VPS Series AC Servo Driver NCR - DCA0

Instruction Manual

Ver. 3.0



Preface

Thank you for adopting our 1 axis synchronous type AC servo driver <VPS series> (hereinafter, referred to as "device" or "this device").

This device is the AC servo driver that executes high speed / high precision servo control in combination with synchronous AC servo motor having features like compactness / high response / high power rate.

The system comprising this device and AC servo motor, can be used as a driving power supply for various machines.

This instruction manual (hereafter, referred to as "this manual") explains installation, wiring, operation, trouble diagnosis and troubleshooting etc. of this device.

In order to use this device properly, please deeply understand the contents of this manual.

At the time of installation, wiring, operation, maintenance, etc., please comply with the conditions and procedures of this manual.

Further, if special version unit is applied, please use both of this manual and specifications of the special version unit.

(Specifications are prior to this manual regarding the described details.)

This instruction manual corresponds to the model for which following items are displayed in status display mode of data display LED.

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L [] [] (Model number) : " [] ."
L [] [] Y (Software version): " [] ."
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[Other manuals]

The instruction manuals other than this manual related to this device are as follows.

- ① Options volume (Option list of cables, terminal block, regenerative resistor, etc.)
- 2 Communication volume (Description of communication connection, procedure, and data)

[Warranty period]

Warranty period of our products is 1 year after shipment from our factory.

However, please note that any failure or abnormality resulting from the following causes is not covered by the warranty.

- 1 Modification by parties other than NIKKI DENSO.
- 2 Operation different from rules and regulations.
- 3 Natural disaster or act of gods.
- 4 Connection with another maker's unit which is not approved by us.

During the warranty period, please inform our sales representative whenever you find any failure or abnormality.

[Check items]

1. Receiving check of our products

Please check the following points when you receive our products.

- (1) If the products are exactly the ones you ordered (type, rated output, accessories, etc.)
- (2) If any damage was made during transportation (package damage, abnormal appearance of the products)
- (3) If accessories are packed together

* If packages as carton boxes are broken, please do not unpack them and inform our sales representative.

And if a problem with any of the above points, damage, or the like is found, please immediately contact our sales representative.

2. Precautions before installation (during transportation)

When transporting a device and a motor, please handle with care so as not to damage them.

× Cautions

Be careful not only to pile device but also putting anything on the device cover.

Be careful not to add shock to a motor shaft.

→ It may damage an encoder attached to the motor.

Do not move a motor by pulling its cable.

→ It may cause cable disconnection.

3. Cautions for storage

If our products are not used immediately after receiving, store them under the following conditions in order to prevent deterioration of insulation and rust formation. However, unpack the packages soon after receiving, and check any damage and other non-conformances incurred during transportation.

Item		Description
	Temperature	-20°C to +60°C
Ambient	Humidity	85% or less (non-condensing)
conditions	Storage location	Store in a clean place free from dust and dirt. Do not store in harmful atmosphere such as corrosive gas, grinding powder, metal powder, oil, etc.
Vibration		Store in a place free from vibration.
Others		If you store the product for long time, please make rust prevention to screws of terminal blocks and inspect them periodically. Rust prevention effective period is within 3 months after the shipment from our factory under the above described ambient conditions. If you store the product for longer than 3 months, please make rust prevention to a motor shaft and flange face and inspect them periodically.

Storage conditions of a device and a motor

4. Precaution of transportation

If you transport our product after receiving, please satisfy following conditions.

Item		Description		
	Temperature	-20°C to +60°C		
Ambient	Humidity	35% or less (non-condensing)		
conditions	Storage	Do not transport in a harmful atmosphere such as corrosive gas,		
	location	grinding powder, metal powder, oil, etc.		
Vibration		0.5G or less (Device, motor)		

Transporting conditions of a device and a motor

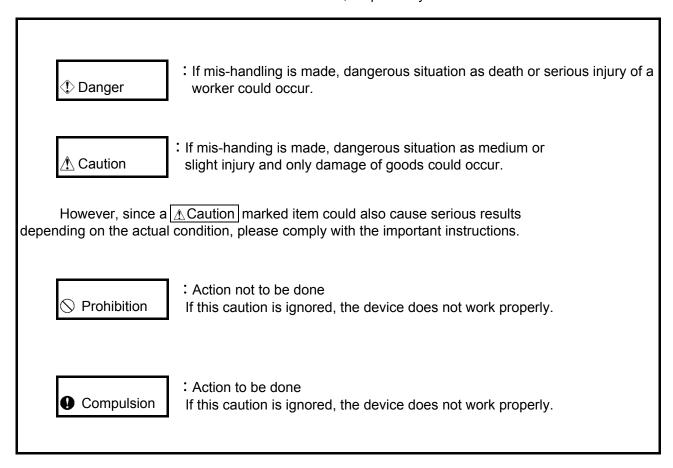
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Cautions for Safety

Before executing the installation / operations / maintenance / inspection, always read this manual and all the attached documents carefully. Use this device only after getting the proper knowledge of this device and understanding the safety information and precautions.

In this manual cautions for safety are ranked as "Danger" and "Caution". And cautions for handling are divided into "Prohibition" and "Compulsion" which are defined as an action not to be done and action to be done, respectively.



Danger

- ☆Since electric shock and injury may occur, please be sure to comply with the following suggestions.
 - ① Never touch inside of this device (AC servo driver) and terminal blocks.
 - · "Electric shock may occur."
 - 2 Be sure to make grounding of an earth terminal or earth cable of this device (AC servo driver) and a motor.

Use larger earth cables as much as possible for JIS Class 3 or better grounding.

- · "Electric shock may occur."
- 3 Execute shifting, wiring, maintenance, and inspection of the device at least after 3 minutes of switching the power off.
 - Since the voltage remains in power section for about 2 to 3 minutes even after switching the power off, do not touch the device carelessly.
 - · "Electric shock may occur."
- 4 Do not damage, force cables excessively, put any heavy thing on cables or nip cables.
 - · "Electric shock may occur."
- 5 Never touch the rotating section of running motor.
 - · "Injury may occur."

- ① Use the motor and this device (AC servo driver) in the specified combination.
 - · "Fire or failure may occur."
- 2 Never use the device in the atmosphere such as water splash, corrosive or flammable gas nor place close to combustible goods.
 - · "Fire or failure may occur."
- 3 Since temperature of a motor, this device (AC servo driver) and peripherals raises quite high, do not touch them.
 - · "Burn may occur."
- 4 In supplying power or for a while after shutting power off, since a radiator, regenerative unit, a motor, etc. could be very hot, do not touch them.
 - · "Burn may occur."
- 5 Never conduct voltage withstanding test and mega test of this device.
 - · "Fire or failure may occur."

[Receiving and checking of packages]

- ① When you receive ordered units, please check the contents (model, output rating, etc.). If wrong thing is found or quantity is wrong, please do not use them and inform the status to our sales representative.
 - · "Electric shock, injury, damage, fire or failure may occur."
- ② If packages of our products are broken, do not unpack them and inform our sales representative.
 - · "Electric shock, injury, damage, fire or failure may occur."

[Storage]

○ Prohibition

① Do not store units in a place of raining, water dripping, and harmful gas / liquid.

• Compulsion

- ① Store units in a place of no direct sun-shine or under controlled temperature / humidity within the specified range.
- ② If the device is stored for longer period, contact our Purchase branch office or Contact counter mentioned in this manual.

[Transportation]

- ① Do not hold a cable and a motor shaft during transporting units.
 - "Injury or failure may occur."
- ② During transportation, handle the device or motor etc. carefully, such that it will not fall down causing damage to the device.
 - "Injury or failure may occur."

Compulsion

① Piling up or overloading the products can induce collapse of cargo; thus, follow instructions.

Caution

- ① Do not climb or put any heavy thing on this device.
 - ·"Injury or failure may occur."
- 2 Prevent foreign particles from entering the device.
 - "Fire may occur."
- 3 Be sure to install this device to the specified direction.
 - ·"Fire or failure may occur."
- 4 Internal side of the control panel or other equipment should be kept at a specific distance from this device.
 - ·"Fire or failure may occur."
- 5 Never apply heavy shock.
 - •"Equipment may be damaged."
- 6 Conduct proper attachment suitable for output or weight of this device.
 - •"Equipment may be damaged."
- Attach this device to a non-flammable thing as metal.
 - ·"Fire may occur."

[Wiring]

- 1) Be sure to conduct correct wiring.
 - "Running away or burning of a motor, injury, fire or failure may occur."
- 2 Never connect the power source to the terminal block (U, V, W) of motor connection of the device
 - •"Running away or burning of a motor, injury, fire or failure may occur."
- 3 To avoid the impact of noise on this device, use cables having specified length and specified features (shielded, twisted, etc.).
 - "Running away of a motor, injury or machine damage may occur."
- 4 To prevent this device from noise influence, use separate control I/O cables of this device (AC servo driver) from other power lines.
 - •"Running away of a motor, injury or machine damage may occur."
- ⑤ To avoid electric shock and noise influence, be sure to make proper grounding (earth).
 - •"Running away of a motor, electric shock, injury or machine damage may occur."

Compulsion

1) Power supply should be within the specified range.

·"Injury, fire or failure may occur."

[Operation and Run]

- Motor does not have protector. Protect using the over current protector / earth leakage circuit breaker / over temperature protector / emergency stop device.
 "Injury or fire may occur."
- 2 Power supply should be within the specified range."Injury, fire or machine damage may occur."
- 3 Before conduct test run, separate a motor from its machine system and fix it to an adequate place and confirm the motion, then connect the motor to the machine.
 "Injury or machine damage may occur."
- Since the holding brake of the machine is only for holding the machine position, do not use it as an actual braking device for securing the safety of the machine.
 "Injury or machine damage may occur."
- Since excess adjustment may make the operation unstable, avoid this situation.
 "Injury or machine damage may occur."
- When an alarm occurs, be sure to eliminate the cause, reset the alarm and then restart.
 "Injury or machine damage may occur."
- When power recovers from temporary blackout status, since sudden re-start may occur, do not approach the machine. (Machine system design shall be considered to maintain safety of workers against re-start.)
 "Injury may occur."
- ® Do not apply static electricity while operating the operation key on the panel. (The operator should set the earthing and should operate the operation key when there is no static charge)
 - "Failure may occur."

[Operation and Run]

○ Prohibition

- ① Do not supply power with the motor shaft turning or vibrating.
 - "Running away of a motor, injury or machine damage may occur."
- ② Since the brake on a motor is for maintenance purpose, do not use it as normal brake.
 - •"Injury or machine damage may occur."

• Compulsion

① Set emergency stop circuit outside in order to stop the operations immediately and stop the power supply.

[Maintenance and inspection]

- ① Capacity of capacitors in the power supply line becomes lower due to deterioration. To prevent secondary damage caused by failures, we recommend to replace capacitors about every 5 years.
 - · "Failure may occur."
- 2 Capacity of aluminum electrolytic capacitors on the printed circuit board becomes lower due to deterioration.
 - To prevent secondary damage caused by failures, we recommend to replace the printed circuit board about every 5 years.
 - · "Failure may occur."
- 3 Cooling efficiency of an internal cooling fan motor of this device will deteriorate as time goes by.
 - To prevent secondary damage caused by failures, we recommend replacing them about every 2 to 3 years.
 - "Failure may occur."

① Overhaul / repair shall be conducted only by us or personnel designated by us.

Chapter	1 Outline	
1-1	Configuration 1-1-1 Servo Motor Driving System Configuration······	1-1
	1-1-2 Names and functions of each part of the device······	1-2
	1-1-3 Mode Configuration······	1-3
•	2 Installation	
2-1		2-1
	Installation Conditions	
2-3	Installation Method·····	2-3
-	3 Wiring	
3-1		3-1
3-2	Motor Connection	3-4
		3-6
3-4	Regenerative Resistor Wiring·····	3-7
3-5	Control Circuit Wiring	
		3-9
3-7	Applicable Cable	3-10
Chapter	4 Connections	
4-1	External Wiring Diagram·····	4-1
4-2	Input and Output Signals	4-2
	4-2-1 Input and Output Signal List······	4-2
	4-2-2 Remote Signal List······	4-17
	4-2-3 I/O interface	
4-3	Connector Pin Layout·····	
	4-3-1 Control I/O signal Connector (CN1) ······	
	4-3-2 Encoder Feedback Pulse Input Connector (CN2) ······	4-23
	4-3-3 Serial Communication Connector (JIS/DSW) ······	4-24
	4-3-4 USB Connector (J2) ······	
	4-3-5 Main Power Input/ Transmission Line Output Terminal·····	4-25
Chapter	5 Setting and Display	
5-1	Function of Each Part of the Operational Panel·····	5-1
	Configuration and Transition of Operation Mode······	
5-3	Status Display Large Mode·····	5-6
	5-3-1 Display Item of Status Display 0 Mode·····	
	5-3-2 Display Item of Status Display 1 Mode·····	5-9
		5-11
		5-12
	Parameter Editing Mode······	
5-5	Item Operation·····	5-14
5-6	Self-dignosis Mode·····	5-21

Chapter 6 Parameter	
6-1 Parameter Group List····································	. 6-2
Chapter 7 Self-dignosis	
7-1 Self-dignosis Mode 7-2 Executing Procedure for Self-dignosis Mod 7-3 Self-dignosis Items 7-4 Auto. Tuning 7-4-1 Auto. Tuning Executing Procedure 7-4-2 Auto. Tuning Function 7-4-3 Tuning Level Adjustment Function	·· 7-2 ··· 7-3 ·· 7-6 ··· 7-7 ·· 7-8
Chapter 8 Run	
8-1 Inspection before Start 8-2 Run Operation 8-3 Speed Control Run 8-4 Pulse Train Run 8-4-1 Position control Run by Pusle Train Command 8-4-2 Zero Return Run 8-4-3 Position Decide Run 8-4-4 Jog Run 8-5 Oscillo-monitor 8-6 Run Procedure 8-7 Adjustment 8-7-1 Adjustment at Shipment 8-7-2 Adjustment Point of Individual Phenomenon (parameter) 8-7-3 Adjustment Method	·· 8-2 ·· 8-4 · 8-7 ··· 8-7 · 8-9 ·· 8-18 · 8-20 · 8-22 · 8-23 ·· 8-26 ·· 8-26
Chapter 9 Error Diagnosis and Counter Measures	
9-1 Inspection and Confirmation Items····· 9-2 Protective Function····· 9-2-1 Protective Function List····· 9-2-2 Inspection Method and Counter Measures when Alarm Occurs····	·· 9-2 ··· 9-3
Chapter 10 Model, Specifications, Outline	
10-1 Controller Model 10-1-1 Controller Model 10-1-2 Controller General specifications 10-1-3 Controller Function Specifications 10-1-4 Controller Electrical Specifications 10-1-5 Controller Outline Diagram 10-2 Regenerative Resistor	·· 10-1 ··· 10-2 · 10-3 ·· 10-4
10-2-1 Regenerative Resistor Combination·····	10-6
10-2-2 Regenerative Resistor Outline······ 10-3 Option 10-3-1 Option Configuration······	
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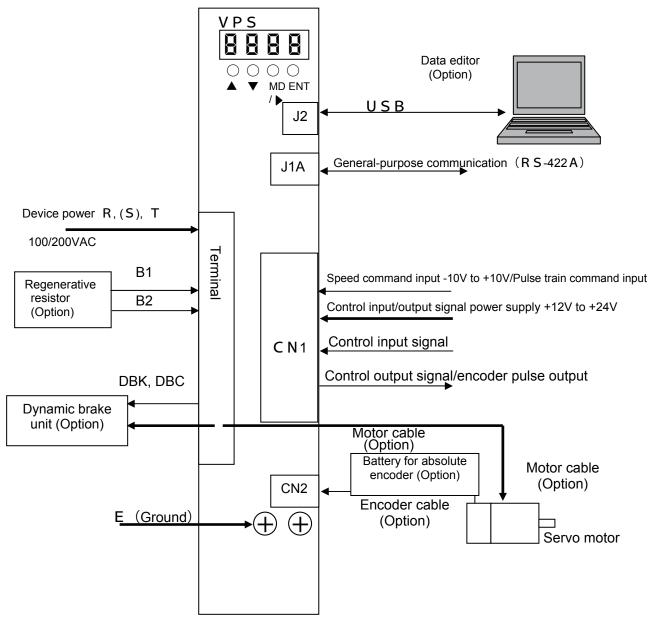
Chapter 1 Outline

1-1 Configuration

1-1-1 Servo Motor Driving System Configuration

Servo motor driving system configuration is as shown in [Fig. 1-1].

The system consists of this device, a servo motor, encoder (attached on the opposite load shaft side of the servomotor) to detect the speed and position, the optional motor cable, encoder cable and regenerative resistor.

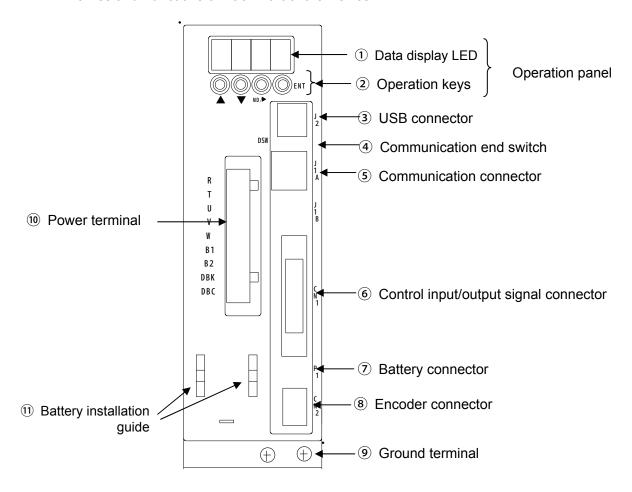


[Fig. 1-1] Servo Motor Driving System Configuration

Change of speed control, pulse train control by external control signal is possible in this device.

Furthermore, the device can cope with several kinds of AC servo motors by using parameters.

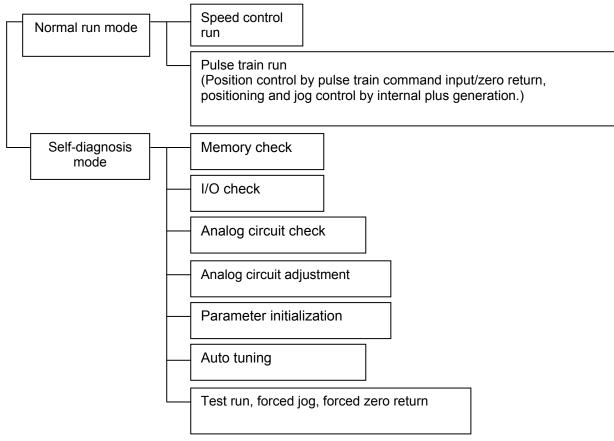
1-1-2 Names and Functions of Each Part of the Device



No	Name	Symbol	Function		
1	Data display LED		It shows the status display, alarm code display, parameter value display, self-diagnosis status display.		
2			These keys execute the selection of status display, parameter editing and the operations of self-diagnosis.		
3	USB connector	J2	It is the connector which connects the USB signal.		
4	Communication end switch	DSW	It is the termination connection switch of the serial communication signal.		
(5)	Communication connector	J1A	It is the connector which connects serial communication signal.		
6	Control input/output signal connector	CN1	It is the connector which connects each command input and control input/output.		
7	Battery connector	P1	This connector is not used.		
8	Encoder connector	CN2	It connects the cable from the motor encoder.		
9	Ground terminal		It is the ground terminal which connects the power grounding and motor power grounding. M3 screw is used.		
10	Power terminal		It connects the power line to the power supply and the motor, and regenerative resistor.		
11	Battery installation guide		This guide is not used.		

1-1-3 Mode Configuration

Each operation mode is selected by parameter and control signal as in [Fig. 1-2].



[Fig. 1-2] Mode Configuration

Outline of each mode

Mode	Function / Contents			
Normal run mode	Speed control run Speed control is executed by speed command input signal. Furthermore, operations at the speed set in the parameter are also possible depending on the speed selection signal. Pulse train run Position control by pulse train command input is executed and zero return, positioning and jog control are carried out by genarating pulse command inside this device. The output torque of the motor shaft can be restricted to less than or equal to the fixed value by torque limit command change signal for both modes. Speed control run mode and pulse train run mode can be changed over by the control input signal.			
Self-diagnosis mode	·Each type of diagnosis is carried out for this device. ·Self-diagnosis mode is changed over from normal run mode by the operation key. Each type of self-diagnosis is carried out by the operation key.			

[Tab. 1-1] Operation Mode Outline

Chapter 2 Installation

2-1 Receiving Check of Our Products

Please confirm following points when you receive our products.

- ① If the products are exactly the ones you ordered (type, rated output, etc.)
- 2 If any damage was made during transportation (package damage, abnormal outlook of devices)
- 3 If accessories are packed together.

If a problem with any of the above points, damage, or the like is found, please immediately inform our sales representative.

∴ Caution

①If packages as carton boxes are broken, please do not unpack them and inform our sales representative.

2-2 Installation Environment

(1) The allowed ambient temperature and the humidity range for the device are as follows.

Ambient temperature:

0 to 55°C

· Ambient humidity: Less than 85% (No condensation)

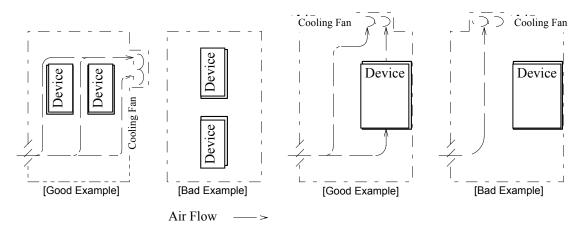
It is recommended that temperature rise inside the storage control board be less than 10°C for outside temperature.

Considering the generation loss of equipment and the device in the control board, and the convection and radiation effect in the board, keep the temperature around the device lower than specified allowable range.

The heating value of the device is approximately 10%+30W of the estimated motor capacity.

- While selecting the cooling fan or heat exchanger, calculate above mentioned generation loss and select those having greater capacity.
- Particularly when multiple devices are to be placed in a single storage control board, see to it that the cooling is taking place properly.

Note that if the device and cooling fan are not properly positioned, the ambient temperature of the device can raise affecting the radiation result. Refer to [Fig. 2-1].



[Fig. 2-1] Fan Position When Multiple Devices Are Installed

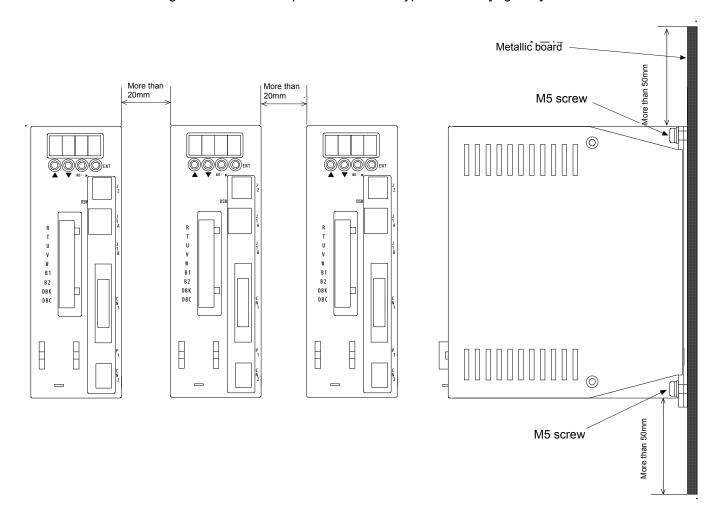
⚠ Caution

① If the allowed ambient temperature is exceeded, there may be failure or damage of parts in the device due to overheating etc., and this may lead to defective operations of the device. Therefore, strictly control the specified ambient temperature.

- **(5)** If there is a heat source, vibration source, etc., please design the structure to avoid their influence.
- Please avoid installing a device in a place of high temperature, high humidity, large amount of dirt / dust, metal powder, lampblack, etc. and corrosive gas.
- Reinforce the grounding process, since the induction noise may also be generated at the place where there is any noise source such as electric welding machines. Moreover, the noise filter is necessary depending on the environment. Refer to [3-6 Noise Protection] to execute the countermeasures against noise.

2-3 Installation Method

- ①In order to get sufficient radiation, be sure to install a device vertically.
- 2 Install the device on a metallic board.
- ③Considering the radiation and maintenance, the space from other devices, parts and the control board surface should be more than 50 mm vertically and 20 mm horizontally. Refer to [Fig. 2-2].
- 4 The device is designed to be used as panel installation type. Refer to [Fig. 2-2].



[Fig. 2-2] Installation and Ventilation of the Device

Chapter 3 Wiring

- 3-1 Power Supply Wiring
- 1. AC input power supply wiring
 - (1) AC input power supply is as follows.

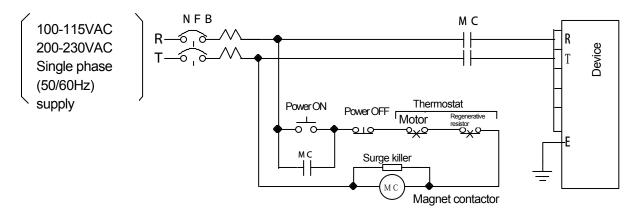
NCR-DCA*A1* Power Single phase 100 to 115VAC, 50/60Hz
NCR-DCA*A2* Power Single phase 200 to 230VAC, 50/60Hz
Please keep this range regardless to power supply fluctuation due to factory load change.

- (2) In order to protect accident and fire, be sure to install a molded case circuit breaker or a fuse suitable for breaking capacity of the line. In case of using an earth leakage breaker, select an anti-high frequency noise type for an inverter.
- (3) Since main circuits of the device are of capacitor input type, high rush current will flow when power is turned on. Depending on power supply capacity or impedance, voltage drop may occur. Therefore, apply a sufficiently large capacity power supply and cables.
- (4) Do not make wrong connection of AC input power supply (R, T) to motor connection terminals (U, V, W) of the device.

●If incorrect AC input power supply (R, T) is connected to motor connection terminals (U, V, W) of the device, the device will be damaged.

2. Power circuit

Typical power circuit is described in [Fig. 3-1].



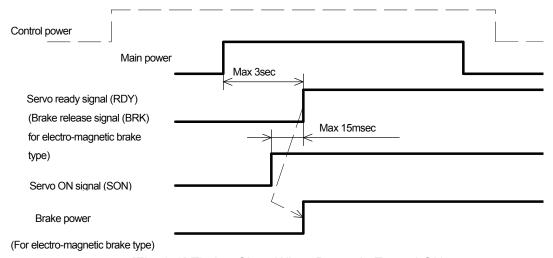
[Fig. 3-1] Typical Power Circuit

∴ Caution

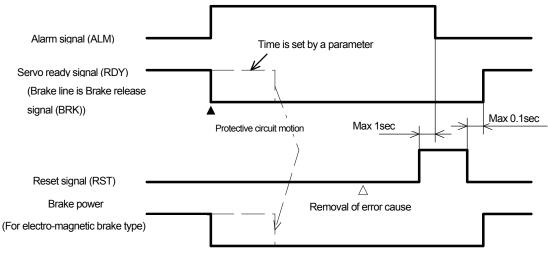
- •Be sure to keep specified range of power supply. If not, the device could be damaged.
- ●In order to protect power supply line, and avoid accident as fire, be sure to install a molded case circuit breaker. For capacity of a breaker, refer to "10-1-4 Device Electrical Specifications".
- •When a magnet contactor is used, be sure to install a surge killer.
- ●If possible, separate the device power supply from the power supply for other high-power equipment.

3. Power supply sequence

- (1) Since the main circuit of the device is a capacitor input type, if frequent switching (ON/OFF) of the power supply is conducted, the main circuit elements will deteriorate. Though power re-input after shutting off the power can be made within one minute, please keep the switching frequency twice / 3 minutes or less.
- (2) The control power shall be turned on before or at the same time as the main power is turned on, and shall be turned off after or at the same time as the main power is turned off. (When control power and main power are separate)



[Fig. 3-2] Timing Chart When Power Is Turned ON



[Fig. 3-3] Timing Chart When a Trouble Occurs

Caution

- •If power is turned on again within 1 minute after it is turned off, the abnormalities may occur in AC power supply or in device operations.
- ●If IPM failure or over load protection works, remove the cause, cool this device about 30 minutes and resume it. If reset is repeatedly conducted in a short period, the device temperature will be extremely increased and it could be damaged.
- Please design sequence externally to turn off the Start signal and stop the command when a protective function works and the alarm occurs (outputted). If the Start signal and its command (Speed command voltage, Pulse train, etc.) are input when power supply recovers after shut down occurred (includes temporary blackout), a motor will start and the situation is quite dangerous.

4. Selection of molded case circuit breaker and earth leakage breaker.

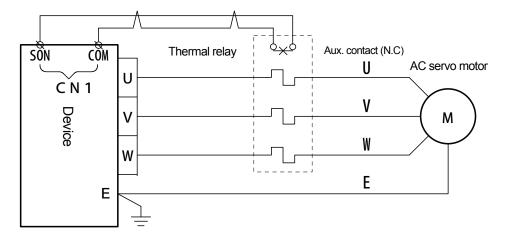
In order to prevent this device from short-circuit in case of device failure, select an appropriate breaker that has the breaking capacity suitable for the power capacity. As for breaker capacity of one device, please refer to "10-1-4 Device Electrical Specifications".

When line capacity (power capacity) is quite large to a device capacity, insert a reactor and conduct power coordination. (As for reactor specification, please ask our sales representative.) And in case of using an earth leakage breaker, since the device inverter section is PWM control, output contains high harmonic components. And leakage current is generated by earth electrostatic capacity of cable route from the device to a motor and floating capacity between a motor coil and an iron core.

Since this leakage current of the high harmonic components could activate an earth leakage breaker, select an inverter type earth leakage breaker for the device power supply circuit.

3-2 Motor Connection

- 1. Wiring for motor power supply
 - (1) Connect motor terminals (U, V, W) and the device terminals (U, V, W) in the correct phase sequence. (Connect U-U, V-V, and W-W, respectively.) If the phase sequence is wrong, normal operation can not be conducted and a motor could vibrate or start without a command input, which is very dangerous.
 - (2) For connection terminals of motor, refer to the motor specifications.
 - (3) In case of wiring between a motor and the device, do not connect the magnet switch or molded case circuit breaker.
 - (4) When a motor equipped with a brake is used, be sure to release it before turning on the Start signal (DR).
 - If the Start signal is turned ON without releasing the brake, the motor may be burn out. Referring to [Fig. 3-2], timing shall be considered.
 - (5) Though an electronic thermal is installed on the device, if a thermal relay will be added externally, set the relay current value to the motor rated current.
 Make a sequence to turn off Servo ON signal (SON) and then stop a motor by an auxiliary contact of the thermal relay when a thermal relay is activated.



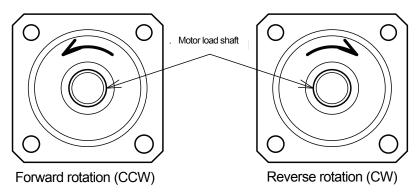
[Fig. 3-4] Thermal Relay Wiring Example

Be sure to connect a motor earth terminal (E) to a device earth terminal (E).

2. Motor run direction setting

Relation of each command and motor run direction in case of connecting a motor to an encoder in the standard specifications is as follows.

① Motor rotation direction



[Fig. 3-5] Motor Rotation Direction

Command input type	Polarity	Motor direction		
	Positive	Shaft rotates counter-clockwise, viewing to motor load		
Speed command	voltage	shaft: Forward rotation (CCW)		
Speed Command	Negative	Shaft rotates clockwise, viewing to motor load shaft:		
	voltage	Reverse rotation (CW)		
	Forward	Shaft rotates counter-clockwise, viewing to motor load		
Directional pulse train	Forward	shaft: Forward rotation (CCW)		
command	Reverse	Shaft rotates clockwise, viewing to motor load shaft:		
		Reverse rotation (CW)		
	B phase	Shaft rotates counter-clockwise, viewing to motor load		
90° phase difference pulse	ahead	shaft: Forward rotation (CCW)		
train command	A phase	Shaft rotates clockwise, viewing to motor load shaft:		
	ahead	Reverse rotation (CW)		

^{*}The direction of rotation for commands can be changed by the following parameters and signal.

P003 [Rotating direction selection], P600 [Select pulse train command], RVS [Reverse Command direction] signal

[Tab. 3-1] Each Command Input and Motor Rotation Direction

3. Wiring of electro-magnetic brake

- (1) Our brakes of motors are for holding purpose during the stop time. And brakes are de-energized operation type.
- (2) Brakes are released when voltage is supplied and when it is not supplied, brakes are applied.
- (3) The brake is activated about 0.5 sec. after voltage is supplied.
- (4) Power supply specifications for brake should be provided by the customer by referring to the motor specifications.

- ●Since an electro-magnetic brake is released about 0.5 sec. after voltage is supplied, turn ON the Start signal (DR) within the timing where this time delay is considered.

 Be sure to turn the Start signal (DR) OFF before activating the electro-magnetic brake.
- Since the electro-magnetic brake is holding purpose only, never activate the brake when a motor is running.

3-3 Grounding

- (1) Be sure to conduct grounding to prevent electric shock and noise influence.
- (2) Use a suitable cable for grounding which has a conductor cross-sectional area greater than or equal to that described later in [Tab. 3-10] Applicable cables, and conduct JIS Class 3 or better grounding (ground resistance 100 Ω or less).
 - Connect the ground cable to the ground terminal (E) of the device.
- (3) Dedicated grounding is preferable as far as possible. If common grounding is used, be sure to apply one-point grounding.
- (4) Be sure to connect a motor ground terminal (E) to a device ground terminal (E).

↑ Caution

- lacktriangle To reduce common mode noise and prevent malfunction of a device, use dedicated ground and satisfy JIS class 3 or better (ground resistance 100 Ω or less).
- When dedicated grounding cannot be used, apply one-point common grounding to commonly ground with other units at the ground point.
- Never use common grounding with high-power units nor connect ground to iron frames, etc.

3-4 Regenerative Resistor Wiring

- (1) Use an attached accessory or optional regenerative resistor.
- (2) Since heat is generated by regenerative energy, locate a regenerative resistor not to influence other units. The regenerative resistor is used to consume excessive energy that the regenerative capacitor cannot absorb, among regenerative energy generated by motor braking when load inertia (GD²) is large.
- (3) A thermostat is attached to a regenerative resistor. Since the thermostat contact opens when a regenerative resistor is over-heated, make wiring to shut main power down at the time. (Refer to [Fig. 3-1].)

Thermostat contact specification is as follows.

Contact	Contact
voltage	current
200VAC	1A

Refer to [10-2 Regenerative Resistor] for thermostat attachment.

- (4) In case of using plural regenerative resistors, comply with description of [10-2 Regenerative Resistor].
- (5) Cable length between a regenerative resistor and the device shall be within 3 m or as short as possible.

As the cable is longer, surge voltage generated by switching of power elements becomes larger, and the motor and the device could be damaged.

⚠ Caution

●When abnormally high current flows in a regenerative resistor, it becomes hot in a short time and quite dangerous.

Be sure to construct a circuit to shut main power down by a thermostat contact.

3-5 Control Circuit Wiring

1. Analog command (speed)

- (1) Since each analog signal is micro-current, use shielded twisted pair cables and be sure to connect those shields to the shield earth FG terminal of connector CN1.
- (2) Cable length shall be 3 m or shorter.

2. Pulse train input and output

- (1) Since pulse train input and encoder pulse train output are high speed Pulse train signals, use shielded twisted pair cables, and be sure to connect those shields to the shield earth FG terminal of connector CN1.
- (2) Cable length shall be 3 m or shorter. (In case of open collector output, 1.5 m or shorter)

3. Encoder feedback signal

- (1) Use shielded twisted pair cables, and be sure to connect those shields to the shield earth FG terminal of connector CN2.
- (2) If a mobile motor is required, make the cable bending radius as large as possible to avoid excessive load.
- (3) Dedicated encoder cable sets are optionally available. Contact our sales representative for details.
- (4) Refer to the motor specifications for connection terminals of the motor side.

4. Control I/O signals

- (1) When relays and switches are used for control input and output signals, please use micro-current types.
- (2) To prevent malfunction by noise, be sure to install surge killers, diodes, etc. to relays, magnet switches, electro-magnetic brakes, solenoids, etc. used around the device and depress the noise generation.
- (3) Control input signal power supply +V (+12 V, 2.5 mA to +24 V, 5 mA / 1 item) should be prepared by the customer.
- (4) Cable length shall be 3 m or shorter.

3-6 Noise Protection

1. External noise intrudes through 2 routes, power supply lines and signal lines. External noise may cause malfunction and a trouble. In order to protect a trouble caused by noise, it is important to depress noise generation and not to induce generated noise to units. Therefore, be sure to conduct the following countermeasures and protection treatment.

. Caution

- For control I/O signal wiring, use specified type of cable with the specified conductor cross-sectional area, and comply with wiring precautions without fail. If this countermeasure is not conducted, unexpected malfunction could occur by noise, etc., which is quite dangerous.
- ●Be sure to separate control I/O signal cables from the power line (power supply, motor, etc.) and never place them in the same duct nor bind them into the same bundle.

2. Installation of surge killer and noise filter

- (1) To depress noise generation, be sure to install a surge killer (for AC power) or a diode (for DC power) on each relay, magnet switch, electro-magnetic brake, solenoid, etc. used near the device.
- (2) If noise generation source such as electric welders and electric discharge machine is near a power supply line and it makes the high noise environment, install a noise filter or noise cut transformer, etc. on the main power supply and control power supply of the device for noise protection on the power supply line.
 - When a noise filter is used, be sure to separate input cables from output cables of the filter, and never bind them into the same bundle. Also, do not bind the filter ground cable into the same bundle of filter output cables but ground (earth) it in the shortest distance.
- (3) Since the device performs high speed switching control of a motor, switching noise is generated. If it is supposed that this noise influences other equipment, insert a noise filter or common mode choke coil in the main power supply of the device and protect the device from inducing the noise into the power supply. And conduct radiation noise measures such as passing the power supply lines and motor lines through a metal tube.

3-7 Applicable Cable

Please use cables described in [Tab. 3-10].

*Please use our optional cable for control circuits.

⚠ Caution

- A cable type and size can be changed depending on actual conditions and environment. Please consult our sales representative for further information.
- ●If a control signal cable is long, this device is likely to be influenced by noise. Please keep specified length for wiring. And be sure to use specified cable type.

	Item	Terminal	Details of applicable cable			
	Analog voltage command input	INH,GND	AWG28 or larger shielded twisted pair cable, length: 3 m or less			
circuit	Pulse train command	FC/FC*, RC/RC*	Line driver method: AWG28 or larger shielded twisted pair cable, length: 3 m or less Open collector method: AWG28 or larger shielded twisted pair cable, length: 1.5 m or less			
Control	Encoder pulse output	EA/EA*,EB/EB* EM/EM*,GND	AWG28 or larger shielded twisted pair cable, length: 3 m or less (0.5 mm ² or larger for GND)			
Co	Encoder feedback input	SD/SD*,BAT+/BA T- +5V,GND	0.2 mm ² or larger shielded twisted pair cable 0.5 mm ² or larger for +5V,GND Length: 20 m or less			
	Other control I/O		AWG28 or larger shielded twisted pair cable, length: 3 m or less (0.5 mm ² or larger for +24V,COM)			

[Tab. 3-10 (a)] Applicable Cable 1/2

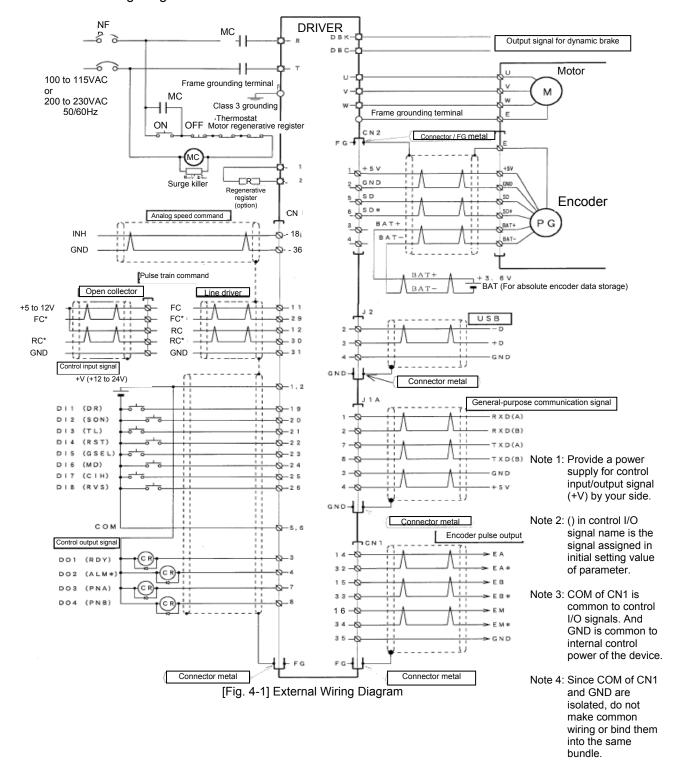
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	Item	Terminal	NCR- DCA0A1* -201	NCR- DCA0A2* -401		
circuit	AC input power supply, ground	R,T,E	2	2		
	Motor	U,V,W	1.25	1.25		
Main	Regenerative resistor	B1,B2	1.25	1.25		

[Tab. 3-10 (b)] Applicable Cable 2/2

Chapter 4 Connection

4-1 External Wiring Diagram



4-2 Input and Output Signals

4-2-1 Input and Output Signal List

⚠ Caution

- Since COM (a common of power supply for control I/O signal) and GND (a common for internal control power supply +5V) are isolated, do not use common wiring and do not put them into the same bundle.
 - st The power supply +V (+24V, 0.5A) for control I/O signals should be prepared by the customer.

1) Control output signals

	Terminal			
Signal name	name	Function		
	Circuit No.			
A phase	EA	①A phase pulse corresponding to the motor encoder signal is output.		
output pulse	EA*	②Setting of output division is possible with the parameters for this		
	O-2	signal.		
		③As for this signal, there is delay of 250 μs in the output for encoder		
		feedback input.		
		Related parameters: P010, P011		
B phase	EB	①B phase pulse corresponding to the motor encoder signal is output.		
output pulse	EB*	②Setting of output division is possible with the parameters for this		
	O-2	signal.		
		③As for this signal, there is delay of 250 µs in the output for encoder		
		feedback input.		
		Related parameters: P010,P011		
Marker output		①Line driver marker pulse corresponding to the motor encoder		
	EM*	position is output.		
	O-2	②Output position is set by the parameter.		
		Related parameters: P012,P013		
Control output		①Signal that is allocated in output allocation (parameter P702) is		
1-4	1-4	output.		
	O-1	②Output signal logic can also be set in output allocation (parameter P702).		
		However, logic of marker output signal (OCEM) is positive logic.		
		③When ABS data request (ABRQ) or Alarm code request (ALRQ) is		
		ON, the output allocation is cancelled and DO3 and DO4 signals will		
		be as follows.		
		DO3: Response data (DRSP), DO4: Response clock (CRSP).		
		Singal output status (C100) is displayed as status display.		
		However, signal output status is not displayed for control output		
		signal where the marker output signal (OCEM) is allocated.		
		Related parameter: P702		

Signal name	Code Circuit No.	Function
Marker output	OCEM	①Open collector marker pulse corresponding to the motor encoder signal is output.
	O-1	©When this signal is used as external output signal, it is allocated to one of the DO1-4 signals by P702. However, this signal is positive logic. Related parameter: P702
Servo ready	RDY	①When the inside of the device is ready to operate, this signal turns
	O-1	ON. ②This signal turns OFF in the following cases. • Alarm occurs. However, OT is excluded. • Motor power supply is OFF. • Maximum 2 seconds after switching the motor power supply OFF to ON.
		 Maximum 2 seconds after power supply of the device is turned ON. When this signal is to be used as external output signal, it is allocated to one of the DO1-4 signals by P702. Signal output status (C102) is displayed as status display. Related parameter:P702
Alarm	ALM	①This signal turns ON when alarm sounds.
	O-1	②This signal turns OFF when
		 The alarm is cancelled When this signal is to be used as external output signal, it is allocated to one of the DO1-4 signals by P702. Signal output status (C102) is displayed as status display. Related parameter:P702
Deviation	PNA	①When the position deviation is within the deviation range A (P202)
range A	O-1	in pulse train run, this signal turns ON. ②This signal turns OFF in the following cases. • Position deviation exceeded the positioning range A • Operation status as per ZST signal • In case of other than pulse train run • DR signal OFF • Motor power supply OFF However, when deviation clear invalid is selected and the servo power supply is in OFF status due to SON signal OFF, the output will be as per the positioning range A. ③When the position deviation is in this deviation range, it is operated by servo lock gain (P201). ④When this signal is to be used as external output signal, it is allocated to one of the DO1-4 signals by P702. ⑤Signal output status (C102) is displayed as status display. Related parameters:P702,P201,P202
Deviation	PNB	①When position deviation is within the deviation range B (P203) in
range B	Ö-1	pulse train run, this signal turns ON. ②The function is the same as that of deviation range A, except that the deviation range is the deviation range B. Related parameters:P702,P203
Speed zero	O-1	①This signal turns ON when the range is less than the speed zero range (P717). ②This signal turns OFF when the range exceeds the speed zero range. ③When this signal is to be used as external output signal, it is allocated to one of the DO1-4 signals by P702. ④Signal output status (C102) is displayed as status display. Related parameters:P702,P717

Signal name	Code	Function
Duels mali -	Circuit No.	This signal toward ON colors because and and the
Brake release	BRK O-1	①This signal turns ON when brakes are released. In other words, this signal turns ON when the motor power supply is ON.
		②This signal turns OFF when brakes are applied. In other words, this signal turns OFF when the motor power supply is OFF. When the motor power supply is turned OFF, the time when this signal turns OFF is set in brake output delay time (P718). ③When this signal is to be used as an external output signal, it is allocated to one of the DO1-4 signals by P702. ④Signal output status (C102) is displayed as status display. Related parameters:P702,P718
Under	EMGO	①This signal turns ON when the emergency stop signal turns ON.
emergency		②This signal turns OFF when the reset signal turns OFF.
stop	O-1	 The motor power supply is not started when this signal is ON. When this signal is to be used as an external output signal, it is allocated to one of the DO1-4 signals by P702. Signal output status (C102) is displayed as status display. Related parameter:P702
Zero return	HCP	①This signal turns ON when the zero return is completed at least for
completion	0-1	once by turning on the power supply and when the device can
	0-1	identify the absolute position. ②This signal turns OFF in the following cases. • When an encoder alarm occurs. • When the power is turned ON • When zero return starts ③Signal output status (C102) is displayed as status display.
Deenenee	DDCD	Related parameter:P702
Response	O-1	①This signal is a bit data output in case of ABS data request (ABRQ), Current position data request (APRQ) or Alarm code request (ALRQ). ②Bit data is output for this signal serially from the topmost bit depending on the ON or OFF edge of the request clock (CRQ). ③This signal is allocated automatically to the control output signal DO3 when ABS data request (ABRQ) or Alarm code request (ALRQ) is ON. ④The bit data of this signal is "1" in case of short circuit and "0" when the current is released. ⑤For data output method, refer to the "Data output time chart of Alarm code request, ABS data request, and Current position data request". ⑥Signal output status (C102) is displayed as status display.
Response clock	CRSP	①This signal is the response clock (CRSP) for the request clock (CRQ) for ABS data request (ABRQ), Current position data request
CIOCK	O-1	(APRQ) or Alarm code request (ABRQ). ②If the response data (DRSP) is output corresponding to ON and OFF edge of the request clock (CRQ), the output for this signal will also correspond to ON and OFF of the request clock (CRQ). ③This signal is allocated automatically to the control output signal DO4 when ABS data request (ABRQ) or Alarm code request (ALRQ) is ON. ④For data output method, refer to the "Data output time chart of Alarm code request, ABS data request, and Current position data request". ⑤Signal output status (C102) is displayed as status display.

2) Control input signals

	Terminal		
Signal name	name	Function	
	Circuit No.		
Speed	INH	①At the time of speed control run, the motor operates at a speed	
command input	I-3	which is in proportion with the voltage applied between this terminal and GND.	
put		②Motor operates at the rated speed when input is $\pm 10 \text{ V}$.	
		The motor operates in forward direction in case of positive voltage input considering GND as a standard and it operates in reverse direction in case of negative voltage input.	
		The motor can operate in reverse diretion by the positive voltage command by the command direction reverse signal (RVS).	
		©The acceleration/deceleration time of the motor can be set by P309 and P310 parameters.	
		©Speed command status (C001) is displayed in status display. Related parameters:P300,P301,P309,P310	
Control input	DI	①This signal is given as a signal allocated in Input allocation	
1-8	1-8	(paramters P700 and P701).	
	I-1	②Input signal logic can be set in input allocation.	
		③When ABS data request (ABRQ) or Alarm code request (ALRQ) is	
		ON, the input allocation is cancelled and DI8 signal will be as follows.	
		DI8: Request clock (CRQ).	
		Signal input status (C100) is displayed as status display. Palata to a page 1200 P701.	
		Related parameters:P700,P701	

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Signal name	Code Circuit No.	Function
Torque limit	TL I-1	①When this signal is turned ON, the torque limit 2 becomes valid. ②When this signal is turned OFF, the torque limit 1 becomes valid. ③When this signal is to be used as an external input signal, it is allocated to one of the DI1-8 signals by P700 and P701. ④Signal status can be fixed to ON or OFF by P705. ⑤Signal input status (C101) is displayed as status display. Related parameters: P700,P701,P705,P007,P008
Reset	RST I-1	①When this signal is turned ON, it becomes as follows. An alarm is cancelled. However, the "Alarm cancellation disallowed" alarm cannot be cancelled by turning this signal ON. Refer to the alarm list for whether alarm cancellation is allowed / not allowed. Motor power is OFF Reset signal reflection parameters are reflected in the control. When this signal is turned OFF, motor power becomes ON. However, the motor power does not turn ON in the following cases. When SON signal is OFF When alarm occurs (excluding OT) When this signal is to be used as an external input signal, it is allocated to one of the DI1-8 signals by P700 and P701. Signal input status (C101) is displayed as status display. [Note] Reset the alarm after that cause is removed. Related parameters: P700,P701,P705
Speed gain selection	GSEL I-1	①When this signal is turned ON, the motor is operated by the speed gain when the GSEL signal is ON. ②When this signal is turned OFF, the motor is operated by the normal speed gain or low speed gain. ③When this signal is to be used as an external input signal, it is allocated to one of the DI1-8 signals by P700 and P701. ④Signal input status (C101) is displayed as status display. Related parameters:P700,P701,P705,P111,P112,P153,P154,PP01
Mode selection	MD I-1	①When this signal is turned ON, the mode changes to pulse train run mode. When the motor is operated by the pulse train command, the following signal conditions are necessary. • This signal ON, SON signal ON, DR signal ON • RST signal OFF, CIH signal OFF, EMG signal OFF • Alarm is not generated ②When this signal is turned OFF, the mode changes to the speed control mode. When the motor is operated by the speed command, the following signal conditions are necessary. • SON signal ON, DR signal ON • This signal OFF, RST signal OFF, EMG signal OFF • Alarm is not generated ③When this signal is to be used as an external input signal, it is allocated to one of the DI1-8 signals by P700 and P701. ④Signal status can be set to ON or OFF by P705. ⑤Signal input status (C101) is displayed as status display. Related parameters: P700,P701,P705

Cianal name	Code		-	Tunation
Signal name	Circuit No.	- Function		
Command	CIH	①When this signal is turned ON, the pulse train commands are		
pulse input	I-1	disabled in the pulse train run mode and motor becomes servo		
prohibition		locked.	a airmal in turnad OF	T the mules train seminary to one
				F, the pulse train commands are node and motor is operated by pulse
		train comm		iode and motor is operated by pulse
				I pulse are allowed even in the count
		prohibition	condition.	
			al is invalid in the sp	
				d as an external input signal, it is
				gnals by P700 and P701. ON or OFF by P705.
				displayed as status display.
		Related pa	rameters:P700,P701	,P705
Reverse	RVS			nand signal. When this signal is turned
command	I-1		owing occurs.	
direction				reversing the speed command or
			rain command direct	ion. Il pulse, internal operation is executed
				he parameter specification.
		• While	e operating the Jog,	the motor is operated in the reverse
			on of the Jog signal in	
				d as an external input signal, it is
				gnals by P700 and P701. ON or OFF by P705.
				displayed as status display.
			rameters:P700,P701	
Command	SS	①This sign	al selects the comma	ands by combining the following
selection	1-3	signal statu	S.	
1-3	I-1	SS3-1 ※	During speed	During internal pulse operation
		3 2 1	control mode	(ZST) in pulse train run mode
			External speed	Zero return (P400-P408)
			command	
			(Analog command)	
			oommana)	
			Speed command	Positioning command 1
			value 1 (P302)	(P416-P417)
			Speed command	Positioning command 2
			value 2 (P303)	(P418-P419)
			Speed command	Positioning command 3
			value 3 (P304)	(P420-P421)
			Speed command value 4 (P305)	Positioning command 4 (P422-P423)
			` '	,
			Speed command value 5 (P306)	Positioning command 5 (P424-P425)
			Speed command	Positioning command 6
			value 6 (P307)	(P426-P427)
			Speed command	Positioning command 7
			value 7 (P308)	(P428-P429)
		※ Bla	nk column:OFF,●:O	N
		 When this signal is to be used as an external input signal, it is allocated to one of the DI1-8 signals by P700 and P701. Signal status can be fixed to ON or OFF by P706. Signal input status (C101) is displayed as status display. 		
				displayed as status display. ,P706,P302-P308,P400-P429
		hveiaien hai	ameters.F/00,F/01	,1 100,5002-500,5400-5429

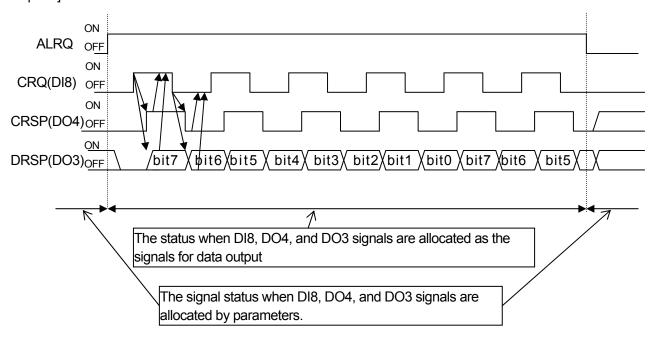
Signal name	Code	Function
F	Circuit No.	OMban this simple turned ON it is also at a standard of the st
Emergency stop	EMG I-1	①When this signal is turned ON, it is stopped under emergency stop. The stop method is selected by P710, P715, P716 emergency stop method.
		②During emergency stop, it is cancelled by turning OFF this signal and the RST signal ON → OFF.
		③During emergency stop, the under emergency stop signal (EMGO) turns ON.
		When this signal is to be used as an external input signal, it is allocated to one of the DI1-8 signals by P700 and P701. Signal status can be fixed to ON or OFF by P706.
		©Signal status can be fixed to ON or OFF by P706. ©Signal input status (C101) is displayed as status display. Related parameters:P700,P701,P706,P710,P715,P716
Forward over	FOT	This signal is the forward travel limit (stroke end) signal.
travel	I-1	②When this signal is turned ON, the motor suddenly stops assuming that the forward travel limit has been reached. ③When this signal is turned ON, the following occurs.
		Operation is not performed for forward command.
		 Operation is performed for reverse command. Alarm signal turns ON.
		When this signal is OFF, operations related to forward command
		are possible. ⑤When this signal is to be used as an external input signal, it is
		allocated to one of the DI1-8 signals by P700 and P701.
		©Signal status can be fixed to ON or OFF by P706. ©Signal input status (C101) is displayed as status display.
		Related parameters:P700,P701,P706
	ROT	①This signal is reverse travel limit (stroke end) signal.
travel	I-1	②When this signal is turned ON, the motor suddenly stops assuming that the reverse travel limit has been reached.
		③When this signal is ON, the following occurs.
		Operation is not performed for reverse command.Operation is performed for forward command.
		 Alarm signal turns ON. When this signal is OFF, operations related to reverse command
		are possible. ⑤When this signal is to be used as external input signal, it is
		allocated to one of the DI1-8 signals by P700 and P701.
		©Signal status can be fixed to ON or OFF by P706. ②Signal input status (C101) is displayed as status display.
		Related parameters:P700,P701,P706
Command	NRF	①When this signal is turned ON, the speed command value 1-7
data reflection prohibition	I-1	(P302-P308) set by the parameters and the positioning command data 1-7 (P413-P429) are not reflected in the operation.
promonion		This signal is the signal for invalidating the parameter settings
		when the speed command value, positioning command data, and
		jog speed are set in real time during communication. ②When command data set by the parameters is reflected in the
		operation by turning this signal ON → OFF (command data
		reflection cancellation), turn ON the reset signal (RST).
		③When this signal is to be used as an external input signal, it is allocated to one of the DI1-8 signals by P700 and P701.
		⑤Signal input status (C101) is displayed as status display. Related parameters:P302-P308,P413-P429,P700,P701,P706

Signal name	Code Circuit No.	Function
Internal pulse start		①Internal operation is executed when this signal is on ON edge. Internal operation is the zero return or positioning operation which is pulse oscillated internally. ②This signal is valid in the pulse train run mode. ③The types of internal operations are selected by SS1-3 signals and RVS signal. ④The settings related to the internal operations are carried out by the parameters no. P4XX. ⑤While executing the internal operations, pulse train commands are prohibited. ⑥During the internal operations, deviation range A and B signals are turned OFF. The internal operations are completed and if it is within the deviation of deviation range A or B then deviation range A or B signal is turned ON. ⑦When this signal is to be used as an external input signal, it is allocated to one of the DI1-8 signals by P700 and P701.
Zero LS	ZLS	Signal status can be fixed to ON or OFF by P707. Signal input status (C101) is displayed as status display. Related parameters:P700,P701,P707,P4XX parameters This signal is the zero deceleration LS at the time of zero return. When this signal is to be used as an external input signal, it is
		allocated to one of the DI1-8 signals by P700 and P701. ③Signal input status (C101) is displayed as status display. Related parameters:P700,P701,P707
Zero marker	I-1	①This signal is the external marker input at the time of zero return. ②When this signal is to be used as an external input signal, it is allocated to one of the DI1-8 signals by P700 and P701. ③Signal input status (C101) is displayed as status display. Related parameters:P700,P701,P707
Forward jog	FJ I-1	①Forward jog is executed when this signal is ON. ②It is stopped by turning this signal OFF. ③This signal is valid in the pulse train run mode. ④When this signal is to be used as an external input signal, it is allocated to one of the DI1-8 signals by P700 and P701. ⑤Signal status can be fixed to ON or OFF by P708. ⑥Signal input status (C101) is displayed as status display. Related parameters:P400,P401,P413,P700,P701,P708
Reverse jog	RJ I-1	①Reverse jog is executed when this signal is ON. ②It is stopped by turning this signal OFF. ③This signal is valid in the pulse train run mode. ④When this signal is to be used as an external input signal, it is allocated to one of the DI1-8 signals by P700 and P701. ⑤Signal status can be fixed to ON or OFF by P708. ⑥Signal input status (C101) is displayed as status display. Related parameters:P400,P401,P413,P700,P701,P708

Signal name	Code Circuit No.	Function
ABS data	ABRQ	①When this signal is turned ON, ABS encoder data (C001 display
request	1-1	contents) output status is set, the I/O allocation of the control I/O signals is cancelled and changes to the following signals. DO3: Response data (DRSP), DO4: Response clock (CRSP), DI8:Request clock (CRQ) (The signal allocated to DI8 is controlled as signal OFF status.) The host device can read the ABS encoder data of this device according to the above mentioned signals. When this signal is turned OFF, ABS data output status is turned
		OFF, and control I/O signals change to the I/O signals set during the signal allocation. ③Refer to "Data output time chart with Alarm code request, ABS data request, and Current position data request" for the data output method.
		 When this signal is to be used as an external input signal, it is allocated to one of the DI1-8 signals by P700 and P701. Signal input status (C101) is displayed as status display. Related parameters:P700,P701,P707
Alarm code	ALRQ	①When this signal is turned ON, alarm code (AL** display contents)
request	1-1	output status is set, I/O allocation of control I/O signals is cancelled and changes to the following signals. DO3:Return data (DRSP), DO4:Return clock (CRSP), DI8:Request clock (CRQ)
		(The signal allocated to DI8 is controlled as signal OFF status.) The host device can read the alarm code of the generating alarm of this device according to the above mentioned signals. ②When this signal is turned OFF, the alarm code output status is turned OFF and control I/O signals change to the I/O signals set during signal allocation. ③Refer to "Data output time chart with Alarm code request, ABS data request, and Current position data request" for the data output method.
		 When this signal is to be used as an external input signal, it is allocated to one of the DI1-8 signals by P700 and P701. Signal input status (C101) is displayed as status display. Related parameters:P700,P701,P707
Current	APRQ	①When this signal is turned ON, the current position data (C016
position data request	I-1	display contents) output status is set, I/O allocation of control I/O signals is cancelled and it changes to the following signals. DO3:Response data (DRSP), DO4:Response clock (CRSP), DI8:Request clock (CRQ) (The signal allocated to DI8 is controlled as signal OFF status.) The host device can read the data at current position of this device according to the above mentioned signals. When this signal is turned OFF, the current position data output status is turned OFF, and control I/O signals change to the I/O signals set during signal allocation. Refer to "Data output time chart with Alarm code request, ABS data request, and Current position data request" for the data output method. When this signal is to be used as an external input signal, it is allocated to one of the DI1-8 signals by P700 and P701. Signal input status (C101) is displayed as status display. Related parameters:P700,P701,P707

Signal name	Code Circuit No.	Function
Request clock	CRQ I-1	①This signal is the clock signal that advances the data output bit position of transmission data (DRSP) at the time of ABS data request (ABRQ), current position data request (APRQ) or alarm code request (ALRQ). ②The output of transmission data (DRSP) is output as bit data sequentially from higher-order bits according to the on/off edge of this signal. ③When the ABS data request (ABRQ), current position data request (APRQ) or alarm code request (ALRQ) is turned ON, this signal is automatically allocated to the control input signal DI8. ④This signal becomes valid from the initial ON edge of this signal after turning ON the ABS data request (ABRQ), current position data request (APRQ) or alarm code request (ABRQ). ⑤Refer to "Data output time chart during Alarm code request, ABS data request, and Current position data request" for the data output method. ⑥Signal input status (C101) is displayed as status display.

[Data output time chart with Alarm code request, ABS data request, and Current position data request]



①The following occurs when ALRQ signal is ON.

- Stores output data value.
- The signals for data output are allocated to the external signals as shown below.

DI8: CRQ signal, DO3: DRSP signal, DO4: CRSP signal.

Moreover, when the signal logic is ON, it is considered as short-circuit.

Also, the signal allocated to DI8 is controlled as signal OFF status.

②After ALRQ signal is turned ON, the topmost bit of data is output in DRSP signal and CRSP signal response is output by initially turning ON the CRQ signal.

Here onwards, the data bit is output serially from higher bit for each ON/OFF edge of CRQ signal.

- ®When CRQ signal greater than the data length is entered, the data is output from the topmost bit. Also, the data saved with ALRQ signal ON edge is output.
- When the host controller fetches the bit data of DRSP signal, after confirming the CRSP signal and after the input signal filter time of host controller is elapsed, the bits which are output to DRSP signal are fetched.

The format of each output data is as follows.

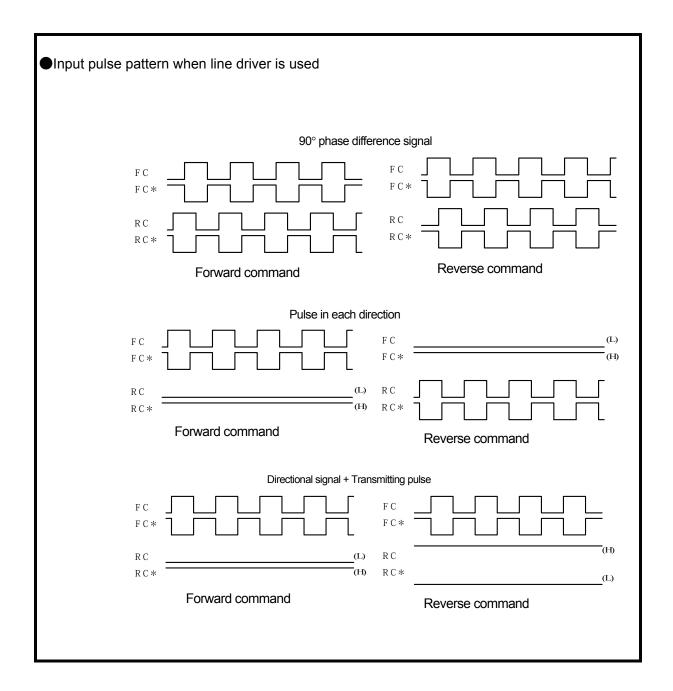
Output data item	Data type				
Alarm code	Unsigned 8 bit binary number				
	The alarm display code is a hexadecimal number code.				
	Ex.) Alarm display code [51]→Binary 0101 0001(Hexadecimal 51)				
ABS data	Signed 32 bit binary number				
Current position data	It is 2's complement for negative data.				
	Ex.) -12345→Binary 1111 1111 1111 1111 1100 1111 1100 0111				
	(Hexadecimal FFFFCFC7)				

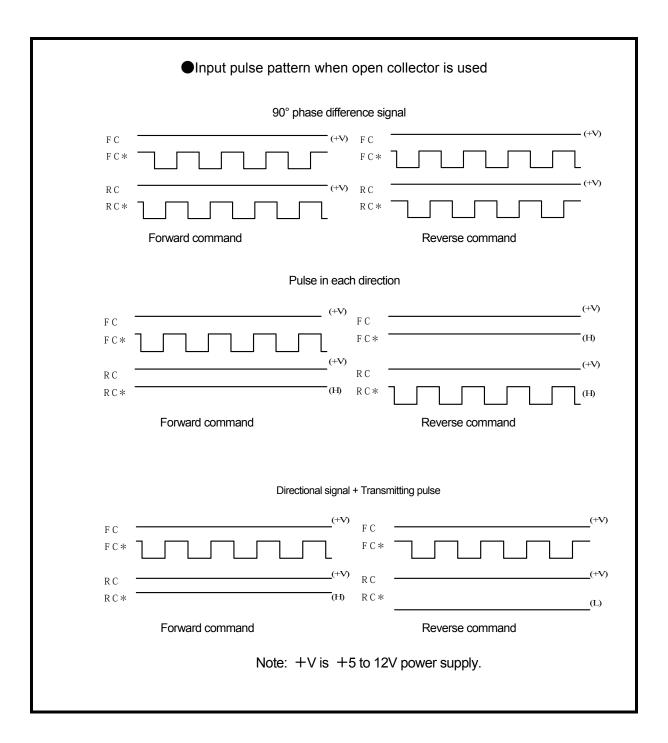
Though this timing chart is an example of the alarm code output, the ALRQ signal acts as ABRQ signal for the ABS data and for the current position the ALRQ signal acts as APRQ signal giving the data length of 32 bits.

©Limitations for using this data output function

- Please do not allocate the ALRQ signal, ABRQ signal and APRQ signal to DI8.
- Please do not use this data output function while executing the zero return operation by allocating ZLS or ZMK signal to DI8.
- Please do not allocate the Marker output signal (OCEM) to DO3 and DO4.
- Please do not turn ON the ALRQ signal, ABRQ signal and APRQ signal at once.

	Terminal	
Signal name	name	Function
	Circuit No.	
Pulse train	FC	①The signal in either of the forms of 90° phase difference,
command	FC*	direction-wise or directional signal + transmitting pulse is connected.
		②The signal form of the pulse train command is selected by P600
	RC	[Select pulse train command].
	RC*	Any of the signal methods can correspond to the line driver method
	I-2	and open collector method.
	-	In case of line driver method, the output of each line driver is connected between FC and FC* and between RC and RC*
		respectively.
		In case of the open collector method, +V (external power supply for
		the open collector circuit) is connected to FC and RC, and the output
		of the open collector is connected to FC* and RC* respectively.
		③In case of pulse train command of 90° phase difference, if the
		pulse train (A phase) of FC* or between FC and FC* is delayed by
		90° phase than the Pulse train (B phase) of RC* or between RC and
		RC*, then the motor operates in the forward direction and when it
		advances by 90° phase, the motor operates in the reverse direction.
		(4) In case of pulse train command for each direction, when the pulse
		train is entered in FC* or between FC and FC*, the motor operates in the forward direction and when the pulse train is entered in RC* or
		between RC and RC*, the motor operates in the reverse direction.
		⑤In case of directional signal + transmitting pulse command, enter
		the directional signal in RC* or between RC and RC*, and enter the
		transmitting pulse in FC* or between FC and FC*.
		©According to P600, the motor can be operated in reverse direction
		by forward pulse train command.
		⑦The maximum input frequency of pulse train command, is as
		follows.
		At the time of line driver output
		• 90° phase difference pulse:1Mpps (4Mpps with 4-multiplication)
		• Pulse in each direction :1Mpps
		 Minimum pulse width : More than 500ns At the time of open controller (used voltage 5-12V) output
		90° phase difference pulse:250kpps (1Mpps with 4-multiplication)
		Pulse in each direction :250kpps
		• Minimum pulse width : More than 2 μ s
		®Refer to the next page for the signal in each pulse command when
		the line driver is used.
		Refer to the next to next page for the signal in each pulse
		command when the open collector is used.
		®Signal input status (C101,C014,C015) is displayed as status
		display.
		Related parameters:P600-P607





Signal name	Terminal name Circuit No.	Function
Encoder feedback signal	SD/SD* IO-1	①The device and encoder are serially communicated (RS-485). Related parameters:P001,P002
Absolute encoder maintenance battery	BAT+/-	①When absolute encoder is used, the battery (3.6VDC) for maintaining multi-rotation data of absolute encoder is connected. Related parameter:P001
Serial communication	TXD(A/B)RX D(A/B)+5V,G ND IO-1	①When external equipment is connected, serial communication 1ch (RS-422A) is performed. TXD(A/B):Transmitted signal from this device, RXD(A/B):Received signal from this device ②The communication conditions can be selected by the parameters. Related parameters:P500,P501
USB	-D,+D	①USB 1.1 specifications of personal computer (even in USB 2.0 specifications connections are possible) are connected and the communication with editing software (option) is performed.

4-2-2 Remote Signal List

When this device is controlled during communication, the control signal is referred to as the remote signal.

For details refer to communication volume.

Control input/output	Signal name	Code	Remote device No.
	Start	DR	X0000
	Servo On	SON	X0001
	Torque limit	TL	X0002
	Speed gain selection	GSEL	X0003
	Reset	RST	X0004
	Mode selection	MD	X0005
	Command pulse input prohibition	CIH	X0006
	Reverse command direction	RVS	X0007
	Command selection 1	SS1	X0008
	Command selection 2	SS2	X0009
	Command selection 3	SS3	X000A
Controlled input	Emergency stop	EMG	X000B
Controlled input	Forward over travel	FOT	X000C
	Reverse over travel	ROT	X000D
	Command data reflection prohibition	NRF	X000E
	Internal pulse start	ZST	X0010
	Zero LS	ZLS	X0011
	Zero marker	ZMK	X0012
	Current position data request		X0014
	Alarm code request	ALRQ	X0015
	ABS data request	ABRQ	X0016
	Request clock	CRQ	X0017
	Forward jog	FJ	X0018
	Reverse jog	RJ	X0019

^{%1} The remote device No. shows the device number of the remote control data area corresponding to each signal in the communication.

[Tab. 4-1] Signal List Corresponding to the Remote Control (Input/Output Signal)

^{*2} Regardless of the positive/ negative logic, for the remote control signal, data "1" corresponds to "ON" and data "0" corresponds to "OFF".

4-2-3 I/O Interface

I/O signal type and its equivalent circuit is shown by a list.

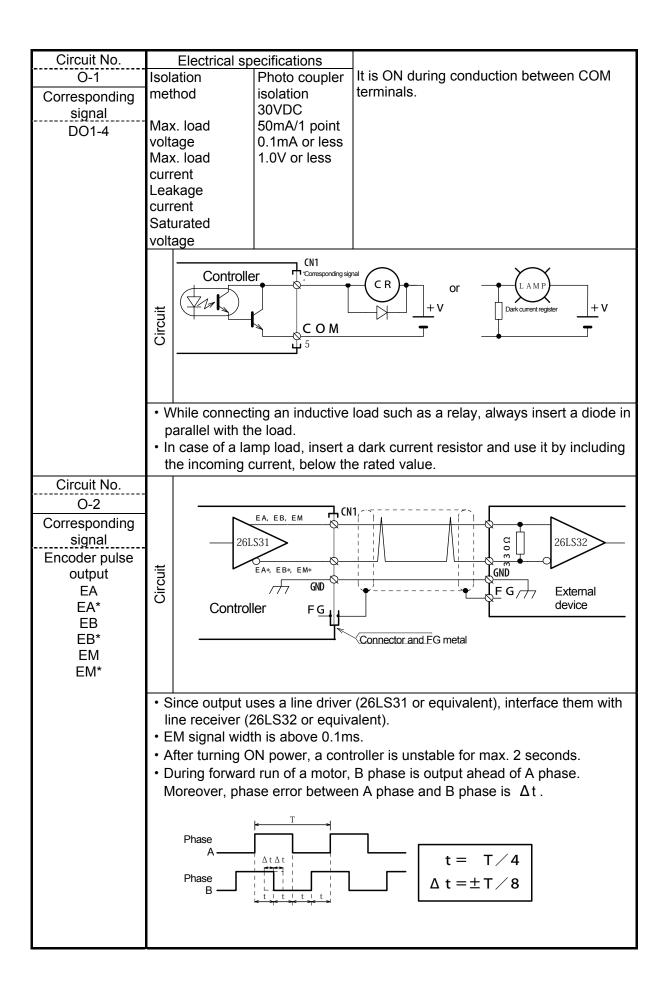
The type of each I/O signal is described in the I/O terminal and circuit number column of [Tab.

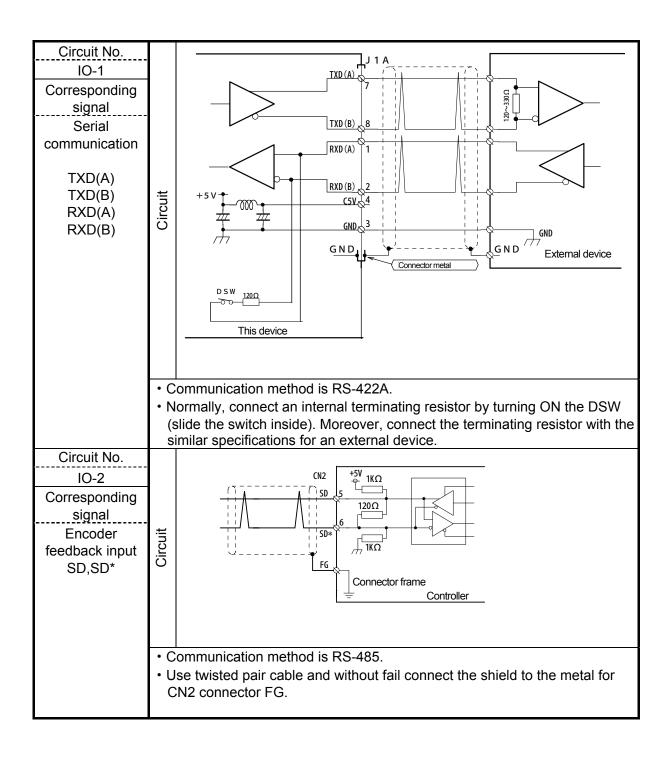
4-2-1 Input and Output Signal List].

Circuit No.	Electrical specifications			Circuit			
I-1	Isol	lation	Photo coupler				
	me	thod	isolation			CN1	
Corresponding	Apr	olied voltage	10.2-26.4VDC		(+ V = +1)	[+V =	
signal	ran				+ v -	<u></u>	
DI1-8	Rip	ple ratio	Within 59	%	⊤ v	a contact Corresponding sig	Inal A A A
		ed input	About			Λ b contact Λ 4. 7KΩ	Controller
		rent	2.5mA/12	2VDC		<u> </u>	·
	(/1	point)	About				
	ļ. —		5.0mA/24				
		ut resistor	About 4.7				
		ut filter time	About 12	0μs			
		istant	r cwitchin	a mioro o	urront or	transistor of an op	on collector
	C	output for the	contact.	y micro-c	uneni oi	transistor or an op	Den conector
	• Ir	n case of pos	itive logic	, when th	e contac	t is closed the sign	al is turned ON
	a	and when the	contact is	opened,	the sign	al is turned OFF.	ad in turned OFF
	1111 e	and when the	contact is	, when the opened.	the sign	t is closed the sigr al is turned ON.	iai is turried OFF
Circuit No.		Input me				coupler	
I-2		Pulse train o	output	Line driv	er	Open collector	
_	_	format					
Corresponding	ţi	Min. input pu	ulse	500ns		2µs	
signal	g	width				,	
Pulse train	ecif	Max. input fr	put frequency 1Mpps			250Kpps	
command	sb	Line driver	26LS31		or		
F0 F0*	ख्न			equiv.			
FC,FC* RC,RC*	ij.	Trans. saturati	ion volt.			0.9V or less	
KO,KO	Electrical specification	Applied volta	age			5.0-12.0VDC	
		range					
		Rated input	current	-		About 10mA/1	
						point	
			CV1		E-	demal power (N1	
			\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	FC	<u> </u>	supply	FC
		26LS31					
			1 129	FC* High sp		R	9 F C * I High speed · photo coupler
			112	R C isolati			
		26LS31	$\left(\begin{array}{cc} 1 & 1 \\ 1 & 1 \end{array} \right)$				
	ξį		1 130	RC*		R	O RC*
	Circuit	`='=		FG Controll		, · · · · · · · · · · · · · · · · · · ·	FG Controller
			rand FG metal	- Controll	<u> </u>	(Cable length 1.5m or les	
			ngth 3m or less ne driver meth			(Open collector me	
		(=		,		Ext.power R value	
						5V 0	w)
		× Pulse train cor	mmand outout ar	nd each GND o	of device may	12V 1 k Ω (1/4 as well be connected.	W /
		i disc il all'i COI	minaria output ai	IG COOT OIND	n action may a	AC THEIR DC CONTRICUION.	

^{*1} Take counter measures such that there will be no noise in supply voltage from an external power supply.

Circuit No.	Electrical sp	ecifications	Circuit.
I-3	Applied voltage	-10 to 10VDC	
	range		
Corresponding	 Use twisted page 	air cable and be	
signal	sure to connec	t the shields to	Connector and FG metal C N 1 F G Controller
INH	FG metal of CN	11 connector.	Command
			0 to ±10V
			1 (1) (104) 1 1 20 (40) 2 (2) (20)
			1
			<i>THI</i>





4-3 Connector Pin Layout

4-3-1 Control I/O Connector (CN1)

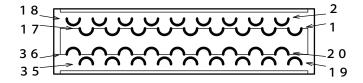
No.	Signal code	Signal name	No.	Signal code	Signal name
1	+V	External power supply (+12V to +24VDC)	19	DI1	Control Input signal 1
2	+V	External power supply (+12V to +24VDC)	20	DI2	Control Input signal 2
3	DO1	Control output signal 1	21	DI3	Control Input signal 3
4	DO2	Control output signal 2	22	DI4	Control Input signal 4
5	СОМ	External power supply (+12V to +24VDC) common	23	DI5	Control Input signal 5
6	СОМ	External power supply (+12V to +24VDC) common	24	DI6	Control Input signal 6
7	DO3	Control output signal 3	25	DI7	Control Input signal 7
8	DO4	Control output signal 4	26	DI8	Control Input signal 8
9	NC	Not connected (Reserved)	27	NC	Not connected (Reserved)
10	NC	Not connected (Reserved)	28	NC	Not connected (Reserved)
11	FC	Forward Pulse train command (+)	29	FC*	Forward Pulse train command (-)
12	RC	Reverse Pulse train command (+)	30	RC*	Reverse Pulse train Command (-)
13	+5V	Internal control power +5V	31	GND	Internal control power common
14	EA	Encoder pulse A phase output (+)	32	EA*	Encoder pulse A phase output (-)
15	EB	Encoder pulse B phase output (+)	33	EB*	Encoder pulse B phase output (-)
16	EM	Encoder pulse Z phase output (+)	34	EM*	Encoder pulse Z phase output (-)
17	NC	Not connected(Reserved)	35	GND	Internal control power common
18	INH	Speed command input	36	GND	Internal control power common

Applied connector : Receptacle / 10236-52A2JL (3M product)
Applicable cable side connector : Soldered plug / 10136-3000VE : Case (shell) / 10336-52AO-008

%1 The following figure is the layout where device side connector is viewed from connected portion.

18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1	
36 35 34 33 32 31 30 29 28 27 26 25 24 23 22 21 20 19	

X2 The following figure is the layout where cable side connector is viewed from soldered terminal.



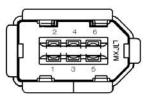
[Tab. 4-2] Connector CN1 Terminal Layout

4-3-2 Encoder Feedback Input Connector (CN2)

No.	Signal code	Signal name	No.	Signal code	Signal name
1	+5V	Encoder power supply	4	BAT-	Absolute-encoder maintenance battery —
2	GND	Encoder power supply common	5	SD	Communication data (+)
3	BAT+	Absolute-encoder maintenance battery +	6	SD*	Communication data (-)

Applied connector :Receptacle /53984-0611 (Molex Japan (Ltd.))
Applicable cable side connector :Soldered plug/55100-0600 (Molex Japan (Ltd.))

%1 The following figure is the layout where device side connector is viewed from connected portion.



*2 The following figure is the layout where cable side connector is viewed from soldered terminal.

[Tab. 4-3] Connector CN2 Terminal Layout

4-3-3 Serial Communication Connector (J1A/DSW)

No.	Signal code	Signal name	No.	Signal code	Signal name
1	RXD(A)	Received data (Paired with RXD(B))	5		(Not used/ Reserved)
2	RXD(B)	Received data (Paired with RXD(A))	6		(Not used/ Reserved)
3	GND	Internal control power common	7	TXD(A)	Transmitted data (Paired with TXD(B))
4	+5V	Internal control power +5V	8	TYD/B)	Transmitted data (Paired with TXD(A))

Applied connector :Receptacle /TCS7580-01-201 (Hoshiden(Ltd.))
Applicable cable side connector : plug /TCP8580 (Hoshiden(Ltd.)) or equivalent

*1 The following figure is the layout where device side connector is viewed from connected portion.



- *2 Soldered type sockets are not arranged for this connector. Please use optional cable of our company.
- DSW is connection switch for communication termination.
 Normally connect built-in terminating resistor by turning ON the DSW (slide the switch internally).

[Tab. 4-4] Connector J1 Terminal Layout

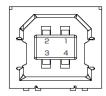
4-3-4 USB Connector (J2)

No.	Signal code	Signal name	No.	Signal code	Signal name
1		(Not connected/ Reserved)	3	+D	Communication data (Paired with -D)
2	-D	Communication data (Paired with +D)	4	GND	Internal control power common

Applicable cable: Commercial USB cable

Device side: A plug ←→Personal computer side: B plug

*1 The following figure is the layout where device side connector is viewed from connected portion.



%2 This cable side connector is not arranged as an option. Please use commercially available USB cable.

[Tab. 4-5] Connector J2 Terminal Layout

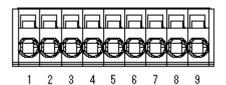
4-3-5 Main Power Input/ Power Line Output Terminal

No.	Signal code	Signal name	No.	Signal code	Signal name
1	R	AC input power R phase(100/200V)	6	B1	Regenerative resistor
2	Т	AC input power T phase(100/200V)	7	B2	Regenerative resistor
3	U	Motor power U phase	8	DBK	Dynamic brake signal
4	V	Motor power V phase	9	DBC	Dynamic brake signal common
5	W	Motor power W phase			

Applied connector : Pin header/721-469/001-000 (Wago Japan (Ltd.))

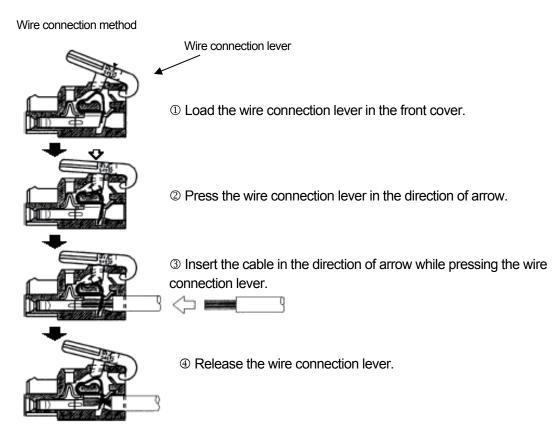
Applicable cable side connector : Plug/721-109/026-000 (Wago Japan (Ltd.))

*1 The following figure is the layout where connector is viewed from cable insert section.



*2 This cable side connector and wire connection lever are included as standard.

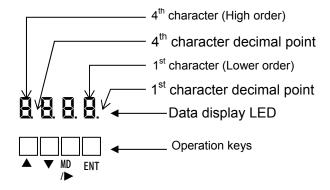
[Tab.4-6] Main Power Input/ Power Line Output Terminal Layout



Chapter 5 Setting and Display

5-1 Function of Each Part of the Operational Panel

Execution of the motor or the device status display, the parameter editing and the self-diagnosis is carried out by operating the operation panel.



1 Data display LED

Corresponding to each operation mode, data display LED displays item and data corresponding to item.

Display number/character list of 7 segment LED is as follows.

7 segment LED display	Number	7 segment LED display	Character	7 segment LED display	Character
	0	A	Α	٥	o (O)
{	1	Ь	b (B)	þ	Р
5	2		С	o	q (Q)
3	3	D.	d (D)	۲	r(R)
4	4	Ш	Е	14	t (T)
5	5	۴	F	11	U
6	6	¥	Н	•	-(negative) *1
η	7	r.	J		
8	8		L	_	
9	9	n	n(N)		

^{*1:} When display data is within 3 digits with -(negative) sign, - is displayed in 4th digit. Moreover, this time, even the 4th decimal point lights. When the display data is 4 digits or more with -(negative) sign, the 4th decimal point is lighted up by considering as -(negative) mark.

In the character display of upper 1 digit or upper 2 digits of the data display LED, the display meanings are as follows.

Display character	Display meanings	Display example
[The status display item is displayed.	[0.0
A	An alarm history item is displayed.	A003
AL	Generating alarm code is displayed.	ALO3
L	Device information display item is displayed.	L00 (
þ	Parameter editing item is displayed.	P002
bЬ	Auto tuning level adjustment item is displayed.	PPOO
d	Self-diagnosis execution item is displayed.	4004
99	Self-diagnosis execution item for manufacturer is displayed.	9904
H	Self-diagnosis editing item is displayed.	H000
HH	Self-diagnosis editing item for manufacturer is displayed.	HH00

There is a special meaning to the decimal point of 7 segment LED. Meaning of each decimal point is as follows.

Decimal point position	Display meaning			
4th digit decimal point	Sign mark Off: + data, On: -(negative) data			
3rd digit decimal point	Data mark of 10-9 digits display Alarm item and delimiter mark for alarm code at the time of alarm code display			
2nd digit decimal point	Data mark of 8-5 digits display (Even when the data of 10-9 digits is displayed, it lights.)			
1st digit decimal point	Data mark of 4-1 digits segment (When the data of 10-5 digits is displayed, it lights.)			

Ex.1) Display in case of 34560890

8-5 digits: **3 4 5 6** 4-1 digits: **0 8 9 0**

Ex.2) Display in case of -34567890

8-5 digits: **3**. **4 5**. **6** 4-1 digits: **7**. **8 9 0**.

Ex.3) Display in case of -185

Ex.4) Display in case of -12345678902

10–9 digits: - . . } 2. 8–5 digits: 3. 4 5 6. 4–1 digits: \P 8 Π Π

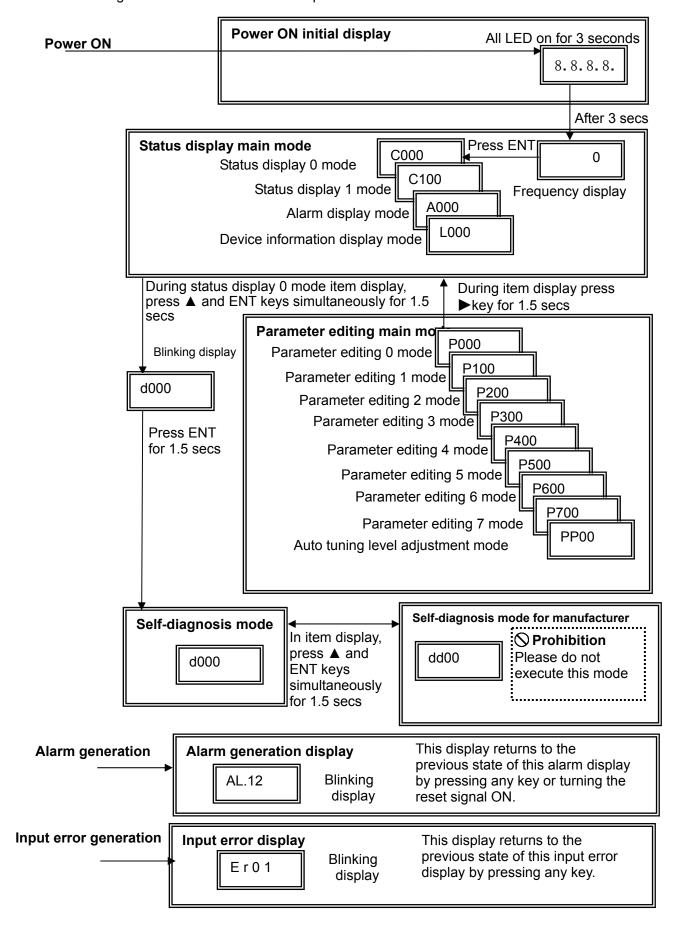
② Operation keys
The operation keys are used to select display item of each operation mode and to edit the parameter.

Function list of each operation key is as follows.

Key	State	Description		
	Item display	Selection of next items		
	Data setting	+1 for the blinking cursor numeric value.		
	Real time data setting	+1 for the entire display data.		
	Data diaglas	Changes 4th - 1st digit→8th - 5th digit→10th - 9th		
	Data display	digit→4th - 1st digit display.		
	Item display	Selection of previous items		
	Data setting	-1 for the blinking cursor numeric value.		
lacktriangle	Real time data setting	-1 for the entire display data.		
	Data diaplay	Changes 10th - 9th digit→8th - 5th digit→4th - 1st		
	Data display	digit→10th - 9th digit display.		
	Item display	Shifts to the next mode in a main operation mode.		
MD/ > *1	Data setting	Selects the data setting digit.		
MD/ ▶ *1	Real time data setting	Invalid		
	Data display	Shifts to data setting state.		
	Item display	Shifts to the next main operation mode.		
MD/▶ key press	Data setting	'		
for 1.5 sec.*1	Real time data setting	I Invalid		
	Data display			
	Data display	Shifts to data display state of a target item.		
	Item display	However, it is the same as \(\Lambda \), during the alarm		
ENIT		history display mode.		
ENT	Data setting	Clears the changed data, and shifts to the data		
	Real time data setting	display.		
	Data display	Shifts to item selection.		
	Item display	Invalid		
	Data setting	Shifts to the data display by registering the displayed		
ENT key press	Real time data setting	data (updated data).		
for 1.5 sec.	_	Shifts to real time data setting state.		
	Data display	However, for the real-time data setting, only the		
		parameter for the servo adjustment is possible.		
▲. ▼	Item display	Invalid		
press	Data setting	Clears the changed data, and shifts to the data		
simultaneously	Real time data setting	display.		
	Data display	Invalid		
	Item display	During alarm display mode, clears entire alarm		
▲,▼	. , ,	history.		
simultaneously	Data setting	Invalid		
press for	Real time data setting			
1.5 sec.	Data display	Clears display data of status display mode to 0.		
	Data display	However, the data that can be cleared is cleared.		
▲, ENT	Item display	Shifts to the self-diagnosis mode when status display		
simultaneously	. ,	is mode 0.		
press for	Data setting	 ,		
1.5 sec.	Real time data setting	Invalid		
	Data display			

^{*1:} MD/▶ key is described as ▶ in this manual.

5-2 Configuration and Transition of the Operation Mode



Details of the operation mode are as follows.

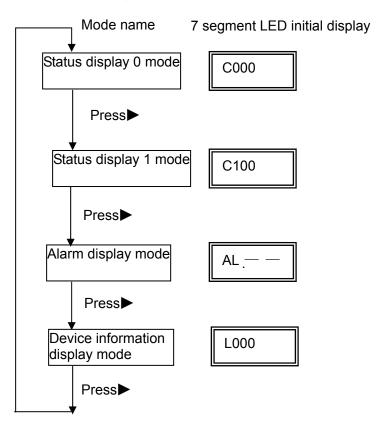
Operation mode	Item/ Data	Details		
	Item selection	The display item code for frequency, actual torque, software version etc. is selected.		
Status display	Data display	Data according to selected display item code is displayed.		
Status display	Alarm generation display	Alarm code at the time of alarm generation is displayed.		
Parameter editing	Item selection	The item code of the parameter to be edited is selected.		
	Edit data	Data according to the selected edit item code is set.		
Self-diagnosis 1/2	Item selection	The item code to be self-diagnosed is selected. Self-diagnosis 1: Self-diagnosis for the device failure confirmation Self-diagnosis 2: Self-diagnosis for delivery inspection		
	Data display / edit	Data according to the selected diagnosis item code is displayed or edited.		

Details of an input error are as follows.

Error display	Details	Remarks
Er01	The value less than setting range is set.	
Er02	The value exceeding the setting range is set.	
Er03	The auto tuning level is adjusted in the state where there is no measurement data in auto tuning.	Please adjust the auto tuning level after the auto tuning execution or by setting P151-154.

5-3 Status Display Main Mode

There are following modes in the status display main mode.



Display mode name	Description
Status display 0 mode	The status related to the servo is displayed. Ex.) Motor revolutions, generated torque, encoder pulse condition etc.
Status display 1 mode	The status other than servo related status is displayed. Ex.) I/O signal status, communication indicator etc.
Alarm display mode	The information of generating alarm and alarm history is displayed.
Device information display mode	The information of device power capacity, device version etc. is displayed.

5-3-1 Display Item of Status Display 0 Mode

	Item d	isplay			
Display sequence	8th - 5th digits Data	4th - 1st digits Data example	Unit	Clear *1	Display contents
1	C 0 None	0 0 2.2 0 0.	rpm		The real operation revolutions of the motor are displayed in rpm. Display range: -9999 to 9999 For Data example, -2200rpm is displayed.
2	C 0 None	1200.	rpm		External speed command input value is displayed in rpm. Display range: -9999 to 9999 For Data example, 1200rpm is displayed.
3	C 0 None	02 200.	%		Actual torque command is displayed in %. Display range: -799 to 799 (At the time of motor rated torque, 100%) For Data example, 200% is displayed.
4	C 0 None	03 250.	%	Valid	Peak torque command is displayed in %. Display range: 0 to 799 (At the time of motor rated torque, 100%) For Data example, 250% is displayed.
5	None	0 4 8 0.	%		Load factor (actual value) of the motor is displayed. Display range: 0 to 300 (At the time of motor rated load, 100%) For Data example, 80% is displayed.
6	C 0 None	0 5 5 0.	%		Thermal trip ratio is displayed in %. Display range: 0 to 100 When display is 100 (100%), there will be overload alarm. For Data example, 50% is displayed.

^{*1:} When ▲ and ▼ are pressed simultaneously for 1.5 seconds during data display conditions, display data is 0 cleared for the data indicated as "Valid" in the clear column.

Display sequence	Item display 10th - 9th digits Data example 8th - 5th 4th - 1st digits digits Data example Data example	Unit	Clear *1	Display contents
7	1 2 3.4. 5 6 7 8.	Encoder pulse	Valid	Encoder pulse cumulative quantity is displayed. Display range: -2147483647 to 2147483647 For Data example, 2112345678 pulse is displayed.
8	C 0 1 1 8 0.3 3.6. 6.6 5 5	Encoder		Encoder position is displayed. Display range: -1073741823 to 1073741823 For Data example, -803366655 pulse is displayed.
9	C 0 1 2 None 1.1. 3 6 5 2	Encoder pulse		Encoder 1 rotational position is displayed. Display range: 0 to 131071 For Data example, 113652 pulse is displayed.
10	C 0 1 3 None 02 3 4	Encoder		Position deviation pulse is displayed. Display range: -99999999 to 99999999 For Data example, -234 pulse is displayed.
11	C 0 1 4 None 1.2 3.4. 5.6 7 8.	Pulse	Valid	Pulse train command cumulative quantity is displayed. Display range: -99999999 to 99999999 For Data example, -12345678 pulse is displayed.
12	C 0 1 5 None .1. 1 2 3 0.	pps		The input frequency of Pulse train command is displayed. Display range: -9999990 to 9999990 The least significant digit is always displayed as 0. For Data example, 11230pps is displayed.
13	C 0 1 6 None .1. 1 2 3 0	Pulse		Current position is displayed. Display range: -99999999 to 99999999 For Data example, 11230 pulse is displayed.

^{*1:} When ▲ and ▼ are pressed simultaneously for 1.5 seconds during data display conditions, display data is 0 cleared for the data indicated as "Valid" in the clear column.

5-3-2 Display Item of Status Display 1 Mode

<u>5-3-2</u>	isplay Item o	ot Status Di	ispiay i ivid	oae	
Display sequence	Item dis 8th - 5th digits Data example	4th - 1st digits Data	Unit	Clear *1	Display contents
1	None	Refer to the display contents column	None		External I/O control signal status display Display correspondence: The following corresponding LED lights when signal is ON. DIS DI7 DI6 DI5 DI4 DI3 DI2 DI1 RC FC D04 D03 D02 D01 All middle horizontal LEDs are always in the lighting status.
2	Refer to the display contents column	Refer to the display contents column	None		Internal input control signal status display for upper digits Display correspondence: The following corresponding LED lights when signal is ON. CRQ ABRQ ALRQ APRQ reserved ZMK ZLS ZST

[※] As signal status display is displayed for approx. 100 msec each, when the signal is turned ON/OFF faster than 100 msec, it cannot be displayed.

Display sequence	Item di 8th - 5th digits Data example	4th - 1st digits Data	Unit	Clear *1	Display contents
3	C 1 0 Refer to the display contents column) 2 Refer to	None		Internal output control signal status display for upper digits Display correspondence: The following corresponding LED lights when signal is ON. CRSP DRSPReserved
4	C 1 (Refer to the display contents column	None		Communication indicator display Display correspondence: Refer to the following. Displays 8 during reception and 1 when there is no reception Displays 8 during transmission and 1 when there is no transmission Constant 1 display

As signal status display is displayed for approx. 100 msec each, when the signal is turned ON/OFF faster than 100 msec, it cannot be displayed.

5-3-3 Display Item of Alarm Display Mode

This display is displayed by summing up the items display and data.

Item Data Display display example Clear Unit Display contents sequence (upper 2 (lower 2 *1 digits) digits) 0.5 AL. The alarm currently being generated is displayed. 1 None Display range: AL.00 - AL.FF For data example, alarm code 05 is displayed. A0. 25 The most recently generated alarm is displayed. 2 Valid Display range: A0.00 - A0.FF None For data example, alarm code 25 is displayed. A1. 14 The 1st generated alarm earlier than the most recent one is displayed. Display range: A1.00 - A1.FF Valid 3 None For data example, alarm code 14 is displayed. A2. 4.5 The 2nd generated alarm earlier than the most recent one is displayed. 4 None Valid Display range: A2.00 - A2.FF For data example, alarm code 45 is displayed. A3. 33 The 3rd generated alarm earlier than the most recent one is displayed. Valid Display range: A3.00 - A3.FF 5 None For data example, alarm code 33 is displayed. A4. 20 The 4th generated alarm earlier than the most recent one is displayed. 6 Valid Display range: A4.00 - A4.FF None For data example, alarm code 20 is displayed. The 5th generated alarm earlier than the most A5. - recent one is displayed. Display range: A5.00 - A5.FF 7 None Valid For data example, it is displayed that there is no alarm.

^{*1:} When ▲ and ▼ are pressed simultaneously for 1.5 seconds during data display conditions, the data indicated as "Valid" in the clear column changes to no-alarm display.

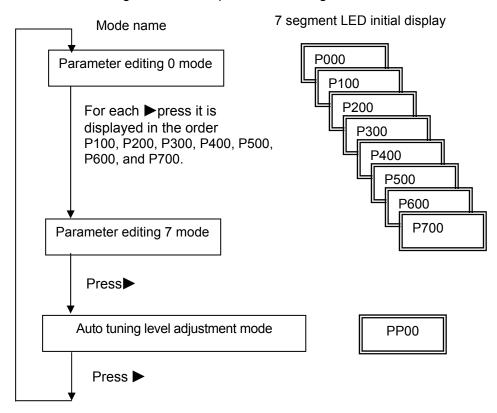
5-3-4 Display Item of Device Information Display Mode

Display sequence	8th - 5th digits Data	lisplay 4th - 1st digits Data example	Unit	Clear *1	Display contents
1	L 0 None	0 0	None		Model number is displayed. Display range: 0 - 9999 For data example, model number 0 is displayed.
2	L 0 None	0 1 4 0 1.	W		The device output capacity is displayed in the following format. 3 rd -2 nd digits: significant digits 1 st digit: Index of 10 Example) 401→40×10 ¹ →400W Display range: 51 - 999 For data example, 400W is displayed.
3	L 0 0 2 None 2 0 0.		V		The device power voltage is displayed in V. Display range: 100 - 400 For data example, 200V is displayed.
4	None	0 3 1.			Hardware version display. Display range: 0 - 9999 For data example, hardware version 1 is displayed.
5	L 0 0 4 None 1.				Software version display. Display range: 0 - 9999 For data example, software version 1 is displayed.

^{*1:} When ▲ and ▼ are pressed simultaneously for 1.5 seconds during data display conditions, display data is 0 cleared for the data indicated as "Valid" in the clear column.

5-4 Parameter Editing Main Mode

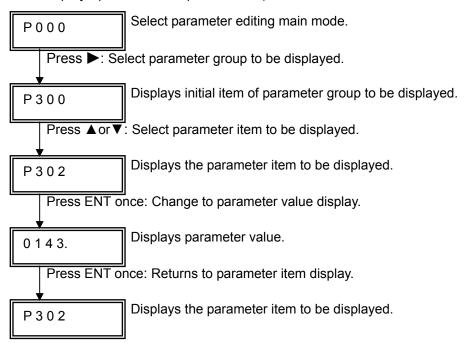
There are following modes in the parameter editing main mode.



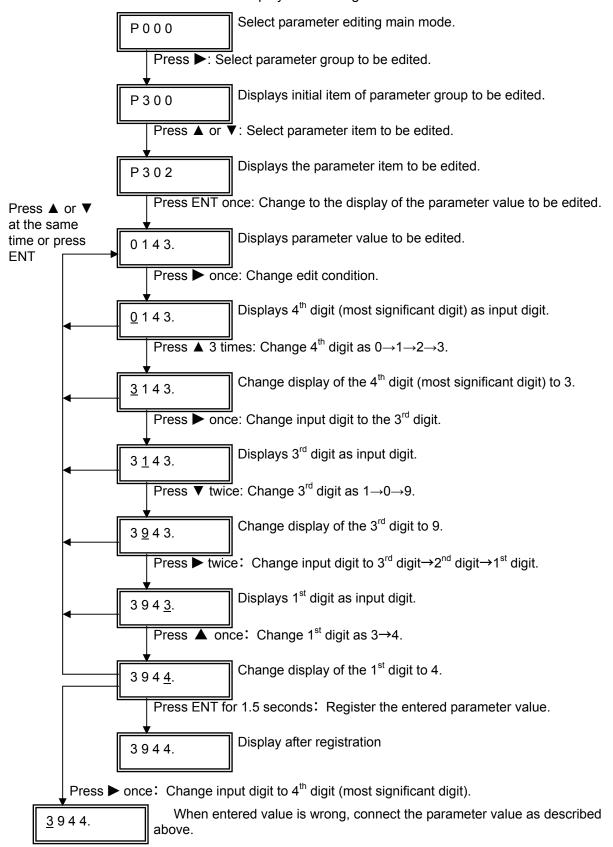
Display mode name	Contents			
Parameter editing 0-7 mode	Parameter value is displayed and set. Parameter editing 0-7 mode corresponds to parameter group 0-7. Refer to the parameter-related chapter for items and contents of parameter groups and parameters.			
Auto tuning level adjustment mode	On the basis of the load measured during auto tuning, proper balance of speed loop proportional gain and speed loop integral time constant is taken and servo response strength is adjusted. Refer to the auto tuning-related chapter for items and contents of auto tuning level adjustment.			

5-5 Item Operation

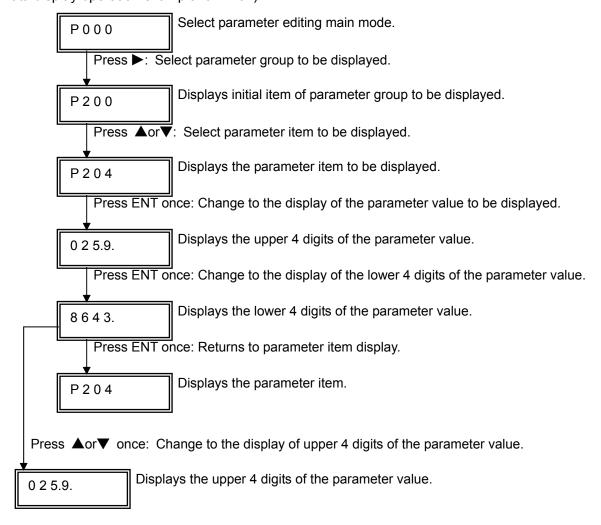
① Display operation for data within 4 digits Data display operation example for P302)



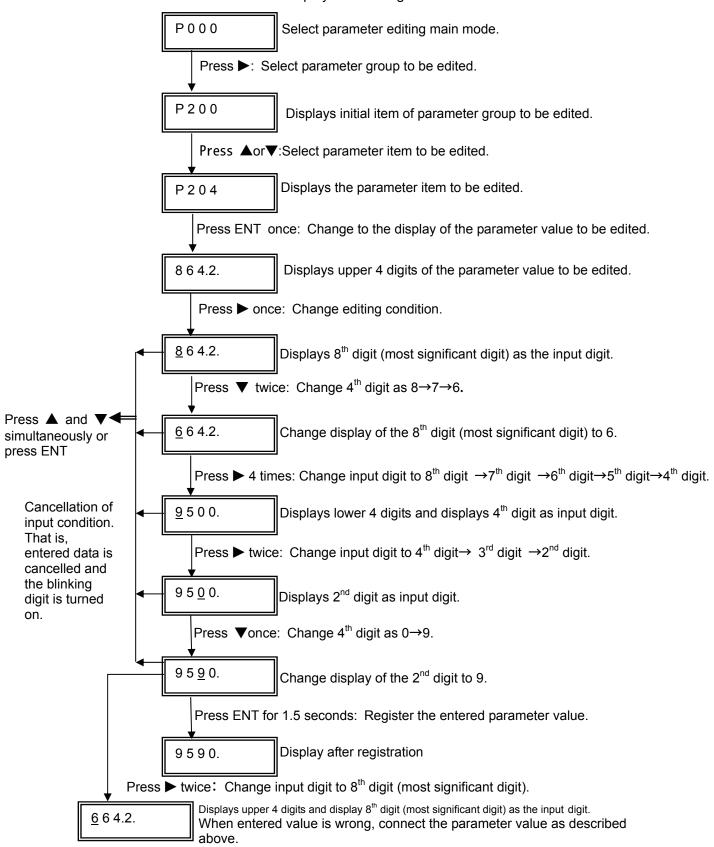
② Edit operation for parameter data within 4 digits Example of change of P302 parameter value: 0143→3944) The underlined numbers in the display are blinking.



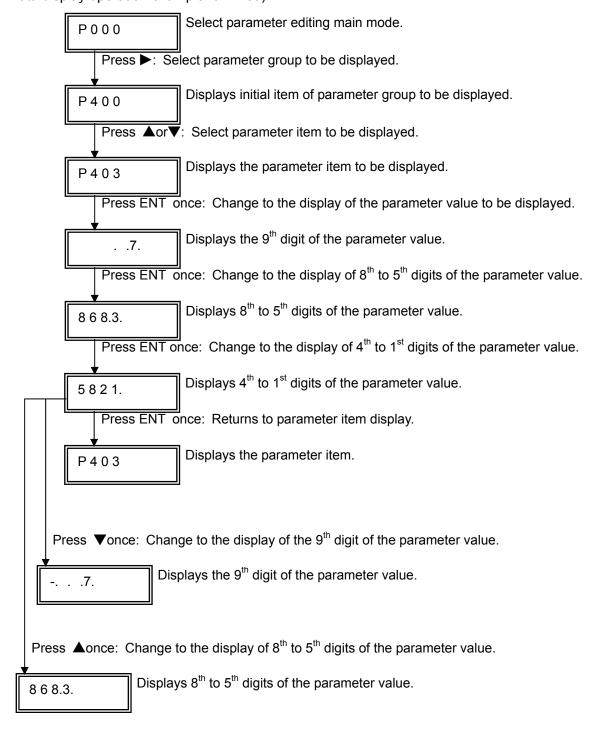
3 Data display operation for 8 to 5 digits Data display operation example for P204)



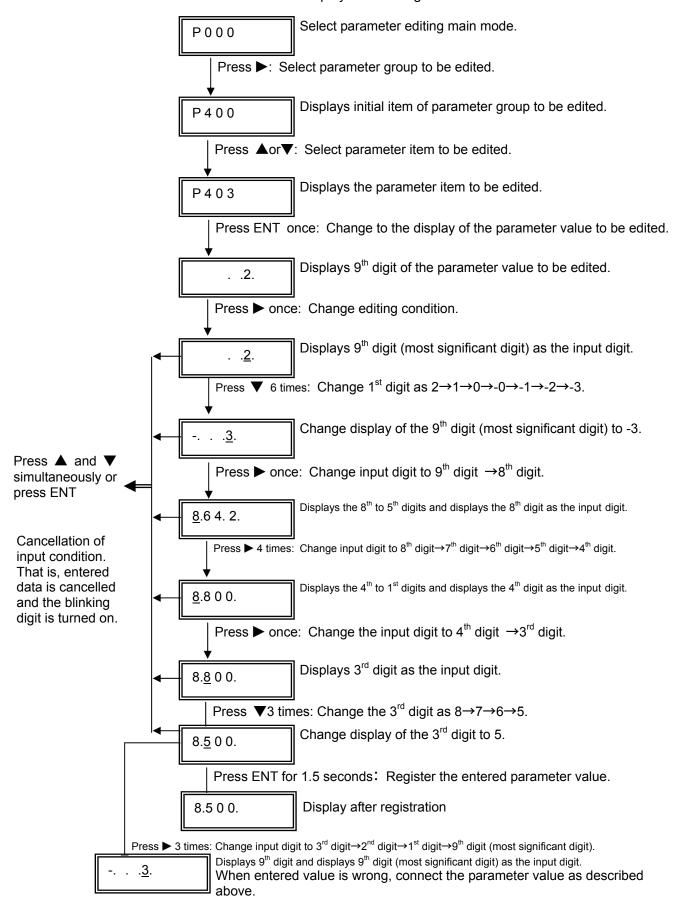
Parameter data editing operation for 8 to 5 digits Example of change of P204 parameter value: 86429500→66429590) The underlined numbers in the display are blinking.



Data display operation for 9 digits
 Data display operation example for P403)



⑤ Parameter data editing operation for 9 digits Example of change of P403 parameter value: 286428800→-786428500) The underlined numbers in the display are blinking.



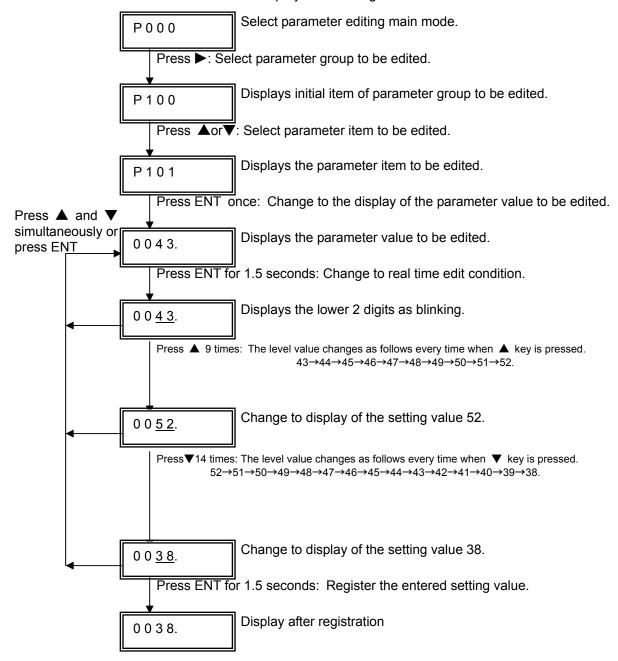
Real Time editing operation

In the servo adjustment parameter, adjustment of the total setting value is possible by pressing \blacktriangle and \blacktriangledown .

Gradual servo adjustment is possible while watching the behavior of the motor, because the adjusted setting value is reflected in the control in real time.

Example of change of P101 parameter value: 0043→0052→0038)

The underlined numbers in the display are blinking.



5-6 Self-diagnosis Mode Refer to the self-diagnosis-related chapter for self-diagnosis mode.

Chapter 6 Parameters

6-1 Parameter Group List

The parameters of this device are classified into groups as shown below.

Parameter group ×	Parameter item	Parameter group name
0	P000-	Motor, encoder parameter
1	P100-	Driver adjustment, self-diagnosis parameter
2	P200-	NC adjustment parameter
3	P300-	Speed control command parameter
4	P400-	Zero return & positioning command parameter
5	P500-	Communication parameter
6	P600-	Pulse train input parameter
7	P700-	I/O signal parameter

^{*} The numerical value next to P in the parameter item is a parameter group number.

6-2 Parameter List

1 Parameter group 0

Parameter	Peremeter name	Linit	Cotyclus
No.	Parameter name	Unit	Set value
P000	Motor type		000 - 999
P001	Encoder type selection		O: Incremental encoder 1: Incremental/absolute encoder Incremental mode is used 2: Incremental/absolute encoder Absolute mode is used 3: Reserved
P002	Encoder pulse selection		0:17bit (131072ppr)
P003	Rotating direction selection		0:CCW normal rotation 1:CW normal rotation
P004	Applicable max. speed	rpm	0-9999
P005	Torque limit value 1+	%	0 - 799
P006	Torque limit value 1—	%	0 - 799
P007	Torque limit value 2+	%	0 - 799
P008	Torque limit value 2—	%	0 - 799
P009	Electronic thermal detection selection	%	50 - 200
P010	Encoder pulse ouput division numerator	, ,	0-131072
P011	Encoder pulse ouput division denominator		1-131072
P012	Encoder marker output specification		0:Each rotation, 1: One stop
P013	Encoder marker output position	Encoder position	-99999999 - 999999999
P020	Motor type and number of poles		0 - 65535
P021	Rated torque current	0.01A	0 - 99999999
P022	Rated speed	rpm	1 - 9999
P023	Momentary max. torque ratio	%	1 - 799
P024	Exciting current command (Induction)		-32768 - 32767
P025	Slip coefficient (Induction)		-32768 - 32767
P026	Primary resistance	mΩ	0 - 65535
P027	Primary self-inductance	μΗ	0 - 65535
P028	Voltage feed-forward rate	%	0 - 100
P029	Induced voltage compensatory rate	%	0 - 100
P030	Incoherence compensatory rate	%	0 - 100
P031 P032	dq proportional gain		0 - 65535
	dq integral gain	0.1μs	-32768 - 32767
P033 P034	Dead time compensation time Torque to torque current conversion coefficient	υ. ι μ s	-32768 - 32767 -32768 - 32767
P035	PWM output limiter value		-32768 - 32767
P036	Electronic thermal correction standard		-32768 - 32767
P037	Conversion limiter of torque command value		-32768 - 32767
P049	Torque constant	0.001 Nm/A	0 - 9999999

P020-P049 become valid when "999" is set in P000.

Parameter							
No.	Parameter name	Unit	Set value				
P100	Low speed gain range	rpm	000 - 100				
P101	Speed loop proportional gain	•	0 - 9999				
P102	Speed loop integral time constant	0.1msec	0 - 29999				
P103	Speed loop derivative time constant	μsec	-999 - 999				
P104	Speed loop proportional gain division ratio	0.1%	-1000 - 1000				
P106	Speed loop proportional gain / Low speed gain range		0 - 9999				
P107	Speed loop integral time constant/ Low speed gain range	0.1msec	0 - 29999				
P108	Speed loop derivative time constant/ Low speed gain range	μsec	-999 - 999				
P109	Speed loop proportional gain division ratio/Low speed gain range	0.1%	-1000 - 1000				
P111	Speed loop proportional Gain/GSEL signal ON		0 - 9999				
P112	Speed loop integral time constant/GSEL signal ON	0.1msec	0 - 29999				
P113	Speed loop derivative time constant/ GSEL signal ON	μsec	-999 - 999				
P114	Speed loop proportional gain division ratio/ GSEL signal ON	0.1%	-1000 - 1000				
P116	Stopped differential coefficient		0 - 999				
P117	Stopped filter time constant	0.1msec	0 - 999				
P118	Speed loop integral torque limit	%	0 - 799				
P119	Stopped feedback filter time constant	0.1msec	0 - 10				
P120	Torque command filter frequency	Hz	0 - 4999				
P121	Notch filter center frequency 1	Hz	0 - 4999				
P122	Notch filter band width 1	Hz	0 - 4999				
P123	Notch filter center frequency 2	Hz	0 - 4999				
P124	Notch filter band width 2	Hz	0 - 4999				
P125	Notch filter center frequency 3	Hz	0 - 4999				
P126	Notch filter band width 3	Hz	0 - 4999				
P127	Notch filter center frequency 4	Hz	0 - 4999				
P128	Notch filter band width 4	Hz	0 - 4999				
P129	Notch filter center frequency 5	Hz	0 - 4999				
P130	Notch filter band width 5	Hz	0 - 4999				
P131	Low speed gain change delay time	msec	0 - 999				
P132	Only for maker		Please set [0].				
/ When "pulse" is appointed in the unit column (when it is not appointed as the appoint and it							

When "pulse" is specified in the unit column (when it is not specified as the encoder pulse), it changes to the pulse train command unit.

Parameter No.	Parameter name	Unit	Set value
P150	Select auto tuning operation specifications		1st - 3rd digits: Operation speed ratio 0-100% 4th digit: Operation direction 0: Both, 1: Only + direction, 2: Only - direction
P151	Inertia	10 ⁻⁶ kg·m ²	0 - 9999999
P152	Viscous friction	10 ⁻⁶ Nm/ (rad/sec)	0 - 9999999
P153	Inertia/GSEL signal ON	10 ⁻⁶ kg·	0 - 99999999
P154	Viscous friction/GSEL signal ON	10 ⁻⁶ Nm/ (rad/sec)	0 - 99999999
P155	Select self-diagnosis test run specifications		1st - 3rd digits: Stop time [0.01sec unit] 0-9.99sec 4th digit: Operation direction 0: Both, 1: Only + direction, 2: Only - direction
P156	Self-diagnosis test run positioning	pulse	0 - 99999999
P157	Self-diagnosis test run speed	pulse/sec	1 - 99999999
P158	Forced jog speed	pulse/sec	1 - 99999999

When "pulse" is specified in the unit column (when it is not specified as the encoder pulse), it changes to the pulse train command unit.

Parameter No.	Parameter name	Unit	Set value
P200	Position loop gain	1/s	0 - 9999
P201	Servo lock gain	1/s	0 - 9999
P202	Deviation range A	Encoder pulse	0 - 99999999
P203	Deviation range B	Encoder pulse	0 - 9999999
P204	Overflow detection pulse	Encoder pulse	0 - 9999999
P205	Position loop derivative time constant	μsec	-999 - 999

Parameter No.	Parameter name	Unit	Set value
P300	Speed command gain	mV	1000 - 99999
P301	Speed command offset	mV	-9999 - 9999
P302	Speed command value 1	rpm	-9999 - 9999
P303	Speed command value 2	rpm	-9999 - 9999
P304	Speed command value 3	rpm	-9999 - 9999
P305	Speed command value 4	rpm	-9999 - 9999
P306	Speed command value 5	rpm	-9999 - 9999
P307	Speed command value 6	rpm	-9999 - 9999
P308	Speed command value 7	rpm	-9999 - 9999
P309	Acceleration time (For speed control)	msec	0 - 9999
P310	Deceleration time (For speed control)	msec	0 - 9999

Parameter	lieter group 4				
No.	Parameter name	Unit	Set value		
P400	Zero return acceleration time	msec	0 to 9999		
P401	Zero return deceleration time	msec 0 to 9999			
P402	Zero return method selection	0:STD.HOME, 1:LS LESS, 2:ABS.HOME,			
F402	Zero return method selection	3:MK.VLD), 4:SHORT.HOME		
			-99999999 to 99999999		
			When P402 is ABS.HOME		
			Consider encoder positioning		
		Encoder	position		
P403	Zero marker selection	position	When P402 is other than ABS.HOME,		
		position	-1: External marker,		
			0 to 131071: Encoder position		
			Other than above: Control as		
			encoder position 0		
P404	Zero return speed	pulse/sec	-9999999 to 99999999		
D405		pulse	1 to 00000000		
P405	Zero return creep speed	/sec	1 to 99999999		
P406	Zero point position constant	pulse	0 to 99999999		
P407	Zero point set distance	pulse	-9999999 to 9999999		
P408	Position data reference point	pulse	-9999999 to 99999999		
P409	Positioning acceleration time 1	msec	0 to 9999		
P410	Positioning deceleration time 1	msec	0 to 9999		
P411	Positioning acceleration time 2	msec	0 to 9999		
P412	Positioning deceleration time 2	msec	0 to 9999		
P413	Positioning speed 1/Jog speed	pulse /sec	1 to 99999999		
		pulse			
P414	Positioning speed 2	/sec	1 to 99999999		
		pulse			
P415	Positioning speed 3	/sec	1 to 99999999		
		1st digit: II	NC/ABS specification		
		0: Relat	ive position specification (INC)		
		1: Abso	lute position specification (ABS)		
		2nd digit:	Speed specification		
		0: Positioning speed 1(P413)			
		1: Positioning speed 2(P414)			
P416	Positioning type command 1		ioning speed 3(P415)		
			Acceleration/deceleration time		
		specific			
			ioning acceleration/deceleration time		
			to P410)		
			ioning acceleration/deceleration time		
		· · · · · · · · · · · · · · · · · · ·	to P412)		
P417	Positioning position command 1	pulse	-9999999 to 99999999		
P418	Positioning type command 2		Same as P416		
P419	Positioning position command 2	pulse	-9999999 to 99999999		
P420	Positioning type command 3		Same as P416		
P421	Positioning position command 3	pulse	-9999999 to 9999999		

Parameter No.	Parameter name	Unit	Set value
P422	Positioning type command 4		Same as P416
P423	Positioning position command 4	pulse	-9999999 to 99999999
P424	Positioning type command 5		Same as P416
P425	Positioning position command 5	pulse	-9999999 to 99999999
P426	Positioning type command 6		Same as P416
P427	Positioning position command 6	pulse	-9999999 to 99999999
P428	Positioning type command 7		Same as P416
P429	Positioning position command 7	pulse	-9999999 to 99999999

When "pulse" is specified in the unit column (when it is not specified as the encoder pulse), it changes to the pulse train command unit.

Parameter No.	Parameter name	Unit	Set value
P500	Select communication specifications		1st digit: Function selection 0: Low-order to High-order data (Little endian) 1: High-order to Low-orde data (Big endian) 2nd digit: Data length 0:7 bits,1:8 bits 3rd digit: Parity 0:None, 1:Odd number, 2:Even number 4th digit: Baud rate 0:9.6K, 1:19.2K, 2:38.4K, 3:57.6K, 4:115.2K
P501	Communication ID		0 to 16

Parameter No.	Parameter name	Unit	Set value
P600	Select pulse train command		1st digit: Phase sequence selection 0: Forward, 1: Reverse 2nd digit: Type selection 0:x1, 1:x2, 2:x4, 3:F/R pls, 4:pls+F/R
P601	Pulse train command ratio numerator		1 to 131072
P602	Pulse train command ratio denominator		1 to 131072
P603	Pulse train feed forward ratio	0.1%	0 to 1200
P604	Pulse train feed forward shift ratio	0.1%	0 to 1000
P605	Pulse train feed forward derivative time constant	μsec	-999 to 999
P606	Pulse train delay compensation time	0.1msec	0 to 9999
P607	Pulse train averaging filter time	1msec	0 to 100
P608	Pulse train inertia feed forward ratio	0.1%	-1000 to 2000
P609	Pulse train viscous friction feed forward ratio	0.1%	-1000 to 2000

Parameter No.	Parameter name	Unit	Set value
P700	Control input signal allocation 1 %00-49:Positive logic, 50-99:Negative logic		1st&2nd digits:DI1(J2-19) 3rd&4th digits:DI2(J2-20) 5th&6th digits:DI3(J2-21) 7th&8th digits:DI4(J2-22)
P701	Control input signal allocation 2		1st&2nd digits:DI5(J2-23) 3rd&4th digits:DI6(J2-24) 5th&6th digits:DI7(J2-25) 7th&8th digits:DI8(J2-26)
P702	Control output signal allocation 1 %00-49:Positive logic, 50-99:Negative logic		1st&2nd digits:DO1(J2-3) 3rd&4th digits:DO2(J2-4) 5th&6th digits:DO3(J2-7) 7th&8th digits:DO4(J2-8)
P705	Control input signal status setting 1 (0:ON/OFF valid,1:Fixed to OFF, 2:Fixed to ON)		1st digit:DR ,2nd digit:SON, 3rd digit:TL ,4th digit:GSEL, 5th digit:RST ,6th digit:MD, 7th digit:CIH ,8th digit:RVS
P706	Control input signal status setting 2		1st digit:SS1 ,2nd digit:SS2, 3rd digit:SS3 ,4th digit:EMG, 5th digit:FOT ,6th digit:ROT, 7th digit:NRF ,8th digit:Reserved
P707	Control input signal status setting 3		1st digit:ZST ,2nd digit:ZLS, 3rd digit:ZMK ,4th digit:Reserved, 5th digit:APRQ,6th digit:ALRQ, 7th digit:ABRQ,8th digit:CRQ 1st digit:FJ ,2nd digit:RJ,
P708	Control input signal status setting 4		3rd digit: Reserved,4th digit: Reserved, 5th digit: Reserved,6th digit: Reserved, 7th digit: Reserved,8th digit: Reserved
P710	Control input signal specification selection 1		1st digit: Deviation clear selection when SON signal is OFF 0:Valid, 1:Invalid 2nd digit: Stop selection when EMG signal is ON 0:Motor power OFF, 1: Brake stop
P715	Deceleration time at emergency stop (when brake stop is selected)	msec	0 - 9999
P716	Servo OFF delay time after Emergency stop (when brake stop is selected)	msec	0 - 9999
P717	Speed zero range (for SZ signal)	rpm	0 - 9999
P718	Brake output delay time	msec	0 - 999
P719	Dynamic brake specification selection		0:INVALID, 1:DMB ON 2:DMB OFF
P720	Servo ON delay time at dynamic brake	msec	0 - 10

6-3 Parameter Details

				Supported run mode					
Parameter No.	Parameter name	Edit type	Activating timing Speed	ъ Pulse train	-	_	Setting unit	Setting range	Factory setting (Initial value)
			•		I.		Fun	ction details	
[Group	0] [Motor, er	cod	er para	meter]					
P000	Motor type		P S	Р	S	3	None	000 – 999	000
		Re To Re P0	eferring select eferring 20-P0 Cautio	a dedicato [Sett 59. cm] cong valu	ollowi ated r ing op ie is s	ing mot ptio	[Applicab tor, input [on specific	le motor list], correctly set it. 999] to this parameter. ation], input dedicated motor p way or fire could occur. Since i ly.	

- Item description [Edit type] Blank column: Real time editing not allowed/ r: Real time editing allowed
- * Item description [Activating timing] I:Real time/ R:Reset or Power ON/ P:Power ON
- * Item description [Level] S:Setting is required./ F:Run can be done by initial value.

[Applicable motor list]

[/ \ppiicabic motor iii	otj									
		Applicable motor								
Device	P000	Motor type	Rated output [kW]	Rated speed [rpm]	Peak torque [%] ※1					
NCR-DCA0A2*-401A	022	NA80-101Z	0.1	3000	300					
Capacity:0.4kW	023	NA80-201M	0.2	3000	300					
Input voltage:200V	024	NA80-401M	0.4	3000	250					
NCR-DCA0A1*-201A	032	NA80-101Z	0.1	3000	300					
Capacity:0.2kW	033	NA80-201L	0.2	3000	250					
Input voltage:100V										

^{%1:}Torque value in which rated torque is assumed to be 100%

Parameter No.	Parameter name	Edit type	Activating timing		Pulse train about a point a particular train a point a	-	Level	Setting unit	Setting range	Factory setting (Initial value)
	01.58.4.4	<u> </u>						Fur	ction details	
[Group (0] [Motor, enc	ode	_				_	Nana	0 0	
P001	Encoder type selection	er da	et n 0:S 1:S ncoc 2:S ncoc ata. 3:R Wh pera define ir pes define coc chen	ese en Stional der protestes the street on t	e type of eric value (Increm S INC m S ABS m en absolution angle af encoder inite encoder inite encoder speed op ower is edevice i automatic	motive de de nentra de la constanta de la cons	etail: cal E	s] Encoder) Icremental Ibsolute m Ide is used Inanufactur Intal encoder p Ir status. I arker statu I put due to I status is I som or less I on. I ated by interes	er) is selected and when the mower-on is 12° or less, it chang us indicates the status where the indefinite encoder marker. released if the device operates with motor angle of 12° or more renal pulse start signal (ZST), tore, and this status is released.	otor ges to his device s at the re, after the he motor
P002	Encoder pulse selection	[S	et n	umb	eric value	ses e de	tail		on of an applied encoder.	0

- * Item description [Edit type] Blank column:Real time editing not allowed/r:Real time edit allowed
- * Item description [Activating timing] I:Real time/ R:Reset or Power ON/ P:Power ON
- * Item description [Level] S:Setting is required./ F:Run can be done by initial value.

Parameter No.	Parameter name	Setting range Setting Setting	-actory setting Initial value)							
[Group	o 0] [Motor, enc	oder parameter]								
		R S P	0							
	Rotating	Select the rotational direction of motor.								
P003	direction	[Set numeric value details]								
	selection	0:CCW rotation for forward direction command								
		1:CW rotation for forward direction command PSPFRPM 0 – 9999								
	Applicable		0							
P004	P004 max. speed	Set the maximum speed applied when the motor is used. When "0" is set, the maximum speed is rated speed.								
	max. speed	Please set the speed less than the rated speed for this parameter.								
-			300							
	Torque limit	Set the motor output torque limit value of forward direction.								
P005	value 1+	The output torque is clamped to the peak torque when the setting exceeds the								
	Value 11	peak torque of the motor.								
		When "0" is set, the torque is not generated in forward direction.								
			300							
DOOG	Torque limit	Set the motor output torque limit value of the reverse direction.								
P006	value 1-	The output torque is clamped to the peak torque when the setting ex	xceeds the							
		peak torque of the motor. When "0" is set, the torque is not generated in reverse direction.								
			100							
		When TL signal is ON, set forward torque limit value.	100							
P007	Torque limit	The output torque is clamped to the peak torque when the setting ex	xceeds the							
	value 2+	peak torque of the motor.								
		When "0" is set, the torque is not generated in forward direction.								
		I S P F % *1 0 – 799	100							
	Torque limit	When TL signal is ON, set reverse torque limit value.								
P008	value 2	The output torque is clamped to the peak torque when the setting ex	xceeds the							
		peak torque of the motor.								
		When "0" is set, the torque is not generated in reverse direction.								

[※] Item description [Edit type] Blank column:Real time editing not allowed/r:Real time editing allowed

Item description [Activating timing] I:Real time/ R:Reset or Power ON/ P:Power ON

^{*} Item description [Level] S:Setting is required./ F:Run can be done by initial value.

^{*1:} Torque value and actual value are set assuming the rated torque to be 100%.

Parameter No.	Parameter name	Activating timing Speed Dulse train Appropriate	Level	Setting unit	Setting range		Factory setting (Initial value)
Crou	Ol [Motor one	oder peremeter		Fur	oction details		
[Group	oj [iviotor, eric	oder parameter]	F	% *1	50 – 200		110
P009	Electronic thermal detection selection	Set the actual value Normally it is set to [• Caution] When more than motor to protect the The built-in electron to protect the The built-in electron to protect the top of the built-in electron to protect the built-in el	ue of e to 110% 111% is ne mote onic the	lectronic the factor of the fa	ermal detection. se connect the the	0% is as follo	ermal to the

- Item description [Edit type] Blank column: Real time editing not allowed/r: Real time editing allowed
- Item description [Activating timing] I:Real time/ R:Reset or Power ON/ P:Power ON
- * Item description [Level] S:Setting is required./ F:Run can be done by initial value.
- *1: Torque value and actual value are set assuming the rated torque to be 100%.

Parameter No.	Parameter name	Supported run mode Supported run mode Setting unit Setting value) Setting value Factory setting (Initial value) Function details							
[Group	0 0] [Motor, enc								
	Encoder	R S P F None 0 – 131072							
P010	pulse output division numerator	When the encoder feedback pulse output is divided, set a numerator value. The division ratio is set as follows. Division ratio = P010 set value / P011 set value							
		R S P F None 1 – 131072							
P011	Encoder pulse output division denominator	When the encoder feedback pulse output is divided, set the denominator value. The division ratio is set as follows. Division ratio = P010 set value / P011 set value Ex.) When the encoder pulse output is assumed to be 10000 pulses/rotation when multiplied by 4 P010 = 10000 (Set the number of pulses to be output per rotation with 4-multiplication) P011 = 131072 (One-rotation resolution of connected encoder)							
		R S P F None 0-1							
P012	Encoder marker ouput specification	Set the output specification of the encoder marker signal output. Encoder marker signal output position is set by P013. [Set numeric value details] 0:Marker signal output for each revolution In this setting, the setting range of P013 is between 0 and (Encoder 1-rotation resolution - 1). Again, P013 set value corresponds to Encoder 1-rotation position display (C012). 1:Marker signal output at one P013 setting position. This setting can be used for connecting the absolute encoder. Also, the set value of P013 corresponds to Encoder position display (C011).							
	Encoder	B S D E Encoder -999999999 - 999999999 (
P013	marker output position	The output position of the encoder marker signal is set. Please refer to P012 for details.							

X Item description [Edit type] Blank column:Real time editing not allowed/r:Real time editing allowed

Item description [Activating timing] I:Real time/ R:Reset or Power ON/ P:Power ON

^{*} Item description [Level] S:Setting is required./ F:Run can be done by initial value.

	<u> </u>			C			1			
			D		oported mode	ג				
rameter No.	Parameter name	Edit type	Activating timing		Pulse train		Level	Setting unit	Setting range	Factory setting (Initial value)
Ра			Act	S	Р					
		<u> </u>						Fur	nction details	
[Group	0] [Motor, enco		· pa P	ram S			_	None	0.05525	520
P020	Motor type and number of poles	Re	feri	ring		ing	F optic	None on specifica	0 – 65535 ation, input it when [999] is se	520 t to
	Rated torque		Р	S	Р		F	10mA	0 – 99999999	1
P021	current	[PC	000	:Mo	tor type	ing e].		•	ation, input it when [999] is se	
P022	Dated speed		P	S	-	in -	F	Rpm	1 – 9999	3000
P022	Rated speed	[PC	000	:Mo	tor type				ation, input it when [999] is se	
P023	Momentary max. torque		P	S	P	ina	F	%	1 - 799 ation, input it when [999] is se	300
F023	ratio	IP(000	ing :Mo	tor type	ing al.	opuc	on specifica	ation, input it when [999] is se	ι ιο
	Exciting		P	S	P	-1.	F		-32768 – 32767	0
P024	current command (Induction)				to Sett		optic	on specifica	ation, input it when [999] is se	t to
	Slip		Р	S	Р		F		-32768 – 32767	0
P025	coefficient (Induction)				to Sett		optic	n specifica	ation, input it when [999] is se	t to
	Primary		Р	S	Р		F	mΩ	0 – 65535	0
P026	resistance	[PC	000	:Mo	tor type	ing ∋].		<u> </u>	ation, input it when [999] is se	
	Primary self-		Р	S	Р		F	μН	0 – 65535	0
P027	inductance	[PC	000	:Mo	tor type	ing ∋].		<u> </u>	ation, input it when [999] is se	t to
	Voltage		Р	S	Р		F	%	0 – 100	0
P028	feed-forward rate	[PC	000	:Mo	tor type			•	ation, input it when [999] is se	
	Induced		Р	S	Р		F	%	0 – 100	0
P029	voltage compensatory rate				to Sett tor type		optio	on specifica	ation, input it when [999] is se	t to
	Incoherence		Р	S			F	%	0 – 100	0
P030	compensatory rate	[PC	000	:Mo	tor type			<u> </u>	ation, input it when [999] is se	t to
D00.1	dq		Р	S			F	None	0 – 65535	0
P031	proportional gain	[PC	000	:Mo	tor type	ing e].			ation, input it when [999] is se	
D000	dq integral			S			F	None	-32768 – 32767	0
P032	gain				to Sett tor type		optic	on specifica	ation, input it when [999] is se	t to

^{*}In the above list, "Edit type": Real time editing allowed, "Activating timing": Power ON, and "Level": Run can be done by initial value.

Parameter No.	Parameter name	Edit type	Activating timing	Speed	ported mode		Level	Setting unit Fur	Setting range	Factory setting (Initial value)
[Group	0] [Motor, enco	ode								
	Dead time		Р	S			F	0.1µs	-32768 – 32767	0
P033	compensation time				Settion Settion		ptic	n specifica	ation, input it when [999] is set	to
	Torque to		Р	S)		F	None	-32768 – 32767	0
P034	torque current conversion coefficient	Referring to Setting option specification, input it when [999] is set to [P000:Motor type].								to
	PWM output		Р	S)		F	None	-32768 – 32767	0
P035	limiter value				o Settii or type		ptic	n specifica	ation, input it when [999] is set	to
	Electronic		Р	S)		F	None	-32768 – 32767	0
P036	thermal correction standard			:Mot	or type		ptic	n specifica	ation, input it when [999] is set	to
	Conversion		Р	S)		F	None	-32768 – 32767	0
P037	limiter of torque command value				o Settii or type		ptic	· 	ation, input it when [999] is set	to
P049	Torque		Р	S			F	0.001 Nm/A	0 – 99999999	0
1 049	constant				o Settii or type		ptic	n specifica	ation, input it when [999] is set	to

^{*}In the above list, "Edit type": Real time editing allowed, "Activating timing": Power ON, and "Level": Run can be done by initial value.

Parameter No.	Parameter name	Edit type Activating timing	Supported run mode Lun mode Lun mode Lun mode Lun mode S P	Level		Setting range	Factory setting (Initial value)			
LGIOUD) 1] [Driver adju		seir-diagnosis S P	F Par		0 – 9999	0			
		_			rpm	when GSEL signal is OFF.	0			
P100	Low speed gain range	When read [Speed parameter But if seed this seed with the	motor speed i loop integral eters ([P106] et value is [0] ting value, co	is les time and , the	ss than this constant] [P107]) in y are not s	setting value, [Speed loop gai are switched to the control set Low speed gain range. switched. And motor speed is lated by parameters ([P101] and	by arger than			
			S P	F	None	0 – 9999	25			
P101	Speed loop proportional gain	When a	lepending on	response becomes faster, vibr	ation may					
			S P	F	0.1msec		200(20.0)			
P102	Speed loop integral time constant	When a is too s	a smaller valu mall, vibration alue is [0], int	ie is n (ch	set, respoi atter vibra	egral compensation. nse becomes faster. However, tion) may easily occur. ation is not conducted.	if the value			
			S P	F	μsec	-999 – 999	0			
P103	Speed loop derivative time constant	When a too larg Norma	a larger value ge, vibration (lly, set [0]. If s	is s chat et v	et, respons ter vibratio alue is [0],	rivative compensation. se becomes faster. However, if n) may easily occur. derivative compensation is not ill be the first-order delay time	conducted.			
		r l	S P	F	0.1%	-1000(-100.0%)–1000(100.0%)	0			
P104	Speed loop proportional gain division ratio	PID sp When a respon	r I S P F 0.1% -1000(-100.0%)–1000(100.0%) Set proportional compensation gain division ratio of two-degree-of-freedom PID speed control system. When a larger value is set, over-shoot to a speed command is depressed, and response to load change of speed control system becomes better. If it is too large, response to speed command becomes worse.							

Item description [Edit type] Blank column: Real time editing not allowed/r: Real time editing allowed

Item description [Activating timing] I:Real time/ R:Reset or Power ON/ P:Power ON

^{*} Item description [Level] S:Setting is required./ F:Run can be done by initial value.

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					pporte					
o.		4)	ing	Tui	n mod	-				Factory
Parameter No.	Parameter name	Edit type	Activating timing	ა Speed	ு Pulse train		Level	Setting unit	Setting range	setting (Initial value)
				<u> </u>	Г			 Fur	l nction details	
[Group	l o 1] [Driver adju	etm	nent	92	f_dian	nosis	nar		iction details	
[Oroup	Speed loop	r	I	, 3C	P	11031	F	None	0 – 9999	25
	proportional		<u> </u>		•			110110	0 0000	
P106	gain /Low speed gain range				d loop ils, ref				low speed gain range.	
	Speed loop	r	I	S	Р		F	0.1msec	0 - 29999(2999.9msec)	200(20.0)
P107	integral time constant/Low speed gain range							ed loop into to [P102].	egral compensation in low spee	ed gain
	Speed loop	r	I	S	Р		F	μsec	-999 – 999	0
P108	derivative time constant/Low speed gain range							ed loop de to [P103].	rivative compensation in low sp	eed gain
	Speed loop	r	I	S	Р		F	0.1%	-1000(-100.0%)-1000(100.0%)	0
P109	proportional gain division ratio/ Low speed gain range	PΙ	D s	pėe		rol s	, yster		n division ratio of two-degree-of l loop within low speed gain ran	
	Speed loop	r	I	S	Р		F	None	0 – 9999	25
P111	proportional gain /GSEL signal ON				d loop ils, ref				hen GSEL signal is ON.	
	Speed loop	r	I	S	Р		F	0.1msec	0 – 29999(2999.9msec)	200(20.0)
P112	integral time constant/ GSEL signal ON							ed loop into [P102].)	egral compensation when GSE	L signal is
	Speed loop	r	I	S	Р		F	μsec	-999 – 999	0
P113	derivative time constant/GSE L signal ON			. (F	or det			ed loop de to [P103].)	rivative compensation in low sp	eed gain
	Speed loop	r	١	S	Р		F	0.1%	-1000(-100.0%)—1000(100.0%)	0.000
P114	proportional gain division ratio/ GSEL signal ON	PΙ	D s etail:	pee s, re	d cont fer to	rol sy [P10	yster 4].)	n of speed	n division ratio of two-degree-of	

Item description [Edit type] Blank column:Real time editing not allowed/r:Real time editing allowed
 Item description [Activating timing] I:Real time/ R:Reset or Power ON/ P:Power ON
 Item description [Level] S:Setting is required./ F:Run can be done by initial value.

Parameter No.	Parameter name	Equit type drivating timing setting unit Set	Factory setting (Initial value)
[Group	n 1] [Driver adju	estment, self-diagnosis parameter]	
<u> </u>		r I S P F None 0-999	0
P116	Stopped differential coefficient	Set the differential coefficient corresponding to the vibrations during It becomes 5 when 0 is set. Normally set [0]. However, adjust as follows in the following conditions. • When the load inertia is great, the friction during stop is great and vibrations during stop are not suppressed even by adjusting P117, can be suppressed by setting this coefficient within the range of 6 to 10. • When there is almost no friction and some sound is heard while then that sound can be controlled by setting this coefficient within the setting that sound can be controlled by setting this coefficient within the s	d the then they to 30. stopping, he range of
P117	Stopped filter time constant	r I S P F 0.1msec 0–999(99.9msec) Set the filter time constant corresponding to the vibrations during so It will be 0.1msec when 0 is set. Normally set [0]. However, adjust as follows in the following conditions. • When there are vibrations while stopping with greater load inertial be suppressed by setting the constant within the range of 0.3 to 9.0	a, those can
P118	Speed loop integral torque limit	I S P F % *1 0 – 799 Set output torque limit value of speed loop Integral compensation. The output torque is clamped to the peak torque when the setting expeak torque of the motor. When "0" is set, it is limited by the peak torque.	0
P119	Stopped feedback filter time constant	r I S P F 0.1msec 0–10(1.0msec) Set the feedback filter time constant corresponding to the vibration stop. It will be 0.2msec when 0 is set. Normally set [0]. The vibrations during stop are reduced when greater value is set. However, if the value is too large, overshoot occurs while stopping.	·

Item description [Edit type] Blank column: Real time editing not allowed/r: Real time editing allowed

Item description [Activating timing] I:Real time/ R:Reset or Power ON/ P:Power ON

^{*} Item description [Level] S:Setting is required./ F:Run can be done by initial value.

^{*1:} Torque value and actual value are set assuming the rated torque to be 100%.

	İ		T		1	1						
			Supported									
o.		ing	run mode	_				Factory				
Ž		Edit type ating timi	train	<u>a</u>	Setting			setting				
ete	Parameter	Jit t		evel	unit	Setting rang	е	(Initial				
Ĭ	name	ati	Speed Pulse tra					value)				
Parameter No.		Edit type Activating timing	0, 9									
"		✓	S P									
						nction details						
[Group	1] [Driver adju	stmen				T	/					
		rl	S P	F	Hz		(1Hz Unit)	1000				
	Torque					rque commar	าด. on with some mad	shine				
D. 4.0.0	command	_					If a smaller value					
P120	filter		mance gets									
	frequency				w frequenc	y, set this sett	ting larger, to prev	ent/				
			nance notch									
		r I	is set, the fi	iter is a	Hz	0 – 4999	(1Hz Unit)	0				
D404	P121 center frequency 1		resonance occurs in combination with some machine system, set resonance requency to prevent the resonance.									
P121			Set notch filter by combining notch filter center frequency and notch filter band									
	irequency i	width	idth. [0] is set, the Notch filter 1 is disabled.									
							(411 11 11)					
D.400	Notch filter	r l	S P	F	Hz	0 – 4999	(1Hz Unit)	0				
P122	band width 1	Set b	and width c	of Notch	filter 1. If [0] is set, the N	Notch filter 1 is dis	abled.				
	Notch filter	r I	S P	F	Hz	0 – 4999	(1Hz Unit)	0				
P123	center						achine system, se					
120	frequency 2						, refer to [P121].)	ctresoriance				
P124	Notch filter	r I	S P	F	Hz		(1Hz Unit)	0				
P 124	band width 2	Set b					Notch filter 2 is dis	abled.				
	Notch filter	r I	S P	F	Hz		(1Hz Unit)	0				
P125	center						achine system, se					
	frequency 3	H - T - :				, `	, refer to [P121].)	1				
P126	Notch filter	r I	S P	F	Hz	1	(1Hz Unit)	0				
1 120	band width 3	Set b	and width c	of Notch	filter 3. If [0] is set, the N	Notch filter 3 is dis	abled.				
	Notch filter	r l	S P	F	Hz		(1Hz Unit)	0				
P127	P127 center						achine system, se	et resonance				
	frequency 4 Notch filter			vent the			, refer to [P121].)	0				
P128	band width 4	r I			Hz		(1Hz Unit) Notch filter 4 is dis	0 helde:				
	Notch filter	rII	S P	F	Hz		(1Hz Unit)	0				
P129	center	If res					achine system, se					
	frequency 5					e. (For details	, refer to [P121].)					
P130	Notch filter	r I	S P	F	Hz		(1Hz Unit)	0				
	band width 5						Notch filter 5 is dis					

^{*}Item description [Edit type] Blank column:Real time editing not allowed/ r:Real time editing allowed

^{*}Item description [Activating time]I:Real time/ R:Reset or Power ON/ P:Power ON *Item description [Level] S:Setting is required./ F:Run can be done by initial value.

			βι		pport mod							
Parameter No.	Parameter name	Edit type	Activating timing	Speed N	ு Pulse train		Level	Setting unit	Setting range	Factory setting (Initial value)		
			Function details									
[Group	o 1] [Driver adju	stm	ent	, se	lf-diag	nosis	s par	ameter]				
		r	I	S	Р		F	msec	0-999(999msec)	0		
		Se	et th	e d	elay ti	me a	fter I	ow speed	detection (parameter P100) till t	the change		
	Low speed				eed g							
P131	gain change			,	set [C	-						
	delay time		When the operation becomes unstable while changing from normal gain to lov									
		speed gain due to different settings of normal gain and low speed gain, stime till when the low speed status is stable.								gain, set the		
		tir	ne t	ill w	hen tl	ne lov	v spe	ed status	is stable.			
P132	Only for						F		0 – 100	0		
1 132	maker	Se	et [0].								

[※] Item description [Edit type] Blank column:Real time editing not allowed/r:Real time editing allowed

^{*} Item description [Activating timing] I:Real time/ R:Reset or Power ON/ P:Power ON

^{*} Item description [Level] S:Setting is required./ F:Run can be done by initial value.

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					pporte							
ö		4	ing	rur	mode)				Factory		
Parameter No.	Parameter name	Edit type	Activating timing	Speed	Pulse train		Level	Setting unit	Setting range	setting (Initial value)		
			Ā	S	Р							
									on details			
[Group	1] [Driver adju	stm	ent	, sel	f-diag	nosis	[a a a a a					
				1			F	None	0 - 2100	0030		
					eratioi eric va				uning of self-diagnosis.			
									ication item is allocated to	each digit		
	0-144-	0										
	Select auto tuning	_	\ 	¥ (<u>/</u> 3rd - 1	st di	gits:	Set motor ope	eration speed as percentage	e of		
P150	operation		(The example to 50%)									
100	specification		When [100] is set, motor rotates at the applicable maximum spee When more than [100] is set, motor rotates at the applicable									
	s									icable		
									the setting as [100]. tion direction. (This example	e is hoth		
					direct			or motor opera	don direction. (This example	e is botti		
								ons, 1: Only fo	orward direction, 2:Only reve	erse direction		
		*	For	det			e refe	er to [7-4 Auto	Tuning].			
			I	S			F	$10^{-6} \text{ kg} \cdot \text{m}^2$		0		
			Set load inertia (including motor rotor inertia). When auto tuning normally ends, the load inertia identified through auto tuning									
					o tunii nis par			illy enas, the id	bad inertia identified throug	n auto tuning		
P151	Inertia							ue and P152 s	et value, tuning level adjust	ment is		
				ble.	,				or raido, tarii.g roror alajao.			
									ted, tuning level adjustment	is possible		
								figure to this				
		*	- For	det	ails, p	ease	rete	er to [7-4 Auto 10 ⁻⁶	l uning].			
			ı	S	Р		F	N • m/	0-99999999	0		
					•		ľ	(rad/sec)				
		Se	et lo	ad v	/iscou	s fric	tion	including mot	or rotor viscous friction).			
	Viscous								oad viscous friction identifie	d through		
P152	friction							parameter.				
				raing ble.	to thi	s sei	vait	ie and P151 s	et value, tuning level adjust	ment is		
					auto t	ınind	n car	not be execut	ted, tuning level adjustment	is possible		
								figure to this		no poddibio		
				det	ails, p		refe	er to [7-4 Auto	Tuning].			
	Inertia	Ļ		S			F	10 ⁻⁶ kg·m ²	0-99999999	0		
P153	/GSEL signal	Set load inertia during GSEL signal ON (including motor rotor inertia).										
	ON	(For details, refer to [P151]. In that case, read the description of "tuning" as "tuning during GSEL signal ON".)										
\ <u>'</u>									not allowed/ r:Real time e			

^{*/}Item description [Edit type] Blank column:Real time editing not allowed/ r:Real time editing allowed

Parameter No.	Parameter name	Edit type	Activating timing		a Pulse train and odd		Level	Setting unit	Setting range	Factory setting (Initial value)		
								Function	details			
[Group	1] [Driver adju	stm	ent,	, se	lt-dia	agnosis	par			1		
	Viscous friction		I	S	Р		Α	10 ⁻⁶ N·m/ (rad/sec)	0-99999999		0	
P154	/GSEL signal ON	fri (F	Set viscous friction when GSEL signal is ON (including motor rotor viscous riction). This parameter is for tuning when GSEL signal is ON. For details, refer to [P152]. In that case, read the description of "tuning" as tuning during GSEL signal ON".)									

^{*}Item description [Edit type] Blank column:Real time editing not allowed/ r:Real time editing allowed *Item description [Activating timing] I:Real time/ R:Reset or Power ON/ P:Power ON *Item description [Level] S:Setting is required./ F:Run can be done by initial value.

Parameter No.	Parameter name	Edit type	Activating timing	Speed un un badan b dela b		Level	Setting unit	Setting range	Factory setting (Initial value)		
[Groun	ı o 1] [Driver adju	stme	ent.	self-di	agnosis	nar		ction actails			
[0.00]			1		3	F	None	0 - 2999	5		
P155	Select self-diagnosis test run specifications	[Set The bel of the be	et no e se low. <u>0</u>	umeric etting f 0 5 3rd 4th th 0	- 1st dig this Vhen [99 digit: Se nis exam :Both di	gits: exa 99] is elect nple) rection	The stop timple) set, the smotor opeons, 1:Fo	em is allocated to each digit at me is set in 0.01sec unit. (0.09) top time is 9.99 sec at each potential direction. ("Both direction ward direction only, 2:Revers items d002 and d003.	5 sec is set in ositioning. ons" is set in se direction		
D.4.50	Self-diagnosis		1	1		F	Pulse *1	0-9999999	0		
P156	test run positioning			•	•	•	f-diagnosis	g in test run for self-diagnosis s items d002 and d003.			
P157	Self-diagnosis		I			F	Pulse/sed	1-99999999	100		
F 137	test run speed							ning in test run for self-diagnos s items d002 and d003.	sis.		
D450	Forced jog		I			F	Pulse/sec	1-9999999	100		
P158	speed	% F	Set the forced jog speed in self-diagnosis. ※For details, refer to self-diagnosis item d004.								

^{*/}Item description [Edit type] Blank column:Real time editing not allowed/r:Real time editing allowed

[%] Item description [Activating timing] I:Real time/ R:Reset or Power ON/ P:Power ON

^{*} Item description [Level] S:Setting is required./ F:Run can be done by initial value.

^{*1: [}Pulse] of the setting unit is the pulse unit of pulse train command input.

In other words, the motor operates at the same speed in case of 100 pulse/sec input by pulse train command and 100 pulse/sec input by this setting.

Parameter No.	Parameter name	Edit type		Ш	Level	Setting unit		Factory setting (Initial value)		
[Group	2] [NC adjustn	nent p	arar	meter]						
P200	Position loop gain	Wheeleasi If see 1 It 2 De	en a ly oo t val is op eviat	larger value is ocur. ue is [0], it be perated by feettion range sig	s set com ed fo nals	, though respo es as follows. rward without (PNA, PNB) to	executing the position loop	on may		
P201	Servo lock gain	3 Position deviation is fixed to "0". r I P F S ⁻¹ 0000 - 9999 Set position loop gain when position deviation is within the range specified [P202:Deviation range A]. When a larger value is set, though response becomes faster, vibration may easily occur. If set value is [0], it will be the same as the P200 gain.								
P202	Deviation range A	Sot	l Outn	P ut range of Pl	F	Encoder resolution	0 - 99999999	50		
	range A						is within this deviation rang	IE		
P203	Deviation	. 137	l	P	F	Encoder resolution	0 - 99999999	1000		
F203	range B			ut range of Pl nal turns ON v		the deviation	is within this deviation rang	je.		
P204	Overflow detection		I	Р	F	Encoder resolution	0 - 99999999	400000		
	pulse	Set	over	flow detection	ı valı	ue of position	deviation.			
P205	Position loop derivative time constant	Set overflow detection value of position deviation.								

^{*}Item description [Edit type] Blank column:Real time editing not allowed/r:Real time editing allowed

^{**}Item description [Activating timing] I:Real time/ R:Reset or Power ON/ P:Power ON

^{*}Item description [Level] S:Setting is required./ F:Run can be done by initial value.

Parameter No.	Parameter name	Edit type Activating timing	3 1	Level	Setting unit Fui	Setting range	Factory setting (Initial value)					
Group	3] [Speed con	troi coi	mmano parame	eterj	I	1000(1,000)(),00000(00,00						
		1	S	F	mV	1000(1.000V)-99999(99.99 9V)	10000(10V)					
	Speed command gain (voltage)	Wher speed Thou	n set value com d command. gh value more	nmar than	nd voltage [10000(10	ed command voltage (DC volta is input, a motor rotates with m V)] can be input, max. input volta	aximum age is ±10V.					
P300	⚠ Caution: Regardless to this setting DC	[1000 Samp Wher	00(10V)] but les ole) n set value is [5	s tha 5000	in max. sp 0(50V)] an	onducted in the speed range mo eed, power running cannot be d applicable maximum speed i	done. s 3000rpm,					
	voltage input range is ± 10V.	motor power running rotation becomes as follows, provided 10V input of speed command voltage. 3000 × 10V/ 50V=600rpm. Speed command resolution reaches the maximum at 10V. When [6000(6V)] is set, speed command resolution is 6/10 of the value when [10000(10V)] is set.										
		r I	S	F	mV	-9999(-9.999V) - 9999(9.999V)	0					
P301	Speed command offset	When to this voltage This If speciarries sets to	n external spees offset voltage ge. parameter is seed command ved out in the speed offset value	et in voltaged to s	mmand vo t this parar order to sto ge automa 0 status of	speed command (DC voltage) litage has offset, a motor slowly meter to stop motor rotation can op the motor due to offset volta tic offset adjustment of self-dia f external speed command, this otor in that external speed com	y rotates due used by offset ge. gnosis is parameter					
P302	Speed command		notor operation	•		│ ─9999 - 9999 mmand direction of internal spe	0 eed command					
	value 1 Speed	1 dur	ing speed cont	rol ru F		- 9999 - 9999						
P303	command value 2	Set n		spe		mmand direction of internal spe	eed command					
P304	Speed command value 3	Set n	S	F	rpm ed and cor	—9999 - 9999 mmand direction of internal spe	eed command					
P305	Speed command value 4		S notor operation ing speed cont			─9999 - 9999 mmand direction of internal spe	eed command					

[※]Item description [Edit type] Blank column:Real time editing not allowed/r:Real time editing allowed

[※]Item description [Activating timing] I:Real time/ R:Reset or Power ON/ P:Power ON

[/]S: Real time reflection when NRF signal (Command data reflection prohibition signal) is OFF. When it is ON, reflection takes place only when the power supply is ON.

^{**}Item description [Level] S:Setting is required./ F:Run can be done by initial value.

Parameter No.	Parameter name	Edit type	timin	run	Pulse train		Level	Setting unit		etting range on details	Factory setting (Initial value)	
[Group	3] [Speed con	trol	com	ma	nd pa	rame	eter]					
	Speed		_	S	·		F	rpm	-	-9999 - 9999	0	
P306	command value 5				opera peed			ed and cor	nm	and direction of internal spe	ed command	
	Speed		S	S			F	rpm	-	-9999 - 9999	0	
P307	command value 6				opera peed				nm	and direction of internal spe	ed command	
	Speed		S	S			F	rpm	-	-9999 - 9999	0	
P308	command value 7				opera peed				nm	and direction of internal spe	ed command	
	Acceleration		R				F			0 - 9999	0	
P309	time (during speed control)		Set acceleration time to reach applicable maximum speed from the time of motor stop in speed control run.									
	Deceleration		R	S			F	msec		0 - 9999	0	
P310	time (during speed control)		Set deceleration time from applicable maximum speed to stop the motor in speed control run.									

[%] Item description [Edit type] Blank column: Real time editing not allowed/r: Real time editing allowed

^{*}Item description [Level] S:Setting is required./ F:Run can be done by initial value.

Parameter No.	Parameter name	Edit type	Supported run mode Supported run mode							Factory setting (Initial value)
[Group	o 41 lZero return	1 &	pos	ition	ina	comm	and i			
[0.00]	Zero return		R		Р		F	msec	0 - 9999	500
P400	acceleration time		et a		erat		ne fro	m the time	of motor stop till it reaches a and jog operation.	
	Zero return		R		Р		F	msec	0 - 9999	500
P401	deceleration								ole maximum speed to stop th	e motor,
	time	dι	ırinç	g ze	ro re	eturn a	and jo	g operatio	n.	
P402	Zero return method selection		R		Р		F	None	0 - 4	0
		At m W is Ri 1 W por Ri 2 It In 1 W th W fro th EI Th Ri cu po	D:ST fter arke /her seter !:LS /ithc pefer e epi e pi e pi e pi e pi e pi e pi e p	TD.H Zercer de Zercer	IOM Dopo Dopo Dopo Dopo Dopo Dopo Dopo Dop	int de tion is eturn seturn se	set aspects of Ret solution position po	d zero returation. LS is is the zero (P404) is vithout execurn Run" [So return) atrol by Zero detection is urn Run" [I e encoder ion set by necoder, the (P404) is sition without (P404) is er position data is at that time urn Run", [ABS encoder details.	detected, the position of position point. 0, the position from where zecuting the positioning. Standard zero return] for details of point deceleration LS, the passet as the zero point. No LS zero return] for details. positioning zero return)	the range of is set from (C016) is set e same time it pulse (EA, eed (P404).

^{*/}Item description [Edit type] Blank column:Real time editing not allowed/r:Real time editing allowed

^{**}Item description [Activating timing] I:Real time/ R:Reset or Power ON/ P:Power ON

^{*}Item description [Level] S:Setting is required./ F:Run can be done by initial value.

^{*1: [}Pulse] of the setting unit is the pulse unit of pulse train command input.

In other words, the motor operates at the same speed in case of 100 pulse/sec input by pulse train command and 100 pulse/sec input by this setting.

Parameter No.	Parameter name	Activating timing Activating timing Speed An Pulse train A Pulse train A Pulse train A Pulse train	Level		Setting range tion details	Factory setting (Initial value)				
LGIOUP	i 4j (Zero retum	& positioning comma Continued from the								
P402	Zero return method selection	3:MK.VLD (Encoder When encoder mark speed and direction When the indefinite without executing at Moreover, the over indefinite encoder mexecuted, encoder mexecuted, encoder mexecuted are ON, the motor of due to over travel researce. We get a consistency of the constant	maxer is set encory optrave encory optrave marke ase encory optrave encory operations as encory operations of the reference o	rker decision is not decided by P404 to do der marker so derations. It release oper status. Where is also decoperation, whates in the direction in the directio	I, the motor operates at 15° a ecide the encoder marker. status is cancelled, the moto eration is also executed irres en the over travel release op	r stops pective of the peration is FOT, ROT) and stops er marker ange of 1				
P403	Zero marker selection	0 to 131071: This s position. Other than above:	numente. TD.H She ettin O in 1 S.H(eric value] OME or LS L xternal mark g value in the the encoder OME or SHO is setting val	er is the marker position. e encoder 1 rotation position 1 rotation position is the mark RT.HOME ue in the encoder position.					
P404	Zero return speed	R P F Pulse/sec -99999999 - 99999999 100 Set initial speed and operation direction during zero return operation. When this data is positive: Forward zero return, when this data is negative: Reverse zero return When Reverse command direction signal (RVS) is ON, zero return is executed in the direction reverse to the above mentioned direction. When P402 is ABS.HOME and 0 or less is set for this data, the setting of ABS.HOME of P402 Zero return method selection is applied.								

^{*}Item description [Edit type] Blank column:Real time editing not allowed/r:Real time editing allowed

^{*}Item description [Activating timing] I:Real time/ R:Reset or Power ON/ P:Power ON *Item description [Level] S:Setting is required./ F:Run can be done by initial value.

^{*1: [}Pulse] of the setting unit is the pulse unit of pulse train command input. In other words, the motor operates at the same speed in case of 100 pulse/sec input by pulse train command and 100 pulse/sec input by this setting.

				uppo ın mo								
Parameter No.	Parameter name	Edit type	Activating timing			Level	Setting unit	Setting range	Factory setting (Initial value)			
			ĕ s	P			F eti e e	dataila				
Croun	 4] [Zero return	2 n	ocitio	nina	oommar	ad na	Function	details				
[Group	4] [Zero return	αρ	บริเมิด				Pulse/sec					
			R	F)	F	*1	1-99999999	10			
P405	Zero return creep speed	det No	tected rmally	i. /, set	1/100 o	r less	of applicable	n after Zero point decelera maximum speed. In case value from the beginning.				
			R			F	Pulse *1	0-99999999	100			
P406	Zero point position constant	det Sei spe Rei [Ca sud mo	R P F Pulse *1 0-99999999 100 Set distance to start marker signal detection after Zero point deceleration LS is detected in zero return operation. Set longer value than min. distance to decelerate speed from Zero return speed to Zero return creep speed. Refer to [8-4-2 Zero Return Run] for details. [Caution] If this setting value is small and Zero return speed is high, a motor suddenly decelerates or stops. Therefore, set adequate value to decelerate a motor to creep speed.									
P407	Zero point set distance	Set use [Su O O O O O O O O O	ed for uppler uppler Positi when When Positi irresp When The done the m Zermplete	trave fine ment n P40 oning a ma n P40 oning ectiv n P40 lispla e set to ret	adjustmof set no of set no	ent o umer D.HC cuted ·] or t LESS cuted [+] a ABS.H acco ue is o	f marker positic value] OME toward the sacoward reverse Stoward the sacond [—] mark. HOME, SHOR rding to this seequal to or sm	-99999999 - 999999999 sition in zero return operation and machine zero points ame direction as Zero return direction when a mark is a mark is a mark in the direction as Zero return. T.HOME, or MK.VLD cetting is not executed. It is executed after zero return details.	rn direction [-]. rn direction of the motor			
P408	Position data reference point	Set Wh the Ho AB this	R t the centre code weve SS.HO s set v	curre ero re e of th r, whe ME a alue	nt value turn is c is settin en the Z and 0 or is not c	F (C01 compling is in the complex of	Pulse *1 6) when the z lete, the currel nverted. eturn method s tive value is s	-99999999 - 99999999 ero return is complete. nt position will be the posi selection P402 is specifie pecified for Zero return spurrent position.	d as			

^{*1: [}Pulse] of the setting unit is the pulse unit of pulse train command input.

In other words, the motor operates at the same speed in case of 100 pulse/sec input by pulse train command and 100 pulse/sec input by this setting.

Parameter No.	Parameter name	Edit type Activating timing	Supported run mode	Level	Setting unit	Setting range	Factory setting (Initial					
Param	Hame	Activat	eads S P P P P P P P P P P P P P P P P P P				value)					
			Function details									
[Group	4] [Zero return		tioning comma	ınd p	parameter]							
		R	Р	F	msec	0 - 9999	500					
P409	Positioning acceleration time 1	accele (P416 Set the	eration/deceler etc.).	atior	n time 1 is spe	f positioning where the positioning type opped till it reaches the app	e commands					
		R	Р	F	msec	0 - 9999	500					
P410	Positioning deceleration time 1	accele (P416 Set the	Set the deceleration time at the time of positioning where the positioning acceleration/deceleration time 1 is specified by the positioning type comma (P416 etc.). Set the time from when the motor is stopped till it reaches the applicable maximum speed.									
		R	Р	F	msec	0 - 9999	500					
P411	Positioning acceleration time 2	accele (P416 Set the	eration/deceler etc.).	atior	n time 2 is spe	f positioning where the positioning type opped till it reaches the app	e commands					
		R	P	F	msec	0 - 9999	500					
P412	Positioning deceleration time 2	accele (P416 Set the	eration/deceler etc.).	atior	n time 2 is spe	f positioning where the positioning type opped till it reaches the app	e commands					
	Positioning	s	Р	F	Pulse/sec	1-99999999	1					
P413	speed 1/Jog speed											
	Positioning	S	Р	F	Pulse/sec	1-99999999	1					
P414	speed 2	Set operation speed at the time of positioning where the positioning speed 2 is specified by the positioning type commands (P416 etc.).										
	Positioning	S	Р	F	Pulse/sec *1	1-99999999	1					
P415	speed 3					itioning where the positionir nands (P416 etc.).	ng speed 3 is					

Item description [Edit type] Blank column: Real time editing not allowed/r: Real time editing allowed

* Item description [Level] S:Setting is required./ F:Run can be done by initial value.

train command and 100 pulse/sec input by this setting.

*2: Generally, real time reflection takes place for P413-P429. However, when Command data reflection prohibition signal (NRF) is ON, reflection takes place only when the power supply is ON.

Item description [Activating timing] I:Real time/ R:Reset or Power ON/ P:Power ON/S: Real time reflection when NRF signal (Command data reflection prohibition signal) is OFF. When it is ON, reflection takes place only when the power supply is ON.

^{*1: [}Pulse] of the setting unit is the pulse unit of pulse train command input.

In other words, the motor operates at the same speed in case of 100 pulse/sec input by pulse train command and 100 pulse/sec input by this setting.

Parameter No.	Parameter name	Edit type Activating timing	Supported run mode Under train Supported run mode Read of the supported run mode Supported run mode	Level	Setting unit	Setting range	Factory setting (Initial value)					
Croun	41 (Zoro roturn	2 posi	Function details & positioning command parameters]									
[Group	4] [Zero return	S	P	F	Jarameters	0-121	0					
P416	Positioning type command 1	[Set n	umeric value detting of each formula of each f	detai type :: IN(ative solute nt po it: Sp sition sition sition t: Ac sition	Is] item is allo C/ABS spe e position se e position C01 peed specining speed ning speed celeration/ ning Accele	pecification (INC) specification (ABS) (Positioning 6) fication 1 (P413) 2 (P414)	g for 09 to P410)					
P417	Positioning position command 1	Set the	P e position of p	F ositio	Pulse *1 oning for w	-99999999 - 99999999 rhen positioning command 1 is	selected.					
P418	Positioning type command 2		P e positioning to settings as de			0-121 ositioning command 2 is select 3.	ed.					
P419	Positioning position command 2	Set the	P e position of p	F ositio	Pulse *1 oning for w	-99999999 - 99999999 then positioning command 2 is	selected.					
P420	Positioning type command 3		P e positioning to settings as de			0-121 ositioning command 3 is select 6.	ed.					
P421	Positioning position command 3	S	P	F	Pulse *1	-99999999 - 99999999 then positioning command 3 is	0 selected.					

- Item description [Edit type] Blank column: Real time editing not allowed/r: Real time editing allowed
- Item description [Activating time] I:Real time/ R:Reset or Power ON/ P:Power ON
 /S: Real time reflection when NRF signal (Command data reflection prohibition signal) is OFF.
 When it is ON, reflection takes place only when the power supply is ON.
- * Item description [Level] S:Setting is required./ F:Run can be done by initial value.
- *1: [Pulse] of the setting unit is the pulse unit of pulse train command input.

 In other words, the motor operates at the same speed in case of 100 pulse/sec input by pulse train command and 100 pulse/sec input by this setting.

Parameter No.	Parameter name	Edit type	Activating timing		Dulse train om di		Level	Setting unit	Setting range	Factory setting (Initial value)	
[Group	4] [Zero return	8	oosi	ition	ing o	comma	and p	arameters]		
	Positioning		S		Р		F		0-121	0	
P422	type command 4					ning t scribe			ositioning command 4 is selected	ed. Make	
	Positioning		S		Р		F	Pulse *1	-99999999 - 99999999	0	
P423	position command 4	Set the position of positioning for when positioning command 4 is selected.								selected.	
	Positioning		S		Р		F		0-121	0	
P424	type command 5					ning t n P41		for position	ing command 5 is selected. Ma	ake settings	
	Positioning		S		Р		F	Pulse *1	-99999999 - 99999999	0	
P425	position command 5	Se	et th	ер	ositic	n of p	ositio	oning for w	hen positioning command 5 is	selected.	
	Positioning		S		Р		F		0-121	0	
P426	type command 6					ning t scribe			ositioning command 6 is selected	ed. Make	
5 405	Positioning		S		Р		F	Pulse *1	-99999999 - 99999999	0	
P427	position command 6	Se		ер		n of p		oning for p	ositioning command 6 is selecte	ed.	
	Positioning		S		Р		F		0-121	0	
P428	type command 7					ning t scribe			ositioning command 7 is selected	ed. Make	
	Positioning		S		Р		F	Pulse *1	-99999999 - 99999999	0	
P429	position command 7	Se	Set the position of positioning for when positioning command 7 is selected.								

- Item description [Edit type] Blank column: Real time editing not allowed/r: Real time editing allowed
- Item description [Activating time] I:Real time/ R:Reset or Power ON/ P:Power ON
 /S: Real time reflection when NRF signal (Command data reflection prohibition signal) is OFF.
 When it is ON, reflection takes place only when the power supply is ON.
- * Item description [Level] S:Setting is required./ F:Run can be done by initial value.
- *1: [Pulse] of the setting unit is the pulse unit of pulse train command input.

 In other words, the motor operates at the same speed in case of 100 pulse/sec input by pulse train command and 100 pulse/sec input by this setting.

Parameter No.	Parameter name	Edit type	Activating timing		Dulse train out of the polymer of th		Level	Setting unit	Setting range	Factory setting (Initial value)	
10	Function details										
[Group 5] [Communication parameter]											
P500	Select communication specifications	[S	R S P F None 0 - 4211 1110 Select the specifications of serial communication. [Set numeric value details] The setting of each specification item is allocated to each digit as follows. 1 1 1 0 1st digit: Select function. (Little endian in this example) 0:In case of 32-bit data, lower to higher order data (Little endian) 1:In case of 32-bit data, higher to lower order data (Big endian) 2nd digit: Data length (8 bits in this example) 0:7 bits, 1:8 bits 3rd digit: Parity (odd number in this example) 0:None, 1:Odd number, 2:Even number 4th digit: Baud rate (19.2K in this example) 0:9.6K, 1:19.2K, 2:38.4K, 3:57.6K, 4:115.2K								
P501	Communication ID	R S P F None 0 - 16 1 Set ID No. (office code) when a daisy chain connection is used in serial communication. (When only 1 unit is connected, set [1].)									

[%] Item description [Edit type] Blank column:Real time editing not allowed/ r:Real time editing allowed

Item description [Activating time] I:Real time/ R:Reset or Power ON/ P:Power ON

^{**}Item description [Level] S:Setting is required./ F:Run can be done by initial value.

Parameter No.	Parameter name	Edit type Activating timing Activating timing A Speed Dulse train A Pulse train	Level	Setting unit	Setting range	Factory setting (Initial value)
		ĕ S P				
[Crour	61 (Dulco train	input parameter]		Fur	nction details	
Group	oj įruise tiairi	R P	F	None	00 - 41	00
Booo	Select pulse	Select the specifica [Set numeric value of the setting of each of the setting of each of the setting of the set	tions detai spec Selec	of pulse transification items ct pulse transification	rain command input. em is allocated to each digit as in command phase sequence s in forward direction by Forward	s follows. . (Forward in
P600	train command	ahea 1:Re ph 2nd digit: 0:x1(1:x2(2:x4(3:F/F 4:P+	d puverse ase a Sele 1 tim 2 tim 4 tim F/R(I	lse train co e. Operate ahead pulse ect pulse tra ne with 90° nes with 90 nes with 90 LSE(Directional	ommand. s in reverse direction by Forward train command. ain command type. (x1 in this phase difference pulse) be phase difference pulse) be phase difference pulse) tional pulse) signal + transmitting pulse)	ard or B
P601	Pulse train command ratio numerator	command input in command [Pulse train command [P601] = Encode [P602] = No. of Setting example: Requirements Encoder 1-rotation No. of pulses for Setting value [P601] = 13107 [P602] = 10000	omb nd ra er 1- puls n res oulse	ination with tio setting rotation re es for puls solution: 13	method] solution e train command for 1 motor r 31072 resolution mand for 1 motor rotation: 100	otation
P602	Pulse train command ratio denominator	Set the operation vo command input in c For details, refer to	omb	ination with	1 - 131072 er resolution unit for one plusen P601.	1 e of pulse train

- Item description [Edit type] Blank column: Real time editing not allowed/r: Real time editing allowed
- Item description [Activating time] I:Real time/ R:Reset or Power ON/ P:Power ON
- * Item description [Level] S:Setting is required./ F:Run can be done by initial value.

Ö		e Jing	Supported run mode				Factory
Parameter No.	Parameter name	Edit type Activating timing	O Speed O Pulse train	Level	Setting unit	Setting range	setting (Initial value)
					Fui	nction details	
[Group	6] [Pulse train	input p	parameter]				
		r I	Р	F	0.1%	0 - 1200(120.0%)	800(80.0)
P603	Pulse train feed forward ratio	large matcl set va	value is set, on the set, of the set, of the set of the	compl achine d give	iance beco e system, v e some dev	ommand in pulse train operationes better, but in some case vibration may occur. In the cas viation to get stable motion. If ducted.	s due to mis- e, lower the
		r I	Р	F	0.1%	0 - 1000(100.0%)	10(1.0)
P604	Pulse train feed forward shift ratio	Feed × se But if	forward amoet value(%))	unt =	Input pul	operation is decreased. se speed — (applicable max ut pulse speed in the above e	·
		r I	Р	F	μsec	-999 - 999	0
P605	Pulse train feed forward derivative time constant	contro Wher too si Norm	ol in pulse tra n a small valu mall, vibration nally, set [0]. If	in ope e is so (chat set v	eration. et, respons tter vibrationalue is [0],	constant to adjust response of se becomes faster. However, i on) may easily occur. derivative compensation is no becomes the first-order delay	f the value is
		r I	Р	F		0 - 9999(999.9msec)	0
P606	Pulse train delay compensation time	While While comp Set v Norm	e operating po e performing s outation formu alue=[P607 s	esition synchr la give set va nchro	ing as per ronous ope en below. lue]*10/2+ nous opera	lelay in pulse train operation. pulse train, set [0]. erations as per pulse train, set -3 ations are performed, set	it as per the
		R		F	msec	0 - 100	0
P607	Pulse train averaging filter time	condi	ucted by pulse n step respon ar acceleratior n linear accel	e trair se /dece eratio	command eleration by n/decelera	this time	ctual motion is

- Item description [Edit type] Blank column:Real time editing not allowed/r:Real time editing allowed
- Item description [Activating time] I:Real time/ R:Reset or Power ON/ P:Power ON
- * Item description [Level] S:Setting is required./ F:Run can be done by initial value.

Parameter No.	Parameter name	Edit type Activating timing	run	ported mode train	Level	Setting unit	Setting range	Factory setting (Initial value)			
						Fur	nction details				
[Group	o 6] [Pulse train	input	oaran	neter]							
P608	Pulse train inertia feed forward ratio	pulse When mism	r I P F 0.1% -1000(-100.0%) - 2000(200.0%) 0 Set the feed forward ratio related to load inertia (parameter P151 or P153) in pulse train operation. When it is set to 100%, compliance becomes better, but in some cases due to mismatching with a machine system, vibration may occur. Normally, set [0]. When set value is [0], feed forward control is not performed.								
P609	Pulse train viscous friction feed forward ratio	pulse When mism	ne fee train n it is atchi	operatio set to 10 ng with a	n. 0%, d mac	compliance	-1000(-100.0%) - 2000(200.0%) b load inertia (parameter P151 b becomes better, but in some on, vibration may occur. c [0], feed forward control is no	or P153) in cases due to			

Item description [Edit type] Blank column: Real time editing not allowed/r: Real time editing allowed

Item description [Activating time] I:Real time/ R:Reset or Power ON/ P:Power ON

^{*} Item description [Level] S:Setting is required./ F:Run can be done by initial value.

Parameter No.	Parameter name	Edit type Activating timing	Supported run mode University of the street	Level	Setting unit Fur	Setting range	Factory setting (Initial value)			
[Group	o 7] [I/O signal p	aramet	ter]							
		Р	S P	F	None	00000000 - 99999999	05030201			
P700	Control input signal allocation 1	In this showr [control Samp 05	Allocate external input signals DI1-DI4 as control input signals. In this allocation setting, each signal is indicated separately with 2 digits as shown to this 2-digit section, allocation number is set in accordance with [control input signal allocation list] (refer to the next page). Sample) 05 03 02 01 2nd - 1st digits:DI1: Allocated to DR signal 4th - 3rd digits:DI2: Allocated to SON signal 6th - 5th digits:DI3: Allocated to TL signal 8th - 7th digits:DI4: Allocated to RST signal							
		Р	S P	F	None	00000000 - 99999999	08070604			
P701	Control input signal allocation 2	In this shown	allocation set to this 2-digit ol input signal le)	ting, sectallocallocallocallocallocallocallocall	each signation, alloca cation list] (and - 1st dig h - 3rd dig h - 5th dig	DI8 as control input signals. all is indicated separately with a tion number is set in accordant (refer to the next page). pits:DI5: Allocated to GSEL signal its:DI6: Allocated to CIH signal its:DI8: Allocated to RVS signal	nce with			

- Item description [Edit type] Blank column: Real time editing not allowed/r: Real time editing allowed
- Item description [Activating time] I:Real time/ R:Reset or Power ON/ P:Power ON
- * Item description [Level] S:Setting is required./ F:Run can be done by initial value.

[Control input signal allocation list]

Allocation No.	Code	Signal name	Allocation No.	Code	Signal name
00		Disabled	25	FJ	Forward jog
01	DR	Start	26	RJ	Reverse jog
02	SON	Servo On	27		Reserved
03	TL	Torque limit	28		Reserved
04	GSEL	Speed gain selection	29		Reserved
05	RST	Reset	30		Reserved
06	MD	Mode selection	31		Reserved
07	CIH	Command pulse input prohibition	32		Reserved
08	RVS	Reverse command direction	33		Reserved
09	SS1	Command selection 1	34		Reserved
10	SS2	Command selection 2	35		Reserved
11	SS3	Command selection 3	36		Reserved
12	EMG	Emergency stop	37		Reserved
13	FOT	Forward over travel	38		Reserved
14	ROT	Reverse over travel	39		Reserved
15	NRF	Command data reflection prohibition	40		Reserved
16		Reserved	41		Reserved
17	ZST	Internal pulse start	42		Reserved
18	ZLS	Zero LS	43		Reserved
19	ZMK	Zero marker	44		Reserved
20		Reserved	45		Reserved
21	APRQ	Current position data request	46		Reserved
22	ALRQ	Alarm code request	47		Reserved
23	ABRQ	ABS data request	48		Reserved
24		Reserved	49		Reserved

^{※1:}In the setting where 50 is added to an allocation number in the above table, the signal corresponding to that allocation number becomes a negative logic input signal.
※2: When the same signal is allocated to two or more input signals (DI1-DI8), the signal will not be

will not be normally input.

Parameter No.	Parameter name	Edit type	timin	Speed -	ported mode	Level	Setting unit	Setting range	Factory setting (Initial value)	
							Fur	nction details		
[Group	7] [I/O signal p	oara	met	er]						
			Р			F	None	00000000 - 99999999	04035201	
P702	Control output signal allocation 1	In she	Allocate external output signals DO1-DO4 as control output signal. In this allocation setting, each signal is indicated separately with 2 digits as shown to this 2-digit section, allocation number is set in accordance with [control output signal allocation list] (refer to the next page). O4 O3 52 O1							

- Item description [Edit type] Blank column:Real time editing not allowed/r:Real time editing allowed
- Item description [Activating time] I:Real time/ R:Reset or Power ON/ P:Power ON
- * Item description [Level] S:Setting is required./ F:Run can be done by initial value.

[Control output signal allocation list]

Allocation No.	Code	Signal name	Allocation No.	Code	Signal name
00		Full-time off	25		Reserved
01	RDY	Ready	26		Reserved
02	ALM	Alarm	27		Reserved
03	PNA	Deviation range A	28		Reserved
04	PNB	Deviation range B	29		Reserved
05	BRK	Brake release	30		Reserved
06	SZ	Speed zero	31		Reserved
07	OCEM	Marker output	32		Reserved
08	EMGO	Under emergency stop	33		Reserved
09	HCP	Zero return completion	34		Reserved
10		Reserved	35		Reserved
11		Reserved	36		Reserved
12		Reserved	37		Reserved
13		Reserved	38		Reserved
14		Reserved	39		Reserved
15		Reserved	40		Reserved
16		Reserved	41		Reserved
17		Reserved	42		Reserved
18		Reserved	43		Reserved
19		Reserved	44		Reserved
20		Reserved	45		Reserved
21		Reserved	46		Reserved
22		Reserved	47		Reserved
23		Reserved	48		Reserved
24		Reserved	49		Reserved
			50		Full-time on

^{*1:}In the setting where 50 is added to an allocation number in the above table, the signal corresponding to that allocation number becomes a negative logic output signal. But, Marker output (OCEM) cannot be allocated to negative logic output.

^{*2:} When the same signal is allocated to two or more output signals (DO1-DO4), the signal will not be normally input.

Parameter No.	Parameter name	Edit type		Pulse train abom u		Level	Setting unit	Setting range	Factory setting (Initial value)
[() "0' ::	71 []/O eiem = 1 :-						Fur	nction details	
[Group	7] [I/O signal p		neterj P S	Р		F	None	00000000 - 22222222	00000000
P705	Control input signal status setting 1	Set ther [Set In the allo	status m to Cot number his separated of the content	eric val	ue d s shh dig 0 (inpu letail own git. 0 0 0 L	t signals (vs] in a sampl 1st digit 2nd digit 2nd digit 3rd digit 4th digit 5th digit 6th digit 7th digit 8th digit	whether to enable control input whether to enable control input le below, status setting of each t:DR signal (Enable signal ON/t:SON signal (Enable signal ON/t:GSEL signal (Enable signal ON/t:MD signal (Enable signal ON t:CIH signal (Enable signal ON t:RVS signal to OFF, 2:Fix the signal	t signals or fix signal is OFF) N/OFF) N/OFF) N/OFF) N/OFF)

- Item description [Edit type] Blank column:Real time editing not allowed/r:Real time editing allowed
- Item description [Activating time] I:Real time/ R:Reset or Power ON/ P:Power ON
- * Item description [Level] S:Setting is required./ F:Run can be done by initial value.

Parameter No.	Parameter name	Edit type Activating timing		Pulse train boom composite train composite tra		Level	Setting unit	Setting range	Factory setting (Initial value)
							Fur	nction details	
[Group	7] [I/O signal p								
P706	Control input signal status setting 2	them [Set In the allocation of the set In the allocation of the set In the allocation of the set In	n to 0 num is se ated	ON or Ceric value ting, a to eaco	DFF) lue c s sh h dig 0 ———————————————————————————————————	detail own git. O O O	1st digit 1st digit 2nd digit 3rd digit 4th digit 5th digit 6th digit 7th digit 8th digit	00000000 - 22222222 whether to enable control input the below, status setting of each thicksets signal (Enable signal ON thicksets signal ON thicksets signal (Enable signal ON thicksets sig	I/OFF) N/OFF) N/OFF) N/OFF) N/OFF) N/OFF) N/OFF)

- Item description [Edit type] Blank column:Real time editing not allowed/r:Real time editing allowed
- Item description [Activating time] I:Real time/ R:Reset or Power ON/ P:Power ON
- * Item description [Level] S:Setting is required./ F:Run can be done by initial value.

	ı				1
		Supported			
Parameter No.	Parameter name	Activating timing A Speed B Pulse train A Pulse train	Setting unit	Setting range	Factory setting (Initial value)
"		ĕ S P			
			Fu	nction details	
[Group	7] [I/O signa		E IN		1 00000000
P707	Control input signal status setting 3	Set status of control in them to ON or OFF). [Set numeric value do In this setting, as should allocated to each digital of the numeric values in the numeric value in the numeric value in the numeric value in the numeric	etails] bwn in a samp it. 1st dig 2nd dig 3rd dig 4th dig 5th dig 6th dig 7th dig 8th dig operation of the dig 7th dig 8th dig OFF, 1:Fix the	whether to enable control inputations of each of the below, status setting of each of the below, it: ZNK signal (Enable signal Of the below) it: APRQ signal (Enable signal of the below) it: CRQ signal (Enable signal Of the below) it: CRQ signal (Enable signal Of the below) it: are described below.	n signal is N/OFF) N/OFF) N/OFF) ON/OFF) ON/OFF) ON/OFF)
		_	F None	00000000 - 22222222 whether to enable control inpu	00000000 t signals or fix
P708	Control input signal status setting 4	them to ON or OFF). [Set numeric value de In this setting, as sho allocated to each digital of the Interval of	etails] bwn in a samp it. 1st dig 2nd dig 3rd dig 4th dig 5th dig 6th dig 7th dig 8th dig OFF, 1:Fix the	ole below, status setting of each it:FJ signal (Enable signal ON/ogit:RJ signal (Enable signal ON it:Reserved	n signal is OFF) /OFF)

- * Item description [Edit type] Blank column:Real time editing not allowed/r:Real time editing allowed
- Item description [Activating time] I:Real time/ R:Reset or Power ON/ P:Power ON
 Item description [Level] S:Setting is required./ F:Run can be done by initial value.

Parameter No.	Parameter name	Edit type Activating timing	Speed nu un Odding Oddi		Level	Setting unit	Setting range	Factory setting (Initial value)
[Group	 o 7] [I/O signal p	aramet	torl			Fur	nction details	
[Group			S	Р	F	None	00 - 11	00
P710	Control input signal specification selection 1	Select [Set n As giv	t specification when below the below ten below	cation value of w, the digit: So exam Deviati digit: So mple is Motor Brake	setti select ple i on c Select s of r	ntrol input ls] ng of each deviation s for devia lear valid, ct stop me motor powe er OFF	signal. specification item is allocated clear valid/invalid when SON stion clear valid.) 1:Deviation clear invalid thod when EMG signal is OFF or OFF)	to each digit. signal is OFF.
P715	Deceleration time at emergency stop	When	set val). When	ue is [0)], th	e motor su	0 - 9999 brake stop is selected with [P7 ddenly stops with max. torque selected with [P710], this para	(torque limit
P716	Servo OFF delay time after emergency stop	Set tin select time b	S P me from ed with pecomes	[P710] s servo	. Wr OFI	nen set val F (torque f	0 - 9999 OFF (torque free) when brake ue is [0], the motor stops and aree). d with [P710], this parameter is	at the same
P717	Speed zero range	Set ou	S P utput rai gnal turr	nge of	F Spee	rpm ed zero sig	0 - 9999 nal (SZ). d is lower than this value.	10
P718	Brake output delay time	alarm,		ency s	top,	Servo OFF	0 - 999 otor enters the torque free stat or reset occurs until the time	

X Item description [Edit type] Blank column:Real time editing not allowed/r:Real time editing allowed

Item description [Activating time] I:Real time/ R:Reset or Power ON/ P:Power ON

^{*} Item description [Level] S:Setting is required./ F:Run can be done by initial value.

Parameter No.	Parameter name	Edit type Activating timin	Supported run mode Parain Par	Level	Setting unit Fur	Setting range	Fac sett (Init valu	tial
[Group	7] [I/O signal p	oaramet						
P719	Dynamic brake specification selection	[Set not over the content of the con	S P specification umeric value /ALID (No conic brake open /B (Dynamic braid dynamic braid bynamic braid) //B OFF (Open //B OWER is turner	detainect ration brake ake c ration d ON	ynamic bra Is] ition) n is not con e operates operation is n invalid) I, dynamic	nducted.) s conducted. brake is ON till primary s	ervo ON a	0 nd from
P720	Servo ON delay time at dynamic brake	R Set tim brake.			msec orake after	0 - 10 confirming motor stop sta	itus by dyn	0 amic
P719 P720	②Dynamic brothe time specimotor stop. ③This brake inot work. Basic occur Motor ALM SON	n is set ake is e fied in [l s an em operati s) operati signal	with [P719: Description of dynamics of dynamics of the control of	vo O ON d se for c bra	FF status velay time a	expecification selection]. when a motor is running, at dynamic brake] passes by stop. In motor stop state the motor runs and torque	after confi us, this bra	rming ake does

- X Item description [Edit type] Blank column:Real time editing not allowed/r:Real time editing allowed
- Item description [Activating time] I:Real time/ R:Reset or Power ON/ P:Power ON
- * Item description [Level] S:Setting is required./ F:Run can be done by initial value.

Chapter 7 Self-diagnosis

7-1 Self-diagnosis Mode

This device has the self-diagnosis function as a check function for auto tuning, external I/O signals, and the internal circuit.

In self-diagnosis mode, the normal run mode operation cannot be done.

After the self-diagnosis is executed, the normal run mode operations become possible by turning on the power supply again.

There are following 2 types of self-diagnosis operation mode.

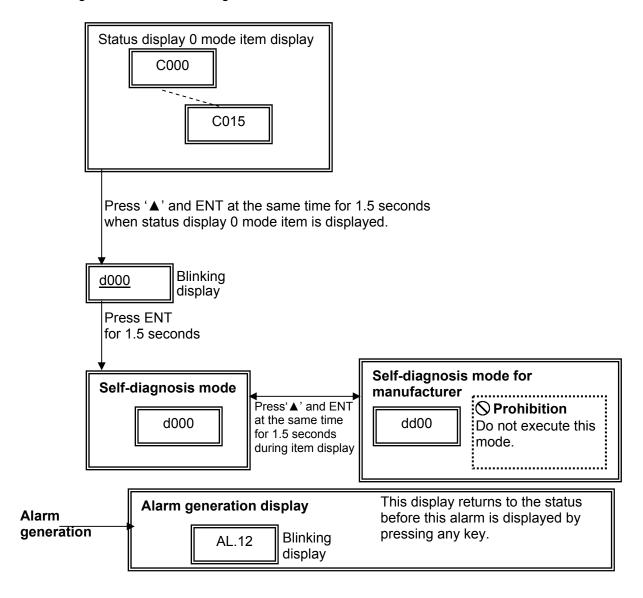
- 1 Self-diagnosis
 - The self-diagnosis for auto tuning, external wiring of the device, or the device failure confirmation is carried out.
- 2 Self-diagnosis for manufacturer
 - This self-diagnosis is exclusively for delivery control for the manufacturer.
 - Do not execute it unless there are such instructions from the manufacturer.

○ Prohibition

①Do not execute the self-diagnosis for the manufacturer.

When the self-diagnosis for manufacturer is carried out improperly, the motor may be damaged, run out of control, or burn out. It may also cause damage to the device or burn-out of the device.

7-2 Executing Procedure of Self-diagnosis Mode



7-3 Self-diagnosis Items
Items displayed in self-diagnosis mode are as follows.

Items displayed in self-diagnosis mode are as follows.					
Display order	Item display Name	Details			
order	d000	The speed control gain is adjusted by measuring the motor load.			
1	Auto tuning	Execution operation: Item display→Press ENT→'run' blinking→ Press ENT for 1.5 seconds→ Motor operation→Result display Forced termination: Press ENT Result display: run= Measurement in process/End= Normal termination / Er1: Measurement 0, Er2: Outside the scope of integration, Er3: Data error, Er9: Suspend (Alarm, RST, EMG, OT) Refer to the "Auto Tuning" section for details.			
2	d001 Auto tuning for GSEL	Auto tuning is carried out by using the gain and other parameters (when GSEL signal is turned on). Details are same as that of d000 "Auto tuning".			
3	d002 Test run	Repeats positioning the specified quantity. Execution operation: Item display→Press ENT→'run' blinking→ Press ENT for 1.5 seconds→ Motor operation and result display Forced termination method: Press ENT Result display: run=Operation in progress/Er9=Suspend (Alarm, RST, EMG) Operation specifications: Run specifications (Select Stop time, two way/one way operation)=P155, Positioning quantity=P156, Speed=P157, Acceleration/deceleration time=P409&P410 Supplement) Stop time is the time after the deviation completion signal (PNA or PNB) is turned on.			
4	d003 Test run for GSEL	Test run is carried out by using the gain and other parameters (when GSEL signal is turned on). Details are same as that of d002 "Test run".			
5	d004 Forced jog	The motor operates by pressing ▲ and ▼. Execution operation: Item display→Press ENT→'run' blinking→ Press ENT for 1.5 seconds→ Motor operates in forward direction by pressing ▲ or in reverse direction by pressing ▼ and the result is displayed. Result display: Operation revolutions of -9999 to 9999 rpm =Normal operation in progress/ Er9=Suspend (Alarm, RST, EMG,OT) Operation specifications: Speed=P158, Acceleration/deceleration time=P400&P401			
6	d005 Forced zero return	The zero return operation is carried out. Execution operation: Item display→Press ENT→'run' blinking→ Press ENT for 1.5 seconds→Motor operation and Result display Forced termination method: Press ENT Result display: run=Operation in progress/End=Normal termination /Er9=Suspend (Alarm, RST, EMG, OT) Operation specification: Same as normal zero return operation.			

Display order	Item display Name	Details
7	d006 Speed command voltage automatic offset adjustment	The offset of analog speed command is automatically adjusted by setting the analog speed command to 0V. Adjusted value is reflected in P301. Execution operation: Item display→Press ENT →'run' blinking→ Press ENT for 1.5 seconds→Result display Result display: run= Measurement in process/End= Normal termination/Er1=Out of adjustment range

^{*} Returns to the self-diagnosis item display by pressing ENT after self-diagnosis is completed (result display status).

Moreover, even when the self-diagnosis is in process, it can be cancelled by pressing ENT and it returns to the self-diagnosis item display.

^{*} The self-diagnosis carried out by the motor is stopped by generating the alarm or using the RST, EMG, or OT signal.

Display order	Item display Name	Details				
	d100	RAM check is carried out.				
8	RAM check	Execution operation: Item display→Press ENT →Result display Result display: run=Checking in progress/End=Normal termination/Er1 to Er3=RAM error				
	d101	LED corresponding to input signals DI1 to DI8 is displayed.				
9	Input signal check	Execution operation: Item display→Press ENT →Result display Result display: Same as the signal display of status display C10				
	d102	One of the DO1 to DO4 and DBK (dynamic brake) signals				
10	Control output signal check	corresponding to the number is output forcibly by setting the number. Execution operation: Item display→Press ENT→'0' blinking display→Set the number corresponding to the signal to be output by pressing ▲ and ▼. Setting range: 0 to 4 Blinking 0=D01 to D04 Signal OFF, 1=D01 Signal ON, 2=D02 Signal ON, 3=D03 Signal ON, 4=D04 Signal ON, 5=DBK Signal ON Caution ⚠ When this operation is executed with the Brake release (BRK) signal allocated to one of D01 to D04 signals, the Brake release (BRK) signal is turned ON, releasing the brake. Be careful since this may cause machine to start operating. Specially, in case of vertical axis, the moving part may fall down due to gravitational force.				
11	d103 Serial communication check	The Transmission / Receipt check is carried out by connecting the transmission signal and reception signal. Execution operation: Item display→Press ENT →Result display Result display: run=Checking in progress/End=Normal termination /Er1=No reply, Er2=Reply data mismatch, Er3=Communication error				
12	d104 U phase current FB display	U phase current feedback is displayed. Execution operation: Item display→Press ENT →Result display Result display:-2048 to 2047 (normal within the range of ±15.)				
d105 13 V phase current FB		V phase current feedback is displayed. Execution operation: Item display→Press ENT→Result display Result display:-2048 to 2047 (normal within the range of ±15)				
	display	All initialization processes are carried out by entering the specified				
14	H000 Initialization	code. Execution operation: Item display→Press ENT→Make settings in the same way as that of parameter input Input range: 0 to 9999 18=Parameter initialization, 1118: Initialization of				
		multi-rotation data of encoders				
N/ Datama	* Returns to the self-diagnosis item display by pressing ENT after self-diagnosis is completed (result					

^{*} Returns to the self-diagnosis item display by pressing ENT after self-diagnosis is completed (result display status).

Moreover, even when the self-diagnosis is in process, it can be cancelled by pressing ENT and it returns to the self-diagnosis item display.

When the self-diagnosis is executed by the editor, the following item is displayed.

	Display order	Item display Name	Details
I		<u>d999</u>	Self-diagnosis execution with editor.
	1	Self-diagnosis execution with editor	This display disappears by pressing any operation key. However, normal run mode operations are not possible for the device because it is still in self-diagnostic mode. When self-diagnosis is executed with the editor, it is necessary to turn on the power supply again in order to return to the normal run mode, in the same way as in case of self-diagnosis executed on the operation panel.

^{*}The underlined text is blinking.

7-4 Auto Tuning

Auto tuning is the function that the device itself sets or supports adequate setting of servo control parameters for a machine (motor load). Auto tuning consists of 2 functions: [Auto tuning function] and [tuning level adjustment function].

Auto tuning function sets servo control parameters in accordance with the actual machine action when a motor is rotated in auto tuning test run (internal run pattern operation).

Tuning level adjustment function supports more adequate setting of servo control parameters for the machine by increasing or decreasing gain in accordance with machine characteristics measured by auto tuning function.

And this device has change function of servo control parameters (selected with GSEL signal) and auto tuning at 2 kinds of motor load status can be used for the purpose.

. Caution

- ①When the auto tuning function is executed, a motor shaft rotates in accordance with the setting of parameter [P150], so confirm that a load machine stays in the movable range.
- ②When auto tuning test run is in progress, it cannot be stopped (aborted) using the Start signal (DR) or Servo On signal (SON).
 - It can be stopped (aborted) using Over travel signal (FOT/ROT), Reset signal (RST), or Emergency stop signal (EMG).
- ③If a trouble as vibration, etc. occurs while executing the auto tuning function, stop the auto tuning immediately by pressing ENT key. In the case, a motor goes into torque free status and moves by its inertia.
- (4) In the cases below, auto tuning may not calculate gain correctly and oscillation or runaway could occur. In the case, set gain manually.
 - (1) Unbalance in load is big.
 - (2) Friction is large.
 - (3) Load inertia fluctuates.
 - (4) Rigidity of the load machine is low.
 - (5) The load machine has play or backlash.
 - (6) Load inertia is 3 times or less of motor inertia.

Compulsion

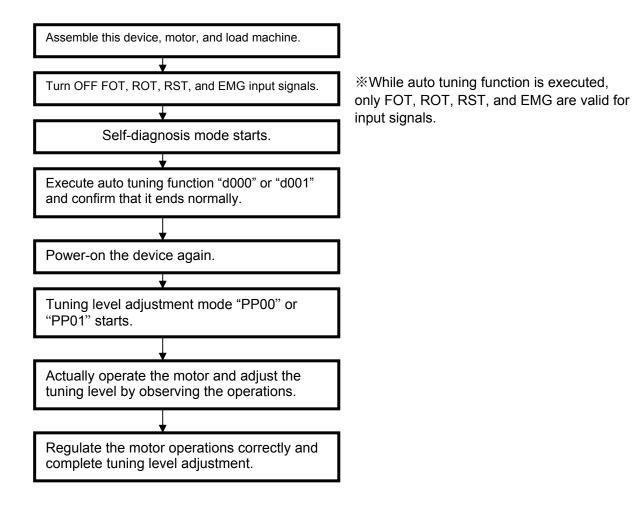
- ①Auto tuning and tuning level adjustment functions calculate optimum speed loop gain based on measured load characteristics.
 - If load changes due to fine adjustment, etc. of the load machine after execution of auto tuning function and tuning level adjustment function, be sure to execute auto tuning function again and measure load characteristics.
- ②If auto tuning function is not executed again even though the load changed, oscillation or runaway of a load machine may occur.

○ Prohibition

①Do not conduct auto tuning of a motor which has a vertical shaft, etc. where external torque always loaded on the motor shaft. When self-diagnosis is selected for conducting auto tuning function, the motor becomes in torque free status and is driven by external torque.

7-4-1 Auto Tuning Execution Procedure

Auto tuning execution procedure is as follows.



[Fig. 7-1] Auto Tuning Execution Procedure

7-4-2 Auto Tuning Function

Auto tuning function is operated by d000 and d001 of self-diagnosis mode.

• d000 measures machine characteristics in auto tuning test run and sets adequate values to the following servo control parameters.

Therefore, be sure to connect the motor with the load and execute d000.

No.	Parameter name	Remarks	
P101	Speed loop gain	Adequate value is set.	
P102	Speed loop integral time constant	Adequate value is set.	
P106	Speed loop proportional gain/ Low speed gain range	Setting value same as P101	
P107	Speed loop integral time constant /Low speed gain range	Setting value same as P102	
P151	Inertia	Load measurement value is set.	
P152	Viscous friction	Load measurement value is set.	

• d001 measures the machine characteristics in auto tuning test run when GSEL signal is ON and sets adequate values to the following servo control parameters.
Therefore, be sure to connect the motor with the load when GSEL signal is ON, and execute d001.

No.	Parameter name	Remarks		
P111	Speed loop proportional gain/GSEL signal ON	Adequate value is set.		
P112	Speed loop Integral time constant/GSEL signal ON	Adequate value is set.		
P153	Inertia/GSEL signal ON	Load measurement value is set.		
P154	Viscous friction/GSEL signal ON	Load measurement value is set.		

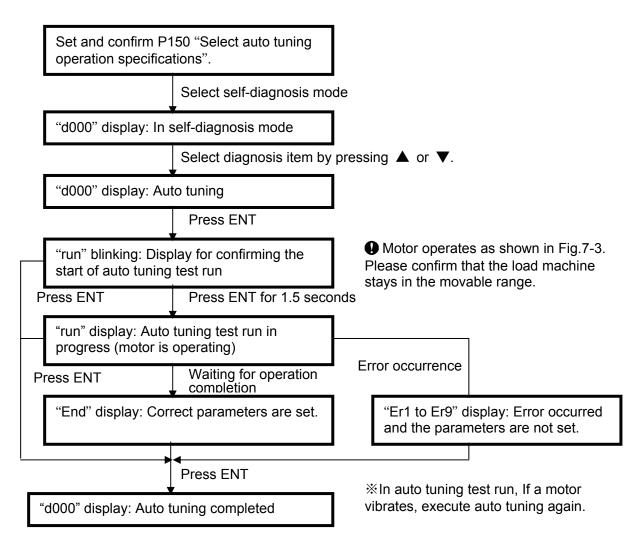
When machine load or other load characteristics are changed, be sure to again measure load characteristics by auto tuning.

Auto tuning function sets adequate gain when load inertia is in the range of 3 to 30 times of motor inertia.

If load inertia exceeds 30 times of motor inertia, since gain setting is a little bit low, please confirm safety and then readjust it by tuning level adjustment function.

2) Auto tuning function execution procedure

Operation for executing the auto tuning function is as follows. (d001 operation is the same)



[Fig. 7-2] Auto Tuning Function Execution Procedure

3) Auto tuning operation specifications

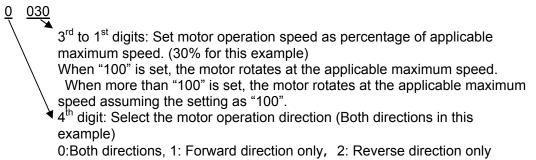
Auto tuning operation is set with P150 "Select auto tuning operation specifications".

P150 "Select auto tuning operation specifications"

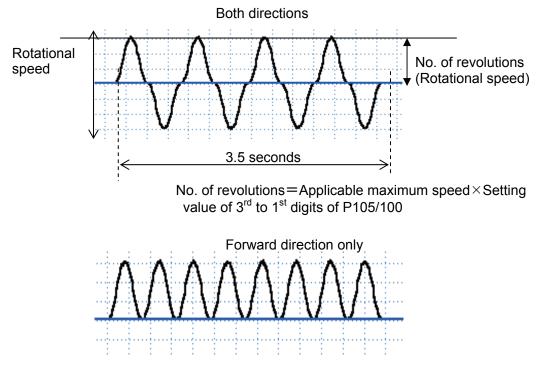
Select the operation specifications of auto tuning of self-diagnosis.

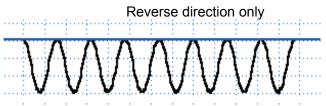
[Set numeric value details]

Setting of each specification item assigned to each digit is as follows.



Motor operation pattern during auto tuning test run is shown as follows.





[Fig. 7-3] Auto Tuning Test Run

♠ Caution

According to the value of parameter [P150], motor travel amount is determined as follows. Please surely confirm that the load machine stays in the movable range before executing auto tuning function

(1) When 4th digit of [P150] is set as "Both directions"

Motor shaft rotating amount =Applicable maximum speed \times Setting value of 3rd to 1st digits of [P150]/100 \times 0.005

Sample) When the setting value of 3rd to 1st digits of [P150] is [30] and the applicable maximum speed is 3000rpm when the motor is rotating

Motor shaft rotating amount $=3000\times30/100\times0.005=4.5$ [turns]

The motor runs about 4.5 turns in the forward direction and then about 4.5 turns in the reverse direction.

(2) When 4th digit of [P150] is set as "Forward direction only" or "Reverse direction only" Motor shaft rotating amount =Applicable maximum speed×3rd to 1st digit setting value of P150/100×0.040

Sample)When the setting value of 3rd to 1st digits of [P150] is [30] and the applicable maximum speed is 3000rpm when the motor is rotating

Motor shaft rotating amount $=3000\times30/100\times0.040=36$ [turns]

The motor runs about 36 turns in the forward or reverse direction.

(3) Reference sample

Sample when setting value of 3rd to 1st digits of [P150] is "30" is shown as reference sample during motor rotation.

Rated	P 150 setting				
speed	Both directions	Forward direction only	Reverse direction only		
2000	3 turns in the forward and reverse directions	24 turns in the forward direction	24 turns in the reverse direction		
3000	4.5 turns in the forward and reverse directions	36 turns in the forward direction	36 turns in the reverse direction		
4000	6 turns in the forward and reverse directions	48 turns in the forward direction	48 turns in the reverse direction		

4) Auto tuning error

Errors during execution of the auto tuning function are as follows.

Error No.	Contents
Er1	Measured data was 0. Confirm that the setting value of 3 rd to 1 st digits of [P150] is not [000] and execute auto tuning again.
Er2	Speed loop integral time constant [P102] or [P112] is out of the range. Auto tuning cannot be executed. Set the parameter manually.
Er3	Measured data was abnormal. Confirm if play, etc. does not exist in a load machine.
Er9	Either error occurrence, FOT, ROT, RST or EMG is the cause of the stop.

7-4-3 Tuning Level Adjustment Function

Tuning level adjustment function is executed in tuning level adjustment mode of parameter editing main mode.

As for tuning level adjustment mode, tuning level can be adjusted by setting the measurement values in Inertia (P151, P153) and Viscous friction (P152, P154), after executing auto tuning function.

Also, the tuning level can be adjusted also by setting the actual load values in Inertia (P151, P153) and Viscous friction (P152, P154) by editing the parameters.

Even after auto tuning function is executed, if load changes, execute auto tuning function again.

- ① In the following cases, there is a possibility of the oscillation or runaway since normal tuning level adjustment is not possible.
 - · When the load is changed after executing the auto tuning function
 - When the values set in Inertia (P151, P153) and Viscous friction (P152, P154) by editing the parameters greatly differ from the actual load
 - Adequate values are set for the following servo control parameters according to the increased or decreased gain in tuning level adjustment mode [PP00].

No.	Parameter name	Remarks		
P101	Speed loop proportional gain	Adequate value is set.		
P102	Speed loop integral time constant	Adequate value is set.		
P106 Speed loop proportional gain/ Low speed gain range		Setting value is same as [P101]		
P107	Speed loop integral time constant/ Low speed gain range	Setting value is same as [P102]		

■ Adequate values are set for the following servo control parameters according to the increased or decreased gain when GSEL signal is ON, in tuning level adjustment mode [PP01].

No.	Parameter name	Remarks		
P111	Speed loop gain/ GSEL signal ON	Adequate value is set.		
	Speed loop integral time constant/ GSEL signal ON	Adequate value is set.		

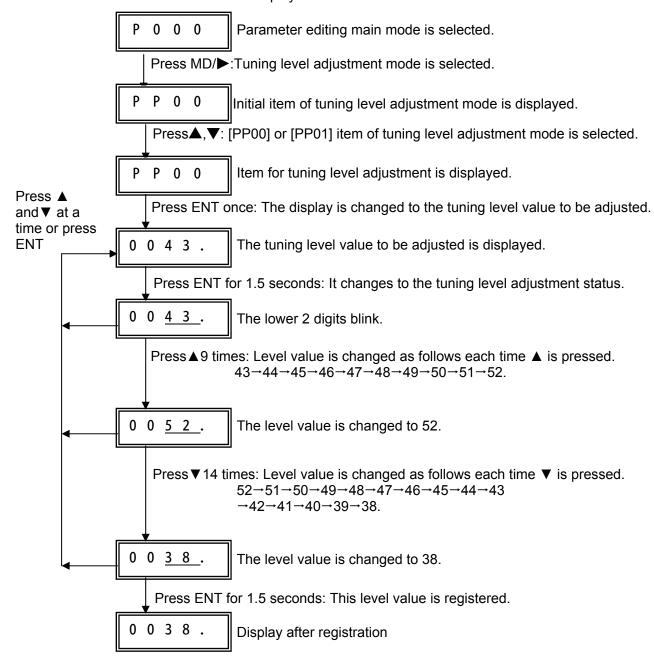
1) Tuning level adjustment function execution procedure

Operation for executing the tuning level adjustment function is the same as real time edit operation, as given below.

When GSEL signal is ON, tuning level adjustment [PP01] operation is also the same.

Example of change of PP00 tuning level: 0043→0052→0038

The underlined numbers blink when displayed.



As for this level value,

By pressing \(\text{key}, \text{ numeric value of the level increases, i.e. high gain \)

By pressing ▼ key, numeric value of the level decreases, i.e. low gain

Adjust the tuning while observing the behavior of the motor, since increased and decreased level numerical value is reflected in the control in real time.

When the level value is correct, register the level value by pressing ENT for 1.5 seconds.

When ENT is pressed for less than 1.5 seconds, the adjusted level value is cancelled and it returns to the value before adjusting this level.

Chapter 8 Run

8-1 Inspection before Run

After installation and wiring is completed, conduct following inspection before starting this device.

- 1 Isn't there any mis-wiring? Specially, is the power not connected to motor connection terminals U, V, W?
- 2 Isn't there any place in short-circuit status by cable chips, etc.?
- Isn't there any part of wires where abnormal force is added on?
- 4 Isn't there any loose fit screw, terminal, etc.? Are connectors inserted tightly?
- 5 Isn't there any short-circuit or line-to-ground fault in external sequence circuits?
- 6 Is grounding method correct? And is the earth ground grade JIS Class 3 or better?

Caution

Never conduct insulation test such as withstand voltage test and mega test, and noise test by a noise simulator, etc. to this device.
"Those tests may damage the device."

Before starting this device, confirm the following setting.

- Set motor type data to the standard motor setting parameter P000 in accordance with [8-6 Run Procedure]. In case of setting a dedicated motor, set [999] to P000 and motor-associated parameters to P020 to P059 in accordance with the specification sheet [Setting option].
- Confirm that Emergency stop (EMG), Forward/Reverse over travel (FOT, ROT), Servo On (SON) and Reset (RST) signals are being input normally.

8-2 Run Operation

According to the Mode selection signal (MD), the following run modes are supported.

Run mode	Mode selection signal (MD)		
Speed control run mode	\circ		
Pulse train run mode	•		

※ ○: Signal OFF ●: Signal ON

[Tab. 8-1] Mode Selection List

The I/O signal table that relates to the run operation is shown below. ●: Related signal

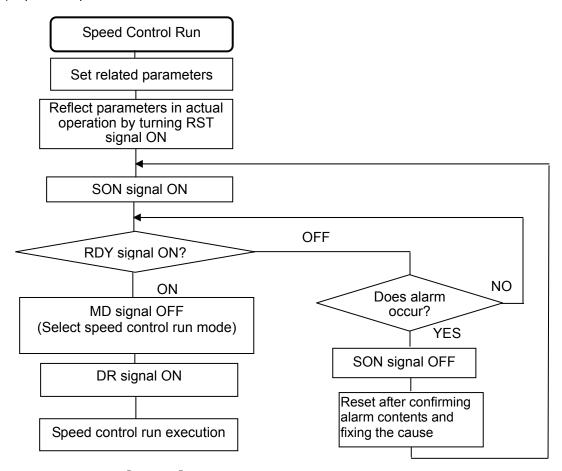
			Speed	Pulse train run mode			
Control I/O	Signal name	Symbol	control run mode	Pulse train command operation	Zero return operation	Positioning operation	Jog operation
	Start	DR		•		•	•
	Servo On	SON		•			•
	Torque limit	TL			•	•	
	Speed gain selection	GSEL	•	•	•	•	•
	Reset	RST			•	•	•
	Mode selection	MD		•	•	•	•
	Command pulse input prohibition	CIH		•			
	Reverse command direction	RVS	•	•	•	•	•
	Command selection 1	SS1					
	Command selection 2	SS2			•		
	Command selection 3	SS3	•		•	•	
Control	Emergency stop	EMG*	•	•	•	•	•
input	Forward over travel	FOT*	•	•	•	•	•
	Reverse over travel	ROT*	•		•	•	•
	Command data reflection prohibition	NRF	•		•	•	•
	Internal pulse start	ZST			•	•	
	Zero LS	ZLS			•		
	Zero marker	ZMK			•		
	Current position data request	APRQ	•	•	•	•	•
	Alarm code request	ALRQ		•			•
	ABS data request	ABRQ		•	•	•	
	Request clock	CRQ		•	•	•	•
I	Forward jog	FJ					•
	Reverse jog	RJ					•
	Servo ready	RDY		•	•	•	•
	Alarm	ALM					
I	Deviation range A	PNA		•	•	•	•
	Deviation range B	PNB		•	•	•	•
Control	Brake release	BRK			•		•
output	Speed zero	SZ			•	•	•
	Under emergency stop	EMGO			•		•
	Zero return completion	HCP			•		
	Response data	DRSP		•		•	•
	Response clock	CRSP					•

[Tab. 8-2] I/O Signal Operation List

8-3 Speed Control Run

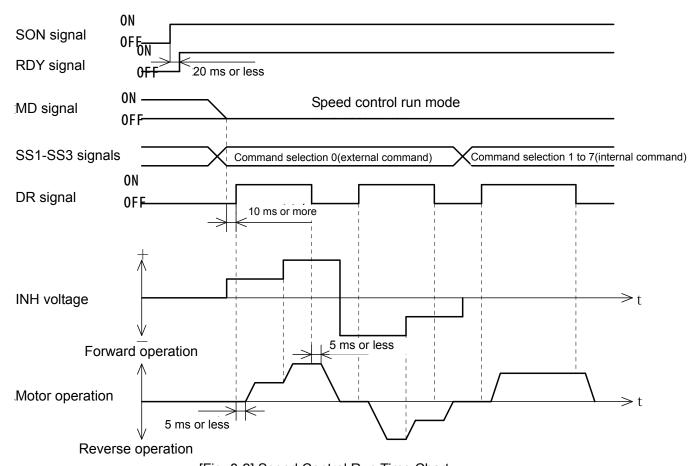
In speed control run mode, the speed control run is executed according to the speed command value set by external speed command voltage (±10VDC) or parameters.

1) Operation procedure



[Fig. 8-1] Speed Control Run Operation Procedure

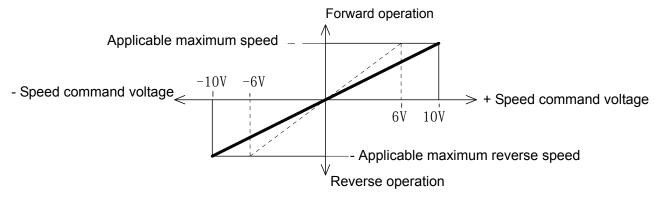
2) Time chart



[Fig. 8-2] Speed Control Run Time Chart

- 3) Relation between external speed command and motor operation speed
 - The operation speed of the motor will be the applicable maximum speed with ±10VDC, which is in proportion to the external speed command (INH) voltage.

 Moreover, depending on the parameter [P300: Speed command gain], the speed command voltage can be set between ±6VDC and ±10VDC, which will be the applicable maximum speed for the motor.
 - The motor is operated in forward direction by external speed command of positive voltage. The motor can also be operated in reverse direction by the external speed command of positive voltage by setting the parameter [P003: Rotating direction selection] or using Reverse command direction signal (RVS).



[Fig. 8-3] Diagram Showing Relation between Speed Command Voltage and Speed

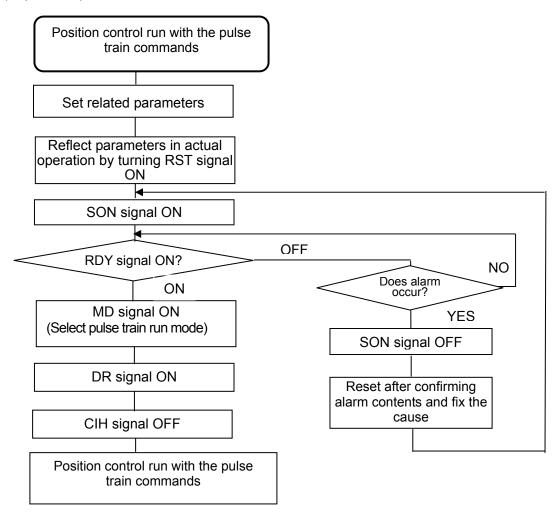
- 4) Relation between torque limit command and maximum output torque of motor
 - The maximum output torque of the motor can be restricted by setting the Torque limit signal (TL) to ON in speed control run mode.
 - Torque can be restricted by setting the limit value of 0.0 to 799.9 in the data of parameter [P007, P008: Torque limit value 2(+/-)].
 - The forward torque is restricted by Torque limit command + (TL+), and the reverse torque is restricted by torque limit command (TL-).

8-4 Pulse Train Run

In pulse train run mode, position control run which is executed in accordance with pulse train command (line driver method or open collector method), zero return, positioning, and jog run are supported.

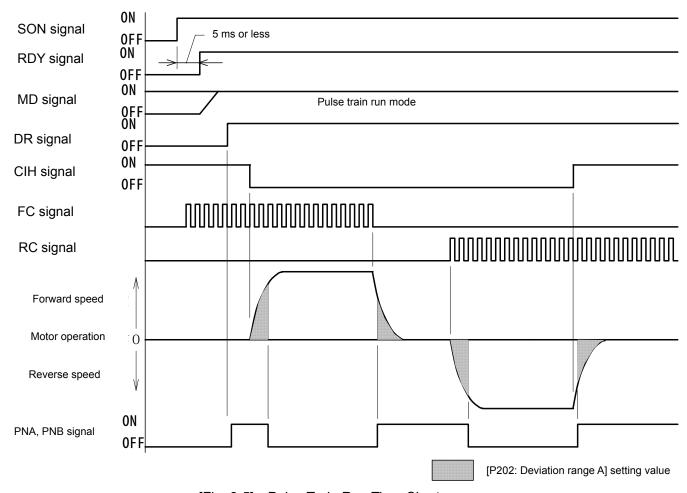
8-4-1 Position control run with the pulse train command

1) Operation procedure



[Fig. 8-4] Position Control Run Operation Procedure with the Pulse Train Commands

2) Time chart



[Fig. 8-5] Pulse Train Run Time Chart

3) Supplement

- The motor can be operated in reverse direction by forward pulse train command by parameter [1st digit of P600: Phase sequence selection] settings or Reverse command direction signal (RVS).
- Motor operation volume per one pulse of pulse train command can be set by parameters [P601: Pulse train command ratio numerator] and [P602: Pulse train command ratio denominator].

8-4-2 Zero Return Run

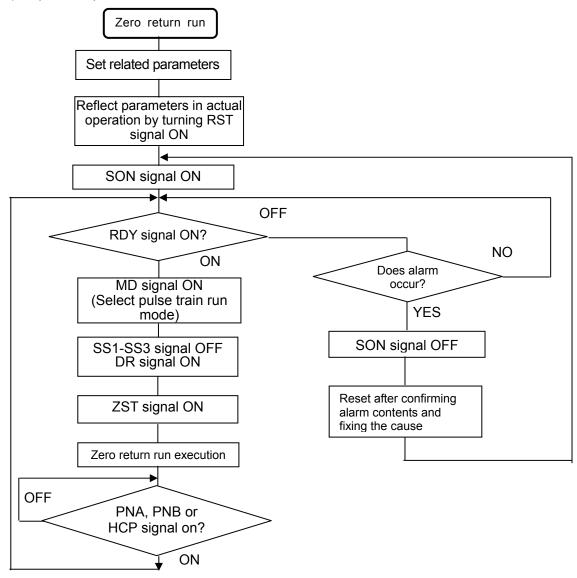
For zero return run, when 0 is selected by command selection (SS1-SS3) and the internal pulse start (ZST) is executed, the zero return operation is carried out.

There are the following types of zero return methods.

Name of zero return method	Setting of [P402:Zero return method selection]	Operation specification
Standard zero return	0:STD.HOME	Zero return is conducted by using zero point deceleration LS. For details, refer to the time chart (a)-(c).
No LS zero return	1:LS LESS	Zero return without zero point deceleration For details, refer to the time chart (d).
Absolute-encoder positioning zero return	2:ABS.HOME	Positioning is done at the absolute encoder position set with P403. For details, refer to the time chart (e)-(f).

[Tab. 8-3] Setting and Operation of Zero Return Methods

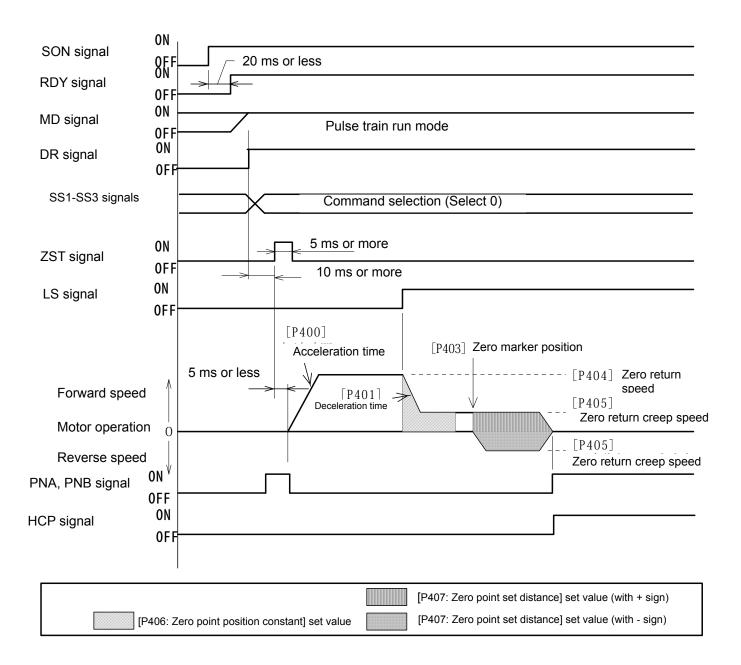
1) Operation procedure



[Fig. 8-6] Zero Return Run Operation Procedure

2) Time chart

(a) [Standard zero return] (The use of encoder position is specified in P403 [Zero marker selection]) [At the start of zero return, in case that zero point deceleration limit is OFF]



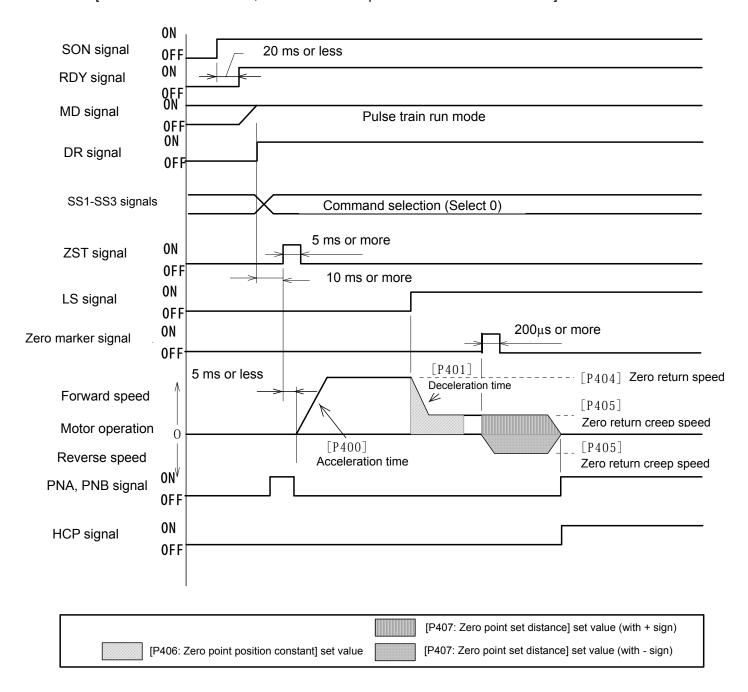
[Fig. 8-7] Standard Zero Return Run Time Chart 1

[At the start of zero return, in case that zero point deceleration limit is ON] 0N SON signal 20 ms or less RDY signal 0FF ON MD signal Pulse train run mode 0FF ON DR signal 0FF SS1-SS3 signals Command selection (Select 0) ON 5 ms or more ZST signal 0FF 10 ms or more ON LS signal 0FF [P403] Zero marker position [P400] Acceleration time Forward speed 5 ms or less [P405] Zero return creep speed Motor operation 0 [P405] [P401] Reverse speed Zero return creep speed Deceleration time [P404] Zero return speed ON PNA, PNB signal 0FF 0N **HCP** signal 0FF [P407: Zero point set distance] set value (with + sign) [P406: Zero point position constant] set value [P407: Zero point set distance] set value (with - sign)

(b) [Standard zero return] (The use of encoder position is specified in P403 [Zero marker selection])

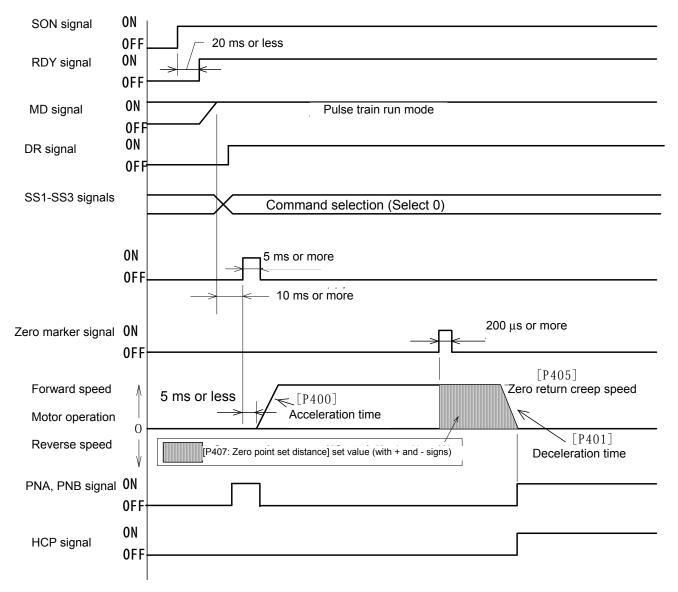
[Fig. 8-8] Standard Zero Return Run Time Chart 2

(c) [Standard zero return] (The use of zero marker is specified in P403 [Zero marker selection]) [At the start of zero return, in case that zero point deceleration limit is OFF]



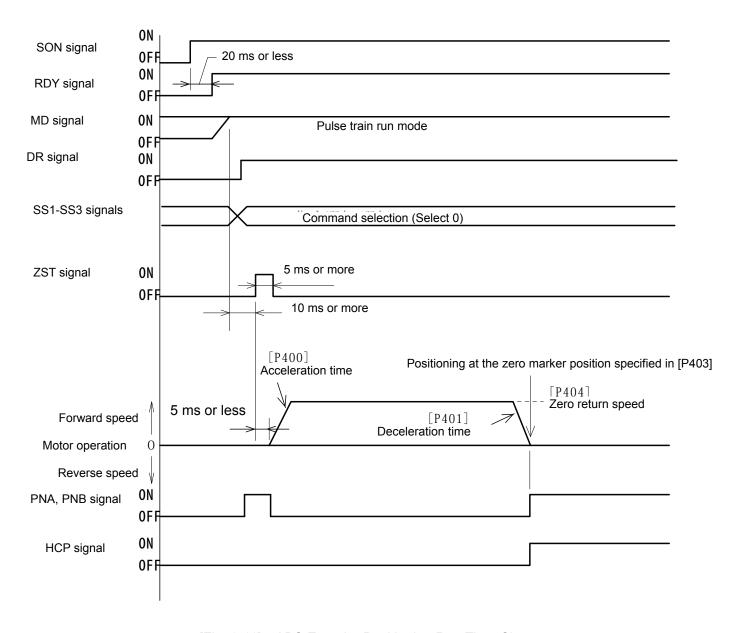
[Fig. 8-9] Standard Zero Return Run Time Chart 3

(d) [No LS zero return] (The use of zero marker is specified in P403 [Zero marker selection])



[Fig. 8-10] No LS Zero Return Run Time Chart

(e) [ABS encoder positioning]



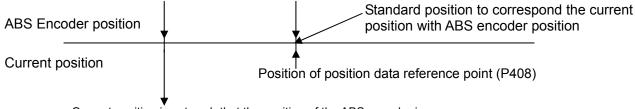
[Fig. 8-11] ABS Encoder Positioning Run Time Chart

(f) [ABS encoder current position setting]

When zero return is executed with Zero return speed (P404) set to 0, current position (C016) is set on the basis of the current ABS encoder position (C011) without performing the motor operation.

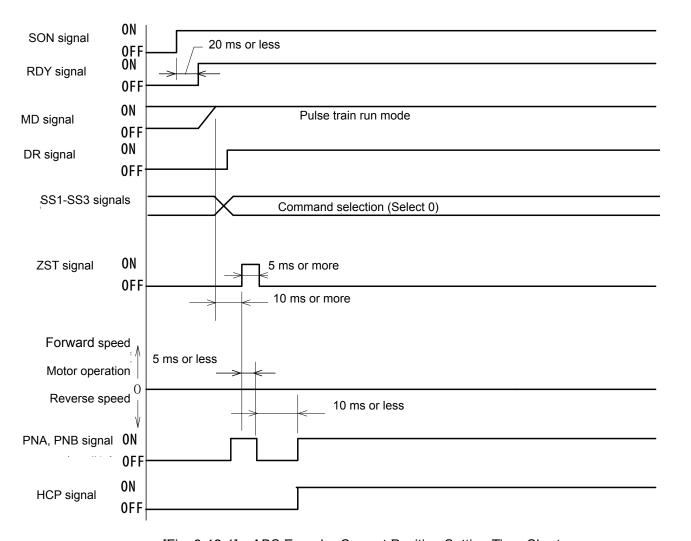
The relation between ABS encoder position and the current position setting is as follows.

ABS encoder position at the start of this zero return Position specified in Zero marker selection (P403)



Current position is set such that the position of the ABS encoder is the position specified in Zero marker selection (P403) after positioning it in the position data reference point (P408) by this zero return start.

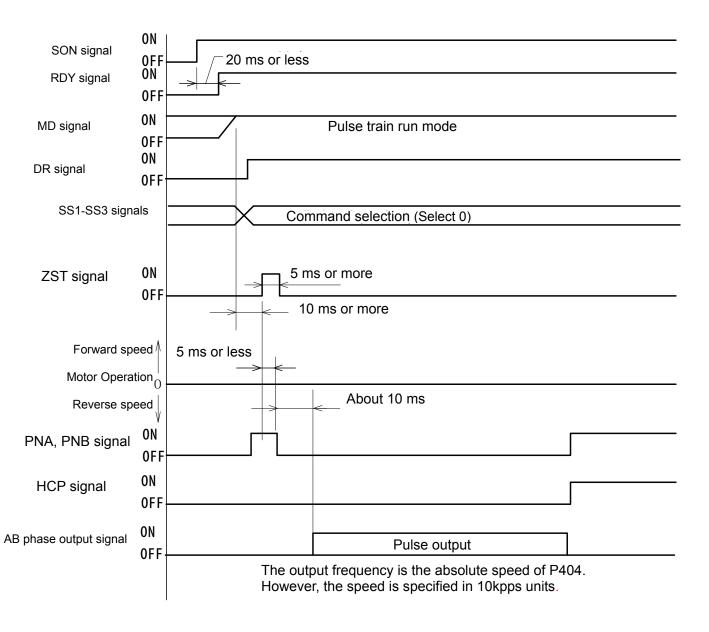
[Fig.8-12] Relation between ABS Encoder Position and Current Position



[Fig. 8-12-1] ABS Encoder Current Position Setting Time Chart

(g) [ABS encoder current position setting and current position pulse output]
When zero return is executed with Zero return speed (P404) set to negative speed, current position (C016) is set on the basis of the current ABS encoder position (C011) and the position data at that current position is pulse output without performing the motor operation.
That is, when current position is "125 pulse", 125 pulses are output from the AB phase output pulse with 4-multiplication.

The relation between ABS encoder position and current position setting is the same as [ABS encoder current position setting].



[Fig. 8-12-2] Time Chart for ABS Encoder Current Position Setting and Current Position Pulse Output

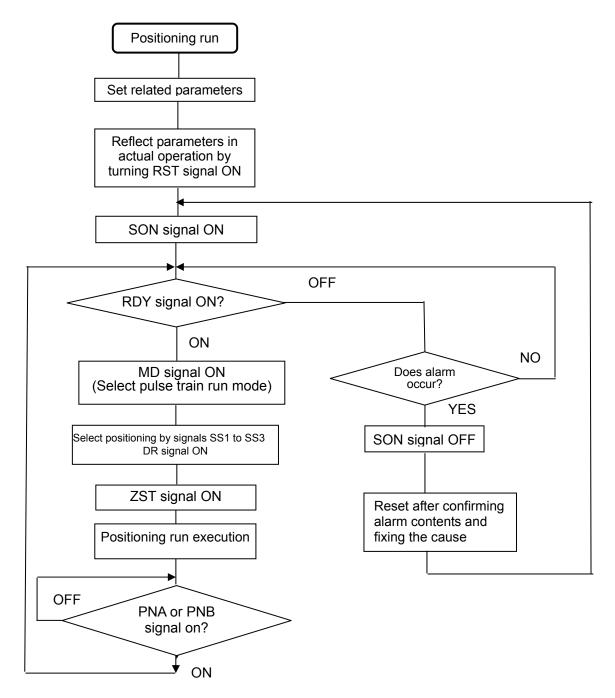
3) Supplement Zero return can be operated in the reverse direction by parameter [P404: Zero return speed] setting or by Reverse command direction signal (RVS).

However, the change in this operation direction is invalid for the ABS encoder positioning.

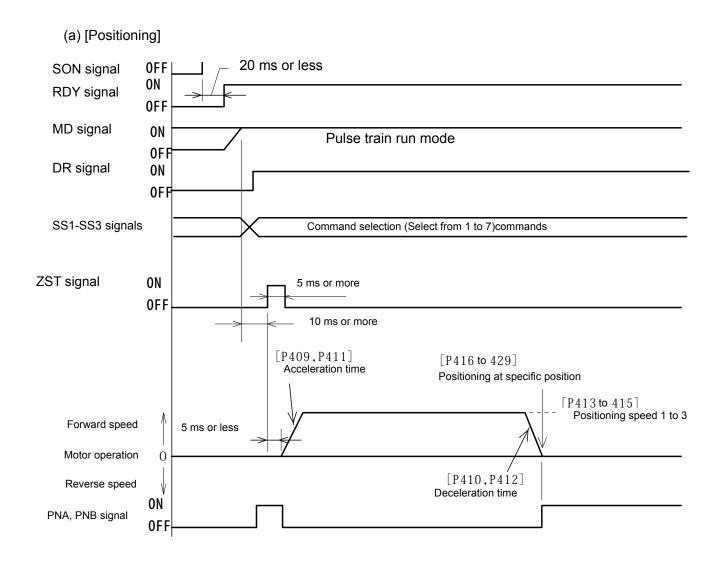
8-4-3 Positioning Run

Positioning run is executed when one of command selection settings 1 to 7 is selected and internal pulse start (ZST) is activated.

1) Operation procedure



[Fig. 8-13] Zero Return Run Operation Procedure

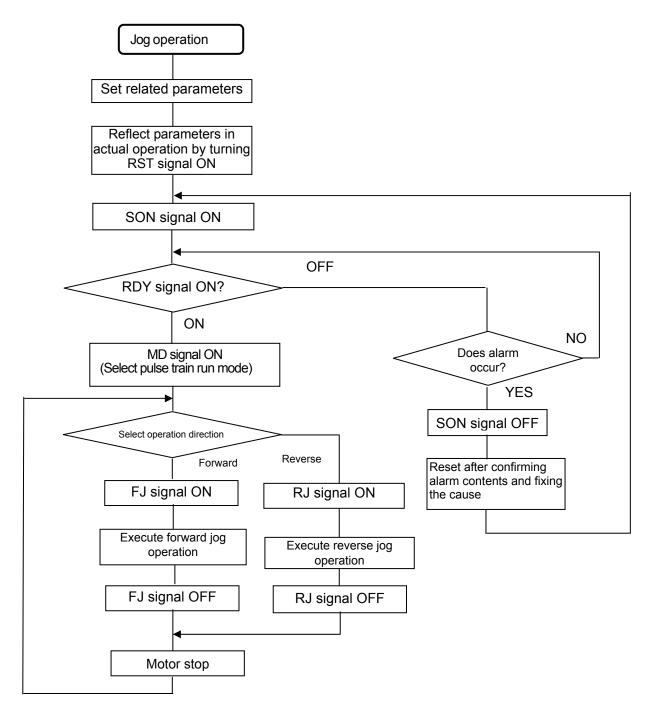


[Fig. 8-14] Positioning Run Time Chart

8-4-4 Jog Run

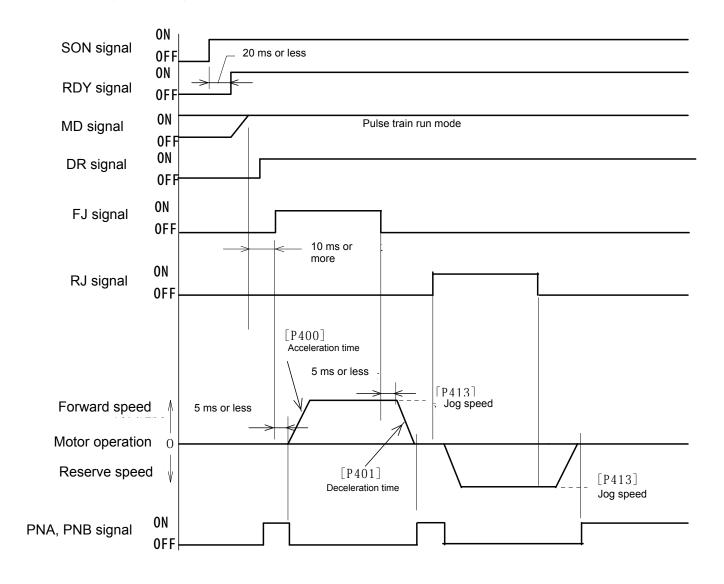
Jog run is executed in the specific direction when Forward jog (FJ) or Reverse jog (RJ) is ON.

1) Operation procedure



[Fig. 8-15] Jog Run Operation Procedure

(a) [Jog positioning]



[Fig. 8-16] Jog Run Time Chart

8-5 Oscillo-monitor

The speed, the generated torque, and deviation etc. can be observed in waveform using the oscillo function of the data editor (option) of this device.

The operating state of the motor (transient and steady states) can be confirmed by the waveform.

8-6 Run Procedure

Operate this device in accordance with the following procedure.

- 1 Be sure to conduct trial run.
- 2 In order to avoid a trouble in the trial run, at first run this device without any load and after confirming no fault, connect the device to your machine. Pay special attention not to cause an accident.

- ① Do not touch terminal block of the device, carelessly. [Since there is high voltage, it is very dangerous.]
- ② Since some residual voltage exists after power is turned OFF, do not touch terminals and main circuits for 2 to 3 minutes after power-off.
- ③ Power ON/OFF shall be conducted after confirming safety, cautiously.

8-6-1 Confirmation of Power Supply Voltage

Please confirm that the power supply for the device satisfies the required specification. For power supply specification, refer to [10-1-4 Device Electrical Specifications].

8-6-2 Trial Run

- 1) Separation of the motor and load
 - ① Remove motor connection from the machine system and put the motor into a no load status.
- 2) Turning OFF of the Servo On signal (SON)
 - ② Before turning power ON, turn the Servo On signal (SON) OFF.
- 3) Power-on
 - ③ When power is turned ON, initial status is displayed in the operation panel.

4) Setting of parameters

① Set [P000: Motor type] and other parameters and positioning data to coincide with your use conditions (refer to Chapter 6 "Parameters").

^{*} Parameters that must be set for trial run are as follows. (When other than [999] is set for [P000: Motor type])

Parameter No.	Name
P000	Motor type
P001	Encoder type selection

[Tab. 8-4] Setting Parameters Required for Trial Run

5) Power re-input

1 In order to reflect parameter value on actual operation, re-input the power.

6) Confirmation of control input signals

- 1 Turn ON/OFF the control input signals other than Servo On signal (SON) and confirm if LEDs corresponding to the signals are turned ON or OFF in status display 1 mode of the operation panel.
- Please confirm the external speed command/pulse train command input in status display 0 mode.

7) Turning ON of the Servo On signal (SON)

- ① After confirming parameter settings and control input signals, turn OFF all control signals, and turn ON then OFF the Reset signal (RST).
- ② Turn ON only the Servo On signal (SON).
- 3 When the Servo ON signal (SON) is turned ON, the motor is ready to generate torque and generates resisting torque to external force.
- 4 If an alarm is displayed or the motor rotates at the same time the Servo On signal (SON) is turned ON, investigate and remove the cause.

8) Run mode selection

① Select run mode by the Mode selection signal (MD).

9) Turning ON of the Start signal (DR)

- ① All speed commands and pulse train commands can be received by turning the Start signal (DR) ON.
- ② When an alarm is displayed and the motor rotates at the same time when the Start signal (DR) is turned ON, investigate and remove the cause.

10) Confirmation of run operation

- ① Run a motor by low-speed run command and confirm if the operation speed is correct, abnormal vibration does not occur, abnormal sound does not exist, etc.
- 2 Change command speed and confirm that the motor operation speed is proportionally changed to the command speed. (We recommend to measure the speed with a tachometer on the motor load shaft.)
- 3 If motor operation speed cannot be increased or is not proportional to the command speed and motor vibration or abnormal sound occurs in the above item ②, remove the cause.
- 4 In case of positioning operation, confirm if the motor rotating amount is correct against the positioning data. (We recommend marking on the motor load shaft to confirm the position.)
- (5) If motor rotating amount is multiplied value by constant ratio or fluctuates in the above item (4), remove the cause.
- 6 Run operation confirmation shall be conducted for both forward and reverse directions.

11) Load run

- ① After trial run in the no load status is over, connect the motor to the machine system and conduct another trial run.
- 2 Before executing load run, confirm that emergency stop, over travel, etc. surely works.
- ③ Inspect if abnormal sound, abnormal vibration, abnormal heat, etc. does not occur.
- 4 If above abnormality occurs or an alarm is displayed, remove the cause.
- Motor operation and load status can be confirmed by the display on the operation panel in status display mode.

8-7 Adjustment

8-7-1 Adjustment at Shipment

All the device adjustments are set by parameters.

For the standard setting at our factory shipment (initial value), refer to [Chapter 6 Parameters]. Though the device is preset standard (initial value) at our factory before shipment, it may be necessary to re-adjust the device depending on actual load status and operating method when it is connected with a machine system.

- *1 Automatic adjustment can be conducted by auto tuning. For auto tuning, refer to [7-4 Auto Tuning].
- *2 In some cases, auto tuning could not be conducted due to actual load status, play in the machine system, etc. In this case, please set the calculated load inertia and viscous friction in the parameter, and adjust the tuning level.
- *3 Please set each parameter manually referring to the following description when sufficient performance cannot be achieved by adjusting the tuning level due to the load status, play in the machine system, etc.

8-7-2 Adjustment Point of Individual Phenomenon (Parameters)

For explanation and setting method for each parameters, refer to [Chapter 6 Parameters] and [Chapter 5 Setting and Display].

Phenomenon	Adjustment point (parameter)
A motor vibrates in stop status.	[P106: Speed loop gain / Low speed gain range] [P107: Speed loop integral time constant/ Low speed gain range] Above parameters are valid in low speed gain range of P100 setting. [P120:Torque command filter frequency] [P201:Servo lock gain]* This parameter is valid in deviation range of P202
A motor vibrates while running.	setting. [P101: Speed loop gain] [P102: Speed loop integral time constant] [P120: Torque command filter frequency] [P200: Position loop gain]* [P603:Pulse train feed forward ratio]
A motor vibrates when GSEL signal is ON.	[P111:Speed loop gain/ GSEL signal ON] [P112:Speed loop integral time constant /GSEL signal ON] [P120:Torque command filter frequency]
Over-shoot or under-shoot is large at motor start or stop.	[P101:Speed loop gain] [P102:Speed loop integral time constant] [P200:Position loop gain]* [P309:Acceleration time]
Over speed error occurs.	[P310:Deceleration time] [P400,P409,P411:Acceleration time]* [P401,P410,P412:Deceleration time]* [P603:Pulse train feed forward ratio]* [P607:Pulse train averaging filter time]*
Deviation overflow occurs.*	[P200:Position loop gain]* [P204:Overflow detection pulse]* [P603:Pulse train feed forward ratio]* [P607:Pulse train averaging filter time]
Positioning time is long. *	[P200:Position loop gain]* [P202:Deviation range A]* [P603:Pulse train feed forward ratio]*
Motor speed does not reach applicable maximum speed by speed command voltage 10V.	[P004:Applicable max. speed] [P300:Speed command gain]
Motor runs slowly by speed command voltage 0V.	[P301:Speed command offset]

Note) * Item of pulse train run

[Tab.8-5] Adjustment Point of Individual Phenomenon (Parameters)

8-7-3 Adjustment Method

1) [Speed loop gain]

- ① [Speed loop gain: P101]/[Low speed gain range: P106]/[GSEL signal ON: P111]
 - The larger the setting value is, the quicker the response is.
 - If setting value is too large, it causes vibration.
 - If setting value is too small, it makes response slow and motion unstable.
- ② [Speed loop integral time constant: P102]/[Low speed gain range: P107]/[GSEL signal ON: P112]
 - The smaller the setting value is, the quicker the response is.
 - If setting value is too small, it causes vibration (chatter vibration).
 - If setting value is too large, it makes response slow and motion unstable.

2) [Torque command filter]

- 1) Torque command filter frequency [P120]
 - If machine resonance occurs, insert a filter to torque command to fix it.
 - The larger the setting value is, the quicker the response is.
 - If setting value is too small, it makes response slower and motion unstable.

3) [Position loop gain]

- 1 Position loop gain [P200]
 - The larger the setting value is, the quicker the response is.
 - If setting value is too large, it causes over-shoot, under-shoot, vibration, etc.
 - If setting value is too small, it makes positioning time longer and positioning accuracy worse.
- 2 Servo lock gain [P201]
 - The larger the setting value is, the quicker the response is in servo lock.
 - If setting value is too large, it causes vibration.
 - If setting value is too small, it makes servo lock weaker and stop position shifts due to external force.

4) [Feed forward ratio]

- ① Pulse train feed forward ratio [P603]
 - The larger the setting value is, the higher the compliance to a pulse train command is.
 - If setting value is too large, it causes over-shoot, under-shoot, vibration, etc.
 - If setting value is too small, it makes positioning time longer.

5) Gain adjustment method

Gain adjustment is conducted by using oscillo function of VPS data editor and observing the waveform of speed feedback.

Adjust individual gain parameters of position loop and speed loop so that no over-shoot or under-shoot exists and that no vibration occurs.

- Conduct adjustment below in the running status.
- ① Set a little bit low value to [P200: Position loop gain] and [P201:Servo lock gain] and adjust [P101: Speed loop gain] as high as possible in the range where the motor does not vibrate.
- 2 Adjust and set an optimum value to [P102: Speed loop integral time constant] and re-adjust [P101: Speed loop gain] to set optimum motor operating condition.
- 3 If machine resonance occurs, adjust and set [P120 :Torque command filter frequency] as high as possible until machine resonance disappears.
- 4 Adjust and set [P200: Position loop gain] as high as possible in the range where over-shoot, under-shoot, and motor vibration does not occur.
- Conduct adjustment below in the stop status.
- ① Copy parameter setting values in the above running status to the parameters in the stop status.

P201 ← [P200 : Position loop gain] P106 ← [P101 : Speed loop gain]

P107 ← [P102 : Speed loop integral time constant]

② If a motor vibrates after setting above parameters, adjust the following parameters according to the adjustment method described for the running status.

[P201:Servo lock gain]

[P106:Speed loop gain/ Low speed gain range]

[P107:Speed loop integral time constant/ Low speed gain range]

- 3 If machine resonance occurs, adjust and set [P120 :Torque command filter frequency] as high as possible until machine resonance disappears.
- Conduct adjustment below in GSEL signal ON status.
 (Adjustment is not required when Speed gain selection (GSEL signal) is not used.)
- Adjust and set [P111: Speed loop gain/ GSEL signal ON] as high as possible in the range where the motor does not vibrate.
- 2 Adjust and set an optimum value to [P112: Speed loop integral time constant/ GSEL signal ON] and re-adjust [P111: Speed loop gain/ GSEL signal ON] to set optimum motor operating condition.
- If machine resonance occurs, adjust and set [P120 :Torque command filter frequency] as high as possible until machine resonance disappears.

6) Speed adjustment

In case of external speed command, operation speed of the motor becomes the maximum rotational speed with the speed command input voltage of ±10VDC. When an auxiliary power supply is used or depending on the external power supply, the maximum rotational speed command could not be exactly ±10VDC. Adjust the value of the parameter [P300: Speed command gain] so that the motor rotates at the maximum rotational speed when the maximum rotational speed command is input. When [P300: Speed command gain] is set as [6.00 to 10.00], adjustment can be made so that the maximum rotational speed is set in the range of speed command input voltage ±6 to 10VDC. When setting the parameter in the range of [10.01 to 100.00], refer to the function of [P300] in [Chapter 6 Parameters].

7) Speed command offset adjustment

- The motor operates slightly with 0V speed command input voltage, in case of external speed command.
 - Adjust the value of the parameter P301 [Speed command offset] to stop the motor. *The automatic offset adjustment is possible with [d006] in self-diagnosis.
- 2 The operations of the motor can be stopped also by turning the Start signal (DR) OFF.

Chapter 9 Error Diagnosis and Corrective Measures

When any error occurs, conduct the following inspections and error diagnosis in order to investigate the cause and properly take corrective measures. If none of the following inspection and confirmation items apply or if it is supposed that a part or a device fails or is damaged, immediately inform the fact to our sales representative.

When corrective measures are conducted, the worker in charge should check power ON/OFF.

Since residual voltage remains in the main circuits even after power is turned OFF, start corrective measures approximately 2 to 3 minutes after the power OFF.

And when it is necessary to touch inside of a device, be careful not to damage it by static electricity.

Never conduct insulation test by a meggar tester as it may damage a device. In case of measuring motor insulation, completely disconnect cables (U, V, W) between a motor and a device beforehand.

9-1 Inspection and Confirmation Items

When an error occurred, inspect and confirm the following items.

If a device or a motor of the same model is available, replace suspicious one and run it to judge whether the device or the motor is damaged or any external factor exists.

[Inspection and confirmation items]

- 1) Inspect how is the status of alarm display.
- 2 Inspect if any error is found by visual check.
- 3 Inspect if the error is reproducible or occurs only in a particular motion.
- 4 Inspect how often the error occurs.
- 5 Inspect how long the device has been used.
- **(6)** Inspect if power voltage is normal or fluctuates largely in a particular time band.
- (7) Inspect if blackout occurred.
- Inspect if the temperature of the motor or device and ambient temperature are normal.
- Inspect if installation environment of a motor and the device is normal. (Water, oil, metal powder, paper fragment, corrosive gas, etc.)
- 10 Inspect when an error occurs during acceleration, deceleration or running at constant speed of a motor.
- ① Inspect if an error occurs at load fluctuation. (When load becomes big or small)
- (1) Inspect if there is difference between forward and reverse rotation of a motor.
- (13) Inspect if there is any error in no load run.

⚠ Caution

If reset is repeatedly conducted when IPM fault or overload error occurs, it may damage the device and may cause burnout of a motor. Thus, be sure to remove the error cause and resume run.

9-2 Protective Function

This device has various protective functions to prevent the device or a motor from damages caused by unusual conditions.

When an error is detected, the motor stops and alarm code is displayed in data display LED when alarm signal is output.

9-2-1 Protective Function List

"Protective Function List" is shown in Tab. 9-1.
Refer to "9-2-2 Inspection Method and Corrective Measures When Alarm Occurs" for the causes

and countermeasures when the protective function is activated.

	a countermeasures when the protective function is activated.	ı	
Display	Items	Operation	Way to release
code	Contents	at an alarm	Way to release
	RAM error	Motor free	Restart the
	RAM (memory) of the device cannot be read/written normally. When	INIOIOI II EE	power supply.
01	this error occurs, the device control is stopped and this alarm is not		power suppry.
	recorded in the alarm history.		
	IPM fault	Same as	Innut DCT signal
10		above	Input RST signal or restart the
10	Current with more than rated value flowed through the power section transistor.	above	
		Cama aa	power supply.
12	Under voltage error	Same as	Same as above
12	DC power voltage of main circuits is reduced to 180[90] V or less.	above	
	A value of 100V specification is in [].		0 1
	Over voltage error	Same as	Same as above
40	Due to excessive load inertia, etc., regenerative energy at motor	above	
13	stop or deceleration is beyond the treatment capacity and DC power		
	voltage of main circuits exceeded about 400[200]V or more. A value		
	of 100V specification is in [].		
14	Over speed error	Same as	Same as above
	Motor speed exceeded about 160% of the maximum speed.	above	
	Overload error	Same as	After cooling of
	Due to overload or excess of allowable repetition frequency, an	above	the device or the
15	internal electronic thermal is activated. Detection method can be		motor, input
10	selected by [P009: Electronic thermal detection selection].		RST signal or
			restart the power
			supply.
	AC power supply error	Same as	Input RST signal
18	AC power supply voltage stopped for 50ms or more.	above	or restart the
	Or power supply started again within 1 minute after it is turned OFF.		power supply.
	Over regeneration current error	Same as	Same as above
19	Current more than the specific value flowed in the transistor of the	above	
	regenerative circuit.		
	Motor selection error	Same as	Restart the
	While setting motor type with the parameter P000, the selected	above	power supply
21	motor number is the number of a motor that is not allowed to be		after setting the
21	selected in combination with the device.		parameter P000
			motor type
			correctly.
	Serial encoder count error	Same as	Input RST signal
32	Serial encoder count error occurred.	above	or restart the
			power supply.
33	Serial encoder communication error	Same as	Same as above
	Data cannot be received from serial encoder.	above	
	Serial encoder marker decision error	Same as	Same as above
	Marker position of the serial encoder could not be decided.	above	
	The motor operated in the condition where the indefinite encoder		
35	marker status is cancelled, however, it is not cancelled.		
	※It is detected when incremental encoder is set in the parameter		
	P001.		
	Refer to P001 [Encoder type selection] for "indefinite encoder		
	marker status."		
	Deviation overflow	Same as	Same as above
40	Position deviation on the encoder pulse exceeded setting of	above	
	[P204: Overflow detection pulse].		
	L	l .	l

[Tab. 9-1 a] Protective Function List 1/2

Display	Items	Operation at	May to valore
code	Contents	an alarm	Way to release
	Pulse train command over speed error	Motor free	Input RST signal
42	Pulse train commands of more than 80Mpps were input for the encoder pulse. When P606 [Pulse train delay compensation time] is other than '0', it is detected at about 40Mpps.		or restart the power supply.
43	ZST cannot be started In operations by Internal pulse start signal (ZST), forward and reverse operations were not possible for over travel (FOT, ROT).	Same as above	Same as above
50	Forward over travel Forward over travel signal (FOT) was detected.	Suddenly stopped	Move the motor in the reverse direction and release Forward over travel (FOT).
51	Reverse over travel signal (ROT) was detected.	Suddenly stopped	Move the motor in the forward direction and
			release Reverse over travel (ROT).
70	Error in stored adjustment data Stored adjustment data during shipment was damaged.	Motor free	Contact us.
71	Error in stored parameter Stored parameter data was damaged.	Same as above	After parameter initialization (self-diagnosis H000), reset all parameters and restart the power supply.
E0	Absolute encoder battery error External battery voltage for absolute encoder data backup dropped. **It is detected when absolute encoder is set in the parameter P001.	Same as above	Replace the external battery and then input RST signal or restart the power supply. (It can be cancelled forcibly by inputting RST signal 5 times.)
E1	Error in stored absolute encoder Multi-rotation data stored by absolute encoder was lost. It is detected when the absolute encoder is set in parameter P001.	Same as above	Restart the power supply after initializing the absolute encoder multi-rotation data setting (self-diagnosis H000).
E2	Absolute encoder overflow Rotating amount of absolute encoder reached ±8191 rotations or more. **It is detected when the absolute encoder is set in parameter P001.	Same as above	Same as above
E3	Absolute encoder count error Absolute encoder count error occurred. ※It is detected when the absolute encoder is set in parameter P001.	Same as above	Same as above
HALt	DSP error DSP (IC for controlling the device) or DSP peripheral device is not operating correctly. Or power was restarted within 1 minute after switching it off. When this error occurred, the device control is stopped and this alarm is not recorded in the alarm history.	Same as above	Restart the power supply.

[Tab. 9-1 b] Protective Function List 2/2

9-2-2 Inspection Method and Corrective Measures When Alarm Occurs

When any error occurs, confirm the error contents by alarm display LED and conduct proper measures. Be sure to remove an error cause before releasing alarm. If an error repeatedly occurs, a device may be damaged.

Error contents	Cause	Corrective measures
[RAM fault]	Malfunction due to noise	Remove the noise source.
Error in RAM (memory).		Take noise prevention
	Davias fallum	measures.
IIDM foult1	Device failure	Repair or replace the device.
[IPM fault]	 Ground fault of a motor Ground fault or short-circuit of 	Replace the motor.Correct the wiring.
Due to ground fault of a motor,	cables (U,V,W) between a	Correct the wiring.
ground fault, short-circuit, or	device and a motor	
wrong wiring of U,V,W cables	Unstable motor motion and	Adjust stability. (Gain
between a device and a motor, over current flowed in the main	vibration	adjustment, play of a machine system improvement, etc.)
circuit power elements.	Wrong parameter setting	Confirm motor selection in the parameter [P000].
	Malfunction due to noise	Remove the noise source.
		Take noise prevention
		measures.
	Device failure	Repair or replace the device.
[Under voltage error]	 Power supply voltage is low (also includes insufficient 	 Supply correct power or reconsider the power supply
Power supply voltage or control power voltage dropped.	capacity)	system, capacity, and cable diameter.
	Blackout occurred.	
	Power cables are thin.	
	 Power terminal screws are loose. 	
	Malfunction due to noise	Remove the noise source.
		Take noise prevention
	D : ()	measures.
[Over veltage error]	Device failure	Repair or replace the device.
[Over voltage error] Due to excessive load inertia, etc.,	Power supply voltage is high.	Supply correct power.
regenerative energy at motor stop	 Excessive regenerative energy due to too large load inertia 	Lower the load inertia, decrease applicable speed,
or deceleration is beyond the	due to too large load inertia	or increase deceleration time.
treatment capacity and DC power		Connect regenerative resistor
voltage of main circuits exceeded		or select it again.
the specific voltage.	 Malfunction due to noise 	• Remove the noise source.
		Take noise prevention
	Device failure	measures.
	- Device idilule	Repair or replace the device.

[Tab. 9-2a] Inspection Method and Corrective Measures When Alarm Occurs 1/4

Error contents	Cause	Corrective measures
[Over speed error]	• Incorrect wiring(U,V,W) between	
Motor speed exceeded	the device and a motor	Correct tile wiring.
160% of rated speed.	Incorrect wiring of encoder	
100 / 01 fated speed.	feedback signal lines	
	Encoder failure	Replace the motor (encoder).
	Due to excessive load inertia or	Lower the load inertia or increase
	gain setting error, over-shoot is	acceleration time.
	large.	Adjust stability. (Gain adjustment and
	3	improvement of play in a machine
		system, looseness of connecting
		section, weak machine rigidity, etc.)
	 Encoder feedback signal is 	Remove the noise source.
	influenced by noise.	Take noise prevention measures.
	 Wrong parameter setting 	Confirm motor selection in the
		parameter [P000].
[Overload error]	Excessive load	Decrease load.
 Due to overload or excess 	 Too frequent start/stop of a 	Decrease the frequency of start/stop
of allowable repetition	motor	of a motor.
frequency, an internal electronic thermal is	• Incorrect wiring (U, V, W)	Correct the wiring.
activated.	between the device and a motor	
dolivated.	Incorrect wiring of encoder foodback signal lines	
Refer to P009 [Electronic	feedback signal lines	Remove the noise source.
thermal detection selection]	 Encoder feedback signal is influenced by noise. 	
parameter for internal	Encoder failure	 Take noise prevention measures. Replace the motor (encoder).
electronic thermal.		Release the brake.
	 Mechanical locking by a brake, etc. 	
	etc.	If there is a fault in the machine, fix it.
	Unstable motor motion and	Adjust stability. (Gain adjustment
	vibration	and improvement of play in a
	1101011	machine system, looseness of
		connecting section, weak machine
		rigidity, etc.)
	 High ambient temperature or 	Lower ambient temperature.
	bad ventilation	Improve the cooling method.
	 Wrong parameter setting 	Confirm motor selection in the
[AC nower outside arrest	Davis a supultivis Harris In In 17.	parameter [P000].
[AC power supply error]	Power supply voltage is low (also includes insufficient conseits)	Supply correct power or reconsider the power supply system, conseits
AC power supply voltage	includes insufficient capacity).	the power supply system, capacity, and cable diameter.
stopped for 50 ms or	Blackout occurred.	and cable diameter.
more.	Power cables are thin.	
	• Power terminal screws are loose.	
	After switching the power supply	When the residual voltage is lost,
	OFF, it is restarted before the	restart the power supply.
	residual voltage of the device is lost.	Wait for about 1 minute and then
	Malfunction due to noise	restart the power supply. • Remove the noise source.
	Manufiction due to 110156	Take noise prevention measures.
	Device failure	Repair or replace the device.
	ection Method and Corrective Measu	

[Tab. 9-2b] Inspection Method and Corrective Measures When Alarm Occurs 2/4

Error contents	Cause	Corrective measures
Over regeneration current	 Regenerative resistor value is 	Replace the regenerative resistor
error]	small.	with the adequate one.
Current more than the specific		
value flowed through the	Faulty wiring of regenerative	Correct the wiring.
transistor of the regenerative	resistor (B1, B2)	
circuit.	Malfunction due to noise	Remove the noise source.
		 Take noise prevention measures.
	Device failure	Repair or replace the device.
[Encoder fault]	Break, disconnection or	Correct the wiring.
Encoder fault, break or	incorrect wiring of encoder	-
disconnection of an encoder	cables	
cable or loose fitting of a	Connector insertion failure	Insert the connector tightly.
connector occurred.	Wrong setting of parameter	Confirm encoder type and set
	P001 Encoder type selection	parameter P001.
	Malfunction due to noise	Remove the noise source.
		Take noise prevention measures.
	Encoder failure	Replace the motor (encoder).
	Device failure	Repair or replace the device.
[Deviation overflow]	Excessive load	Decrease the load.
Position deviation on the	Due to excessive load inertia	Lower the load inertia or increase
encoder pulse exceeded set	or gain setting error,	acceleration/deceleration time.
value of P204: Overflow	over-shoot is large.	 Adjust stability. (Gain adjustment and
detection pulse].		improvement of play in a machine
		system, looseness of connecting
		section, weak machine rigidity, etc.)
	Incorrect wiring (U, V, W)	Correct the wiring.
	between the device and a	
	motor	
	Incorrect wiring of encoder	
	feedback signal lines	
	Encoder failure	Replace the motor (encoder).
	When deviation clear invalid	When SON signal is set to OFF by
	was set with the parameter	setting the parameter mentioned on
	P710 [deviation clear	left, the motor is locked
	selection when SON signal is	mechanically.
	OFF] and the SON signal	
	was turned OFF, the motor	
	was rotated by external	
	force.	
	Motor does not follow the	Extend the torque limit.
	commands since the output	
	torque is reduced in the	
	torque limit.	
	Mechanical locking by a	Release the brake.
	brake, etc.	• If there is a fault in the machine, fix it.
	Wrong parameter setting	Confirm motor selection in the
	Dulas train security (parameter [P000].
	• Pulse train commands of more	<u>.</u>
	than rated speed were given.	frequency.
		Confirm parameter P601 and P602.

[Tab. 9-2c] Inspection Method and Corrective Measures When Alarm Occurs 3/4

Error contents	Cause	Corrective measures
 [Pulse train command over speed error] Pulse train command of more than 80Mpps is input for encoder pulse. When P606 [Pulse train delay compensation time] is other than 0, it is detected at about 40Mpps. 	Pulse train commands of more than that in left column were given.	 Confirm pulse train command frequency. Confirm parameter P601 and P602.
[Error in stored parameter]	Power supply was switched	Set all parameters after
Stored parameter data was damaged.	OFF during parameter registration.	initializing the parameters (self-diagnosis H000).
	Malfunction due to noise	Remove the noise source. Take noise prevention measures.
	Device failure	Repair or replace the device.
[Error in stored adjustment data]Stored adjustment data was damaged.	Malfunction due to noise	 Remove the noise source. Take noise prevention measures.
	Device failure	Repair or replace the device.
 [Error in stored absolute encoder] Rotation data of stored absolute encoder was damaged. 	 Absolute encoder battery was removed. (Also includes removal of the encoder cable.) Battery is dead. 	 Fix the absolute encoder battery in such a way that it cannot be removed. Replace the battery immediately if absolute encoder battery error has occurred.
	Malfunction due to noise Device failure	 Remove the noise source. Take noise prevention measures. Repair or replace the device.
[DSP error]	Malfunction due to noise	Remove the noise source
Watch-dog timer is timed out due to DSP (IC for controlling the		Take noise prevention measures.
device) or DSP peripheral device error.	Device failure	Repair or replace the device.

[Tab. 9-2d] Inspection Method and Corrective Measures When Alarm Occurs 4/4

If reset is repeatedly conducted when IPM fault or overload error occurs, it may damage the device and may cause burnout of a motor. Thus, be sure to remove the error cause and resume run.

Chapter 10 Type, Specifications, and Outline

10-1 Device 10-1-1 Device Type

Type of the VPS series is as follows.

NCR - (1) (2) (3) - (4) (5) - (6)

Example NCR - DCA0 A2 A - 401 A

Number	Item	Indication	Description
		NCR	NIKKI AC servo controller series
		DCA0	NA80 motor exclusive-use VPS series
(1)	Product	DCB0	Reserved
· ·	classification	DCC0	IO specification VPS series
		DCD0	CC-Link specification VPS series
2	Input power	A1	100 VAC system
•	specification	A2	200 VAC system
3	Designing order	A,B, • • •	Starting from A
		Example)	$401 = 40 \times 10^{1} = 400W$
4	Output capacity	401	L Index portion of the exponentiation of 10
			Significant figures
		Α	NA80/800 series motor Serial encoder
		В	NA80/800 series motor 90-degree phase
			difference pulse encoder
		С	au linear motor High-resolution encoder
(5)	Motor type	D	au linear motor 90-degree phase difference
			pulse encoder
		E	τ DISC motor High-resolution encoder
		F	τ DISC motor 90-degree phase difference pulse
			encoder
<u>6</u>	Chaoial appoification	Nil	Standard specification
6	Special specification	S**	Special specification

10-1-2 General Specifications of the Device

	Item	Description
Outline Please refer to [10-1-5 Device Outline Diagram].		Please refer to [10-1-5 Device Outline Diagram].
ے ۔ا	Temperature	0 to 55℃
Ambient condition	Humidity Setting location	85% or less, non-condensing
idu ibi	Setting	Do not install the device in harmful atmosphere such as corrosive gas, grinding oil,
₹ 8	location	metal powder, oil, etc.
	100011011	Refer to [2-2 Installation Environment].
<u>⊬</u>	Voltage/	Single phase 100 to 115 VAC 50/60Hz (200 VAC system)
power		Single phase 200 to 230 VAC 50/60Hz (200 VAC system)
out pow	Allowable	Single phase 90 to 121 VAC (100 VAC system)
Input	voltage	Single phase 180 to 242 VAC (200 VAC system)
_	fluctuation	
Cool	ing method	Natural air cooling (800W or less), Forced air cooling (1.6kW or more)
Mou	nting method	Panel mounting type
		0.5G (10 to 50Hz) No resonance should occur.
resistance		
Shoo	k resistance	5G
		Line noise:2000V(50ns,1µs) 1 minute
Nois	e resistance	Radiation noise:1000V(50ns/10cm) 1 minute
Electro-static noise:10kV(between earth and case)		Electro-static noise:10kV(between earth and case)

[Tab. 10-1] General Specifications of the Device

10-1-3 Device Function Specifications

Item	Contents and specifications
No. of control axes	1 axis
Max. speed	Rated speed of motor to be used
Major functions	Speed control run, pulse train run, torque limit, self-diagnosis, forward/reverse operation change
Speed command	Analog command voltage gain change, 7 internal speed commands Acceleration/deceleration time: 0 to 9.99 sec.
External pulse train command	Directional pulse/Direction signal + transmitting pulse/90-degree phase difference pulse change Phase sequence change, electronic gear, command averaging function
Internal pulse train command	Jog, zero return (Standard, No LS, Dividing), 7 positioning commands Two acceleration/deceleration commands (0 to 9.999 sec.), S-shaped acceleration and deceleration (command averaging function used)
Torque limit	Two parameter settings (each for forward and reverse)
Servo performance improvement function	Speed gain change: 3 gains (normal, low-speed, GSEL change) Feed-forward (speed, inertia, viscous friction) Five notch filters, torque command filter
Control input signal	Control input signal types (to be assigned to the external input signal, or signals controllable by communication) DR (Start), SON (Servo On), TL (Torque limit), GSEL (Speed gain selection), RST (Reset), MD (Mode selection), CIH (Command pulse input prohibition), RVS (Reverse command direction) SS1-SS3 (Command selection 1-3), EMG (Emergency stop), ZST (Internal pulse start), FOT (Forward over travel), ROT (Reverse over travel), NRF (Command data reflection prohibition), ZLS (Zero LS), ZMK (Zero marker), APRQ (Current position data request), ALRQ (Alarm code request), ABRQ (ABS data request), FJ (Forward jog), RJ (Reverse jog) The control input signals enable immobilization of the signal status. When being assigned to the external input signal, signal logic change is possible.
Control output signal	Control output signal types (to be assigned to the external output signal, or signals controllable by communication) RDY (Servo ready), ALM (Alarm), PNA (Deviation range A), PNB (Deviation range B) BRK (Brake release), SZ (Speed zero), OCEM (Marker output), EMGO (Under emergency stop),HCP (Zero return completion) When being assigned to the external output signal, signal logic change is possible. (OCEM is excluded)
Absolute position management function	Absolute serial encoder position can be converted to the current position. Absolute serial encoder position or the current position can be output as the control signal. The current position can be output as the encoder pulse output.
Encoder pulse output	Frequency dividing function, Marker output position specifying function
Protective function	Encoder fault, over speed, over load (electronic thermal), under voltage, over voltage, IPM fault, deviation error, DSP fault Latest five alarm records can be displayed.

Item	Contents and specifications
Monitor function	Data display LED (7segment LED 4 digits) Select and display alarm, speed, torque, deviation rate, speed command input, I/O signal and parameter status, etc. Editor oscillo monitor (option) Speed command input, speed feedback, torque command, deviation rate
Communication function	USB 1.1: Connection with the editor RS-422A serial communication enables transmission and reception of various signals and data
Self-diagnosis	Auto tuning, test run, jog, zero return, I/O signal check, initialization
Option	Editor

[Tab.10-2] Device Function Specifications

10-1-4 Device Electrical Specifications

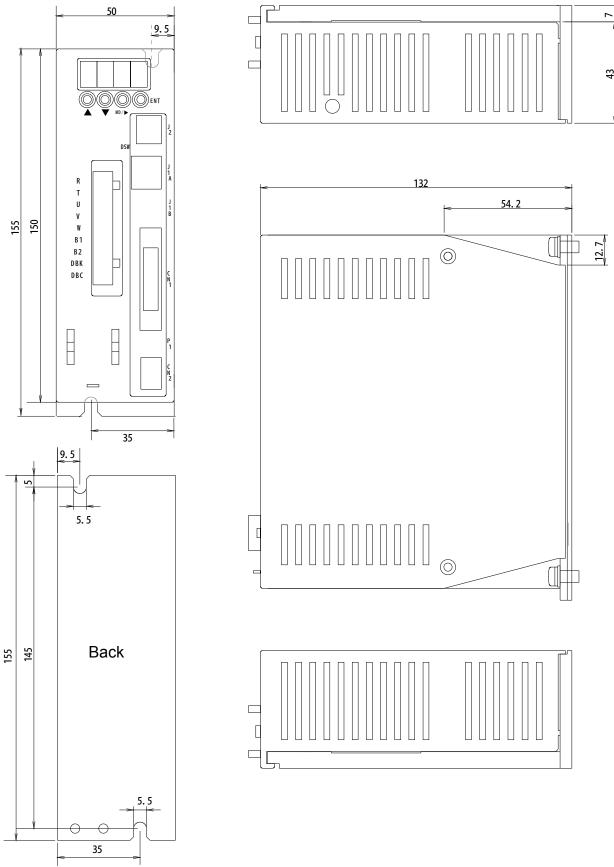
Item			Unit	Specification				
Туре				NCR-DCA0A1*-201A NCR-DCA0A2*-401A				
ı	System			Main circuit/control circuit integrated power system				
) WE	Voltage specification		V	Single-phase 100-115 VAC	Single-phase 200-230 VAC			
Input power	Allowable voltage fluctuation		V	Single-phase 90-121 VAC	Single-phase 180-242 VAC			
<u>L</u>	Frequency		Hz	50/60				
Mair	Main circuit system			Transistor full bridge (Sine wave PWM control)				
Continuous output current (rms)			Α	3.5	3.5			
Instantaneous output current (rms)			Α	8.75	8.75			
Con	trol m	ethod		Semi-closed loop by encoder feedback				
Brak	king m	ethod		Regenerative braking: Regenerative resistor externally installed				
Carr	rier fre	quency	Ηz	10 K				
Spe		Speed variation	%	Load variation (0 – 100%): ±0.1				
cont	trol			Voltage variation (±10%):±0.02				
run				Temperature variation (0∼	55℃) : ±0. 3			
	Speed control 1: 2000 *1 range		1:2000 *1					
I/O s	signal	l		8 input signals, 4 output signals (12-24 VDC photo-coupler insulation)				
	log inp	out		Speed command input 1 point (-10 to +10 VDC)				
				Either of directional pulse, direction signal + transmitting pulse,				
				90-degree phase difference pulse Maximum input frequency: 1Mpps (250kpps when open-collector is used)				
Puls	se trair	n input						
<u>L</u>				Line-driver or open-collector output acceptable				
		oulse output		90-degree phase difference pulse + Marker signal (line-driver output)				
	nmuni			USB 1.1 x 1 CH, RS-422A serial communication x 1 CH Absolute serial encoder, incremental serial encoder				
		e encoder			VA80-10**Z			
App	Applicable motor				NA80-10 Z NA80-20**M			
					NA80-40**M			
Applicable load GD2				Less than 30 times of G D ² Motor				
Power capacity			KVA					
(In case of rated output)				0.6	1.1			
Molded case circuit breaker			Α	5				
(Rated current) *2								
Weight			Κg	Approx 1.0				
Shape				Refer to the outline diagram.				
Option				Regenerative resistor, dynamic brake, various cables, battery for the absolute serial encoder				
			1	מטטטוענט טטוומו בווטטעבו				

[Tab.10-3] Device Electrical Specifications

- *1: The motor may not rotate smoothly at the speed of 1/2000 of the rated speed.

 The speed control range is based on term where the motor does not stop when the load is 100%.
- *2: Select the molded case circuit breaker whose breaking capacity is suitable to the power supply capacity to achieve protection coordination.

10-1-5 Device Outline Diagram [NCR-DCA0A1*-201A, NCR-DCA0A2*-401A]



[Fig. 10 -1] Device Outline Diagram (200W,400W)

10-2 Regenerative Resistor

10-2-1 Regenerative Resistor Combination

[200V system controller Attached regenerative resistor list]

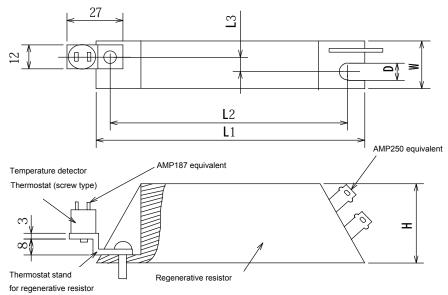
Controller type	Attached regenerative resistor type
NCR-DCA*2*-401	Not attached. It is provided as an option as follows when it is necessary.
Capacity : 0.4kw	RGH-60-F-V-80-J 60W, 80Ω -1 piece, Cement resistor

[100V system controller Attached regenerative resistor list]

Controller type	Attached regenerative resistor type		
NCR-DCA*1*-201	Not attached. It is provided as an option as follows when it is necessary.		
Capacity : 0.2kw	RGH-60-F-V-80-J 60W, 80Ω -1 piece, Cement resistor		

10-2-2 Regenerative Resistor Outline

Outline and dimensions of regenerative resistor and installation position of the thermostat are shown below.

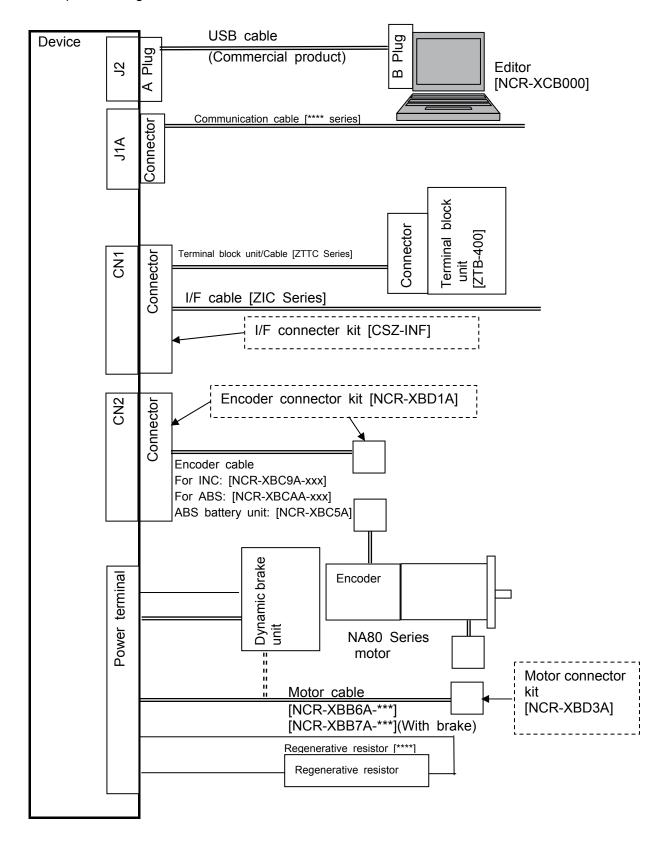


The thermostat is inserted and fixed with the installation screw of regenerative resistor

Туре	Rating	L1	L2	W	Н	L3	D	Outline
RGH60	60W	115	100	20	40	5	4.3	Outline 1
CAN200	200W	215	200	26	50	8	5.3	Outline 2
CAN400	400W	265	250	33	61	13	5.3	Outline 3

[Fig. 10 -2] Regenerative Resistor Outline

10-3-1 Option Configuration



* For details of the options, refer to "Options volume" instruction manual.