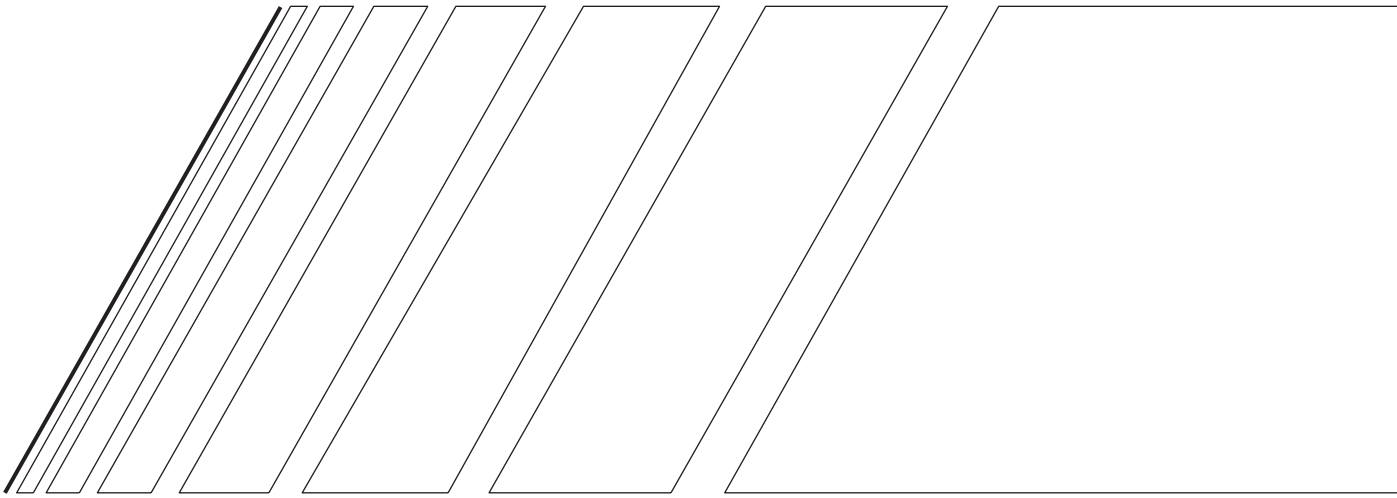
Cat. No. I534-E1-01

OMRON



OPERATION MANUAL

SMARTSTEP A SERIES

MODELS R7M-A□ (Servomotors)
R7D-AP□ (Servo Drivers)

Servomotors/Servo Drivers

Thank you for choosing this SMARTSTEP A-series product. Proper use and handling of the product will ensure proper product performance, will length product life, and may prevent possible accidents.
Please read this manual thoroughly and handle and operate the product with care. Please keep this manual handy for reference after reading it.

NOTICE

1. This manual describes operation procedures of the SMARTSTEP A-series Parameter Unit (R7A-PR02A). For information about installation, wiring, switch setting, and troubleshooting of the SMARTSTEP A Series, refer to the *SMARTSTEP A Series User's Manual (I533)*.
2. Be sure that this manual accompanies the product to its final user.
3. Although care has been given in documenting the product, please contact your OMRON representative if you have any suggestions on improving this manual.
4. Assume that anything not specifically described in this manual is not possible.
5. Do not allow the Servomotor or Servo Driver to be wired, set, or operated (from a Parameter Unit) by anyone that is not a profession electrical engineer or the equivalent.
6. We recommend that you add the following precautions to any instruction manuals you prepare for the system into which the product is being installed.
   - Precautions on the dangers of high-voltage equipment.
   - Precautions on touching the terminals of the product even after power has been turned OFF. (These terminals are live even with the power turned OFF.)
7. Specifications and functions may be changed without notice in order to improve product performance.
8. Positive and negative rotation of AC Servomotors described in this manual are defined as looking at the end of the output shaft of the motor as follows: Counterclockwise rotation is positive and clockwise rotation is negative.
9. Do not perform withstand-voltage or other megameter tests on the product. Doing so may damage internal components.
10. Servomotors and Servo Drivers have a finite service life. Be sure to keep replacement products on hand and to consider the operating environment and other conditions affecting the service life.
11. Do not set values for any parameters not described in this manual. Operating errors may result. Consult your OMRON representative if you have questions.
12. Before using the product under conditions which are not described in the manual or applying the product to nuclear control systems, railroad systems, aviation systems, vehicles, combustion systems, medical equipment, amusement machines, safety equipment, and other systems, machines, and equipment that may have a serious influence on lives and property if used improperly, consult your OMRON representative.

Items to Check Before Unpacking

1. Check the following items before removing the product from the package:
   - Has the correct product been delivered (i.e., the correct model number and specifications)?
   - Has the product been damaged in shipping?
2. Check that the following accessories have been delivered.
   - Safety Precautions

     No connectors or mounting screws are provided. Obtain these separately.

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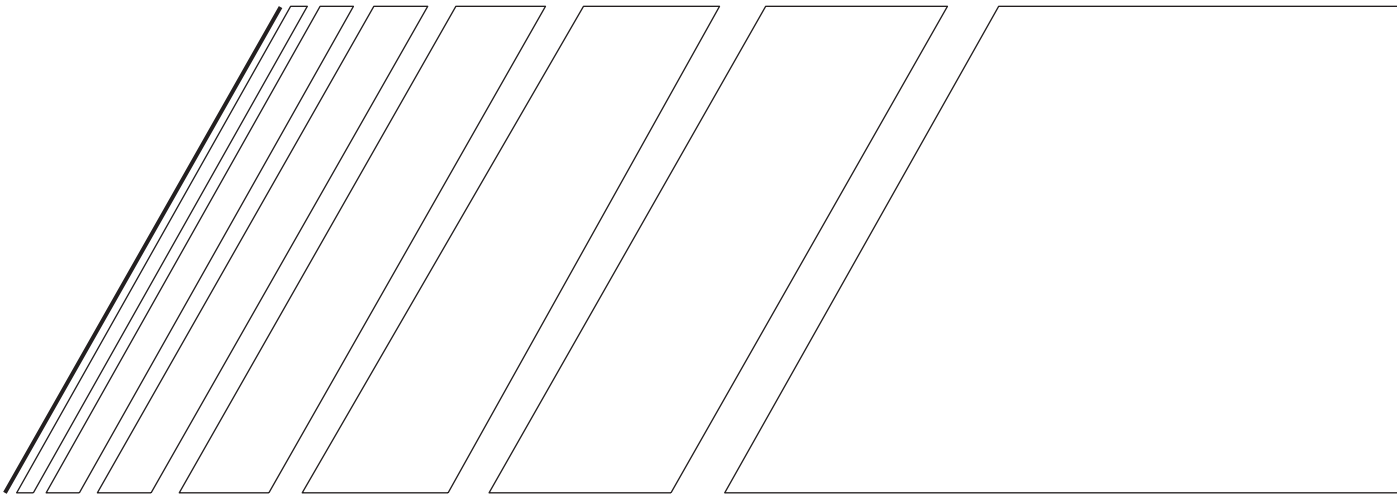

OPERATION MANUAL

SMARTSTEP A SERIES

MODELS R7M-A□ (Servomotors)
R7D-AP□ (Servo Drivers)

Servomotors/Servo Drivers

Notice:

OMRON products are manufactured for use according to proper procedures by a qualified operator and only for the purposes described in this manual.

The following conventions are used to indicate and classify precautions in this manual. Always heed the information provided with them. Failure to heed precautions can result in injury to people or damage to property.

⚠ **DANGER** Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

⚠ **WARNING** Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠ **Caution** Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury, or property damage.

OMRON Product References

All OMRON products are capitalized in this manual. The word “Unit” is also capitalized when it refers to an OMRON product, regardless of whether or not it appears in the proper name of the product.

The abbreviation “Ch,” which appears in some displays and on some OMRON products, often means “word” and is abbreviated “Wd” in documentation in this sense.

The abbreviation “PC” means Programmable Controller and is not used as an abbreviation for anything else.

Visual Aids

The following headings appear in the left column of the manual to help you locate different types of information.

Note Indicates information of particular interest for efficient and convenient operation of the product.

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No patent liability is assumed with respect to the use of the information contained herein. Moreover, because OMRON is constantly striving to improve its high-quality products, the information contained in this manual is subject to change without notice. Every precaution has been taken in the preparation of this manual. Nevertheless, OMRON assumes no responsibility for errors or omissions. Neither is any liability assumed for damages resulting from the use of the information contained in this publication.

General Warnings

Observe the following warnings when using the SMARTSTEP Servomotor and Servo Driver and all connected or peripheral devices.

This manual may include illustrations of the product with protective covers removed in order to describe the components of the product in detail. Make sure that these protective covers are on the product before use.

Consult your OMRON representative when using the product after a long period of storage.

⚠ **WARNING** Always connect the frame ground terminals of the Servo Driver and the Servomotor to a class-3 ground (to 100 Ω or less). Not connecting to a class-3 ground may result in electric shock.

⚠ **WARNING** Do not touch the inside of the Servo Driver. Doing so may result in electric shock.

⚠ **WARNING** Do not remove the front cover, terminal covers, cables, or optional items while the power is being supplied. Doing so may result in electric shock.

⚠ **WARNING** Installation, operation, maintenance, or inspection must be performed by authorized personnel. Not doing so may result in electric shock or injury.

⚠ **WARNING** Wiring or inspection must not be performed for at least five minutes after turning OFF the power supply. Doing so may result in electric shock.

⚠ **WARNING** Do not damage, pull on, apply excessive stress to, or place heavy objects on the cables. Doing so may result in electric shock, product failure, or burning.

⚠ **WARNING** Do not touch the rotating parts of the Servomotor in operation. Doing so may result in injury.

⚠ **WARNING** Do not modify the product. Doing so may result in injury or damage to the product.

⚠ **WARNING** Provide a stopping mechanism on the machine to ensure safety. The holding brake is not designed as a stopping mechanism for safety purposes.

⚠ **WARNING** Provide an external emergency stopping mechanism that can stop operation and shutting off the power supply immediately. Not doing so may result in injury.

⚠ **WARNING** Do not come close to the machine immediately after resetting momentary power interruption to avoid an unexpected restart. (Take appropriate measures to secure safety against an unexpected restart.) Doing so may result in injury.

⚠ **Caution** Use the Servomotors and Servo Drivers in a specified combination. Using them incorrectly may result in fire or damage to the products.

⚠ **Caution** Do not store or install the product in the following places. Doing so may result in fire, electric shock, or damage to the product.

- Locations subject to direct sunlight.
- Locations subject to temperatures or humidity outside the range specified in the specifications.
- Locations subject to condensation as the result of severe changes in temperature.
- Locations subject to corrosive or flammable gases.
- Locations subject to dust (especially iron dust) or salts.
- Locations subject to shock or vibration.
- Locations subject to exposure to water, oil, or chemicals.

⚠ **Caution** Do not touch the Servo Driver radiator, Servo Driver regeneration resistor, or Servomotor while the power is being supplied or soon after the power is turned OFF. Doing so may result in a skin burn due to the hot surface.

Storage and Transportation Precautions

⚠ **Caution** Do not hold the product by the cables or motor shaft while transporting it. Doing so may result in injury or malfunction.

⚠ **Caution** Do not place any load exceeding the figure indicated on the product. Doing so may result in injury or malfunction.

Installation and Wiring Precautions

⚠ **Caution** Do not step on or place a heavy object on the product. Doing so may result in injury.

⚠ **Caution** Do not cover the inlet or outlet ports and prevent any foreign objects from entering the product. Doing so may result in fire.

⚠ **Caution** Be sure to install the product in the correct direction. Not doing so may result in malfunction.

⚠ **Caution** Provide the specified clearances between the Servo Driver and the control panel or with other devices. Not doing so may result in fire or malfunction.

⚠ **Caution** Do not apply any strong impact. Doing so may result in malfunction.

⚠ **Caution** Be sure to wire correctly and securely. Not doing so may result in motor runaway, injury, or malfunction.

⚠**Caution** Be sure that all the mounting screws, terminal screws, and cable connector screws are tightened to the torque specified in the relevant manuals. Incorrect tightening torque may result in malfunction.

⚠**Caution** Use crimp terminals for wiring. Do not connect bare stranded wires directly to terminals. Connection of bare stranded wires may result in burning.

⚠**Caution** Always use the power supply voltage specified in the User's Manual. An incorrect voltage may result in malfunction or burning.

⚠**Caution** Take appropriate measures to ensure that the specified power with the rated voltage and frequency is supplied. Be particularly careful in places where the power supply is unstable. An incorrect power supply may result in malfunction.

⚠**Caution** Install external breakers and take other safety measures against short-circuiting in external wiring. Insufficient safety measures against short-circuiting may result in burning.

⚠**Caution** Take appropriate and sufficient countermeasures when installing systems in the following locations. Failure to do so may result in damage to the product.

- Locations subject to static electricity or other forms of noise.
- Locations subject to strong electromagnetic fields and magnetic fields.
- Locations subject to possible exposure to radioactivity.
- Locations close to power supplies.

Operation and Adjustment Precautions

⚠**Caution** Confirm that no adverse effects will occur in the system before performing the test operation. Not doing so may result in equipment damage.

⚠**Caution** Check the newly set parameters and software switches for proper execution before actually running them. Not doing so may result in equipment damage.

⚠**Caution** Do not make any extreme adjustments or setting changes. Doing so may result in unstable operation and injury.

⚠**Caution** Separate the Servomotor from the machine, check for proper operation, and then connect to the machine. Not doing so may cause injury.

⚠**Caution** When an alarm occurs, remove the cause, reset the alarm after confirming safety, and then resume operation. Not doing so may result in injury.

⚠**Caution** Do not use the built-in brake of the Servomotor for ordinary braking. Doing so may result in malfunction.

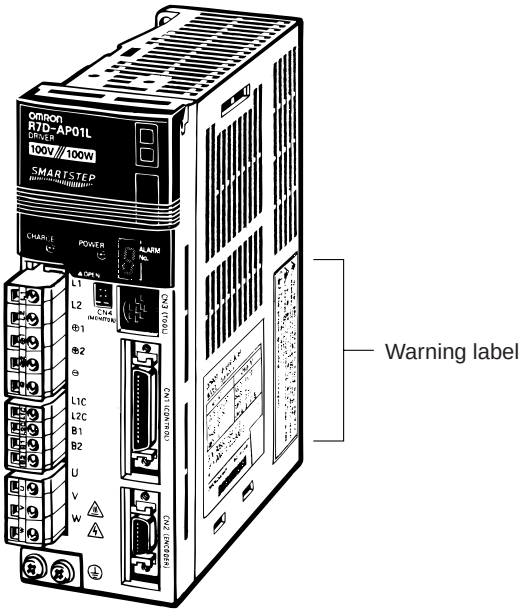
Maintenance and Inspection Precautions

⚠ **WARNING** Do not attempt to disassemble, repair, or modify any Units. Any attempt to do so may result in electric shock or injury.

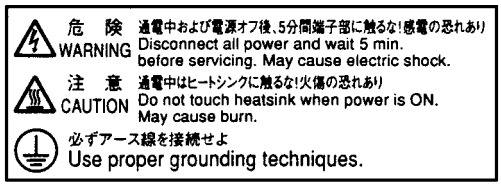
⚠ **Caution** Resume operation only after transferring to the new Unit the contents of the data required for operation. Not doing so may result in an unexpected operation.

Warning Labels

Warning labels are pasted on the product as shown in the following illustration. Be sure to follow the instructions given there.



Example from R7D-AP01L



Example from R7D-AP01L

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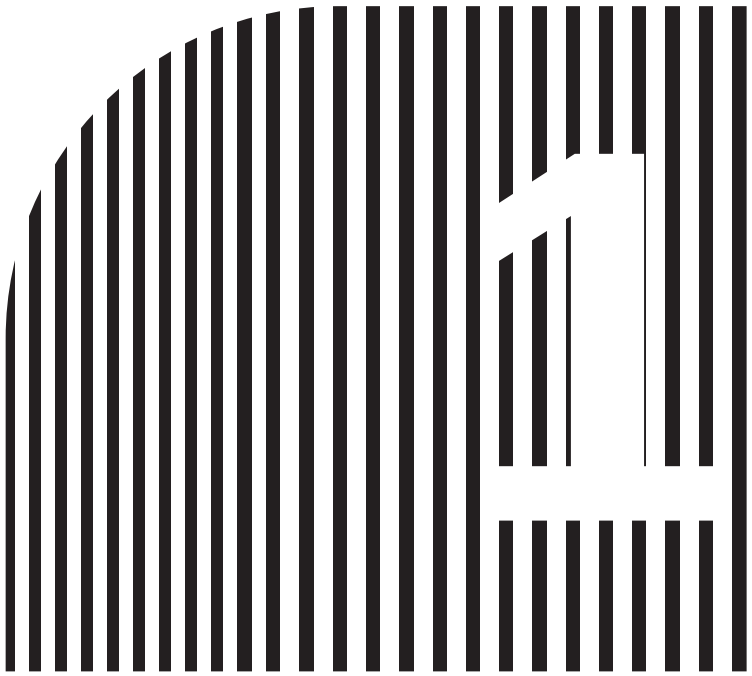


Chapter 1

Introduction

1-1 Parameter Unit Functions
1-2 Connecting the Parameter Unit
1-3 Nomenclature and Functions
1-4 Modes and Switching Methods

1-1 Parameter Unit Functions

The SMARTSTEP A-series R7A-PR02A Parameter Unit displays and sets the user parameters stored inside the Servo Driver. The Parameter Unit and Servo Driver are connected through the CN3 communications connector.

■ Display Area

The Parameter Unit has a 17-character × 5-line LCD display area. There are also 5 indicators, showing the base block status, positioning completion status, and other information.

■ Editing User Parameters

The user parameters (Pn□□□) inside the Servo Driver can be displayed and set.

■ Copying Parameters between Servo Drivers

The Parameter Unit enables the following operations: Reading parameters from the Servo Driver to the Parameter Unit, writing parameters from the Parameter Unit to the Servo Driver, comparing parameters between the Servo Driver and the Parameter Unit, and deleting blocks of parameters from the Parameter Unit. Up to 7 blocks of user parameters can be saved to the EEPROM inside the Parameter Unit. With these functions, parameters can be copied between Servo Drivers.

■ Monitoring (Un□□□)

The following items can be monitored: Speed feedback, torque commands, number of pulses from phase Z, electrical angle, I/O signal status, command pulse speed, position deviation (deviation counter), cumulative load rate, regenerative load rate, dynamic braking resistance load rate, input pulse counter, and feedback pulse counter.

■ Function Execution (Fn□□□)

The following functions can be executed: Displaying the alarm history, clearing alarm history data, jogging, Servomotor origin searches, analog monitor output adjustment, and adjustment of the Servomotor current detection offset.

■ Displaying/Resetting Alarms

If an alarm occurs, an alarm history (containing up to the 10 most recent alarms) will be displayed. The alarm can be reset by pressing the RESET Key (there are also alarms which can only be reset by turning OFF and ON the power supply).

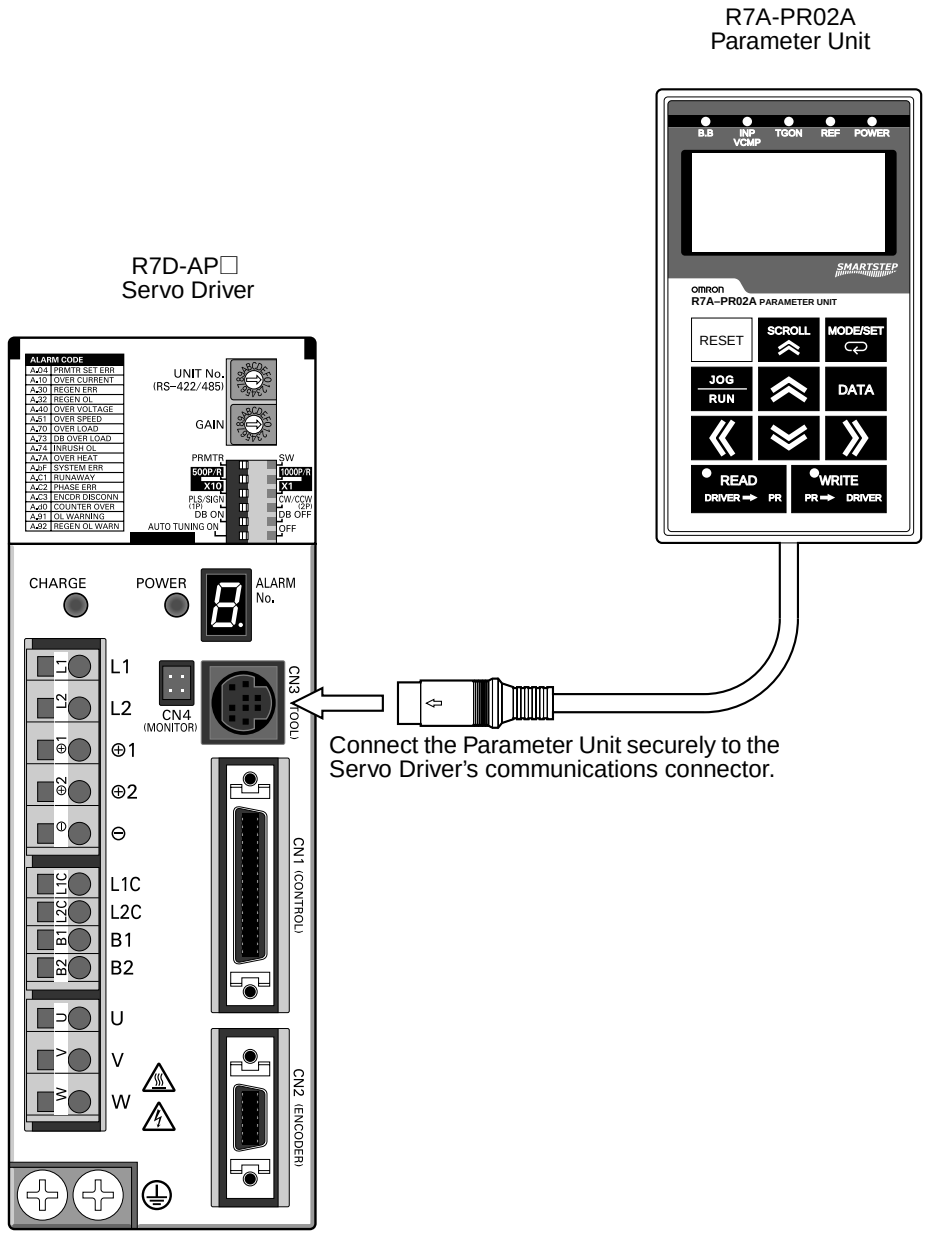
■ Saving the Current Screen

The Parameter/Monitor Mode, jog operation, or origin search screen can be saved by pressing the WRITE Key while the desired screen is being displayed. The screen will be displayed the next time the power supply is turned ON.

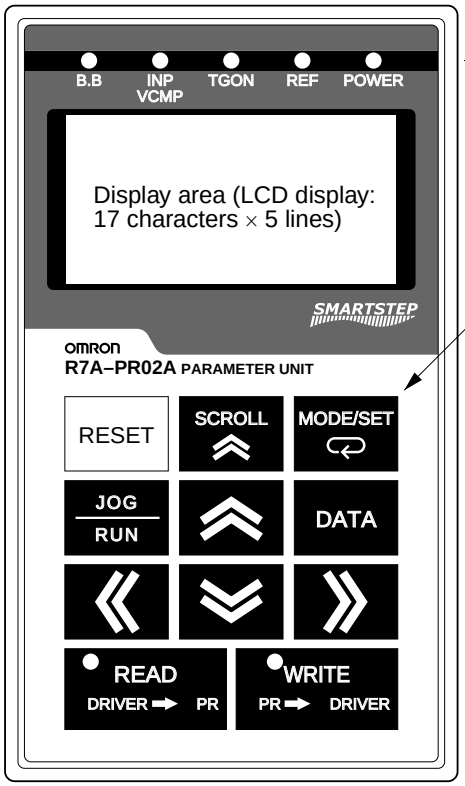
1-2 Connecting the Parameter Unit

■ Connecting the Parameter Unit

Make sure the power supply is turned OFF and then connect the Parameter Unit to the CN3 communications connector on the Servo Driver. Do not connect or disconnect the Parameter Unit while the power supply is ON.



1-3 Nomenclature and Functions



Indicators (red LEDs × 5)

Operation keys

■ Indicators

Indicator name	Function
B.B	Lit during baseblock status (no current supplied to the Servomotor). Not lit when baseblock is released.
INP/VCMP	Lit when positioning has been completed. Not lit when positioning has not been completed.
TGON	Lit during Servomotor rotation. Not lit when the Servomotor is stopped.
REF	Lit when command pulses have been input. Not lit when no command pulse has been input.
POWER	Lit when the main circuit power supply is ON. Not lit when the main circuit power supply is OFF.

■ Operation Keys

Appearance	Name	Main Function
RESET	RESET Key	Resets the alarm. (If the cause of the alarm has not been removed, the alarm cannot be reset.)
MODE/SET	MODE/SET Key	Changes the Parameter Unit Display Mode.
DATA	DATA Key	Changes the cursor position during parameter setting (between the parameter number and setting), moves to the selected function's execution screen in Function Mode, and moves to the selected menu's execution screen in Parameter Copy Mode.
SCROLL	SCROLL Key	Moves the cursor up in Parameter/Monitor Mode.
JOG RUN	JOG/RUN Key	Turns the servo ON and OFF during jog operation.
« »	Left and Right Cursor Keys	Moves the cursor left or right during Parameter/Monitor Mode.
»	Up and Down Cursor Keys	Increments or decrements the parameter number, setting data, monitor number, and function number; puts the Servomotor in forward run or reverse run during jog operation; and is used for selecting from menus during Copy Mode.
READ DRIVER → PR	READ Key or DRIVER → PR Key	In Parameter Copy Mode, reads parameters if parameter reading from the Servo Driver has been selected, or releases the lock if parameter lock releasing has been selected.
WRITE PR → DRIVER	WRITE Key or PR → DRIVER Key	In Parameter Copy Mode, writes parameters if parameter writing to the Servo Driver has been selected, or compares parameters if parameter verifying has been selected. In Parameter/Monitor Mode, saves the display screen when a jog operation screen or origin search screen is displayed.

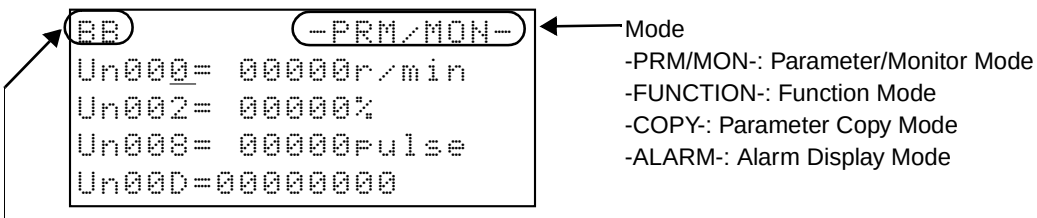
1-4 Modes and Switching Methods

■ Modes

The Parameter Unit has the following four display modes.

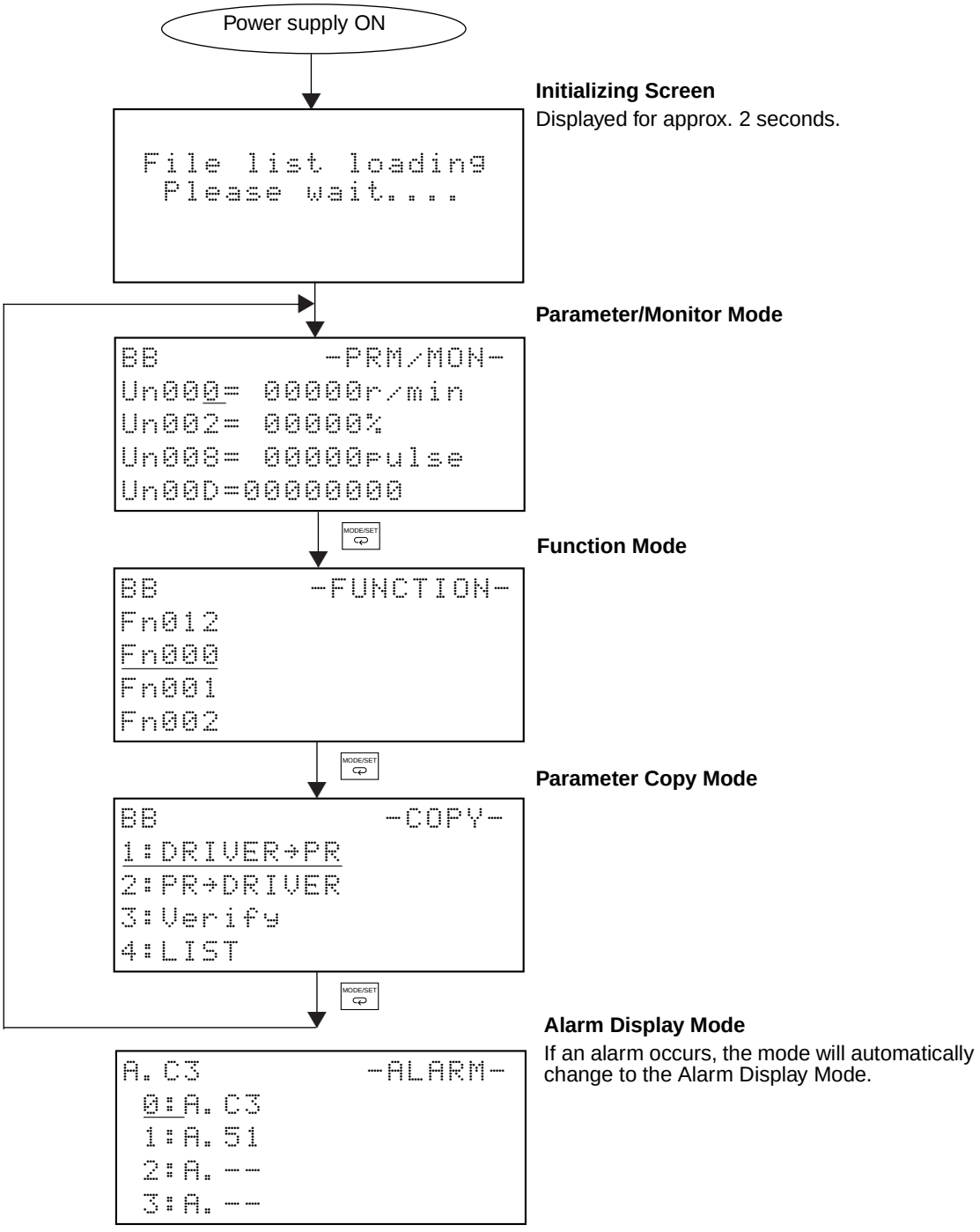
Mode	Display example	Function
Parameter/ Monitor Mode	BB -PRM/MON- Un000= 00000r/min Un002= 00000% Un008= 00000pulse Un00D=00000000	Displays monitor items (Un□□□), and displays and sets user parameters (Pn□□□).
Function Mode	BB -FUNCTION- Fn012 Fn000 Fn001 Fn002	Executes functions (Fn□□□). (Functions are as follows: Alarm history display, rigidity selection, jog operation, Servomotor origin search, user parameter initialization, alarm history clear, online autotune storage, manual monitor output offset adjustment, analog monitor output scaling, automatic Servomotor current detection offset adjustment, password setting, and version check).
Parameter Copy Mode	BB -COPY- 1:DRIVER→PR 2:PR→DRIVER 3:Verify 4:LIST	Reads parameters (Servo Driver → Parameter Unit), writes parameters (Parameter Unit → Servo Driver), compares parameters (Parameter Unit ↔ Servo Driver), and releases parameter lock.
Alarm Display Mode	A.C3 -ALARM- 0:A.C3 1:A.51 2:A.-- 3:A.--	Displays an alarm history (up to the 10 most recent alarms).

Note Abbreviations for each mode are displayed in the upper right corner of the display screen. The Servo Driver status is also displayed in the upper left corner.



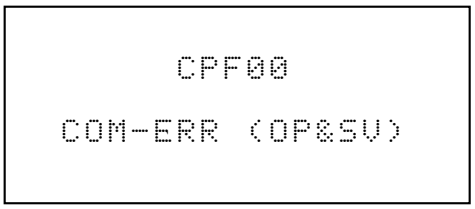
■ Changing the Mode

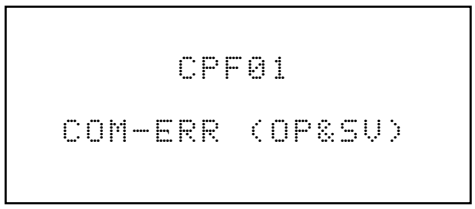
When the Parameter Unit is connected to the Servo Driver and the Servo Driver's power supply is turned ON, the initializing screen and then the Parameter/Monitor Mode will be displayed. The mode can be switched by pressing the MODE/SET Key. If an alarm occurs, the mode will automatically change to the Alarm Display Mode.

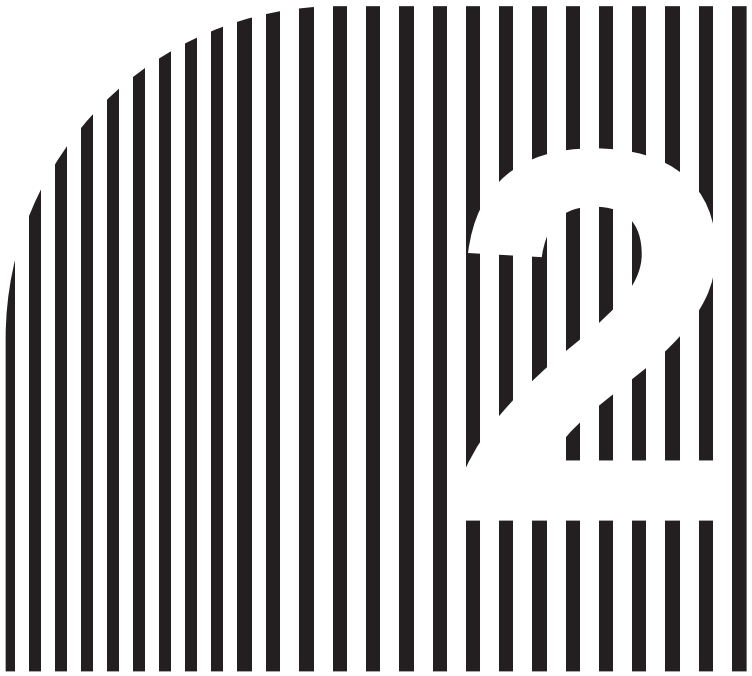


Other Alarm Displays

The following communications errors will be displayed if an error occurs in communications between the Servo Driver and the Parameter Unit. If one of these is displayed, turn the power supply OFF and ON. If communications still do not return to normal, replace the Parameter Unit or the Servo Driver.







Chapter 2

Parameter/Monitor Mode

2-1 Monitoring Items in Parameter/Monitor Mode
2-2 Setting Parameters in Parameter/Monitor Mode

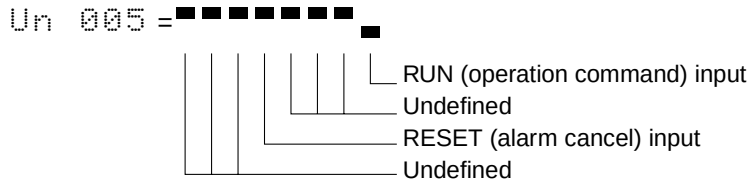
2-1 Monitoring Items in Parameter/Monitor Mode

This section lists monitor items and describes monitor item display operations in Parameter/Monitor Mode.

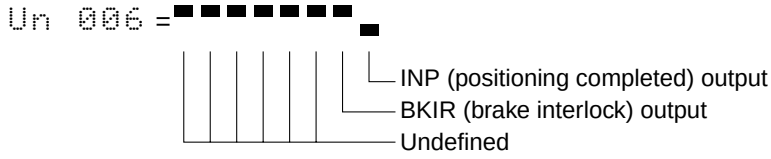
2-1-1 Monitor Items

Monitor No.	Monitor item	Unit	Explanation
Un000	Speed feedback	r/min.	Displays actual rotation speed of Servomotor.
Un002	Torque command	%	Displays command values to current loop (rated torque = 100%).
Un003	Number of pulses from phase Z	Pulses	Displays rotation position from phase Z (4× calculation).
Un004	Electrical angle	Degrees	Displays the electrical angle of the Servomotor.
Un005	Input signal monitor	---	Displays the input status of the control input signal (CN1) (See note 1).
Un006	Output signal monitor	---	Displays the output status of the control output signal (CN1) (See note 2).
Un007	Command pulse speed display	r/min.	Calculates and displays command pulse frequency in r/min.
Un008	Position deviation	Command units	Displays number of residual pulses in deviation counter in “command” units (input pulse standard). Note: Displayed in “pulse” units on the Parameter Unit.
Un009	Cumulative load ratio	%	Displays effective torque (rated torque = 100%, 10-s cycle).
Un00A	Regeneration load ratio	%	Displays regeneration absorption current due to regeneration resistance (calculates internal resistance capacity or Pn600 setting as 100% in 10-s cycles).
Un00B	Dynamic brake resistance load ratio	%	Displays current consumption during dynamic brake operation (calculates tolerance current consumption as 100% in 10-s cycles).
Un00C	Input pulse counter	Command units	Counts and displays input pulses (hexadecimal 8-digit display).
Un00D	Feedback pulse counter	Pulses	Counts and displays feedback pulse (4× calculation, hexadecimal 8-digit display).

Note 1. The input signal monitor (Un005) display is shown below. The upper level indicates OFF status, and the lower level indicates ON status. All undefined digits are displayed on the upper level (OFF).



Note **2.** The output signal monitor (Un006) display is shown below. The upper level indicates OFF status, and the lower level indicates ON status. All undefined digits are displayed on the upper level (OFF).



2-1-2 Monitor Item Display Operations

■ Display Example

```
BB          -PRM/MON-
Un000= 00000r/min
Un002= 00000%
Un008= 00000Pulse
Un00D=00000000
```

Shows that the Un000 (speed feedback) is 0 r/min.

- Four items (consisting of monitor items and parameters) can be displayed on the Parameter/Monitor Mode display.
- The four items in the display example above are the default display items. To change the default display items, select the items for default display, and press the WRITE Key to save the currently displayed screen as the default. This will enable default display of the selected items the next time the power supply is turned ON.

Note In this manual, the underlines in the display examples, e.g., under the last digit of Un000 above, indicate flashing digits or letters. There are no underlines on the real screen. The flashing position is called the cursor position.

■ Operation Key Functions

● Overview

RESET	Resets the alarm. (If the cause of the alarm has not been removed, the alarm cannot be reset.)
MODE/SET	Changes to the Function Mode.
DATA	Not used during monitor displays. This key is used to change parameter settings.
SCROLL	Moves the cursor up.
JOG / RUN	Not used.
≪ ≫	Moves the cursor left or right.
⌃ ⌄	Increments or decrements the monitor number.
READ DRIVER → PR	Not used.
WRITE PR → DRIVER	Saves the current display screen.

● Details

⌃ ⌄	Keys

• Pressing the Up and Down Keys changes the monitor number the accompanying data values.

Speed feedback — Un000= 00000r/min

⌄ ↑ ↓ ⌃

Torque command — Un002= 00000%

⌄ ↑ ↓ ⌃

Number of pulses from phase Z — Un003=00000 Pulse

⌄ ↑ ↓ ⌃

Electrical angle — Un004=00090 deg

⌄ ↑ ↓ ⌃

Input signal monitor — Un005= ■■■■■■■■

⌄ ↑ ↓ ⌃

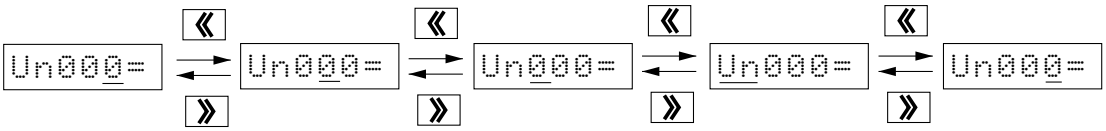
...

⌄ ↑ ↓ ⌃

Feedback pulse counter — Un00D=00000000

« » Keys

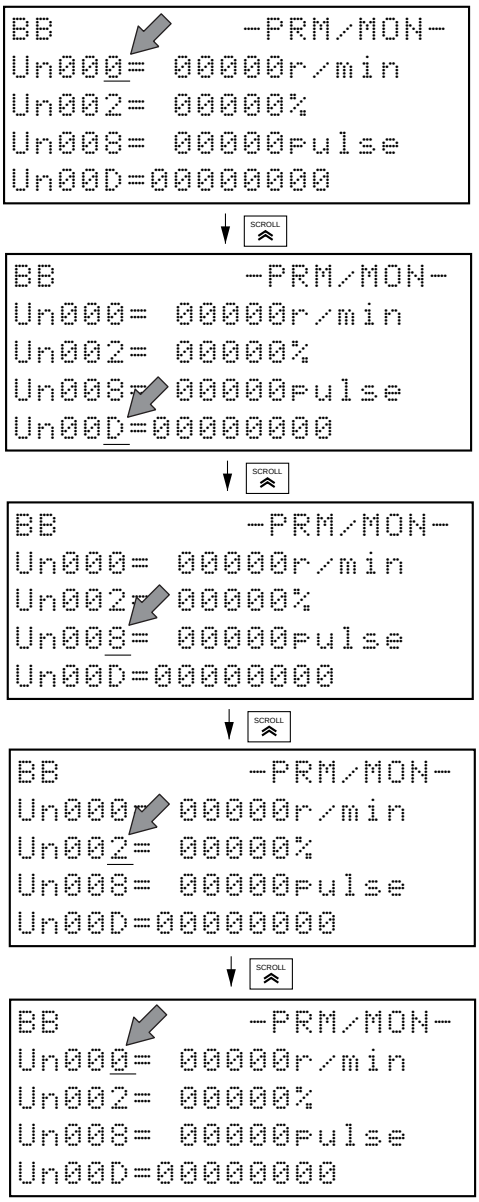
• Pressing the Left and Right Keys moves the cursor as follows:



Note Generally speaking, only the rightmost digit of the monitor number changes, so these keys are not often used for monitor number operations. (They are used for displaying and setting parameters.)

SCROLL	Key

• Pressing the SCROLL Key moves the cursor as follows:

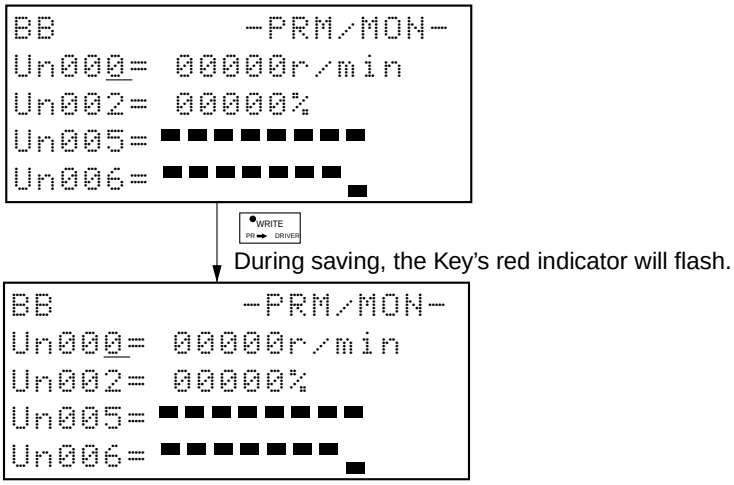


Note 1. Pressing the SCROLL Key moves the cursor to the line above. If the SCROLL Key is pressed when the cursor is on the top line, the cursor moves to the bottom line.

Note 2. The SCROLL Key is also used to select the display position of the Monitor Items and Parameters for default display and other settings.

WRITE PR→DRIVER Key

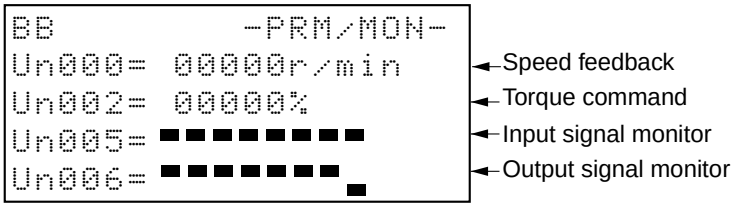
- Pressing the WRITE Key enables saving the current screen.
- The saved screen will be displayed the next time the power supply is turned ON.



Note Do not turn OFF the Servo Driver control power supply during the saving process. Doing so will prevent the screen from being saved. If the screen has not been saved successfully, the previous default setting will be used, but no alarm will occur.

■ Operating Example

The following example describes how to first display and then save a screen with the first line = Un000 (speed feedback), the second line = Un002 (torque command), the third line = Un005 (input signal monitor), and the fourth line = Un006 (output signal monitor).



Operation keys	Display example	Explanation
MODE/SET	BB -PRM/MON- Un000= 00000r/min Un002= 00000% Un008= 00000pulse Un00D=00000000	Press the MODE/SET Key to display Parameter/Monitor Mode.
SCROLL	BB -PRM/MON- Un000= 00000r/min Un002= 00000% Un008= 00000pulse Un00D=00000000	Press the SCROLL Key once to move the cursor to the bottom line.
↑ ↓	BB -PRM/MON- Un000= 00000r/min Un002= 00000% Un008= 00000pulse Un006=	Press the Up and Down Keys until Un006 (output signal monitor) is displayed.
SCROLL	BB -PRM/MON- Un000= 00000r/min Un002= 00000% Un008= 00000pulse Un006=	Press the SCROLL Key once to move the cursor up one line.

Operation keys	Display example	Explanation
⏫ ⏬	BB -PRM/MON- Un000= 00000r/min Un002= 00000% Un005= ■■■■■■■■ Un006= ■■■■■■■■	Press the Up and Down Keys until Un005 (input signal monitor) is displayed. The desired screen is now displayed.
WRITE PR ➡ DRIVER	BB -PRM/MON- Un000= 00000r/min Un002= 00000% Un005= ■■■■■■■■ Un006= ■■■■■■■■	Press the WRITE Key. The key's indicator will flash while the screen is being saved. Note: Do not turn OFF the Servo Driver control power supply during the saving process.

2-2 Setting Parameters in Parameter/Monitor Mode

This section describes parameter display and setting methods in Parameter/Monitor Mode.

Note: For parameter details, refer to the *User's Manual* (Cat. No. I533).

2-2-1 Parameter Items

- The parameters for which each digit number must be set separately are given with the digit number added to the parameter number. For example, Pn001.0 (i.e., digit 0 of parameter Pn001).
- The default setting for parameters set using 5 digits are given in the table without leading zeros (e.g., if the default setting is 00080, 80 is given in the table).

Parameter No.	Parameter name	Description for parameters set with 5 digits				Default	Unit	Setting range	Restart?
		Digit No.	Name	Setting	Description for parameters with individually set digits				
Pn000	Basic switches 1	0	Reverse rotation mode	0	CCW direction is taken for positive command.	0010	–	–	Yes
				1	CW direction is taken for positive command.				
		1	Control mode selection	1	Position control by pulse train command				
		2	Not used.	0	---				
		3	Not used.	0	---				
Pn001 (See note 1.)	Basic switches 2	0	Stop selection if an alarm occurs when servo is OFF	0	Servomotor stopped by dynamic brake.	1002	–	–	Yes
				1	Servomotor stopped by dynamic brake. Dynamic brake released after Servomotor stops.				
				2	Servomotor stopped with free run.				
		1	Not used.	0	---				
		2	Not used.	0	---				
		3	Not used.	1	---				
Pn100	Speed loop gain	Speed loop response adjustment				80	Hz	1 to 2000	–
Pn101	Speed loop integral time constant	Speed loop integral time constant				2000	×0.01 ms	15 to 51200	–
Pn102	Position loop gain	Adjusts position loop responsiveness.				40	1/s	1 to 2000	–
Pn103	Inertia ratio	The ratio between the machine system inertia and the Servomotor rotor inertia				300	%	0 to 10000	–
Pn109	Feed-forward amount	Position control feed-forward compensation				0	%	0 to 100	–
Pn10A	Feed-forward command filter	The position control feed-forward command filter				0	×0.01 ms	0 to 6400	–
Pn110 (See note 1.)	Online autotuning setting	0	Online autotuning selection	0	Autotunes initial operations only after power is turned ON.	0012	–	–	Yes (The power supply does not need to be restarted. for Pn110.2.)
				1	Always autotunes.				
				2	No autotuning				
		1	Not used.	1	---				
		2	Adhesive friction compensation selection	0	Friction compensation: OFF				
				1	Friction compensation: Rated torque ratio small				
				2	Friction compensation: Rated torque ratio large				
		3	Not used.	0	---				

Parameter No.	Parameter name	Description for parameters set with 5 digits				Default	Unit	Setting range	Restart?
		Digit No.	Name	Setting	Description for parameters with individually set digits				
Pn200 (See note 2.)	Position control setting 1	0	Command pulse mode	0	Feed pulse forward and reverse signal, positive logic	1011	–	–	Yes
				1	Forward pulse and reverse pulse, positive logic				
				2	90° phase difference (phase A/B) signal (x1), positive logic				
				3	90° phase difference (phase A/B) signal (x2), positive logic				
				4	90° phase difference (phase A/B) signal (x4), positive logic				
				5	Feed pulse forward and reverse signal, negative logic				
				6	Forward pulse and reverse pulse, negative logic				
				7	90° phase difference (phase A/B) signal (x1), negative logic				
				8	90° phase difference (phase A/B) signal (x2), negative logic				
				9	90° phase difference (phase A/B) signal (x4), negative logic				
		1	Deviation counter reset	0	Signal high level				
				1	Rising edge (low to high)				
				2	Signal low level				
				3	Falling signal (high to low)				
		2	Deviation counter reset for alarms and when servo is turned OFF	0	Deviation counter reset when an alarm occurs and when Servomotor is OFF.				
				1	Deviation counter not reset when an alarm occurs nor when Servomotor is OFF.				
				2	Deviation counter reset only when an alarm occurs.				
		3	Not used.	1	---				
Pn202 (See note 2.)	Electronic gear ratio G1 (numerator)	The pulse rate for the command pulses and Servo Servomotor travel distance $0.01 \leq G1/G2 \leq 100$				4	–	1 to 65535	Yes
Pn203 (See note 2.)	Electronic gear ratio G2 (denominator)					1	–	1 to 65535	Yes
Pn204	Position command filter time constant 1 (primary filter)	Soft start setting for command pulses (Soft start characteristics are for the primary filter.)				0	×0.01 ms	0 to 6400	–
Pn207	Position control setting 2	0	Selects position command filter.	0	Primary filter (Pn204)	0000	–	–	Yes
				1	Linear acceleration and deceleration (Pn208)				
		1 to 3	Not used.	0	---				
Pn208	Position command filter time constant 2 (Linear acceleration and deceleration)	Soft start setting for command pulses (Soft start characteristics are for the linear acceleration and deceleration.)				0	×0.01 ms	0 to 6400	Yes
Pn304	Jog speed	Rotation speed during jog operation				500	r/min	0 to 10000	–
Pn401	Torque command filter time constant	The constant when filtering the internal torque command				40	×0.01 ms	0 to 65535	–
Pn402	Forward torque limit	Forward rotation output torque limit (rated torque ratio)				350	%	0 to 800	–
Pn403	Reverse torque limit	Reverse rotation output torque limit (rated torque ratio)				350	%	0 to 800	–
Pn500	Positioning completed range	The range of positioning completed output (INP)				3	Command units	0 to 250	–
Pn505	Deviation counter overflow level	The detection level for a deviation counter overflow alarm				1024	×256 command units	1 to 32767	–
Pn600	Regeneration resistor capacity	Setting for regeneration resistance load ratio monitoring calculations Note: If using an External Regeneration Resistor, set the regeneration capacity for when the temperature rises above 120°C. If not using an External Regeneration Resistor, set Pn600 to 0.				0	×10 W	From 0 (Varies by Unit.)	–

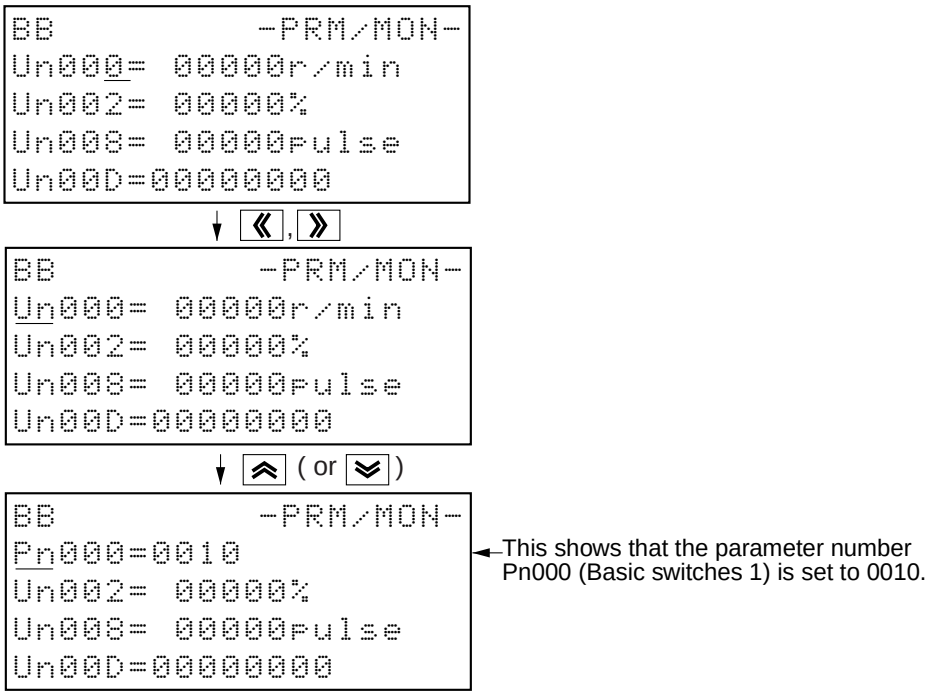
Note 1. Pn001.0 and Pn110.0 are enabled when function switch 6 on the Servo Driver's front panel is turned ON to enable parameter setting. When function switch 6 is OFF, function switch 2 (dynamic brake setting) and function switch 1 (online autotuning) are enabled.

Note 2. Pn200.0, Pn202 and Pn203 are enabled when function switch 6 on the Servo Driver's front panel is turned ON to enable parameter setting. When function switch 6 is OFF, function switch is OFF, function switch 3 (command pulse input setting) and function switches 4 and 5 (resolution setting) are enabled.

2-2-2 Parameter Display and Setting

■ Display Example

• In Parameter/Monitor Mode, pressing the Left or Right Key will move the cursor to Un, and pressing the Up or Down Key will switch "Un" to "Pn" and display the parameter.



• Four items (made up of monitor items and parameters) can be displayed on the Parameter/Monitor Mode display.

• The four items in the display example above are the default display items. To change the default display items, select the items for default display, and press the WRITE Key to save the current screen to enable default display of the selected items the next time the power supply is turned ON.

■ Operation Key Functions

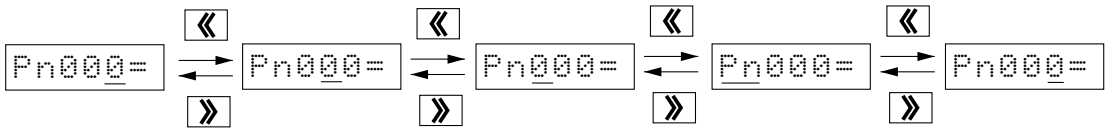
● Overview

RESET	Resets the alarm. (If the cause of the alarm has not been removed, the alarm cannot be reset.)
MODE/SET	Changes to the Function Mode.
DATA	Changes the cursor between the parameter number and the setting data. Writes the setting data to the EEPROM inside the Servo Driver.
SCROLL	Moves the cursor up. If the cursor is at the setting data, it will move on the setting data side.
JOG / RUN	Not used.
《 》	Moves the cursor left or right.
≪ ≫	Switches between Un and Pn. Increments or decrements the parameter number or the setting data.
READ DRIVER → PR	Not used.
WRITE PR → DRIVER	Saves the current display screen.

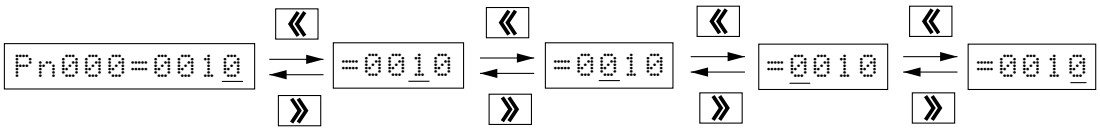
● Details

《 》 Keys

• When the cursor is on the left side (the number side), pressing the Left and Right Keys moves the cursor as follows:



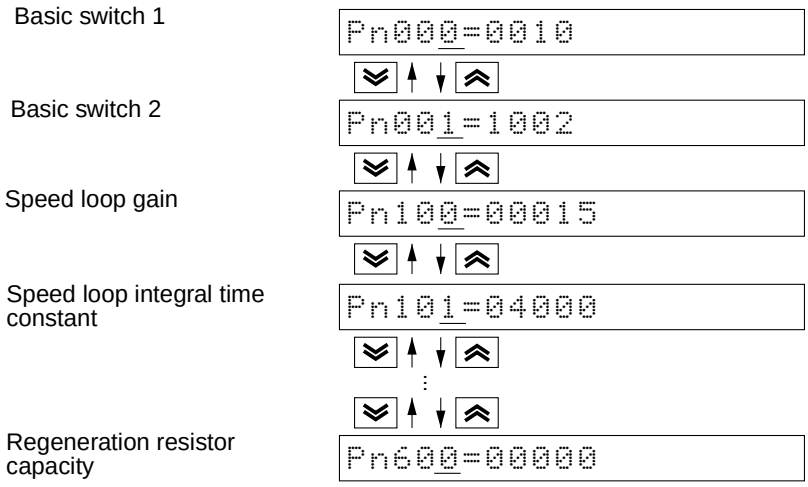
• When the cursor is on the right side (the setting data side), pressing the Left and Right Keys moves the cursor as follows:



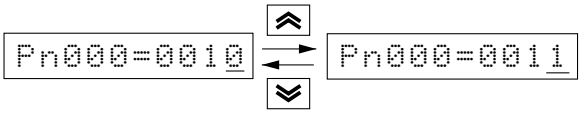
≪ ≫ Keys

• When the cursor is at Un or Pn on the left side (the number side), pressing the Up and Down Keys switches between monitor number and parameter number.

- When the cursor is at a digit on the left side (the number side), pressing the Up and Down Keys changes the parameter number and the accompanying setting data.

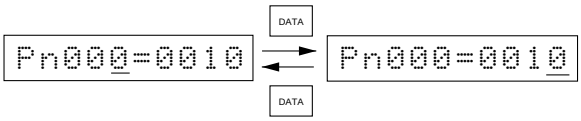


- When the cursor is on the right side (the setting data side), pressing the Up and Down Keys increments or decrements the numeric value of the digit at the cursor.



DATA Key

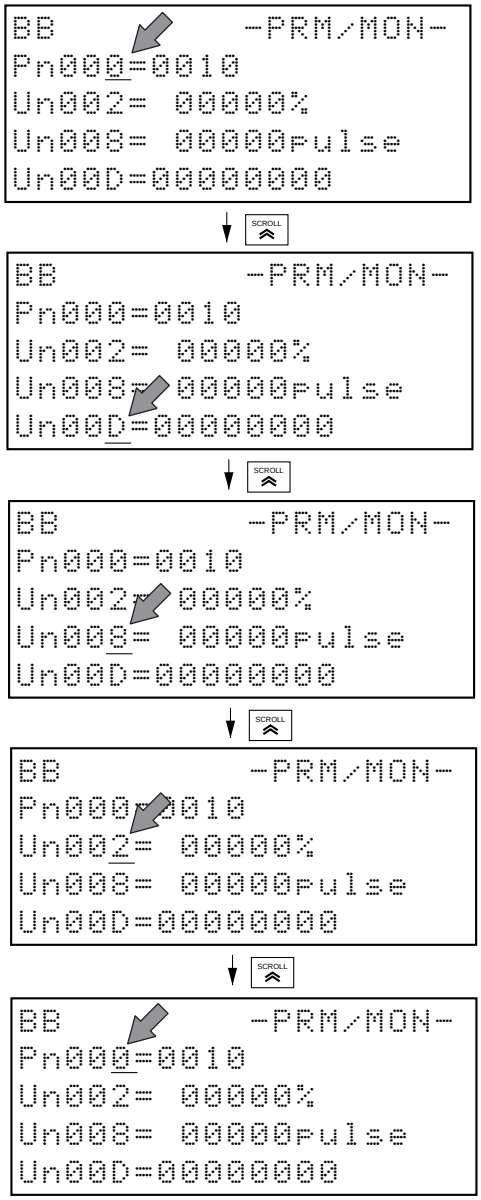
- Pressing the DATA Key switches the cursor between the parameter number and the setting data.



- By pressing the DATA Key once more after changing the setting data, the setting data will be written to the EEPROM inside the Servo Driver.

SCROLL	Key

• Pressing the SCROLL Key moves the cursor as follows:



Note 1. Pressing the SCROLL Key moves the cursor up one line. If the SCROLL Key is pressed when the cursor is on the top line, the cursor moves to the bottom line.

Note 2. The SCROLL Key is used to select the display position of the Monitor Items and Parameters for default display and other settings.

WRITE PR→DRIVER Key

- Pressing the WRITE Key enables saving the current screen.
- The saved screen will be displayed the next time the power supply is turned ON.

Note Do not turn OFF the Servo Driver control power supply during the saving process. Doing so will prevent the screen from being saved. If the screen has not been saved successfully, the previous default setting will be used, but no alarm will occur.

■ Operation Example 1: Setting a Parameter Requiring Individual Digit Settings

Basic switches 1 and 2 (Pn000 and Pn001), online autotuning settings (Pn110), and position control settings 1 and 2 (Pn200 and Pn207) require individual digits to be set.

The following example describes how to set the deviation counter reset (Pn200.1) in position control settings 1 (Pn200) to 0 (resetting on signal high level).

Operation keys	Display example	Explanation
MODE/SET	BB -PRM/MON- Un000= 00000r/min Un002= 00000% Un008= 00000pulse Un00D=00000000	Press the MODE/SET Key to display Parameter/Monitor Mode.
《 》	BB -PRM/MON- Un000= 00000r/min Un002= 00000% Un008= 00000pulse Un00D=00000000	Press the Left or Right Key until the cursor is at Un.
⌃ ⌄	BB -PRM/MON- Pn000=0010 Un002= 00000% Un008= 00000pulse Un00D=00000000	Press either the Up or Down Key to switch Un to Pn.
》	BB -PRM/MON- Pn000=1011 Un002= 00000% Un008= 00000pulse Un00D=00000000	Press the Right Key once to move the cursor to the right side of Pn.

Operation keys	Display example	Explanation
⏫	BB -PRM/MON- Pn200=1011 Un002= 00000% Un008= 00000pulse Un00D=00000000	Press the Up Key twice to display Pn200.
DATA	BB -PRM/MON- Pn200=1011 Un002= 00000% Un008= 00000pulse Un00D=00000000	Press the DATA Key. The cursor will move from the parameter number side to the setting data side (to Pn200.0).
⏪	BB -PRM/MON- Pn200=1011 Un002= 00000% Un008= 00000pulse Un00D=00000000	Press the Left Key once to move the cursor to Pn200.1.
⏬	BB -PRM/MON- Pn200=1001 Un002= 00000% Un008= 00000pulse Un00D=00000000	Press the Down Key once to change the set value of Pn200.1 to 0.
DATA	BB -PRM/MON- Pn200=1001 Un002= 00000% Un008= 00000pulse Un00D=00000000	Press the DATA Key to write the parameter set value to the EEPROM inside the Servo Driver and move the cursor to the parameter number side.

Note All parameters requiring individual digit settings are enabled the next time the power supply is turned ON. Even though the new setting data is written to the EEPROM inside the Servo Driver by pressing the DATA Key after the setting data is changed, the set values will be enabled only after the power supply is turned OFF, then ON again.

For Pn110.2 (adhesive friction compensation selection in online autotuning settings), however, the power supply does not need to be cycled. The setting will be enabled as soon as the setting data is changed.

■ Operation Example 2: Setting a Parameter to 5 Digit Places

The following example describes how to set the jog speed (Pn304) to 1000 (r/min).

Operation keys	Display example	Explanation
MODE/SET	BB -PRM/MON- Un000= 00000r/min Un002= 00000% Un008= 00000pulse Un00D=00000000	Press the MODE/SET Key to display Parameter/Monitor Mode.
◀ ▶	BB -PRM/MON- Un000= 00000r/min Un002= 00000% Un008= 00000pulse Un00D=00000000	Press the Left or Right Key until the cursor is at Un.
▲ ▼	BB -PRM/MON- Pn000=0010 Un002= 00000% Un008= 00000pulse Un00D=00000000	Press either the Up or Down Key to change Un to Pn.
▶	BB -PRM/MON- Pn000=1011 Un002= 00000% Un008= 00000pulse Un00D=00000000	Press the Right Key once to move the cursor to Pn on the right side.
▲	BB -PRM/MON- Pn304=00500 Un002= 00000% Un008= 00000pulse Un00D=00000000	Press the Up Key three times to display Pn304. **Note** In this example, Pn304 can be displayed by pressing the Up Key three times. In general, however, the Left and Right Keys are used to specify the operation line, and the Up and Down Keys are used to set the digit value.
DATA	BB -PRM/MON- Pn304=00500 Un002= 00000% Un008= 00000pulse Un00D=00000000	Press the DATA Key. The cursor will move from the parameter number to the setting data (to the “1st digit” of Pn304).

Operation keys	Display example	Explanation
«	BB -PRM/MON- Pn304=00500 Un002= 00000% Un008= 00000pulse Un00D=00000000	Press the Left Key twice to move the cursor to the hundreds column of Pn304.
»	BB -PRM/MON- Pn304=01000 Un002= 00000% Un008= 00000pulse Un00D=00000000	Press the Up Key five times to change the setting data to 1000.
DATA	BB -PRM/MON- Pn304=01000 Un002= 00000% Un008= 00000pulse Un00D=00000000	Press the DATA Key to write the parameter set value to the EEPROM inside the Servo Driver and move the cursor to the parameter number.

Note Of the parameters set to 5 digits, Pn202 (electronic gear ratio G1), Pn203 (electronic gear ratio G2), and Pn208 (Position command filter time constant 2) are enabled only after the power supply is cycled. Their settings will be enabled the next time the power supply is turned ON.

■ Timing of Parameter Enabling

Except for user parameters requiring the power supply to be cycled, parameters are enabled as soon as the settings are changed. For example, even while changing the gain using the Up and Down Keys, the results of this change are reflected during the setting operation in real-time. Changes are not, however, written to the EEPROM inside the Servo Driver until the DATA Key is pressed after changing the settings.

Data will not be written to EEPROM if the DATA Key is not pressed before performing other operations. For example, data will not be written to EEPROM if the DATA Key is not pressed before pressing the MODE/SET Key to move to another screen (e.g., Function Mode), before pressing the SCROLL Key to move the cursor to the setting data, or before performing other operations.

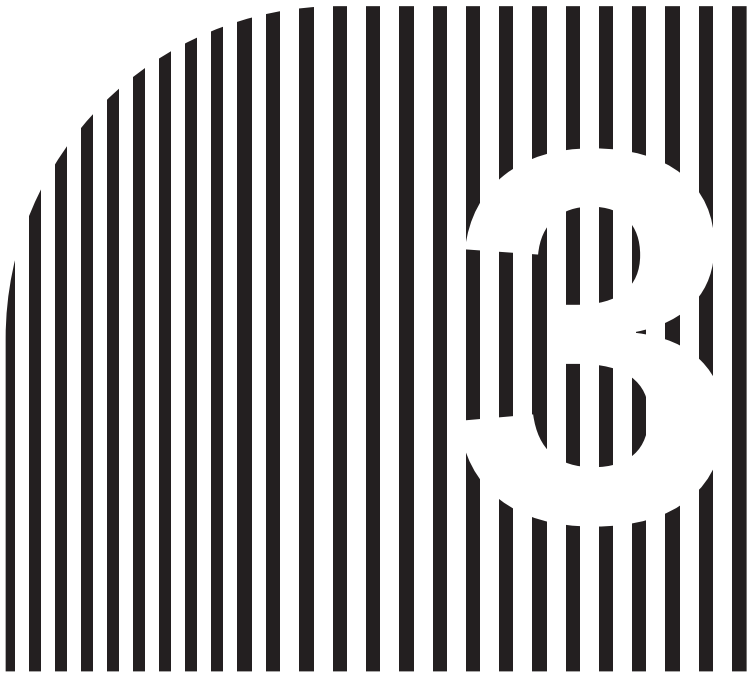
■ Gain-related Parameters

If the gain adjustment rotary switch on the Servo Driver's front panel is set to other than 0, the gain set by the rotary switch's position (refer to the following table) will be used in the Parameter Unit.

Gain adjustment rotary switch position	Position loop gain (s^{-1}) (Pn102)	Speed loop gain (Hz) (Pn100)	Speed loop integral time constant (× 0.01 ms) (Pn101)	Torque command filter time constant (× 0.01 ms) (Pn401)
0	The values set in the parameter area are used.			
1	15	15	4000	250
2	20	20	3500	200
3	30	30	3000	150
4	40	40	2000	100
5	60	60	1500	70
6	85	85	1000	50
7	120	120	800	30
8	160	160	600	20
9	200	200	500	15
A to F	250	250	400	10

If the position of the gain adjustment rotary switch is changed, the values in the above table will be used in the Parameter Unit. These values cannot be changed from the Parameter Unit.

To set these values from the Parameter Unit, set the gain adjustment rotary switch to 0 and then set the values in the parameter area.



Chapter 3

Function Mode

3-1 Functions

3-2 Function Mode Operations

3-3 Function Details and Operation

3-1 Functions

Function Mode is used to execute various functions (Fn□□□).

■ Functions

Function No.	Name	Function	Remarks
Fn000	Alarm history display	Displays an alarm history of up to the 10 most recent alarms.	---
Fn001	Rigidity selection	Sets the machine rigidity. **Note** Only enabled if the gain adjustment rotary switch is set to 0.	Protected.
Fn002	Jog operation	Rotates the Servomotor using the Parameter Unit keys.	Protected. Disabled during RUN.
Fn003	Servomotor origin search	Rotates the Servomotor using the Parameter Unit keys, detects phase Z, and stops the Servomotor on phase Z.	Protected. Disabled during RUN.
Fn005	User parameter initialization	Initializes the user parameters to their default values.	Protected.
Fn006	Alarm history data clear	Clears alarm history data.	Protected.
Fn007	Online autotuning results save	Writes the load inertia ratio determined by autotuning to Pn103 (inertia ratio).	Protected.
Fn00C	Manual analog monitor output offset adjustment	Adjusts each analog monitor output offset manually.	Protected.
Fn00D	Analog monitor output scaling	Scales (i.e., adjusts the output voltage) of the analog monitor output.	Protected.
Fn00E	Automatic Servomotor current detection offset adjustment	Adjusts the Servomotor current detection offset automatically.	Protected.
Fn00F	Manual Servomotor current detection offset adjustment	Adjusts the Servomotor current detection offset manually.	Protected.
Fn010	Password setting	Enables or disables changes to user parameters.	
Fn012	Version check	Displays the Servo Driver version.	

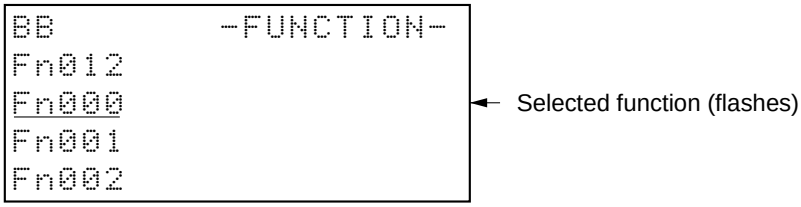
Note 1. Functions indicates as “Protected” in the *Remarks* column cannot be executed if the password in Fn010 has been set to write-protect the system. NO_OP will be displayed if attempting to switch from the Function Mode Main Menu to a function screen.

Note 2. Functions indicates as “Disabled during RUN” in the *Remarks* column cannot be executed if the RUN input (RUN command) is ON. NO_OP will be displayed if an attempt is made to switch from the Function Mode Main Menu to one of these function screens while the RUN input is ON.

3-2 Function Mode Operations

Pressing the MODE/SET Key in Parameter/Monitor Mode will display the Function Mode Main Menu.
Select the function to be executed using the Up and Down Keys, then press the DATA Key to switch to the function screen.

■ Function Mode Main Menu Screen



■ Operation Key Functions

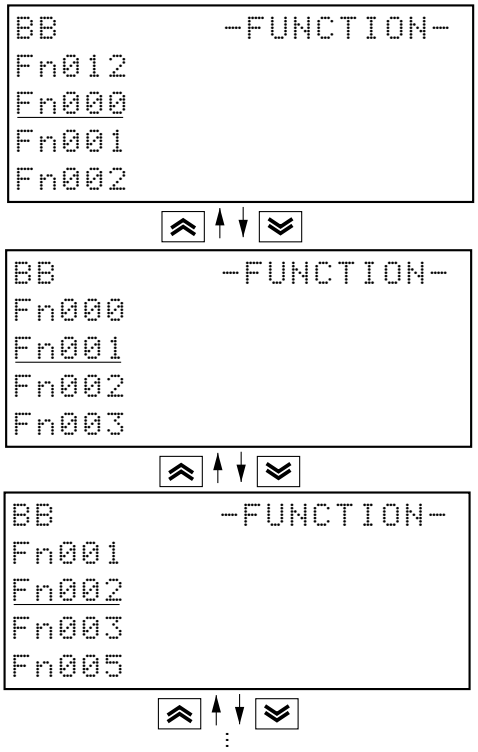
● Overview

RESET	Resets the alarm. (If the cause of the alarm has not been removed, the alarm cannot be reset.)
MODE/SET	Switches to Parameter Copy Mode.
DATA	Switches to the execution screen of the selected function.
SCROLL	Not used.
JOG RUN	Not used.
« »	Not used.
^ v	Selects the function.
READ DRIVER → PR	Not used.
WRITE PR → DRIVER	Not used.

● Details

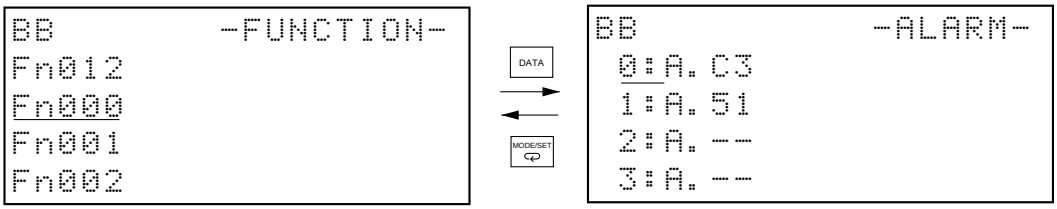
⇈ ⇊	Keys

• Pressing the Up and Down Keys enables function number selection.

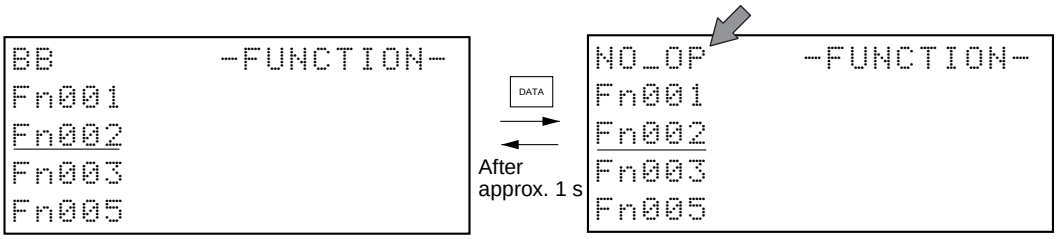


DATA	Key

• Pressing the DATA Key switches to the execution screen of the selected (flashing) function.



• Selecting a function that cannot be executed and pressing the DATA Key will display NO_OP.



Note The previous screen will be displayed if an attempt is made to execute Fn002 (jog operation) when password has been set in Fn010 to write-protect the system.

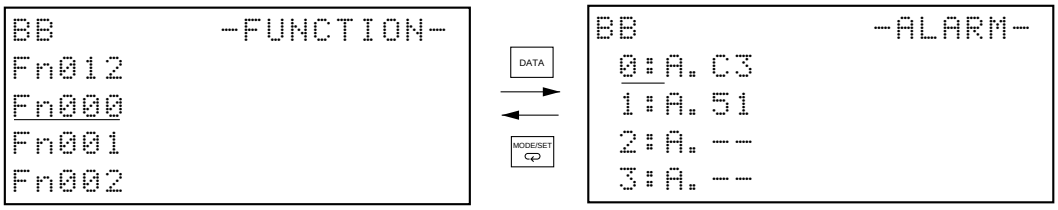
3-3 Function Details and Operation

This section describes the operating methods for the execution screens of each function selected from the Function Mode Main Menu.

3-3-1 Alarm History Display (Fn000)

The Servo Driver records up to the 10 most recent alarms. Their details can be checked using the alarm history display.

■ Display Example



■ Operation Key Functions

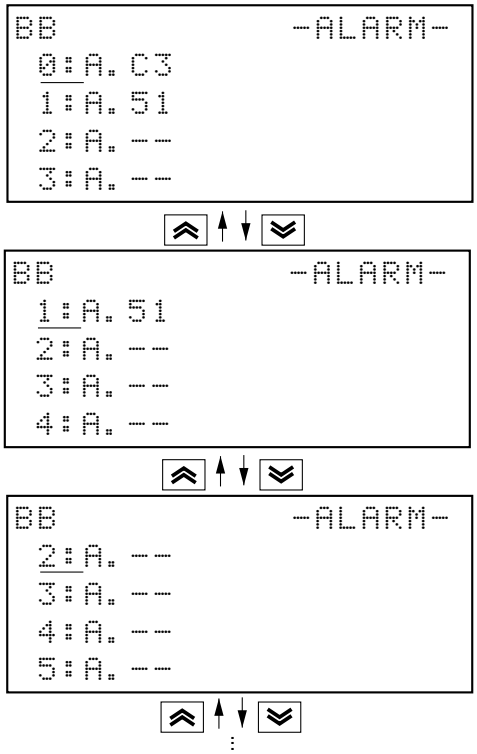
● Overview (Applicable Keys Only)

RESET	Resets the alarm. (If the cause of the alarm has not been removed, the alarm cannot be reset.)
MODE/SET	Returns to the Function Mode Main Menu.
▲ ▼	Displays past alarm details.

● **Details**

⏫ ⏬	Key

• Pressing the Up and Down Keys displays past alarm details.



Note **1.** "0" is the most recent alarm and "9" is the least recent.

Note **2.** Alarms CPF00 and CPF01 are Parameter Unit alarms, and are not stored in the alarm history.

Note **3.** Warnings are not stored in the alarm history.

Note **4.** Even if the same alarm occurs repeatedly, it is entered in the alarm history only as a single alarm.

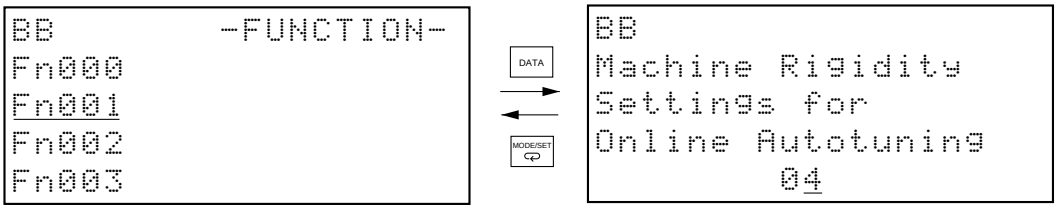
3-3-2 Rigidity Selection (Fn001)

This function manipulates the same settings as the gain adjustment rotary switch.

Note **1.** Fn001 cannot be executed if the gain adjustment rotary switch is set to other than 0.

Note **2.** Fn001 cannot be executed if the password in Fn010 has been set to write-protect the system.

■ Display Example



■ Operation Key Functions

● Overview (Applicable Keys Only)

RESET	Resets the alarm. (If the cause of the alarm has not been removed, the alarm cannot be reset.)
MODE/SET	Returns to the Function Mode Main Menu. If settings have been changed using the Up and Down Keys, pressing MODE/SET Key once will have the same effect as the DATA Key (i.e., writing the data to EEPROM). Pressing it a second time will return to the main menu.
DATA	Writes the selected rigidity to EEPROM. During writing, *done* will be displayed in the upper right corner of the display screen (status display area).
⏫ ⏬	Selects the rigidity from a range of 01 to 10, as shown in the following table. The rigidity will be enabled as soon as it is changed. (However, writing to EEPROM occurs when the DATA Key or MODE/SET Key is pressed.)

● Details

⏫ ⏬ Key

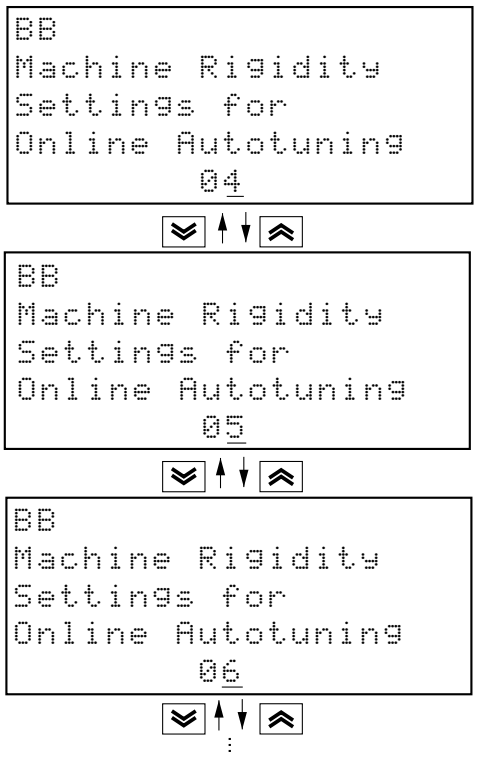
• Pressing the Up and Down Keys selects the rigidity, from the following 10 levels.

Level	Set value	Position loop gain (s^{-1}) (Pn102)	Speed loop gain (Hz) (Pn100)	Speed loop integral time constant (× 0.01 ms) (Pn101)	Torque command filter time constant (× 0.01 ms) (Pn401)	Typical applications (mechanical systems)
Low	01	15	15	4000	250	Articulated robots, harmonic drives, chain drives, belt drives, rack and pinion drives, etc.
	02	20	20	3500	200	
	03	30	30	3000	150	
Medium	04	40	40	2000	100	XY tables, orthogonal robots, general-purpose mechanical systems, etc.
High	05	60	60	1500	70	Ball screws (direct couplings), feeders, etc.
	06	85	85	1000	50	
	07	120	120	800	30	
	08	160	160	600	20	
	09	200	200	500	15	
	10	250	250	400	10	

Note 1. The servo system loop gain will increase in response to a higher switch set value, shortening positioning time. If the setting is too large, however, the machinery may vibrate. Reduce the setting if vibration is a problem.

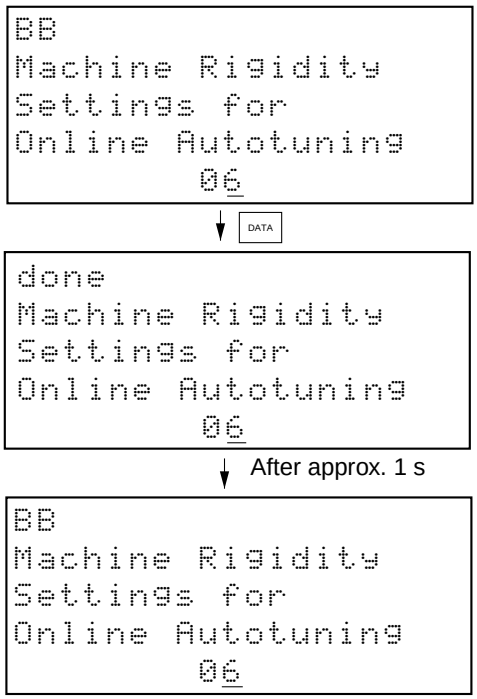
Note 2. When the rigidity is set, the user parameters given in the above table will change automatically.

Note 3. If autotuning is enabled without setting the rigidity, tuning is performed using the user parameter settings (Pn102, Pn100, Pn101, and Pn401) as the target values.



DATA Key

- Pressing the DATA Key writes the selected rigidity to EEPROM.



Note During writing, *done* will be displayed in the status display area.

3-3-3 Jog Operation (Fn002)

The Servomotor can be operated in forward or reverse by using the keys on the Parameter Unit.

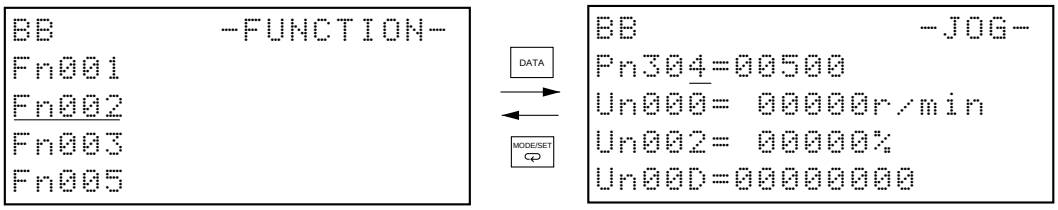
For safety reasons, only use the jog operation when the Servomotor is not loaded (i.e., when the shaft is not connected to the mechanical system). Also, to prevent the Servomotor from turning sideways, fasten the Servomotor mounting surface firmly to the machinery.

Use the job operation only when the host controller's power supply is OFF or when the host controller is not connected.

Note 1. Fn002 cannot be executed if the password in Fn010 has been set to write-protect the system.

Note 2. Switching to the jog operation execution screen will not be possible if the RUN input (RUN command) is ON.

■ Display Example



Four user parameters and monitor items can be displayed on the jog operation screen, the same as in Parameter/Monitor Mode. These user parameters can be changed if the servo is OFF.

By setting the parameter or monitor numbers to be displayed and then pressing the WRITE Key, the current screen can be saved as the default screen.

■ Operation Key Functions

● Overview (Applicable Keys Only)

RESET	Resets the alarm. (If the cause of the alarm has not been removed, the alarm cannot be reset.)
MODE/SET	Returns to the Function Mode Main Menu. Pressing the MODE/SET Key when the servo has been turned ON (by pressing the JOG-RUN Key) will turn OFF the servo and return to the Function Mode Main Menu.
SCROLL	When the servo is OFF (during baseblock): Switches the editing line (in the same way as in Parameter/Monitor Mode). When the servo is ON (during RUN): No operation.
JOG RUN	Switches between servo OFF and servo ON status. "BB" is displayed in the status area when the servo is OFF; "RUN" is displayed when the servo is ON.
DATA	When the servo is OFF (during baseblock): Edits the user parameters (in the same way as in Parameter/Monitor Mode). When the servo is ON (during RUN): No operation.
⏫ ⏬	When the servo is OFF (during baseblock): Changes the parameter number, the monitor number, or the parameter set value (in the same way as in Parameter/Monitor Mode). When the servo is ON (during RUN): Rotates the Servomotor at jog speed (Pn304) either counterclockwise (Up Key) or clockwise (Down Key). **Note 1.** If Pn000.0 (reverse rotation mode) is set to 1, the rotation direction will be reverse. **Note 2.** If the shaft is rotating while the Up or Down Key is being pressed, and then the Key is released, the shaft will stop.
⏪ ⏩	When the servo is OFF (during baseblock): Moves the cursor position to the left or right (in the same way as in Parameter/Monitor Mode). When the servo is ON (during RUN): No operation.
WRITE PR➡DRIVER	Saves the display screen.

■ Operation Example

The following example shows how to set the Servomotor to rotate at a jog speed of 1,000 r/min. The default setting 500 r/min.

Operation keys	Display example	Explanation
MODE/SET	BB -FUNCTION- Fn012 Fn000 Fn001 Fn002	Press the MODE/SET Key to display the Function Mode Main Menu.
⏬	BB -FUNCTION- Fn001 Fn002 Fn003 Fn005	Press the Down Key twice to select Fn002.

Operation keys	Display example	Explanation
DATA	BB -JOG- Pn304=00500 Un000= 00000r/min Un002= 00000% Un00D=00000000	Press the DATA Key to switch the screen to the Fn002 (jog operation) execution screen. **Note** If, after pressing the DATA Key, the screen does not switch and NO_OP is displayed in the status display area, either the RUN input (RUN command) is ON or the password in Fn010 has been set to write-protect the system. Check and reset.
DATA	BB -JOG- Pn304=00500 Un000= 00000r/min Un002= 00000% Un00D=00000000	Press the DATA Key to move the cursor to the setting data for Pn304 (jog speed).
« » ⌃ ⌄	BB -JOG- Pn304=01000 Un000= 00000r/min Un002= 00000% Un00D=00000000	Using the Left, Right, Up, and Down Keys, set the jog speed to 1,000 (r/min).
DATA	BB -JOG- Pn304=01000 Un000= 00000r/min Un002= 00000% Un00D=00000000	Press the DATA Key to fix the set value and to move the cursor to the parameter number.
JOG RUN	RUN -JOG- Pn304=01000 Un000= 00000r/min Un002= 00000% Un00D=00000000	Press the JOG-RUN Key to change the status display to RUN and to change the Servomotor to servo ON status.
⌃ ⌄	RUN -JOG- Pn304=01000 Un000= 00000r/min Un002= 00000% Un00D=00000000	Press the Up Key to rotate the Servomotor counterclockwise at a speed of 1,000 r/min. Press the Down Key to rotate the Servomotor clockwise at a speed of 1,000 r/min.

Operation keys	Display example	Explanation
JOG/RUN	BB -JOG- Pn304=01000 Un000= 00000r/min Un002= 00000% Un00D=00000000	Press the JOG-RUN Key after Servomotor operation confirmation has finished to change the status display to BB and change the Servomotor to servo OFF status.
MODE/SET	BB -FUNCTION- Fn001 Fn002 Fn003 Fn005	Press the MODE/SET Key to return to the Function Mode Main Menu.

3-3-4 Servomotor Origin Search (Fn003)

Parameter Unit keys can be used to rotate the Servomotor, detect phase Z, and then stop the Servomotor on phase Z.

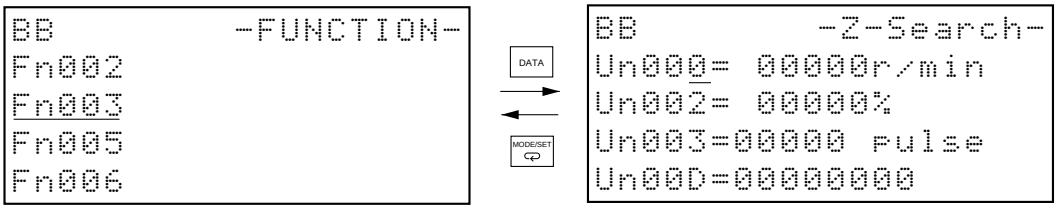
Use this function to adjust the origin position of the Servomotor shaft and mechanical system.

Note 1. Fn003 cannot be executed if the password in Fn010 has been set to write-protect the system.

Note 2. Fn003 cannot be executed if the RUN input (RUN command) is ON. Turn OFF the RUN command.

Note 3. Execute the Servomotor origin search before connecting the Servomotor shaft and mechanical system.

■ Display Example



Four user parameters and monitor items can be displayed on the Servomotor origin search screen, the same as in Parameter/Monitor Mode. The user parameters can be changed if the servo is OFF.

By setting the parameter or monitor numbers to be displayed and then pressing the WRITE Key, the current screen can be saved.

■ Operation Key Functions

● Overview (Applicable Keys Only)

RESET	Resets the alarm. (If the cause of the alarm has not been removed, the alarm cannot be reset.)
MODE/SET	Returns to the Function Mode Main Menu. When the servo has been turned ON by pressing the JOG-RUN Key, pressing the MODE/SET Key will turn OFF the servo and return to the Function Mode Main Menu.

SCROLL	When the servo is OFF (during baseblock): Switches the editing line (in the same way as in Parameter/Monitor Mode). When the servo is ON (during RUN): No operation.
JOG RUN	Switches between servo OFF and servo ON status. "BB" is displayed in the status area when the servo is OFF; "RUN" is displayed when the servo is ON.
DATA	When the servo is OFF (during baseblock): Edits the user parameters (in the same way as in Parameter/Monitor Mode). When the servo is ON (during RUN): No operation.
▲ ▼	When the servo is OFF (during baseblock): Changes the parameter number, the monitor number, or the parameter set value (in the same way as in Parameter/Monitor Mode). When the servo is ON (during RUN): Rotates the Servomotor at 60 r/min either counterclockwise (Up Key) or clockwise (Down Key) and positions it on phase Z. **Note 1.** If Pn000.0 (reverse rotation mode) is set to 1, the rotation direction will be reversed. **Note 2.** Rotates while the key is pressed, and stops when the key is released. (To stop at the phase-Z position, keep pressing the key until the motor stops.)
◀ ▶	When the servo is OFF (during baseblock): Moves the cursor position to the left or right (in the same way as in Parameter/Monitor Mode). When the servo is ON (during RUN): No operation.
WRITE PR→DRIVER	Saves the display screen.

■ Operation Example

The following example shows how to set the Servomotor to rotate counterclockwise and stop it on phase Z.

Operation keys	Display example	Explanation
MODE/SET ▲ ▼	BB -FUNCTION- Fn002 Fn003 Fn005 Fn006	Press the MODE/SET Key to display the Function Mode Main Menu, and then press the Up and Down Keys to select Fn003.
DATA	BB -Z-Search- Un000= 00000r/min Un002= 00000% Un003=00774 pulse Un00D=00000000	Press the DATA Key. The screen will switch to the Fn003 (jog operation) execution screen. **Note** If, after pressing the DATA Key, the screen does not switch and NO_OP is displayed in the status display area, either the RUN input (RUN command) is ON or the password in Fn010 has been set to write-protect the system. Check and reset.
JOG RUN	RUN -Z-Search- Un000= 00000r/min Un002= 00000% Un003=00774 pulse Un00D=00000000	Press the JOG-RUN Key. The status display will change to RUN and the Servomotor status will change to servo ON.

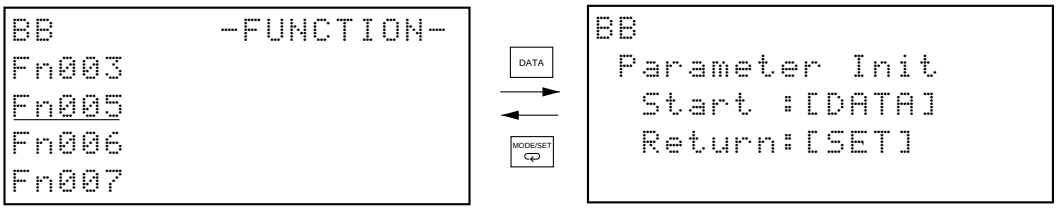
Operation keys	Display example	Explanation
⏫	RUN -Complete- Un000= 00000r/min Un002= 00000% Un003=00000 pulse Un00D=00001D58	Press the Up Key to rotate the Servomotor counter-clockwise and stop it on phase Z. **Note 1.** Press and hold the Key until the Servomotor stops. **Note 2.** If the origin search is completed successfully, *Complete* will be displayed in the upper left corner of the screen, and the number of pulses from phase Z (Un003) will change to 0.
JOG RUN	BB -Z-Search- Un000= 00000r/min Un002= 00000% Un003=00000 pulse Un00D=00001D58	Press the JOG-RUN Key after the Servomotor origin search has been completed. The status display will change to BB and the Servomotor status will change to servo OFF.
MODE/SET	BB -FUNCTION- Fn002 Fn003 Fn005 Fn006	Press the MODE/SET Key to return to the Function Mode Main Menu.

3-3-5 User Parameter Initialization (Fn005)

The user parameters can be initialized to the default settings.

Note Fn005 cannot be executed if the password in Fn010 has been set to write-protect the system, or if the Servomotor is ON.

■ Display Example



■ Operation Key Functions

● Overview (Applicable Keys Only)

RESET	Resets the alarm (if the cause of the alarm has not been removed, the alarm cannot be reset).
MODE/SET	Returns to the Function Mode Main Menu.
DATA	Initializes user parameters. During initialization, *Parameter Init* will flash, and once initialization has been completed, *done* will be displayed in the status display area.

■ Operation Example

Operation keys	Display example	Explanation
MODE/SET ↑ ↓	BB -FUNCTION- Fn003 Fn005 Fn006 Fn007	Press the MODE/SET Key to display the Function Mode Main Menu, and then press the Up and Down Keys to select Fn005.
DATA	BB Parameter Init Start :[DATA] Return:[SET]	Press the DATA Key. The screen will switch to the Fn005 (user parameter initialization) execution screen. **Note** If, after pressing the DATA Key, the screen does not switch and NO_OP is displayed in the status display area, the password in Fn010 has been set to write-protect the system. Check and reset.
DATA	BB Parameter Init Start :[DATA] Return:[SET]	Press the DATA Key to initialize user parameters. During initialization, *Parameter Init* will flash. Once initialization has been completed the flashing will stop, and the status display changes from BB to *done* and then back to BB again. **Note** If initialization is not desired, press the MODE/SET Key to return to the Function Mode Main Menu.

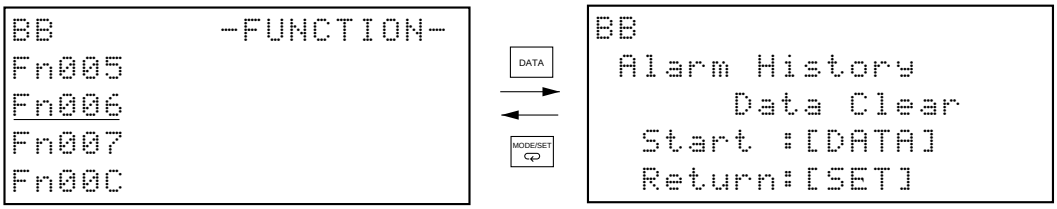
Note User parameter settings will be initialized. Some user parameters, however, require the power supply to be turned OFF then turned ON again to enable their settings.

3-3-6 Alarm History Data Clearing (Fn006)

Fn006 clears the alarm history data.

Note Fn006 cannot be executed if the password in Fn010 has been set to write-protect the system.

■ Display Example



■ Operation Key Functions

● Overview (Applicable Keys Only)

RESET	Resets the alarm. (If the cause of the alarm has not been removed, the alarm cannot be reset.)
MODE/SET	Returns to the Function Mode Main Menu.
DATA	Clears alarm history data. During clearing, *done* will be displayed in the status display area.

■ Operation Example

Operation keys	Display example	Explanation
MODE/SET ↑ ↓	BB -FUNCTION- Fn005 Fn006 Fn007 Fn00C	Press the MODE/SET Key to display the Function Mode Main Menu, and then press the Up and Down Keys to select Fn006.
DATA	BB Alarm History Data Clear Start :[DATA] Return:[SET]	Press the DATA Key. The screen will switch to the Fn006 (alarm history data clearing) execution screen. **Note** If, after pressing the DATA Key, the screen does not switch and NO_OP is displayed in the status display area, the password in Fn010 has been set to write-protect the system. Check and reset.
DATA	done Alarm History Data Clear Start :[DATA] Return:[SET]	Press the DATA Key to clear the alarm history data. During clearing, *done* will be displayed in the status display area. Once clearing has been completed, the status display will return to BB. **Note** If alarm history data clearing is not desired, press the MODE/SET Key to return to the Function Mode Main Menu.

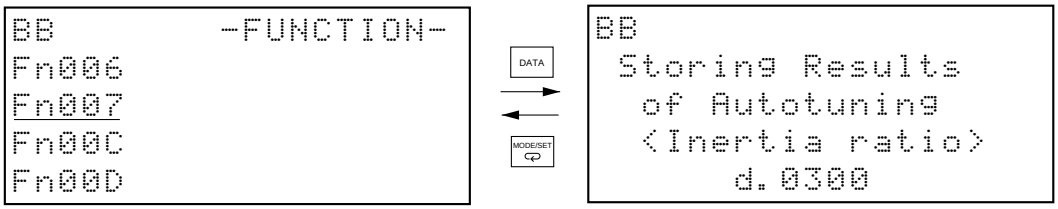
3-3-7 Online Autotuning Results Save (Fn007)

Fn007 writes to EEPROM the load inertia ratio determined with autotuning to Pn103 (inertia ratio).

Note 1. Fn007 cannot be executed if the password in Fn010 has been set to write-protect the system.

Note 2. The load inertia will be used as the inertia ratio calculation default value once the power supply has been turned OFF, then ON again.

■ Display Example



■ Operation Key Functions

● Overview (Applicable Keys Only)

RESET	Resets the alarm. (If the cause of the alarm has not been removed, the alarm cannot be reset.)
MODE/SET	Returns to the Function Mode Main Menu.
DATA	Writes the inertia ratio displayed on the screen (in the example above, this is 300%) to EEPROM. During writing, *done* will be displayed in the status display area.

■ Operation Example

Operation keys	Display example	Explanation
MODE/SET ▲ ▼	BB -FUNCTION- Fn006 Fn007 Fn00C Fn00D	Press the MODE/SET Key to display the Function Mode Main Menu, and then press the Up and Down Keys to select Fn007.

Operation keys	Display example	Explanation
DATA	BB Storing Results of Autotuning <Inertia ratio> d.0300	Press the DATA Key. The screen will switch to the Fn007 (online autotuning results storage) execution screen. **Note** If, after pressing the DATA Key, the screen does not switch and NO_OP is displayed in the status display area, the password in Fn010 has been set to write-protect the system. Check and reset.
DATA	done Storing Results of Autotuning <Inertia ratio> d.0300	Press the DATA Key to write the identified inertia ratio to EEPROM. During writing, *done* will be displayed in the status display area. Once writing has been completed, the status display will return to BB. **Note** If inertia ratio writing is not desired, press the MODE/SET Key to return to the Function Mode Main Menu.

3-3-8 Manual Analog Monitor Output Offset Adjustment (Fn00C)

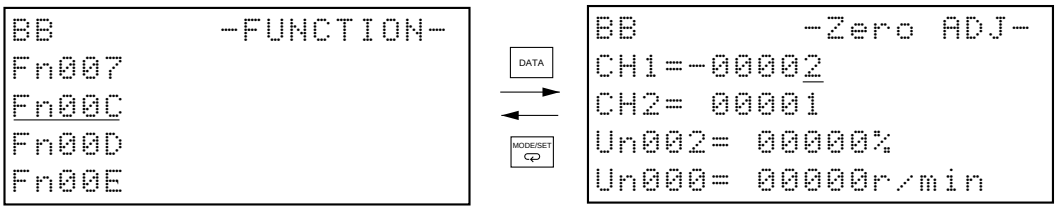
Fn00C adjusts the offsets of the analog monitor outputs (current monitor and speed monitor) manually.

Note **1.** Fn00C cannot be executed if the password in Fn010 has been set to write-protect the system.

Note **2.** Even if user parameter initialization (Fn005) is executed, the adjustment values will not be initialized.

Note **3.** Before adjusting the analog monitor output offsets, confirm that the output voltage is 0 (e.g., if outputting the Servomotor rotation speed, confirm that the status is servo OFF, and the Servomotor shaft is not moving) and connect the measurement instrument that will actually be used.

■ Display Example



■ Operation Key Functions

● Overview (Applicable Keys Only)

RESET	Cancels the alarm (if the cause of the alarm is unknown, the alarm cannot be reset).
MODE/SET	Returns to the Function Mode Main Menu.
SCROLL	Switches the channel for offset adjustment (CH1 or CH2).
▲ ▼	Increments (Up Key) or decrements (Down Key) by 1 the set value of the channel being adjusted. **Note** The setting will be enabled as soon as it is changed. The setting will not be written to EEPROM, however, unless the DATA Key is pressed.
DATA	Writes the settings (both CH1 and CH2) to EEPROM. During writing, *done* will be displayed in the status display area.

Note 1. The digit being manipulated cannot be changed using the Left and Right Keys. The rightmost digit is always manipulated.

Note 2. CH1 is the current monitor, and CH2 is the speed monitor.

Note 3. If the set value is incremented or decremented by 1, the voltage will change by approximately 17 mV. The setting range is from –128 to 127.

■ Operation Example

Operation keys	Display example	Explanation
MODE/SET ▲ ▼	BB -FUNCTION- Fn007 Fn00C Fn00D Fn00E	Press the MODE/SET Key to display the Function Mode Main Menu, and then press the Up and Down Keys to select Fn00C.
DATA	BB -Zero ADJ- CH1=-00002 CH2= 00001 Un002= 00000% Un000= 00000r/min	Press the DATA Key. The screen will switch to the Fn00C (manual analog monitor output offset adjustment) execution screen. **Note** If, after pressing the DATA Key, the screen does not switch and NO_OP is displayed in the status display area, the password in Fn010 has been set to write-protect the system. Check and reset.
▲ ▼	BB -Zero ADJ- CH1=-00005 CH2= 00001 Un002= 00000% Un000= 00000r/min	First of all, adjust the CH1 (current monitor) offset by pressing the Up and Down Keys. Adjust so that the measured value of the measurement device is 0 V.

Operation keys	Display example	Explanation
SCROLL	BB -Zero ADJ- CH1=-00005 CH2= 00001 Un002= 00000% Un000= 00000r/min	Once the CH1 offset adjustment has been completed, adjust the CH2 (speed monitor) offset. Press the SCROLL Key to move the cursor to the CH2 line.
↑ ↓	BB -Zero ADJ- CH1=-00005 CH2= 00006 Un002= 00000% Un000= 00000r/min	Adjust the CH2 offset in the same way as for CH1: Pressing the Up and Down Keys, adjust so that the measured value of the measurement device is 0 V.
DATA	done -Zero ADJ- CH1=-00005 CH2= 00006 Un002= 00000% Un000= 00000r/min	Once the CH1 and CH2 offset adjustments have been completed, press the DATA Key to write the adjustment results to EEPROM. During writing, *done* will be displayed in the status display area. Once writing has been completed, the status display will return to BB.
MODE/SET	BB -FUNCTION- Fn007 Fn00C Fn00D Fn00E	Press the MODE/SET Key to return to the Function Mode Main Menu.

3-3-9 Analog Monitor Output Scaling (Fn00D)

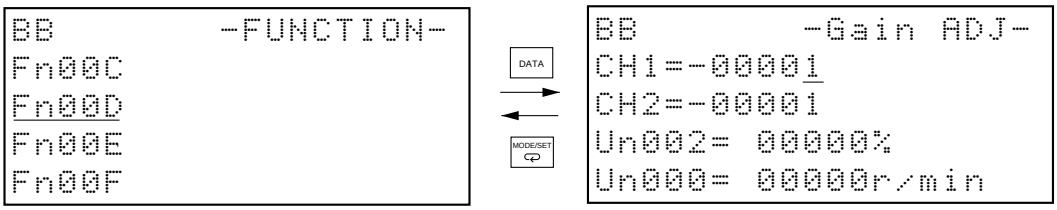
Fn00D executes analog monitor output (current monitor and speed monitor) scaling. The two monitor outputs can be set separately. The analog monitor output scale setting range is –128 to 127 (× 0.4%).

Set the scale that is centered on 100%. For example, if you set –125, 100% – (125 × 0.4%) = 50%, so the monitor output voltage = 1/2. Alternatively, if you set 125, 100% + (125 × 0.4%) = 150%, so the monitor output voltage = × 1.5.

Note 1. Fn00D cannot be executed if the password in Fn010 has been set to write-protect the system.

Note 2. Even if user parameter initialization (Fn005) is executed, the setting will not be initialized.

■ Display Example



■ Operation Key Functions

● Overview (Applicable Keys Only)

RESET	Resets the alarm. (If the cause of the alarm has not been removed, the alarm cannot be reset.)
MODE/SET	Returns to the Function Mode Main Menu.
SCROLL	Switches the channel for offset adjustment (CH1 or CH2).
▲ ▼	Increments (Up Key) or decrements (Down Key) the set value of the channel being adjusted. **Note** The setting will be enabled as soon as it is changed. The setting will not be written to EEPROM, however, unless the DATA Key is pressed.
DATA	Writes the set values (both CH1 and CH2) to EEPROM. During writing, *done* will be displayed in the status display area.

Note 1. The digit being manipulated cannot be changed using the Left and Right Keys. The rightmost digit is always manipulated.

Note 2. CH1 is the current monitor, and CH2 is the speed monitor.

■ Operation Example

Operation keys	Display example	Explanation
MODE/SET ▲ ▼	BB -FUNCTION- Fn00C Fn00D Fn00E Fn00F	Press the MODE/SET Key to display the Function Mode Main Menu, and then press the Up and Down Keys to select Fn00D.
DATA	BB -Gain ADJ- CH1=-00001 CH2=-00001 Un002= 00000% Un000= 00000r/min	Press the DATA Key. The screen will switch to the Fn00D (analog monitor output scaling) execution screen. **Note** If, after pressing the DATA Key, the screen does not switch and NO_OP is displayed in the status display area, the password in Fn010 has been set to write-protect the system. Check and reset.
▲ ▼	BB -Gain ADJ- CH1= 00125 CH2=-00001 Un002= 00000% Un000= 00000r/min	First of all, scale CH1 (current monitor) by pressing the Up and Down Keys to change the scale. **Note** The scale unit is × 0.4%.

Operation keys	Display example	Explanation
SCROLL	BB -Gain ADJ- CH1= 00125 CH2=-00001 Un002= 00000% Un000= 00000r/min	Once CH1 scaling has been completed, adjust the CH2 (speed monitor) scale. Press the SCROLL Key to move the cursor to the CH2 line.
▲ ▼	BB -Gain ADJ- CH1= 00125 CH2=-00125 Un002= 00000% Un000= 00000r/min	Adjust the CH2 scale in the same way as for CH1: Pressing the Up and Down Keys, change the scale. **Note** The scale unit is × 0.4%.
DATA	done -Gain ADJ- CH1= 00125 CH2=-00125 Un002= 00000% Un000= 00000r/min	Once the CH1 and CH2 scale settings have been completed, press the DATA Key to write the setting results to EEPROM. During writing, *done* will be displayed in the status display area. Once writing has been completed, the status display will return to BB.
MODE/SET	BB -FUNCTION- Fn00C Fn00D Fn00E Fn00F	Press the MODE/SET Key to return to the Function Mode Main Menu.

3-3-10 Automatic Servomotor Current Detection Offset Adjustment (Fn00E)

Servomotor current detection offset adjustment has already been completed at the factory. Consequently, there is normally no need to perform this adjustment.

If the torque ripple caused by current detection offset is considered abnormally large, perform automatic Servomotor current detection offset adjustment (Fn00E).

After performing automatic adjustment, perform manual adjustment (Fn00F) if further lowering of the torque ripple is required. If manual adjustment is performed badly, however, there is a risk of worsening the characteristics.

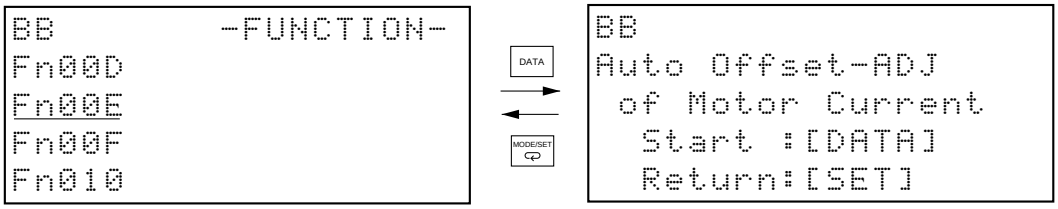
Note 1. Automatic Servomotor current detection offset adjustment can be performed only when the power supply to the main circuit is turned ON and the power supply to the servo is OFF.

Note 2. Do not execute during command pulse input.

Note 3. Fn00E cannot be executed if the password in Fn010 has been set to write-protect the system.

Note 4. Even if user parameter initialization (Fn005) is executed, the setting will not be initialized.

■ Display Example



■ Operation Key Functions

● Overview (Applicable Keys Only)

RESET	Resets the alarm. (If the cause of the alarm has not been removed, the alarm cannot be reset.)
MODE/SET	Returns to the Function Mode Main Menu.
DATA	Executes automatic adjustment. During adjusting operations, *done* will be displayed in the status display area.

■ Operation Example

Operation keys	Display example	Explanation
MODE/SET ▲ ▼	BB -FUNCTION- Fn00D Fn00E Fn00F Fn010	Press the MODE/SET Key to display the Function Mode Main Menu, and then press the Up and Down Keys to select Fn00E.
DATA	BB Auto Offset-ADJ of Motor Current Start :[DATA] Return:[SET]	Press the DATA Key. The screen will switch to the Fn00E (automatic Servomotor current detection offset adjustment) execution screen.
DATA	done Auto Offset-ADJ of Motor Current Start :[DATA] Return:[SET]	Press the DATA Key to execute automatic Servomotor current detection offset adjustment. During adjusting, *done* will be displayed in the status display area. Once adjusting has been completed, the status display will return to BB. **Note** If automatic adjustment is not desired, press the MODE/SET Key to return to the Function Mode Main Menu.

3-3-11 Manual Servomotor Current Detection Offset Adjustment (Fn00F)

Fn00F manually adjusts the Servomotor current detection offset. Adjust the phase-U and phase-V offsets alternately while balancing each separately.

When performing adjustments, rotate the Servomotor at 100 r/min. without connecting the mechanical system to the Servomotor shaft (i.e., make sure there is no load), and perform the adjustments while monitoring the waveform of the analog monitor output's current monitor.

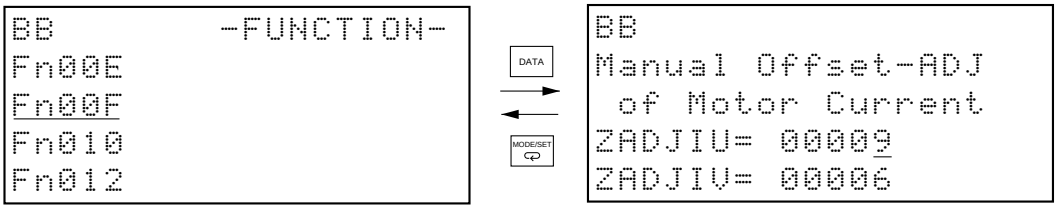
The Servomotor current detection offset setting range is –512 to 511.

Note **1.** If adjusting the Servomotor current detection offset, first try performing the automatic adjustment (Fn00E). Only attempt manual adjustment if the torque ripple is still too large after performing automatic adjustment.

Note **2.** Fn00F cannot be executed if the password in Fn010 has been set to write-protect the system.

Note **3.** Even if user parameter initialization (Fn005) is executed, the setting will not be initialized.

■ Display Example

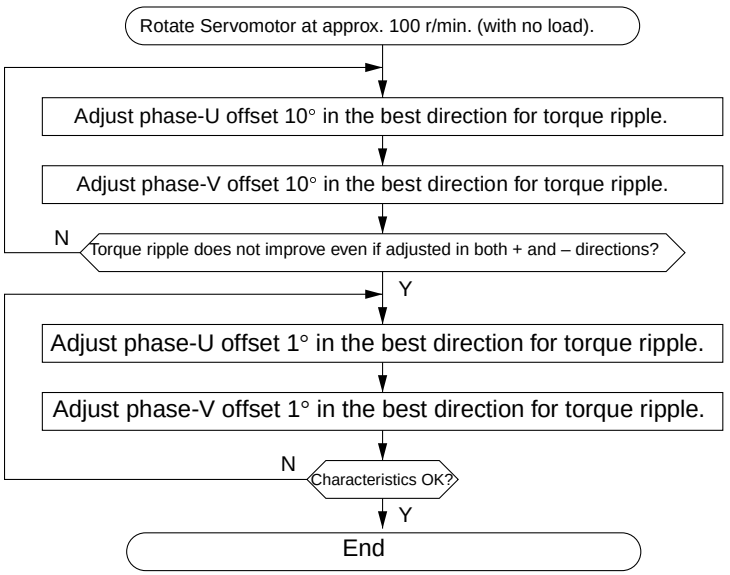


■ Operation Key Functions

● Overview (Applicable Keys Only)

RESET	Resets the alarm. (If the cause of the alarm has not been removed, the alarm cannot be reset.)
MODE/SET	Returns to the Function Mode Main Menu.
SCROLL	Switches the phase for offset adjustment (phase U or phase V).
↑ ↓	Increments (Up Key) or decrements (Down Key) the set value of the phase being adjusted. **Note** The setting will be enabled as soon as it is changed. The setting will not be written to EEPROM, however, unless the DATA Key is pressed.
DATA	Writes the set values (both phase U and phase V) to EEPROM. During writing, *done* will be displayed in the status display area.

■ Flowchart for Manual Servomotor Current Detection Offset Adjustment



Note 1. Adjust the offset while monitoring the current monitor's waveform.

Note 2. Perform rough adjustments in units of 10°, and fine adjustments in units of 1°. (You can also perform intermediate adjustments in units of 5°.)

Note 3. Do not greatly adjust either U phase or V phase alone.

■ Operation Example

Operation keys	Display example	Explanation
MODE/SET ↑ ↓	BB -FUNCTION- Fn00E Fn00F Fn010 Fn012	Press the MODE/SET Key to display the Function Mode Main Menu, and then press the Up and Down Keys to select Fn00F.
DATA	BB Manual Offset-ADJ of Motor Current ZADJIU= 00009 ZADJIV= 00006	Press the DATA Key. The screen will switch to the Fn00F (manual Servomotor current detection offset adjustment) execution screen.
↑ ↓	BB Manual Offset-ADJ of Motor Current ZADJIU= 00019 ZADJIV= 00006	First of all, adjust the phase-U offset by pressing the Up and Down Keys to change the offset unit. Adjust 10° in the best direction for torque ripple reduction. (ZADJIU = Zero ADJust phase-U current.)
SCROLL ↑	BB Manual Offset-ADJ of Motor Current ZADJIU= 00019 ZADJIV= 00006	Next, adjust the phase-V offset. Press the SCROLL Key to move the cursor to the phase-V line.

Operation keys	Display example	Explanation
⏫ ⏬	BB Manual Offset-ADJ of Motor Current ZADJIU= 00019 ZADJIV= 00016	Adjust the phase-U offset by pressing the Up and Down Keys to change the offset volume. Adjust 10° in the best direction for torque ripple reduction. (ZADJIV = Zero ADJust phase-V current.)
Repeat the above operation (phase-U adjustment to phase-V adjustment) until the torque ripple improves no further even by changing the offset in both the + and - directions. Next, finely adjust phase U and phase V in the same way.		
DATA	done Manual Offset-ADJ of Motor Current ZADJIU= 00019 ZADJIV= 00016	Once the offset adjustments have been completed, press the DATA Key to write the adjustment results to EEPROM. During writing, *done* will be displayed in the status display area. Once writing has been completed, the status display will return to BB.
MODE/SET	BB -FUNCTION- Fn00E Fn00F Fn010 Fn012	Press the MODE/SET Key to return to the Function Mode Main Menu.

3-3-12 Password Setting (Fn010)

Fn010 prevents the user parameter settings, Function Mode settings, Function Mode adjustments, and other settings from being overwritten unintentionally.

From the next time the power supply is turned ON after the write-protect password is set, it will be impossible to change parameter settings in Function Mode. It still remains possible, however, to refer to the user parameters and perform some functions in Function Mode. The functions that can be performed in System Check Mode while write-protect is enabled are as follows:

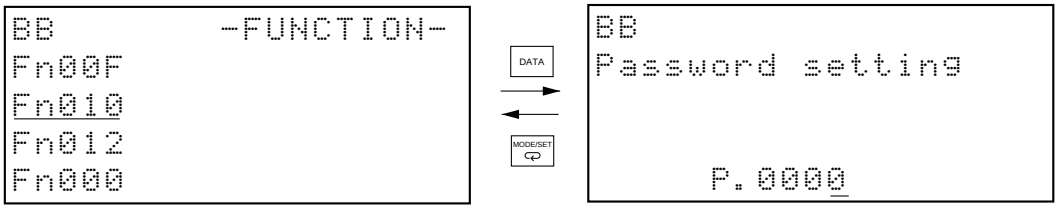
Alarm history display (Fn000), password setting (Fn010), and version check (Fn012)

If attempts are made to perform any functions other than these, *NO_OP* will be displayed for approximately 1 second, and then the display will return to the Function Mode Main Menu.

If the write-enable password is set, the write-protect status will be canceled (i.e., writing to the user parameters, etc., will be enabled when the power is next turned ON).

Note Even when the write-protect password is set, Pn103 (inertia ratio) will still be changed to the load inertia ratio determined by autotuning if the online autotuning switch (function setting switch 1) is turned OFF.

■ Display Example



■ Operation Key Functions

● Overview (Applicable Keys Only)

RESET	Resets the alarm. (If the cause of the alarm has not been removed, the alarm cannot be reset.)
MODE/SET	Returns to the Function Mode Main Menu.
DATA	Writes the input set values to EEPROM. During writing, *done* will be displayed in the status display area. If an invalid password has been set, *NO_OP* is displayed.
≪ ≫	Moves the cursor position to the left and right.
≪ ≫	Increments (Up Key) or decrements (Down Key) the set value. **Note** Valid set values are the following: 0000: User parameter write-enabled 0001: User parameter write-protected

■ Write Prohibit Operation Example

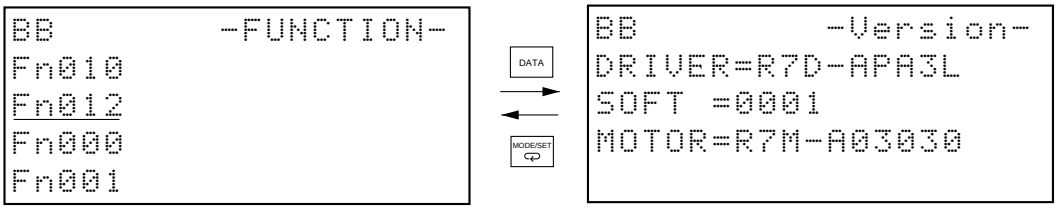
Operation keys	Display example	Explanation
MODE/SET ≪ ≫	BB -FUNCTION- Fn00F Fn010 Fn012 Fn000	Press the MODE/SET Key to display the Function Mode Main Menu, and then press the Up and Down Keys to select Fn010.
DATA	BB Password setting P.0000	Press the DATA Key. The screen will switch to the Fn010 (password setting) execution screen.
≪	BB Password setting P.0001	Press the Up Key to set the password setting to 0001.

Operation keys	Display example	Explanation
DATA	done Password setting P.0001	Press the DATA Key to write the password setting to EEPROM. During writing, *done* will be displayed in the status display area. Once writing has been completed, the status display will return to BB. **Note** The password that has been set (in this case, "write-protect") will be enabled from the next time the power supply is turned ON.
MODE/SET	BB -FUNCTION- Fn00F Fn010 Fn012 Fn000	Press the MODE/SET Key to return to the Function Mode Main Menu.

3-3-13 Version Check (Fn012)

Fn012 displays the Servo Driver model, the Servo Driver system software version, and the Servomotor model connected.

■ Display Example



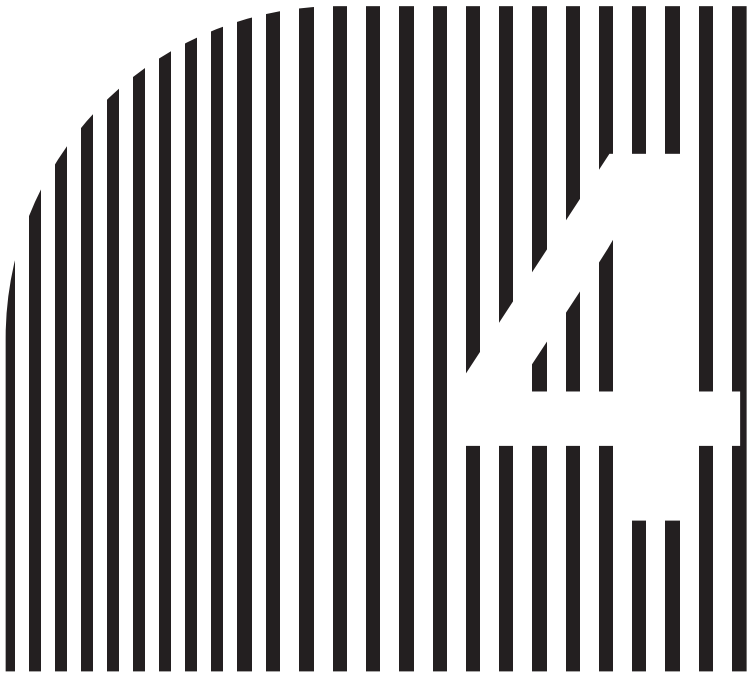
DRIVER: Servo Driver model
SOFT: Servo Driver system software version
MOTOR: Servomotor model connected

Note If a Servomotor is not connected, *Not connect* will be displayed on the *MOTOR* line. If a Servomotor with an incorrect capacity is connected, it will not normally be displayed.

■ Operation Key Functions

● Overview (Applicable Keys Only)

RESET	Resets the alarm. (If the cause of the alarm has not been removed, the alarm cannot be reset.)
MODE/SET	Returns to the Function Mode Main Menu.



Chapter 4

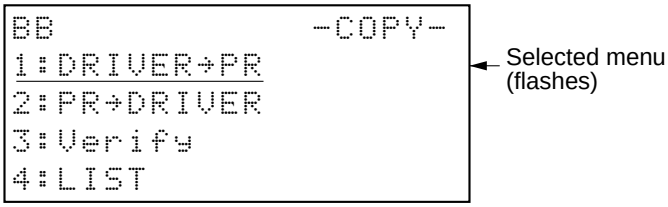
Parameter Copy Mode

4-1 Operations in Parameter Copy Mode
4-2 Parameter Reading (DRIVER to PR)
4-3 Parameter Writing (PR to DRIVER)
4-4 Parameter Verification (Verify)
4-5 Parameter Block Delete (LIST)

4-1 Operations in Parameter Copy Mode

The R7A-PR02A Parameter Unit for the SMARTSTEP A Series contains an EEPROM capable of storing seven blocks of user parameters. Parameter Copy Mode manipulates these user parameter blocks.
Pressing the MODE/SET Key in Function Mode will display the Parameter Copy Mode menu screen. Select the menu to be executed using the Up and Down Keys, and then press the DATA Key to switch to the selected menu's execution screen.

■ Parameter Copy Mode Menu Screen



■ Parameter Copy Mode Functions

In Parameter Copy Mode, the following four functions can be executed.

Display	Function
1: DRIVER → PR	Parameter reading from the Servo Driver to the Parameter Unit.
2: PR → DRIVER	Parameter writing from the Parameter Unit to the Servo Driver.
3: Verify	Parameter comparison between the Servo Driver and the Parameter Unit.
4: LIST	Deleting a parameter block.

■ Operation Key Functions

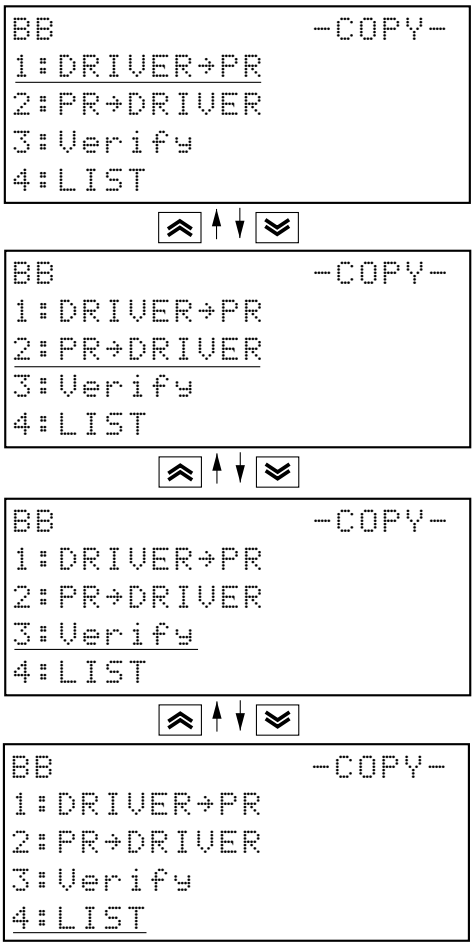
● Overview

RESET	Resets the alarm. (If the cause of the alarm has not been removed, the alarm cannot be reset.)
MODE/SET	Switches to Parameter/Monitor Mode.
DATA	Switches to the execution screen of the selected menu.
SCROLL	Not used.
JOG / RUN	Not used.
« »	Not used.
≪ ≫	Selects the menu item.
READ DRIVER → PR	Not used.
	Not used.

● Details

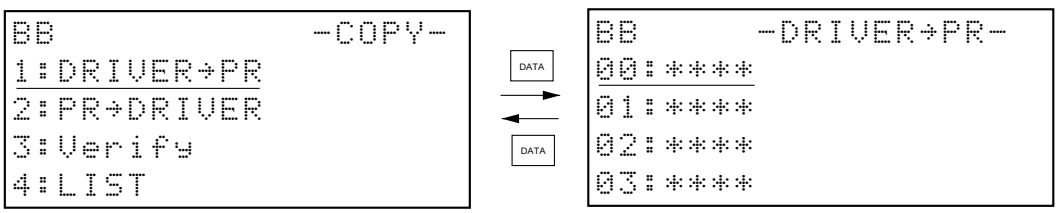
⏫ ⏬	Keys

• Pressing the Up and Down Keys enables menu selection.



DATA	Key

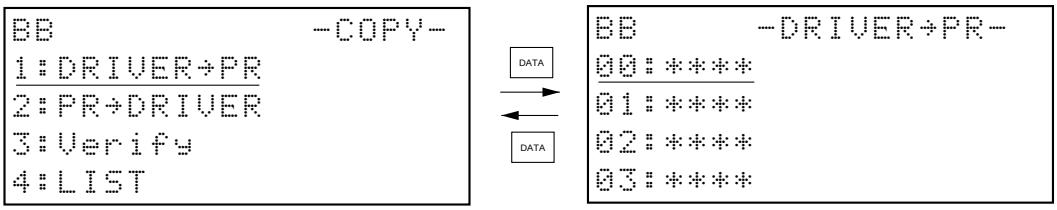
• Pressing the DATA Key switches to the execution screen of the selected (flashing) menu item.



4-2 Parameter Reading (DRIVER to PR)

The parameter read operation reads the user parameters saved in the Servo Driver's EEPROM and stores them in one of the seven blocks of user parameters stored in the Parameter Unit's memory.

■ Display Example



■ Parameter Reading Procedure

Operation keys	Display example	Explanation
MODE/SET ▲ ▼	BB -COPY- 1:DRIVER→PR 2:PR→DRIVER 3:Verify 4:LIST	**Menu Selection** Use the MODE/SET and Up and Down Keys to display the Parameter Copy Mode Main Menu, and select DRIVER → PR. The menu flashing is the menu that is currently selected.
DATA	BB -DRIVER→PR- 00:**** 01:**** 02:**** 03:****	**Menu Execution** Press the DATA Key to switch to the Parameter Block Selection Screen.
▲ ▼	BB -DRIVER→PR- 00:**** 01:**** 02:**** 03:****	**Parameter Block Selection** Using the Up and Down Keys, select to which parameter block (00 to 06) in the Parameter Unit the parameters read from the Servo Driver are to be stored.
MODE/SET	BB -DRIVER→PR- 00:**** Start :[Read] Return:[DATA]	**Switching to the Parameter Reading Execution Screen** Press the MODE/SET Key to switch to the parameter reading execution screen.

Operation keys	Display example	Explanation
READ DRIVER → PR	BB -DRIVER→PR- 00:**** Parameter reading%% <<DRIVER>>	**Parameter Reading Execution** Press the READ (DRIVER → PR) Key to start parameter reading from the Servo Driver. **Note** If read execution is not desired, press the DATA Key to return to the Parameter Block Selection Screen.
	BB -PR→DRIVER- 00:R7D-APA3L Complete	**Parameter Reading Completion** When parameter reading from the Servo Driver and storing to the designated block inside the Parameter Unit are complete, *Complete* will be displayed.
	BB -PR→DRIVER- 00:R7D-APA3L 01:**** 02:**** 03:****	**Switching to the Parameter Block Selection Screen** When parameter reading has been completed (after *Complete* has been displayed), the screen will switch to the Parameter Block Selection Screen. The Servo Driver model (in this example: R7D-APA3L) will be displayed in the designated block.
DATA	BB -COPY- 1:DRIVER→PR 2:PR→DRIVER 3:Verify 4:LIST	**Switching to the Menu Screen** Press the DATA Key to return to the Parameter Copy Mode menu screen.

■ Supplementary Information on Reading Parameters

- While reading parameters, do not disconnect the Parameter Unit from the Servo Driver. If the Parameter Unit is disconnected during parameter reading, the Servo Driver and Parameter Unit data may be damaged. If the Servo Driver's EEPROM data is damaged, an A.BF (system error) alarm will occur at the next startup, and the user parameters will need to be initialized (Fn005).
- If parameter reading is performed for a parameter block that has already had parameters written to it, the parameter block will be overwritten.
- Pressing the DATA Key during parameter reading will interrupt reading, and the parameter block will be deleted (****).
- During parameter reading, the following sequence operation information will be displayed in the display area of the Parameter Unit. The reading operation will end within 10 seconds.

During parameter reading from the Servo Driver

```
BB        -DRIVER→PR-
00:****
  Parameter
   reading%%
<<DRIVER>>
```

During parameter writing to the Parameter Unit

```
BB        -DRIVER→PR-
00:****
  Parameter
   writing%%
<<PR>>
```

During Servo Driver model information writing to the Parameter Unit

```
BB        -DRIVER→PR-
00:****
  File_info
   saving%%
<<PR>>
```

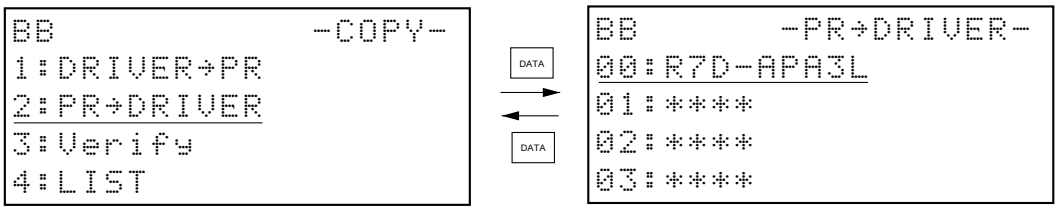
When the operation has ended

```
BB        -DRIVER→PR-
00:R7D-APA3L
  Complete
```

4-3 Parameter Writing (PR to DRIVER)

The parameter write operation writes one of the seven blocks of user parameters stored in the Parameter Unit's EEPROM to the Servo Driver's EEPROM.

■ Display Example



■ Parameter Writing Procedure

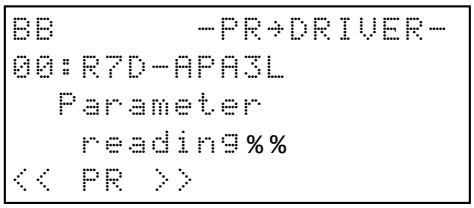
Operation keys	Display example	Explanation
MODE/SET ▲ ▼	BB -COPY- 1:DRIVER→PR 2:PR→DRIVER 3:Verify 4:LIST	**Menu selection.** Use the MODE/SET and Up and Down Keys to display the Parameter Copy Mode Main Menu, and select PR → DRIVER. The menu flashing is the menu that is currently selected.
DATA	BB -PR→DRIVER- 00:R7D-APA3L 01:**** 02:**** 03:****	**Menu execution.** Press the DATA Key to switch to the Parameter Block Selection Screen.
▲ ▼	BB -PR→DRIVER- 00:R7D-APA3L 01:**** 02:**** 03:****	**Parameter block selection.** Using the Up and Down Keys, select the parameter block (from 00 to 06) in the Parameter Unit that contains the parameters to be written to the Servo Driver.
MODE/SET	BB -PR→DRIVER- 00:R7D-APA3L Start :[Write] Return:[DATA]	**Switching to the parameter writing execution screen.** Press the MODE/SET Key to switch to the parameter writing execution screen.

Operation keys	Display example	Explanation
WRITE PR → DRIVER	BB -PR→DRIVER- 00:R7D-APA3L Parameter reading%% << PR >>	**Parameter Writing Execution** Press the WRITE (PR → DRIVER) Key to start parameter writing to the Servo Driver. **Note** If write execution is not desired, press the DATA Key to return to the Parameter Block Selection Screen.
	BB -PR→DRIVER- 00:R7D-APA3L Complete	**Parameter Writing Completion** When parameter reading from the designated block inside the Parameter Unit and storage to the Servo Driver are complete, *Complete* will be displayed.
	BB -PR→DRIVER- 00:R7D-APA3L 01:**** 02:**** 03:****	**Switching to the Parameter Block Selection Screen** When parameter writing has been completes (after *Complete* has been displayed), the screen will switch to the Parameter Block Selection Screen.
DATA	BB -COPY- 1:DRIVER→PR 2:PR→DRIVER 3:Verify 4:LIST	**Switching to the Menu Screen** Press the DATA Key to return to the Parameter Copy Mode menu screen.

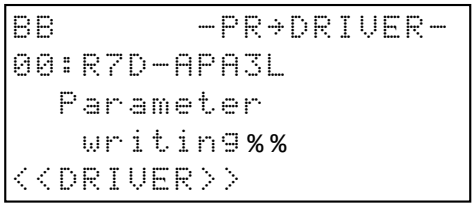
■ Supplementary Information on Writing Parameters

- While writing parameters, do not disconnect the Parameter Unit from the Servo Driver. If the Parameter Unit is disconnected during parameter writing, the Servo Driver and Parameter Unit data may be damaged. If the Servo Driver's EEPROM data is damaged, an A.BF (system error) alarm will occur at the next startup, and the user parameters will need to be initialized (Fn005).
- If parameter writing is attempted to a parameter block with a Servo Driver with different voltage or capacity, or to an empty (****) parameter block, *Parameter File Unmatched* will be displayed and writing will not occur.
- During parameter writing, the following sequence operation information will be displayed in the display area of the Parameter Unit. The writing operation will end within 10 seconds.

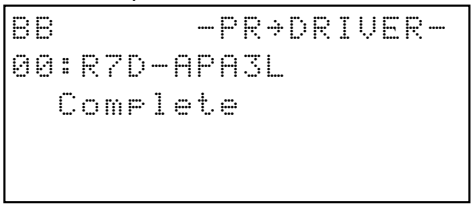
During parameter reading from the Parameter Unit



During parameter writing to the Servo Driver



When the operation has ended

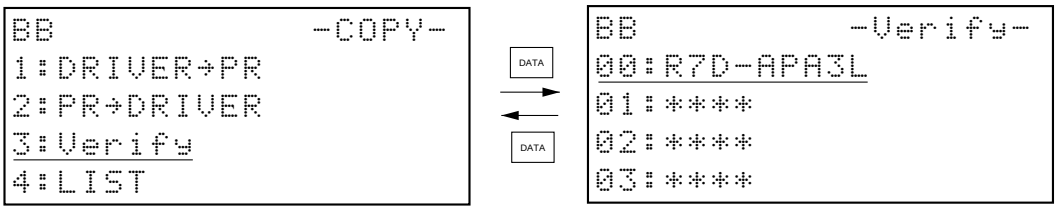


Note Pressing the DATA Key while these screens are displayed will interrupt writing, and the display will return to the Parameter Block Selection Screen.

4-4 Parameter Verification (Verify)

The parameter verification operation compares one of the seven blocks of user parameters stored in the Parameter Unit's EEPROM and the user parameters stored in the Servo Driver's EEPROM, and displays the results.

■ Display Example



■ Parameter Verifying Procedure

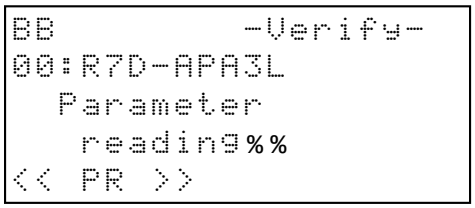
Operation keys	Display example	Explanation
MODE/SET ▲ ▼	BB -COPY- 1:DRIVER→PR 2:PR→DRIVER 3:Verify 4:LIST	**Menu Selection** Use the MODE/SET and Up and Down Keys to display the Parameter Copy Mode Main Menu, and select *Verify*. The menu flashing is the menu that is currently selected.
DATA	BB -LIST- 00:R7D-APA3L 01:**** 02:**** 03:****	**Menu Execution** Press the DATA Key to switch to the Parameter Block Selection Screen.
▲ ▼	BB -LIST- 00:R7D-APA3L 01:**** 02:**** 03:****	**Parameter Block Selection** Using the Up and Down Keys, select the parameter block (from 00 to 06) in the Parameter Unit that contains the parameters to be compared with the Servo Driver parameters.
MODE/SET	BB -Verify- 00:R7D-APA3L Start :[Write] Return:[DATA]	**Switching to the Parameter Verifying Execution Screen** Press the MODE/SET Key to switch to the parameter verifying execution screen.

Operation keys	Display example	Explanation
WRITE PR→DRIVER	BB -PR→DRIVER- 00:R7D-APA3L Parameter reading%% << PR >>	**Parameter Verifying Execution** Press the WRITE (PR → DRIVER) Key to start parameter verifying. **Note** If verify execution is not desired, press the DATA Key to return to the Parameter Block Selection Screen.
	BB -Verify- 00:R7D-APA3L Complete	**Parameter Verifying Completion** When parameter reading from the designated block inside the Parameter Unit, parameter reading from the Servo Driver, and comparison have been completed, *Complete* will be displayed.
	Data Matches BB -Result- Same files%% **Data Does Not Match** BB -Result- Pn001 FILE Pn100 Unmatched Pn101 Pn202	**Displaying Parameter Verification Results** After parameter comparison has ended (after *Complete* has been displayed), the comparison results will be displayed. If the comparison shows data that does not match, a list of non-matching parameter numbers will be displayed. If 5 or more parameters do not match, use the Up and Down Keys to scroll through and check the parameter numbers.
DATA	BB -LIST- 00:R7D-APA3L 01:**** 02:**** 03:****	**Switching to the Parameter Block Selection Screen** Press the DATA Key to switch to the Parameter Block Selection Screen.
DATA	BB -COPY- 1:DRIVER→PR 2:PR→DRIVER 3:Verify 4:LIST	**Switching to the Menu Screen** Press the DATA Key to return to the Parameter Copy Mode menu screen.

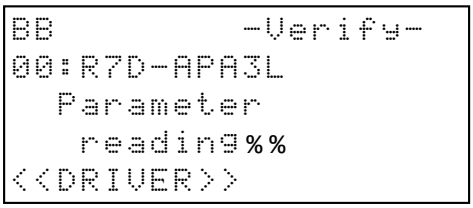
■ Supplementary Information on Comparing Parameters

- While comparing parameters, do not disconnect the Parameter Unit from the Servo Driver. If the Parameter Unit is disconnected during parameter comparison, the Servo Driver and Parameter Unit data may be damaged. If the Servo Driver's EEPROM data is damaged, an A.BF (system error) alarm will occur at the next startup, and the user parameters will need to be initialized (Fn005).
- Pressing the DATA Key during parameter comparison will interrupt comparison, and the display will return to the Parameter Block Selection Screen.
- During parameter comparison, the following sequence operation information will be displayed in the display area of the Parameter Unit. The comparison operation will end within 15 seconds.

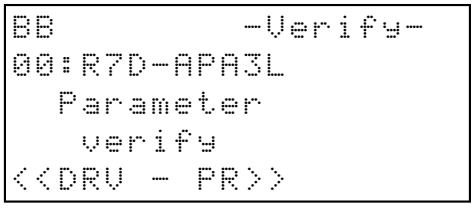
During parameter reading from the Parameter Unit



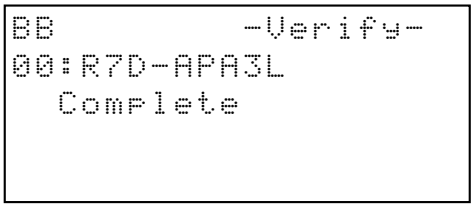
During parameter reading from the Servo Driver



During parameter verifying



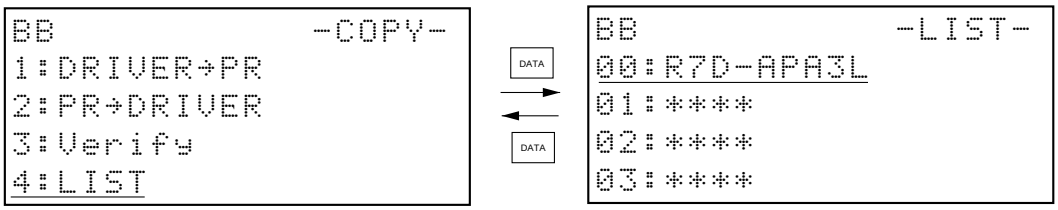
When the operation has ended



4-5 Parameter Block Delete (LIST)

The parameter block delete operation deletes one of the seven blocks of user parameters stored in the Parameter Unit's EEPROM.

■ Display Example



■ Parameter Block Delete Procedure

Operation keys	Display example	Explanation
MODE/SET ▲ ▼	BB -COPY- 1:DRIVER→PR 2:PR→DRIVER 3:Verify 4:LIST	**Menu Selection** Use the MODE/SET and Up and Down Keys to display the Parameter Copy Mode Main Menu, and select LIST. The flashing menu is the menu that is currently selected.
DATA	BB -LIST- 00:R7D-APA3L 01:**** 02:**** 03:****	**Menu Execution** Press the DATA Key to switch to the Parameter Block Selection Screen.
▲ ▼	BB -LIST- 00:R7D-APA3L 01:**** 02:**** 03:****	**Parameter Block Selection** Using the Up and Down Keys, select the parameter block (from 00 to 06) in the Parameter Unit to be deleted.
MODE/SET	BB -LIST- 00:R7D-APA3L FILE DELETE Start :[Read] Return:[DATA]	**Switching to the Parameter Block Delete Execution Screen** Press the MODE/SET Key to switch to the parameter block delete execution screen.

Operation keys	Display example	Explanation
READ DRIVER → PR	BB -LIST- 00:R7D-APA3L Parameter delete << PR >>	**Parameter Block Delete Execution** Press the READ (DRIVER → PR) Key to start parameter block delete. **Note** If delete execution is not desired, press the DATA Key to return to the Parameter Block Selection Screen.
	BB -LIST- 00:R7D-APA3L Complete	**Parameter Block Delete Completion** When deleting the designated block inside the Parameter Unit has been completed *Complete* will be displayed.
	BB -LIST- 00:**** 01:**** 02:**** 03:****	**Switching to the Parameter Block Selection Screen** After parameter deletion has ended (after *Complete* has been displayed), the display switches to the Parameter Block Selection Screen. The designated block will change to a deleted block display (****).
DATA	BB -COPY- 1:DRIVER→PR 2:PR→DRIVER 3:Verify 4:LIST	**Switching to the Menu Screen** Press the DATA Key to return to the Parameter Copy Mode Main Menu Screen.

■ Supplementary Information on Deleting Parameters

- While deleting parameters, do not disconnect the Parameter Unit from the Servo Driver. If the Parameter Unit is disconnected during parameter deletion, the Servo Driver and Parameter Unit data may be damaged.
- During parameter block deletion, the following sequence operation information will be displayed in the display area of the Parameter Unit. The deletion operation will end within 5 seconds.

During parameter block deleting

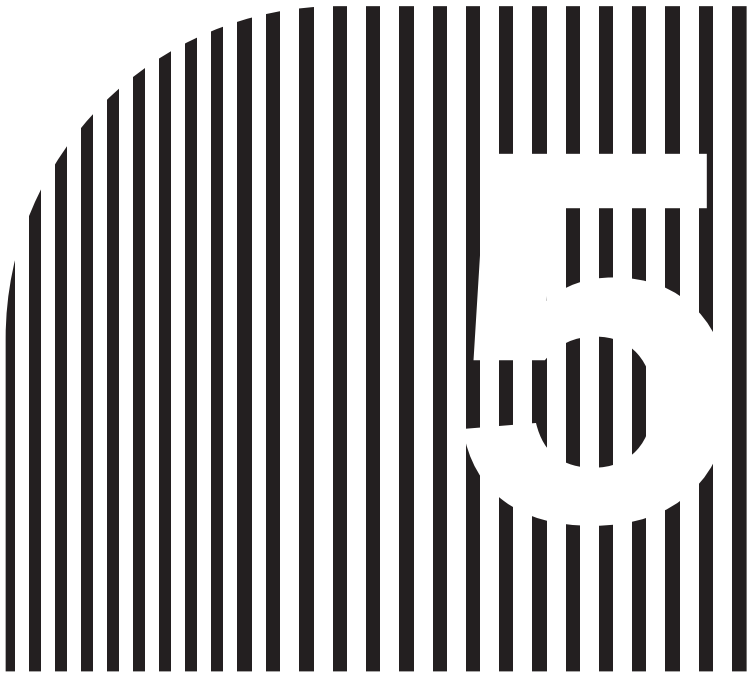
```
BB              -LIST-
00:R7D-APA3L
     Parameter
      delete
<<  PR  >>
```

During Servo Driver model deleting ↓

```
BB              -LIST-
00:R7D-APA3L
     File_Info
      saving%%
<<  PR  >>
```

When the operation has ended ↓

```
BB              -LIST-
00:R7D-APA3L
  Complete
```



Chapter 5

Alarm Display Mode

5-1 Operations in Alarm Display Mode

5-2 Alarms

5-3 Error Diagnosis Using Alarm Display

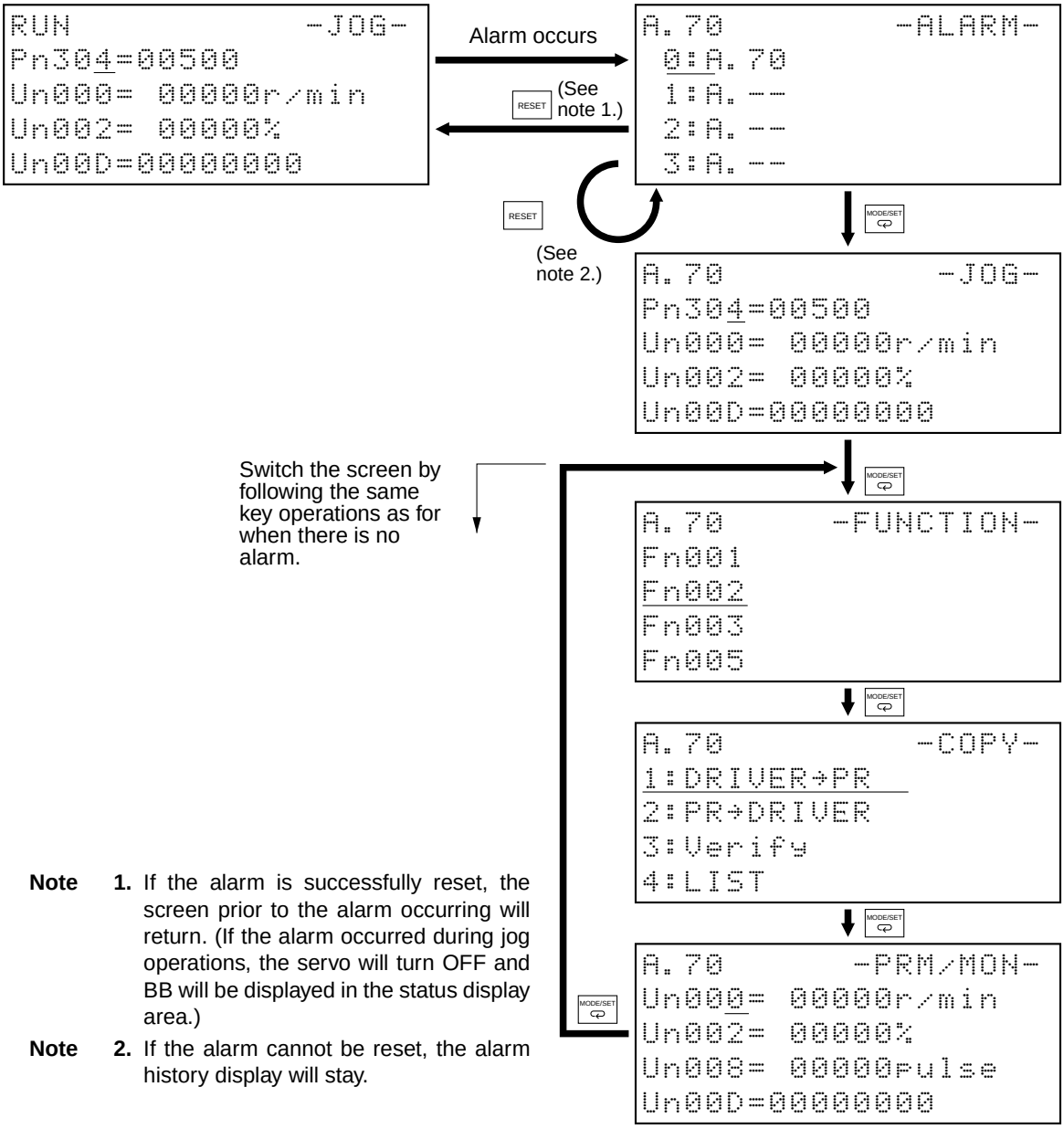
5-1 Operations in Alarm Display Mode

When an alarm occurs in the Servo Driver, the Parameter Unit automatically changes to Alarm Display Mode. The Alarm Display Mode Screen here is the same as the Function Mode Alarm History Display Screen (Fn000).
If the RESET Key is pressed in Alarm Display Mode and the alarm reset, the screen prior to canceling the alarm will be displayed. If switching to another screen is desired while an alarm is being registered, press the MODE/SET Key. The screen will switch back to the screen before the alarm occurred.

Note: If an alarm is reset while RUN is turned ON, the Servo Driver will start as soon as the alarm is reset, which is dangerous. Be sure to turn OFF the RUN command before resetting the alarm.

■ Screen Switching when an Alarm Occurs

The procedure for switching screens while an alarm has occurred is shown in the following diagram, an example of an alarm occurring during jog operation (Fn002).



Note **1.** If the alarm is successfully reset, the screen prior to the alarm occurring will return. (If the alarm occurred during jog operations, the servo will turn OFF and BB will be displayed in the status display area.)

Note **2.** If the alarm cannot be reset, the alarm history display will stay.

5-2 Alarms

■ Alarms

Code	Error detection function	Cause of error	RESET Key effective?
A.04	Parameter setting error	Incorrect parameter setting.	No
A.10	Overcurrent	Overcurrent detected.	No
A.30	Regeneration error	Regeneration circuit damaged due to large amount of regenerative energy.	Yes
A.32	Regeneration overload	Regenerative energy exceeded the regeneration resistance.	Yes
A.40	Overvoltage/undervoltage	Main circuit DC voltage above the allowable range, or Main circuit DC voltage below the allowable range	Yes
A.51	Overspeed	Servomotor rotation speed exceeded the maximum speed.	Yes
A.70	Overload	Output torque exceeded 120% of rated torque.	Yes
A.73	Dynamic brake overload	Regenerative energy exceeded the dynamic brake resistance during dynamic brake operation.	Yes
A.74	Inrush resistance overload	Inrush current exceeded the inrush resistance during power supply inrush.	Yes
A.7A	Overheat	Abnormal temperature rise detected in radiation shield.	Yes
A.BF	System error	A control circuit system error was detected.	No
A.C1	Runaway detected	The Servomotor rotated in the opposite direction from the command.	Yes
A.C2	Phase error detected	The Servomotor's electrical angle was incorrectly detected.	No
A.C3	Encoder disconnection detected	The encoder's phase A, B, or S is disconnected or short-circuited.	No
A.D0	Deviation counter overflow	Deviation counter's residual pulses exceeded the deviation counter overflow level set in Pn505.	Yes
CPF00	Parameter Unit transmission error 1	Data could not be transmitted after the power supply was turned ON.	
CPF01	Parameter Unit transmission error 2	Transmission timeout error	

Note 1. "Yes" in the *RESET Key effective?* column indicates that the alarm can be reset and "No" indicates that the alarm cannot be reset (i.e., the power supply must be cycled). The CPF00 and CPF01 alarms cannot be reset using the RESET Key, but if transmission is successful, these alarms will be reset automatically.

Note 2. Alarms CPF00 and CPF01 are not stored in the alarm history.

■ Warnings

Code	Error	Cause of error
A.91	Overload warning	A warning occurs before the overload alarm (A.70) is reached. An alarm may be generated if the Servomotor continues to operate.
A.92	Regeneration overload warning	A warning occurs before the regeneration overload alarm (A.32) is reached. An alarm may be generated if the Servomotor continues to operate.

Note Warnings are not stored in the alarm history.

5-3 Error Diagnosis Using Alarm Display

Display	Error	Status when error occurs	Cause of error	Countermeasures
A.04	Parameter setting error	Occurs when control circuit power supply is turned ON.	A value outside of the setting range was previously set in the parameters.	Reset the parameters within the setting range.
			Control panel error	Replace the Servo Driver.
A.10	Overcurrent	Occurs when power supply is turned ON.	Control panel error Main circuit transistor module error	Replace the Servo Driver.
		Occurs when servo is turned ON.	Current feedback circuit error Main circuit transistor module error	Replace the Servo Driver.
			Servomotor power line is short-circuited or grounded between phases.	Repair the short-circuited or grounded wire. Measure the insulation resistance at the Servomotor and, if there is a short-circuit, replace the Servomotor.
			Miswiring between U-phase, V-phase, W-phase, and ground.	Correct the wiring.
			Servomotor winding is burned out.	Measure the winding resistance, and if the winding is burned out, replace the Servomotor.
			Operating above rated output.	Lighten the load.
A.30	Regeneration error	Occurs during operation.	Error in the regenerative circuit parts.	Replace the Servo Driver.
			External Regeneration Resistor is disconnected.	Replace the External Regeneration Resistor.
			There is a short-circuit missing between B2 and B3, but the external circuit resistor is not connected.	Correctly connect the external circuit resistor (between B1 and B2).
			Setting error in Pn600 (regeneration resistor capacity).	Set Pn600 correctly.
A.32	Regeneration overload	Occurs during operation.	Regenerative energy exceeds tolerance.	Calculate the regenerative energy, and connect an external Regeneration Resistor with the required regeneration absorption capacity.
			Setting error in Pn600 (regeneration resistor capacity)	Set Pn600 correctly.
			Main-circuit power supply voltage is outside tolerance range.	Change the main-circuit power supply voltage to within tolerance range.

Display	Error	Status when error occurs	Cause of error	Countermeasures
A.40	Overvoltage	Occurs when power supply is turned ON.	Main circuit power supply voltage is outside tolerance range.	Change the main circuit power supply voltage to within tolerance range.
			Main-circuit power supply is damaged.	Replace the Servo Driver.
		Occurs when Servomotor is decelerating.	Load inertia is too great.	Deceleration time is too long. Calculate the regenerative energy, and connect an external Regeneration Resistor with the required regeneration absorption capacity.
			Main circuit power supply voltage exceeds tolerance range.	Reduce main circuit power supply voltage to within tolerance range.
		Occurs during descent (vertical axis)	Gravitational torque is too large.	Add a counterbalance to the machinery to lower gravitational torque. Slow the descent speed. Calculate the regenerative energy, and connect and external Regeneration Resistor with the required regeneration absorption capacity.
	Low voltage	Occurs when the control circuit power supply only is turned ON.	Control panel error	Replace the Servo Driver.
		Occurs when the main circuit power supply is turned ON.	Main circuit power supply voltage is outside tolerance range.	Change the main circuit power supply voltage to within tolerance range.
			Main circuit power supply is damaged.	Replace the Servo Driver.
A.51	Overspeed	Occurs when the servo is ON.	Encoder signal between controllers is wired incorrectly.	Rewire correctly.
			Servomotor power line is wired incorrectly.	Rewire correctly.
		Occurs along with high-speed rotation when a command is input.	Position command input exceeds 4,500 r/min.	Input command values correctly.
			Pn202 and Pn203 (electronic gear ratio) setting is too large.	Set the parameters correctly.
			Resolution setting switch (switches 4 and 5) setting is too low.	Reset the switches correctly.
			Rotation limit has been exceeded due to overshooting.	Adjust the gain. Lower the maximum specified speed.

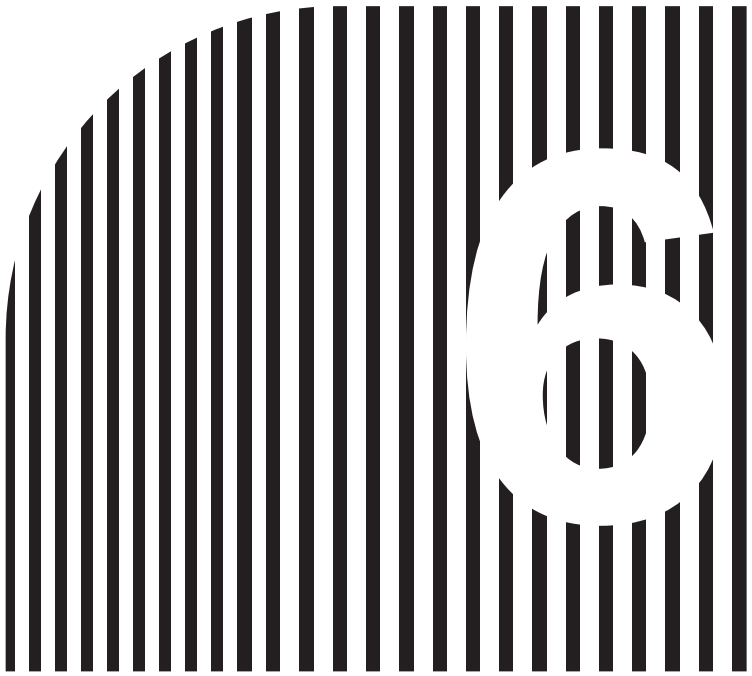
Display	Error	Status when error occurs	Cause of error	Countermeasures
A.70	Overload	Occurs during operation.	Running at over 120% of rated torque (effective torque).	Repair the Servomotor shaft if it is locked. If the Servomotor power line is wired incorrectly, rewire it correctly. Lighten the load. Lengthen the acceleration and deceleration times. Adjust the gain.
			Power supply voltage has fallen.	Check the power supply voltage, and lower to within tolerance range.
			Servomotor winding is burned out.	Check the winding resistance. Replace the Servomotor if the winding is burned out.
			Servo Driver is burned out.	Replace the Servo Driver.
A.73	Dynamic brake overload	Occurs when the servo is turned OFF after operating.	Energy required for stopping exceeds the dynamic brake resistor tolerance.	Lower the rotation speed. Reduce the load inertia. Reduce the frequency of dynamic brake use.
		Occurs when the power supply is turned ON.	Control panel error	Replace the Servo Driver.
A.74	Inrush resistance overload	Occurs when the main circuit power supply is turned ON.	The frequency by which main-circuit power supply is turned ON and OFF exceeds 5 times/min.	Reduce the frequency by which the main circuit power supply is turned ON and OFF.
		Occurs when the control circuit power supply only is turned ON.	Control panel error	Replace the Servo Driver.
A.7A	Overheat	Occurs when the control circuit power supply only is turned ON.	Control panel error	Replace the Servo Driver.
		Occurs during operation	Ambient Servo Driver temperature exceeds 55°C.	Lower the Servo Driver's ambient temperature to 55°C or less.
			Radiation shield sink air convection is poor.	Mount according to mounting conditions.
			The fan has stopped.	Replace the Servo Driver.
			Operating above rated output.	Lighten the load.

Display	Error	Status when error occurs	Cause of error	Countermeasures
A.bF	System error	Occurs during operation.	Control panel error	Replace the Servo Driver.
			Power supply was turned OFF during parameter operations or the Parameter Unit was disconnected.	Initialize user parameters (Fn005) to reset the parameters.
			Automatic Servomotor current detection offset was adjusted (Fn00E) during pulse input.	Turn OFF the power supply, then ON again.
			Internal memory error	Replace the Servo Driver.
A.C1	Runaway detected	Occurs when there is a slight movement upon startup.	Encoder is wired incorrectly. Servomotor power line is wired incorrectly.	Correct the wiring.
			Servo turned ON when the Servomotor was rotated from the outside.	Adjust servo ON timing.
			Servo Driver is burned out.	Replace the Servo Driver.
A.C2	Phase error detected.	Occurs when there is a slight movement upon startup.	Encoder is wired incorrectly. Faulty Connector contact	Rewire correctly. Plug the Connector in securely.
		Occurs when the power supply is turned ON.	Encoder is burned out.	Replace the Servomotor.
			Servo Driver is burned out.	Replace the Servo Driver.
A.C3	Encoder disconnection detected.	Occurs when there is a slight movement upon startup.	Encoder wiring is disconnected or shorted. Faulty Connector contact.	Correct the disconnected or shorted part. Plug the Connector in securely.
			Encoder is wired incorrectly.	Rewire correctly.
			Encoder is burned out.	Replace the Servomotor.
			Servo Driver is burned out.	Replace the Servo Driver.
			Locked mechanically.	Repair the Servomotor shaft if it is locked.

Display	Error	Status when error occurs	Cause of error	Countermeasures
A.d0	Deviation counter overflow	Servomotor will not rotate even when command pulses are input.	Servomotor power or encoder line is wired incorrectly.	Rewire correctly.
			Locked mechanically	Repair if the Servomotor shaft is locked
			Control panel error	Replace the Servo Driver.
		Occurs when rotating at high speed	Servomotor power or encoder line is miswired.	Rewire correctly.
		Occurs when long command pulses are sent	Gain adjustment is insufficient.	Adjust the gain.
			Acceleration and deceleration is too violent.	Lengthen acceleration and deceleration time. Use position command filter (Pn207.0, Pn204, and Pn208).
			Load is too large.	Lighten the load. Reselect the Servomotor.
			Pn505 (deviation counter overflow level) setting is too large.	Reset the parameter correctly.
			Resolution setting switch (switches 4 and 5) setting is too low.	Reset the switches correctly.
			Pn202 and Pn203 (electronic gear ratio) setting is too large.	Reset the parameters correctly.
CPF00	Parameter Unit transmission error 1	Occurs when power supply is turned ON.	Faulty Connector contact.	Plug the Connector in securely.
			Internal element malfunction.	Turn OFF the power supply, then ON again.
			Internal element is faulty.	Replace the Servo Driver. Replace the Parameter Unit.
CPF01	Parameter Unit transmission error 2	Occurs when Parameter Unit is in use.	Faulty Connector contact.	Plug the Connector in securely.
			Internal element malfunction	Turn OFF the power supply, then ON again.
			Internal element is faulty	Replace the Servo Driver. Replace the Parameter Unit.

■ Parameter Unit Alarms

Display	Error	Status when error occurs	Cause of error	Countermeasures
OPERATOR ERR ROM CHECK ERR	ROM error	Occurs when power supply is turned ON.	Internal element malfunction.	Turn OFF the power supply, then ON again.
			Internal element is faulty.	Replace the Parameter Unit.
OPERATOR ERR RAM CHECK ERR	RAM error	Occurs during Parameter Unit use.	Internal element malfunction.	Turn OFF the power supply, then ON again.
			Internal element is faulty.	Replace the Parameter Unit.
OPERATOR ERR DATA SEND ERR	Send operation error	Occurs during Parameter Unit use.	Internal element malfunction.	Turn OFF the power supply, then ON again.
			Internal element is faulty.	Replace the Parameter Unit.



Chapter 6

Appendix

6-1 Parameter Setting Tables

6-1 Parameter Setting Tables

Parameter No.	Parameter name	Description for parameters set with 5 digits				Default	Unit	Setting range	Restart?	Parameter setting
		Digit No.	Name	Setting	Description for parameters with individually set digits					
Pn000	Basic switches 1	0	Reverse rotation mode	0	CCW direction is taken for positive command.	0010	–	–	Yes	001□
				1	CW direction is taken for positive command.					
		1	Control mode selection	1	Position control by pulse train command					
		2	Not used.	0	---					
		3	Not used.	0	---					
Pn001 (See note 1.)	Basic switches 2	0	Stop selection if an alarm occurs when servo is OFF	0	Servomotor stopped by dynamic brake.	1002	–	–	Yes	100□
				1	Servomotor stopped by dynamic brake. Dynamic brake released after Servomotor stops.					
				2	Servomotor stopped with free run.					
		1	Not used.	0	---					
		2	Not used.	0	---					
		3	Not used.	1	---					
Pn100	Speed loop gain	Speed loop response adjustment				80	Hz	1 to 2000	–	
Pn101	Speed loop integral time constant	Speed loop integral time constant				2000	×0.01 ms	15 to 51200	–	
Pn102	Position loop gain	Adjusts position loop responsiveness.				40	1/s	1 to 2000	–	
Pn103	Inertia ratio	The ratio between the machine system inertia and the Servomotor rotor inertia				300	%	0 to 10000	–	
Pn109	Feed-forward amount	Position control feed-forward compensation				0	%	0 to 100	–	
Pn10A	Feed-forward command filter	The position control feed-forward command filter				0	×0.01 ms	0 to 6400	–	
Pn110 (See note 1.)	Online autotuning setting	0	Online autotuning selection	0	Autotunes initial operations only after power is turned ON.	0012	–	–	Yes The power supply does not need to be restarted. for Pn110.2.	0□1□
				1	Always autotunes.					
				2	No autotuning					
		1	Not used.	1	---					
		2	Adhesive friction compensation selection	0	Friction compensation: OFF					
				1	Friction compensation: Rated torque ratio small					
				2	Friction compensation: Rated torque ratio large					
		3	Not used.	0	---					

Parameter No.	Parameter name	Description for parameters set with 5 digits				Default	Unit	Setting range	Restart?	Parameter setting
		Digit No.	Name	Setting	Description for parameters with individually set digits					
Pn200 (See note 2.)	Position control setting 1	0	Command pulse mode	0	Feed pulse forward and reverse signal, positive logic	1011	–	–	Yes	1□□□
				1	Forward pulse and reverse pulse, positive logic					
				2	90° phase difference (phase A/B) signal (x1), positive logic					
				3	90° phase difference (phase A/B) signal (x2), positive logic					
				4	90° phase difference (phase A/B) signal (x4), positive logic					
				5	Feed pulse forward and reverse signal, negative logic					
				6	Forward pulse and reverse pulse, negative logic					
				7	90° phase difference (phase A/B) signal (x1), negative logic					
				8	90° phase difference (phase A/B) signal (x2), negative logic					
				9	90° phase difference (phase A/B) signal (x4), negative logic					
		1	Deviation counter reset	0	Signal high level					
				1	Rising edge (low to high)					
				2	Signal low level					
				3	Falling signal (high to low)					
		2	Deviation counter reset for alarms and when servo is turned OFF	0	Deviation counter reset when an alarm occurs and when Servomotor is OFF.					
				1	Deviation counter not reset when an alarm occurs nor when Servomotor is OFF.					
				2	Deviation counter reset only when an alarm occurs.					
		3	Not used.	1	---					
Pn202 (See note 2.)	Electronic gear ratio G1 (numerator)	The pulse rate for the command pulses and Servo Servomotor travel distance 0.01 ≤ G1/G2 ≤ 100				4	–	1 to 65535	Yes	
Pn203 (See note 2.)	Electronic gear ratio G2 (denominator)					1	–	1 to 65535	Yes	
Pn204	Position command filter time constant 1 (primary filter)	Soft start setting for command pulses (Soft start characteristics are for the primary filter.) **Note** Enabled when Pn207.0 = 0.				0	×0.01 ms	0 to 6400	–	
Pn207	Position control setting 2	0	Selects position command filter.	0	Primary filter (Pn204)	0000	–	–	Yes	000□
				1	Linear acceleration and deceleration (Pn208)					
		1 to 3	Not used.	0	---					
Pn208	Position command filter time constant 2 (Linear acceleration and deceleration)	Soft start setting for command pulses (Soft start characteristics are for the linear acceleration and deceleration.) **Note** Enabled when Pn207.0 = 1.				0	×0.01 ms	0 to 6400	Yes	
Pn304	Jog speed	Rotation speed during jog operation				500	r/min	0 to 10000	–	
Pn401	Torque command filter time constant	The constant when filtering the internal torque command				40	×0.01 ms	0 to 65535	–	

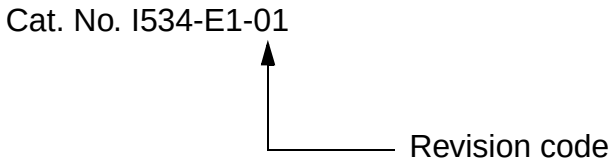
Parameter No.	Parameter name	Description for parameters set with 5 digits				Default	Unit	Setting range	Restart?	Parameter setting
		Digit No.	Name	Setting	Description for parameters with individually set digits					
Pn402	Forward torque limit	Forward rotation output torque limit (rated torque ratio)				350	%	0 to 800	–	
Pn403	Reverse torque limit	Reverse rotation output torque limit (rated torque ratio)				350	%	0 to 800	–	
Pn500	Positioning completed range	The range of positioning completed output (INP)				3	Command units	0 to 250	–	
Pn505	Deviation counter overflow level	The detection level for a deviation counter overflow alarm				1024	×256 command units	1 to 32767	–	
Pn600	Regeneration resistor capacity	Setting for regeneration resistance load ratio monitoring calculations Note: If using an External Regeneration Resistor, set the regeneration capacity for when the temperature rises above 120°C. If not using an External Regeneration Resistor, set Pn600 to 0.				0	×10 W	From 0 (Varies by Unit.)	–	

Note 1. Pn001.0 and Pn110.0 are enabled when function switch 6 on the Servo Driver's front panel is turned ON to enable parameter setting. When function switch 6 is OFF, function switch 2 (dynamic brake setting) and function switch 1 (online autotuning) are enabled.

Note 2. Pn200.0, Pn202 and Pn203 are enabled when function switch 6 on the Servo Driver's front panel is turned ON to enable parameter setting. When function switch 6 is OFF, function switch 3 (command pulse input setting) and function switches 4 and 5 (resolution setting) are enabled.

Revision History

A manual revision code appears as a suffix to the catalog number on the front cover of the manual.



The following table outlines the changes made to the manual during each revision. Page numbers refer to the previous version.

Revision code	Date	Revised content
01	November 2001	Original production

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Systems Components Division
66 Matsumoto
Mishima-city, Shizuoka 411-8511
Japan
Tel: (81)559-77-9633/Fax: (81)559-77-9097

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SMARTSTEP A Series Servomotors/Servo Drivers

OPERATION MANUAL

OMRON