OMRON

USER'S MANUAL

OMNUC G5 SERIES

AC SERVODRIVERS Block Operation Function

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Introduction

Thank you for purchasing the OMNUC G5 Series. This User's Manual describes setting methods of the parameters required to use the block operation function of the OMNUC G5 Series and troubleshooting measures. Refer to the related manuals below for information on installation, wiring method, peripheral devices and parameter settings other than block operation.

*R88M-Kx/R88D-KTx AC Servomotors/Servo Drives User's Manual : I571

Intended Readers

This manual is intended for the following individuals.

Those having electrical knowledge (certified electricians or individuals having equivalent knowledge) and also being qualified for one of the following:

- Introducing FA equipment
- Designing FA systems
- Managing FA sites

Notice

This manual contains information you need to know to correctly use OMNUC G5-series Servo Drive and peripheral equipment.

Before using the Servo Drive, read this manual and gain a full understanding of the information provided herein.

After you finished reading the manual, keep it in a convenient place so that it can be referenced at any time.

Make sure this manual is delivered to the end user.

Items Requiring Acknowledgment

1. Terms of Warranty

(1) Warranty period

The warranty period of this product is 1 year after its purchase or delivery to the specified location.

(2) Scope of warranty

If the product fails during the above warranty period due to design, material or workmanship, we will provide a replacement unit or repair the faulty product free of charge at the location where you purchased the product.

Take note, however, that the following failures are excluded from the scope of warranty.

- a) Failure due to use or handling of the product in any condition or environment not specified in the catalog, operation manual, etc.
- b) Failure not caused by this product
- c) Failure caused by any modification or repair not carried out by OMRON
- d) Failure caused by any use not intended for this product
- e) Failure that could not be predicted with the level of science and technology available when the product was shipped from OMRON
- f) Failure caused by a natural disaster or any other reason for which OMRON is not held responsible

Take note that this warranty applies to the product itself, and losses induced by a failure of the product are excluded from the scope of warranty.

2. Limited Liability

- (1) OMRON shall not assume any responsibility whatsoever for any special damage, indirect damage or passive damage arising from this product.
- (2) OMRON shall not assume any responsibility for programming done by individuals not belonging to OMRON, if the product is programmable, or outcomes of such programming.

3. Conditions for Intended Application

- (1) If this product is combined with other product, the customer must check the standards and regulations applicable to such combination. The customer must also check the compatibility of this product with any system, machinery or device used by the customer. If the above actions are not taken, OMRON shall not assume any responsibility regarding the compatibility of this product.
- (2) If the product is used in the following applications, consult your OMRON sales representative to check the necessary items according to the specification sheet, etc. Also make sure the product is used within the specified ratings and performance ranges with an ample margin and implement safety measures, such as designing a safety circuit, to minimize danger should the product fail.
 - a) Used in any outdoor application, application subject to potential chemical contamination or electrical interference, or in any condition or environment not specified in the catalog, operation manual, etc.
 - b) Nuclear power control equipment, incineration equipment, railway, aircraft and vehicle equipment, medical machinery, entertainment machinery, safety system or any other device controlled by an administrative agency or industry regulation
 - c) System, machinery or device that may threaten human life or property
 - d) Gas, water or electricity supply system, system operated continuously for 24 hours or any other equipment requiring high reliability
 - e) Any other application where a high level of safety corresponding to a) to d) above is required

- (3) If the customer wishes to use this product in any application that may threaten human life or property, be sure to confirm beforehand that the entire system is designed in such a way to notify dangers or ensure the necessary level of safety via design redundancy, and that the product is wired and installed appropriately in the system according to the intended application.
- (4) Sample applications explained in the catalog, etc. are provided for reference purposes only. When adopting any of these samples, check the function and safety of each equipment or device.
- (5) Understand all prohibited items and notes on use provided herein, so that this product will be used correctly and that customers or third parties will not suffer unexpected losses.

4. Specification Change

The product specifications and accessories explained in the catalog, operation manual, etc. are subject to change, if necessary, for the reasons of improvement, etc. Contact your OMRON sales representative to check the actual specifications of this product.

5. Scope of Service

The price of this product excludes costs of service such as dispatching engineers. If you have any request regarding service, consult your OMRON sales representative.

6. Scope of Application

The above paragraphs are based on the assumption that this product is traded and used in Japan.

If you wish to trade or use this product outside Japan, consult your OMRON sales representative.

Safety Precautions

To ensure that the OMNUC G5-series Servomotor and Servo Drive as well as peripheral equipment are used safely and correctly, be sure to read this Safety Precautions section and the main text before using the product in order to learn items you should know regarding the equipment as well as required safety information and precautions.

■Make an arrangement so that this manual also gets to the end user of this product.

■After reading this manual, keep it in a convenient place so that it can be referenced at any time.

Explanation of Display

- The precautions explained in this section describe important information regarding safety and must be followed without fail.
- The display of precautions in this manual and their meanings are explained below.



Even those items denoted by the caution symbol may lead to a serious outcome depending on the situation. Accordingly, be sure to observe all safety precautions.



Precautions for Safe Use

Indicates precautions on what to do and what not to do to ensure using the product safely.

Precautions for Correct Use

Indicates precautions on what to do and what not to do to ensure proper operation and performance.

🛝 Reference

Indicates an item that helps deepen your understanding of the product or other useful tip.

Explanation of Symbols

| Example of symbols | |
|--------------------|--|
| | \triangle This symbol indicates danger and caution. |
| <u> </u> | The specific instruction is described using an illustration or text inside or near Δ . The symbol shown to the left indicates "beware of electric shock". |
| | \bigotimes This symbol indicates a prohibited item (item you must not do). |
| | The specific instruction is described using an illustration or text inside or near \otimes . The symbol shown to the left indicates "disassembly prohibited". |
| | This symbol indicates a compulsory item (item that must be done). |
| A | The specific instruction is described using an illustration or text inside or near (. The symbol shown to the left indicates "grounding required". |

For Safe Use of This Product

- Illustrations contained in this manual sometimes depict conditions without covers and safety shields for the purpose of showing the details. When using this product, be sure to install the covers and shields as specified and use the product according to this manual.
- ■If the product has been stored for an extended period of time, contact your OMRON sales representative.

| | \land Danger |
|--------------------------|---|
| | Always connect the frame ground terminals of a 100 V or 200 V type drive and motor to a type-D or higher ground. Always connect the ground terminals of a 400 V type to a type-C or higher ground. Improper grounding may result in electrical shock. |
| | Never touch the parts inside the Servo Drive. Electric shock may result. |
| | While the power is supplied, do not remove the front cover, terminal covers, cables and options. Electric shock may result. |
| | Installation, operation and maintenance or inspection by unauthorized personnel is prohibited. Electric shock or injury may result. |
| | Before carrying out wiring or inspection, turn OFF the power supply and wait for at least 15 minutes. Electric shock may result. |
| | Do not damage, pull, stress strongly, or pinch the cables or place heavy articles on them. Electric shock, stopping of Servo Drive operation, or burn damage may result. |
| $\underline{\land}$ | Never touch the rotating part of the Servomotor during operation. Injury may result. |
| \bigwedge | Never modify the Servo Drive. Injury or equipment damage may result. |
| \bigwedge | Install a stopping device on the machine to ensure safety. * The holding brake is not a stopping device to ensure safety. Injury may result. |
| \bigwedge | Install an immediate stop device externally to the machine so that the operation can be stopped and the power supply cut off immediately. Injury may result. |
| \bigwedge | When the power is restored after a momentary power interruption, the machine may restart suddenly. Never come close to the machine when restarting power. * Implement measures to ensure safety of people nearby even when the machine is restarted. Injury may result. |
| $\underline{\mathbb{N}}$ | After an earthquake, be sure to conduct safety checks. Electric shock, injury or fire may result. |
| $\underline{\land}$ | Never drive the Servomotor using an external drive source. Fire may result. |

| | \land Danger |
|--------------------------|--|
| \triangle | Do not place flammable materials near the Servomotor, Servo Drive, or Regeneration Resistor. Fire may result. |
| $\underline{\mathbb{N}}$ | Install the Servomotor, Servo Drive, and Regeneration Resistor on non-flammable materials such as metals. Fire may result. |
| $\underline{\mathbb{N}}$ | When you perform a system configuration using the safety function, be sure to fully understand the relevant safety standards and the information in the operation manual, and apply them to the system design. Injury or damage may result. |
| Â | Do not use the cable when it is laying in oil or water. Electric shock, injury, or fire may result. |
| | Never connect a commercial power supply directly to the Servomotor. Fire or failure may result. |
| | Do not perform wiring or any operation with wet hands. Electric shock, injury, or fire may result. |
| $\overline{\mathbb{N}}$ | Do not touch the key grooves with bare hands if a motor with shaft-end key grooves is being used. Injury may result. |





Use the Servomotor and Servo Drive in a specified combination. Fire or equipment damage may result.

Do not store or install the Servo Drive in the following locations:



Location subject to direct sunlight Location where the ambient temperature exceeds the specified level Location where the relative humidity exceeds the specified level Location subject to condensation due to rapid temperature changes Location subject to corrosive or flammable gases Location subject to higher levels of dust, salt content, or iron dust Location subject to splashes of water, oil, chemicals, etc. Location where the Servo Drive may receive vibration or impact directly Installing or storing the Servo Drive in these locations may result in fire, electric shock, or equipment damage.



The Servo Drive radiator, Regeneration Resistor, Servomotor, etc. may become hot while the power is supplied or remain hot for a while even after the power supply is cut off. Never touch these components. A burn injury may result.

Storage and Transportation

| | ▲ Caution |
|--------------------------|--|
| \triangle | When transporting the Servo Drive, do not hold it by the cables or Servomotor shaft. Injury or failure may result. |
| $\underline{\land}$ | Do not overload the Servo Drive or Servomotor. (Follow the instruction on the product label.) Injury or failure may result. |
| $\underline{\mathbb{V}}$ | Use the motor eye-bolts only when transporting the Servomotor. Do not use them to transport the machine. Injury or failure may result. |
| \triangle | When lifting a 15 kW or higher Servo Drive during moving or installation, always have two people lift the product by grasping a metal part. Do not grasp a plastic part. Risk of injury or product damage. |

Installation and Wiring

| | ▲ Caution |
|--------------------------|---|
| \bigwedge | Do not step on the Servo Drive or place heavy articles on it. Injury may result. |
| | Do not block the intake or exhaust openings. Do not allow foreign objects to enter the product. Fire may result. |
| $\underline{\mathbb{N}}$ | Be sure to observe the mounting direction. Failure may result. |
| | Provide the specified clearance between the Servo Drive and the inner surface of the control panel or other equipment. Fire or failure may result. |
| \triangle | Do not apply strong impact on the Servomotor shaft or Servo Drive. Failure may result. |
| \triangle | Wire the cables correctly and securely. Runaway motor, injury, or failure may result. |
| \triangle | Securely tighten the mounting screws, terminal block screws, and cable screws. Failure may result. |
| | Use crimp terminals for wiring. If simple twisted wires are connected directly to the protective ground terminal, fire may result. |
| \triangle | Only use the power supply voltage specified in this manual. Burn damage may result. |
| \triangle | In locations where the power supply infrastructure is poor, make sure the rated voltage can be supplied. Equipment damage may result. |
| | Provide safety measures, such as a breaker, to protect against short circuiting of external wiring. Fire may result. |
| | If the Servo Drive is used in the following locations, provide sufficient shielding measures. Location subject to noise generates due to static electricity, etc. Location subject to a strong electric or magnetic field Location where exposure to radioactivity may occur Location near power supply lines Using the Servo Drive in these locations may result in equipment damage. |
| \triangle | Connect an immediate stop relay in series with the brake control relay. Injury or failure may result. |
| \triangle | When connecting the battery, make sure the polarity is correct. Battery damage or explosion may result. |

Operation and Adjustment

| | ▲ Caution |
|--------------------------|--|
| \bigwedge | Conduct a test operation after confirming that the equipment is not affected. Equipment damage may result. |
| $\underline{\mathbb{N}}$ | Before operating the Servo Drive in an actual environment, check if it operates correctly based on the parameters you have set. Equipment damage may result. |
| $\underline{\mathbb{N}}$ | Never adjust or set parameters to extreme values, as it will make the operation unstable. Injury may result. |
| $\underline{\mathbb{N}}$ | Separate the motor from the mechanical system and check its operation before installing the motor to the machine. Injury may result. |
| $\underline{\mathbb{V}}$ | If an alarm generated, remove the cause of the alarm and ensure safety, and then reset the alarm and restart the operation. Injury may result. |
| $\underline{\mathbb{N}}$ | Do not use the built-in brake of the motor for normal braking operation. Failure may result. |
| $\underline{\land}$ | Do not operate the Servomotor connected to an excessive load inertia. Failure may result. |
| $\underline{\land}$ | Install safety devices to prevent idle running or lock of the electromagnetic brake or the gear head, or leakage of grease from the gear head. Injury, damage, or taint damage may result. |
| | If the Servo Drive fails, cut off the power supply to the Servo Drive at the power supply. Fire may result. |
| $\underline{\wedge}$ | Do not turn ON and OFF the main Servo Drive power supply frequently. Failure may result. |

Maintenance and Inspection



Location of Warning Label

The Servo Drive bears a warning label at the following location to provide handling warnings. When handling the Servo Drive, be sure to observe the instructions provided on this label.



Warning label display location

(R88D-KTA5L)

Instructions on Warning Label



Disposal

- When disposing of the battery, insulate it using tape and dispose of it by following the applicable ordinance of your local government.
- Dispose of the Servo Drive as an industrial waste.

Revision History

The manual revision symbol is an alphabet appended at the end of the manual number found in the bottom left-hand corner of the front or back cover.

Example

| Man.No. | | I575-E1-01 | |
|---------------|---------------|---------------------|--|
| Revision code | | | |
| Revision code | Revision date | Revised content | |
| 01 | January 2011 | Original production | |

Related Manuals

The related manuals that are available are listed in the table below. Refer to the related manuals for information on installation, wiring method, peripheral devices and parameter settings other than block operation. Before using the product, be sure to fully understand the conditions, such as the product specifications and use restrictions.

| Man No. | Name of manuals | Contents |
|---------|--|---|
| 1571 | R88M-Kx/R88D-KTx AC Servomotors/Servo Drives User's Manual | The OMNUC G5 Series models and functions are explained. |

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1

Outline of Operation

This section explains the features and specifications of the block operation function.

| 1-1 | Features | 1-1 |
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1-1 Features

With the use of the block operation function, positioning operations of up to 32 points can be achieved without using a position controller. Semi-closed control and full closing control position control operations are supported. Furthermore, the block operation function delivers the equal positioning performance as with the analog/pulse input command.

1-2 Specifications

| Item | Specifications | |
|---|--|--------------|
| Block processing cycle | 0.5 ms | |
| Number of blocks | Maximum 32 | |
| Number of velocity setting parameters | Maximum 8 | |
| Number of acceleration setting parameters | Maximum 4 | |
| Number of deceleration setting parameters | Maximum 4 | |
| Input signals | Maximum 10 ^{*1} | |
| Output signals | Maximum 4 ^{*2} | |
| Conditional branching | Measured | |
| | Position control (including full closing control) | Measured |
| | Velocity control Torque control | Not measured |
| Origin search | search Measured | |
| Velocity update | Measured | |
| Target position update | Not measured *3 | |
| Block designation update | Not measured *4 | |
| Wrap around | Not measured *5 | |

*1 This is used with general-purpose input signals allocated.

- *2 This is used with general-purpose output signals allocated. (SO3 is fixed to ALM output.)
- *3 If the target position is updated (if a new operation command is executed when an operation is already in progress), the block operation error (alarm 94.0) will occur.
- *4 The unit cannot be started by specifying a new block number when a block operation is already in progress.
- *5 If the command position or the current position exceeds the C0000001h or 3FFFFFFh range, the wrap around error (alarm 94.1) will occur.

2

Parameter Setting

This section explains the parameters required to use the block operation function.

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2-1 Initial Setting

Parameters Requiring Settings

| Parameter number | Parameter name | Explanation | Reference |
|---------------------|--------------------------------------|--|-----------|
| Pn628 | Special Function Selection | Select the command method. | P.2-1 |
| Pn722 | Origin Search Disable Selection | Select whether or not to omit the origin search operation when an incremental encoder is used. | P.2-1 |
| Pn001 | CONTROL Mode Selection | Select the CONTROL mode. | P.2-2 |
| Pn008 | Electronic Gear Integer Setting | Set the number of command pulses corresponding to 1 motor rotation. | P.2-2 |
| Pn009 | Electronic Gear Ratio Numerator | Set the numerator of the electronic gear ratio. | P.2-2 |
| Pn010 | Electronic Gear Ratio Denominator | Set the denominator of the electronic gear ratio. | P.2-2 |
| Pn400 to Pn409 | Input Signal Selection 1 to 10 | Set the input signal function allocation and logic. | P.2-2 |
| Pn410 to Pn413 | Output Signal Selection 1 to 4 | Set the output signal function allocation. | P.2-5 |

Special Function Selection (Pn628)

Select enable block operation function (set value: 2). Note that, in this case, analog/pulse command input signals will be disabled.

| Parameter number | Parameter name | Explanation | Setting range | Unit |
|---------------------|-----------------------|---|------------------|------|
| | Special | Select the command method. | | |
| Pn628 | Function Selection | 0: Analog/pulse command input enabled2: Block operation function enabled | 0, 2 | _ |

Origin Search Disable Selection (Pn722)

Select origin search not required (set value: 1) when using an incremental encoder to omit origin search and perform relative or absolute travel. In this case, the position at which the power supply is turned ON will be set as the origin. Origin search is not required regardless of this set value when an absolute encoder is used. Note that origin search is also not required when performing a JOG operation.

| Parameter number | Parameter name | Explanation | Setting range | Unit |
|---------------------|---------------------------------------|--|------------------|------|
| Pn722 | Origin Search Disable Selection | Select whether or not to omit the origin search operation when an incremental encoder is used. 0: Origin search required 1: Origin search not required | 0, 1 | - |

CONTROL Mode Selection (Pn001)

When the block operation function is enabled, the [CONTROL Mode Selection] will be controlled as follows. Both with semi-closed control and full closing control, the CONTROL mode switching is not available and is fixed to position control.

| Parameter number | Parameter name | Explanation | Setting range | Unit |
|---------------------|---------------------------|--|---------------|------|
| Pn001 | CONTROL Mode Selection | Select the CONTROL mode. 0 to 5: Semi-closed control 6: Full closing control | 0 to 6 | _ |

Electronic Gear Function (Pn008 to Pn010)

When the block operation function is used, set the electronic gear ratio to 1:1. Operation cannot be guaranteed if this is set to any other ratio.

Input Signal Selection 1 to 10 (Pn400 to Pn409)

When the block operation function is enabled, the following functions can be allocated to input signals. Allocate the necessary functions to Pn400 to Pn409. Refer to "I/O signal allocation method" (P.2-6) for details on setting method. Be sure to allocate operation command (RUN) and strobe input (STB). Furthermore, when specifying a block operation number to start a block operation, allocate the block operation designation input (B-SEL 1/2/4/8/16).

Function Number Table

The set values and functions to be used for allocations are as follows:

| O'must a sms | Or much and | Set value | | | | |
|------------------------------------|-------------|-----------|-----------------------|---|--|--|
| Signal name | Symbol | NO | NC | Function | | |
| Disabled | - | 00h | Setting not available | Input signals are ignored. | | |
| Forward drive prohibition input | POT | 01h | 81h | Forward drive prohibition input. | | |
| Reverse drive prohibition input | NOT | 02h | 82h | Reverse drive prohibition input. | | |
| Operation command *1 | RUN | 03h | 83h | This is used when turning servo ON/OFF. | | |
| Alarm reset input | RESET | 04h | Setting not available | This is used when externally resetting the servo alarm. | | |
| Gain switching | GSEL | 06h | 86h | This is used when switching between gain 1 and gain 2. | | |
| Torque limit switching | TLSEL | 09h | 89h | This is used when switching the torque limit. | | |
| Damping filter switching 1 | DFSEL1 | 0Ah | 8Ah | This is used when switching the damping filter. | | |
| Damping filter switching 2 | DFSEL2 | 0Bh | 8Bh | This is used when switching the damping filter. | | |
| Forced alarm input | E-STOP | 14h | 94h | Alarm stop input from the external. | | |
| Inertia ratio switching input | J-SEL | 15h | 95h | Inertia ratio switching input. | | |
| Latch input 1 *2 | EXT1 | 20h | Setting not available | This is used when performing an origin search with the forward end of the sensor set as the origin. | | |
| Origin proximity input | HOME | 22h | A2h | This is used when performing an origin search using the sensor and phase Z. | | |
| Immediate stop input | H-STOP | 23h | A3h | This is used when stopping at the maximum deceleration during an operation. The block operation is ended after the unit is stopped with this input. | | |
| Deceleration stop input | S-STOP | 24h | A4h | This is used when stopping at the designation deceleration during an operation. The block operation is ended after the unit is stopped with this input. | | |
| Strobe input *3 | STB | 25h | A5h | This is used as a signal to start a block operation. The operation begins with the block number specified when this input is starting. | | |
| Block select input 1 | B-SEL1 | 26h | A6h | Specify the block number when starting a block | | |
| Block select input 2 | B-SEL2 | 27h | A7h | operation. For example, to start with block | | |
| Block select input 4 | B-SEL4 | 28h | A8h | B - SEL1 = 1 (ON) | | |
| Block select input 8 | B-SEL8 | 29h | A9h | B - SEL2 = 0 (OFF) | | |
| Block select input 16 | B-SEL16 | 2Ah | AAh | B - SEL4 = 0 (OFF) B - SEL8 = 1 (ON) B - SEL16 = 1 (ON) Note that unallocated block operation input signals are always set to 0 (OFF). | | |

*1 You must always allocate the operation command (RUN). Servo-on cannot be actived if it is not allocated.

*2 Allocate this to Input Signal Selection 4 (Pn403). An alarm will occur if it is allocated to any other parameter.

*3 You must always allocate the strobe input (STB). The block operation function cannot be started if it is not allocated.

2

Precautions for Correct Use

- Do not use any values other than the settings listed.
- If you allocate the same function to multiple input signals, interface input duplicate allocation error 1 (Alarm 33.0) or interface input duplicate allocation error 2 (Alarm 33.1) will occur.
- Latch input 1 (EXT1) can only be allocated to Input Signal Selection 4 (Pn403). A latch input 1 allocation error (Alarm 33.8) will occur if it is allocated to any other parameter.
- You must always allocate the operation command (RUN). Servo cannot be turned ON if it is not allocated.
- You must always allocate the strobe input (STB). The block operation function cannot be started if it is not allocated.

When the block operation function is enabled, the following functions are disabled. If these functions are allocated, the interface input allocation error (alarm 33.x) will occur. Change the input signal selections that are already allocated in the default setting.

| Signal name | Symbol | Set v | /alue | Default setting |
|--|--------|-------|-----------------------|-----------------|
| Signal name | Symbol | NO | NC | Delaun Setting |
| CONTROL mode switching input *1 | TVSEL | 05h | 85h | SI9 |
| Error counter reset input *1 | ECRST | 07h | Setting not available | SI7 |
| Pulse prohibition input *1 | IPG | 08h | 88h | SI10 |
| Electronic gear switching input 1 | DIV1 | 0Ch | 8Ch | - |
| Electronic gear switching input 2 | DIV2 | 0Dh | 8Dh | - |
| Internally set velocity selection 1 *1 | VSEL1 | 0Eh | 8Eh | SI10 |
| Internally set velocity selection 2 *1 | VSEL2 | 0Fh | 8Fh | SI7 |
| Internally set velocity selection 3 *1 | VSEL3 | 10h | 90h | SI5 |
| Zero velocity designation input *1 | VZERO | 11h | 91h | SI3 |
| Velocity command sign input | VSIGN | 12h | 92h | - |
| Torque command sign input | TSIGN | 13h | 93h | _ |

*1 This needs to be changed as it is allocated in the default setting.

Parameter Setting

Output Signal Selection 1 to 4 (Pn410 to Pn413)

When the block operation function is enabled, the following functions can be allocated to output signals. Allocate the necessary functions to Pn410 to Pn413. Refer to "I/O signal allocation method" (P.2-6) for details on setting method.

Function Number Table

The set values and functions to be used for allocations are as follows:

| Signal name | Symbol | Set value | Function |
|--|----------|--------------|---|
| Disabled | - | 00h | This is not used as an output signal. |
| Servo ready completed output | READY | 02h | This turns ON when the power can be supplied to the driver. |
| Brake interlock output | BKIR | 03h | This is an external brake timing signal output. |
| Positioning completion output | INP | 04h | This turns ON when the position error is at or below the set value (Pn431). |
| Motor rotation velocity detection output | TGON | 05h | This turns ON when the motor velocity exceeds the set value (Pn436). |
| Torque limiting signal | TLC | 06h | This turns ON during torque limit status. |
| Zero velocity detection output | ZSP | 07h | This turns ON when the motor rotation velocity is at or below the set value (Pn434). |
| Velocity conformity output | VCMP | 08h | This turns ON when the difference between the command velocity and the motor rotation velocity is at or below the set value (Pn435). |
| Warning output 1 | WARN1 | 09h | This turns ON when a warning occurs according to the settings in [Warning Output Selection 1] (Pn440). |
| Warning output 2 | WARN2 | 0Ah | This turns ON when a warning occurs according to the settings in [Warning Output Selection 2] (Pn441). |
| Position command status output | P-CMD | 0Bh | This turns ON when a positioning command is input. |
| Positioning completed 2 | INP2 | 0Ch | This turns ON when the position error is at or below the set value (Pn442). |
| Alarm attribute output | ALM-ATB | 0Eh | This turns ON when an alarm that can be cleared occurs. |
| Block operation output1 | B-CTRL1 | 24h | This is used when operating the block general- |
| Block operation output 2 | B-CTRL2 | 25h | purpose output signals with the block general- |
| Block operation output 3 | B-CTRL3 | 26h | (08h). *1 |
| Output during a block operation | B-BUSY | 28h | The block operation status is output. This turns ON during a block operation, and OFF when the block operation is stopped. |
| Origin search complete output | HOME-CMP | 29h | The origin search completion status is output. * ² This is always ON when an absolute encoder is used. This is turned OFF if an incremental encoder is used when the power supply is turned ON. This turns OFF when the origin search command is executed, and turns ON when the origin search is completed. |

*1 For details on the command, refer to Chapter 3.

*2 Origin search completion output turns ON/OFF based on the conditions, regardless of the set value in [Origin Search Disable Selection] (Pn722).

2

Precautions for Correct Use

- Do not use any values other than the settings listed.
- You can allocate the same function to more than one output signal.
- You cannot change the output signal logic. When the function is disabled (OFF), signal input is open with COM–, and when the function is enabled (ON), signal input is shorted with COM–.

I/O signal allocation method

Signals can be allocated to any parameters between Pn400 and Pn413. [Output Signal Selection 3] (Pn412) is fixed to alarm output signal.

Set the parameters based on the hex display standard. Specify the set value of the function in "**" below. Refer to the function number table provided above for the set value of each function. The logic setting is included in the function numbers.

000000<u>**</u>h

— Position control/fully-closed control

Example: Position control or fully-closed control: Strobe input 1 for contact NO (25h)

000000<u>25</u>h

Position control/fully-closed control

This will be "37" since the front panel display is in decimal numbers.

2-2 Block Operation Setting Parameter

Parameters related to block operation are described. These parameters must be set before the block operation function is started.

Note that all of these parameters are initialized to 0 when initialization is executed.

Block Operation Setting Parameter

| Parameter number | Parameter name | Attribute | Setting range | Unit |
|---------------------|--|---|-----------------------------|-------|
| Pn700 ^{*1} | Block Operation Velocity [0] | | 0 to 20000 *2 *3 | r/min |
| Pn701 ^{*1} | Block Operation Velocity [1] | Up to eight block operation velocitys can be | 0 to 20000 *2 *3 | r/min |
| Pn702 *1 | Block Operation Velocity [2] | set. | 0 to 20000 *2 *3 | r/min |
| Pn703 ^{*1} | Block Operation Velocity [3] | Absolute Movement, and JOG and Velocity | 0 to 20000 *2 *3 | r/min |
| Pn704 ^{*1} | Block Operation Velocity [4] | Update commands. | 0 to 20000 *2 *3 | r/min |
| Pn705 ^{*1} | Block Operation Velocity [5] | Block Operation Velocity number (value in | 0 to 20000 *2 *3 | r/min |
| Pn706 *1 | Block Operation Velocity [6] | []), instead of the parameter number. | 0 to 20000 *2 *3 | r/min |
| Pn707 ^{*1} | Block Operation Velocity [7] | | 0 to 20000 *2 *3 | r/min |
| Pn708 ^{*1} | Block Operation Acceleration [0] | Up to four accelerations for block operation | 0 to 10000 ^{*3 *4} | ms |
| Pn709 *1 | Block Operation Acceleration [1] | Set the acceleration times between 0 [r/min] | 0 to 10000 ^{*3 *4} | ms |
| Pn710 ^{*1} | Block Operation Acceleration [2] | to 3,000 [r/min]. | 0 to 10000 ^{*3 *4} | ms |
| Pn711 ^{*1} | Block Operation Acceleration [3] | For argument of each command, set the Block Operation Acceleration number (value in []), instead of the parameter number. | 0 to 10000 ^{*3 *4} | ms |
| Pn712 *1 | Block Operation Deceleration [0] | Up to four decelerations for block operation | 0 to 10000 ^{*3 *4} | ms |
| Pn713 *1 | Block Operation Deceleration [1] | Set the deceleration times between 3.000 [r/ | 0 to 10000 ^{*3 *4} | ms |
| Pn714 *1 | Block Operation Deceleration [2] | min] and 0 [r/min]. | 0 to 10000 ^{*3 *4} | ms |
| Pn715 ^{*1} | Block Operation Deceleration [3] | For argument of each command, set the Block Operation Deceleration number (value in []), instead of the parameter number. | 0 to 10000 ^{*3 *4} | ms |
| Pn720 ^{*1} | Origin Search Approach Velocity 1 (H-SPD) | Set the high-velocity operation velocity for origin search. | 0 to 20000 *2 *3 | r/min |
| Pn721 *1 | Origin Search Approach Velocity 2 (L-SPD) | Set the low-velocity operation velocity for origin search. | 0 to 20000 *2 *3 | r/min |
| Pn722 | Origin Search Disable Selection | Select whether or not to omit the origin search operation when an incremental encoder is used. | 0, 1 | _ |

*1 Parameter changes are reflected immediately, but not guaranteed during a block operation. Be sure to specify the settings before starting a block operation. To change a value, first stop the block operation.

*2 Up to 20,000 block-related velocitys can be set as parameter settings, but the internal data is limited based on the maximum motor velocity. The maximum motor velocity is calculated as a value 5/6th times the value read from the motor, rather than the protection level set in the [Overspeed Level Setting] (Pn513, Pn615).

*3 If the velocity specified to perform a block operation, acceleration, and deceleration are set to 0, the block operation data setting error (alarm 93.1) will occur.

*4 If the acceleration/deceleration are set to a value between 1 and 29, the control is at the same acceleration/deceleration as 30.

2

Precautions for Correct Use

• Do not change the block operation setting parameters as a block operation cannot be guaranteed once it is started.

3

Block Operation Control Parameter

This section explains the block operation control parameter.

| 3-1 | Parameter Configuration | 3-1 |
|-----|--|------|
| | Block Operation Command Configuration | 3-1 |
| | Block Operation Data Configuration | 3-1 |
| | List of Block Operation Control Parameters | 3-2 |
| 3-2 | Command List | 3-5 |
| 3-3 | Command Details | 3-6 |
| 3-4 | Block Jump Conditions and Finishing | 3-25 |
| | Block Jump Conditions | |
| | | |

3-1 Parameter Configuration

Block operation control parameter consists of the 16-bit block operation command and the 32bit block operation data. These parameters must be set before starting the block operation function.

Note that all of these parameters are initialized to 0 when initialization is executed.

Block Operation Command Configuration

Block operation command consists of arguments, such as a command code, operation velocity, and acceleration/deceleration. For the contents of the arguments, refer to command details.

| | bit | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|------|-----|--------------|-------|------------|---|-------|-------|-------|-------|
| byte | | | | | | | | | |
| 0 | | Argum | ent 2 | Argument 3 | | Argum | ent 4 | Argum | ent 5 |
| 1 | | Command code | | | | Argum | ent 1 | | |

Block Operation Data Configuration

Movement distance, timer counter set value, and so forth are set in the block operation data. For details, refer to command details.

| | bit | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
|------|-----|--------|------------|---|---|---|---|---|----|--|
| byte | | | | | | | | | | |
| 0 | | | | | | | | | | |
| 1 | | Aroum | Argumont 6 | | | | | | | |
| 2 | | Aiguin | ento | | | | | | HL | |
| 3 | | | | | | | | | | |

List of Block Operation Control Parameters

| Parameter number | Parameter name | Explanation | Setting range | | |
|---------------------|---------------------------------|---|-----------------------|--|--|
| Pn800 | Block Operation Command [0] | Set command code, and arguments 1 to 5. | 0000h to FFFFh | | |
| Pn801 | Block Operation Data [0] | Set argument 6 for Block operation data [0]. | 00000000h to FFFFFFFh | | |
| Pn802 | Block Operation Command [1] | Set command code, and arguments 1 to 5. | 0000h to FFFFh | | |
| Pn803 | Block Operation Data [1] | Set argument 6 for Block operation data [1]. | 00000000h to FFFFFFFh | | |
| Pn804 | Block Operation Command [2] | Set command code, and arguments 1 to 5. | 0000h to FFFFh | | |
| Pn805 | Block Operation Data [2] | Set argument 6 for Block operation data [2]. | 00000000h to FFFFFFFh | | |
| Pn806 | Block Operation Command [3] | Set command code, and arguments 1 to 5. | 0000h to FFFFh | | |
| Pn807 | Block Operation Data [3] | Set argument 6 for Block operation data [3]. | 00000000h to FFFFFFFh | | |
| Pn808 | Block Operation Command [4] | Set command code, and arguments 1 to 5. | 0000h to FFFFh | | |
| Pn809 | Block Operation Data [4] | Set argument 6 for Block operation data [4]. | 00000000h to FFFFFFFh | | |
| Pn810 | Block Operation Command [5] | Set command code, and arguments 1 to 5. | 0000h to FFFFh | | |
| Pn811 | Block Operation Data [5] | Set argument 6 for Block operation data [5]. | 00000000h to FFFFFFFh | | |
| Pn812 | Block Operation Command [6] | Set command code, and arguments 1 to 5. | 0000h to FFFFh | | |
| Pn813 | Block Operation Data [6] | Set argument 6 for Block operation data [6]. | 00000000h to FFFFFFFh | | |
| Pn814 | Block Operation Command [7] | Set command code, and arguments 1 to 5. | 0000h to FFFFh | | |
| Pn815 | Block Operation Data [7] | Set argument 6 for Block operation data [7]. | 00000000h to FFFFFFFh | | |
| Pn816 | Block Operation Command [8] | Set command code, and arguments 1 to 5. | 0000h to FFFFh | | |
| Pn817 | Block Operation Data [8] | Set argument 6 for Block operation data [8]. | 00000000h to FFFFFFFh | | |
| Pn818 | Block Operation Command [9] | Set command code, and arguments 1 to 5. | 0000h to FFFFh | | |
| Pn819 | Block Operation Data [9] | Set argument 6 for Block operation data [9]. | 00000000h to FFFFFFFh | | |
| Pn820 | Block Operation Command [10] | Set command code, and arguments 1 to 5. | 0000h to FFFFh | | |
| Pn821 | Block Operation Data [10] | Set argument 6 for Block operation data [10]. | 00000000h to FFFFFFFh | | |
| Pn822 | Block Operation Command [11] | Set command code, and arguments 1 to 5. | 0000h to FFFFh | | |
| Pn823 | Block Operation Data [11] | Set argument 6 for Block operation data [11]. | 00000000h to FFFFFFFh | | |

The following is a list of block operation control parameters.

3

| Parameter number | Parameter name | Explanation | Setting range | | |
|---------------------|---------------------------------|---|-----------------------|--|--|
| Pn824 | Block Operation Command [12] | Set command code, and arguments 1 to 5. | 0000h to FFFFh | | |
| Pn825 | Block Operation Data [12] | Set argument 6 for Block operation data [12]. | 00000000h to FFFFFFFh | | |
| Pn826 | Block Operation Command [13] | Set command code, and arguments 1 to 5. | 0000h to FFFFh | | |
| Pn827 | Block Operation Data [13] | Set argument 6 for Block operation data [13]. | 00000000h to FFFFFFFh | | |
| Pn828 | Block Operation Command [14] | Set command code, and arguments 1 to 5. | 0000h to FFFFh | | |
| Pn829 | Block Operation Data [14] | Set argument 6 for Block operation data [14]. | 00000000h to FFFFFFFh | | |
| Pn830 | Block Operation Command [15] | Set command code, and arguments 1 to 5. | 0000h to FFFFh | | |
| Pn831 | Block Operation Data [15] | Set argument 6 for Block operation data [15]. | 00000000h to FFFFFFFh | | |
| Pn832 | Block Operation Command [16] | Set command code, and arguments 1 to 5. | 0000h to FFFFh | | |
| Pn833 | Block Operation Data [16] | Set argument 6 for Block operation data [16]. | 00000000h to FFFFFFFh | | |
| Pn834 | Block Operation Command [17] | Set command code, and arguments 1 to 5. | 0000h to FFFFh | | |
| Pn835 | Block Operation Data [17] | Set argument 6 for Block operation data [17]. | 00000000h to FFFFFFFh | | |
| Pn836 | Block Operation Command [18] | Set command code, and arguments 1 to 5. | 0000h to FFFFh | | |
| Pn837 | Block Operation Data [18] | Set argument 6 for Block operation data [18]. | 00000000h to FFFFFFFh | | |
| Pn838 | Block Operation Command [19] | Set command code, and arguments 1 to 5. | 0000h to FFFFh | | |
| Pn839 | Block Operation Data [19] | Set argument 6 for Block operation data [19]. | 00000000h to FFFFFFFh | | |
| Pn840 | Block Operation Command [20] | Set command code, and arguments 1 to 5. | 0000h to FFFFh | | |
| Pn841 | Block Operation Data [20] | Set argument 6 for Block operation data [20]. | 00000000h to FFFFFFFh | | |
| Pn842 | Block Operation Command [21] | Set command code, and arguments 1 to 5. | 0000h to FFFFh | | |
| Pn843 | Block Operation Data [21] | Set argument 6 for Block operation data [21]. | 00000000h to FFFFFFFh | | |
| Pn844 | Block Operation Command [22] | Set command code, and arguments 1 to 5. | 0000h to FFFFh | | |
| Pn845 | Block Operation Data [22] | Set argument 6 for Block operation data [22]. | 00000000h to FFFFFFFh | | |
| Pn846 | Block Operation Command [23] | Set command code, and arguments 1 to 5. | 0000h to FFFFh | | |
| Pn847 | Block Operation Data [23] | Set argument 6 for Block operation data [23]. | 00000000h to FFFFFFFh | | |
| Pn848 | Block Operation Command [24] | Set command code, and arguments 1 to 5. | 0000h to FFFFh | | |
| Pn849 | Block Operation Data [24] | Set argument 6 for Block operation data [24]. | 00000000h to FFFFFFFh | | |

| Parameter number | Parameter name | Explanation | Setting range | |
|---------------------|---------------------------------|---|------------------------|--|
| Pn850 | Block Operation Command [25] | Set command code, and arguments 1 to 5. | 0000h to FFFFh | |
| Pn851 | Block Operation Data [25] | Set argument 6 for Block operation data [25]. | 00000000h to FFFFFFFh | |
| Pn852 | Block Operation Command [26] | Set command code, and arguments 1 to 5. | 0000h to FFFFh | |
| Pn853 | Block Operation Data [26] | Set argument 6 for Block operation data [26]. | 00000000h to FFFFFFFh | |
| Pn854 | Block Operation Command [27] | Set command code, and arguments 1 to 5. | 0000h to FFFFh | |
| Pn855 | Block Operation Data [27] | Set argument 6 for Block operation data [27]. | 00000000h to FFFFFFFh | |
| Pn856 | Block Operation Command [28] | Set command code, and arguments 1 to 5. | 0000h to FFFFh | |
| Pn857 | Block Operation Data [28] | Set argument 6 for Block operation data [28]. | 00000000h to FFFFFFFFh | |
| Pn858 | Block Operation Command [29] | Set command code, and arguments 1 to 5. | 0000h to FFFFh | |
| Pn859 | Block Operation Data [29] | Set argument 6 for Block operation data [29]. | 00000000h to FFFFFFFh | |
| Pn860 | Block Operation Command [30] | Set command code, and arguments 1 to 5. | 0000h to FFFFh | |
| Pn861 | Block Operation Data [30] | Set argument 6 for Block operation data [30]. | 00000000h to FFFFFFFh | |
| Pn862 | Block Operation Command [31] | Set command code, and arguments 1 to 5. | 0000h to FFFFh | |
| Pn863 | Block Operation Data [31] | Set argument 6 for Block operation data [31]. | 00000000h to FFFFFFFh | |
| | | | | |

Precautions for Correct Use

• Do not change any related parameters as a block operation cannot be guaranteed once it is started.

3

3-2 Command List

| | Block operation control parameter (48 bit) | | | | | | |
|---|--|----------------------|---|------------------------|-------------------------------|---|---|
| Command name | Block operation command | | | | | Block operation data | |
| | Command code | Argument 1 | Argument 2 | Argument 3 | Argument 4 | Argument 5 | Argument 6 |
| | 4 bit | 4 bit | 2 bit | 2 bit | 2 bit | 2 bit | 32 bit |
| Relative Movement | 1h | Velocity number | Acceleration number | Deceleration number | _ | Block jump conditions | Relative movement distance [pulse] |
| Absolute Movement | 2h | Velocity number | Acceleration number | Deceleration number | - | Block jump conditions | Target absolute position [pulse] |
| JOG | 3h | Velocity number | Acceleration number | Deceleration number | JOG direction | Block jump conditions | - |
| Origin Search | 4h | Detection method | Acceleration number | Deceleration number | Origin search direction | Block jump conditions | - |
| Deceleration Stop | 5h | Stop method | - | _ | - | Block jump conditions | _ |
| Velocity Update | 6h | Velocity number | _ | _ | JOG direction | Block jump conditions | _ |
| Timer | 7h | _ | - | - | _ | Block jump conditions | Timer counter setting value [1ms] |
| Block Operation Output Signal Control | 8h | B-CTRL1 | B-CTRL2 | B-CTRL3 | _ | Block jump conditions | - |
| Jump | 9h | - | Block number (destination) Block jump conditions | | | _ | |
| Conditional Branching1 (=) | Ah | Comparison target | Block number (destination when Yes) Block jump conditions | | | Comparison value (threshold value) | |
| Conditional Branching1 (>) | Bh | Comparison target | Block number (destination when Yes) Block jump conditions | | | Comparison value (threshold value) | |
| Conditional Branching1 (<) | Ch | Comparison target | Block number (destination when Yes) Block jump conditions | | | Comparison value (threshold value) | |

The following is a list of commands that can be used in a block operation.

_
3-3 Command Details

Relative Movement (01h)

This is used when performing a relative movement. If [Origin Search Disable Selection] (Pn722) is set to 0, perform an origin search before starting the operation.

| | Block operation control parameter (48 bit) | | | | | | | |
|-------------------|--|--------------------|------------------------|------------------------|---------------|-----------------------|---|--|
| Command name | Block operation command | | | | | | | |
| | Command code | Argument 1 | Argument 2 | Argument 3 | Argument 4 | Argument 5 | Argument 6 | |
| | 4 bit | 4 bit | 2 bit | 2 bit | 2 bit | 2 bit | 32 bit | |
| Relative Movement | 1h | Velocity number | Acceleration number | Deceleration number | _ | Block jump conditions | Relative movement distance [pulse] | |



| Cor | mmand argument | Setting range | Content |
|-----|--|--|--|
| 1 | Velocity number | 0 to 7 | Set selection number x for block operation velocity [x]. |
| 2 | Acceleration number | 0 to 3 | Set selection number y for block operation acceleration [y]. |
| 3 | Deceleration number | 0 to 3 | Set selection number z for block operation deceleration [z]. |
| 4 | - | - | Set 0. |
| 5 | Block jump conditions ^{*1} | 0 to 3 | Set the block jump conditions after this command is executed. [LSB] 0: Jump to the next block after the operation is started. 1: Jump to the next block upon movement completion. *2 [MSB] 0: End the block operation at the current block. 1: Continue the block operation. |
| 6 | Relative movement distance [pulse] | 80000001h to 7FFFFFFh ^{*3} | Set the relative movement distance per pulse. |
| | | | |

*1 For details on the block jump conditions, refer to "3-4 Block Jump Conditions and Finishing" (P.3-25).

*2 "Upon movement completion" refers to the point when the internal position command generation process is finished. This is not based on when the motor actually stops. Furthermore, note that the movement command will still be output even after the internal position command generation process is finished if the position command filter (FIR, smoothing) is used.

*3 If the target position (the relative movement distance added to the current command position) is outside of the range between C0000001h to 3FFFFFFh, Block operation data setting error (alarm 93.1) will occur.

| Parameter | Setting range | Unit | Content |
|-------------------------------------|-----------------------------|-------|---|
| Block Operation Velocity [x] | 0 to maximum motor velocity | r/min | Set the velocity. |
| Block Operation Acceleration [y] | 0 to 10000 | ms | Set the acceleration. Set the acceleration time between 0 and 3,000 [r/min]. |
| Block Operation Deceleration [z] | 0 to 10000 | ms | Set the deceleration. Set the deceleration time between 3,000 and 0 [r/min]. |

Absolute Movement (02h)

This is used when performing an absolute movement. If [Origin Search Disable Selection] (Pn722) is set to 0, perform an origin search before starting the operation.

| | Block operation control parameter (48 bit) | | | | | | | |
|-------------------|--|--------------------|------------------------|------------------------|---------------|-----------------------|---|--|
| Command name | Block operation command | | | | | | | |
| | Command code | Argument 1 | Argument 2 | Argument 3 | Argument 4 | Argument 5 | Argument 6 | |
| | 4 bit | 4 bit | 2 bit | 2 bit | 2 bit | 2 bit | 32 bit | |
| Absolute Movement | 2h | Velocity number | Acceleration number | Deceleration number | _ | Block jump conditions | Target absolute position [pulse] | |



| Cor | nmand argument | Setting range | Content |
|-----|--|--------------------------|--|
| 1 | Velocity number | 0 to 7 | Set selection number x for Block Operation Velocity [x]. |
| 2 | Acceleration number | 0 to 3 | Set selection number y for Block Operation Acceleration [y]. |
| 3 | Deceleration number | 0 to 3 | Set selection number z for Block Operation Deceleration [z]. |
| 4 | - | - | Set 0. |
| 5 | Block jump conditions ^{*1} | 0 to 3 | Set the block jump conditions after this command is executed. [LSB] 0: Jump to the next block after the operation is started. 1: Jump to the next block upon movement completion. *2 [MSB] 0: End the block operation at the current block. 1: Continue the block operation. |
| 6 | Target absolute position [pulse] | C0000001h to 3FFFFFFh | Set the target absolute position (with sign) per pulse. |

*1 For details on the block jump conditions, refer to "3-4 Block Jump Conditions and Finishing" (P.3-25).

*2 "Upon movement completion" refers to the point when the internal position command generation process is finished. This is not based on when the motor actually stops. Furthermore, note that the movement command will still be output even after the internal position command generation process is finished if the position command filter (FIR, smoothing) is used.

| Parameter | Setting range | Unit | Content |
|-------------------------------------|--------------------------------|-------|---|
| Block Operation Velocity [x] | 0 to maximum motor velocity | r/min | Set the velocity. |
| Block Operation Acceleration [y] | 0 to 10000 | ms | Set the acceleration. Set the acceleration time between 0 and 3,000 [r/min]. |
| Block operation Deceleration [z] | 0 to 10000 | ms | Set the deceleration. Set the deceleration time between 3,000 and 0 [r/min]. |

JOG (03h)

This is used when performing a JOG operation.

Stop a JOG operation with the deceleration stop command (5h), or an immediate stop input or deceleration stop input, which are external input signals. Each of these stop input signals must be allocated in advance to general-purpose inputs signals. Note that, if the operation is stopped by an external input signal, the block operation itself is also finished.

The operation moves to the next block after the JOG operation is started. Be sure to avoid endless looping with no means of stopping it by combining conditional branching commands (Ah, Bh, Ch) and the deceleration stop command (5h).

| | Block operation control parameter (48 bit) | | | | | | | |
|--------------|--|--------------------|---------------------|---------------------|------------------|-----------------------|---------------|--|
| Command name | Block operation command | | | | | | | |
| | Command code | Argument 1 | Argument 2 | Argument 3 | Argument 4 | Argument 5 | Argument 6 | |
| | 4 bit | 4 bit | 2 bit | 2 bit | 2 bit | 2 bit | 32 bit | |
| JOG | 3h | Velocity number | Acceleration number | Deceleration number | JOG direction | Block jump conditions | _ | |



| Cor | nmand argument | Setting range | Content |
|-----|--|---------------|---|
| 1 | Velocity number | 0 to 7 | Set selection number x for block operation velocity [x]. |
| 2 | Acceleration number | 0 to 3 | Set selection number y for block operation acceleration [y]. |
| 3 | Deceleration number | 0 to 3 | Set selection number z for block operation deceleration [z]. |
| 4 | JOG direction | 0, 1 | 0: Forward direction 1: Reverse direction |
| 5 | Block jump conditions ^{*1} | 0 to 3 | Set the block jump conditions after this command is executed. [LSB] 0, 1: Jump to the next block after the operation is started. [MSB] 0: End the block operation at the current block. 1: Continue the block operation. |
| 6 | _ | _ | Set 0. |

*1 For details on the block jump conditions, refer to "3-4 Block Jump Conditions and Finishing" (P.3-25).

| Parameter | Setting range | Unit | Content |
|-------------------------------------|--------------------------------|-------|---|
| Block Operation Velocity [x] | 0 to maximum motor velocity | r/min | Set the velocity. |
| Block Operation Acceleration [y] | 0 to 10000 | ms | Set the acceleration. Set the acceleration time between 0 and 3,000 [r/min]. |
| Block Operation Deceleration [z] | 0 to 10000 | ms | Set the deceleration. Set the deceleration time between 3,000 and 0 [r/min]. |

Origin Search (04h)

- This is used when performing origin search.
- Origin search must be performed when an incremental encoder is used.
- Even when an incremental encoder is used, origin search can still be omitted by setting [Origin search disable selection] (Pn722) to 1. In this case, the position at which the power supply is turned ON will be set as the origin.
- If origin search is executed when an absolute encoder is used, the origin search error (alarm 94.2) will occur.

| | Block operation control parameter (48 bit) | | | | | | |
|---------------|--|---------------------|---------------------|---------------------|-------------------------------|-----------------------|---------------|
| Command name | Block operation command | | | | | | |
| | Command code | Argument 1 | Argument 2 | Argument 3 | Argument 4 | Argument 5 | Argument 6 |
| | 4 bit | 4 bit | 2 bit | 2 bit | 2 bit | 2 bit | 32 bit |
| Origin Search | 4h | Detection method | Acceleration number | Deceleration number | Origin search direction | Block jump conditions | _ |

| Cor | nmand argument | Setting range | Content |
|-----|--|---------------|--|
| 1 | Detection method | 0, 1 | Set the detection method of origin position. 0: Origin proximity input (HOME) posterior end base + phase Z 1: Latch input 1 (EXT1) forward end base |
| 2 | Acceleration number | 0 to 3 | Set selection number y for Block Operation Acceleration [y]. |
| 3 | Deceleration number | 0 to 3 | Set selection number z for Block Operation Deceleration [z]. |
| 4 | Origin search direction | 0, 1 | 0: Forward direction 1: Reverse direction |
| 5 | Block jump conditions ^{*1} | 0 to 3 | Set the block jump conditions after this command is executed. [LSB] 0, 1: Jump to the next block upon origin search completion. [MSB] 0: End the block operation at the current block. 1: Continue the block operation. |
| 6 | - | - | Set 0. |

*1 For details on the block jump conditions, refer to "3-4 Block Jump Conditions and Finishing" (P.3-25).

| Parameter | Setting range | Unit | Content |
|--|--------------------------------|-------|---|
| Origin Search Approach Velocity 1 (H-SPD) | 0 to maximum motor velocity | r/min | Set the high-velocity operation velocity for origin search. |
| Origin Search Approach Velocity 2 (L-SPD) | 0 to maximum motor velocity | r/min | Set the low-velocity operation velocity for origin search. |
| Block Operation Acceleration [y] | 0 to 10000 | ms | Set the acceleration. Set the acceleration time between 0 and 3,000 [r/min]. |
| Block Operation Deceleration [z] | 0 to 10000 | ms | Set the deceleration. Set the deceleration time between 3,000 and 0 [r/min]. |

(Example 1) Detection method 0: Origin proximity input (HOME) posterior end base + phase Z

Example: Origin search direction (forward)



(Example 2) Detection method 1: Latch input 1 (EXT1) forward end base

Example: Origin search direction (forward)



Precautions for Correct Use

- Sequence input signals (SI1 to SI10) must be allocated in advance to origin proximity input (HOME) or latch input 1 (EXT1), and the origin sensor needs to be connected. Set the sensor signal width to 4 ms min.
- To avoid erroneous detections when the detection method is set to 0, set the time between the detection of the posterior end base of the origin proximity input (HOME) and phase Z to 10 ms min.
- If there is any problem with the setup of the origin proximity input, latch input 1 (EXT1) or drive prohibition input (POT/NOT), the origin search error (alarm 94.2) will occur.
- If the drive prohibition input in the origin search direction turns ON during an origin search operation, a reverse operation will be performed with the servo ON regardless of the value set in [Stop Selection for Drive Prohibition Input] (Pn5.05).
- If the drive prohibition input in the origin search direction turns ON, and a drive prohibition input in the direction opposite of the origin search direction turns ON during a reverse operation, the origin search error (alarm 94.2) will occur.
- If the position information with its base at the position where the power supply was turned ON or where the origin search was last completed exceeds the range between C0000001h and 3FFFFFFh even during an origin search operation, the wrap around error (alarm 94.1) will occur.

Deceleration Stop (05h)

This is used when stopping a JOG operation or when forcibly stopping other operations.

| Command name | Block operation control parameter (48 bit) | | | | | | | | | | |
|-------------------|--|-------------------------|---------------|---------------|---------------|-----------------------|---------------|--|--|--|--|
| | | Block operation command | | | | | | | | | |
| | Command code | Argument 1 | Argument 2 | Argument 3 | Argument 4 | Argument 5 | Argument 6 | | | | |
| | 4 bit | 4 bit | 2 bit | 2 bit | 2 bit | 2 bit | 32 bit | | | | |
| Deceleration Stop | 5h | Stop method | - | _ | - | Block jump conditions | - | | | | |



| Command argument | | Setting range | Content |
|------------------|-------------------------------------|---------------|--|
| 1 | Stop method | 0, 1 | Set the deceleration stop method.0: Stop at the deceleration specified when the operation currently in progress was started1: Stop immediately |
| 2 | - | _ | Set 0. |
| 3 | - | _ | Set 0. |
| 4 | - | _ | Set 0. |
| 5 | Block jump conditions ^{*1} | 0 to 3 | Set the block jump conditions after this command is executed. [LSB] 0, 1: Jump to the next block upon deceleration stop completion. ^{*2} [MSB] 0: End the block operation at the current block. 1: Continue the block operation. |
| 6 | - | - | Set 0. |

*1 For details on the block jump conditions, refer to "3-4 Block Jump Conditions and Finishing" (P.3-25).

*2 "Upon deceleration stop" refers to the point where the internal position command generation process is finished. This is not based on when the motor actually stops. Furthermore, note that the movement command will still be output even after the internal position command generation process is finished if the position command filter (FIR, smoothing) is used.

Velocity Update (06h)

This is used when updating the velocity of the operation currently in progress.

While or after the velocity is updated, the operation before this command was executed will be continued.

This is enabled only for a relative or absolute movement operation, or a JOG operation, and the velocity for an origin search operation cannot be updated while it is in progress. Furthermore, the velocity cannot be updated once a deceleration operation starts.

| | Block operation control parameter (48 bit) | | | | | | | | |
|-----------------|--|--------------------|---------------|---------------|------------------|--------------------------|---------------|--|--|
| Command name | Block operation command | | | | | | | | |
| | Command code | Argument 1 | Argument 2 | Argument 3 | Argument 4 | Argument 5 | Argument 6 | | |
| | 4 bit | 4 bit | 2 bit | 2 bit | 2 bit | 2 bit | 32 bit | | |
| Velocity Update | 6h | Velocity number | - | - | JOG direction | Block jump conditions | - | | |

Example: Velocity change during an absolute movement operation (velocity 1 to velocity 2)



Update only the velocity, and stop at the original target position.

| Со | mmand argument | Setting range | Content |
|----|--|---------------|--|
| 1 | Velocity number | 0 to 7 | Select the velocity for the update. Set the selection number x for block operation velocity [x]. |
| 2 | - | - | Set 0. |
| 3 | - | - | Set 0. |
| 4 | JOG direction | 0, 1 | Set the operation direction only for a JOG operation. This setting is disabled for relative or absolute movement operation. 0: Forward direction 1: Reverse direction |
| 5 | Block jump conditions ^{*1} | 0 to 3 | Set the block jump conditions after this command is executed. [LSB] 0: Jump to the next block after the operation is started. 1: The operation moves to the next block after completion of the operation that was started before the velocity update. *2 [MSB] 0: End the block operation at the current block. 1: Continue the block operation. |
| 6 | - | - | Set 0. |

*1 For details on the block jump conditions, refer to "3-4 Block Jump Conditions and Finishing" (P.3-25).

*2 "After completion of the operation" refers to the point where the internal position command generation process is finished. This is not based on when the motor actually stops. Furthermore, note that the movement command will still be output even after the internal position command generation process is finished if the position command filter (FIR, smoothing) is used.

Timer (07h)

This is used to start the timer. The timer is initialized with the set value and decremented by 1ms until the value of 0 is reached.

Refer to the conditional branching commands (Ah, Bh, Ch) for using the timer counter value.

| | | Block operation control parameter (48 bit) | | | | | | | | |
|--------------|-------------------------|--|---------------|---------------|---------------|-----------------------|--|--|--|--|
| Command name | Block operation command | | | | | | | | | |
| | Command code | Argument 1 | Argument 2 | Argument 3 | Argument 4 | Argument 5 | Argument 6 | | | |
| | 4 bit | 4 bit | 2 bit | 2 bit | 2 bit | 2 bit | 32 bit | | | |
| Timer | 7h | - | - | - | _ | Block jump conditions | Timer counter setting value [1ms] | | | |



| Со | mmand argument | Setting range | Content |
|----|--|---------------|---|
| 1 | - | - | Set 0. |
| 2 | - | - | Set 0. |
| 3 | - | - | Set 0. |
| 4 | - | - | Set 0. |
| 5 | Block jump conditions ^{*1} | 0 to 3 | Set the block jump conditions after this command is executed. [LSB] 0: Jump to the next block after the operation is started. 1: The operation moves to the next block after the counter starts and then stops (counter is at 0). The counter can be used as the wait timer to indicate when the next block starts. [MSB] 0: End the block operation at the current block. 1: Continue the block operation. |
| 6 | Timer counter setting value | 0 to 1000000 | Set the initial value of the decrement counter per 1 [ms]. The counter decrements by -1 in cycles of 1 ms from the set value, and stops at 0. The counter value after it is started is used by the conditional branching command. |

*1 For details on the block jump conditions, refer to "3-4 Block Jump Conditions and Finishing" (P.3-25).

Block Operation Output Signal Control (08h)

This is used when operating the output signals.

The block operation output signals (B-CTRL1 to B-CTRL3) need to be allocated in advance to sequence output signals (SO1 to SO4).

| | | Block operation control parameter (48 bit) | | | | | | | | |
|---|--------------|--|---------|---------------|---------------|-----------------------|---------------|--|--|--|
| Command name | | Block operation command | | | | | | | | |
| | Command code | Command Argument code 1 | | Argument 3 | Argument 4 | Argument 5 | Argument 6 | | | |
| | 4 bit | 4 bit | 2 bit | 2 bit | 2 bit | 2 bit | 32 bit | | | |
| Block Operation Output Signal Control | 8h | B-CTRL1 | B-CTRL2 | B-CTRL3 | _ | Block jump conditions | _ | | | |

LSB = 0: OFF (Output photocoupler OFF) 1: ON (Output photocoupler ON)

MSB = 0: No operation (Current value maintained) 1: Operation

| Command argument | | Setting range | Content |
|------------------|--|---------------|---|
| 1 | B-CTRL1 | 0 to 3 | The following operation can be performed when the general-purpose |
| 2 | B-CTRL2 | 0 to 3 | terminal SOn is set to block operation output B-CTRLn. |
| 3 | B-CTRL3 | 0 to 3 | 2: OFF (Output photocoupler OFF) 3: ON (Output photocoupler ON) |
| 4 | - | - | Set 0. |
| 5 | Block jump conditions ^{*1} | 0 to 3 | Set the block jump conditions after this command is executed. [LSB] 0, 1: Jump to the next block after the operation is started. [MSB] 0: End the block operation at the current block. 1: Continue the block operation. |
| 6 | - | _ | Set 0. |

*1 For details on the block jump conditions, refer to "3-4 Block Jump Conditions and Finishing" (P.3-25).

Jump (09h)

This is used when jump to the specified block number.

| | Block operation control parameter (48 bit) | | | | | | | | | |
|--------------|--|---------------|---|-------|--------------------------|---------------|---------------|--|--|--|
| Command name | Block operation command | | | | | | | | | |
| | Command code | Argument 1 | ArgumentArgumentArgument234 | | Argument 4 | Argument 5 | Argument 6 | | | |
| | 4 bit | 4 bit | 2 bit | 2 bit | 2 bit | 2 bit | 32 bit | | | |
| Jump | 9h | - | Block number (destination) Block jump conditions | | Block jump conditions | - | | | | |

| Command argument | | Setting range | Content |
|------------------|--|---------------|---|
| 1 | - | - | Set 0. |
| 2 | | | |
| 3 | Block number | 0 to 31 | Set the destination block number. |
| 4 | | | |
| 5 | Block jump conditions ^{*1} | 0 to 3 | Set the block jump conditions after this command is executed. The block operation moves to the specified block and is continued regardless of this setting. |
| 6 | _ | _ | Set 0. |

*1 For details on the block jump conditions, refer to "3-4 Block Jump Conditions and Finishing" (P.3-25).

Conditional Branching 1 (=) (0Ah)

This is used when jump to the specified block number (destination when Yes) when the specified conditions are met.

| | | Block operation control parameter (48 bit) | | | | | | | | |
|--------------------------------|--|--|---|-------|-----------------------|---|--------|--|--|--|
| Command name | | Block operation command | | | | | | | | |
| | Command codeArgument 1Argument 2Argument 3Argument 4Argument 5 | | | | | Argument 6 | | | | |
| | 4 bit | 4 bit | 2 bit | 2 bit | 2 bit | 2 bit | 32 bit | | | |
| Conditional Branching 1 (=) | Ah | Comparison target | Block number (destination when Yes) Block jump conditions | | Block jump conditions | Comparison value (threshold value) | | | | |

| Con | nmand argument | Setting range | Content | | | | |
|-----|---------------------------------------|---------------------------|---|-------------------|-------|--|--|
| | | | Value | Comparison target | Unit | Note | |
| | | | 0 | Command position | pulse | Command position after filtering | |
| | | | 1 | Current position | pulse | Current position of the motor | |
| | | | 2 | Position error | pulse | Position error (= command position - current position) | |
| 1 | Comparison target | 0 to 15 | 3 | Command velocity | r/min | Command velocity to the motor | |
| | | | 4 | Motor velocity | r/min | Current velocity of the motor | |
| | | | 5 | Command torque | 0.1 % | Command torque to the motor | |
| | | | 6 | Timer counter | - | Counter value | |
| | | | 7 | Input signals | _ | Input signals ^{*1} | |
| | | | 8 | Output signals | - | Output signals *2 | |
| | | | 9 to 15 | (Reserved) | - | Do not use. | |
| 2 | | | Set the destination block number when the specified conditions are met (when Yes). | | | | |
| 3 | Block number | 0 to 31 | | | | | |
| 4 | | | | | | | |
| 5 | Block jump conditions | 0 to 3 | Set the block jump conditions after this command is executed. [LSB] 0: When Yes is indicated after starting, the operation moves to the specified block. When No is indicated, operation moves to the next block. 1: The current block operation is executed until Yes is indicated. When Yes is indicated, the operation moves to the specified block. [MSB] 0: End the block operation at the current block. 1: Continue the block operation. | | | | |
| 6 | Comparison value (threshold value) | 80000000h to 7FFFFFFFh | Set the comparison value (threshold value). The comparison value and unit vary depending on the comparison target. | | | | |

Note. Erroneous judgment may result due to the error in the sampling timing, etc. In such a case, use conditional branching ((>) or (<)).

*1 Comparison target: Input signal (7h)

Jump to the specified block number (destination when Yes) when the conditions of each signal are all met.

| Comparison value (4 byte) | | bit 7 | bit 6 | bit 5 | bit 4 | bit 3 | bit 2 | bit 1 | bit 0 |
|------------------------------|------|-------|-------|-------|-------|-------|-------|-------|-------|
| Function | Byte | | | | | | | | |
| Signal status | LL | SI8 | SI7 | SI6 | SI5 | SI4 | SI3 | SI2 | SI1 |
| Signal status | LH | - | - | - | - | - | - | SI10 | SI9 |
| With or without comparison | HL | SI8 | SI7 | SI6 | SI5 | SI4 | SI3 | SI2 | SI1 |
| | HH | - | - | - | - | - | - | SI10 | SI9 |

Be sure to set the bit (-) used by the manufacturer to 0.

The function of the 4-byte comparison value data is separated by 2 bytes.

- Most significant 2-bytes (HH, HL): Specify whether or not to perform comparison for each bit.
 0: Without comparison
 - 1: With comparison
- Least significant 2 bytes (LH, LL): Specify the value for comparison (physical level signal status) for each bit.
 - 0: Input photocoupler OFF (physical level)
 - 1: Input photocoupler ON (physical level)
- *2 Comparison target: Output signal (8h)
 - Jump to the specified block number (destination when Yes) when the conditions of each signal are all met.

| Comparison value (4 byte) | | bit 7 | bit 6 | bit 5 | bit 4 | bit 3 | bit 2 | bit 1 | bit 0 |
|------------------------------|------|-------|-------|-------|-------|-------|-------|-------|-------|
| Function | Byte | | | | | | | | |
| Signal status | LL | - | VCMP | TLC | ZSP | BKIR | INP | ALM | READY |
| Signal status | LH | - | INP2 | - | WARN2 | WARN1 | - | TGON | - |
| With or without comparison | HL | - | VCMP | TLC | ZSP | BKIR | INP | ALM | READY |
| | HH | - | INP2 | - | WARN2 | WARN1 | - | TGON | - |

Be sure to set the bit (-) used by the manufacturer to 0.

The function of the 4-byte comparison value data is separated by 2 bytes.

- Most significant 2-bytes (HH, HL): Specify whether or not to perform comparison for each bit. 0: Without comparison
 - 1: With comparison
- Least significant 2 bytes (LH, LL): Set the value for comparison (logical level signal status) for each bit.
 - 0: OFF (logical level)
 - 1: ON (logical level)

Conditional Branching 2 (>) (0Bh)

This is used when jump to the specified block number (destination when Yes) when the specified conditions are met.

| | | Block operation control parameter (48 bit) | | | | | | | | |
|--------------------------------|--------------|---|---|---------------|---|-------|--------|--|--|--|
| Command name | | Block operation command | | | | | | | | |
| | Command code | Command codeArgument 1Argument 2Argument 3Argument 4 | | Argument 5 | Argument 6 | | | | | |
| | 4 bit | 4 bit | 2 bit | 2 bit | 2 bit | 2 bit | 32 bit | | | |
| Conditional Branching 2 (>) | Bh | Comparison target | Block number (destination when Yes) Block jump conditions | | Comparison value (threshold value) | | | | | |

| Command argument | | Setting range | Content | | | | | |
|------------------|---------------------------------------|--------------------------|---|-----------------------|------------|--|--|--|
| | | | Value | Comparison target | Unit | Note | | |
| | | 0 to 15 | 0 | Command position | pulse | Command position after filtering | | |
| | | | 1 | 1 Current position | | Current position of the motor | | |
| 1 | Comparison target | | 2 | Position error | pulse | Position error (= command position - current position) | | |
| | | | 3 | Command velocity | r/min | Command velocity to the motor | | |
| | | | 4 | Motor velocity | r/min | Current velocity of the motor | | |
| | | | 5 | Command torque | 0.1 % | Command torque to the motor | | |
| | | | 6 | Timer counter | - | Counter value | | |
| | | | 7 to 15 | (Reserved) | _ | Do not use. | | |
| 2 3 | Block number | 0 to 31 | Set the | destination block num | ber when t | he specified conditions are | | |
| 4 | | | met (wit | en resj. | | | | |
| 5 | Block jump conditions | 0 to 3 | Set the block jump conditions after this command is executed. [LSB] 0: When Yes is indicated after starting, the operation moves to the specified block. When No is indicated, operation moves to the next block. 1: The current block operation is executed until Yes is indicated. When Yes is indicated, the operation moves to the specified block. [MSB] 0: End the block operation at the current block. 1: Continue the block operation. | | | | | |
| 6 | Comparison value (threshold value) | 80000000h to 7FFFFFFh | Set the comparison value (threshold value). The comparison value and unit vary depending on the comparison target. | | | | | |

Conditional Branching 3 (<) (0Ch)

This is used when jump to the specified block number (destination when Yes) when the specified conditions are met.

| | Block operation control parameter (48 bit) | | | | | | | | |
|--------------------------------|--|----------------------|---|---------------|---|---------------|---------------|--|--|
| Command name | Block operation command | | | | | | | | |
| | Command code | Argument 1 | Argument 2 | Argument 3 | Argument 4 | Argument 5 | Argument 6 | | |
| | 4 bit | 4 bit | 2 bit | 2 bit | 2 bit | 2 bit | 32 bit | | |
| Conditional Branching 3 (<) | Ch | Comparison target | Block number (destination when Yes) Block jump conditions | | Comparison value (threshold value) | | | | |

| Cor | nmand argument | Setting range | Content | | | | | |
|-------------|---------------------------------------|--------------------------|---|---|------------|--|--|--|
| | | | Value | Comparison target | Unit | Note | | |
| | | | 0 | Command position | pulse | Command position after filtering | | |
| | | | 1 | Current position | pulse | Current position of the motor | | |
| 1 | Comparison target | 0 to 15 | 2 | Position error | pulse | Position error (= command position - current position) | | |
| | | | 3 | Command velocity | r/min | Command velocity to the motor | | |
| | | | 4 | Motor velocity | r/min | Current velocity of the motor | | |
| | | | 5 | Command torque | 0.1 % | Command torque to the motor | | |
| | | | 6 | Timer counter | - | Counter value | | |
| | | | 7 to 15 | (Reserved) | - | Do not use. | | |
| 2 3 4 | Block number | 0 to 31 | Set the met (wh | destination block num en Yes). | ber when t | he specified conditions are | | |
| 5 | Block jump conditions | 0 to 3 | Set the block jump conditions after this command is executed. [LSB] 0: When Yes is indicated after starting, the operation moves to the specified block. When No is indicated, operation moves to the next block. 1: The current block operation is executed until Yes is indicated. When Yes is indicated, the operation moves to the specified block. [MSB] 0: End the block operation at the current block. 1: Continue the block operation. | | | | | |
| 6 | Comparison value (threshold value) | 80000000h to 7FFFFFFh | Set the The con target. | Set the comparison value (threshold value). The comparison value and unit vary depending on the comparison target. | | | | |

3-4 Block Jump Conditions and Finishing

Block Jump Conditions

Up to 32 blocks can be set, and therefore, the block setup (block programming) needs to be configured efficiently so that complex operations can be performed. Block programming can be streamlined with an effective utilization of block jump conditions.

Block jump conditions are set based on argument 5 (block jump condition) of each command, and the most significant bit (MSB) and least significant bit (LSB) functions can be categorized as follows.

LSB: Set a condition to jump to the block when set to continue block operation (MSB = 1). ^{*1} 0: Move to the specified block after the applicable block processing is started. ^{*2} 1: Move to the specified block after the applicable block processing is completed. ^{*2} MSB: Specify whether to finish or continue the block operation at the current block. 0: Finish the block operation when the current block processing is finished. 1: Continue the block operation even after the current block processing is finished.

- *1 When this is set to finish the block operation (MSB = 0), the least significant bit (LSB) setting will be disabled, and the block operation will be finished after the applicable block processing is completed.
- *2 The least significant bit (LSB) function varies depending on the command. The above illustrates the basic functions. With the jump command (9h), for example, the operation moves to the block specified after it was started regardless of the set value. For details, refer to the description of each command.

Finishing the Block Operation

A block operation finishes when the block processing for which the block jump condition MSB is set to 0 is finished.

As soon as the block operation is finished, the block operation status output is set to 0. However, if an operation command (Relative or Absolute Movement, JOG, or Origin Search) is executed prior to the applicable block, and that operation has not been completed, the block operation will not be finished until the operation is completed ^{*1}, and the block operation status output (B-BUSY) will remain at 1.

Note, in particular, that a JOG operation will continue until the deceleration stop command (5h) is executed.

*1 "Operation is completed" refers to the point where the internal position command generation process is finished. This is not based on when the motor actually stops. Furthermore, note that the movement command will still be output even after the internal position command generation process is finished if the position command filter (FIR, smoothing) is used.

Note that, as exceptions, the block operation will be automatically finished in the following situations.

- When an external stop input (immediate or deceleration stop) is entered.
- When the servo turns OFF (including when the servo turns OFF as a result of an alarm or drive prohibition input).

4

Block Operation Example

This chapter provides a block operation setting example in the following operation sequence.

| 4-1 | Installation Conditions4-1 |
|-----|----------------------------|
| | Operation Sequence |
| | Parameter Settings |

4-1 Installation Conditions

Operation Sequence

- 1-1. Set the block operation output 1 (B-CTRL1) to OFF.
- 1-2. Latch input 1 (EXT1) is used as the origin signal, and origin search is started in the forward direction.(Acceleration number 1 and deceleration number 1 are used.)
- 1-3. After the origin search is completed, block general-purpose output 1 (B-CTRL1) is turned ON and block operation output 2 (B-CTRL2) is turned OFF, and the block operation is finished.
- 2-1. Absolute movement is performed to the 100000th pulse.(Velocity number 1, acceleration number 2 and deceleration number 2 are used.)
- 2-2. After moving to the 30000th pulse, the velocity is updated to velocity number 2.
- 2-3. After moving to the 100000th pulse, block operation output 2 (B-CTRL2) is turned ON and the block operation is finished.

Parameter Settings

Block Number 0

Pn800 = 8202h, Pn801 = 0000000h

| Block operat | ion command / data | Value | Content |
|---------------------|-----------------------|-------|---|
| Command Code (4bit) | | 8h | Block Operation Output Signal Control |
| Argument 1 (4bit) | B-CTRL1 | 2 | OFF |
| Argument 2 (2bit) | B-CTRL2 | 0 | Current value maintained |
| Argument 3 (2bit) | B-CTRL3 | 0 | Current value maintained |
| Argument 4 (2bit) | - | 0 | - |
| Argument 5 (2bit) | Block jump conditions | 2 | Operation moves after starting and block operation continues. |
| Argument 6 (32bit) | - | 0 | - |

Block Number 1

• Pn802 = 4153h, Pn803 = 0000000h

| Block operation command / data | | Value | Content |
|--------------------------------|-------------------------|-------|---|
| Command Code (4bit) | | 4h | Origin Search |
| Argument 1 (4bit) | Detection method | 1 | Latch input 1 (EXT1) forward end base |
| Argument 2 (2bit) | Acceleration number | 1 | Use Block Operation Acceleration [1] (= Pn709) |
| Argument 3 (2bit) | Deceleration number | 1 | Use Block Operation Deceleration [1] (= Pn713) |
| Argument 4 (2bit) | Origin search direction | 0 | Forward direction |
| Argument 5 (2bit) | Block jump conditions | 3 | Operation moves after starting and block operation continues. |
| Argument 6 (32bit) | - | 0 | - |

Block Number 2

• Pn804 = 8380h, Pn805 = 0000000h

| Block operat | ion command / data | Value | Content |
|---------------------|-----------------------|-------|--|
| Command Code (4bit) | | 8h | Block Operation Output Signal Control |
| Argument 1 (4bit) | B-CTRL1 | 3 | ON |
| Argument 2 (2bit) | B-CTRL2 | 2 | OFF |
| Argument 3 (2bit) | B-CTRL3 | 0 | Current value maintained |
| Argument 4 (2bit) | - | 0 | - |
| Argument 5 (2bit) | Block jump conditions | 0 | End the block operation at the current block |
| Argument 6 (32bit) | - | 0 | - |

Block Number 3

• Pn806 = 21A2h, Pn807 = 000186A0h (100000)

| Block operat | ion command / data | Value | Content |
|---------------------|----------------------------------|--------|---|
| Command Code (4bit) | | 2h | Absolute Movement |
| Argument 1 (4bit) | Velocity number | 1 | Use Block Operation Velocity [1] (= Pn701) |
| Argument 2 (2bit) | Acceleration number | 2 | Use Block Operation Acceleration [2] (= Pn710) |
| Argument 3 (2bit) | Deceleration number | 2 | Use Block Operation Deceleration [2] (= Pn714) |
| Argument 4 (2bit) | - | 0 | - |
| Argument 5 (2bit) | Block jump conditions | 2 | Operation moves after starting and block operation continues. |
| Argument 6 (32bit) | Target absolute position [pulse] | 100000 | Travel is performed to the 100,000th pulse |

Block Number 4

• Pn808 = B017h, Pn809 = 00007530h (30000)

| Block operat | ion command / data | Value | Content | |
|---------------------|------------------------|-------|--|--|
| Command Code (4bit) | | Bh | Conditional Branching 2 (>) | |
| Argument 1 (4bit) | Comparison target | 0 | Set a Command position for the comparison target | |
| Argument 2 (2bit) | Die els asseste en | | | |
| Argument 3 (2bit) | (destination when Yes) | 5 | conditions are met | |
| Argument 4 (2bit) | (, | | | |
| Argument 5 (2bit) | Block jump conditions | 3 | Start the current block until conditions are met. After conditions are met, operation moves to the specified block and block operation continues. | |
| Argument 6 (32bit) | Comparison value | 30000 | Set the 30,000th pulse for the comparison value | |

Block Number 5

• Pn810 = 6203h, Pn811 = 0000000h

| Block operat | ion command / data | value | Content |
|--------------------|-----------------------|-------|---|
| Command Code (4b | oit) | 6h | Velocity Update |
| Argument 1 (4bit) | Velocity number | 2 | Use Block Operation Velocity [2] (= Pn702) |
| Argument 2 (2bit) | - | 0 | - |
| Argument 3 (2bit) | - | 0 | - |
| Argument 4 (2bit) | JOG direction | 0 | This cannot be used in velocity updates during absolute movement. |
| Argument 5 (2bit) | Block jump conditions | 3 | Operation moves after starting and block operation continues. |
| Argument 6 (32bit) | - | 0 | - |

Block Number 6

• Pn812 = 80C0h, Pn813 = 0000000h

| Block operat | ion command / data | Value | Content |
|--------------------|-----------------------|-------|--|
| Command Code (4b | pit) | 8h | Block Operation Output Signal Control |
| Argument 1 (4bit) | B-CTRL1 | 0 | Current value maintained |
| Argument 2 (2bit) | B-CTRL2 | 3 | ON |
| Argument 3 (2bit) | B-CTRL3 | 0 | Current value maintained |
| Argument 4 (2bit) | - | 0 | - |
| Argument 5 (2bit) | Block jump conditions | 0 | End the block operation at the current block |
| Argument 6 (32bit) | - | 0 | - |



 $^{\star1}\,$ Leave at least 10 ms between a B-SELn input and an STB input.

5

Error Diagnosis and Remedies

This chapter explains the error diagnosis and remedies.

| 5-1 | Error Processing | 5-1 |
|------------|---|-----------------------------------|
| | Preliminary Checks When a Problem Occurs | 5-1 |
| | Precautions When a Problem Occurs | 5-2 |
| | Replacing the Servomotor or Servo Drive | 5-3 |
| 5-2 | Warning List | 5-4 |
| | 5 | |
| 5-3 | Alarm List | 5-5 |
| 5-3 5-4 | Alarm List Troubleshooting | 5-5 5-11 |
| 5-3 5-4 | Alarm List Troubleshooting Error Diagnosis Using the Alarm Displays | 5-5 5-11 5-11 |

Error Processing 5-1

Preliminary Checks When a Problem Occurs

This section explains the preliminary checks and analytical software required to determine the cause of a problem if one occurs.

Checking the Power Supply Voltage

Check the voltage at the power supply input terminals.

| oncon and vonag | o at the ponor oupping | input torrinialo. |
|--------------------|------------------------|---|
| Main Circuit Pow | er Supply Input Term | inals (L1, L2, L3) |
| R88D-KT□L | (50 to 400 W) | : Single-phase 100 to 120 VAC (85 to 132 V) 50/60 Hz |
| R88D-KT⊟H | (100 W to 1.5 kW) | : Single-phase 200 to 240 VAC (170 to 264 V) 50/60 Hz |
| | (750 W to 1.5 kW) | : 3-phase 200 to 240 VAC (170 to 264 V) 50/60 Hz |
| | (2 to 15 kW) | : 3-phase 200 to 230 VAC (170 to 253 V) 50/60 Hz |
| R88D-KT⊡F | (750 W to 15 kW) | : 3-phase 380 to 480 VAC (323 to 528 V) 50/60 Hz |
| Control Circuit Po | ower Supply Input Te | rminals (L1C, L2C) |

Supply

| R88D-KT⊡L | (50 to 400 W) | : Single-phase 100 to 120 VAC (85 to 132 V) 50/60 Hz |
|-----------|-------------------|---|
| R88D-KT⊟H | (100 W to 1.5 kW) | : Single-phase 200 to 240 VAC (170 to 264 V) 50/60 Hz |
| | (2 to 15 kW) | : Single-phase 200 to 230 VAC (170 to 253 V) 50/60 Hz |
| R88D-KT⊡F | (750 W to 15 kW) | : 24 VDC (21.6 to 26.4 V) |
| | | |

If the voltage is out of range, there is a risk of operation failure. Be sure that the power supply is within the specified range.

 Check the voltage of the sequence input power supply (+24 VIN terminal (CN1 pin 7)). It must be between 11 and 25 VDC.

If the voltage is out of range, there is a risk of operation failure. Be sure that the power supply is within the specified range.

Checking Whether an Alarm Has Occurred

- Make an analysis using the 7-segment LED display area in the front of the Servo Drive and using the Operation keys.
- · When an alarm has occurred

... Check the alarm display that is displayed $(\Box \Box)$ and make an analysis based on the alarm that is indicated.

- · When an alarm has not occurred
 - ... Make an analysis according to the error conditions.
- In either case, refer to "5-4 Troubleshooting" (P.5-11) for details.

Precautions When a Problem Occurs

When checking and verifying I/O after a problem has occurred, the Servo Drive may suddenly start to operate or suddenly stop, so always take the following precautions.

You should assume that anything not described in this manual is not possible with this product.

Precautions

- Disconnect the wiring before checking for cable breakage. If you test conduction with the cable connected, test results may not be accurate due to conduction via bypassing circuit.
- If the encoder signal is lost, the motor may run away, or an alarm may occur. Be sure to disconnect the motor from the mechanical system before checking the encoder signal.
- When measuring the encoder output, perform the measurement based on the SENGND (CN1 pin 13).

When an oscilloscope is used for measurement, it will not be affected by noise if measurements are performed using the differential between CH1 and CH2.

• When performing tests, first check that there are no persons in the vicinity of the equipment, and that the equipment will not be damaged even if the motor runs away.

Before performing the tests, verify that you can immediately stop the machine using an emergency stop even if it runs away.

Replacing the Servomotor or Servo Drive

Use the following procedure to replace the Servomotor or Servo Drive.

Replacing the Servomotor

1. Replace the motor.

2. Perform origin adjustment (for position control).

- When the motor is replaced, the motor's origin position (phase Z) may deviate, so origin adjustment must be performed.
- Refer to "Command Details"(P.3-6) for details on performing origin adjustment.

3. Set up the absolute encoder.

- If a motor with an absolute encoder is used, the absolute value data in the absolute encoder is cleared when the motor is replaced, so setup is again required.
 The multi-rotation data will be different from before it was replaced, so initialize the Motion Control Unit settings.
- For details, refer to R88M-Kx/R88D-KTx AC Servomotors/Servo Drives User's Manual (I571).

Replacing the Servo Drive

1. Copy the parameters.

Use the Operation keys on the Servo Drive to write down all the contents of parameter settings.

2. Replace the Servo Drive.

3. Set the parameters.

Use the Operation keys on the Servo Drive to set all the parameters.

4. Set up the absolute encoder.

- If a motor with an absolute encoder is used, the absolute value data in the absolute encoder is cleared when the Servo Drive is replaced, so setup is again required.
 The multi-rotation data will be different from before it was replaced, so initialize the Motion Control Unit settings.
- For details, refer to R88M-Kx/R88D-KTx AC Servomotors/Servo Drives User's Manual (I571).

5-2 Warning List

This is a function to output a warning signal before the protective function operates to notify the overload and other statuses in advance. Set the warning output type to Warning Output Selection 1 (Pn440) and Waning Output Selection 2 (Pn441).

Precautions for Correct Use

• Each warning automatically returns to the status before it occurred once the system recovers from the error. However, for the time set in the Warning Latch Hold Time Selection (Pn627), the warning status will be held. To clear the warning during the latch hold time, do so by performing the same procedures as alarm clear.

Warning List

| Warning number | Warning name | Latch ^{*1} | Warning condition | Warning Output Selection (Pn440, Pn441) ^{*2} | Warning Mask Setting (Pn638) |
|-------------------|---|---------------------------------------|--|--|---------------------------------|
| A0 | Overload warning | \checkmark | The load ratio is 85% or more of the protection level. | 1 | bit 7 |
| A1 | Excessive regeneration warning | \checkmark | The regeneration load ratio is 85% or more of the protection level. | 2 | bit 5 |
| A2 | Battery warning | Always fixed with no time limit | Battery voltage is 3.2 V or less. | 3 | bit 0 |
| A3 | Fan warning | \checkmark | The fan stops for 1 second. | 4 | bit 6 |
| A4 | Encoder communications warning | \checkmark | Encoder communications errors occurred in series more than the specified value. | 5 | bit 4 |
| A5 | Encoder overheating warning | V | The encoder temperature exceeded the specified value. | 6 | bit 3 |
| A6 | Vibration detection warning | | Vibration is detected. | 7 | bit 9 |
| A7 | Life expectancy warning | Always fixed with no time limit | The life expectancy of the capacitor or the fan is shorter than the specified value. | 8 | bit 2 |
| A8 | External encoder error warning | \checkmark | The external encoder detected a warning. | 9 | bit 8 |
| A9 | External encoder communications warning | 1 | The external encoder has more communications errors in series than the specified value. | 10 | bit 10 |

*1. The "√" fields can be set to 1 to 10 s in the Warning Latch Hold Time Selection (Pn627) or to the notime limit setting. However, the battery warning is fixed with no time limit.

*2. Select the type of warning to be output in warning output 1 (WARN1) and warning output 2 (WARN2) in the Warning Output Selection 1 (Pn440) and Warning Output Selection 2 (Pn441). If you set this to 0, all warning types will be output. Do not set it to a value other than above.

*3. Each warning detection can be masked using the Warning Mask Setting (Pn638). The corresponding bits are shown in the table.

The warning detection is masked when the bit = 1.

5-3 Alarm List

If the drive detects an error, the alarm output (ALM) will turn ON, the power drive circuit in the drive will turn OFF, and the alarm code will be displayed.

Precautions for Correct Use

- Refer to "Error Diagnosis Using the Alarm Displays" (P.5-11) for appropriate alarm measures.
- Reset the alarm using one of the following methods. Remove the cause of the alarm first.
 - · Input the alarm reset input (RESET) signal.
 - \cdot Turn OFF the power supply, then turn it ON again.
 - \cdot Execute the alarm reset on CX-Drive.

However, some alarms can only be reset by turning the power supply OFF then ON again. Refer to the next item "Alarm List".

 If you reset an alarm while the operation command (RUN) is turned ON, the Servo Drive will start operation as soon as the alarm is released, which is dangerous. Be sure to turn OFF the RUN before clearing the alarm.

If the RUN is always ON, first check safety sufficiently before clearing the alarm.

Alarm List

| Alarm number | | Error detection function | Detection details and probable | Attribute | | |
|-----------------|-----|---|--|--|-------------------|----------------------|
| Main | Sub | | cause | History | Can be cleared | Immediate stop *1 |
| 11 | 0 | Control power supply undervoltage | The DC voltage of the main circuit fell below the specified value. | - | \checkmark | - |
| 12 | 0 | Overvoltage | The DC voltage in the main circuit is abnormally high. | \checkmark | \checkmark | - |
| 13 | 0 | Main power supply undervoltage (Insufficient voltage between P and N) | The DC voltage of the main circuit is low. | _ | \checkmark | - |
| 15 | 1 | Main power supply undervoltage (AC cut-off detection) | A location was detected where the main circuit AC power supply is cut off. | _ | \checkmark | - |
| 1/ | 0 | Overcurrent | Overcurrent flowed to the IGBT. | f $f $ f | _ | |
| 14 | 1 | IPM error | Motor power line ground fault or short circuit. | \checkmark | - | _ |
| 15 | 0 | Servo Drive overheat | The temperature of the Servo Drive radiator exceeded the specified value. | | _ | |
| 16 | 0 | Overload | Operation was performed with torque significantly exceeding the rating for several seconds to several tens of seconds. | | \checkmark | _ |
| 18 | 0 | Regeneration overload | The regenerative energy exceeds the processing capacity of the Regeneration Resistor. | | _ | |
| | 1 | Regeneration Tr error | An error was detected in a Servo Drive regeneration drive Tr. | | - | - |
| 01 | 0 | Encoder communications disconnection error | The encoder wiring is disconnected. | \checkmark | - | - |
| 21 | 1 | Encoder communications error | An encoder communications error was detected. | | - | - |
| 23 | 0 | Encoder communications data error | Communications cannot be performed between the encoder and the Servo Drive. | | _ | - |
| | 0 | Error counter overflow | The error counter accumulated pulse exceeds the set value for the Error Counter Overflow Level (Pn014). | | \checkmark | |
| 24 | 1 | Excessive speed error | The difference between the internal position command speed and the actual speed (i.e., the speed error) exceeded the Excessive Speed Error Setting (Pn602). | | \checkmark | \checkmark |
| 25 | 0 | Excessive hybrid error | During fully-closed control, difference between position of load from external encoder and position of motor due to encoder was larger than the pulse number set by Excessive Hybrid Error Setting (Pn332). | V | _ | V |

| Alarm number | | Envoy detection from the | Detection details and probable | Attribute | | |
|-----------------|-----|--|--|--------------|-------------------|----------------------|
| Main | Sub | Error detection function | cause | History | Can be cleared | Immediate stop *1 |
| 26 | 0 | Overspeed | The motor rotation speed exceeded the value set on the Overspeed Level set (Pn513). | \checkmark | \checkmark | \checkmark |
| 20 | 1 | Overspeed 2 | The motor rotation speed exceeded the value set on the Overspeed Level set 2 (Pn615). | | \checkmark | - |
| | 0 | Command pulse frequency error | A command pulse frequency error was detected. | | \checkmark | \checkmark |
| 27 | 1 | Absolute value cleared | The multi-rotation counter for the absolute encoder was cleared by the CX-Drive. | \checkmark | - | _ |
| | 2 | Command pulse multiplier error | The command pulse divider or multiplier is not suitable. | | \checkmark | \checkmark |
| | 4 | Command error | The position command variation is higher than the specified value. | | _ | _ |
| 28 | 0 | Pulse regeneration error | The pulse regeneration output frequency exceeded the limit. | | \checkmark | \checkmark |
| | 0 | Error counter overflow | Error counter value based on the encoder pulse reference exceeded 2 ²⁹ (536,870,912). | | \checkmark | _ |
| 29 | 2 | Error counter overflow 2 | The position error in pulses exceeded the specified value. Alternatively, the position error in command units exceeded the specified value. | | _ | - |
| 30 (st) | 0 | Safety input error | Safety input signal turned OFF. | - | \checkmark | - |
| | 0 | Interface input duplicate allocation error 1 | A duplicate setting for the interface input signals was detected. | | _ | _ |
| | 1 | Interface input duplicate allocation error 2 | | \checkmark | _ | - |
| | 2 | Interface input function number error 1 | An undefined number was detected in the interface input signal allocations. | \checkmark | _ | _ |
| | 3 | Interface input function number error 2 | | \checkmark | _ | - |
| 33 | 4 | Interface output function number error 1 | An undefined number was detected in the interface output signal allocations. | | - | - |
| | 5 | Interface output function number error 2 | | | - | _ |
| | 6 | Counter reset allocation error | The counter reset function was allocated to something other than input signal SI7. | | _ | _ |
| | 7 | Command pulse prohibition input allocation error | The command pulse prohibition input function was allocated to something other than input signal SI10. | | _ | _ |
| | 8 | Latch input 1 allocation error | Latch input 1 was allocated to a signal other than input signal SI4, or with contact NC. | \checkmark | - | _ |
| 34 | 0 | Overrun limit error | The motor exceeded the allowable operating range set in the Overrun Limit Setting (Pn514) with respect to the position command input. | | | _ |

| Alarm number | | Error detection function | Detection details and probable | Attribute | | |
|-----------------|-----------|--|--|--------------|-------------------|----------------------|
| Main | Sub | Error detection function | cause | History | Can be cleared | Immediate stop *1 |
| 36 | 0 to 2 | Parameter error | Data in the Parameter Save area was corrupted when the power supply was turned ON and data was read from the EEPROM. | - | _ | _ |
| 37 | 0 to 2 | Parameters destruction | The checksum for the data read from the EEPROM when the power supply was turned ON does not match. | _ | _ | _ |
| 38 | 0 | Drive prohibition input error | The forward drive prohibition and reverse drive prohibition inputs are both turned OFF. | _ | \checkmark | _ |
| | 0 | Excessive analog input 1 | A current exceeding the Speed Command/Torque Command Input | | \checkmark | \checkmark |
| 39 | 1 | Excessive analog input 2 | overflow Level Setting (Pn424, Pn427 or Pn430) was applied to the analog command input (pin 14). | \checkmark | \checkmark | \checkmark |
| | 2 | Excessive analog input 3 | ommand input (pin 14). | \checkmark | \checkmark | \checkmark |
| 40 | 0 | Absolute encoder system down error ABS | The voltage supplied to the absolute encoder is lower than the specified value. | | \checkmark | _ |
| 41 | 0 | Absolute encoder counter overflow error ABS | The multi-rotation counter of the absolute encoder exceeds the specified value. | | _ | _ |
| 42 | 0 | Absolute encoder overspeed error ABS | The motor rotation speed exceeds the specified value when only the battery power supply of the absolute encoder is used. | | \checkmark | _ |
| 43 | 0 | Encoder initialization error | An encoder initialization error was detected. | \checkmark | _ | - |
| 44 | 0 | Absolute encoder 1- rotation counter error ABS | A 1-turn counter error was detected. | \checkmark | _ | _ |
| 45 | 0 | Absolute encoder multi- rotation counter error ABS | A multi-rotation counter error or phase-AB signal error was detected. | \checkmark | _ | - |
| 47 | 0 | Absolute encoder status error ABS | The rotation of the absolute encoder is higher than the specified value. | | - | _ |
| 48 | 0 | Encoder phase-Z error | A serial incremental encoder phase Z pulse irregularity was detected. | | - | - |
| 49 | 0 | Encoder CS signal error | A logic error was detected in the CS signal for serial incremental encoder. | | _ | _ |
| 50 | 0 | External encoder connection error | An error was detected in external encoder connection. | | - | - |
| 50 | 1 | External encoder communications data error | An error was detected in external encoder communications data. | \checkmark | - | _ |

| Ala nun | arm nber | Error detection function | Detection details and probable | Attribute | | |
|----------------------|-------------|---|---|--------------|-------------------|----------------------|
| Main | Sub | | cause | History | Can be cleared | Immediate stop *1 |
| | 0 | External encoder status error 0 | An external encoder alarm code was detected. | \checkmark | - | - |
| | 1 | External encoder status error 1 | | \checkmark | - | - |
| 51 | 2 | External encoder status error 2 | | \checkmark | _ | - |
| 51 | 3 | External encoder status error 3 | | \checkmark | _ | - |
| | 4 | External encoder status error 4 | | \checkmark | _ | - |
| | 5 | External encoder status error 5 | | \checkmark | _ | - |
| | 0 | Phase-A connection error | An error was detected in the external encoder phase A connection. | \checkmark | _ | - |
| 55 | 1 | Phase-B connection error | An error was detected in the external encoder phase B connection. | \checkmark | _ | - |
| | 2 | Phase-Z connection error | An error was detected in the external encoder phase Z connection. | \checkmark | _ | - |
| 87 | 0 | Forced alarm input error | The forced alarm input signal was input. | _ | \checkmark | - |
| 00 | 0 | Encoder data restoration Error | Initialization of internal position data was not processed correctly in semi- closed control mode and absolute value mode. | | _ | _ |
| 55 87 92 93 | 1 | External encoder data restoration error | Initialization of internal position data was not processed correctly in fully- closed control mode and absolute value mode. | \checkmark | _ | _ |
| 93 | 1 | Block operation data setting error | A setting error was detected in the block operation setting data and block operation control data. | | \checkmark | _ |
| | 2 | Parameter setting error 2 | External encoder ratio exceeded the allowable range. | \checkmark | - | - |
| | 0 | Block operation error | A block operation was started during a block operation or while the servo was OFF. | \checkmark | \checkmark | _ |
| | 1 | Wrap around error | The position command value or the current position exceeds the C0000001h and 3FFFFFFFh range. | \checkmark | - | - |
| 94 | 2 | Origin search error | Drive prohibition input turned ON during an origin search operation, and a reverse direction drive prohibition input turned ON during a reverse operation. Origin search was executed when an absolute encoder is used. Relative or absolute travel was executed when origin search has not been completed. | \checkmark | \checkmark | - |
| Alarm number | | Error detection function | Detection details and probable | Attribute | | |
|-----------------|-----------|--------------------------|---|-----------|-------------------|----------------------|
| Main | Sub | | cause | History | Can be cleared | Immediate stop *1 |
| 95 | 0 to 4 | Motor non-conformity | The combination of the Servomotor and Servo Drive is not appropriate. The encoder was not connected when the power supply was turned ON. | _ | _ | _ |
| Other numbe | ers | Other errors | | | | |

*1. An immediate stop means an alarm causing an immediate stop when the Pn510 "Stop Selection for Alarm Detection" is set to 4 to 7.

If an error occurs in the machine, determine the error conditions from the alarm displays and operation status, identify the cause of the error, and take appropriate measures.

Error Diagnosis Using the Alarm Displays

| Alarm number | Error conditions | Status when error occurs | Cause | Measures | |
|-----------------|---|--|--|---|---|
| | Power supply | Occurs when the power | The power supply voltage is low. Momentary power interruption occurred. Power supply capacity is insufficient. The power supply voltage is reduced because the main power supply is OFF. The main power supply is not input. | MeasuresIncrease the power supply capacity. Change the power supply. Turn ON the power supply.Increase the power supply.Increase the power supply capacity.Connect the phases (L1, L2, L3) of the power supply voltage correctly. For single-phase, connect to L1 and L3 correctly.Replace the Servo Drive.Change the main circuit power supply voltage to within allowable range.Calculate the regenerative energy and connect an External Regeneration Resistor with the required regeneration absorption capacity. Extend the deceleration time.Change the main circuit power supply voltage to within allowable range.Add a counterbalance to the machine to lower | |
| 11 | undervoltage | is turned ON. | Power supply capacity is insufficient. | Increase the power supply capacity. | |
| | | | Phase loss | Image: Second stateMeasuresoly.ver.urredapacity.voltage.e the.y is OFF.rsupplyapacity.Increase the power supply.apacity.Increase the power supply.apacity.Increase the power supply.apacity.Increase the power supply capacity.apacityConnect the phases (L1, L2, L3) of the power supply voltage correctly | |
| | | | The main circuit power supply is damaged. Control PCB error. | Replace the Servo Drive. | |
| 12 | Occurs when the power supply is turned ON. | Occurs when the power supply is turned ON. | Main circuit power supply voltage is out of allowable range. | Change the main circuit power supply voltage to within allowable range. | |
| | | Load inertia is too large. | Calculate the regenerative energy and connect an External Regeneration Resistor with the required regeneration absorption capacity. Extend the deceleration time. | | |
| | 12 | Overvoltage | | Main circuit power supply voltage is out of allowable range. | Change the main circuit power supply voltage to within allowable range. |
| | | Occurs during descent (vertical axis). | Gravitational torque is too large. | Add a counterbalance to the machine to lower gravitational torque. Reduce the descent speed. Calculate the regenerative energy and connect an External Regeneration Resistor with the required regeneration absorption capacity. | |

| Alarm number | Error conditions | Status when error occurs | Cause | Measures |
|-----------------|---|--|---|--|
| 13 | Main circuit power supply undervoltage | Occurs when the servo is turned ON. | The power supply voltage is low. Momentary power interruption occurred. Power supply capacity is insufficient. The power supply voltage is reduced because the main power supply is OFF. The main power supply is not input. | Measures Check the power supply, capacity. Change the power supply. Turn ON the power supply. Extend the Momentary Hold Time (Pn509). Correctly connect the phases of the power supply voltage. Correctly connect the single-phase. Replace the Servo Drive. Replace the Servo Drive. Replace the Servo Drive. Measure the insulation resistance at the motor and, if there is a short circuit, replace the motor. Wire correctly. Measure the winding resistance, and if the winding is burned out, replace the motor. Do not frequently input the operation command (RUN) input. Do not operate the system by turning the servo ON and OFF. Use a Servomotor that is appropriate for use with the Servo Drive. |
| | | | · Phase loss | Correctly connect the phases of the power supply voltage. |
| | | Occurs when the power supply is turned ON. | | Check the power supply capacity. Change the power supply. Turn ON the power supply. Extend the Momentary Hold Time (Pn509). Correctly connect the phases of the power supply voltage. Correctly connect the single-phase. Replace the Servo Drive. Replace the Servo Drive. Repair the short-circuited or ground-faulted power line. Measure the insulation resistance at the motor and, if there is a short circuit, replace the motor. Wire correctly. Measure the winding resistance, and if the winding is burned out, replace the motor. Do not frequently input the operation command (RUN) input. Do not operate the system by turning the servo ON and OFF. Use a Servomotor that is appropriate for use with the Servo Drive. |
| | Main circuit power supply undervoltage | | The main circuit power supply is damaged. Control PCB damage. | Replace the Servo Drive. |
| | | | Control PCB error | · Replace the Servo Drive. |
| | | | The motor power line is short-circuited or ground-faulted between phases. | Repair the short-circuited or ground-faulted power line. Measure the insulation resistance at the motor and, if there is a short circuit, replace the motor. |
| | | | Control PCB damage. Control PCB error Replace the Servo Drive. The motor power line is short-circuited or ground-faulted or ground-faulted between phases. Phase U, phase V, phase W, and the ground are wired incorrectly. Measure the motor. Phase U, phase V, phase W, and the ground are wired incorrectly. Motor winding is burned out. Measure the winding resistance, and if the winding is burned out, replace the motor. Measure the winding resistance, and if the winding is burned out, replace the motor. | |
| | | | Motor winding is burned out. | or Measure the insulation resistance at the motor and, if there is a short circuit, replace the motor. V, phase nd are Wire correctly. · Measure the winding resistance, and if the winding is burned out, replace the motor. · Do not frequently input the operation command (RUN) input. |
| 14 | 4 Overcurrent | Occurs when the servo is turned ON. | The relay for the dynamic brake has been deposited. | Do not frequently input the operation command (RUN) input. Do not operate the system by turning the servo ON and OFF. |
| | | | Motor non-conformity | Use a Servomotor that is appropriate for use with the Servo Drive. |
| | Overcurrent Occurs when the servo is turned ON. • The relay for the dynamic brake habeen deposited. • Motor non-conform • Motor non-conform • The pulse input times to early. | The pulse input timing is too early. | Wait at least 100 ms before inputting pulses after turning ON the operation command (RUN). | |
| | | | The resistor in the Servo Drive is abnormally overheating. | Reduce the ambient temperature of the Servo Drive to 55°C or lower. If the relay does not click when the power supply is turned ON, replace the Servo Drive. |

Alarm Status when error **Error conditions** Cause Measures number occurs Lower the ambient temperature. The ambient . Increase the capacity of the temperature is too drive and motor. 15 Servo Drive overheat Occurs during operation. high. Reduce the load. Extend the acceleration/ The load is too large. . deceleration times. There is an error in the Wire the Servomotor motor wiring (the wiring or power cable correctly. the connections are faulty). Occurs when the servo The electromagnetic is turned ON. · Turn OFF the brake. brake is ON. The Servo Drive has Replace the Servo Drive. broken down. The effective torque Review the load conditions 16 Overload exceeds the rated torque. and operating conditions. The initial torgue exceeds Review the motor the maximum torque. capacity. Occurs during operation. Unusual noise or vibration is caused by Adjust the gain correctly. faulty gain adjustment. The Servo Drive has · Replace the Servo Drive. broken down. Calculate the regenerative energy and connect an External Load inertia is too Regeneration Resistor with the large. required regeneration absorption capacity. Extend the deceleration time. Reduce the motor rotation speed. Occurs when the motor Extend the deceleration time. The deceleration time is decelerating. · Calculate the regenerative is too short. energy and connect an The motor rotation **External Regeneration** speed is too high. Resistor with the required regeneration absorption capacity. Regeneration 18 The operating limit of the overload Set Pn016 to 2. External Regeneration Resistor is limited to 10% duty. Add a counterbalance to the machine to lower gravitational torque. Reduce the descent speed. Gravitational torque is Calculate the regenerative too large. energy and connect an Occurs during descent **External Regeneration** (vertical axis). Resistor with the required regeneration absorption capacity. The operating limit of the External Regeneration Set Pn016 to 2. Resistor is limited to 10% duty.

| Alarm number | Error conditions | Status when error occurs | Cause | Measures |
|-----------------|-------------------------------------|--|--|--|
| 21 | Encoder | | The encoder is disconnected. Connector contacts are faulty. | Fix the locations that are disconnected. Wire correctly. |
| | | Occurs during operation | The encoder is wired incorrectly. | · Wire correctly. |
| | communications error | | • The encoder is damaged. | · Replace the motor. |
| | | | The Servo Drive is faulty. | Replace the Servo Drive. |
| | | | The motor is mechanically held. | If the motor shaft is held, release it. |
| 23 | | | The encoder signal line is wired incorrectly. | · Wire correctly. |
| | Encoder communications data | Occurs when the power supply is turned ON. | Noise on the encoder wiring causes incorrect operation. | Take measures against noise on the encoder wiring. |
| | error | Or, occurs during operation. | The encoder power supply voltage has dropped (especially when the cable is long.) | Provide the required encoder power supply voltage (5 VDC ± 5%). |
| | Error counter overflow | Occurs when the motor does not rotate even when command pulses are input. | • The motor power line or the encoder wiring is incorrect. | · Wire correctly. |
| | | | The motor is mechanically held. | If the motor shaft is held, release it. Release the electromagnetic brake. |
| | | | Control PCB error | · Replace the Servo Drive. |
| | | Occurs during high- speed rotation. | The motor power line or the encoder wiring is incorrect. | · Wire correctly. |
| 24 | | Occurs when a long string of command pulses is given. | Gain adjustment is insufficient. | · Adjust the gain. |
| | | | The acceleration/ deceleration is too rapid. | Extend the acceleration/ deceleration times. |
| | | | • The load is too large. | Reduce the load.Select a suitable motor. |
| | | Occurs during operation. | The set value for the Error Counter Overflow Level (Pn014) is exceeded. The value set for the Excessive Speed Error Setting (Pn602) was exceeded. | Increase the set value of Pn014. Reduce the rotation speed. Reduce the load. Extend the acceleration/ deceleration times. Set Pn602 to 0 (disabled) or increase the setting. |
| 25 | Excessive hybrid deviation error | Occurs for fully-closed control. | There is deviation between the load position according to the external encoder and the motor position according to the encoder. | Check the motor and load connection. Check the external encoder and drive connection. Check the external encoder load position and encoder motor position settings. |

| Alarm number | Error conditions | Status when error occurs | Cause | Measures |
|-----------------|-----------------------------|--|--|--|
| 26 | | | The speed command input is too large. | Set the command pulse frequency to 500 Kpps max. |
| | | Occurs during high- | The setting for the Electronic Gear Ratio Numerator (Pn009, Pn500 to Pn502) is not appropriate. | Measures• Set the command pulse frequency to 500 Kpps max.• Set the electronic gear ratio numerator so that the command pulse frequency is 500 Kpps or lower.• Adjust the gain. • Reduce the maximum command speed.• Wire correctly.• When the torque limit switching function is used, set the motor operating speed range correctly in the Error Counter Overflow Level (Pn014).• Check the command pulse input. • Increase the set value of Pn532.• Check to see if the multi- rotation counter for the absolute encoder was cleared during USB communications by the CX-Drive. |
| | Overspeed | speed rotation. | The speed exceeds the maximum rotation speed due to overshooting. | Adjust the gain. Reduce the maximum command speed. |
| | | | The encoder is wired incorrectly. | · Wire correctly. |
| | | Occurs when torque limit switching function is used. | The set value for the Overspeed Detection Level Setting (Pn513) is exceeded. | When the torque limit switching function is used, set the motor operating speed range correctly in the Error Counter Overflow Level (Pn014). |
| 27 | Command pulse error | Occurs when control signal is input or command is input. | The command pulse input frequency exceeded the limit. | Check the command pulse input. Increase the set value of Pn532. |
| | | Occurs when the multi- rotation counter for the absolute encoder was cleared by the CX-Drive. | The multi-rotation counter for the absolute encoder was cleared during USB communications by the CX-Drive. | Check to see if the multi- rotation counter for the absolute encoder was cleared during USB communications by the CX-Drive. Note: This operation is performed for safety and is not an error. |
| | | Occurs during operation. | The position command variation is higher than the specified value. | Check to see if the position command variation is large. |
| 28 | Pulse regeneration error | Occurs during operation. | The pulse regeneration output frequency exceeded the limit. | Check the set value of Pn011 and Pn503. Set Pn533 to 0 to disable the function. |

| Alarm number | Error conditions | Status when error occurs | Cause | Measures |
|-----------------|-----------------------------------|--|--|---|
| | | | The error counter value for the encoder pulse reference exceeded ±2²⁹ (536,870,912). | Check that the motor rotates according to the position command. Check on the torque monitor that the output torque is not saturated. Adjust the gain. Increase the setting for Pn013 or Pn524 to the maximum. Wire the encoder correctly. |
| 29 | Error counter overflow | Occurs during operation. | The position error in pulses exceeded ±2²⁹ (536,870,912). Alternatively, the position error in command units exceeded ±2³⁰ (1,073,741,824). | Check to see if the Servomotor rotates according to the position command. Check on the torque monitor to see if the output torque is saturated. Adjust the gain. Maximize the set values on the Positive torque limit value and the Negative torque limit value. Wire the encoder as shown in the wiring diagram. |
| 30 | Safety input error | Occurs during operation. | Safety input signal turned OFF. | Check the statuses of safety inputs 1 and 2. |
| | Interface I/O allocation error | | There is a duplicate setting in the I/O signal function allocation. Specify the undefined number with the I/O signal function allocation. | Set the function allocation correctly. |
| 33 | | Occurs when the power supply is turned ON. | There is a mistake in the counter function allocation. | · Allocate to SI7. |
| | | | There is a mistake in the command pulse prohibition input function allocation. | Allocate to SI10. |
| | | | The latch input 1 allocation is incorrect. | Allocate to SI4 with contact NO. |
| 34 | Overrun limit error | Occurs during operation. | The Overrun Limit Setting (Pn514) was exceeded during operation. | Adjust the gain. Increase the set value of Pn514. Set Pn514 to 0 to disable the function. |
| 36 | Parameter error | Occurs when the power | There are data errors in the parameters that were read. | · Reset all parameters. |
| | | | • The drive is faulty. | Replace the Servo Drive. |
| 37 | Parameters destruction | Occurs when the power supply is turned ON. | The parameters that were read are corrupt. | Replace the Servo Drive. |

Alarm Status when error **Error conditions** Cause Measures number occurs Wire correctly. The forward drive Replace the limit sensor. Occurs when the servo prohibition (POT) input Check whether the power Drive prohibition input is turned ON. and reverse drive supply for control is input 38 prohibition (NOT) input error Or, occurs during correctly. were both OFF at the Check whether the setting for operation. same time **Drive Prohibition Input Selection** (Pn504) is correct. Reduce the input voltage. Excessive analog input The voltage input to pin 39 Occurs during operation. Change the value for Pn424, 14 is too high. Pn427, and Pn430. Absolute encoder Occurs when the power The voltage supplied to Set up the absolute encoder. 40 system down error supply is turned ON. the absolute encoder is Connect the battery ABS Occurs during operation. low. power supply. Absolute encoder The multi-rotation counter of Properly set the Operation 41 counter overflow error Occurs during operation. the absolute encoder Switch when Using Absolute ABS exceeds the specified value. Encoder (Pn015). The motor rotation speed Absolute encoder exceeds the specified Reduce the motor rotation Occurs when the power 42 overspeed error value when the battery speed and supply power. supply is turned ON. power supply is turned ON. Check the wiring. ABS The wiring is incorrect. Absolute encoder 1-Occurs when the power 44 rotation counter error The encoder is faulty. Replace the Servomotor. supply is turned ON. ABS Absolute encoder Occurs when the power 45 multi-rotation counter The encoder is faulty. Replace the Servomotor. supply is turned ON. error ABS Do not let the motor move The motor was moving Absolute encoder Occurs when the power 47 when the power supply when the power supply is status error ABS supply is turned ON. turned ON. was turned ON. A phase Z pulse from 48 Encoder phase-Z error Occurs during operation. the encoder was not Replace the Servomotor. detected regularly. A logic error was Encoder PS signal 49 Occurs during operation. detected in the PS Replace the Servomotor. error signal from the encoder. The disconnection detection function was activated Wire correctly. because communications Fix the locations that are between the external disconnected. encoder and drive were External encoder 50 Occurs during operation. interrupted. communications error Provide the required external There was a communications error encoder power supply voltage. in data from external Wire correctly. encoder. · Connect the shield to FG. Check the external encoder specifications. An external encoder External encoder From the front panel, clear

Occurs during operation.

5-4 Troubleshooting

51

status error

the external encoder alarm,

then turn the power supply OFF, then ON again.

alarm code was

detected.

| Alarm number | Error conditions | Status when error occurs | Cause | Measures |
|-----------------|------------------------------------|--|--|--|
| 55 | Phases-A, B and Z connection error | Occurs during operation. | A disconnection or other error was detected in external encoder phase A, phase B, or phase Z connection. | Check the connection. |
| 87 | Forced alarm input error | Occurs during operation. | The forced alarm input signal was input. | • Turn OFF the EMG-STOP signal. |
| 92 | Encoder data | In sem initializ positio proces | | Apply the correct power voltage for the long encoder wire. Install the motor power line separately from the encoder wire. Connect the shield cable to FG. |
| | restoration error | is turned ON. | In FULL CLOSING CONTROL mode, itialization of internal position data is not processed correctly. | Apply the correct power voltage for the long connection cable for the external encoder. Install the motor power line separately from the encoder wire. Connect the shield cable to FG. |

| Alarm number | Error conditions | Status when error occurs | Cause | Measures |
|-----------------|--|---|--|--|
| 93 | | | The velocity, acceleration and deceleration were set to 0 and a block operation was started. | Set the specified velocity, acceleration and deceleration to a value other than 0. |
| | | | A target that is not applicable to comparison by the conditional branching command was set. | Check to make sure that there is no problem with the conditional branching command or the comparison target. |
| | Dovometor eatting | The error occurred | A command that is not defined as a command code for the block operation control parameters was set. | Check to make sure that there is no problem with the block operation control parameters. |
| | Parameter setting error when a block was started. | when a block operation or was started. | There is an error with another block operation setting parameter or block operation control parameter setting. | Check to make sure that there is no problem with the block operation setting parameters or block operation control parameters. |
| | | | External encoder ratio exceeded the allowable range. | Check the object settings. The external encoder ratio must be set between 1/40 and 160. Check the values on the External Feedback Pulse Dividing Numerator (Pn324) and the External Feedback Pulse Dividing enominator (Pn325) are set correctly. |

| Alarm number | Error conditions | Status when error occurs | Cause | Measures | |
|-----------------|-----------------------|--|---|---|--|
| 94 | | | | A new operation command was executed while an operation command (relative or absolute movement, JOG or origin search) is being executed. | Check to make sure that there is no problem with the block operation sequence. |
| | | The error occurred | A new block operation was started while a block operation is already in progress. | Check to make sure that there is no problem with the host side sequence. | |
| | | during an operation or when a block operation was started. | A block operation was started when the servo is OFF. | Check to make sure that there is no problem with the host side sequence. Start a block operation when the servo is ON. | |
| | Block operation error | | Outlins A new operation command was executed while an operation command (relative or absolute movement, JOG or origin search) is being Check to make sure that there is no problem with the block operation sequence. e error occurred ing an operation or s started. - A new block operation was started while a block operation is already in progress. - Check to make sure that there is no problem with the host side sequence. - A block operation was started when the servo is OFF. - Check to make sure that there is no problem with the host side sequence. - The position command value or the current position exceeds the C0000001h to 3FFFFFFFh range. - Check to make sure that there is no problem with the bock data settings, such as the travel distance. e error occurred ing an origin search pertor occurred tring an origin search pertor occurred ing an origin search pertor occurred tree are or occurred ing an origin search operation, and a reverse direction are verse operation. - Check to make sure that there is no problem with the block data settings, such as the travel distance. - Origin search operation, are verse operation. - Check to make sure that there is no problem with the block operation and a reverse direction and a reverse direction are verse operation. - Check to make sure that there is no problem with the block operation parameter settings and absolute encoder is used. - Origin search was executed when origin search has not been completed when an absolute encoder is used. - Check to make sure that there is no problem with the block operation parameter settings and the settings when an absolute encoder is used.< | | |
| | | The error occurred during an origin search operation. | | • Check to make sure that there is no problem with the placement relationship among the drive prohibition input, origin signal and phase Z. | |
| | | The error occurred when | | • Check to make sure that there is no problem with the block operation parameter settings and the settings when an absolute encoder is used. | |
| | | a block operation is started. | Relative or absolute movement was executed when origin search has not been completed when an incremental encoder is being used. | Check to make sure that there is no problem with the block operation parameter settings, etc. Upon completion of origin search, execute a relative or absolute movement. | |
| 0.5 | | Occurs when the power | • The motor and drive combination is incorrect. | • Use a correct combination. | |
| 95 | Motor non-conformity | supply is turned ON. | • The encoder wiring is disconnected. | Wire the encoder wiring. Fix the locations that are disconnected. | |

| Alarm number | Error conditions | Status when error occurs | Cause | Measures |
|------------------|------------------|--------------------------|---|---|
| Other numbers | Other errors | | The control circuit malfunctioned due to excess noise or some other problem. The self- diagnosis function of the Servo Drive was activated, and an error occurred in the Servo Drive. | Turn OFF the power once, and turn it ON again. If the error is displayed even after the power is turned ON again, the system may be faulty. Stop using the system, and replace the Servomotor and/or the Servo Drive. Return the Servo Drive to the dealer that is was purchased from and ask for investigation and repair. |

Troubleshooting Using the Operation Status

| Symptom | Probable cause | Items to check | Measures |
|---|---|--|---|
| The PWR LED indicator does not light when the power | The power supply cable is wired incorrectly. | Check to see if the power supply input is within the allowed power supply voltage range. | Supply the correct power supply voltage. |
| supply is turned ON. | | Check to see if the power supply input is wired correctly. | Wire correctly. |
| The motor does not rotate even after a block operation is | The operation command (RUN) is OFF. | In Monitor Mode, check whether the RUN signal is ON or OFF. | Turn ON the operation command (RUN). Wire correctly. |
| Stariou. | The strobe input (STB) is OFF. | Check if the STB signal is ON or OFF using the MONITOR mode. | Enter strobe input (STB). Wire correctly. |
| | The Forward or Reverse Drive Prohibition Input (POT or NOT) is OFF. | In Monitor Mode, check whether the POT signal and NOT signal are ON or OFF. | Turn ON the POT and NOT signals. Disable them in the settings when the POT and NOT signals are not used. |
| | The control mode does not conform to the command. | Check the control mode Selection (Pn001). | Set the control mode according to the command. |
| | The No. 1 Torque Limit (Pn013) or No. 2 Torque Limit (Pn522) is set to 0. | Check the set value of Pn013 and Pn522. | Return the set value to the default setting. |
| | The Servomotor power cable is wired incorrectly. | Check the wiring. | Wire correctly. |
| | The encoder cable is wired incorrectly. | | |
| | The control I/O connector (CN1) | Check the command pulse's wiring. | Wire correctly. |
| | is when incorrectly. | Check the command pulse type. | Set the Servo Drive's pulse type to match the controller's command pulse type. |
| | | Check the command pulse's voltage. | Connect a resistor that matches the voltage. |
| | Power is not supplied. | Check whether the power supply is ON and check the PWR LED indicator. | Turn ON the power supply. |
| | | Check the voltage across the power supply terminals. | Wire the power-ON circuit correctly. |
| | The Servo Drive has broken down. | - | Replace the Servo Drive. |
| The Servomotor operates | The Servomotor power cable is wired incorrectly. | Check the wiring of the Servomotor power cable's phases U, V, and W. | Wire correctly. |
| it does not operate after that. | The encoder cable is wired incorrectly. | Check the encoder cable's wiring. | Wire correctly. |
| The Servomotor rotates without a command. | The Servo Drive has broken down. | _ | Replace the Servo Drive. |

| Symptom | Probable cause | Items to check | Measures |
|--|---|---|--|
| Motor rotation is unstable | The Servomotor power cable or encoder cable is wired incorrectly. | Check the wiring of the Servomotor power cable's phases U, V, and W and check the encoder cable's wiring. | Wire correctly. |
| | The coupling system between the motor shaft and the mechanical | Check the mechanical system's coupling section. | Review and adjust the machine. |
| | system has eccentricity or loose screws, or the load torque is fluctuating due to engagement between pulleys or gears. | Try rotating the motor without a load. (Disconnect it from the mechanical system.) | |
| | The load's moment of inertia exceeds the Servo Drive's allowable value. | Try rotating the motor without a load. (Disconnect it from the mechanical system.) | Reduce the load. Replace the Servomotor and Servo Drive with higher capacity models. |
| | The gain is wrong. | - | Perform manual tuning. |
| The Servomotor is overheating. | The ambient temperature is too high. | Check that the ambient temperature around the motor is 40°C or less. | Lower the ambient temperature around the Servomotor to 40°C or less. (Use a fan or air conditioner.) |
| | Ventilation is obstructed. | Check to see whether anything is blocking ventilation. | Improve ventilation. |
| | The Servomotor is overloaded. | Try rotating the motor without a load. | · Reduce the load. |
| | The Servomotor vibrates during rotation. | system.) | Servo Drive with higher capacity models. |
| The Servomotor holding brake is ineffective. | Power is supplied to the holding brake. | Check whether power is supplied to the holding brake. | Configure a circuit that cuts power supply to the holding brake when the motor stops and the load is held by the holding brake. |
| The motor does not stop or is hard to stop even if the operation | The load inertia is too large. | Check the following: ·Is the load too large? ·Is the motor rotation speed too high? | Review the load conditions, and replace the Servomotor and Servo Drive with appropriate models. |
| turned OFF while the motor is rotating. | The stop circuit failed. | - | Replace the Servo Drive. |

| Symptom | Probable cause | Items to check | Measures |
|---|--|--|---|
| The motor is producing unusual | There are problems with the machine's installation. | Check to see if the Servomotor's mounting screws are loose. | Retighten the mounting screws. |
| Symptom The motor is producing unusual noises or the machine is vibrating | | Check whether the axes are misaligned in the coupling. | Align the coupling. |
| | | Check whether the coupling is unbalanced. | Adjust the coupling's balance. |
| | There is a problem with the bearings. | Check for noise or vibration around the bearings. | Contact your OMRON dealer or sales office. |
| | The gain is wrong. | - | Perform manual tuning. |
| | The Speed Feedback Filter Time Constant (Pn103) is wrong. | Check the value set in Pn103. | Return the set to 0 (default set) or increase the set value. |
| | Noise is entering into the control I/O signal cable because the cable does not meet specifications. | Check to see if the cable is a twisted-pair cable or shielded twisted-pair cable with core wires that are at least 0.08 mm dia. | Use a control I/O signal cable that meets specifications. |
| | Noise is entering into the control I/O signal cable because the cable is longer than the specified length. | Check the length of the control I/O signal cable. | Shorten the control I/O signal cable to 3 m or less. |
| | Noise is entering into the cable because the encoder cable does not meet specifications. | Check to see if it is a shielded twisted-pair cable with core wires that are at least 0.12 mm dia. | Use an encoder cable that meets specifications. |
| | Noise is entering into the encoder cable because the cable is longer than the specified length. | Check the length of the encoder cable. | Shorten the encoder cable to less than 50 m. |
| | Noise is entering into the signal lines because the encoder cable is stuck or the sheath is damaged. | Check the encoder cable for damage. | Correct the encoder cable's pathway. |
| | Excessive noise on encoder cable. | Check to see if the encoder cable is bound together with or too close to high- current lines. | Install the encoder cable where it won't be subjected to surges. |
| | The FG's potential is fluctuating due to devices near the Servomotor, such as welding machines. | Check for ground problems (loss of ground or incomplete ground) at equipment such as welding machines near the Servomotor. | Ground the equipment properly and prevent current from flowing to the encoder FG. |
| | Errors are being caused by excessive vibration or shock on the encoder. | There are problems with mechanical vibration or Servomotor installation (such as the precision of the mounting surface, attachment, or axial offset). | Reduce the mechanical vibration or correct the Servomotor's installation. |
| | The machine and the motor are resonating. | Check to see if the machine is resonating. | Readjust the torque command filter time constant. If there is resonance, set the Notch Filter 1 Frequency (Pn201), Notch Filter 1 Width (Pn202), and Notch Filter 1 Depth (Pn203). |
| Vibration is occurring at the same | Inductive noise is occurring. | Check to see if the drive control signal lines are too long. | Shorten the control signal lines. |
| power supply. | | Check to see if the control signal lines and power supply lines are not bound together. | Separate control signal lines from power supply lines. Use a low-impedance power supply for control signals. |

| Symptom | Probable cause | Items to check | Measures |
|---|--|---|---|
| The position is misaligned. (Position | There is an error in the coupling of the mechanical system and the Servomotor. | Check to see if the coupling of the mechanical system and the Servomotor is misaligned. | Correct the coupling between the mechanical system and the Servomotor. |
| without an alarm | The gain is wrong. | - | Perform manual tuning. |
| being output.) | The load inertia is large. | Inspect the following. · Is the load too large? · Is the motor rotation speed too high? | Adjust the gain. Review the load conditions, and replace the Servomotor and Servo Drive with appropriate models. |

A

Appendix

| A-1 | Restrictions | A-1 |
|-----|----------------|-----|
| A-2 | Parameter List | A-2 |

A-1 Restrictions

The following restrictions apply when the block operation function is enabled. When using the following functions, enable the analog/pulse commands. For information on how to switch between a block operation and the analog/pulse command, refer to "2-1Initial Setting" (P.2-1)

- The block operation function is supported by software version 1.10 or higher. The software version can be confirmed on the front panel or the CX-Drive.
- Analog/pulse input signals are disabled. Analog Torque Feed-forward is also disabled.
- The trial operation function and the FFT function cannot be used with support tool, CX-Drive.
- JOG operation is not available from the front panel.
- Set the electronic gear ratio to 1:1. Operation cannot be guaranteed if this is set to any other ratio.
- When the absolute encoder is being used and the current position cannot be acquired with the host controller, set the Absolute Interface Function Selection (Pn616) to 0.

A-2 Parameter List

- Some parameters are enabled by turning the power supply OFF and then ON again. (Those parameters are indicated in the table.) After changing these parameters, turn OFF the power supply, confirm that the power supply indicator has gone OFF, and then turn ON the power supply again.
- Do not change the parameters marked "Reserved". Do not change the settings marked "Reserved".

| Pn number | Parameter name | Setting | Description | Default setting | Unit | Setting range | Power supply OFF to ON |
|-----------|--|---|--|--------------------|---|----------------------|---------------------------------|
| | | Set dire | the relation between the command ction and the motor rotation direction. | | | 0 or 1 | |
| 000 | Rotation Direction Switching | 0 | The +command indicates the forward direction as viewed from the shaft end (CW). | 1 | - | | Yes |
| | | 1 | The +command indicates the reverse direction as viewed from the shaft end (CCW). | | | | |
| | | Sele | ect the Servo Drive control mode. | | Unit Setting range - 0 or 1 - 0 to 6 - 0 to 6 | | |
| 001 ♦ | Control Mode Selection | 0 to 5 | Semi-closed control | 0 | | 0 to 6 | Yes |
| _ | | 6 | Fully-closed control | | | | |
| | | Set the operation mode for realtime autotuning. | | | | | |
| | | 0 | Disabled | 1 | | | _ |
| | | 1 | Emphasizes stability | | | 0 to 6 | |
| | | 2 | Emphasizes positioning | | - | | |
| 002 | Realtime Autotuning Mode Selection | 3 | If there is an unbalanced load like in a vertical axis. | | | | |
| | | 4 | Used when friction is large. | | | | |
| | | 5 | Used when there is an unbalanced load, such as a vertical axis, and friction is large. | | | | |
| | | 6 | Used to customize the Realtime Autotuning Mode. | | | | |
| 003 | Realtime Autotuning Machine Rigidity Setting | Set real | the machine rigidity for executing time autotuning. | See Note 1 | _ | 0 to 31 | _ |
| 004 | Inertia Ratio | Set mot | the load inertia as a percentage of the or rotor inertia. | 250 | % | 0 to 10,000 | _ |
| 800 | Electronic Gear Integer Setting | Set mot | the number of command pulses per or rotation. | 10000 | Pulses | 0 to 2 ²⁰ | Yes |

Basic Setting Parameters

A

| Pn number | Parameter name | Setting | Description | Default setting | Unit | Setting range | Power supply OFF to ON |
|-----------|---|---|--|--------------------|------------------|----------------------|---------------------------------|
| 009 | Electronic Gear Ratio Numerator 1 | Set If Pi the Set | the electronic gear ratio. n009 = 0, the encoder resolution is set as numerator. this to 1:1. | 0 | _ | 0 to 2 ³⁰ | - |
| 010 | Electronic Gear Ratio Denominator | | Electronic gear ratio numerator 1 (Pn009) Electronic gear ratio denominator (Pn010) | 10000 | _ | 1 to 2 ³⁰ | _ |
| 011 | Encoder Dividing Numerator | Set outp | the number of phase A and phase B put pulses, respectively per motor rotation. | 2500 | P/r | 1 to 262,144 | Yes |
| | | Sele rege | ect the phase B logic for pulse eneration output and the output source. | | | | |
| 012 | Encoder Output | 0 | Phase B logic: Not reversed Output source: Encoder | | | 0 to 3 | Yes |
| | Direction Switching | 1 | Phase B logic: Reversed Output source: Encoder | 0 | _ | | |
| | Selection | 2 | Phase B logic: Not reversed Output source: External encoder | | | | |
| | | 3 | Phase B logic: Reversed Output source: External encoder | | | | |
| 013 | No. 1 Torque Limit | Set t | he No. 1 limit value for the output torque of the motor. | 500 | % | 0 to 500 | - |
| 014 | Error Counter Overflow Level | Set leve leve | the range of the error counter overflow el. Detection of error counter overflow el error is disabled if the set value is 0. | 100000 | Command units | 0 to 2 ²⁷ | - |
| | | Select the absolute encoder usage method. | | | | | |
| | Operation | 0 | Used as an absolute encoder. | | | | |
| 015 | Switch when | 1 | Used as an incremental encoder. | 1 | - | 0 to 2 | Yes |
| | Encoder | 2 | Used as an absolute encoder. (Multi-rotation counter overflows are ignored.) | | | | |
| | | Sel | ect the Regeneration Resistor used. | | | | |
| | | 0 | Use the Built-in Resistor. Triggering of regeneration overload protection (Alarm No. 18) depends on the Built-in Resistor (with approx. 1% duty). | | | | |
| 016 | Regeneration Resistor Selection | 1 | Use an External Resistor. The regeneration processing circuit operates and regeneration overload protection (Alarm No. 18) is triggered when the operating rate of the Regeneration Resistor exceeds 10%. | See Note 2 | _ | 0 to 3 | Yes |
| | | 2 | Use an External Resistor. Regeneration overload protection (Alarm No. 18) does not operate. | | | | |
| | | 3 | No Regeneration Resistor All regeneration power is processed with built-in capacitors | | | | |

| Pn number | Parameter name | Setting | Description | Default setting | Unit | Setting range | Power supply OFF to ON |
|-----------|-------------------|------------|---|--------------------|------|------------------|---------------------------------|
| | | Sel the | ect the type of load ratio calculation for External Regeneration Resistor. | | _ | 0 to 4 | Yes |
| | External | 0 | Regeneration load ratio is 100% when operating rate of the External Regeneration Resistor is 10%. | -0 | | | |
| 017 | Resistor Setting | 1 | Reserved | | | | |
| | | 2 | Reserved | | | | |
| | | 3 | Reserved | | | | |
| | | 4 | Reserved | | | | |

Note 1: The default setting is 11 for 200-V Servo Drives of 1 kW or higher and 400-V Servo Drives.
Note 2: The default setting is 0 for 100-V Servo Drives of 400 W, 200-V Servo Drives of 750 W or higher, and 400-V Servo Drives.

Gain Parameters

| Pn number | Parameter name | Setting | Description | Default setting | Unit | Setting range | Power supply OFF to ON |
|-----------|--|-------------|--|--------------------|------------|------------------|---------------------------------|
| 100 | Position Loop Gain | Set | the position loop gain 1. | See Note 1 | 0.1/s | 0 to 30,000 | - |
| 101 | Speed Loop Gain | Set | the speed loop gain 1. | See Note 2 | 0.1 Hz | 1 to 32,767 | - |
| 102 | Speed Loop Integral Time Constant | Set | the speed loop integral time constant 1. | See Note 3 | 0.1 ms | 1 to 10,000 | - |
| 103 | Speed Feedback Filter Time Constant | The of 6 | speed feedback filter 1 can be set to one values. | 0 | _ | 0 to 5 | _ |
| 104 | Torque Command Filter Time Constant | Set | the time constant for the torque filter 1. | See Note 4 | 0.01 ms | 0 to 2,500 | _ |
| 105 | Position Loop Gain 2 | Set | he position loop gain 2. | | 0.1/s | 0 to 30,000 | _ |
| 106 | Speed Loop Gain 2 | Set | the speed loop gain 2. | See Note 6 | 0.1 Hz | 1 to 32,767 | _ |
| 107 | Speed Loop Integral Time Constant 2 | Set | the speed loop integral time constant 2. | 10000 | 0.1 ms | 1 to 10,000 | _ |
| 108 | Speed Feedback Filter Time Constant 2 | The of 6 | speed feedback filter 2 can be set to one values. | 0 | _ | 0 to 5 | - |
| 109 | Torque Command Filter Time Constant 2 | Set | the time constant for the torque filter 2. | See Note 7 | 0.01 ms | 0 to 2,500 | - |
| 110 | Speed Feed- forward Amount | Set | the speed feed-forward amount. | 300 | 0.1% | 0 to 1,000 | _ |
| 111 | Speed Feed- forward Command Filter | Set con | the speed feed-forward filter time stant. | 50 | 0.01 ms | 0 to 6,400 | _ |
| 112 | Torque Feed- forward Amount | Set | the torque feed-forward amount. | 0 | 0.1% | 0 to 1,000 | _ |
| 113 | Torque Feed- forward Command Filter | Set | the torque feed-forward filter. | 0 | 0.01 ms | 0 to 6,400 | _ |
| | Gain Switching | Exe swi | cute optimum tuning using the gain tching function. | | | | |
| 114 | Input Operating Mode Selection | 0 | Gain 1 (PI/P switching enabled) | 1 | - | 0 or 1 | - |
| | | 1 | Gain 1 and gain 2 switching available | 1 | | | |

| Pn number | Parameter name | Setting | Description | Default setting | Unit | Setting range | Power supply OFF to ON |
|-----------|---|----------------------|--|--------------------|--------|------------------|---------------------------------|
| | | Sele pos It is | Select the gain switching condition for position control. It is necessary that Pn114 be set to 1. | | | | |
| | | 0 | Always gain 1 | | | | |
| | | 1 | Always gain 2 | | | 0 to 10 | |
| | | 2 | Switching using gain switching input (GSEL) | | - | | |
| | Switching Mode | 3 | Torque command change amount | | | | |
| 115 | in Position Control | 4 | Always gain 1 | 0 | | | _ |
| | | 5 | Command speed | | | | |
| | | 6 | Amount of position error | | | | |
| | | 7 | Command pulses received | | | | |
| | | 8 | Positioning completion signal (INP) OFF | | | | |
| | | 9 | Actual motor speed | | | | |
| | | 10 | Combination of command pulse input and speed | | | | |
| 116 | Gain Switching Delay Time in Position Control | Set to g | the delay time for switching from gain 2 ain 1. | 50 | 0.1 ms | 0 to 10,000 | - |
| 117 | Gain Switching Level in Position Control | Set | the gain switching level. | 50 | - | 0 to 20,000 | - |
| 118 | Gain Switching Hysteresis in Position Control | Set | the hysteresis for gain switching. | 33 | _ | 0 to 20,000 | _ |
| 119 | Position Gain Switching Time | Set swit | the position gain switching time for gain ching. | 33 | 0.1 ms | 0 to 10,000 | _ |

- •Note 1: The default setting is 320 for 200-V Servo Drives of 1 kW or higher, and 400-V Servo Drives.
- •Note 2: The default setting is 180 for 200-V Servo Drives of 1 kW or higher, and 400-V Servo Drives.
- •Note 3: The default setting is 310 for 200-V Servo Drives of 1 kW or higher, and 400-V Servo Drives.
- •Note 4: The default setting is 126 for 200-V Servo Drives of 1 kW or higher, and 400-V Servo Drives.
- •Note 5: The default setting is 380 for 200-V Servo Drives of 1 kW or higher, and 400-V Servo Drives.
- •Note 6: The default setting is 180 for 200-V Servo Drives of 1 kW or higher, and 400-V Servo Drives.
- •Note 7: The default setting is 126 for 200-V Servo Drives of 1 kW or higher, and 400-V Servo Drives.

Vibration Suppression Function Parameters

| Pn number | Parameter name | Setting | Description | Default setting | Unit | Setting range | Power supply OFF to ON |
|-----------|---------------------------------|----------------------------|---|--------------------|------|------------------|---------------------------------|
| | | Set | the operation of the adaptive filter. | | | | |
| | | 0 | Disabled | | | | |
| | | 1 | One enabled. Frequency limited after adaptation. | | | | |
| 200 | Adaptive Filter Selection | 2 | Two enabled. Frequency limited after adaptation. | 0 | _ | 0 to 4 | - |
| | | 3 | One enabled. Adaptation performed at all times. | - | | | |
| | | 4 | Two enabled. Adaptation performed with 1 filter at all times. | | | | |
| 201 | Notch 1 Frequency Setting | Set sup | the notch frequency of resonance pression notch filter 1. | 5000 | Hz | 50 to 5,000 | _ |
| 202 | Notch 1 Width Setting | Set sup | the notch width of the resonance pression notch filter 1. | 2 | - | 0 to 20 | - |
| 203 | Notch 1 Depth Setting | Set sup | the notch depth of resonance pression notch filter 1. | 0 | _ | 0 to 99 | _ |
| 204 | Notch 2 Frequency Setting | Set sup | the notch frequency of resonance pression notch filter 2. | 5000 | Hz | 50 to 5,000 | _ |
| 205 | Notch 2 Width Setting | Set sup | the notch width of the resonance pression notch filter 2. | 2 | - | 0 to 20 | - |
| 206 | Notch 2 Depth Setting | Set sup | the notch depth of resonance pression notch filter 2. | 0 | - | 0 to 99 | - |
| 207 | Notch 3 Frequency Setting | Set sup This note | the notch frequency of resonance pression notch filter 3. s is set automatically when an adaptive ch is enabled. | 5000 | Hz | 50 to 5,000 | _ |
| 208 | Notch 3 Width Setting | Set sup This note | the notch width of the resonance pression notch filter 3. s is set automatically when an adaptive ch is enabled. | 2 | _ | 0 to 20 | _ |
| 209 | Notch 3 Depth Setting | Set sup This note | the notch depth of resonance pression notch filter 3. s is set automatically when an adaptive ch is enabled. | 0 | _ | 0 to 99 | _ |
| 210 | Notch 4 Frequency Setting | Set sup This note | the notch frequency of resonance pression notch filter 4. s is set automatically when an adaptive ch is enabled. | 5000 | Hz | 50 to 5,000 | _ |
| 211 | Notch 4 Width Setting | Set sup This note | the notch width of the resonance pression notch filter 4. s is set automatically when an adaptive ch is enabled. | 2 | _ | 0 to 20 | _ |

| Pn number | Parameter name | Setting | Description | Default setting | Unit | Setting range | Power supply OFF to ON |
|-----------|-----------------------------|-------------------------------|--|--|--------|------------------|---------------------------------|
| 212 | Notch 4 Depth Setting | Set sup This noto | the notch depth of resonance pression notch filter 4. s is set automatically when an adaptive ch is enabled. | 0 | _ | 0 to 99 | - |
| | | Sele | ect the damping filter switching method. | | | | |
| 213 | Damping Filter Selection | 0 | Enabled When DF-SEL1 input open: Damping filter 1 and 3 enabled When DF-SEL1 input shorted: Damping filter 2 and 4 enabled | 0 | _ | 0 to 3 | |
| | | 2 | When DF-SEL1 open and DF-SEL2 open: Damping filter 1 enabled When DF-SEL1 shorted and DF-SEL2 open: Damping filter 2 enabled When DF-SEL1 open and DF-SEL2 shorted: Damping filter 3 enabled When DF-SEL1 shorted and DF-SEL2 shorted: Damping filter 4 enabled | | | | _ |
| | | 3 | Forward direction: Damping filter 1 and 3 enabled Reverse direction: Damping filter 2 and 4 enabled | | | | |
| 214 | Damping Frequency 1 | Set ena | the damping frequency 1. The function is oled if the set value is 10 (= 1 Hz) or greater. | DescriptionDefault settingUnitSetti rangenotch depth of resonance sion notch filter 4. set automatically when an adaptive enabled.0-0 to 9ne damping filter switching method. ibled0-0 to 9en DF-SEL1 input shorted: mping filter 1 and 3 enabled en DF-SEL1 input shorted: mping filter 2 enabled en DF-SEL1 open and DF-SEL2 open: mping filter 2 enabled en DF-SEL1 shorted and DF-SEL2 rted: mping filter 3 enabled en DF-SEL1 shorted and DF-SEL2 rted: mping filter 4 enabled amping filter 4 enabled amping filter 2 and 4 enabled en DF-SEL1 shorted and DF-SEL2 rted: mping filter 3 enabled en DF-SEL1 shorted and DF-SEL2 rted: mping filter 4 enabled amping filter 2 and 4 enabled amping filter 3 enabled (anping control function 1. If aturation occurs, lower this setting; as responsiveness, raise this00.1 Hz0 to 2,00000.1 Hz0 to 1,00010 to 100.1 Hz0 to 2,00011000.1 Hz0 to 2,0001000.1 Hz0 to 2,0001000.1 Hz0 to 2,0001000.1 Hz0 to 2,0001000.1 Hz0 to | | 0 to 2,000 | - |
| 215 | Damping Filter 1 Setting | Fine torq to ir sett | ely adjust damping control function 1. If ue saturation occurs, lower this setting; ncrease responsiveness, raise this ing. | 0 | 0.1 Hz | 0 to 1,000 | _ |
| 216 | Damping Frequency 2 | Set enal | the damping frequency 2. The function is oled if the set value is 10 (= 1 Hz) or greater. | 0 | 0.1 Hz | 0 to 2,000 | - |
| 217 | Damping Filter 2 Setting | Fine torq to ir sett | ely adjust damping control function 2. If ue saturation occurs, lower this setting; ncrease responsiveness, raise this ing. | 0 | 0.1 Hz | 0 to 1,000 | _ |
| 218 | Damping Frequency 3 | Set ena grea | the damping frequency 3. The function is bled if the set value is 10 (= 1 Hz) or ater. | 0 | 0.1 Hz | 0 to 2,000 | _ |
| 219 | Damping Filter 3 Setting | Fine torq to ir sett | ely adjust damping control function 3. If ue saturation occurs, lower this setting; ncrease responsiveness, raise this ing. | 0 | 0.1 Hz | 0 to 1,000 | _ |
| 220 | Damping Frequency 4 | Set ena grea | the damping frequency 4. The function is bled if the set value is 10 (= 1 Hz) or ater. | 0 | 0.1 Hz | 0 to 2,000 | _ |
| 221 | Damping Filter 4 Setting | Fine toro to ir sett | ely adjust damping control function 4. If ue saturation occurs, lower this setting; increase responsiveness, raise this ing. | 0 | 0.1 Hz | 0 to 1,000 | _ |

A-2 Parameter List

| Pn number | Parameter name | Setting | Description | Default setting | Unit | Setting range | Power supply OFF to ON |
|-----------|---|--------------|---|--------------------|--------|------------------|---------------------------------|
| 222 | Position Command Filter Time Constant | Set filte | the time constant of the first-order lag r for the position command. | 0 | 0.1 ms | 0 to 10,000 | _ |
| 223 | Smoothing Filter Time Constant | Set pos | the time constant of the FIR filter for the ition command. | 0 | 0.1 ms | 0 to 10,000 | _ |

Fully-Closed Control Parameters

| Pn number | Parameter name | Setting | Description | Default setting | Unit | Setting range | Power supply OFF to ON |
|-----------|--|--------------------|---|--------------------|------------------|--|---------------------------------|
| | | Sele | ect the external feedback pulse type. | | | | |
| | External | 0 | Phase AB output | | | | |
| 323 | Feedback Pulse Type Selection | 1 | Incremental encoder with serial communications | 0 | - | 0 to 2 | Yes |
| _ | | 2 | Absolute encoder with serial communications | | | | |
| 324 | External Feedback Pulse Dividing Numerator | Set nun | et the external feedback pulse dividing umerator. | | _ | 0 to 2 ²⁰ | Yes |
| 325 | External Feedback Pulse Dividing Denominator | Set den | the external feedback pulse dividing ominator. | 10000 | _ | 1 to 2 ²⁰ | Yes |
| | External Feedback Pulse | Rev dire | Reverse the external feedback pulse count direction by changing the setting. | | | 0 or 1 | Voc |
| 326 | Direction | 0 | Count direction not reversed | 0 | - | 0 or 1 Y | Yes |
| _ | Switching | 1 | Count direction reversed | | | | |
| 327 | External Feedback Pulse | Set unc type | disconnection detection in the Phase-Z onnected state when a phase AB output e external feedback pulse is used. | 0 | _ | 0 or 1 | Yes |
| | Phase-Z Setting | 0 | Enabled | | | | |
| | | 1 | Disabled | | | 0 to 2 0 to 2^{20} 1 to 2^{20} 0 or 1 0 or 1 1 to 2^{27} 1 to 2^{27} s 0 to 100 | |
| 328 | Internal/External Feedback Pulse Error Counter Overflow Level | Set dev | the threshold for feedback pulse iation errors. | 16000 | Command units | 1 to 2 ²⁷ | Yes |
| 329 | Internal/External Feedback Pulse Error Counter Reset | Clea eac | ar to 0 the feedback pulse error value for h set rotation speed. | 0 | Rotations | 0 to 100 | Yes |

| Interface Monitor | Setting | Parameters |
|-------------------|---------|------------|
|-------------------|---------|------------|

| Pn number | Parameter name | Setting | Description | Default setting | Unit | Setting range | Power supply OFF to ON |
|-----------|------------------------------|---------|--|--------------------|------|-------------------|---------------------------------|
| 400 | Input Signal Selection 1 | Set | the input signal 1 function and logic. | 855309 0 | _ | 0 to 00FFFFFFh | Yes |
| 401 | Input Signal Selection 2 | Set | the input signal 2 function and logic. | 848729 7 | _ | 0 to 00FFFFFFh | Yes |
| 402 | Input Signal Selection 3 | Set | the input signal 3 function and logic. | 953985 0 | _ | 0 to 00FFFFFFh | Yes |
| 403 | Input Signal Selection 4 | Set | the input signal 4 function and logic. | 394758 | _ | 0 to 00FFFFFFh | Yes |
| 404 | Input Signal Selection 5 | Set | the input signal 5 function and logic. | 4108 | _ | 0 to 00FFFFFFh | Yes |
| 405 | Input Signal Selection 6 | Set | the input signal 6 function and logic. | 197379 | _ | 0 to 00FFFFFFh | Yes |
| 406 | Input Signal Selection 7 | Set | the input signal 7 function and logic. | 3847 | _ | 0 to 00FFFFFFh | Yes |
| 407 | Input Signal Selection 8 | Set | the input signal 8 function and logic. | 263172 | - | 0 to 00FFFFFFh | Yes |
| 408 | Input Signal Selection 9 | Set | the input signal 9 function and logic. | 328965 | - | 0 to 00FFFFFFh | Yes |
| 409 | Input Signal Selection 10 | Set | the input signal 10 function and logic. | 3720 | - | 0 to 00FFFFFFh | Yes |
| 410 | Output Signal Selection 1 | Set | the output signal 1 function allocation. | 197379 | - | 0 to 00FFFFFFh | Yes |
| 411 | Output Signal Selection 2 | Set | the output signal 2 function allocation. | 131586 | _ | 0 to 00FFFFFFh | Yes |
| 412 | Not used | Do | not change the set value. | - | - | - | - |
| 413 | Output Signal Selection 4 | Set | the output signal 4 function allocation. | 328964 | _ | 0 to 00FFFFFFh | Yes |

| Pn number | Parameter name | Setting | Description | Default setting | Unit | Setting range | Power supply OFF to ON |
|-----------|-----------------------------------|---|---|--------------------|------------------|---------------------|---------------------------------|
| | | Sel | ect the type for analog monitor 1. | | | | |
| | | 0 | Motor speed | | | | |
| | | 1 | Position command speed | | | | |
| | | 2 | Internal position command speed | | | | |
| | | 3 | Speed Control Command | | | | |
| | | 4 | Torque command | | | | |
| | | 5 | Position command error | | | | |
| | | 6 | Encoder Position Error | | | | |
| | | 7 | Fully-closed Error | | | | |
| | | 8 | Hybrid Error | | | | _ |
| | | 9 | P-N voltage | | | | |
| 416 | Analog Monitor | 10 | Regeneration load ratio | 0 | _ | 0 to 21 | |
| | | 11 | Overload load ratio | | | | |
| | | 12 | Forward direction torque limit | | | | |
| | | 13 | Reverse direction torque limit | | | | |
| | | 14 | Speed limit value | | | | |
| | | 15 | Inertia Ratio | | | | |
| | | 16 | Analog input 1 | | | | |
| | | 17 | Analog input 2 | | | | |
| | | 18 | Analog input 3 | | | | |
| | | 19 | Encoder temperature | | | | |
| | | 20 | Drive temperature | | | | |
| | | 21 | Encoder 1-rotation data | | | | |
| 417 | Analog Monitor 1 Scale Setting | Set | the output gain for analog monitor 1. | 0 | _ | 0 to 214,748,364 | _ |
| 418 | Analog Monitor 2 Selection | Sel The san | ect the type for analog monitor 2. e set values for this parameter are the ne as Analog Monitor 1 Type (Pn416). | 4 | _ | 0 to 21 | - |
| 419 | Analog Monitor 2 Scale Setting | Sel | ect the output gain for analog monitor 2. | 0 | _ | 0 to 214,748,364 | _ |
| | | Sele | ect the analog monitor output voltage method. | | | | |
| | Analog Monitor | 0 | Output range: -10 to 10 V Data output: Positive, negative | 0 | | | |
| 421 | Output Setting | etting 1 Output range: 0 to 10 V Data output: Positive, nega | Output range: 0 to 10 V Data output: Positive, negative | | _ | 0 to 2 | _ |
| | | 2 | Output range: 0 to 10 V Data output: Positive, negative | | | | |
| 431 | Positioning Completion Range 1 | Set pos | the allowed number of pulses for the itioning completion range. | 10 | Command units | 0 to 262,144 | _ |

| Pn number | Parameter name | Setting | Description | Default setting | Unit | Setting range | Power supply OFF to ON |
|-----------|--------------------------------------|----------------------------|--|--------------------|------------------|------------------|---------------------------------|
| | | Set th | he judgment conditions for positioning completion output. | | | | |
| | | 0 | Positioning completion output turns ON when the position error is within the Positioning Completion Range 1 (Pn431). | | | | |
| | Positioning | 1 | Positioning completion output turns ON when the position error is within the Positioning Completion Range 1 (Pn431) and there is no position command. | | | | |
| 432 | Completion Condition Selection | 2 | Positioning completion output turns ON when the zero speed detection signal is ON, the position error is within the Positioning Completion Range 1 (Pn431), and there is no position command. | 0 | _ | 0 to 3 | _ |
| | | 3 | Positioning completion output turns ON when the position error is within the Positioning Completion Range 1 (Pn431) and there is no position command. The ON status will then be held until the next position command is received. | | | | |
| 433 | Positioning Completion Hold Time | Set | the positioning completion hold time. | 0 | 1 ms | 0 to 30,000 | _ |
| 434 | Zero Speed Detection | Set (ZS | et the detection threshold for zero speed 50 SP). | | r/min | 10 to 20,000 | - |
| 437 | Brake Timing when Stopped | Set bral | the operation time for the mechanical ke at stop. | 0 | 1 ms | 0 to 10,000 | _ |
| 438 | Brake Timing during Operation | Set bral | t the operation time for the mechanical 0 ake during operation. | | 1 ms | 0 to 10,000 | _ |
| 439 | Brake Release Speed Setting | Set bral | the speed threshold for mechanical ke output judgment during operation. | 30 | r/min | 30 to 3,000 | _ |
| | | Sele Wa | ect the warning type to be output by rning Output 1. | | | | |
| | | 0 | An OR output of all alarm status | | | | |
| | | 1 | Overload warning | | | | |
| | | 2 | Excessive regeneration warning | | | | |
| | | 3 | Battery warning | | | | |
| 440 | Warning Output | 4 | Fan warning | | | 0 40 10 | |
| 440 | Selection 1 | 5 | Encoder communications warning | 0 | _ | 0 10 10 | _ |
| | | 6 | Encoder overheating warning | | | | |
| | | 7 | Vibration detection warning | | | | |
| | | 8 | Service life detection warning | | | | |
| | | 9 | External encoder error warning | | | | |
| | | 10 | External encoder communications error warning | | | | |
| 441 | Warning Output Selection 2 | Sele Wa The are t | ect the warning type to be output by rning Output 2. relationships among the set values for this parameter he same as for Warning Output Selection 1 (Pn440). | 0 | - | 0 to 10 | - |
| 442 | Positioning Completion Range 2 | Set sec | the allowable number of pulses for the ond positioning completion range. | 10 | Command units | 0 to 262,144 | - |

A

Expansion Parameters

| Pn number | Parameter name | Setting | Description | Default setting | Unit | Setting range | Power supply OFF to ON |
|-----------|--|---------------------------|--|--------------------|------|------------------|---------------------------------|
| 503 | Encoder Dividing Denominator | Set t moto | he denominator when the number of pulses per or rotation in pulse regeneration is not an integer. | 0 | _ | 0 to 262,144 | Yes |
| | | Set reve | the operation to be performed upon forward/ erse direction drive prohibition input. | | | | |
| 504 | Drive | 0 | Forward or reverse direction drive prohibition input enabled | _ | | 0.4-0 | N |
| 504 | Input Selection | 1 | Forward or reverse direction drive prohibition input disabled | | _ | 0 to 2 | res |
| | | 2 | Forward or reverse direction drive prohibition input enabled | | | | |
| | | Mak | te the setting upon drive prohibition input. | | | | |
| 505 • | Stop Selection for Drive Prohibition | 0, 2 | The torque in the drive prohibit direction is disabled, and the dynamic brake is activated. | 0 | _ | 0 to 2 | Yes |
| • | Input | 1 | The torque in the drive prohibit direction is disabled, and free-run deceleration is performed. | | | | |
| | Stop Selection | Set t | he stop operation when the servo is turned OFF. | | | | |
| | | 0, 4 | During deceleration: Dynamic brake After stopping: Dynamic brake Error counter: Clear | 0 | | | |
| | | 1, 5 | During deceleration: Free-run After stopping: Dynamic brake Error counter: Clear | | | 0 to 9 | |
| 506 ♦ | | 2, 6 | During deceleration: Dynamic brake After stopping: Servo free Error counter: Clear | | _ | | _ |
| | | 3, 7 | During deceleration: Free-run After stopping: Servo free Error counter: Clear | | | | |
| | | 8 | During deceleration: Emergency stop After stopping: Dynamic brake Error counter: Clear | | | | |
| | | 9 | During deceleration: Emergency stop After stopping: Servo free Error counter: Clear | | | | |
| 507 ♦ | Stop Selection with Main Power Supply OFF | Set sup The as S | the stop operation when the main power ply is turned OFF. set values for this parameter are the same Stop Selection with Servo OFF (Pn506). | 0 | _ | 0 to 9 | _ |
| 508 | Undervoltage Alarm Selection | Sele serv | ect whether to trip the LV or turn OFF the vo if there is a main power supply alarm. | 1 | _ | 0 or 1 | _ |
| 509 | Momentary Hold Time | Set | the main power supply alarm detection time. | 70 | 1 ms | 70 to 2,000 | Yes |

A Appendix

| Pn number | Parameter name | Setting | Description | Default setting | Unit | Setting range | Power supply OFF to ON |
|-----------|--|------------|--|--------------------|------------------|------------------|---------------------------------|
| _ | | Set | the alarm sequence. | | | | |
| | | 0 | During deceleration: Dynamic brake After stopping: Dynamic brake | | | | |
| | | 1 | During deceleration: Free-run After stopping: Dynamic brake | | | | |
| | | 2 | During deceleration: Dynamic brake After stopping: Servo free | | | | |
| | | 3 | During deceleration: Free-run After stopping: Servo free | | | | |
| 510 ♦ | Stop Selection for Alarm Detection ^{*1} | 4 | During Emergency stop alarm deceleration: Emergency stop During deceleration: Dynamic brake After stopping: Dynamic brake | 0 | _ | 0 to 7 | _ |
| | | 5 | During Emergency stop alarm deceleration: Emergency stop During deceleration: Free-run After stopping: Dynamic brake | | | | |
| | | 6 | During Emergency stop alarm deceleration: Emergency stop During deceleration: Dynamic brake After stopping: Servo free | | | | |
| | | 7 | During Emergency stop alarm deceleration: Emergency stop During deceleration: Free-run After stopping: Servo free | | | | |
| 511 | Immediate Stop Torque | Set | the torque limit for immediate stops. | 0 | % | 0 to 500 | - |
| 512 | Overload Detection Level Setting | Set | the overload detection level. | 0 | % | 0 to 500 | - |
| 513 | Overspeed Detection Level Setting | Set | the overspeed error detection level. | 0 | r/min | 0 to 20,000 | - |
| 514 | Overrun Limit Setting | Set pos | the motor over-travel distance for ition commands. | 10 | 0.1 Rotations | 0 to 1,000 | - |
| | | Sele | ect from one of 4 values for the IF read cycle. | | | | |
| | Control Input | 0 | 0.166 ms | | | | |
| 515 | Signal Read | 1 | 0.333 ms | 0 | - | 0 to 3 | Yes |
| | Setting | 2 | 1 ms | | | | |
| | | 3 | 1.666 ms | | | | |
| | Alarm Reset | Set | the alarm clear input detection method. | | | | |
| 516 | Condition | 0 | 120 ms | 0 | - | 0 or 1 | Yes |
| | Setting | 1 | Follow the Control Input Signal Read Setting (Pn515). | | | | |

| Pn number | Parameter name | Setting | Description | Default setting | Unit | Setting range | Power supply OFF to ON |
|-----------|--|---------------------|---|--------------------|-------------|------------------|---------------------------------|
| | | Set | the clear condition for the error counter reset | | | | |
| | | 0 | Disabled | | | | |
| | | | Clears the error counter with the level. | | | | |
| | Error Counter | | (Shorted for 500 μ s or longer) | _ | | | |
| 517 | Reset Condition Selection | 2 | Clears the error counter with the level. (Shorted for 1 ms or longer) | 0 | - | 0 to 4 | _ |
| | | 3 | Clears the error counter with the edge. (Change from open to shorted for 100 μs or longer) | | | | |
| | | 4 | Clears the error counter with the edge. (Change from open to shorted 1 ms or longer) | | | | |
| | Command | Ena prol | ble or disable the command pulse hibition input signals (INH). | | | | |
| 518 | Prohibition | 0 | Enabled | 1 | - | 0 or 1 | - |
| | Input Setting | 1 | Disabled | | | | |
| | | Selec | t the signal read cycle for the command pulse prohibition input. | | | | |
| | Command Pulse Prohibition Input Read Setting | 0 | 0.166 ms | | | | |
| 519 | | 1 | 0.333 ms | 0 | | 0 to 4 | Voc |
| | | 2 | 1 ms | 0 | _ | 0104 | |
| | | 3 | 1.666 ms | | | | |
| | | 4 | 0.166 ms | | | | |
| | Position Setting | Sele errc | ect the positioning completion range and or counter overflow level setting unit. | | | 0 or 1 | |
| 520 | Unit Selection | 0 | Command unit | 0 | - | | Yes |
| | | 1 | Encoder unit | | | | |
| | | Set limi | the forward or reverse direction torque t selection method. | | | | |
| | | 0, 1, 4, 5 | Pn013 is the limit value for both forward and reverse directions. | | | | |
| 521 ♦ | Torque Limit Selection | 2 | Forward operation: Set by Pn013, Reverse operation: Set by Pn522. | 1 | - | 0 to 6 | _ |
| | | 3 | When TL-SEL input is open: Use Pn013. When TL-SEL input is shorted: Use Pn522. | | | | |
| | | 6 | When TL-SEL input is open: Forward direction, use Pn013; Reverse direction, use Pn522. When TL-SEL input is shorted: Forward direction, use Pn525; Reverse direction, use Pn526. | | | | |
| 522 | No. 2 Torque Limit | Set | the No. 2 limit value for the motor output torque. | 500 | % | 0 to 500 | - |
| 523 | Torque Limit Switching Setting 1 | Set toro | the change rate (fluctuate) for when the ue limit is switched from No. 1 to No. 2. | 0 | ms/ 100% | 0 to 4,000 | |
| 524 | Torque Limit Switching Setting 2 | Set torq | the change rate (fluctuate) for when the ue limit is switched from No. 2 to No. 1. | 0 | ms/ 100% | 0 to 4,000 | _ |

| Pn number | Parameter name | Setting | Description | Default setting | Unit | Setting range | Power supply OFF to ON |
|-----------|----------------------------------|----------------|---|--------------------|------------------|------------------|---------------------------------|
| 525 | Forward External Torque Limit | Set inpu | the forward direction torque limit for TL-SEL t when Pn521 Torque Limit Selection is set to 6. | 500 | % | 0 to 500 | - |
| 526 | Reverse External Torque Limit | Set inpu | the reverse direction torque limit for TL-SEL t when Pn521 Torque Limit Selection is set to 6. | 500 | % | 0 to 500 | _ |
| | | Sele initia | ect the data to be displayed on the 7-segment LED lly when the control power supply is turned ON. | | | | |
| | | 0 | Position command error | | Command units | | |
| | | 1 | Motor speed | 1 | r/min | | |
| | | 2 | Position command speed | | r/min | | |
| | | 3 | Speed Control Command | | r/min | | |
| | | 4 | Torque command | | % | | |
| | | 5 | Total encoder pulses | | Pulses | | |
| | | 6 | Total command pulses | | Pulses | | |
| | | 8 | Total External Encoder Feedback Pulses | | Pulses | | |
| | | 9 | Control mode | | - | | |
| | | 10 | I/O signal status | | - | | |
| | | 11 | Analog input value | | V | | |
| | | 12 | Alarm factor, history | | - | | |
| | | 13 | Warning number | | - | | |
| | | 14 | Regeneration resistance load ratio | - | % | 0 to 35 | |
| 528 | Default Display | 15 | Overload load ratio | 1 | % | | Yes |
| | | 16 | Inertia Ratio | | % | | |
| | | 17 | Reason for no rotation | | _ | | |
| | | 18 | Display of the number of I/O signal changes | | times | | |
| | | 20 | Absolute encoder data | | _ | | |
| | | 21 | Absolute external encoder position | | - | | |
| | | 22 | Monitor for the number of encoder communications errors | | times | | |
| | | 23 | Display of axis numbers for communication | | - | | |
| | | 24 | Position error (encoder unit) | | - | | |
| | | 25 | External encoder error (external encoder unit) | - | _ | - | |
| | | 26 | Hybrid error | | Command units | | |
| | | 27 | P-N voltage | | V | | |
| | | 28 | Soft version | 1 | - | 1 | |
| | | 29 | Drive serial number | 1 | - | 1 | |
| | | 30 | Motor serial number | | - | 1 | |
| | | 31 | Accumulative operation time | | h | 1 | |
| | | 32 | Automatic Motor Recognition Function | 1 | _ | 1 | |

A

Appendix

| Pn number | Parameter name | Setting | Description | Default setting | Unit | Setting range | Power supply OFF to ON |
|-----------|-------------------|---------|--|--------------------|------|------------------|---------------------------------|
| 528 | Default Display | 33 | Temperature Information | 1 | °C | 0 to 35 | Yes |
| 520 | Delaut Display | 35 | Safety status monitor | ' | - | 0.000 | 103 |
| 531 | Axis Number | Set | the axis number for communication. | 1 | - | 0 to 127 | Yes |
| | Pulse | Set | the detection of pulse regeneration limit error. | | _ | 0 or 1 | Yes |
| 533 | Limit Output | 0 | Disabled | 0 | | | |
| | Setting | 1 | Enabled | | | | |
| | Front Key | Set | the operation limit for the front panel. | | | | Yes |
| 535 | Protection | 0 | Operation not blocked | 0 | - | 0 or 1 | |
| | Setting | 1 | Operation blocked | | | | |

*1 When Pn510 = 0 to 3, the position error is cleared after an alarm is generated. When Pn510 = 4 to 7, the position error is retained immediately after an alarm is generated, and is cleared after the unit is stopped.

Special Setting Parameters

| Pn number | Parameter name | Setting | Description | Default setting | Unit | Setting range | Power supply OFF to ON |
|-----------|---|------------------------|---|--------------------|--------|------------------|---------------------------------|
| 602 | Excessive Speed Error Setting | Set pos spe | the detection level between the internal ition command speed and the actual ed (i.e., the speed error). | 0 | r/min | 0 to 20000 | _ |
| 605 | Gain 3 Effective Time | Set swit | effective time of gain 3 of 3-step gain ching. | 0 | 0.1 ms | 0 to 10,000 | _ |
| 606 | Gain 3 Ratio Setting | Set | gain 3 as a multiple of gain 1. | 100 | % | 50 to 1,000 | _ |
| 607 | Torque Command Value Offset | Set | offset torque to add to torque command. | 0 | % | -100 to 100 | _ |
| 608 | Forward Direction Torque Offset | Set for f | the value to add to a torque command orward direction operation. | 0 | % | -100 to 100 | _ |
| 609 | Reverse Direction Torque Offset | Set for i | the value to add to a torque command reverse direction operation. | 0 | % | -100 to 100 | _ |
| 610 | Function Expansion Setting | Set con | the function expansion. The setting tents vary depending on the function. | | _ | 0 to 63 | _ |
| 611 | Electric Current Response Setting | Mał resp | the fine adjustment to electric current sponse. The default setting is 100%. | | % | 50 to 100 | - |
| 613 | Inertia Ratio 2 | Set | the inertia ratio switching. | 250 | - | 0 to 10,000 | _ |
| 614 | Alarm Detection Allowable Time Setting | Set an e dete | the allowable time until stopping when emergency stop is actuated upon alarm action. | 200 | ms | 0 to 1,000 | _ |
| 615 | Overspeed Detection Level Setting at Immediate Stop | Dur dete set | ing an emergency stop upon alarm action, if the motor speed exceeds this value, this is an overspeed 2 error. | 0 | r/min | 0 to 20,000 | _ |
| | Absolute | Sele | ect the absolute encoder data transfer. | | | | Yes |
| 616 | Function | 0 | Disabled | 1 | - | 0 or 1 | |
| | Selection *1 | 1 | Enabled | | | | |
| | Front Donal | Sele whe | ect the EEPROM write specifications en a parameter is changed. | | | | |
| 617 | Parameter Write Selection | 0 | Writing not to be performed when a parameter is changed. | 0 | - | 0 or 1 | Yes |
| | | 1 | Writing to be performed when a parameter is changed. | | | | |
| 618 | Power Supply ON Initialization Time | Set to th | initialization time after power supply ON ne standard 1.5 s plus some. | 0 | 0.1 s | 0 to 100 | Yes |
| 619 | Encoder Phase- Z Setting | Fine the i after | ly adjust the encoder phase-Z width when number of output pulses per motor rotation r the division of pulse output is not an integer. | 0 | Pulses | 0 to 32,767 | Yes |
| 620 | External Encoder Phase-Z Expansion Setting | Set widt | the external encoder phase-Z output h. | 0 | μs | 0 to 400 | Yes |
| Pn number | Parameter name | Setting | Description | Default setting | Unit | Setting range | Power supply OFF to ON |
|-----------|--|---|---|--------------------|------------|----------------------|---------------------------------|
| 621 | Serial Absolute External Encoder Phase- Z Setting | Set the | the phase-Z regeneration position when serial absolute external encoder is used. | 0 | Pulses | 0 to 2 ²⁸ | Yes |
| 622 | Phase-AB Regeneration Method Selection for External Encoder of Phase-AB Output Type | Sele outr enc 0 | ect the regeneration method of pulse buts OA and OB when an external oder of phase AB-output type is used. Without signal regeneration With signal regeneration | 0 | _ | 0 or 1 | Yes |
| 623 | Disturbance Torque Compensation Gain | Set dist | the compensation gain for the urbance torque. | 0 | % | -100 to 100 | - |
| 624 | Disturbance Observer Filter Setting | Set torq | the filter time constant for disturbance ue compensation. | 53 | 0.01 ms | 10 to 2,500 | _ |
| 627 | Warning Latch Hold Time Selection | rning Latch d Time ection 1 to Latch time infinite 1 to Latch time of 1 to 10 s | | 5 | S | 0 to 10 | Yes |
| 628 | 628Special Function SelectionSelect the command meth 0628Function Selection01Not used. Do not set. 22Block operation function | | ect the command method. Analog/pulse command input enabled Not used. Do not set. Block operation function enabled | 0 | _ | 0, 2 | Yes |
| | Realtime | Set whe | the load characteristics estimated speed en realtime autotuning is enabled. Finalize estimated results when load estimation becomes stable. | | | | |
| 631 | Autotuning Estimated Speed | 1 | Estimates every minute from the load characteristic changes. | 0 | _ | 0 to 3 | _ |
| | Selection | 2 3 | Estimates every second from the load characteristic changes. Estimates the optimum speed from the load | | | | |
| 632 | Realtime Autotuning Customization Mode Setting | Set real | et the Customization Mode detail for altime autotuning. | | _ | -32,768 to 32,767 | _ |
| 633 | Absolute Encoder Initial Pulse Regeneration Speed | Set initia | the pulse regeneration speed when the al pulse is output. | 1000 | r/min | 1,000 to 3,000 | _ |
| 634 | Hybrid Vibration Suppression Gain | Set duri | the hybrid vibration suppression gain ng fully-closed control. | 0 | 0.1/s | 0 to 30,000 | _ |
| 635 | Hybrid Vibration Suppression Filter | Set time | the hybrid vibration suppression filter e constant during fully-closed control. | 10 | 0.01 ms | 0 to 6,400 | _ |

| Pn number | Parameter name | Setting | Description | Default setting | Unit | Setting range | Power supply OFF to ON |
|-----------|-------------------------------------|-----------------------------|---|--------------------|------|----------------------|---------------------------------|
| 637 | Vibration Detection Threshold | Set If to dete occ | the vibration detection threshold. rque vibration that exceeds this setting is ected, the vibration detection warning will ur. | 0 | 0.1% | 0 to 1,000 | - |
| 638 | Warning Mask Setting | Set the corr disa | a mask for warning detection. If you set corresponding bit to 1, the responding warning detection will be abled. | 4 | - | -32,768 to 32,767 | Yes |

*1 When the absolute encoder is being used and the current position cannot be acquired with the host controller, set the Absolute Interface Function Selection (Pn616) to 0.

Block Operation Setting Parameters

| Pn number | Parameter name | Setting | Description 5 | | Unit | Setting range | Power supply OFF to ON |
|------------------|-----------------------------------|-------------------|---|---|-------|------------------|---------------------------------|
| 700 | Block operation velocity [0] | Set Abs Upd | the velocitys to be used for Relative or olute Movement, JOG and Velocity ate command. | 0 | r/min | 0 to 20000 | _ |
| 701 | Block operation velocity [1] | Set Abs Upd | the velocitys to be used for Relative or olute Movement, JOG and Velocity ate command. | 0 | r/min | 0 to 20000 | _ |
| 702 | Block operation velocity [2] | Set Abs Upd | the velocitys to be used for Relative or olute Movement, JOG and Velocity late command. | 0 | r/min | 0 to 20000 | _ |
| 703 | Block operation velocity [3] | Set Abs Upd | the velocitys to be used for Relative or olute Movement, JOG and Velocity late command. | 0 | r/min | 0 to 20000 | - |
| 704 | Block operation velocity [4] | Set Abs Upd | the velocitys to be used for Relative or olute Movement, JOG and Velocity late command. | 0 | r/min | 0 to 20000 | - |
| 705 | Block operation velocity [5] | Set Abs Upd | et the velocitys to be used for Relative or osolute Movement, JOG and Velocity pdate command. | | r/min | 0 to 20000 | - |
| 706 | Block operation velocity [6] | Set Abs Upd | the velocitys to be used for Relative or olute Movement, JOG and Velocity ate command. | 0 | r/min | 0 to 20000 | _ |
| 707 | Block operation velocity [7] | Set Abs Upd | et the velocitys to be used for Relative or osolute Movement, JOG and Velocity odate command. | | r/min | 0 to 20000 | _ |
| 708 | Block operation acceleration [0] | Set and | the acceleration time between 0 [r/min] 3,000 [r/min]. | 0 | ms | 0 to 10000 | - |
| 709 | Block operation acceleration [1] | Set and | the acceleration time between 0 [r/min] 3,000 [r/min]. | 0 | ms | 0 to 10000 | _ |
| 710 | Block operation acceleration [2] | Set and | the acceleration time between 0 [r/min] 3,000 [r/min]. | 0 | ms | 0 to 10000 | _ |
| 711 | Block operation acceleration [3] | Set and | the acceleration time between 0 [r/min] 3,000 [r/min]. | 0 | ms | 0 to 10000 | _ |
| 712 | Block operation deceleration [0] | Set [r/m | the deceleration time between 3,000 in] and 0 [r/min]. | 0 | ms | 0 to 10000 | - |
| 713 | Block operation deceleration [1] | Set [r/m | the deceleration time between 3,000 in] and 0 [r/min]. | 0 | ms | 0 to 10000 | _ |
| 714 | Block operation deceleration [2] | Set [r/m | the deceleration time between 3,000 in] and 0 [r/min]. | 0 | ms | 0 to 10000 | - |
| 715 | Block operation deceleration [3] | Set [r/m | the deceleration time between 3,000 in] and 0 [r/min]. | 0 | ms | 0 to 10000 | - |
| 716 to 719 | Not used | Do i | not change the settings. | _ | _ | _ | - |
| 720 | Origin search approach speed 1 | Set orig | the high-velocity operation speed for in search. | 0 | r/min | 0 to 20000 | _ |

A Appendix

| Pn number | Parameter name | Setting | Description | Default setting | Unit | Setting range | Power supply OFF to ON |
|-----------|-----------------------------------|--------------------|--|--------------------|-------|------------------|---------------------------------|
| 721 | Origin search approach speed 2 | Set orig | the low-velocity operation speed for in search. | 0 | r/min | 0 to 20000 | _ |
| 700 | Origin search disable selection | Selo sea enc | Select whether or not to omit the origin search operation when an incremental encoder is used. | | _ | 0 1 | Yes |
| | | 0 | Origin search required | - | | - , | |
| | | 1 | Origin search not required | | | | |
| 723 | Not used | Do | not change the settings. | _ | _ | _ | _ |
| 724 | Not used | Do | not change the settings. | _ | _ | _ | _ |

Block Operation Control Parameters

| Pn number | Parameter name | Setting | Description | Default setting | Unit | Setting range | Power supply OFF to ON |
|-----------|--------------------------------|---------|---|--------------------|------|------------------------------|---------------------------------|
| 800 | Block Operation Command [0] | Set | command code, and arguments 1 to 5. | 0000h | _ | 0000h to FFFFh | _ |
| 801 | Block Operation Data [0] | Set | argument 6 for Block operation data [0]. | 00000000h | _ | 00000000h to FFFFFFFh | _ |
| 802 | Block Operation Command [1] | Set | command code, and arguments 1 to 5. | 0000h | - | 0000h to FFFFh | _ |
| 803 | Block Operation Data [1] | Set | argument 6 for Block operation data [1]. | 00000000h | _ | 00000000h to FFFFFFFh | - |
| 804 | Block Operation Command [2] | Set | command code, and arguments 1 to 5. | 0000h | _ | 0000h to FFFFh | _ |
| 805 | Block Operation Data [2] | Set | argument 6 for Block operation data [2]. | 00000000h | _ | 00000000h to FFFFFFFFh | - |
| 806 | Block Operation Command [3] | Set | command code, and arguments 1 to 5. | 0000h | - | 0000h to FFFFh | - |
| 807 | Block Operation Data [3] | Set | argument 6 for Block operation data [3]. | 00000000h | - | 00000000h to FFFFFFFh | - |
| 808 | Block Operation Command [4] | Set | command code, and arguments 1 to 5. | 0000h | - | 0000h to FFFFh | _ |
| 809 | Block Operation Data [4] | Set | argument 6 for Block operation data [4]. | 00000000h | _ | 00000000h to FFFFFFFh | _ |
| 810 | Block Operation Command [5] | Set | command code, and arguments 1 to 5. | 0000h | - | 0000h to FFFFh | - |
| 811 | Block Operation Data [5] | Set | argument 6 for Block operation data [5]. | 00000000h | _ | 00000000h to FFFFFFFFh | _ |
| 812 | Block Operation Command [6] | Set | command code, and arguments 1 to 5. | 0000h | - | 0000h to FFFFh | - |
| 813 | Block Operation Data [6] | Set | argument 6 for Block operation data [6]. | 00000000h | _ | 00000000h to FFFFFFFFh | _ |
| 814 | Block Operation Command [7] | Set | command code, and arguments 1 to 5. | 0000h | _ | 0000h to FFFFh | _ |
| 815 | Block Operation Data [7] | Set | argument 6 for Block operation data [7]. | 00000000h | _ | 00000000h to FFFFFFFh | _ |
| 816 | Block Operation Command [8] | Set | command code, and arguments 1 to 5. | 0000h | - | 0000h to FFFFh | - |
| 817 | Block Operation Data [8] | Set | argument 6 for Block operation data [8]. 00 | | _ | 00000000h to FFFFFFFh | - |

A Appendix

| Pn number | Parameter name | Setting | Description | Default setting | Unit | Setting range | Power supply OFF to ON |
|-----------|---------------------------------|---------|--|--------------------|------|-----------------------------|---------------------------------|
| 818 | Block Operation Command [9] | Set | command code, and arguments 1 to 5. | 0000h | - | 0000h to FFFFh | _ |
| 819 | Block Operation Data [9] | Set | argument 6 for Block operation data [9]. | 00000000h | _ | 00000000h to FFFFFFFh | _ |
| 820 | Block Operation Command [10] | Set | command code, and arguments 1 to 5. | 0000h | - | 0000h to FFFFh | _ |
| 821 | Block Operation Data [10] | Set | argument 6 for Block operation data [10]. | 00000000h | _ | 00000000h to FFFFFFFh | _ |
| 822 | Block Operation Command [11] | Set | command code, and arguments 1 to 5. | 0000h | - | 0000h to FFFFh | - |
| 823 | Block Operation Data [11] | Set | argument 6 for Block operation data [11]. | 00000000h | _ | 00000000h to FFFFFFFh | _ |
| 824 | Block Operation Command [12] | Set | command code, and arguments 1 to 5. | 0000h | _ | 0000h to FFFFh | _ |
| 825 | Block Operation Data [12] | Set | et argument 6 for Block operation data [12]. 0 | | _ | 00000000h to FFFFFFFh | _ |
| 826 | Block Operation Command [13] | Set | et command code, and arguments 1 to 5. | | - | 0000h to FFFFh | - |
| 827 | Block Operation Data [13] | Set | argument 6 for Block operation data [13]. | 00000000h | _ | 00000000h to FFFFFFFh | _ |
| 828 | Block Operation Command [14] | Set | command code, and arguments 1 to 5. | 0000h | - | 0000h to FFFFh | _ |
| 829 | Block Operation Data [14] | Set | argument 6 for Block operation data [14]. | 00000000h | _ | 00000000h to FFFFFFFh | _ |
| 830 | Block Operation Command [15] | Set | command code, and arguments 1 to 5. | 0000h | - | 0000h to FFFFh | _ |
| 831 | Block Operation Data [15] | Set | argument 6 for Block operation data [15]. | 00000000h | _ | 00000000h to FFFFFFFh | _ |
| 832 | Block Operation Command [16] | Set | command code, and arguments 1 to 5. | 0000h | - | 0000h to FFFFh | - |
| 833 | Block Operation Data [16] | Set | et argument 6 for Block operation data [16]. | | _ | 00000000h to FFFFFFFh | _ |
| 834 | Block Operation Command [17] | Set | et command code, and arguments 1 to 5. | | - | 0000h to FFFFh | _ |
| 835 | Block Operation Data [17] | Set | argument 6 for Block operation data [17]. | 00000000h | _ | 00000000h to FFFFFFFh | _ |
| 836 | Block Operation Command [18] | Set | command code, and arguments 1 to 5. | 0000h | _ | 0000h to FFFFh | _ |

| Pn number | Parameter name | Setting | Description | Default setting | Unit | Setting range | Power supply OFF to ON |
|-----------|---------------------------------|---------|--|--------------------|------|------------------------------|---------------------------------|
| 837 | Block Operation Data [18] | Set | argument 6 for Block operation data [18]. | 00000000h | - | 00000000h to FFFFFFFh | - |
| 838 | Block Operation Command [19] | Set | command code, and arguments 1 to 5. | 0000h | - | 0000h to FFFFh | - |
| 839 | Block Operation Data [19] | Set | argument 6 for Block operation data [19]. | 00000000h | _ | 00000000h to FFFFFFFFh | _ |
| 840 | Block Operation Command [20] | Set | command code, and arguments 1 to 5. | 0000h | _ | 0000h to FFFFh | _ |
| 841 | Block Operation Data [20] | Set | argument 6 for Block operation data [20]. | 00000000h | _ | 00000000h to FFFFFFFh | _ |
| 842 | Block Operation Command [21] | Set | command code, and arguments 1 to 5. | 0000h | _ | 0000h to FFFFh | _ |
| 843 | Block Operation Data [21] | Set | et argument 6 for Block operation data [21]. | | _ | 00000000h to FFFFFFFh | - |
| 844 | Block Operation Command [22] | Set | command code, and arguments 1 to 5. | 0000h | _ | 0000h to FFFFh | _ |
| 845 | Block Operation Data [22] | Set | argument 6 for Block operation data [22]. | 00000000h | _ | 00000000h to FFFFFFFh | _ |
| 846 | Block Operation Command [23] | Set | command code, and arguments 1 to 5. | 0000h | _ | 0000h to FFFFh | - |
| 847 | Block Operation Data [23] | Set | argument 6 for Block operation data [23]. | 00000000h | _ | 00000000h to FFFFFFFFh | _ |
| 848 | Block Operation Command [24] | Set | command code, and arguments 1 to 5. | 0000h | _ | 0000h to FFFFh | _ |
| 849 | Block Operation Data [24] | Set | argument 6 for Block operation data [24]. | 00000000h | _ | 00000000h to FFFFFFFh | _ |
| 850 | Block Operation Command [25] | Set | command code, and arguments 1 to 5. | 0000h | - | 0000h to FFFFh | - |
| 851 | Block Operation Data [25] | Set | argument 6 for Block operation data [25]. | 00000000h | - | 00000000h to FFFFFFFh | - |
| 852 | Block Operation Command [26] | Set | command code, and arguments 1 to 5. | 0000h | _ | 0000h to FFFFh | _ |
| 853 | Block Operation Data [26] | Set | argument 6 for Block operation data [26]. | 00000000h | _ | 00000000h to FFFFFFFh | _ |
| 854 | Block Operation Command [27] | Set | command code, and arguments 1 to 5. | 0000h | _ | 0000h to FFFFh | _ |
| 855 | Block Operation Data [27] | Set | argument 6 for Block operation data [27]. | 00000000h | _ | 00000000h to FFFFFFFFh | _ |

| Pn number | Parameter name | Setting | Description | Default setting | Unit | Setting range | Power supply OFF to ON |
|-----------|---------------------------------|---------|---|--------------------|------|-----------------------------|---------------------------------|
| 856 | Block Operation Command [28] | Set | command code, and arguments 1 to 5. | 0000h | - | 0000h to FFFFh | _ |
| 857 | Block Operation Data [28] | Set | et argument 6 for Block operation data [28]. | | _ | 00000000h to FFFFFFFh | - |
| 858 | Block Operation Command [29] | Set | command code, and arguments 1 to 5. | 0000h | _ | 0000h to FFFFh | _ |
| 859 | Block Operation Data [29] | Set | t argument 6 for Block operation data [29]. (| | _ | 00000000h to FFFFFFFh | _ |
| 860 | Block Operation Command [30] | Set | command code, and arguments 1 to 5. | 0000h | _ | 0000h to FFFFh | _ |
| 861 | Block Operation Data [30] | Set | argument 6 for Block operation data [30]. | 00000000h | _ | 00000000h to FFFFFFFh | _ |
| 862 | Block Operation Command [31] | Set | command code, and arguments 1 to 5. | 0000h | _ | 0000h to FFFFh | _ |
| 863 | Block Operation Data [31] | Set | t argument 6 for Block operation data [31]. | | _ | 00000000h to FFFFFFFh | _ |



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