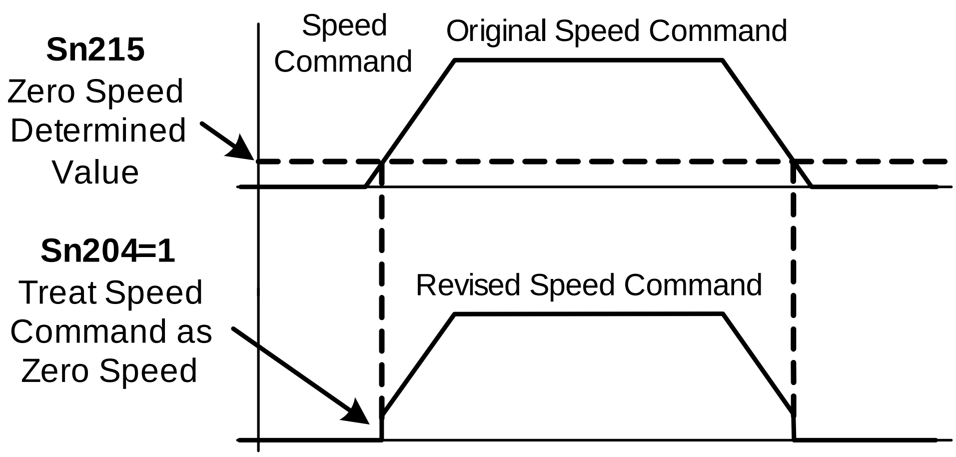
Sn204.0 Zero Speed Determined Operation

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0-1	--	--

RS-485 Communication Position	Pi	Pe	S	T
0204H	O	O	O	O

Setting Description:

Setting	Description
0	Does not operate
1	Treat Speed Command as Zero Speed



Sn205.0 Speed Command Acceleration / Deceleration Method

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	X	0-3	--	--

RS-485 Communication Position	Pi	Pe	S	T
0205H	-	-	O	-

Setting Description:

Setting	Description
0	Do not use Speed Command Acceleration / Deceleration Function
1	Use the Speed Command One Time Smoothing Acceleration / Deceleration Function
2	Use the Speed Command Linear Smoothing Acceleration / Deceleration Function
3	Use S-type Speed Command One Time Smoothing Acceleration / Deceleration Function

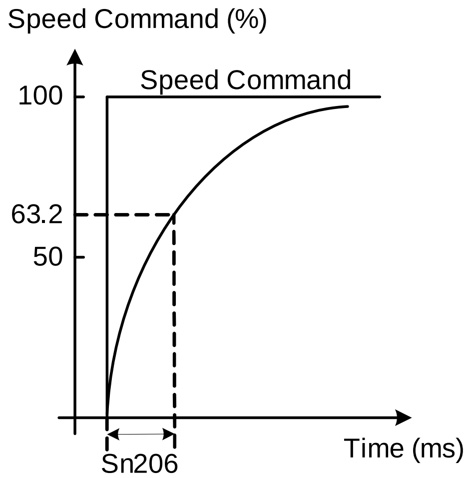
Sn206 Speed Command One Time Smoothing Acceleration / Deceleration Time Constant

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
1	msec	1-10000	--	--

RS-485 Communication Position	Pi	Pe	S	T
0206H	-	-	O	-

Setting Description: Set Sn205=1 to activate Speed Command One time Smoothing Acceleration / Deceleration Function. The definition of Speed Command One Time Smoothing Acceleration / Deceleration Time Constant is the time for the Speed one time delayed rise from Zero Speed to 63.2% of the Speed Command.

The definition of Speed Command One Time Smoothing Acceleration / Deceleration Time Constant is the time for the Speed one time delayed rise from Zero Speed to 63.2% of the Speed Command, the schematic diagram is as follows:

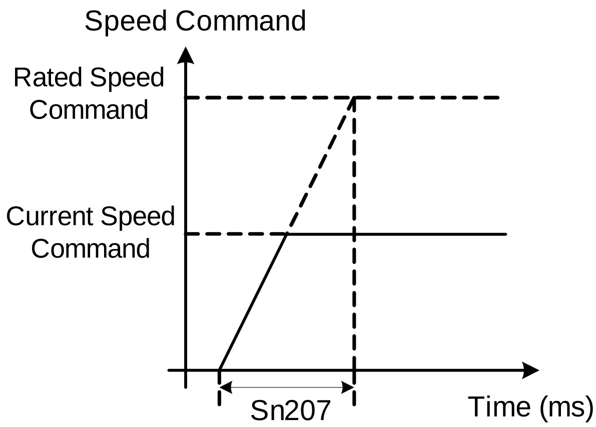


Sn207 Speed Command One Time Smoothing Acceleration / Deceleration Time Constant

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
1	msec	1-50000	--	--

RS-485 Communication Position	Pi	Pe	S	T
0207H	-	-	O	-

Setting Description: Set Sn205=2 to activate Speed Command Linear Acceleration / Deceleration Function. The definition of Speed Command Linear Acceleration / Deceleration Time Constant is the time of Speed from zero linear rises to Rated Speed. The definition of Speed Command Linear Acceleration / Deceleration Time Constant is the time of Speed from zero linear to rise to Rated Speed, the schematic diagram is as follows:



Sn208 S-type Speed Command Acceleration / Deceleration Time Setting

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
1	msec	1-1000	--	--

RS-485 Communication Position	Pi	Pe	S	T
0208H	-	-	O	-

Setting Description: Set Sn205=3 to activate S-type Speed Command Acceleration / Deceleration Function. During Acceleration / Deceleration, due to the severe Acceleration / Deceleration Changes when activating Stop that resulted in machine oscillation, adding S-type Acceleration / Deceleration to Speed Command can achieve the function of smooth operations.

Sn209 S-type Speed Command Acceleration Time Setting

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
200	msec	0-5000	--	--

RS-485 Communication Position	Pi	Pe	S	T
0209H	-	-	O	-

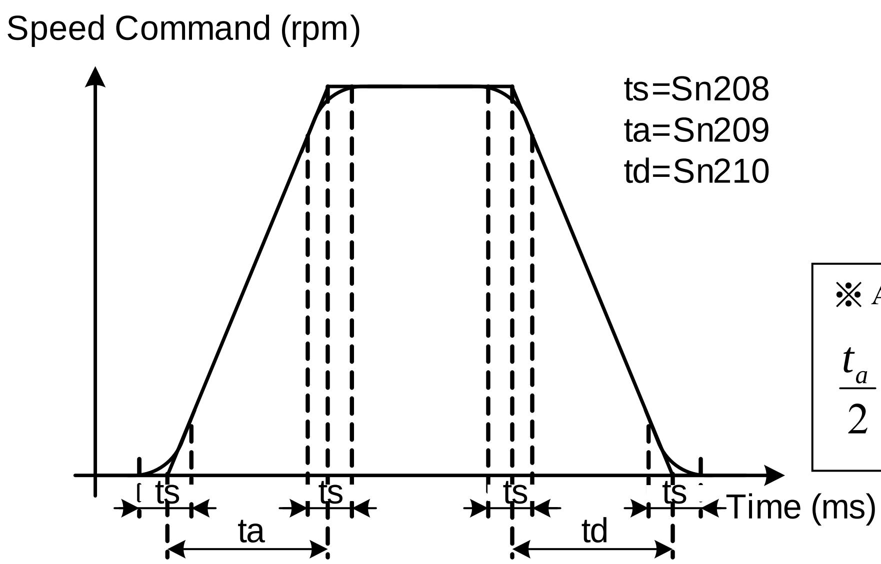
Setting Description: Please refer to Sn208 Description

Sn210 S -type Speed Command Deceleration Time Setting

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
200	msec	0-5000	--	--

RS-485 Communication Position	Pi	Pe	S	T
020AH	-	-	O	-

Setting Description: Please refer to Sn208 Description



※ **Attention! Setting Rules:**

$$\frac{t_a}{2} > t_s \ , \ \frac{t_d}{2} > t_s$$

Sn211 Speed Loop Gain 1

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
40	Hz	2-1500	--	--

RS-485 Communication Position	Pi	Pe	S	T
020BH	O	O	O	-

Setting Description: The Speed Loop Gain directly determines the Response Bandwidth of the Speed Control Loop. Under the premise of the mechanical system does not generate vibration or noise, increasing the Speed Loop Gain value will speed up the Speed Response. If Cn025 (Load Inertia Ratio) is set correctly, the Speed Loop Bandwidth equals the Speed Loop Gain.

Sn212 Speed Loop Integration Time Constant 1

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
2000	x0.01msec	40-50000	--	--

RS-485 Communication Position	Pi	Pe	S	T
020CH	O	O	O	-

Setting Description: Adding integration components to the Speed Control Loop can effectively eliminate the speed steady-state error and quickly respond to subtle speed changes. In general, under the premise that the mechanical system does not generate vibration or noise, the speed loop integration time constant is reduced to increase the system rigidity. Please use the following formula to calculate Speed Loop Integration Time Constant:

$$\text{Speed Loop Integration Time Constant} \geq 5 \times \frac{1}{2\pi \times \text{Speed Loop Gain}}$$

Sn213 Speed Loop Gain 2

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
40	Hz	2-1500	--	--

RS-485 Communication Position	Pi	Pe	S	T
020DH	O	O	O	-

Setting Description: Please refer to Sn211 Description for Setting Method

Sn214 Speed Loop Integration Time Constant 2

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
2000	x0.01msec	40-50000	--	--

RS-485 Communication Position	Pi	Pe	S	T
020EH	O	O	O	-

Setting Description: Please refer to Sn212 Description for Setting Method

Sn215 Zero Speed Determined Value

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
50	rpm	0-1.5*Rated Speed	--	--

RS-485 Communication Position	Pi	Pe	S	T
020FH	O	O	O	O

Setting Description: When the Speed is lower than the Speed set by Sn215 (Zero Speed Determined Value), the Output Contact ZS operates.

Sn216 Zero Analog Speed Command Proportioner

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
Rated Speed	Rpm/10V	100-2*Rated Speed	--	--

RS-485 Communication Position	Pi	Pe	S	T
0210H	-	-	O	-

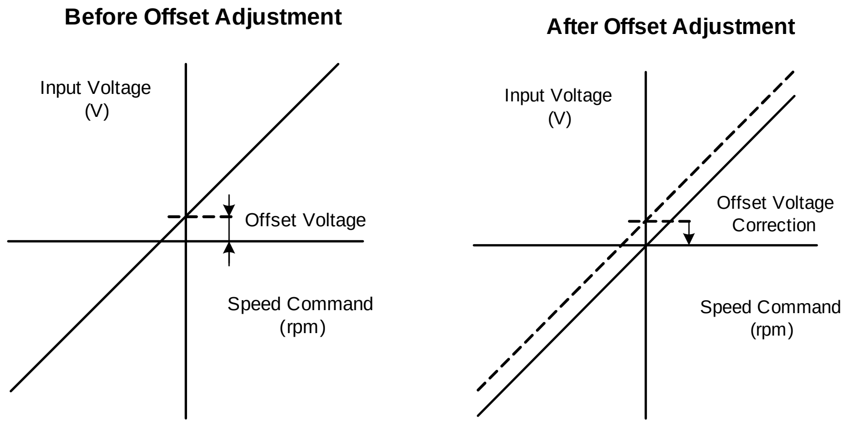
Setting Description: Used to adjust the slope of Voltage Command relative to the Speed Command. ***Remarks: This Parameter is the same as Tn109, with different Functions in different Modes**

Sn217 Zero Analog Speed Command Offset Adjustment

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	mv	-2500-2500	--	--

RS-485 Communication Position	Pi	Pe	S	T
0211H	-	-	O	-

Setting Description: Used to correct offset when the Analog Speed Command Voltage generates the offset phenomenon.



Sn218 Analog Speed Command Limit

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
1.02* Rated Speed	Rpm	100-1.5*Rated Speed	--	--

RS-485 Communication Position	Pi	Pe	S	T
0212H	-	-	O	-

Setting Description: The user can set Sn218 to limit the Maximum Speed of the Analog Input.

7-3-4 Position Control Parameters (Pn3□□)

Pn301.0 Position Pulse Command Type Selection

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0-3	★	--

RS-485 Communication Position	Pi	Pe	S	T
0301H	-	O	-	-

Setting Description:

Setting	Description
0	Pulse+Sign
1	CCW/CW Pulse
2	Phase AB Pulsex2
3	Phase AB Pulsex4

Pn301.1 Position Pulse Command Logic Selection

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0-1	★	--

RS-485 Communication Position	Pi	Pe	S	T
0301H	-	O	-	-

Setting Description:

Setting	Description
0	Positive Logic
1	Negative Logic

Pn301.2 Drive inhibits Command Receiving Selection

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0-1	★	--

RS-485 Communication Position	Pi	Pe	S	T
0301H	O	O	-	-

Setting Description:

Setting	Description
0	After the Drive Prohibition occurs, continue recording the Position Command Input Quantity.
1	After the Drive Prohibition occurs, ignore Position Command Input Quantity.

Pn301.3 Position Pulse Command Filter Width Selection

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
3	--	0-7	★	--

RS-485 Communication Position	Pi	Pe	S	T
0301H	-	O	-	-

Setting Description:

Setting	Description	Setting	Description
0	4500KHz	4	370KHz
1	2500KHz	5	190KHz
2	1200KHz	6	90KHz
3	750KHz	7	40KHz

Pn302 Electronic Gear Ratio Numerator 1

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
1	--	1-8388608	--	--

RS-485 Communication Position	Pi	Pe	S	T
0302H/0303H	O	O	-	-

Setting Description: Input Contact GN1, GN2 can be used to switch four sets of Electronic Gear Ratio Numerators. When using Electronic Gear Ratio Numerator 1, the Input Contact GN1, GN2 states are as the following combination:

Input ContactGN2	Input ContactGN1
0	0

Pn303 Electronic Gear Ratio Numerator 2

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
1	--	1-8388608	--	--

RS-485 Communication Position	Pi	Pe	S	T
0304H/0305H	O	O	-	-

Setting Description: Input Contact GN1, GN2 can be used to switch four sets of Electronic Gear Ratio Numerators. When using Electronic Gear Ratio Numerator 1, the Input Contact GN1, GN2 states are as the following combination:

Input ContactGN2	Input ContactGN1
0	1

Pn304 Electronic Gear Ratio Numerator 3

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
1	--	1-8388608	--	--

RS-485 Communication Position	Pi	Pe	S	T
0306H/0307H	O	O	-	-

Setting Description: Input Contact GN1, GN2 can be used to switch four sets of Electronic Gear Ratio Numerators. When using Electronic Gear Ratio Numerator 1, the Input Contact GN1, GN2 states are as the following combination:

Input ContactGN2	Input ContactGN1
1	0

Pn305 Electronic Gear Ratio Numerator 4

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
1	--	1-8388608	--	--

RS-485 Communication Position	Pi	Pe	S	T
0308H/0309H	O	O	-	-

Setting Description: Input Contact GN1, GN2 can be used to switch four sets of Electronic Gear Ratio Numerators. When using Electronic Gear Ratio Numerator 1, the Input Contact GN1, GN2 states are as the following combination:

Input ContactGN2	Input ContactGN1
1	1

Pn306 Electronic Gear Ratio Denominator

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
1	--	1-8388608	★	--

RS-485 Communication Position	Pi	Pe	S	T
030AH/030BH	O	O	-	-

Setting Description: Set Pn306 (Electronic Gear Ratio Denominator) and input the Electronic Gear Ratio Numerator selected by Input Contact GN1, GN2, the obtained Electronic Gear Ratio must conform to the following conditions, otherwise this Device cannot operate normally.

$$\frac{1}{1000} \leq \text{Electronic Gear Ratio} \leq 4000$$

Attention! The Electronic Gear Ratio must conform to the following conditions, otherwise the Device cannot operate normally.

Pn307 Positioning Completed Determined Value

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
One thousandth of a Revolution	pulse	0-41943040	--	--

RS-485 Communication Position	Pi	Pe	S	T
030CH/030DH	O	O	-	-

Setting Description: When the Position Error is lower than the number of Pulses set by Pn307 (Positioning Completed Determined Value), the Output Contact INP operates.

Pn308 Positive Maximum Position Error Determined Value

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
50000	1/10000 of a Revolution	0-50000	--	--

RS-485 Communication Position	Pi	Pe	S	T
030EH	O	O	-	-

Setting Description: When the Position Error is higher than the number of Pulses set by Pn308 (Positive Maximum Position Error Determined Value), this device generates AL-11 (Excessive Position Error Alarm).

Pn309 Negative Maximum Position Error Determined Value

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
50000	1/10000 of a Revolution	0-50000	--	--

RS-485 Communication Position	Pi	Pe	S	T
030FH	O	O	-	-

Setting Description: When the Position Error is higher than the number of Pulses set by Pn309 (Negative Maximum Position Error Determined Value), this device generates AL-11 (Excessive Position Error Alarm).

Pn310 Position Loop Gain 1

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
40	Rad/s	1-2000	--	--

RS-485 Communication Position	Pi	Pe	S	T
0310H	O	O	-	-

Setting Description: Under the premise that the mechanical system does not generate vibration or noise, increasing the Position Loop Gain value will speed up the Speed Response, shorten the Position Time. In general, the Position Loop Bandwidth cannot be higher than the Speed Loop Bandwidth. The recommended formula is as follows:

$$\text{Position Loop Gain} \leq 2\pi \times \frac{\text{Speed Loop Gain}}{5}$$

Pn311 Position Loop Gain 2

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
40	Rad/s	1-2000	--	--

RS-485 Communication Position	Pi	Pe	S	T
0311H	O	O	-	-

Setting Description: Please refer to Pn310 Description for the Setting Method

Pn312 Position Loop Feed Forward Gain

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	%	0-100	--	--

RS-485 Communication Position	Pi	Pe	S	T
0312H	O	O	-	-

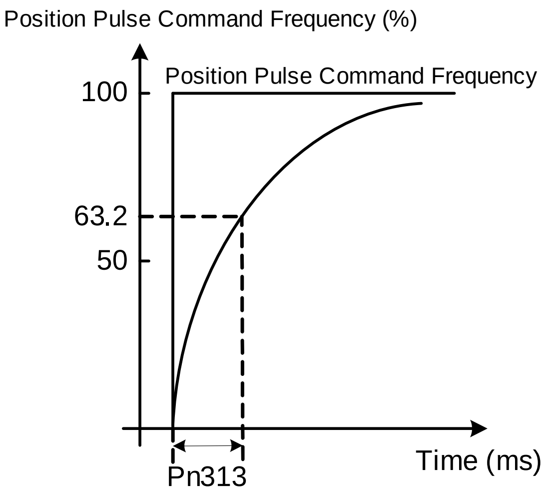
Setting Description: It can reduce the tracking error of the position control and speed up the reaction, if the feed forward gain is too large, it may cause a speed overshoot and the output contact INP (positioning completion signal) is repeatedly turned on and off.

Pn313 Internal / External Position Command One time Smoothing Acceleration / Deceleration Time Constant

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	msec	0-10000	★	--

RS-485 Communication Position	Pi	Pe	S	T
0313H	O	O	-	-

Setting Description: Will smooth the Position Pulse Command of originally fixed frequency. The definition of External Position Command One Time Smoothing Acceleration / Deceleration Time Constant is the time of the Position Command Frequency starts one time delay rise from zero to 63.2% of the External Position Pulse Command Frequency, the schematic diagram is as follows:



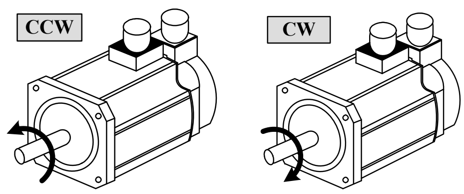
Pn314.0 Position Command Direction Definition (from the Motor Load End)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
1	--	0-1	★	--

RS-485 Communication Position	Pi	Pe	S	T
0314H	O	O	-	-

Setting Description:

Setting	Description
0	Clockwise Rotation (CW)
1	Counterclockwise Rotation (CCW)



Pn315.0 Pulse Error Clearing Mode

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0-2	--	--

RS-485 Communication Position	Pi	Pe	S	T
0315H	Determined by the Setting			

Setting Description:

Setting	Description
0	When the Input Contact **CLR** operates, clear the Pulse Error.
1	When the Input Contact **CLR** triggers, cancel the Position Command to interrupt the Motor operation, re-set the Mechanical Origin, and clear the Pulse Error.
2	When the Input Contact CLR triggers, cancel the Position Command to interrupt the Motor operation, and clear the Pulse Error.

Pn316.0 Internal Position Command Mode

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0-1	★	--

RS-485 Communication Position	Pi	Pe	S	T
0316H	O	-	-	-

Setting Description:

Setting	Description
0	Absolute Type Positioning
1	Relative Type Positioning

Pn316.1 Internal Position Command Hold (PHOLD) Procedure Selection

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0-1	★	--

RS-485 Communication Position	Pi	Pe	S	T
0316H	O	-	-	-

Setting Description:

Setting	Description
0	After Input Contact PHOLD operates, when PTRG is triggered again, the Motor will continue to complete the Internal Position Command before the PHOLD is triggered.
1	After Input Contact PHOLD operates, when PTRG is triggered again, the Motor will operate according to the current selected Internal Position Command immediately.

Pn316.2 Encoder Signal Dividing Output Phase

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0-1	★	--

RS-485 Communication Position	Pi	Pe	S	T
0316H	O	O	O	O

Setting Description:

Setting	Description
0	Dividing Output Phase **A** leading Phase **B**
1	Dividing Output Phase **A** behind Phase **B**

Pn316.3 Encoder Signal Dividing Output Frequency Elimination

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0-1	★	--

RS-485 Communication Position	Pi	Pe	S	T
0316H	O	O	O	O

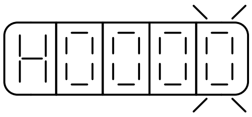
Setting Description:

Setting	Description
0	Output according to **Cn005** Setting Value
1	Output according to **Cn005** Setting Value divided by **4**

Pn317.0 After activated the Returns to Origin, the Origin Search Direction and Select Origin Reference Point Setting

Initial Value	**Unit**	**Setting Range**	**Effective**	**Cn029 Reset**
0	--	0-5	--	--

RS-485 Communication Position	**Pi**	**Pe**	**S**	**T**
0317H	O	O	-	-

Setting Description: 

Setting	Description
0	After activated the Return to Origin, the Motor searches the Origin with first stage Speed in **Forward** Direction, and uses the Input Contact Point CCWL or CWL as the Origin Reference Point. After completing the Return to Origin and positioning, the Input Contact CCWL or CWL becomes the Limit Function again. When using this Function, Pn317.1 cannot be set to 1 or 2. Attention! Cn002.1 (Contact Auxiliary Function - Input Contact CCWL and CWL Function Selection) must be set to 0.
1	After activated the Return to Origin, the Motor searches the Origin with first stage Speed in **Reverse** Direction, and uses the Input Contact Point CCWL or CWL as the Origin Reference Point. After completing the Return to Origin and positioning, the Input Contact CWL or CCWL becomes the Limit Function again. When using this Function, Pn317.1 cannot be set to 1 or 2. Attention! Cn002.1 (Contact Auxiliary Function - Input Contact CCWL and CWL Function Selection) must be set to 0.
2	After activated the Return to Origin, the Motor searches the Origin with first stage Speed in **Forward** Direction, and uses the Input Contact ORG (External Detector Input Point) as the Origin Reference Point. If Pn317.1=2, then the Origin Reference Point is not required and searches for the top edge closest to the Input Contact Point ORG as the Machine Origin and stops according to the method set in Pn317.3.
3	After activated the Return to Origin, the Motor searches the Origin with first stage Speed in **Reverse** Direction, and uses the Input Contact ORG (External Detector Input Point) as the Origin Reference Point. If Pn317.1=2, then the Origin Reference Point is not required and searches for the top edge closest to the Input Contact Point ORG as the Machine Origin and stops according to the method set in Pn317.3.
4	After activated the Return to Origin, the Motor searches the Origin with first stage Speed in **Forward** Direction, the Origin Reference Point is not required and searches for the closest Phase Z Pulse Origin. When using this function, must set Pn317.1=2 (After searched Phase Z Pulse as the Mechanical Origin and stops according to the method set in Pn317.3).
5	After activated the Return to Origin, the Motor searches the Origin with first stage Speed in **Reverse** Direction, the Origin Reference Point is not required and searches for the closest Phase Z Pulse Origin. When using this function, must set Pn317.1=2 (After searched Phase Z Pulse as the Mechanical Origin and stops according to the method set in Pn317.3).

Pn317.1 After Found Origin Reference Point, the Moving Method Setting for Searching Mechanical Origin

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0-2	--	--

RS-485 Communication Position	Pi	Pe	S	T
0317H	O	O	-	-

Setting Description:

Setting	Description
0	After founding the Reference Origin, the Motor will**return** with a second stage speed to search the closest Phase Z Pulse as the Mechanical Origin and stops according to the method set in Pn317.3.
1	After the Reference Origin is found, the Motor will **continue forward** with the second stage speed to search the closest PhaseZPulse as the Mechanical Origin and stops according to the method set in Pn317.3.
2	When Pn317.0=2 or 3, after the top edge of the Input Contact ORG is found as the Mechanical Origin and stops according to the method set in Pn317.3; when Pn317.0=4 or 5, after the Phase Z Pulse is found as the Mechanical Origin and stops according to the method set in Pn317.3.

Pn317.2 Return to Origin Activation Mode Setting

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0-2	--	--

RS-485 Communication Position	Pi	Pe	S	T
0317H	O	O	-	-

Setting Description:

Setting	Description
0	Turn Off Return to Origin Function.
1	When the power is turned on, only the first Servo Activation **(Servo ON)** will automatically execute the Return to Origin Function. When the Servo System does not have to repeat executing the Return to Origin Function during operations, this Mode can be used to omit an Input Contact used to execute the Return to Origin Function.
2	Trigger the Return to Origin Function by Input Contact SHOME, in Position Mode, the Input Contact SHOME can be triggered at any time to execute the Return to Origin Function.

Pn317.3 Stop Mode Setting after the Mechanical Origin is Found

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0-1	--	--

RS-485 Communication Position	Pi	Pe	S	T
0317H	O	O	-	-

Setting Description:

Setting	Description
0	After the Mechanical Origin Signal is found, **record** this position as the Mechanical Origin (both Un-14 Encoder Feedback Number of Revolutions, Un-15 Encoder Feedback Number of Pulse are all zero), the Motor decelerates

	to stop, and after the Motor stopped, **return** moving to the Mechanical Origin Position with second stage speed.
1	After the Mechanical Origin Signal is found, **record** this position as the Mechanical Origin (both Un-14 Encoder Feedback Number of Revolutions, Un-15 Encoder Feedback Number of Pulse are all zero), the Motor decelerates to stop.

Pn318 Return to Origin First Stage High Speed

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
100	Rpm	1-Rated Speed	--	--

RS-485 Communication Position	Pi	Pe	S	T
0318H	O	O	-	-

Setting Description: Set the Moving Speed of Return to Origin First Stage High Speed

Pn319 Return to Origin Second Stage High Speed

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
50	Rpm	1-Rated Speed	--	--

RS-485 Communication Position	Pi	Pe	S	T
0319H	O	O	-	-

Setting Description: Set the Moving Speed of Return to Origin Second Stage High Speed

Pn320 Return to Origin Offset Number of Revolutions

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	Rev	-30000-30000	--	--

RS-485 Communication Position	Pi	Pe	S	T
031AH	O	O	-	-

Setting Description: After the Motor has found the Mechanical Origin in accordance with Pn317(Return to Origin Mode), it will position in accordance with Pn320 (Return to Origin Offset Number of Revolutions) and Pn321 (Return to Origin Offset Number of Pulses) as the New Mechanical Origin

Pn321 Number of Pulse of Return to Origin Offset

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	pulse	-8388607~8388607	--	--

RS-485 Communication Position	Pi	Pe	S	T
031BH/031CH	O	O	-	-

Setting Description: Return to Origin Offset Position =Pn320 (Number of Revolutions) x Number of Pulses in One Revolution of Encoder x4+Pn321(Number of Pulses)

Pn322 Internal Position Command S-type Acceleration / Deceleration Smoothing Constant (TSL)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	X0.4ms	0-5000	--	--

RS-485 Communication Position	Pi	Pe	S	T
031DH	O	-	-	-

Setting Description: The Position S-type Smoother is suitable for the Control Mode of the Internal Position Command Input, and provides the smoothing process of the motion command. The generated speed and acceleration are continuous, and the jerkiness of the acceleration is smaller, which can improve the characteristics of acceleration / deceleration of the Motor, and more smooth in mechanical structure operations.

Pn323 Internal Position Command S-type Acceleration / Deceleration Constant (TACC)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
1	X0.4ms	1-5000	--	--

RS-485 Communication Position	Pi	Pe	S	T
031EH	O	-	-	-

Setting Description: Please refer to Pn322 Description.

Pn329 Pulse Command Smoothing Filter

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	x2msec	0- 2500	--	--

RS-485 Communication Position	Pi	Pe	S	T
0325H	O	O	-	-

Setting Description: Can select Filter Smoothing Time.

Pn330 Pulse Command Moving Filter

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	X0.4msec	0- 250	--	--

RS-485 Communication Position	Pi	Pe	S	T
0326H	O	O	-	-

Setting Description: Pulse Command Moving Filter

Pn332.0 Internal Position Command Acceleration / Deceleration Method

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0-2	--	--

RS-485 Communication Position	Pi	Pe	S	T
0329H	O	-	-	-

Setting Description:

Setting	Description
0	Use Internal Position Command One Time Smoothing Acceleration / Deceleration
1	Use Internal Position Command **S**-type Acceleration / Deceleration
2	Use Internal Position Command **S**-type Acceleration / Deceleration Separation

Pn333 Internal Position Command S-type Deceleration Constant (TDEC)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
1	*0.4msec	1-5000	--	--

RS-485 Communication Position	Pi	Pe	S	T
032AH	O	-	-	-

Setting Description: Please refer to PN322 Description

Pn334 PTRG Trigger Delay Time Parameter

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	*4ms	0-2500	--	--

RS-485 Communication Position	Pi	Pe	S	T
032BH	O	-	-	-

Setting Description: After PTRG is triggered, and after the Delay setting time, the Motor starts rotation.

Pn336.0 Automatic Low Frequency Vibration Suppression Enabling Selection

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0-3	--	--

RS-485 Communication Position	Pi	Pe	S	T
032DH	O	O	-	-

Setting Description:

Setting	Description
0	Disable Automatic Detection of Low Frequency Vibration Frequency
1	Enable Automatic Detection of Low Frequency Vibration Frequency1
2	Enable Automatic Detection of Low Frequency Vibration Frequency2
3	Enable Automatic Detection of Low Frequency Vibration Frequency3

Pn337 Automatic Low Frequency Vibration Suppression Delay

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
100	1ms	0-1000	--	--

RS-485 Communication Position	Pi	Pe	S	T
032EH	O	O	-	-

Setting Description: Automatically detects the Delay Time of Low Frequency Vibration Frequency

Pn338 Low Frequency Swinging Detection Level

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
50	0.1 %	1-1000	--	--

RS-485 Communication Position	Pi	Pe	S	T
032FH	O	O	-	-

Setting Description: The detection level when executing automatic low frequency vibration suppression (Pn336=1~3), this value setting method is used to set the percentage of the positioning completion determined value (Pn307), adjusting the low frequency swinging detection level (Pn338) can adjust the detection sensitivity, and the lower the setting the easier for the noise to be determined incorrectly.

Pn339 Low Frequency Vibration Suppression Frequency

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
1000	0.1 Hz	10-1000	--	--

RS-485 Communication Position	Pi	Pe	S	T
0330H	O	O	-	-

Setting Description: Used to eliminate the Low Frequency Vibration generated by insufficient mechanism rigidity.

Pn340 First Set Low Frequency Vibration Suppression Parameter

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0-30	--	--

RS-485 Communication Position	Pi	Pe	S	T
0331H	O	O	-	-

Setting Description: Used to adjust the frequency range to be suppressed, greater the value, wider the frequency range of suppression is, the recommended setting is 10.

Pn341 Second Point Low Frequency Vibration Suppression Frequency

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
1000	0.1Hz	10-1000	--	--

RS-485 Communication Position	Pi	Pe	S	T
0332H	O	O	-	-

Setting Description: Used to adjust the frequency range to be suppressed, greater the value, wider the frequency range of suppression is, the recommended setting is 10.

Pn342 Second Set Low Frequency Vibration Suppression Parameter

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0-30	--	--

RS-485 Communication Position	Pi	Pe	S	T
0333H	O	O	-	-

Setting Description: Used to adjust the frequency range to be suppressed, greater the value, wider the frequency range of suppression is, the recommended setting is 10.

Pn343 Third Point Low Frequency Vibration Suppression Frequency

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
1000	0.1Hz	10-1000	--	--

RS-485 Communication Position	Pi	Pe	S	T
0334H	O	O	-	-

Setting Description: Used to adjust the frequency range to be suppressed, greater the value, wider the frequency range of suppression is, the recommended setting is 10.

Pn344 Third Set Low Frequency Vibration Suppression Parameter

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0-30	--	--

RS-485 Communication Position	Pi	Pe	S	T
0335H	O	O	-	-

Setting Description: Used to adjust the frequency range to be suppressed, greater the value, wider the frequency range of suppression is, the recommended setting is 10.

Pn354 Single Rotation Pulse Command Function

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	pulse	64~32768 (15bit Encoder) 64~131072 (17bit Encoder) 64~8388608 (23bit Encoder)	★	--

RS-485 Communication Position	Pi	Pe	S	T
0341H/0342H	O	O	-	-

Setting Description: The number of pulses corresponding to the External Optical Finger when the Motor rotates one revolution (Encoder resolution of the Fully Closed Loop CN4 connection)

7-3-5 Multiple Position Control Parameters (Pn4□□)

Internal Position Command 1~32-Number of Revolutions

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	Rev	-16000-16000	--	--

RS-485 Communication Position	Pi	Pe	S	T
Refer to the Table below	O	-	-	-

Setting Description: Set Number of Rotations of Internal Position Command Use Input Contact POS1~POS5 to select the use of First Stage Position Command, please refer to Section 5-4-2. Following is the related parameter list.

Parameter Code	Parameter Name	RS-485	Parameter Code	Parameter Name	RS-485
Pn401	Internal Position Command 1-Number of Revolution	0701H	Pn449	Internal Position Command 17-Number of Revolution	0741H
Pn404	Internal Position Command 2-Number of Revolution	0705H	Pn452	Internal Position Command 18-Number of Revolution	0745H
Pn407	Internal Position Command 3-Number of Revolution	0709H	Pn455	Internal Position Command 19-Number of Revolution	0749H
Pn410	Internal Position Command 4-Number of Revolution	070DH	Pn458	Internal Position Command 20-Number of Revolution	074DH
Pn413	Internal Position Command 5-Number of Revolution	0711H	Pn461	Internal Position Command 21-Number of Revolution	0751H
Pn416	Internal Position Command 6-Number of Revolution	0715H	Pn464	Internal Position Command 22-Number of Revolution	0755H
Pn419	Internal Position Command 7-Number of Revolution	0719H	Pn467	Internal Position Command 23-Number of Revolution	0759H
Pn422	Internal Position Command 8-Number of Revolution	071DH	Pn470	Internal Position Command 24-Number of Revolution	075DH
Pn425	Internal Position Command 9-Number of Revolution	0721H	Pn473	Internal Position Command 25-Number of Revolution	0761H
Pn428	Internal Position Command 10-Number of Revolution	0725H	Pn476	Internal Position Command 26-Number of Revolution	0765H
Pn431	Internal Position Command 11-Number of Revolution	0729H	Pn479	Internal Position Command 27-Number of Revolution	0769H
Pn434	Internal Position Command 12-Number of Revolution	072DH	Pn482	Internal Position Command 28-Number of Revolution	076DH
Pn437	Internal Position Command 13-Number of Revolution	0731H	Pn485	Internal Position Command 29-Number of Revolution	0771H
Pn440	Internal Position Command 14-Number of Revolution	0735H	Pn488	Internal Position Command 30-Number of Revolution	0775H
Pn443	Internal Position Command 15-Number of Revolution	0739H	Pn491	Internal Position Command 31-Number of Revolution	0779H
Pn446	Internal Position Command 16-Number of Revolution	073DH	Pn494	Internal Position Command 32-Number of Revolution	077DH

Internal Position Command 1~32 - Number of Pulses

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	pulse	-8388608-8388608	--	--

RS-485 Communication Position	Pi	Pe	S	T
Refer to the Table below	O	-	-	-

Setting Description: Set the Number of Rotation Pulse for the Internal Position Command , the following is the relevant parameter list.

Internal Position Command 1 = Pn401 (Number of Revolutions) x Number of Pulses in One Revolution of Encoder x4+Pn402 (Number of Pulses)

Parameter Code	Parameter Name	RS-485 Communication Position
Pn402	Internal Position Command 1-Number of Pulses	0702H/0703H
Pn405	Internal Position Command 2-Number of Pulses	0706H/0707H
Pn408	Internal Position Command 3-Number of Pulses	070AH/070BH
Pn411	Internal Position Command 4-Number of Pulses	070EH/070FH
Pn414	Internal Position Command 5-Number of Pulses	0712H/0713H
Pn417	Internal Position Command 6-Number of Pulses	0716H/0717H

Parameter Code	Parameter Name	RS-485 Communication Position
Pn420	Internal Position Command 7-Number of Pulses	071AH/071BH
Pn423	Internal Position Command 8-Number of Pulses	071EH/071FH
Pn426	Internal Position Command 9-Number of Pulses	0722H/0723H
Pn429	Internal Position Command 10-Number of Pulses	0726H/0727H
Pn432	Internal Position Command 11-Number of Pulses	072AH/072BH
Pn435	Internal Position Command 12-Number of Pulses	072EH/072FH
Pn438	Internal Position Command 13-Number of Pulses	0732H/0733H
Pn441	Internal Position Command 14-Number of Pulses	0736H/0737H
Pn444	Internal Position Command 15-Number of Pulses	073AH/073BH
Pn447	Internal Position Command 16-Number of Pulses	073EH/073FH
Pn450	Internal Position Command 17-Number of Pulses	0742H/0743H
Pn453	Internal Position Command 18-Number of Pulses	0746H/0747H
Pn456	Internal Position Command 19-Number of Pulses	074AH/074BH
Pn459	Internal Position Command 20-Number of Pulses	074EH/074FH
Pn462	Internal Position Command 21-Number of Pulses	0752H/0753H
Pn465	Internal Position Command 22-Number of Pulses	0756H/0757H
Pn468	Internal Position Command 23-Number of Pulses	075AH/075BH
Pn471	Internal Position Command 24-Number of Pulses	075EH/075FH
Pn474	Internal Position Command 25-Number of Pulses	0762H/0763H
Pn477	Internal Position Command 26-Number of Pulses	0766H/0767H
Pn480	Internal Position Command 27-Number of Pulses	076AH/076BH
Pn483	Internal Position Command 28-Number of Pulses	076EH/076FH
Pn486	Internal Position Command 29-Number of Pulses	0772H/0773H
Pn489	Internal Position Command 30-Number of Pulses	0776H/0777H
Pn492	Internal Position Command 31-Number of Pulses	077AH/077BH
Pn495	Internal Position Command 32-Number of Pulses	077EH/077FH

Internal Position Command 1~32 - Moving Speed

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	RPM	0-2*Rated Speed	--	--

RS-485 Communication Position	Pi	Pe	S	T
Refer to the Table below	O	-	-	-

Setting Description: Set the Moving Speed of the Internal Position Command

Parameter Code	Parameter Name	RS-485	Parameter Code	Parameter Name	RS-485
Pn403	Internal Position Command 1-Moving Speed	0704H	Pn451	Internal Position Command 17-Moving Speed	0744H
Pn406	Internal Position Command 2-Moving Speed	0708H	Pn454	Internal Position Command 18-Moving Speed	0748H
Pn409	Internal Position Command 3-Moving Speed	070CH	Pn457	Internal Position Command 19-Moving Speed	074CH
Pn412	Internal Position Command 4-Moving Speed	0710H	Pn460	Internal Position Command 20-Moving Speed	0750H
Pn415	Internal Position Command 5-Moving Speed	0714H	Pn463	Internal Position Command 21-Moving Speed	0754H
Pn418	Internal Position Command 6-Moving Speed	0718H	Pn466	Internal Position Command 22-Moving Speed	0758H
Pn421	Internal Position Command 7-Moving Speed	071CH	Pn469	Internal Position Command 23-Moving Speed	075CH

Parameter Code	Parameter Name	RS-485	Parameter Code	Parameter Name	RS-485
Pn424	Internal Position Command 8-Moving Speed	0720H	Pn472	Internal Position Command 24-Moving Speed	0760H
Pn427	Internal Position Command 9-Moving Speed	0724H	Pn475	Internal Position Command 25-Moving Speed	0764H
Pn430	Internal Position Command 10-Moving Speed	0728H	Pn478	Internal Position Command 26-Moving Speed	0768H
Pn433	Internal Position Command 11-Moving Speed	072CH	Pn481	Internal Position Command 27-Moving Speed	076CH
Pn436	Internal Position Command 12-Moving Speed	0730H	Pn484	Internal Position Command 28-Moving Speed	0770H
Pn439	Internal Position Command 13-Moving Speed	0734H	Pn487	Internal Position Command 29-Moving Speed	0774H
Pn442	Internal Position Command 14-Moving Speed	0738H	Pn490	Internal Position Command 30-Moving Speed	0778H
Pn445	Internal Position Command 15-Moving Speed	073CH	Pn493	Internal Position Command 31-Moving Speed	077CH
Pn448	Internal Position Command 16-Moving Speed	0740H	Pn496	Internal Position Command 32-Moving Speed	0780H

7-3-6 Shortcut Parameters (qn5□□)

Qn501 Speed Loop Gain 1

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
40	Hz	2-1500	--	--

RS-485 Communication Position	Pi	Pe	S	T
0401H	O	O	O	-

Setting Description: Same as Sn211

Qn502 Speed Loop Integration Time Constant 1

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
2000	x0.01msec	40-50000	--	--

RS-485 Communication Position	Pi	Pe	S	T
0402H	O	O	O	-

Setting Description: Same as Sn212.

Qn503 Speed Loop Gain 2

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
40	Hz	2-1500	--	--

RS-485 Communication Position	Pi	Pe	S	T
0403H	O	O	O	-

Setting Description: Same as Sn213.

Qn504 Speed Loop Integration Time Constant 2

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
2000	x0.01msec	40-50000	--	--

RS-485 Communication Position	Pi	Pe	S	T
0404H	O	O	O	-

Setting Description: Same as Sn214.

Qn505 Position Loop Gain 1

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
40	Rad/s	1-2000	--	--

RS-485 Communication Position	Pi	Pe	S	T
0405H	O	O	-	-

Setting Description: Same as Pn310.

Qn506 Position Loop Gain 2

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
40	Rad/s	1-2000	--	--

RS-485 Communication Position	Pi	Pe	S	T
0406H	O	O	-	-

Setting Description: Same as Pn311.

Qn507 Position Loop Feed Forward Gain

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	%	0-100	--	--

RS-485 Communication Position	Pi	Pe	S	T
0407H	O	O	-	-

Setting Description: Same as Pn312.

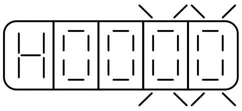
7-3-7 Multi-function Contact Planning Parameters (Hn6□□)

Hn601.0/Hn601.1 DI-1 Pin Function

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
Change with Mode	--	00-20(Hexadecimal)	★	--

RS-485 Communication Position	Pi	Pe	S	T
0501H	O	O	O	O

Setting Description:



Setting	Description		Setting	Description	
	Code	Contact Operation Function		Code	Contact Operation Function
00	NULL	Not Used	10	GN1	Electronic Gear Ratio Numerator Selection1
01	SON	Servo Start	11	GN2	Electronic Gear Ratio Numerator Selection2
02	ALRS	Error Alarm Clearing	12	PTRG	Internal Position Command Trigger
03	PCNT	PI/P Switching	13	PHOLD	Internal Position Command Hold
04	CCWL	CCW Direction Drive Prohibited	14	SHOME	Start to Return to Origin
05	CWL	CW Direction Drive Prohibited	15	ORG	External Reference Origin
06	TLMT	External Torque Limit	16	POS1	Internal Position Command Selection1
07	CLR	Pulse Error Clearing	17	POS2	Internal Position Command Selection2
08	LOK	Servo Lock	18	POS3	Internal Position Command Selection3
09	EMC	Emergency Stop	19	POS4	Internal Position Command Selection4
0A	SPD1	Internal Speed Command Selection1 DI_Jog_1(*1)	1A	TRQINV	Torque Command Reverse
0B	SPD2	Internal Speed Command Selection2 /DI_Jog_2(*1)	1B	RS1	Torque Command Forward Selection
0C	MDC	Control Mode Switching	1C	RS2	Torque Command Reverse Selection
0D	INH	Position Command Prohibited	1E	POS5	Internal Position Command Selection5
0E	SPDINV	Speed Command Reverse	20	VDI	Virtual Point Digital Input
0F	G-SEL	Gain Switching			

Hn601.2 DI-1 Pin Function Operation Electric Potential

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0-1	★	--

RS-485 Communication Position	Pi	Pe	S	T
0501H	O	O	O	O

Setting Description:

Setting	Description
0	When the Pin is Low Potential (short circuit with IG24 pin), function operates.
1	When the Pin is High Potential (open circuit with IG24 pin), function operates.

Hn602-Hn612 DI Pin Function Operation Potential (DI-2~DI-12)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
Change with Mode	--	000-120	★	--

RS-485 Communication Position	Pi	Pe	S	T
Please refer to the Table below	O	O	O	O

Setting Description: Please refer to Hn601 Description for the Setting Method.

Parameter Code	Parameter Name	RS-485 Communication Position
Hn602	DI-2Pin Function Planning	0502H
Hn603	DI-3Pin Function Planning	0503H
Hn604	DI-4Pin Function Planning	0504H
Hn605	DI-5Pin Function Planning	0505H
Hn606	DI-6Pin Function Planning	0506H
Hn607	DI-7Pin Function Planning	0507H
Hn608	DI-8Pin Function Planning	0508H

Hn613.0/Hn613.1 DO-1 Pin Function

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
Change with Mode	--	00-12	★	--

RS-485 Communication Position	Pi	Pe	S	T
050DH	O	O	O	O

Setting Description:

Setting	Description	
	Code	Contact Operation Function
00	NON	Not Used
01	RDY	Servo Ready
02	ALM	Servo Error
03	ZS	Zero Speed Signal
04	BI	Mechanical Brake Signal
05	INS	Speed Reached Signal
06	INP	Positioning Completion Signal

Setting	Description	
	Code	Contact Operation Function
07	HOME	Return to Origin Completion Signal
08	INT	Torque Reached Signal
0F	OL	Motor Overload Signal
10	BAT	Encoder Battery Abnormality Signal
11	LIT	Left and Right Limit Signal
12	VDO	Virtual Point Digital Output

Hn613.2 DO-1 Pin Function Operation Electric Potential

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
0	--	0-1	★	--

RS-485 Communication Position	Pi	Pe	S	T
050DH	O	O	O	O

Setting Description: Please refer to Hn601 Description for the Setting Method.

Setting	Description
0	When the Function operates, the Pin is at Low Potential (short circuit with **IG24** Pin).
1	When the Function operates, the Pin is at High Potential (open circuit with **IG24** Pin).

Hn614-Hn616 DI Pin Function Operation Potential (DO-2~DO-4)

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
Change with Mode	--	000-112	★	--

RS-485 Communication Position	Pi	Pe	S	T
Please refer to the Table below	O	O	O	O

Setting Description: Please refer to Hn613 Description for the Setting Method.

Parameter Code	Parameter Name	RS-485 Communication Position
Hn614	DO-2Pin Function Planning	050EH
Hn615	DO-3Pin Function Planning	050FH
Hn616	DO-4Pin Function Planning	0510H

Hn617 Digital Input Contact Control Method Selection

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
H0F00	--	H0000- H0FFF(Hexadecimal)	--	--

RS-485 Communication Position	Pi	Pe	S	T
0511H	O	O	O	O

Setting Description: The 12-bit Digital Input Contact is determined by Bit Setting Method with external terminal or communication control (DI-9~DI12 only uses communication control); correspond the Digital Input Contacts DI-1 ~ DI-12 to the binary first 0 ~ 11 bits first, then set after converted the planned binary bits to hexadecimal.

Binary Bit Representation: 0: Digital Input Contact is controlled by an External terminal.
1: Digital Input Contacts is controlled by communications.

Example: To set the Digital Input Contacts DI-1, DI-3, and DI-6 to use communication control, the remaining Contacts are controlled by the External Terminals; the corresponding binary bits of the Digital Input Contacts are: [0000 1111 0010 0101]; and can be set as 〔H 0 F 2 5〕after being converted to hexadecimal

Hn618 Communication Control Digital Input Contact Status

Initial Value	Unit	Setting Range	Effective	Cn029 Reset
H0000	--	H0000 ~ H0FFF (Hexadecimal)	--	--

RS-485 Communication Position	Pi	Pe	S	T
0512H	O	O	O	O

Setting Description: Determine the Contact State when the 12-bit Digital Input Contact uses communication control by the Bit Setting Method; please refer to Hn617 Description for Bit Setting Method.

Binary bit representation: 0: Digital Input Contact OFF
1: Digital Input Contact ON

Set the parameter to H0000 represents that all communication control Digital Input Contacts are Open. When set to H0FFF represents all communication control Digital Input Contacts are in Conduction.

Note) The use of this function must coordinate with the setting of parameter Hn617.

Hn 601~Hn 616 Corresponding to the Factory Setting Value of Different Model

Cn001 / Parameter Code	0 T	1 S	2 Pe	3 Pe S	4 S T	5 Pe T	6 Pi	7 Pi S	8 Pi T	A Pi Pe
Hn 601	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001
Hn 602	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002
Hn 603	0003	0003	0003	0003	0003	0003	0016	0016	0016	0003
Hn 604	0104	0104	0104	0104	0104	0104	0017	0017	0017	0104
Hn 605	0105	0105	0105	0105	0105	0105	0018	0018	0018	0105
Hn 606	001B	0006	0006	0006	001B	001B	0019	0019	0019	0006
Hn 607	001C	000E	0007	000E	001C	001C	001E	001E	001E	0007
Hn 608	001A	0008	000D	0008	001A	001A	0012	0012	0012	000D
Hn 609	0009	0009	0009	0009	0009	0009	0009	0009	0009	0009
Hn 610	000A	000A	0014	000A	000A	000A	0014	000A	001B	0014
Hn 611	000B	000B	0015	000B	000B	000B	0015	000B	001C	0015
Hn 612	000C	000C	000C	000C	000C	000C	0013	000C	000C	000C
Hn 613	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001
Hn 614	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002
Hn 615	0008	0003	0007	0003	0008	0008	0007	0003	0008	0007
Hn 616	0005	0005	0006	0006	0005	0006	0006	0006	0006	0006

7-3-8 Monitoring Parameters (Un-□□)

Parameter Code	Display Content	Unit	Description	RS-485 Address
Un-01	Actual Motor Speed	rpm	For example: The display of 120 indicates that the current Motor Speed is 120 rpm.	0601H
Un-02	Actual Motor Torque	%	Expressed by the percentage of Rated Torque. For example: The display of 20 indicates that the Motor Torque Output is now 20% of the Rated Torque.	0602H
Un-03	Regenerative Load Rate	%	The average percentage of Regenerative Power Output.	0603H
Un-04	Effective Load rate	%	The average percentage of Power Output.	0604H
Un-05	Maximum Load Rate	%	The maximum value of Effective Load Rate has ever appeared.	0605H
Un-06	Speed Command	rpm	For example: The display of 120 indicates that the current Speed Command is 120 rpm.	0606H
Un-07	Position Error (32bit)	pulse	Difference between Position Command and Position Feedback.	0607H 0608H
Un-08	Position Feedback (32bit)	pulse	Pulse Accumulation of Motor Encoder.	0609H 060AH
Un-09	External Analog Voltage Command Value	V	For example: The display of 5.25 indicates that the External Voltage Command is 5.25V.	060BH
Un-10	Main Circuit (Vdc Bus) Voltage	V	For example: The display of 310 indicates that the Main Circuit Voltage is 310V.	060CH
Un-11	External Analog Voltage Limit Value	V	For example: The display of 5.25 indicates that the External Voltage Command is 5.25V.	060DH
Un-12	External CCW Direction Torque Limit Command Value	%	For example: The display of 100 indicates that the current External CCW Direction Torque Limit Command is 100%.	060EH

Parameter Code	Display Content	Unit	Description	RS-485 Address
Un-13	External CW Direction Torque Limit Command Value	%	For example: The display of 100 indicates that the current External CW Direction Torque Limit Command is 100%.	060FH
Un-14	Motor Feedback - Number of Pulses in one Rotation	pulse	After the power is turned on, display the number of pulses in one Motor rotation with Absolute Value.	0610H 0611H
Un-16	Motor Feedback - Number of Rotations (32bit)	rev	After the power is turned on, display the number of rotations of the Motor with Absolute Value.	0612H 0613H
Un-18	Pulse Command - Number of pulses absolute value (32bit) in one rotation	pulse	After the power is turned on, display the number of pulses in one rotation of the Pulse Command Input with Absolute Value.	0614H 0615H
Un-20	Pulse Command - Number of Rotations (32bit)	rev	After the power is turned on, display the number of rotations of the Pulse Command Input with Absolute Value.	0616H 0617H
Un-22	Feedback Position Information of the Pulse Encoder	pulse	Absolute Position of the Pulse Encoder Motor	0618H 0619H
Un-24	Multi-revolution Position Information of the Communication Encoder Feedback	rev	Multi-revolution Absolute Position of the Communication Encoder Motor	061AH
Un-25	Single Revolution Position Information of the Communication Encoder Feedback	pulse	Single Revolution Absolute Position of the Communication Encoder Motor	061BH 061CH
Un-27	Communication Encoder Message	—	Feedback Communication Encoder Status	061DH
Un-28	Torque Command	%	Feedback Communication Encoder Status	061EH
Un-29	Load Inertia Ratio	x0.1	Expressed by the percentage of Rated Torque. For example: The display of 50 indicates that the current Motor Torque Command is 50% of the Rated Torque.	061FH
Un-30	Digital Output Contact Status (DO)	—	Displays the Status of Digital Output Contact (DO) in Hexadecimal For example: H00XX (0000 0000 00 DO-6/5 DO-4/3/2/1)	0620H
Un-31	Digital Input Contact Status (D1)	—	Displays the Status of Digital Input Contact (DI) in Hexadecimal For example: HXXXX (0000 0000 DI-8/7/6/5 DI-4/3/2/1)	0621H
Un-43	Motor Electrical Angle	degree	Display Motor Current Electrical Angle Position	062DH
Un-44	Motor Model Number Read by the Communication Encoder	—	For example: The display of H1267 indicates that the Motor Cn030 Number is H1267	062EH
Un-45	OnLine_AutoTuning Inertia Estimation	X0.1	For example: The display of 100 indicates that the Load Inertia Ratio is 10 times.	062FH
Un-46	OFFLine_Tuning Status	—	OFFLine_Tuning Operating Status	0630H
Un-47	OFFLine_Tuning Error Code	—	Error Code of OFFLine_Tuning	0631H
Un-49	Driver Temperature	度	Driver Temperature	0633H
Un-53	Current Alarm Number	—	For example: The display of 01 indicates the current alarm number is AL-01	0639H
Un-55	System Multi-revolution Absolute Position	rev	System Multi-revolution Absolute Position	063BH
Un-56	System Single Revolution Absolute Position	pulse	System Single Revolution Absolute Position	063CH 063DH

7-3-9 Diagnostic Parameters (dn-□□)

Parameter Code	Name and Function	Communication Address
		RS485
dn-01	Current Control Mode Display	0F01H
dn-02	Output Contact Signal Status	0F02H
dn-03	Input Contact Signal Status	0F03H
dn-04	CPU Software Version Display	0F04H
dn-05	Jog Mode Operation	-
dn-06	Reserved	-
dn-07	External Voltage Offset Automatic Adjustment	0F07H
dn-08	Display Serialized Models	0F08H
dn-09	ASIC Software Version Display	0F09H
dn-11	Automatic Detection of Magnetic Angle Position	0F0BH

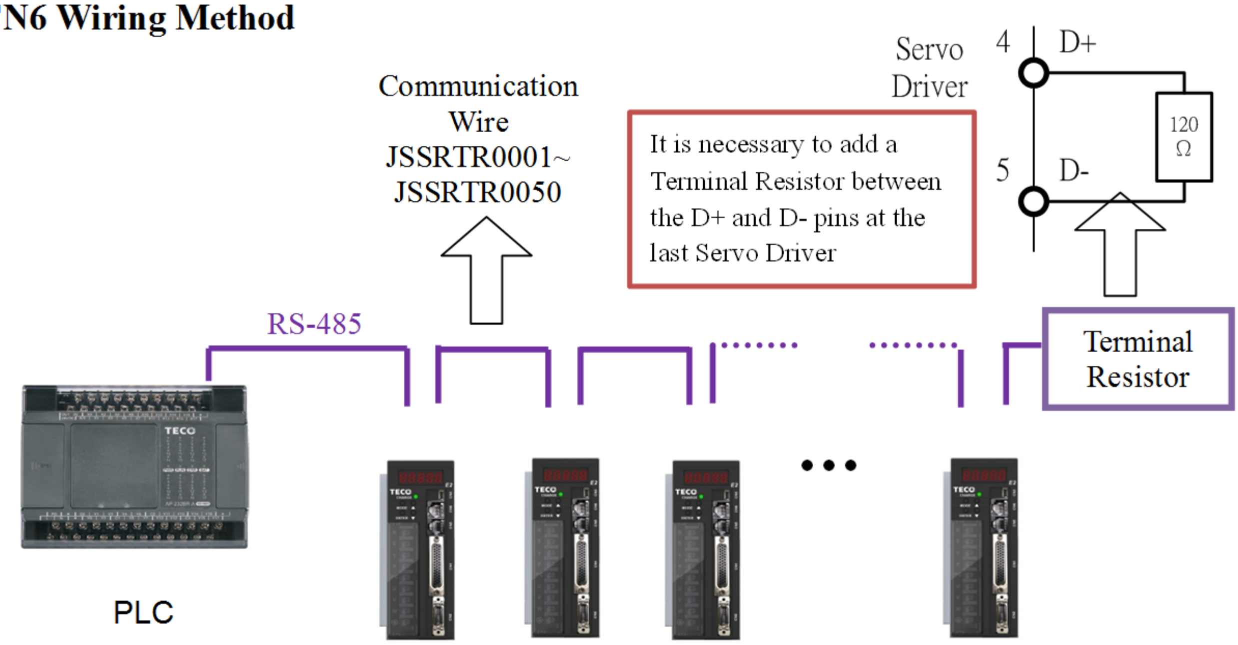
Chap 8 Communication Function

8-1 RS-485 Communication Function

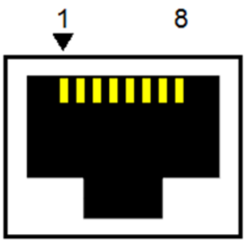
This Servo Driver provides RS-485 Communication Function and the following describes the communication wiring and communication protocol.

8-1-1 RS-485 Communication Wiring

CN5 / CN6 Wiring Method



CN5 / CN6 Terminal Configuration Diagram (RS-485 Communication):



Pin	Name
1	-
2	-
3	GND
4	D+
5	D-
6	-
7	GND
8	-

8-1-2 RS-485 Communication Related Parameters

Cn036 ID Setting

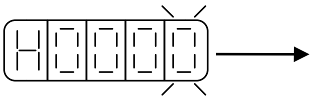
Initial Value	Unit	Setting Range	Effective	RS-485 Address
1	--	1-254	Power Re-set	0027H

Setting Description: When using the Modbus Communication Interface, each set of Drivers needs to set different IDs in this parameter in advance; if the IDs are set repeatedly, it will result in communication not being operated normally.

Cn037.0 Modbus RS-485 Communication Transmission Rate

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1	--	0-5	Power Re-set	0028H

Setting Description:



Setting	Description	Setting	Description
0	4800	3	38400
1	9600	4	57600
2	19200	5	115200

Cn037.2 RS-485 Communication Write Selection

Initial Value	Unit	Setting Range	Effective	RS-485 Address
1	--	0-1	Power Re-set	0028H

Setting Description:

Setting	Description
0	RS-485 Communication Write to EEPROM
1	RS-485 Communication Write to SRAM

Cn038 Communication Protocol

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	--	0-8	Power Re-set	0029H

Setting Description:

Setting	Description	Setting	Description
0	7 , N , 2 (Modbus , ASCII)	5	8 , O , 1 (Modbus , ASCII)
1	7 , E , 1 (Modbus , ASCII)	6	8 , N , 2 (Modbus , RTU)
2	7 , O , 1 (Modbus , ASCII)	7	8 , E , 1 (Modbus , RTU)
3	8 , N , 2 (Modbus , ASCII)	8	8 , O , 1 (Modbus , RTU)
4	8 , E , 1 (Modbus , ASCII)	-	

Cn039 Communication Timeout Setting

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	Sec	0-20	Power Re-set	002AH

Setting Description: If the setting value is greater than 0, the Communication Timeout Function is turned on immediately and must conduct communication within the set time, otherwise, a communication error will appear; if the setting value is 0, then indicates this function is turned off.

Cn040 Communication Response Delay Time

Initial Value	Unit	Setting Range	Effective	RS-485 Address
0	0.5msec	0-255	Power Re-set	002BH

Setting Description: Delay the communication time of Driver responding to Supervisory Control Unit.

Hn617 Digital Input Contact Control Method Selection

Initial Value	Unit	Setting Range	Effective	RS-485 Address
H0F00	--	H0F00- H0FFF(Hexadecimal)	Effective after Set	0511H

Setting Description: The 12-bit Digital Input Contact is determined by Bit Setting Method with external terminal or communication control (DI-9~DI12 only uses communication control); correspond the Digital Input Contacts DI-1 ~ DI-12 to the binary first 0 ~ 11 bits first, then set after converted the planned binary bits to hexadecimal.

Binary Bit Representation: 0: Digital Input Contact is controlled by an External terminal.

1: Digital Input Contacts is controlled by communications.

Example: To set the Digital Input Contacts DI-1, DI-3, and DI-6 to use communication control, the remaining Contacts are controlled by the External Terminals; the corresponding binary bits of the Digital Input Contacts are: [0000 1111 0010 0101]; and can be set as 〔H 0 F 2 5〕after being converted to hexadecimal

Hn618 Communication Control Digital Input Contact Status

Initial Value	Unit	Setting Range	Effective	RS-485 Address
H0000	--	H0000 ~ H0FFF (Hexadecimal)	Effective after Set	0512H

Setting Description: Determine the Contact State when the 12-bit Digital Input Contact uses communication control by the Bit Setting Method; please refer to Hn617 Description for Bit Setting Method.

Binary bit representation: 0: Digital Input Contact OFF

1: Digital Input Contact ON

Set the parameter to H0000 represents that all communication control Digital Input Contacts are Open. When set to H0FFF represents all communication control Digital Input Contacts are in Conduction.

Note) The use of this function must coordinate with the setting of parameter Hn617.

8-1-3 RS-485 Communication Protocol and Format

When using the RS-485 Modbus communication interface, each set of drivers must set its driver ID in advance in parameter **Cn036**. The Supervisory Control Unit can then perform communication control on the individual Drivers based on the ID.

The communication method uses Modbus network communication. The following two communication protocols can be used: ASCII (American Standard Code for information interchange) mode and RTU (Remote Terminal Unit) mode. The required communication protocol can be set using parameter **Cn038**.

Code Meaning

ASCII Mode

Every 8-bit data consists of two ASCII bytes.

For example, a 1-byte data 26H is represented by ASCII Code '26' and includes ASCII Code of '2' <32H> and ASCII Code of '6' <36H>.

HEX numbers 0 to 9 and A to F ASCII Codes, as shown in the following Table:

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

RTU Mode

Every 8-bit data consists of two 4-bit Hexadecimal bits.

For example: a 1-byte data 26H.

Byte Structure

10 bit Character Frame (for 7-bit Byte Data)

7N2	Start bit	0	1	2	3	4	5	6	Stop bit	Stop bit
		←- - - Data: 7 bits - - -→								
	←- - - - - - - - - Character Frame: 10 bits - - - - - - - - -→									

7E1	Start bit	0	1	2	3	4	5	6	Even parity	Stop bit
		←- - - Data: 7 bits - - -→								
	←- - - - - - - - - Character Frame: 10 bits - - - - - - - - -→									

7O1	Start bit	0	1	2	3	4	5	6	Odd parity	Stop bit
		←- - - Data: 7 bits - - -→								
	←- - - - - - - - - Character Frame: 10 bits - - - - - - - - -→									

11 bit Character Frame (for 8-bit Byte Data)

8N2	Start bit	0	1	2	3	4	5	6	7	Stop bit	Stop bit
		←- - - Data: 8 bits - - -→									
	←- - - - - - - - - Character Frame: 11 bits - - - - - - - - -→										

8E1	Start bit	0	1	2	3	4	5	6	7	Even parity	Stop bit
		←- - - Data: 8 bits - - -→									
	←- - - - - - - - - Character Frame: 11 bits - - - - - - - - -→										

8O1	Start bit	0	1	2	3	4	5	6	7	Odd parity	Stop bit
		←- - - Data: 8 bits - - -→									
	←- - - - - - - - - Character Frame: 11 bits - - - - - - - - -→										

Communication Data Structure

ASCII Mode

Code	Name	Content Description
STX	Communication Starts	3AH; Character ’:‘
ADR	Communication Address	1-byte includes 2 ASCII Codes For the communication address range is 1 ~ 254 must be converted to hexadecimal first; For example, the Driver ID is 20, hexadecimal is 14H, ADR = ’1‘ , ‘4’ → ’1‘ = 31H , ‘0’ = 34H
CMD	Command Instruction	1-byte includes 2 ASCII Codes Common command instruction codes are as follows: 03H (Read Register), 06H (Write Single Register), 08H (Diagnostic Function), 10H (Write Multiple Registers)
DATA(n-1) | DATA(0)	Data Character	n-word = 2n-byte (consists of 4n ASCII Codes)；n≦30 Data Character Format is determined by the Command Instruction Code
LRC	Check Digit	1-byte includes 2 ASCII Codes
END 1	End Code 1 (CR)	0DH；Character ' \ r'
END 0	End Code 0 (LF)	0AH；Character ' \ n'

RTU Mode

Code	Name	Content Description
STX	Communication Starts	More than 10ms of Quiescent Time
ADR	Communication Address	1-byte For the communication address range is 1 ~ 254 must be converted to hexadecimal first; For example, the Driver ID is 20, hexadecimal is 14H, and ADR = ’14H’
CMD	Command Instruction	1-byte Common command instruction codes are as follows: 03H (Read Register), 06H (Write Single Register), 08H (Diagnostic Function), 10H (Write Multiple Registers)
DATA(n-1) | DATA(0)	Data Character	n-word = 2n-byte；n≦30 Data Character Format is determined by the Command Instruction Code
CRC-Low	Check Digit - Least Significant Bit	1-byte
CRC-High	Check Digit - Most Significant Bit	1-byte
END 0	End Code 0	More than 10ms of Quiescent Time

Commonly Used Command Instruction Code

03H: Read Register

Read N words in succession, N maximum is 29 (1DH).

For Example: Read 2 words in succession from the starting address 0200 of the Driver with ID 01H.

ASCII Mode

Instruction MessagePC → Servo

STX		‘ : ’
ADR		‘ 0 ’
		‘ 1 ’
CMD		‘ 0 ’
		‘ 3 ’
Starting Data Address	(MSB)	‘ 0 ’
		‘ 2 ’
	(LSB)	‘ 0 ’
		‘ 0 ’
Data Length (Calculated by word)		‘ 0 ’
		‘ 0 ’
		‘ 0 ’
		‘ 2 ’
LRC		‘ F ’
		‘ 8 ’
END1 (CR)		(0DH)
END0 (LF)		(0AH)

Response MessageServo → PC (OK)

STX		‘ : ’
ADR		‘ 0 ’
		‘ 1 ’
CMD		‘ 0 ’
		‘ 3 ’
Data (Number of Bits)		‘ 0 ’
		‘ 4 ’
Address 0200H Content	(MSB)	‘ 0 ’
		‘ 0 ’
	(LSB)	‘ B ’
		‘ 1 ’
Address 0201H Content	(MSB)	‘ 1 ’
		‘ F ’
	(LSB)	‘ 4 ’
		‘ 0 ’
LRC		‘ E ’
		‘ 8 ’
END1 (CR)		(0DH)
END0 (LF)		(0AH)

Servo → PC (ERROR)

STX	‘ : ’
ADR	‘ 0 ’
	‘ 1 ’
CMD	‘ 8 ’
	‘ 3 ’
Error Code	‘ 0 ’
	‘ 2 ’
LRC	‘ 7 ’
	‘ A ’
END1 (CR)	(0DH)
END0 (LF)	(0AH)

RTU Mode

Instruction MessagePC → Servo

ADR		01H
CMD		03H
Starting Data Address	(MSB)	02H
	(LSB)	00H
Data Length (Calculated by word)		00H
		02H
CRC LSB		04H
CRC MSB		07H

Response MessageServo → PC (OK)

ADR		01H
CMD		03H
Data (Number of Bits)		04H
Content of 0200H	(MSB)	00H
	(LSB)	BAH
Content of 0201H	(MSB)	1FH
	(LSB)	40H
CRC LSB		A3H
CRC MSB		D4H

Servo → PC (ERROR)

ADR	01H
CMD	83H
Error Code	02H
CRC LSB	C0H
CRC MSB	F1H

06H: Write Single Register

Write 1 word to Register

Write 100 (0064H) in the starting address 0200H of the Driver with ID 01.

ASCII Mode

Instruction MessagePC → Servo

STX		‘ : ’
ADR		‘ 0 ’
		‘ 1 ’
CMD		‘ 0 ’
		‘ 6 ’
Starting Data Address	(MSB)	‘ 0 ’
		‘ 2 ’
	(LSB)	‘ 0 ’
		‘ 0 ’
Data Content (word Format)		‘ 0 ’
		‘ 0 ’
		‘ 6 ’
		‘ 4 ’
LRC		‘ 9 ’
		‘ 3 ’
END1 (CR)		(0DH)
END0 (LF)		(0AH)

Response MessageServo → PC (OK)

STX		‘ : ’
ADR		‘ 0 ’
		‘ 1 ’
CMD		‘ 0 ’
		‘ 6 ’
Starting Data Address	(MSB)	‘ 0 ’
		‘ 2 ’
	(LSB)	‘ 0 ’
		‘ 0 ’
Data Content (word Format)		‘ 0 ’
		‘ 0 ’
		‘ 6 ’
		‘ 4 ’
LRC		‘ 9 ’
		‘ 3 ’
END1 (CR)		(0DH)
END0 (LF)		(0AH)

Servo → PC (ERROR)

STX	‘ : ’
ADR	‘ 0 ’
	‘ 1 ’
CMD	‘ 8 ’
	‘ 6 ’
Error Code	‘ 0 ’
	‘ 3 ’
LRC	‘ 7 ’
	‘ 6 ’
END1 (CR)	(0DH)
END0 (LF)	(0AH)

RTU Mode

Instruction MessagePC → Servo

ADR		01H
CMD		06H
Starting Data Address	(MSB)	02H
	(LSB)	00H
Data Content (word Format)		00H
		64H
CRC LSB		89H
CRC MSB		99H

Response MessageServo → PC (OK)

ADR		01H
CMD		03H
Starting Data Address	(MSB)	02H
	(LSB)	00H
Data Content (word Format)		00H
		64H
CRC LSB		89H
CRC MSB		99H

Servo → PC (ERROR)

ADR	01H
CMD	86H
Error Code	03H
CRC LSB	02H
CRC MSB	61H

08H: Diagnostic Function

Use Sub-function Code 0000H to check the Transmission Signal between Master and Slaver. The Data Content can be any number.

For example: Use Diagnostic Function on the Driver with ID 01H.

ASCII Mode

Instruction MessagePC → Servo

STX		‘ : ’
ADR		‘ 0 ’
		‘ 1 ’
CMD		‘ 0 ’
		‘ 8 ’
Sub-function Code	(MSB)	‘ 0 ’
		‘ 0 ’
	(LSB)	‘ 0 ’
		‘ 0 ’
Data Content (word Format)		‘ A ’
		‘ 5 ’
		‘ 3 ’
		‘ 7 ’
LRC		‘ 1 ’
		‘ B ’
END1 (CR)		(0DH)
END0 (LF)		(0AH)

Response MessageServo → PC (OK)

STX		‘ : ’
ADR		‘ 0 ’
		‘ 1 ’
CMD		‘ 0 ’
		‘ 8 ’
Sub-function Code	(MSB)	‘ 0 ’
		‘ 0 ’
	(LSB)	‘ 0 ’
		‘ 0 ’
Data Content (word Format)		‘ A ’
		‘ 5 ’
		‘ 3 ’
		‘ 7 ’
LRC		‘ 1 ’
		‘ B ’
END1 (CR)		(0DH)
END0 (LF)		(0AH)

Servo → PC (ERROR)

STX	‘ : ’
ADR	‘ 0 ’
	‘ 1 ’
CMD	‘ 8 ’
	‘ 8 ’
Error Code	‘ 0 ’
	‘ 3 ’
LRC	‘ 7 ’
	‘ 4 ’
END1 (CR)	(0DH)
END0 (LF)	(0AH)

RTU Mode

Instruction MessagePC → Servo

ADR		01H
CMD		08H
Sub-function Code	(MSB)	00H
	(LSB)	00H
Data Content (word Format)		A5H
		37H
CRC LSB		DAH
CRC MSB		8DH

Response MessageServo → PC (OK)

ADR		01H
CMD		08H
Sub-function Code	(MSB)	00H
	(LSB)	00H
Data Content (word Format)		A5H
		37H
CRC LSB		DAH
CRC MSB		8DH

Servo → PC (ERROR)

ADR	01H
CMD	88H
Error Code	03H
CRC LSB	06H
CRC MSB	01H

10H: Write Multiple Registers

Write N words to consecutive registers, N maximum is 27 (1BH).

For example: Write 100 (0064H), 300 (012CH) in two consecutive registers of starting address 0100H Servo Driver with ID 01.

ASCII Mode

Instruction MessagePC → Servo

STX		‘ : ’
ADR		‘ 0 ’
ADR		‘ 1 ’
CMD		‘ 1 ’
CMD		‘ 0 ’
Starting Data Address	(MSB)	‘ 0 ’
Starting Data Address	(MSB)	‘ 1 ’
Starting Data Address	(LSB)	‘ 0 ’
Starting Data Address	(LSB)	‘ 0 ’
Data Length (Calculated by word)		‘ 0 ’
Data Length (Calculated by word)		‘ 0 ’
Data Length (Calculated by word)		‘ 0 ’
Data Length (Calculated by word)		‘ 2 ’
Data Length (Number of Bits)		‘ 0 ’
Data Length (Number of Bits)		‘ 4 ’
Write Data to 0100H	(MSB)	‘ 0 ’
Write Data to 0100H	(MSB)	‘ 0 ’
Write Data to 0100H	(LSB)	‘ 6 ’
Write Data to 0100H	(LSB)	‘ 4 ’
Write Data to 0101H	(MSB)	‘ 0 ’
Write Data to 0101H	(MSB)	‘ 1 ’
Write Data to 0101H	(LSB)	‘ C ’
Write Data to 0101H	(LSB)	‘ 2 ’
LRC		‘ 5 ’
LRC		‘ 7 ’
END1 (CR)		(0DH)
END0 (LF)		(0AH)

Response MessageServo → PC (OK)

STX		‘ : ’
ADR		‘ 0 ’
ADR		‘ 1 ’
CMD		‘ 1 ’
CMD		‘ 0 ’
Starting Data Address	(MSB)	‘ 0 ’
Starting Data Address	(MSB)	‘ 1 ’
Starting Data Address	(LSB)	‘ 0 ’
Starting Data Address	(LSB)	‘ 0 ’
Data Length (Calculated by word)		‘ 0 ’
Data Length (Calculated by word)		‘ 0 ’
Data Length (Calculated by word)		‘ 0 ’
Data Length (Calculated by word)		‘ 2 ’
LRC		‘ E ’
LRC		‘ C ’
END1 (CR)		(0DH)
END0 (LF)		(0AH)

Servo → PC (ERROR)

STX	‘ : ’
ADR	‘ 0 ’
ADR	‘ 1 ’
CMD	‘ 9 ’
CMD	‘ 0 ’
Error Code	‘ 0 ’
Error Code	‘ 2 ’
LRC	‘ 6 ’
LRC	‘ D ’
END1 (CR)	(0DH)
END0 (LF)	(0AH)

RTU Mode

Instruction MessagePC → Servo

ADR		01H
CMD		10H
Starting Data Address	(MSB)	01H
	(LSB)	00H
Data Length (Calculated by word)		00H
		02H
Data (Number of Bits)		04H
Write Data to 0100H	(MSB)	00H
	(LSB)	64H
Write Data to 0101H	(MSB)	01H
	(LSB)	2CH
CRC LSB		BFH
CRC MSB		ADH

Response MessageServo → PC (OK)

ADR		01H
CMD		10H
Starting Data Address	(MSB)	01H
	(LSB)	00H
Data Length (Calculated by word)		00H
		02H
CRC LSB		40H
CRC MSB		34H

Servo → PC (ERROR)

ADR	01H
CMD	90H
Error Code	02H
CRC LSB	CDH
CRC MSB	C1H

LRC (ASCII Mode) and CRC (RTU Mode) Check Digit

LRC Check Digit:

ASCII Mode uses LRC (Longitudinal Redundancy Check) Check Digit.

The LRC Check is to calculate the sum of ADR, CMD, starting data address, and data contents, after the sum is divided with the unit in 256 (100H) and take the remainder (if the total sum is 19DH, then take 9DH), and the remainder is calculated in 2's complement, the final result calculated is the LRC Check Digit.

For example: Use Diagnostic Function on the Driver with ID 01H.

STX		‘ : ’
ADR		‘ 0 ’
		‘ 1 ’
CMD		‘ 0 ’
		‘ 8 ’
Sub-function Code	(MSB)	‘ 0 ’
		‘ 0 ’
	(LSB)	‘ 0 ’
		‘ 0 ’

Data Content (word Format)	‘ A ’
	‘ 5 ’
	‘ 3 ’
	‘ 7 ’
LRC	‘ 1 ’
	‘ B ’
END1 (CR)	(0DH)
END0 (LF)	(0AH)

01H+08H+00H+00H+A5H+37H = E5H

Take E5H 2's complement is 1BH, so the LRC is '1', 'B'

CRC Check Digit:

RTU Mode uses CRC (Cyclical Redundancy Check) Check Digit.

CRC Check Calculation Method is as follows:

1. Load a 16-bit CRC register with FFFFH;
2. Perform XOR (Exclusive OR) calculation on the first 8-bit byte value of the data content with the low byte of the CRC Register, and store the result in the CRC Register.
3. Shift the CRC Register one bit (LSB) to the right, then fill 0 to the Most Significant Bit (MSB);
4. Check the value of bit (LSB) shifted to the right.
   If it is 0, then save the new value in the CRC Register;
   If it is 1, then perform XOR calculation on the new value and A001H, then save the result in the CRC Register;
5. Repeat Steps 3 ~ 4, until all 8 bit are completed calculation, then perform Step 6;
6. Take the next 8-bits message data of the data content to calculate repeating Steps 2 ~ 5, until all message data are completed calculations, the CRC Register content at this time is the CRC Check Digit.

Error Code

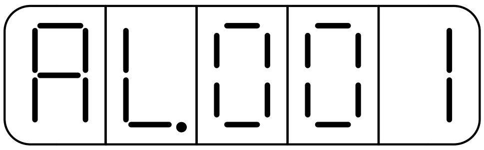
If an error has occurred in the Communication connecting process, the Driver will issue an Error Code and after adding 80H to the Command Function Code then transmit it to the ModBus Master System.

Error Code	Name	Description
01	Command Instruction Code Error	The function code received in the query is not an allowable action for the server (or slave).
02	Data Address Error	The data address received in the query is not an allowable address for the server (or slave).
03	Data Content Error	A value contained in the query data field is not an allowable value for server (or slave).
04	Slave Equipment Error	An unrecoverable error occurred while the server (or slave) was attempting to perform the requested action.
05	Communication Command Mode Error	RTU mode: CRC check error
06	Communication Command Mode Error	ASCII mode: LRC check error or no end code(CRLF)

Chap 9 Error Alarm Clear

9-1 Error Alarm Description

When the leftmost two LEDs of this Device display AL, represents this Device is currently cannot operate normally. The user can follow the countermeasure instructions in the next Section to eliminate the situation and continue operating the Device with the normal procedure. When the Error Alarm cannot be resolved, please contact Dealer or Manufacturer for further handling methods. When Error Alarm occurs, LED Display Status is shown as follows:



Error Alarm History Parameter **Error Alarm Number**

Among them, please refer to the description in the next Section for the Alarm corresponding to the Error Alarm Number. For example, the Error Alarm Number is 001 representing that the Low Power Supply Voltage Alarm is currently occurring.

This Device also provides the user with inquiry of the past nine Error Alarms, as shown in the following:

Error Alarm History Parameter

Parameter Code	Name and Function
AL.xxx	Current Alarm Message
A1.xxx	Past First Alarm Message
A2.xxx	Past Second Alarm Message
A3.xxx	Past Third Alarm Message
A4.xxx	Past Fourth Alarm Message
A5.xxx	Past Fifth Alarm Message
A6.xxx	Past Sixth Alarm Message
A7.xxx	Past Seventh Alarm Message
A8.xxx	Past Eighth Alarm Message
A9.xxx	Past Ninth Alarm Message

Note) **xxx** represents the Error Alarm Number at that time.

Please follow the steps below to use the Error Alarm History Parameters to inquire the past nine Error Alarms.

Steps	Operation Key	LED Display Screen after Operation	Description
1	Turn on Power		When the power is turned on, Enter the **Status Display Screen**.
2	MODE		Press MODE Key three times to enter the **Error Alarm History Parameter**.
3	▲		Press UP Key one time, to select the **Previous first Alarm History** item, two LEDS on the right side display the **Alarm Number** of 003 (Motor Overload).
4	▼		Press UP Key one time, to select the **Previous second Alarm History** item, two LEDS on the right side display the **Alarm Number** of 001 (Power Supply Voltage Too Low).
5	MODE		Press MODE Key one time to enter the **System Parameter**.

9-2 Error List

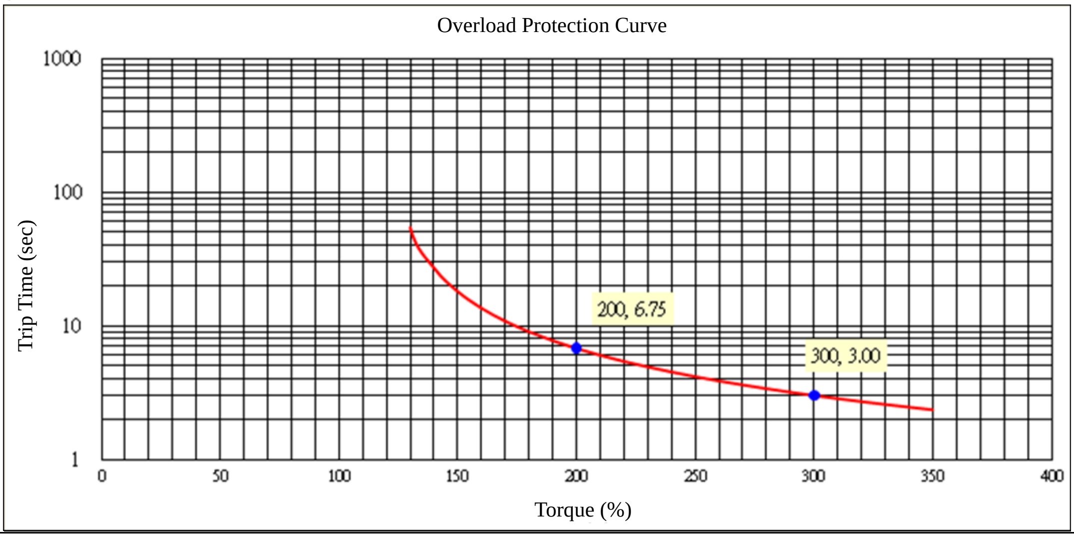
Error Alarm Number	Error Alarm Description	CiA402 Error Code	Alarm Clearing Method
AL000	No Alarm Currently	0x0000	—
AL001	Power Supply Voltage Too Low	0x3220-04-0001	Switch Reset
AL002	Power Supply Voltage Too High	0x3210-04-0002	Switch Reset
AL003	Motor Overload	0x3230-02-0003	Switch Reset
AL004	Driver Over Current	0x2310-02-0004	Power Re-set
AL005	Encoder Signal Error	0x7305-01-0005	Power Re-set
AL006	Encoder Phase UVW Signal Error	0x7305-01-0006	Power Re-set

Error Alarm Number	Error Alarm Description	CiA402 Error Code	Alarm Clearing Method
AL007	Multi-function Contact Planning Error	0x5441-01-0007	Power Re-set
AL008	Parameter Data Read/Write Error	0x5500-01-0008	Switch Reset
AL009	Emergency Stop Operates	0x5442-01-0009	Switch Reset
AL010	Absolute Type Encoder Battery Warning	0x7305-01-0010	Switch Reset
AL011	Excessive Position Error	0x8611-01-0011	Switch Reset
AL012	Motor Over Speed	0x8400-01-0012	Switch Reset
AL013	Motor Model Number Error	0x6320-01-0013	Power Re-set
AL014	Drive Prohibit Error	0x5443-01-0014	Switch Reset
AL015	Driver Overheat	0x4210-08-0015	Switch Reset
AL016	Absolute Type Encoder Number of Revolution Error	0x7305-01-0016	Switch Reset
AL017	MCU Error1	0x6100-80-0017	Power Re-set
AL018	MCU Error2	0x6100-80-0018	Power Re-set
AL019	MCU Error3	0x6100-80-0019	Power Re-set
AL020	Auto tune Motor Wire Disconnection Error	0xff03-80-0020	Power Re-set
AL021	Communication Type Encoder Internal Error	0x7305-01-0021	Power Re-set
AL025	200V/400 Switching Error	0x6320-01-0025	Power Re-set
AL028	Self-build Motor Parameter Error	0x5220-01-0028	Power Re-set
AL030	Modbus Communication Timeout Error	0x7510-01-0030	Switch Reset
AL033	Driver Chip Error	0x5220-01-0033	Power Re-set
AL034	Excessive Dividing Frequency	0x5444-01-0034	Switch Reset
AL035	Auto tuning Error	0x6100-01-0035	Switch Reset
AL037	Regenerative Error	0xff04-20-0037	Switch Reset
AL038	Hardware Charge Circuit Error	0xff05-20-0038	Power Re-set
AL041	Control Mode Selection Error	0x6320-80-0041	Power Re-set
AL042	Dividing Setting Error	0x6320-80-0042	Power Re-set
AL044	Internal Position S Curve Setting Error	0x6320-80-0044	Switch Reset
AL045	Communication Type Encoder Model Error	0x7305-80-0045	Power Re-set
AL046	Encoder Feedback Value Error	0xff05-80-0046	Power Re-set
AL050	Absolute Type Encoder Position Error	0x7305-80-0050	Switch Reset

9-3 Countermeasures to Clear Error

AL001	**Power Supply Voltage Too Low**	**Cia402 Error Code**	**0x3220-04-0001**
Alarm Cause	The Power Supply Voltage is lower than the setting of Cn051 and is higher than the Time set by Cn052.		
Check and Handling	Use an Electric Meter to measure the external power supply voltage and verify that the input voltage meets the specifications. If cannot resolved after the Cn051 and Cn052 are adjusted, the internal components of the Driver may be malfunction. ※This message usually occurs when the power is fed to the Driver.		
Alarm Clearing Method	Switch Reset		

AL002	**Power Supply Voltage Too High**	**Cia402 Error Code**	**0x3210-04-0002**
Alarm Cause	The Power Supply Voltage is higher than 410/820V (200/400V).		
Check and Handling	1. Please use an Electric Meter to measure the external power supply voltage and verify that the input voltage meets the specifications. 2. This message is generated during the operation: Extend the Acceleration / Deceleration Time or reduce the Load Inertia within the permitted range. Otherwise need to add Regenerative Resistors. (please contact Dealer or Manufacturer)		
Alarm Clearing Method	Switch Reset		

<table>
<tr><td>AL003</td><td>Motor Overload</td><td>Cia402 Error Code</td><td>0x3230-02-0003</td></tr>
<tr><td>Alarm Cause</td><td colspan="3">If continuing to use the Driver more than the Rated Load, this Error Alarm will be generated, please refer to the Overload Protection Curve.

</td></tr>
<tr><td>Check and Handling</td><td colspan="3">1. Check if the Motor Terminal wiring (U, V, W) and Encoder wiring is normal.
2. Adjust the Driver Gain since improper Gain Adjustment will cause Motor to resonate and result in excessive current to cause Motor Overload.
3. Extend the Acceleration / Deceleration Time or reduce the Load Inertia within the permitted range.
※This message usually occurs during operation, if the Error Alarm occurs within when short period time of operation, please check item No. 1.</td></tr>
<tr><td>Alarm Clearing Method</td><td colspan="3">Switch Reset</td></tr>
<tr><td>AL004</td><td>Driver Over Current</td><td>Cia402 Error Code</td><td>0x2310-02-0004</td></tr>
<tr><td>Alarm Cause</td><td colspan="3">The main circuit current of the Driver exceeds the protection range, and the Power Transistor generates Error Alarm directly.</td></tr>
<tr><td>Check and Handling</td><td colspan="3">1. Check if the Motor Terminal wiring (U, V, W) and Encoder wiring is normal, and please connect to the external power supply in accordance with Chapter 2 Motor and Power Supply Standard Wiring Diagram.
2. Please turn off the power first and reconnect the power 30 minutes later, if the Error Alarm still exists, it may be caused by the Driver's Internal Power Transistor Component failure or noise interference.</td></tr>
<tr><td>Alarm Clearing Method</td><td colspan="3">Power Re-set</td></tr>
</table>

AL005	Encoder Signal Error	Cia402 Error Code	0x7305-01-0005
Alarm Cause	Motor Encoder malfunction or poor connection of Encoder power line.		
Check and Handling	1. Check if the Motor Encoder wiring is connected to the Driver. 2. Check if the Encoder Connector is short-circuited, cold-welded or has fallen out.		
Alarm Clearing Method	Power Re-set		

AL006	Encoder Phase UVW Signal Error	Cia402 Error Code	0x7305-01-0006
Alarm Cause	Motor Encoder malfunction or poor connection of Encoder power line.		
Check and Handling	1. Check if the Motor Encoder wiring is connected to the Driver. 2. Check if the Encoder Connector is short-circuited, cold-welded or has fallen out. 3. Check if the Encoder Signal Terminal CN2-4 and CN2-5 (Encoder Power Supply 5V) are normal.		
Alarm Clearing Method	Power Re-set		

AL007	Multi-function Contact Planning Error	Cia402 Error Code	0x5441-01-0007
Alarm Cause	Input Output Contact Function Planning Error.		
Check and Handling	1. Check whether or not the Input Contact Function Planning of Parameters Hn601~Hn612 are matched: DI-1~DI-12 pin function can be repeated, but the pin action electrical potential of repeated function must be the same. 2. Check whether or not the Output Contact Function Planning of Parameters Hn613~Hn616 are matched: DO-1~DO-4 pin function cannot be repeated.		
Alarm Clearing Method	Power Re-set		

AL008	Parameter Data Read/Write Error	Cia402 Error Code	0x5500-01-0008
Alarm Cause	An Error occurred when Writing the Parameter.		
Check and Handling	1. In normal operations, indicating Write Error of the Parameter Data, please Write the Parameter again. 2. Remove all connectors, when the Alarm still occurs when the power is turned on, it is necessary to replace the Driver.		
Alarm Clearing Method	Switch Reset		

AL009	Emergency Stop Operates	Cia402 Error Code	0x5442-01-0009
Alarm Cause	This Error Alarm is generated when Input Contact EMC operates ※As far as it is High Electric Potential Operation or Low Electric Potential Operation, please check the Hn parameter setting.		
Check and Handling	1. Release the Input Contact EMC operation. 2. Caused by noise interference internal to the Driver, please connect External Power Supply and Signal Wire in accordance with Chapter 2 Motor and Power Supply Standard Wiring Diagram and Control signal Standard Wiring Diagram.		
Alarm Clearing Method	Switch Reset		

AL010	Absolute Type Encoder Battery Warning	Cia402 Error Code	0x7305-01-0010
Alarm Cause	The battery module voltage is lower than 2.75V.		
Check and Handling	1. When this Error Alarm occurs, the Driver can continue to operate. 2. Encoder battery low voltage, please replace the battery.		
Alarm Clearing Method	Switch Reset		

AL011	**Excessive Position Error**	**Cia402 Error Code**	**0x8611-01-0011**
Alarm Cause	The difference between the Pulse Command and the Encoder Feedback Pulse exceeds the setting of Pn308 or Pn309.		
Check and Handling	1. Increase the setting of Position Loop Gain (Pn310 and Pn311) 2. Increase the setting of the Position Loop Feed Forward Gain (Pn312) to speed up the Motor Reaction Speed. 3. Extend the Acceleration / Deceleration Time or reduce the Load Inertia within the permitted range. 4. Check whether the Motor Wiring (U, V, W) is connected properly.		
Alarm Clearing Method	Switch Reset		

AL012	**Motor Over Speed**	**Cia402 Error Code**	**0x8400-01-0012**
Alarm Cause	The detected Motor Speed is abnormally too high.		
Check and Handling	1. Reduce the Input Command Speed 2. Improper setting of the Electronic Gear Ratio, please check the related setting of the Electronic Gear Ratio. 3. Adjust the Speed Loop Gain (Sn211 and Sn213) appropriately to speed up the Motor Reaction Speed.		
Alarm Clearing Method	Switch Reset		

AL013	**Motor Model Number Error**	**Cia402 Error Code**	**0x6320-01-0013**
Alarm Cause	Motor Model Number Setting Error or Automatic Identification Function Error.		
Check and Handling	Please check Cn030 to determine if the Motor Model Number Setting is correct		
Alarm Clearing Method	Power Re-set		

AL014	Drive Prohibit Error	Cia402 Error Code	0x5443-01-0014
Alarm Cause	This Error Alarm is generated when the Input Contacts CCWL and CWL operate simultaneously. ※As far as it is High Electric Potential Operation or Low Electric Potential Operation, please check the Hn parameter setting.		
Check and Handling	1. Set Cn002.1 to release the Input Contact CCWL or CWL operation. 2. Caused by noise interference internal to the Driver, please connect External Power Supply and Signal Wire in accordance with Chapter 2 Motor and Power Supply Standard Wiring Diagram and Control signal Standard Wiring Diagram.		
Alarm Clearing Method	Switch Reset		

AL015	Driver Overheat	Cia402 Error Code	0x4210-08-0015
Alarm Cause	Detected the Power Transistor Temperature exceeded the Temperature Resistance of the Component.		
Check and Handling	Repeated overloading will cause the Driver to overheat, please correct the operating mode.		
Alarm Clearing Method	Switch Reset		

AL016	Absolute Type Encoder Number of Revolution Error	Cia402 Error Code	0x7305-01-0016
Alarm Cause	The Battery Module removal or the Battery Voltage is less than 3.1V.		
Check and Handling	After replacing the battery, it is necessary to clear the Encoder number of revolutions with Cn041=2.		
Alarm Clearing Method	Switch Reset		

AL017	MCU Error 1	Cia402 Error Code	0x6100-80-0017
Alarm Cause	System Operating Error Self Checking Error during System Operations.		
Check and Handling	Please contact Dealer or Manufacturer		
Alarm Clearing Method	Power Re-set		

AL018	MCU Error 2	Cia402 Error Code	0x6100-80-0018
Alarm Cause	System Operating Error Self Checking Error during System Operations.		
Check and Handling	Please contact Dealer or Manufacturer		
Alarm Clearing Method	Power Re-set		

AL019	MCU Error 3	Cia402 Error Code	0x6100-80-0019
Alarm Cause	CPU Software and FPGA Software Version Compatibility Error		
Check and Handling	Please contact Dealer or Manufacturer		
Alarm Clearing Method	Power Re-set		

AL020	Auto tune Motor Wire Disconnection Error	Cia402 Error Code	0xff03-80-0020
Alarm Cause	Motor UVW Power Line Disconnection Error		
Check and Handling	Check the Motor Terminal Wiring (U, V, W) is Normal, and please follow Chapter 2 Motor Standard Wiring Diagram.		
Alarm Clearing Method	Power Re-set		

AL021	**Communication Type Encoder Internal Error**	**Cia402 Error Code**	**0x7305-01-0021**
Alarm Cause	Communication Type Encoder Internal Error		
Check and Handling	Clear the Communication Type Encoder Internal Error by Cn041=1, if recurring after the power is turned off, this indicates that the Encoder is malfunctioning and needs to replace the Motor Encoder. (please contact Dealer or Manufacturer)		
Alarm Clearing Method	Power Re-set		

AL025	**200V/400 Switching Error**	**Cia402 Error Code**	**0x6320-01-0025**
Alarm Cause	Motor Model Number Setting Error or Automatic Identification Function Error.		
Check and Handling	1. Please select the appropriate Driver. 2. Please set correct Cn030.		
Alarm Clearing Method	Power Re-set		

AL028	**Self-build Motor Parameter Error**	**Cia402 Error Code**	**0x5220-01-0028**
Alarm Cause	Motor Model Number Setting Error.		
Check and Handling	Set the self-built Motor Parameters to the appropriate values.		
Alarm Clearing Method	Power Re-set		

AL030	**Modbus Communication Timeout Error**	**Cia402 Error Code**	**0x7510-01-0030**
Alarm Cause	The Modbus Communication Timeout exceeded the set value of Cn039.		
Check and Handling	1. Check if the setting time of Cn039 is too short. 2. Check if the Communication Status is abnormal.		
Alarm Clearing Method	Switch Reset		

AL033	Driver Chip Error	Cia402 Error Code	0x5220-01-0033
Alarm Cause	Driver Chip Error		
Check and Handling	The Alarm still occurs after power is re-connected, the Driver needs to be replaced. (please contact Dealer or Manufacturer)		
Alarm Clearing Method	Re-set		

AL034	Excessive Dividing Frequency	Cia402 Error Code	0x5444-01-0034
Alarm Cause	Dividing Output Frequency is higher than 3.2MHz, please refer to Cn005 Setting for details.		
Check and Handling	Confirm that the Cn005 Encoder Signal Dividing Output Setting Value and the required operating speed are correct.		
Alarm Clearing Method	Switch Reset		

AL035	Auto tuning Error	Cia402 Error Code	0x6100-01-0035
Alarm Cause	The abnormality caused by system cannot converge in the Auto tuning process.		
Check and Handling	The System generates Vibration Resonance or Acoustic Resonance. Adjust the Cn026 system rigidity down until it does not generate vibration, or execute PC-link mechanical analysis to observe whether or not the system has resonance and perform suppression.		
Alarm Clearing Method	Switch Reset		

AL037	Regenerative Error	Cia402 Error Code	0xff04-20-0037
Alarm Cause	The Regenerative Voltage is too high.		
Check and Handling	Confirm whether or not the Parameter Cn012 is set according to regulations.		
Alarm Clearing Method	Switch Reset		

AL038	Hardware Charge Circuit Error	Cia402 Error Code	0xff05-20-0038
Alarm Cause	Hardware Charging Circuit Error.		
Check and Handling	This Alarm still generated after power is disconnected, please replace the Driver. (please contact Dealer or Manufacturer)		
Alarm Clearing Method	Power Re-set		

AL041	Control Mode Selection Error	Cia402 Error Code	0x6320-80-0041
Alarm Cause	The Driver does not support part of the Control Mode.		
Check and Handling	Set correct Cn001 Control Mode. ※E2 Cn001 does not have 9, b and c Mode		
Alarm Clearing Method	Power Re-set		

AL042	Dividing Setting Error	Cia402 Error Code	0x6320-80-0042
Alarm Cause	Dividing Setting Error		
Check and Handling	Please refer to Cn005 Setting Description.		
Alarm Clearing Method	Power Re-set		

AL044	Internal Position S Curve Setting Error	Cia402 Error Code	0x6320-80-0044
Alarm Cause	Parameter Setting Error.		
Check and Handling	Please refer to Pn322 Setting Description for details.		
Alarm Clearing Method	Switch Reset		

AL045	Communication Type Encoder Model Error	Cia402 Error Code	0x7305-80-0045
Alarm Cause	Motor Model Number Setting Error or Automatic Identification Function Error.		
Check and Handling	Confirm if the Cn030 motor model and the Encoder match is correct.		
Alarm Clearing Method	Power Re-set		

AL046	Encoder Feedback Value Error	Cia402 Error Code	0xff05-80-0046
Alarm Cause	Encoder Speed Error is too High.		
Check and Handling	The Alarm still occurs after power is re-connected for operations, need to confirm if the Encoder is damaged. (please contact Dealer or Manufacturer)		
Alarm Clearing Method	Power Re-set		

AL050	Absolute Type Encoder Position Error	Cia402 Error Code	0x7305-80-0050
Alarm Cause	Absolute Type Encoder Position Error.		
Check and Handling	The Alarm still occurs after power is re-connected, need to confirm if the Encoder is damaged. (please contact Dealer or Manufacturer)		
Alarm Clearing Method	Power Re-set		

Error Alarm Clearing Method Description:

1. Switch Re-set: Can use the following two methods to clear Error Alarms:
   - (a) Input Contact Reset: After Error is resolved, release Input Contact **SON** operation first (that is to release the Motor Excitation State), then enable the Input Contact **ALRS** operation can clear the Error Alarm to allow the Driver to return to normal operations. As far as the Input Contact is High Potential Operation or Low Electric Potential Operation, please set in reference to【**5-5-1** Input / Output Contact Function Planning】.
   - (b) Key Re-set: After Error is resolved, release Input Contact **SON** operations first (that is to release the Motor Excitation State), then pressing ▲ and ▼ keys at the same time can clear the Error Alarm to allow the Driver to return to normal operations.
2. Power Re-set: After Error is resolved, it is necessary to **Re-start** (Re-start Power after turning off power), in order to clear the Error Alarm to allow the Driver to return to normal operations. **It is highly recommended to use Power Re-set to clear the Error Alarm. It is better to release the Input Contact SON operations (that is, release the Motor Excitation State).**

Attention
Before clearing the Error Alarm, it is necessary to make sure that the controller did not issue Commands to the Driver to avoid causing sudden unintended acceleration of the Motor

Chap 10 Comprehensive Specifications

10-1 Servo Driver Detail Specifications

Servo Driver Model JSDE2-□□□□		200V Class					
		10A	15A	20A	30A	50A3	75A3
Basic Specifications	Servo Motor Maximum Capacity [KW]	0.1	0.4	0.75	1.0	2.0	3.0
	Continuous Output Current [A rms]	0.94	2.5	4.4	5.16	9.5	15.0
	Maximum Output Current [A rms]	2.82	7.5	13.2	15.5	28.5	42.0
	Main Circuit R, S, T	Single-phase or Three-phase AC 200 ~ 230V, -15~+10%				Three-phase AC 200 ~ 230V, -15~+10%	
	Cooling Method	Natural Cooling	Fan Cooling				
	Control Method	Three-phase Full-wave Rectification IGBT PWM Control (Sine Wave Current Drive Method)					
	Encoder Resolution	Communication Type Encoder: 17 bit(INC/ABS) / 23 bit(INC/ABS)					
Internal Features	Display and Operations	CHARGE Indicator; five-digit seven-segment display; four function keys					
	Control Mode	Position (External Pulse Command), Position (Internal Position Command), Speed, Torque and Dual Mode Switching (Position/Speed, Speed/Torque, Position/Torque)					
	Regenerative Brake	Built-in Brake Transistor / capable of connecting Brake Resistor					
	Dynamic Brake	Built-in Dynamic Brake; Operates when Power-off, Servo-off, Drive Prohibit and Abnormality occurred.					
	Protection	Various error alarms					
	Communication Interface	USB / RS-485					

Servo Driver Model JSDE2-□□□□			200V Class
Position Control Mode	Command Control Method		External Instruction Pulse Command / 32 Sets Internal Register Command
	External Command Pulse Input	Type	Positive and Negative Edge Trigger: Direction + Pulse, CCW Pulse + CW Pulse, Phase Differential Pulse (Phase A + Phase B)
		Waveform	Line Driver (+5V Level), Open Collector (+5 ~ +24V Level)
		Maximum Frequency	4Mpps(Line Driver) / 200Kpps(Open Collector)
	Electronic Gear Ratio		1 / 1000≦A / B≦131072（A = 1 ~ 8388608；B = 1 ~ 8388608）
	Command Smoothing Method		Smoothing Time Constant: 0 ~ 10sec
	Positioning Completion Judgment		0 ~ 41943040 Pulse
	Feedforward Gain Compensation		0 ~ 100 %
	Origin Return Function		Internal Parameter Setting
Speed Control Mode	Command Control Method		External Analog Command / Three Stage Internal Speed Command
	External Analog Command	Voltage Range	0 ~ ±10Vdc
		Input Impedance	10KΩ
	Speed Control Range		1: 5000 (Internal Speed Command / 1: 2000 (External Analog Command)
	Speed Fluctuation		Load Fluctuation: 0-100%±0.03% or less (at rated speed)
			Voltage Fluctuation: ±10% fluctuation ±0.2% or less (at rated speed)
			Temperature Fluctuation: 0-50^{0}C %±0.5% or less (at rated speed)
	Command Smoothing Method		Linear Time Constant: 0-50 seconds; S-shape Time Constant: 0-5 seconds; Smoothing Time Constant: 0-10 seconds
	Torque Limit		External Analog Command / Internal Parameter Setting
	Zero Speed Determination / Speed Reached Determination		0-4500rpm (internal parameter setting)
Torque Control Mode	Command Control Method		External Analog Command
	External Analog Command	Voltage Range	0 ~ ±10Vdc
		Input Impedance	10KΩ
	Command Smoothing Method		Linear Time Constant: 0 ~ 50sec; Smoothing Time Constant: 0 ~ 10sec
	Speed Limit		External Analog Command / Internal Parameter Setting
	Torque Arrival Judgment		0 ~ 300% (Internal Parameter Setting)

<table>
<tr><th colspan="3">Servo Driver Model
JSDE2-□□□□-</th><th>200V Class</th></tr>
<tr><td rowspan="6">Input / Output Signal</td><td rowspan="2">Position Output</td><td>Output Type</td><td>Phase A, B, Z Linear Drive Output / Phase Z Open Collector Output</td></tr>
<tr><td>Division Ratio</td><td>Pulse Output 1 ~ Encoder One Revolution Number of Pulses (Internal Parameter Arbitrary Value Setting)</td></tr>
<tr><td>Digital input [NPN/PNP]</td><td>8 points can be planned arbitrarily</td><td>Servo start, error alarm clear, P/PI switching, CCW/CW direction drive prohibition, external torque limit, pulse error removal, servo lock, emergency stop, internal speed command selection, control mode switching, position command prohibition, gain switching, electronic gear ratio numerator selection, internal position command trigger, internal position command pause, start to return to origin, external reference origin, internal position command selection, virtual contact digit input, etc.</td></tr>
<tr><td rowspan="2">Digital output [NPN/PNP]</td><td>2 Points Fixed Output</td><td>The fixed output contact function varies under different circumstances as described below.
【No Alarm】: Torque in Limit / P in Operation
【Alarm Occurred】: Error Alarm Code 0 / Error Alarm Code 1</td></tr>
<tr><td>4 points can be planned arbitrarily</td><td>Servo Ready, Servo Error, Zero Speed Signal, Mechanical Brake Signal, Speed Reached Signal, Positioning Completion Signal, Return to Origin Completion Signal, Torque Reached Output Completion Signal, Tool Magazine Mode Selection Tool Position Display, Motor Overload Signal, Encoder Battery Abnormality Signal, Positive and Negative Limit Signal, Virtual Point Digital Output, etc...</td></tr>
<tr></tr>
<tr><td rowspan="6">Environment</td><td colspan="2" rowspan="2">Location</td><td>Indoors (avoid direct sunlight)</td></tr>
<tr><td>Non-corrosive Mist (avoid fumes, flammable gases and dust)</td></tr>
<tr><td colspan="2">Altitude</td><td>Up to 1000M</td></tr>
<tr><td colspan="2">Temperature</td><td>Operating Temperature: 0 ~ 50℃;
Storage Temperature: -20 ~ +85℃</td></tr>
<tr><td colspan="2">Humidity</td><td>Up to 95%RH (non-condensing)</td></tr>
<tr><td colspan="2">Vibration</td><td>10 ~ 57Hz：$20m/s^2$；57 ~ 150Hz：2G</td></tr>
<tr><td colspan="2" rowspan="2">Safety Certification</td><td>CE Declaration</td><td>In compliance with EN61800-3 and EN61800-5-1</td></tr>
<tr><td>UL Certification</td><td>UL508C</td></tr>
</table>

10-2 Battery Module Specification

Cooperating with the Absolute Encoder requirements, the JSDE2 Series added Battery option modules. The battery modules are mainly divided into two parts: the battery and the mounting housing. Details are as follows.

Battery Specification

Labeled Capacity:2400mAh

Labeled Voltage:3.6V

Operating Temperature Range: -40~85℃

Maximum Continuous Discharge Current: 100 mA

Reference Weight: Approximately 19.0g

Appendix A Battery Module

In Cooperation with the Absolute Encoder Requirements, optional battery module is added for the JSDAP Series, the Battery Module is mainly divided into two parts of Battery and mounting shell with detailed description as follows.

Battery Specification

Labeled Capacity: 2400mAh

Labeled Voltage: 3.6V

Operating Temperature Range: -40~85℃

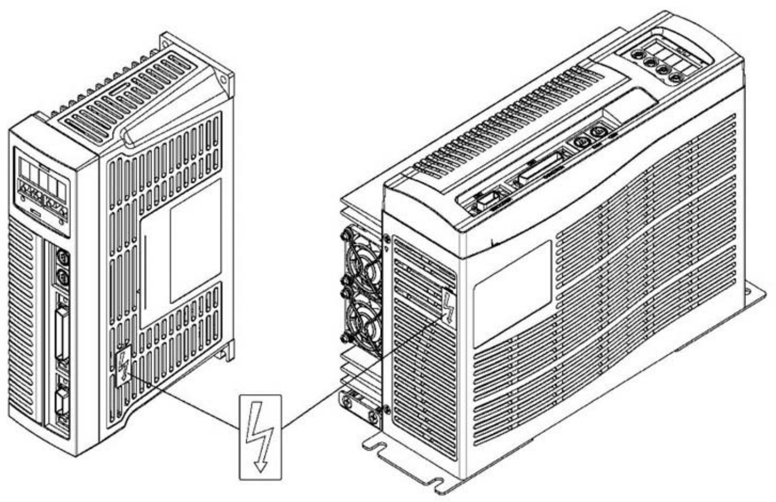
Maximum Continuous Discharge Current: 100 mA

Reference Weight: Approximately 19.0g

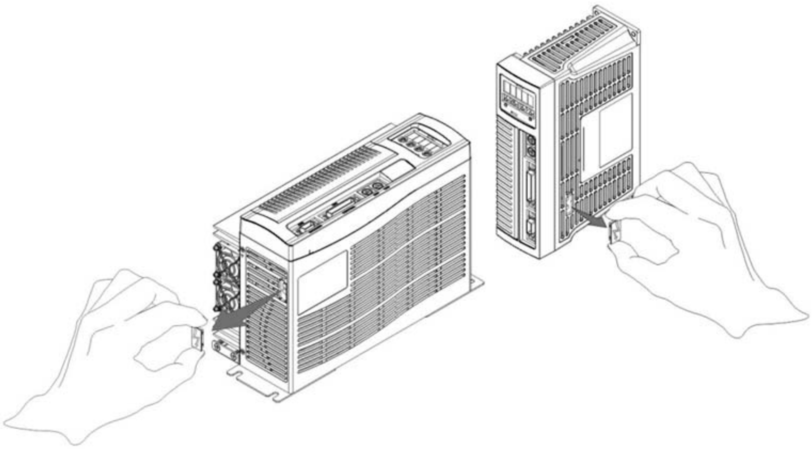
Installation Method

When the User receives the Battery Module, the battery and the mounting shell are already installed. Please refer to the following description for the detailed installation procedure.

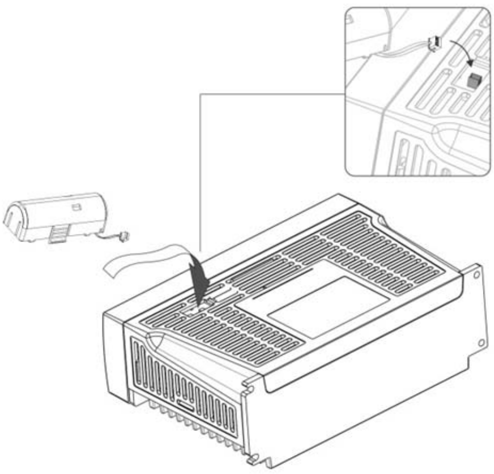
1. The Driver has a black lightning symbol protective cap, as labeled with the circle.



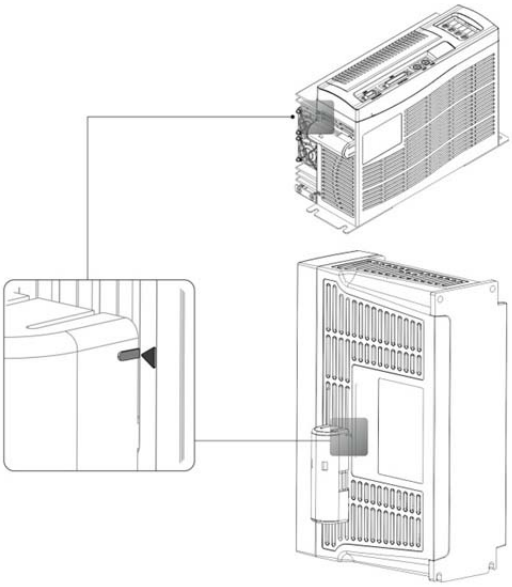
2. Remove the protective cap.

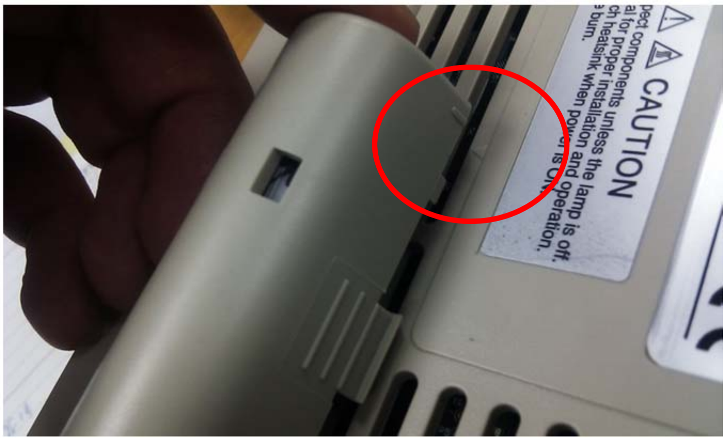


3. After removing the protective cover, there are two connectors available, select one of them and refer to the attached Battery Module Instructions to connect the battery connector and the other connector is reserved for battery replacement. The new battery can be connected first, then remove the old battery to avoid power interruption.



4. When the Battery Module is installed, there is an arrow label on the side of the Driver, align it to the Battery Module label as shown in the Figure.





5. After the labels are aligned, connect the latch to complete the Battery Module installation.