

# Accurax G5 Drive Programming

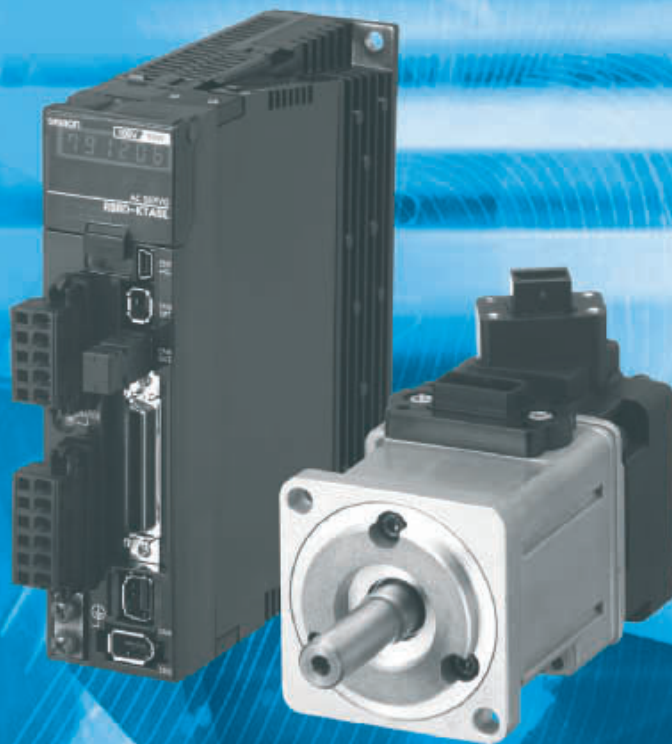
with Analogue/Pulse control

Model:

R88D-KT\_ Servo drives

R88M-K\_ Servo motors

## USER'S MANUAL



**OMRON**



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# Introduction

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

♦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 Accurax 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.

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# Items Requiring Acknowledgment

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## 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 Accurax 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.

|  |   |
|--|---|
|  <b style="font-size: 1.5em;">DANGER</b>  | Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. Additionally, there may be severe property damage. |
|  <b style="font-size: 1.5em;">Caution</b> | Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury, or property damage.                                |

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  |  |
|---|--|
|  | <p>△ This symbol indicates danger and caution.</p> <p>The specific instruction is described using an illustration or text inside or near △. The symbol shown to the left indicates "beware of electric shock".</p>                     |
|  | <p>⊘ This symbol indicates a prohibited item (item you must not do).</p> <p>The specific instruction is described using an illustration or text inside or near ⊘. The symbol shown to the left indicates "disassembly prohibited".</p> |
|  | <p>● This symbol indicates a compulsory item (item that must be done).</p> <p>The specific instruction is described using an illustration or text inside or near ●. The symbol shown to the left indicates "grounding required".</p>   |

## 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.

|  <span style="font-size: 2em; font-weight: bold; margin-left: 10px;">Danger</span> |  |
|---|--|
|    | <p>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.</p>                           |
|    | <p>Never touch the parts inside the Servo Drive.<br/>Electric shock may result.</p>  |
|    | <p>While the power is supplied, do not remove the front cover, terminal covers, cables and options.<br/>Electric shock may result.</p>   |
|    | <p>Installation, operation and maintenance or inspection by unauthorized personnel is prohibited.<br/>Electric shock or injury may result.</p>   |
|   | <p>Before carrying out wiring or inspection, turn OFF the power supply and wait for at least 15 minutes.<br/>Electric shock may result.</p>  |
|    | <p>Do not damage, pull, stress strongly, or pinch the cables or place heavy articles on them.<br/>Electric shock, stopping of Servo Drive operation, or burn damage may result.</p>  |
|    | <p>Never touch the rotating part of the Servomotor during operation.<br/>Injury may result.</p>  |
|    | <p>Never modify the Servo Drive.<br/>Injury or equipment damage may result.</p>  |
|    | <p>Install a stopping device on the machine to ensure safety.<br/>* The holding brake is not a stopping device to ensure safety.<br/>Injury may result.</p>  |
|    | <p>Install an immediate stop device externally to the machine so that the operation can be stopped and the power supply cut off immediately.<br/>Injury may result.</p>  |
|    | <p>When the power is restored after a momentary power interruption, the machine may restart suddenly. Never come close to the machine when restarting power.<br/>* Implement measures to ensure safety of people nearby even when the machine is restarted.<br/>Injury may result.</p> |
|    | <p>After an earthquake, be sure to conduct safety checks.<br/>Electric shock, injury or fire may result.</p>   |
|    | <p>Never drive the Servomotor using an external drive source.<br/>Fire may result.</p>   |



# Danger



Do not place flammable materials near the Servomotor, Servo Drive, or Regeneration Resistor.  
Fire may result.



Install the Servomotor, Servo Drive, and Regeneration Resistor on non-flammable materials such as metals.  
Fire may result.



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.



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.



Do not touch the key grooves with bare hands if a motor with shaft-end key grooves is being used.  
Injury may result.



# Caution



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.



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## Storage and Transportation



# Caution



When transporting the Servo Drive, do not hold it by the cables or Servomotor shaft. Injury or failure may result.



Do not overload the Servo Drive or Servomotor. (Follow the instruction on the product label.) Injury or failure may result.



Use the motor eye-bolts only when transporting the Servomotor. Do not use them to transport the machine. Injury or failure may result.



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.

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## Installation and Wiring



# Caution



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.



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.



Do not apply strong impact on the Servomotor shaft or Servo Drive.  
Failure may result.



Wire the cables correctly and securely.  
Runaway motor, injury, or failure may result.



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.



Only use the power supply voltage specified in this manual.  
Burn damage may result.



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.














Connect an immediate stop relay in series with the brake control relay.  
Injury or failure may result.



When connecting the battery, make sure the polarity is correct.  
Battery damage or explosion may result.

Operation and Adjustment

|  <h1 style="margin: 0;">Caution</h1> |   |
|---|---|
|                                      | <p>Conduct a test operation after confirming that the equipment is not affected.<br/>Equipment damage may result.</p>   |
|                                      | <p>Before operating the Servo Drive in an actual environment, check if it operates correctly based on the parameters you have set.<br/>Equipment damage may result.</p>                               |
|                                      | <p>Never adjust or set parameters to extreme values, as it will make the operation unstable.<br/>Injury may result.</p>   |
|                                      | <p>Separate the motor from the mechanical system and check its operation before installing the motor to the machine.<br/>Injury may result.</p>   |
|                                      | <p>If an alarm generated, remove the cause of the alarm and ensure safety, and then reset the alarm and restart the operation.<br/>Injury may result.</p>   |
|                                     | <p>Do not use the built-in brake of the motor for normal braking operation.<br/>Failure may result.</p>   |
|                                    | <p>Do not operate the Servomotor connected to an excessive load inertia.<br/>Failure may result.</p>  |
|                                    | <p>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.<br/>Injury, damage, or taint damage may result.</p> |
|                                    | <p>If the Servo Drive fails, cut off the power supply to the Servo Drive at the power supply.<br/>Fire may result.</p>  |
|                                    | <p>Do not turn ON and OFF the main Servo Drive power supply frequently.<br/>Failure may result.</p>   |

### Maintenance and Inspection



## Caution



After replacing the Servo Drive, transfer to the new Servo Drive all data needed to resume operation, before restarting the operation.  
Equipment damage may result.



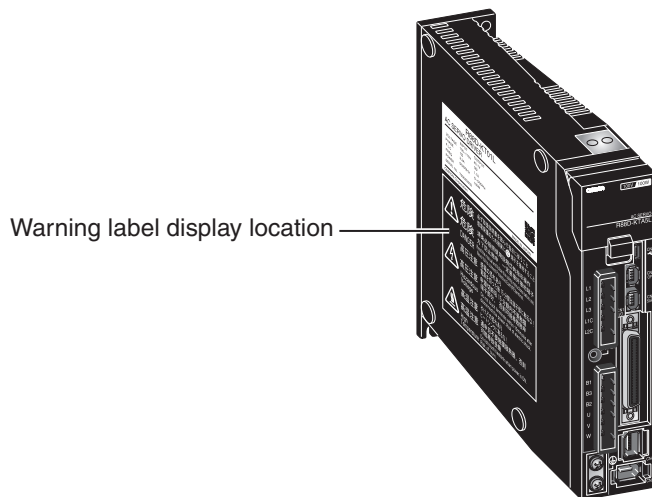
Never repair the Servo Drive by disassembling it.  
Electric shock or injury may result.



Be sure to turn OFF the power supply when the Servo Drive is not going to be used for a prolonged period of time.  
Injury may result.

### 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.



(R88D-KTA5L)

Instructions on Warning Label

|  |   |   |
|--|---|---|
|  | <p><b>危険</b><br/><b>危険</b><br/><b>DANGER</b></p>                | <p>必ず取扱説明書を読んで指示に従うこと<br/>感電保護のため確実にⓍ端子を接地すること</p> <p>请务必按照使用说明书的指示操作<br/>为了防止触电，一定要接好接地端子</p> <p>Read the manual and follow the safety instructions before use.<br/>Never fail to connect Protective Earth(PE) terminal.</p> |
|  | <p><b>高压注意</b><br/><b>高压注意</b><br/><b>Hazardous Voltage</b></p> | <p>感電の恐れあり<br/>電源を切った後15分間は端子部に触るな!</p> <p>电源切断后15分钟内不要触摸<br/>端子部分，否则可能导致触电</p> <p>Do not touch terminals within 15 minutes after<br/>disconnect the power. Risk of electric shock.</p>                                       |
|  | <p><b>高温注意</b><br/><b>高温注意</b><br/><b>High Temperature</b></p>  | <p>やけどの恐れあり<br/>ヒートシンクに触るな!</p> <p>通电后不要触摸散热器，否则<br/>可能导致受伤</p> <p>Do not touch heatsink when power is ON.<br/>Risk of burn.</p>  |

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.

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# Revision History

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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



Revision code

| Revision code | Revision date | Revised content     |
|---------------|---------------|---------------------|
| 01            | January 2011  | Original production |

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# Related Manuals

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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 drive programming. 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  |
|---------|--|---|
| I571    | R88M-Kx/R88D-KTx AC Servomotors/Servo Drives User's Manual | The Accurax G5 Series models and functions are explained. |

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# 1

## Outline of Operation

This section explains the features and specifications of the drive programming function.

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|            |                             |            |
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# 1-1 Features

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With the use of the drive programming 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 drive programming function delivers the equal positioning performance as with the analog/pulse input command.

# 1-2 Specifications

The drive programming specifications are as follows.

| 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 <sup>*1</sup>                          |              |
| Output signals                            | Maximum 4 <sup>*2</sup>                           |              |
| Conditional branching                     | Measured  |              |
| CONTROL mode                              | Position control (including full closing control) | Measured     |
|   | Velocity control<br>Torque control                | Not measured |
| Origin search                             | Measured  |              |
| Velocity update                           | Measured  |              |
| Target position update                    | Not measured <sup>*3</sup>                        |              |
| Block designation update                  | Not measured <sup>*4</sup>                        |              |
| Wrap around                               | Not measured <sup>*5</sup>                        |              |

\*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 drive programming error (alarm 94.0) will occur.

\*4 The unit cannot be started by specifying a new block number when a drive programming is already in progress.

\*5 If the command position or the current position exceeds the C000001h or 3FFFFFFh range, the wrap around error (alarm 94.1) will occur.



# 2

## Parameter Setting

This section explains the parameters required to use the drive programming function.

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|            |   |            |
|------------|---|------------|
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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 1 | 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 drive programming 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 |
|------------------|----------------------------|--|---------------|------|
| Pn628            | Special Function Selection | Select the command method.<br>0: Analog/pulse command input enabled<br>2: Drive Programming 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.<br>0: Origin search required<br>1: Origin search not required | 0, 1          | –    |

### CONTROL Mode Selection (Pn001)

When the drive programming 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.<br>0 to 5: Semi-closed control<br>6: Full closing control | 0 to 6        | –    |

### Electronic Gear Function (Pn008 to Pn010)

When the drive programming 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 drive programming 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 drive programming number to start a drive programming, allocate the drive programming 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:

| Signal name                     | Symbol  | Set value |                       | Function  |
|---------------------------------|---------|-----------|-----------------------|---|
|                                 |         | NO        | NC                    |   |
| 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 drive programming 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 drive programming 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 drive programming. 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 drive programming. For example, to start with block number 25 (19h), set as follows.<br>B - SEL1 = 1 (ON)<br>B - SEL2 = 0 (OFF)<br>B - SEL4 = 0 (OFF)<br>B - SEL8 = 1 (ON)<br>B - SEL16 = 1 (ON)<br>Note that unallocated drive programming input signals are always set to 0 (OFF). |
| Block select input 2            | B-SEL2  | 27h       | A7h                   |   |
| Block select input 4            | B-SEL4  | 28h       | A8h                   |   |
| Block select input 8            | B-SEL8  | 29h       | A9h                   |   |
| Block select input 16           | B-SEL16 | 2Ah       | AAh                   |   |

\*1 You must always allocate the operation command (RUN). Servo-on cannot be activated 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 drive programming function cannot be started if it is not allocated.





### 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 drive programming function cannot be started if it is not allocated.

When the drive programming 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 value |                       | Default setting |
|--|--------|-----------|-----------------------|-----------------|
|  |        | NO        | NC                    |                 |
| 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.

## Output Signal Selection 1 to 4 (Pn410 to Pn413)

When the drive programming 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.   |
| Drive Programming output1                | B-CTRL1  | 24h       | This is used when operating the block general-purpose output signals with the block general-purpose output signal operation command (08h). *1   |
| Drive Programming output 2               | B-CTRL2  | 25h       |   |
| Drive Programming output 3               | B-CTRL3  | 26h       |   |
| Output during a drive programming        | B-BUSY   | 28h       | The drive programming status is output. This turns ON during a drive programming, and OFF when the drive programming 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).



### 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\*\*h  


Example:

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

00000025h  


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

## 2-2 Drive Programming Setting Parameter

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

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

### Drive Programming Setting Parameter

2

Parameter Setting

| Parameter number | Parameter name                            | Attribute  | Setting range    | Unit  |
|------------------|---|--|------------------|-------|
| Pn700 *1         | Drive Programming Velocity [0]            | Up to eight drive programming velocities can be set.<br>Set the velocity for Relative Movement, Absolute Movement, and JOG and Velocity Update commands.<br>For argument of each command, set the Drive Programming Velocity number (value in [ ]), instead of the parameter number. | 0 to 20000 *2 *3 | r/min |
| Pn701 *1         | Drive Programming Velocity [1]            |  | 0 to 20000 *2 *3 | r/min |
| Pn702 *1         | Drive Programming Velocity [2]            |  | 0 to 20000 *2 *3 | r/min |
| Pn703 *1         | Drive Programming Velocity [3]            |  | 0 to 20000 *2 *3 | r/min |
| Pn704 *1         | Drive Programming Velocity [4]            |  | 0 to 20000 *2 *3 | r/min |
| Pn705 *1         | Drive Programming Velocity [5]            |  | 0 to 20000 *2 *3 | r/min |
| Pn706 *1         | Drive Programming Velocity [6]            |  | 0 to 20000 *2 *3 | r/min |
| Pn707 *1         | Drive Programming Velocity [7]            |  | 0 to 20000 *2 *3 | r/min |
| Pn708 *1         | Drive Programming Acceleration [0]        | Up to four accelerations for drive programming can be set<br>Set the acceleration times between 0 [r/min] to 3,000 [r/min].  | 0 to 10000 *3 *4 | ms    |
| Pn709 *1         | Drive Programming Acceleration [1]        |  | 0 to 10000 *3 *4 | ms    |
| Pn710 *1         | Drive Programming Acceleration [2]        |  | 0 to 10000 *3 *4 | ms    |
| Pn711 *1         | Drive Programming Acceleration [3]        | For argument of each command, set the Drive Programming Acceleration number (value in [ ]), instead of the parameter number.   | 0 to 10000 *3 *4 | ms    |
| Pn712 *1         | Drive Programming Deceleration [0]        | Up to four decelerations for drive programming can be set<br>Set the deceleration times between 3,000 [r/min] and 0 [r/min].   | 0 to 10000 *3 *4 | ms    |
| Pn713 *1         | Drive Programming Deceleration [1]        |  | 0 to 10000 *3 *4 | ms    |
| Pn714 *1         | Drive Programming Deceleration [2]        |  | 0 to 10000 *3 *4 | ms    |
| Pn715 *1         | Drive Programming Deceleration [3]        | For argument of each command, set the Drive Programming 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 drive programming. Be sure to specify the settings before starting a drive programming. To change a value, first stop the drive programming.

\*2 Up to 20,000 block-related velocities 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 drive programming, acceleration, and deceleration are set to 0,

the drive programming 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.



### Precautions for Correct Use

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- ♦ Do not change the drive programming setting parameters as a drive programming cannot be guaranteed once it is started.
-



# 3

## Drive Programming Control Parameter

This section explains the drive programming control parameter.

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|            |  |             |
|------------|--|-------------|
| <b>3-1</b> | <b>Parameter Configuration.....</b>                | <b>3-1</b>  |
|            | Drive Programming Command Configuration .....      | 3-1         |
|            | Drive Programming Data Configuration .....         | 3-1         |
|            | List of Drive Programming Control Parameters ..... | 3-2         |
| <b>3-2</b> | <b>Command List.....</b>                           | <b>3-5</b>  |
| <b>3-3</b> | <b>Command Details .....</b>                       | <b>3-6</b>  |
| <b>3-4</b> | <b>Block Jump Conditions and Finishing .....</b>   | <b>3-25</b> |
|            | Block Jump Conditions .....                        | 3-25        |
|            | Finishing the Drive Programming.....               | 3-25        |

# 3-1 Parameter Configuration

Drive Programming control parameter consists of the 16-bit drive programming command and the 32-bit drive programming data. These parameters must be set before starting the drive programming function.

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

## Drive Programming Command Configuration

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

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

## Drive Programming Data Configuration

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

| byte | bit | 7          | 6 | 5 | 4 | 3 | 2 | 1 | 0 |    |
|------|-----|------------|---|---|---|---|---|---|---|----|
| 0    |     | Argument 6 |   |   |   |   |   |   |   | LL |
| 1    |     |            |   |   |   |   |   |   |   | LH |
| 2    |     |            |   |   |   |   |   |   |   | HL |
| 3    |     |            |   |   |   |   |   |   |   | HH |



## List of Drive Programming Control Parameters

The following is a list of drive programming control parameters.

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

### 3-1 Parameter Configuration

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

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



#### Precautions for Correct Use

- ◆ Do not change any related parameters as a drive programming cannot be guaranteed once it is started.

## 3-2 Command List

The following is a list of commands that can be used in a drive programming.

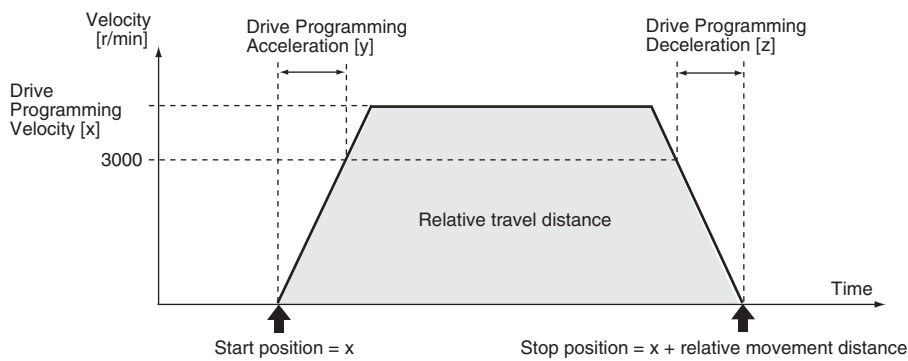
| Command name                            | Drive Programming control parameter (48 bit) |                   |                                     |                     |                         |                       |                                    |
|---|--|-------------------|-------------------------------------|---------------------|-------------------------|-----------------------|------------------------------------|
|   | Drive Programming command                    |                   |                                     |                     |                         |                       | Drive Programming 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]  |
| Drive Programming 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) |

# 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.

| Command name      | Drive Programming control parameter (48 bit) |                 |                     |                     |            |                       |                                    |
|-------------------|--|-----------------|---------------------|---------------------|------------|-----------------------|------------------------------------|
|                   | Drive Programming command                    |                 |                     |                     |            |                       | Drive Programming 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] |



### 3-3 Command Details

| Command argument |                                    | Setting range           | Content  |
|------------------|------------------------------------|-------------------------|--|
| 1                | Velocity number                    | 0 to 7                  | Set selection number x for drive programming velocity [x].   |
| 2                | Acceleration number                | 0 to 3                  | Set selection number y for drive programming acceleration [y].   |
| 3                | Deceleration number                | 0 to 3                  | Set selection number z for drive programming deceleration [z].   |
| 4                | –                                  | –                       | Set 0.   |
| 5                | Block jump conditions *1           | 0 to 3                  | Set the block jump conditions after this command is executed.<br>[LSB] 0: Jump to the next block after the operation is started.<br>1: Jump to the next block upon movement completion. *2<br>[MSB] 0: End the drive programming at the current block.<br>1: Continue the drive programming. |
| 6                | Relative movement distance [pulse] | 8000001h 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.

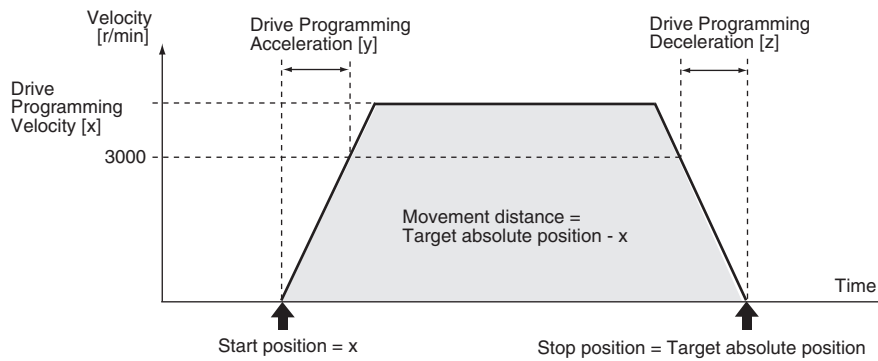
\*3 If the target position (the relative movement distance added to the current command position) is outside of the range between C000001h to 3FFFFFFh, Drive Programming data setting error (alarm 93.1) will occur.

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

| Command name      | Drive Programming control parameter (48 bit) |                 |                     |                     |            |                       |                                  |
|-------------------|--|-----------------|---------------------|---------------------|------------|-----------------------|----------------------------------|
|                   | Drive Programming command                    |                 |                     |                     |            |                       | Drive Programming 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                           |
| Absolute Movement | 2h   | Velocity number | Acceleration number | Deceleration number | -          | Block jump conditions | Target absolute position [pulse] |



| Command argument | Setting range                    | Content              |  |
|------------------|----------------------------------|----------------------|--|
| 1                | Velocity number                  | 0 to 7               | Set selection number x for Drive Programming Velocity [x].   |
| 2                | Acceleration number              | 0 to 3               | Set selection number y for Drive Programming Acceleration [y].   |
| 3                | Deceleration number              | 0 to 3               | Set selection number z for Drive Programming Deceleration [z].   |
| 4                | -                                | -                    | Set 0.   |
| 5                | Block jump conditions *1         | 0 to 3               | Set the block jump conditions after this command is executed.<br>[LSB] 0: Jump to the next block after the operation is started.<br>1: Jump to the next block upon movement completion. *2<br>[MSB] 0: End the drive programming at the current block.<br>1: Continue the drive programming. |
| 6                | Target absolute position [pulse] | C000001h 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.

### 3-3 Command Details

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



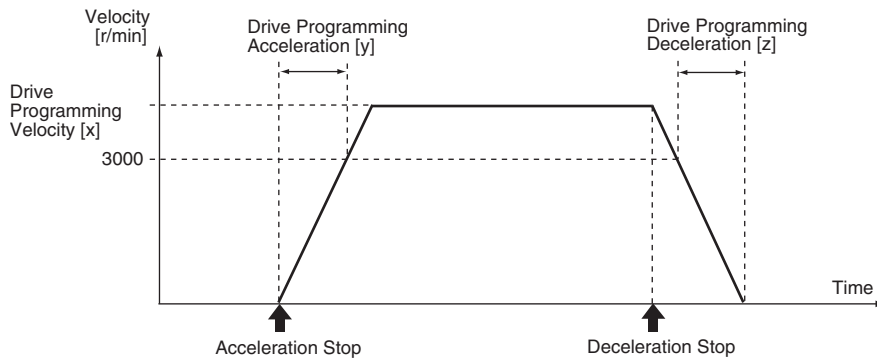
## JOG (03h)

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 drive programming 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).

| Command name | Drive Programming control parameter (48 bit) |                 |                     |                     |               |                       |                        |
|--------------|--|-----------------|---------------------|---------------------|---------------|-----------------------|------------------------|
|              | Drive Programming command                    |                 |                     |                     |               |                       | Drive Programming 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                 |
| JOG          | 3h   | Velocity number | Acceleration number | Deceleration number | JOG direction | Block jump conditions | -                      |



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

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

### 3-3 Command Details

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

| Command name  | Drive Programming control parameter (48 bit) |                  |                     |                     |                         |                       |                        |
|---------------|--|------------------|---------------------|---------------------|-------------------------|-----------------------|------------------------|
|               | Drive Programming command                    |                  |                     |                     |                         |                       | Drive Programming 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                 |
| Origin Search | 4h   | Detection method | Acceleration number | Deceleration number | Origin search direction | Block jump conditions | –                      |

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

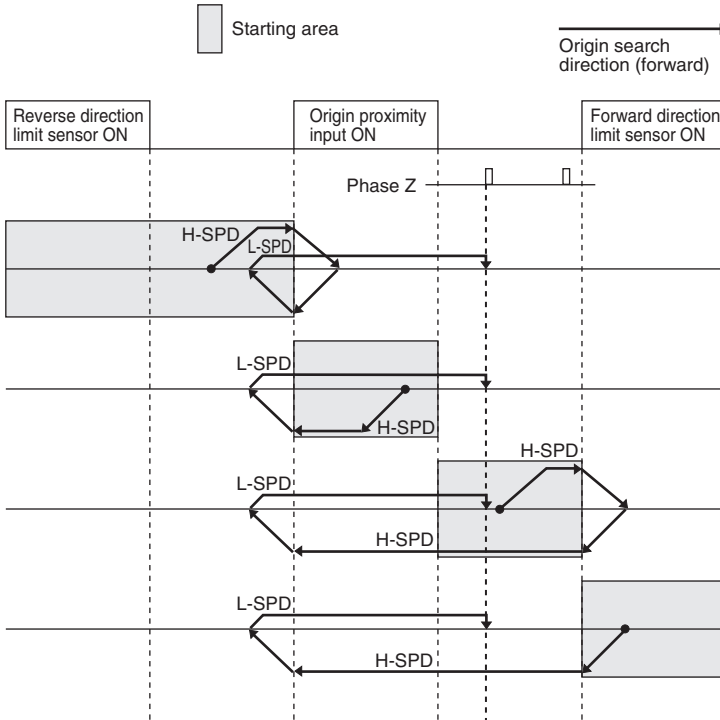
\*1 For details on the block jump conditions, refer to "3-4 Block Jump Conditions and Finishing" (P.3-25).

| 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.                      |
| Drive Programming Acceleration [y]        | 0 to 10000                  | ms    | Set the acceleration.<br>Set the acceleration time between 0 and 3,000 [r/min]. |
| Drive Programming Deceleration [z]        | 0 to 10000                  | ms    | Set the deceleration.<br>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

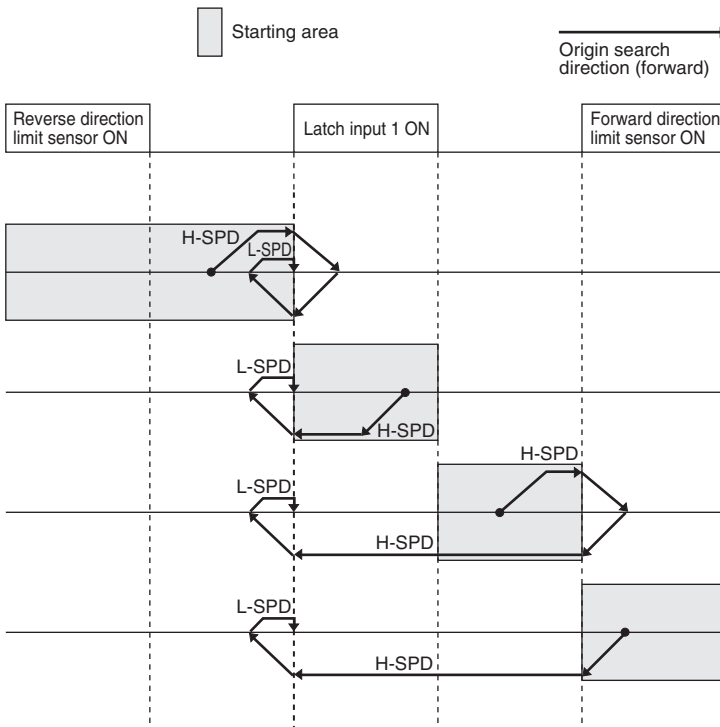
Example: Origin search direction (forward)



(Example 2)

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

Example: Origin search direction (forward)





#### Precautions for Correct Use

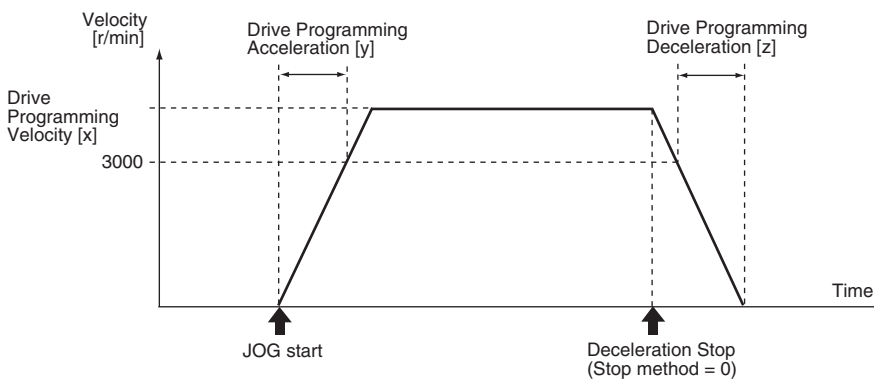
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- Sequence input signals (SI1 to SI10) must be allocated in advance to origin proximity input (HOME) or latch input 1 (EXT1), and the origin sensor needs to be connected. Set the sensor signal width to 4 ms min.
  - To avoid erroneous detections when 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 C000001h 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      | Drive Programming control parameter (48 bit) |             |            |            |            |                       |                        |
|-------------------|--|-------------|------------|------------|------------|-----------------------|------------------------|
|                   | Drive Programming command                    |             |            |            |            |                       | Drive Programming 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                 |
| Deceleration Stop | 5h   | Stop method | -          | -          | -          | Block jump conditions | -                      |



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

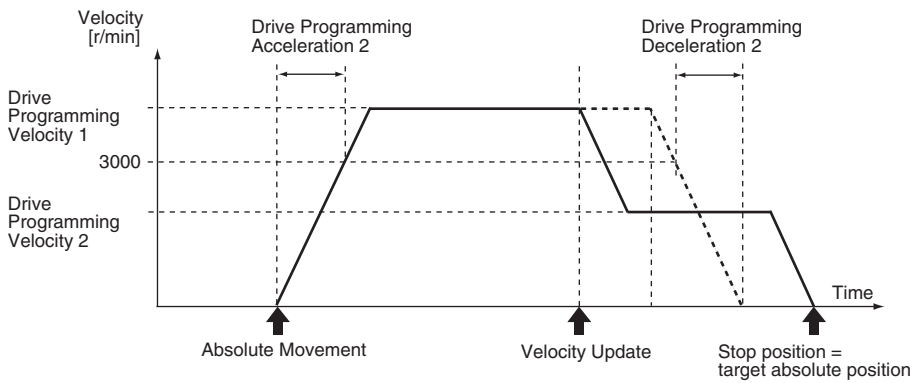
### Velocity Update (06h)

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.

| Command name    | Drive Programming control parameter (48 bit) |                 |            |            |               |                       |                        |
|-----------------|--|-----------------|------------|------------|---------------|-----------------------|------------------------|
|                 | Drive Programming command                    |                 |            |            |               |                       | Drive Programming 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                 |
| 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.

### 3-3 Command Details

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



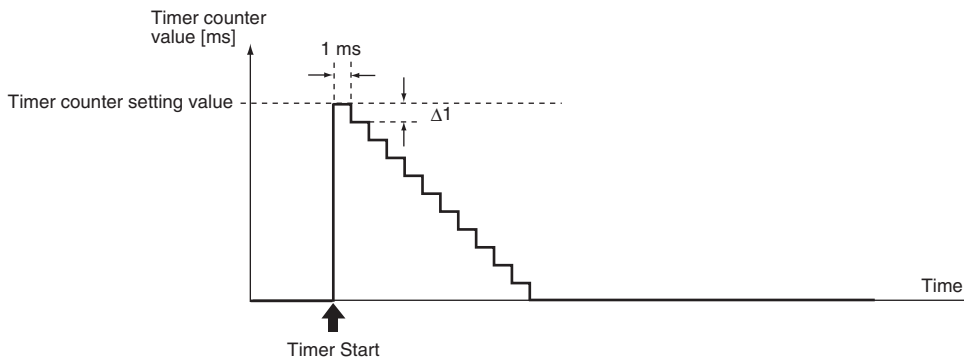


### Timer (07h)

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.

| Command name | Drive Programming control parameter (48 bit) |            |            |            |            |                       |                                   |
|--------------|--|------------|------------|------------|------------|-----------------------|-----------------------------------|
|              | Drive Programming command                    |            |            |            |            |                       | Drive Programming 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                            |
| Timer        | 7h   | -          | -          | -          | -          | Block jump conditions | Timer counter setting value [1ms] |



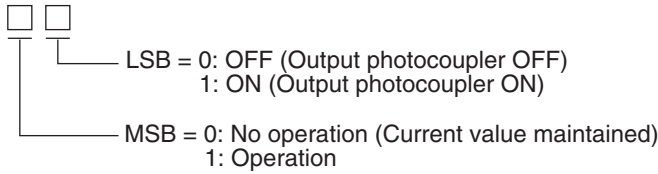
| Command argument | Setting range                               | Content   |
|------------------|---|---|
| 1                | -   | Set 0.  |
| 2                | -   | Set 0.  |
| 3                | -   | Set 0.  |
| 4                | -   | Set 0.  |
| 5                | Block jump conditions *1<br>0 to 3          | Set the block jump conditions after this command is executed.<br>[LSB] 0: Jump to the next block after the operation is started.<br>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.<br>[MSB] 0: End the drive programming at the current block.<br>1: Continue the drive programming. |
| 6                | Timer counter setting value<br>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).

### Drive Programming Output Signal Control (08h)

This is used when operating the output signals.  
 The drive programming output signals (B-CTRL1 to B-CTRL3) need to be allocated in advance to sequence output signals (SO1 to SO4).

| Command name                            | Drive Programming control parameter (48 bit) |            |            |            |            |                       |                        |
|---|--|------------|------------|------------|------------|-----------------------|------------------------|
|   | Drive Programming command                    |            |            |            |            |                       | Drive Programming 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                 |
| Drive Programming Output Signal Control | 8h   | B-CTRL1    | B-CTRL2    | B-CTRL3    | –          | Block jump conditions | –                      |



| Command argument | Setting range            | Content   |
|------------------|--------------------------|---|
| 1                | B-CTRL1                  | The following operation can be performed when the general-purpose terminal SOn is set to drive programming output B-CTRLn.<br>0, 1: No operation (Current value maintained)<br>2: OFF (Output photocoupler OFF)<br>3: ON (Output photocoupler ON) |
| 2                | B-CTRL2                  |   |
| 3                | B-CTRL3                  |   |
| 4                | –                        | Set 0.  |
| 5                | Block jump conditions *1 | Set the block jump conditions after this command is executed.<br>[LSB] 0, 1: Jump to the next block after the operation is started.<br>[MSB] 0: End the drive programming at the current block.<br>1: Continue the drive programming.             |
| 6                | –                        | Set 0.  |

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

3 Drive Programming Control Parameter

## Jump (09h)

This is used when jump to the specified block number.

| Command name | Drive Programming control parameter (48 bit) |            |                            |            |            |                       |                        |
|--------------|--|------------|----------------------------|------------|------------|-----------------------|------------------------|
|              | Drive Programming command                    |            |                            |            |            |                       | Drive Programming 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                 |
| Jump         | 9h   | –          | Block number (destination) |            |            | Block jump conditions | –                      |

| Command argument | Setting range            | Content   |
|------------------|--------------------------|---|
| 1                | –                        | Set 0.  |
| 2                | Block number             | Set the destination block number.   |
| 3                |                          |   |
| 4                |                          |   |
| 5                | Block jump conditions *1 | 0 to 3<br>Set the block jump conditions after this command is executed. The drive programming 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.

| Command name                | Drive Programming control parameter (48 bit) |                   |                                     |            |            |                       |                                    |
|-----------------------------|--|-------------------|-------------------------------------|------------|------------|-----------------------|------------------------------------|
|                             | Drive Programming command                    |                   |                                     |            |            |                       | Drive Programming 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                             |
| Conditional Branching 1 (=) | Ah   | Comparison target | Block number (destination when Yes) |            |            | Block jump conditions | Comparison value (threshold value) |

| Command argument |                                    | Setting range          | Content   |                   |       |  |
|------------------|------------------------------------|------------------------|---|-------------------|-------|--|
|                  |                                    |                        | Value   | Comparison target | Unit  | Note   |
| 1                | Comparison target                  | 0 to 15                | 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) |
|                  |                                    |                        | 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 <sup>*1</sup>                            |
|                  |                                    |                        | 8   | Output signals    | –     | Output signals <sup>*2</sup>                           |
|                  |                                    |                        | 9 to 15   | (Reserved)        | –     | Do not use.  |
| 2                | Block number                       | 0 to 31                | Set the destination block number when the specified conditions are met (when Yes).  |                   |       |  |
| 3                |                                    |                        |   |                   |       |  |
| 4                |                                    |                        |   |                   |       |  |
| 5                | Block jump conditions              | 0 to 3                 | Set the block jump conditions after this command is executed.<br>[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.<br>1: The current drive programming is executed until Yes is indicated. When Yes is indicated, the operation moves to the specified block.<br>[MSB] 0: End the drive programming at the current block.<br>1: Continue the drive programming. |                   |       |  |
| 6                | Comparison value (threshold value) | 80000000h to 7FFFFFFFh | Set the comparison value (threshold value).<br>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   |
|                            | 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 |
|                            | 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.

| Command name                | Drive Programming control parameter (48 bit) |                   |                                     |            |            |                       |                                    |
|-----------------------------|--|-------------------|-------------------------------------|------------|------------|-----------------------|------------------------------------|
|                             | Drive Programming command                    |                   |                                     |            |            |                       | Drive Programming 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                             |
| 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   |
| 1                | Comparison target                  | 0 to 15              | 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) |
|                  |                                    |                      | 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                | Block number                       | 0 to 31              | Set the destination block number when the specified conditions are met (when Yes).   |                   |       |  |
| 3                |                                    |                      |  |                   |       |  |
| 4                |                                    |                      |  |                   |       |  |
| 5                | Block jump conditions              | 0 to 3               | Set the block jump conditions after this command is executed.<br>[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.<br>1: The current drive programming is executed until Yes is indicated.<br>When Yes is indicated, the operation moves to the specified block.<br>[MSB] 0: End the drive programming at the current block.<br>1: Continue the drive programming. |                   |       |  |
| 6                | Comparison value (threshold value) | 8000000h to 7FFFFFFh | Set the comparison value (threshold value).<br>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.

| Command name                | Drive Programming control parameter (48 bit) |                   |                                     |            |            |                       |                                    |
|-----------------------------|--|-------------------|-------------------------------------|------------|------------|-----------------------|------------------------------------|
|                             | Drive Programming command                    |                   |                                     |            |            |                       | Drive Programming 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                             |
| Conditional Branching 3 (<) | Ch   | Comparison target | Block number (destination when Yes) |            |            | Block jump conditions | Comparison value (threshold value) |

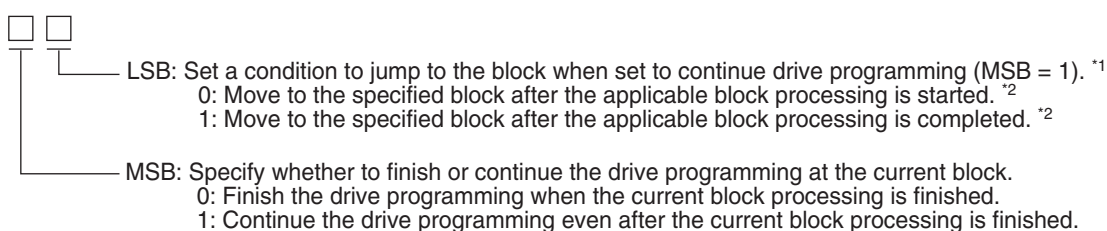
| Command argument |                                    | Setting range          | Content   |                   |       |  |
|------------------|------------------------------------|------------------------|---|-------------------|-------|--|
|                  |                                    |                        | Value   | Comparison target | Unit  | Note   |
| 1                | Comparison target                  | 0 to 15                | 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) |
|                  |                                    |                        | 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                | Block number                       | 0 to 31                | Set the destination block number when the specified conditions are met (when Yes).  |                   |       |  |
| 3                |                                    |                        |   |                   |       |  |
| 4                |                                    |                        |   |                   |       |  |
| 5                | Block jump conditions              | 0 to 3                 | Set the block jump conditions after this command is executed.<br>[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.<br>1: The current drive programming is executed until Yes is indicated. When Yes is indicated, the operation moves to the specified block.<br>[MSB] 0: End the drive programming at the current block.<br>1: Continue the drive programming. |                   |       |  |
| 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.  |                   |       |  |

## 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.



\*1 When this is set to finish the drive programming (MSB = 0), the least significant bit (LSB) setting will be disabled, and the drive programming 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 Drive Programming

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

As soon as the drive programming is finished, the drive programming 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 drive programming will not be finished until the operation is completed \*1, and the drive programming 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 drive programming 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

## Drive Programming Example

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

---

|            |                                      |            |
|------------|--------------------------------------|------------|
| <b>4-1</b> | <b>Installation Conditions .....</b> | <b>4-1</b> |
|            | Operation Sequence .....             | 4-1        |
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# 4-1 Installation Conditions

## Operation Sequence

- 1-1. Set the drive programming 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 drive programming output 2 (B-CTRL2) is turned OFF, and the drive programming 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, drive programming output 2 (B-CTRL2) is turned ON and the drive programming is finished.

## Parameter Settings

### Block Number 0

- ♦ Pn800 = 8202h, Pn801 = 00000000h

| Drive Programming command / data |                       | Value | Content   |
|----------------------------------|-----------------------|-------|---|
| Command Code (4bit)              |                       | 8h    | Drive Programming 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 drive programming continues. |
| Argument 6 (32bit)               | –                     | 0     | –   |

**Block Number 1**

- ♦ Pn802 = 4153h, Pn803 = 00000000h

| Drive Programming 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 Drive Programming Acceleration [1]<br>(= Pn709)             |
| Argument 3 (2bit)                | Deceleration number     | 1     | Use Drive Programming Deceleration [1]<br>(= Pn713)             |
| Argument 4 (2bit)                | Origin search direction | 0     | Forward direction   |
| Argument 5 (2bit)                | Block jump conditions   | 3     | Operation moves after starting and drive programming continues. |
| Argument 6 (32bit)               | –                       | 0     | –   |

**Block Number 2**

- ♦ Pn804 = 8380h, Pn805 = 00000000h

| Drive Programming command / data |                       | Value | Content  |
|----------------------------------|-----------------------|-------|--|
| Command Code (4bit)              |                       | 8h    | Drive Programming 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 drive programming at the current block |
| Argument 6 (32bit)               | –                     | 0     | –  |

**Block Number 3**

- ♦ Pn806 = 21A2h, Pn807 = 000186A0h (100000)

| Drive Programming command / data |                                  | Value  | Content   |
|----------------------------------|----------------------------------|--------|---|
| Command Code (4bit)              |                                  | 2h     | Absolute Movement   |
| Argument 1 (4bit)                | Velocity number                  | 1      | Use Drive Programming Velocity [1]<br>(= Pn701)                 |
| Argument 2 (2bit)                | Acceleration number              | 2      | Use Drive Programming Acceleration [2]<br>(= Pn710)             |
| Argument 3 (2bit)                | Deceleration number              | 2      | Use Drive Programming Deceleration [2]<br>(= Pn714)             |
| Argument 4 (2bit)                | –                                | 0      | –   |
| Argument 5 (2bit)                | Block jump conditions            | 2      | Operation moves after starting and drive programming 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)

| Drive Programming 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)                | Block number (destination when Yes) | 5     | Move to block number 5 when conditions are met  |
| Argument 3 (2bit)                |                                     |       |   |
| 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 drive programming continues. |
| Argument 6 (32bit)               | Comparison value                    | 30000 | Set the 30,000th pulse for the comparison value   |

### Block Number 5

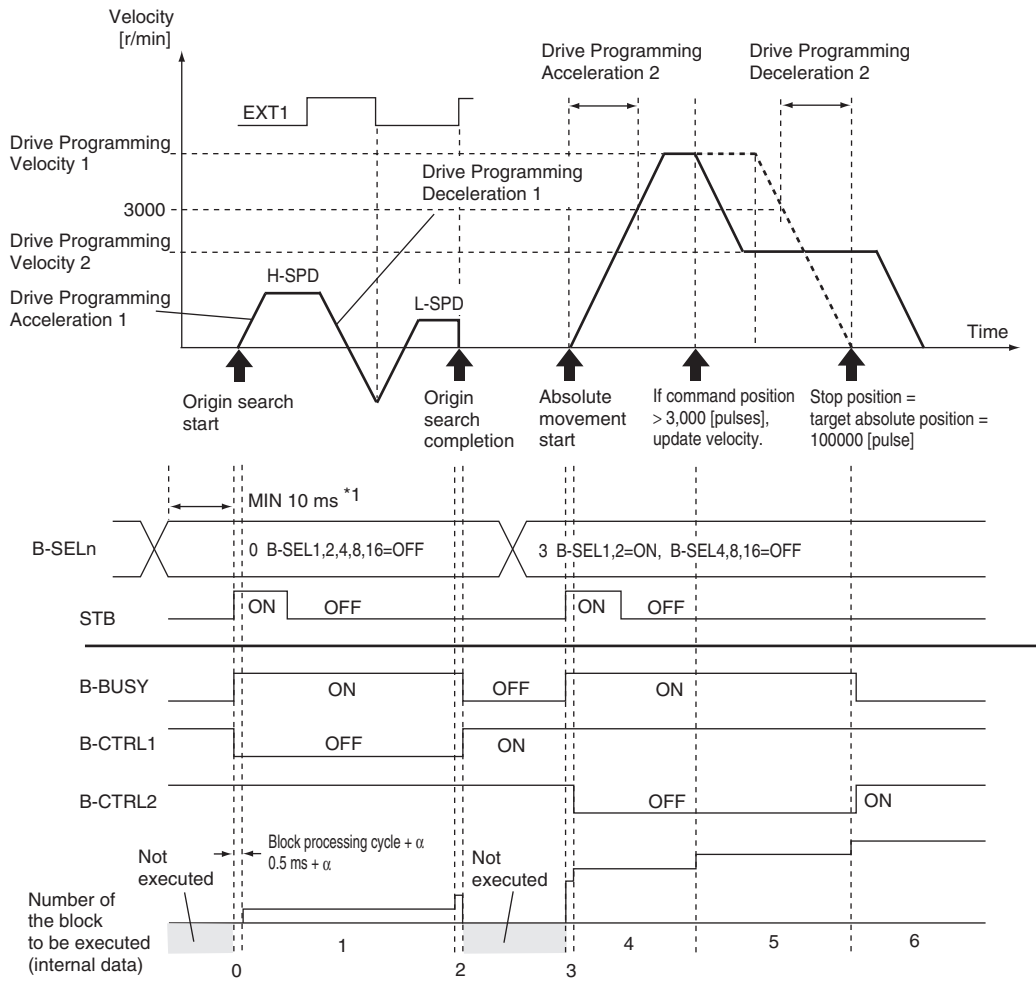
- ♦ Pn810 = 6203h, Pn811 = 00000000h

| Drive Programming command / data |                       | Value | Content   |
|----------------------------------|-----------------------|-------|---|
| Command Code (4bit)              |                       | 6h    | Velocity Update   |
| Argument 1 (4bit)                | Velocity number       | 2     | Use Drive Programming 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 drive programming continues.   |
| Argument 6 (32bit)               | –                     | 0     | –   |

### Block Number 6

- ♦ Pn812 = 80C0h, Pn813 = 00000000h

| Drive Programming command / data |                       | Value | Content  |
|----------------------------------|-----------------------|-------|--|
| Command Code (4bit)              |                       | 8h    | Drive Programming 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 drive programming at the current block |
| Argument 6 (32bit)               | –                     | 0     | –  |



\*1 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.

---

|            |  |             |
|------------|--|-------------|
| <b>5-1</b> | <b>Error Processing.....</b>                     | <b>5-1</b>  |
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# 5-1 Error Processing

## 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.

Main Circuit Power Supply Input Terminals (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 | (600 to 15 kW)    | : 3-phase 380 to 480 VAC (323 to 528 V) 50/60 Hz      |

Control Circuit Power Supply Input Terminals (L1C, L2C)

|           |                   |   |
|-----------|-------------------|---|
| 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 | (600 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 (□□) 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 Warning 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 <sup>*1</sup>             | Warning condition   | Warning Output Selection (Pn440, Pn441) <sup>*2</sup> | Warning Mask Setting (Pn638) |
|----------------|---|---------------------------------|---|---|------------------------------|
| A0             | Overload warning                        | √                               | The load ratio is 85% or more of the protection level.                                  | 1   | bit 7                        |
| A1             | Excessive regeneration warning          | √                               | 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                             | √                               | The fan stops for 1 second.   | 4   | bit 6                        |
| A4             | Encoder communications warning          | √                               | Encoder communications errors occurred in series more than the specified value.         | 5   | bit 4                        |
| A5             | Encoder overheating warning             | √                               | 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          | √                               | The external encoder detected a warning.  | 9   | bit 8                        |
| A9             | External encoder communications warning | √                               | 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 no-time 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.

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## 5-3 Alarm List

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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

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- ◆ 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.
  - Turn OFF the power supply, then turn it ON again.
  - 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 cause  | Attribute |                |                   |
|--------------|-----|---|---|-----------|----------------|-------------------|
| Main         | Sub |   |   | 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.  | –         | √              | –                 |
| 12           | 0   | Overvoltage   | The DC voltage in the main circuit is abnormally high.  | √         | √              | –                 |
| 13           | 0   | Main power supply undervoltage (Insufficient voltage between P and N) | The DC voltage of the main circuit is low.  | –         | √              | –                 |
|              | 1   | Main power supply undervoltage (AC cut-off detection)                 | A location was detected where the main circuit AC power supply is cut off.  | –         | √              | –                 |
| 14           | 0   | Overcurrent   | Overcurrent flowed to the IGBT.   | √         | –              | –                 |
|              | 1   | IPM error   | Motor power line ground fault or short circuit.   | √         | –              | –                 |
| 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.  | √         | √              | –                 |
| 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.   | √         | –              | –                 |
| 21           | 0   | Encoder communications disconnection error                            | The encoder wiring is disconnected.   | √         | –              | –                 |
|              | 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.   | √         | –              | –                 |
| 24           | 0   | Error counter overflow  | The error counter accumulated pulse exceeds the set value for the Error Counter Overflow Level (Pn014).   | √         | √              | √                 |
|              | 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).   | √         | √              | √                 |
| 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). | √         | –              | √                 |

| Alarm number |     | Error detection function                         | Detection details and probable cause  | Attribute |                |                   |
|--------------|-----|--|---|-----------|----------------|-------------------|
| Main         | Sub |  |   | History   | Can be cleared | Immediate stop *1 |
| 26           | 0   | Overspeed  | The motor rotation speed exceeded the value set on the Overspeed Level set (Pn513).   | √         | √              | √                 |
|              | 1   | Overspeed 2                                      | The motor rotation speed exceeded the value set on the Overspeed Level set 2 (Pn615).   | √         | √              | –                 |
| 27           | 0   | Command pulse frequency error                    | A command pulse frequency error was detected.   | √         | √              | √                 |
|              | 1   | Absolute value cleared<br><b>ABS</b>             | The multi-rotation counter for the absolute encoder was cleared by the CX-Drive.  | √         | –              | –                 |
|              | 2   | Command pulse multiplier error                   | The command pulse divider or multiplier is not suitable.  | √         | √              | √                 |
|              | 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.   | √         | √              | √                 |
| 29           | 0   | Error counter overflow                           | Error counter value based on the encoder pulse reference exceeded 2 <sup>29</sup> (536,870,912).  | √         | √              | –                 |
|              | 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.   | –         | √              | –                 |
| 33           | 0   | Interface input duplicate allocation error 1     | A duplicate setting for the interface input signals was detected.   | √         | –              | –                 |
|              | 1   | Interface input duplicate allocation error 2     |   | √         | –              | –                 |
|              | 2   | Interface input function number error 1          | An undefined number was detected in the interface input signal allocations.   | √         | –              | –                 |
|              | 3   | Interface input function number error 2          |   | √         | –              | –                 |
|              | 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.  | √         | –              | –                 |
| 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 cause  | Attribute |                |                   |
|--------------|--------|--|---|-----------|----------------|-------------------|
| Main         | Sub    |  |   | 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.   | –         | √              | –                 |
| 39           | 0      | Excessive analog input 1                                 | A current exceeding the Speed Command/Torque Command Input Overflow Level Setting (Pn424, Pn427 or Pn430) was applied to the analog command input (pin 14). | √         | √              | √                 |
|              | 1      | Excessive analog input 2                                 |   | √         | √              | √                 |
|              | 2      | Excessive analog input 3                                 |   | √         | √              | √                 |
| 40           | 0      | Absolute encoder system down error <b>ABS</b>            | The voltage supplied to the absolute encoder is lower than the specified value.   | √         | √              | –                 |
| 41           | 0      | Absolute encoder counter overflow error <b>ABS</b>       | The multi-rotation counter of the absolute encoder exceeds the specified value.   | √         | –              | –                 |
| 42           | 0      | Absolute encoder overspeed error <b>ABS</b>              | The motor rotation speed exceeds the specified value when only the battery power supply of the absolute encoder is used.                                    | √         | √              | –                 |
| 43           | 0      | Encoder initialization error                             | An encoder initialization error was detected.   | √         | –              | –                 |
| 44           | 0      | Absolute encoder 1-rotation counter error <b>ABS</b>     | A 1-turn counter error was detected.  | √         | –              | –                 |
| 45           | 0      | Absolute encoder multi-rotation counter error <b>ABS</b> | A multi-rotation counter error or phase-AB signal error was detected.   | √         | –              | –                 |
| 47           | 0      | Absolute encoder status error <b>ABS</b>                 | 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.   | √         | –              | –                 |
|              | 1      | External encoder communications data error               | An error was detected in external encoder communications data.  | √         | –              | –                 |

| Alarm number |     | Error detection function                | Detection details and probable cause  | Attribute |                |                   |
|--------------|-----|---|---|-----------|----------------|-------------------|
| Main         | Sub |   |   | History   | Can be cleared | Immediate stop *1 |
| 51           | 0   | External encoder status error 0         | An external encoder alarm code was detected.  | √         | -              | -                 |
|              | 1   | External encoder status error 1         |   | √         | -              | -                 |
|              | 2   | External encoder status error 2         |   | √         | -              | -                 |
|              | 3   | External encoder status error 3         |   | √         | -              | -                 |
|              | 4   | External encoder status error 4         |   | √         | -              | -                 |
|              | 5   | External encoder status error 5         |   | √         | -              | -                 |
| 55           | 0   | Phase-A connection error                | An error was detected in the external encoder phase A connection.   | √         | -              | -                 |
|              | 1   | Phase-B connection error                | An error was detected in the external encoder phase B connection.   | √         | -              | -                 |
|              | 2   | Phase-Z connection error                | An error was detected in the external encoder phase Z connection.   | √         | -              | -                 |
| 87           | 0   | Forced alarm input error                | The forced alarm input signal was input.  | -         | √              | -                 |
| 92           | 0   | Encoder data restoration Error          | Initialization of internal position data was not processed correctly in semi-closed control mode and absolute value mode.   | √         | -              | -                 |
|              | 1   | External encoder data restoration error | Initialization of internal position data was not processed correctly in fully-closed control mode and absolute value mode.  | √         | -              | -                 |
| 93           | 1   | Drive Programming data setting error    | A setting error was detected in the drive programming setting data and drive programming control data.  | √         | √              | -                 |
|              | 2   | Parameter setting error 2               | External encoder ratio exceeded the allowable range.  | √         | -              | -                 |
| 94           | 0   | Drive Programming error                 | A drive programming was started during a drive programming or while the servo was OFF.  | √         | √              | -                 |
|              | 1   | Wrap around error                       | The position command value or the current position exceeds the C0000001h and 3FFFFFFFh range.   | √         | -              | -                 |
|              | 2   | Origin search error                     | <ul style="list-style-type: none"> <li>· Drive prohibition input turned ON during an origin search operation, and a reverse direction drive prohibition input turned ON during a reverse operation.</li> <li>· Origin search was executed when an absolute encoder is used.</li> <li>· Relative or absolute travel was executed when origin search has not been completed.</li> </ul> | √         | √              | -                 |



| Alarm number  |        | Error detection function | Detection details and probable cause   | Attribute |                |                   |
|---------------|--------|--------------------------|--|-----------|----------------|-------------------|
| Main          | Sub    |                          |  | 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 numbers |        | 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.

## 5-4 Troubleshooting

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   |
|--------------|---------------------------|--|--|--|
| 11           | Power supply undervoltage | Occurs when the power is turned ON.        | <ul style="list-style-type: none"> <li>The power supply voltage is low.</li> <li>Momentary power interruption occurred.</li> <li>Power supply capacity is insufficient.</li> <li>The power supply voltage is reduced because the main power supply is OFF.</li> <li>The main power supply is not input.</li> </ul> | <ul style="list-style-type: none"> <li>Increase the power supply capacity.</li> <li>Change the power supply.</li> <li>Turn ON the power supply.</li> </ul>   |
|              |                           |  | <ul style="list-style-type: none"> <li>Power supply capacity is insufficient.</li> </ul>   | <ul style="list-style-type: none"> <li>Increase the power supply capacity.</li> </ul>  |
|              |                           |  | <ul style="list-style-type: none"> <li>Phase loss</li> </ul>   | <ul style="list-style-type: none"> <li>Connect the phases (L1, L2, L3) of the power supply voltage correctly.</li> <li>For single-phase, connect to L1 and L3 correctly.</li> </ul>  |
|              |                           |  | <ul style="list-style-type: none"> <li>The main circuit power supply is damaged.</li> <li>Control PCB error.</li> </ul>  | <ul style="list-style-type: none"> <li>Replace the Servo Drive.</li> </ul>   |
| 12           | Overvoltage               | Occurs when the power supply is turned ON. | <ul style="list-style-type: none"> <li>Main circuit power supply voltage is out of allowable range.</li> </ul>   | <ul style="list-style-type: none"> <li>Change the main circuit power supply voltage to within allowable range.</li> </ul>  |
|              |                           | Occurs when the motor is decelerating.     | <ul style="list-style-type: none"> <li>Load inertia is too large.</li> </ul>   | <ul style="list-style-type: none"> <li>Calculate the regenerative energy and connect an External Regeneration Resistor with the required regeneration absorption capacity.</li> <li>Extend the deceleration time.</li> </ul>   |
|              |                           | Occurs during descent (vertical axis).     | <ul style="list-style-type: none"> <li>Gravitational torque is too large.</li> </ul>   | <ul style="list-style-type: none"> <li>Add a counterbalance to the machine to lower gravitational torque.</li> <li>Reduce the descent speed.</li> <li>Calculate the regenerative energy and connect an External Regeneration Resistor with the required regeneration absorption capacity.</li> </ul> |

| Alarm number | Error conditions                       | Status when error occurs                   | Cause  | Measures  |
|--------------|--|--|--|---|
| 13           | Main circuit power supply undervoltage | Occurs when the servo is turned ON.        | <ul style="list-style-type: none"> <li>· The power supply voltage is low.</li> <li>· Momentary power interruption occurred.</li> <li>· Power supply capacity is insufficient.</li> <li>· The power supply voltage is reduced because the main power supply is OFF.</li> <li>· The main power supply is not input.</li> </ul> | <ul style="list-style-type: none"> <li>· Check the power supply capacity.</li> <li>· Change the power supply.</li> <li>· Turn ON the power supply.</li> <li>· Extend the Momentary Hold Time (Pn509).</li> </ul>            |
|              |  | Occurs when the power supply is turned ON. | <ul style="list-style-type: none"> <li>· Phase loss</li> </ul>   | <ul style="list-style-type: none"> <li>· Correctly connect the phases of the power supply voltage.</li> <li>· Correctly connect the single-phase.</li> </ul>  |
|              |  |  | <ul style="list-style-type: none"> <li>· The main circuit power supply is damaged.</li> <li>· Control PCB damage.</li> </ul>   | <ul style="list-style-type: none"> <li>· Replace the Servo Drive.</li> </ul>  |
|              |  |  |  |   |
| 14           | Overcurrent                            | Occurs when the servo is turned ON.        | <ul style="list-style-type: none"> <li>· Control PCB error</li> </ul>  | <ul style="list-style-type: none"> <li>· Replace the Servo Drive.</li> </ul>  |
|              |  |  | <ul style="list-style-type: none"> <li>· The motor power line is short-circuited or ground-faulted between phases.</li> </ul>  | <ul style="list-style-type: none"> <li>· Repair the short-circuited or ground-faulted power line.</li> <li>· Measure the insulation resistance at the motor and, if there is a short circuit, replace the motor.</li> </ul> |
|              |  |  | <ul style="list-style-type: none"> <li>· Phase U, phase V, phase W, and the ground are wired incorrectly.</li> </ul>   | <ul style="list-style-type: none"> <li>· Wire correctly.</li> </ul>   |
|              |  |  | <ul style="list-style-type: none"> <li>· Motor winding is burned out.</li> </ul>   | <ul style="list-style-type: none"> <li>· Measure the winding resistance, and if the winding is burned out, replace the motor.</li> </ul>  |
|              |  |  | <ul style="list-style-type: none"> <li>· The relay for the dynamic brake has been deposited.</li> </ul>  | <ul style="list-style-type: none"> <li>· Do not frequently input the operation command (RUN) input.</li> <li>· Do not operate the system by turning the servo ON and OFF.</li> </ul>  |
|              |  |  | <ul style="list-style-type: none"> <li>· Motor non-conformity</li> </ul>   | <ul style="list-style-type: none"> <li>· Use a Servomotor that is appropriate for use with the Servo Drive.</li> </ul>  |
|              |  |  | <ul style="list-style-type: none"> <li>· The pulse input timing is too early.</li> </ul>   | <ul style="list-style-type: none"> <li>· Wait at least 100 ms before inputting pulses after turning ON the operation command (RUN).</li> </ul>  |
|              |  |  | <ul style="list-style-type: none"> <li>· The resistor in the Servo Drive is abnormally overheating.</li> </ul>   | <ul style="list-style-type: none"> <li>· Reduce the ambient temperature of the Servo Drive to 55°C or lower.</li> <li>· If the relay does not click when the power supply is turned ON, replace the Servo Drive.</li> </ul> |

## 5-4 Troubleshooting

| Alarm number | Error conditions      | Status when error occurs               | Cause  | Measures   |
|--------------|-----------------------|--|--|--|
| 15           | Servo Drive overheat  | Occurs during operation.               | <ul style="list-style-type: none"> <li>The ambient temperature is too high.</li> <li>The load is too large.</li> </ul>                                   | <ul style="list-style-type: none"> <li>Lower the ambient temperature.</li> <li>Increase the capacity of the drive and motor.</li> <li>Reduce the load.</li> <li>Extend the acceleration/ deceleration times.</li> </ul>  |
| 16           | Overload              | Occurs when the servo is turned ON.    | <ul style="list-style-type: none"> <li>There is an error in the motor wiring (the wiring or the connections are faulty).</li> </ul>                      | <ul style="list-style-type: none"> <li>Wire the Servomotor power cable correctly.</li> </ul>   |
|              |                       |  | <ul style="list-style-type: none"> <li>The electromagnetic brake is ON.</li> </ul>   | <ul style="list-style-type: none"> <li>Turn OFF the brake.</li> </ul>  |
|              |                       | Occurs during operation.               | <ul style="list-style-type: none"> <li>The Servo Drive has broken down.</li> </ul>   | <ul style="list-style-type: none"> <li>Replace the Servo Drive.</li> </ul>   |
|              |                       |  | <ul style="list-style-type: none"> <li>The effective torque exceeds the rated torque.</li> <li>The initial torque exceeds the maximum torque.</li> </ul> | <ul style="list-style-type: none"> <li>Review the load conditions and operating conditions.</li> <li>Review the motor capacity.</li> </ul>   |
| 18           | Regeneration overload | Occurs when the motor is decelerating. | <ul style="list-style-type: none"> <li>Unusual noise or vibration is caused by faulty gain adjustment.</li> </ul>  | <ul style="list-style-type: none"> <li>Adjust the gain correctly.</li> </ul>   |
|              |                       |  | <ul style="list-style-type: none"> <li>The Servo Drive has broken down.</li> </ul>   | <ul style="list-style-type: none"> <li>Replace the Servo Drive.</li> </ul>   |
|              |                       | Occurs during descent (vertical axis). | <ul style="list-style-type: none"> <li>Load inertia is too large.</li> </ul>   | <ul style="list-style-type: none"> <li>Calculate the regenerative energy and connect an External Regeneration Resistor with the required regeneration absorption capacity.</li> <li>Extend the deceleration time.</li> </ul>   |
|              |                       |  | <ul style="list-style-type: none"> <li>The deceleration time is too short.</li> <li>The motor rotation speed is too high.</li> </ul>                     | <ul style="list-style-type: none"> <li>Reduce the motor rotation speed.</li> <li>Extend the deceleration time.</li> <li>Calculate the regenerative energy and connect an External Regeneration Resistor with the required regeneration absorption capacity.</li> </ul>                               |
|              |                       |  | <ul style="list-style-type: none"> <li>The operating limit of the External Regeneration Resistor is limited to 10% duty.</li> </ul>                      | <ul style="list-style-type: none"> <li>Set Pn016 to 2.</li> </ul>  |
|              |                       |  | <ul style="list-style-type: none"> <li>Gravitational torque is too large.</li> </ul>   | <ul style="list-style-type: none"> <li>Add a counterbalance to the machine to lower gravitational torque.</li> <li>Reduce the descent speed.</li> <li>Calculate the regenerative energy and connect an External Regeneration Resistor with the required regeneration absorption capacity.</li> </ul> |
|              |                       |  | <ul style="list-style-type: none"> <li>The operating limit of the External Regeneration Resistor is limited to 10% duty.</li> </ul>                      | <ul style="list-style-type: none"> <li>Set Pn016 to 2.</li> </ul>  |

| Alarm number   | Error conditions   | Status when error occurs  | Cause   | Measures  |
|--|--|---|---|---|
| 21   | Encoder communications error   | Occurs during operation.  | <ul style="list-style-type: none"> <li>The encoder is disconnected.</li> <li>Connector contacts are faulty.</li> </ul>  | <ul style="list-style-type: none"> <li>Fix the locations that are disconnected.</li> <li>Wire correctly.</li> </ul>   |
|  |  |   | <ul style="list-style-type: none"> <li>The encoder is wired incorrectly.</li> </ul>   | <ul style="list-style-type: none"> <li>Wire correctly.</li> </ul>   |
|  |  |   | <ul style="list-style-type: none"> <li>The encoder is damaged.</li> </ul>   | <ul style="list-style-type: none"> <li>Replace the motor.</li> </ul>  |
|  |  |   | <ul style="list-style-type: none"> <li>The Servo Drive is faulty.</li> </ul>  | <ul style="list-style-type: none"> <li>Replace the Servo Drive.</li> </ul>  |
|  |  |   | <ul style="list-style-type: none"> <li>The motor is mechanically held.</li> </ul>   | <ul style="list-style-type: none"> <li>If the motor shaft is held, release it.</li> </ul>   |
| 23   | Encoder communications data error  | Occurs when the power supply is turned ON. Or, occurs during operation.   | <ul style="list-style-type: none"> <li>The encoder signal line is wired incorrectly.</li> </ul>   | <ul style="list-style-type: none"> <li>Wire correctly.</li> </ul>   |
|  |  |   | <ul style="list-style-type: none"> <li>Noise on the encoder wiring causes incorrect operation.</li> </ul>   | <ul style="list-style-type: none"> <li>Take measures against noise on the encoder wiring.</li> </ul>  |
|  |  |   | <ul style="list-style-type: none"> <li>The encoder power supply voltage has dropped (especially when the cable is long.)</li> </ul>   | <ul style="list-style-type: none"> <li>Provide the required encoder power supply voltage (5 VDC ± 5%).</li> </ul>   |
| 24   | Error counter overflow   | Occurs when the motor does not rotate even when command pulses are input. | <ul style="list-style-type: none"> <li>The motor power line or the encoder wiring is incorrect.</li> </ul>  | <ul style="list-style-type: none"> <li>Wire correctly.</li> </ul>   |
|  |  |   | <ul style="list-style-type: none"> <li>The motor is mechanically held.</li> </ul>   | <ul style="list-style-type: none"> <li>If the motor shaft is held, release it.</li> <li>Release the electromagnetic brake.</li> </ul>   |
|  |  |   | <ul style="list-style-type: none"> <li>Control PCB error</li> </ul>   | <ul style="list-style-type: none"> <li>Replace the Servo Drive.</li> </ul>  |
|  |  | Occurs during high-speed rotation.  | <ul style="list-style-type: none"> <li>The motor power line or the encoder wiring is incorrect.</li> </ul>  | <ul style="list-style-type: none"> <li>Wire correctly.</li> </ul>   |
|  |  | Occurs when a long string of command pulses is given.                     | <ul style="list-style-type: none"> <li>Gain adjustment is insufficient.</li> </ul>  | <ul style="list-style-type: none"> <li>Adjust the gain.</li> </ul>  |
|  |  |   | <ul style="list-style-type: none"> <li>The acceleration/ deceleration is too rapid.</li> </ul>  | <ul style="list-style-type: none"> <li>Extend the acceleration/ deceleration times.</li> </ul>  |
|  |  | Occurs during operation.  | <ul style="list-style-type: none"> <li>The load is too large.</li> </ul>  | <ul style="list-style-type: none"> <li>Reduce the load.</li> <li>Select a suitable motor.</li> </ul>  |
| <ul style="list-style-type: none"> <li>The set value for the Error Counter Overflow Level (Pn014) is exceeded.</li> <li>The value set for the Excessive Speed Error Setting (Pn602) was exceeded.</li> </ul> | <ul style="list-style-type: none"> <li>Increase the set value of Pn014.</li> <li>Reduce the rotation speed.</li> <li>Reduce the load.</li> <li>Extend the acceleration/ deceleration times.</li> <li>Set Pn602 to 0 (disabled) or increase the setting.</li> </ul> |   |   |   |
| 25   | Excessive hybrid deviation error   | Occurs for fully-closed control.  | <ul style="list-style-type: none"> <li>There is deviation between the load position according to the external encoder and the motor position according to the encoder.</li> </ul> | <ul style="list-style-type: none"> <li>Check the motor and load connection.</li> <li>Check the external encoder and drive connection.</li> <li>Check the external encoder load position and encoder motor position settings.</li> </ul> |

## 5-4 Troubleshooting

| Alarm number | Error conditions         | Status when error occurs   | Cause  | Measures  |
|--------------|--------------------------|--|--|---|
| 26           | Overspeed                | Occurs during high-speed rotation.   | · The speed command input is too large.  | · Set the command pulse frequency to 500 Kpps max.  |
|              |                          |  | · The setting for the Electronic Gear Ratio Numerator (Pn009, Pn500 to Pn502) is not appropriate.            | · Set the electronic gear ratio numerator so that the command pulse frequency is 500 Kpps or lower.   |
|              |                          |  | · The speed exceeds the maximum rotation speed due to overshooting.  | · Adjust the gain.<br>· 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.<br>· 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.<br>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.<br>· Set Pn533 to 0 to disable the function.  |

| Alarm number | Error conditions               | Status when error occurs                   | Cause   | Measures  |
|--------------|--------------------------------|--|---|---|
| 29           | Error counter overflow         | Occurs during operation.                   | <ul style="list-style-type: none"> <li>The error counter value for the encoder pulse reference exceeded <math>\pm 2^{29}</math> (536,870,912).</li> </ul>   | <ul style="list-style-type: none"> <li>Check that the motor rotates according to the position command.</li> <li>Check on the torque monitor that the output torque is not saturated.</li> <li>Adjust the gain.</li> <li>Increase the setting for Pn013 or Pn524 to the maximum.</li> <li>Wire the encoder correctly.</li> </ul>   |
|              |                                |  | <ul style="list-style-type: none"> <li>The position error in pulses exceeded <math>\pm 2^{29}</math> (536,870,912). Alternatively, the position error in command units exceeded <math>\pm 2^{30}</math> (1,073,741,824).</li> </ul> | <ul style="list-style-type: none"> <li>Check to see if the Servomotor rotates according to the position command.</li> <li>Check on the torque monitor to see if the output torque is saturated.</li> <li>Adjust the gain.</li> <li>Maximize the set values on the Positive torque limit value and the Negative torque limit value.</li> <li>Wire the encoder as shown in the wiring diagram.</li> </ul> |
| 30           | Safety input error             | Occurs during operation.                   | <ul style="list-style-type: none"> <li>Safety input signal turned OFF.</li> </ul>   | <ul style="list-style-type: none"> <li>Check the statuses of safety inputs 1 and 2.</li> </ul>  |
| 33           | Interface I/O allocation error | Occurs when the power supply is turned ON. | <ul style="list-style-type: none"> <li>There is a duplicate setting in the I/O signal function allocation.</li> <li>Specify the undefined number with the I/O signal function allocation.</li> </ul>                                | <ul style="list-style-type: none"> <li>Set the function allocation correctly.</li> </ul>  |
|              |                                |  | <ul style="list-style-type: none"> <li>There is a mistake in the counter function allocation.</li> </ul>  | <ul style="list-style-type: none"> <li>Allocate to SI7.</li> </ul>  |
|              |                                |  | <ul style="list-style-type: none"> <li>There is a mistake in the command pulse prohibition input function allocation.</li> </ul>  | <ul style="list-style-type: none"> <li>Allocate to SI10.</li> </ul>   |
| 34           | Overrun limit error            | Occurs during operation.                   | <ul style="list-style-type: none"> <li>The Overrun Limit Setting (Pn514) was exceeded during operation.</li> </ul>  | <ul style="list-style-type: none"> <li>Adjust the gain.</li> <li>Increase the set value of Pn514.</li> <li>Set Pn514 to 0 to disable the function.</li> </ul>   |
|              |                                |  | <ul style="list-style-type: none"> <li>There are data errors in the parameters that were read.</li> </ul>   | <ul style="list-style-type: none"> <li>Reset all parameters.</li> </ul>   |
|              |                                |  | <ul style="list-style-type: none"> <li>The drive is faulty.</li> </ul>  | <ul style="list-style-type: none"> <li>Replace the Servo Drive.</li> </ul>  |
| 37           | Parameters destruction         | Occurs when the power supply is turned ON. | <ul style="list-style-type: none"> <li>The parameters that were read are corrupt.</li> </ul>  | <ul style="list-style-type: none"> <li>Replace the Servo Drive.</li> </ul>  |

## 5-4 Troubleshooting

| Alarm number | Error conditions  | Status when error occurs   | Cause  | Measures  |
|--------------|---|--|--|---|
| 38           | Drive prohibition input error                               | Occurs when the servo is turned ON.<br>Or, occurs during operation.    | <ul style="list-style-type: none"> <li>The forward drive prohibition (POT) input and reverse drive prohibition (NOT) input were both OFF at the same time.</li> </ul>                | <ul style="list-style-type: none"> <li>Wire correctly.</li> <li>Replace the limit sensor.</li> <li>Check whether the power supply for control is input correctly.</li> <li>Check whether the setting for Drive Prohibition Input Selection (Pn504) is correct.</li> </ul> |
| 39           | Excessive analog input 1                                    | Occurs during operation.   | <ul style="list-style-type: none"> <li>The voltage input to pin 14 is too high.</li> </ul>   | <ul style="list-style-type: none"> <li>Reduce the input voltage.</li> <li>Change the value for Pn424, Pn427, and Pn430.</li> </ul>  |
| 40           | Absolute encoder system down error<br><b>ABS</b>            | Occurs when the power supply is turned ON.<br>Occurs during operation. | <ul style="list-style-type: none"> <li>The voltage supplied to the absolute encoder is low.</li> </ul>   | <ul style="list-style-type: none"> <li>Set up the absolute encoder.</li> <li>Connect the battery power supply.</li> </ul>   |
| 41           | Absolute encoder counter overflow error<br><b>ABS</b>       | Occurs during operation.   | <ul style="list-style-type: none"> <li>The multi-rotation counter of the absolute encoder exceeds the specified value.</li> </ul>  | <ul style="list-style-type: none"> <li>Properly set the Operation Switch when Using Absolute Encoder (Pn015).</li> </ul>  |
| 42           | Absolute encoder overspeed error<br><b>ABS</b>              | Occurs when the power supply is turned ON.                             | <ul style="list-style-type: none"> <li>The motor rotation speed exceeds the specified value when the battery power supply is turned ON.</li> <li>The wiring is incorrect.</li> </ul> | <ul style="list-style-type: none"> <li>Reduce the motor rotation speed and supply power.</li> <li>Check the wiring.</li> </ul>  |
| 44           | Absolute encoder 1-rotation counter error<br><b>ABS</b>     | Occurs when the power supply is turned ON.                             | <ul style="list-style-type: none"> <li>The encoder is faulty.</li> </ul>   | <ul style="list-style-type: none"> <li>Replace the Servomotor.</li> </ul>   |
| 45           | Absolute encoder multi-rotation counter error<br><b>ABS</b> | Occurs when the power supply is turned ON.                             | <ul style="list-style-type: none"> <li>The encoder is faulty.</li> </ul>   | <ul style="list-style-type: none"> <li>Replace the Servomotor.</li> </ul>   |
| 47           | Absolute encoder status error<br><b>ABS</b>                 | Occurs when the power supply is turned ON.                             | <ul style="list-style-type: none"> <li>The motor was moving when the power supply was turned ON.</li> </ul>  | <ul style="list-style-type: none"> <li>Do not let the motor move when the power supply is turned ON.</li> </ul>   |
| 48           | Encoder phase-Z error                                       | Occurs during operation.   | <ul style="list-style-type: none"> <li>A phase Z pulse from the encoder was not detected regularly.</li> </ul>   | <ul style="list-style-type: none"> <li>Replace the Servomotor.</li> </ul>   |
| 49           | Encoder PS signal error                                     | Occurs during operation.   | <ul style="list-style-type: none"> <li>A logic error was detected in the PS signal from the encoder.</li> </ul>  | <ul style="list-style-type: none"> <li>Replace the Servomotor.</li> </ul>   |
| 50           | External encoder communications error                       | Occurs during operation.   | <ul style="list-style-type: none"> <li>The disconnection detection function was activated because communications between the external encoder and drive were interrupted.</li> </ul> | <ul style="list-style-type: none"> <li>Wire correctly.</li> <li>Fix the locations that are disconnected.</li> </ul>   |
|              |   |  | <ul style="list-style-type: none"> <li>There was a communications error in data from external encoder.</li> </ul>  | <ul style="list-style-type: none"> <li>Provide the required external encoder power supply voltage.</li> <li>Wire correctly.</li> <li>Connect the shield to FG.</li> </ul>   |
| 51           | External encoder status error                               | Occurs during operation.   | <ul style="list-style-type: none"> <li>An external encoder alarm code was detected.</li> </ul>   | <ul style="list-style-type: none"> <li>Check the external encoder specifications.</li> <li>From the front panel, clear the external encoder alarm, then turn the power supply OFF, then ON again.</li> </ul>  |



| Alarm number | Error conditions                   | Status when error occurs            | Cause  | Measures   |
|--------------|------------------------------------|-------------------------------------|--|--|
| 55           | Phases-A, B and Z connection error | Occurs during operation.            | <ul style="list-style-type: none"> <li>· A disconnection or other error was detected in external encoder phase A, phase B, or phase Z connection.</li> </ul> | <ul style="list-style-type: none"> <li>· Check the connection.</li> </ul>  |
| 87           | Forced alarm input error           | Occurs during operation.            | <ul style="list-style-type: none"> <li>· The forced alarm input signal was input.</li> </ul>   | <ul style="list-style-type: none"> <li>· Turn OFF the EMG-STOP signal.</li> </ul>  |
| 92           | Encoder data restoration error     | Occurs when the power is turned ON. | <ul style="list-style-type: none"> <li>· In semi-closing control, initialization of internal position data is not processed correctly.</li> </ul>            | <ul style="list-style-type: none"> <li>· Apply the correct power voltage for the long encoder wire.</li> <li>· Install the motor power line separately from the encoder wire.</li> <li>· Connect the shield cable to FG.</li> </ul>                              |
|              |                                    |                                     | <ul style="list-style-type: none"> <li>· In FULL CLOSING CONTROL mode, initialization of internal position data is not processed correctly.</li> </ul>       | <ul style="list-style-type: none"> <li>· Apply the correct power voltage for the long connection cable for the external encoder.</li> <li>· Install the motor power line separately from the encoder wire.</li> <li>· Connect the shield cable to FG.</li> </ul> |

## 5-4 Troubleshooting

| Alarm number | Error conditions        | Status when error occurs  | Cause  | Measures   |
|--------------|-------------------------|---|--|--|
| 93           | Parameter setting error | The error occurred during an operation or when a drive programming was started. | <ul style="list-style-type: none"> <li>The velocity, acceleration and deceleration were set to 0 and a drive programming was started.</li> </ul>                     | <ul style="list-style-type: none"> <li>Set the specified velocity, acceleration and deceleration to a value other than 0.</li> </ul>   |
|              |                         |   | <ul style="list-style-type: none"> <li>A target that is not applicable to comparison by the conditional branching command was set.</li> </ul>                        | <ul style="list-style-type: none"> <li>Check to make sure that there is no problem with the conditional branching command or the comparison target.</li> </ul>   |
|              |                         |   | <ul style="list-style-type: none"> <li>A command that is not defined as a command code for the drive programming control parameters was set.</li> </ul>              | <ul style="list-style-type: none"> <li>Check to make sure that there is no problem with the drive programming control parameters.</li> </ul>   |
|              |                         |   | <ul style="list-style-type: none"> <li>There is an error with another drive programming setting parameter or drive programming control parameter setting.</li> </ul> | <ul style="list-style-type: none"> <li>Check to make sure that there is no problem with the drive programming setting parameters or drive programming control parameters.</li> </ul>   |
|              |                         |   | <ul style="list-style-type: none"> <li>External encoder ratio exceeded the allowable range.</li> </ul>   | <ul style="list-style-type: none"> <li>Check the object settings. The external encoder ratio must be set between 1/40 and 160.</li> <li>Check the values on the External Feedback Pulse Dividing Numerator (Pn324) and the External Feedback Pulse Dividing enominator (Pn325) are set correctly.</li> </ul> |

| Alarm number | Error conditions        | Status when error occurs  | Cause   | Measures  |
|--------------|-------------------------|---|---|---|
| 94           | Drive Programming error | The error occurred during an operation or when a drive programming was started. | <ul style="list-style-type: none"> <li>· A new operation command was executed while an operation command (relative or absolute movement, JOG or origin search) is being executed.</li> </ul>  | <ul style="list-style-type: none"> <li>· Check to make sure that there is no problem with the drive programming sequence.</li> </ul>  |
|              |                         |   | <ul style="list-style-type: none"> <li>· A new drive programming was started while a drive programming is already in progress.</li> </ul>   | <ul style="list-style-type: none"> <li>· Check to make sure that there is no problem with the host side sequence.</li> </ul>  |
|              |                         |   | <ul style="list-style-type: none"> <li>· A drive programming was started when the servo is OFF.</li> </ul>  | <ul style="list-style-type: none"> <li>· Check to make sure that there is no problem with the host side sequence.</li> <li>· Start a drive programming when the servo is ON.</li> </ul>   |
|              |                         |   | <ul style="list-style-type: none"> <li>· The position command value or the current position exceeds the C0000001h to 3FFFFFFFh range.</li> </ul>  | <ul style="list-style-type: none"> <li>· Check to make sure that there is no problem with the coordinate series.</li> <li>· Check to make sure that there is no problem with the block data settings, such as the travel distance.</li> </ul>   |
|              |                         | The error occurred during an origin search operation.                           | <ul style="list-style-type: none"> <li>· Drive prohibition input turned ON during an origin search operation, and a reverse direction drive prohibition input turned ON during a reverse operation.</li> </ul>  | <ul style="list-style-type: none"> <li>· Check to make sure that there is no problem with the placement relationship among the drive prohibition input, origin signal and phase Z.</li> </ul>   |
|              |                         | The error occurred when a drive programming is started.                         | <ul style="list-style-type: none"> <li>· Origin search was executed when an absolute encoder is used.</li> <li>· Relative or absolute movement was executed when origin search has not been completed when an incremental encoder is being used.</li> </ul> | <ul style="list-style-type: none"> <li>· Check to make sure that there is no problem with the drive programming parameter settings and the settings when an absolute encoder is used.</li> <li>· Check to make sure that there is no problem with the drive programming parameter settings, etc.</li> <li>· Upon completion of origin search, execute a relative or absolute movement.</li> </ul> |
| 95           | Motor non-conformity    | Occurs when the power supply is turned ON.                                      | <ul style="list-style-type: none"> <li>· The motor and drive combination is incorrect.</li> </ul>   | <ul style="list-style-type: none"> <li>· Use a correct combination.</li> </ul>  |
|              |                         |   | <ul style="list-style-type: none"> <li>· The encoder wiring is disconnected.</li> </ul>   | <ul style="list-style-type: none"> <li>· Wire the encoder wiring.</li> <li>· Fix the locations that are disconnected.</li> </ul>  |

## 5-4 Troubleshooting

| 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. | <ul style="list-style-type: none"> <li>· Turn OFF the power once, and turn it ON again.</li> <li>· 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.</li> </ul> |

## Troubleshooting Using the Operation Status

| Symptom   | Probable cause  | Items to check   | Measures  |
|---|---|--|---|
| The PWR LED indicator does not light when the power supply is turned ON.      | 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.  |
|   |   | Check to see if the power supply input is wired correctly.                               | Wire correctly.   |
| The motor does not rotate even after a drive programming is started.          | The operation command (RUN) is OFF.                                       | In Monitor Mode, check whether the RUN signal is ON or OFF.                              | <ul style="list-style-type: none"> <li>Turn ON the operation command (RUN).</li> <li>Wire correctly.</li> </ul>   |
|   | The strobe input (STB) is OFF.  | Check if the STB signal is ON or OFF using the MONITOR mode.                             | <ul style="list-style-type: none"> <li>Enter strobe input (STB).</li> <li>Wire correctly.</li> </ul>  |
|   | 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.              | <ul style="list-style-type: none"> <li>Turn ON the POT and NOT signals.</li> <li>Disable them in the settings when the POT and NOT signals are not used.</li> </ul> |
|   | 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) is wired incorrectly.                     | Check the command pulse's wiring.  | Wire correctly.   |
|   |   | 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 momentarily, but then it does not operate after that. | The Servomotor power cable is wired incorrectly.                          | Check the wiring of the Servomotor power cable's phases U, V, and W.                     | Wire correctly.   |
|   | 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.  |

## 5-4 Troubleshooting

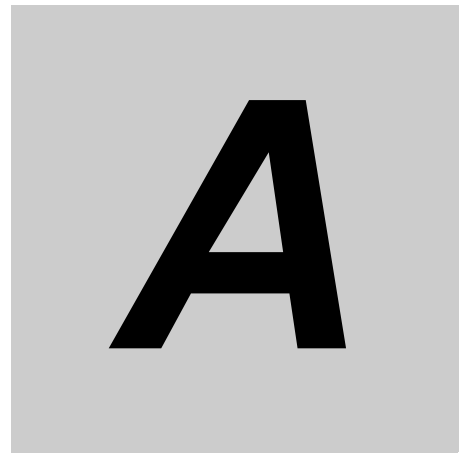
| Symptom   | Probable cause  | Items to check  | Measures  |
|---|---|---|---|
| Motor rotation is unstable  | The Servomotor power cable or encoder cable is wired incorrectly.   | Check the wiring of the Servomotor power cable's phases U, V, and W and check the encoder cable's wiring. | Wire correctly.   |
|   | The coupling system between the motor shaft and the mechanical system has eccentricity or loose screws, or the load torque is fluctuating due to engagement between pulleys or gears. | Check the mechanical system's coupling section.   | Review and adjust the machine.  |
|   |   | 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.)                        | <ul style="list-style-type: none"> <li>Reduce the load.</li> <li>Replace the Servomotor and Servo Drive with higher capacity models.</li> </ul> |
| 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.<br>The Servomotor vibrates during rotation.   | Try rotating the motor without a load. (Disconnect it from the mechanical system.)                        | <ul style="list-style-type: none"> <li>Reduce the load.</li> <li>Replace the Servomotor and Servo Drive with higher capacity models.</li> </ul> |
| 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 command (RUN) is turned OFF while the motor is rotating. | The load inertia is too large.  | Check the following:<br>·Is the load too large?<br>·Is the motor rotation speed too high?                 | Review the load conditions, and replace the Servomotor and Servo Drive with appropriate models.   |
|   | The stop circuit failed.  | –   | Replace the Servo Drive.  |

| Symptom  | Probable cause   | Items to check  | Measures  |
|--|--|---|---|
| The motor is producing unusual noises or the machine is vibrating. | There are problems with the machine's installation.  | Check to see if the Servomotor's mounting screws are loose.   | Retighten the mounting screws.  |
|  |  | 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.   | <ul style="list-style-type: none"> <li>· Readjust the torque command filter time constant.</li> <li>· If there is resonance, set the Notch Filter 1 Frequency (Pn201), Notch Filter 1 Width (Pn202), and Notch Filter 1 Depth (Pn203).</li> </ul> |   |
| Vibration is occurring at the same frequency as the power supply.  | Inductive noise is occurring.  | Check to see if the drive control signal lines are too long.  | Shorten the control signal lines.   |
|  |  | Check to see if the control signal lines and power supply lines are not bound together.   | <ul style="list-style-type: none"> <li>· Separate control signal lines from power supply lines.</li> <li>· Use a low-impedance power supply for control signals.</li> </ul> |

## 5-4 Troubleshooting

| Symptom  | Probable cause   | Items to check  | Measures  |
|--|--|---|---|
| The position is misaligned.<br>(Position misalignment occurs without an alarm being output.) | 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.  |
|  | The gain is wrong.   | –   | Perform manual tuning.  |
|  | The load inertia is large.   | Inspect the following.<br><ul style="list-style-type: none"> <li>· Is the load too large?</li> <li>· Is the motor rotation speed too high?</li> </ul> | <ul style="list-style-type: none"> <li>· Adjust the gain.</li> <li>· Review the load conditions, and replace the Servomotor and Servo Drive with appropriate models.</li> </ul> |





# Appendix



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



# A-1 Restrictions

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

- ♦ The drive programming 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

- ♦ A list of parameters when the drive programming function is enabled is provided as follows. The contents of the parameter numbers marked with ♦ are different from those when the analog/pulse commands are enabled.
- ♦ 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".

## Basic Setting Parameters

| Pn number | Parameter name                                  | Setting  | Description  | Default setting | Unit   | Setting range        | Power supply OFF to ON |
|-----------|---|--|--|-----------------|--------|----------------------|------------------------|
| 000       | Rotation Direction Switching                    | Set the relation between the command direction and the motor rotation direction. |  | 1               | -      | 0 or 1               | Yes                    |
|           |   | 0  | The +command indicates the forward direction as viewed from the shaft end (CW).        |                 |        |                      |                        |
|           |   | 1  | The +command indicates the reverse direction as viewed from the shaft end (CCW).       |                 |        |                      |                        |
| 001<br>♦  | Control Mode Selection                          | Select the Servo Drive control mode.   |  | 0               | -      | 0 to 6               | Yes                    |
|           |   | 0 to 5   | Semi-closed control  |                 |        |                      |                        |
|           |   | 6  | Fully-closed control   |                 |        |                      |                        |
| 002       | Realtime Autotuning Mode Selection              | Set the operation mode for realtime autotuning.                                  |  | 1               | -      | 0 to 6               | -                      |
|           |   | 0  | Disabled   |                 |        |                      |                        |
|           |   | 1  | Emphasizes stability   |                 |        |                      |                        |
|           |   | 2  | Emphasizes positioning   |                 |        |                      |                        |
|           |   | 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 the machine rigidity for executing realtime autotuning.                      |  | See Note 1      | -      | 0 to 31              | -                      |
| 004       | Inertia Ratio                                   | Set the load inertia as a percentage of the motor rotor inertia.                 |  | 250             | %      | 0 to 10,000          | -                      |
| 008       | Electronic Gear Integer Setting                 | Set the number of command pulses per motor rotation.                             |  | 10000           | Pulses | 0 to 2 <sup>20</sup> | Yes                    |

## A-2 Parameter List

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

A

Appendix

| Pn number | Parameter name                         | Setting | Description   | Default setting | Unit | Setting range | Power supply OFF to ON |
|-----------|--|---------|---|-----------------|------|---------------|------------------------|
| 017       | External Regeneration Resistor Setting |         | Select the type of load ratio calculation for the External Regeneration Resistor.                 | 0               | -    | 0 to 4        | Yes                    |
|           |  | 0       | Regeneration load ratio is 100% when operating rate of the External Regeneration Resistor is 10%. |                 |      |               |                        |
|           |  | 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 speed feedback filter 1 can be set to one of 6 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 the position loop gain 2.                              | See Note 5      | 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 speed feedback filter 2 can be set to one of 6 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 the speed feed-forward filter time constant.           | 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    | –                      |
| 114       | Gain Switching Input Operating Mode Selection |         | Execute optimum tuning using the gain switching function.  | 1               | –       | 0 or 1        | –                      |
|           |   | 0       | Gain 1 (PI/P switching enabled)                            |                 |         |               |                        |
|           |   | 1       | Gain 1 and gain 2 switching available                      |                 |         |               |                        |

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**Appendix**

| Pn number | Parameter name                                | Setting | Description  | Default setting | Unit   | Setting range | Power supply OFF to ON |
|-----------|---|---------|--|-----------------|--------|---------------|------------------------|
| 115       | Switching Mode in Position Control            |         | Select the gain switching condition for position control.<br>It is necessary that Pn114 be set to 1. | 0               | -      | 0 to 10       | -                      |
|           |   | 0       | Always gain 1  |                 |        |               |                        |
|           |   | 1       | Always gain 2  |                 |        |               |                        |
|           |   | 2       | Switching using gain switching input (GSEL)  |                 |        |               |                        |
|           |   | 3       | Torque command change amount   |                 |        |               |                        |
|           |   | 4       | Always gain 1  |                 |        |               |                        |
|           |   | 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 the delay time for switching from gain 2 to gain 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 the position gain switching time for gain switching.   | 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.

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**Appendix**

**Vibration Suppression Function Parameters**

| Pn number | Parameter name  | Setting   | Description                                      | Default setting | Unit | Setting range | Power supply OFF to ON |
|-----------|---|---|--|-----------------|------|---------------|------------------------|
| 200       | Adaptive Filter Selection                                     | Set the operation of the adaptive filter.   |  | 0               | -    | 0 to 4        | -                      |
|           |   | 0   | Disabled   |                 |      |               |                        |
|           |   | 1   | One enabled. Frequency limited after adaptation. |                 |      |               |                        |
|           |   | 2   | Two enabled. Frequency limited after adaptation. |                 |      |               |                        |
|           |   | 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 the notch frequency of resonance suppression notch filter 1.  |  | 5000            | Hz   | 50 to 5,000   | -                      |
| 202       | Notch 1 Width Setting   | Set the notch width of the resonance suppression notch filter 1.  |  | 2               | -    | 0 to 20       | -                      |
| 203       | Notch 1 Depth Setting   | Set the notch depth of resonance suppression notch filter 1.  |  | 0               | -    | 0 to 99       | -                      |
| 204       | Notch 2 Frequency Setting                                     | Set the notch frequency of resonance suppression notch filter 2.  |  | 5000            | Hz   | 50 to 5,000   | -                      |
| 205       | Notch 2 Width Setting   | Set the notch width of the resonance suppression notch filter 2.  |  | 2               | -    | 0 to 20       | -                      |
| 206       | Notch 2 Depth Setting   | Set the notch depth of resonance suppression notch filter 2.  |  | 0               | -    | 0 to 99       | -                      |
| 207       | Notch 3 Frequency Setting                                     | Set the notch frequency of resonance suppression notch filter 3. This is set automatically when an adaptive notch is enabled. |  | 5000            | Hz   | 50 to 5,000   | -                      |
| 208       | Notch 3 Width Setting   | Set the notch width of the resonance suppression notch filter 3. This is set automatically when an adaptive notch is enabled. |  | 2               | -    | 0 to 20       | -                      |
| 209       | Notch 3 Depth Setting   | Set the notch depth of resonance suppression notch filter 3. This is set automatically when an adaptive notch is enabled.     |  | 0               | -    | 0 to 99       | -                      |
| 210       | Notch 4 Frequency Setting                                     | Set the notch frequency of resonance suppression notch filter 4. This is set automatically when an adaptive notch is enabled. |  | 5000            | Hz   | 50 to 5,000   | -                      |
| 211       | Notch 4 Width Setting   | Set the notch width of the resonance suppression notch filter 4. This is set automatically when an adaptive notch 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 the notch depth of resonance suppression notch filter 4. This is set automatically when an adaptive notch is enabled.  | 0               | –      | 0 to 99       | –                      |
| 213       | Damping Filter Selection   |         | Select the damping filter switching method.  | 0               | –      | 0 to 3        | –                      |
|           |  | 0       | Enabled  |                 |        |               |                        |
|           |  | 1       | When DF-SEL1 input open:<br>Damping filter 1 and 3 enabled<br>When DF-SEL1 input shorted:<br>Damping filter 2 and 4 enabled  |                 |        |               |                        |
|           |  | 2       | When DF-SEL1 open and DF-SEL2 open:<br>Damping filter 1 enabled<br>When DF-SEL1 shorted and DF-SEL2 open:<br>Damping filter 2 enabled<br>When DF-SEL1 open and DF-SEL2 shorted:<br>Damping filter 3 enabled<br>When DF-SEL1 shorted and DF-SEL2 shorted:<br>Damping filter 4 enabled |                 |        |               |                        |
| 3         | Forward direction:<br>Damping filter 1 and 3 enabled<br>Reverse direction:<br>Damping filter 2 and 4 enabled |         |  |                 |        |               |                        |
| 214       | Damping Frequency 1  |         | Set the damping frequency 1. The function is enabled if the set value is 10 (= 1 Hz) or greater.   | 0               | 0.1 Hz | 0 to 2,000    | –                      |
| 215       | Damping Filter 1 Setting   |         | Finely adjust damping control function 1. If torque saturation occurs, lower this setting; to increase responsiveness, raise this setting.   | 0               | 0.1 Hz | 0 to 1,000    | –                      |
| 216       | Damping Frequency 2  |         | Set the damping frequency 2. The function is enabled if the set value is 10 (= 1 Hz) or greater.   | 0               | 0.1 Hz | 0 to 2,000    | –                      |
| 217       | Damping Filter 2 Setting   |         | Finely adjust damping control function 2. If torque saturation occurs, lower this setting; to increase responsiveness, raise this setting.   | 0               | 0.1 Hz | 0 to 1,000    | –                      |
| 218       | Damping Frequency 3  |         | Set the damping frequency 3. The function is enabled if the set value is 10 (= 1 Hz) or greater.   | 0               | 0.1 Hz | 0 to 2,000    | –                      |
| 219       | Damping Filter 3 Setting   |         | Finely adjust damping control function 3. If torque saturation occurs, lower this setting; to increase responsiveness, raise this setting.   | 0               | 0.1 Hz | 0 to 1,000    | –                      |
| 220       | Damping Frequency 4  |         | Set the damping frequency 4. The function is enabled if the set value is 10 (= 1 Hz) or greater.   | 0               | 0.1 Hz | 0 to 2,000    | –                      |
| 221       | Damping Filter 4 Setting   |         | Finely adjust damping control function 4. If torque saturation occurs, lower this setting; to increase responsiveness, raise this setting.   | 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 the time constant of the first-order lag filter for the position command. | 0               | 0.1 ms | 0 to 10,000   | —                      |
| 223       | Smoothing Filter Time Constant        |         | Set the time constant of the FIR filter for the position 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 |
|-----------|---|---------|---|-----------------|---------------|----------------------|------------------------|
| 323       | External Feedback Pulse Type Selection                        |         | Select the external feedback pulse type.  | 0               | -             | 0 to 2               | Yes                    |
|           |   | 0       | Phase AB output   |                 |               |                      |                        |
|           |   | 1       | Incremental encoder with serial communications  |                 |               |                      |                        |
|           |   | 2       | Absolute encoder with serial communications   |                 |               |                      |                        |
| 324       | External Feedback Pulse Dividing Numerator                    |         | Set the external feedback pulse dividing numerator.   | 0               | -             | 0 to 2 <sup>20</sup> | Yes                    |
| 325       | External Feedback Pulse Dividing Denominator                  |         | Set the external feedback pulse dividing denominator.   | 10000           | -             | 1 to 2 <sup>20</sup> | Yes                    |
| 326       | External Feedback Pulse Direction Switching                   |         | Reverse the external feedback pulse count direction by changing the setting.  | 0               | -             | 0 or 1               | Yes                    |
|           |   | 0       | Count direction not reversed  |                 |               |                      |                        |
|           |   | 1       | Count direction reversed  |                 |               |                      |                        |
| 327       | External Feedback Pulse Phase-Z Setting                       |         | Set disconnection detection in the Phase-Z unconnected state when a phase AB output type external feedback pulse is used. | 0               | -             | 0 or 1               | Yes                    |
|           |   | 0       | Enabled   |                 |               |                      |                        |
|           |   | 1       | Disabled  |                 |               |                      |                        |
| 328       | Internal/External Feedback Pulse Error Counter Overflow Level |         | Set the threshold for feedback pulse deviation errors.  | 16000           | Command units | 1 to 2 <sup>27</sup> | Yes                    |
| 329       | Internal/External Feedback Pulse Error Counter Reset          |         | Clear to 0 the feedback pulse error value for each 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.   | 8553090         | –    | 0 to 00FFFFFFh | Yes                    |
| 401       | Input Signal Selection 2  |         | Set the input signal 2 function and logic.   | 8487297         | –    | 0 to 00FFFFFFh | Yes                    |
| 402       | Input Signal Selection 3  |         | Set the input signal 3 function and logic.   | 9539850         | –    | 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 |
|-----------|--------------------------------|---|--|-----------------|---------------|------------------|------------------------|
| 416       | Analog Monitor 1 Selection     | Select the type for analog monitor 1.   |  | 0               | -             | 0 to 21          | -                      |
|           |                                | 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  |                 |               |                  |                        |
|           |                                | 10  | Regeneration load ratio                                      |                 |               |                  |                        |
|           |                                | 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     | Select the type for analog monitor 2.<br>The set values for this parameter are the same as Analog Monitor 1 Type (Pn416). |  | 4               | -             | 0 to 21          | -                      |
| 419       | Analog Monitor 2 Scale Setting | Select the output gain for analog monitor 2.  |  | 0               | -             | 0 to 214,748,364 | -                      |
| 421       | Analog Monitor Output Setting  | Select the analog monitor output voltage method.  |  | 0               | -             | 0 to 2           | -                      |
|           |                                | 0   | Output range: -10 to 10 V<br>Data output: Positive, negative |                 |               |                  |                        |
|           |                                | 1   | Output range: 0 to 10 V<br>Data output: Positive, negative   |                 |               |                  |                        |
|           |                                | 2   | Output range: 0 to 10 V<br>Data output: Positive, negative   |                 |               |                  |                        |
| 431       | Positioning Completion Range 1 | Set the allowed number of pulses for the positioning completion range.  |  | 10              | Command units | 0 to 262,144     | -                      |

## A-2 Parameter List

| Pn number | Parameter name                                | Setting | Description  | Default setting | Unit          | Setting range | Power supply OFF to ON |
|-----------|---|---------|--|-----------------|---------------|---------------|------------------------|
| 432       | Positioning Completion Condition Selection    |         | Set the judgment conditions for positioning completion output.   | 0               | -             | 0 to 3        | -                      |
|           |   | 0       | Positioning completion output turns ON when the position error is within the Positioning Completion Range 1 (Pn431).   |                 |               |               |                        |
|           |   | 1       | Positioning completion output turns ON when the position error is within the Positioning Completion Range 1 (Pn431) and there is no position command.  |                 |               |               |                        |
|           |   | 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.                                      |                 |               |               |                        |
|           |   | 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 the detection threshold for zero speed (ZSP).  | 50              | r/min         | 10 to 20,000  | -                      |
| 437       | Brake Timing when Stopped                     |         | Set the operation time for the mechanical brake at stop.   | 0               | 1 ms          | 0 to 10,000   | -                      |
| 438       | Brake Timing during Operation                 |         | Set the operation time for the mechanical brake during operation.  | 0               | 1 ms          | 0 to 10,000   | -                      |
| 439       | Brake Release Speed Setting                   |         | Set the speed threshold for mechanical brake output judgment during operation.   | 30              | r/min         | 30 to 3,000   | -                      |
| 440       | Warning Output Selection 1                    |         | Select the warning type to be output by Warning Output 1.  | 0               | -             | 0 to 10       | -                      |
|           |   | 0       | An OR output of all alarm status   |                 |               |               |                        |
|           |   | 1       | Overload warning   |                 |               |               |                        |
|           |   | 2       | Excessive regeneration warning   |                 |               |               |                        |
|           |   | 3       | Battery warning  |                 |               |               |                        |
|           |   | 4       | Fan warning  |                 |               |               |                        |
|           |   | 5       | Encoder communications warning   |                 |               |               |                        |
|           |   | 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                    |         | Select the warning type to be output by Warning Output 2.<br>The relationships among the set values for this parameter are the same as for Warning Output Selection 1 (Pn440).   | 0               | -             | 0 to 10       | -                      |
| 442       | Positioning Completion Range 2                |         | Set the allowable number of pulses for the second positioning completion range.  | 10              | Command units | 0 to 262,144  | -                      |

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Appendix

**Expansion Parameters**

| Pn number | Parameter name  | Setting | Description  | Default setting | Unit | Setting range | Power supply OFF to ON |
|-----------|---|---------|--|-----------------|------|---------------|------------------------|
| 503       | Encoder Dividing Denominator  |         | Set the denominator when the number of pulses per motor rotation in pulse regeneration is not an integer.  | 0               | –    | 0 to 262,144  | Yes                    |
| 504       | Drive Prohibition Input Selection   |         | Set the operation to be performed upon forward/reverse direction drive prohibition input.  | 1               | –    | 0 to 2        | Yes                    |
|           |   | 0       | Forward or reverse direction drive prohibition input enabled   |                 |      |               |                        |
|           |   | 1       | Forward or reverse direction drive prohibition input disabled  |                 |      |               |                        |
|           |   | 2       | Forward or reverse direction drive prohibition input enabled   |                 |      |               |                        |
| 505<br>◆  | Stop Selection for Drive Prohibition Input  |         | Make the setting upon drive prohibition input.   | 0               | –    | 0 to 2        | Yes                    |
|           |   | 0, 2    | The torque in the drive prohibit direction is disabled, and the dynamic brake is activated.  |                 |      |               |                        |
|           |   | 1       | The torque in the drive prohibit direction is disabled, and free-run deceleration is performed.  |                 |      |               |                        |
| 506<br>◆  | Stop Selection with Servo OFF   |         | Set the stop operation when the servo is turned OFF.   | 0               | –    | 0 to 9        | –                      |
|           |   | 0, 4    | During deceleration: Dynamic brake<br>After stopping: Dynamic brake<br>Error counter: Clear  |                 |      |               |                        |
|           |   | 1, 5    | During deceleration: Free-run<br>After stopping: Dynamic brake<br>Error counter: Clear   |                 |      |               |                        |
|           |   | 2, 6    | During deceleration: Dynamic brake<br>After stopping: Servo free<br>Error counter: Clear   |                 |      |               |                        |
|           |   | 3, 7    | During deceleration: Free-run<br>After stopping: Servo free<br>Error counter: Clear  |                 |      |               |                        |
|           |   | 8       | During deceleration: Emergency stop<br>After stopping: Dynamic brake<br>Error counter: Clear   |                 |      |               |                        |
| 9         | During deceleration: Emergency stop<br>After stopping: Servo free<br>Error counter: Clear |         |  |                 |      |               |                        |
| 507<br>◆  | Stop Selection with Main Power Supply OFF   |         | Set the stop operation when the main power supply is turned OFF.<br>The set values for this parameter are the same as Stop Selection with Servo OFF (Pn506). | 0               | –    | 0 to 9        | –                      |
| 508       | Undervoltage Alarm Selection  |         | Select whether to trip the LV or turn OFF the servo 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-2 Parameter List

| Pn number | Parameter name  | Setting | Description   | Default setting | Unit          | Setting range | Power supply OFF to ON |
|-----------|---|---------|---|-----------------|---------------|---------------|------------------------|
| 510<br>◆  | Stop Selection for Alarm Detection *1   |         | Set the alarm sequence.   | 0               | -             | 0 to 7        | -                      |
|           |   | 0       | During deceleration: Dynamic brake<br>After stopping: Dynamic brake   |                 |               |               |                        |
|           |   | 1       | During deceleration: Free-run<br>After stopping: Dynamic brake  |                 |               |               |                        |
|           |   | 2       | During deceleration: Dynamic brake<br>After stopping: Servo free  |                 |               |               |                        |
|           |   | 3       | During deceleration: Free-run<br>After stopping: Servo free   |                 |               |               |                        |
|           |   | 4       | During Emergency stop alarm deceleration: Emergency stop<br>During deceleration: Dynamic brake<br>After stopping: Dynamic brake |                 |               |               |                        |
|           |   | 5       | During Emergency stop alarm deceleration: Emergency stop<br>During deceleration: Free-run<br>After stopping: Dynamic brake      |                 |               |               |                        |
|           |   | 6       | During Emergency stop alarm deceleration: Emergency stop<br>During deceleration: Dynamic brake<br>After stopping: Servo free    |                 |               |               |                        |
| 7         | During Emergency stop alarm deceleration: Emergency stop<br>During deceleration: Free-run<br>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 the motor over-travel distance for position commands.   | 10              | 0.1 Rotations | 0 to 1,000    | -                      |
| 515       | Control Input Signal Read Setting   |         | Select from one of 4 values for the IF read cycle.  | 0               | -             | 0 to 3        | Yes                    |
|           |   | 0       | 0.166 ms  |                 |               |               |                        |
|           |   | 1       | 0.333 ms  |                 |               |               |                        |
|           |   | 2       | 1 ms  |                 |               |               |                        |
|           |   | 3       | 1.666 ms  |                 |               |               |                        |
| 516       | Alarm Reset Condition Setting   |         | Set the alarm clear input detection method.   | 0               | -             | 0 or 1        | Yes                    |
|           |   | 0       | 120 ms  |                 |               |               |                        |
|           |   | 1       | Follow the Control Input Signal Read Setting (Pn515).   |                 |               |               |                        |

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**Appendix**



| Pn number | Parameter name   | Setting  | Description  | Default setting | Unit    | Setting range | Power supply OFF to ON |
|-----------|--|--|--|-----------------|---------|---------------|------------------------|
| 517       | Error Counter Reset Condition Selection  |  | Set the clear condition for the error counter reset input signal.                          | 0               | -       | 0 to 4        | -                      |
|           |  | 0  | Disabled   |                 |         |               |                        |
|           |  | 1  | Clears the error counter with the level. (Shorted for 500 μs or longer)                    |                 |         |               |                        |
|           |  | 2  | Clears the error counter with the level. (Shorted for 1 ms or longer)                      |                 |         |               |                        |
|           |  | 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) |  |  |                 |         |               |                        |
| 518       | Command Pulse Prohibition Input Setting  |  | Enable or disable the command pulse prohibition input signals (INH).                       | 1               | -       | 0 or 1        | -                      |
|           |  | 0  | Enabled  |                 |         |               |                        |
| 519       | Command Pulse Prohibition Input Read Setting   |  | Select the signal read cycle for the command pulse prohibition input.                      | 0               | -       | 0 to 4        | Yes                    |
|           |  | 0  | 0.166 ms   |                 |         |               |                        |
|           |  | 1  | 0.333 ms   |                 |         |               |                        |
|           |  | 2  | 1 ms   |                 |         |               |                        |
|           |  | 3  | 1.666 ms   |                 |         |               |                        |
| 4         | 0.166 ms   |  |  |                 |         |               |                        |
| 520       | Position Setting Unit Selection  |  | Select the positioning completion range and error counter overflow level setting unit.     | 0               | -       | 0 or 1        | Yes                    |
|           |  | 0  | Command unit   |                 |         |               |                        |
| 521<br>◆  | Torque Limit Selection   |  | Set the forward or reverse direction torque limit selection method.                        | 1               | -       | 0 to 6        | -                      |
|           |  | 0, 1, 4, 5   | Pn013 is the limit value for both forward and reverse directions.                          |                 |         |               |                        |
|           |  | 2  | Forward operation: Set by Pn013, Reverse operation: Set by Pn522.                          |                 |         |               |                        |
|           |  | 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 the change rate (fluctuate) for when the torque limit is switched from No. 1 to No. 2. | 0               | ms/100% | 0 to 4,000    | -                      |
| 524       | Torque Limit Switching Setting 2   |  | Set the change rate (fluctuate) for when the torque limit is switched from No. 2 to No. 1. | 0               | ms/100% | 0 to 4,000    | -                      |

## A-2 Parameter List

| Pn number | Parameter name                       | Setting | Description  | Default setting | Unit          | Setting range | Power supply OFF to ON |
|-----------|--------------------------------------|---------|--|-----------------|---------------|---------------|------------------------|
| 525       | Forward External Torque Limit        |         | Set the forward direction torque limit for TL-SEL input when Pn521 Torque Limit Selection is set to 6.     | 500             | %             | 0 to 500      | –                      |
| 526       | Reverse External Torque Limit        |         | Set the reverse direction torque limit for TL-SEL input when Pn521 Torque Limit Selection is set to 6.     | 500             | %             | 0 to 500      | –                      |
| 528       | Default Display                      |         | Select the data to be displayed on the 7-segment LED initially when the control power supply is turned ON. | 1               |               | 0 to 35       | Yes                    |
|           |                                      | 0       | Position command error   |                 | Command units |               |                        |
|           |                                      | 1       | Motor speed  |                 | 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   |                 | %             |               |                        |
|           |                                      | 15      | Overload load ratio  |                 | %             |               |                        |
|           |                                      | 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                         | –       |  |                 |               |               |                        |
| 29        | Drive serial number                  | –       |  |                 |               |               |                        |
| 30        | Motor serial number                  | –       |  |                 |               |               |                        |
| 31        | Accumulative operation time          | h       |  |                 |               |               |                        |
| 32        | Automatic Motor Recognition Function | –       |  |                 |               |               |                        |

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**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                    |
|           |   | 35   | Safety status monitor   |                 | –    |               |                        |
| 531       | Axis Number                             | Set the axis number for communication.               |                         | 1               | –    | 0 to 127      | Yes                    |
| 533       | Pulse Regeneration Limit Output Setting | Set the detection of pulse regeneration limit error. |                         | 0               | –    | 0 or 1        | Yes                    |
|           |   | 0  | Disabled                |                 |      |               |                        |
|           |   | 1  | Enabled                 |                 |      |               |                        |
| 535       | Front Key Protection Setting            | Set the operation limit for the front panel.         |                         | 0               | –    | 0 or 1        | Yes                    |
|           |   | 0  | Operation not blocked   |                 |      |               |                        |
|           |   | 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 the detection level between the internal position command speed and the actual speed (i.e., the speed error).                                 | 0               | r/min  | 0 to 20000    | –                      |
| 605       | Gain 3 Effective Time                               |         | Set effective time of gain 3 of 3-step gain switching.  | 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 the value to add to a torque command for forward direction operation.   | 0               | %      | -100 to 100   | –                      |
| 609       | Reverse Direction Torque Offset                     |         | Set the value to add to a torque command for reverse direction operation.   | 0               | %      | -100 to 100   | –                      |
| 610       | Function Expansion Setting                          |         | Set the function expansion. The setting contents vary depending on the function.  | 0               | –      | 0 to 63       | –                      |
| 611       | Electric Current Response Setting                   |         | Make fine adjustment to electric current response. The default setting is 100%.   | 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 the allowable time until stopping when an emergency stop is actuated upon alarm detection.  | 200             | ms     | 0 to 1,000    | –                      |
| 615       | Overspeed Detection Level Setting at Immediate Stop |         | During an emergency stop upon alarm detection, if the motor speed exceeds this set value, this is an overspeed 2 error.                           | 0               | r/min  | 0 to 20,000   | –                      |
| 616       | Absolute Interface Function Selection *1            | 0       | Disabled  | 1               | –      | 0 or 1        | Yes                    |
|           |   | 1       | Enabled   |                 |        |               |                        |
| 617       | Front Panel 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 initialization time after power supply ON to the standard 1.5 s plus some.  | 0               | 0.1 s  | 0 to 100      | Yes                    |
| 619       | Encoder Phase-Z Setting                             |         | Finely adjust the encoder phase-Z width when the number of output pulses per motor rotation after the division of pulse output is not an integer. | 0               | Pulses | 0 to 32,767   | Yes                    |
| 620       | External Encoder Phase-Z Expansion Setting          |         | Set the external encoder phase-Z output width.  | 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 phase-Z regeneration position when the serial absolute external encoder is used. | 0               | Pulses  | 0 to 2 <sup>28</sup> | Yes                    |
| 622       | Phase-AB Regeneration Method Selection for External Encoder of Phase-AB Output Type | 0   | Without signal regeneration  | 0               | -       | 0 or 1               | Yes                    |
|           |   | 1   | With signal regeneration   |                 |         |                      |                        |
| 623       | Disturbance Torque Compensation Gain  |   | Set the compensation gain for the disturbance torque.                                    | 0               | %       | -100 to 100          | -                      |
| 624       | Disturbance Observer Filter Setting   |   | Set the filter time constant for disturbance torque compensation.                        | 53              | 0.01 ms | 10 to 2,500          | -                      |
| 627       | Warning Latch Hold Time Selection   | 0   | Latch time infinite  | 5               | s       | 0 to 10              | Yes                    |
|           |   | 1 to 10   | Latch time of 1 to 10 s  |                 |         |                      |                        |
| 628       | Special Function Selection  | Select the command method.  |  | 0               | -       | 0, 2                 | Yes                    |
|           |   | 0   | Analog/pulse command input enabled   |                 |         |                      |                        |
|           |   | 1   | Not used. Do not set.  |                 |         |                      |                        |
|           |   | 2   | Drive Programming function enabled   |                 |         |                      |                        |
| 631       | Realtime Autotuning Estimated Speed Selection                                       | Set the load characteristics estimated speed when realtime autotuning is enabled. |  | 1               | -       | 0 to 3               | -                      |
|           |   | 0   | Finalize estimated results when load estimation becomes stable.                          |                 |         |                      |                        |
|           |   | 1   | Estimates every minute from the load characteristic changes.                             |                 |         |                      |                        |
|           |   | 2   | Estimates every second from the load characteristic changes.                             |                 |         |                      |                        |
|           |   | 3   | Estimates the optimum speed from the load characteristic changes.                        |                 |         |                      |                        |
| 632       | Realtime Autotuning Customization Mode Setting                                      |   | Set the Customization Mode detail for realtime autotuning.                               | 0               | -       | -32,768 to 32,767    | -                      |
| 633       | Absolute Encoder Initial Pulse Regeneration Speed                                   |   | Set the pulse regeneration speed when the initial pulse is output.                       | 1000            | r/min   | 1,000 to 3,000       | -                      |
| 634       | Hybrid Vibration Suppression Gain   |   | Set the hybrid vibration suppression gain during fully-closed control.                   | 0               | 0.1/s   | 0 to 30,000          | -                      |
| 635       | Hybrid Vibration Suppression Filter   |   | Set the hybrid vibration suppression filter time constant during fully-closed control.   | 10              | 0.01 ms | 0 to 6,400           | -                      |

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**Appendix**

## A-2 Parameter List

| Pn number | Parameter name                | Setting | Description   | Default setting | Unit | Setting range     | Power supply OFF to ON |
|-----------|-------------------------------|---------|---|-----------------|------|-------------------|------------------------|
| 637       | Vibration Detection Threshold |         | Set the vibration detection threshold. If torque vibration that exceeds this setting is detected, the vibration detection warning will occur. | 0               | 0.1% | 0 to 1,000        | –                      |
| 638       | Warning Mask Setting          |         | Set a mask for warning detection. If you set the corresponding bit to 1, the corresponding warning detection will be disabled.                | 0               | –    | -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.

## Drive Programming Setting Parameters

| Pn number | Parameter name                     | Setting | Description   | Default setting | Unit  | Setting range | Power supply OFF to ON |
|-----------|------------------------------------|---------|---|-----------------|-------|---------------|------------------------|
| 700       | Drive Programming velocity [0]     |         | Set the velocities to be used for Relative or Absolute Movement, JOG and Velocity Update command. | 0               | r/min | 0 to 20000    | —                      |
| 701       | Drive Programming velocity [1]     |         | Set the velocities to be used for Relative or Absolute Movement, JOG and Velocity Update command. | 0               | r/min | 0 to 20000    | —                      |
| 702       | Drive Programming velocity [2]     |         | Set the velocities to be used for Relative or Absolute Movement, JOG and Velocity Update command. | 0               | r/min | 0 to 20000    | —                      |
| 703       | Drive Programming velocity [3]     |         | Set the velocities to be used for Relative or Absolute Movement, JOG and Velocity Update command. | 0               | r/min | 0 to 20000    | —                      |
| 704       | Drive Programming velocity [4]     |         | Set the velocities to be used for Relative or Absolute Movement, JOG and Velocity Update command. | 0               | r/min | 0 to 20000    | —                      |
| 705       | Drive Programming velocity [5]     |         | Set the velocities to be used for Relative or Absolute Movement, JOG and Velocity Update command. | 0               | r/min | 0 to 20000    | —                      |
| 706       | Drive Programming velocity [6]     |         | Set the velocities to be used for Relative or Absolute Movement, JOG and Velocity Update command. | 0               | r/min | 0 to 20000    | —                      |
| 707       | Drive Programming velocity [7]     |         | Set the velocities to be used for Relative or Absolute Movement, JOG and Velocity Update command. | 0               | r/min | 0 to 20000    | —                      |
| 708       | Drive Programming acceleration [0] |         | Set the acceleration time between 0 [r/min] and 3,000 [r/min].                                    | 0               | ms    | 0 to 10000    | —                      |
| 709       | Drive Programming acceleration [1] |         | Set the acceleration time between 0 [r/min] and 3,000 [r/min].                                    | 0               | ms    | 0 to 10000    | —                      |
| 710       | Drive Programming acceleration [2] |         | Set the acceleration time between 0 [r/min] and 3,000 [r/min].                                    | 0               | ms    | 0 to 10000    | —                      |
| 711       | Drive Programming acceleration [3] |         | Set the acceleration time between 0 [r/min] and 3,000 [r/min].                                    | 0               | ms    | 0 to 10000    | —                      |
| 712       | Drive Programming deceleration [0] |         | Set the deceleration time between 3,000 [r/min] and 0 [r/min].                                    | 0               | ms    | 0 to 10000    | —                      |
| 713       | Drive Programming deceleration [1] |         | Set the deceleration time between 3,000 [r/min] and 0 [r/min].                                    | 0               | ms    | 0 to 10000    | —                      |
| 714       | Drive Programming deceleration [2] |         | Set the deceleration time between 3,000 [r/min] and 0 [r/min].                                    | 0               | ms    | 0 to 10000    | —                      |

## A-2 Parameter List

| Pn number  | Parameter name                     | Setting | Description  | Default setting | Unit  | Setting range | Power supply OFF to ON |
|------------|------------------------------------|---------|--|-----------------|-------|---------------|------------------------|
| 715        | Drive Programming deceleration [3] |         | Set the deceleration time between 3,000 [r/min] and 0 [r/min].                                 | 0               | ms    | 0 to 10000    | –                      |
| 716 to 719 | Not used                           |         | Do not change the settings.  | –               | –     | –             | –                      |
| 720        | Origin search approach speed 1     |         | Set the high-velocity operation speed for origin search.                                       | 0               | r/min | 0 to 20000    | –                      |
| 721        | Origin search approach speed 2     |         | Set the low-velocity operation speed for origin search.  | 0               | r/min | 0 to 20000    | –                      |
| 722        | Origin search disable selection    |         | Select whether or not to omit the origin search operation when an incremental encoder is used. | 0               | –     | 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.  | –               | –     | –             | –                      |

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**Appendix**



## Drive Programming Control Parameters

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

## A-2 Parameter List

| Pn number | Parameter name                 | Setting | Description                                     | Default setting | Unit | Setting range          | Power supply OFF to ON |
|-----------|--------------------------------|---------|---|-----------------|------|------------------------|------------------------|
| 815       | Drive Programming Data [7]     |         | Set argument 6 for Drive Programming data [7].  | 00000000h       | —    | 00000000h to FFFFFFFFh | —                      |
| 816       | Drive Programming Command [8]  |         | Set command code, and arguments 1 to 5.         | 0000h           | —    | 0000h to FFFFh         | —                      |
| 817       | Drive Programming Data [8]     |         | Set argument 6 for Drive Programming data [8].  | 00000000h       | —    | 00000000h to FFFFFFFFh | —                      |
| 818       | Drive Programming Command [9]  |         | Set command code, and arguments 1 to 5.         | 0000h           | —    | 0000h to FFFFh         | —                      |
| 819       | Drive Programming Data [9]     |         | Set argument 6 for Drive Programming data [9].  | 00000000h       | —    | 00000000h to FFFFFFFFh | —                      |
| 820       | Drive Programming Command [10] |         | Set command code, and arguments 1 to 5.         | 0000h           | —    | 0000h to FFFFh         | —                      |
| 821       | Drive Programming Data [10]    |         | Set argument 6 for Drive Programming data [10]. | 00000000h       | —    | 00000000h to FFFFFFFFh | —                      |
| 822       | Drive Programming Command [11] |         | Set command code, and arguments 1 to 5.         | 0000h           | —    | 0000h to FFFFh         | —                      |
| 823       | Drive Programming Data [11]    |         | Set argument 6 for Drive Programming data [11]. | 00000000h       | —    | 00000000h to FFFFFFFFh | —                      |
| 824       | Drive Programming Command [12] |         | Set command code, and arguments 1 to 5.         | 0000h           | —    | 0000h to FFFFh         | —                      |
| 825       | Drive Programming Data [12]    |         | Set argument 6 for Drive Programming data [12]. | 00000000h       | —    | 00000000h to FFFFFFFFh | —                      |
| 826       | Drive Programming Command [13] |         | Set command code, and arguments 1 to 5.         | 0000h           | —    | 0000h to FFFFh         | —                      |
| 827       | Drive Programming Data [13]    |         | Set argument 6 for Drive Programming data [13]. | 00000000h       | —    | 00000000h to FFFFFFFFh | —                      |
| 828       | Drive Programming Command [14] |         | Set command code, and arguments 1 to 5.         | 0000h           | —    | 0000h to FFFFh         | —                      |
| 829       | Drive Programming Data [14]    |         | Set argument 6 for Drive Programming data [14]. | 00000000h       | —    | 00000000h to FFFFFFFFh | —                      |
| 830       | Drive Programming Command [15] |         | 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 |
|-----------|--------------------------------|---------|---|-----------------|------|------------------------|------------------------|
| 831       | Drive Programming Data [15]    |         | Set argument 6 for Drive Programming data [15]. | 00000000h       | –    | 00000000h to FFFFFFFFh | –                      |
| 832       | Drive Programming Command [16] |         | Set command code, and arguments 1 to 5.         | 0000h           | –    | 0000h to FFFFh         | –                      |
| 833       | Drive Programming Data [16]    |         | Set argument 6 for Drive Programming data [16]. | 00000000h       | –    | 00000000h to FFFFFFFFh | –                      |
| 834       | Drive Programming Command [17] |         | Set command code, and arguments 1 to 5.         | 0000h           | –    | 0000h to FFFFh         | –                      |
| 835       | Drive Programming Data [17]    |         | Set argument 6 for Drive Programming data [17]. | 00000000h       | –    | 00000000h to FFFFFFFFh | –                      |
| 836       | Drive Programming Command [18] |         | Set command code, and arguments 1 to 5.         | 0000h           | –    | 0000h to FFFFh         | –                      |
| 837       | Drive Programming Data [18]    |         | Set argument 6 for Drive Programming data [18]. | 00000000h       | –    | 00000000h to FFFFFFFFh | –                      |
| 838       | Drive Programming Command [19] |         | Set command code, and arguments 1 to 5.         | 0000h           | –    | 0000h to FFFFh         | –                      |
| 839       | Drive Programming Data [19]    |         | Set argument 6 for Drive Programming data [19]. | 00000000h       | –    | 00000000h to FFFFFFFFh | –                      |
| 840       | Drive Programming Command [20] |         | Set command code, and arguments 1 to 5.         | 0000h           | –    | 0000h to FFFFh         | –                      |
| 841       | Drive Programming Data [20]    |         | Set argument 6 for Drive Programming data [20]. | 00000000h       | –    | 00000000h to FFFFFFFFh | –                      |
| 842       | Drive Programming Command [21] |         | Set command code, and arguments 1 to 5.         | 0000h           | –    | 0000h to FFFFh         | –                      |
| 843       | Drive Programming Data [21]    |         | Set argument 6 for Drive Programming data [21]. | 00000000h       | –    | 00000000h to FFFFFFFFh | –                      |
| 844       | Drive Programming Command [22] |         | Set command code, and arguments 1 to 5.         | 0000h           | –    | 0000h to FFFFh         | –                      |
| 845       | Drive Programming Data [22]    |         | Set argument 6 for Drive Programming data [22]. | 00000000h       | –    | 00000000h to FFFFFFFFh | –                      |
| 846       | Drive Programming Command [23] |         | Set command code, and arguments 1 to 5.         | 0000h           | –    | 0000h to FFFFh         | –                      |

**A**

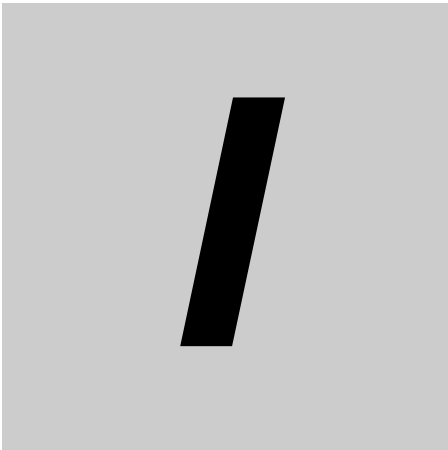
**Appendix**

## A-2 Parameter List

| Pn number | Parameter name                 | Setting | Description                                     | Default setting | Unit | Setting range          | Power supply OFF to ON |
|-----------|--------------------------------|---------|---|-----------------|------|------------------------|------------------------|
| 847       | Drive Programming Data [23]    |         | Set argument 6 for Drive Programming data [23]. | 00000000h       | —    | 00000000h to FFFFFFFFh | —                      |
| 848       | Drive Programming Command [24] |         | Set command code, and arguments 1 to 5.         | 0000h           | —    | 0000h to FFFFh         | —                      |
| 849       | Drive Programming Data [24]    |         | Set argument 6 for Drive Programming data [24]. | 00000000h       | —    | 00000000h to FFFFFFFFh | —                      |
| 850       | Drive Programming Command [25] |         | Set command code, and arguments 1 to 5.         | 0000h           | —    | 0000h to FFFFh         | —                      |
| 851       | Drive Programming Data [25]    |         | Set argument 6 for Drive Programming data [25]. | 00000000h       | —    | 00000000h to FFFFFFFFh | —                      |
| 852       | Drive Programming Command [26] |         | Set command code, and arguments 1 to 5.         | 0000h           | —    | 0000h to FFFFh         | —                      |
| 853       | Drive Programming Data [26]    |         | Set argument 6 for Drive Programming data [26]. | 00000000h       | —    | 00000000h to FFFFFFFFh | —                      |
| 854       | Drive Programming Command [27] |         | Set command code, and arguments 1 to 5.         | 0000h           | —    | 0000h to FFFFh         | —                      |
| 855       | Drive Programming Data [27]    |         | Set argument 6 for Drive Programming data [27]. | 00000000h       | —    | 00000000h to FFFFFFFFh | —                      |
| 856       | Drive Programming Command [28] |         | Set command code, and arguments 1 to 5.         | 0000h           | —    | 0000h to FFFFh         | —                      |
| 857       | Drive Programming Data [28]    |         | Set argument 6 for Drive Programming data [28]. | 00000000h       | —    | 00000000h to FFFFFFFFh | —                      |
| 858       | Drive Programming Command [29] |         | Set command code, and arguments 1 to 5.         | 0000h           | —    | 0000h to FFFFh         | —                      |
| 859       | Drive Programming Data [29]    |         | Set argument 6 for Drive Programming data [29]. | 00000000h       | —    | 00000000h to FFFFFFFFh | —                      |
| 860       | Drive Programming Command [30] |         | Set command code, and arguments 1 to 5.         | 0000h           | —    | 0000h to FFFFh         | —                      |
| 861       | Drive Programming Data [30]    |         | Set argument 6 for Drive Programming data [30]. | 00000000h       | —    | 00000000h to FFFFFFFFh | —                      |
| 862       | Drive Programming Command [31] |         | 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 |
|-----------|-----------------------------|---------|---|-----------------|------|------------------------|------------------------|
| 863       | Drive Programming Data [31] |         | Set argument 6 for Drive Programming data [31]. | 00000000h       | –    | 00000000h to FFFFFFFFh | –                      |





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