

Instruction Manual
AC Servo driver
VPH Series
HA Type
 τ DISC

Preface

Thank you for adopting the AC servo driver <VPH HA series>. Before use, please read this manual carefully to fully exploit the performance of this device.

Definition of terms

In this instruction manual, the terms listed below are used unless otherwise specified.

Term	Description
this manual	VPH HA Series Instruction Manual
device, this device	Nikki AC servo driver (VPH HA series)
motor	Nikki τ DISC motor
VPH DES	VPH Data Editing Software (editing software dedicated to VPH)
P***	Parameter number ("****" is a 3-digit number.)

Precautions in safety





Before installation, wiring, operation, maintenance and inspection, and abnormality diagnosis and countermeasures, carefully read this manual and all other related operating instruction manuals for proper usage.

Before use, be sure to fully acquaint with the equipment, safety information, and other related precautions.










The following labels are used to indicate safety precautions in this manual.

Cautions are ranked as "Danger" and "Caution".




And contents to follow are ranked as "Prohibition" and "Compulsion".

 Danger	If mishandling is made, dangerous situation as death or serious injury on a worker could occur.
 Caution	If mishandling is made, dangerous situation as medium or light injury could occur and damages on goods could be suspected. However, since Caution-marked item could also cause serious results depending on the actual conditions, please comply with the important instructions.
 Prohibition	Prohibitions (actions not to be done) are indicated.
 Compulsion	Compulsions (actions to be done) are indicated.




Precautions in handling

 Danger		
 Prohibition	<ul style="list-style-type: none"> Never touch inside of this device and terminal blocks. Do not give damages, apply excessive force, and put any heavy articles on cables, and do not pinch any cable. 	Electric shock may occur.
 Prohibition	<ul style="list-style-type: none"> Never touch rotating blocks of a running motor. 	Injury may occur.
 Compulsion	<ul style="list-style-type: none"> Be sure to ground the earth terminal or earth cable of this device or the motor. Use the earth cable specified in this manual or a thicker cable than that, for the class-D grounding or better. Execute relocation, wiring, maintenance, and inspection, after five minutes or more of the power-off. Start job after "CHARGE" LED is turned off. Never fail to shut off the control power, adding to the main power. 	Electric shock may occur.
 Caution		
 Prohibition	<ul style="list-style-type: none"> Never use this device in the atmosphere such as water splash, corrosive or flammable gas, nor place it close to combustible materials. 	Fire or failure may occur.
 Prohibition	<ul style="list-style-type: none"> Since temperature of the motor, this device, and peripheral equipment raise high, do not touch them. In supplying power or for a while after shutting power off, since a radiator, motor, regenerative resistor, and other components could be very hot, do not touch them. 	Burn may occur.
 Compulsion	<ul style="list-style-type: none"> Use the motor and this device in the specified combination. 	Fire or failure may occur.
 Compulsion	<ul style="list-style-type: none"> Never conduct voltage withstanding test and Mega test of this device. 	Failure may occur.







Storage

 Caution		
 Prohibition	<ul style="list-style-type: none"> Do not store this device in a place of raining, water dripping, and harmful gas and liquid. 	Failure may occur.
 Compulsion	<ul style="list-style-type: none"> Store this device under controlled temperature and humidity within the range specified in this manual in a place avoiding direct sunlight. Be sure to contact our sales representative when the storage period after purchase has passed more than three years. 	Failure may occur.






Transportation

 Caution		
 Prohibition	<ul style="list-style-type: none"> Do not hold a shaft when handling the cable and motor in transportation. 	Injury or failure may occur.
 Compulsion	<ul style="list-style-type: none"> Piling up or overloading the products can induce collapse of cargo; thus, follow instructions. 	Injury or failure may occur.








Installation




 Caution		
 Prohibition	<ul style="list-style-type: none"> Do not climb or put any heavy thing on this device. 	Injury or failure may occur.
 Prohibition	<ul style="list-style-type: none"> Do not apply heavy shock. 	Equipment may be damaged.
 Compulsion	<ul style="list-style-type: none"> Never block air-intake/exhaust windows and do not allow foreign substance to go in. Be sure to install this device to the specified directions. Attach this device to a non-flammable thing as metal. 	Fire may occur.
 Compulsion	<ul style="list-style-type: none"> Distance of alignments between this device and the internal walls of control panel and other equipment should follow the measurements specified by this manual. 	Fire and failure may occur.
 Compulsion	<ul style="list-style-type: none"> Conduct proper attachment suitable for the output or weight of this unit. 	Equipment may be damaged.

Wiring




 Danger		
 Compulsion	<ul style="list-style-type: none"> To avoid electric shock and noise influence, be sure to make proper grounding (earth). 	Motor runaway, electric shock, injury, or machine damage may occur.
 Caution		
 Compulsion	<ul style="list-style-type: none"> Be sure to conduct correct wiring. 	Motor runaway or burnout, injury, or fire may occur.
 Compulsion	<ul style="list-style-type: none"> To avoid the impact of noise on this device, use cables having the adequate length and features (shielded, twisted, and other treatments) specified by this manual. For the control input/output (I/O) signal line of this device, prepare another line system separate from other power lines and motor power lines. 	Motor runaway, injury, or machine damage may occur.

Operation and run

 Caution		
 Prohibition	<ul style="list-style-type: none"> Since excessive adjustment can make the operation unstable, avoid this situation. Brake of the brake-incorporated motor is to keep the machine position. Thus, do not use it for braking or to secure the machine safeness. 	Injury or machine damage may occur.
 Prohibition	<ul style="list-style-type: none"> Do not turn on the power in the condition where the motor shaft is in rotation or in vibration. 	Motor runaway, injury, or machine damage may occur.
 Prohibition	<ul style="list-style-type: none"> While the main power supply is ON, make sure the control power supply to be ON as well, and avoid energizing the main power supply only. 	Motor runaway, injury, or machine damage may occur. Failure may occur.
 Compulsion	<ul style="list-style-type: none"> Protect the motor by such as an emergency stop circuit having the built-in thermostat. If a motor does not have a thermostat, add protective functions separately. 	Injury or fire may occur.
 Compulsion	<ul style="list-style-type: none"> Check the power specifications are normal. 	Injury, fire, or machine damage may occur.
 Compulsion	<ul style="list-style-type: none"> Install an emergency stop circuit externally, to stop operation instantly and shut off the power. For trial run, fix the motor, check this device and motor only for operation, and then attach them to the machine. When alarm happened, be sure to remove the cause after reset, and then restart. 	Injury or machine damage may occur.

 Caution		
 Compulsion	<ul style="list-style-type: none"> After sudden blackout and restoration of power, keep away from the machine as it may restart suddenly. Design the machine to secure safeness of man even if it restarts. 	Injury may occur.
 Compulsion	<ul style="list-style-type: none"> Avoid turning ON/OFF repeatedly. It may cause the deterioration of main circuit element. 	Failure may occur.

Maintenance and inspection

 Caution		
 Prohibition	<ul style="list-style-type: none"> Overhaul/repair shall be conducted only by us or personnel designated by us. 	Failure may occur.
 Compulsion	<ul style="list-style-type: none"> Be sure to use the device in the range of stipulated environmental temperature and humidity. 	Unusual operation and failure may occur.
	<ul style="list-style-type: none"> The lifetime of the device closely relates to the surrounding temperature in use. Such use in hot and humid conditions can shorten the lifetime of the device; thus, pay attention. General understanding is that 10°C-increase in temperature shortens the lifetime of the equipment half. Capacitance of the main circuit electrolytic capacitor inside the device becomes low due to deterioration. To prevent secondary accidents caused by failures, it is recommended to replace it earlier than arranged. For the standard replacement period, refer to the section related to maintenance. Cooling effect of an equipped cooling fan motor of this device will deteriorate as the time goes by. To prevent secondary accidents caused by failures, it is recommended to replace it earlier than arranged. For the standard replacement period, refer to the section related to maintenance. 	Failure may occur.

Precautions before installation (during transportation)

During transportation, please handle with care so as not to damage the device.
Do not pile up devices and do not put any item on the cover.

Cautions in storage

If the products are not used soon 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.

Storage conditions of the device

Item		Description
Ambient conditions	Temperature	-20°C to +65°C
	Humidity	90% or less (non-condensing)
	Storage location	Store in a clean place free from dust and dirt. (Avoid a harmful atmosphere such as corrosive gas, grinding fluid, metal powder, and oil.)
Vibration		Store in a place free from vibration.
Others		If you store the product for a long period of time, conduct rust prevention treatments onto the screws at the terminal block and carry out periodic inspection.

Precautions in transportation

When it is necessary to transport the products after receive, satisfy following conditions.

Transporting conditions of the device		
Item		Description
Ambient conditions	Temperature	-20°C to +65°C
	Humidity	90% or less (non-condensing)
	Storage location	Do not transport the products in a harmful atmosphere such as corrosive gas, grinding fluid, metal powder, oil, etc.
Vibration		0.5G or less

 Caution
Humidity conditions remarkably affect the life of the device. Recommended storing or transporting condition is in humidity of 75% RH or less. If the humidity exceeds 75% RH, contact our sales representative.

About this manual

This manual explains installation, wiring, way of use, maintenance and inspection, abnormality diagnosis, and countermeasures about the device and motor.

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

At the time of installation, wiring, operation, maintenance and inspection, and in other works, follow the conditions and procedures described on this manual.

Note that contents in this manual are subject to change without prior notification in future.

When using a customized device, read this manual in parallel with the specification document for that customized device.

Here, the specification document prevails over this manual, if description and items are overlapped.

Warranty period

Warranty period of our products is one 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 us.
 - ② Nonstandard operation different from rules and regulations stipulated by this manual.
 - ③ Natural disasters.
 - ④ Connection with another maker's unit which is not approved by us.
- Warranty of this device is limited for repairing only. Any damage caused by the fault of delivered device, or lost opportunity on the customer's side, profit loss, secondary damage, and accident will not be covered.
 - Regardless of the warranty period, please inform our sales person whenever you find any failure or abnormality.



Caution

- Our products have been designed and manufactured for the aim of the general purpose applications in the general industry. The products are not intended to be used in any equipment and system that may involve human life. For this reason, we are free from any responsibility if the products are used in any other applications than we intended. (Examples: Applications in the equipment and system for the purpose of atomic, aerospace, medical, and passenger vehicles that may greatly involve the human-life and assets)
- When installing the product to the facility that may involve serious accidents and loss by excessive exterior noises or failure on the motor, install the back-up and fail-safe functions systematically.
- If used under the conditions where sulfur or sulfide gas is produced, splitting due to corrosion on the tip resistors or poor connection on the contacts can occur.

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Chapter 1 Outline

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This device copes with the motor control, and it carries out speed control, torque control, pulse train control, and simple positioning control. The device has the following features, and it can cope with several types of motors and encoders by itself according to the parameter setting.

Features of VPH HA series

- ① For each operation, different gain, filter, and acceleration/deceleration time settings can be made. Slow S-curve acceleration/deceleration can be applied in the jog mode and high-response acceleration/deceleration can be applied in the positioning mode without changing the type of acceleration/deceleration using an external signal or the like.
- ② Torque waveforms are controlled with quadric curve under 2-stage S-curve acceleration/deceleration control.
- ③ The positioning start time is within 1ms.
- ④ Digital control through driftless, solution of adjustment mismatch, enhancement of man-machine interface, and other features pursue the reliability and user friendly operation.
- ⑤ Adoption of IPM (IGBT) to the power switching block realizes the improvement of servo performance and noise reduction.
- ⑥ Speed command run, torque command run, pulse train command run, and built-in command run can be executed by selecting the relevant mode, which allows a wide range of applications.
- ⑦ Linear/S-curve acceleration/deceleration, feed-forward, torque command filter, at-stop and low-speed gain changeover, and real software servo enable control, fitting the machine rigidity.
- ⑧ Serial communication allows connection with such peripheral equipment as the touch panel and upper position controller.
- ⑨ VPH DES can be connected through USB communication to display servo waveforms with an oscilloscope and frequency response characteristics and edit parameters, programs, and indirect data.
- ⑩ By using the absolute encoder, Zero Return is not necessary.
- ⑪ The auto-tuning function makes servo adjustment easy.

1-2 System configuration

Figure 1-1 shows a peripheral system configuration of this device.

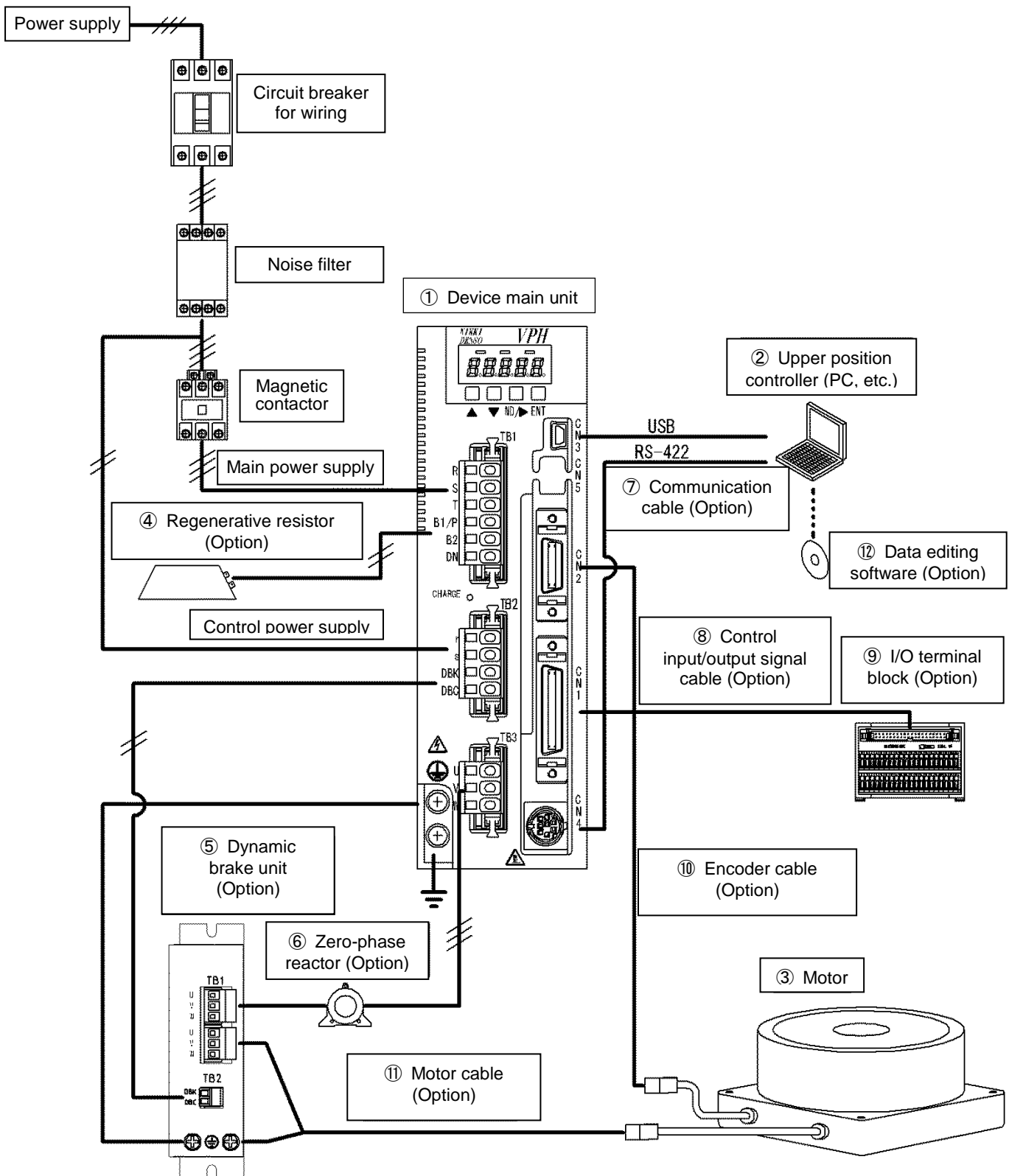


Figure 1-1 NCR-HA type system configuration

Names of parts

- ① Device main unit
This device controls the motor.
Using parameters, one device can cope with multiple kinds of motors and encoders.
- ② Upper position controller (PLC, personal computer, etc).
Control software developed by us or end user can perform below:
 - Data display of status data (number of rotations, deviations, etc).
 - Control of the device control signal.
 - Parameter setting and backup.Some machine models cannot be connected with a commercial PC; so, please consult us upon necessary.
- ③ Motor
As standard, our motor is connected.
- ④ Regenerative resistor (option)
The regenerative resistor is used to consume regenerative power generated by motor braking.
- ⑤ Dynamic brake unit (option)
The dynamic brake unit can brake the coasting motor.
- ⑥ Zero-phase reactor (option)
The zero-phase reactor is used to absorb noise produced by the main unit of the VPH series and reduce the impact of noise on the device itself and peripheral equipment.
- ⑦ Communication cable (option)
The communication cable is connected to the serial communication connector (CN4) on the main unit of the VPH series to input and output data between the upper position controller and VPH series via the RS-422 interface.
- ⑧ Control input/output signal cable (option)
The control input/output signal cable is connected to the control input/output connector (CN1) on the main unit of the VPH series to input and output signals.
- ⑨ I/O terminal block (option)
The I/O terminal block unit converts the control input/output connector (CN1) on the main unit of the VPH series to a terminal block.
- ⑩ Encoder cable (option)
The encoder cable is used to connect the encoder feedback pulse input connector (CN2) on the main unit of the VPH series to an encoder and magnetic pulse sensor.
- ⑪ Motor cable (option)
The motor cable is used to connect the motor power connector (TB3) on the main unit of the VPH series to the motor power cable.
- ⑫ Data editing software (option)
Data editing software allows you to perform VPH series operations including parameter editing, remote operation, checking of the operation status and signal status, and measurement of oscilloscope data from a PC.

* Set parameters and other items through USB communication with VPH DES.

You can also set them on the operation panel on the device front panel and through serial communication from a PC.

1-3 Mode configuration

1-3-1 Run mode

The following run modes are available by selecting each with the relevant external input signals. Select the self-diagnosis mode using VPH DES.

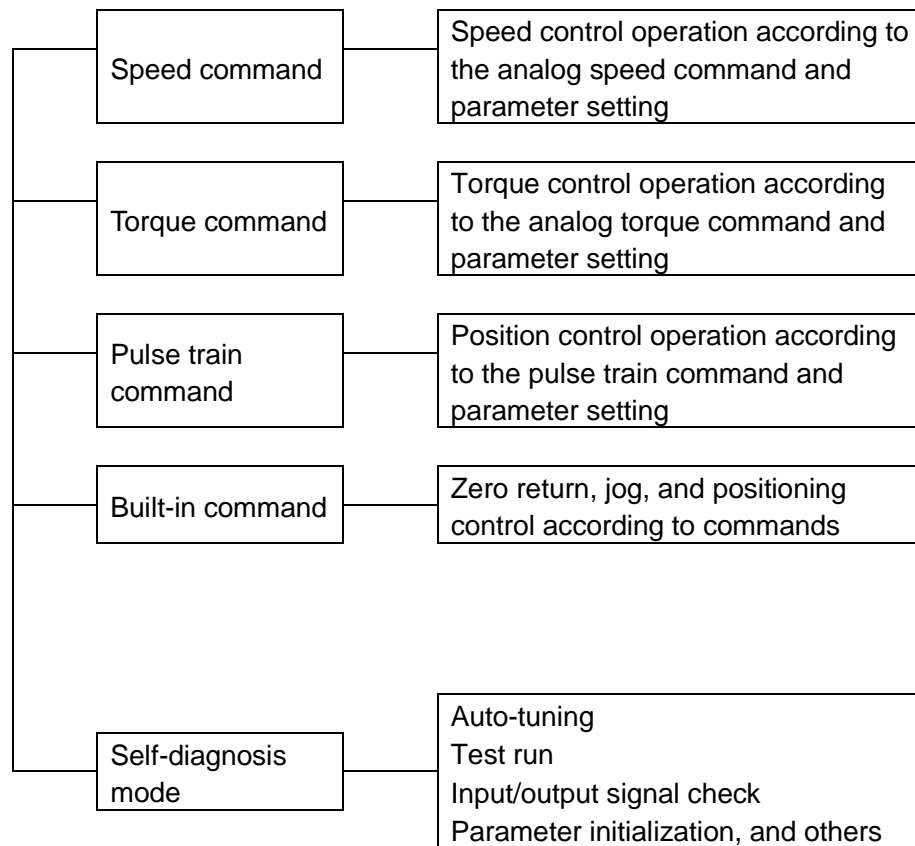


Figure 1-2 Mode configuration diagram

1-4 Procedure before run

To run this device, prepare according to the following procedure.

Product check at delivery

- 1) No damages during transportation? (Check packages for no breakages and product surface for no abnormalities)
- 2) Correct products? (Check the model and rated output, referring to "12-1-1 Model")
- 3) Accessories packaged? (Check the accessories, referring to "2-1 Incoming check")

* If any short shipment or damages are found, contact our sales representative immediately.

Installation

Correctly install the device, referring to "2-2 Installation environment" and "2-3 Installation method".

Wiring

- 1) Wiring of the power supply block of the device main unit
Connect the power supply of the device main unit, referring to "3-1 Power supply connection".
- 2) Connecting of the motor
Connect the motor and the device main unit, referring to "3-2 Motor connection".
- 3) Grounding
Be sure to ground to prevent electric shock and for noise measures, referring to "3-3 Grounding".
- 4) Connecting of the regenerative resistor
When the regenerative resistor is supplied, refer to "3-4 Regenerative resistor wiring".
- 5) Control circuit wiring
The control circuit to connect with the device main unit is connected. Refer to "3-5 Control circuit wiring".
- 6) Noise prevention measures
To prevent troubles due to noise, be sure to take noise prevention measures and treatments, referring to "3-6 Noise protection".

When carrying out each wiring, refer to "4-1 External wiring diagram".

As for electric wire to use in wiring, adopt the one described in "3-7 Applicable electric wire".

As for cables for the control circuit, use Nikki optional cables.

Inspection before run and start-up of the device

Inspection before run

Be sure to carry out every item described in "5-1 Before-run inspection".

Start-up of the device

After completion of the inspection, carry out test run and adjustment, referring to "5-3 Run procedure".

Run start

Chapter 2 Installation

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2-1 Incoming check

At the time of product delivery, check below points.

- ① Correct products as you ordered? (Model, rated output, etc.)
- ② No damages during transportation? (If no breakages in the package and no exterior abnormalities on products)
- ③ Found all accessories?

If found any short shipment or damages, please contact our sales representative immediately.

An accessory of this device differs depending on the model, as listed below.

Table 2-1 100V-device accessory list

Device model	Accessory	
	Model	Quantity
NCR-H*1051*-**-*** Capacity: 0.05kW	Plug connector for main circuit block A [06JFAT-SAYGF-I]	1
	Plug connector for main circuit block B [03JFAT-SAYGF-I]	1
	Plug connector for the control block [04JFAT-SAYGF-I]	1
	Open tool [J-FAT-OT]	1
NCR-H*1101*-**-*** Capacity: 0.1kW	Plug connector for main circuit block A [06JFAT-SAYGF-I]	1
	Plug connector for main circuit block B [03JFAT-SAYGF-I]	1
	Plug connector for the control block [04JFAT-SAYGF-I]	1
	Open tool [J-FAT-OT]	1
NCR-H*1201*-**-*** Capacity: 0.2kW	Plug connector for main circuit block A [06JFAT-SAYGF-I]	1
	Plug connector for main circuit block B [03JFAT-SAYGF-I]	1
	Plug connector for the control block [04JFAT-SAYGF-I]	1
	Open tool [J-FAT-OT]	1

Table 2-2 200V-device accessory list

Device model	Accessory	
	Model	Quantity
NCR-H*2101*-**-*** Capacity: 0.1kW	Plug connector for main circuit block A [06JFAT-SAYGF-I]	1
	Plug connector for main circuit block B [03JFAT-SAYGF-I]	1
	Plug connector for the control block [04JFAT-SAYGF-I]	1
	Open tool [J-FAT-OT]	1
NCR-H*2201*-**-*** Capacity: 0.2kW	Plug connector for main circuit block A [06JFAT-SAYGF-I]	1
	Plug connector for main circuit block B [03JFAT-SAYGF-I]	1
	Plug connector for the control block [04JFAT-SAYGF-I]	1
	Open tool [J-FAT-OT]	1
NCR-H*2401*-**-*** Capacity: 0.4kW	Plug connector for main circuit block A [06JFAT-SAYGF-I]	1
	Plug connector for main circuit block B [03JFAT-SAYGF-I]	1
	Plug connector for the control block [04JFAT-SAYGF-I]	1
	Open tool [J-FAT-OT]	1
NCR-H*2801*-**-*** Capacity: 0.8kW	Plug connector for main circuit block A [06JFAT-SAYGF-I]	1
	Plug connector for main circuit block B [03JFAT-SAYGF-I]	1
	Plug connector for the control block [04JFAT-SAYGF-I]	1
	Open tool [J-FAT-OT]	1



Caution

If found damages on the package such as a cardboard box, please contact our sales representative without opening the package.

2-2 Installation environment

- (1) As for the ambient conditions of the device, refer to "12-1-2 General specifications".
- (2) The device lifetime has a close relation with the temperature in use, and a use under the high temperature and high humidity environment may shorten the device lifetime. Generally it is said that an increase of 10°C in temperature can shorten the lifetime of equipment to half.
- (3) For the temperature inside the storage control panel, consider the surrounding temperature and the temperature increase due to a loss in this device and in the equipment inside the panel. Be sure to keep the surrounding temperature of the device within the permissible range. For the calorific value of this device due to loss, refer to "12-1-5 Device electrical specification".
- (4) As the device is equipped with a fan to cool the radiator, secure an opening not to block airflow. When storing plural devices, align them so that ventilation does not influence each other. (Refer to Figure 2-1.)
- (5) If there are nearby heating elements and vibrating sources, prepare an appropriate construction against the influence.
- (6) Do not install the product in a place of high temperature and high humidity or in places where excessive dust particles, metal powder, and cloud of steam exist, and in an environment where corrosive gas exists.
- (7) If there is a noise generation source, reinforce the grounding treatment to avoid mixture of induction noises. Depending on the using conditions, a noise filter may be required. Conduct the noise prevention measures, referring to "3-6 Noise protection".

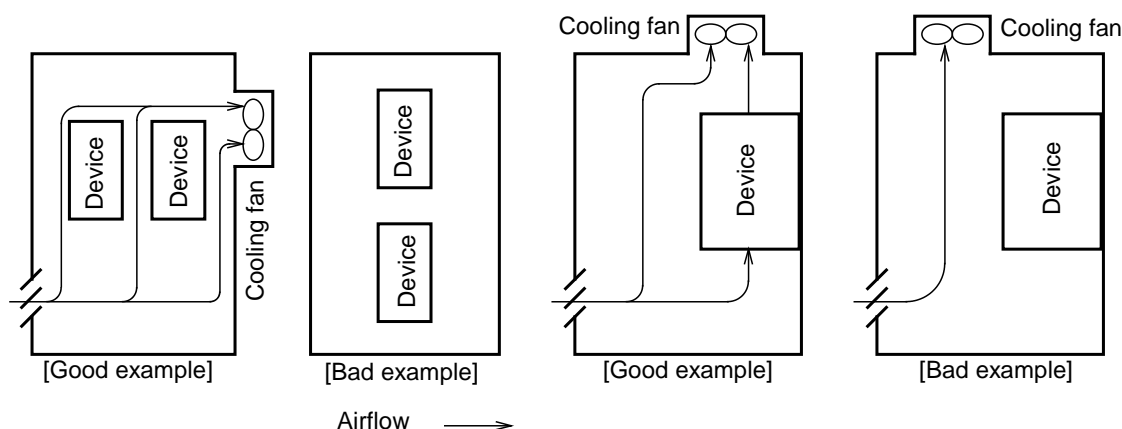



Figure 2-1 Alignment example when storing plural devices

 Caution
<p>Be sure to use this device within the range of permissible surrounding temperature and humidity. Negligence may result in errors and failures.</p>

2-3 Installation method

- (1) Be sure to install the device in the vertical direction to secure normal heat radiation effect.
- (2) Space around the device must be secured with the designated distance appointed by Figure 2-2 (distance from other components or parts and a side wall of the control panel) in view of heat radiation efficiency and maintenance easiness.

2-3-1 Installation method

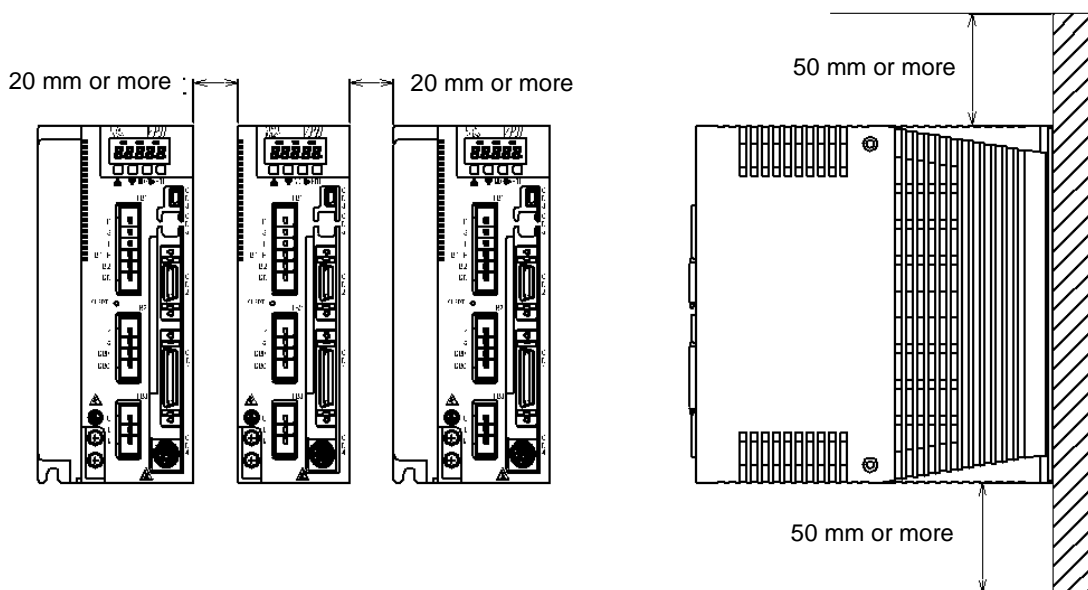
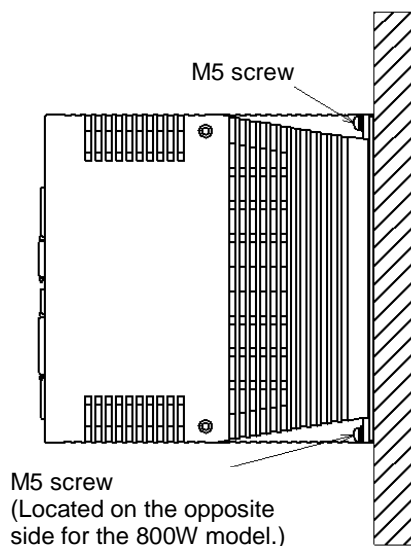


Figure 2-2 Installation and ventilation for a device



Chapter 3 Wiring

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3-1 Power supply connection

3-1-1 Power supply wiring

- (1) The power supply specifications are listed below.

NCR-H*1051*-*-*** to NCR-H*1201*-*-***

Main power supply 100 to 120VAC, 50/60Hz, single-phase power supply

Control power supply 100 to 120VAC, 50/60Hz, single-phase power supply

NCR-H*2101*-*-*** to NCR-H*2801*-*-***

Main power supply 200 to 230VAC, 50/60Hz, single-/3-phase power supply

Control power supply 200 to 230VAC, 50/60Hz, single-phase power supply

If there is a fluctuation in power supply due to the operating status of the factory, be sure not to exceed this limit.

- (2) For accident and fire prevention, install a circuit breaker for wiring or fuse that is absolutely suitable for the line breaking capacity. When using an earth leakage circuit breaker, select a model that employs high-frequency measures for inverters.
- (3) As the main circuit of this device is the capacitor input type, big inrush current flows at the time of power-on. Therefore, voltage drop can be induced depending on the power capacity and power supply impedance. Allow enough spare or ample room in choosing the power capacity and electric wire.
- (4) Be very careful not to connect the motor connecting terminal (U, V, W, E) of this device to the main power supply (R, S, T, E) erroneously.
- (5) When the power supply capacity exceeds 500KVA, connect a reactor to coordinate power supply. (For the reactor, contact our sales representative.)



Caution

Be very careful not to connect the motor connecting terminal (U, V, W, E) of this device to the main power supply (R, S, T, E) erroneously. Otherwise, the device may be damaged.

3-1-2 Power supply circuit

Representative power supply circuits are shown in Figure 3-1 and Figure 3-2.

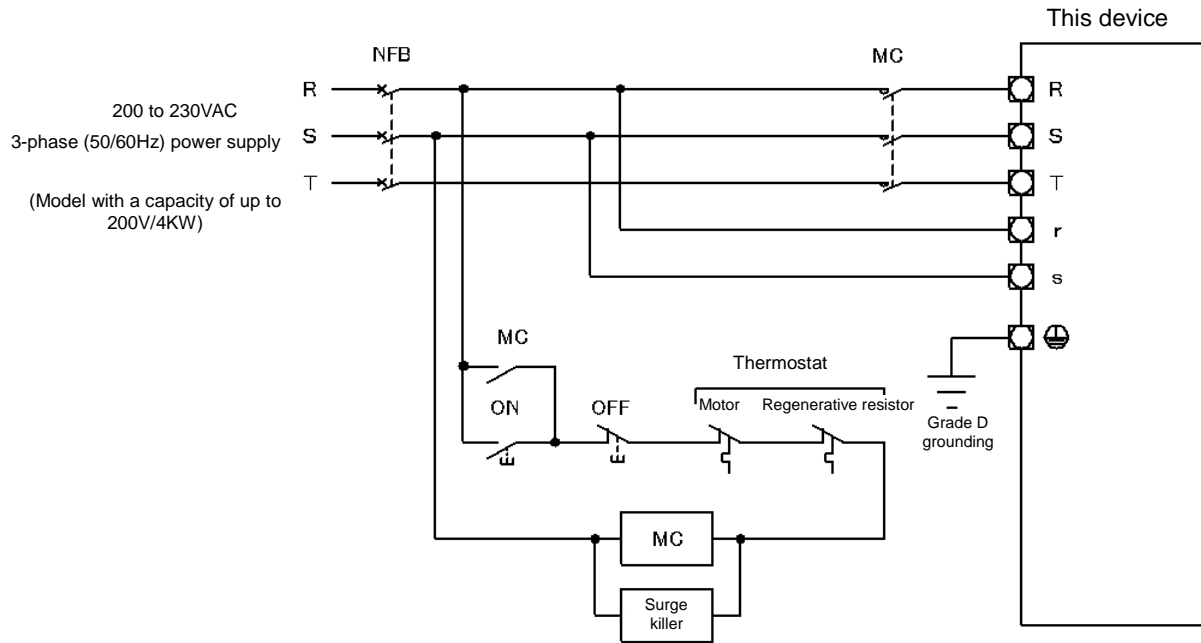


Figure 3-1 Typical power supply circuit for 3-phase power supply

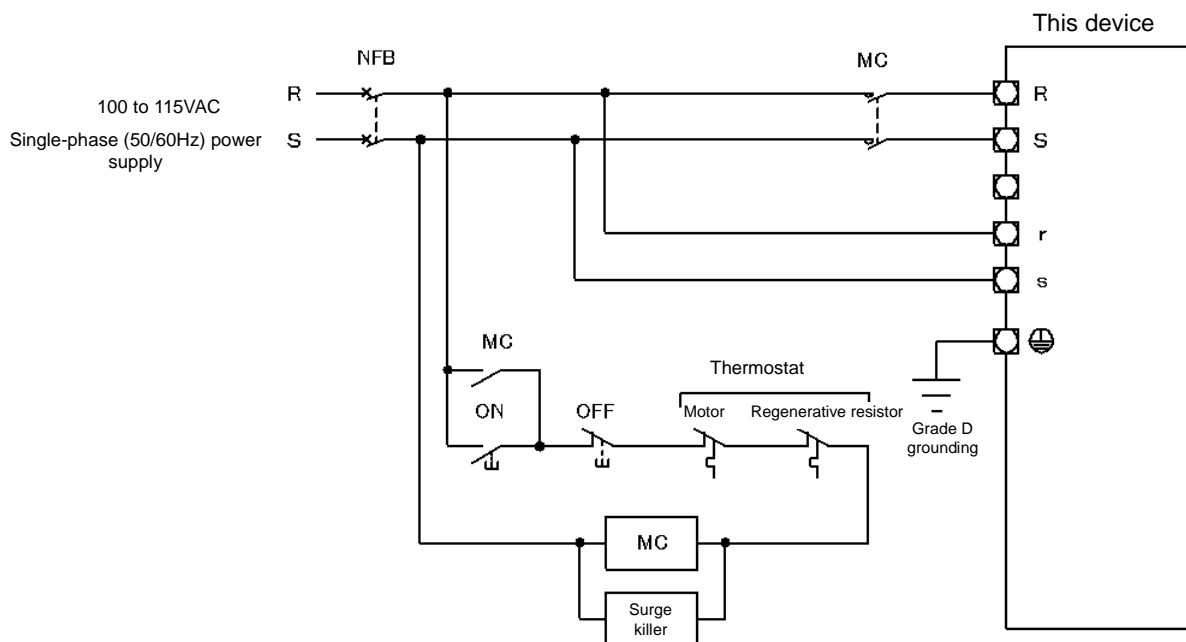


Figure 3-2 Typical power supply circuit for single-phase power supply

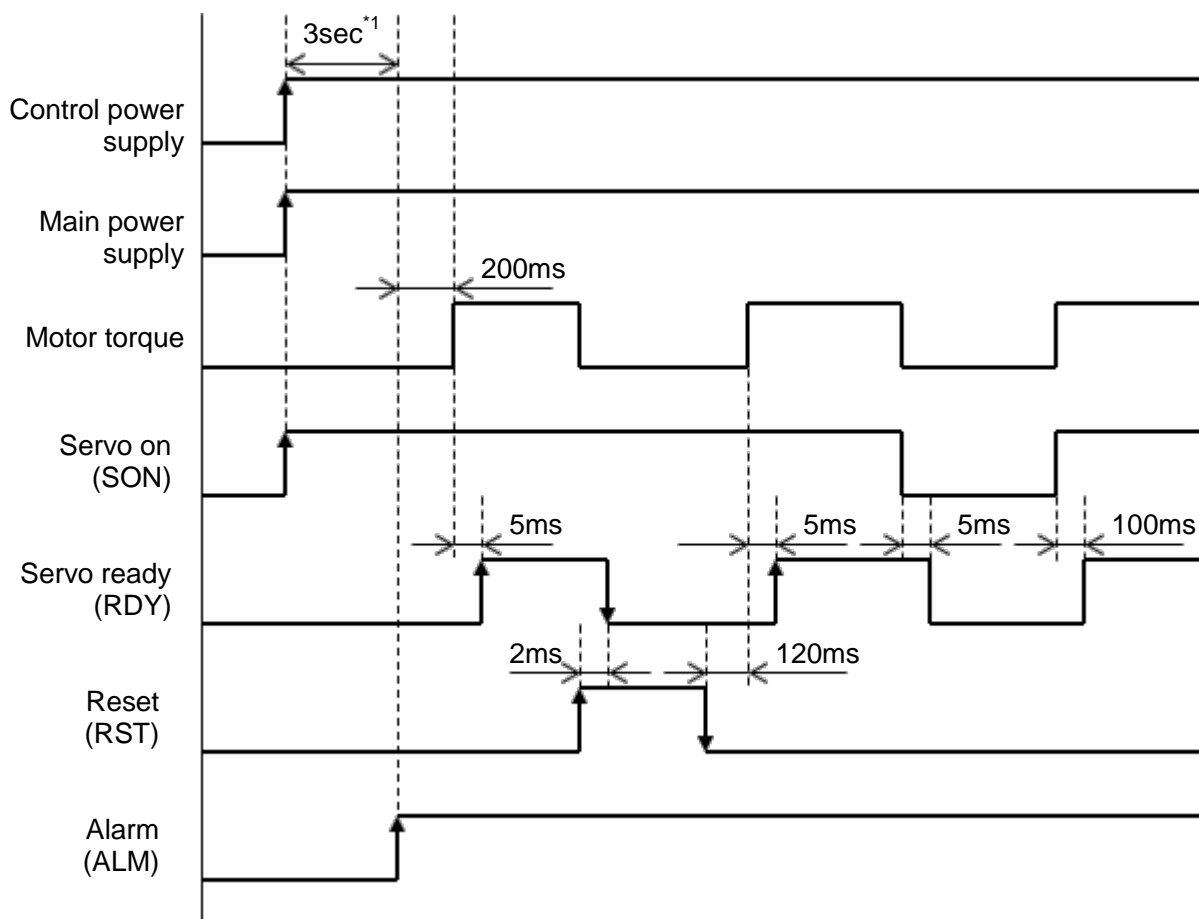


Caution

- Never use by turning on the main power supply only. Device can be broken.
- Be sure to strictly keep the range of specifications for the power supply. Device can be broken.
- Install the circuit breaker for wiring, for power supply line protection and for fire and accident prevention.
- As for the breaker capacity, refer to "12-1-5 Device electrical specification".
- When using the magnet contact, be sure to install the surge killer.
- Prepare special power supply for the device apart from the power supply for other high-power equipment when possible.

3-1-3 Power-on sequence

- (1) Avoid turning power ON/OFF repeatedly since the main circuit of the device is condenser input type, and it may cause the deterioration of main circuit element.
- (2) Turn on the control power supply before turning on the main power supply or at the same timing, and turn off the control power supply after turning off the main power supply or at the same timing.
- (3) When the SON signal is turned ON at the same time as the control power supply and main power supply, servo on is accepted after about 3 seconds and after another about 200 ms, motor torque is applied and the device becomes ready for operation.
- (4) Figure 3-3 shows a timing chart. For timing charts related to brake output signals, refer to [P658] to [P660] in "Chapter 6 Parameters".



*1 When automatic magnetic pole detection is performed during servo on, the time described above plus the time for automatic magnetic pole detection operation is required. For automatic magnetic pole detection operation, refer to "5-5 Automatic magnetic pole detection operation".

Figure 3-3 Timing chart

3-1-4 Selecting circuit breaker for wiring and earth leakage breaker

- For short circuit protection in case of device failure, select an appropriate breaker that has the rated breaking capacity suitable for the power capacity. For the breaker capacity per a device, refer to "12-1-5 Device electrical specification".
- When using the earth leakage circuit breaker, as the inverter block of the device is PWM control, its output contains harmonic components. Therefore, electrostatic capacitance against the ground in the electric line from the device to the motor and floating capacitance between the winding wire and the iron core in the motor generate leakage current. Thus, the earth leakage circuit breaker should be selected in the inverter applicable type. A zero-phase reactor can be connected to the motor power supply line to suppress leakage current.



Caution

- The device may not function properly when the power is turned on immediately after power-off.
- If the over current or overload protection has been activated, remove the cause of abnormality, leave it for about 30 minutes for cooling, then restart the device. Repeated reset operation in a short period of time increases the device temperature abnormally, which leads to the device breakages.
- Set up the sequence control to stop the command upon the alarm occurrence due to the activation of protective function. On the contrary, when the power supply is restored after the electricity failure (including a sudden stop), do not set up the external sequence control that immediately runs the motor by entering commands (such as speed command voltage or pulse train).

3-2 Motor connection

3-2-1 Motor wiring

- (1) Connect correctly without mistakes in the phase sequence of the motor connecting terminal (U, V, W, E) and this device connecting terminal (U, V, W, E). (Connect U-U, V-V, and W-W respectively). Connection in the wrong phase sequence interrupts the normal operation, and the motor can vibrate and the motor can also run regardless of the input command, which is very dangerous.
- (2) On the motor-device wiring, do not connect a magnet switch or a circuit breaker for wiring.
- (3) When using a motor with a brake, be sure to release the brake before operating the motor. If the motor is operated without releasing the brake, the motor may be burn out. Thus, pay attention to the timing, referring to "Figure 3-3 Timing chart".
- (4) Kits containing a motor power supply cable and connectors are available as Nikki options. In addition, shielded cables and zero-phase reactors are also available as noise prevention measures.

3-3 Grounding

- (1) Be sure to ground for electric shock prevention and noise prevention measures.
- (2) Use a wire for grounding which has a conductor cross-sectional area greater than or equal to that described in "3-7 Applicable electric wire".
- (3) Connect grounding wire to grounding terminal (E) of the device.
- (4) Use exclusive grounding. If common grounding is used, be sure to apply one-point grounding.
- (5) Be sure to connect the motor grounding wire to the grounding terminal (E) of the device.



Caution

- To decrease common mode noise and to prevent erroneous run of the device, grounding should be the exclusive grounding and better than D-class grounding (grounding resistance 100Ω or less).
- If exclusive grounding is impossible, secure one-point common grounding to commonly ground with other equipment at the grounding spot.
- Be sure to avoid common grounding with high-power equipment and grounding to steel frames.
- Carefully wire not to loop the grounding wire. Failure in this can increase leakage current of the device and activate the earth leakage circuit breaker.

3-4 Regenerative resistor wiring

- (1) Use the regenerative resistor supplied as an option, unless otherwise specified.
- (2) The regenerative resistor is used to consume excessive energy that the capacitor in the device cannot absorb, among regenerative energy generated by motor braking when load inertia (GD^2) is large.
- (3) Since heat is generated by regenerative energy, locate the regenerative resistor not to influence other equipment.
- (4) A thermostat is supplied with the regenerative resistor. The contact of the thermostat operates (is opened) when the regenerative resistor gets overheated. Carry out wiring so that the main power supply is shut down when the contact operates. In the contact specifications of the thermostat, the contact current is 15A at 100VAC or 10A at 200VAC. When mounting the thermostat, refer to Figure 3-4.
- (5) The cable length between the regenerative resistor and device shall be up to 3m or as short as possible. As the cable is longer, surge voltage generated by power element switching becomes higher, and the device could be damaged.

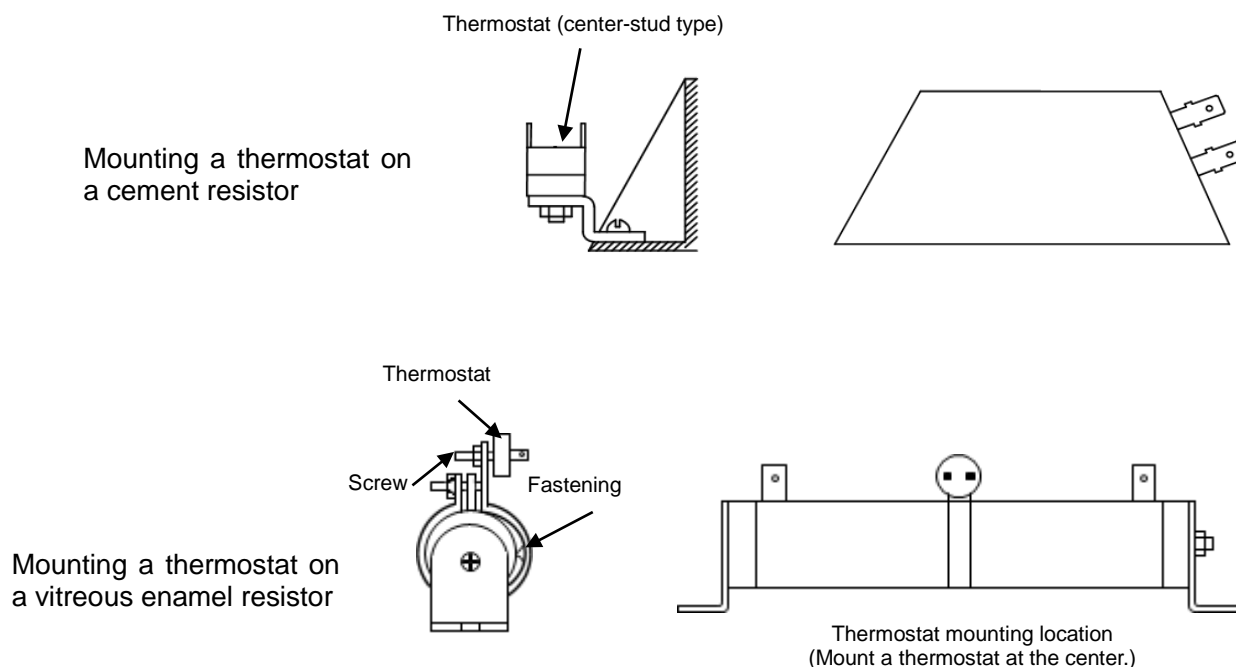


Figure 3-4 Thermostat mounting location



Caution

If abnormally high current flows in a regenerative resistor, the resistor becomes hot in a short time and quite dangerous. Be sure to construct a circuit to shut down the main power supply using the contact of the thermostat.

1. Analog command (speed, torque)
 - (1) Current of each analog signal is very small; thus, use shielded twisted pair cables and be sure to connect the shield to the metal connector (FG) of connector CN1.
 - (2) Keep the length of cable within 3 m.
2. Pulse train input/output
 - (1) Pulse train input and encoder pulse train output are of high-speed pulse train signal, thus, use shielded twisted pair cables and be sure to connect the shield to the metal connector (FG) of connector CN1.
 - (2) Keep the length of cable within 3 m.
3. Encoder feedback pulse signal
 - (1) Using shielded twisted pair cable, be sure to connect the shield to the metal connector (FG) of connector CN2.
 - (2) For the purpose of movement of motor itself, keep the bending radius of motor as big as possible so as not to give stress.
 - (3) The maximum cable length differs depending on the combination of motor. Exclusive encoder cable sets are available as options. Contact our sales representative for details.
4. Control input/output signals
 - (1) When using relays and switches for control input/output signals, use an element for micro current.
 - (2) To prevent erroneous run due to noises, be sure to install surge killers and diode to relays, magnet switches, solenoid brakes, and solenoids, that are used around the device and suppress noise generation.
 - (3) Prepare the power supply +V (+12V, 2.5mA to +24V, 5mA/1 item) for control input signals by yourself.
 - (4) Keep the length of cable within 3 m.

3-6 Noise protection

1. There are two intrusion routes for the incoming noise; one is [power supply line] and the other is [signal line]. Incoming noise can cause erroneous run, which induces troubles. To prevent troubles by noises, it is important to suppress noise generation and not to lead generated noises. Therefore, be sure to carry out following countermeasures and preventive treatments.
2. Setting surge absorptions and noise filters
 - (1) Be sure to attach surge killers (for AC power supply) and diodes (for DC power supply) to the relay, magnet switch, solenoid brake, and solenoid that are used around the device, and suppress noise generation.
 - (2) If the noise source such as electric welding machines and electric discharge machines exists close to the power supply line, and it makes the high noise environment, install noise filters or noise cut transformers on the main power supply and control power supply of the device to carry out noise prevention measures on the power supply line.
 - (3) When using noise filters, be sure to separate input wiring and output wiring of the filter and never bundle all wires together. Harness the grounding wire of filter separately from the filter output wire and be sure to carry out wiring (grounding) in the shortest distance.
 - (4) This device switching controls the motor at the high speed. For this reason, generated switching noise can affect other equipment. In this case, at the front of the AC reactor unit attached as an accessory, install noise filters or common mode choke coils to the main power supply of the device to prevent round-about noises to the power supply. Furthermore, carry out countermeasures against radiation noises by housing power supply lines and motor lines into an iron-made pipe.



Caution

- For control input/output signals wiring, use specified type of cable with the specified conductor cross-sectional area, and strictly follow precautions in wiring. No countermeasures may result in unexpected erroneous run due to noises and is very dangerous.
- Separate wiring of control input/output signals from power line (power supply line, motor line, etc.), and never put them into the same duct and avoid all-in-one wire bundling.

3-7 Applicable electric wire

Use electric wires shown in Table 3-1 to Table 3-3.

As for cables for control circuit, use optional items.

Table 3-1 Applicable electric wire

	Item	Terminal	Conditions
Control circuit	Analog voltage command input	INH, TQH, GND	<ul style="list-style-type: none"> Shielded twisted pair cable of AWG28 (0.08mm²) or more Length: 3 m or less
	Pulse train command	FC/FC*, RC/RC*	<ul style="list-style-type: none"> Shielded twisted pair cable of AWG28 (0.08mm²) or more Length: 3 m or less
	Encoder pulse output	EA/EA*, EB/EB*, EM/EM*, GND	<ul style="list-style-type: none"> Shielded twisted pair cable of AWG28 (0.08mm²) or more Length: 3 m or less (GND: AWG20 (0.5mm²) or more)
	Encoder feedback pulse input	A/A*, B/B*, Z/Z*, SD/SD* (EP5, GND)	<ul style="list-style-type: none"> Shielded twisted pair cable of AWG24 (0.2mm²) or more EP5, GND: AWG20 (0.5mm²) or more Length: 50 m or less^{*1}
	Magnetic pole sensor input	HA/HA*, HB/HB*, HC/HC*	<ul style="list-style-type: none"> Shielded twisted pair cable of AWG24 (0.2mm²) or more EP5, GND: AWG20 (0.5mm²) or more Length: 50 m or less
	Other control input/output		<ul style="list-style-type: none"> Shielded cable of AWG28 (0.08mm²) or more Length: 3 m or less

* Electric wire diameter on Table 3-1 is decided based on PVC shielded twisted pair cable under the following conditions.

PVC shielded twisted pair cable: Rated 300 V, 80°C, Surrounding maximum temperature: 40°C, Wiring conditions: air wiring, single string.



Caution

- Wire type and wire diameter can differ depending on use conditions and environment. For details, contact our sales representative.
- If control signal wire is long, it becomes easy to receive the influence of noises. Thus, wire within the stipulated length.
- As for cable type, be sure to use the stipulated type.

^{*1} Wire diameter of EP5 and GND of the encoder feedback pulse input differs depending on encoder and the length of cable to combine. Thus, for details, contact our sales representative.

Table 3-2 Applicable electric wire 100VAC specificationUnit: AWG(mm²)

	Item	Terminal	NCR- H*1051* *_***	NCR- H*1101* *_***	NCR- H*1201* *_***		
Main circuit	Main power supply, grounding	R, S, E	16 (1.25)	16 (1.25)	16 (1.25)		
	Control power supply	r, s	18 (0.75)	18 (0.75)	18 (0.75)		
	Motor power supply	U, V, W	16 (1.25)	16 (1.25)	16 (1.25)		
	Regenerative resistor	B1/P, B2	18 (0.75)	18 (0.75)	18 (0.75)		


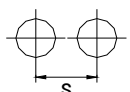
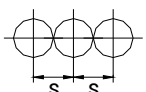
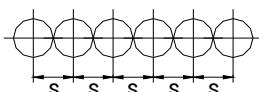
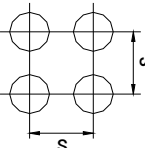
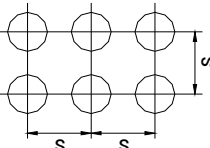
Table 3-3 Applicable electric wire 200VAC specificationUnit: AWG(mm²)

	Item	Terminal	NCR- H*2101* *_***	NCR- H*2201* *_***	NCR- H*2401* *_***	NCR- H*2801* *_***	
Main circuit	Main power supply, grounding	R, S, T, E	16 (1.25)	16 (1.25)	16 (1.25)	16 (1.25)	
	Control power supply	r, s	18 (0.75)	18 (0.75)	18 (0.75)	18 (0.75)	
	Motor power supply	U, V, W	16 (1.25)	16 (1.25)	16 (1.25)	16 (1.25)	
	Regenerative resistor	B1/P, B2	18 (0.75)	18 (0.75)	18 (0.75)	18 (0.75)	

- ① Electric wire diameter on Table 3-1 to Table 3-3 is decided based on vinyl insulation electric wire (KIV electric wire) for electric equipment under the following conditions.
 - KIV electric wire: Rated 600 V, 60°C, Operating temperature: 40°C, Wiring conditions: air, 3-string (interval s=d) wiring.
- ② Permissible current of electric wire differs depending on use conditions (operating temperature, wiring conditions, etc.), trunking, insulation, and maker. Thus, choose appropriate electric wire diameter depending on use environment and conditions.
- ③ In the case of calculating the permissible current by changing operating temperature and wiring conditions to be used, the permissible current reduction coefficient and permissible current compensatory coefficient should be calculated according to the objective temperature and conditions. Permissible current reduction coefficient (when cable permissible maximum temperature is 60°C) when operating temperature is 30°C or higher.

$$\text{Permissible current reduction coefficient} = \sqrt{\frac{(60-\theta)}{30}} \quad (\theta = \text{using temperature } \theta < 60)$$

Table 3-4 Permissible current compensatory coefficients when wiring plural cables in air

Coefficient	1	2	3	6	4	6
Center-Interval Alignment						
s=d	1.00	0.85	0.80	0.70	0.70	0.60
s=2d		0.95	0.95	0.90	0.90	0.90
s=3d		1.00	1.00	0.95	0.95	0.95

Chapter 4 Signal connection

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4-4-2	Control output signal	4-18
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4-1 External wiring diagram

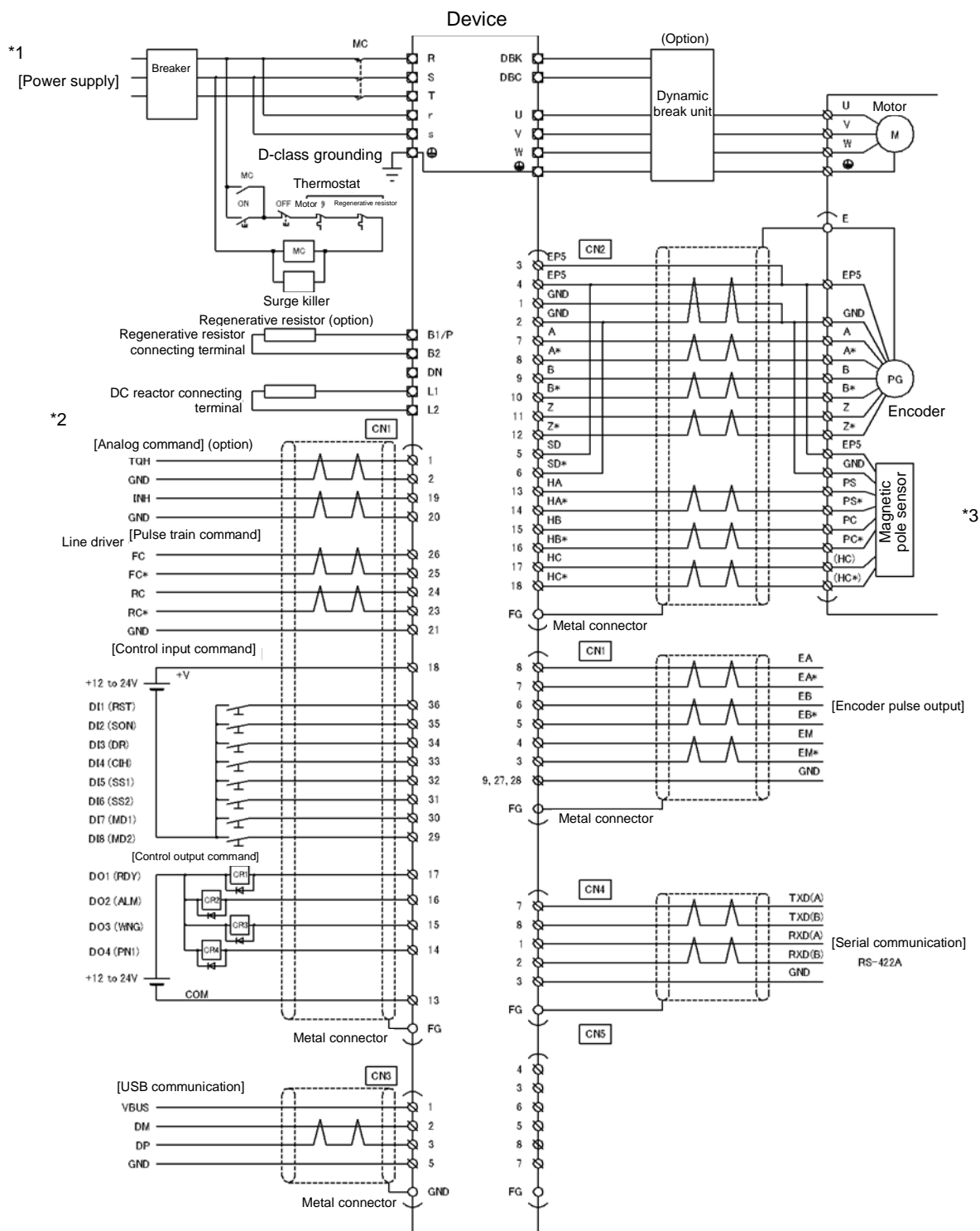


Figure 4-1 External wiring diagram

*1: For details of connecting the power supply, refer to "3-1-2 Power supply circuit".

*2: The DC reactor terminal is available to a model with an output capacity of at least 1.5kW.

*3: Wiring is required when using the magnetic pole sensor.

- Note 1: COM of CN1 connector is a common for control input/output signals. GND is a common for control power supply (+5V) in the device.
- Note 2: As COM of CN1 and GND are isolated, avoid common wiring and all-in-one wire bundling.
- Note 3: Status of switches connected to control input signal show OFF status of each input signal.
- Note 4: As for connection between motor and encoder, refer to each motor instruction manual.
- Note 5: A pin not mentioned in this connecting diagram is NC.
- Note 6: Value in () in control input/output signal name is parameter initial value.
- Note 7: When a serial encoder is used, make a connection as shown below.

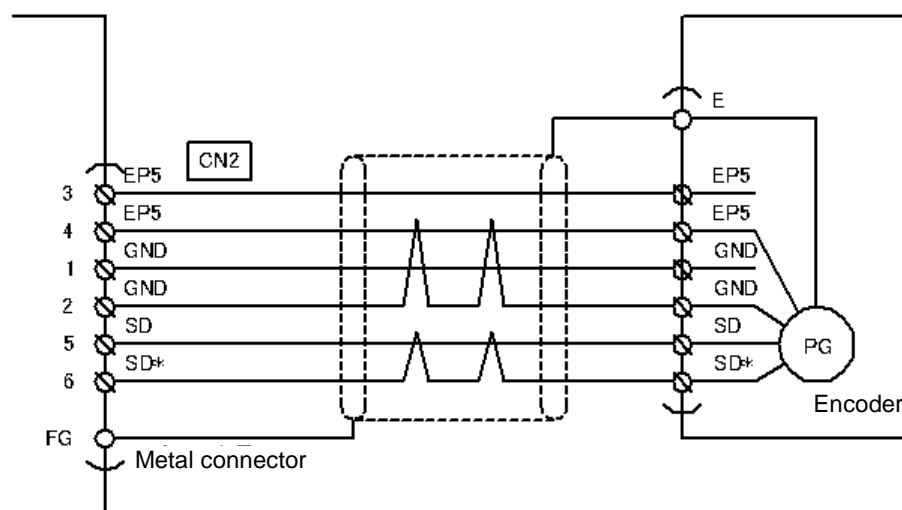


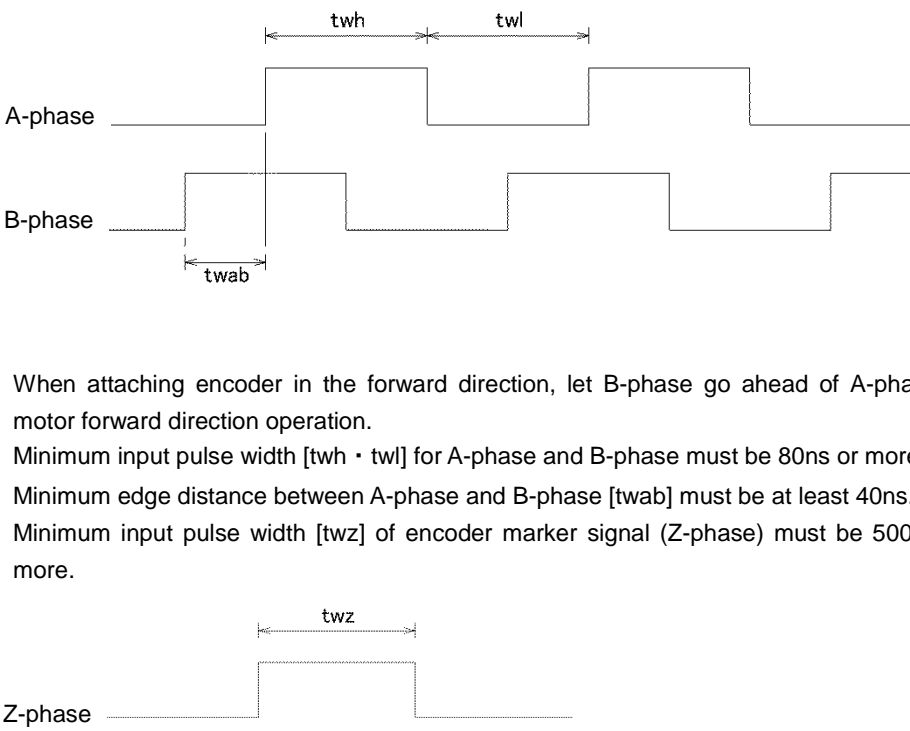
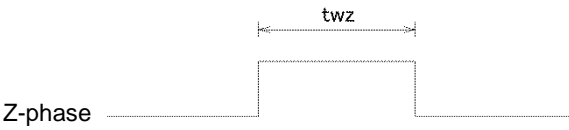
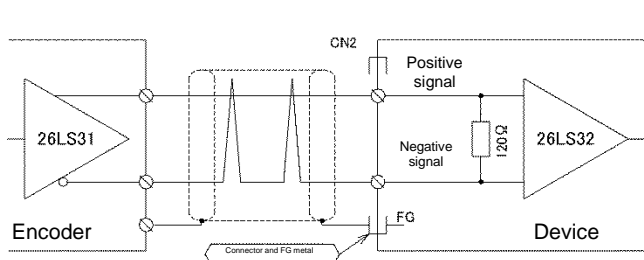
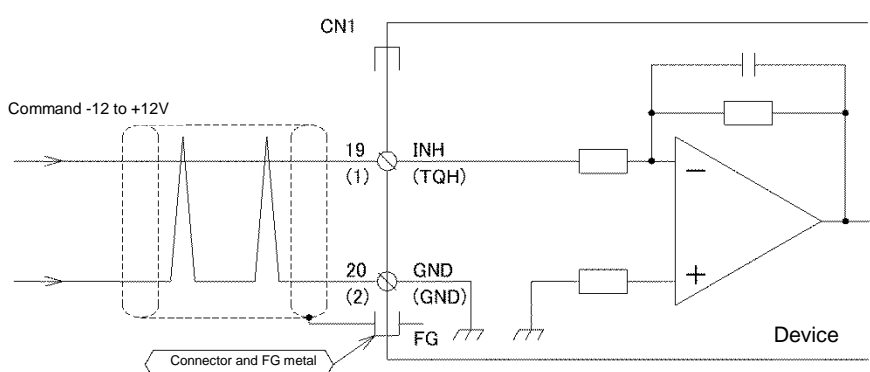
Figure 4-2 Serial encoder connecting diagram

4-2 Input/output interface

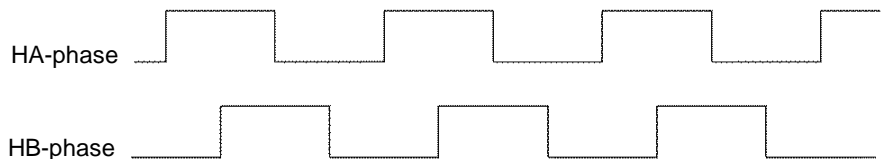
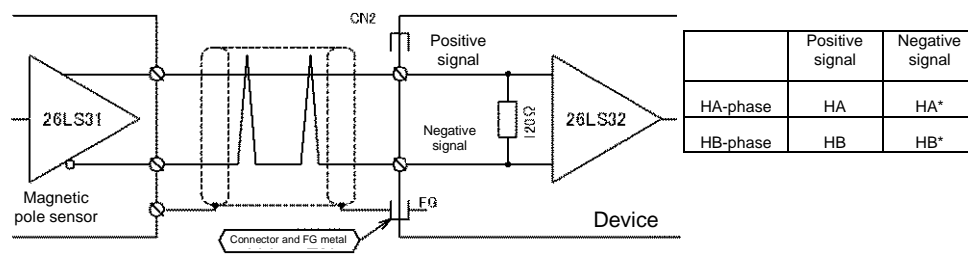
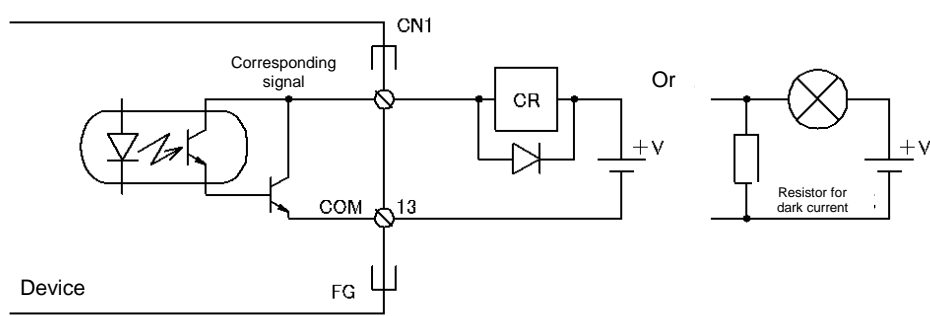
Type and equivalent circuit of input/output signals are shown in the table.

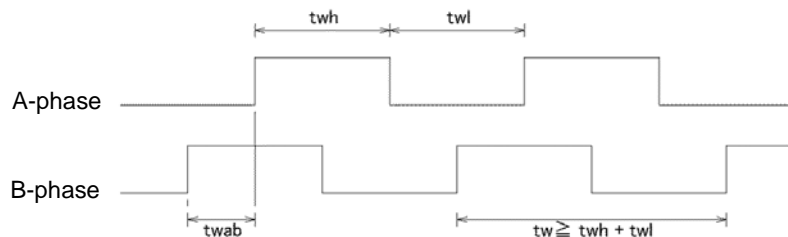
Type of each input/output signal is shown in "4-4-1 Control input and output signal list".

Circuit No.	Electrical specifications	Insulation method	Photo coupler insulation	<ul style="list-style-type: none">As a contact element, use micro current on/off relay or open collector output transistor.This signal becomes valid after input for at least 1ms.
I-1		Operating voltage range	10.2 to 26.4VDC	
Corresponding signal		Ripple ratio	Within 5%	
Control input signal DI1 - 8		Rated input current	About 2.5mA / 12VDC About 5.0mA / 24VDC	
Connector No.		Input resistance	About 4.7kΩ	
CN1		Input filter time constant	About 120μs	
Equivalent circuit				
Circuit No.	Electrical specifications	Input method	Line receiver	
I-2		Pulse train output form	Line driver	
Corresponding signal		Minimum input pulse width	80ns	
Pulse train command FC,FC*,RC,RC*		Maximum input frequency	25Mpps (4-multiplication) 26LS31 equivalent	
Line driver				
Connector No.	Equivalent circuit			
CN1				

Circuit No.	Electrical specifications	<div></div> <ul style="list-style-type: none">• When attaching encoder in the forward direction, let B-phase go ahead of A-phase in motor forward direction operation.• Minimum input pulse width [twh + twl] for A-phase and B-phase must be 80ns or more.• Minimum edge distance between A-phase and B-phase [twab] must be at least 40ns.• Minimum input pulse width [twz] of encoder marker signal (Z-phase) must be 500ns or more. <div></div> <p style="text-align: right;">*In case of positive logic</p>											
I-3													
Corresponding signal													
Encoder Feedback Pulse Input A,A*,B,B*,Z,Z*													
Connector No.													
CN2													
Equivalent circuit	<div></div> <table><thead><tr><th></th><th>Positive signal</th><th>Negative signal</th></tr></thead><tbody><tr><td>A-phase</td><td>A</td><td>A*</td></tr><tr><td>B-phase</td><td>B</td><td>B*</td></tr><tr><td>Z-phase</td><td>Z</td><td>Z*</td></tr></tbody></table> <ul style="list-style-type: none">• Be sure that encoder feedback pulse is line driver (26LS31 equivalent) output.		Positive signal	Negative signal	A-phase	A	A*	B-phase	B	B*	Z-phase	Z	Z*
	Positive signal	Negative signal											
A-phase	A	A*											
B-phase	B	B*											
Z-phase	Z	Z*											
Circuit No.	Electrical specifications	Operating voltage range	-12 to +12V										
I-4		<ul style="list-style-type: none">• Make sure to use twisted pair cable. The shield must be properly connected to CN1 metal connector (FG).											
Corresponding signal													
Analog command INH,TQH (Option)													
Connector No.		Equivalent circuit	<div></div>										
CN1													

Signal connection

Circuit No.	Electrical specifications	Maximum input frequency	25Mpps (4-multiplication)	
I-5		Input method	Line receiver	
Corresponding signal				
Magnetic pole sensor HA,HA*,HB,HB*				
Connector No. CN2				
Equivalent circuit				
Circuit No.	Electrical specifications	Insulation method	Photo coupler insulation	<ul style="list-style-type: none">• When conducted COM terminals, it becomes ON.• When released COM terminals, it becomes OFF.
O-1		Maximum load voltage	30VDC	
Corresponding signal		Maximum load current	50mA/1-point	
Control output signal DO1 - 4		Leak current	0.1mA	
		Saturation voltage	1.0V or less	
Connector No. CN1	Equivalent circuit			
		<ul style="list-style-type: none">• When connecting inductive load such as relay, be sure to insert diode in parallel to the load.• In the case of lamp load, insert resistor for dark current and use the circuit within the rated current including inrush current.• Since photo coupler (PS2733 equivalent) is used in the output circuit, please consider the switching time by receipt circuit.		

Circuit No.	Output method	Dividing frequency output by hardware, control output by software					
O-2	Minimum output pulse width	t_{wh}, t_{wl}	75ns				
Corresponding signal	Minimum edge distance	t_{wab}	37.5ns				
Encoder Pulse Output EA,EA*,EB,EB*, EM,EM*	<div></div>						
Connector No.							
CN1							

Electrical specifications

The dividing frequency output method is determined according to the combination of the settings of [P060: Encoder type] and [P140: Pulse output selection]. For details of the parameters, refer to the explanation of the relevant parameter Nos. in "Chapter 6 Parameters".

①Dividing frequency output fixed by hardware

Select an encoder for which [frequency output by hardware] is set for [P060].

Select any of [0: 1/1 division output] to [5: 1/32 division output] for [P140].

②Control output by software (fixed dividing frequency)

Select an encoder for which [frequency output by software] is set for [P060].

Select any of [0: 1/1 division output] to [5: 1/32 division output] for [P140].

③Control output by software (free dividing frequency)

Select an encoder for which [frequency output by hardware] or [frequency output by software] is set for [P060].

Select [6: P141/P142 division output] or [7: P141/P142 division output, pulse output after absolute position compensation] for [P140].

The following lists the specification of the dividing frequency output methods.

①Dividing frequency output fixed by hardware

Input/output division ratio	1/1	1/2	1/4	1/8	1/16	1/32
Minimum edge distance [ns]	37.5	75	150	300	600	1200
Minimum sampling frequency [MHz]	26.67	13.34	6.67	3.34	1.67	0.84
Maximum encoder pulse output delay to encoder pulse input [ns]	150	175	200	225	250	275

②Control output by software (fixed dividing frequency)

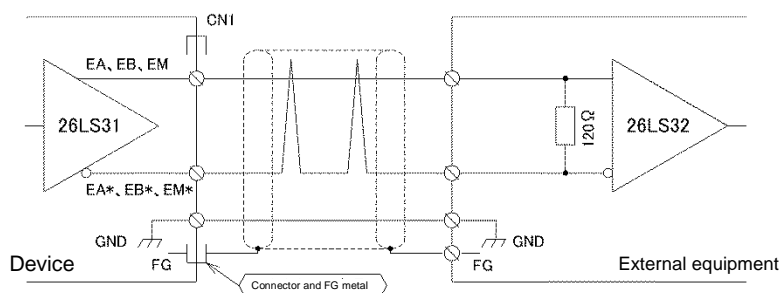
Input/output division ratio	1/1	1/2	1/4	1/8	1/16	1/32
Maximum output pulse count (4-multiplication) [Mpps]	20.46	10.22	5.1	2.54	1.26	0.62
Minimum edge distance [ns]	37.5	87.5	187.5	387.5	775	1562.5
Minimum sampling frequency [MHz]	26.67	11.43	5.33	2.58	1.29	0.64
Maximum encoder pulse output delay to encoder feedback input signal [μs]	150					

* The fixed dividing frequency output function controlled by software sets the pulse count based on the fixed cycle in the device and outputs pulses. The output waveform does not always indicate the waveform of a signal of Duty50%, and the edge distance is not constant, so there is a difference between the maximum output pulse count and minimum sampling frequency.

* Select an optimum division ratio based on the following conditions:

CN1

Equivalent circuit



- As line driver (26LS31 equivalent) is used as the output, interface with line receiver (26LS32 equivalent).
- Terminal resistor of receiving side should be 120Ω (1/2W or more).
- When motor is running in forward direction, B-phase is output ahead of A-phase. Phase relation of A-phase and B-phase always coincides with motor operation direction, and it is not affected by operation direction setting through parameter.
- After power-on, it becomes unstable for 2 seconds in maximum.

Signal connection

<div>Circuit No.</div> <div>IO-1</div> <div>Corresponding signal</div> <div>Serial communication TxD(A),TxD(B), RxD(A),RxD(B)</div> <div>Connector No.</div> <div>CN4</div>	<div>Electrical specifications</div> <div> <ul style="list-style-type: none"> Communication method is RS-422A. If you want to use the built-in terminal resistor, jumper pins 5 and 6 of connector CN4. Set the communication baud rate in parameter [P701: RS422 communication baud rate]. </div> <div>Equivalent circuit</div> <div> </div>
<div>Circuit No.</div> <div>IO-2</div> <div>Corresponding signal</div> <div>Serial encoder data input/output SD, SD*, SCK, SCK*</div> <div>Connector No.</div> <div>CN2</div>	<div>Electrical specifications</div> <div> <ul style="list-style-type: none"> When a serial encoder is connected, serial data is processed in the half-duplex mode. When an ABS linear scale (ST70*) is connected, serial data is input at 2.5Mbps. </div> <div>Equivalent circuit</div> <div> </div>
<div>Circuit No.</div> <div>IO-3</div> <div>Corresponding signal</div> <div>USB communication</div> <div>Connector No.</div> <div>CN3</div>	<div>Electrical specifications</div> <div> <ul style="list-style-type: none"> This circuit is provided for communication with a PC. Communication is possible based on USB2.0 (FULL SPEED). </div>

4-3 Connector pin alignment

4-3-1 Control input/output connector CN1

Table 4-1 Control input/output

No.	Signal code	Signal name	No.	Signal code	Signal name
1	TQH	Torque command (option)	19	INH	Speed command input (option)
2	GND	Internal control power supply common	20	GND	Internal control power supply common
3	EM*	Encoder pulse Z-phase output (negative pole)	21	GND	Internal control power supply common
4	EM	Encoder pulse Z-phase output (positive pole)	22	NC	Not connected (reserved)
5	EB*	Encoder pulse B-phase output (negative pole)	23	RC*	Reverse direction pulse train command input (negative pole)
6	EB	Encoder pulse B-phase output (positive pole)	24	RC	Reverse direction pulse train command input (positive pole)
7	EA*	Encoder pulse A-phase output (negative pole)	25	FC*	Forward direction pulse train command input (negative pole)
8	EA	Encoder pulse A-phase output (positive pole)	26	FC	Forward direction pulse train command input (positive pole)
9	GND	Internal control power supply common	27	GND	Internal control power supply common
10	NC	Not connected (reserved)	28	GND	Internal control power supply common
11	NC	Not connected (reserved)	29	DI8	Control input signal 8 (MD2)
12	NC	Not connected (reserved)	30	DI7	Control input signal 7 (MD1)
13	COM	External power supply common (+12VDC - +24VDC)	31	DI6	Control input signal 6 (SS2)
14	DO4	Control output signal 4 (PN1)	32	DI5	Control input signal 5 (SS1)
15	DO3	Control output signal 3 (WNG)	33	DI4	Control input signal 4 (CIH)
16	DO2	Control output signal 2 (ALM)	34	DI3	Control input signal 3 (DR)
17	DO1	Control output signal 1 (RDY)	35	DI2	Control input signal 2 (SON)
18	+V	External power supply (+12VDC - +24VDC)	36	DI1	Control input signal 1 (RST)

Connector to be used (receptacle):

10236-52A2PL (3M) or equivalent

Applicable cable side connector (soldered plug):

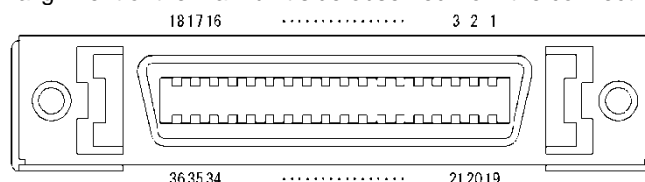
10136-3000PE (3M) or equivalent

Applicable cable side connector (shell):

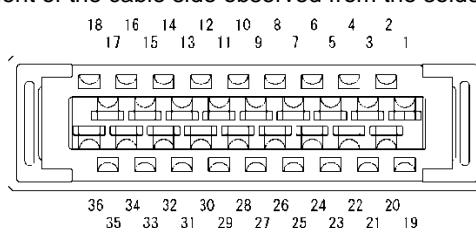
10336-52A0-008 (3M) or equivalent

*1 The parameter initial values are indicated in parentheses for control output signals DO1 to DO4 and control input signals DI1 to DI8.

*2 Figure below is connector alignment of the main unit side observed from the connecting block.



*3 Figure below is connector alignment of the cable side observed from the soldering terminal side.



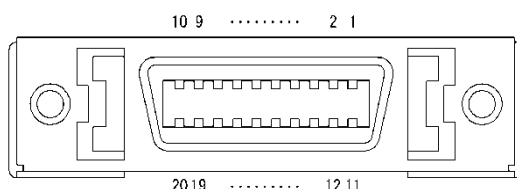
4-3-2 Encoder feedback pulse input connector CN2

Table 4-2 Encoder feedback pulse input

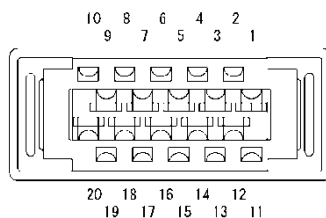
No.	Signal code	Signal name	No.	Signal code	Signal name
1	GND	Internal control power supply common	11	Z	Encoder marker signal input (positive pole)
2	GND	Internal control power supply common	12	Z*	Encoder marker signal input (negative pole)
3	EP5	Encoder power supply (+5V)	13	HA	Magnetic pole sensor input
4	EP5	Encoder power supply (+5V)	14	HA*	Magnetic pole sensor input
5	SD	Communication data (positive pole)	15	HB	Magnetic pole sensor input
6	SD*	Communication data (negative pole)	16	HB*	Magnetic pole sensor input
7	A	Encoder pulse A-phase input (positive pole)	17	HC	Magnetic pole sensor input
8	A*	Encoder pulse A-phase input (negative pole)	18	HC*	Magnetic pole sensor input
9	B	Encoder pulse B-phase input (positive pole)	19	NC	Not connected (reserved)
10	B*	Encoder pulse B-phase input (negative pole)	20	NC	Not connected (reserved)

Connector to be used (receptacle): 10220-52A2PL (3M) or equivalent
 Applicable cable side connector (soldered plug): 10120-3000PE (3M) or equivalent
 Applicable cable side connector (shell): 10320-52A0-008 (3M) or equivalent

*1 Figure below is connector alignment of the main unit side observed from the connecting block.



*2 Figure below is connector alignment of the cable side observed from the soldering terminal side.



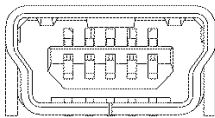
4-3-3 USB communication connector CN3

Table 4-3 USB communication

No.	Signal code	Signal name	No.	Signal code	Signal name
1	VBUS	USB power supply (+5V)	4	NC	Not connected (reserved)
2	DM	Communication data (a pair with DP)	5	GND	Internal control power supply common
3	DP	Communication data (a pair with DM)			

Connector to be used (receptacle): UX60SC-MB-5S8 (HIROSE) or equivalent
Applicable cable: Marketed USB cable
(Host: A plug ⇔ Device: Mini B plug)

Figure below is connector alignment of the main unit side observed from the connecting block.



1 2 3 4 5

* We do not prepare any USB cable as an option.

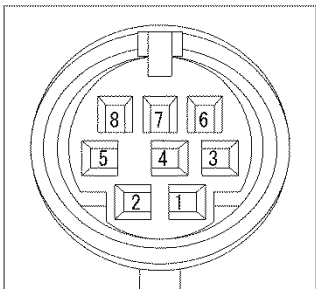
4-3-4 Serial communication connector CN4

Table 4-4 Serial communication

No.	Signal code	Signal name	No.	Signal code	Signal name
1	RXD(A)	Receiving data (a pair with RXD(B))	5	TERM	Built-in terminal resistor connection
2	RXD(B)	Receiving data (a pair with RXD(A))	6	TERM_RET	Built-in terminal resistor connection return
3	GND	Internal control power supply common	7	TXD(A)	Sending data (a pair with TXD(B))
4	+5V	Internal control power supply +5V	8	TXD(B)	Sending data (a pair with TXD(A))

Connector to be used (receptacle): TCS7588-01-201 (Hosiden Co.) or equivalent
Applicable cable side connector (plug): TCP8580 (Hosiden Co.) or equivalent

Figure below is connector alignment of the main unit side observed from the connecting block.



* A soldering-type plug of this connector is available as an option.

4-3-5 Power supply terminal TB1

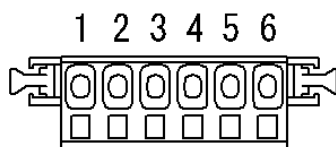
Table 4-5 Power supply terminal (TB1)

No.	Signal code	Signal name	No.	Signal code	Signal name
1	R	Main power supply R-phase (100V/200V)	4	B1/P	Regenerative resistor
2	S	Main power supply S-phase (100V/200V)	5	B2	Regenerative resistor
3	T	Main power supply T-phase (200V)	6	DN	Not used

Connector to be used (pin header): S06B-F32SK-GGXR (JST) or equivalent

Applicable cable side connector (plug): 06JFAT-SBXGF-I (JST) or equivalent
(supplied with the device main unit)

The figure below illustrates the alignment when the plug is viewed from the cable insertion block.



Connect the grounding to the grounding terminal on the device cabinet.

4-3-6 Power supply terminal TB2

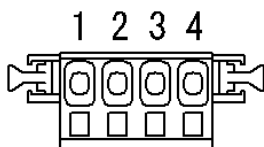
Table 4-6 Power supply terminal (TB2)

No.	Signal code	Signal name	No.	Signal code	Signal name
1	r	Control power supply R-phase (100V/200V)	3	DBK	Dynamic brake signal
2	s	Control power supply S-phase (100V/200V)	4	DBC	Dynamic brake signal common

Connector to be used (pin header): S04B-F32SK-GGXR (JST) or equivalent

Applicable cable side connector (plug): 04JFAT-SBXGF-I (JST) or equivalent
(supplied with the device main unit)

The figure below illustrates the alignment when the plug is viewed from the cable insertion block.



4-3-7 Motor power supply terminal TB3

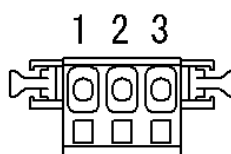
Table 4-7 Motor power supply terminal (TB3)

No.	Signal code	Signal name	No.	Signal code	Signal name
1	U	U-phase	3	W	W-phase
2	V	V-phase			

Connector to be used (pin header): S03B-F32SK-GGYR (JST) or equivalent

Applicable cable side connector (plug): 03JFAT-SBYGF-I (JST) or equivalent
(supplied with the device main unit)

The figure below illustrates the alignment when the plug is viewed from the cable insertion block.



Connect the grounding to the grounding terminal on the device cabinet.

4-4 Control input and output signal

4-4-1 Control input and output signal list

Table 4-8 Control input and output signal list

Control output signal			Control input signal		
Allocation	Signal code	Signal name	Allocation	Signal code	Signal name
No.			No.		
1	ALM	Alarm	1	RST	Reset
2	WNG	Warning	2	ARST	Alarm reset
3	RDY	Servo ready	3	EMG	Emergency stop
4	SZ	Speed Zero	4	SON	Servo on
5	PE1	Position deviation range 1	5	DR	Drive
6	PE2	Position deviation range 2	6	CLR	Deviation clear
7	PN1	Positioning complete 1	7	CIH	Command pulse input proportional control
8	PN2	Positioning complete 2	8	TL	Torque limit
9	PZ1	Positioning complete response 1	9	FOT	Forward direction over travel
10	PZ2	Positioning complete response 2	10	ROT	Reverse direction over travel
11	ZN	Command complete	11	MD1	Mode select 1
12	ZZ	Command complete response	12	MD2	Mode select 2
13	ZRDY	Command drive ready	13	GSL1	Gain select 1
14	PRF	Rough match	14	GSL2	Gain select 2
15	VCP	Speed attainment	15		
16			16	RVS	Command direction inversion
17	BRK	Brake Release	17	SS1	Command selection 1
18	LIM	Limit in-Process	18	SS2	Command selection 2
19	EMGO	Emergency stop in-process	19	SS3	Command selection 3
20	HCP	Zero return complete	20	SS4	Command selection 4
21	HLDZ	Command zero in-process	21	SS5	Command selection 5
22	OTO	Over travel in-process	22	SS6	Command selection 6
23	MTON	Motor electrification in-process	23	SS7	Command selection 7
24			24	SS8	Command selection 8
25	SMOD	Speed command mode in-process	25	ZST	Positioning drive
26	TMOD	Torque command mode in-process	26	ZLS	Deceleration LS
27	PMOD	Pulse train command mode in-process	27	ZMK	External zero point marker
28	NMOD	Built-in command mode in-process	28	TRG	External trigger
29			29	CMDZ	Command zero
30			30	ZCAN	Positioning cancel
31			31	FJOG	Forward direction jog
32			32	RJOG	Reverse direction jog

Control output signal			Control input signal		
Allocation	Signal code	Signal name	Allocation	Signal code	Signal name
No.			No.		
33	OUT1	Common output 1	33		
34	OUT2	Common output 2	34		
35	OUT3	Common output 3	35		
36	OUT4	Common output 4	36		
37	OUT5	Common output 5	37		
38	OUT6	Common output 6	38		
39	OUT7	Common output 7	39		
40	OUT8	Common output 8	40		
41			41		
42			42		
43			43		
44			44		
45			45		
46			46		
47			47		
48			48		
49	OCEM	Marker output	49		

4-4-2 Control output signal

The signal for which a hyphen (-) is indicated in the Initial allocation field is not allocated in the initial status. Allocate the signal in [P622] when required.

Signal name	Signal code	Function
	Supported mode	
	Circuit No.	
	Initial allocation	
	Corresponding connector	
Alarm	ALM	<ul style="list-style-type: none"> If an alarm occurs, the motor executes brake stop or enters the power-off state. When an alarm occurs, this signal is switched ON, and at the same time, the servo ready signal (RDY) is switched OFF. When the motor enters the power-off state, the break release signal (BRK) is switched OFF. When this signal is ON, the relevant alarm number is displayed on the data display LED for status display. For how to release the alarm, refer to "Chapter 10 Protective function". <p>[Switched OFF when]</p> <ul style="list-style-type: none"> The power is turned off, then on again. The reset signal (RST) is switched ON. The alarm reset signal (ARST) is switched ON. <p>[Related signals] [RST: Reset] [ARST: Alarm reset]</p>
	S T P N	
	O-1	
	D02	
	CN1	
Warning	WNG	<ul style="list-style-type: none"> If continuing operation in the current status may cause the device to detect an error and stop, this signal is switched ON as warning. When this signal is ON, run operation does not stop. When there is no possibility that an error occurs, this signal is switched OFF. When this signal is ON, the relevant warning number is displayed on the data display LED for status display. For how to release the warning, refer to "Chapter 10 Protective function".
	S T P N	
	O-1	
	DO3	
	CN1	
Servo ready	RDY	<ul style="list-style-type: none"> When motor control is ready to operate, this signal is switched ON. After an alarm occurs and this signal is switched OFF, this signal is recovered when the alarm is reset. <p>[Switched OFF when]</p> <ul style="list-style-type: none"> An alarm occurs. The reset signal (RST) is switched ON. The servo on signal (SON) is switched OFF. The motor enters the power-off state.
	S T P N	
	O-1	
	DO1	
	CN1	

Signal name	Signal code	Function
	Supported mode	
	Circuit No.	
	Initial allocation	
	Corresponding connector	
Speed Zero	SZ	<ul style="list-style-type: none"> This signal is ON when the motor speed is within the speed range specified in [P651: SZ signal speed range] and is OFF when the speed is not within the range. [Related parameter] [P651: SZ signal speed range]
	S T P N	
	O-1	
	-	
	CN1	
Position deviation range 1, 2	PE1, 2	<ul style="list-style-type: none"> This signal is ON when position deviation is within the deviation range specified in [P653: PE1 Signal deviation range] ([P655]). [Switched OFF when] <ul style="list-style-type: none"> Operation is performed not in the pulse train command or built-in command run mode. Position deviation is not within the range specified in [P653] ([P655]). [Related parameters] [P653: PE1 Signal deviation range] [P655: PE2 signal deviation range]
	- - P N	
	O-1	
	-	
	CN1	
Positioning complete 1, 2	PN1, 2	<ul style="list-style-type: none"> After the execution of a command is completed, this signal is switched ON when position deviation falls within the range specified in [P653: PE1 Signal deviation range] ([P655]). [Switched OFF when] <ul style="list-style-type: none"> An alarm occurs. The run mode is changed. The reset signal (RST) is switched ON. The emergency stop signal (EMG) is switched ON. The servo on signal (SON) is switched OFF. The deviation clear signal (CLR) is switched ON. The positioning drive signal (ZST) is switched ON. The positioning cancel signal (ZCAN) is switched ON. [Related parameters] [P179: S-curve time 2] [P470: PLSSEL0 S-curve time 1] [P522: SEL Internal command S-curve time 1] [P653: PE1 Signal deviation range] [P654: PE1 Signal delay time] [P655: PE2 signal deviation range] [P656: PE2 Signal delay time]
	- - P N	
	O-1	
	-	
	CN1	

Signal name	Signal code	Function
	Supported mode	
	Circuit No.	
	Initial allocation	
	Corresponding connector	
Positioning complete response 1, 2	PZ1, 2	<ul style="list-style-type: none"> This signal is used as a handshake to check that the device recognizes the positioning drive signal (ZST). This signal is switched ON when positioning is completed. [Switched OFF when] <ul style="list-style-type: none"> Operation is performed not in the built-in command run mode. The positioning drive signal (ZST) is switched ON.
	- - - N	
	O-1	
	-	
	CN1	
Command complete	ZN	<ul style="list-style-type: none"> This signal is switched ON when the execution of any of the POS/HOME/INDX commands is completed. [Switched OFF when] <ul style="list-style-type: none"> An alarm occurs. The run mode is changed. The command is issued. The reset signal (RST) is switched ON. The emergency stop signal (EMG) is switched ON. The servo on signal (SON) is switched OFF. The deviation clear signal (CLR) is switched ON. The positioning cancel signal (ZCAN) is switched ON.
	- - - N	
	O-1	
	-	
	CN1	
Command complete response	ZZ	<ul style="list-style-type: none"> This signal is used as a handshake to check that the device recognizes the positioning drive signal (ZST). This signal is switched ON when the execution of the relevant command is completed. [Switched OFF when] <ul style="list-style-type: none"> Operation is performed not in the built-in command run mode. The positioning drive signal (ZST) is switched ON.
	- - - N	
	O-1	
	-	
	CN1	
Command drive ready	ZRDY	<ul style="list-style-type: none"> This signal is switched ON when command operation becomes ready. After an alarm occurs and this signal is switched OFF, this signal is recovered when the alarm is reset. [Switched OFF when] <ul style="list-style-type: none"> An alarm occurs. The reset signal (RST) is switched ON. The servo on signal (SON) is switched OFF. The motor enters the power-off state.
	- - - N	
	O-1	
	-	
	CN1	

Signal name	Signal code	Function
	Supported mode	
	Circuit No.	
	Initial allocation	
	Corresponding connector	
Rough match	PRF	<ul style="list-style-type: none"> After positioning operation starts, this signal is switched ON when the difference between the current position and target position falls within the range specified in [P657: PRF signal distance].
	- - - N	
	O-1	
	-	
	CN1	
Speed attainment	VCP	<ul style="list-style-type: none"> After positioning operation starts, this signal is switched ON when the difference between the specified speed and motor speed falls within the range specified in [P652: VCP signal speed deviation range].
	S - P N	
	O-1	
	-	
	CN1	
Brake Release	BRK	<ul style="list-style-type: none"> This signal is ON when the brake is released. For details of this signal, refer to the explanation of P658 to P660 in "Chapter 6 Parameters".
	S T P N	
	O-1	
	-	
	CN1	

Signal name	Signal code	Function
	Supported mode	
	Circuit No.	
	Initial allocation	
	Corresponding connector	
Limit in-Process	LIM	<ul style="list-style-type: none"> This signal is switched ON when the motor enters the torque limit area and OFF when the motor leaves the torque limit area. In the torque command run mode, this signal is switched ON and OFF according to the torque limit value and speed limit value. This signal is switched ON when the motor enters the torque or speed limit area. <p>[Related parameters] [P080: Max torque limit value +] [P081: Max torque limit value -] [P415 - : Torque limit value] [P440: Speed limit value at torque command mode] [P443 - : TRQSEL Speed limit value] [P472 - : PLSSEL Torque limit value] [P523 - : SEL Internal command torque limit value] [P636: TL signal torque limit value +] [P637: TL signal torque limit value -]</p>
	S T P N	
	O-1	
	-	
	CN1	
Emergency stop in-process	EMGO	<ul style="list-style-type: none"> This signal is switched ON when the emergency stop signal (EMG) is switched ON. When the emergency stop signal (EMG) is OFF, this signal is switched OFF by switching the reset signal ON, then OFF again. <p>[Related signals] [RST: Reset] [EMG: Emergency stop]</p>
	S T P N	
	O-1	
	-	
	CN1	
Zero return complete	HCP	<ul style="list-style-type: none"> This signal is switched ON when the device can recognize the absolute position. <ul style="list-style-type: none"> When an absolute encoder is used and the value indicating Reflected is specified in P170, this signal is switched ON at power-on. When other than an absolute encoder is used, this signal is switched ON once zero return is completed after power-on. <p>[Switched OFF when] <ul style="list-style-type: none"> The power is turned on. Zero return is started. An encoder alarm occurs. <p>[Related parameters] [P060: Encoder type] [P170: Present position reflection selection after main power of ABS is ON]</p> </p>
	S T P N	
	O-1	
	-	
	CN1	

Signal name	Signal code	Function
	Supported mode	
	Circuit No.	
	Initial allocation	
	Corresponding connector	
Command zero in-process	HLDZ	<ul style="list-style-type: none"> This signal is switched ON when the command zero signal (CMDZ) is ON and the motor stops. [Switched OFF when] <ul style="list-style-type: none"> The motor runs. The command zero signal (CMDZ) is switched OFF. [Related signal] [CMDZ: Command zero]
	STPN	
	O-1	
	-	
	CN1	
Over travel in-process	OTO	<ul style="list-style-type: none"> This signal is switched ON when an overtravel state occurs. This signal is switched OFF when the overtravel state is canceled. [Related signals] [FOT: Forward direction over travel] [ROT: Reverse direction over travel]
	STPN	
	O-1	
	-	
	CN1	
Motor electrification in-process	MTON	<ul style="list-style-type: none"> This signal is switched ON when the servo on signal (SON) is switched ON and the motor enters the power-on state. When the reset signal (RST) is switched ON in the motor power-on state, the motor is in the power-off state while the reset signal (RST) is ON. The motor enters the power-on state again when the reset signal (RST) is switched OFF. [Switched OFF when] <ul style="list-style-type: none"> The reset signal (RST) is switched ON. The servo on signal (SON) is switched OFF. [Related parameters] [P633: Servo OFF delay time after EMG braking stoppage] [P658: Brake activation delay time]
	STPN	
	O-1	
	-	
	CN1	
Speed command mode in-process	SMOD	<ul style="list-style-type: none"> This signal is ON in the speed command run mode. [Related signal] [MD1,2: Mode select 1, 2]
	S---	
	O-1	
	-	
	CN1	
Torque command mode in-process	TMOD	<ul style="list-style-type: none"> This signal is ON in the torque command run mode. [Related signal] [MD1,2: Mode select 1, 2]
	-T--	
	O-1	
	-	
	CN1	

Signal name	Signal code	Function
	Supported mode	
	Circuit No.	
	Initial allocation	
	Corresponding connector	
Pulse train command mode in-process	PMOD	<ul style="list-style-type: none"> This signal is ON in the pulse train command run mode. [Related signal] [MD1,2: Mode select 1, 2]
	- - P -	
	O-1	
	-	
	CN1	
Built-in command mode in-process	NMOD	<ul style="list-style-type: none"> This signal is ON in the built-in command run mode. [Related signal] [MD1,2: Mode select 1, 2]
	- - - N	
	O-1	
	-	
	CN1	
Common output 1 - 8	OUT1 - 8	<ul style="list-style-type: none"> This signal is switched ON when a command for which common output data is valid is executed in the command run mode. This signal is kept ON after the execution of the command is completed. OUT8 to OUT1 are treated as binary data (8 bits) and correspond to bit 7 to 0, respectively. Corresponding bit = 0: This signal is OFF. Corresponding bit = 1: This signal is ON. [Switched OFF when] <ul style="list-style-type: none"> An alarm occurs. The run mode is changed. The execution of a command starts. The reset signal (RST) is switched ON. The emergency stop signal (EMG) is switched ON. The servo on signal (SON) is switched OFF. The deviation clear signal (CLR) is switched ON.
	- - - N	
	O-1	
	-	
	CN1	
Marker output	OCEM	<ul style="list-style-type: none"> This signal outputs the marker pulse corresponding to the motor encoder marker signal. (When a 90 deg phase difference pulse encoder or serial incremental encoder is used) Other functions are the same as the encoder pulse output EM and EM*. [Switched OFF when] <ul style="list-style-type: none"> No marker signal is output.
	S T P N	
	O-1	
	-	
	CN1	

4-4-3 Control input signal

The signal for which a hyphen (-) is indicated in the Initial allocation field is not allocated in the initial status. Allocate the signal in [P620/P621] when required.

Signal name	Signal code	Function
	Supported mode	
	Circuit No.	
	Initial allocation	
	Corresponding connector	
Reset	RST	<ul style="list-style-type: none"> When this signal is switched ON, any detected alarm is reset and the alarm signal (ALM) is switched OFF. When this signal is ON, the motor is in the power-off state and the brake release signal (BRK) and servo ready signal (RDY) are not output. When this signal is switched OFF again, the brake release signal (BRK) and servo ready signal (RDY) are switched ON and the device returns to the normal operating status. When this signal is switched ON, the emergency stop in-process signal (EMGO) is released. <p>⚠ Be sure to remove the cause of an alarm before resetting the alarm.</p> <p>[Related signals] [ALM: Alarm] [RDY: Servo ready] [BRK: Brake Release] [EMGO: Emergency stop in-process]</p>
	S T P N	
	I-1	
	DI1	
	CN1	
Alarm reset	ARST	<ul style="list-style-type: none"> When this signal is switched ON, any detected alarm is reset and the alarm signal (ALM) is switched OFF. When no alarm is detected and this signal is switched ON, no operation is performed. <p>⚠ Be sure to remove the cause of an alarm before resetting the alarm.</p> <p>[Related signal] [ALM: Alarm]</p>
	S T P N	
	I-1	
	-	
	CN1	

Signal name	Signal code	Function
	Supported mode	
	Circuit No.	
	Initial allocation	
	Corresponding connector	
Emergency stop	EMG	<ul style="list-style-type: none"> When this signal is switched ON, the emergency stop in-process signal (EMGO) is switched ON and the motor stops according to the stop mode and deceleration time specified in [P633]. At this time, the servo ready signal (RDY) is switched OFF. After the motor stops, when the time specified in [P633: Servo OFF delay time after EMG braking stoppage] has elapsed, the motor enters the power-off state. In the emergency stop state, no alarm is detected. Note that if the device enters the emergency stop state in the alarm status, any new alarm is not detected. For details of this signal, refer to the explanation of P633 in "Chapter 6 Parameters". <p>[Related signals] [RDY: Servo ready] [EMGO: Emergency stop in-process]</p> <p>[Related parameter] [P633: Stopping selection when EMG signal is ON, Deceleration time after EMG signal braking stoppage, Servo OFF delay time after EMG braking stoppage]</p>
	S T P N	
	I-1	
	—	
	CN1	
Servo on	SON	<ul style="list-style-type: none"> When this signal is switched ON, the motor enters the power-on state. When this signal is switched OFF, the motor enters the power-off state. When this signal is OFF, the brake release signal (BRK) and servo ready signal (RDY) are not output. <p>[Related signals] [RDY: Servo ready] [BRK: Brake Release] [MTON: Motor electrification in-process]</p>
	S T P N	
	I-1	
	DI2	
	CN1	

Signal name	Signal code	Function										
	Supported mode											
	Circuit No.											
	Initial allocation											
	Corresponding connector											
Drive	DR	<ul style="list-style-type: none">When this signal is switched ON, the command in each mode can be accepted.When this signal is switched OFF during motor operation, each command becomes invalid and the motor stops in the relevant mode listed below. <table border="1"><thead><tr><th>Run mode</th><th>Stop mode</th></tr></thead><tbody><tr><td>Speed command</td><td>Deceleration stop with the settings in P405, P407, and P409</td></tr><tr><td>Torque command</td><td>Deceleration stop with the settings in P438 and P439</td></tr><tr><td>Pulse train command</td><td>Quick stop</td></tr><tr><td>Built-in command</td><td>Quick stop</td></tr></tbody></table> <p>[Related parameters] [P405: Speed command deceleration standard time] [P407: Analog speed command deceleration standard time] [P409: Internal speed command deceleration standard time]</p>	Run mode	Stop mode	Speed command	Deceleration stop with the settings in P405, P407, and P409	Torque command	Deceleration stop with the settings in P438 and P439	Pulse train command	Quick stop	Built-in command	Quick stop
	Run mode		Stop mode									
	Speed command		Deceleration stop with the settings in P405, P407, and P409									
	Torque command		Deceleration stop with the settings in P438 and P439									
	Pulse train command		Quick stop									
	Built-in command		Quick stop									
S T P N												
I-1												
DI3												
CN1												
Deviation clear	CLR	<ul style="list-style-type: none">When this signal is switched ON, position deviation is cleared and the motor stops in the status in which the speed command is "0".When this signal is switched ON during motor operation, the motor stops quickly. The commands remaining when this signal is switched On are discarded.										
	- - P N											
	I-1											
	-											
	CN1											
Command pulse input proportional control	CIH	<ul style="list-style-type: none">When this signal is switched ON, the pulse train command becomes invalid and the motor enters the servo-lock state.When this signal is switched ON during motor operation, the motor processes the position deviation pulses and stops.										
	- - P -											
	I-1											
	-											
	CN1											

Signal name	Signal code	Function
	Supported mode	
	Circuit No.	
	Initial allocation	
	Corresponding connector	
Torque limit	TL	<ul style="list-style-type: none"> When this signal is switched ON, the torque limit values specified in [P636: TL signal torque limit value +] and [P637: TL signal torque limit value -] become valid. The lowest torque limit value specified in the following related parameters is used.
	S T P N	
	I-1	
	-	
	CN1	
Forward direction over travel	FOT	<ul style="list-style-type: none"> This signal indicates the travel limit (stroke end) in the forward direction. When this signal is switched ON, the motor recognizes that the travel limit point is reached, stops quickly, and enters the servo-lock state. When this signal is ON, operation can be performed only in the reverse direction. When this signal is OFF, the device recognizes that the current position is within the normal operation range and can perform normal operation.
	S T P N	
	I-1	
	-	
	CN1	
Reverse direction over travel	ROT	<ul style="list-style-type: none"> This signal indicates the travel limit (stroke end) in the reverse direction. When this signal is switched ON, the motor recognizes that the travel limit point is reached, stops quickly, and enters the servo-lock state. When this signal is ON, operation can be performed only in the forward direction. When this signal is OFF, the device recognizes that the current position is within the normal operation range and can perform normal operation.
	S T P N	
	I-1	
	-	
	CN1	

Signal name	Signal code	Function															
	Supported mode																
	Circuit No.																
	Initial allocation																
	Corresponding connector																
Mode select 1, 2	MD1,2	<ul style="list-style-type: none">When this signal is switched ON, each run mode is selected in the combination of MD1 and MD2 as shown in the table below. <table><tr><th>MD2</th><th>MD1</th><th>Run mode</th></tr><tr><td>OFF</td><td>OFF</td><td>Speed command</td></tr><tr><td>OFF</td><td>ON</td><td>Torque command</td></tr><tr><td>ON</td><td>OFF</td><td>Pulse train command</td></tr><tr><td>ON</td><td>ON</td><td>Built-in command</td></tr></table> <p>[Related parameter] [P638: MD signal delay time]</p>	MD2	MD1	Run mode	OFF	OFF	Speed command	OFF	ON	Torque command	ON	OFF	Pulse train command	ON	ON	Built-in command
	MD2		MD1	Run mode													
	OFF		OFF	Speed command													
	OFF		ON	Torque command													
	ON		OFF	Pulse train command													
	ON		ON	Built-in command													
STPN																	
I-1																	
MD1: DI7 MD2: DI8																	
CN1																	
Gain select 1, 2	GSL1,2	<ul style="list-style-type: none">When this signal is switched ON, a gain number is selected in the combination of GSL1 and GSL2 as shown in the table below. <table><tr><th>GSL2</th><th>GSL1</th><th>Valid gain number</th></tr><tr><td>OFF</td><td>OFF</td><td>Gain number selected with SEL</td></tr><tr><td>OFF</td><td>ON</td><td>Gain number 1</td></tr><tr><td>ON</td><td>OFF</td><td>Gain number 2</td></tr><tr><td>ON</td><td>ON</td><td>Gain number 3</td></tr></table>	GSL2	GSL1	Valid gain number	OFF	OFF	Gain number selected with SEL	OFF	ON	Gain number 1	ON	OFF	Gain number 2	ON	ON	Gain number 3
	GSL2		GSL1	Valid gain number													
	OFF		OFF	Gain number selected with SEL													
	OFF		ON	Gain number 1													
	ON		OFF	Gain number 2													
	ON		ON	Gain number 3													
STPN																	
I-1																	
-																	
CN1																	
Command direction inversion	RVS	<ul style="list-style-type: none">When this signal is switched ON, the direction specified in the command is inversed.															
	S - P -																
	I-1																
	-																
	CN1																
Command selection 1 - 8	SS1 - 8	<ul style="list-style-type: none">These signals, SS1 to SS8, select a command in combination of them.SS4 to SS8 are valid only for built-in commands. When SS4 to SS8 are specified for other than a built-in command, they are ignored. <p>[Related parameter] [P638: SS signal delay time]</p>															
	STPN																
	I-1																
	-																
	CN1																

Signal name	Signal code	Function
	Supported mode	
	Circuit No.	
	Initial allocation	
	Corresponding connector	

- The signals SS4 to SS8 are invalid for speed commands, torque commands, pulse train commands, and built-in commands (jog).

●: ON, Blank: OFF

SS3 - 1			Speed command	Torque command	Pulse train command	Built-in command (jog)
3	2	1				
			Speed command 0 (P410 - P412)	Torque command 0 (P441 - P443)	Pulse train command 0 (P467 - P472)	Jog speed 0 (P573)
		●	Speed command 1 (P413 - P415)	Torque command 1 (P444 - P446)	Pulse train command 1 (P473 - P478)	Jog speed 1 (P574)
	●		Speed command 2 (P416 - P418)	Torque command 2 (P447 - P449)	Pulse train command 2 (P479 - P484)	Jog speed 2 (P575)
	●	●	Speed command 3 (P419 - P421)	Torque command 3 (P450 - P452)	Pulse train command 3 (P485 - P490)	Jog speed 3 (P576)
●			Speed command 4 (P422 - P424)	Torque command 4 (P453 - P455)	Pulse train command 4 (P491 - P496)	Jog speed 4 (P577)
●		●	Speed command 5 (P425 - P427)	Torque command 5 (P456 - P458)	Pulse train command 5 (P497 - P502)	Jog speed 5 (P578)
●	●		Speed command 6 (P428 - P430)	Torque command 6 (P459 - P461)	Pulse train command 6 (P503 - P508)	Jog speed 6 (P579)
●	●	●	Speed command 7 (P431 - P433)	Torque command 7 (P462 - P464)	Pulse train command 7 (P509 - P514)	Jog speed 7 (P580)

Signal name	Signal code	Function
	Supported mode	
	Circuit No.	
	Initial allocation	
	Corresponding connector	

SS8 - 1								Built-in command (command)
8	7	6	5	4	3	2	1	
								Address 0
							●	Address 1
						●		Address 2
						●	●	Address 3
					●			Address 4
					●		●	Address 5
					●	●		Address 6
					●	●	●	Address 7
●	●	●	●	●	●		●	Address 253
●	●	●	●	●	●	●		Address 254
●	●	●	●	●	●	●	●	Address 255

Positioning drive	ZST	<ul style="list-style-type: none">When this signal is switched ON, positioning operation starts.When this signal is ON, the positioning complete signals (PN1 and PN2) are OFF. <div>[Related parameter]</div> <div>[P638: ZST signal delay time]</div>
	- - - N	
	I-1	
	-	
	CN1	

Deceleration LS	ZLS	<ul style="list-style-type: none">When this signal is switched ON during zero return operation, zero point deceleration starts.When this signal is ON and zero return operation starts, the device moves the motor in the direction opposite to the zero return direction once, check that this signal is OFF, and execute zero return operation.For details, refer to "Chapter 5 Run". <div>[Related parameter]</div> <div>[P582: Homing creep speed]</div>
	- - - N	
	I-1	
	DI6	
	CN1	

External zero point marker	ZMK	<ul style="list-style-type: none">This signal is used as the external marker input during zero return. <div>[Related parameter]</div> <div>[P581: Zero point marker selection for homing]</div>
	- - - N	
	I-1	
	-	
	CN1	

Signal name	Signal code	Function										
	Supported mode											
	Circuit No.											
	Initial allocation											
	Corresponding connector											
External trigger	TRG	<ul style="list-style-type: none">When operation for which built-in command external trigger positioning is valid is executed, switching TRG ON starts external trigger positioning operation.This signal can be input as a pulse signal for at least 200μsec.										
	- - - N											
	I-1											
	-											
	CN1											
Command zero	CMDZ	<ul style="list-style-type: none">When this signal is switched ON, the command listed below becomes zero. <table><tr><th>Run mode</th><th>Corresponding command</th></tr><tr><td>Speed command</td><td>Speed command</td></tr><tr><td>Torque command</td><td>Torque command</td></tr><tr><td>Pulse train command</td><td>Pulse train command</td></tr><tr><td>Built-in command</td><td>Speed command</td></tr></table> <ul style="list-style-type: none">When this signal is switched ON during motor operation, the execution of the command is stopped and the motor performs deceleration stop. The deceleration time follows the parameter setting of each command. When this signal is switched OFF, motor operation restarts from the point in the command at which operation was stopped.	Run mode	Corresponding command	Speed command	Speed command	Torque command	Torque command	Pulse train command	Pulse train command	Built-in command	Speed command
	Run mode		Corresponding command									
	Speed command		Speed command									
	Torque command		Torque command									
	Pulse train command		Pulse train command									
	Built-in command		Speed command									
S T P N												
I-1												
-												
CN1												
Positioning cancel	ZCAN	<ul style="list-style-type: none">When this signal is switched ON during motor operation, the motor performs deceleration stop according to the specified deceleration time.When this signal is switched ON during the execution of a command, the operation is canceled.<ul style="list-style-type: none">Stops automatic run operation.Releases the temporary stop state.The device is in the start waiting state with address assignment when the motor is being stopped and after it is stopped.										
	- - - N											
	I-1											
	-											
	CN1											

Signal name	Signal code	Function						
	Supported mode							
	Circuit No.							
	Initial allocation							
	Corresponding connector							
Forward direction jog	FJOG	<ul style="list-style-type: none">When this signal is ON for at least the time listed in the table below, jog operation is performed in the forward direction. When this signal is switched OFF, the execution of the command is stopped. <table><tr><th>ON state time</th><th>Jog operation</th></tr><tr><td>Minimum signal acceptance time*¹</td><td>One-shot jog*²</td></tr><tr><td>100[ms]</td><td>Forward direction jog</td></tr></table> <ul style="list-style-type: none">When this signal is ON, switching the reverse direction jog signal (RJOG) ON stops the execution of the forward direction jog command. <p>[Related signal] [RJOG: Reverse direction jog]</p> <p>[Related parameter] [P573 - : Jog speed]</p>	ON state time	Jog operation	Minimum signal acceptance time* ¹	One-shot jog* ²	100[ms]	Forward direction jog
	ON state time		Jog operation					
	Minimum signal acceptance time* ¹		One-shot jog* ²					
	100[ms]		Forward direction jog					
	- - - N							
	I-1							
DI4								
CN1								
Reverse direction jog	RJOG	<ul style="list-style-type: none">When this signal is ON for at least the time listed in the table below, jog operation is performed in the reverse direction. When this signal is switched OFF, the execution of the command is stopped. <table><tr><th>ON state time</th><th>Jog operation</th></tr><tr><td>Minimum signal acceptance time*¹</td><td>One-shot jog*²</td></tr><tr><td>100[ms]</td><td>Reverse direction jog</td></tr></table> <ul style="list-style-type: none">When this signal is ON, switching the forward direction jog signal (FJOG) ON stops the execution of the reverse direction jog command. <p>[Related signal] [FJOG: Forward direction jog]</p> <p>[Related parameter] [P573 - : Jog speed]</p>	ON state time	Jog operation	Minimum signal acceptance time* ¹	One-shot jog* ²	100[ms]	Reverse direction jog
	ON state time		Jog operation					
	Minimum signal acceptance time* ¹		One-shot jog* ²					
	100[ms]		Reverse direction jog					
	- - - N							
	I-1							
DI5								
CN1								

*¹ Minimum ON time required for recognizing the signal. For details of the time, refer to the explanation of input/output interface DI0 to DI8.

*² Travel in the distance of the minimum setting unit

Chapter 5 Run

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5-1 Before-run inspection

After completing installation and wiring, carry out following before-run inspection.

- ① Isn't there any miswiring? Specially, is the power not connected to motor connection terminal U, V, W?
- ② Isn't there any place in short-circuit status by cable chips, etc.?
- ③ Isn't there any place where excessive stress is on wires?
- ④ Isn't there any loose fit screw or terminal? Are connectors inserted tightly?
- ⑤ Is power supply voltage correct?
- ⑥ Isn't there any short-circuit or line-to-ground fault in external sequence circuit?
- ⑦ Is grounding method correct? Is the grounding grade D-class or better?



Caution

Never apply insulation test such as withstand voltage test and mega test, and noise test using noise simulators, to the device.

Those tests may damage the device.

Before starting this device, confirm following setting.

- Set motor data using VPH DES.
- Check the positive/negative logic setting for input signals (when used).
- Set the parameter corresponding to the positive/negative logic operation of the servo on signal (SON).

5-1-1 Setting the motor run direction

The relations between each command and motor run direction are shown below when the motor and encoder are connected according to the standard specifications.

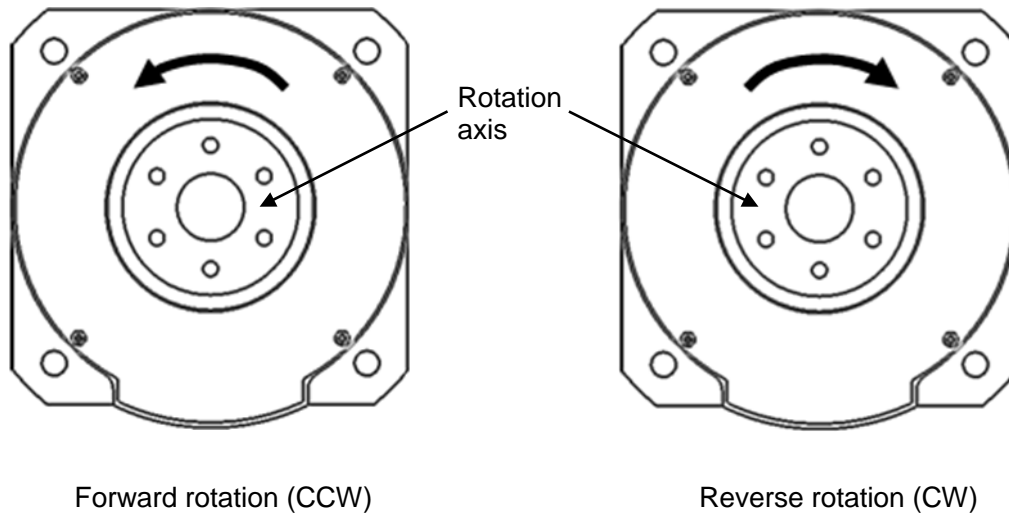


Figure 5-1 Run direction of the τ DISC motor

Table 5-1 Each command input and motor rotation direction (with the τ DISC motor)

Command input mode	Polarity	Motor rotation direction	
Speed command	Forward direction	The rotation axis rotates counterclockwise when viewed from the front.	: Forward rotation (CCW)
	Reverse direction	The rotation axis rotates clockwise when viewed from the front.	: Reverse rotation (CW)
Torque command	Forward direction	The rotation axis rotates counterclockwise when viewed from the front.	: Forward rotation (CCW)
	Reverse direction	The rotation axis rotates clockwise when viewed from the front.	: Reverse rotation (CW)
Positioning operation command	Forward direction	The rotation axis rotates counterclockwise when viewed from the front.	: Forward rotation (CCW)
	Reverse direction	The rotation axis rotates clockwise when viewed from the front.	: Reverse rotation (CW)
Directional pulse train command	Forward direction	The rotation axis rotates counterclockwise when viewed from the front.	: Forward rotation (CCW)
	Reverse direction	The rotation axis rotates clockwise when viewed from the front.	: Reverse rotation (CW)
90 deg phase difference pulse train command	B-phase ahead	The rotation axis rotates counterclockwise when viewed from the front.	: Forward rotation (CCW)
	A-phase ahead	The rotation axis rotates clockwise when viewed from the front.	: Reverse rotation (CW)

Hereinafter in this document, "motor forward direction" means the motor move direction when the forward direction is specified in the input command, and "motor reverse direction" means the motor move direction when the reverse direction is specified in the input command.

To run the motor in the reverse direction with a positive voltage command or forward direction command, set parameter [P161: Moving direction selection] to "Reverse movement" in the standard connection state.

5-2 Run mode

5-2-1 Run operation input/output signals

By switching mode select signals 1 and 2 (MD1, 2) on or off, run modes are supported as shown below.

Table 5-2 Mode select table

Run mode	Mode select signal 1 (MD1)	Mode select signal 2 (MD2)
Speed command	-	-
Torque command	○	-
Pulse train command	-	○
Built-in command	○	○

* ○: Signal ON - : Signal OFF

The tables below show run operation input/output signals.

Table 5-3 Input signal operation table

Signal name	Signal code	Run mode					
		Speed command	Torque command	Pulse train command	Built-in command* ¹		
					Jog	POS	HOME
Reset	RST	○	○	○	○	○	○
Alarm reset	ARST	○	○	○	○	○	○
Emergency stop	EMG	○	○	○	○	○	○
Servo on	SON	○	○	○	○	○	○
Drive	DR	○	○	○	○	○	○
Deviation clear	CLR	-	-	○	○	○	○
Command pulse input proportional control	CIH	-	-	○	-	-	-
Torque limit	TL	○	○	○	○	○	○
Forward direction over travel	FOT	○	○	○	○	○	○
Reverse direction over travel	ROT	○	○	○	○	○	○
Mode select 1, 2	MD1,MD2	○	○	○	○	○	○
Gain select 1, 2	GSL1,GSL2	○	○	○	○	○	○
Command direction inversion	RVS	○	-	○	-	-	-
Command selection 1 - 3	SS1 - SS3	○	○	○	○	○	○
Command selection 4 - 8	SS4 - SS8	-	-	-	-	○	○
Positioning drive	ZST	-	-	-	-	○	○
Deceleration LS	ZLS	-	-	-	-	-	○
External zero point marker	ZMK	-	-	-	-	-	○
External trigger	TRG	-	-	-	-	○	-
Command zero	CMDZ	○	○	○	○	○	○
Positioning cancel	ZCAN	-	-	-	-	○	○
Forward direction jog	FJOG	-	-	-	○	-	-
Reverse direction jog	RJOG	-	-	-	○	-	-

* ○: Supported, -: Not supported

*¹ Jog: Jog operation, POS: POS/INDX command, HOME: HOME command

Table 5-4 Output signal operation table

Signal name	Signal code	Run mode					
		Speed command	Torque command	Pulse train command	Built-in command* ²		
					Jog	POS	HOME
Alarm	ALM	○	○	○	○	○	○
Warning	WNG	○	○	○	○	○	○
Servo ready	RDY	○	○	○	○	○	○
Speed Zero	SZ	○	○	○	○	○	○
Position deviation range 1, 2	PE1,PE2	-	-	○	○	○	○
Positioning complete 1, 2	PN1,PN2	-	-	○	○	○	○
Positioning complete response 1, 2	PZ1,PZ2	-	-	-	-	○	○
Command complete	ZN	-	-	-	-	○	○
Command complete response	ZZ	-	-	-	-	○	○
Rough match	PRF	-	-	-	-	○	○
Speed attainment	VCP	○	-	○	○	○	○
Brake Release	BRK	○	○	○	○	○	○
Limit in-Process	LIM	○	○	○	○	○	○
Emergency stop in-process	EMGO	○	○	○	○	○	○
Zero return complete	HCP	○	○	○	○	○	○
Command zero in-process	HLDZ	○	○	○	○	○	○
Over travel in-process	OTO	○	○	○	○	○	○
Motor electrification in-process	MTON	○	○	○	○	○	○

* ○: Supported, -: Not supported

*²Jog: Jog operation mode, POS: POS/INDX command, HOME: HOME command

5-2-2 Speed command mode

In the speed command mode, speed command run is executed according to the speed command value specified in the analog speed command (INH) or a parameter.

1) Time chart

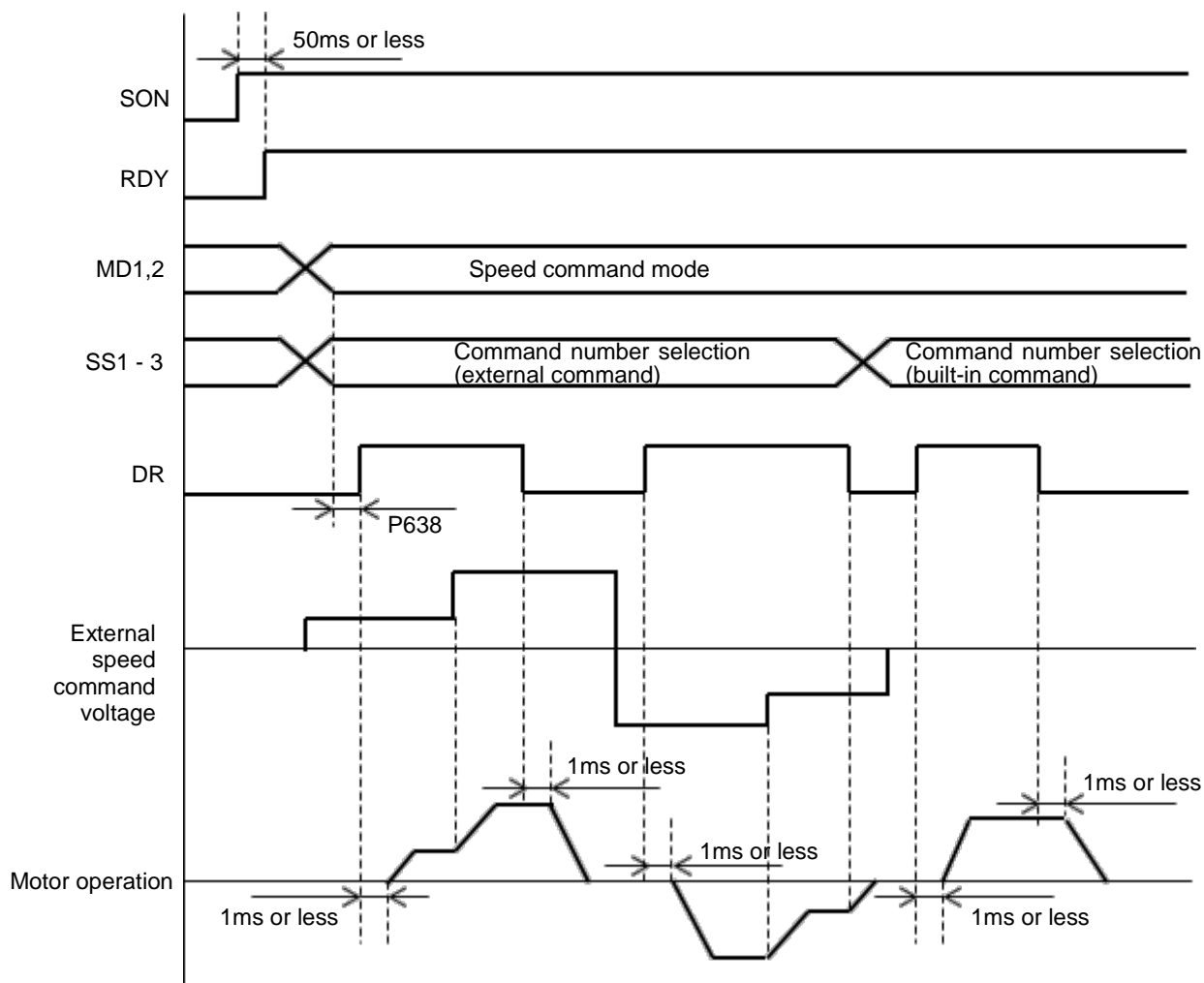


Figure 5-2 Speed command run time chart

2) Relations between the analog speed command and motor operation speed

- The motor operation speed is proportional to the analog speed command and the maximum speed is reached at $\pm 10\text{VDC}$ in the initial setting status. The speed command voltage at which the maximum motor speed is reached can be specified to a voltage between $\pm 0.001\text{VDC}$ and $\pm 99.999\text{VDC}$ in [P401: Analog speed command voltage gain]. The maximum input voltage range is $\pm 10\text{V}$, however.
- The motor runs in the forward direction with an analog speed command in which a positive voltage is specified. The motor can be run in the reverse direction with an analog speed command in which a positive voltage is specified using the setting in [P161: Moving direction selection].

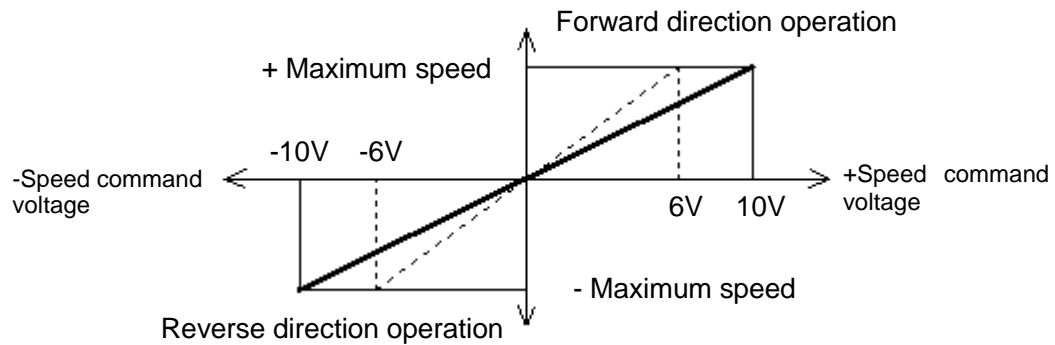


Figure 5-3 Relations between the analog speed command and motor operation speed

3) Relations between torque limit command and motor maximum output torque

- In the speed command mode, the maximum motor output torque can be limited with an analog command.
- The relevant torque limit specification can be selected with [P400: Analog torque command spec selection] to enable the torque in an analog torque command to be limited.
- The maximum motor output torque is proportional to the value in the analog torque limit command and is 300% torque at $+10\text{VDC}$ in the initial setting status. The analog torque command voltage at which the maximum motor torque is reached can be specified to a voltage between $\pm 0.001\text{VDC}$ and $\pm 99.999\text{VDC}$ in [P435: Analog torque command voltage gain].
- The common analog torque limit command is used both in the forward and reverse directions.
- The analog torque limit value or internal torque limit value, whichever is lower, is used as the torque limit value.

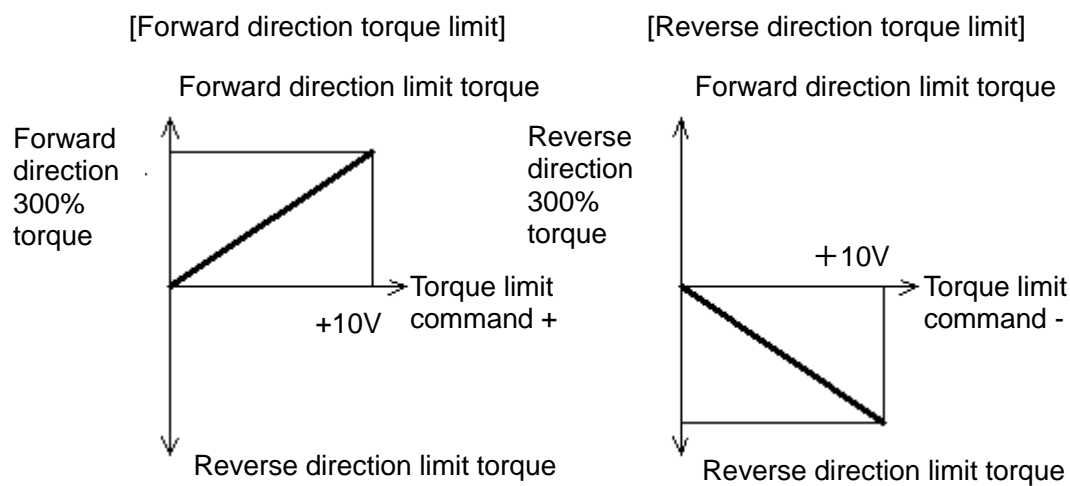


Figure 5-4 Relations between torque limit command and motor maximum output torque

5-2-3 Torque command mode

In the torque command mode, torque command run is executed according to the torque command value specified in the analog torque command (TQH) or a parameter.

1) Time chart

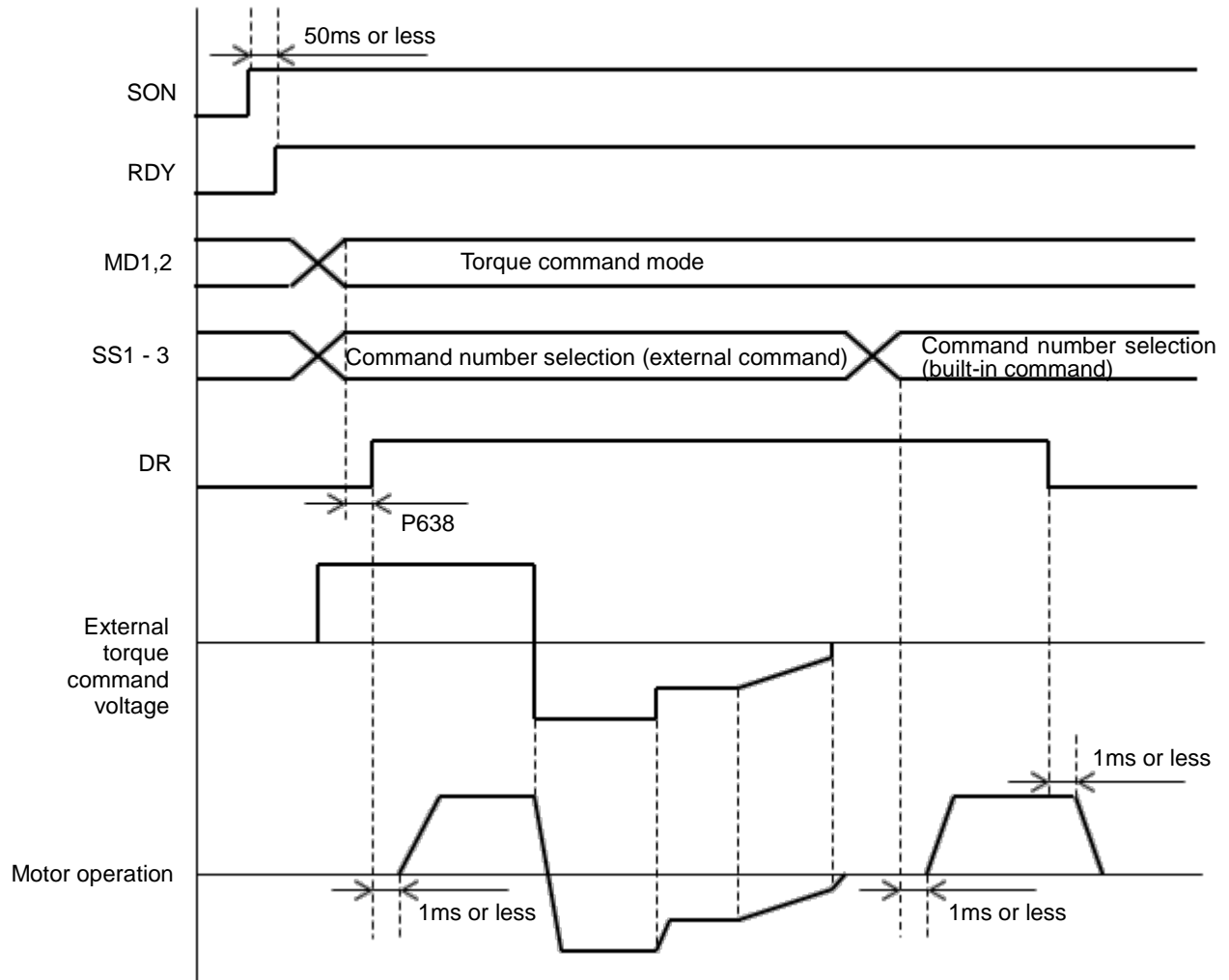


Figure 5-5 Torque command run time chart

Run

2) Relations between the analog torque command and motor output torque

- The motor output torque is proportional to the value in the analog torque command and is 300% torque at $\pm 10\text{VDC}$ in the initial setting status.
The torque command voltage at which the rated motor torque is reached can be specified to a voltage between $\pm 0.001\text{VDC}$ and $\pm 99.999\text{VDC}$ in [P435: Analog torque command voltage gain].
- The motor produces output torque in the forward direction with an analog torque command in which a positive voltage is specified.
The motor produces output torque in the reverse direction with an analog torque command in which a negative voltage is specified.

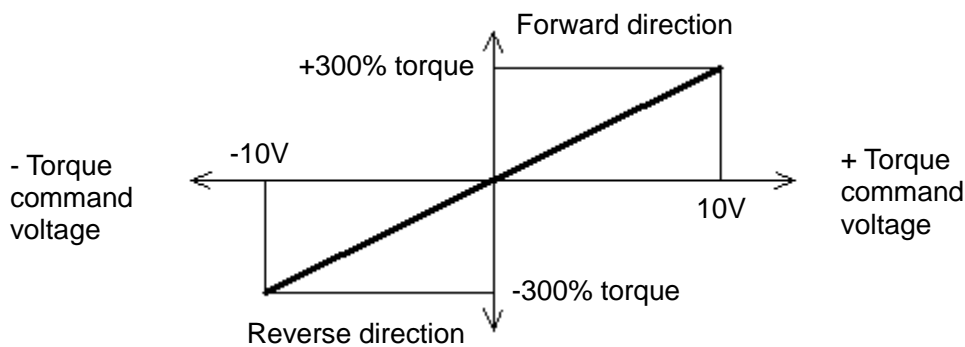


Figure 5-6 Relations between the analog torque command and motor output torque

3) Relations between speed limit command and motor maximum speed

- Maximum speed of motor can be limited to suppress increase of motor speed in the case of light load in torque control.
- The relevant speed limit specification can be selected with [P434: Analog speed command spec] to enable the speed in an analog speed command to be limited.
- The maximum motor speed is proportional to the value in the analog speed limit command and is reached at $+10\text{VDC}$ in the initial setting status.
- The analog speed limit command value or internal speed limit parameter value, whichever is lower, is used as the speed limit value.
- The common analog speed limit command and internal speed limit value are used both in the forward and reverse directions.

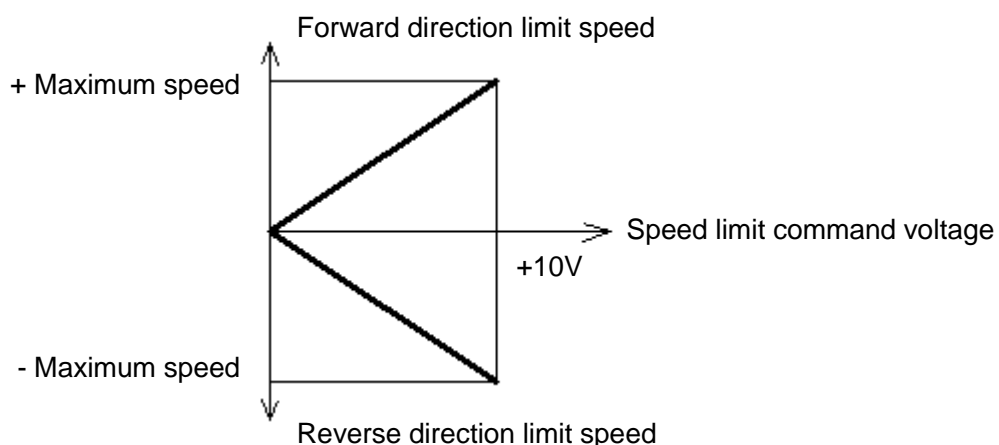


Figure 5-7 Relations between the speed limit command and motor operation speed

5-2-4 Pulse train command mode

In the pulse train command mode, run is executed according to the pulse train command.

1) Time chart

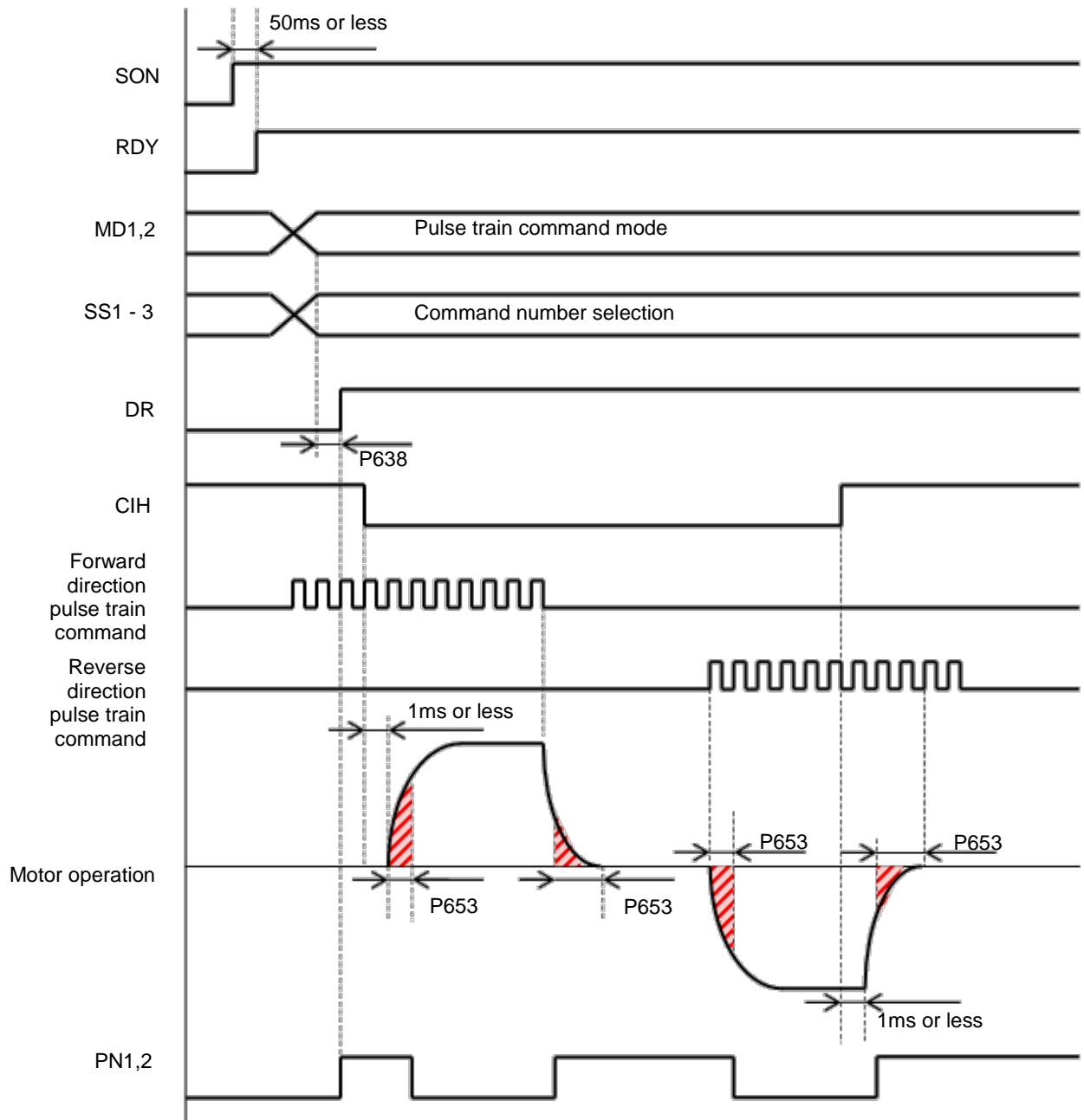


Figure 5-8 Pulse train command run time chart

About pulse train run

- The amount of operation per command pulse input pulse ^{*3} is the amount of the minimum setting unit.
- For the positioning complete signals (PN1 and PN2), the output signal condition is determined according to the setting of [P653,655: PE Signal deviation range] and the amount of deviation at that time.
- Time from a point where deviation enters the positioning complete range to a point where Positioning Complete signal is output can be set with [P654,656: PE Signal delay time].^{*4}

^{*3} Pulse obtained by calculating the pulse train command ratio

^{*4} When the specified PE signal deviation range is large, the PN signal may become ON even during motor rotation.

5-2-5 Built-in command mode (jog operation)

In the built-in command mode, when the forward direction jog signal (FJOG) or reverse direction jog signal (RJOG) is kept ON for at least 1ms, one-shot jog (*⁵) is performed. When the signal is kept ON for at least 100ms, jog operation is continuously performed.

When the forward direction jog signal (FJOG) and reverse direction jog signal (RJOG) are input at the same time, the motor performs deceleration stop. Acceleration/deceleration is performed according to the settings of SEL0 parameters.

1) Time chart

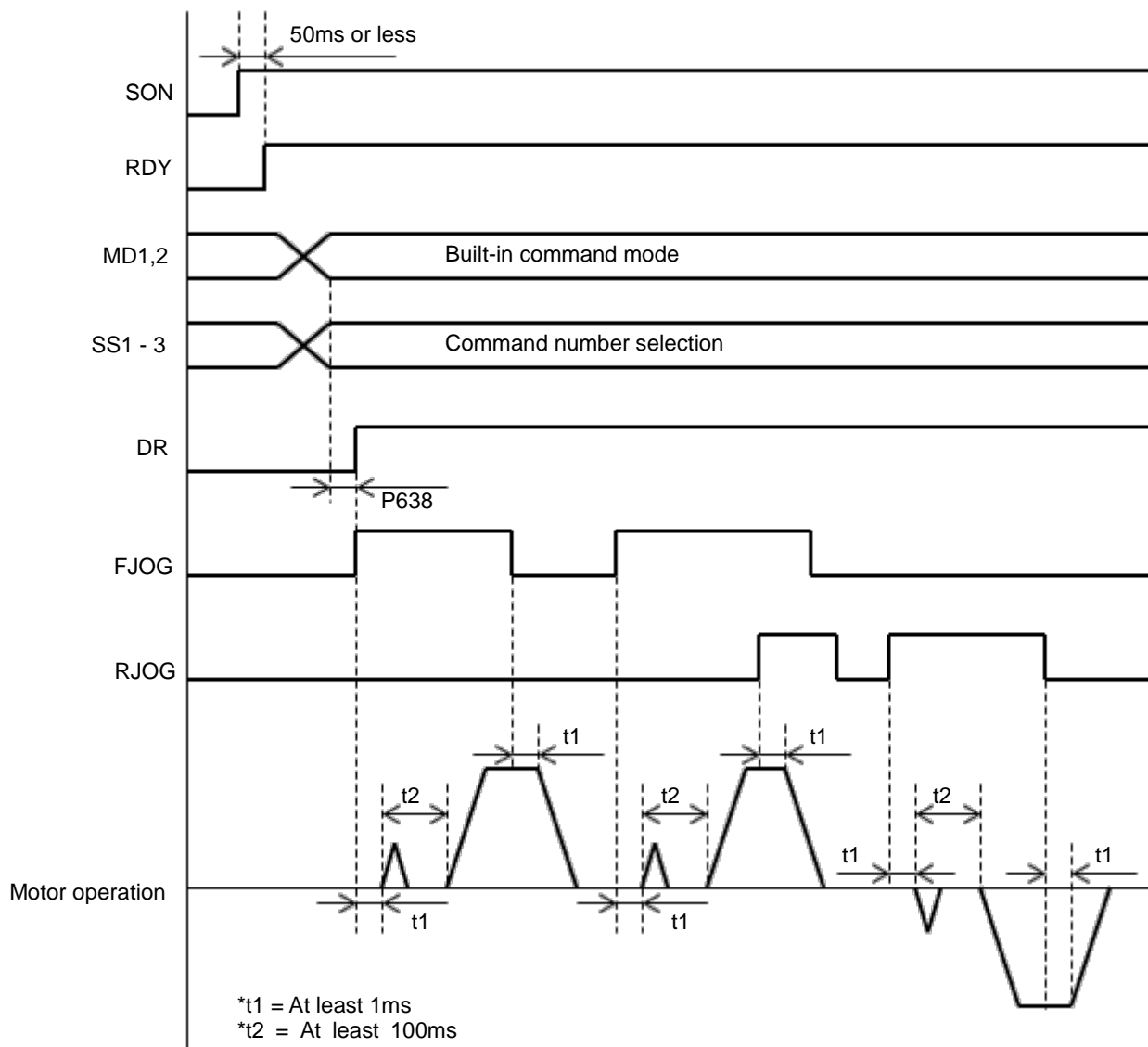


Figure 5-9 Built-in command jog operation time chart

*⁵ One-shot jog is to travel by the amount of the minimum setting unit.

5-2-6 Built-in command mode (POS command)

In the built-in command mode, positioning operation can be executed by specifying the address at which the POS command is set.

[P516: Positioning approval selection when homing is not completed] can be used to disable positioning operation before the completion of zero return.

Switching the positioning drive signal (ZST) ON executes the command at the specified address.

Use the command to set operation. For details, refer to "Chapter 8 Commands".

1) Time chart

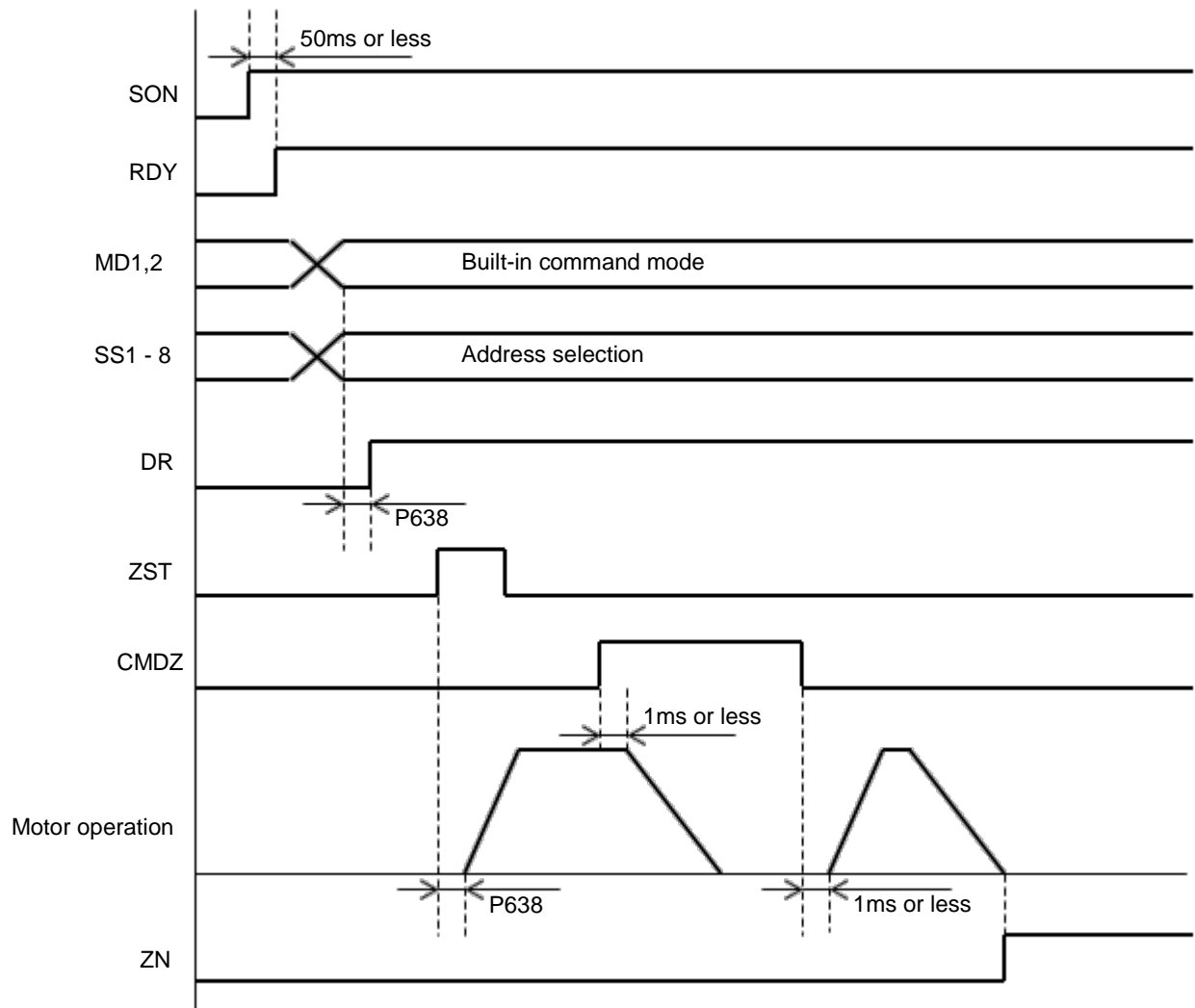


Figure 5-10 Built-in command POS command time chart

5-2-7 Built-in command mode (HOME command)

In the built-in command mode, zero return operation can be executed by specifying the address at which the HOME command is set.

During operation, the zero return speed follows the speed command value set in [P582: Homing creep speed] or the HOME command.

Switching the positioning drive signal (ZST) ON executes the command at the specified address.

There are several types of zero return modes. For details, refer to "Chapter 8 Commands".

1) Time chart

(a) STD HOME

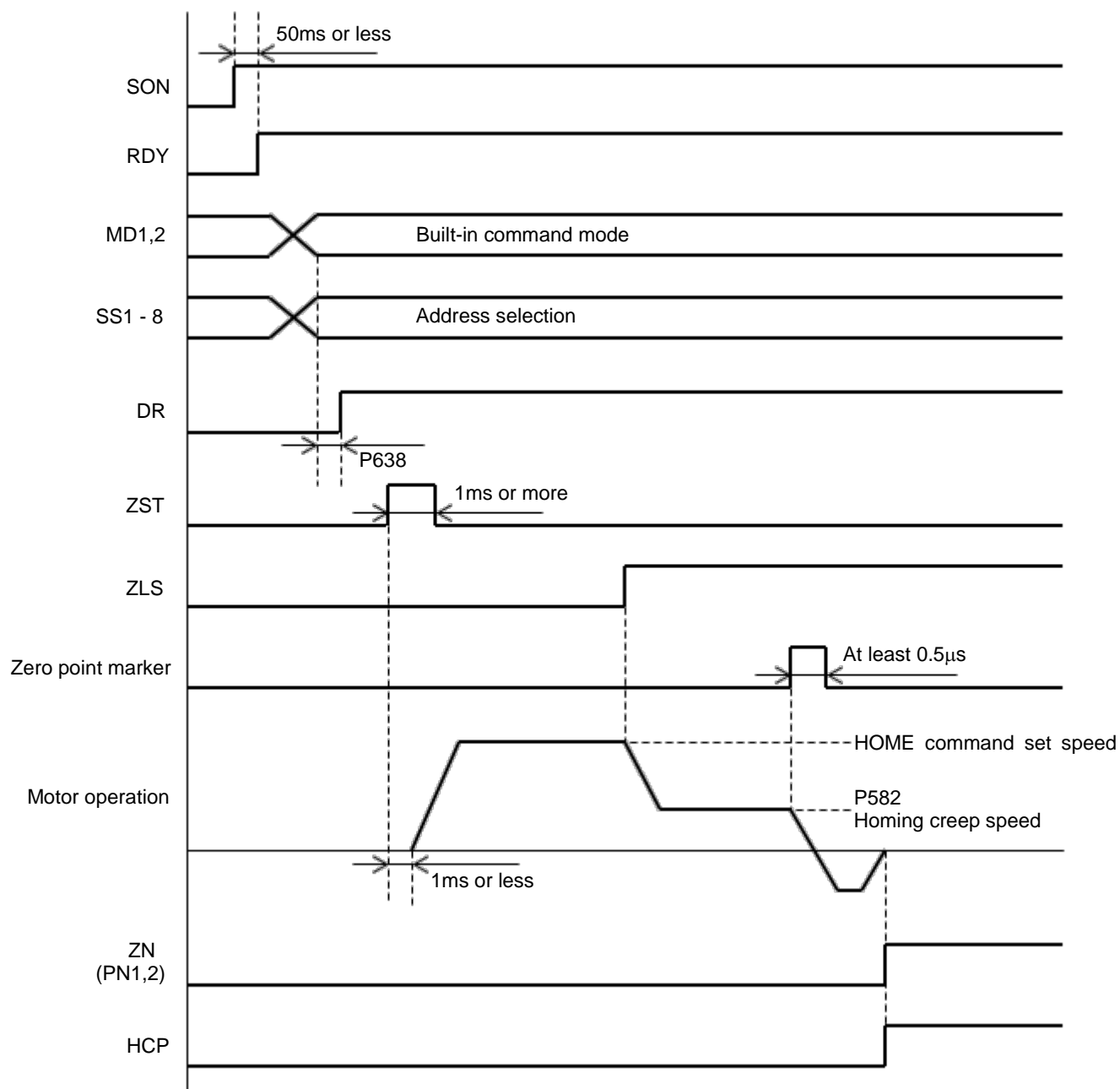


Figure 5-11 STD HOME time chart ①

(b) STD HOME

When [P584: Setting distance for homing] is set

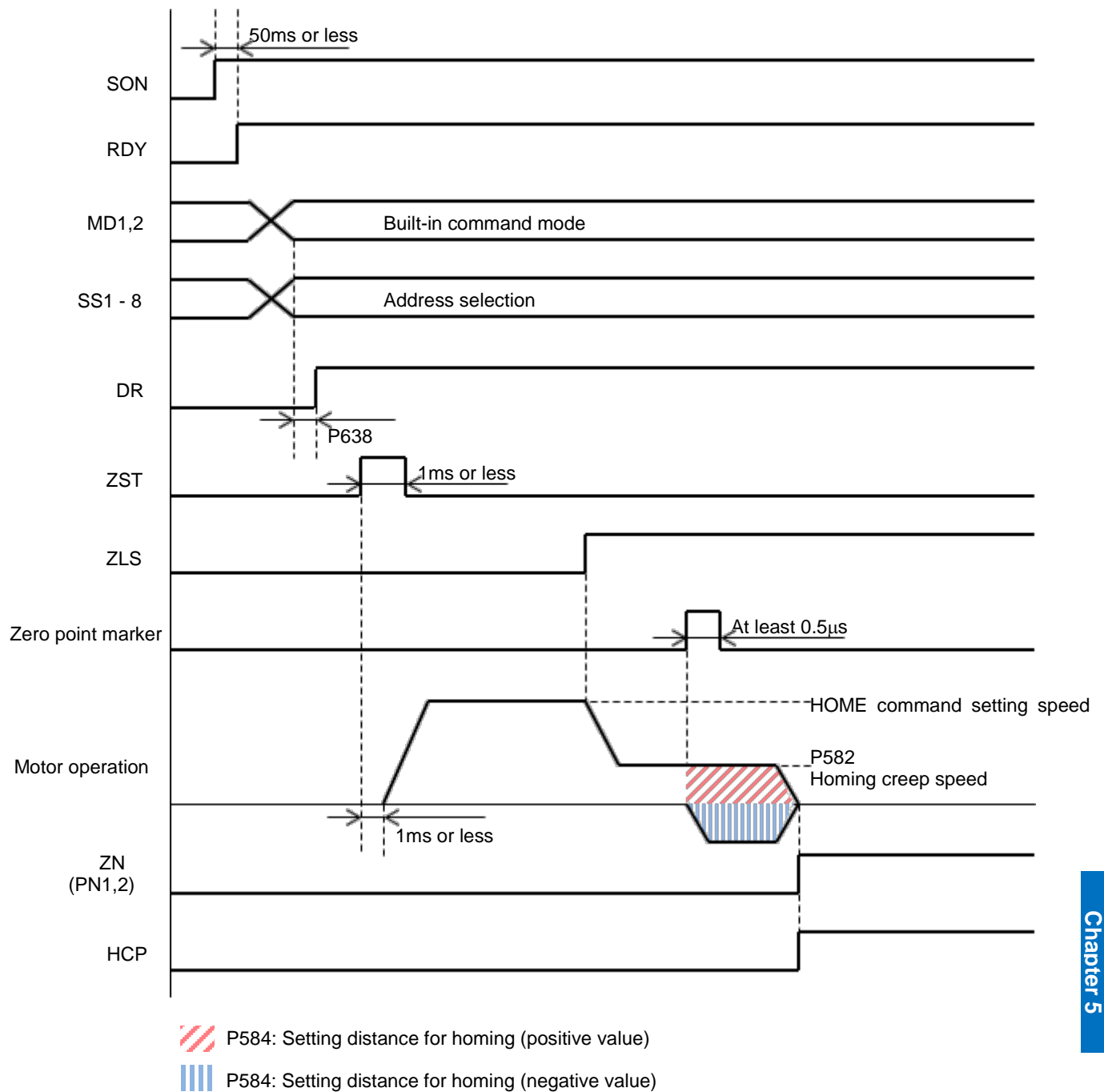


Figure 5-12 STD HOME time chart ②

Run

(c) STD HOME

When the command is executed in the ZLS signal ON state

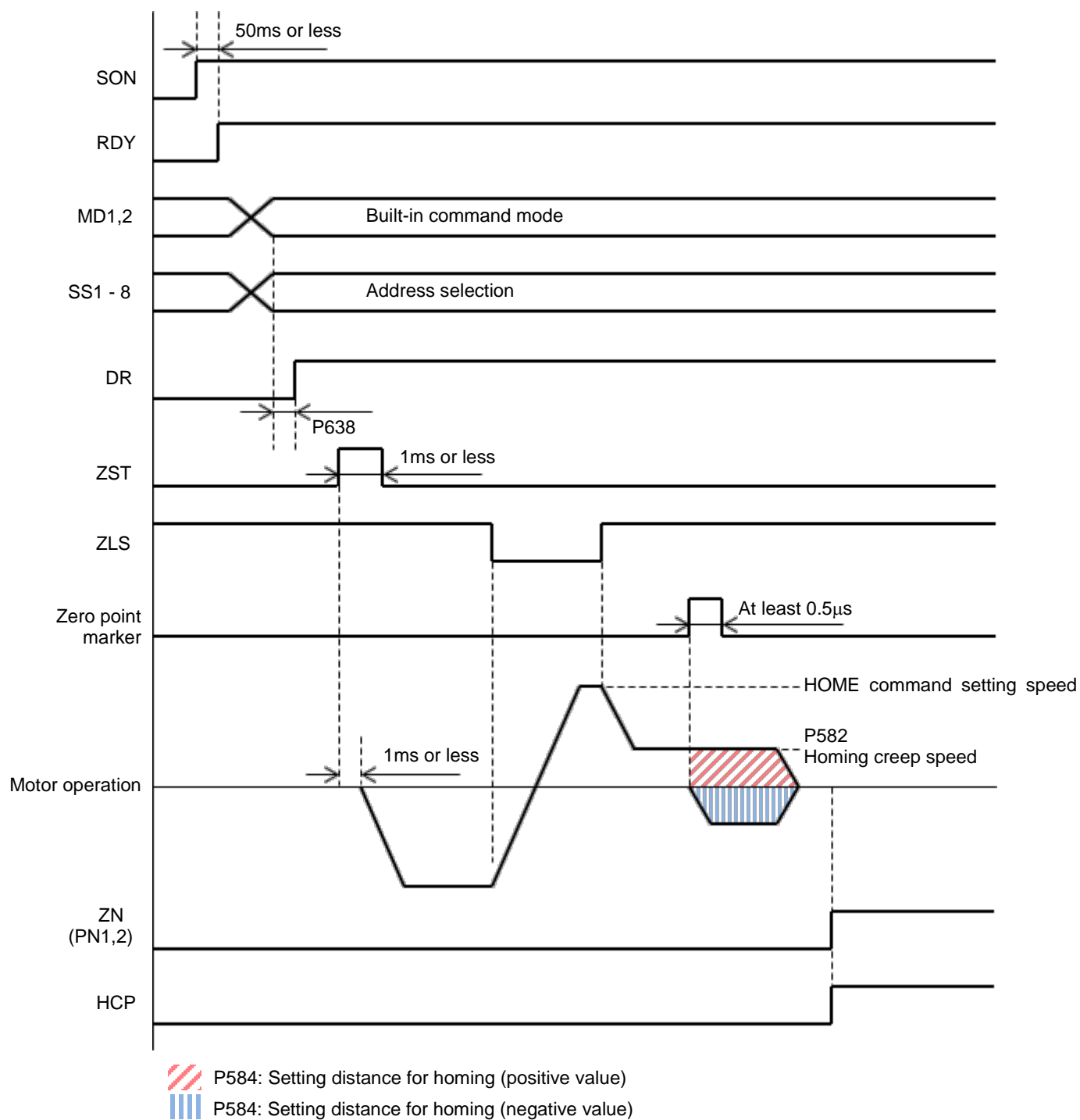


Figure 5-13 STD HOME time chart ③

(d) LS LESS

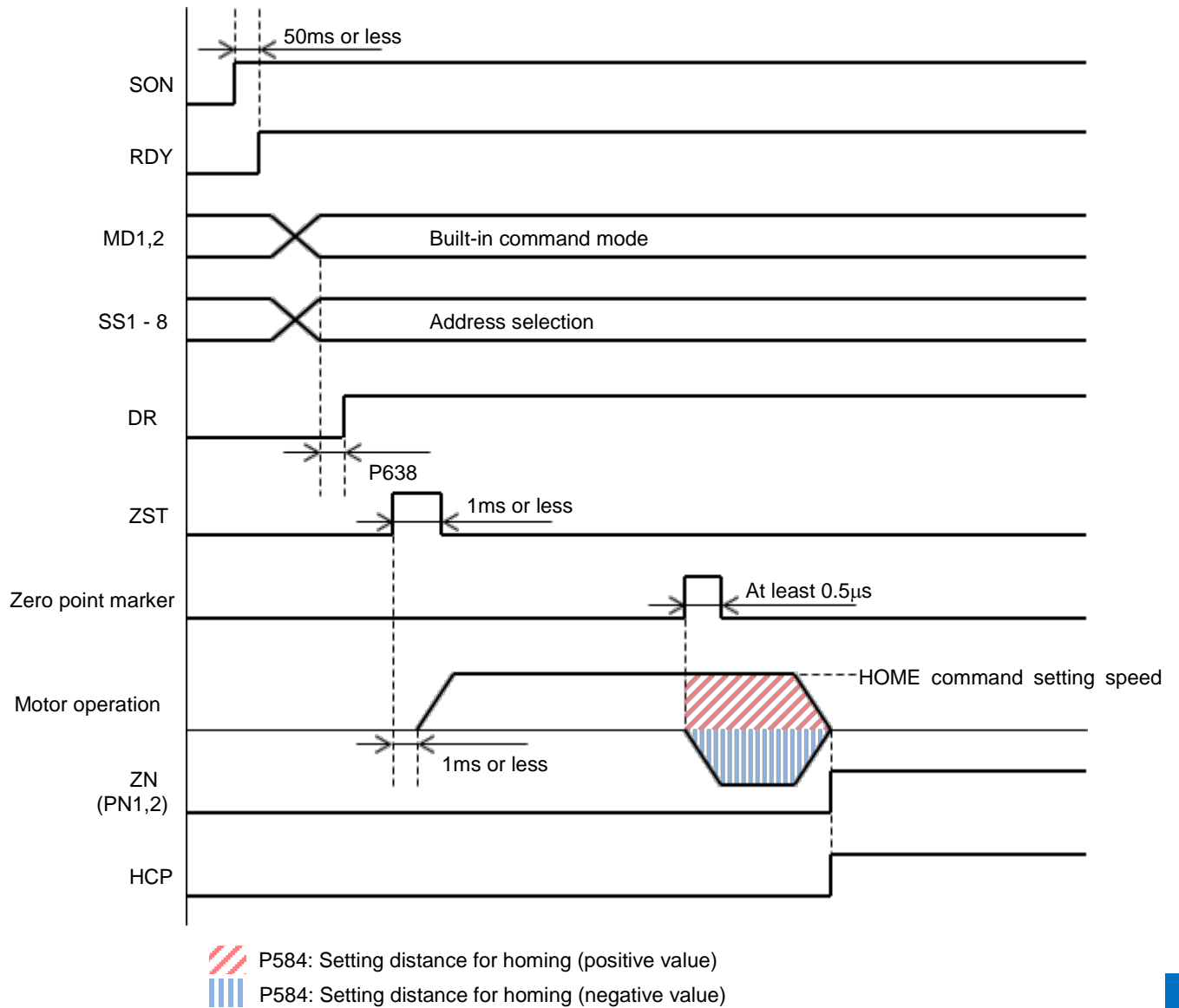


Figure 5-14 LS LESS time chart

(e) OT HOME

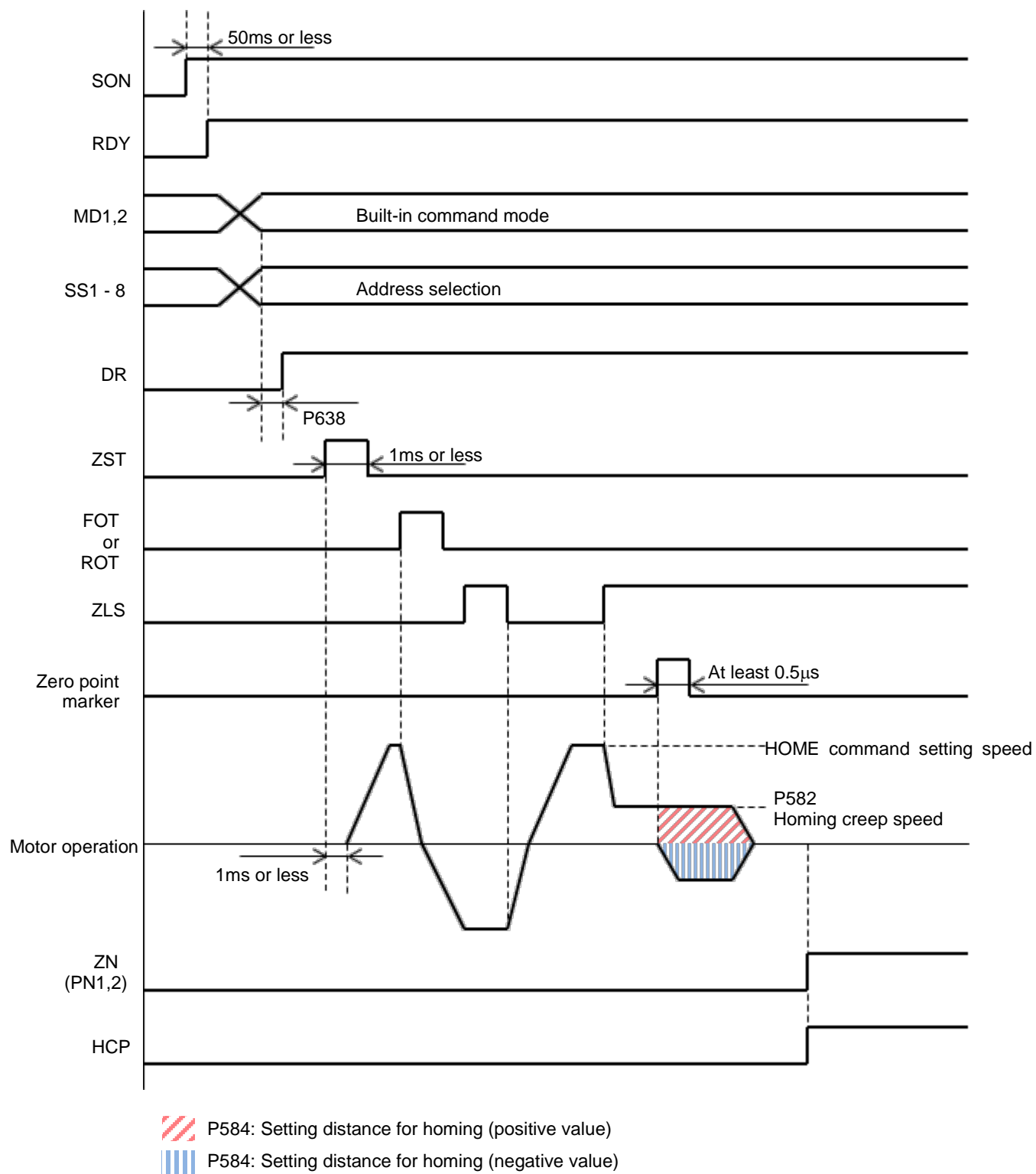


Figure 5-15 OT HOME time chart ①

(f) OT HOME

When the command is executed in the FOT or ROT signal ON state

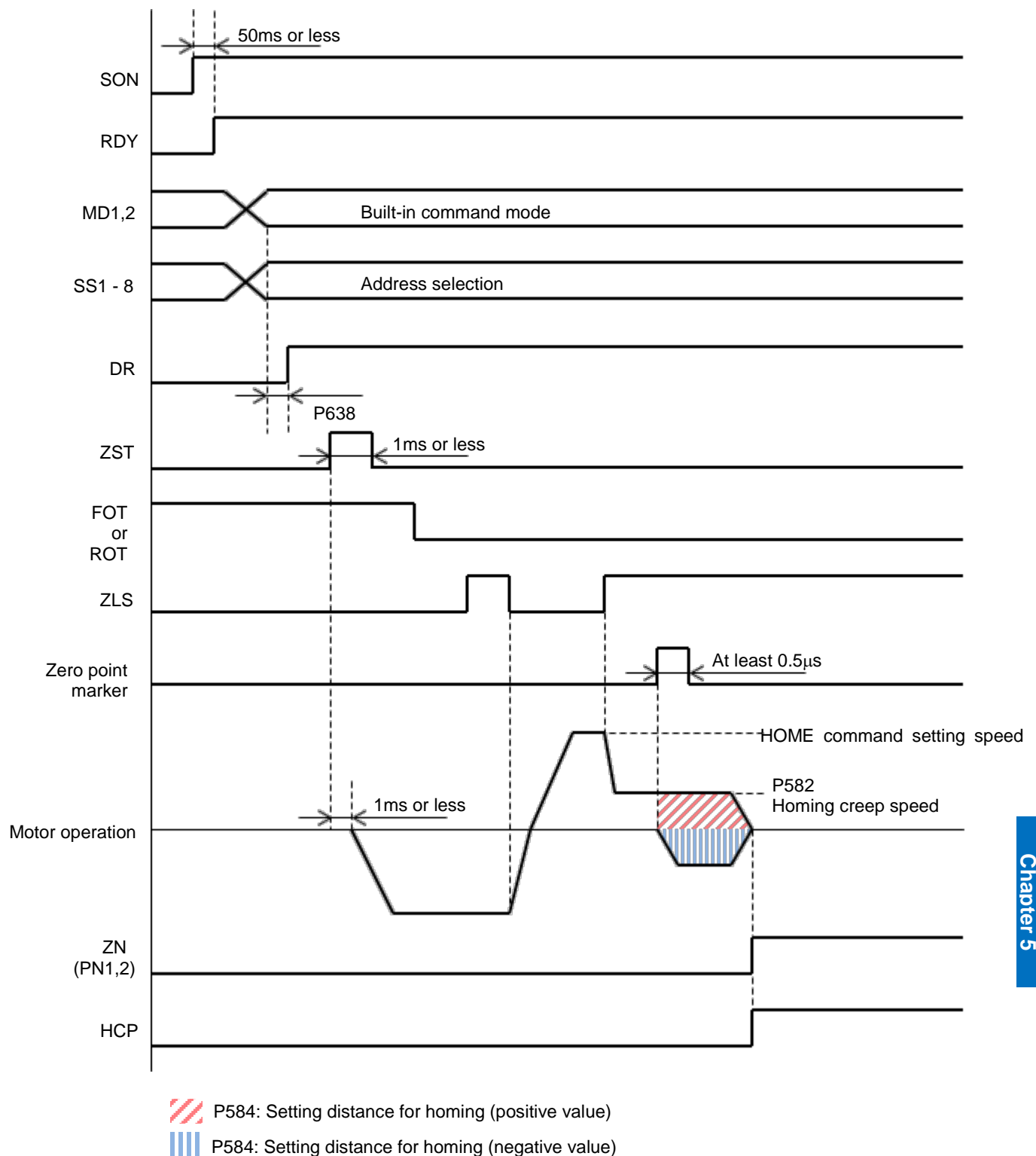


Figure 5-16 OT HOME time chart ②

Run

(g) SET ABS

When this command is executed, the value of the current position (C020) is set in [P168: ABS standard data].

When [P169: ABS standard mechanical position] is set, the [P169] value is used as the current position (C020) for the [P168] position.

This command can be executed also in the servo off status.

For details of the setting, refer to "5-7 Adjustment of the machine position of the ABS encoder".

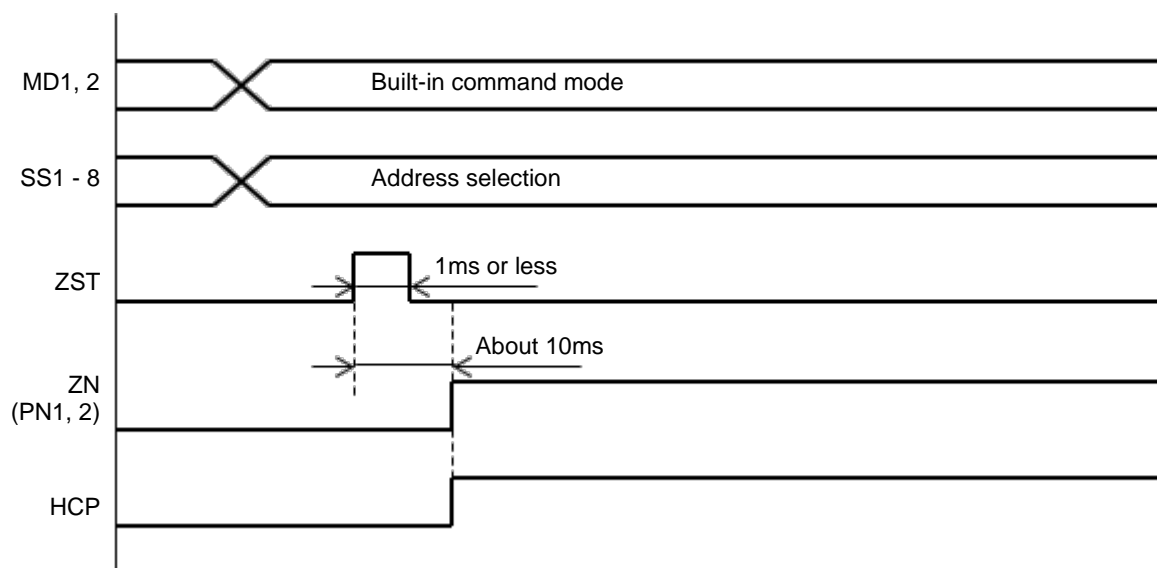


Figure 5-17 SET ABS time chart

(h) OUT POS

This command outputs the pulse count for the current position with the encoder pulse output. When the pulse count has been output, the command complete signal (ZN) is switched ON. This command can be executed also in the servo off status.

However, this command can be executed only when [6: P141/P142 division output] is set in [P140: Pulse output selection]. If an attempt is made to execute this command with another setting, a [pulse output selection setting error (AL.436)] occurs.

The output frequency is set to the zero return speed specified in the command. The value obtained by rounding the setting up to the nearest 20kpps is used as the actual output frequency.

[Example] Zero return speed = 123456
Current position = 987.654

Output frequency setting = 123.456kHz → Actual output frequency = 140kHz
987654 pulses are output with an output frequency of 140kHz.

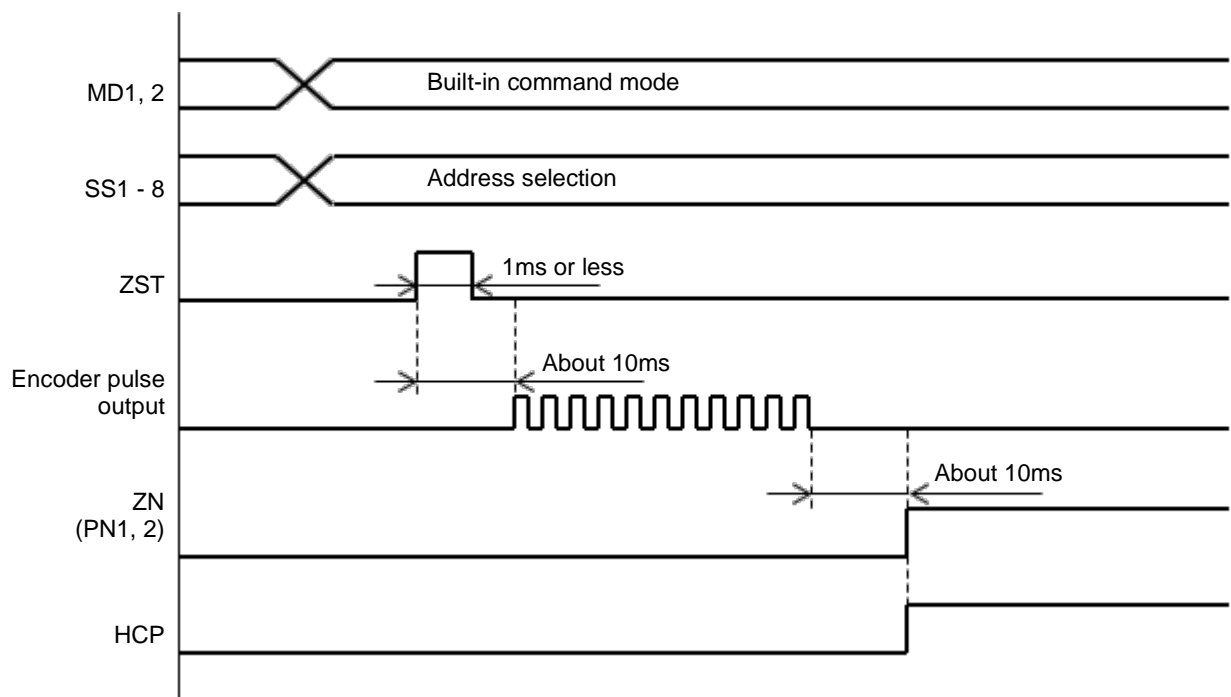





Figure 5-18 OUT POS time chart

Operate this device in accordance with following procedure.

- ① Be sure to conduct trial run.
- ② When conducting trial run, be very careful not to cause accident. To avoid problems, first run this device in the no-load status. After confirming no fault, connect the device to the machine.
- ③ When magnetic pole sensor is not used with τ DISC motor, at the power-on or after recovery from encoder errors, [automatic magnetic pole detection operation] is executed at the first Servo On. In this operation, note that motor performs Swing Motion. Swing motion in this operation depends on values in parameter [P380] to [P387] (Magnetic pole detection operation parameters). When this operation cannot be terminated normally, the motor stops due to error detection. During this operation, the servo ready signal (RDY) is not output. It is output after normal end.

 Caution		
 Prohibition	<ul style="list-style-type: none"> Do not touch terminal block of the device carelessly. Do not use the device leaving the cover of terminal block removed. Voltage also remains after the power is turned off. Confirm that the "CHARGE" LED on the device front panel goes off, then start work. 	Electric shock may occur.
 Prohibition	<ul style="list-style-type: none"> After duly confirming safety, switch ON/OFF the power supply. Note that motor performs swing motion in the automatic magnetic pole detection operation. In the case of machine that cannot carry out automatic magnetic pole detection operation at the power-on with τ DISC motor (due to interference on works, etc) use [Magnetic pole sensor]. 	Injury or failure may occur.

5-3-1 Power supply voltage check

- Confirm that the power supply voltage for the device satisfies required specification.
- For specification of the power supply voltage, refer to "12-1-5 Device electrical specification".

5-3-2 Trial run

1) Separation of motor and load

Remove connection between motor and machine system and make no-load status.
Disconnect CN1 before power-on.

2) Power-on

When the power is turned on, the initial status is displayed on the data display LED.

3) Setting the device and motor specifications

Set the motor specifications using VPH DES. (Refer to "Chapter 6 Parameters".)
On the "Driver/Motor selection" window of VPH DES, set the motor and encoder to be connected.

4) Servo ready state

- ① On the "Remote operation -> Switch BOX" window of VPH DES, set Operation mode to NC.
- ② Switch only the servo on signal (SON) ON. When the servo on signal (SON) is ON, the motor enters the status to generate torque and generates resisting torque against external force.
- ③ Switch the drive signal (DR) ON. The commands can be accepted.
- ④ If the motor rotates or an alarm occurs simultaneously when the drive signal (DR) is switched ON, check the error and remove the cause.

5) Confirming run operation

On the Switch BOX window, switch the forward direction jog signal (FJOG) or reverse direction jog signal (RJOG) ON to run the motor at about 10[deg/s]. Confirm that the operation speed is correct and there is no unusual sound or vibration.

All the device adjustments are set by parameters.

1) Connecting the motor to load

When trial run in the no-load status is finished, link the motor with a machine system.

Before starting operation, make sure that emergency stop, overtravel, and other functions reliably operate.

2) Auto-tuning

On "Adjustment function -> Self diagnosis" of VPH DES, execute auto-tuning.

3) Test run

- ① Start the "Adjustment function -> Test run" window of VPH DES.
- ② Set test run parameters and start test run.
- ③ Start "Analysis function -> Oscilloscope" of VPH DES and check the speed, deviation, and other items during operation.

4) Tuning level adjustment

- ① In the test run operation state, start the "Adjustment function -> Auto-tuning level adjustment" window.
- ② Adjust the auto-tuning level while checking deviation and other data with the oscilloscope.
When the level is too high, vibration occurs. Carefully adjust the level.

5-4-1 Adjustment at shipment

- For standard factory setting (initial value), refer to "6-2 Parameter list".
- This device is preset standard (initial value) at the factory before shipment; however, when linked with machine systems, readjustment can be required depending on load status and method to be used.

5-5 Automatic magnetic pole detection operation

When magnetic pole sensor is not used with τ DISC motor, "automatic magnetic pole detection operation" is executed in the operation below so as to confirm magnetic pole position of the motor by the device.

- In the initial Servo On operation after the power-on
- In the initial Servo On operation after recovery from encoder errors

- 1) Carefully perform this operation because the motor performs swing motion during the operation. The swing and motion in this operation depend on the settings of [P380] to [P387] (magnetic pole detection operation related parameters).

Table 5-5 Automatic magnetic pole detection operation related parameters

No.	Name	Input range [unit]
P380	Magnetic pole detection torque limit value	0 - 799 [%]
P381	Magnetic pole detection gain 1	0 - 9999
P382	Magnetic pole detection integration time constant	0.1 - 999.9 [ms]
P383	Magnetic pole detection gain 2	0 - 9999 [s ⁻¹]
P384	Magnetic pole detection complete range	0.0 - 30.0 [deg]
P385	Magnetic pole detection filter order selection	0: Primary 1: Secondary
	Magnetic pole detection filter frequency	0 - 9999 [Hz]
P386	Landing torque	0 - 799 [%]
	Landing torque holding time	0.00 - 99.99 [s]
P387	Magnetic pole detection torque minimum value	0 - 799 [%]
	Magnetic pole detection torque attenuation pattern selection	0: Slow attenuation 1: Rapid attenuation

- 2) Magnetic pole detection operation
Operation pattern during the automatic magnetic pole detection is as follows. ^{*6*7*8}
The servo ready signal (RDY) is not output during this operation. The signal is output after normal termination.

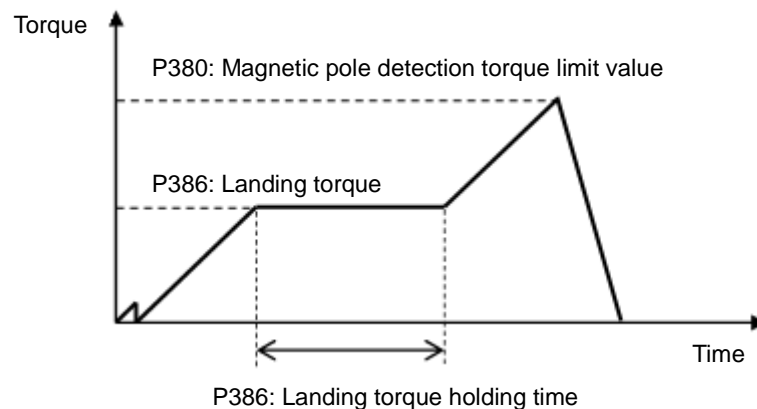


Figure 5-19 Automatic magnetic pole detection 1-time pattern operation

^{*6} The time required for automatic magnetic pole detection operation is four seconds plus the time set in [P386: Landing torque holding time].

^{*7} Figure 5-19 indicates operation pattern for one time. In the actual automatic magnetic pole detection, it needs operation for two times.

When the [P386] setting is "0", however, automatic magnetic pole detection needs operation for three times.

^{*8} When the [P386] setting is "0", the slope of output torque is linear until it reaches the [P380] setting from the "0" status. The time required to reach the [P380] setting from the "0" status is 500ms.

Run

- 3) If this operation cannot end normally, operation stops with an alarm "Magnetic pole detection error".
In this case, causes below can be suspected.
- Unbalanced load
 - Big friction
 - Big load inertia
 - Big change in load inertia
 - Too low rigidity in the loaded machine
 - Too big plays and backlash in the loaded machine
 - In the automatic magnetic pole detection operation (swing motion), the machine hits stoppers.
 - Improper setting in motor and encoder relating parameters
 - Improper setting in parameters relating magnetic pole detection operation
- 4) Automatic magnetic pole detection operation adjustment
- ① P380: Magnetic pole detection torque limit value
 - Torque limit value is set according to the motor to use.
 - The larger the setting value is, the quicker the response is, while producing bigger torque by the motor.
 - If the setting value is decreased too much, response becomes slow and it makes magnetic pole detection difficult.
 - ② P381: Magnetic pole detection gain 1
 - The larger the setting value is, the quicker the response is.
 - If the setting value is increased too much, vibration occurs.
 - If the setting value is decreased too much, response becomes slow and it makes magnetic pole detection difficult.
 - ③ P832: Magnetic pole detection integration time constant
 - The smaller the setting value is, the quicker the response is.
 - If the setting value is decreased too much, vibration (chatter vibration) occurs.
 - If the setting value is increased too much, response becomes slow and it makes magnetic pole detection difficult.
 - ④ P383: Magnetic pole detection gain 2
 - The larger the setting value is, the quicker the response is.
 - If the setting value is increased too much, over-shoot, under-shoot, or vibration occurs.
 - If the setting value is decreased too much, response becomes slow and it makes magnetic pole detection difficult.
 - ⑤ P385: Magnetic pole detection filter frequency
 - If machine resonance occurs, enter a filter to torque command and fix it.
 - The larger the setting value is, the quicker the response is.
 - If the setting value is decreased too much, response becomes slow and it makes magnetic pole detection difficult.
 - ⑥ P386: Landing torque
 - The landing torque value is set according to the torque limit value at magnetic pole detection.
 - If the setting value is decreased too much or too close in comparison to the torque limit value at magnetic pole detection, it makes magnetic pole detection difficult.
 - ⑦ P386: Landing torque holding time
 - The landing torque holding time is set according to the torque limit value at magnetic pole detection.
 - The larger the setting value is, the more stable the magnetic pole detection operation in the landing torque becomes, but magnetic pole detection time becomes long.



Caution

- In the case of machine that cannot carry out [automatic magnetic pole detection operation (swing motion of the motor)] at the power-on (due to interference between works, etc.), use the [magnetic pole sensor].
- Note that the motor performs swing motion in the automatic magnetic pole detection operation.

5-6 Active vibration control filter

This device is equipped with the active vibration control filter function, to cope with resonant frequency caused by minute vibration or to cope with low-rigidity machines.

This function can suppress resonance in the case of low frequency vibration.

(1) Setting parameters

When setting this function, correctly set the parameters below.

Table 5-6 Active vibration control filter related parameters

Parameter No.	Name	Input range (unit)	Remarks
P340	Vibration control filter ineffective speed range ^{*9}	0.00 - 99999.999 [rpm]	
P341	Vibration control filter center frequency ^{*9}	0 - 4999 [Hz]	
P341	Vibration control filter band width ratio ^{*9}	0 - 100 [%]	Ratio to the vibration control filter center frequency

(2) Operation pattern

Operation with the active vibration control filter set is as follows. ^{*10*11}

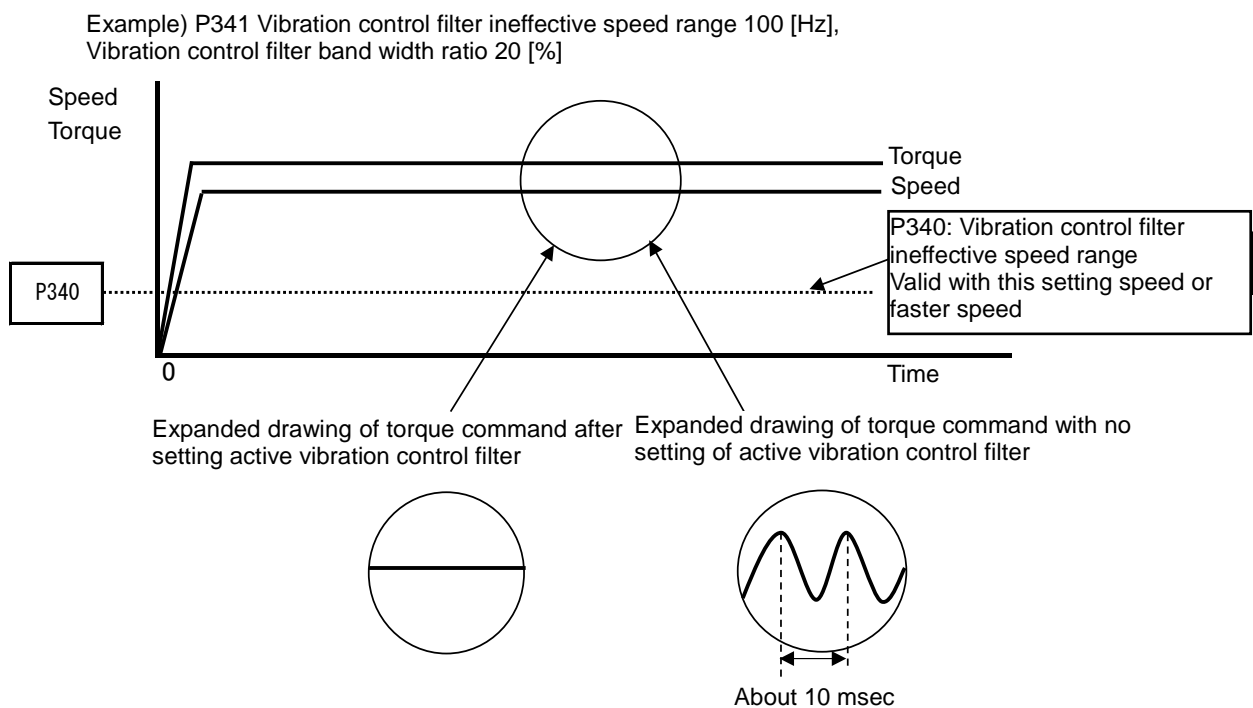


Figure 5-20 Active vibration control filter setting example in case of 100 [Hz] vibration occurrences

(3) Limits

When this function is valid, it can bring bad influence to motor acceleration/deceleration operation. Set the correct value to [P340], according to the contents of operation.

^{*9} If an appropriate value is not set to any of parameters P340/P341, the motor does not operate normally. When P340 or P341 is set to "0", the active vibration control filter function is disabled.

^{*10} Filter values can be set only in manual manner.

^{*11} Filter values can be determined based on the torque, speed, and deviation waveform.

5-7 Adjustment of the machine position of the ABS encoder

5-7-1 Initialization of the ABS encoder

In the following cases, initialize the ABS encoder:

- First start-up of the machine
- Motor replacement

5-7-2 ABS encoder position setting

Make settings for associating the machine standard position with the current position (C020).

1) Setting parameters

To set this function, set the following parameters.

Table 5-7 Parameters related to the adjustment of the machine position of the ABS encoder

Parameter No.	Name	Input range	Unit
P060	Encoder type	0 - 14	
P168	ABS standard data	-2147483648 - 2147483647	FB resolution
P169	ABS standard mechanical position	-2147483648 - 2147483647	P161 setting unit

2) Setting procedure

Follow the procedure below to set this function.

① Encoder type setting

Set [P060: Encoder type]. Select the ABS encoder (S-ABS2).

② ABS standard data setting

Set [P168: ABS standard data]. Set a position to be used as the machine standard position.

You can also execute the SET ABS command to automatically set P168.

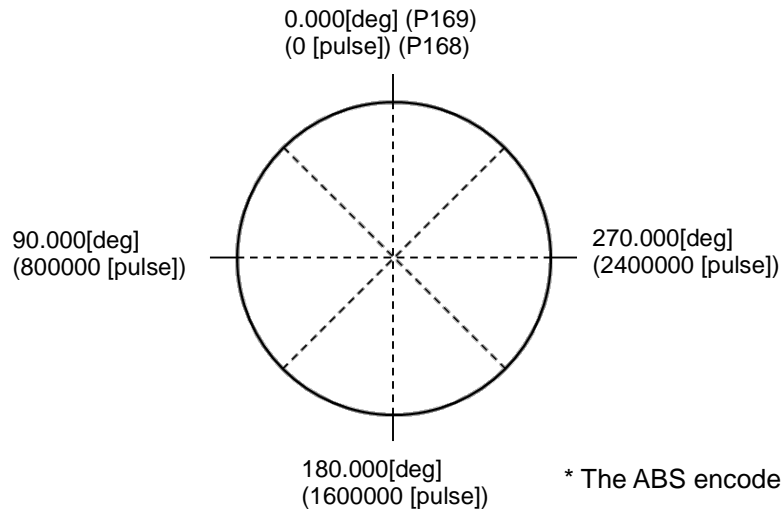
For details of the procedure using the command, refer to "5-7-3 ABS encoder position setting using a command".

③ ABS standard mechanical position

Set [P169: ABS standard mechanical position]. Set the value to be displayed as the current position (C020) for the [P168] position.

[Example 1]

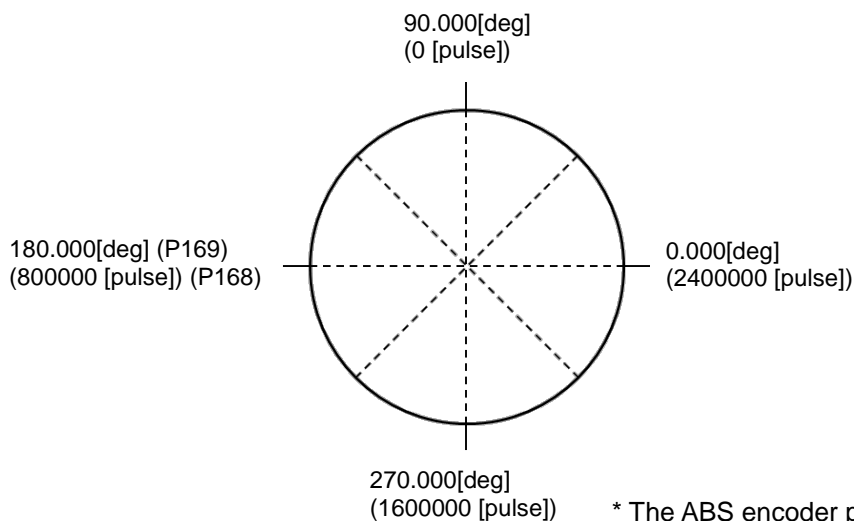
P061: Encoder pulse of rotary type motor	= 3200000 [ppr]
P161: Position unit selection	= deg
P161: Position decimal point unit selection	= 0.0001
P165: Rotation position range	= 360.000 [deg]
P168: ABS standard data	= 0 [pulse]
P169: ABS standard mechanical position	= 0 [deg]



* The ABS encoder position is indicated in parentheses.

[Example 2]

P061: Encoder pulse of rotary type motor	= 3200000 [ppr]
P161: Position unit selection	= deg
P161: Position decimal point unit selection	= 0.0001
P165: Rotation position range	= 360.000 [deg]
P168: ABS standard data	= 800000 [pulse]
P169: ABS standard mechanical position	= 180 [deg]



* The ABS encoder position is indicated in parentheses.

Run

5-7-3 ABS encoder position setting using a command

Execute the SET ABS command to adjust the machine position. Executing SET ABS at a desired position automatically sets the motor current position (C020) and displays the P169 value as the current position (C020).

[Example 1]

When SET ABS is executed at the current position 1600000 [pulse]

P061: Encoder pulse of rotary type motor = 3200000 [ppr]

P161: Position unit selection = deg

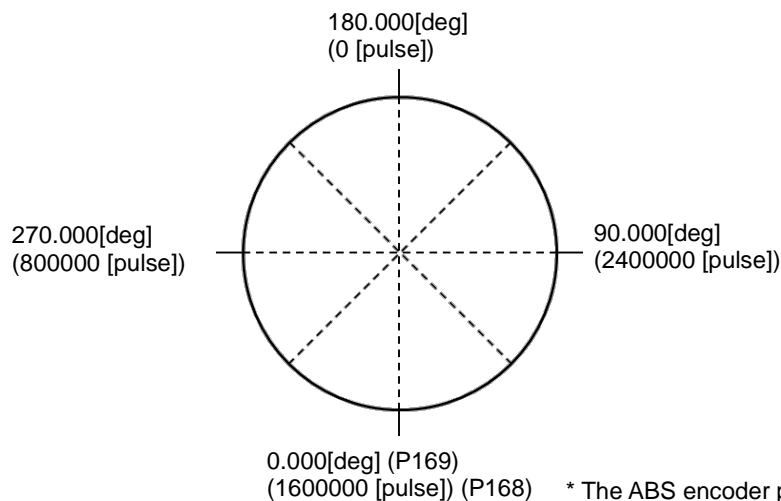
P161: Position decimal point unit selection = 0.0001

P165: Rotation position range = 360.000 [deg]

P169: ABS standard mechanical position = 0 [deg]

[P168] is automatically set after the execution of SET ABS.

P168: ABS standard data = 1600000 [pulse]



Chapter 6 Parameters

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6-1 Parameter group list

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

Table 6-1 Parameter group list

Parameter group* ¹	Parameter group name	
	Parameter range	Classification in the parameter group
0	Motor- and encoder-related parameters	
	P000 -	Motor parameters
	P060 -	Encoder and magnetic pole parameters
	P080 -	Motor characteristic change parameters
	*P000 - P079 can be set with the "control device and motor selection" of VPH DES.	
1	Device- and machine specification-related parameters	
	P100 -	Device specification parameters
	P120 -	Error specification parameters
	P140 -	Pulse output parameters
	P150 -	Reserved
	P160 -	Unit and coordinate parameters
2, 3	Servo adjustment-related parameters	
	P200 -	Gain-related parameters
	P210 -	Gain No. 0 parameters
	P240 -	Gain No. 1 parameters
	P270 -	Gain No. 2 parameters
	P300 -	Gain No. 3 parameters
	P330 -	Common filter parameters
	P380 -	Automatic magnetic pole detection adjustment parameters
4, 5	Command-related parameters	
	P400 -	Speed command parameters
	P434 -	Torque command parameters
	P465 -	Pulse train command parameters
	P515 -	Built-in command SEL0 to SEL7 parameters
	P573 -	Jog and zero return command parameters
6	Self-diagnosis- and input and output-related parameters	
	P600 -	Front panel- and self-diagnosis-related parameters
	P620 -	Input and output signal parameters
7	Communication-related parameters	
	P700 -	USB communication, general-purpose communication, and field net parameters
8	P800 -	Standard device addition parameters
9	P900 -	Special spec parameters

*¹ The numerical value following the P in the parameter item is a parameter number.

6-2 Parameter list

Parameter No., parameter name, and unit for each parameter group are listed below.

6-2-1 Motor- and encoder-related parameters (group 0)

No.	Target digit	Parameter name	Unit
P000		Motor Identification code	
P001 - P005		Various code areas for data editing software	
P006		Driver combination rated output	kW
P007		Driver combination power voltage	V
P008	1	Driver combination main power supply single phase / 3 phase	
	2	Driver combination main power supply AC /DC power source	
P009	3 - 1	Driver combination revision	
	7 - 4	Driver combination special spec code	
P010	1	Motor type identification	
	2	Main power supply type for the driver to match with motor	
P011		Motor rated output	kW
P012		Motor rated current	A
P013		Motor momental max. current	%
P014		Motor rated speed	rpm
P015		Motor torque/force constant	Nm/A
P016		Number of poles	poles
P018		Motor phase resistance	mΩ
P019		Motor phase inductance (Lq)	mH
P020		Motor phase inductance (Ld)	mH
P021		Current cut off frequency	Hz
P028	3 - 1	Phase control division ratio	%
	6 - 4	Phase control integrated limit value	%
P030	3 - 1	Motor electronic thermal detected actual value	%
	7 - 4	Motor electronic thermal detection time	s
P031	3 - 1	Motor 1 phase concentration electronic thermal detection ratio	%
	5 - 4	Motor 1 phase concentration electronic thermal detection motion range	rev
	7 - 6	Motor 1 phase concentration electronic thermal detection low speed range	rps
P032	3 - 1	Dead time compensation factor	%
	6 - 4	Dead time compensation low current control range	%
P033		Dead time compensation invalid speed	rpm
P034	3 - 1	Current command variation limit value	%
	6 - 4	Voltage output limit value	%
	9 - 7	Current loop integral stop voltage	%
P035	3 - 1	Reserved	%
	6 - 4	Induced electromotive force compensation rate	%
P036		Incoherence compensation ratio	%
P037	3 - 1	Torque electric angle position phase correction angle	deg
	6 - 4	Torque electric angle position phase correction start speed	%
	9 - 7	Torque electric angle position phase correction complete speed	%
P038	3 - 1	Speed electric angle phase correction angle	deg
	6 - 4	Speed electric angle phase correction starting speed	%
	9 - 7	Speed electric angle phase correction complete speed	%
P039	3 - 1	d axis current ratio	%
	6 - 4	d axis current start speed	%
	9 - 7	d axis current complete speed	%
P040	3 - 1	1st torque correction value	%
	6 - 4	1st torque correction value start speed	%
	9 - 7	1st torque correction value complete speed	%
P041	3 - 1	2nd torque correction value	%

Parameters

No.	Target digit	Parameter name	Unit
P042	6 - 4	2nd torque correction value start speed	%
	9 - 7	2nd torque correction value complete speed	%
	3 - 1	Torque correction ratio for 6th harmonic	%
	6 - 4	Torque correction shift electric angle for 6th harmonic	deg
P043	3 - 1	Reserved	
	6 - 4	PWM drive circuit fully charged waiting time	ms
	8 - 7	PWM drive circuit charging time	ms
P060		Encoder type	
P061		Encoder pulse of rotary type motor	Mppr (resolution)
P066		Encoder input direction switching	
P067		Max. speed of motor	
P068		Magnetic pole sensor type	
P070		Encoder wire breakage detection filter selection	
P080		Max torque limit value +	%
P081		Max torque limit value -	%
P082		Motor max speed special setting	rpm
P083	3 - 1	Motor electronic thermal detection actual value	%
	7 - 4	Motor electronic thermal time constant	s
P084	3 - 1	Motor 1 phase concentration electronic thermal detection ratio	%
	5 - 4	Motor 1 phase concentration electronic thermal detection motion range	rev
	7 - 6	Motor 1 phase concentration electronic thermal detection low speed range	rps
P085	3 - 1	Regenerative resistor	Ω
	9 - 4	Regenerative resistor capacity	kW
P086	3 - 1	Regenerative resistor overload detection ratio	%
	7 - 4	Regenerative resistor load time constant	s

6-2-2 Device- and machine specification-related parameters (group 1)

No.	Target digit	Parameter name	Unit
P100		Carrier frequency setting	kHz
P103	1	Dynamic break spec selection	
	3 - 2	Servo On delay time setting after dynamic brake is off	ms
P104		Absolute position compensation action entry	
P120		Servo control abnormality detection dead band torque	
P121	1	Main power OFF abnormality detection selection specifications	
	4 - 2	Main power OFF abnormality detection time	ms
P122	2 - 1	Main power supply voltage drop detection value	%
	6 - 3	Main power supply AAC./DEC. drop time constant	ms
	9 - 7	Main power supply torque drop limit Fluctuation changing time	ms
P123	3 - 1	Main power supply speed drop limit	%
	6 - 4	Main power supply recovery speed drop additional value	%
	9 - 7	Main power supply drop torque limit value	%
P126	1	Overload abnormal motion selection	
	4 - 2	Overload abnormal deceleration torque limit value	%
P127	1	Over speed abnormality spec selection	

No.	Target digit	Parameter name	Unit
	4 - 2	Over speed abnormality detection speed	%
P140	2 - 1	Pulse output selection	
P141		Pulse output selection dividing numerator	
P142		Pulse output selection dividing denominator	
P143		Marker output position	FB position
P160		Inertia and viscous friction range selection	
P161	1	Moving direction selection	
	2	Position unit selection	
	3	Position decimal point unit selection	
P162		Electronic gear numerator ratio	
P163		Electronic gear denominator ratio	
P164		Mechanical movement	P161 setting unit
P165		Rotation position range	P161 setting unit
P166		Rotation position range sign switching position	P161 setting unit
P167		ABS multi turn limit	Rotation speed
P168		ABS standard data	FB resolution
P169		ABS standard mechanical position	P161 setting unit
P170		Present position reflection selection after main power of ABS is ON	
P171		Positive direction soft OT limit	P161 setting unit
P172		Negative direction soft OT limit	P161 setting unit
P173		Max travel amount for positive direction positioning	P161 setting unit
P174		Max travel amount for negative direction positioning	P161 setting unit
P175		Position deviation exorbitance detection pulse at Servo OFF -> Servo ON	FB resolution
P176		Position deviation exorbitance detection pulse Max. value	FB resolution
P177		Position deviation exorbitance detection pulse Min value	FB resolution
P178		Position deviation exorbitance detection ratio	%
P179		S-curve time 2	ms

6-2-3 Servo adjustment-related parameters (groups 2 and 3)

No.	Target digit	Parameter name	Unit
P200	3 - 1	Speed detection filter time constant for gain switching	ms
	6 - 4	Position deviation detection filter time constant for gain switching	ms
P210		Gain No. 0 Low speed gain switching speed	rpm
P211		Gain No. 0 Low speed gain switching deviation pulse	FB resolution
P212	3 - 1	Gain No. 0 Normal speed -> Low speed gain switching time constant	ms
	6 - 4	Gain No. 0 Low speed -> Normal speed gain switching filter time constant	ms
	7	Gain No. 0 Low speed gain switching spec 1 selection	
	8	Gain No. 0 Low speed gain switching spec 2 selection	
P213	4 - 1	Gain No. 0 Low speed gain switching delay time	ms
	9 - 5	Gain No. 0 Low speed gain holding time after switching	ms
P214		Gain No. 0 speed loop proportional gain	

No.	Target digit	Parameter name	Unit
P215		Gain No. 0 speed loop integral time constant	ms
P216		Gain No. 0 speed loop derivative time constant	μ s
P217		Gain No. 0 speed loop proportional gain distribution factor	%
P218		Gain No. 0 speed loop derivative gain distribution factor	%
P219		Gain No. 0 low speed loop proportional gain	
P220		Gain No. 0 low speed loop integral time constant	ms
P221		Gain No. 0 low speed loop derivative time constant	μ s
P222		Gain No. 0 low speed loop proportional gain distribution factor	%
P223		Gain No. 0 low speed loop derivative gain distribution factor	%
P224		Gain No. 0 speed loop integral torque limit value	%
P225		Gain No. 0 position loop gain	s^{-1}
P226		Gain No. 0 low speed position loop gain	s^{-1}
P227	4 - 1	Gain No. 0 position loop derivative time constant	μ s
	8 - 5	Gain No. 0 low speed position loop derivative time constant	μ s
P228	4 - 1	Reserved	
	8 - 5	Gain No. 0 positioning command delay time	ms
P229	4 - 1	Gain No. 0 speed feed forward ratio	%
	8 - 5	Gain No. 0 speed feed forward shift ratio	%
P230		Gain No. 0 speed feed forward filter time constant	ms
P231		Gain No. 0 Inertia	P160 range $kg \cdot m^2$
P232		Gain No. 0 Viscous friction	P160 range N/m/s
P233	4 - 1	Gain No. 0 Inertia feed forward ratio	%
	8 - 5	Gain No. 0 Viscous friction feed forward ratio	%
P234		Gain No. 0 Torque feed forward filter time constant	ms
P235	3 - 1	Gain No. 0 filter derivative coefficient while stopping	
	6 - 4	Gain No. 0 filter time constant while stopping	ms
P236	4 - 1	Gain No. 0 Notch filter center frequency	Hz
	7 - 5	Gain No. 0 Notch filter band width ratio	%
P240		Gain No. 1 Low speed gain switching speed	rpm
P241		Gain No. 1 Low speed gain switching deviation pulse	FB resolution
P242	3 - 1	Gain No. 1 Normal speed -> Low speed gain switching time constant	ms
	6 - 4	Gain No. 1 Low speed -> Normal speed gain switching filter time constant	ms
	7	Gain No. 1 Low speed gain switching spec 1 selection	
	8	Gain No. 1 Low speed gain switching spec 2 selection	
P243	4 - 1	Gain No. 1 Low speed gain switching delay time	ms
	9 - 5	Gain No. 1 Low speed gain holding time after switching	ms
P244		Gain No. 1 speed loop proportional gain	
P245		Gain No. 1 speed loop integral time constant	ms
P246		Gain No. 1 speed loop derivative time constant	μ s
P247		Gain No. 1 speed loop proportional gain distribution factor	%

No.	Target digit	Parameter name	Unit
P248		Gain No. 1 speed loop derivative gain distribution factor	%
P249		Gain No. 1 low speed loop proportional gain	
P250		Gain No. 1 low speed loop integral time constant	ms
P251		Gain No. 1 low speed loop derivative time constant	μs
P252		Gain No. 1 low speed loop proportional gain distribution factor	%
P253		Gain No. 1 low speed loop derivative gain distribution factor	%
P254		Gain No. 1 speed loop integral torque limit value	%
P255		Gain No. 1 position loop gain	s^{-1}
P256		Gain No. 1 low speed position loop gain	s^{-1}
P257	4 - 1	Gain No. 1 position loop derivative time constant	μs
	8 - 5	Gain No. 1 low speed position loop derivative time constant	μs
P258	4 - 1	Reserved	
	8 - 5	Gain No. 1 positioning command delay time	ms
P259	4 - 1	Gain No. 1 speed feed forward ratio	%
	8 - 5	Gain No. 1 speed feed forward shift ratio	%
P260		Gain No. 1 speed feed forward filter time constant	ms
P261		Gain No. 1 Inertia	P160 range $kg \cdot m^2$
P262		Gain No. 1 Viscous friction	P160 range N/m/s
P263	4 - 1	Gain No. 1 Inertia feed forward ratio	%
	8 - 5	Gain No. 1 Viscous friction feed forward ratio	%
P264		Gain No. 1 Torque feed forward filter time constant	ms
P265	3 - 1	Gain No. 1 filter derivative coefficient while stopping	
	6 - 4	Gain No. 1 filter time constant while stopping	ms
P266	4 - 1	Gain No. 1 Notch filter center frequency	Hz
	7 - 5	Gain No. 1 Notch filter band width ratio	%
P270		Gain No. 2 Low speed gain switching speed	rpm
P271		Gain No. 2 Low speed gain switching deviation pulse	FB resolution
P272	3 - 1	Gain No. 2 Normal speed -> Low speed gain switching time constant	ms
	6 - 4	Gain No. 2 Low speed -> Normal speed gain switching filter time constant	ms
	7	Gain No. 2 Low speed gain switching spec 1 selection	
	8	Gain No. 2 Low speed gain switching spec 2 selection	
P273	4 - 1	Gain No. 2 Low speed gain switching delay time	ms
	9 - 5	Gain No. 2 Low speed gain holding time after switching	ms
P274		Gain No. 2 speed loop proportional gain	
P275		Gain No. 2 speed loop integral time constant	ms
P276		Gain No. 2 speed loop derivative time constant	μs
P277		Gain No. 2 speed loop proportional gain distribution factor	%
P278		Gain No. 2 speed loop derivative gain distribution factor	%
P279		Gain No. 2 low speed loop proportional gain	
P280		Gain No. 2 low speed loop integral time constant	ms

Parameters

No.	Target digit	Parameter name	Unit
P281		Gain No. 2 low speed loop derivative time constant	μ s
P282		Gain No. 2 low speed loop proportional gain distribution factor	%
P283		Gain No. 2 low speed loop derivative gain distribution factor	%
P284		Gain No. 2 speed loop integral torque limit value	%
P285		Gain No. 2 position loop gain	s ⁻¹
P286		Gain No. 2 low speed position loop gain	s ⁻¹
P287	4 - 1	Gain No. 2 position loop derivative time constant	μ s
	8 - 5	Gain No. 2 low speed position loop derivative time constant	μ s
P288	4 - 1	Reserved	
	8 - 5	Gain No. 2 positioning command delay time	ms
P289	4 - 1	Gain No. 2 speed feed forward ratio	%
	8 - 5	Gain No. 2 speed feed forward shift ratio	%
P290		Gain No. 2 speed feed forward filter time constant	ms
P291		Gain No. 2 Inertia	P160 range kg · m ²
P292		Gain No. 2 Viscous friction	P160 range N/m/s
P293	4 - 1	Gain No. 2 Inertia feed forward ratio	%
	8 - 5	Gain No. 2 Viscous friction feed forward ratio	%
P294		Gain No. 2 Torque feed forward filter time constant	ms
P295	3 - 1	Gain No. 2 filter derivative coefficient while stopping	
	6 - 4	Gain No. 2 filter time constant while stopping	ms
P296	4 - 1	Gain No. 2 Notch filter center frequency	Hz
	7 - 5	Gain No. 2 Notch filter band width ratio	%
P300		Gain No. 3 Low speed gain switching speed	rpm
P301		Gain No. 3 Low speed gain switching deviation pulse	FB resolution
P302	3 - 1	Gain No. 3 Normal speed -> Low speed gain switching time constant	ms
	6 - 4	Gain No. 3 Low speed -> Normal speed gain switching filter time constant	ms
	7	Gain No. 3 Low speed gain switching spec 1 selection	
	8	Gain No. 3 Low speed gain switching spec 2 selection	
P303	4 - 1	Gain No. 3 Low speed gain switching delay time	ms
	9 - 5	Gain No. 3 Low speed gain holding time after switching	ms
P304		Gain No. 3 speed loop proportional gain	
P305		Gain No. 3 speed loop integral time constant	ms
P306		Gain No. 3 speed loop derivative time constant	μ s
P307		Gain No. 3 speed loop proportional gain distribution factor	%
P308		Gain No. 3 speed loop derivative gain distribution factor	%
P309		Gain No. 3 low speed loop proportional gain	
P310		Gain No. 3 low speed loop integral time constant	ms
P311		Gain No. 3 low speed loop derivative time constant	μ s
P312		Gain No. 3 low speed loop proportional gain distribution factor	%
P313		Gain No. 3 low speed loop derivative gain distribution factor	%
P314		Gain No. 3 speed loop integral torque limit value	%

No.	Target digit	Parameter name	Unit
P315		Gain No. 3 position loop gain	s^{-1}
P316		Gain No. 3 low speed position loop gain	s^{-1}
P317	4 - 1	Gain No. 3 position loop derivative time constant	μs
	8 - 5	Gain No. 3 low speed position loop derivative time constant	μs
P318	4 - 1	Reserved	
P318	8 - 5	Gain No. 3 positioning command delay time	ms
P319	4 - 1	Gain No. 3 speed feed forward ratio	%
	8 - 5	Gain No. 3 speed feed forward shift ratio	%
P320		Gain No. 3 speed feed forward filter time constant	ms
P321		Gain No. 3 Inertia	P160 range $kg \cdot m^2$
P322		Gain No. 3 Viscous friction	P160 range N/m/s
P323	4 - 1	Gain No. 3 Inertia feed forward ratio	%
	8 - 5	Gain No. 3 Viscous friction feed forward ratio	%
P324		Gain No. 3 Torque feed forward filter time constant	ms
P325	3 - 1	Gain No. 3 filter derivative coefficient while stopping	
	6 - 4	Gain No. 3 filter time constant while stopping	ms
P326	4 - 1	Gain No. 3 Notch filter center frequency	Hz
	7 - 5	Gain No. 3 Notch filter band width ratio	%
P330	1	Torque command filter order selection	
	5 - 2	Torque command filter frequency	Hz
P331	4 - 1	Notch filter center frequency 1	Hz
	7 - 5	Notch filter band width ratio 1	%
P332	4 - 1	Notch filter center frequency 2	Hz
	7 - 5	Notch filter band width ratio 2	%
P333	4 - 1	Notch filter center frequency 3	Hz
	7 - 5	Notch filter band width ratio 3	%
P334	4 - 1	Notch filter center frequency 4	Hz
	7 - 5	Notch filter band width ratio 4	%
P340		Vibration control filter ineffective speed range	rpm
P341	4 - 1	Vibration control filter center frequency	Hz
	7 - 5	Vibration control filter band width ratio	%
P342	1	Feedback filter order selection	
	5 - 2	Feedback filter center frequency	Hz
P380		Magnetic pole detection torque limit value	%
P381		Magnetic pole detection gain 1	
P382		Magnetic pole detection integration time constant	ms
P383		Magnetic pole detection gain 2	s^{-1}
P384		Magnetic pole detection complete range	deg
P385	1	Magnetic pole detection filter order selection	
P385	5 - 2	Magnetic pole detection filter frequency	Hz
P386	3 - 1	Landing torque	%
	7 - 4	Landing torque holding time	s
P387	3 - 1	Magnetic pole detection torque minimum value	%
	4	Magnetic pole detection torque attenuation pattern selection	

6-2-4 Command-related parameters (groups 4 and 5)

No.	Target digit	Parameter name	Unit
P400		Analog torque command spec selection	
P401		Analog speed command voltage gain	V
P402		Analog speed command offset	V
P403		Analog speed command filter time constant	ms
P404		Speed command acceleration standard time	P161 setting unit/s
P405		Speed command deceleration standard time	P161 setting unit/s
P406		Analog speed command acceleration standard time	s
P407		Analog speed command deceleration standard time	s
P408		Internal speed command acceleration standard time	s
P409		Internal speed command deceleration standard time	s
P410	1	SPDSEL0 Speed command spec selection	
	2	SPDSEL0 Gain No. selection	
	3	SPDSEL0 Overtravel spec selection	
P411		SPDSEL0 Speed command value	P161 setting unit/s
P412		SPDSEL0 Torque limit value	%
P413	1	SPDSEL1 Speed command spec selection	
	2	SPDSEL1 Gain No. selection	
	3	SPDSEL1 Overtravel spec selection	
P414		SPDSEL1 Speed command value	P161 setting unit/s
P415		SPDSEL1 Torque limit value	%
P416	1	SPDSEL2 Speed command spec selection	
	2	SPDSEL2 Gain No. selection	
	3	SPDSEL2 Overtravel spec selection	
P417		SPDSEL2 Speed command value	P161 setting unit/s
P418		SPDSEL2 Torque limit value	%
P419	1	SPDSEL3 Speed command spec selection	
	2	SPDSEL3 Gain No. selection	
	3	SPDSEL3 Overtravel spec selection	
P420		SPDSEL3 Speed command value	P161 setting unit/s
P421		SPDSEL3 Torque limit value	%
P422	1	SPDSEL4 Speed command spec selection	
	2	SPDSEL4 Gain No. selection	
	3	SPDSEL4 Overtravel spec selection	
P423		SPDSEL4 Speed command value	P161 setting unit/s
P424		SPDSEL4 Torque limit value	%
P425	1	SPDSEL5 Speed command spec selection	
	2	SPDSEL5 Gain No. selection	
	3	SPDSEL5 Overtravel spec selection	
P426		SPDSEL5 Speed command value	P161 setting unit/s
P427		SPDSEL5 Torque limit value	%

No.	Target digit	Parameter name	Unit
P428	1	SPDSEL6 Speed command spec selection	
	2	SPDSEL6 Gain No. selection	
	3	SPDSEL6 Overtravel spec selection	
P429		SPDSEL6 Speed command value	P161 setting unit/s
P430		SPDSEL6 Torque limit value	%
P431	1	SPDSEL7 Speed command spec selection	
	2	SPDSEL7 Gain No. selection	
	3	SPDSEL7 Overtravel spec selection	
P432		SPDSEL7 Speed command value	P161 setting unit/s
P433		SPDSEL7 Torque limit value	%
P434		Analog speed command spec at torque command mode	
P435		Analog torque command voltage gain	V
P436		Analog torque command offset	V
P437		Analog torque command filter time constant	ms
P438		Analog torque command Increase/Decrease change time	s
P439		Internal torque command Increase/Decrease change time	s
P440		Speed limit value at torque command mode	P161 setting unit/s
P441	1	TRQSEL0 Torque command spec selection	
	2	TRQSEL0 Gain No. selection	
	3	TRQSEL0 Overtravel spec selection	
P442		TRQSEL0 Torque command value	%
P443		TRQSEL0 Speed limit value	P161 setting unit/s
P444	1	TRQSEL1 Torque command spec selection	
	2	TRQSEL1 Gain No. selection	
	3	TRQSEL1 Overtravel spec selection	
P445		TRQSEL1 Torque command value	%
P446		TRQSEL1 Speed limit value	P161 setting unit/s
P447	1	TRQSEL2 Torque command spec selection	
	2	TRQSEL2 Gain No. selection	
	3	TRQSEL2 Overtravel spec selection	
P448		TRQSEL2 Torque command value	%
P449		TRQSEL2 Speed limit value	P161 setting unit/s
P450	1	TRQSEL3 Torque command spec selection	
	2	TRQSEL3 Gain No. selection	
	3	TRQSEL3 Overtravel spec selection	
P451		TRQSEL3 Torque command value	%
P452		TRQSEL3 Speed limit value	P161 setting unit/s
P453	1	TRQSEL4 Torque command spec selection	
	2	TRQSEL4 Gain No. selection	
	3	TRQSEL4 Overtravel spec selection	
P454		TRQSEL4 Torque command value	%

Parameters

No.	Target digit	Parameter name	Unit
P455		TRQSEL4 Speed limit value	P161 setting unit/s
P456	1	TRQSEL5 Torque command spec selection	
	2	TRQSEL5 Gain No. selection	
	3	TRQSEL5 Overtravel spec selection	
P457		TRQSEL5 Torque command value	%
P458		TRQSEL5 Speed limit value	P161 setting unit/s
P459	1	TRQSEL6 Torque command spec selection	
	2	TRQSEL6 Gain No. selection	
	3	TRQSEL6 Overtravel spec selection	
P460		TRQSEL6 Torque command value	%
P461		TRQSEL6 Speed limit value	P161 setting unit/s
P462	1	TRQSEL7 Torque command spec selection	
	2	TRQSEL7 Gain No. selection	
	3	TRQSEL7 Overtravel spec selection	
P463		TRQSEL7 Torque command value	%
P464		TRQSEL7 Speed limit value	P161 setting unit/s
P465	1	Analog speed command spec at pulse train command mode	
P465	2	Analog torque command spec at pulse train command mode	
P466	1	Pulse train command input spec selection	
	2	Pulse train command input direction switching	
P467	1	PLSSEL0 Numerator ratio & Denominator ratio selection	
	2	PLSSEL0 Gain No. selection	
	3	PLSSEL0 Overtravel spec selection	
P468		PLSSEL0 Numerator ratio	
P469		PLSSEL0 Denominator ratio	
P470		PLSSEL0 S-curve time 1	ms
P471	4 - 1	PLSSEL0 Delay compensation	ms
	8 - 5	PLSSEL0 Lead compensation	ms
P472		PLSSEL0 Torque limit value	%
P473	1	PLSSEL1 Numerator ratio & Denominator ratio selection	
	2	PLSSEL1 Gain No. selection	
	3	PLSSEL1 Overtravel spec selection	
P474		PLSSEL1 Numerator ratio	
P475		PLSSEL1 Denominator ratio	
P476		PLSSEL1 S-curve time 1	ms
P477	4 - 1	PLSSEL1 Delay compensation	ms
	8 - 5	PLSSEL1 Lead compensation	ms
P478		PLSSEL1 Torque limit value	%
P479	1	PLSSEL2 Numerator ratio & Denominator ratio selection	
	2	PLSSEL2 Gain No. selection	
	3	PLSSEL2 Overtravel spec selection	

No.	Target digit	Parameter name	Unit
P480		PLSSEL2 Numerator ratio	
P481		PLSSEL2 Denominator ratio	
P482		PLSSEL2 S-curve time 1	ms
P483	4 - 1	PLSSEL2 Delay compensation	ms
	8 - 5	PLSSEL2 Lead compensation	ms
P484		PLSSEL2 Torque limit value	%
P485	1	PLSSEL3 Numerator ratio & Denominator ratio selection	
	2	PLSSEL3 Gain No. selection	
	3	PLSSEL3 Overtravel spec selection	
P486		PLSSEL3 Numerator ratio	
P487		PLSSEL3 Denominator ratio	
P488		PLSSEL3 S-curve time 1	ms
P489	4 - 1	PLSSEL3 Delay compensation	ms
	8 - 5	PLSSEL3 Lead compensation	ms
P490		PLSSEL3 Torque limit value	%
P491	1	PLSSEL4 Numerator ratio & Denominator ratio selection	
	2	PLSSEL4 Gain No. selection	
	3	PLSSEL4 Overtravel spec selection	
P492		PLSSEL4 Numerator ratio	
P493		PLSSEL4 Denominator ratio	
P494		PLSSEL4 S-curve time 1	ms
P495	4 - 1	PLSSEL4 Delay compensation	ms
	8 - 5	PLSSEL4 Lead compensation	ms
P496		PLSSEL4 Torque limit value	%
P497	1	PLSSEL5 Numerator ratio & Denominator ratio selection	
	2	PLSSEL5 Gain No. selection	
	3	PLSSEL5 Overtravel spec selection	
P498		PLSSEL5 Numerator ratio	
P499		PLSSEL5 Denominator ratio	
P500		PLSSEL5 S-curve time 1	ms
P501	4 - 1	PLSSEL5 Delay compensation	ms
	8 - 5	PLSSEL5 Lead compensation	ms
P502		PLSSEL5 Torque limit value	%
P503	1	PLSSEL6 Numerator ratio & Denominator ratio selection	
	2	PLSSEL6 Gain No. selection	
	3	PLSSEL6 Overtravel spec selection	
P504		PLSSEL6 Numerator ratio	
P505		PLSSEL6 Denominator ratio	
P506		PLSSEL6 S-curve time 1	ms
P507	4 - 1	PLSSEL6 Delay compensation	ms
	8 - 5	PLSSEL6 Lead compensation	ms

No.	Target digit	Parameter name	Unit
P508		PLSSEL6 Torque limit value	%
P509	1	PLSSEL7 Numerator ratio & Denominator ratio selection	
	2	PLSSEL7 Gain No. selection	
	3	PLSSEL7 Overtravel spec selection	
P510		PLSSEL7 Numerator ratio	
P511		PLSSEL7 Denominator ratio	
P512		PLSSEL7 S-curve time 1	ms
P513	4 - 1	PLSSEL7 Delay compensation	ms
	8 - 5	PLSSEL7 Lead compensation	ms
P514		PLSSEL7 Torque limit value	%
P515	1	Analog speed command spec at Inner command mode	
	2	Analog torque command spec at Inner command mode	
P516		Positioning approval selection when homing is not completed	
P517	1	SEL0 Homing incomplete signal selection	
	2	SEL0 Gain No. selection	
	3	SEL0 Overtravel spec selection	
P518		SEL0 Internal command acceleration standard time	P161 setting unit/s
P519		SEL0 Internal command deceleration standard time	P161 setting unit/s
P520		SEL0 Internal command acceleration time	s
P521		SEL0 Internal command deceleration time	s
P522		SEL0 Internal command S-curve time 1	s
P523		SEL0 Internal command torque limit value	%
P524	1	SEL1 Homing incomplete signal selection	
	2	SEL1 Gain No. selection	
	3	SEL1 Overtravel spec selection	
P525		SEL1 Internal command acceleration standard time	P161 setting unit/s
P526		SEL1 Internal command deceleration standard time	P161 setting unit/s
P527		SEL1 Internal command acceleration time	s
P528		SEL1 Internal command deceleration time	s
P529		SEL1 Internal command S-curve time 1	s
P530		SEL1 Internal command torque limit value	%
P531	1	SEL2 Homing incomplete signal selection	
	2	SEL2 Gain No. selection	
	3	SEL2 Overtravel spec selection	
P532		SEL2 Internal command acceleration standard time	P161 setting unit/s
P533		SEL2 Internal command deceleration standard time	P161 setting unit/s
P534		SEL2 Internal command acceleration time	s
P535		SEL2 Internal command deceleration time	s
P536		SEL2 Internal command S-curve time 1	s
P537		SEL2 Internal command torque limit value	%
P538	1	SEL3 Homing incomplete signal selection	
	2	SEL3 Gain No. selection	
	3	SEL3 Overtravel spec selection	
P539		SEL3 Internal command acceleration standard time	P161 setting unit/s
P540		SEL3 Internal command deceleration standard time	P161 setting unit/s
P541		SEL3 Internal command acceleration time	s

No.	Target digit	Parameter name	Unit
P542		SEL3 Internal command deceleration time	s
P543		SEL3 Internal command S-curve time 1	s
P544		SEL3 Internal command torque limit value	%
P545	1	SEL4 Homing incomplete signal selection	
	2	SEL4 Gain No. selection	
	3	SEL4 Overtravel spec selection	
P546		SEL4 Internal command acceleration standard time	P161 setting unit/s
P547		SEL4 Internal command deceleration standard time	P161 setting unit/s
P548		SEL4 Internal command acceleration time	s
P549		SEL4 Internal command deceleration time	s
P550		SEL4 Internal command S-curve time 1	s
P551		SEL4 Internal command torque limit value	%
P552	1	SEL5 Homing incomplete signal selection	
	2	SEL5 Gain No. selection	
	3	SEL5 Overtravel spec selection	
P553		SEL5 Internal command acceleration standard time	P161 setting unit/s
P554		SEL5 Internal command deceleration standard time	P161 setting unit/s
P555		SEL5 Internal command acceleration time	s
P556		SEL5 Internal command deceleration time	s
P557		SEL5 Internal command S-curve time 1	s
P558		SEL5 Internal command torque limit value	%
P559	1	SEL6 Homing incomplete signal selection	
	2	SEL6 Gain No. selection	
	3	SEL6 Overtravel spec selection	
P560		SEL6 Internal command acceleration standard time	P161 setting unit/s
P561		SEL6 Internal command deceleration standard time	P161 setting unit/s
P562		SEL6 Internal command acceleration time	s
P563		SEL6 Internal command deceleration time	s
P564		SEL6 Internal command S-curve time 1	s
P565		SEL6 Internal command torque limit value	%
P566	1	SEL7 Homing incomplete signal selection	
	2	SEL7 Gain No. selection	
	3	SEL7 Overtravel spec selection	
P567		SEL7 Internal command acceleration standard time	P161 setting unit/s
P568		SEL7 Internal command deceleration standard time	P161 setting unit/s
P569		SEL7 Internal command acceleration time	s
P570		SEL7 Internal command deceleration time	s
P571		SEL7 Internal command S-curve time 1	s
P572		SEL7 Internal command torque limit value	%
P573		Jog speed 0	P161 setting unit/s
P574		Jog speed 1	P161 setting unit/s

Parameters

No.	Target digit	Parameter name	Unit
P575		Jog speed 2	P161 setting unit/s
P576		Jog speed 3	P161 setting unit/s
P577		Jog speed 4	P161 setting unit/s
P578		Jog speed 5	P161 setting unit/s
P579		Jog speed 6	P161 setting unit/s
P580		Jog speed 7	P161 setting unit/s
P581	1	Zero point marker selection for homing	
	2	Homing acceleration/deceleration control in reverse direction	
P582		Homing creep speed	P161 setting unit/s
P583		Homing position constant	P161 setting unit
P584		Setting distance for homing	P161 setting unit
P585		Position data standard point	P161 setting unit
P586		OT deceleration time at OT HOME	s

6-2-5 Self-diagnosis- and input and output-related parameters (group 6)

No.	Target digit	Parameter name	Unit
P600	3 - 1	Status display C000 display item selection	
	4	Reserved	
	5	Status display C000 display multiplier factor selection	
P601	1	Auto tuning moving direction	
	4 - 2	Auto tuning test operation ratio	
	7 - 5	Max torque at auto tuning	%
	8	Auto tuning inertia multiplying selection	
P604	1	Position assignment for test run	
	2	Test run traveling direction	
	3	Test run SEL selection	
	7 - 4	Test run stopping time	s
P605		Test run starting position	P161 setting unit
P606		Test run positioning amount	P161 setting unit
P607		Test run positioning speed	P161 setting unit/s
P608		Test run starting position movement speed	P161 setting unit/s
P620		Control input signal allocation 1	
P621		Control input signal allocation 2	
P622		Control output signal allocation 1	
P623		Control input signal condition setting 1	
P624		Control input signal condition setting 2	
P625		Control input signal condition setting 3	
P626		Control input signal condition setting 4	
P627		Control input signal condition setting 5	
P628		Control input signal condition setting 6	

No.	Target digit	Parameter name	Unit
P629		Control input signal condition setting 7	
P630		Control input signal condition setting 8	
P631		Deviation clear selection when SON signal is OFF	
P633	1	Stopping selection when EMG signal is ON	
	5 - 2	Deceleration time after EMG signal braking stoppage	s
	8 - 6	Servo OFF delay time after EMG braking stoppage	s
P634	1	Reserved	
	5 - 2	Deceleration time after OT signal braking stoppage	s
	8 - 6	OT condition holding time	s
P635	1	Reserved	
	5 - 2	Soft OT braking stoppage deceleration time	s
	8 - 6	Soft OT condition holding time	s
P636		TL signal torque limit value +	%
P637		TL signal torque limit value -	%
P638	3 - 1	MD signal delay time	ms
	6 - 4	SS signal delay time	ms
	9 - 7	ZST signal delay time	ms
P650	1	RDY signal specifications Selection of OT ALM signal is ON	
	2	RDY signal specifications Selection of motor electrification ALM signal other than OT is ON	
P651		SZ signal speed range	P161 setting unit/s
P652		VCP signal speed deviation range	P161 setting unit/s
P653		PE1 Signal deviation range	FB resolution
P654		PE1 Signal delay time	s
P655		PE2 signal deviation range	FB resolution
P656		PE2 Signal delay time	s
P657		PRF signal distance	P161 setting unit
P658	4 - 1	Brake release delay time	s
	8 - 5	Brake activation delay time	s
P659		Brake activation effective low speed range	P161 setting unit/s
P660		Brake enforced to be activate delay time	s

6-2-6 Communication-related parameters (group 7)

No.	Target digit	Parameter name	Unit
P701	3 - 1	RS422 communication ID No.	
	4	RS422 communication function selection	
	5	RS422 communication data length	
	6	RS422 communication parity	
	7	RS422 communication baud rate	
P702		RS422 communication timeout	s

6-3 Parameter specification

6-3-1 Parameter specification configuration

1) Outline of parameter items

The following provides the details of each parameter. The initial values of parameters are set so that the motor operates without any load (trial run). To operate by connecting to the machine system, adjust the operation speed, gain, and so on according to the load status.

Each item in the explanatory tables is as described below.

Table 6-2 Details of parameter items

Item	Description
Parameter No.	Shows the parameter number displayed in parameter edit mode.
Parameter name	Shows the name of the parameter.
Edit type	Shows the type of parameter edit method. Blank : Editing with numeric value input r : Editing with numeric value input or real-time editing on the operation panel ^{*2} S : Editing enabled only if [P000] is set to a special motor * For a parameter of this type, set the value presented from the manufacturer. H : Display enabled only if [P000] is set to a special motor * Editing is always disabled.
Activating timing	Shows when edited data is reflected. I : Real-time R : Reset or power ON P : Power ON E : Command execution or power re-input * If a parameter to be reflected immediately is changed during motor operation, vibration, sudden starting, sudden stopping, and so on may occur. Confirm safety before changing it.
Supported command mode	Shows the run mode supported by the parameter. S : Speed command T : Torque command P : Pulse train command N : Built-in command
Level	Shows whether the motor can be operated with the initial value. S : Setting required. F : Can be run with the initial value.
Setting unit	Shows the unit of data.
Setting range	Shows the range in which data can be set.
Supported model	Shows the model supported by the parameter. Blank : VPH-HA model τ DISC version
Factory setting (Initial value)	Shows the initial value before product shipment.
Function details	Shows the function details of the parameter.

^{*2} For information about real-time editing with the operation panel, refer to "Figure 11-9 Example of changing P214 parameter value (up to 5 digits) from 00043 to 00052 and to 00038".

2) Parameter setting method

Values to input in the parameter editing window are of the types below.

- Parameter setting (supported by all parameters)
An input value will directly become a setting.
[Example] If wishing to set 360 in [P411: SPDSEL0 Speed command value]
① In the parameter editing window, set "360" in the P411 setting column.
- Indirect data number assigned value (supported by some parameters only)
An input value will become the assigned value of the indirect data number, and the value input for the specified indirect data number will become a setting.
[Example] If wishing to use indirect data IX01 to set 360 in [P411: SPDSEL0 Speed command value]
① In the parameter editing window, set "-1" in the P411 setting column. (Specify an indirect data number as a negative value.)
② In the indirect data editing window, set "360" in the IX01 setting column.

3) Notes on using indirect data

If using indirect data for parameter setting, note the following.

For details of indirect data, refer to "Chapter 7 Indirect data".

- To specify an indirect data number, input a negative value in the parameter setting column. The setting range is "-1 to -91", which correspond to indirect data numbers "IX01 to IX91".
- At present, "IX92 to IX99" are reserved, so do not specify them as indirect data numbers.
- In parameter setting, "0" is handled as a numeric value, so "IX00" cannot be specified.
- If the setting range of the parameter is narrower than the input-enabled range of the indirect data, a value outside the parameter range may be set in the indirect data. If a value outside the range is set, it will be converted into "0" inside the device before being processed.
- If using indirect data for a parameter to which [P161: Position decimal point unit selection] is applied, set the indirect data number in the integer digits. For other parameters, set the number in the lower two digits, regardless of the decimal point position. ^{*3}

[Example 1] To specify IX15 for [P411: SPDSEL0 Speed command value], with [P161] being set to 0.01, set "-15.00".

[Example 2] To specify IX15 for [P412: SPDSEL0 Torque limit value], set "-1.5".

^{*3} For details on "parameter to which [P161: Position decimal point unit selection] is applied", refer to "6-2 Parameter list". Those parameters for which "P161" is contained in the Unit column are such parameters.

6-3-2 Motor- and encoder-related parameters (group 0)

Parameter No.	Parameter name	Edit type	Supported command mode				Level	Setting unit	Setting range	
			Activating timing							
			Speed	Torque	Pulse train	Built-in				
			S	T	P	N				
		Supported model						Factory setting (Initial value)		
Function details: [Target digit]										
《Group 0》 "Motor- and encoder-related parameters"										
P000	Motor Identification code		P	S	T	P	N	F		-2147483648 - 2147483647
									0	
		Set the identification code of the motor used. If a motor identification code has been registered, it will automatically be set when you select the motor from VPH DES. * From the operation panel, only "19999" can be input. 0 : Motor unregistered 19999 : [P006] to [P059] can be input individually with VPH DES.								
P001 - P005	Various code areas for data editing software	H	P	S	T	P	N	F		-2147483648 - 2147483647
							0			
Areas used with VPH DES.										
P006	Driver combination rated output	S	P	S	T	P	N	F	kW	0.000 - 9999.999
									0.000	
		Set the rated output of the device used.								
P007	Driver combination power voltage	S	P	S	T	P	N	F	V	0 - 9999
									0	
		Set the power voltage of the device used.								
P008	Driver combination main power supply single phase / 3 phase	S	P	S	T	P	N	F		0 - 3
									0	
		[1st digit] Select the main power supply type of the device used. 0 : No selection 1 : Single phase 2 : 3 phase 3 : 3 phase power supply regeneration								
	Driver combination main power supply AC/DC power source	S	P	S	T	P	N	F		0 - 2
									0	
[2nd digit] Select the power supply support of the device used. 0 : No selection 1 : AC power supply 2 : DC power supply										

Parameter No.	Parameter name	Edit type	Supported command mode				Level	Setting unit	Setting range	
			Activating timing	Speed	Torque	Pulse train				Built-in
				S	T	P				N
				Supported model						Factory setting (Initial value)
		Function details: [Target digit]								
《Group 0》 "Motor- and encoder-related parameters"										
P009	Driver combination revision	S	P	S	T	P	N	F		000 - 999
									0	
		[3rd - 1st digits] Set the revision of the device used.								
	Driver combination special spec code	S	P	S	T	P	N	F		0000 - 9999
									0	
[7th - 4th digits] Set the specification code to use if combining with a special motor and a special device.										
P010	Motor type identification	S	P	S	T	P	N	F		0 - 5
									0	
		[1st digit] Select the type of motor used. 0 : No selection 1 : τ DISC 2 : τ linear 3 : Reserved 4 : Reserved 5 : Reserved								
	Main power supply type for the driver to match with motor	S	P	S	T	P	N	F		0 - 4
									0	
[2nd digit] Select the main power supply type of the device that corresponds to the motor used. 0 : No selection 1 : Common type 2 : Single phase only 3 : 3 phase only 4 : Power regeneration only										

Parameters

Parameter No.	Parameter name	Edit type	Supported command mode				Level	Setting unit	Setting range	
			Activating timing							
			Speed	Torque	Pulse train	Built-in				
			S	T	P	N				
		Supported model						Factory setting (Initial value)		
Function details: [Target digit]										
《Group 0》 "Motor- and encoder-related parameters"										
P011	Motor rated output	S	P	S	T	P	N	F	kW	0.001 - 9999.999
								0.001		
		Set the rated output of the motor used.								
P012	Motor rated current	S	P	S	T	P	N	F	A	0.000 - 99999.999
								0.000		
		Set the rated current of the motor used.								
P013	Motor momental max. current	S	P	S	T	P	N	F	%	100 - 799
								100		
		Set the momental maximum current ratio of the motor used.								
P014	Motor rated speed	S	P	S	T	P	N	F	rpm	0.001 - 99999.999
								0.001		
		Set the rated speed of the motor used. If [P067] or [P082] is not set, this setting will be the maximum speed.								
P015	Motor torque/force constant	S	P	S	T	P	N	F	Nm/A	0.0001 - 99999.9999
								0.0001		
		Set the torque constant or force constant of the motor used.								
P016	Number of poles	S	P	S	T	P	N	F	poles	2 - 10000
								2		
		Set the number of poles of the motor used.								
P018	Motor phase resistance	S	P	S	T	P	N	F	mΩ	0.001 - 99999.999
								0.001		
		Set the phase resistance value of the motor used.								
P019	Motor phase inductance (Lq)	S	P	S	T	P	N	F	mH	0.001 - 999.999
								0.001		
		Set the motor phase inductance (Lq).								
P020	Motor phase inductance (Ld)	S	P	S	T	P	N	F	mH	0.001 - 999.999
								0.001		
		Set the motor phase inductance (Ld).								
P021	Current cut off frequency	S	P	S	T	P	N	F	Hz	1 - 5000
								1000		
		Set the current cut off frequency.								
P028	Phase control division ratio		P	S	T	P	N	F	%	0 - 100
								0		
		[3rd - 1st digits] Set the phase control division ratio.								
	Phase control integrated limit value		P	S	T	P	N	F	%	0 - 999
								0		
[6th - 4th digits] Set the phase control integrated limit value.										

Parameter No.	Parameter name	Edit type	Supported command mode				Level	Setting unit	Setting range	
			Activating timing							
			Speed	Torque	Pulse train	Built-in				
			S	T	P	N				
		Supported model						Factory setting (Initial value)		
Function details: [Target digit]										
《Group 0》 "Motor- and encoder-related parameters"										
P030	Motor electronic thermal detected actual value	S	I	S	T	P	N	F	%	0 - 799
								110		
		[3rd - 1st digits] Set the load ratio at which to detect a motor thermal error.								
	Motor electronic thermal detection time	S	I	S	T	P	N	F	s	0 - 9999
						53				
[7th - 4th digits] Set the motor thermal time constant.										
P031	Motor 1 phase concentration electronic thermal detection ratio	S	I	S	T	P	N	F	%	0 - 200
								70		
		[3rd - 1st digits] Set the load ratio at which to detect a thermal error during motor 1 phase concentration.								
	Motor 1 phase concentration electronic thermal detection motion range	S	I	S	T	P	N	F	rev	0 - 9.9
								1.0		
		[5th - 4th digits] Set the operation range in which to detect a motor 1 phase concentration state.								
	Motor 1 phase concentration electronic thermal detection low speed range	S	I	S	T	P	N	F	rps	0 - 9.9
								1.0		
[7th - 6th digits] Set the speed at which to defect a low speed state.										
P032	Dead time compensation factor	S	P	S	T	P	N	F	%	0 - 200
								50		
		[3rd - 1st digits] Set the dead time compensation factor.								
	Dead time compensation low current control range	S	P	S	T	P	N	F	%	0.0 - 99.9
						0.5				
[6th - 4th digits] Set the dead time compensation low current limit range.										
P033	Dead time compensation invalid speed	S	P	S	T	P	N	F	rpm	0.000 - 99999.999
								0.000		
Set the speed at which the dead time compensation is to become invalid.										

Parameters

Parameter No.	Parameter name	Edit type	Supported command mode				Level	Setting unit	Setting range	
			Activating timing							
			Speed	Torque	Pulse train	Built-in				
			S	T	P	N				
		Supported model							Factory setting (Initial value)	
Function details: [Target digit]										
《Group 0》 "Motor- and encoder-related parameters"										
P034	Current command variation limit value	S	P	S	T	P	N	F	%	0 - 799
									100	
		[3rd - 1st digits] Set the current command variation limiter ratio.								
	Voltage output limit value	S	P	S	T	P	N	F	%	0 - 799
									0	
		[6th - 4th digits] Set the voltage output limit value.								
	Current loop integral stop voltage	S	P	S	T	P	N	F	%	0 - 799
									0	
		[9th - 7th digits] Set the current loop integral stop voltage.								
P035	Reserved									
									0	
		[3rd - 1st digits] Reserved area. Set the initial value.								
	Induced electromotive force compensation rate	S	P	S	T	P	N	F	%	0 - 100
									0	
P036	Incoherence compensation ratio	S	P	S	T	P	N	F	%	0 - 100
									0	
		Set the incoherence compensation ratio.								

Parameter No.	Parameter name	Edit type	Supported command mode				Level	Setting unit	Setting range	
			Activating timing							
			Speed	Torque	Pulse train	Built-in				
			S	T	P	N				
		Supported model							Factory setting (Initial value)	
Function details: [Target digit]										
《Group 0》 "Motor- and encoder-related parameters"										
P037	Torque electric angle position phase correction angle	S	P	S	T	P	N	F	deg	0.0 - 90.0
									0.0	
		[3rd - 1st digits] Set the electric angle phase correction angle during rated torque output.								
	Torque electric angle position phase correction start speed	S	P	S	T	P	N	F	%	0 - 999
									0	
		[6th - 4th digits] Set the speed at which to start torque electric angle phase correction.								
	Torque electric angle position phase correction complete speed	S	P	S	T	P	N	F	%	0 - 999
									0	
		[9th - 7th digits] Set the speed at which to complete torque electric angle phase correction.								
P038	Speed electric angle phase correction angle	S	P	S	T	P	N	F	deg	0.0 - 90.0
									0.0	
		[3rd - 1st digits] Set the speed electric angle phase correction angle.								
	Speed electric angle phase correction starting speed	S	P	S	T	P	N	F	%	0 - 999
									0	
		[6th - 4th digits] Set the speed at which to start speed electric angle phase correction.								
	Speed electric angle phase correction complete speed	S	P	S	T	P	N	F	%	0 - 999
									0	
		[9th - 7th digits] Set the speed at which to complete speed electric angle phase correction.								
P039	d axis current ratio	S	P	S	T	P	N	F	%	0.0 - 99.0 (weak magnetic field)
									0.0	
		[3rd - 1st digits] Set the d axis current value.								
	d axis current start speed	S	P	S	T	P	N	F	%	0 - 999
									0	
		[6th - 4th digits] Set the speed at which to start the d axis current.								
	d axis current complete speed	S	P	S	T	P	N	F	%	0 - 999
									0	
		[9th - 7th digits] Set the speed at which to complete the d axis current.								

Parameters

Parameter No.	Parameter name	Edit type	Supported command mode				Level	Setting unit	Setting range	
			Activating timing	Speed	Torque	Pulse train				Built-in
				S	T	P				N
		Supported model						Factory setting (Initial value)		
		Function details: [Target digit]								
《Group 0》 "Motor- and encoder-related parameters"										
P040	1st torque correction value	S	P	S	T	P	N	F	%	0.0 - 99.0
								0.0		
		[3rd - 1st digits] Set the first torque correction value.								
	1st torque correction value start speed	S	P	S	T	P	N	F	%	0 - 999
								0		
		[6th - 4th digits] Set the speed at which to start the first torque correction value.								
	1st torque correction value complete speed	S	P	S	T	P	N	F	%	0 - 999
								0		
		[9th - 7th digits] Set the speed at which to complete the first torque correction.								
P041	2nd torque correction value	S	P	S	T	P	N	F	%	0.0 - 99.0
								0.0		
		[3rd - 1st digits] Set the second torque correction value.								
	2nd torque correction value start speed	S	P	S	T	P	N	F	%	0 - 999
								0		
		[6th - 4th digits] Set the speed at which to start the second torque correction value.								
	2nd torque correction value complete speed	S	P	S	T	P	N	F	%	0 - 999
								0		
		[9th - 7th digits] Set the speed at which to complete the second torque correction.								
P042	Torque correction ratio for 6th harmonic	S	I	S	T	P	N	F	%	0.00 - 9.99
								0.00		
		[3rd - 1st digits] Set the sixth harmonic torque correction ratio.								
	Torque correction shift electric angle for 6th harmonic	S	I	S	T	P	N	F	deg	0 - 359
								0		
[6th - 4th digits] Set the sixth harmonic torque correction shift electric angle.										

Parameter No.	Parameter name	Edit type	Supported command mode				Level	Setting unit	Setting unit			
			Activating timing	Speed	Torque	Pulse-train				Built-in		
				S	T	P				N		
				Supported model						Factory setting (Initial value)		
				Function details: [Target digit]								
《Group 0》 "Motor- and encoder-related parameters"												
P043	Reserved											
		0										
		[3rd - 1st digits] Reserved area. Set the initial value.										
	PWM drive circuit fully charged waiting time	S	P	S T P N		F	ms	0 - 999				
		0										
		[6th - 4th digits] Set the waiting time after the PWM drive circuit has fully been charged. If "0" is set, the waiting time is assumed to be "200".										
	PWM drive circuit charging time	S	P	S T P N		F	ms	0.0 - 9.9				
		0.0										
		[8th - 7th digits] Set the PWM drive circuit charging time. This function is enabled when a value other than "0" is set.										

Parameter No.	Parameter name	Edit type	Activating timing	Supported command mode				Level	Setting unit	Setting range	
				Speed	Torque	Pulse train	Built-in				
				S	T	P	N				
				Supported model							Factory setting (Initial value)
		Function details: [Target digit]									
《Group 0》 "Motor- and encoder-related parameters"											
P060	Encoder type		P	S	T	P	N	S		Refer to the encoder selection table.	
		0									
		Select the type of encoder used.									
		The dividing frequency output method and marker output method differ depending on the encoder type.									
		For the setting of the dividing frequency and marker width, refer to [P140].									
		For details of the dividing frequency output method, refer to the explanation of "encoder pulse output" in "Chapter 4 Signal connection".									
		Setting	VPH DES P060 item		Encoder type				Dividing frequency output method		Marker output method
		0	No selection		Encoder not selected						
		1	INC1		Reserved						
		2	INC2		Reserved						
		3	INC3		Reserved						
		4	L-SEN		τ linear sensor				Frequency output by hardware		Marker input
		5	S-INC		Reserved						
		6	S-ABS		Reserved						
		7	C-SEN1		Reserved						
		8	C-SEN2		τ DISC motor, with marker				Frequency output by hardware		Marker input
		9	S-INC2		Reserved						
		10	S-ABS2		Serial absolute 2				Frequency output by software		Serial
		11	L-LESS		Scaleless sensor				Frequency output by hardware		
		12	L-ABS		Reserved						
		13	S-ABS3		Reserved						
		14	S-MABS		Reserved						
		15	L-Biss		Linear BiSS encoder				Frequency output by software		Serial
		16	R- Biss		Reserved						
P061	Encoder pulse of rotary type motor	S	P	S	T	P	N	S	Mppr (resolution)	0.000000 - 999.999999	
		0.000000									
		Set the number of encoder pulses per rotation of the rotary system motor.									

Parameter No.	Parameter name	Edit type	Supported command mode				Level	Setting unit	Setting range	
			Activating timing	Speed	Torque	Pulse train				Built-in
		Supported model				Factory setting (Initial value)				
Function details: [Target digit]										
《Group 0》 "Motor- and encoder-related parameters"										
P066	Encoder input direction switching	S	P	S	T	P	N	F		0 - 1
									0	
		Select the encoder input direction. 0 : Non-reverse 1 : Reversal								
P067	Max. speed of motor	S	P	S	T	P	N	F	rpm	0.000 - 99999.999
									0.000	
		Set the maximum speed for the combination of the motor used and the encoder. If [P082] is set, it has priority.								
P068	Magnetic pole sensor type	S	P	S	T	P	N	S		0 - 7
									0	
		[1st digit] Select the magnetic pole sensor type. 0 : Automatic magnetic pole sensing 1 : 2 phase (HA, HB signals) 2 : 3 phase (HA, HB, HC signals) 3 : 2 phase (serial communication signal) 4 : 3 phase (serial communication signal) 5 : Multi rotation serial ABS encoder 6 : Nikki serial ABS encoder 7 : Mitsutoyo ABS linear scale 8 : Biss								
P070	Encoder wire breakage detection selection	S	P	S	T	P	N	F		0 - 1
									0	
		Select the encoder wire breakage detection filter. 0 : 100 ns 1 : 6.4 μs								

Parameters

Parameter No.	Parameter name	Edit type	Supported command mode				Level	Setting unit	Setting range	
			Activating timing							
			Speed	Torque	Pulse train	Built-in				
			S	T	P	N				
		Supported model						Factory setting (Initial value)		
Function details: [Target digit]										
《Group 0》 "Motor- and encoder-related parameters"										
P080	Max torque limit value +		I	S	T	P	N	F	%	0.0 - 799.9
								300.0		
		Set the forward direction motor output torque limit value. If the setting exceeds the peak torque of the motor, the output torque is clamped to the peak torque. If "0" is set, no forward direction torque is generated.								
P081	Max torque limit value -		I	S	T	P	N	F	%	0.0 - 799.9
								300.0		
		Set the reverse direction motor output torque limit value. If the setting exceeds the peak torque of the motor, the output torque is clamped to the peak torque. If "0" is set, no reverse direction torque is generated.								
P082	Motor max speed special setting		P	S	T	P	N	F	rpm	0.000 - 99999.999
								0.000		
		Set the maximum speed of the motor used. This setting has priority over [P067]. If "0" is set, the maximum speed conforms to [P067].								

Parameter No.	Parameter name	Edit type	Supported command mode				Level	Setting unit	Setting range			
			Activating timing	Speed	Torque	Pulse train				Built-in		
		Supported model					Factory setting (Initial value)					
Function details: [Target digit]												
《Group 0》 "Motor- and encoder-related parameters"												
P083	Motor electronic thermal detection actual value		I	S	T	P	N	F	%	0 - 200		
									0			
		[3rd - 1st digits] Set the load ratio at which to detect a motor thermal error. The setting is the ratio to the motor rated current value, which is assumed "100%". If a value greater than the device rated current is set, this setting will be device rated current value. If "0" is set, the setting of [P030 (3rd - 1st digits)] is effective.										
			I	S	T	P	N	F	s	0 - 9999		
									0			
[7th - 4th digits] Set the motor thermal time constant.												
P084	Motor 1 phase concentration electronic thermal detection ratio		I	S	T	P	N	F	%	0 - 200		
									0			
		[3rd - 1st digits] Set the load ratio at which to detect a thermal error during motor 1 phase concentration. When the motor goes below the detection operation range or the detection low speed range, it switches from [P083 (3rd - 1st digits)] to this setting. If "0" is set, the detection ratio is "1".										
	Motor 1 phase concentration electronic thermal detection motion range		I	S	T	P	N	F	rev	0.0 - 9.9		
									0.0			
		[5th and 4th digits] Set the operation range in which to detect motor 1 phase concentration. If "0" is set, detection is not performed.										
	Motor 1 phase concentration electronic thermal detection low speed range		I	S	T	P	N	F	rps	0.0 - 9.9		
							0.0					
[7th and 6th digits] Set the speed at which to detect a low speed state. If "0" is set, detection is not performed.												

Parameters

Parameter No.	Parameter name	Edit type	Activating timing				Supported command mode	Level	Setting unit	Setting range
			Speed	Torque	Pulse train	Built-in				
			S	T	P	N				
			Supported model							
		Function details: [Target digit]								
《Group 0》 "Motor- and encoder-related parameters"										
P085	Regenerative resistor		I	S	T	P	N	F	Ω	0 - 999
									0	
		[3rd - 1st digits] Set the regenerative resistor value if a regenerative resistor is connected.								
	Regenerative resistor capacity		I	S	T	P	N	F	kW	0.000 - 999.999
									0.000	
[9th - 4th digits] Set the regenerative resistor capacity if a regenerative resistor is connected.										
P086	Regenerative resistor overload detection ratio		I	S	T	P	N	F	%	0 - 100
									15	
		[3rd - 1st digits] Set the overload detection ratio if a regenerative resistor is connected. Normally, set the initial value.								
	Regenerative resistor load time constant		I	S	T	P	N	F	s	0 - 9999
									300	
[7th - 4th digits] Set the load time constant if a regenerative resistor is connected. Normally, set the initial value.										

6-3-3 Device- and machine specification-related parameters (group 1)

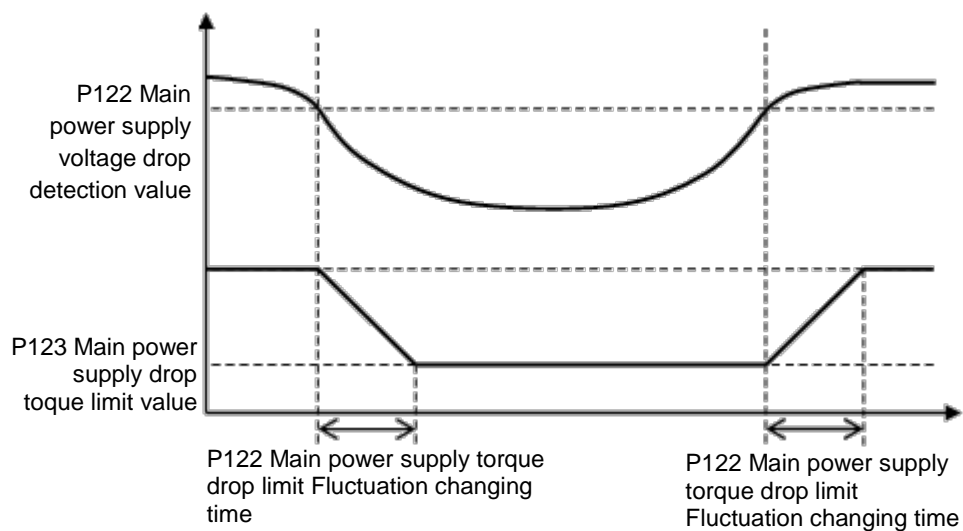
Parameter No.	Parameter name	Edit type	Supported command mode				Level	Setting unit	Setting range	
			Activating timing							
			Speed	Torque	Pulse train	Built-in				
			S	T	P	N				
		Supported model							Factory setting (Initial value)	
Function details: [Target digit]										
《Group 1》 "Device- and machine specification-related parameters"										
P100	Carrier frequency setting		P	S	T	P	N	F	kHz	0 - 20
									0	
		Select the PWM carrier frequency. 0 : Device standard frequency 1 - 4 : Fixed at 5 kHz 5 - : Preset value The actual carrier frequency is limited to the maximum carrier frequency of the target device. Example) If the maximum carrier frequency of the target device is 10 kHz and this setting is 15 kHz, the actual carrier frequency is 10 kHz. * The current control cycle is two times this setting if the frequency is 5 to 10 kHz, and one times this setting if 11 to 20 kHz.								
P103	Dynamic brake spec selection		I	S	T	P	N	F		0 - 2
									0	
		[1st digit] Select the dynamic brake specification. 0 : INVALID (not connected) Dynamic brake operation is not performed. 1 : DMB ON (dynamic brake operation) Normal dynamic brake operation is performed. 2 : DMB OFF (operation with the SON signal disabled) DMB operation by turning off the external input SON signal is not performed. If SON is off due to an alarm and so on, operation is performed.								
	Servo On delay time setting after dynamic brake is off		I	S	T	P	N	F	ms	0 - 10
									10	
		[3rd and 2nd digits] Set the time after which to enable servo on again after the status of motor operation stop with the dynamic brake is confirmed.								
P104	Absolute position compensation action entry		P	S	T	P	N	F		0 - 3
									0	
		Specify the operation of the absolute position compensation function. 0 : Absolute position compensation function ineffective 1 : Standard absolute position compensation effective 2 : Absolute position compensation after homing 3 : With the start of standard absolute position compensation, resetting (present position acquisition) is implemented per marker.								

Parameters

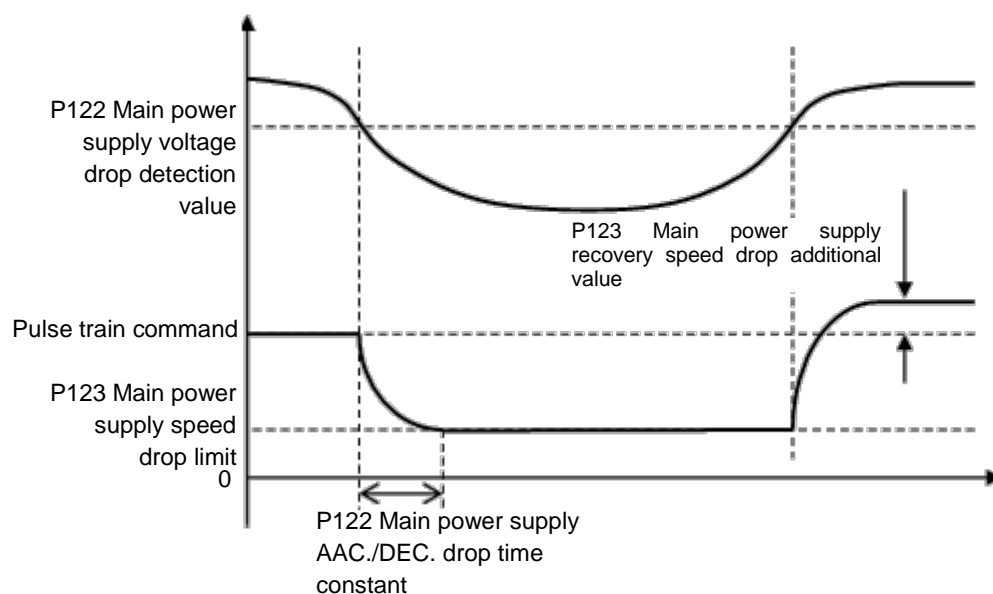
Parameter No.	Parameter name	Edit type	Supported command mode				Level	Setting unit	Setting range	
			Activating timing							
			Speed	Torque	Pulse train	Built-in				
			S	T	P	N				
		Supported model						Factory setting (Initial value)		
Function details: [Target digit]										
《Group 1》 "Device- and machine specification-related parameters"										
P120	Servo control abnormality detection dead band torque		I	S	T	P	N	F	%	-799 - 799
									0	
		Set the servo control abnormality detection dead band torque value. If the torque value is equal to or less than this setting, no servo control abnormality is detected.								
P121	Main power OFF abnormality detection selection specifications		I	S	T	P	N	F		0 - 1
									0	
		[1st digit] Select the operation to perform when a main power OFF abnormality is detected. 0 : Servo OFF after braking stop 1 : Servo OFF (DB stop if the DB is provided)								
	Main power OFF abnormality detection time		I	S	T	P	N	F	ms	0 - 999
									50	
[4th - 2nd digits] If the main power OFF status continues for the time that is set, abnormality detection is performed. If "0" is set, abnormality detection is ineffective.										

Parameter No.	Parameter name	Edit type	Supported command mode				Level	Setting unit	Setting range	
			Activating timing							
			Speed	Torque	Pulse train	Built-in				
			S	T	P	N				
		Supported model						Factory setting (Initial value)		
Function details: [Target digit]										
《Group 1》 "Device- and machine specification-related parameters"										
P122	Main power supply voltage drop detection value		I	S	T	P	N	F	%	0 - 99
								70		
		[2nd and 1st digits] Set the voltage value at which a main power supply drop is detected. The setting is the ratio to the device main power supply standard voltage, which is assumed "100%".								
	Main power supply AAC./DEC. drop time constant		I	—	—	P	—	F	ms	0 - 9999
								100		
		[6th - 3th digits] Set the acceleration/deceleration time constant at a main power supply drop.								
	Main power supply torque drop limit Fluctuation changing time		I	S	T	P	N	F	ms	0 - 999
								50		
		[9th - 7th digits] Set the torque limit changing ratio at the occurrence of a main power supply drop and at recovery. This setting is the time required to reach the rated torque from the torque of zero.								
P123	Main power supply speed drop limit		I	—	—	P	N	F	%	0 - 100
								70		
		[3rd - 1st digits] Set the main power supply drop speed limit value. The setting is the ratio to the motor maximum speed, which is assumed "100%".								
	Main power supply recovery speed drop additional value		I	—	—	P	—	F	%	0 - 100
								10		
		[6th - 4th digits] Set the main power supply recovery speed additional value. The setting is the ratio to the motor maximum speed, which is assumed "100%".								
	Main power supply drop torque limit value		I	S	T	P	N	F	%	0 - 300
								100		
		[9th - 7th digits] Set the main power supply drop torque limit value. The setting is the ratio to the rated torque, which is assumed "100%".								
P124	Main power supply shortage error spec selection		I	S	T	P	N	F		0 - 1
								1		
		[1st digit] Select the abnormality detection specification at a main power supply undervoltage. 0 : Abnormal detection invalid (constant warning detection) 1 : Anomaly detection among the servo ON								

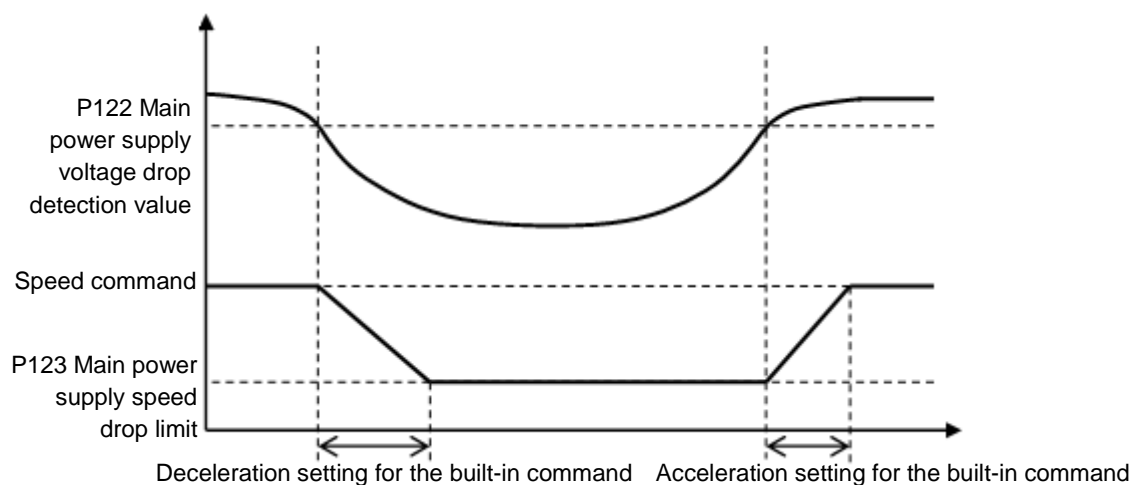
[Relation between main power supply drop and torque limit (for the speed command and the torque command)]



[Relation between main power supply drop and pulse train command (for the pulse train command)]



[Relation between main power supply drop and speed limit (for the built-in command)]



Parameter No.	Parameter name	Edit type	Supported command mode				Level	Setting unit	Setting range	
			Activating timing							
			Speed	Torque	Pulse train	Built-in				
			S	T	P	N				
		Supported model						Factory setting (Initial value)		
Function details: [Target digit]										
《Group 1》 "Device- and machine specification-related parameters"										
P126	Overload abnormal motion selection		I	S	T	P	N	F		0 - 1
									0	
		[1st digit] Select the motor operation to perform when an overload abnormality is detected. 0 : Servo OFF after braking stop 1 : Servo OFF (DB stop if the DB is provided)								
	Overload abnormal deceleration torque limit value		I	S	T	P	N	F	%	0 - 799
							0			
[4th - 2nd digits] Set the torque limit value after an overload abnormality is detected. If "0" is set, the torque limit value is "35%". When an overload abnormality occurs, the torque is also limited with the thermal detected/detection actual value [%] of [P030] and [P083].										
P127	Over speed abnormality spec selection		I	S	T	P	N	F		0 - 1
									0	
		[1st digit] Select the specification when an over speed abnormality is detected. 0 : Re-magnetic pole detection invalid after release Zero point return complete signal (HCP) condition not changed 1 : Re-magnetic pole detection valid after release Zero point return complete signal (HCP) OFF								
	Over speed abnormality detection speed		I	S	T	P	N	F	%	0 - 200
							0			
[4th - 2nd digits] Set the speed at which to detect an over speed abnormality. The setting is the ratio to the motor maximum speed, which is assumed "100%". If "0" is set, the speed is "130%".										

Parameter No.	Parameter name	Edit type	Supported command mode				Level	Setting unit	Setting range	
			Activating timing	Speed	Torque	Pulse train				Built-in
				S	T	P				N
		Supported model						Factory setting (Initial value)		
Function details: [Target digit]										
《Group 1》 "Device- and machine specification-related parameters"										
P140	Pulse output selection		I	S	T	P	N	F		0 - 7
									0	
		[2nd and 1st digits] Select the pulse output method. For details, refer to the explanation of the encoder pulse ouput in "4-2 Input/output interface". 0 : 1/1 division output 1 : 1/2 division output 2 : 1/4 division output 3 : 1/8 division output 4 : 1/16 division output 5 : 1/32 division output 6 : P141/P142 division output 7 : P141/P142 division output Pulse output after absolute position compensation								
	Marker output width		I	S	T	P	N	F		0 - 5
									0	
		[3rd digit] Select the marker output width. The width is as given below, depending on [P060] encoder type.								
		Setting	[P060] marker input				[P060] serial			
		0	Through output				50 μ s			
		1	50 μ s,				50 μ s,			
P141	Pulse output selection dividing numerator		I	S	T	P	N	F		-99999999 - 99999999
									1	
		Set the numerator value of pulse output division. If a negative value is set, the encoder feedback output is reversed.								
P142	Pulse output selection dividing denominator		I	S	T	P	N	F		1 - 99999999
									1	
		Set the denominator value of pulse output division.								
P143	Marker output position		I	S	T	P	N	F	FB position	-2147483648 - 2147483647
									0	
		Set the encoder marker output position. (It is effective only for the ABS encoder.) The setting range of the 1-rotation ABS encoder is 0 to (1-rotation resolution of the encoder - 1). The marker output occurs when [C024: Encoder position] matches this setting.								

Parameter No.	Parameter name	Edit type	Supported command mode				Level	Setting unit	Setting range	
			Activating timing							
			Speed	Torque	Pulse train	Built-in				
			S	T	P	N				
		Supported model						Factory setting (Initial value)		
Function details: [Target digit]										
《Group 1》 "Device- and machine specification-related parameters"										
P160	Inertia and viscous friction range selection		R	S	T	P	N	F		0 - 6
									4	
		Select the minimum setting unit of inertia and viscous friction data.								
		0 : 1 1 : 0.1 2 : 0.01 3 : 0.001 4 : 0.0001 5 : 0.00001 6 : 0.000001								
P161	Moving direction selection		R	S	T	P	N	F		0 - 1
									0	
		[1st digit] Select the operating direction of the motor for commands. 0 : Forward direction operation 1 : Reverse direction operation								
	Position unit selection		R	S	T	P	N	F		0 - 7
									1	
		[2nd digit] Select the basic unit of positioning data and other settings. All position and speed settings are made in this unit. 0 : None 1 : deg 2 : m 3 : mm 4 : um 5 : inch 6 : pulse 7 : kpulse								
	Position decimal point unit selection		R	S	T	P	N	F		0 - 7
									3	
		[3rd digit] Select the minimum setting unit of positioning data. This parameter decides the decimal point position of position data and speed data, which is reflected in the display of the data.								
		0 : 1 1 : 0.1 2 : 0.01 3 : 0.001 4 : 0.0001 5 : 0.00001 6 : 0.000001 7 : 0.0000001								

Parameter No.	Parameter name	Edit type	Supported command mode				Level	Setting unit	Setting range	
			Activating timing							
			Speed	Torque	Pulse train	Built-in				
			S	T	P	N				
		Supported model							Factory setting (Initial value)	
Function details: [Target digit]										
《Group 1》 "Device- and machine specification-related parameters"										
P162	Electronic gear numerator ratio		R	S	T	P	N	F		1 - 99999999
									1	
		Set the gear ratio between the drive shaft and the motor shaft of the machine system in combination with [P163]. The division ratio is set with the formula below. Division ratio = [P162]/[P163]								
P163	Electronic gear denominator ratio		R	S	T	P	N	F		1 - 99999999
									1	
		Set the gear ratio between the drive shaft and the motor shaft of the machine system in combination with [P162]. For a setting example, refer to [P162].								
P164	Mechanical movement		R	S	T	P	N	F	P161 unit	0 - 99999999
									360000 (when P161 is in the initial status, 360.000 deg)	
		Set the load travel volume per rotation of the drive shaft (load shaft) of the machine system. When VPH DES is used, set this parameter in "Unit, Electric gear setting".								
P165	Rotation position range		R	S	T	P	N	F	P161 unit	-99999999 - 99999999
									360000 (when P161 is in the initial status, 360.000 deg)	
		Set the one rotation data range to the rotating machine. With this, the absolute position (ABS) data range is the range from 0 to ([this setting] -1). If "0" is set, the index positioning command (INDX) cannot be used. If "0" is set and an attempt is made to execute the INDX command, an error will occur. In either of the following cases, this function is disabled. <ul style="list-style-type: none">• The power is turned on with the setting being a negative value.• Homing other than SET ABS is executed.								
P166	Rotation position sign switching position		R	S	T	P	N	F	P161 unit	-99999999 - 99999999
									0	
		Set the sign switching position within motor 1 rotation range. In any of the following cases, this function is disabled. <ul style="list-style-type: none">• The setting is "0".• A value equal to or greater than the [P165] setting is set.• [P165] is disabled.• A value less than the [P169] setting is set. * If using the INDX command, set "0".								

[Relation between the rotation position range and the sign switching position]

1) If P165 is a positive value (1 - 999999999)

At power ON, the present position is acquired according to the [P165] and [P166] settings.
Subsequently, the present position is rounded within the [P166] range.

2) If P165 is a negative value (-999999999 - -1)

At power ON, the present position is acquired according to the [P165] and [P166] settings.
Subsequently, rounding within the range is not performed.

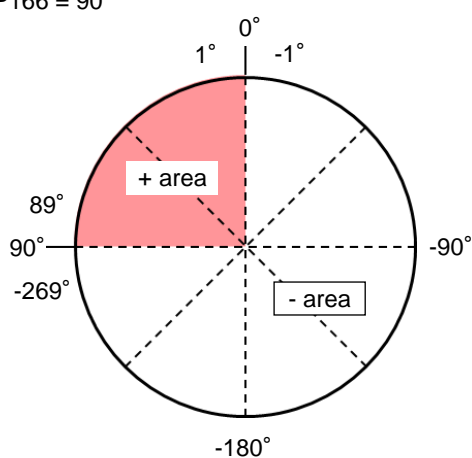
3) Setting examples

The sign areas if P165 and P166 are set as below are shown in the figures below.

[Example 1]

P165 = 360

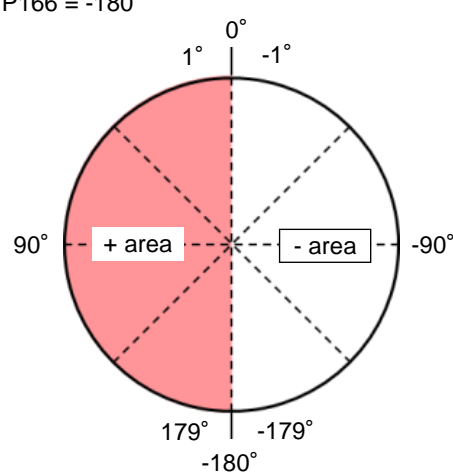
P166 = 90



[Example 2]

P165 = 360

P166 = -180



Parameters

Parameter No.	Parameter name	Edit type	Activating timing				Level	Setting unit	Setting range	
			Supported command mode							
			Speed	Torque	Pulse train	Built-in				
			S	T	P	N				
		Supported model					Factory setting (Initial value)			
Function details: [Target digit]										
《Group 1》 "Device- and machine specification-related parameters"										
P167	ABS multi turn limit		I	S	T	P	N	F	Rotation speed	0 - 999999999
									0	
		At present, this function is disabled. Set the initial value.								
P168	ABS standard data		E	S	T	P	N	F	FB resolution	-2147483648 - 2147483647
									0	
		Set the ABS data at the machine standard position. (Effective only for the ABS encoder.) This is effective if "0" is set in [P170].								
P169	ABS standard mechanical position		E	S	T	P	N	F	P161 unit	-2147483648 - 2147483647
									0	
		Set the machine position for the machine standard position. (Effective only for the ABS encoder.) This is effective if "0" is set in [P170].								
P170	Present position reflection selection after main power of ABS is ON		P	S	T	P	N	F		0 - 1
									0	
		Select the specification of the present position at power ON. (Effective only for the ABS encoder.) 0 : Reflected Set the present position based on the ABS encoder position at power ON. 1 : No reflection The present position at power ON is "0". Execute the HOME command to match the machine zero point.								

Parameter No.	Parameter name	Edit type	Supported command mode				Level	Setting unit	Setting range	
			Activating timing							
			Speed	Torque	Pulse train	Built-in				
			S	T	P	N				
		Supported model						Factory setting (Initial value)		
Function details: [Target digit]										
《Group 1》 "Device- and machine specification-related parameters"										
P171	Positive direction soft OT limit		I	S	T	P	N	F	P161 unit	-2147483648 - 2147483647
									0	
		Set the forward direction travel limit as the distance from [P585]. This is always effective after the power supply is turned on and homing is completed. For the ABS encoder, however, this takes effect as soon as the power supply is turned on. If "0" is set, OT limit detection is not performed.								
		[Cautions] After turning on the power supply, be sure to perform homing. [P585] is set upon completion of homing, so before the completion of homing, soft OT limit detection is not performed. The soft OT limit is detected with the command position, so if the delay deviation is large, a stop may occur before the soft OT limit position.								
P172	Negative direction soft OT limit		I	S	T	P	N	F	P161 unit	-2147483648 - 2147483647
									0	
		Set the reverse direction travel limit as the distance from [P585]. This is always effective after the power supply is turned on and homing is completed. For the ABS encoder, however, this takes effect as soon as the power supply is turned on. If "0" is set, OT limit detection is not performed.								
		[Cautions] After turning on the power supply, be sure to perform homing. [P585] is set upon completion of homing, so before the completion of homing, soft OT limit detection is not performed. The soft OT limit is detected with the command position, so if the delay deviation is large, a stop may occur before the soft OT limit position.								

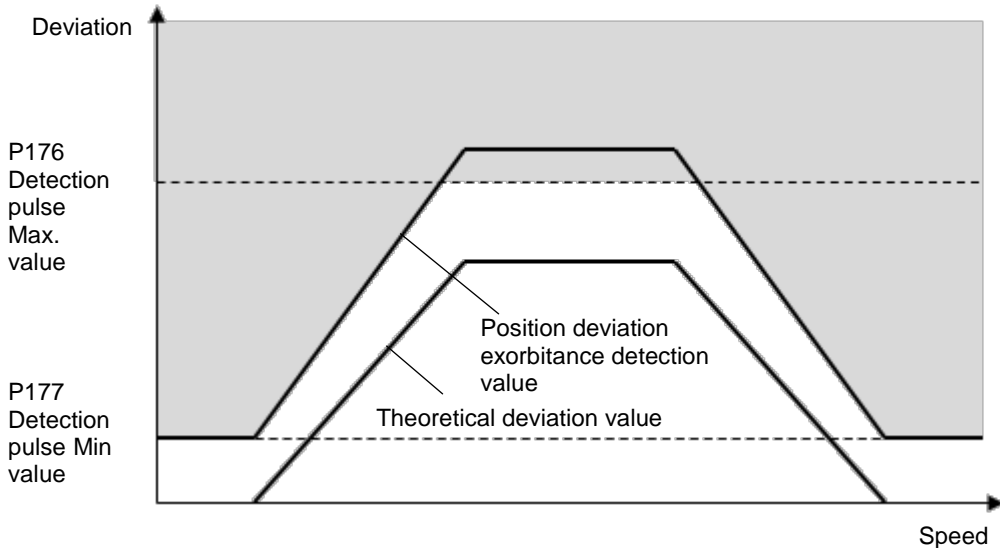
Parameter No.	Parameter name	Edit type	Supported command mode				Level	Setting unit	Setting range	
			Activating timing	Speed	Torque	Pulse train				Built-in
				S	T	P				N
				Supported model						Factory setting (Initial value)
		Function details: [Target digit]								
《Group 1》 "Device- and machine specification-related parameters"										
P173	Max travel amount for positive direction positioning		I	—	—	—	N	F	P161 unit	0 - 2147483647
									0	
		Set the maximum forward direction positioning quantity as an incremental quantity. (The decimal point position depends on [P161 (3rd digit)].) If the positioning quantity of the executed command is larger than this setting, the command is terminated with an alarm. If "0" is set, the forward direction positioning quantity is not checked.								
P174	Max travel amount for negative direction positioning		I	—	—	—	N	F	P161 unit	-2147483648 - 0
									0	
		Set the maximum reverse direction positioning quantity as an incremental quantity. (The decimal point position depends on [P161 (3rd digit)].) If the positioning quantity of the executed command is larger than this setting, the command is terminated with an alarm. If "0" is set, the reverse direction positioning quantity is not checked.								
P175	Position deviation exorbitance detection pulse at Servo OFF -> Servo ON		I	—	—	P	N	F	FB resolution	0 - 99999999
									1000	
		If the deviation pulse at a change from servo OFF to servo ON is equal to or greater than this setting, abnormality detection is performed. If "0" is set in [P631], the deviation pulse is detected.								
P176	Position deviation exorbitance detection pulse Max. value		I	—	—	P	N	F	FB resolution	0 - 99999999
									1000000	
		Set the maximum value at which to perform abnormality detection. If the deviation pulse is equal to or greater than this setting, abnormality detection is performed.								
P177	Position deviation exorbitance detection pulse Min value		I	—	—	P	N	F	FB resolution	0 - 99999999
									300000	
		Set the minimum value at which to perform abnormality detection. If the deviation pulse is equal to or less than this setting, abnormality detection is not performed. This setting is effective when [P178] is effective.								
P178	Position deviation exorbitance detection ratio		I	—	—	P	N	F	%	0 - 999
									150	
		Set the detection ratio, with the theoretical deviation value when the motor tracks the speed (referred to simply as the "theoretical deviation value") being assumed "100%". If the position deviation pulse exceeds the detection ratio, abnormality detection is performed. If "0" is set, position deviation exorbitance detection is ineffective.								

Parameter No	Parameter name	Edit type	Supported command mode				Level	Setting unit	Setting range
			Activating timing						
			Speed	Torque	Pulse train	Built-in			
			S	T	P	N			
			Supported model						
Function details: [Target digit]									
《Group 1》 "Device- and machine specification-related parameters"									

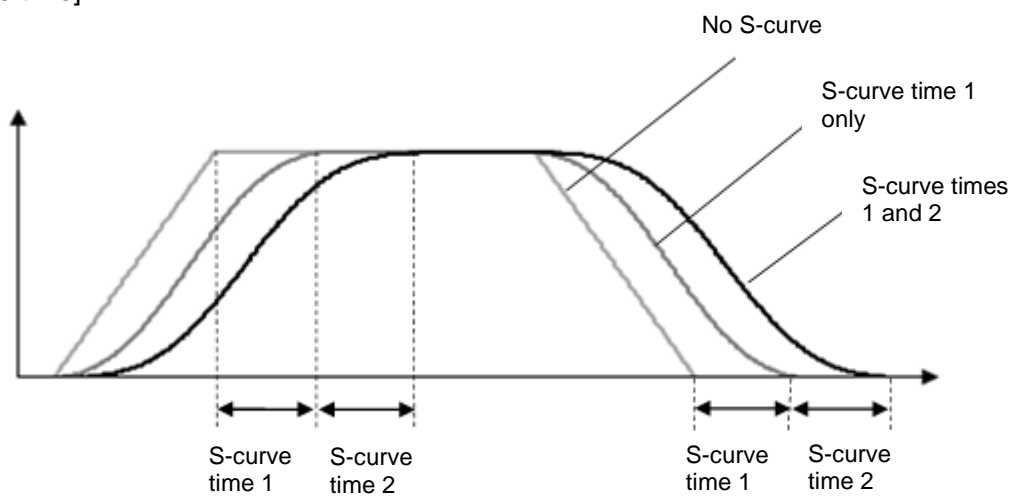
[Position deviation pulse detection relation]

Set the deviation allowance for the theretical deviation value, using [P178: Position deviation exorbitance detection ratio].

Position deviation exorbitance detection value = Theoretical deviation value × P178 + P177



The graph illustrates the relationship between Deviation (Y-axis) and Speed (X-axis). It shows a trapezoidal shape representing the 'Position deviation exorbitance detection value'. The top horizontal line of the trapezoid is labeled 'P176 Detection pulse Max. value'. The bottom horizontal line is labeled 'P177 Detection pulse Min. value'. The area between these two lines is shaded gray. The trapezoid itself is outlined in black. The area above the top line is also shaded gray. The area below the bottom line is white. The trapezoid is labeled 'Position deviation exorbitance detection value'. The area between the trapezoid and the bottom line is labeled 'Theoretical deviation value'.

Parameter No	Parameter name	Edit type	Supported command mode				Level	Setting unit	Setting range	
			Activating timing							
			Speed	Torque	Pulse train	Built-in				
			S	T	P	N				
			Supported model							Factory setting (Initial value)
Function details: [Target digit]										
《Group 1》 "Device- and machine specification-related parameters"										
P179	S-curve time 2		R	—	—	P	N	F	ms	0 - 1000.0
									3.0	
		Set the acceleration/deceleration curve of the motor in each operation of the pulse train command, command, and jog, with time if the curve is assumed to be an "S-curve". For [P470, P476, P482, P488, P494, P500, P506, P512] or [P522, P529, P536, P543, P550, P557, P564, P571], an S-curve is further applied to the time to which an S-curve has been applied.								
		If "0" is set, this function is ineffective.								
[S-curve time]										
<div></div>										

6-3-4 Servo adjustment-related parameters (groups 2 and 3)

Parameter No.	Parameter name	Edit type	Supported command mode				Level	Setting unit	Setting range		
			Speed	Torque	Pulse train	Built-in					
			S	T	P	N					
			Supported model							Factory setting (Initial value)	
		Function details: [Target digit]									
《Groups 2 and 3》 "Servo adjustment-related parameters"											
P200	Speed detection filter time constant for gain switching		I	S	T	P	N		ms	0.0 - 99.9	
									0.0		
		[3rd - 1st digits] Set the time constant for the speed for gain switching.									
	Position deviation detection filter time constant for gain switching		I	S	T	P	N		ms	0.0 - 99.9	
									0.0		
[6th - 4th digits] Set the time constant for the position deviation for gain switching.											
P210	Gain No. 0 Low speed gain switching speed		I	S	T	P	N		rpm	0.000 - 99999.999	
									1.000		
		Set the speed at which to switch between the normal speed gain and the low speed gain. When the operation speed is equal to or less than this speed, the gain is switched to the low speed gain. If "0" is set, switching to the low speed gain is ineffective.									
P211	Gain No. 0 Low speed gain switching deviation pulse		I	S	T	P	N		FB resolution	0 - 99999999	
									10		
		Set the deviation pulse at which to switch between the normal speed gain and the low speed gain. When the deviation pulse goes below this deviation range, the gain is switched to the low speed gain. If "0" is set, switching to the low speed gain is ineffective.									

Parameter No.	Parameter name	Edit type	Supported command mode				Level	Setting unit	Setting range			
			Activating timing	Speed	Torque	Pulse train				Built-in		
		Supported model						Factory setting (Initial value)				
Function details: [Target digit]												
《Groups 2 and 3》 "Servo adjustment-related parameters"												
P212	Gain No. 0 Normal speed -> Low speed gain switching time constant		I	S	T	P	N	F	ms	0.0 - 99.9		
									5.0			
		[3rd - 1st digits] Set the time constant when the gain is switched from the normal speed gain to the low speed gain. <ul style="list-style-type: none">• This setting is effective only for the speed loop gain parameter, integral time constant parameter, and position loop gain parameter.• For parameters other than the above, switching is performed without a filter time constant.• For gain switching between gain numbers, switching is performed under the conditions of the selected gain number.										
	Gain No. 0 Low speed -> Normal speed gain switching filter time constant		I	S	T	P	N	F	ms	0.0 - 99.9		
									0.0			
		[6th - 4th digits] Set the time constant when the gain is switched from the low speed gain to the normal speed gain. <ul style="list-style-type: none">• This setting is effective only for the speed loop gain parameter, integral time constant parameter, and position loop gain parameter.• For parameters other than the above, switching is performed without a filter time constant.• For gain switching between gain numbers, switching is performed under the conditions of the selected gain number.										
	Gain No. 0 Low speed gain switching spec 1 selection		I	S	T	P	N	F		0 - 2		
									0			
		[7th digit] Set the low speed gain switching specification. 0 : Speed and deviation pulse interlocking The speed loop gain and the position loop gain are switched when both the switching speed range and the switching deviation range match. 1 : Speed and deviation pulse separate 1 For the speed loop, the gain is switched when the switching speed range matches. For the position loop, the gain is switched when the switching deviation range matches. 2 : Speed and deviation pulse separate 2 For the position loop, the gain is switched when the switching deviation range matches. For the speed loop, the gain is switched when the position loop is in a low speed gain status and the switching speed range matches.										
	Gain No. 0 Low speed gain switching spec 2 selection		I	S	T	P	N	F		0 - 1		
									0			
		[8th digit] Set the low speed gain switching specification. 0 : During command input, low speed gain switching is ineffective. In position command mode, switching during the position command is ineffective. In speed command mode, switching during the speed command is ineffective. 1 : Low speed gain switching is effective regardless of command input.										

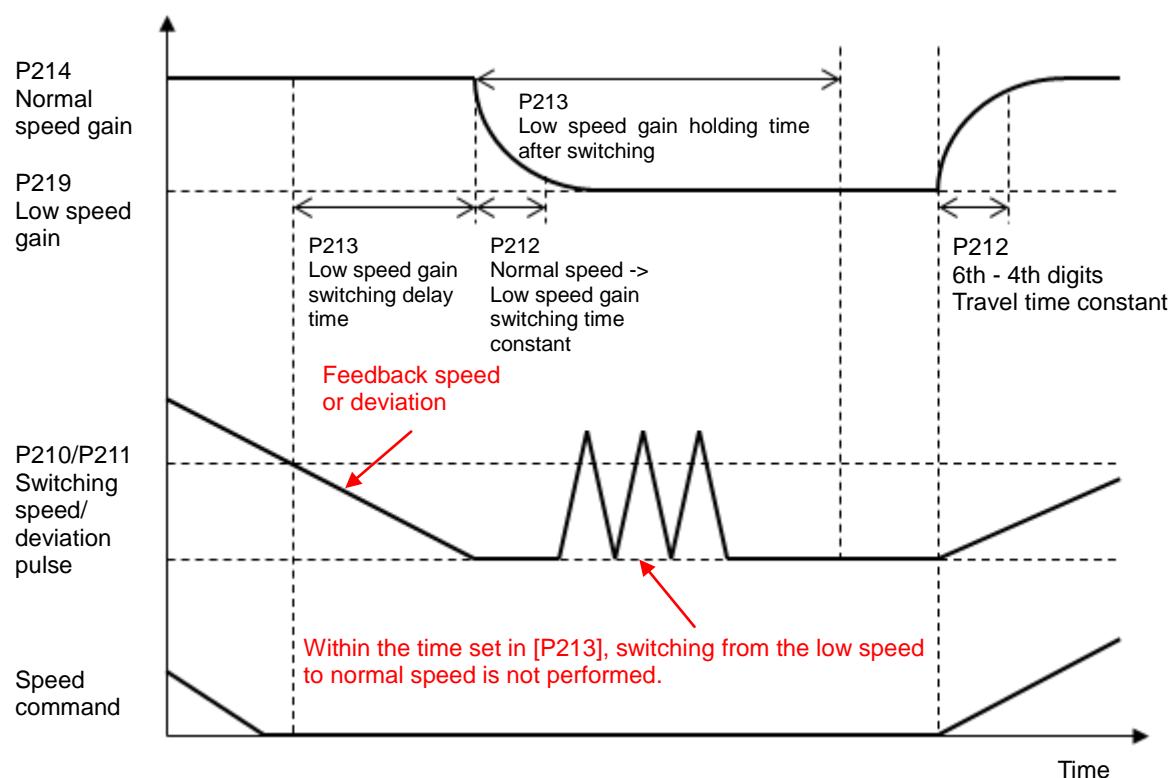
Parameter No.	Parameter name	Edit type	Supported command mode				Level	Setting unit	Setting range	
			Activating timing							
			Speed	Torque	Pulse train	Built-in				
			S	T	P	N				
		Supported model						Factory setting (Initial value)		
Function details: [Target digit]										
《Groups 2 and 3》 "Servo adjustment-related parameters"										
P213	Gain No. 0 Low speed gain switching delay time		I	S	T	P	N	F	ms	0.0 - 999.9
									10.0	
		[4th - 1st digits] Set the delay time when the gain switches from the normal speed gain to the low speed gain. The gain switches to the low speed gain after the elapse of this time after the low speed gain switching condition is met.								
			I	S	T	P	N	F	ms	0.0 - 9999.9
									0.0	
P214	Gain No. 0 Low speed gain holding time after switching	[9th - 5th digits] Within this time after switching to the low speed gain, the low speed gain status is held even if the normal speed gain switching condition is met. If, however, "0" is set in [P212] switching specification 2 selection, and command input is performed, the normal speed gain is assumed by canceling the holding time after switching to the low speed gain switching.								
		r	I	S	T	P	N	F		0 - 99999
									25	
		Set the speed loop gain. The larger the setting, the faster the response, but vibration is more likely to occur. If "0" is set, the motor is in the torque 0 status.								
			I	S	T	P	N	F	ms	0.0 - 9999.9
P215	Gain No. 0 speed loop integral time constant								20.0	
		Set the time constant of speed loop integral compensation. The smaller the setting, the faster the response, but if it is too small, vibration will occur. If "0" is set, integral compensation is ineffective.								
		r	I	S	T	P	N	F	μs	-999 - 999
									0	
		Set the time constant of speed loop derivative compensation. The larger the setting, the faster the response, but if it is too large, vibration is likely to occur. If "0" is set, derivative compensation is not performed. If a negative value is set, the time constant will be a first-order delay time constant.								
P216	Gain No. 0 speed loop derivative time constant	r	I	S	T	P	N	F	%	-100.0 - 100.0
									0.0	
		Set the proportional compensation gain distribution factor of the two-degree-of-freedom PID speed control system. The larger the setting, the faster the decrease in position deviation upon completion of positioning. If it is too large, it will cause over-shoot.								
			I	S	T	P	N	F	%	-100.0 - 100.0
									0.0	
P217	Gain No. 0 speed loop proportional gain distribution factor	Set the derivative compensation gain distribution factor of the two-degree-of-freedom PID speed control system. This is effective if a positive value is set in [P216]. The smaller the setting, the faster the decrease in position deviation upon completion of positioning. If it is too small, it will cause over-shoot.								
		r	I	S	T	P	N	F	%	-100.0 - 100.0
									0.0	
		Set the derivative compensation gain distribution factor of the two-degree-of-freedom PID speed control system. This is effective if a positive value is set in [P216]. The smaller the setting, the faster the decrease in position deviation upon completion of positioning. If it is too small, it will cause over-shoot.								
			I	S	T	P	N	F	%	-100.0 - 100.0
P218	Gain No. 0 speed loop derivative gain distribution factor	Set the derivative compensation gain distribution factor of the two-degree-of-freedom PID speed control system. This is effective if a positive value is set in [P216]. The smaller the setting, the faster the decrease in position deviation upon completion of positioning. If it is too small, it will cause over-shoot.								
		r	I	S	T	P	N	F	%	-100.0 - 100.0
									0.0	
		Set the derivative compensation gain distribution factor of the two-degree-of-freedom PID speed control system. This is effective if a positive value is set in [P216]. The smaller the setting, the faster the decrease in position deviation upon completion of positioning. If it is too small, it will cause over-shoot.								
			I	S	T	P	N	F	%	-100.0 - 100.0

Parameter No.	Parameter name	Edit type	Activating timing				Supported command mode				Level	Setting unit	Setting range
			Speed	Torque	Pulse train	Built-in							
		Supported model								Factory setting (Initial value)			
Function details: [Target digit]													
《Groups 2 and 3》 "Servo adjustment-related parameters"													
P219	Gain No. 0 low speed loop proportional gain	r	I	S	T	P	N	F		0 - 99999			
										25			
		Set the speed loop gain in the low speed gain range. (For details, refer to [P214].)											
P220	Gain No. 0 low speed loop integral time constant	r	I	S	T	P	N	F	ms	0.0 - 9999.9			
										20.0			
		Set the time constant of speed loop integral compensation in the low speed gain range. (For details, refer to [P215].)											
P221	Gain No. 0 low speed loop derivative time constant	r	I	S	T	P	N	F	μs	-999 - 999			
										0			
		Set the time constant of speed loop derivative compensation in the low speed gain range. (For details, refer to [P216].)											
P222	Gain No. 0 low speed loop proportional gain distribution factor	r	I	S	T	P	N	F	%	-100.0 - 100.0			
										0.0			
		Set the proportional compensation gain distribution factor o of the two-degree-of freedom PID speed control system in the low speed gain range. (For details, refer to [P217].)											
P223	Gain No. 0 low speed loop derivative gain distribution factor	r	I	S	T	P	N	F	%	-100.0 - 100.0			
										0.0			
		Set the derivative compensation gain distribution factor of the two-degree-of freedom PID speed control system in the low speed gain range. (For details, refer to [P218].)											
P224	Gain No. 0 speed loop integral torque limit value		I	S	T	P	N	F	%	0 - 799 (0 means no limit.)			
										0			
		Set the output torque limit value of speed loop integral compensation. If the setting exceeds the peak torque of the motor, the output torque is clamped to the peak torque. If "0" is set, the torque is limited with the torque limit value during operation.											

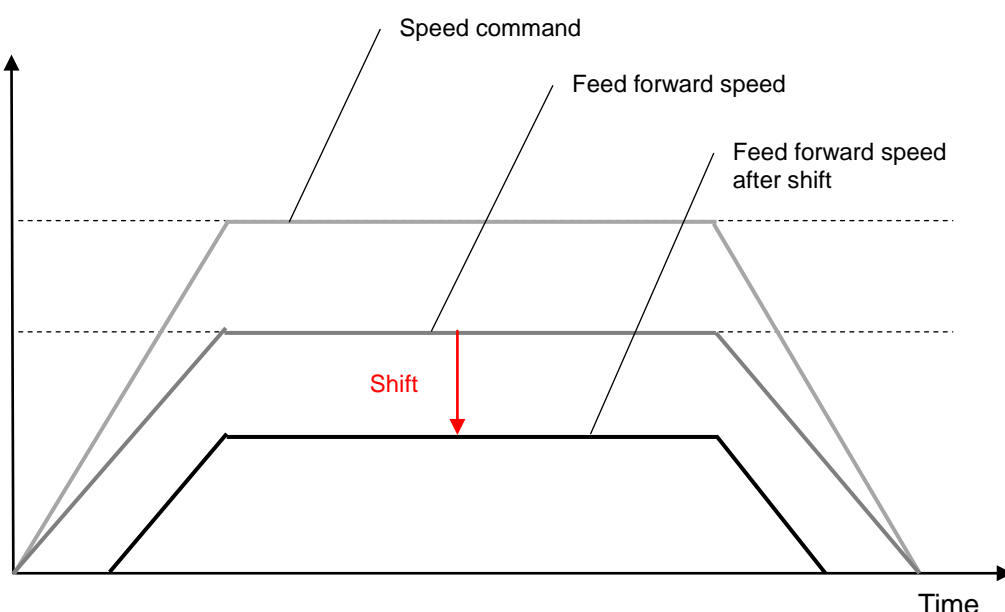
[Switching between the normal speed gain and the low speed gain]

P212: Low speed gain switching spec 1 selection = 0 Speed and deviation pulse interlocking

P212: Low speed gain switching spec 2 selection = 0 During command input, low speed gain switching ineffective.



Parameter No.	Parameter name	Edit type	Activating timing	Supported command mode				Level	Setting unit	Setting range	
				Speed	Torque	Pulse train	Built-in				
				S	T	P	N				
		Supported model					Factory setting (Initial value)				
Function details: [Target digit]											
《Groups 2 and 3》 "Servo adjustment-related parameters"											
P225	Gain No. 0 position loop gain	r	I	—	—	P	N	F	s ⁻¹	0.0 - 9999.9	
							20.0				
		Set the position loop gain. The larger the setting, the faster the response, but vibration is more likely to occur. If "0" is set, the following applies. ▪ Position loop control is not performed, but operation is performed with the speed command of [P229 Speed feed forward]. ▪ Position deviation exorbitance is not detected.									
P226	Gain No. 0 low speed position loop gain	r	I	—	—	P	N	F	s ⁻¹	0.0 - 9999.9	
							20.0				
		Set the position loop gain in the low speed gain range. The larger the setting, the faster the response, but vibration is more likely to occur. If "0" is set, normal positioning operation cannot be performed.									
P227	Gain No. 0 position loop derivative time constant		I	—	—	P	N	F	μs	0 - 9999	
							0				
		[4th - 1st digits] Set the derivative compensation time constant of the position loop. The larger the setting, the faster the response, but if it is too large, vibration is likely to occur. If "0" is set, derivative compensation is not performed.									
	Gain No. 0 low speed position loop derivative time constant		I	—	—	P	N	F	μs	0 - 9999	
							0				
		[8th - 5th digits] Set the position loop derivative time constant in the low speed gain range.									
P228	Reserved						F				
							0				
		[4th - 1st digits] Reserved area. Set the initial value.									
	Gain No. 0 positioning command delay time		I	—	—	P	N	F	ms	0.0 - 1.0	
							0.0				
[8th - 5th digits] Set the delay time after which to output the positioning command.											

Parameter No.	Parameter name	Edit type	Supported command mode				Level	Setting unit	Setting range	
			Activating timing	Speed	Torque	Pulse train				Built-in
				S	T	P				N
				Supported model						
			Function details: [Target digit]							
《Groups 2 and 3》 "Servo adjustment-related parameters"										
P229	Gain No. 0 speed feed forward ratio		I	—	—	P	N	F	%	0.0 - 120.0
									80.0	
		[4th - 1st digits] Set the speed feed forward ratio. The larger the setting, the higher the compliance, but over-shoot is more likely to occur. If this occurs, reduce the setting a little to allow for a slight deviation, thereby stabilizing operation. If "0" is set, feed forward control is ineffective.								
			I	—	—	P	N	F	%	0.0 - 100.0
									0.0	
P229	Gain No. 0 speed feed forward shift ratio	[8th - 5th digits] Reduce the feed forward speed. If the sign of the feed forward speed in the formula below changes, the feed forward speed is "0". Feed forward speed = Speed based on P229 speed feed forward ratio - (Use maximum speed x Setting [%])								
			I	—	—	P	N	F	%	0.0 - 100.0
									0.0	
		[8th - 5th digits] Reduce the feed forward speed. If the sign of the feed forward speed in the formula below changes, the feed forward speed is "0". Feed forward speed = Speed based on P229 speed feed forward ratio - (Use maximum speed x Setting [%])								
									0.0	
P230	Gain No. 0 speed feed forward filter time constant		I	—	—	P	N	F	ms	-100.0 - 100.0
									0.2	
		Set the low pass filter time constant for the speed feed forward command. Positive value : The larger the setting, the smoother the speed feed forward command, but over-shoot is more likely to occur. Negative value : If it is set, it will be the derivative control time constant for the speed feed forward command.								
		[Relation between [P229, P230] speed feed forward parameters]								
										

Parameter No.	Parameter name	Edit type	Activating timing	Supported command mode				Level	Setting unit	Setting range	
				Speed	Torque	Pulse train	Built-in				
				S	T	P	N				
				Supported model							Factory setting (Initial value)
		Function details: [Target digit]									
《Groups 2 and 3》 "Servo adjustment-related parameters"											
P231	Gain No. 0 Inertia		I	S	T	P	N	F	P160 range kg·m ²	0 - 999999999	
									0		
		Set the inertia of the control system. The range can be set with [P160]. Usually, it is set with auto tuning.									
P232	Gain No. 0 Viscous friction		I	S	T	P	N	F	P160 range N·m/rad/s	0 - 999999999	
									0		
		Set the viscous friction of the control system. The range can be set with [P160]. Usually, it is set with auto tuning.									
P233	Gain No. 0 Inertia feed forward ratio		I	S	—	P	N	F	%	0.0 - 200.0	
									0.0		
		[4th - 1st digits] Set the feed forward ratio for the load inertia [P231]. If "100%" is set, the compliance increases, but vibration may occur depending on the mismatch with the machine system. If the load inertia fluctuates, usually set "0". If the load inertia does not fluctuate, set "100" after servo adjustment. If "0" is set, this feed forward control is not performed.									
	Gain No. 0 Viscous friction feed forward ratio		I	S	—	P	N	F	%	0.0 - 200.0	
									0.0		
		[8th - 5th digits] Set the feed forward ratio for the load viscous friction [P232]. If "100%" is set, the compliance increases, but vibration may occur depending on the mismatch with the machine system. If "0" is set, this feed forward control is not performed.									
P234	Gain No. 0 Torque feed forward filter time constant		I	—	—	P	N	F	ms	-100.0 - 100.0	
									0.1		
		Set the low pass filter time constant for the torque feed forward command. This torque feed forward command is the torque command output for [P231], [P232], and [P233] load inertia and load viscous friction. Depending on the sign of the setting, the specification differs. Positive value : The larger the setting, the smoother the torque feed forward command, but over-shoot is more likely to occur. Negative value : If it is set, it will be the derivative control time constant for the torque feed forward command.									

Parameter No.	Parameter name	Edit type	Activating timing				Level	Setting unit	Setting range	
			Supported command mode							
			Speed	Torque	Pulse train	Built-in				
			S	T	P	N				
		Supported model						Factory setting (Initial value)		
Function details: [Target digit]										
《Groups 2 and 3》 "Servo adjustment-related parameters"										
P235	Gain No. 0 filter derivative coefficient while stopping		I	S	T	P	N	F		0.0 - 99.9
									1.0	
		[3rd - 1st digits] Set the derivative coefficient for vibration while stopping. Depending on the condition, make an adjustment as described below. <ul style="list-style-type: none">▪ If the load inertia is large and the friction is large, so the vibration while stopping cannot be suppressed even if the stopped filter time constant is adjusted, the vibration can be suppressed by setting in the range of 1.0 to 20.0.▪ If there is hardly any friction and some sound is heard while stopping, decrease the setting.								
			I	S	T	P	N	F	ms	0.0 - 99.9
									0.2	
	Gain No. 0 filter time constant while stopping		[6th - 4th digits] Set the filter time constant for vibration while stopping. Depending on the condition, make an adjustment as described below. <ul style="list-style-type: none">▪ If the load inertia is large and vibration occurs while stopping, the vibration can be suppressed by setting in the range of 0.3 to 9.0.▪ If the load inertia is small and the static friction of the motor is large, set in the range of 0.0 to 0.3.							

Parameter No.	Parameter name	Edit type	Supported command mode				Level	Setting unit	Setting range	
			Activating timing							
			Speed	Torque	Pulse train	Built-in				
			S	T	P	N				
			Supported model							Factory setting (Initial value)
Function details: [Target digit]										
《Groups 2 and 3》 "Servo adjustment-related parameters"										
P236	Gain No. 0 Notch filter center frequency		I	S	T	P	N	F	Hz	0 - 9999
									0	
		[4th - 1st digits] If resonance occurs depending on the combination with the machine system, set the resonance frequency, thereby preventing the resonance. Set the notch filter with a combination of notch filter center frequency and notch filter band width. If "0" is set, the filter is ineffective.								
	Gain No. 0 Notch filter band width ratio		I	S	T	P	N	F	%	0 - 100
									0	
		[7th - 5th digits] Set the band width of notch filter 1. Set it with a ratio to the notch filter center frequency. If "0" is set, the filter is ineffective. Example) Center frequency x This setting = Band width 1000 Hz x 20% (0.20) = 200 Hz								
[Relation between [P236] notch filter center frequency and band width]										
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Parameter No.	Parameter name	Edit type	Activating timing	Supported command mode				Level	Setting unit	Setting range		
				Speed	Torque	Pulse train	Built-in					
				S	T	P	N					
				Supported model							Factory setting (Initial value)	
				Function details: [Target digit]								
《Groups 2 and 3》 "Servo adjustment-related parameters"												
P240 - P269	Gain No. 1		I	S	T	P	N	F				
		Refer to parameters for gain No. 0, [P210] to [P236]. Note the following differences. • Read gain number 0 as 1. • Read the parameter numbers as those on the left.										
P270 - P299	Gain No. 2		I	S	T	P	N	F				
		Refer to parameters for gain No. 0, [P210] to [P236]. Note the following differences. • Read gain number 0 as 2. • Read the parameter numbers as those on the left.										
P300 - P329	Gain No. 3		I	S	T	P	N	F				
		Refer to parameters for gain No. 0, [P210] to [P236]. Note the following differences. • Read gain number 0 as 3. • Read the parameter numbers as those on the left.										

Parameters

Parameter No.	Parameter name	Edit type	Supported command mode				Level	Setting unit	Setting range	
			Activating timing							
			Speed	Torque	Pulse train	Built-in				
			S	T	P	N				
		Supported model						Factory setting (Initial value)		
Function details: [Target digit]										
《Groups 2 and 3》 "Servo adjustment-related parameters"										
P330	Torque command filter order selection		I	S	T	P	N	F		0 - 1
								0		
		[1st digit] Select the torque command filter order. 0 : Primary 1 : Secondary								
	Torque command filter frequency		I	S	T	P	N	F	Hz	0 - 9999
								0		
[5th - 2nd digits] Set the filter (low pass) frequency of the torque command. If resonance occurs depending on the combination with the machine system, insert a torque command filter to fix it. If "0" is set, the filter is ineffective.										
P331	Notch filter center frequency 1		I	S	T	P	N	F	Hz	0 - 9999
								0		
		[4th - 1st digits] If resonance occurs depending on the combination with the machine system, set the resonance frequency, thereby preventing the resonance. Set the notch filter with a combination of notch filter center frequency and notch filter band width. If "0" is set, the filter is ineffective.								
	Notch filter band width ratio 1		I	S	T	P	N	F	%	0 - 100
								0		
[7th - 5th digits] Set the band width of notch filter 1. Set it with a ratio to the notch filter center frequency. If "0" is set, the filter is ineffective. Example) Center frequency x This setting = Band width 1000 Hz x 20% (0.20) = 200 Hz										

Parameter No.	Parameter name	Edit type	Supported command mode				Level	Setting unit	Setting range	
			Activating timing							
			Speed	Torque	Pulse train	Built-in				
			S	T	P	N				
		Supported model						Factory setting (Initial value)		
Function details: [Target digit]										
《Groups 2 and 3》 "Servo adjustment-related parameters"										
P332	Notch filter center frequency 2		I	S	T	P	N	F	Hz	0 - 9999
								0		
		[4th - 1st digits] Refer to Notch filter center frequency 1 [P331].								
	Notch filter center frequency 2		I	S	T	P	N	F	%	0 - 100
								0		
[7th - 5th digits] Refer to Notch filter band width ratio 1 [P331].										
P333	Notch filter center frequency 3		I	S	T	P	N	F	Hz	0 - 9999
								0		
		[4th - 1st digits] Refer to Notch filter center frequency 1 [P331].								
	Notch filter center frequency 3		I	S	T	P	N	F	%	0 - 100
								0		
[7th - 5th digits] Refer to Notch filter band width ratio 1 [P331].										
P334	Notch filter center frequency 4		I	S	T	P	N	F	Hz	0 - 9999
								0		
		[4th - 1st digits] Refer to Notch filter center frequency 1 [P331].								
	Notch filter center frequency 4		I	S	T	P	N	F	%	0 - 100
								0		
[7th - 5th digits] Refer to Notch filter band width ratio 1 [P331].										

Parameters

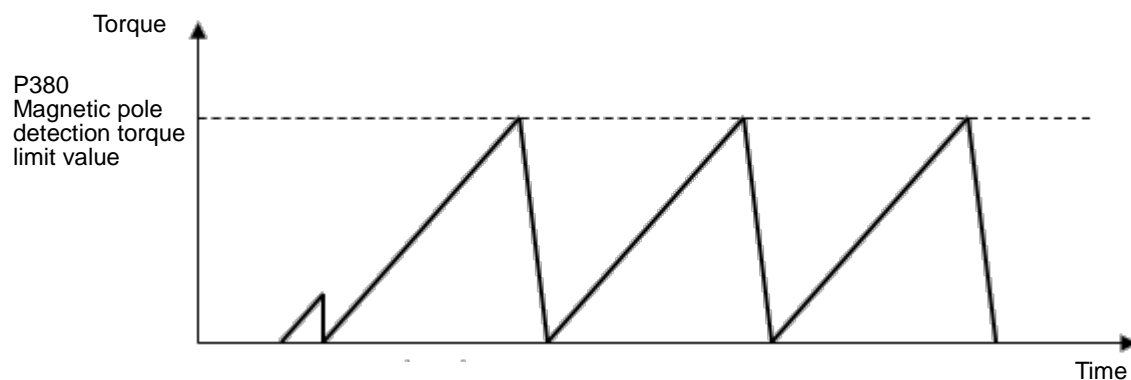
Parameter No.	Parameter name	Edit type	Supported command mode				Level	Setting unit	Setting range	
			Speed	Torque	Pulse train	Built-in				
			S	T	P	N				
			Supported model							Factory setting (Initial value)
		Function details: [Target digit]								
《Groups 2 and 3》 "Servo adjustment-related parameters"										
P340	Vibration control filter ineffective speed range		I	S	—	P	N	F	rpm	0.000 - 99999.999
									0.000	
		Set the ineffective speed range of the vibration control filter. If the speed is equal to or less than this setting, the vibration control filter is ineffective. If "0" is set, the vibration control filter is ineffective.								
P341	Vibration control filter center frequency		I	S	—	P	N	F	Hz	0 - 9999
									0	
		[4th - 1st digits] If the rigidity is low depending on the combination with the machine system, and low-frequency vibration occurs, set the resonance frequency to prevent the resonance.								
	Vibration control filter band width ratio		I	S	—	P	N	F	%	0 - 100
									0	
		[7th - 5th digits] Set the band width of the vibration control filter.								
P342	Feedback filter order selection		I	S	T	P	N	F		0 - 1
									0	
		[1st digit] Select the order of the speed feedback filter. 0 : Primary 1 : Secondary								
	Feedback filter center frequency		I	S	T	P	N	F	Hz	0 - 9999
									1000	
		[5th - 2nd digits] Set the speed feedback filter frequency.								

Parameter No.	Parameter name	Edit type	Supported command mode				Level	Setting unit	Setting range	
			Activating timing							
			Speed	Torque	Pulse train	Built-in				
			S	T	P	N				
		Supported model						Factory setting (Initial value)		
Function details: [Target digit]										
《Groups 2 and 3》 "Servo adjustment-related parameters"										
P380	Magnetic pole detection torque limit value		I	S	T	P	N	F	%	0 - 799
								200		
		Set the torque limit value during automatic magnetic pole detection. The same limit value is used for both forward direction and reverse direction.								
P381	Magnetic pole detection gain 1		I	S	T	P	N	F		0 - 9999
								80		
		Set the proportional compensation gain during automatic magnetic pole detection. The larger the setting, the faster the response, but vibration may occur depending on the rigidity of the machine system. If "0" is set, automatic magnetic pole detection does not operate normally.								
P382	Magnetic pole detection integration time constant		I	S	T	P	N	F	ms	0.1 - 999.9
								200.0		
		Set the integral compensation time constant during automatic magnetic pole detection. The smaller the setting, the faster the response, but if it is too small, vibration is likely to occur. If "0" is set, integral compensation is ineffective.								
P383	Magnetic pole detection gain 2		I	S	T	P	N	F	s ⁻¹	0 - 9999
								20		
		Set the position loop gain during automatic magnetic pole detection. The larger the setting, the faster the response, but vibration is more likely to occur. If "0" is set, the position loop is open, so that automatic magnetic pole detection cannot be performed.								
P384	Magnetic pole detection complete range		I	S	T	P	N	F	deg	0.0 - 30.0
								5.0		
		Set the automatic magnetic pole detection completion range. The wider the range, the easier the completion of automatic magnetic pole detection, but the larger the magnetic pole position error. If the range is made narrow, it may not be possible to complete automatic magnetic pole detection.								

Parameter No.	Parameter name	Edit type	Supported command mode				Level	Setting unit	Setting range	
			Activating timing	Speed	Torque	Pulse train				Built-in
		Supported model					Factory setting (Initial value)			
Function details: [Target digit]										
《Groups 2 and 3》 "Servo adjustment-related parameters"										
P385	Magnetic pole detection filter order selection		I	S	T	P	N	F		0 - 1
									0	
		[1st digit] Select the automatic magnetic pole detection filter order. 0 : Primary 1 : Secondary								
	Magnetic pole detection filter frequency		I	S	T	P	N	F	Hz	0 - 9999
									2000	
[5th - 2nd digits] Set the filter during automatic magnetic pole detection. If resonance occurs depending on the combination with the machine system, insert a low pass filter to fix it. If "0" is set, the filter is ineffective.										
P386	Landing torque		I	S	T	P	N	F	%	0 - 799
									0	
		Set the landing torque during automatic magnetic pole detection. The same limit value is used for both forward direction and reverse direction. If "0" is set, the landing torque is ineffective.								
	Landing torque holding time		I	S	T	P	N	F	s	0.00 - 99.99
									0.00	
Set the landing torque holding time during automatic magnetic pole detection. If "0" is set, the landing torque is ineffective.										
P387	Magnetic pole detection torque minimum value		I	S	T	P	N	F	%	0 - 799
									0	
		[3rd - 1st digits] Set the minimum value of automatic magnetic pole detection torque for the second and subsequent sessions.								
	Magnetic pole detection torque attenuation pattern selection		I	S	T	P	N	F		0 - 1
									0	
[4th digit] Select the pattern during automatic magnetic pole detection torque attenuation. 0 : Soft damping 1 : Rapid damping										

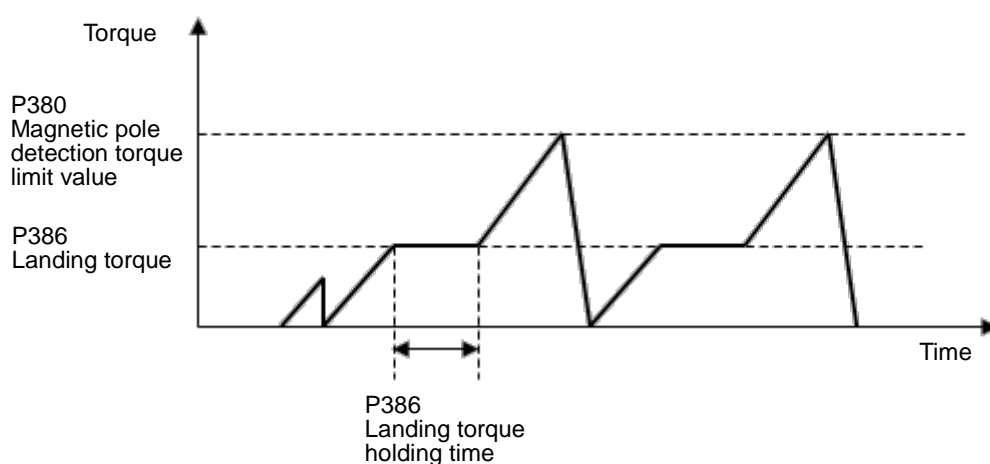
[Example 1: If the load inertia is equal to or less than several tens of times the motor inertia]

A non-zero value is set in P380, and P386 and P387 are set to 0.



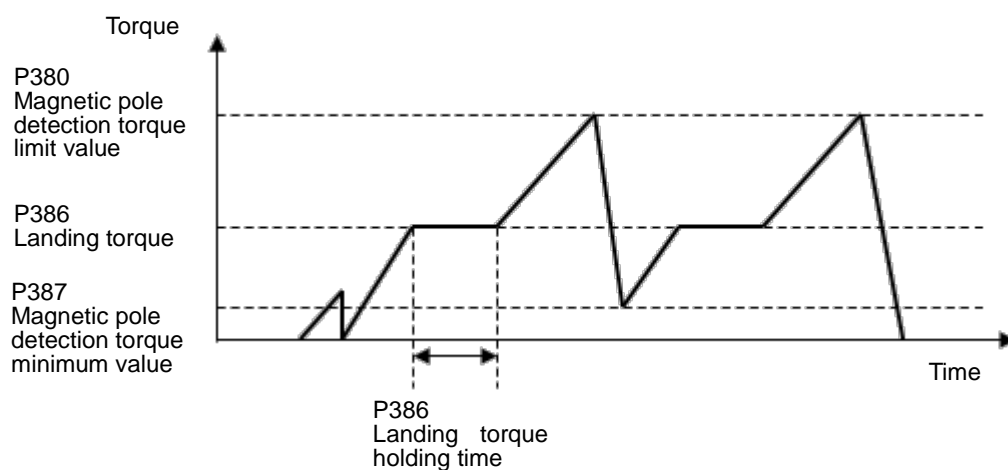
[Example 2: If the load inertia is equal to or greater than several tens of times the motor inertia]

A non-zero value is set in P380 and P386, and P387 is set to 0.



[Example3: If the load inertia is equal to or greater than several tens of times the motor inertia, and the load is slightly unbalanced]

A non-zero value is set in P380, P386, and P387.

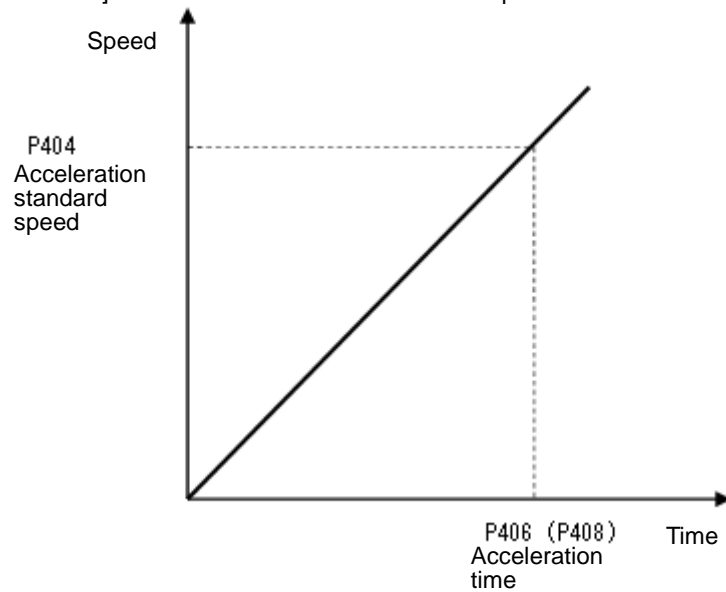


6-3-5 Command-related parameters (groups 4 and 5)

Parameter No.	Parameter name	Edit type	Supported command mode				Level	Setting unit	Setting range	
			Activating timing							
			Speed	Torque	Pulse train	Built-in				
			S	T	P	N				
		Supported model						Factory setting (Initial value)		
Function details: [Target digit]										
《Groups 4 and 5》 "Command-related parameters"										
P400	Analog torque command spec selection		I	S	—	—	—			0 - 2
									0	
		Select the analog torque command specification in speed command mode. 0 : Analog command ineffective 1 : Torque command addition 2 : Torque limit spec								
P401	Analog speed command voltage gain		I	S	T	—	N		V	0.001 - 99.999
									10.000	
		Set the full scale value of the analog speed command voltage (DC voltage). If the command voltage equal to the setting is input, the motor rotates at the motor maximum speed. The setting can be equal to or greater than "10.00", but the maximum value of the input voltage is ±10 V. Motor regenerative operation in a rotation range exceeding "10.00" is possible within motor maximum rotation, but power running is impossible. Example) If the setting "50.00" and the rated rotation is 2000 rpm, motor power running rotation is as follows, with 10 V input as the speed command voltage: 2000 x 10 V/50.00 = 400 rpm. The speed command resolution is maximized at 10 V. The speed command resolution if "06.00" is set is 6/10 of that if "10.00" is set.								
P402	Analog speed command offset		I	S	T	—	N		V	-12.000 - 12.000
									0.000	
		Set the offset voltage value of the analog speed command (DC voltage). If the analog speed command voltage has an offset, the motor rotates slowly because of this. Set this parameter so that the rotation of the motor due to the offset voltage stops.								
P403	Analog speed command filter time constant		I	S	T	—	N		ms	0.00 - 99.99
									0.50	
		Set the filter time constant for the analog speed command.								

Parameter No.	Parameter name	Edit type	Activating timing	Supported command mode				Level	Setting unit	Setting range
				Speed	Torque	Pulse train	Built-in			
				S	T	P	N			
				Supported model						
		Function details: [Target digit]								
《Groups 4 and 5》 "Command-related parameters"										
P404	Speed command acceleration standard time		I	S	—	—	—	F	P161 unit/s	0 - 300000000
									0	
		Set the standard speed in speed command acceleration. If "0" is set, the maximum speed is set.								
P405	Speed command deceleration standard time		I	S	—	—	—	F	P161 unit/s	0 - 300000000
									0	
		Set the standard speed in speed command deceleration. If "0" is set, maximum speed is set.								
P406	Analog speed command acceleration standard time		I	S	—	—	—	F	s	0.0000 - 99.9999
									0.0000	
		Set the acceleration time analog speed command. This setting is the time required to reach the speed that is set in [P404].								
P407	Analog speed command deceleration standard time		I	S	—	—	—	F	s	0.0000 - 99.9999
									0.0000	
		Set the deceleration time for the analog speed command. This setting is the time required to reach the speed that is set in [P405].								
P408	Internal speed command acceleration standard time		I	S	—	—	—	F	s	0.0000 - 99.9999
									0.5000	
		Set the acceleration time for the internal speed command. This setting is the time required to reach the speed that is set in [P404].								
P409	Internal speed command deceleration standard time		I	S	—	—	—	F	s	0.0000 - 99.9999
									0.5000	
		Set the acceleration time for the internal speed command. This setting is the time required to reach the speed that is set in [P405].								

[Relation between [P404 - P409] acceleration/deceleration standard speed and acceleration/deceleration time]



Parameter No.	Parameter name	Edit type	Activating timing	Supported command mode				Level	Setting unit	Setting range
				Speed	Torque	Pulse train	Built-in			
				S	T	P	N			
				Supported model						
Function details: [Target digit]										
《Groups 4 and 5》 "Command-related parameters"										
P410	SPDSEL0 Speed command spec selection		I	S	—	—	—	F		0 - 2
										1
		[1st digit] Select the speed command value specification in speed command mode. 0 : Speed command value/Setting value of command number 0 1 : Analog speed command 2 : Speed command value/indirect data assignment Speed data stored with the indirect data number specified with command number 0								
	SPDSEL0 Gain No. selection		I	S	—	—	—	F		0 - 3
										0
		[2nd digit] Select the gain number in speed command mode. 0 : Gain No. 0 1 : Gain No. 1 2 : Gain No. 2 3 : Gain No. 3								
	SPDSEL0 Overtravel spec selection		I	S	—	—	—	F		0 - 2
								0		
[3rd digit] Select the overtravel specification in speed command mode. 0 : Auto release alarm 1 : Reset release alarm 2 : Warning										
P411	SPDSEL0 Speed command value		I	S	—	—	—	F	P161 unit/s	-300000000 - 300000000
									Indirect data number	-99 - -1
										0
		Set the internal speed command value of command number 0. For indirect data assignment, the following applies. ▪ For [P410 (1st digit)], set "2: Speed command value/indirect data assignment". ▪ Settings -99 to -1 correspond to indirect data items 99 to 1. ▪ With a setting outside the above range, the speed command is 0.								
P412	SPDSEL0 Torque limit value		I	S	—	—	—	F	%	-99 - 799.9
										300.0
		Set the motor output torque limit value for command number 0 in speed command mode. If a value exceeding the peak torque of the motor is set, the output torque is clamped to the peak torque. If "0" is set, no forward direction torque is generated. For a negative value, indirect data assignment is assumed.								

Parameter No.	Parameter name	Edit type	Supported command mode				Level	Setting unit	Setting range			
			Speed	Torque	Pulse train	Built-in						
			S	T	P	N						
			Supported model							Factory setting (Initial value)		
			Function details: [Target digit]									
《Groups 4 and 5》 "Command-related parameters"												
P413 - P415	SPDSEL1 parameter		I	S	—	—	—	F				
		Refer to SPDSEL0 parameters [P410] to [P412]. Note the following differences. • Read SPDSEL number 0 as 1. • Read the parameter numbers as those on the left. • The initial value of [P413 SPDSEL1 Speed command spec selection] [1st digit] is "0".										
P416 - P418	SPDSEL2 parameter		I	S	—	—	—	F				
		Refer to SPDSEL0 parameters [P410] to [P412]. Note the following differences. • Read SPDSEL number 0 as 2. • Read the parameter numbers as those on the left. • The initial value of [P416 SPDSEL2 Speed command spec selection] [1st digit] is "0".										
P419 - P421	SPDSEL3 parameter		I	S	—	—	—	F				
		Refer to SPDSEL0 parameters [P410] to [P412]. Note the following differences. • Read SPDSEL number 0 as 3. • Read the parameter numbers as those on the left. • The initial value of [P419 SPDSEL3 Speed command spec selection] [1st digit] is "0".										
P422 - P424	SPDSEL4 parameter		I	S	—	—	—	F				
		Refer to SPDSEL0 parameters [P410] to [P412]. Note the following differences. • Read SPDSEL number 0 as 4. • Read the parameter numbers as those on the left. • The initial value of [P422 SPDSEL4 Speed command spec selection] [1st digit] is "0".										
P425 - P427	SPDSEL5 parameter		I	S	—	—	—	F				
		Refer to SPDSEL0 parameters [P410] to [P412]. Note the following differences. • Read SPDSEL number 0 as 5. • Read the parameter numbers as those on the left. • The initial value of [P425 SPDSEL5 Speed command spec selection] [1st digit] is "0".										
P428 - P430	SPDSEL6 parameter		I	S	—	—	—	F				
		Refer to SPDSEL0 parameters [P410] to [P412]. Note the following differences. • Read SPDSEL number 0 as 6. • Read the parameter numbers as those on the left. • The initial value of [P428 SPDSEL6 Speed command spec selection] [1st digit] is "0".										
P431 - P433	SPDSEL7 parameter		I	S	—	—	—	F				
		Refer to SPDSEL0 parameters [P410] to [P412]. Note the following differences. • Read SPDSEL number 0 as 7. • Read the parameter numbers as those on the left. • The initial value of [P431 SPDSEL7 Speed command spec selection] [1st digit] is "0".										

Parameter No.	Parameter name	Edit type	Supported command mode				Level	Setting unit	Setting range	
			Activating timing							
			Speed	Torque	Pulse train	Built-in				
			S	T	P	N				
		Supported model						Factory setting (Initial value)		
Function details: [Target digit]										
《Groups 4 and 5》 "Command-related parameters"										
P434	Analog speed command spec at torque command mode		I	—	T	—	—	F		0 - 1
									0	
		Select the analog speed command specification in torque command mode. 0 : Analog speed command ineffective 1 : Speed limit								
P435	Analog torque command voltage gain		I	S	T	—	—	F	V	0.001 - 99.999
									3.333	
		Set the scale value of the analog torque command voltage (DC voltage). If the command voltage equal to the setting is input, the rated torque value is output. The setting can be equal to or greater than "10.00", but the maximum value of the input voltage is ±10 V.								
P436	Analog torque command offset		I	S	T	—	—	F	V	-12.000 - 12.000
									0.000	
		Set the offset voltage value of the analog torque command.								
P437	Analog torque command filter time constant		I	S	T	—	—	F	ms	0.00 - 99.99
									0.50	
		Set the filter time constant of the analog torque command.								
P438	Analog torque command Increase/Decrease change time		I	S	T	—	—	F	s	0.0000 - 9.9999
									0.0000	
		Set the increase/decrease change time of the analog torque command. This setting is the time required to reach the rated torque.								
P439	Internal torque command Increase/Decrease change time		I	S	T	—	—	F	s	0.0000 - 9.9999
									0.0000	
		Set the increase/decrease change time of the internal torque command. This setting is the time required to reach the rated torque.								
[Relation between [P438, P439] torque command increase/decrease change time and rated torque]										
<div><div>Torque</div><div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><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Parameter No.	Parameter name	Edit type	Supported command mode				Level	Setting unit	Setting range	
			Activating timing							
			Speed	Torque	Pulse train	Built-in				
			S	T	P	N				
		Supported model						Factory setting (Initial value)		
Function details: [Target digit]										
《Groups 4 and 5》 "Command-related parameters"										
P440	Speed limit value at torque command mode		I	—	T	—	—	F	P161 unit/s	0 - 300000000
									0	
		Set the motor operation speed limit value in torque command mode. If "0" is set, the maximum speed is set.								
P441	TRQSEL0 Torque command spec selection		I	—	T	—	—	F		0 - 2
									1	
		[1st digit] Select the torque command value specification in torque command mode. 0 : Torque command value/Setting value of command number 0 1 : Analog torque command 2 : Torque command value/indirect data assignment Torque value stored with the indirect data number specified with [P442]								
	TRQSEL0 Gain No. selection		I	—	T	—	—	F		0 - 3
									0	
		[2nd digit] Select the gain number in torque command mode. 0 : Gain No. 0 1 : Gain No. 1 2 : Gain No. 2 3 : Gain No. 3								
	TRQSEL0 Overtravel spec selection		I	—	T	—	—	F		0 - 2
									0	
		[3rd digit] Select the overtravel specification in torque command mode. 0 : Auto release alarm 1 : Reset release alarm 2 : Warning								
P442	TRQSEL0 Torque command value		I	—	T	—	—	F	%	-799.9 - 799.9
									Indirect data number	-99 - -1
									0.0	
		Set the internal torque command value and the command direction for command number 0 in torque command mode. For indirect data assignment, the following applies. ▪ For [P441 (1st digit)], set "2: Torque command value/indirect data assignment". ▪ Settings -99 to -1 correspond to indirect data items 99 to 1. ▪ With a setting outside the above range, the speed command is "0".								
P443	TRQSEL0 Speed limit value		I	—	T	—	—	F	P161 unit/s	-99 - 300000000
									0	
		Set the motor operation speed limit value for command number 0 in torque command mode. If "0" is set, the maximum speed is set. For a negative value, indirect data assignment is assumed.								

Parameter No.	Parameter name	Edit type	Supported command mode				Level	Setting unit	Setting range	
			Activating timing							
			Speed	Torque	Pulse train	Built-in				
			S	T	P	N				
		Supported model							Factory setting (Initial value)	
Function details: [Target digit]										
《Groups 4 and 5》 "Command-related parameters"										
P444 - P446	TRQSEL1 parameter		I	—	T	—	—	F		
		Refer to TRQSEL0 parameters [P441] to [P443]. Note the following differences. • Read TRQSEL number 0 as 1. • Read the parameter numbers as those on the left. • The initial value of [P444 (1st digit)] is "0".								
P447 - P449	TRQSEL2 parameter		I	—	T	—	—	F		
		Refer to TRQSEL0 parameters [P441] to [P443]. Note the following differences. • Read TRQSEL number 0 as 2. • Read the parameter numbers as those on the left. • The initial value of [P447 (1st digit)] is "0".								
P450 - P452	TRQSEL3 parameter		I	—	T	—	—	F		
		Refer to TRQSEL0 parameters [P441] to [P443]. Note the following differences. • Read TRQSEL number 0 as 3. • Read the parameter numbers as those on the left. • The initial value of [P450 (1st digit)] is "0".								
P453 - P455	TRQSEL4 parameter		I	—	T	—	—	F		
		Refer to TRQSEL0 parameters [P441] to [P443]. Note the following differences. • Read TRQSEL number 0 as 4. • Read the parameter numbers as those on the left. • The initial value of [P453 (1st digit)] is "0".								
P456 - P458	TRQSEL5 parameter		I	—	T	—	—	F		
		Refer to TRQSEL0 parameters [P441] to [P443]. Note the following differences. • Read TRQSEL number 0 as 5. • Read the parameter numbers as those on the left. • The initial value of [P456 (1st digit)] is "0".								
P459 - P461	TRQSEL6 parameter		I	—	T	—	—	F		
		Refer to TRQSEL0 parameters [P441] to [P443]. Note the following differences. • Read TRQSEL number 0 as 6. • Read the parameter numbers as those on the left. • The initial value of [P459 (1st digit)] is "0".								
P462 - P464	TRQSEL7 parameter		I	—	T	—	—	F		
		Refer to TRQSEL0 parameters [P441] to [P443]. Note the following differences. • Read TRQSEL number 0 as 7. • Read the parameter numbers as those on the left. • The initial value of [P462 (1st digit)] is "0".								

Parameter No.	Parameter name	Edit type	Supported command mode				Level	Setting unit	Setting range	
			Activating timing							
			Speed	Torque	Pulse train	Built-in				
			S	T	P	N				
		Supported model							Factory setting (Initial value)	
Function details: [Target digit]										
《Groups 4 and 5》 "Command-related parameters"										
P465	Analog speed command spec at pulse train command mode		I	—	—	P	—	F		0 - 1
									0	
		[1st digit] Select the analog speed specification in pulse command mode. 0 : Analog command ineffective 1 : Speed command addition								
			I	—	—	P	—	F		0 - 2
P465	Analog torque command spec at pulse train command mode								0	
		[2nd digit] Select the analog torque specification in pulse command mode. 0 : Analog command ineffective 1 : Torque command addition 2 : Torque limit								
			I	—	—	P	—	F		0 - 6
									0	
P466	Pulse train command input spec selection	[1st digit] Select the signal input form and the multiplication ratio of the pulse train command. 0 : x1 90 ° phase difference pulse (1 time) 1 : x2 90 ° phase difference pulse (2 times) 2 : x4 90 ° phase difference pulse (4 times) 3 : F/R pulse x1 Directional pulse (1 time) 4 : F/R pulse x2 Directional pulse (2 times) 5 : pulse + F/R x1 Direction signal + feed pulse (1 time) 6 : pulse + F/R x2 Direction signal + feed pulse (2 times)								
			I	—	—	P	—	F		0 - 1
									0	
		[2nd digit] Select the motor operation command direction for the pulse train command. 0 : No reversal 1 : Reversal								

Parameter No.	Parameter name	Edit type	Supported command mode				Level	Setting unit	Setting range		
			Activating timing		Speed	Torque				Pulse train	Built-in
			S	T							
			Supported model							Factory setting (Initial value)	
		Function details: [Target digit]									
《Groups 4 and 5》 "Command-related parameters"											
P467	PLSSEL0 Numerator ratio & Denominator ratio selection		I	—	—	P	—	F		0 - 1	
									0		
		[1st digit] Select the pulse train correction ratio numerator specification. 0 : Setting of [P468] 1 : Value stored with the indirect data number specified with [P468]									
	PLSSEL0 Gain No. selection		I	—	—	P	—	F		0 - 3	
									0		
		[2nd digit] Select the gain number in pulse train command mode. 0 : Gain No. 0 1 : Gain No. 1 2 : Gain No. 2 3 : Gain No. 3									
	PLSSEL0 Overtravel spec selection		I	—	—	P	—	F		0 - 2	
									0		
		[3rd digit] Select the overtravel specification in pulse train command mode. 0 : Auto release alarm 1 : Reset release alarm 2 : Warning									

Parameter No.	Parameter name	Edit type	Supported command mode				Level	Setting unit	Setting range	
			Activating timing	Speed	Torque	Pulse train				Built-in
				S	T	P				N
			Supported model							Factory setting (Initial value)
		Function details: [Target digit]								
《Groups 4 and 5》 "Command-related parameters"										
P468	PLSSEL0 Numerator ratio		I	—	—	P	—	F		-99999999 - 99999999
									Indirect data number	-99 - -1
								1		
		Set the operation volume in the [P161] resolution unit for one pulse of pulse train command input in combination with [P469]. For indirect data assignment, the following applies. ▪ For [P467 (1st digit)], select "1: Value stored with the indirect data number specified with [P468]". ▪ Settings -99 to -1 correspond to indirect data items IX99 to IX01. ▪ If a value outside the above range is set, the PLSSEL0 ratio numerator is assumed to be "0" for calculation.								
P469	PLSSEL0 Denominator ratio		I	—	—	P	—	F		-99 - 99999999
								1		
		Set the operation volume in the [P161] resolution unit for one pulse of pulse train command input in combination with [P468]. If "0" is set, the numerator/denominator is 1/1. For a negative value, indirect data assignment is assumed.								
P470	PLSSEL0 S-curve time 1		I	—	—	P	—	F	ms	-99 - 1000.0
								10.0		
		Set the S-curve acceleration/deceleration time for the pulse train command. For a negative value, indirect data assignment is assumed.								
P471	PLSSEL0 Delay compensation		I	—	—	P	—	F	ms	0.00 - 99.99
								0.00		
		[4th - 1st digits] Set the control delay compensation time for the pulse train command.								
	PLSSEL0 Lead compensation		I	—	—	P	—	F	ms	0.00 - 99.99
								0.00		
		[8th - 5th digits] Set the control lead compensation time for the pulse train command.								
P472	PLSSEL0 Torque limit value		I	—	—	P	—	F	%	-99 - 799.9
								300.0		
		Set the motor output torque limit value for the pulse train command. For a setting exceeding the peak torque of the motor, the output torque is clamped to the peak torque. If "0" is set, no forward direction torque is generated. For a negative value, indirect data assignment is assumed.								

Parameter No.	Parameter name	Edit type	Supported command mode				Level	Setting unit	Setting range		
			Activating timing								
			Speed	Torque	Pulse train	Built-in					
			S	T	P	N					
		Supported model						Factory setting (Initial value)			
Function details: [Target digit]											
《Groups 4 and 5》 "Command-related parameters"											
P473 - P478	PLSSEL1 parameter		I	-	-	P	-	F			
		Refer to PLSSEL0 parameters [P467] to [P472]. Note the following differences. • Read PLSSEL number 0 as 1. • Read the parameter numbers as those on the left.									
P479 - P484	PLSSEL2 parameter		I	-	-	P	-	F			
		Refer to PLSSEL0 parameters [P467] to [P472]. Note the following differences. • Read PLSSEL number 0 as 2. • Read the parameter numbers as those on the left.									
P485 - P490	PLSSEL3 parameter		I	-	-	P	-	F			
		Refer to PLSSEL0 parameters [P467] to [P472]. Note the following differences. • Read PLSSEL number 0 as 3. • Read the parameter numbers as those on the left.									
P491 - P496	PLSSEL4 parameter		I	-	-	P	-	F			
		Refer to PLSSEL0 parameters [P467] to [P472]. Note the following differences. • Read PLSSEL number 0 as 4. • Read the parameter numbers as those on the left.									
P497 - P502	PLSSEL5 parameter		I	-	-	P	-	F			
		Refer to PLSSEL0 parameters [P467] to [P472]. Note the following differences. • Read PLSSEL number 0 as 5. • Read the parameter numbers as those on the left.									
P503 - P508	PLSSEL6 parameter		I	-	-	P	-	F			
		Refer to PLSSEL0 parameters [P467] to [P472]. Note the following differences. • Read PLSSEL number 0 as 6. • Read the parameter numbers as those on the left.									
P509 - P514	PLSSEL7 parameter		I	-	-	P	-	F			
		Refer to PLSSEL0 parameters [P467] to [P472]. Note the following differences. • Read PLSSEL number 0 as 7. • Read the parameter numbers as those on the left.									

Parameter No.	Parameter name	Edit type	Supported command mode				Level	Setting unit	Setting range	
			Activating timing	Speed	Torque	Pulse train				Built-in
				S	T	P				N
				Supported model						Factory setting (Initial value)
Function details: [Target digit]										
《Groups 4 and 5》 "Command-related parameters"										
P515	Analog speed command spec at Inner command mode		I	—	—	—	N	F		0 - 1
									0	
		[1st digit] Select the analog speed command specification in built-in command mode. 0 : Analog command ineffective 1 : Speed command addition								
			I	—	—	—	N	F		0 - 2
									0	
P516	Analog torque command spec at Inner command mode		I	—	—	—	N	F		0 - 2
									0	
		[2nd digit] Select the analog torque command specification in built-in command mode. 0 : Analog command ineffective 1 : Torque command addition 2 : Torque limit								
			I	—	—	—	N	F		0 - 2
									0	
P517	SEL0 Homing incomplete signal selection		I	—	—	—	N	F		0 - 1
									0	
		[1st digit] Select the positioning completion signal in built-in command mode. 0 : PN1 1 : PN2								
			I	—	—	—	N	F		0 - 3
									0	
P517	SEL0 Gain No. selection		I	—	—	—	N	F		0 - 3
									0	
		[2nd digit] Select the gain number in built-in command mode. 0 : Gain No. 0 1 : Gain No. 1 2 : Gain No. 2 3 : Gain No. 3								
			I	—	—	—	N	F		0 - 2
									0	
P517	SEL0 Overtravel spec selection		I	—	—	—	N	F		0 - 2
									0	
		[3rd digit] Select the overtravel specification in built-in command mode. For the software overtravel state, however, the specification is fixed to "reset release alarm". 0 : Auto release alarm 1 : Reset release alarm 2 : Warning								

Parameter No.	Parameter name	Edit type	Supported command mode				Level	Setting unit	Setting range	
			Activating timing	Speed	Torque	Pulse train				Built-in
				S	T	P				N
				Supported model						Factory setting (Initial value)
		Function details: [Target digit]								
《Groups 4 and 5》 "Command-related parameters"										
P518	SEL0 Internal command acceleration standard time		I	—	—	—	N	F	P161 unit/s	-99 - 300000000
									0	
		Set the acceleration standard speed in built-in command mode. If "0" is set, the acceleration standard speed is the maximum speed. For a negative value, indirect data assignment is assumed.								
P519	SEL0 Internal command deceleration standard time		I	—	—	—	N	F	P161 unit/s	-99 - 300000000
									0	
		Set the deceleration standard speed in built-in command mode. If "0" is set, the deceleration standard speed is the maximum speed. For a negative value, indirect data assignment is assumed.								
P520	SEL0 Internal command acceleration time		I	—	—	—	N	F	s	-99 - 99.9999
									0.5000	
		Set the acceleration time in built-in command mode. This setting is the time required to reach the speed that is set in [P518]. For a negative value, indirect data assignment is assumed.								
P521	SEL0 Internal command deceleration time		I	—	—	—	N	F	s	-99 - 99.9999
									0.5000	
		Set the deceleration time in built-in command mode. This setting is the time required to reach the speed that is set in [P519]. For a negative value, indirect data assignment is assumed.								
P522	SEL0 Internal command S-curve S-curve time 1		I	—	—	—	N	F	s	-99 - 1.0000
									0.0100	
		Set the S-curve acceleration/deceleration time in built-in command mode. For a negative value, indirect data assignment is assumed.								
P523	SEL0 Internal command torque limit value		I	—	—	—	N	F	%	-99 - 799.9
									300.0	
		Set the torque limit value in built-in command mode. If a value exceeding the peak torque of the motor is set, the output torque is clamp to the peak torque. For a negative value, indirect data assignment is assumed.								

Parameter No.	Parameter name	Edit type	Activating timing	Supported command mode				Level	Setting unit	Setting range	
				Speed	Torque	Pulse train	Built-in				
				S	T	P	N				
		Supported model					Factory setting (Initial value)				
Function details: [Target digit]											
《Groups 4 and 5》 "Command-related parameters"											
P524 - P530	SEL1 parameter		I	-	-	-	N	F			
		Refer to SEL0 parameters [P517] to [P523]. Note the following differences. ▪ Read SEL number 0 as 1. ▪ Read the parameter numbers as those on the left.									
P531 - P537	SEL2 parameter		I	-	-	-	N	F			
		Refer to SEL0 parameters [P517] to [P523]. Note the following differences. ▪ Read SEL number 0 as 2. ▪ Read the parameter numbers as those on the left.									
P538 - P544	SEL3 parameter		I	-	-	-	N	F			
		Refer to SEL0 parameters [P517] to [P523]. Note the following differences. ▪ Read SEL number 0 as 3. ▪ Read the parameter numbers as those on the left.									
P545 - P551	SEL4 parameter		I	-	-	-	N	F			
		Refer to SEL0 parameters [P517] to [P523]. Note the following differences. ▪ Read SEL number 0 as 4. ▪ Read the parameter numbers as those on the left.									
P552 - P558	SEL5 parameter		I	-	-	-	N	F			
		Refer to SEL0 parameters [P517] to [P523]. Note the following differences. ▪ Read SEL number 0 as 5. ▪ Read the parameter numbers as those on the left.									
P559 - P565	SEL6 parameter		I	-	-	-	N	F			
		Refer to SEL0 parameters [P517] to [P523]. Note the following differences. ▪ Read SEL number 0 as 6. ▪ Read the parameter numbers as those on the left.									
P566 - P572	SEL7 parameter		I	-	-	-	N	F			
		Refer to SEL0 parameters [P517] to [P523]. Note the following differences. ▪ Read SEL number 0 as 7. ▪ Read the parameter numbers as those on the left.									

Parameter No.	Parameter name	Edit type	Activating timing	Supported command mode				Level	Setting unit	Setting range
				Speed	Torque	Pulse train	Built-in			
				S	T	P	N			
				Supported model						
		Function details: [Target digit]								
《Groups 4 and 5》 "Command-related parameters"										
P573	Jog speed 0		I	— — — N				F	P161 unit/s	-99 - 300000000
									10000 (when P161 is in the initial status, 10.000 deg/s)	
		Set the speed for jog operation. The acceleration/deceleration time and so on follow the setting value of SEL0. For a negative value, indirect data assignment is assumed. To select jog speeds 0 to 7, use the command selection 1 to 3 signals (SS1 to SS3).								
P574	Jog speed 1		I	— — — N				F	P161 unit/s	-99 - 300000000
									10000 (when P161 is in the initial status, 10.000 deg/s)	
		Refer to [P573].								
P575	Jog speed 2		I	— — — N				F	P161 unit/s	-99 - 300000000
									10000 (when P161 is in the initial status, 10.000 deg/s)	
		Refer to [P573].								
P576	Jog speed 3		I	— — — N				F	P161 unit/s	-99 - 300000000
									10000 (when P161 is in the initial status, 10.000 deg/s)	
		Refer to [P573].								
P577	Jog speed 4		I	— — — N				F	P161 unit/s	-99 - 300000000
									10000 (when P161 is in the initial status, 10.000 deg/s)	
		Refer to [P573].								
P578	Jog speed 5		I	— — — N				F	P161 unit/s	-99 - 300000000
									10000 (when P161 is in the initial status, 10.000 deg/s)	
		Refer to [P573].								
P579	Jog speed 6		I	— — — N				F	P161 unit/s	-99 - 300000000
									10000 (when P161 is in the initial status, 10.000 deg/s)	
		Refer to [P573].								
P580	Jog speed 7		I	— — — N				F	P161 unit/s	-99 - 300000000
									10000 (when P161 is in the initial status, 10.000 deg/s)	
		Refer to [P573].								

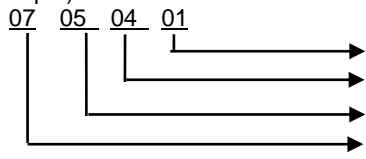
Parameter No.	Parameter name	Edit type	Supported command mode				Level	Setting unit	Setting range	
			Activating timing							
			Speed	Torque	Pulse train	Built-in				
			S	T	P	N				
		Supported model							Factory setting (Initial value)	
Function details: [Target digit]										
《Groups 4 and 5》 "Command-related parameters"										
P581	Zero point marker selection for homing		E	—	—	—	N	F		0 - 1
									0	
		[1st digit] Select the signal to use as a zero point marker. 0 : Feedback marker 1 : External marker								
	Homing acceleration/ deceleration control in reverse direction		I	—	—	—	N	F		0 - 1
									0	
[2nd digit] Select the specification of homing acceleration/deceleration in reverse direction. 0 : Acc./Dec. (SEL acceleration/deceleration setting) 1 : Quick Acc./Dec.										
P582	Homing creep speed		I	—	—	—	N	F	P161 unit/s	1 - 300000000
									10000 (when P161 is in the initial status, 10.000 deg/s)	
		Set the creep operation speed after zero point deceleration LS detection in zero return operation. Usually, set a value equal to or less than 1/100 of the motor rated speed.								
P583	Homing position constant		I	—	—	—	N	F	P161 unit	0 - 2147483647
									0	
		Set the distance after which to start marker signal detection after zero point deceleration LS detection in zero return operation. Set a value equal to or greater than the distance enabling deceleration from the zero return speed to the homing creep speed. [Cautions] If the zero return speed is high and this setting is small, sudden deceleration and sudden stopping may occur. Set a value sufficient for deceleration to the creep speed.								
P584	Setting distance for homing		I	—	—	—	N	F	P161 unit	-2147483648 - 2147483647
									0	
		Set the +α travel distance from the marker signal detection point in zero return operation. This is used for fine adjustment of the marker signal position and the machine zero point position. If the sign is positive, positioning is performed in the same direction as the zero return direction, and if the sign is negative, positioning is performed in the reverse direction. If "0" is set, zero return is completed at the time of marker signal detection. If the setting is equal to or less than the deceleration distance to stop the motor from the homing creep speed, over-shoot occurs upon completion of zero return.								

Parameter No.	Parameter name	Edit type	Supported command mode				Level	Setting unit	Setting range		
			Activating timing								
			Speed	Torque	Pulse train	Built-in					
			S	T	P	N					
		Supported model						Factory setting (Initial value)			
Function details: [Target digit]											
《Groups 4 and 5》 "Command-related parameters"											
P585	Position data standard point		I	—	—	—	N	F	P161 unit	-2147483648 - 2147483647	
									0		
		Set the standard position of the absolute position data as the distance from the machine zero point.									
		The setting is made upon completion of zero return.									
		If positioning operation is performed without performing zero return after the power supply is turned on, the position at which the power supply is turned on becomes the standard position of absolute position data.									
P586	OT deceleration time at OT HOME		I	—	—	—	N	F	s	0.0000 - 99.9999	
									0.0000		
		Set the deceleration time for the motor to stop from the rated speed.									
		This setting is valid only in OT reverse operation of OT-return zero return.									

6-3-6 Self-diagnosis- and input and output-related parameters (group 6)

Parameter No.	Parameter name	Edit type	Activating timing				Supported command mode				Level	Setting unit	Setting range
			Speed	Torque	Pulse train	Built-in							
Supported model								Factory setting (Initial value)					
Function details: [Target digit]													
《Group 6》 "Self-diagnosis-related and input and output-related parameters"													
P600	Status display C000 display item selection		I	S	T	P	N	F			0 - 999		
										0			
		[3rd - 1st digits] Select the item to display in status display C000. If "0" is set, the display item is "C001". 0 - 999: C000 - C999											
	Reserved							F					
										0			
		[4th digit] Reserved area. Set the initial value.											
	Status display C000 display multiplier factor selection		I	S	T	P	N	F			0 - 6		
										0			
		[5th digit] Select the display multiplier of status display C000. The unit is [P161 (2nd digit)]. 0 : 1 1 : 1 / 10 2 : 1 / 100 3 : 1 / 1000 4 : 1 / 10000 5 : 1 / 100000 6 : 1 / 1000000											
P601	Auto tuning moving direction		I	—	—	—	—	F			0 - 2		
										0			
		[1st digit] Select the direction in which to run the motor during the execution of the auto tuning function. 0 : Both 1 : Forward 2 : Reverse											
	Auto tuning test operation ratio		I	—	—	—	—	F			0.00 - 1.00		
										0.30			
		[4th - 2nd digits] Set the speed at which to test run the motor during the execution of the auto tuning function, as a ratio to the maximum speed. If "1.00" is set, the maximum speed is assumed.											
	Max torque at auto tuning		I	—	—	—	—	F		%	0 - 300		
										100			
		[7th - 5th digits] Set the maximum torque during auto tuning.											
	Auto tuning inertia multiplying selection		I	—	—	—	—	F		%	0 - 2		
								0					
[8th digit] Set the magnitude of the load inertia for the inertia moment of the motor. 0 : 150 or less times 1 : 150 to 300 times 2 : More than 300 times													

Parameter No.	Parameter name	Edit type	Supported command mode				Level	Setting unit	Setting range	
			Activating timing							
			Speed	Torque	Pulse train	Built-in				
			S	T	P	N				
		Supported model						Factory setting (Initial value)		
Function details: [Target digit]										
《Group 6》 "Self-diagnosis-related and input and output-related parameters"										
P604	Position assignment for test run		I	—	—	—	—	F		0 - 2
									0	
		[1st digit] Select the position assignment for test run. 0 : INVALID 1 : ABS 2 : INC								
	Test run traveling direction		I	—	—	—	—	F		0 - 2
									0	
		[2nd digit] Select the motor command direction for test run. 0 : Both 1 : Forward 2 : Reverse								
	Test run SEL selection		I	—	—	—	—	F		0 - 7
									0	
		[3rd digit] Select the SEL number used for test run. 0 - 7 : SEL.0 - 7								
	Test run stopping time		I	—	—	—	—	F	s	0.000 - 999.999
									1.000	
		[7th - 4th digits] Set the stopping time for test run.								
P605	Test run starting position		I	—	—	—	—	F	P161 unit	-2147483648 - 2147483647
									0	
		Set the run starting position for test run.								
P606	Test run positioning amount		I	—	—	—	—	F	P161 unit	0 - 2147483647
									0	
		Set the repetition distance for test run.								
P607	Test run positioning speed		I	—	—	—	—	F	P161 unit/s	0 - 300000000
									10000 (when P161 is in the initial status, 10.000 deg/s)	
		Set the positioning operation speed for test run.								
P608	Test run starting position movement speed		I	—	—	—	—	F	P161 unit/s	0 - 300000000
									10000 (when P161 is in the initial status, 10.000 deg/s)	
		Set the speed at which the motor moves to the starting position for the start of test run.								

Parameter No.	Parameter name	Edit type	Activating timing				Supported command mode				Level	Setting unit	Setting range	
			Speed	Torque	Pulse train	Built-in								
			S	T	P	N								
Supported model										Factory setting (Initial value)				
Function details: [Target digit]														
《Group 6》 "Self-diagnosis-related and input and output-related parameters"														
P620	Control input signal allocation 1		I	S	T	P	N	F		00000000 - 99999999				
										07050401				
		Set the allocation of control input signals DI1 to DI4. Each input signal has two digits assigned to it. Set the allocation number in the two digits. For information about the allocation number of each signal, refer to the control input and output signal allocation number table. If "00" is set, the input signal is ineffective. A number listed in the control input and output signal allocation number table + 50 results in a negative logic setting. 1st & 2nd digits DI1 (CN1-36) 3rd & 4th digits DI2 (CN1-35) 5th & 6th digits DI3 (CN1-34) 7th & 8th digits DI4 (CN1-33) Example) 												
		DI1: Allocation to RST signal DI2: Allocation to SON signal DI3: Allocation to DR signal DI4: Allocation to CIH signal												
P621	Control input signal allocation 2		I	S	T	P	N	F		00000000 - 99999999				
										12111817				
		Set the allocation of control input signals DI5 to DI8. Each input signal has two digits assigned to it. Set the allocation number in the two digits. For information about the allocation number of each signal, refer to the control input and output signal allocation number table. If "00" is set, the input signal is ineffective. A number listed in the control input and output signal allocation number table + 50 results in a negative logic setting. 1st & 2nd digits DI5 (CN1-32) 3rd & 4th digits DI6 (CN1-31) 5th & 6th digits DI7 (CN1-30) 7th & 8th digits DI8 (CN1-29)												
P622	Control output signal allocation 1		I	S	T	P	N	F		00000000 - 99999999				
										07025103				
		Set the allocation of control output signals DO1 to DO4. Each output signal has two digits assigned to it. Set the allocation number in the two digits. For information about the allocation number of each signal, refer to the control input and output signal allocation number table. If "00" is set, the output signal is ineffective. A number listed in the control input and output signal allocation number table + 50 results in a negative logic setting. 1st & 2nd digits DO1 (CN1-17) 3rd & 4th digits DO2 (CN1-16) 5th & 6th digits DO3 (CN1-15) 7th & 8th digits DO4 (CN1-14)												

Parameter No.	Parameter name	Edit type	Supported command mode				Level	Setting unit	Setting range	
			Activating timing							
			Speed	Torque	Pulse train	Built-in				
			S	T	P	N				
		Supported model					Factory setting (Initial value)			
Function details: [Target digit]										
《Group 6》 "Self-diagnosis-related and input and output-related parameters"										
P623	Control input signal condition setting 1		I	S	T	P	N	F		00000000 - 99999999
									00000000	
		Set the control input signal conditions. Each signal has a digit assigned to it. Select an ON/OFF condition for each. 0 : ON/OFF effective 1 : OFF fixed 2 : ON fixed								
		[1st digit: RST]				[5th digit: DR]				
		[2nd digit: ARST]				[6th digit: CLR]				
[3rd digit: EMG]				[7th digit: CIH]						
[4th digit: SON]				[8th digit: TL]						
P624	Control input signal condition setting 2		I	S	T	P	N	F		00000000 - 99999999
									00000000	
		Refer to [P623].								
		[1st digit: FOT]				[5th digit: GSL1]				
		[2nd digit: ROT]				[6th digit: GSL2]				
[3rd digit: MD1]				[7th digit: PFB]						
[4th digit: MD2]				[8th digit: RVS]						
P625	Control input signal condition setting 3		I	S	T	P	N	F		00000000 - 99999999
									00000000	
		Refer to [P623].								
		[1st digit: SS1]				[5th digit: SS5]				
		[2nd digit: SS2]				[6th digit: SS6]				
[3rd digit: SS3]				[7th digit: SS7]						
[4th digit: SS4]				[8th digit: SS8]						
P626	Control input signal condition setting 4		I	S	T	P	N	F		00000000 - 99999999
									00000000	
		Refer to [P623].								
		[1st digit: ZST]				[5th digit: CMDZ]				
		[2nd digit: ZLS]				[6th digit: ZCAN]				
[3rd digit: ZMK]				[7th digit: FJOG]						
[4th digit: TRG]				[8th digit: RJOG]						

Parameters

Parameter No.	Parameter name	Edit type	Supported command mode				Level	Setting unit	Setting range	
			Activating timing							
			Speed	Torque	Pulse train	Built-in				
			S	T	P	N				
		Supported model						Factory setting (Initial value)		
Function details: [Target digit]										
《Group 6》 "Self-diagnosis-related and input and output-related parameters"										
P627	Control input signal condition setting 5		I	S	T	P	N	F		00000000 - 99999999
									00000000	
		Refer to [P623].								
		[1st digit: Reserved]				[5th digit: Reserved]				
		[2nd digit: Reserved]				[6th digit: Reserved]				
		[3rd digit: Reserved]				[7th digit: Reserved]				
		[4th digit: Reserved]				[8th digit: Reserved]				
P628	Control input signal condition setting 6		I	S	T	P	N	F		00000000 - 99999999
									00000000	
		Refer to [P623].								
		[1st digit: Reserved]				[5th digit: Reserved]				
		[2nd digit: Reserved]				[6th digit: Reserved]				
		[3rd digit: Reserved]				[7th digit: Reserved]				
		[4th digit: Reserved]				[8th digit: Reserved]				
P629	Control input signal condition setting 7		I	S	T	P	N	F		00000000 - 99999999
									00000000	
		Refer to [P623].								
		[1st digit: Reserved]				[5th digit: Reserved]				
		[2nd digit: Reserved]				[6th digit: Reserved]				
		[3rd digit: Reserved]				[7th digit: Reserved]				
		[4th digit: Reserved]				[8th digit: Reserved]				
P630	Control input signal condition setting 8		I	S	T	P	N	F		00000000 - 99999999
									00000000	
		Refer to [P623].								
		[1st digit: Reserved]				[5th digit: Reserved]				
		[2nd digit: Reserved]				[6th digit: Reserved]				
		[3rd digit: Reserved]				[7th digit: Reserved]				
		[4th digit: Reserved]				[8th digit: Reserved]				

Control input and output signal allocation number table

Output (slave → master)			Input (master → slave)		
Allocation No.	Signal code	Signal name	Allocation No.	Signal code	Signal name
1	ALM	Alarm	1	RST	Reset
2	WNG	Warning	2	ARST	Alarm reset
3	RDY	Ready	3	EMG	Emergency stop
4	SZ	Speed Zero	4	SON	Servo on
5	PE1	Position deviation range 1	5	DR	Drive
6	PE2	Position deviation range 2	6	CLR	Deviation clear
7	PN1	Positioning complete 1	7	CIH	Command pulse input proportional control
8	PN2	Positioning complete 2	8	TL	Torque limit
9	PZ1	Positioning response 1 complete	9	FOT	Forward direction over travel
10	PZ2	Positioning response 2 complete	10	ROT	Reverse direction over travel
11	ZN	Command complete	11	MD1	Mode select 1
12	ZZ	Command response complete	12	MD2	Mode select 2
13	ZRDY	Command drive ready	13	GSL1	Gain select 1
14	PRF	Rough match	14	GSL2	Gain select 2
15	VCP	Speed attainment	15		
16			16	RVS	Command direction inversion
17	BRK	Brake Release	17	SS1	Command selection 1
18	LIM	Limit in-Process	18	SS2	Command selection 2
19	EMGO	Emergency stop	19	SS3	Command selection 3
20	HCP	Zero return complete	20	SS4	Command selection 4
21	HLDZ	Command zero in-process	21	SS5	Command selection 5
22	OTO	Over travel in-process	22	SS6	Command selection 6
23	MTON	Motor electrification in-process	23	SS7	Command selection 7
24			24	SS8	Command selection 8
25	SMOD	Speed command mode in-process	25	ZST	Positioning drive
26	TMOD	Torque command mode in-process	26	ZLS	Deceleration LS
27	PMOD	Pulse train command mode in-process	27	ZMK	External zero point marker
28	NMOD	Built-in command mode in-process	28	TRG	External trigger
29			29	CMDZ	Command zero
30			30	ZCAN	Positioning cancel
31			31	FJOG	Reverse direction jog
32			32	RJOG	Forward direction jog

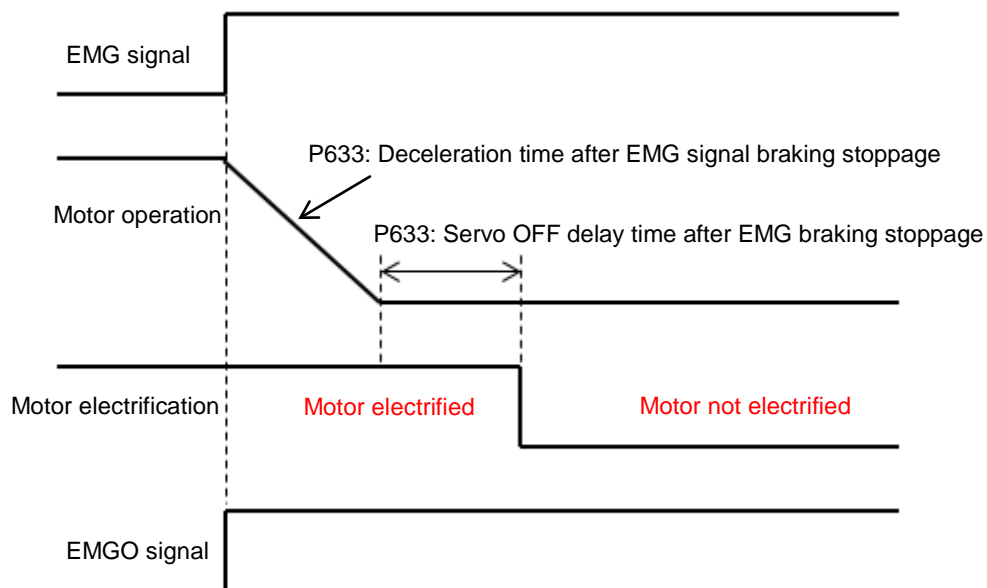
Parameters

Output (slave → master)			Input (master → slave)		
Allocation No.	Signal code	Signal name	Allocation No.	Signal code	Signal name
33	OUT1	Common output 1	33		
34	OUT2	Common output 2	34		
35	OUT3	Common output 3	35		
36	OUT4	Common output 4	36		
37	OUT5	Common output 5	37		
38	OUT6	Common output 6	38		
39	OUT7	Common output 7	39		
40	OUT8	Common output 8	40		
41			41		
42			42		
43			43		
44			44		
45			45		
46			46		
47			47		
48			48		
49	OCEM	Marker output	49		

Parameter No.	Parameter name	Edit type	Supported command mode				Level	Setting unit	Setting range				
			Activating timing										
			Speed	Torque	Pulse train	Built-in							
		S	T	P	N	Supported model				Factory setting (Initial value)			
		Function details: [Target digit]											
		《Group 6》 "Self-diagnosis-related and input and output-related parameters"											
P631	Deviation clear selection when SON signal is OFF		I	—	—	P	N	F		0 - 1			
									0				
		Select the deviation clear setting when the servo on signal (SON) is turned OFF. If deviation clear is made ineffective, abnormality detection is performed with the value of [P175]. 0 : Deviation clear effective 1 : Deviation clear ineffective											
P633	Stopping selection when EMG signal is ON		I	S	T	P	N	F		0 - 1			
									0				
		[1st digit] Select the stopping method when the emergency stop signal (EMG) is ON. 0 : Servo OFF after braking stop 1 : Servo OFF											
	Deceleration time after EMG signal braking stoppage		I	S	T	P	N	F	s	0.00 - 99.99			
									0.00				
		[5th - 2nd digits] Set the deceleration time of braking stoppage by turning ON the emergency stop signal (EMG). The setting is the deceleration time required for stoppage from the motor maximum speed.											
Servo OFF delay time after EMG braking stoppage		I	S	T	P	N	F	s	0.00 - 9.99				
								0.50					
	[8th - 6th digits] Set the delay time from the braking stoppage by turning ON the emergency stop signal (EMG) until the motor electrification in-process signal (MTON) turns OFF.												

[P633: EMG signal braking stoppage selection]

As soon as the emergency stop signal (EMG) is turned ON, the motor performs braking stoppage. After the elapse of the time that is set in [P633 (4th - 1st digits)], the motor electrification in-process signal (MTON) turns ON.



Parameter No.	Parameter name	Edit type	Supported command mode				Level	Setting unit	Setting range	
			Activating timing							
			Speed	Torque	Pulse train	Built-in				
		S	T	P	N					
		Supported model							Factory setting (Initial value)	
Function details: [Target digit]										
《Group 6》 "Self-diagnosis-related and input and output-related parameters"										
P634	Reserved							F		
									0	
		[1st digit]								
		Reserved area. Set the initial value.								
	Deceleration time after OT signal braking stoppage		I	S	T	P	N	F	s	0.00 - 99.99
									0.00	
		[5th - 2nd digits]								
		Set the deceleration time of braking stoppage due to OT detection. The setting is the deceleration time required for stoppage from the motor maximum speed.								
	OT condition holding time		I	S	T	P	N	F	s	0.00 - 9.99
									2.00	
		[8th - 6th digits]								
		Set the time for which to hold the OT condition after an OT is detected and the OT is released.								
P635	Reserved							F		
									0	
		[1st digit]								
		Reserved area. Set the initial value.								
	Soft OT braking stoppage deceleration time		I	S	T	P	N	F	s	0.00 - 99.99
									0.00	
		[5th - 2nd digits]								
		Set the deceleration time of braking stoppage due to soft OT detection. The setting is the deceleration time required for stoppage from the motor maximum speed.								
	Soft OT condition holding time		I	S	T	P	N	F	s	0.00 - 9.99
									2.00	
		[8th - 6th digits]								
		Set the time for which to hold the OT condition after a soft OT is detected and the OT is released.								

Parameters

Parameter No.	Parameter name	Edit type	Supported command mode				Level	Setting unit	Setting range	
			Activating timing							
			Speed	Torque	Pulse train	Built-in				
			S	T	P	N				
		Supported model							Factory setting (Initial value)	
Function details: [Target digit]										
《Group 6》 "Self-diagnosis-related and input and output-related parameters"										
P636	TL signal torque limit value +		I	S	T	P	N	F	%	-99 - 799.9
									100.0	
		Set the forward direction torque limit value when the torque limit signal (TL) is ON. The torque is limited with whichever is lower of this setting and [P080]. For a negative value, indirect data assignment is assumed.								
P637	TL signal torque limit value -		I	S	T	P	N	F	%	-99 - 799.9
									100.0	
		Set the reverse direction torque limit value when the torque limit signal (TL) is ON. The torque is limited with whichever is lower of this setting and [P081]. For a negative value, indirect data assignment is assumed.								
P638	MD signal delay time		I	S	T	P	N	F	ms	0 - 999
									0	
		[3rd - 1st digits] Set the delay time from the time the mode selection signal (MD1 or MD2) is changed until the run mode is switched. The actual run mode switching time is this setting plus 0.02 sec.								
	SS signal delay time		I	S	T	P	N	F	ms	0 - 999
									0	
		[6th - 4th digits] Set the delay time from the time the command selection signal (SS1 to SS8) is changed until the command is switched.								
	ZST signal delay time		I	—	—	—	N	F	ms	0 - 999
									0	
		[9th - 7th digits] Set the delay time from the time the positioning start signal (ZST) is changed until positioning starts.								

Parameter No.	Parameter name	Edit type	Supported command mode				Level	Setting unit	Setting range	
			Activating timing							
			Speed	Torque	Pulse train	Built-in				
			S	T	P	N				
		Supported model						Factory setting (Initial value)		
Function details: [Target digit]										
《Group 6》 "Self-diagnosis-related and input and output-related parameters"										
P650	RDY signal specifications Selection of OT ALM signal is ON		R	S	T	P	N	F		0 - 1
								0		
		[1st digit] Select the servo ready signal (RDY) condition when the alarm signal (ALM) is turned ON due to OT detection. 0 : RDY signal OFF 1 : RDY signal ON								
P650	RDY signal specifications Selection of motor electrification ALM signal other than OT is ON		R	S	T	P	N	F		0 - 1
								0		
		[2nd digit] Select the servo ready signal (RDY) condition when the alarm signal (ALM) is turned ON if a non-OT alarm that does not cause servo off occurs. 0 : RDY signal OFF 1 : RDY signal ON								
P651	SZ signal speed range		I	S	T	P	N	F	P161 unit/s	0 - 300000000
								10000 (when P161 is in the initial status, 10.000 deg/s)		
		Set the speed zero signal (SZ) output range speed.								
P652	VCP signal speed deviation range		I	S	—	P	N	F	P161 unit/s	0 - 300000000
								10000 (when P161 is in the initial status, 10.000 deg/s)		
		Set the speed attainment signal (VCP) output range.								
P653	PE1 Signal deviation range		I	—	—	P	N	F	FB resolution	0 - 99999999
								10		
		Set the position deviation range 1 signal (PE1) output deviation range.								
P654	PE1 Signal delay time		I	—	—	P	N	F	s	0.000 - 9.999
								0.000		
		Set the delay time from the time the deviation becomes equal to or less than the [P653] setting until the position deviation range 1 signal (PE1) turns ON.								
P655	PE2 signal deviation range		I	—	—	P	N	F	FB resolution	0 - 99999999
								10		
		Set the position deviation range 2 signal (PE2) output deviation range.								
P656	PE2 Signal delay time		I	—	—	P	N	F	s	0.000 - 9.999
								0.000		
		Set the delay time from the time the deviation becomes equal to or less than the [P655] setting until the position deviation range 2 signal (PE2) turns ON.								
P657	PRF signal distance		I	—	—	—	N	F	P161 unit	0 - 2147483647
								1000 (when P161 is in the initial status, 1.000 deg/s)		
		Set the rough match signal (PRF) output range.								

Parameter No.	Parameter name	Edit type	Supported command mode				Level	Setting unit	Setting range			
			Activating timing	Speed	Torque	Pulse train				Built-in		
				S	T	P				N		
				Supported model						Factory setting (Initial value)		
Function details: [Target digit]												
《Group 6》 "Self-diagnosis-related and input and output-related parameters"												
P658	Brake release delay time		I	S	T	P	N	F	s	0.000 - 9.999		
									0.000			
		[4th - 1st digits] Set the delay time from the time the motor is electrified until the brake is released (BRK signal ON).										
P658	Brake activation delay time		I	S	T	P	N	F	s	0.000 - 9.999		
									0.000			
		[8th - 5th digits] Set the delay time from the time the brake is activated (BRK signal OFF) when an alarm, emergency stop, servo OFF, or reset occurs until the motor un-electrified status (MTON signal OFF) is assumed.										
P659	Brake activation effective low speed range		I	S	T	P	N	F	P161 unit/s	0 - 300000000		
									0			
		Set the speed range in which to activate the brake.										
P660	Brake enforced to be activate delay time		I	S	T	P	N	F	s	0.000 - 9.999		
									0.000			
		Set the delay time after which to activate the brake.										
[P658: Brake release delay time] As soon as the servo on signal (SON) is turned ON, the motor electrified status is assumed. After the elapse of the time that is set in [P658 (4th - 1st digits)], the brake release signal (BRK) turns ON.												
<div><div><div>SON signal</div><div>BRK signal</div><div>Motor electrification</div></div><div><div>P658 Brake release delay time</div><div>Brake holding</div><div>Brake release</div><div>Motor un-electrified</div><div>Motor electrified</div></div></div>												

[P658: Brake activation delay time]

The brake release signal (BRK) output timing differs between when the motor is stopped and when it is operating. To judge whether the motor is stopped, use the speed zero signal (SZ). Adjust the [P651] setting so that the speed zero signal (SZ) becomes stable when the brake release signal (BRK) is operated.

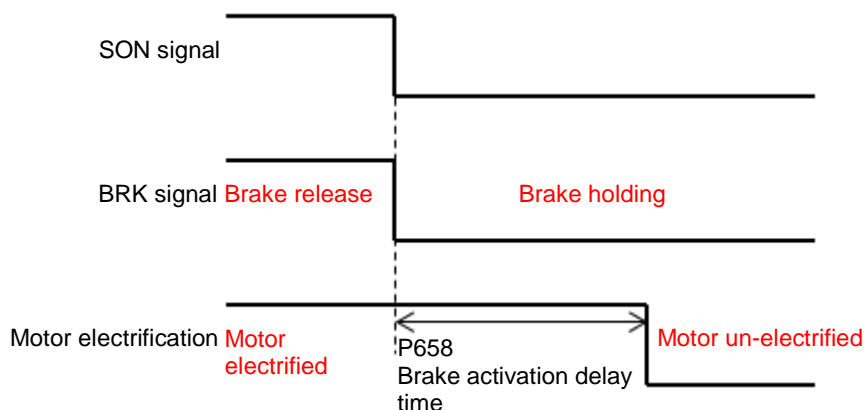
1) When the motor is stopped (if the SZ signal is ON)

① If the servo on signal (SON) is OFF (if it is longer than the [P658 (8th - 5th digits)] setting)

After the servo on signal (SON) is turned OFF, the brake release signal (BRK) is turned OFF, and after the elapse of the time that is set in [P658 (8th - 5th digits)], the servo off status is assumed.

(The brake release signal (BRK) is turned OFF in the servo on status, thereby preventing the vertical shafts from dropping.)

Example)



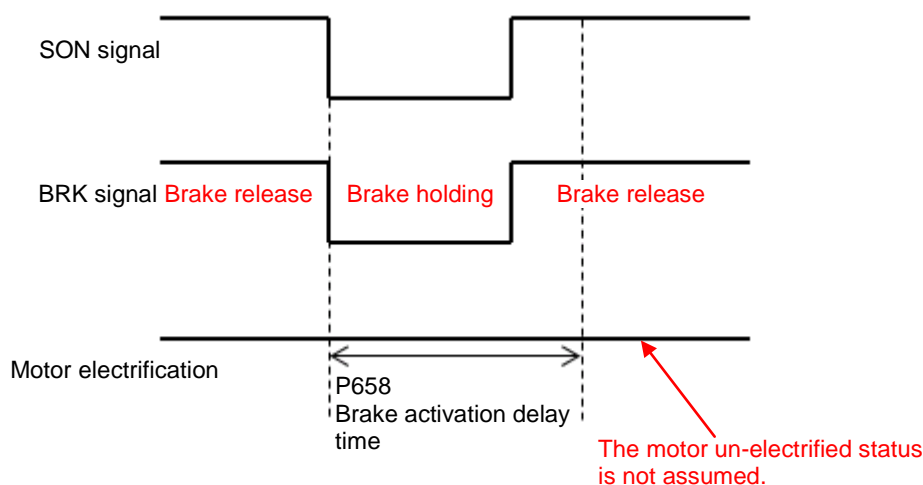
② If the servo on signal (SON) is OFF (if it is shorter than the [P658 (8th - 5th digits)] setting)

After the servo on signal (SON) is turned OFF, the brake release signal (BRK) is turned OFF, and after the elapse of the time that is set in [P658 (8th - 5th digits)], the servo off status is assumed.

If the interval of switching the servo on signal (SON) from OFF to ON is shorter than the time that is set in [P658 (8th - 5th digits)], the brake release signal (BRK) is turned OFF as soon as the servo on signal (SON) is turned OFF, and the brake release signal (BRK) is turned ON as soon as the servo on signal (SON) is turned ON.

In this case, the motor un-electrified status is not assumed because the [P658 (8th - 5th digits)] time has not elapsed.

Example)



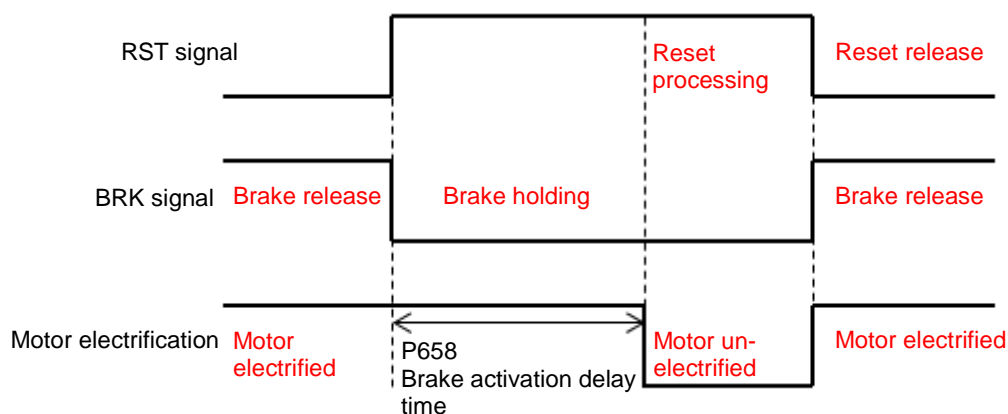
③ If the reset signal (RST) is turned ON (if it is held ON for a time longer than the [P658 (8th - 5th digits)] setting)

After the reset signal (RST) is turned ON, the brake release signal (BRK) is turned OFF, and after the elapse of [P658 (8th - 5th digits)], a reset (servo off status) occurs.

With the reset signal (RST) being turned OFF, the brake release signal (BRK) and the motor electrification in-process signal (MTON) are turned ON (servo on status) again.

* The operation starts with the SON signal being ON (servo on status).

Example)

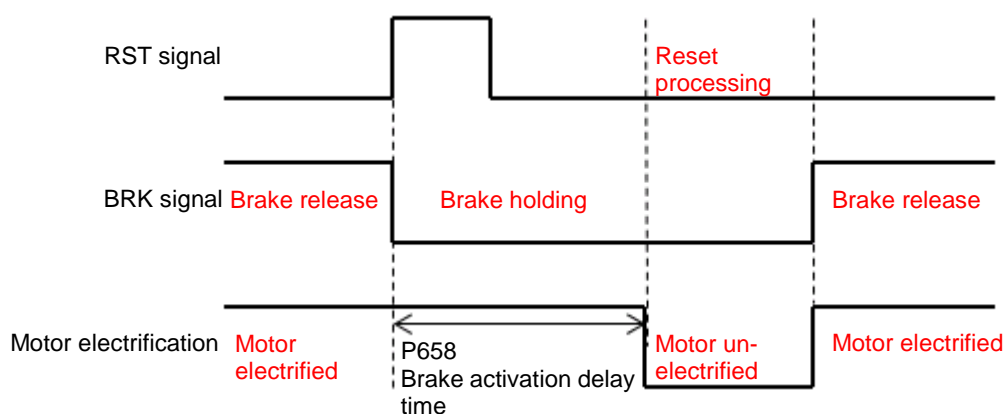


④ If the reset signal (RST) is turned ON (if it is held ON for a time shorter than the [P658 (8th - 5th digits)] setting)

After the reset signal (RST) is turned ON, the brake release signal (BRK) is turned OFF, and because the reset signal (RST) is turned OFF before the [P658 (8th - 5th digits)] setting, the servo off status is assumed in internal reset processing time only.

* The operation starts with the SON signal being ON (servo on status).

Example)



After the elapse of the time that is set in [P658 (8th - 5th digits)] from the ON edge of the reset signal (RST), reset processing is performed.

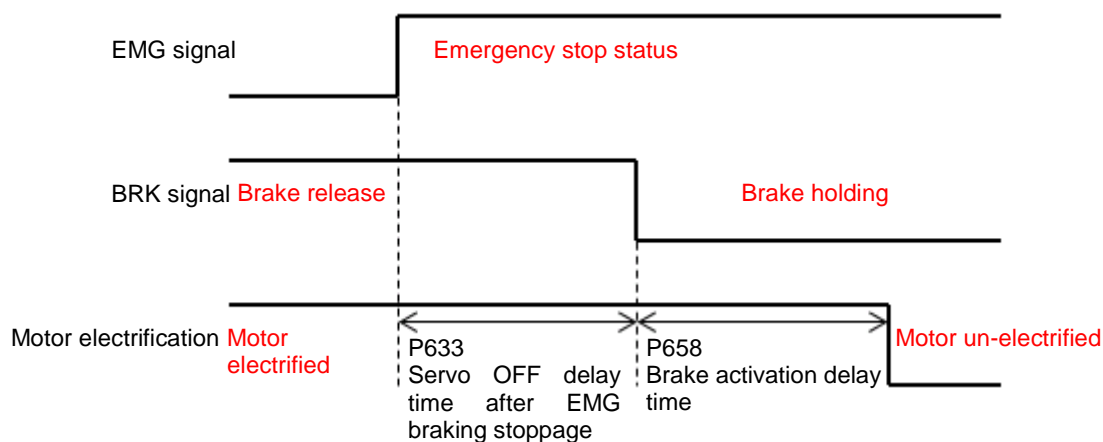
During reset processing, the servo off status (MTON signal OFF) is assumed.

⑤ If the emergency stop signal (EMG) is turned ON

After the emergency stop signal (EMG) is turned ON, the brake release signal (BRK) is turned OFF, and after the elapse of [P658 (8th - 5th digits)], the emergency stop status is assumed.

(The BRK signal is turned OFF in the servo on status, thereby preventing the vertical shafts from dropping.)

Example)

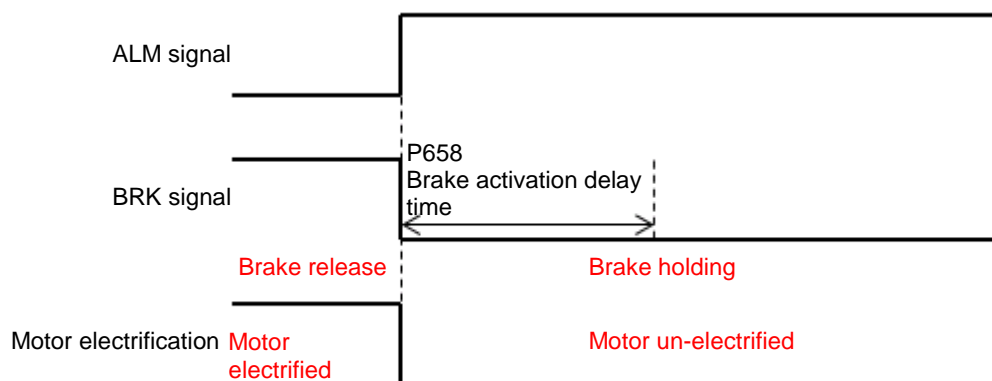


⑥ When a torque free alarm and a warning occurs

If a torque free alarm or a warning occurs, the brake holding status is assumed and the motor is un-electrified at the time of its occurrence.

It takes time for brake holding to be actually effective (the holding of the electromagnetic brake to be effective), so during that time, the motor is in the dropping status.

Example)



2) When the motor is operating (if the SZ signal is OFF)

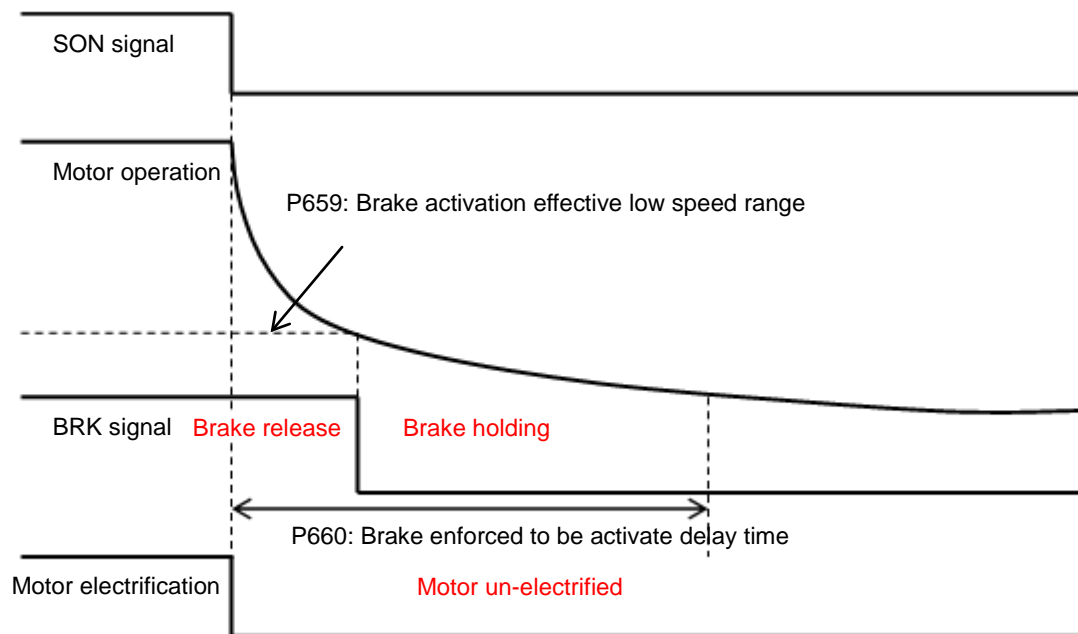
During motor operation, the brake release signal (BRK) is turned OFF when either [P659] or [P660] meets the condition.

* During motor operation, there is no time at which braking holding is performed in the servo on status.

The time that can be set is a time when the motor can hold the brake while it is in the servo off status.

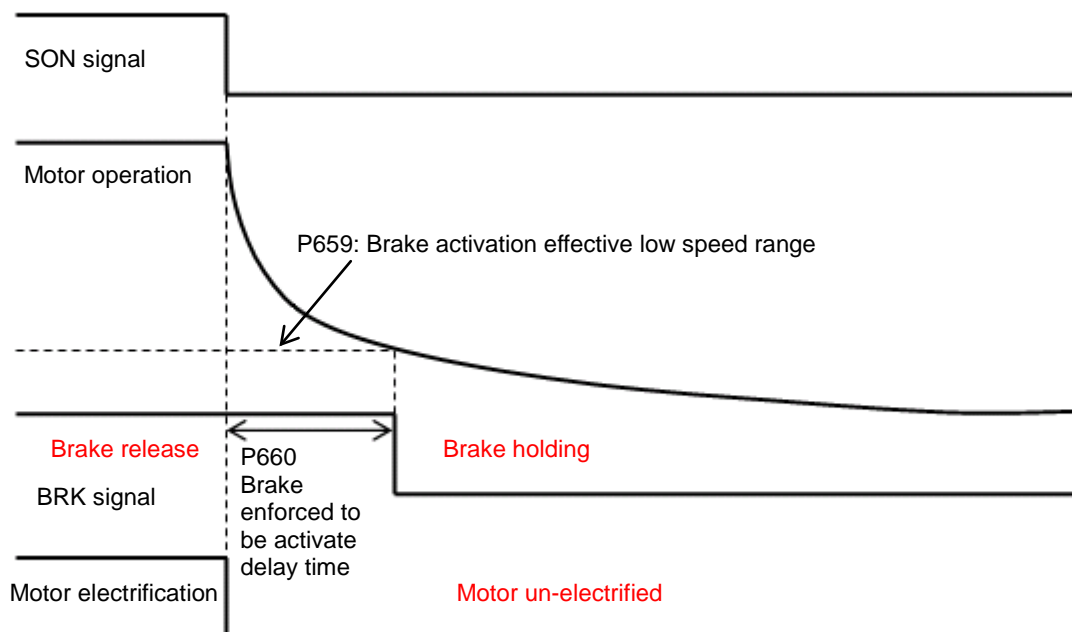
① If [P659] meets the condition first

Example)



② If [P660] meets the condition first

Example)



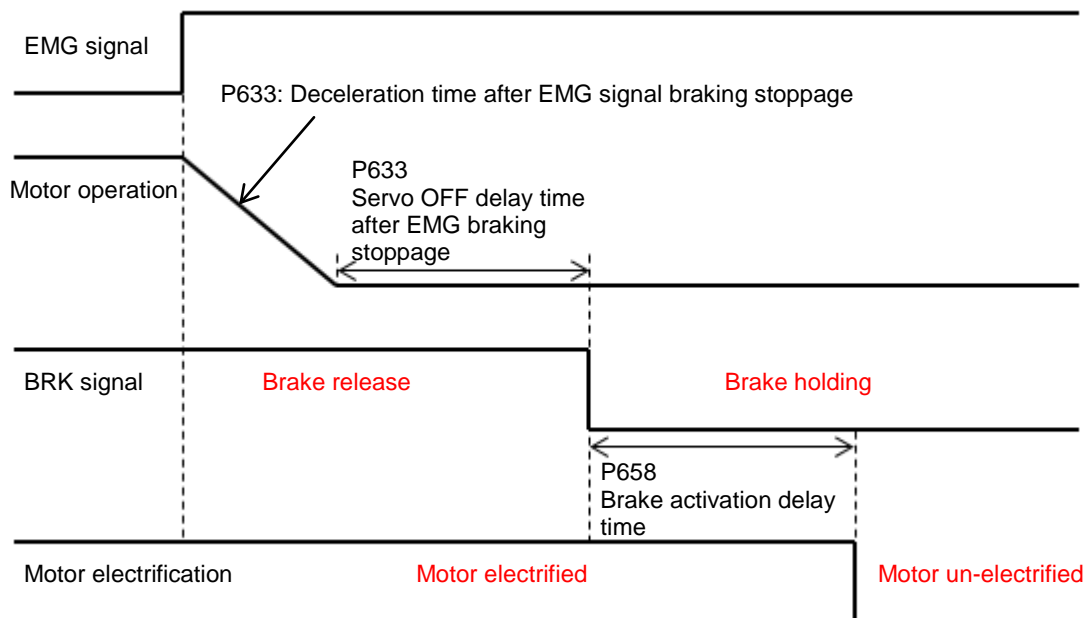
③ If the emergency stop signal (EMG) is turned ON during motor operation

* This operation is effective if [P633 (1st digit)] is set to "braking stoppage".

After the emergency stop signal (EMG) is turned OFF, the motor performs braking stoppage with [P633 (5th - 2nd digits)], and after the elapse of the time that is set in the [P633 (8th - 6th digits)] setting, the brake release signal (BRK) is turned OFF and the brake holding status is assumed. After the elapse of the time that is set in [P658 (8th - 5th digits)], the servo off status is assumed.

(The BRK signal is turned OFF in the servo on status, thereby preventing the vertical shafts from dropping.)

Example)

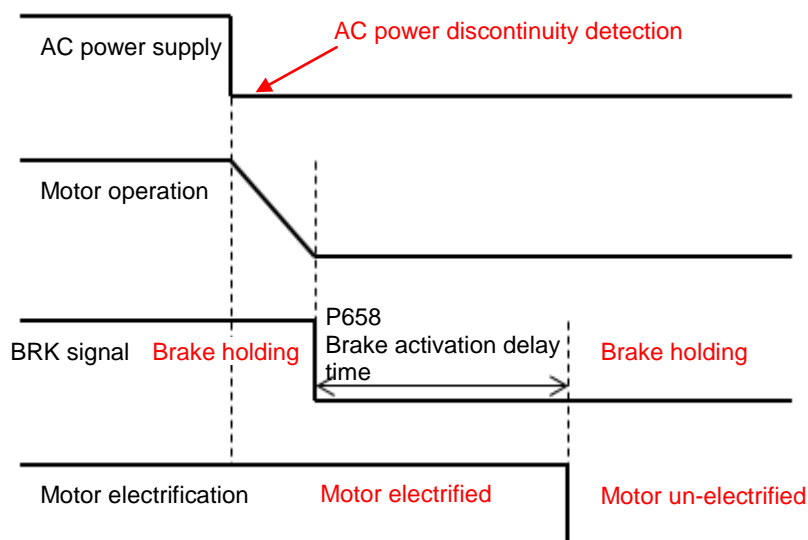


* In the case of coasting to stop ([P633 (1st digit)] = Servo OFF), the motor operates as described in ① or ② above.

④ Power discontinuity

To prevent dropping during power discontinuity, operation is possible by setting [P121 (1st digit)] to 0 (braking).

Example)



* Depending on the status of the device, the torque free status may be assumed before the elapse of the [P658 (8th - 5th digits)] time.

6-3-7 Communication-related parameters (group 7)

Parameter No.	Parameter name	Edit type	Supported command mode				Level	Setting unit	Setting range	
			Activating timing	Speed	Torque	Pulse train				Built-in
				S	T	P				N
		Supported model						Factory setting (Initial value)		
Function details: [Target digit]										
《Group 7》 "Communication-related parameters"										
P701	RS422 communication ID No.		R	S	T	P	N	F		0 - 247
									1	
		[3rd - 1st digits] Set the ID No. (office code) when a daisy chain connection is used in serial communication. * If connecting only a single unit, set "1". * Do not set "0". If [0] is set, an attempt is made to communicate with all connected devices, resulting in communication conflicts and potentially disabling normal communication.								
			R	S	T	P	N	F		0 - 1
	RS422 communication function selection								0	
		[4th digit] Select the serial communication specification. 0 : Low-order to high-order data (little endian) 1 : High-order to low-order data (big endian)								
			R	S	T	P	N	F		0 - 1
									1	
	RS422 communication data length	[5th digit] Select the serial communication data length. 0 : 7 bits 1 : 8 bits								
			R	S	T	P	N	F		0 - 2
									1	
		[6th digit] Select the serial communication parity. 0 : None 1 : Odd number 2 : Even number								
	RS422 communication baud rate		R	S	T	P	N	F		0 - 4
									1	
		[7th digit] Select the serial communication baud rate. 0 : 9.6 K 1 : 19.2 K 2 : 38.4 K 3 : 57.6 K 4 : 115.2 K								
			I	S	T	P	N	F	s	0.000 - 9.999
P702	RS422 communication time out								0.000	
		Set the serial communication time out time. If "0" is set, time out monitoring is ineffective.								

Chapter 7 Indirect data

7-1	Indirect data list.....	7-2
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7-1 Indirect data list

Indirect data No.	Indirect data name	Type	Function
IX00 - IX49	Indirect data 00 - Indirect data 49	Sustained	Indirect data also sustained after power off. Can be rewritten up to 1 billion times.
IX50 - IX89	Indirect data 50 - Indirect data 89	0 cleared	Arbitrary indirect data not sustained after power off. Cleared to "0" at power on.
IX90	Indirect data 90		Indirect data used to set an analog speed command value. Data unit: P161 setting unit speed value
IX91	Indirect data 91		Indirect data used to set an analog torque command value. Data unit: 0.1%
IX92 - IX99	Indirect data 92 - Indirect data 99		Reserved.

Chapter 8 Commands

8-1	Command list.....	8-2
8-2	Command specifications.....	8-3
8-2-1	Operation commands.....	8-3

8-1 Command list

Group	Title	Command name	Functional overview
0 Operation command	NOP	No operation [No OPeration]	Performs no operation.
	POS	Positioning [POSitioning]	Performs positioning operation.
	HOME	Zero return [HOME positioning]	Performs zero return operation.
	INDX	Index positioning [INDeX positioning]	Performs rotator positioning operation.

8-2 Command specifications

This section outlines the commands this device supports.

8-2-1 Operation commands

Title	Command name	Setting data		
		Data	Setting unit	Setting range (direct data)
				Setting range (indirect data)
				Function
POS	Positioning [POSitioning]	POS [Positioning position and direction]	P161 unit	-2147483648 - 2147483647 IX00 - IX99
		A/I [Absolute position/relative position]	None	ABSOLUTE/INCREMENT
		F [Positioning speed]	P161 unit/s	0 - 300000000 IX00 - IX99
		UPDN [Acceleration/deceleration time, etc.]	None	SEL.0 - 7
		TRG [External trigger position]	P161 unit	0 - 2147483647 IX00 - IX99
		OUT [Common output]	Binary	00000000 - 11111111 IX00 - IX99
		<ul style="list-style-type: none">▪ The POS command performs positioning operation.▪ With SEL, the acceleration/deceleration time, S-curve acceleration/deceleration time, torque limit value, gain number, and PN signal can be specified.▪ When the positioning speed is set to 0, the motor completely stops.▪ When the positioning speed is set to IX90, the motor runs at an analog speed.▪ When INC is specified and the maximum positioning position is set, infinite length operation is performed.▪ External trigger positioning can be performed. Set the amount of travel after the TRG signal is input as the external trigger position.▪ After the completion of operation, this command terminates the program.▪ At the start of operation, common output data is valid.▪ Operation is performed in the reverse direction also in the overtravel state.		

Title	Command name	Setting data		
		Data	Setting unit	Setting range (direct data)
				Setting range (indirect data)
		Function		
HOME	Zero return [HOME positioning]	TYPE [Zero return method]	None	STD.HOME/LS LESS/ STOP HOME/ OT HOME/SET ABS/ OUT POS
		F [Zero return speed]	P161 unit/s	0 - 300000000
				IX00 - IX99
		DIR [Zero return direction]	None	FORWARD/REVERSE
		UPDN [Acceleration/deceleration time, etc.]	None	SEL.0 - 7
		OUT [Common output]	Binary	00000000 - 11111111
				IX00 - IX99
		<ul style="list-style-type: none">• The HOME command performs zero return operation.• With SEL, the S-curve acceleration/deceleration time, torque limit value, gain number, and PN signal can be specified.• The zero return mode and direction can be set.• The command operation follows the settings in zero return-related parameters other than command setting data.• When the zero return speed is set to 0, the motor completely stops.• When the zero return speed is set to IX90, the motor runs at an analog speed.• At the start of operation, common output data is valid.• After the completion of operation, the command terminates the program.• Operation is performed in the reverse direction also in the overtravel state.		
		[Zero return modes]		
		<ul style="list-style-type: none">• STD.HOME: Sets the zero point to the position at which the marker is detected and positioning is performed.• LS LESS: Detects the marker and sets the zero point.• STOP HOME: Sets the zero point to the current motor position.• OT HOME: Sets the zero point to the position at which the marker is detected and positioning is performed. The direction is reversed when OT is detected.• SET ABS: Sets the zero point position when an absolute encoder is used.• OUT POS: Outputs the pulse count for the current position with the encoder pulse output.		
		* SET ABS and OUT POS can be executed also in the servo off status.		

Title	Command name	Setting data		
		Data	Setting unit	Setting range (direct data)
				Setting range (indirect data)
		Function		
INDX	Index positioning [INDeX positioning]	POS [Positioning position]	P161 unit	0 - 2147483647 IX00 - IX99
		DIR2 [Positioning direction]	None	SHORT/FORWARD/REVERSE
		F [Positioning speed]	P161 unit/s	0 - 300000000 IX00 - IX99
		UPDN [Acceleration/deceleration time, etc.]	None	SEL.0 - 7 <div></div>
		OUT [Common output]	Binary	00000000 - 11111111 IX00 - IX99
		<ul style="list-style-type: none">The INDX command performs short cut ABS positioning operation for a rotator.With SEL, the S-curve acceleration/deceleration time, torque limit value, gain number, and PN signal can be specified.When the positioning speed is set to 0, the motor completely stops.When the positioning speed is set to IX90, the motor runs at an analog speed.At the start of operation, common output data is valid.After the completion of operation, this command terminates the program.		
		[Operation direction] <ul style="list-style-type: none">SHORT: Direction in which the positioning travel distance is shorterFORWARD: Forward directionREVERSE: Reverse direction		

Chapter 9 Self-diagnosis mode

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9-1 Self-diagnosis mode

9-1-1 Self-diagnosis mode configuration

This device has a self-diagnosis function for auto-tuning and checking external input/output signals and internal circuit.

The following three types of self-diagnosis modes are available.

① Self-diagnosis

In this mode, self-diagnosis is executed for auto-tuning, external wiring of the device, or device error check.

② Self-diagnosis for the manufacturer

In this mode, self-diagnosis dedicated to the manufacturer is executed for adjustment at shipment.

Do not execute this mode unless there are such instructions from the manufacturer.

③ Device parameter edit

In this mode, device parameter editing dedicated to the manufacturer is executed for adjustment at shipment.

Do not execute this mode unless there are such instructions from the manufacturer.



Prohibition

- Do not execute self-diagnosis for the manufacturer or device parameter editing.
If self-diagnosis for the manufacturer or device parameter editing is executed improperly, the motor may run out of control, burn out, or be damaged or the device may burn out or be damaged.

9-1-2 Input/output signals related to self-diagnosis

The following table indicates whether each signal is valid or invalid during the execution of self-diagnosis.

Table 9-1 Whether each signal is valid or invalid during self-diagnosis

Control output signal			Control input signal		
Signal name	Signal code		Signal name	Signal code	
Alarm	ALM	○	Reset	RST	○
Warning	WNG	○	Alarm reset	ARST	○
Servo ready	RDY	○	Emergency stop	EMG	○
Speed zero	SZ	○	Servo on	SON	-
Position deviation range 1, 2	PE1, PE2	○	Drive	DR	-
Positioning complete 1, 2	PN1, PN2	○	Deviation clear	CLR	-
Positioning complete response 1, 2	PZ1, PZ2	-	Command pulse input proportional control	CIH	-
Command complete	ZN	-	Torque limit	TL	○
Command complete response	ZZ	-	Forward over travel	FOT	○
Command drive ready	ZRDY	-	Reverse direction over travel	ROT	○
Rough match	PRF	○	Mode select 1, 2	MD1, MD2	-
Speed attainment	VCP	○	Gain select 1, 2	GSL1, GSL2	○
Brake release	BRK	○	Command direction inversion	RVS	-
Limit in-process	LIM	○	Command selection 1 - 3	SS1 - SS3	-
Emergency stop in-process	EMGO	○	Command selection 4 - 8	SS4 - SS8	-
Zero return complete	HCP	○	Positioning drive	ZST	-
Command zero in-process	HLDZ	-	Deceleration LS	ZLS	-
Over travel in-process	OTO	○	External zero point marker	ZMK	-
Motor electrification in-process	MTON	○	External trigger	TRG	-
Speed command mode in-process	SMOD	○	Command zero	CMDZ	-
Torque command mode in-process	TMOD	○	Positioning cancel	ZCAN	-
Pulse train command mode in-process	PMOD	○	Forward direction jog	FJOG	-
Built-in command mode in-process	NMOD	○	Reverse direction jog	RJOG	-
Common output 1 - 8	OUT1 - OUT8	-			
Marker output	OCEM	○			

9-2 Diagnosis procedure

Self-diagnosis is executed through VPH DES.

The following figure shows the procedure for executing self-diagnosis through the operation panel.

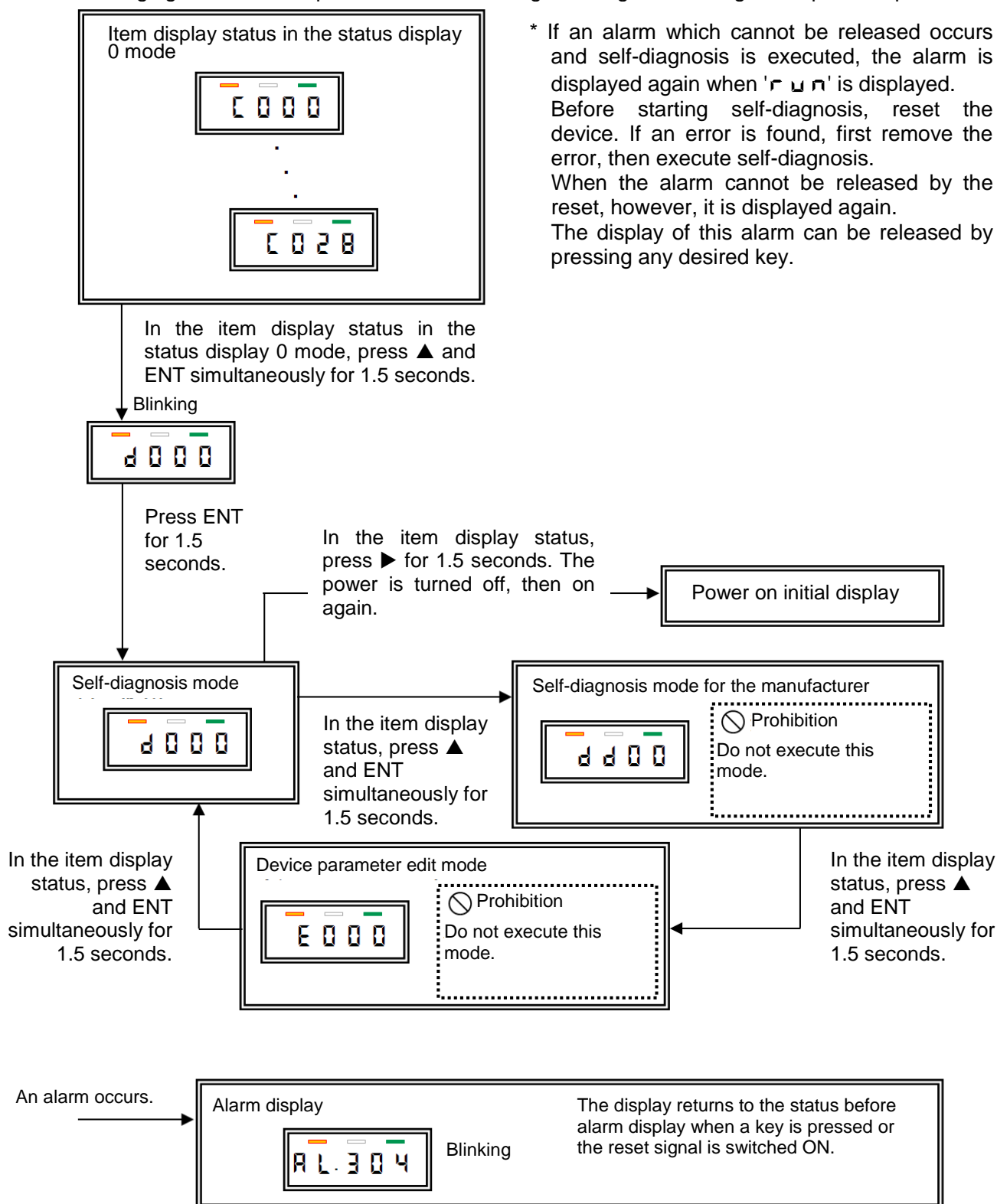


Figure 9-1 Procedure for executing self-diagnosis

9-3 Diagnosis items

The self-diagnosis items are listed below.

Table 9-2 Self-diagnosis items (1/3)

Display order	Item display	Details
	Name	
1	d000	<p>Measures the motor load and sets the position loop gain and speed loop gain for gain No. 0 parameters.</p> <p>Procedure: Item display status → Press ENT. → r u n blinks. → Press ENT for 1.5 seconds. → The motor runs. → The result is displayed.</p> <p>To forcibly terminate diagnosis: Press ENT.</p> <p>Result: r u n = Measurement in progress/ E n d = Normal termination/ E r 1 = Measurement 0/ E r 2 = Out of integral/ E r 3 = Data error/ E r 9 = Stop during operation (ALM, RST, EMG, OT)</p>
	Auto tuning gain number 0	
2	d001	Same as for d000. Sets values for gain No. 1 parameters.
	Auto tuning gain number 1	
3	d002	Same as for d000. Sets values for gain No. 2 parameters.
	Auto tuning gain number 2	
4	d003	Same as for d000. Sets values for gain No. 3 parameters.
	Auto tuning gain number 3	
5	d004	<p>Repeats positioning by the specified distance.</p> <p>Procedure: Item display status → Press ENT. → r u n blinks. → Press ENT for 1.5 seconds. → The motor runs and the result is displayed.</p> <p>To forcibly terminate diagnosis: Press ENT.</p> <p>Result: r u n = Operation in progress/ E r 9 = Stop during operation (ALM, RST, EMG, OT)</p> <p>Operation specified by: [P604] to [P607]</p>
	Test run	
6	d005	<p>Runs the motor when ▲ and ▼ are pressed.</p> <p>Procedure: Item display status → Press ENT. → r u n blinks. → Press ENT for 1.5 seconds. → Press ▲ and ▼ to run the motor and the result is displayed.</p> <p>(▲: Forward operation, ▼: Reverse operation)</p> <p>Result: -99999 to 99999</p> <p>Operation speed displayed on rpm speed display = Normal operation in progress/ E r 9 = Stop during operation (ALM, RST, EMG, OT)</p> <p>Operation specified by: Jog speed = Command number 0, SEL0 (P573)</p> <p>* When the operation speed exceeds ±100000, ±99999 is displayed.</p>
	Forced jog	

* The self-diagnosis in which the motor runs stops when an alarm occurs or the RST, EMG, or OT signal is switched ON.

Table 9-3 Self-diagnosis items (2/3)























Display order	Item display	Details
	Name	
7		<p>Performs DC energisation at 70% of the motor rated current. Procedure: Item display status → Press ENT. →  blinks. → Press ENT for 1.5 seconds. → The motor runs and the result is displayed.</p> <p>To forcibly terminate diagnosis: Press ENT. Result:  = DC energisation in progress/ = Stop during operation (ALM, RST, EMG, OT) * The motor draws in electrical angle 0° by DC energisation.</p>
	DC energisation	
8		<p>Automatically adjusts the offset of the analog speed command by setting the analog speed command to 0V. The adjusted value is reflected in P402. Procedure: Item display status → Press ENT. →  blinks. → Press ENT for 1.5 seconds. → The result is displayed. Result:  = Measurement in progress/ = Normal termination/ = Out of adjustment range</p>
	Analogue speed command voltage offset adjustment	
9		<p>Automatically adjusts the offset of the analog torque command by setting the analog torque command to 0V. The adjusted value is reflected in P436. Procedure: Item display status → Press ENT. →  blinks. → Press ENT for 1.5 seconds. → The result is displayed. Result:  = Measurement in progress/ = Normal termination/ = Out of adjustment range</p>
	Analogue torque command voltage offset adjustment	
10		<p>Displays U phase current feedback. Procedure: Item display status → Press ENT. → The result is displayed. Result: -32768 to 32767 (Within ± 32: Normal)</p>
	U phase electric current FB display	
11		<p>Displays V phase current feedback. Procedure: Item display status → Press ENT. → The result is displayed. Result: -32768 to 32767 (Within ± 32: Normal)</p>
	V phase electric current FB display	
12		<p>Displays W phase current feedback. Procedure: Item display status → Press ENT. → The result is displayed. Result: -32768 to 32767 (Within ± 32: Normal)</p>
	W phase electric current FB display	
13		<p>Transfers absolute position compensation related data (compensation values and user parameters) stored in the VPH main unit to the IPU. Procedure: Item display status → Press ENT. →  blinks. → Press ENT for 1.5 seconds. → The result is displayed. Result:  = Transmission in progress/ = Normal termination/ = Abnormal termination</p>
	Transfer the absolute position compensation data (VPH → IPU)	

Table 9-4 Self-diagnosis items (3/3)

Display order	Item display	Details
	Name	
14	d 100	<p>Performs a RAM check.</p> <p>Procedure: Item display status → Press ENT. → The result is displayed.</p> <p>Result: r u n = Check in progress/E n d = Normal termination/E r 1 to E r 3 = RAM error</p>
	RAM check	
15	d 101	<p>Displays the LED corresponding to each of input signals DI1 to DI8. In the CC-Link specification, displays the LED corresponding to each of input signals DI1 and DI2.</p> <p>Procedure: Item display status → Press ENT. → The result is displayed.</p> <p>Result: Same as the upper section of the lower-order display of status display .C 100</p>
	Control input signal check	
16	d 102	<p>Forcibly outputs the signal corresponding to the set number.</p> <p>Procedure: Item display status → Press ENT. → 0 is displayed. (The digit indication bar blinks at right.) → Press ▲ and ▼ to select an output signal. → The selected signal is output in real time.</p> <p>Setting range: 0 to 5 0 = DO1 to DO4 signals and DBK (dynamic brake) signal OFF 1 to 4 = DO1 to DO4 signals ON 5 = DBK signal ON</p> <p>* With VPH DES, each signal can be switched ON and OFF.</p>
	Control output signal check	
17	d 103	<p>Connects the transmission and reception signals to perform a transmission/reception check.</p> <p>Procedure: Item display status → Press ENT. → The result is displayed.</p> <p>Result: r u n = Check in progress/E n d = Normal termination/E r 1 = No response/E r 2 = Response data inconsistency/E r 3 = Communication error</p> <p>* This item is displayed only in the IO specification.</p>
	Serial communication check	
18	d 104	<p>Checks the 90 deg phase difference encoder marker.</p> <p>The displayed value is incremented by one each time the encoder marker signal is input. When the value exceeds 32767, the counter is set to -32768 and counting continues toward 0.</p> <p>Procedure: Item display status → Press ENT. → The result is displayed.</p> <p>Result: -32768 to 32767 (starting with 0)</p>
	90 deg phase difference encoder marker check	
19	H 000	<p>Performs the initialization process corresponding to the specified code.</p> <p>Procedure: Item display status → Press ENT. → Set data in the same way as for parameter input.</p> <p>Input range: 0 to 9999</p> <p>1 0 = Parameter initialization 3 1 = Absolute position compensation data initialization (0 clear)</p>
	Initialization	

Chapter 10 Protective function

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10-1 Protective function and error processing

The device is equipped with various protective functions to protect device and motor from damages by unusual conditions.

Protective functions include [Alarm processing] and [Warning processing].

① Alarm processing

When an error is detected, the motor stops (brake stop or servo off status, depending on the error contents). The alarm signal is output and the relevant error code is displayed on the data display LED panel.

② Warning processing

If current use condition is highly likely to cause errors, an alert about errors is issued in advance. When an alert is issued, the warning signal is output and the relevant error code is displayed on the data display LED panel.

Table 10-1 Error occurrence and processing

Contents of error	Processing contents in error occurrence (detection)		
	Motor operating conditions	Control output signal	Data display LED panel
Alarm processing	Brake stop or servo off	Alarm signal ON	Error code
Warning processing	Continue current operation	Warning signal ON	Error code

10-2 Error code list

When an error occurs, the relevant error code is displayed on the data display LED panel on the device front panel.

For details of the data display LED panel, refer to "Chapter 11 Setting and display".

The following tables list error codes.

10-2-1 Alarm list

Table 10-2 Errors related to device hardware

Error type	Error code	Error contents
Error related to device hardware	hALt	Driver system error
	AL.001	RAM error
	AL.002	FRAM write error
	AL.003	Driver irregular stop
	AL.004	Main power supply voltage detection element error
	AL.010	Maker data sustain error
	AL.011	Parameter sustain error
	AL.012	Command data sustain error
	AL.013	Indirect data sustain error
	AL.015	ABS position compensation data sustain error
	AL.020	Error in matching of firmware and manufacturer data

Table 10-3 Servo-related errors

Error type	Error code	Error contents
Servo-related error	AL.100	Power element error
	AL.101	Main power supply discontinuity error
	AL.102	Main power supply shortage error
	AL.103	Main power supply excessive voltage error
	AL.104	Over speed error
	AL.105	Motor overload error
	AL.106	Driver overload error
	AL.107	Regenerative resistor overload error
	AL.108	Control power supply momentary stop error
	AL.109	Regenerative over-current error
	AL.110	Servo control error
	AL.112	Motor power line disconnection error
	AL.113	Over-current error
	AL.115	Device overheat error ^{*1}
	AL.117	Main power supply open-phase error

^{*1} This error applies to devices of which the revision is "1" or later. Check L013 described in "11-2-4 Driver information display mode display items" to see the revision of the device you use.

Table 10-4 Errors related to parameter setting

Error type	Error code	Error contents
Error related to parameter setting	AL.200	Motor unselection
	AL.201	Motor selection incorrect 1 (invalid device output capacity combination)
	AL.202	Motor selection incorrect 2 (invalid device power voltage combination)
	AL.203	Motor selection incorrect 3 (invalid device single-phase power supply combination)
	AL.204	Motor selection incorrect 4 (invalid device specification or revision combination)
	AL.205	Motor type error
	AL.209	Inverter output frequency error
	AL.210	Maximum speed command higher limit incorrect
	AL.211	Maximum speed command lower limit incorrect
	AL.213	1 rotation position range incorrect

Table 10-5 Encoder-related errors

Error type	Error code	Error contents
Encoder-related error	AL.301	Magnetic pole signal pattern error
	AL.302	Error in matching of magnetic pole signal and encoder resolution
	AL.303	Auto magnetic pole detection error
	AL.304	Encoder signal disconnection error
	AL.305	Encoder velocity error
	AL.307	ABS position compensation data unregistered
	AL.308	ABS position compensation data collation error
	AL.309	ABS position compensation data none error
	AL.310	IPU communication error
	AL.312	Communication error between encoder IPU
	AL.313	Cable disconnection between encoder IPU
	AL.314	Encoder position detection signal error
	AL.315	1 rotation position detection velocity error
	AL.316	Photo acceptance unit error
	AL.317	Light emitting element error
	AL.318	IPU backup error
	AL.319	ABS position compensation encoder pulse number error
	AL.320	Magnetic pole signal disconnection error ^{*2}

^{*2} This error applies to devices of which the revision is "1" or later. Check L013 described in "11-2-4 Driver information display mode display items" to see the revision of the device you use.

Table 10-6 NC-related errors

Error type	Error code	Error contents
NC-related error	AL.400	Forward direction over travel / Automatic release
	AL.401	Reverse direction over travel / Automatic release
	AL.402	Forward direction software over travel / Automatic release
	AL.403	Reverse direction software over travel / Automatic release
	AL.404	Forward direction over travel / Reset release
	AL.405	Reverse direction over travel / Reset release
	AL.406	Forward direction software over travel / Reset release
	AL.407	Reverse direction software over travel / Reset release
	AL.408	Forward direction positioning amount over
	AL.409	Reverse direction positioning amount over
	AL.410	Address setting error
	AL.420	Position deviation excess 1 (maximum position deviation over)
	AL.421	Position deviation excess 2 (theoretical position deviation over)
	AL.422	Position deviation excess 3 (servo-on position deviation over)
	AL.423	Pulse train command over-speed error
	AL.424	Main power supply voltage is lowered by the excessive deviation
	AL.431	1 rotation data un-setup error
	AL.432	Positioning command incorrect
	AL.433	1 revolution short cut positioning position setting error
	AL.434	Indirection data number incorrect
	AL.435	Zero-point position setting run error
	AL.436	Pulse output selection setting error

Table 10-7 Errors related to communication network

Error type	Error code	Error contents
Error related to communication network	AL.500	RS422 communication disconnected
	AL.501	RS422 communication error
	AL.505	USB communication disconnected

Table 10-8 Warnings

Error type	Warning code	Warning contents
Warning	FL.900	Motor overload preliminary announcement
	FL.902	Main power supply undervoltage detection warning
	FL.903	Zero return uncompleted automatic start warning
	FL.904	Driver emergency stop
	FL.905	Controller emergency stop
	FL.906	Main power supply voltage is lowered
	FL.912	Encoder position detection parts deterioration warning
	FL.920	Forward direction over travel
	FL.921	Reverse direction over travel
	FL.922	Forward direction software over travel
	FL.923	Reverse direction software over travel

10-3 Error code specifications

The following table describes each item in the tables listing details of each error code.

Error code	Details of the error	
(Example) AL.004	Error name	Indicates the error name corresponding to the error code. (Example) Main power supply voltage detection element error
	Contents	Describes the nature of the error. (Example) An error occurs in the voltage detection element and the main power supply voltage cannot be read normally.
	Operation at an error	Indicates the operation of the device (motor) when the error occurs. (Example) Servo OFF
	Release method	Indicates the method for releasing the error status. (Example) Turn the power off, then on again.
	Related display	Indicates the status display on the device that is related to the error. (Example) — When there is no status display related to the error, "—" is indicated.
	Related parameter	Indicates the parameter related to the error. (Example) — When there is no parameter related to the error, "—" is indicated.
	Output signal status	Indicates the status of each typical output signal. ○: ON/●: OFF/—: Follows other status. (Not switched ON or OFF due to the occurrence of the error.) (Example) ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●

Table 10-9 Errors related to device hardware

Error code	Details of the error	
hALt	Error name	
	Driver system error	
	Contents	
	The DSP and DSP peripheral devices do not operate normally. * This alarm is not recorded in the alarm history.	
	Operation at an error	
	The motor enters the servo off status, then control for the device stops.	
	Release method	
	Repair at our factory is necessary.	
	Related display	
	—	
	Related parameter	
	—	
	Output signal status	
	ALM: —/WNG: —/RDY: —/ZRDY: —/BRK: —	
AL.001	Error name	
	RAM error	
	Contents	
	The RAM (memory) in the device cannot be read or written normally. * This alarm is not recorded in the alarm history.	
	Operation at an error	
	Control for the device stops.	
	Release method	
	Turn the power off, then on again. (If the error still occurs, repair at our factory is necessary.)	
	Related display	
	—	
	Related parameter	
	—	
	Output signal status	
	ALM: —/WNG: —/RDY: —/ZRDY: —/BRK: —	

Error code	Details of the error	
AL.002	Error name	
	FRAM write error	
	Contents	
	Data cannot be written in the FRAM in the device. * This alarm is not recorded in the alarm history.	
	Operation at an error	
	The motor immediately stops and enters the servo off status.	
	Release method	
	Turn the power off, then on again. (If the error still occurs, repair at our factory is necessary.)	
	Related display	
	—	
	Related parameter	
	—	
AL.003	Output signal status	
	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●	
	Error name	
	Driver irregular stop	
	Contents	
	A DSP peripheral device does not operate normally.	
	Operation at an error	
	Servo OFF	
	Release method	
	Turn the power off, then on again. (If the error still occurs, repair at our factory is necessary.)	
	Related display	
	—	
	Related parameter	
	—	
	Output signal status	
	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●	

Error code	Details of the error	
AL.004	Error name	
	Main power supply voltage detection element error	
	Contents	
	An error occurs in the voltage detection element and the main power supply voltage cannot be read normally.	
	Operation at an error	
	Servo OFF	
	Release method	
	Turn the power off, then on again. (If the error still occurs, repair at our factory is necessary.)	
	Related display	
	—	
	Related parameter	
	—	
AL.010	Output signal status	
	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●	
	Error name	
	Maker data sustain error	
	Contents	
	The stored factory-set manufacturer data is corrupted.	
	Operation at an error	
	Servo OFF	
	Release method	
	Repair at our factory is necessary.	
	Related display	
	—	
	Related parameter	
	—	
	Output signal status	
	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●	

Error code	Details of the error	
AL.011	Error name	Parameter sustain error
	Contents	The stored parameter data is corrupted.
	Operation at an error	Servo OFF
	Release method	Initialize data (execute self-diagnosis H000), set the parameters, command data, and indirect data again, and turn the power off, then on again.
	Related display	—
	Related parameter	—
	Output signal status	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●
	Error name	Command data sustain error
	Contents	The stored command data is corrupted.
	Operation at an error	Servo OFF
	Release method	Initialize data (execute self-diagnosis H000), set the parameters, command data, and indirect data again, and turn the power off, then on again.
	Related display	—
AL.012	Related parameter	—
	Output signal status	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●
	Error name	Command data sustain error
	Contents	The stored command data is corrupted.
	Operation at an error	Servo OFF
	Release method	Initialize data (execute self-diagnosis H000), set the parameters, command data, and indirect data again, and turn the power off, then on again.
	Related display	—
	Related parameter	—
	Output signal status	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●
	Error name	Command data sustain error
	Contents	The stored command data is corrupted.

Error code	Details of the error	
AL.013	Error name	
	Indirect data sustain error	
	Contents	
	The stored indirect data (IX00 to IX49) is corrupted.	
	Operation at an error	
	Servo OFF	
	Release method	
	Initialize data (execute self-diagnosis H000), set the parameters, command data, and indirect data again, and turn the power off, then on again.	
	Related display	
	—	
	Related parameter	
	—	
	Output signal status	
	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●	
AL.015	Error name	
	ABS position compensation data sustain error	
	Contents	
	The stored absolute position compensation data is corrupted.	
	Operation at an error	
	Servo OFF	
	Release method	
	Initialize ABS position compensation data (execute self-diagnosis H000), register the ABS position compensation data in the device using the VPH ABS position compensation data transfer program (VPH APE), and turn the power off, then on again.	
	Related display	
	—	
	Related parameter	
	—	
	Output signal status	
	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●	

Error code	Details of the error	
AL.020	Error name	Error in matching of firmware and manufacturer data
	Contents	Software controlling the device is inconsistent with the data used by the software.
	Operation at an error	The motor enters the servo off status, then control for the device stops.
	Release method	Repair at our factory is necessary.
	Related display	—
	Related parameter	—
	Output signal status	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●

Table 10-10 Servo-related errors

Error code	Details of the error	
AL.100	Error name	
	Power element error	
	Contents	
	Excessive current flowed in the power element in the main circuit. Or, the cooling heat sink of the power element got overheated.	
	Operation at an error	
	Servo OFF	
	Release method	
	[Check item: 10-4 (1) Power element error] • Input the RST signal. • Turn the power off, then on again.	
	Related display	
	—	
	Related parameter	
	—	
	Output signal status	
	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●	
AL.101	Error name	
	Main power supply discontinuity error	
	Contents	
	The main power-off status continues for more than the time set in [P121].	
	Operation at an error	
	The motor stops as selected in [P121] and enters the servo off status.	
	Release method	
	• Input the RST signal. • Turn the power off, then on again.	
	Related display	
	—	
	Related parameters	
	P121: Main power OFF abnormality detection selection specifications P121: Main power OFF abnormality detection time	
	Output signal status	
	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●	

Error code	Details of the error	
AL.102	Error name	
	Main power supply shortage error	
	Contents	
	The DC voltage of the main power supply is lower than the specified value in the servo on status.	
	Operation at an error	
	Servo OFF	
	Release method	
	[Check item: 10-4 (2) Main power supply shortage voltage error] <ul style="list-style-type: none"> ▪ Input the RST signal. ▪ Turn the power off, then on again. 	
	Related display	
	C016: Main power supply DC voltage value	
	Related parameter	
	—	
	Output signal status	
AL.103	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●	
	Error name	
	Main power supply excessive voltage error	
	Contents	
	The regeneration processing capacity is exceeded due to a rise of the main power supply voltage, excessive load inertia, or another reason, and the DC voltage of the main power supply exceeds the specified value. The ground potential rises due to a ground fault in the motor or excessive leak current, and the DC voltage of the main power supply exceeds the specified value.	
	Operation at an error	
	Servo OFF	
	Release method	
	[Check item: 10—4 (3) Excessive voltage error] <ul style="list-style-type: none"> ▪ Input the RST signal. ▪ Turn the power off, then on again. 	
	Related display	
	—	
	Related parameter	
	—	
	Output signal status	
	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●	

Error code	Details of the error	
AL.104	Error name	
	Over speed error	
	Contents	
	The motor operation speed reaches the value set in [P127].	
	Operation at an error	
	Servo OFF	
	Release method	
	[Check item: 10-4 (4) Over speed error] <ul style="list-style-type: none"> • Input the RST signal. • Turn the power off, then on again. 	
	Related display	
	—	
	Related parameter	
	P127: Over speed abnormality detection speed	
	Output signal status	
	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●	
AL.105	Error name	
	Motor overload error	
	Contents	
	The built-in electronic thermal operated because the motor torque effective value exceeds the motor allowable range.	
	Operation at an error	
	The motor stops as selected in [P126] and enters the servo off status.	
	Release method	
	[Check item: 10-4 (5) Motor overload error] Cool the motor and execute either of the following operations: <ul style="list-style-type: none"> • Input the RST signal. • Turn the power off, then on again. 	
	Related display	
	C012: Thermal trip rate of motor	
	Related parameters	
	P083: Motor electronic thermal detection actual value P084: Motor 1 phase concentration electronic thermal detection ratio P126: Overload abnormal motion selection	
	Output signal status	
	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●	

Error code	Details of the error	
AL.106	Error name	
	Driver overload error	
	Contents	
	The load became excessive for the device power element. Current 180% or higher than the device rated current flows for at least the specified time while the motor is running at low speed.	
	Operation at an error	
	The motor stops as selected in [P126] and enters the servo off status.	
	Release method	
	[Check item: 10-4 (6) Device overload error] Cool the device and execute either of the following operations: <ul style="list-style-type: none"> Input the RST signal. Turn the power off, then on again. 	
	Related display	
	C014: Thermal trip ratio of driver	
	Related parameter	
	P126: Overload abnormal motion selection	
	Output signal status	
	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●	
AL.107	Error name	
	Regenerative resistor overload error	
	Contents	
	Regenerative power generated in deceleration of load inertia exceeded the permissible power range of the regenerative resistor connected to the device.	
	Operation at an error	
	The motor stops as selected in [P126] and enters the servo off status.	
	Release method	
	<ul style="list-style-type: none"> Input the RST signal. Turn the power off, then on again. 	
	Related display	
	C018: Load ratio of regenerative resistor	
	Related parameters	
	P086: Regenerative resistor overload detection ratio P126: Overload abnormal motion selection	
	Output signal status	
	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●	

Error code	Details of the error	
AL.108	Error name	
	Control power supply momentary stop error	
	Contents	
	The voltage of the control power supply is lower than the specified value for at least 50ms.	
	Operation at an error	
	The motor stops with brake stop and enters the servo off status.	
	Release method	
	<ul style="list-style-type: none"> • Input the RST signal. • Turn the power off, then on again. 	
	Related display	
	—	
	Related parameter	
	—	
	Output signal status	
	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●	
AL.109	Error name	
	Regenerative over-current error	
	Contents	
	Current higher than the specified value flowed in the transistor in the regenerative circuit.	
	Operation at an error	
	Servo OFF	
	Release method	
	<ul style="list-style-type: none"> • Input the RST signal. • Turn the power off, then on again. 	
	Related display	
	—	
	Related parameter	
	—	
	Output signal status	
	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●	

Error code	Details of the error	
AL.110	Error name	
	Servo control error	
	Contents	
	The motor rotated in a direction opposite to that expected for the torque output by the device. If this error is detected during normal operation, make an adjustment using [P120].	
	Operation at an error	
	Servo OFF	
	Release method	
	<ul style="list-style-type: none"> ▪ Input the RST signal. ▪ Turn the power off, then on again. 	
	Related display	
	C017: Peak servo control error ratio	
	Related parameter	
	P120: Servo control abnormality detection dead band torque	
	Output signal status	
	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●	
AL.112	Error name	
	Motor power line disconnection error	
	Contents	
	The motor power line is broken, not connected, or connected incorrectly. Or, the current detection sensor for motor power does not operate normally.	
	Operation at an error	
	Servo OFF	
	Release method	
	Check the motor power line and execute either of the following operations: <ul style="list-style-type: none"> ▪ Input the RST signal. ▪ Turn the power off, then on again. 	
	Related display	
	—	
	Related parameter	
	—	
	Output signal status	
	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●	

Error code	Details of the error	
AL.113	Error name	
	Over-current error	
	Contents	
	Abnormal current was detected by the current FB detection for at least 500ms.	
	Operation at an error	
	Servo OFF	
	Release method	
	Check the connected power supply and related parameter setting and execute either of the following operations: <ul style="list-style-type: none"> • Input the RST signal. • Turn the power off, then on again. 	
	Related display	
	—	
	Related parameter	
	—	
	Output signal status	
	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●	
AL.115	Error name	
	Device overheat error ^{*3}	
	Contents	
	The device temperature exceeds the allowable range.	
	Operation at an error	
	Servo OFF	
	Release method	
	Cool the device and execute either of the following operations: <ul style="list-style-type: none"> • Input the RST signal. • Turn the power off, then on again. 	
	Related display	
	—	
	Related parameter	
	—	
	Output signal status	
	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●	

^{*3} This error applies to devices of which the revision is "1" or later. Check L013 described in "11-2-4 Driver information display mode display items" to see the revision of the device you use.

Error code	Details of the error	
AL.117	Error name	
	Main power supply open-phase error	
	Contents	
	When a 3-phase power supply is specified in the motor specification, a problem including disconnection, no connection, or wrong wiring occurred for at least one phase.	
	Operation at an error	
	Servo OFF	
	Release method	
	Check the connected power supply and related parameter setting and turn the power off, then on again.	
	Related display	
	—	
	Related parameter	
	—	
	Output signal status	
	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●	

Table 10-11 Parameter-related errors

Error code	Details of the error	
AL.200	Error name	
	Motor unselection	
	Contents	
	The motor parameter is not set.	
	Operation at an error	
	Servo OFF	
	Release method	
	Check the motor parameter setting and turn the power off, then on again.	
	Related display	
	—	
	Related parameter	
	—	
	Output signal status	
ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●		
AL.201	Error name	
	Motor selection incorrect 1 (invalid device output capacity combination)	
	Contents	
	The device output capacity is not consistent with the motor specification.	
	Operation at an error	
	Servo OFF	
	Release method	
	Check the connected device and motor parameter setting and turn the power off, then on again.	
	Related display	
	—	
	Related parameter	
	—	
	Output signal status	
ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●		

Error code	Details of the error	
AL.202	Error name	
	Motor selection incorrect 2 (invalid device power voltage combination)	
	Contents	
	The device power voltage is not consistent with the motor specification.	
	Operation at an error	
	Servo OFF	
	Release method	
	Check the connected device and motor parameter setting and turn the power off, then on again.	
	Related display	
	—	
	Related parameter	
	—	
	Output signal status	
	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●	
AL.203	Error name	
	Motor selection incorrect 3 (invalid device single-phase power supply combination)	
	Contents	
	The device power supply type is not consistent with the motor specification.	
	Operation at an error	
	Servo OFF	
	Release method	
	Check the connected device and motor parameter setting and turn the power off, then on again.	
	Related display	
	—	
	Related parameter	
	—	
	Output signal status	
	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●	

Error code	Details of the error	
AL.204	Error name	Motor selection incorrect 4 (invalid device specification or revision combination)
	Contents	The device specification is not consistent with the motor specification.
	Operation at an error	Servo OFF
	Release method	Check the connected device and motor parameter setting and turn the power off, then on again.
	Related display	—
	Related parameter	—
	Output signal status	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●
	Error name	Motor type error
	Contents	The combination of the motor and device is invalid.
	Operation at an error	Servo OFF
	Release method	Check the device and motor settings turn the power off, then on again.
	Related display	—
AL.205	Related parameter	—
	Output signal status	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●
	Error name	Motor type error
	Contents	The combination of the motor and device is invalid.
	Operation at an error	Servo OFF
	Release method	Check the device and motor settings turn the power off, then on again.
	Related display	—
	Related parameter	—
	Output signal status	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●

Error code	Details of the error	
AL.209	Error name	Inverter output frequency error
	Contents	An attempt was made to use a motor of which the maximum electrical angle frequency (inverter output frequency) is 600Hz or higher.
	Operation at an error	Servo OFF
	Release method	Set a value smaller than "72000/[number of poles]" in [P082] and turn the power off, then on again.
	Related display	—
	Related parameter	P082: Motor max speed special setting
	Output signal status	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●
AL.210	Error name	Maximum speed command higher limit incorrect
	Contents	The speed in the motor rated speed mode according to the setting in [P162], [P163], and [P164] exceeds 300M (P161 setting unit/sec).
	Operation at an error	Servo OFF
	Release method	[Check item: 10-4 (7) Maximum speed command invalid] Check the related parameter setting and execute either of the following operations: <ul style="list-style-type: none"> ▪ Input the RST signal. ▪ Turn the power off, then on again.
	Related display	—
	Related parameters	P162: Electronic gear numerator ratio P163: Electronic gear denominator ratio P164: Mechanical movement
	Output signal status	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●

Error code	Details of the error	
AL.211	Error name	
	Maximum speed command lower limit incorrect	
	Contents	
	The speed in the motor maximum speed mode according to the setting in [P162], [P163], and [P164] does not reach 100 (P161 setting unit/sec).	
	Operation at an error	
	Servo OFF	
	Release method	
	[Check item: 10-4 (7) Maximum speed command invalid] Check the related parameter setting and execute either of the following operations: <ul style="list-style-type: none"> • Input the RST signal. • Turn the power off, then on again. 	
	Related display	
	—	
	Related parameter	
	—	
AL.213	Output signal status	
	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●	
	Error name	
	1 rotation position range incorrect	
	Contents	
	There is an inconsistency in the relationships between the values set in [P165] and [P166].	
	Operation at an error	
	Servo OFF	
	Release method	
	Check the related parameter setting and execute either of the following operations: <ul style="list-style-type: none"> • Input the RST signal. • Turn the power off, then on again. 	
	Related display	
	—	
	Related parameters	
	P165: Rotation position range P166: Rotation position range sign switching position	
	Output signal status	
	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●	

Table 10-12 Encoder-related errors

Error code	Details of the error	
AL.301	Error name	
	Magnetic pole signal pattern error	
	Contents	
	When the magnetic pole sensor was used, the signal from the magnetic pole sensor could not be read normally.	
	Operation at an error	
	Servo OFF	
	Release method	
	[Check item: 10-4 (8) Magnetic pole signal error] Check the magnetic pole sensor, sensor cable, and others or use VPH DES to check the encoder, magnetic sensor, and other settings, and execute either of the following operations: <ul style="list-style-type: none"> ▪ Input the RST signal. ▪ Turn the power off, then on again. 	
	Related display	
	—	
	Related parameters	
	P002: Magnetic pole sensor identification code P068: Magnetic pole sensor type	
	Output signal status	
	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●	
AL.302	Error name	
	Error in matching of magnetic pole signal and encoder resolution	
	Contents	
	When the magnetic pole sensor was used, the motor rotated one turn before four patterns of the magnetic pole signal were detected.	
	Operation at an error	
	Servo OFF	
	Release method	
	[Check item: 10-4 (8) Magnetic pole signal error] Check the magnetic pole sensor, sensor cable, and others or use VPH DES to check the encoder, magnetic sensor, and other settings, and execute either of the following operations: <ul style="list-style-type: none"> ▪ Input the RST signal. ▪ Turn the power off, then on again. 	
	Related display	
	—	
	Related parameters	
	P002: Magnetic pole sensor identification code P068: Magnetic pole sensor type	
	Output signal status	
	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●	

Error code	Details of the error	
AL.303	Error name	
	Auto magnetic pole detection error	
	Contents	
	In the automatic magnetic pole detection mode, automatic magnetic pole detection operation was not completed normally.	
	Operation at an error	
	Servo OFF	
	Release method	
	[Check item: 10-4 (9) Automatic magnetic pole detection error] Check the related parameter setting and others and execute either of the following operations: <ul style="list-style-type: none"> • Input the RST signal. • Turn the power off, then on again. 	
	Related display	
	—	
	Related parameters	
AL.304	P380: Magnetic pole detection torque limit value P381: Magnetic pole detection gain 1 P382: Magnetic pole detection integration time constant P383: Magnetic pole detection gain 2 P384: Magnetic pole detection complete range P385: Magnetic pole detection filter order selection P386: Landing torque P387: Magnetic pole detection torque minimum value	
	Output signal status	
	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●	
	Error name	
	Encoder signal disconnection error	
	Contents	
	The encoder cable is broken or not connected, or the connector is loose. The connected encoder is inconsistent with the parameter setting.	
	Operation at an error	
	Servo OFF	
	Release method	
	[Check item: 10-4 (10) Encoder error] Check the encoder, encoder cable, related parameter setting, and others, and: <ul style="list-style-type: none"> • Turn the power off, then on again. 	
	Related display	
	—	
	Related parameter	
	—	
	Output signal status	
	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●	

Error code	Details of the error	
AL.305	Error name	Encoder velocity error
	Contents	The encoder cannot be read normally.
	Operation at an error	Servo OFF
	Release method	Check the encoder, encoder cable, related parameter setting, and others, and execute either of the following operations. <ul style="list-style-type: none"> ▪ Input the RST signal. ▪ Input the ARST signal. ▪ Turn the power off, then on again.
	Related display	—
	Related parameter	—
	Output signal status	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●
	Error name	ABS position compensation data unregistered *4
	Contents	Although [P104] is set so that ABS position compensation is effective, no ABS position compensation data is registered in the device.
	Operation at an error	Servo OFF
	Release method	Execute either of the following operations: <ul style="list-style-type: none"> ▪ Set ABS position compensation data in the device and turn the power off, then on again. ▪ Set [P104] to "0: Absolute position compensation function ineffective" and turn the power off, then on again.
	Related display	L021: Whether ABS position compensation data is valid or invalid
	Related parameter	P104: Absolute position compensation action entry
AL.307	Output signal status	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●

*4 This error occurs only when no IPU is used (C-SEN2).

Error code	Details of the error	
AL.308	Error name	
	ABS position compensation data collation error * ⁵	
	Contents	
	The ABS position compensation data registered in the device is inconsistent with the data registered in the IPU.	
	Operation at an error	
	Servo OFF	
	Release method	
	Execute either of the following operations: • Input the RST signal. • Turn the power off, then on again. (After the RST signal is input or the power is turned off, then on again, the ABS position compensation data registered in the IPU is automatically registered in the device.)	
	Related display	
	—	
	Related parameter	
	—	
AL.309	Output signal status	
	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●	
	Error name	
	ABS position compensation data none error * ⁵	
	Contents	
	No ABS position compensation data is registered in the IPU.	
	Operation at an error	
	Servo OFF	
	Release method	
	[When ABS position compensation data is registered in the device] • Execute self-diagnosis d015 to transfer ABS position compensation data from the device to the IPU. [When no ABS position compensation data is registered in the device] • Use the VPH ABS position compensation data transfer program (VPH APE) to register ABS position compensation data in the device and turn the power off, then on again.	
	Related display	
	L021: Whether ABS position compensation data is valid or invalid	
	Related parameter	
	—	
	Output signal status	
	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●	

*⁵ This error occurs only when an IPU is used (S-ABS2).

Error code	Details of the error	
AL.310	Error name	
	IPU communication error * ⁶	
	Contents	
	A communication error occurred between the device and IPU due to the broken or disconnected cable or loose connector. Or, encoder selection made by setting the related parameter is invalid.	
	Operation at an error	
	Servo OFF	
	Release method	
	Check the encoder cable, related parameter setting, and others and execute either of the following operations: <ul style="list-style-type: none"> Input the RST signal. Turn the power off, then on again. 	
	Related display	
	—	
	Related parameter	
	—	
AL.312	Output signal status	
	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●	
	Error name	
	Communication error between encoder IPU * ⁶	
	Contents	
	An error occurred in the communication circuit between the encoder and IPU.	
	Operation at an error	
	Servo OFF	
	Release method	
	[Check item: 10—4 (11) Serial encoder/IPU communication error] <ul style="list-style-type: none"> Turn the power off, then on again. Repair the device at our factory. 	
	Related display	
	—	
	Related parameter	
	—	
	Output signal status	
	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●	

*⁶ This error occurs only when an IPU is used (S-ABS2).

Error code	Details of the error	
AL.313	Error name	
	Cable disconnection between encoder IPU ^{*7}	
	Contents	
	The cable between the encoder and IPU is broken or not connected, or the connector is loose.	
	Operation at an error	
	Servo OFF	
	Release method	
	[Check item: 10—4 (11) Serial encoder/IPU communication error] Check the cable and execute either of the following operations: • Turn the power off, then on again.	
	Related display	
	—	
	Related parameter	
	—	
AL.314	Output signal status	
	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●	
	Error name	
	Encoder position detection signal error ^{*7}	
	Contents	
	The encoder cannot read the positional signal detection waveform normally.	
	Operation at an error	
	Servo OFF	
	Release method	
	Motor replacement or repair is necessary.	
	Related display	
	—	
	Related parameter	
	—	
	Output signal status	
	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●	

^{*7} This error occurs only when an IPU is used (S-ABS2).

Error code	Details of the error	
AL.315	Error name	
	1 rotation position detection velocity error * ⁸	
	Contents	
	When an ABS encoder is used and the power is turned on or when a serial encoder communication error is released, the motor rotates or vibrates at 1rpm or more.	
	Operation at an error	
	Servo OFF	
	Release method	
	[Check item: 10-4 (12) Encoder position detection signal error] <ul style="list-style-type: none"> Input the RST signal. Turn the power off, then on again. 	
	Related display	
	—	
	Related parameter	
	—	
AL.316	Output signal status	
	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●	
	Error name	
	Photo acceptance unit error * ⁸	
	Contents	
	A failure occurred in an element in the ABS encoder for the τ DISC.	
	Operation at an error	
	Servo OFF	
	Release method	
	Turn the power off, then on again. (If the error still occurs, motor replacement or repair is necessary.)	
	Related display	
	—	
	Related parameter	
	—	
	Output signal status	
	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●	

*⁸ This error occurs only when an IPU is used (S-ABS2).

Error code	Details of the error	
AL.317	Error name	
	Light emitting element error * ⁹	
	Contents	
	A failure occurred in an element in the ABS encoder for the τ DISC.	
	Operation at an error	
	Servo OFF	
	Release method	
	Turn the power off, then on again. (If the error still occurs, motor replacement or repair is necessary.)	
	Related display	
	—	
	Related parameter	
	—	
	Output signal status	
ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●		
AL.318	Error name	
	IPU backup error * ⁹	
	Contents	
	IPU backup data is damaged.	
	Operation at an error	
	Servo OFF	
	Release method	
	<ul style="list-style-type: none"> • Turn the power off, then on again. • IPU replacement or repair is necessary. 	
	Related display	
	—	
	Related parameter	
	—	
	Output signal status	
ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●		

*⁹ This error occurs only when an IPU is used (S-ABS2).

Error code	Details of the error	
AL.319	Error name	
	ABS position compensation encoder pulse number error	
	Contents	
	The number of encoder pulses set in the device is not the same as the number set in ABS position compensation data.	
	Operation at an error	
	Servo OFF	
	Release method	
	Register ABS position compensation data again.	
	Related display	
	—	
	Related parameter	
	—	
	Output signal status	
	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●	
AL.320	Error name	
	Magnetic pole signal disconnection error *10	
	Contents	
	The encoder cable is broken or not connected, or the connector is loose. The magnetic pole sensor is inconsistent with the parameter setting.	
	Operation at an error	
	Servo OFF	
	Release method	
	[Check item: 10-4 (8) Magnetic pole signal error] Check the magnetic pole sensor, sensor cable, and others or use VPH DES to check the encoder, magnetic sensor, and other settings, and turn the power off, then on again.	
	Related display	
	—	
	Related parameter	
	P002: Magnetic pole sensor identification code P068: Magnetic pole sensor type	
	Output signal status	
	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●	

*10 This error applies to devices of which the revision is "1" or later. Check L013 described in "11-2-4 Driver information display mode display items" to see the revision of the device you use.

Table 10-13 NC-related errors

Error code	Details of the error	
AL.400	Error name	
	Forward direction over travel / Automatic release	
	Contents	
	The forward direction over travel signal (FOT) was detected.	
	Operation at an error	
	The motor stops after the deceleration time set in [P634] and enters the servo lock status.	
	Release method	
	Move the motor in the reverse direction with jog operation to the operation range.	
	Related display	
	—	
	Related parameters	
	P410 -: SPDSEL0 to SPDSEL7 Overtravel spec selection P441 -: TRQSEL0 to TRQSEL7 Overtravel spec selection P467 -: PLSSEL0 to PLSSEL7 Overtravel spec selection P517 -: SEL0 to SEL7 Overtravel spec selection P634: Deceleration time after OT signal braking stoppage, OT condition holding time	
	Output signal status	
	ALM: ○/WNG: ●/RDY: Follows [P650]./ZRDY: ○ (in the built-in command mode)/BRK: ●	
AL.401	Error name	
	Reverse direction over travel / Automatic release	
	Contents	
	The reverse direction over travel signal (ROT) was detected.	
	Operation at an error	
	The motor stops after the deceleration time set in [P634] and enters the servo lock status.	
	Release method	
	Move the motor in the forward direction with jog operation to the operation range.	
	Related display	
	—	
	Related parameters	
	P410 -: SPDSEL0 to SPDSEL7 Overtravel spec selection P441 -: TRQSEL0 to TRQSEL7 Overtravel spec selection P467 -: PLSSEL0 to PLSSEL7 Overtravel spec selection P517 -: SEL0 to SEL7 Overtravel spec selection P634: Deceleration time after OT signal braking stoppage, OT condition holding time	
	Output signal status	
	ALM: ○/WNG: ●/RDY: Follows [P650]./ZRDY: ○ (in the built-in command mode)/BRK: ●	

Error code	Details of the error	
AL.402	Error name	
	Forward direction software over travel / Automatic release	
	Contents	
	The current position (status display: C020) is beyond the position set in [P171].	
	Operation at an error	
	The motor stops after the deceleration time set in [P635] and enters the servo lock status.	
	Release method	
	Move the motor in the reverse direction with jog operation to the operation range.	
	Related display	
	—	
	Related parameters	
	P171: Positive direction soft OT limit P410 -: SPDSEL0 to SPDSEL7 Overtravel spec selection P441 -: TRQSEL0 to TRQSEL7 Overtravel spec selection P467 -: PLSSEL0 to PLSSEL7 Overtravel spec selection P517 -: SEL0 to SEL7 Overtravel spec selection P635: Soft OT braking stoppage deceleration time, Soft OT condition holding time	
	Output signal status	
	ALM: ○/WNG: ●/RDY: Follows [P650]./ZRDY: ○ (in the built-in command mode)/BRK: ●	
AL.403	Error name	
	Reverse direction software over travel / Automatic release	
	Contents	
	The current position (status display: C020) is beyond the position set in [P172].	
	Operation at an error	
	The motor stops after the deceleration time set in [P635] and enters the servo lock status.	
	Release method	
	Move the motor in the forward direction with jog operation to the operation range.	
	Related display	
	—	
	Related parameters	
	P172: Negative direction soft OT limit P410 -: SPDSEL0 to SPDSEL7 Overtravel spec selection P441 -: TRQSEL0 to TRQSEL7 Overtravel spec selection P467 -: PLSSEL0 to PLSSEL7 Overtravel spec selection P517 -: SEL0 to SEL7 Overtravel spec selection P635: Soft OT braking stoppage deceleration time, Soft OT condition holding time	
	Output signal status	
	ALM: ○/WNG: ●/RDY: Follows [P650]./ZRDY: ○ (in the built-in command mode)/BRK: ●	

Error code	Details of the error	
AL.404	Error name	
	Forward direction over travel / Reset release	
	Contents	
	The forward direction over travel signal (FOT) was detected.	
	Operation at an error	
	The motor stops after the deceleration time set in [P634] and enters the servo lock status.	
	Release method	
	Execute one of the following operations, and then move the motor in the reverse direction with jog operation to the operation range: <ul style="list-style-type: none"> ▪ Input the RST signal. ▪ Input the ARST signal. ▪ Turn the power off, then on again. 	
	Related display	
	—	
	Related parameters	
	P410 -: SPDSEL0 to SPDSEL7 Overtravel spec selection P441 -: TRQSEL0 to TRQSEL7 Overtravel spec selection P467 -: PLSSEL0 to PLSSEL7 Overtravel spec selection P517 -: SEL0 to SEL7 Overtravel spec selection P634: Deceleration time after OT signal braking stoppage, OT condition holding time	
	Output signal status	
	ALM: ○/WNG: ●/RDY: Follows [P650]./ZRDY: ○ (in the built-in command mode)/BRK: ●	

Error code	Details of the error	
AL.405	Error name	Reverse direction over travel / Reset release
	Contents	The reverse direction over travel signal (ROT) was detected.
	Operation at an error	The motor stops after the deceleration time set in [P634] and enters the servo lock status.
	Release method	Execute one of the following operations, and then move the motor in the forward direction with jog operation to the operation range: <ul style="list-style-type: none"> ▪ Input the RST signal. ▪ Input the ARST signal. ▪ Turn the power off, then on again.
	Related display	—
	Related parameters	P410 -: SPDSEL0 to SPDSEL7 Overtravel spec selection P441 -: TRQSEL0 to TRQSEL7 Overtravel spec selection P467 -: PLSSEL0 to PLSSEL7 Overtravel spec selection P517 -: SEL0 to SEL7 Overtravel spec selection P634: Deceleration time after OT signal braking stoppage, OT condition holding time
	Output signal status	ALM: ○/WNG: ●/RDY: Follows [P650]./ZRDY: ○ (in the built-in command mode)/BRK: ●

Error code	Details of the error	
AL.406	Error name	Forward direction software over travel / Reset release
	Contents	The current position (status display: C020) is beyond the position set in [P171].
	Operation at an error	The motor stops after the deceleration time set in [P635] and enters the servo lock status.
	Release method	Execute one of the following operations, and move the motor in the reverse direction with jog operation to the operation range: <ul style="list-style-type: none"> • Input the RST signal. • Input the ARST signal. • Turn the power off, then on again.
	Related display	—
	Related parameters	P171: Positive direction soft OT limit P410 -: SPDSEL0 to SPDSEL7 Overtravel spec selection P441 -: TRQSEL0 to TRQSEL7 Overtravel spec selection P467 -: PLSSEL0 to PLSSEL7 Overtravel spec selection P517 -: SEL0 to SEL7 Overtravel spec selection P635: Soft OT braking stoppage deceleration time, Soft OT condition holding time
	Output signal status	ALM: ○/WNG: ●/RDY: Follows [P650]./ZRDY: ○ (in the built-in command mode)/BRK: ●

Error code	Details of the error	
AL.407	Error name	
	Reverse direction software over travel / Reset release	
	Contents	
	The current position (status display: C020) is beyond the position set in [P172].	
	Operation at an error	
	The motor stops after the deceleration time set in [P635] and enters the servo lock status.	
	Release method	
	Execute one of the following operations, and then move the motor in the forward direction with jog operation to the operation range: <ul style="list-style-type: none"> ▪ Input the RST signal. ▪ Input the ARST signal. ▪ Turn the power off, then on again. 	
	Related display	
	—	
	Related parameters	
AL.408	P172: Negative direction soft OT limit P410 -: SPDSEL0 to SPDSEL7 Overtravel spec selection P441 -: TRQSEL0 to TRQSEL7 Overtravel spec selection P467 -: PLSSEL0 to PLSSEL7 Overtravel spec selection P517 -: SEL0 to SEL7 Overtravel spec selection P635: Soft OT braking stoppage deceleration time, Soft OT condition holding time	
	Output signal status	
	ALM: ○/WNG: ●/RDY: Follows [P650]./ZRDY: ○ (in the built-in command mode)/BRK: ●	
	Error name	
	Forward direction positioning amount over	
	Contents	
	An attempt was made to execute the positioning command with a positioning quantity greater than the value set in [P173].	
	Operation at an error	
	Servo lock	
	Release method	
	Check the related parameters or correct the positioning quantity set in the command and execute one of the following operations: <ul style="list-style-type: none"> ▪ Input the RST signal. ▪ Input the ARST signal. ▪ Turn the power off, then on again. 	
	Related display	
	—	
	Related parameter	
	P173: Max travel amount for positive direction positioning	
	Output signal status	
	ALM: ○/WNG: ●/RDY: Follows [P650]./ZRDY: ●/BRK: ●	

Error code	Details of the error	
AL.409	Error name	
	Reverse direction positioning amount over	
	Contents	
	An attempt was made to execute the positioning command with a positioning quantity greater than the value set in [P174].	
	Operation at an error	
	Servo lock	
	Release method	
	Check the related parameters or correct the positioning quantity set in the command and execute one of the following operations: <ul style="list-style-type: none"> • Input the RST signal. • Input the ARST signal. • Turn the power off, then on again. 	
	Related display	
	—	
	Related parameter	
	P174: Max travel amount for negative direction positioning	
	Output signal status	
	ALM: ○/WNG: ●/RDY: Follows [P650]/ZRDY: ●/BRK: ●	
AL.410	Error name	
	Address setting error	
	Contents	
	An attempt was made to specify a command address other than 0 to 255 and execute a command.	
	Operation at an error	
	Servo lock	
	Release method	
	Correct the command address and execute one of the following operations: <ul style="list-style-type: none"> • Input the RST signal. • Input the ARST signal. • Turn the power off, then on again. 	
	Related display	
	—	
	Related parameter	
	—	
	Output signal status	
	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●	

Error code	Details of the error	
AL.420	Error name	
	Position deviation excess 1 (maximum position deviation over)	
	Contents	
	The position deviation exceeds the value set in [P176].	
	Operation at an error	
	The motor immediately stops and enters the servo off status.	
	Release method	
	Execute one of the following operations: <ul style="list-style-type: none"> ▪ Input the RST signal. ▪ Input the ARST signal. ▪ Turn the power off, then on again. 	
	Related display	
	—	
	Related parameter	
	P176: Position deviation exorbitance detection pulse Max. value	
AL.421	Output signal status	
	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●	
	Error name	
	Position deviation excess 2 (theoretical position deviation over)	
	Contents	
	The position deviation exceeds the amount based on the value set in [P178].	
	Operation at an error	
	The motor immediately stops and enters the servo off status.	
	Release method	
	Execute one of the following operations: <ul style="list-style-type: none"> ▪ Input the RST signal. ▪ Input the ARST signal. ▪ Turn the power off, then on again. 	
	Related display	
	—	
	Related parameters	
	P177: Position deviation exorbitance detection pulse Min value P178: Position deviation exorbitance detection ratio	
	Output signal status	
	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●	

Error code	Details of the error	
AL.422	Error name	
	Position deviation excess 3 (servo-on position deviation over)	
	Contents	
	When the position deviation exceeded the value set in [P175], servo-on operation was performed.	
	Operation at an error	
	Servo OFF	
	Release method	
	Execute one of the following operations: <ul style="list-style-type: none"> • Input the RST signal. • Input the ARST signal. • Turn the power off, then on again. 	
	Related display	
	—	
	Related parameter	
	P175: Position deviation exorbitance detection pulse at Servo OFF -> Servo ON	
	Output signal status	
	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●	
AL.423	Error name	
	Pulse train command over-speed error	
	Contents	
	The pulse train command was input with at least 80Mpps of the encoder pulse. * ¹¹	
	Operation at an error	
	The motor immediately stops and enters the servo off status.	
	Release method	
	Execute one of the following operations: <ul style="list-style-type: none"> • Input the RST signal. • Input the ARST signal. • Turn the power off, then on again. 	
	Related display	
	—	
	Related parameter	
	P471 -: Delay compensation time for the pulse train command	
	Output signal status	
	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●	

*¹¹ When a value other than 0 is set in [P471 -], this error may occur with about 40Mpps.

Error code	Details of the error	
AL.424	Error name	
	Main power supply voltage is lowered by the excessive deviation	
	Contents	
	When the DC voltage of the main power supply is lower than the specified value, the number of pulse train command pulses accumulated due to the speed limit set in [P123] exceeds 2.1 billion.	
	Operation at an error	
	The motor immediately stops and enters the servo off status.	
	Release method	
	Check the related parameter setting and execute one of the following operations: <ul style="list-style-type: none"> ▪ Input the RST signal. ▪ Input the ARST signal. ▪ Turn the power off, then on again. 	
	Related display	
	—	
	Related parameter	
	P123: Main power supply speed drop limit	
	Output signal status	
	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●	
AL.431	Error name	
	1 rotation data un-setup error	
	Contents	
	An attempt was made to execute INDX command when [P165] was not set.	
	Operation at an error	
	Servo lock	
	Release method	
	Correct the command setting and execute one of the following operations: <ul style="list-style-type: none"> ▪ Input the RST signal. ▪ Input the ARST signal. ▪ Turn the power off, then on again. 	
	Related display	
	—	
	Related parameter	
	P165: Rotation position range	
	Output signal status	
	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●	

Error code	Details of the error	
AL.432	Error name	
	Positioning command incorrect	
	Contents	
	A value outside the range is set in the positioning command. * ¹²	
	Operation at an error	
	Servo lock	
	Release method	
	Correct the command setting and execute one of the following operations: <ul style="list-style-type: none"> • Input the RST signal. • Input the ARST signal. • Turn the power off, then on again. 	
	Related display	
	—	
	Related parameter	
	—	
AL.433	Output signal status	
	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●	
	Error name	
	1 revolution short cut positioning position setting error	
	Contents	
	A value greater than that set in [P165] is specified as the positioning position in the INDX command. Or, an attempt was made to execute the INDX command when sign switching was enabled according to the setting in [P166].	
	Operation at an error	
	Servo lock	
	Release method	
	Correct the command setting or set 0 in [P166] and execute one of the following operations: <ul style="list-style-type: none"> • Input the RST signal. • Input the ARST signal. • Turn the power off, then on again. 	
	Related display	
	—	
	Related parameters	
	P165: Rotation position range P166: Rotation position range sign switching position	
	Output signal status	
	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●	

*¹² When indirect data is specified, this alarm does not occur and the value is set to "0".

Error code	Details of the error	
AL.434	Error name	
	Indirection data number incorrect	
	Contents	
	An attempt was made to specify an indirect data number other than IX00 to IX99 and execute a command.	
	Operation at an error	
	Servo lock	
	Release method	
	Correct the command setting and execute one of the following operations: <ul style="list-style-type: none"> ▪ Input the RST signal. ▪ Input the ARST signal. ▪ Turn the power off, then on again. 	
	Related display	
	—	
	Related parameter	
	P175: Position deviation exorbitance detection pulse at Servo OFF -> Servo ON	
	Output signal status	
	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●	
AL.435	Error name	
	Zero-point position setting run error	
	Contents	
	When other than the ABS encoder was used, SET ABS zero return was executed.	
	Operation at an error	
	Servo lock	
	Release method	
	Execute one of the following operations: <ul style="list-style-type: none"> ▪ Input the RST signal. ▪ Input the ARST signal. ▪ Turn the power off, then on again. 	
	Related display	
	—	
	Related parameter	
	P060: Encoder type	
	Output signal status	
	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●	

Error code	Details of the error	
AL.436	Error name	
	Pulse output selection setting error	
	Contents	
	When other than "6: P141/P142 division output" was set in [P140], OUT POS zero return was executed.	
	Operation at an error	
	Servo lock	
	Release method	
	Correct the related parameter setting and execute one of the following operations: <ul style="list-style-type: none"> • Input the RST signal. • Input the ARST signal. • Turn the power off, then on again. 	
	Related display	
	—	
	Related parameter	
	P140: Pulse output selection	
	Output signal status	
	ALM: ○/WNG: ●/RDY: ●/ZRDY: ●/BRK: ●	

Table 10-14 Errors related to communication network

Error code	Details of the error	
AL.500	Error name	RS422 communication disconnected
	Contents	RS422 communication is disconnected for at least the time set in [P702].
	Operation at an error	The motor immediately stops and enters the servo off status.
	Release method	Check the communication cable and others and execute one of the following operations: <ul style="list-style-type: none"> ▪ Input the RST signal. ▪ Input the ARST signal. ▪ Turn the power off, then on again.
	Related display	—
	Related parameter	P702: RS422 communication time out
	Output signal status	ALM: ○/WNG: ●/RDY: Follows [P650]./ZRDY: ●/BRK: ●
	Error name	RS422 communication error
	Contents	An error occurred during RS422 communication.
	Operation at an error	The motor immediately stops and enters the servo off status.
	Release method	Check the related parameter settings and execute one of the following operations: <ul style="list-style-type: none"> ▪ Input the RST signal. ▪ Input the ARST signal. ▪ Turn the power off, then on again.
	Related display	—
AL.501	Related parameters	P701: RS422 communication ID No. P701: RS422 communication function selection P701: RS422 communication data length P701: RS422 communication parity P701: RS422 communication baud rate
	Output signal status	ALM: ○/WNG: ●/RDY: Follows [P650]./ZRDY: ●/BRK: ●
	Error name	RS422 communication error
	Contents	An error occurred during RS422 communication.
	Operation at an error	The motor immediately stops and enters the servo off status.
	Release method	Check the related parameter settings and execute one of the following operations: <ul style="list-style-type: none"> ▪ Input the RST signal. ▪ Input the ARST signal. ▪ Turn the power off, then on again.
	Related display	—
	Related parameters	P701: RS422 communication ID No. P701: RS422 communication function selection P701: RS422 communication data length P701: RS422 communication parity P701: RS422 communication baud rate
	Output signal status	ALM: ○/WNG: ●/RDY: Follows [P650]./ZRDY: ●/BRK: ●
	Error name	RS422 communication error
	Contents	An error occurred during RS422 communication.

Error code	Details of the error	
AL.505	Error name	USB communication disconnected
	Contents	USB communication was disconnected during VPH DES test run.
	Operation at an error	The motor immediately stops and enters the servo off status.
	Release method	Check the communication cable and others and execute one of the following operations: <ul style="list-style-type: none"> ▪ Input the RST signal. ▪ Input the ARST signal. ▪ Turn the power off, then on again.
	Related display	—
	Related parameter	—
	Output signal status	ALM: ○/WNG: ●/RDY: Follows [P650]./ZRDY: ●/BRK: ●

10-3-2 Warning list

Table 10-15 Warning

Warning code	Details of the warning	
FL.900	Error name	
	Motor overload preliminary announcement	
	Contents	
	The thermal trip rate of the motor (status display: C012) reaches 90%.	
	Operation at an error	
	Current operation is continued.	
	Release method	
	Remove the cause of overload. *13	
	Related display	
	—	
	Related parameters	
	P083: Motor electronic thermal detection actual value P084: Motor 1 phase concentration electronic thermal detection ratio	
	Output signal status	
FL.902	ALM: ●/WNG: ○/RDY: —/ZRDY: —/BRK: —	
	Error name	
	Main power supply undervoltage detection warning	
	Contents	
	The DC voltage of the main power supply (status display: C016) is lower than the specified value in the servo off status.	
	Operation at an error	
	Release method	
	Recover the main power supply voltage to the normal range.	
	Related display	
	—	
	Related parameter	
	—	
	Output signal status	
	ALM: ●/WNG: ○/RDY: ●/ZRDY: ●/BRK: ●	

*13 When the thermal trip rate of the motor reaches 100%, a motor overload error (AL.105) occurs.

Warning code	Details of the warning	
FL.903	Error name	
	Zero return uncompleted automatic start warning	
	Contents	
	When [P516] was set to the value indicating positioning not allowed, an attempt was made to start a positioning command (POS/INDX) before zero return was completed.	
	Operation at an error	
	— (The positioning drive signal is ignored.)	
	Release method	
	Execute one of the following operations: <ul style="list-style-type: none"> • Perform zero return. • Perform jog operation. • Input the RST signal. • Input the ARST signal. • Change the related parameter setting and start positioning. • Change the run mode. • Turn the power off, then on again. 	
	Related display	
	—	
	Related parameter	
	P516: Positioning approval selection when homing is not completed	
FL.904	Output signal status	
	ALM: ●/WNG: ○/RDY: ○/ZRDY: ○/BRK: ○	
	Error name	
	Driver emergency stop	
	Contents	
	The emergency stop signal (EMG), a control input signal, was input.	
	Operation at an error	
	The motor stops as selected in [P633] and enters the servo off status.	
	Release method	
	Release the emergency stop signal and execute one of the following operations: <ul style="list-style-type: none"> • Input the ARST signal. • Input the RST signal. • Turn the power off, then on again. 	
	Related display	
	—	
	Related parameters	
	P633: Stopping selection when EMG signal is ON P633: Deceleration time after EMG signal braking stoppage P633: Servo OFF delay time after EMG braking stoppage	
	Output signal status	
	ALM: ●/WNG: ○/RDY: —/ZRDY: —/BRK: —	

Warning code	Details of the warning	
FL.905	Error name	Controller emergency stop
	Contents	The emergency stop signal (EMG) was input via communication.
	Operation at an error	The motor stops as selected in [P633] and enters the servo off status.
	Release method	Release the emergency stop signal and execute one of the following operations: <ul style="list-style-type: none"> ▪ Input the ARST signal. ▪ Input the RST signal. ▪ Turn the power off, then on again.
	Related display	—
	Related parameters	P633: Stopping selection when EMG signal is ON P633: Deceleration time after EMG signal braking stoppage P633: Servo OFF delay time after EMG braking stoppage
	Output signal status	ALM: ●/WNG: ○/RDY: —/ZRDY: —/BRK: —
	Error name	Main power supply voltage is lowered
	Contents	The main power supply voltage is lower than the value set in [P122].
	Operation at an error	Current operation is continued.
	Release method	Recover the main power supply voltage to the normal range.
	Related display	—
	Related parameter	P122: Main power supply voltage drop detection value
FL.906	Output signal status	ALM: ●/WNG: ○/RDY: —/ZRDY: —/BRK: —

Warning code	Details of the warning	
FL.912	Error name	
	Encoder position detection parts deterioration warning	
	Contents	
	Deterioration of the positional signal detection parts of the encoder has progressed.	
	Operation at an error	
	Current operation is continued.	
	Release method	
	Motor replacement or repair is necessary.	
	Related display	
	—	
	Related parameter	
	—	
	Output signal status	
	ALM: ●/WNG: ○/RDY: —/ZRDY: —/BRK: —	
FL.920	Error name	
	Forward direction over travel	
	Contents	
	The forward over travel signal (FOT) was detected.	
	Operation at an error	
	The motor stops after the deceleration time set in [P634] and enters the servo lock status.	
	Release method	
	Move the motor in the reverse direction with jog operation to the operation range.	
	Related display	
	—	
	Related parameters	
	P410 -: SPDSEL0 to SPDSEL7 Overtravel spec selection P441 -: TRQSEL0 to TRQSEL7 Overtravel spec selection P467 -: PLSSEL0 to PLSSEL7 Overtravel spec selection P517 -: SEL0 to SEL7 Overtravel spec selection P634: Deceleration time after OT signal braking stoppage, OT condition holding time	
	Output signal status	
	ALM: ●/WNG: ○/RDY: Follows [P650]./ZRDY: ○ (in the built-in command mode)/BRK: —	

Warning code	Details of the warning	
FL.921	Error name	Reverse direction over travel
	Contents	The reverse over travel signal (ROT) was detected.
	Operation at an error	The motor stops after the deceleration time set in [P634] and enters the servo lock status.
	Release method	Move the motor in the forward direction with jog operation to the operation range.
	Related display	—
	Related parameters	P410 -: SPDSEL0 to SPDSEL7 Overtravel spec selection P441 -: TRQSEL0 to TRQSEL7 Overtravel spec selection P467 -: PLSSEL0 to PLSSEL7 Overtravel spec selection P517 -: SEL0 to SEL7 Overtravel spec selection P634: Deceleration time after OT signal braking stoppage, OT condition holding time
	Output signal status	ALM: ●/WNG: ○/RDY: Follows [P650]./ZRDY: ○ (in the built-in command mode)/BRK: —
FL.922	Error name	Forward direction software over travel
	Contents	The current position (status display: C020) is beyond the position set in [P171].
	Operation at an error	The motor stops after the deceleration time set in [P635] and enters the servo lock status.
	Release method	Move the motor in the reverse direction with jog operation to the operation range.
	Related display	—
	Related parameters	P171: Positive direction soft OT limit P410 -: SPDSEL0 to SPDSEL7 Overtravel spec selection P441 -: TRQSEL0 to TRQSEL7 Overtravel spec selection P467 -: PLSSEL0 to PLSSEL7 Overtravel spec selection P517 -: SEL0 to SEL7 Overtravel spec selection P635: Soft OT braking stoppage deceleration time, Soft OT condition holding time
	Output signal status	ALM: ●/WNG: ○/RDY: Follows [P650]./ZRDY: ○ (in the built-in command mode)/BRK: —

Warning code	Details of the warning	
FL.923	Error name	Reverse direction software over travel
	Contents	The current position (status display: C020) is beyond the position set in [P172].
	Operation at an error	The motor stops after the deceleration time set in [P635] and enters the servo lock status.
	Release method	Move the motor in the forward direction with jog operation to the operation range.
	Related display	—
	Related parameters	P172: Negative direction soft OT limit P410 -: SPDSEL0 to SPDSEL7 Overtravel spec selection P441 -: TRQSEL0 to TRQSEL7 Overtravel spec selection P467 -: PLSSEL0 to PLSSEL7 Overtravel spec selection P517 -: SEL0 to SEL7 Overtravel spec selection P635: Soft OT braking stoppage deceleration time, Soft OT condition holding time
	Output signal status	ALM: ●/WNG: ○/RDY: Follows [P650]./ZRDY: ○ (in the built-in command mode)/BRK: —

10-4 Verification when the protective function is activated

When an error occurs, check the error code displayed on the data display LED panel to determine the error.

Be sure to investigate the cause of the error, remove the cause, then release the alarm.

(1) Power element error (AL.100)

When this error occurred, excessive current may have flowed in the transistors in the device main circuit (power block). For this reason, if this error frequently occurs, the device may be damaged.

Be sure to remove the cause of the error, then restart the device.

Some devices may have a function which radiates heat generated by the above power element. This error also occurs due to an excessive heating error caused when an error occurs in the radiating function.

Possible causes of the error include:

- A short-circuit occurs in the motor power line.
- The overload status continued due to excess of the rated load or excess of permissible repetition frequency.
- The ambient temperature of the device rises.
- The radiator is clogged.
- The radiator cooling fan is faulty or its capacity is lowered.

Thus, when this error occurs, check the wiring, ambient temperature, ventilation around the device, fan operation, and others.

When an overheat error occurs, remove the cause of the error and wait for some cooling time (about 30 minutes) until the radiator temperature becomes low, then resume run.

(2) Main power supply shortage voltage error (AL.102)

When this error occurred, possible causes are a voltage drop due to insufficient power capacity and an instantaneous power failure (power failure for at least about 10ms).

After an instantaneous power failure occurs and the protective function is activated, if the power failure status continues, no control power is supplied and the protective circuit is reset. After that, when the power is recovered, various commands (including the speed command and pulse train command) are input. If the motor runs immediately after power recovery in a sequence, it is dangerous. Do not design such a sequence. Design an external sequence in which each signal is switched OFF and the execution of each command is stopped when the protective function is activated and an alarm occurs (is output).

The following table lists the DC voltage values of the main power supply in the device with which this error occurs.

Table 10-16 Values detected as a main power supply shortage voltage error

Input power supply specification	Voltage detected as an error
100VAC	90V or less
200VAC	180V or less

(3) Excessive voltage error (AL.103)

If an excessive voltage error occurs when the motor is stopping or decelerating, regenerative energy may be excessive due to too large load inertia. In this case, take the following measures:

- Add a regenerative resistor.
- Increase the deceleration time.
- Decrease the applicable operation speed.

This error may also be caused because the ground potential rises due to a ground fault in the motor or excessive leak current, and the DC voltage of the main power supply exceeds the specified value. Check the connection circuit and grounding for the device and motor, and the applicable power supply voltage.

The following table lists the DC voltage values of the main power supply in the device with which this error occurs.

Table 10-17 Values detected as an excessive voltage error

Input power supply specification	Voltage detected as an error
100VAC	200V or more
200VAC	400V or more

(4) Over speed error (AL.104)

When this error occurred, speed overshoot at the start of the motor may be excessive due to a condition including large load inertia. In this case, adjust the speed loop gain and position loop gain or increase the acceleration time.

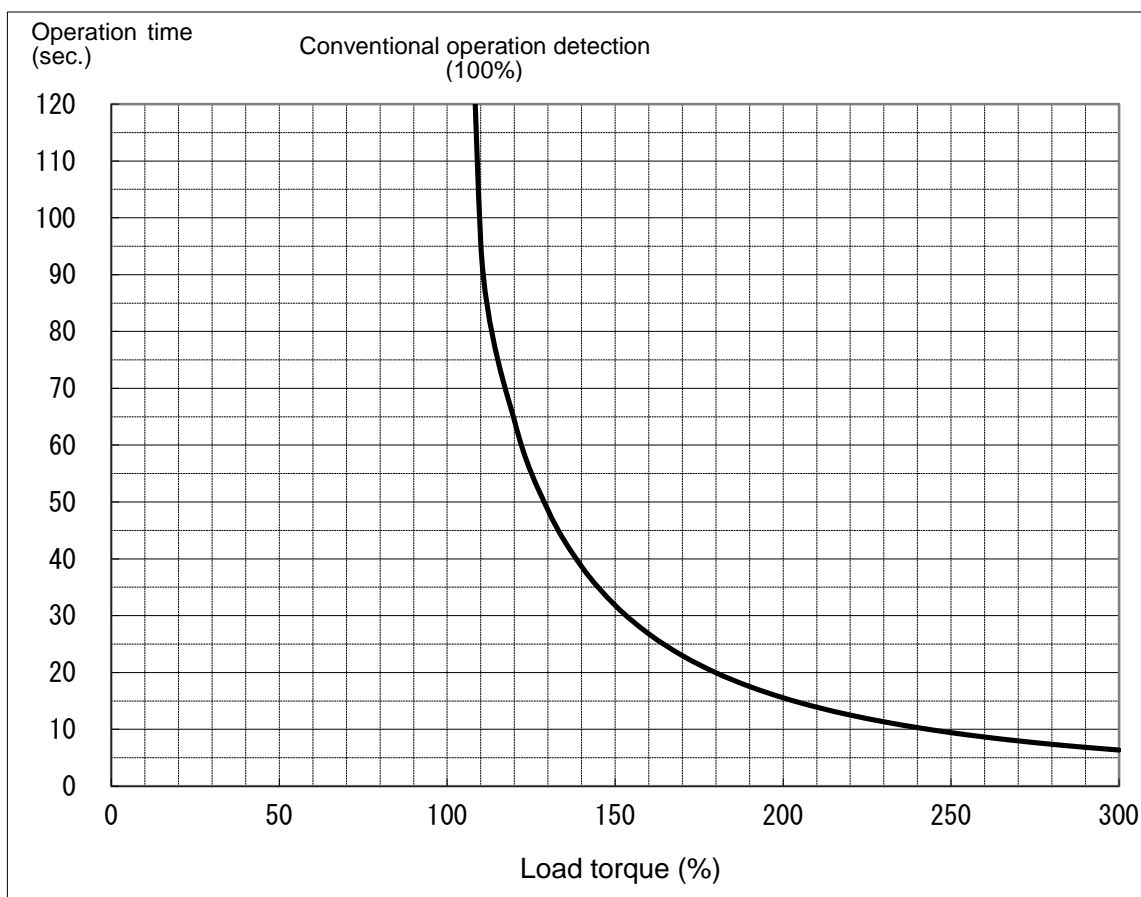
For how to adjust each gain, refer to "5-4 Adjustment".

(5) Motor overload error (AL.105)

When this error occurred, it is considered built-in electronic thermal was activated due to overload or excess of permissible repetition frequency. If alarm reset and operation are repeated in a short period of time, temperature in device power element and in motor goes up abnormally, which leads to breakage. Be sure to remove cause of error, allow the cooling time for about 30 minutes, and then resume run.

During normal operation, if the effective value detected by the motor electronic thermal reaches 110%^{*14} when the motor rated torque is assumed to be 100%, this error is detected.

To prevent a thermal failure due to current focused on one phase of the motor, however, when the motor operation range is smaller than 1.0rev^{*15} or the motor speed is smaller than 1rps^{*16}, if the effective value detected by the motor electronic thermal reaches 70%, this error is detected.^{*17}



^{*14} When a value other than 0 is set in [P083: 3rd - 1st digits], the values set in [P083: Motor electronic thermal detection actual value/Motor electronic thermal time constant] are used.

^{*15} When a value other than 0 is set in [P084: 3rd - 1st digits], the value set in [P084: Motor 1 phase concentration electronic thermal detection motion range] is used.

^{*16} When a value other than 0 is set in [P084: 3rd - 1st digits], the value set in [P084: Motor 1 phase concentration electronic thermal detection low speed range] is used.

^{*17} When a value other than 0 is set in [P084: 3rd - 1st digits], the value set in [P084: Motor 1 phase concentration electronic thermal detection ratio] is used.

(6) Driver overload error (AL.106)

The power element of the device may be overloaded.

A possible cause of the error is that a current of 180% or higher of the rated current value of the device flows for at least the specified time when the motor runs at low speed.

Repeating an alarm reset and operation in a short time may cause the device power element and motor temperatures to rise abnormally, resulting in damage. After removing the cause of the error, be sure to wait for the cooling time (about 30 minutes) and resume run.

(7) Maximum speed command invalid (AL.210/AL.211)

It is considered that the maximum speed calculated by the relevant parameter settings is out of the range of 100 to 300M [setting unit: sec].

Change the parameter settings so that the calculated value falls within the range.

(8) Magnetic pole signal error (AL.301/AL.302)

The magnetic pole sensor signal cannot be read normally. Possible causes of the error include:

- Magnetic pole decision was not completed normally because the operation speed is too fast.
- The magnetic pole sensor is faulty.
- Noise is added on the signal.
- The encoder cable is not connected or is broken, or the connector is loose.

Check the operation speed and encoder cable.

When the magnetic pole sensor itself is faulty, a magnetic sensor error may not be detected.

In this case, an error including an overload error occurs while the motor is running.

(9) Automatic magnetic pole detection error (AL.303)

Adjust the values in [P380] to [P387] parameters so that automatic magnetic pole detection is completed normally. For the adjustment method, refer to "5-5 Automatic magnetic pole detection operation".

(10) Encoder error (AL.304)

When this error occurred, no connection or disconnection of encoder cable, unplugging of connector, noise on encoder signal, or setting error in parameters can be suspected.

If encoder itself goes into malfunction, encoder error may not be detected.

In this case, overload error occurs in the time of motor run.

(11) Serial encoder/IPU communication error (AL.312/AL.313)

Disconnection in communication line with serial encoder and IPU, unplugging of connector, and noises can be suspected.

Check wiring environment.

If this error occurs when ABS position compensation data, user data, or IPU parameters are transmitted, another possible cause is a failure in the IPU. In this case, contact our sales representative.

(12) Encoder position detection signal error (AL.315)

If this error occurs when the motor stops, the encoder may be faulty. Contact our sales representative.

When the encoder is mounted additionally, the sensor may be mounted incorrectly. Check the mounting status.

Chapter 11 Setting and display

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11-1 Operation of the operation panel

11-1-1 Function of each part of the operation panel

Use the operation panel to display the motor or device status, edit parameters, and execute self-diagnosis.

(1) Configuration of the operation panel

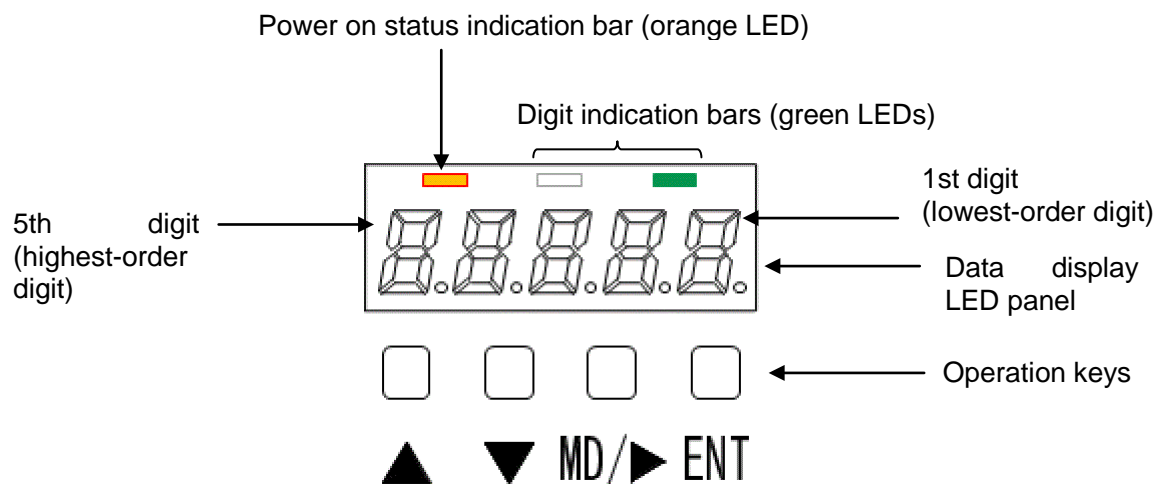


Figure 11-1 Configuration of the operation panel

(2) Data display LED panel

The data display LED panel displays an item and its corresponding data for each operation mode. On the data display LED panel, the numbers and characters listed below are displayed.

Table 11-1 Numbers and characters displayed on the data display LED panel

Data display LED	Number	Data display LED	Character	Data display LED	Character
0	0	A	A	n	n(N)
1	1	b	b(B)	o	o(O)
2	2	C	C	P	P
3	3	d	d(D)	q	q(Q)
4	4	E	E	r	r(R)
5	5	F	F	t	t(T)
6	6	H	H	U	U
7	7	h	h	u	u
8	8	J	J	-	-(negative sign) *1
9	9	L	L		

*1: When a negative value consisting of up to four digits is displayed, - (negative sign) is displayed in the 5th digit.

At this time, the decimal point at the 5th digit also lights.

When a negative value consisting of five or more digits is displayed, the decimal point at the 5th digit lights instead of - (negative sign).

A character or characters displayed in the one or two high-order digits of the data display LED panel indicate an item as listed below.

Table 11-2 Displayed characters and corresponding items

Displayed character(s)	Corresponding item	Example
E	Status display item	$\text{E}001$
A^*	Alarm history item	$\text{A}0.003$
AL^*	Code of an alarm being issued	$\text{AL}003$
F^*	Warning history item	$\text{F}0.903$
FL^*	Code of a warning being issued	$\text{FL}903$
L	Device information display item	$\text{L}001$
P	Parameter edit item	$\text{P}002$
PP	Auto-Tuning level adjustment item	$\text{PP}00$
d	Self-diagnosis execution item	$\text{d}004$
dd	Execution item of self-diagnosis for the manufacturer	$\text{dd}04$
H	Self-diagnosis edit item	$\text{H}000$
HH	Edit item of self-diagnosis for the manufacturer	$\text{HH}00$
EH	Indirect data edit item	$\text{EH}00$
Ad	Command address	$\text{A}d000$
Ed	Command edit item	$\text{E}d00$
E	Device parameter edit item	$\text{E}000$
Er	Input error	$\text{E}r001$
hALt	Device system error	hALt

*: Error or warning history number






















Each decimal point on the data display LED panel has a special meaning. The following table lists its meaning.

Table 11-3 Decimal points on the data display LED panel

Decimal point at	Meaning
5th digit	Sign indication Off: + data On: - (negative) data
4th digit	Delimiter between the character and number of an alarm or warning item
3rd digit	Always off. On only at power-on.
2nd digit	Always off. On only at power-on.
1st digit	Always off. On only at power-on.

The indication bars at the top of the operation panel have the following meaning.

Table 11-4 Indication bars

Name	Meaning						
Power on status indication bar	Leftmost indication bar on the panel. Always on in  (orange) when the power is on.						
Digit indication bar	Center and rightmost indication bars on the panel. Their meanings are listed below. <table border="1"> <tr> <td> </td><td>The 1st to 5th digits or an item is displayed.</td></tr> <tr> <td> </td><td>The 6th to 10th digits are displayed.</td></tr> <tr> <td> </td><td>The data mode selection digit is displayed in the command edit mode. For details, refer to "11-5 Command edit mode".</td></tr> </table> <p>: On in green, : Off</p>	 	The 1st to 5th digits or an item is displayed.	 	The 6th to 10th digits are displayed.	 	The data mode selection digit is displayed in the command edit mode. For details, refer to "11-5 Command edit mode".
 	The 1st to 5th digits or an item is displayed.						
 	The 6th to 10th digits are displayed.						
 	The data mode selection digit is displayed in the command edit mode. For details, refer to "11-5 Command edit mode".						

(3) Operation keys

Use the operation keys to select a display item in each operation mode and edit parameters and other data.

The following table lists the function of each operation key.

Table 11-5 Operation key function list

Key	Status	Description
▲	Item display	Selects the next item.
	Data setting	Increments the blinking numeric value at the cursor by 1.
	Real time data setting	Increments the entire display data by 1.
	Data display	Changes the displayed data from the 5th to 1st digits to the 10th to 6th digits, data mode selection digit, and the 5th to 1st digits.
▼	Item display	Selects the previous item.
	Data setting	Decrements the blinking numeric value at the cursor by 1.
	Real time data setting	Decrements the entire display data by 1.
	Data display	Changes the displayed data from the 5th to 1st digits to the data mode selection digit, 10th to 6th digits, and the 5th to 1st digits.
MD/▶ *1	Item display	Moves to the next main operation mode. Returns to the command address item display status in the command setting data item display status.
	Data setting	Selects a digit to which to set data.
	Real time data setting	Disabled.
	Data display	Moves to the data setting status.
MD/▶ when pressed for 1.5 s *1	Item display	Moves to the next main operation mode. * Automatically restarts the device in the self-diagnosis mode.
	Data setting	Disabled.
	Real time data setting	
	Data display	
ENT	Item display	Moves to the data display status of the current item. Functions in the same way as ▲ in the alarm history display mode.
	Data setting	Cancels data changes and moves to the data display status.
	Real time data setting	
	Data display	Changes the displayed data from the 5th to 1st digits to the selected item, data mode selection digit, 10th to 6th digits, and the 5th to 1st digits.
ENT when pressed for 1.5 s	Item display	Disabled.
	Data setting	Registers the display data (data changes) and moves to the data display status.
	Real time data setting	
	Data display	Moves to the real time data setting status. Real time data setting is available only for servo adjustment parameters and auto-tuning level adjustment data, however.
▲, ▼ when pressed simulta- neously	Item display	Disabled.
	Data setting	Cancels data changes and moves to the data display status.
	Real time data setting	
	Data display	Disabled.
▲, ▼ when pressed simulta- neously for 1.5 s	Item display	Clears all alarm history in the alarm display mode.
	Data setting	Disabled.
	Real time data setting	
	Data display	Clears the display data in the status display mode to 0. Data is cleared only when it can be cleared, however.
▲, ENT when pressed simulta- neously for 1.5 s	Item display	Moves to the self-diagnosis mode in the status display 0 mode.
	Data setting	Disabled.
	Real time data setting	
	Data display	

*1: In this manual, the MD/▶ key is represented with ▶.

11-1-2 Operation mode configuration and transition

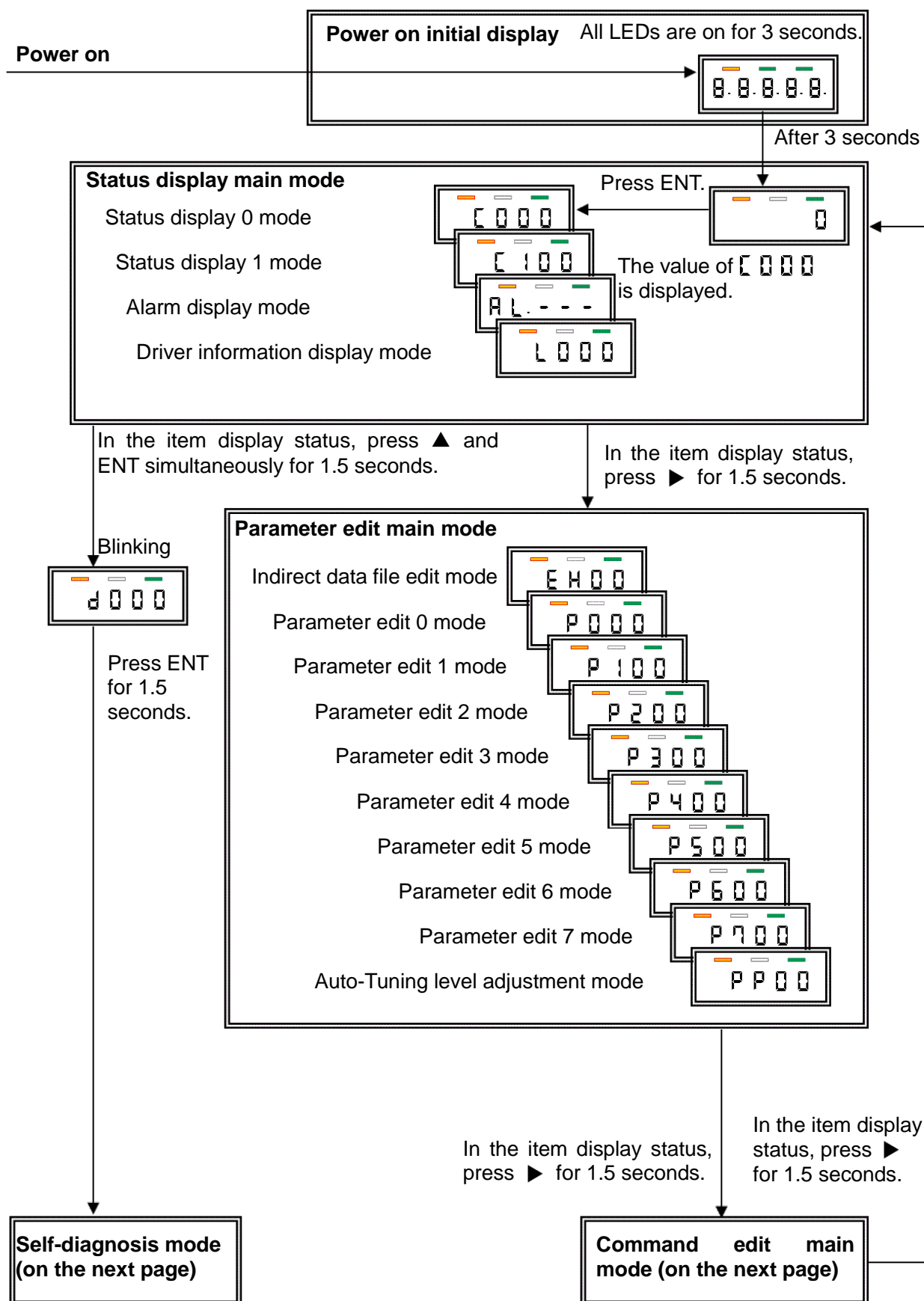


Figure 11-2 Operation mode configuration and transition (1/2)

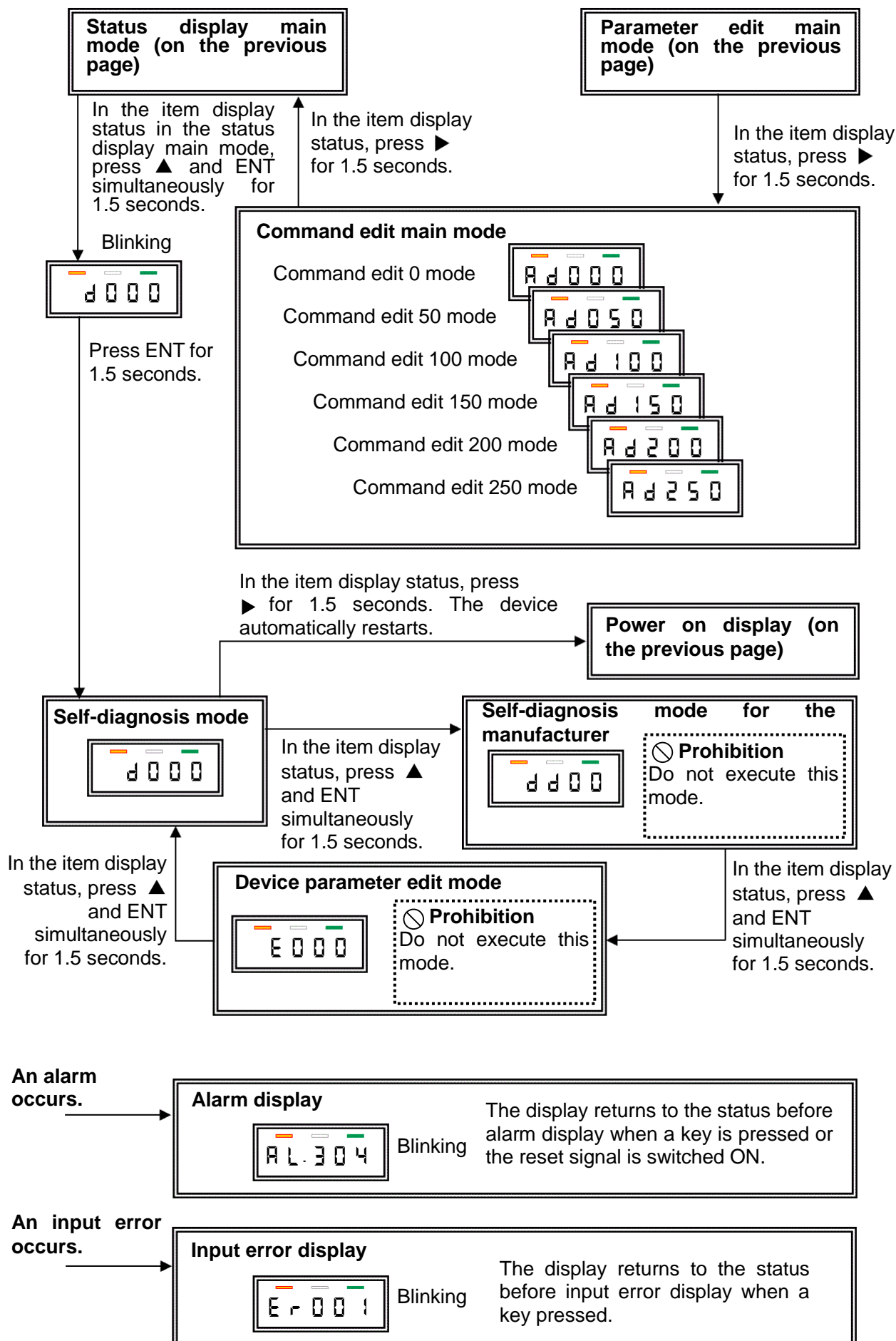


Figure 11-3 Operation mode configuration and transition (2/2)

The following table lists operations available in each operation mode.

Table 11-6 Operation mode list

Operation mode	Operation	Description
Status display	Item selection	Selects the code of a display item including the operation speed, actual torque, and software version.
	Data display	Displays data corresponding the selected display item code.
	Alarm display	Displays the code of an alarm which occurs.
	Warning display	Displays the code of a warning which occurs.
Parameter edit	Item selection	Selects the code of a parameter item to be edited.
	Data editing	Sets data for the selected edit item code.
Self-diagnosis	Item selection	Selects an item code for self-diagnosis. Self-diagnosis: Self-diagnosis for checking device errors Self-diagnosis dedicated to the manufacturer: Do not execute this mode. Device parameter mode: Do not execute this mode.
	Data display/editing	Displays or edits data corresponding to the selected diagnosis item code.
Command edit	Address selection	Selects the address of a command to be edited.
	Command item selection	Selects a command item to be edited.
	Command/data editing	Edits the command code and setting data.

The following input errors may occur.

Table 11-7 Input error list

Error display	Description	Remarks
E r 0 0 1	The set value is below the setting range.	
E r 0 0 2	The set value exceeds the setting range.	
E r 0 0 3	Auto-tuning level adjustment was made when there was no measurement data by auto-tuning.	Execute auto-tuning or set the following parameters, and make auto-tuning level adjustment. Parameters: P231, P261, P291, P321

Under the status display main mode, there are the following modes.

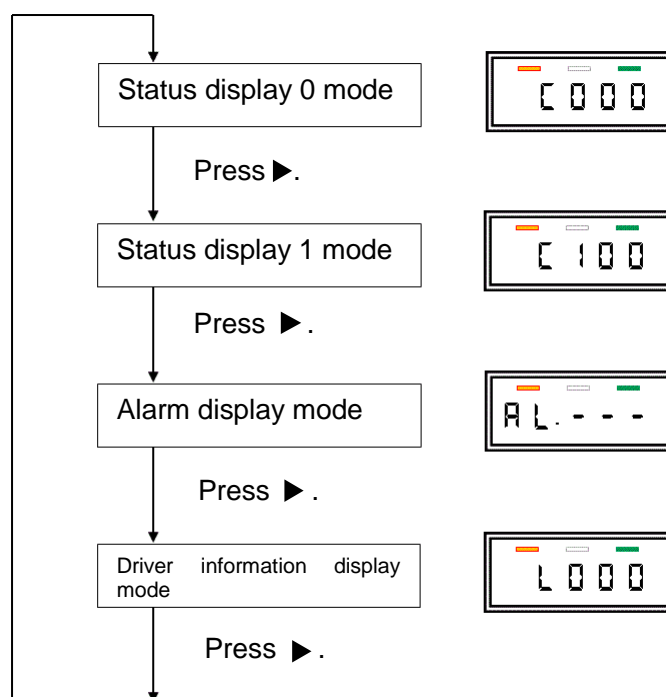









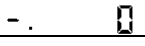
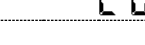
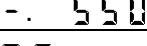
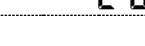


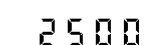

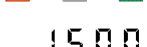
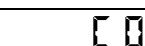

Figure 11-4 Status display main mode configuration and transition

Table 11-8 List of display modes in the status display main mode

Display mode	Description
Status display 0 mode	Displays servo-related status data. Examples) Motor operation speed, generated torque, and encoder pulse status
Status display 1 mode	Displays data other than servo-related status data. Examples) Input/output signal status and communication indicator
Alarm display mode	Displays information including an alarm which occurs, alarm history, a warning which occurs, and warning history.
Driver information display mode	Displays driver information including the output capacity and driver version.

11-2-1 Status display 0 mode display items

Table 11-9 Status display 0 mode display contents (1/3)

Display item		Setting unit	Setting range	Clear ^{*1}
10th to 6th digit data string	5th to 1st digit data string	Display contents		
		Same as for the item selected in P600	Same as for the item selected in P600	
		Displays a user desired status display item. When C001 or a subsequent status display number is specified in [P600], the value of the specified item is displayed in C000. The value of this item is displayed immediately after the termination of power on initial display (all LEDs are on). You can specify a frequently used item to check the status more smoothly. In the initial status, the value of C001 is displayed. The example indicates -234.		
		P161 setting unit/sec	-300000000 - 300000000	
		Displays the actual motor operation speed. The example indicates -1347.		
		P161 setting unit/sec	-300000000 - 300000000	
		Displays the maximum operable speed. The example indicates -1234.		
		P161 setting unit/sec	-300000000 - 300000000	
		Displays the analog speed command value. The example indicates -1234.		
		rpm	-99999 - 99999	
No display 		Displays the actual motor rotation speed. The example indicates -550rpm.		
		0.1%	-799.9 - 799.9	
No display 		Displays the actual torque command value. When the motor rated torque is set, 100% is displayed. The example indicates 200.0%.		
		0.1%	-799.9 - 799.9	Enabled
No display 		Displays the peak torque command value. When the motor rated torque is set, 100% is displayed. The example indicates 250.0%.		
		0.1%	-799.9 - 799.9	
No display 		Displays the analog torque command value. When the motor rated torque is set, 100% is displayed. The example indicates 150.0%.		
		0.1%	0.0 - 300.0	
No display 		Displays the motor load ratio (effective value). When the motor rated load is applied, 100% is displayed. The example indicates 50.0%.		

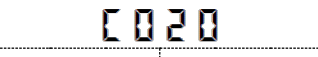

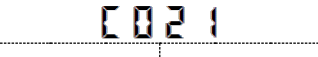
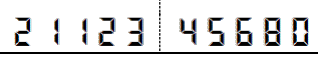

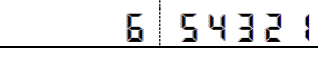

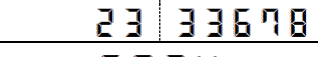

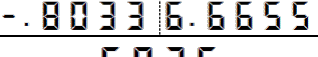



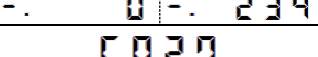

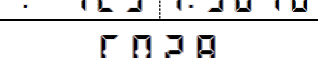

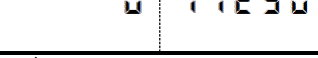
^{*1}: When "Enabled" is indicated in the Clear field for data, pressing ▲ and ▼ simultaneously for 1.5 seconds in the data display status clears the display data to 0.

Table 11-10 Status display 0 mode display contents (2/3)

Display item		Setting unit	Setting range	Clear* ¹
10th to 6th digit data string	5th to 1st digit data string	Display contents		
		0.1%	0.00 - 799.9	
No display		Displays the current torque limit value +. When the motor rated torque is set, 100% is displayed. The example indicates 100.0%.		
		0.1%	0.00 - 799.9	
No display		Displays the current torque limit value -. When the motor rated torque is set, 100% is displayed. The example indicates 50.0%.		
		P161 setting unit/sec	0 - 300000000	
		Displays the current speed limit value. The example indicates 15000000.		
		0.1%	0.0 - 100.0	
No display		Displays the motor thermal trip rate. When the display data indicates 100.0 (100%), a "motor overload error" is detected. The example indicates 45.0%.		
		0.1%	0.0 - 100.0	
No display		Displays the device thermal trip rate. When the display data indicates 100.0 (100%), a "driver overload error" is detected. The example indicates 40.0%.		
		V	0 - 999	
No display		Displays the DC voltage value of the main power supply. The example indicates 280V.		
		0.1%	0.0 - 300.0	Enabled
No display		Displays the peak servo control error detection rate. When the display data indicates 100.0 (100%), a "servo control error" is detected. This error detection rate can be adjusted using "P120: Servo control abnormality detection dead band torque". The error detection rate is cleared to 0 when: <ul style="list-style-type: none"> • The RST signal is switched ON after a servo control error occurs. • The setting of P120 is changed. The example indicates 30.0%.		
		0.1%	0.0 - 100.0	
No display		Displays the regenerative resistor overload rate. When the display data indicates 100.0 (100%), "regenerative resistor overload error" is detected. The example indicates 30.0%.		

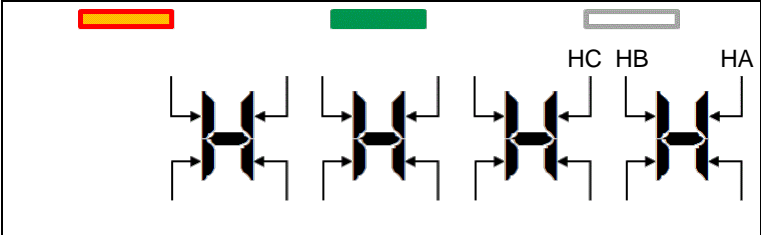
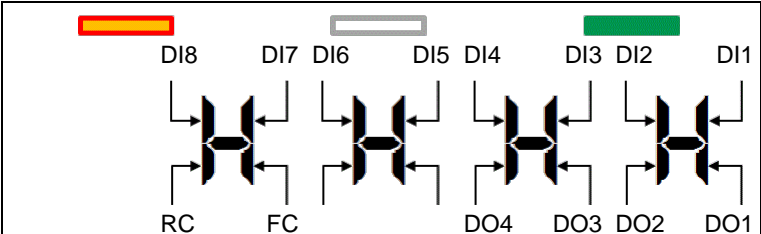
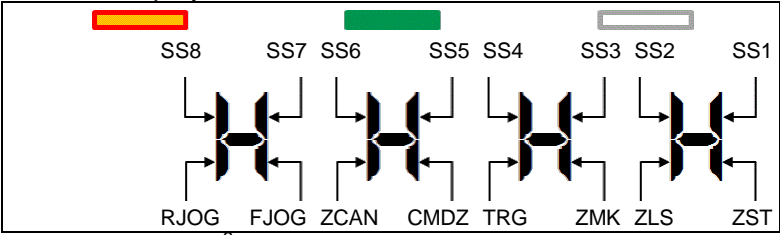
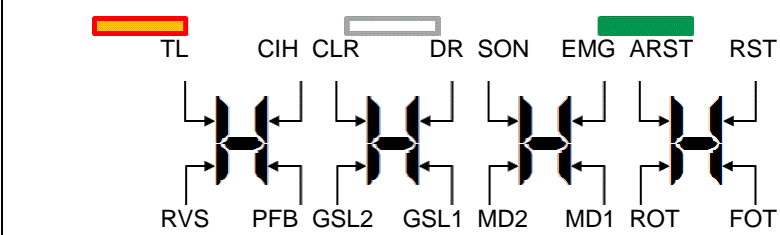
*1: When "Enabled" is indicated in the Clear field for data, pressing ▲ and ▼ simultaneously for 1.5 seconds in the data display status clears the display data to 0.

Table 11-11 Status display 0 mode display contents (3/3)

Display item		Setting unit	Setting range	Clear ^{*1}
10th to 6th digit data string	5th to 1st digit data string	Display contents		
		P161 setting unit	-2147483648 - 2147483647	
		Displays the current position (command position). The example indicates position 2112345678.		
		P161 setting unit	-2147483648 - 2147483647	
		Displays the current position (feedback position). The example indicates position 2112345680.		
		P161 setting unit	-2147483648 - 2147483647	
		Displays the incremental position. The example indicates position 654321.		
		Encoder pulse	-2147483648 - 2147483647	Enabled
		Displays the accumulated number of encoder pulses. The example indicates 2333678 pulses.		
		Encoder pulse	-2147483648 - 2147483647	
		Displays the encoder position. The example indicates -803366655 pulses.		
		Encoder pulse	-2147483648 - 2147483647	
		Displays the encoder 1-rotation position. The example indicates 113652 pulses.		
		Encoder pulse	-2147483648 - 2147483647	
		Displays the position deviation pulses. The example indicates -234 pulses.		
		Pulse	-2147483648 - 2147483647	Enabled
		Displays the accumulated number of pulses in the pulse train command. The example indicates -12345678 pulses.		
		pps	-30000000 - 30000000	
		Displays the input frequency in the pulse train command. In the least significant digit, 0 is always displayed. The example indicates 11230pps.		

^{*1}: When "Enabled" is indicated in the Clear field for data, pressing ▲ and ▼ simultaneously for 1.5 seconds in the data display status clears the display data to 0.

Table 11-12 Status display 1 mode display contents (1/3)

Display item		Setting unit	Setting range	Clear ^{*1}
10th to 6th digit data string	5th to 1st digit data string	Display contents		
C 100		None	None	
Refer to the description in Display contents.	Refer to the description in Display contents.	<p>Displays the external input/output control signal status. Description: When a signal is ON, the corresponding LED shown below is on.</p> <p>Upper-order display ^{*3}</p>  <p>Lower-order display ^{*3}</p>  <p>In the above figure, the LEDs for which no signal is assigned are always off. The center horizontal LEDs in the 1st to 4th digits are always on.</p>		
C 101		None	None	
Refer to the description in Display contents.	Refer to the description in Display contents.	<p>Displays internal input/output control signal status 1. Description: When a signal is ON, the corresponding LED shown below is on.</p> <p>Upper-order display ^{*3}</p>  <p>Lower-order display ^{*3}</p>  <p>In the above figure, the LEDs for which no signal is assigned are always off. The center horizontal LEDs in the 1st to 4th digits are always on.</p>		

^{*1}: When "Enabled" is indicated in the Clear field for data, pressing ▲ and ▼ simultaneously for 1.5 seconds in the data display status clears the display data to 0.

^{*2}: The signal status display is refreshed at intervals of about 100msec. When a signal is switched ON or OFF at a high speed faster than 100msec, the displayed status is incorrect.

^{*3}: The LED for which no signal name is assigned is "reserved".

Table 11-13 Status display 1 mode display contents (2/3)

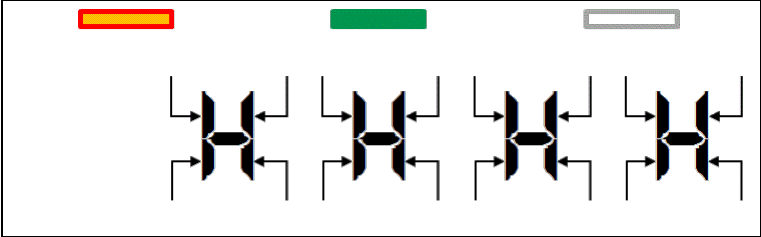
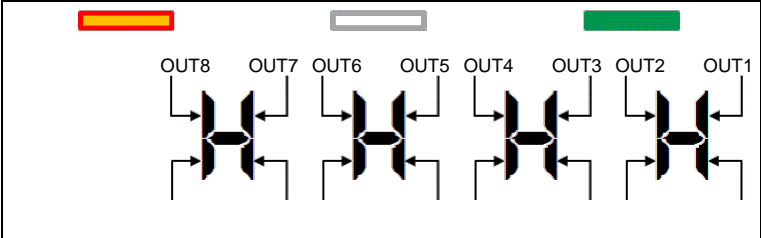
Display item		Setting unit	Setting range	Clear ^{*1}
10th to 6th digit data string	5th to 1st digit data string	Display contents		
[102]		None	None	
Refer to the description in Display contents.	Refer to the description in Display contents.	<p>Displays internal input/output control signal status 2.</p> <p>Description: When a signal is ON, the corresponding LED shown below is on.</p> <p>Upper-order display ^{*3}</p> <p>Lower-order display ^{*3}</p> <p>In the above figure, the LEDs for which no signal is assigned are always off.</p> <p>The center horizontal LEDs in the 1st to 4th digits are always on.</p>		
[103]		None	None	
Refer to the description in Display contents.	Refer to the description in Display contents.	<p>Displays internal output control signal status 1.</p> <p>Description: When a signal is ON, the corresponding LED shown below is on.</p> <p>Upper-order display ^{*3}</p> <p>Lower-order display ^{*3}</p> <p>In the above figure, the LEDs for which no signal is assigned are always off.</p> <p>The center horizontal LEDs in the 1st to 4th digits are always on.</p>		

^{*1}: When "Enabled" is indicated in the Clear field for data, pressing ▲ and ▼ simultaneously for 1.5 seconds in the data display status clears the display data to 0.

^{*2}: The signal status display is refreshed at intervals of about 100msec. When a signal is switched ON or OFF at a high speed faster than 100msec, the displayed status is incorrect.

^{*3}: The LED for which no signal name is assigned is "reserved".

Table 11-14 Status display 1 mode display contents (3/3)







Display item		Setting unit	Setting range	Clear ^{*1}
10th to 6th digit data string	5th to 1st digit data string	Display contents		
[104]		None	None	
Refer to the description in Display contents.	Refer to the description in Display contents.	<p>Displays internal output control signal status 2.</p> <p>Description: When a signal is ON, the corresponding LED shown below is on.</p> <p>Upper-order display ^{*3}</p>  <p>Lower-order display ^{*3}</p>  <p>In the above figure, the LEDs for which no signal is assigned are always off.</p> <p>The center horizontal LEDs in the 1st to 4th digits are always on.</p>		
[105]		None	None	
No display	18 18	<p>Displays the communication indicator.</p> <p>The values displayed in each digit are described below.</p> <p>1st digit (rightmost): 8 → Reception in progress, 1 → No reception</p> <p>2nd digit: 1 (fixed)</p> <p>3rd digit: 8 → Transmission in progress, 1 → No transmission</p> <p>4th digit: 1 (fixed)</p> <p>5th digit: Always off</p> <p>The example indicates "reception in progress, transmission in progress".</p>		

^{*1}: When "Enabled" is indicated in the Clear field for data, pressing ▲ and ▼ simultaneously for 1.5 seconds in the data display status clears the display data to 0.

^{*2}: The signal status display is refreshed at intervals of about 100msec. When a signal is switched ON or OFF at a high speed faster than 100msec, the displayed status is incorrect.

^{*3}: The LED for which no signal name is assigned is "reserved".

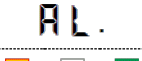
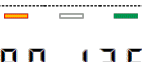
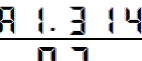
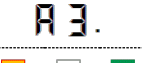
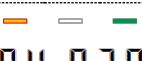
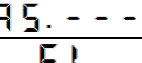
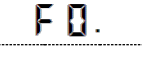
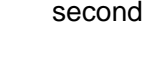

Table 11-15 Status display 1 mode display contents (3/3)

Display item		Setting unit	Setting range	Clear* ¹
10th to 6th digit data string	5th to 1st digit data string	Display contents		
		None	0 - 7	
No display		Displays the current SEL number. For each run mode, the following SEL name is assigned. SPDSEL : Speed command TRQSEL : Torque command PLSSEL : Pulse train command SEL : Built-in command The example indicates SEL number 2.		
		None	0 - 3	
No display		Displays the current gain number. The example indicates gain number 0.		
		None	0 - 255	
No display		Displays the address of the command being executed or the address of the command which has been executed. "0" is displayed from power-on until the execution of the first command. The example indicates address 128.		

11-2-3 Alarm display mode display items

In the alarm display mode, an item and its corresponding data are displayed at a time.

Table 11-16 Alarm display mode display contents

Display item	Setting unit	Setting range	Clear ^{*1}
Display code	Display contents		
 AL.	None	AL.000 - AL.899	
AL.005	Displays the present alarm. The example indicates alarm code 005.		
 AO.	None	A0.000 - A0.899	Enabled
AO.125	Displays the latest alarm. The example indicates alarm code 125.		
 A1.	None	A1.000 - A1.899	Enabled
A1.314	Displays the latest alarm but one. The example indicates alarm code 314.		
 A2.	None	A2.000 - A2.899	Enabled
A2.045	Displays the latest alarm but two. The example indicates alarm code 045.		
 A3.	None	A3.000 - A3.899	Enabled
A3.233	Displays the latest alarm but three. The example indicates alarm code 233.		
 A4.	None	A4.000 - A4.899	Enabled
A4.020	Displays the latest alarm but four. The example indicates alarm code 020.		
 A5.	None	A5.000 - A5.899	Enabled
A5. - - -	Displays the latest alarm but five. The example indicates no alarm.		
 FL.	None	FL.000 - FL.999	
FL. - - -	Displays the present warning. The example indicates no warning.		
 F0.	None	F0.000 - F0.999	Enabled
FL.914	Displays the latest warning. The example indicates warning 914.		

^{*1}: When "Enabled" is indicated in the Clear field for data, pressing ▲ and ▼ simultaneously for 1.5 seconds in the data display status clears all alarm and warning histories to " - - -".













11-2-4 Driver information display mode display items

Table 11-17 Driver information display mode display contents

Display item		Setting unit	Setting range	Clear ^{*1}
10th to 6th digit data string	5th to 1st digit data string	Display contents		
L 000		None	0 - 9999	
No display	200	Displays the model number. The example indicates model number 200.		
L 001		W	50 - 99999	
No display	400	Displays the driver output capacity. The example indicates 400W.		
L 002		V	100 - 400	
No display	200	Displays the driver input power supply voltage. The example indicates 200V.		
L 003		None	0 - 9999	
No display	1	Displays the hardware version. The example indicates hardware version 1.		
L 004		None	0 - 9999	
No display	145	Displays the software version. The example indicates software version 145.		
L 005		None	0 - 9999	
No display	0	Displays the special software code. The example indicates special software code 0.		
L 006		None	-2147483648 - 2147483647	
2112	45678	Displays the upper digits of the equipment manufacture serial number. The example indicates the upper digits of the equipment manufacture serial number 211245678.		
L 007		None	-2147483648 - 2147483647	
45678	21612	Displays the lower digits of the equipment manufacture serial number. The example indicates the lower digits of the equipment manufacture serial number 567821612.		

*1: When "Enabled" is indicated in the Clear field for data, pressing ▲ and ▼ simultaneously for 1.5 seconds in the data display status clears the display data to 0.

Table 11-18 Driver information display mode display contents

Display item		Setting unit	Setting range	Clear ^{*1}
10th to 6th digit data string	5th to 1st digit data string	Display contents		
L010		None	0 - 9999	
No display	   4503	Displays the driver system software number. The example indicates driver system software number 4503.		
L012		None	0 - 9999	
No display	   123	Displays the special hardware code. The example indicates special hardware code 123.		
L013		None	0 - 9999	
No display	   13	Displays the driver revision number. The example indicates driver revision number 13.		
No display				
L021		None	0: Invalid 1: Valid	
No display	   1	Displays data indicating whether ABS position compensation data is valid or invalid. The example indicates that ABS position compensation data is valid.		

^{*1}: When "Enabled" is indicated in the Clear field for data, pressing ▲ and ▼ simultaneously for 1.5 seconds in the data display status clears the display data to 0.

11-3 Parameter edit mode

Under the parameter edit main mode, there are the following modes.

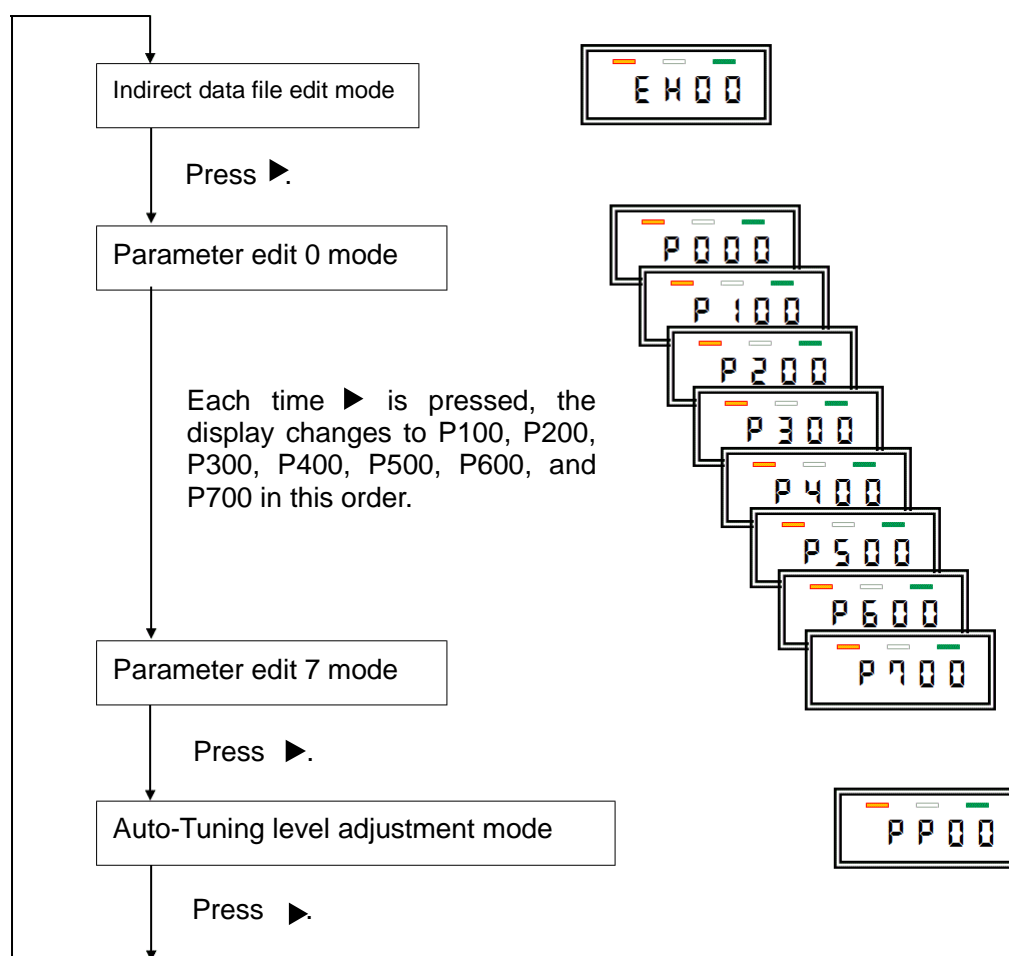


Figure 11-5 Parameter edit main mode configuration and transition

Table 11-19 List of display modes in the parameter edit main mode

Display mode	Description
Indirect data file edit mode	Displays and sets indirect data to be used in the command edit mode. For how indirect data is handled, refer to "Chapter 7 Indirect data".
Parameter edit 0 - 7 mode	Displays and sets parameter values. The parameter edit 0 to 7 mode corresponds to parameter group 0 to 7. For details of parameter groups and parameter items, refer to "Chapter 6 Parameters".
Auto-Tuning level adjustment mode	Adjusts the servo response level based on the load measured by auto-tuning while setting the speed loop proportional gain, speed loop integral time constant, and position loop gain in appropriate proportion. For details and items of auto-tuning level adjustment, refer to "5-4 Adjustment".

11-3-1 Parameter setting

(1) Displaying parameter data consisting of up to 5 digits

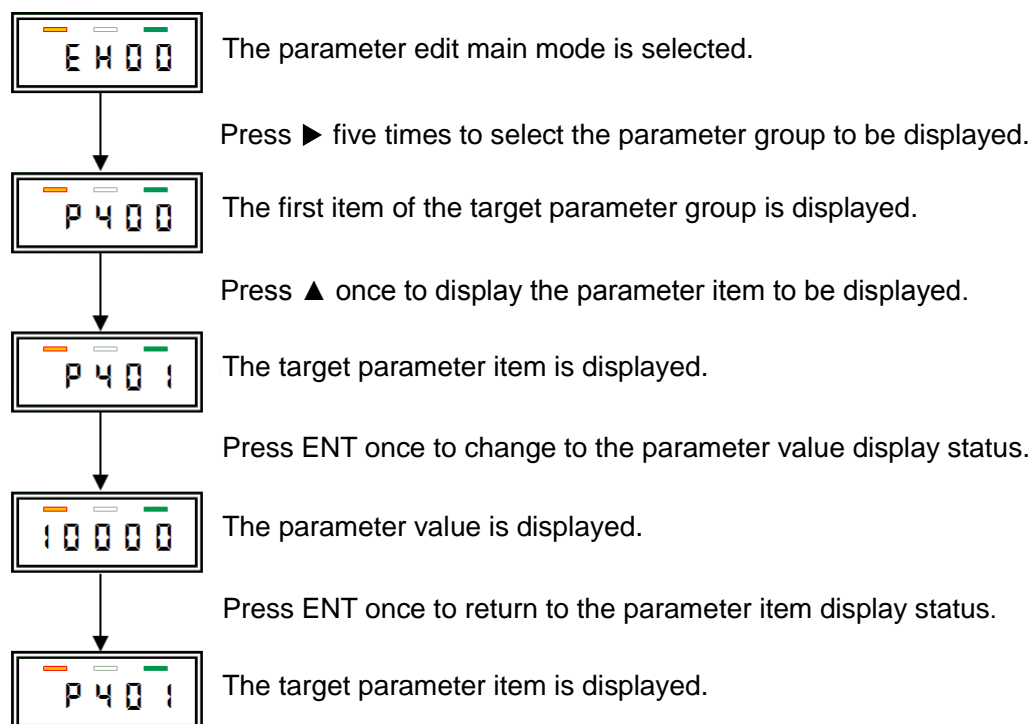


Figure 11-6 Example of displaying P401 data

(2) Editing parameter data consisting of up to 5 digits

(The underlined digit in the display blinks.)

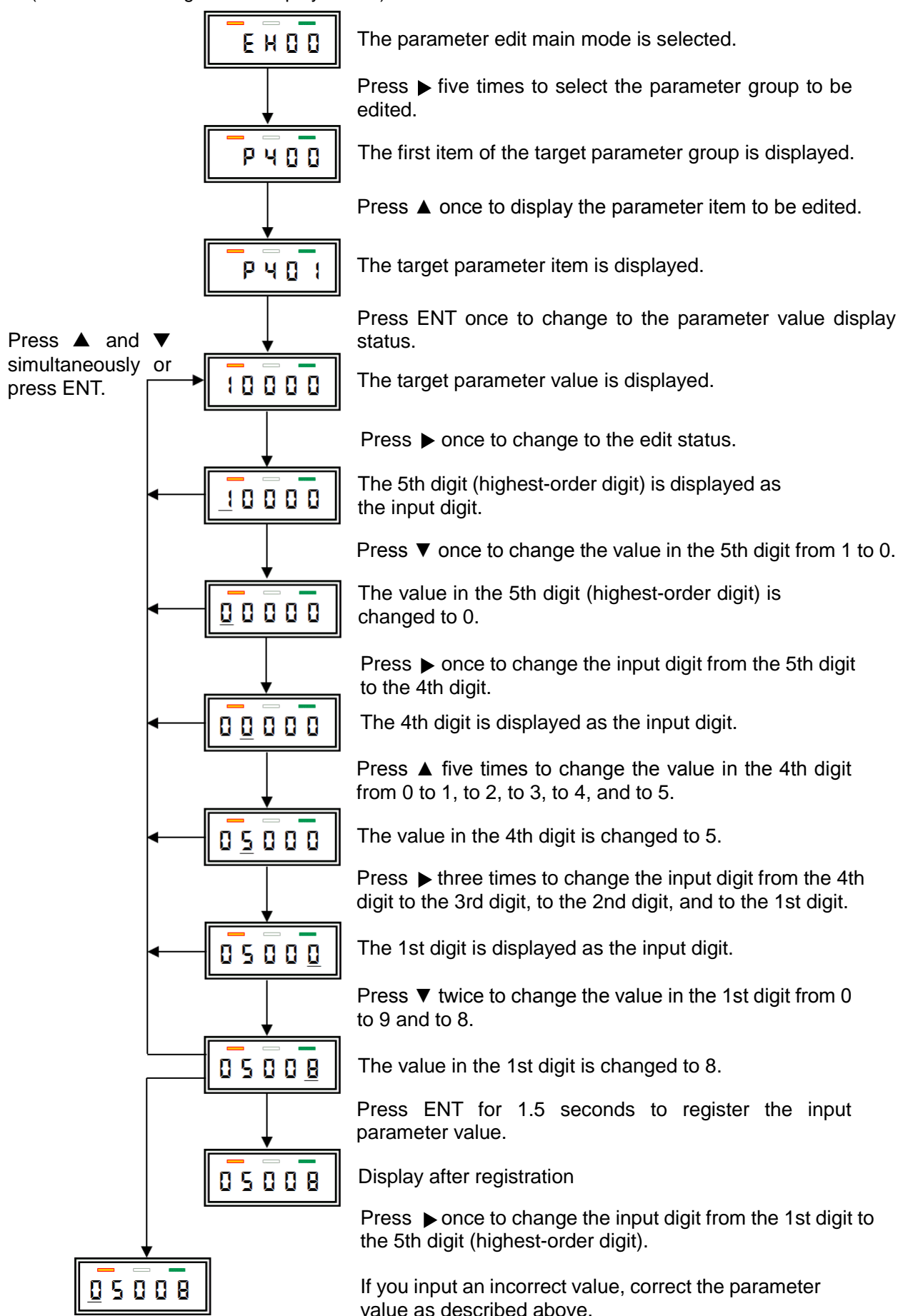


Figure 11-7 Example of changing the P401 parameter value (up to 5 digits) from 10000 to 5008

(3) Editing parameter data consisting of 6 to 10 digits
(The underlined digit in the display blinks.)

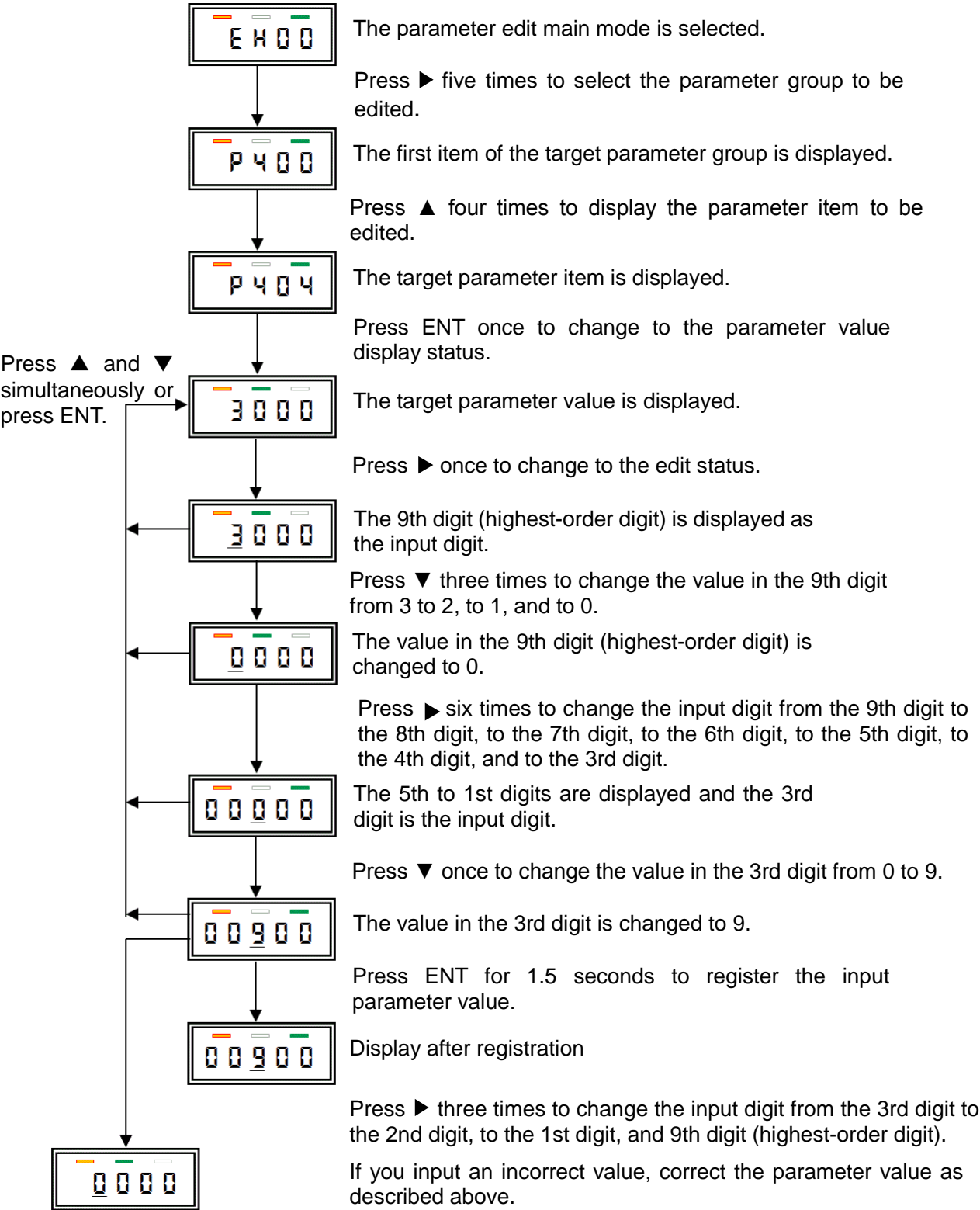


Figure 11-8 Example of changing the P404 parameter value (up to 9 digits) from 300000000 to 900

(4) Editing parameter data in real time

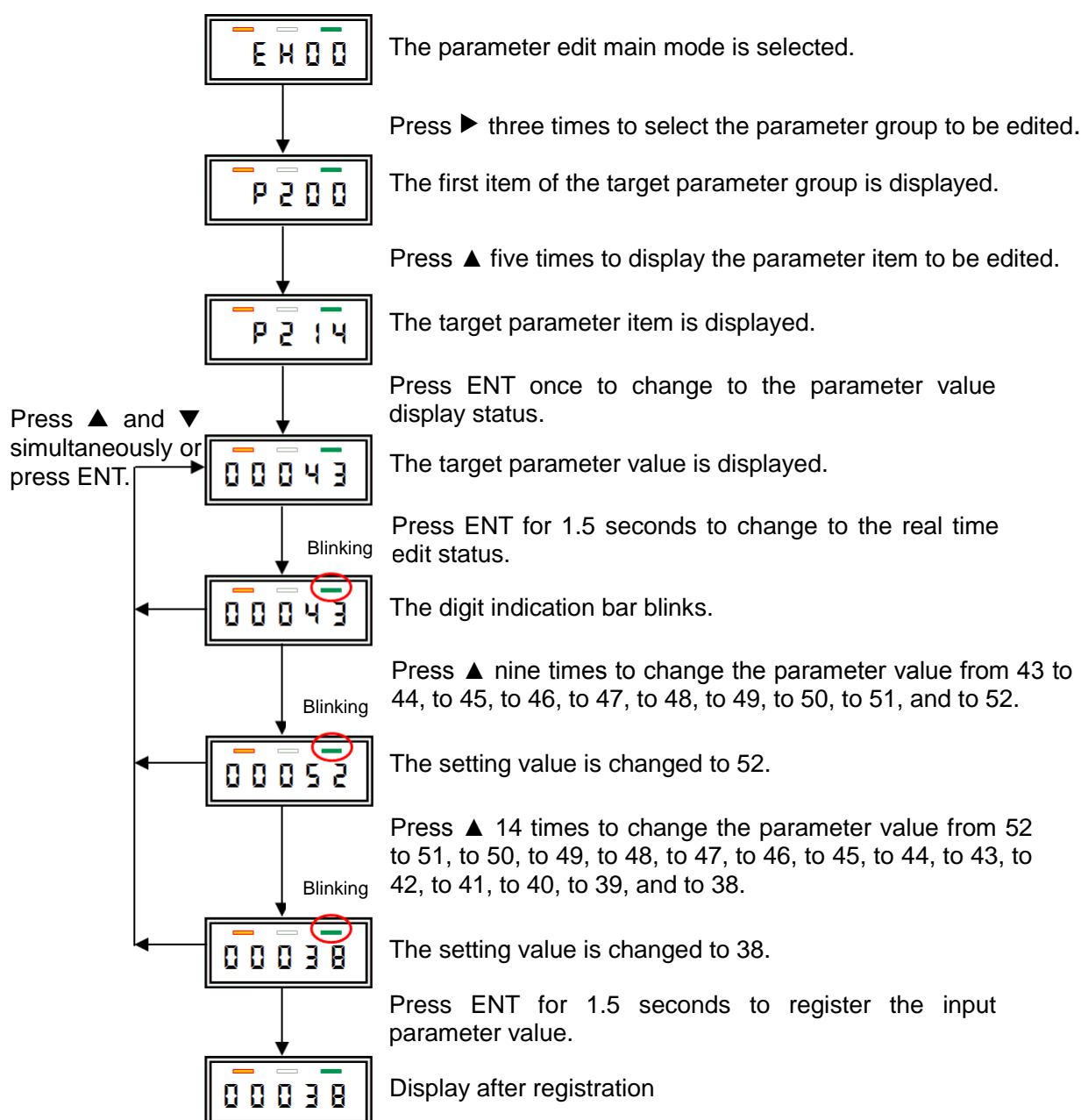


Figure 11-9 Example of changing P214 parameter value (up to 5 digits) from 00043 to 00052 and to 00038

11-4 Self-diagnosis mode

For details of the self-diagnosis mode, refer to "Chapter 9 Self-diagnosis mode".

11-5 Command edit mode

11-5-1 Command edit mode

Under the command edit main mode, there are the following modes.

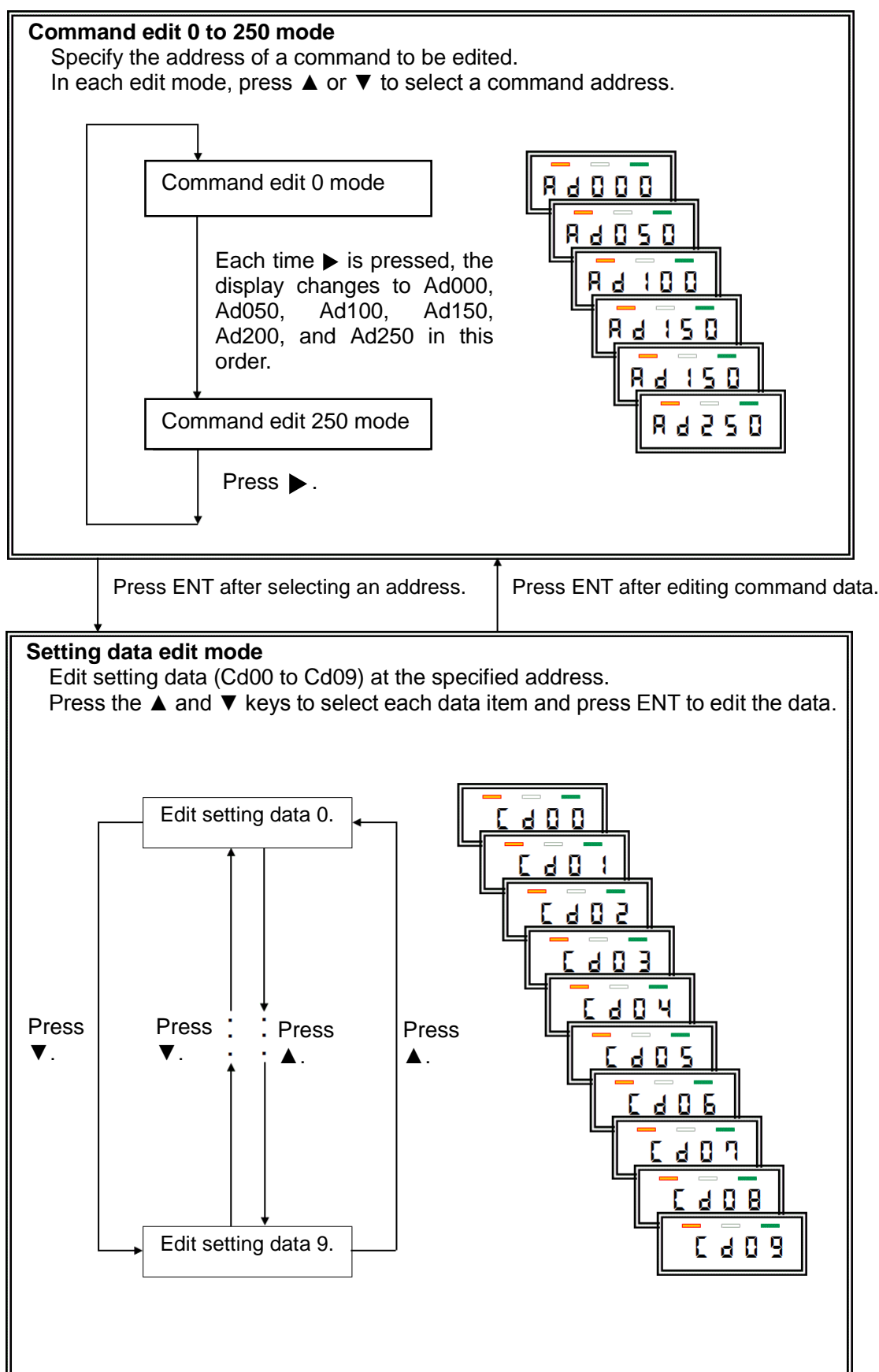


Figure 11-10 Command edit main mode configuration and transition

Setting and display
 11-5-2 Command editing
 (1) Editing a command

Set the following index positioning command at Ad.154.

Table 11-20 Sample command to be edited

Setting data number	Cd00	Cd02	Cd04	Cd05	Cd06	Cd08	Cd09
Setting data name	COM	UPDN	OUT Valid/invalid	POS (0.01pulse)	F (0.01pps)	OUT	DIR
Data to be set	INDX	SEL.0 (Initial value)	Invalid (Initial value)	10000.50	IX50 reference	0 (Initial value)	SHORT (Initial value)
Data to be displayed	3	0	0	00001000050	1000000050	0000	0

* For details of each command and setting data specification, refer to "Chapter 8 Commands".

Set values other than the initial values (Cd00, Cd05, and Cd06) in the above table.

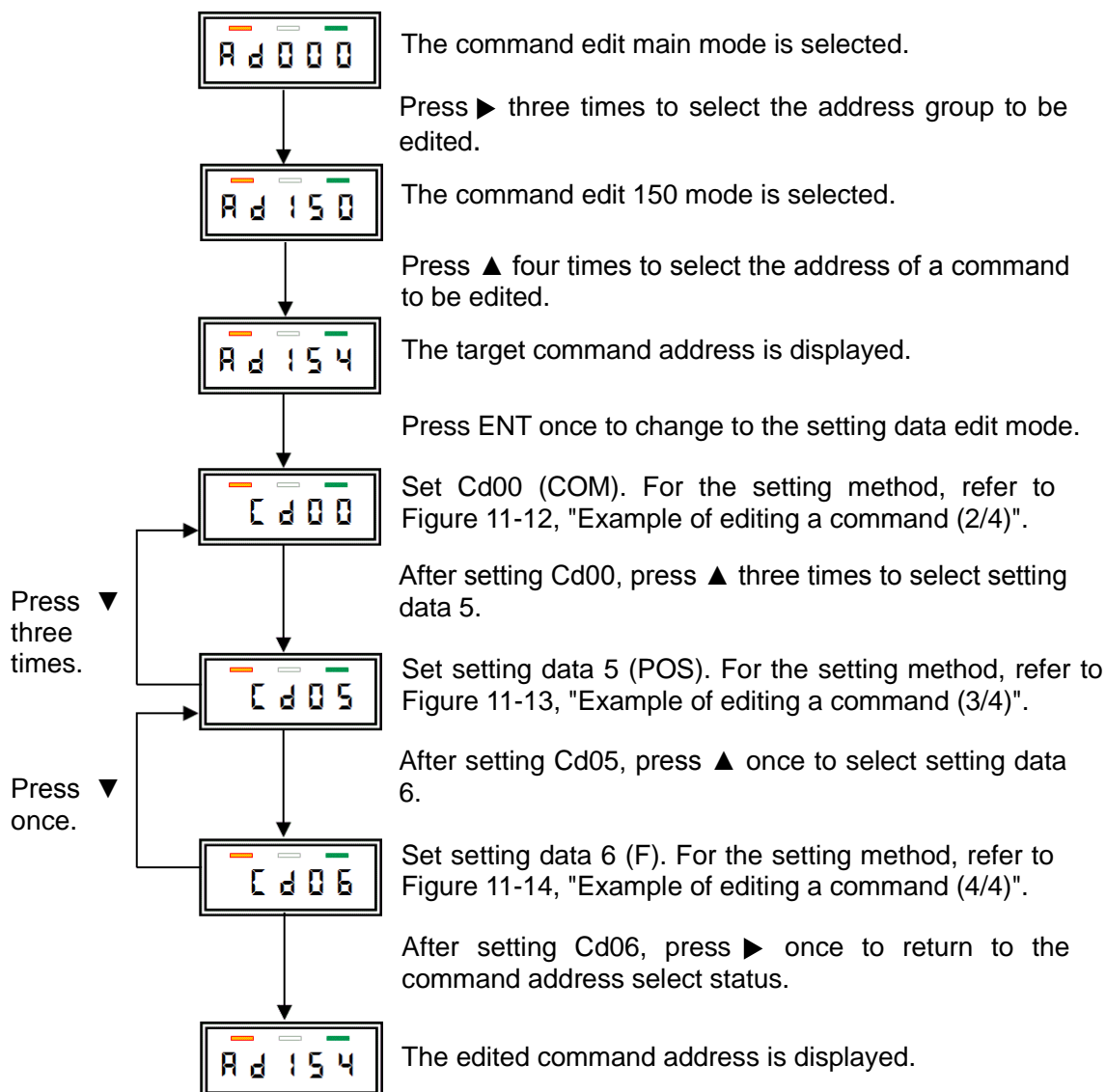


Figure 11-11 Example of editing a command (1/4)

Set Cd00 (COM) = 3 (INDX).

(The underlined digit in the display blinks.)

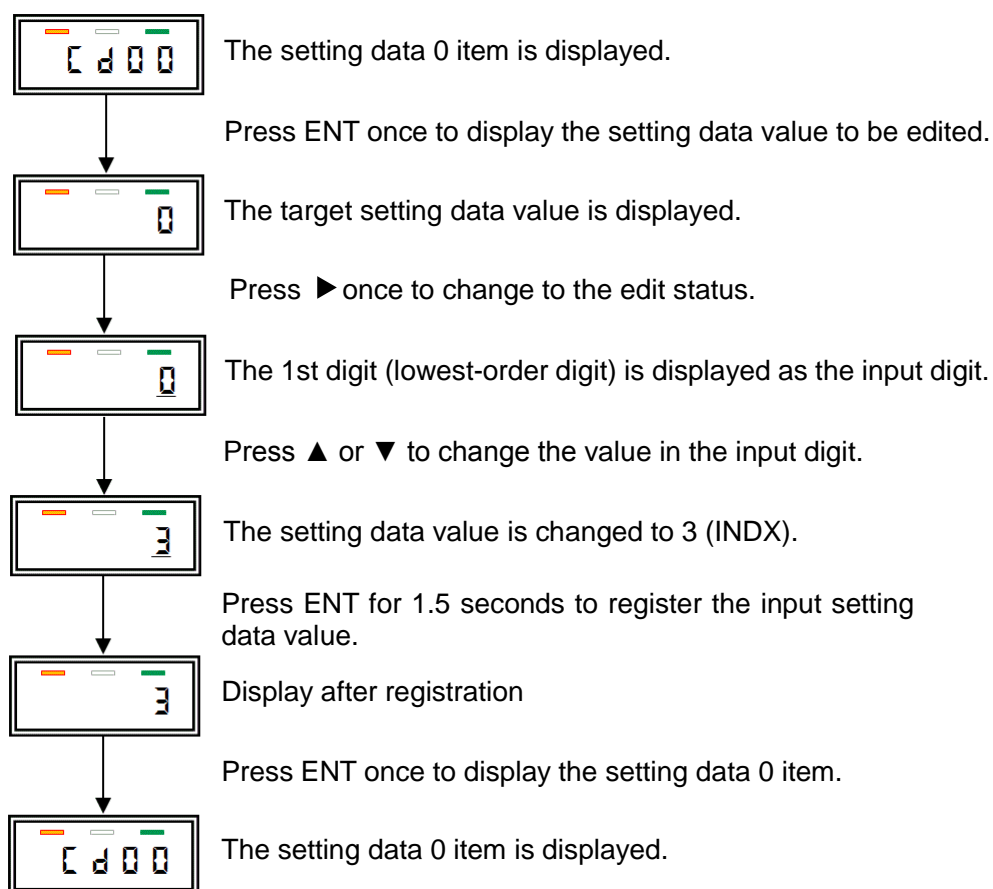


Figure 11-12 Example of editing a command (2/4)

Set Cd05 (POS) = 00001000050 (10,000.50).

(The underlined digit in the display blinks.)

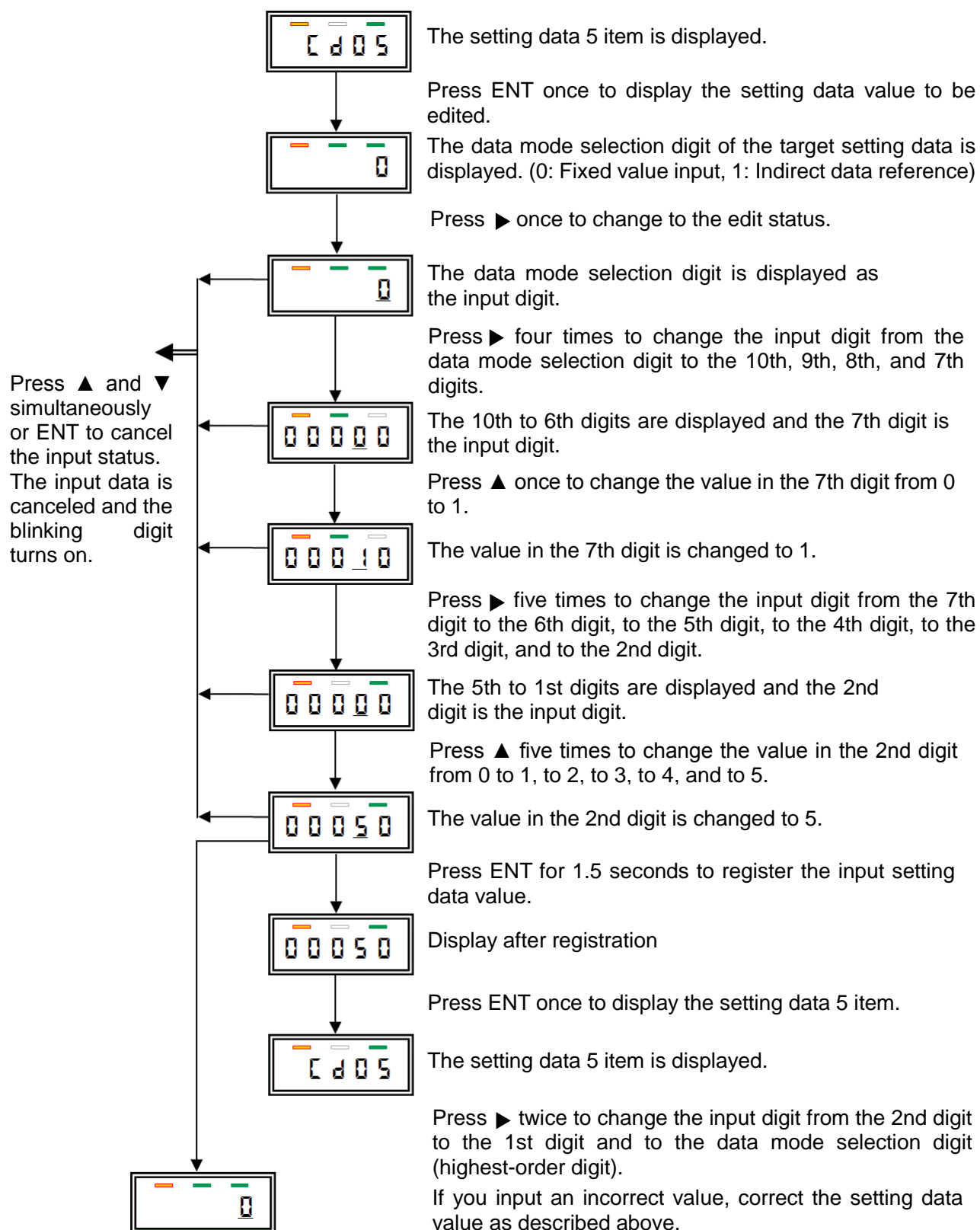


Figure 11-13 Example of editing a command (3/4)

Set Cd06 (F) = 10000000050 (IX50 reference).

(The underlined digit in the display blinks.)

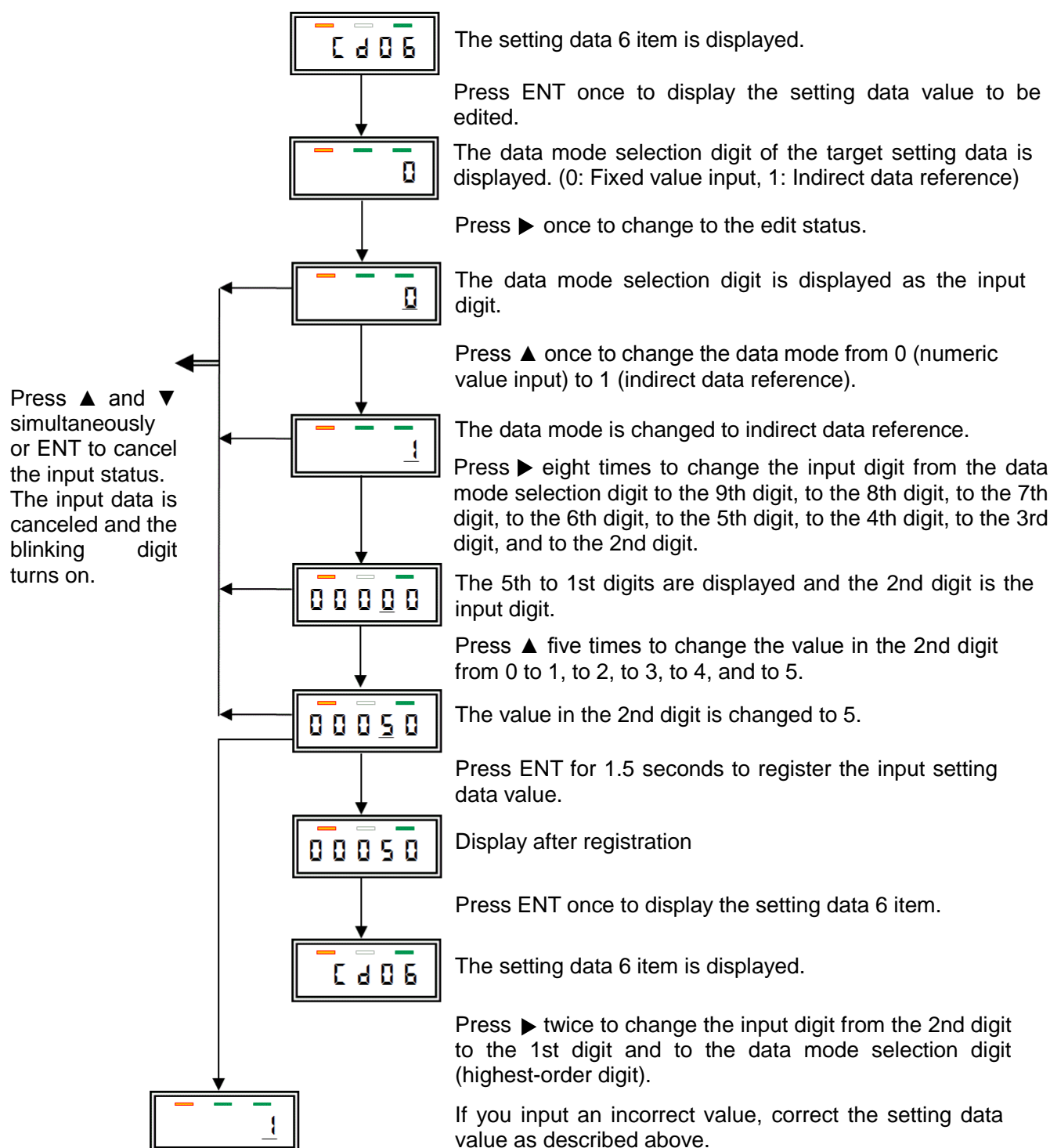


Figure 11-14 Example of editing a command (4/4)

Chapter 12 Data

12-1	Specifications.....	12-2
12-1-1	Model.....	12-2
12-1-2	General specifications.....	12-3
12-1-3	Functional specifications.....	12-4
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12-1 Specifications

12-1-1 Model

Model of VPH series is as follows.

Table 12-1 Model display

NCR – ① ② ③ ④ ⑤ – ⑥ – ⑦ ⑧ ⑨ – ⑩

Number	Item	Display	Description
		NCR	Nikki AC servo controller series
①	Series name	H	VPH Series
②	Machine model type	A	I/O specification
③	Input power specification	1	100VAC system
		2	200VAC system
④	Output capacity	Example) 401	$40 \ 1 = 40 \times 10^1 = 400W$ └─ Exponent portion of exponentiation of 10 └─ Significant figures
⑤	Hardware specification	A	Standard specification
		B	Coating specification
⑥	Software type	A	τ DISC
		B	τ LINER
		C	Servo compass
⑦	Analog option	0	Not provided
		1	Provided
⑧	Absolute position compensation	0	Not provided
		1	Absolute position compensation data incorporation
⑨	Reserved	0	Fixed
⑩	Special specification	None	Standard specification
		S***	Special specification

12-1-2 General specifications

Table 12-2 General specifications

Item		Description
Ambient condition (when used)	Temperature	0 - 55°C (no freezing allowed)
	Humidity	90%RH or less (no condensation allowed)
	Sea level	1000m or less
	Atmosphere	Avoid any harmful atmosphere including corrosive gas, grinding oil, metal dust, and oil. Indoor place not exposed to direct sunlight
Vibration resistance		Acceleration 5.9m/s ² (10 - 55 Hz) No resonance

Table 12-3 Functional specifications (1/2)

Item		Description
Number of control shafts		1 shaft
Control method		Semiclosed loop with feedback
Feedback signal		Serial method Maximum of 250M resolution/sec 90 deg phase difference method Maximum of the frequency of 4-multiplication of 25Mpps
Applicable motor		τ DISC
Run modes		Speed command, torque command, pulse train command, and built-in command run modes
Speed command	Analog command* ¹	1. Input voltage range: -12 - +12V Any voltage at the maximum speed can be set.
	Internal speed command	7. Selected by the control signal (speed in the setting unit specified)
	Acceleration/deceleration	A value between 0 - 99.999sec can be specified for each of acceleration and deceleration.
Torque command	Analog command* ¹	1. Input voltage range: -12 - +12V Any voltage at a torque of 300% (when the rated torque is assumed to be 100%) can be set.
	Internal torque command	7. Selected by the control signal (Setting unit: 0.1%)
	Torque increase/decrease time	0 - 9.999sec
Pulse command	Command style	Line driver method: Up to 6.25Mpps (1-multiplication) 90 deg phase difference pulse (1-, 2-, or 4-multiplication), directional pulse (1- or 2-multiplication) or directional signal + feed pulse (1- or 2-multiplication) can be selected
	Pulse command compensation	8. A/B (A, B: 1 - 99999999)
	S-curve acceleration/deceleration	8 (0 - 1.000sec)
Built-in command	Setting unit	deg, mm, inch, μ m, pulse, kpulse
	Jog	8 speeds
	Command	256 commands Three types POS (positioning): ABS/INC INDX (index positioning): Short cut/unidirectional HOME (zero return): STD, LS LESS, OT HOME, SET ABS, OUT POS
	Acceleration/deceleration	8 types (individually selected for acceleration and deceleration in a range between 0 - 99.999sec)
	S-curve acceleration/deceleration	8 types (0 - 1.000sec)
	Coordinate management	Infinite feed Absolute position management -2147483648 - +2147483647 Load axis 1-rotation position management (Examples: 0 - 359deg, -179 - +180deg)
Servo adjustment item	Gain change	4 gains (changed according to the GSL1 and GSL2 signals and operation conditions)
	Feed forward	Speed feed forward ratio, speed feed forward shift ratio Inertia torque feed forward ratio, viscous friction torque feed forward ratio
	Filter	Feedback filter, torque command filter, five torque command notch filters Speed feed forward filter, torque feed forward filter
	Auto-tuning	Position gain, speed loop gain/integral time constant setting

*¹ This is an optional function.

Table 12-4 Functional specifications (2/2)

Item	Description
Control input signal	<p>Eight external input signals. The following signals can be assigned to each signal: RST (reset), ARST (alarm reset), EMG (emergency stop), SON (servo on), DR (drive), CLR (deviation clear), CIH (command pulse input proportional control), TL (torque limit), FOT (forward direction over travel), ROT (reverse direction over travel), MD1 - MD2 (mode select 1 - 2), GSL1 - GSL2 (gain select 1 - 2), RVS (command direction inversion), SS1 - SS8 (command selection 1 - 8), ZST (positioning drive), ZLS (deceleration LS), ZMK (external zero point marker), TRG (external trigger), CMDZ (command zero), ZCAN (positioning cancel), FJOG (forward direction jog), RJOG (reverse direction jog) The ON/OFF status of the control input signal can be fixed. When assigned to an external input signal, signal logic change is possible.</p>
Control output signal	<p>Four external output signals. The following signals can be assigned to each signal: ALM (alarm), WNG (warning), RDY (servo ready), SZ (speed zero), PE1 - PE2 (position deviation range 1 - 2), PN1 - PN2 (positioning complete 1 - 2), PZ1 - PZ2 (positioning complete response), ZN (command complete), ZZ (command complete response), ZRDY (command drive ready), PRF (rough match), VCP (speed attainment), BRK (brake release), LIM (limit in-process), EMG0 (emergency stop), HCP (zero return complete), HLDZ (command zero in-process), OTO (over travel in-process), MTON (motor electrification in-process), OUT1 - OUT8 (common output), SMOD (speed command mode in-process), TMOD (torque command mode in-process), PMOD (pulse train command mode in-process), NMOD (built-in command mode in-process), OCEM (marker output) When assigned to an external output signal, signal logic change is possible (except OCEM).</p>
Error detection	<p>Encoder error, over speed error, motor overload error, device overload error, power supply shortage error, excessive voltage error, over current error, servo control error, cable disconnection error, magnetic pole error, deviation error, backup data error, CPU error, etc. Five alarms stored in the history</p>
Holding brake (BRK signal)	<p>BRK (brake release) signal OFF in the motor power off status With control for drop prevention of the vertical axis (Control for drop prevention is disabled when a power error occurs, however.)</p>
Dynamic brake	<p>External dynamic brake unit (Activated in the motor power off status)</p>
Pulse output	<ul style="list-style-type: none"> Line driver method: 90 deg phase difference pulse + marker The marker output signal can also be output as the control output signal. Can be set with a maximum width of 2ms. Dividing frequency output by hardware: Maximum output frequency of 25Mpps (4-multiplication) Control output by software: Maximum output frequency of 20.46Mpps (4-multiplication) Pulse output division: A/B (A, B:1 - 99999999) Current position data pulse output function (outputs as many pulses as indicating the current position.)
Torque limit command	<p>Torque limit set in 0.1% unit by the relevant parameter</p>
Compensation function	<p>Absolute position compensation, torque compensation</p>
Display	<p>CHARGE, front data display 5-digit LED panel</p>
Communication	<ul style="list-style-type: none"> USB2.0 (Full Speed): 1ch For connection between a PC (VPH DES) and device RS422: 1ch
VPH DES function	<ul style="list-style-type: none"> Parameter editing and parameter transmission and reception Self-diagnosis: Auto-tuning, test run, input/output signal check, etc. Oscilloscope display: Waveform monitor: 3ch, Control signal monitor: 1ch

Table 12-5 Performance

Item		Description
Speed control	Speed control range	1:5000 Analog speed command: 1:2000
	Speed variation	Load 0 - 100% load: $\pm 0.01\%$ or less (at rated speed)
		Voltage Rated voltage $\pm 10\%$: 0% (at rated speed)
		Temperature 0 - 40°C: $\pm 0.1\%$ or less (at rated speed) Analog speed command: $\pm 0.2\%$ or less
Torque control	Resolution	1:1000 (up to rated torque)
	Reproducibility	$\pm 1\%$ (up to rated torque)

12-1-5 Device electrical specification

(1) Electrical specification of the 100V, single-phase input device

Table 12-6 Electrical specification of the 100V, single-phase input device

Item		NCR- HA1051* _*.*.*	NCR- HA1101* _*.*.*	NCR- HA1201* _*.*.*				
Control power supply	Rated voltage [V] Frequency [Hz]	100 - 120AC 1 ϕ 50/60						
	Permissible voltage fluctuation [V]	85 - 132AC						
	Rated current [Arms]	0.24	0.24	0.24				
	Rated capacity [W]	24	24	24				
	Inrush current [A]* ²	10 [10ms]	10 [10ms]	10 [10ms]				
Main power supply	Rated voltage [V] Frequency [Hz]	100 - 120AC 1 ϕ 50/60						
	Permissible voltage fluctuation [V]	85 - 132VAC						
	Rated current [Arms]	1.5	3.0	6.0				
	Rated capacity [kVA]	0.15	0.3	0.6				
	Inrush current [A]* ²	25 [13ms]	25 [13ms]	25 [13ms]				
Rated output [W]		50	100	200				
Drive method		3-phase sine wave PWM						
Control method		Regenerative brake: External regenerative resistor						
Continuous output current [Arms]		1.1	2.0	3.5				
Instant output current [Arms]		3.3	6.0	9.9				
Carrier frequency [kHz]		Parameter selection Up to 10kHz						
Circuit breaker for wiring [A]		5	5	10				
Structure (IP code)		Air cooling, open (IP20)						
Mounting type		Panel mounting						
Shape		Type1						
Weight [kg]		About 1.0						
Accessory		One main power plug terminal One motor power plug terminal One control power plug terminal One open tool						
Option		Regenerative resistor, analog input, dynamic brake unit, etc.						

*² The value in brackets ([]) indicates the standard time until inrush current is eliminated.

(2) Electrical specification of the 200V, 3-phase input device

Table 12-7 Electrical specification of the 200V, 3-phase input device

Item		NCR- HA2101* _*_***	NCR- HA2201* _*_***	NCR- HA2401* _*_***	NCR- HA2801* _*_***			
Control power supply	Rated voltage [V]	200 - 230AC 1ϕ 50/60Hz						
	Frequency [Hz]							
	Permissible voltage fluctuation [V]	170 - 253AC						
	Rated current [Arms]	0.24	0.24	0.24	0.24			
	Rated capacity [W]	24	24	24	24			
	Inrush current [A]* ³	18 [3ms]	18 [3ms]	18 [3ms]	18 [3ms]			
Main power supply	Rated voltage [V]	200 - 230VAC 3ϕ 50/60Hz						
	Frequency [Hz]							
	Permissible voltage fluctuation [V]	170 - 253VAC						
	Rated current [Arms]	0.9	1.7	3.2	5.2			
	Rated capacity [kVA]	0.3	0.6	1.1	1.8			
	Inrush current [A]* ³	48 [5ms]	48 [5ms]	48 [5ms]	48 [9ms]			
Rated output [W]		100	200	400	800			
Drive method		3-phase sine wave PWM						
Control method		Regenerative brake: External regenerative resistor						
Continuous output current [Arms]		1.1	2.0	3.5	6.8			
Instant output current [Arms]		3.3	6.0	9.9	17.0			
Carrier frequency [kHz]		Parameter selection Up to 10kHz						
Circuit breaker for wiring [A]		5	5	5	10			
Structure (IP code)		Air cooling, open (IP20)			Forced cooling, open (IP20)			
Mounting type		Panel mounting						
Shape		Type1			Type2			
Weight [kg]		About 1.0			About 1.5			
Accessory		One main power plug terminal One motor power plug terminal One control power plug terminal One open tool						
Option		Regenerative resistor, analog input, dynamic brake unit, etc.						

*³ The value in brackets ([]) indicates the standard time until inrush current is eliminated.

12-2 Outline

12-2-1 Main unit outline drawing and names of parts

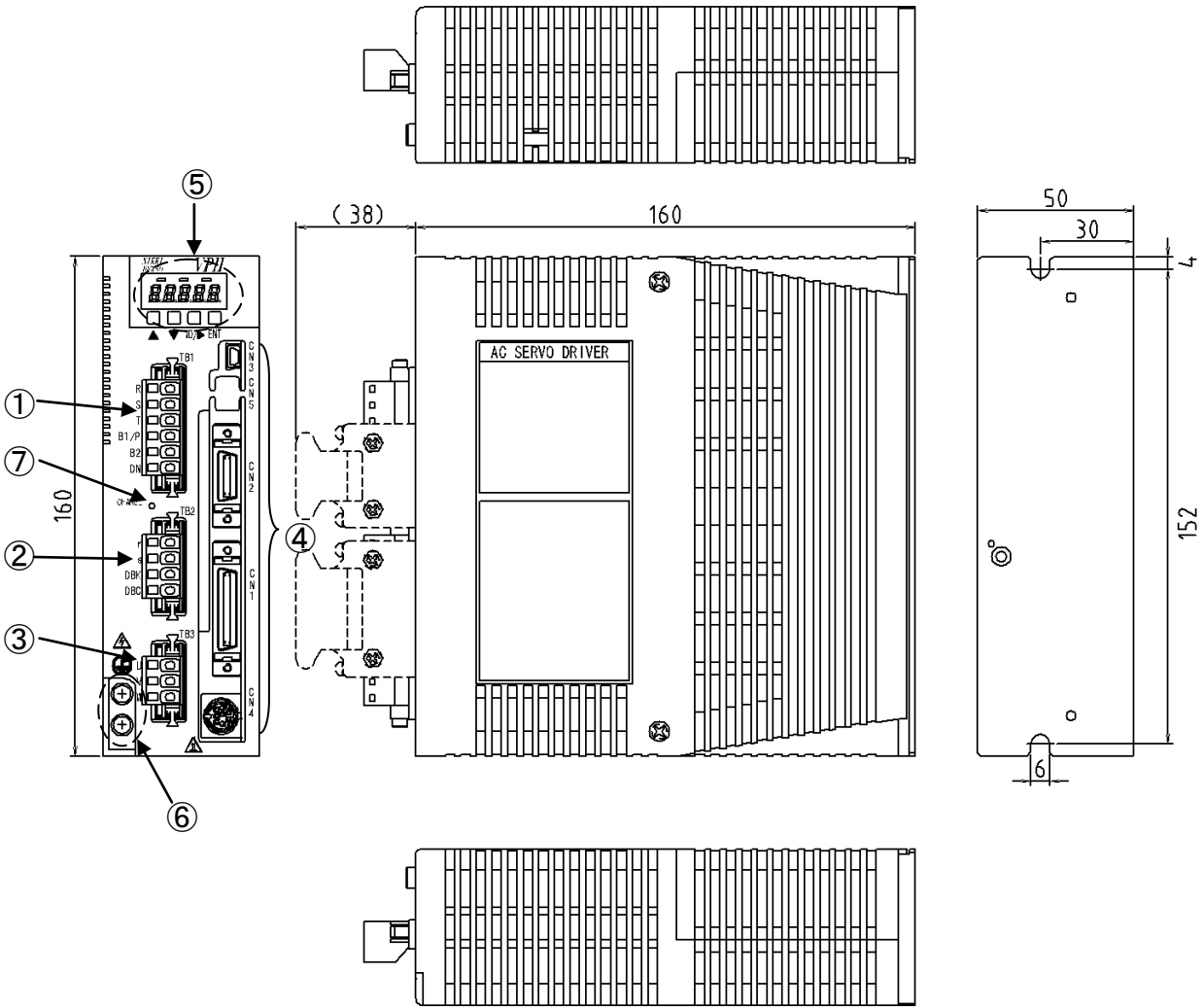


Figure 12-1 Outline drawing of the main unit of the device with up to 400W (Type 1)

Table 12-8 Name of each part

Number	Name	Function	
①	TB1	<ul style="list-style-type: none"> ▪ Main power supply terminals (R, S, T) ▪ Regenerative resistor connection terminals (B1/P, B2) ▪ Unused (DN) 	
②	TB2	<ul style="list-style-type: none"> ▪ Control power supply connection terminals (r, s) ▪ Dynamic brake connection terminals (DBK, DBC) 	
③	TB3	<ul style="list-style-type: none"> ▪ Motor connection terminals (U, V, W) 	
④	CN1	<ul style="list-style-type: none"> ▪ Control input/output signal connector 	
	CN2	<ul style="list-style-type: none"> ▪ Encoder connection connector Input the encoder feedback pulse signal from the encoder mounted on the motor. 	
	CN3	<ul style="list-style-type: none"> ▪ USB communication connector Used to connect a PC on which VPH DES is installed for USB communication. 	
	CN4	<ul style="list-style-type: none"> ▪ Serial communication connector Used to connect an external device for serial communication. 	
⑤	Operation panel	LED1 - LED5	▪ Data display LED panel (5 digits)
		SW	▪ Operation keys (UP, DOWN, MODE, ENTER)
⑥	E	<ul style="list-style-type: none"> ▪ Terminal for connecting power and motor grounding cables 	▪ Size M4
⑦	CHARGE LED	<ul style="list-style-type: none"> ▪ On when high voltage is charged in the main circuit capacitor in the device. 	

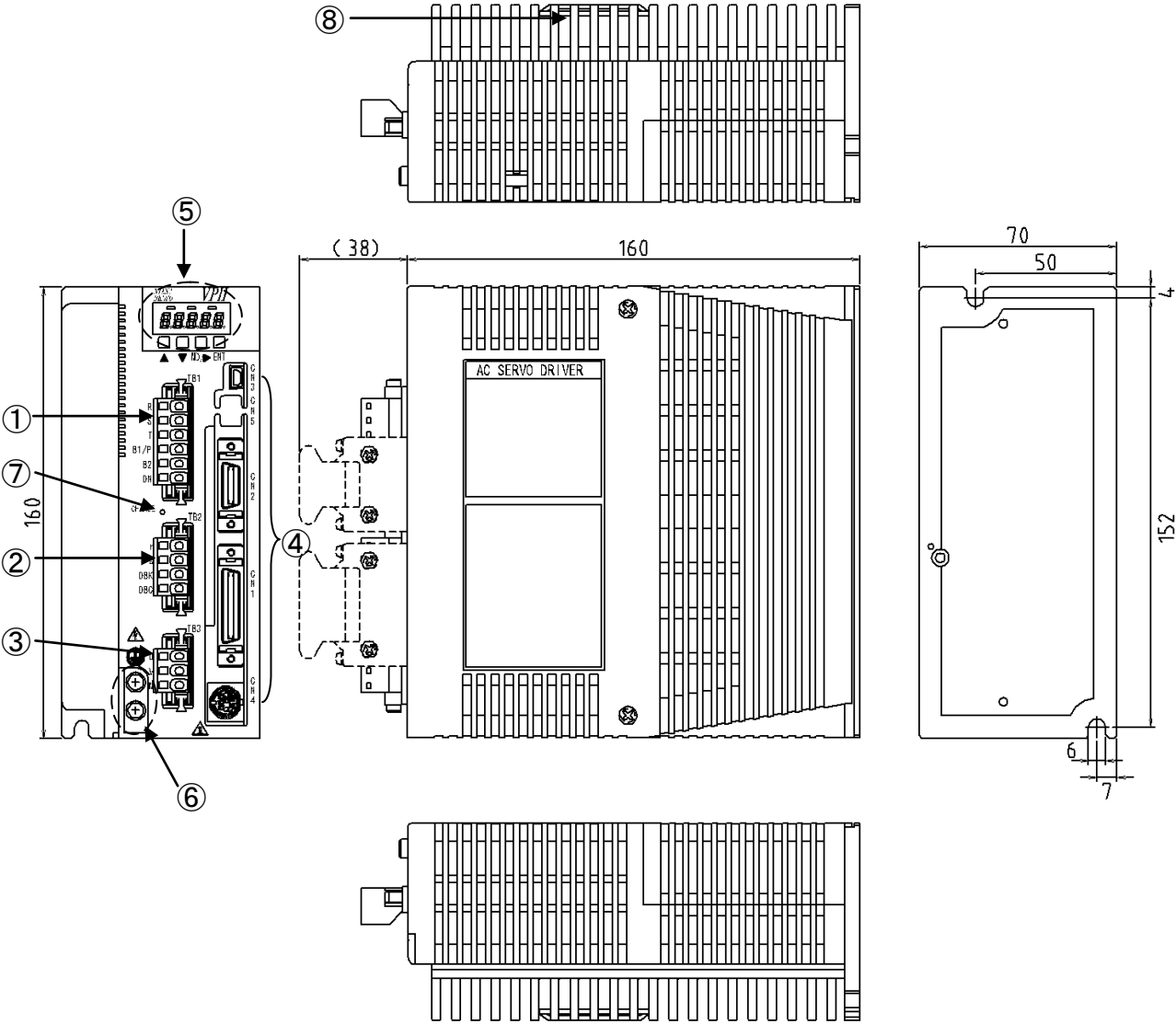


Table 12-9 Name of each part

Number	Name	Function	
①	TB1	<ul style="list-style-type: none"> ▪ Main power supply terminals (R, S, T) ▪ Regenerative resistor connection terminals (B1/P, B2) ▪ Unused (DN) 	
②	TB2	<ul style="list-style-type: none"> ▪ Control power supply connection terminals (r, s) ▪ Dynamic brake connection terminals (DBK, DBC) 	
③	TB3	<ul style="list-style-type: none"> ▪ Motor connection terminals (U, V, W) 	
④	CN1	<ul style="list-style-type: none"> ▪ Control input/output signal connector 	
	CN2	<ul style="list-style-type: none"> ▪ Encoder connection connector Input the encoder feedback pulse signal from the encoder mounted on the motor. 	
	CN3	<ul style="list-style-type: none"> ▪ USB communication connector Used to connect a PC on which VPH DES is installed for USB communication. 	
	CN4	<ul style="list-style-type: none"> ▪ Serial communication connector Used to connect an external device for serial communication. 	
⑤	Operation panel	LED1 - LED 5	<ul style="list-style-type: none"> ▪ Data display LED panel for displaying the status and alarm (5 digits)
		SW	<ul style="list-style-type: none"> ▪ Operation keys (UP, DOWN, MODE, ENTER)
⑥	E	<ul style="list-style-type: none"> ▪ Terminal for connecting power and motor grounding cables 	<ul style="list-style-type: none"> ▪ Size M4
⑦	CHARGE LED	<ul style="list-style-type: none"> ▪ On when high voltage is charged in the main circuit capacitor in the device. 	
⑧	FAN	<ul style="list-style-type: none"> ▪ Cooling fan 	

12-3 Relationships among command selection, SEL numbers, and gain numbers

12-3-1 Speed command

Relationships among command selection SS1 to SS3, SEL numbers, and gain numbers in the speed command mode

Command selection SS1 - SS3	Speed command parameter	Speed command No. 1 parameter	Gain No. parameter	Gain No. 1 parameter
0	SPDSEL0 P410 - P412	P413 Speed command Speed command spec selection Speed command Gain No. selection	Gain No. 0 P210 - P236	P240 Low speed gain switching speed
1	SPDSEL1 P413 - P415	P414 Speed command Speed command value	Gain No. 1 P240 - P266	P241 Low speed gain switching deviation pulse
2	SPDSEL2 P416 - P418	P415 Speed command Torque limit value	Gain No. 2 P240 - P266	P242 Normal speed > Low speed gain switching time constant Low speed > Normal speed gain switching filter time constant Low speed gain switching spec 1 selection Low speed gain switching spec 2 selection
3	SPDSEL3 P419 - P421		Gain No. 3 P240 - P266	P243 Low speed gain switching delay time Low speed gain holding time after switching
4	SPDSEL4 P422 - P424			P244 Speed loop proportional gain Normal speed gain
5	SPDSEL5 P425 - P427			P245 Speed loop integral time constant Normal speed gain
6	SPDSEL6 P428 - P430			P246 Speed loop deriv alive time constant Normal speed gain
7	SPDSEL7 P431 - P433			P247 Speed loop proportional gain distribution factor Normal speed gain P248 Speed loop deriv alive gain distribution factor Normal speed gain P249 Speed loop proportional gain Low speed gain P250 Speed loop integral time constant Low speed gain P251 Speed loop deriv alive time constant Low speed gain P252 Speed loop proportional gain distribution factor Low speed gain P253 Speed loop deriv alive gain distribution factor Low speed gain P254 Speed loop integral torque limit value P255 Position loop gain P256 Position loop gain Low speed gain P257 Position loop deriv alive time constant Position loop deriv alive time constant Low speed gain P258 Positioning command delay time P259 Speed feed forward ratio Speed feed forward shift ratio P260 Speed feed forward filter time constant P261 Inertia P262 Viscous friction P263 Inertia feed forward ratio Viscous friction feed forward ratio P264 Torque feed forward filter time constant P265 Filter derivative coefficient while stopping Filter time constant while stopping P266 Notch filter center frequency Notch filter band width ratio

Relationships among command selection SS1 to SS3, SEL numbers, and gain numbers in the torque command mode

Command selection SS1 - SS3	Torque command parameter
0	TRQSEL0 P441 - P443
1	TRQSEL1 P444 - P446
2	TRQSEL2 P447 - P449
3	TRQSEL3 P450 - P452
4	TRQSEL4 P453 - P455
5	TRQSEL5 P456 - P458
6	TRQSEL6 P459 - P461
7	TRQSEL7 P462 - P464

TRQSEL1 parameter
P444 Torque command Torque command spec selection
Torque command Gain No. selection
Torque command Overtravel spec selection
P445 Torque command Torque command value
P446 Torque command Speed limit value

Gain No. parameter
Gain No. 0 P210 - P236
Gain No. 1 P240 - P266
Gain No. 2 P240 - P266
Gain No. 3 P240 - P266

Gain No. 1 parameter
P240 Low speed gain switching speed
P241 Low speed gain switching deviation pulse
P242 Normal speed -> Low speed gain switching time constant
Low speed -> Normal speed gain switching filter time constant
Low speed gain switching spec 1 selection
Low speed gain switching spec 2 selection
P243 Low speed gain switching delay time
Low speed gain holding time after switching
P244 Speed loop proportional gain Normal speed gain
P245 Speed loop integral time constant Normal speed gain
P246 Speed loop derivative time constant Normal speed gain
P247 Speed loop proportional gain distribution factor Normal speed gain
P248 Speed loop derivative gain distribution factor Normal speed gain
P249 Speed loop proportional gain Low speed gain
P250 Speed loop integral time constant Low speed gain
P251 Speed loop derivative time constant Low speed gain
P252 Speed loop proportional gain distribution factor Low speed gain
P253 Speed loop derivative gain distribution factor Low speed gain
P254 Speed loop integral torque limit value
P255 Position loop gain
P256 Position loop gain Low speed gain
P257 Position loop derivative time constant
Position loop derivative time constant Low speed gain
P258 Positioning command delay time
P259 Speed feed forward ratio
Speed feed forward shift ratio
P260 Speed feed forward filter time constant
P261 Inertia
P262 Viscous friction
P263 Inertia feed forward ratio
Viscous friction feed forward ratio
P264 Torque feed forward filter time constant
P265 Filter derivative coefficient while stopping
Filter time constant while stopping
P266 Notch filter center frequency
Notch filter band width ratio

Relationships among command selection SS1 to SS3, SEL numbers, and gain numbers in the pulse train command mode

Command selection SS1 - SS3	Pulse train command parameter	PLSSEL1 parameter	Gain No. parameter	Gain No. 1 parameter
0	PLSSEL0 P467 - P472	P473 Pulse train command Numerator ratio & Denominator ratio selection Pulse train command Gain No. selection Pulse train command Overtravel spec selection	Gain No. 0 P210 - P236	P240 Low speed gain switching speed P241 Low speed gain switching deviation pulse P242 Normal speed -> Low speed gain switching time constant Low speed -> Normal speed gain switching filter time constant Low speed gain switching spec 1 selection Low speed gain switching spec 2 selection
1	PLSSEL1 P473 - P478	P474 Pulse train command Numerator ratio P475 Pulse train command Denominator ratio P476 Pulse train command S-curve time 1 P477 Pulse train command Delay compensation Pulse train command Lead compensation	Gain No. 1 P240 - P266	P243 Low speed gain switching delay time Low speed gain holding time after switching
2	PLSSEL2 P479 - P484		Gain No. 2 P240 - P266	P244 Speed loop proportional gain Normal speed gain P245 Speed loop integral time constant Normal speed gain P246 Speed loop derivative time constant Normal speed gain
3	PLSSEL3 P485 - P490		Gain No. 3 P240 - P266	P247 Speed loop proportional gain distribution factor Normal speed gain P248 Speed loop derivative gain distribution factor Normal speed gain P249 Speed loop proportional gain Low speed gain P250 Speed loop integral time constant Low speed gain P251 Speed loop derivative time constant Low speed gain
4	PLSSEL4 P491 - P496			P252 Speed loop proportional gain distribution factor Low speed gain P253 Speed loop derivative gain distribution factor Low speed gain P254 Speed loop integral torque limit value
5	PLSSEL5 P497 - P502			P255 Position loop gain P256 Position loop gain Low speed gain P257 Position loop derivative time constant Position loop derivative time constant Low speed gain
6	PLSSEL6 P503 - P508			P258 Positioning command delay time P259 Speed feed forward ratio Speed feed forward shift ratio
7	PLSSEL7 P509 - P514			P260 Speed feed forward filter time constant P261 Inertia P262 Viscous friction P263 Inertia feed forward ratio Viscous friction feed forward ratio P264 Torque feed forward filter time constant P265 Filter derivative coefficient while stopping Filter time constant while stopping P266 Notch filter center frequency Notch filter band width ratio

Relationships among command selection SS1 to SS8, SEL numbers, and gain numbers for the POS, INDEX, and HOME commands

Command selection SS1 - SS8	Command	SEL parameter	SEL1 parameter	Gain No. parameter	Gain No. 1 parameter
0	POS, INDEX, HOME	SEL0	P524 Homing incomplete signal selection	Gain No. 0	P240 Low speed gain switching speed
		P517 - P523	Gain No. selection	P210 - P236	P241 Low speed gain switching deviation pulse
		SEL1	Overtravel spec selection	Gain No. 1	P242 Normal speed -> Low speed gain switching time constant
1	POS, INDEX, HOME	P524 - P530	Internal command acceleration standard time	P240 - P266	Low speed -> Normal speed gain switching filter time constant
		SEL2	Internal command deceleration standard time	Gain No. 2	Low speed gain switching spec 1 selection
		P531 - P537	Internal command acceleration time	P240 - P266	Low speed gain switching spec 2 selection
2	POS, INDEX, HOME	SEL3	Internal command deceleration time	Gain No. 3	P243 Low speed gain switching delay time
		P538 - P544	Internal command S-curve time 1	P240 - P266	Low speed gain holding time after switching
		SEL4	Torque limit value		
3	POS, INDEX, HOME	P545 - P551			P244 Speed loop proportional gain Normal speed gain
		SEL5			P245 Speed loop integral time constant Normal speed gain
		P552 - P558			P246 Speed loop derivative time constant Normal speed gain
4	POS, INDEX, HOME	SEL6			P247 Speed loop proportional gain distribution factor Normal speed gain
		P559 - P565			P248 Speed loop derivative gain distribution factor Normal speed gain
		SEL7			P249 Speed loop proportional gain Low speed gain
5	POS, INDEX, HOME	P566 - P572			P250 Speed loop integral time constant Low speed gain
					P251 Speed loop derivative time constant Low speed gain
					P252 Speed loop proportional gain distribution factor Low speed gain
6	POS, INDEX, HOME				P253 Speed loop derivative gain distribution factor Low speed gain
					P254 Speed loop integral torque limit value
					P255 Position loop gain
7	POS, INDEX, HOME				P256 Position loop gain Low speed gain
					P257 Position loop derivative time constant
					P258 Positioning command delay time
252	POS, INDEX, HOME	SEL3			P259 Speed feed forward ratio
					Speed feed forward shift ratio
					P260 Speed feed forward filter time constant
253	POS, INDEX, HOME	SEL5			P261 Inertia
					P262 Viscous friction
					P263 Inertia feed forward ratio
254	POS, INDEX, HOME	SEL2			Viscous friction feed forward ratio
					P264 Torque feed forward filter time constant
					P265 Filter derivative coefficient while stopping
255	POS, INDEX, HOME	SEL6			Filter time constant while stopping
					P266 Notch filter center frequency
					Notch filter band width ratio

Relationships among command selection SS1 to SS3, SEL numbers, and gain numbers in the jog mode

Command selection SS1 - SS3	Jog speed parameter	SEL parameter	SEL0 parameter	Gain No. parameter	Gain No. 1 parameter
0	P573	SEL0	P517 Homing incomplete signal selection	Gain No. 0	P240 Low speed gain switching speed
1	P574	P517 -	Gain No. selection	P210 - P236	P241 Low speed gain switching deviation pulse
2	P575	P523	Overtravel spec selection	Gain No. 1	P242 Normal speed -> Low speed gain switching time constant
3	P576		P518 Internal command acceleration standard time	P240 - P266	Low speed -> Normal speed gain switching filter time constant
4	P577		P519 Internal command deceleration standard time	Gain No. 2	Low speed gain switching spec 1 selection
5	P578		P520 Internal command acceleration time	P240 - P266	Low speed gain switching spec 2 selection
6	P579		P521 Internal command deceleration time	Gain No. 3	P243 Low speed gain switching delay time
7	P580		P522 Internal command S-curve time 1	P240 - P266	Low speed gain holding time after switching
			P523 Torque limit value		P244 Speed loop proportional gain Normal speed gain
					P245 Speed loop integral time constant Normal speed gain
					P246 Speed loop derivative time constant Normal speed gain
					P247 Speed loop proportional gain distribution factor Normal speed gain
					P248 Speed loop derivative gain distribution factor Normal speed gain
					P249 Speed loop proportional gain Low speed gain
					P250 Speed loop integral time constant Low speed gain
					P251 Speed loop derivative time constant Low speed gain
					P252 Speed loop proportional gain distribution factor Low speed gain
					P253 Speed loop derivative gain distribution factor Low speed gain
					P254 Speed loop integral torque limit value
					P255 Position loop gain
					P256 Position loop gain Low speed gain
					P257 Position loop derivative time constant
					Position loop derivative time constant Low speed gain
					P258 Positioning command delay time
					P259 Speed feed forward ratio
					Speed feed forward shift ratio
					P260 Speed feed forward filter time constant
					P261 Inertia
					P262 Viscous friction
					P263 Inertia feed forward ratio
					Viscous friction feed forward ratio
					P264 Torque feed forward filter time constant
					P265 Filter derivative coefficient while stopping
					Filter time constant while stopping
					P266 Notch filter center frequency
					Notch filter band width ratio

12-4 Maintenance

The device and the motor are maintenance-free; however, in order to prevent breakdown by the change in the use conditions, periodically inspect them.



Caution

- The responsible worker should switch ON/OFF the power.
- Even when power supply is shut down, high voltage is charged in the main circuit capacitor. Wait for at least 5 minutes after power shutdown (the "CHARGE" LED on the device front panel goes off), then start work.
- Never apply insulation test to the device with the mega tester.

<The device will be damaged.>

When measuring insulation of the motor, completely disconnect wiring (U, V, W) between the motor and device, and then carry it out.

12-4-1 Daily inspection

Carry out the following daily inspections.

[Inspection items]

- (1) If motor runs normally.
- (2) If no unusual factors are found in the environment of the installed place (power supply, temperature, humidity, dusts, etc.).
- (3) If no malfunctions are found in the cooling system.
- (4) If no loosening is found on the terminals and connectors.
- (5) If there are no unusual sounds and vibrations.
- (6) If no excessive heating and discoloration are found.
- (7) If no error is found in the regenerative resistor and other components.

12-4-2 Periodic inspection

Carry out the following periodic inspections at the interval of designated operating time or at the fixed interval (for such as a half year or one year).

[Inspection items]

- (1) If no loosening is found at the block connected with load, no slack in belts, no play in the shaft key, no unusual sound in the motor bearing.
- (2) If no unusual factors are found in the environment of the installed place (power supply, temperature, humidity, dusts, etc.).
- (3) If no malfunctions are found in the cooling system.
- (4) If no loosening is found on the terminals and connectors.
- (5) If there are no unusual sounds and vibrations.
- (6) If no excessive heating and discoloration are found.
- (7) If there are no foreign substances and dusts inside the device.
- (8) If there are no scratches and wear on cables.
- (9) If no error is found in the regenerative resistor and other components.
- (10) Inspection on the radiator fan of the control panel, cleaning of the air filter, and inspection or replacement of relays, etc.

12-4-3 Suggestions for parts replacement

Suggestions for parts replacement are as follows.

Table 12-10 Parts replacement guide 1

Part name	Replacement guide	Use conditions
Smoothing capacitor	10 years	<ul style="list-style-type: none"> Surrounding temperature: Annual average temperature 30°C Loading rate: 80% or less Working rate: 20 hours or less/day
Cooling fan	2 or 3 years	

For other parts that have lifetime, the suggestive interval of parts replacement is indicated in the following table.

Table 12-11 Parts replacement guide 2

Part name	Replacement guide	Use conditions
Internal device memory	10 years	<ul style="list-style-type: none"> Relay: 10 years Power-on: 10 times/day



Caution

Temperature and humidity conditions greatly affect lifetime. Thus, avoid the use under a high temperature and high humidity condition. Generally, it is said that 10°C increase in the operating temperature can shorten the equipment lifetime by half.