Oriental motor

HM-40097

Data Setter OPX-2A
<NX Series>

OPERATING MANUAL

Thank you for purchasing an Oriental Motor product.
This Operating Manual describes product handling procedures and safety precautions.

- Please read it thoroughly to ensure safe operation.
- Always keep the manual where it is readily available.

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1 Safety precautions

The precautions described below are intended to prevent danger or injury to the user and other personnel through safe, correct use of the product. Use the product only after carefully reading and fully understanding these instructions.
Also read the "Safety precautions" sections in the operating manuals that came with the product you are combining with the **OPX-2A**.

⚠ **Warning**	Handling the product without observing the instructions that accompany a "Warning" symbol may result in serious injury or death.
⚠ **Caution**	Handling the product without observing the instructions that accompany a "Caution" symbol may result in injury or property damage.
Note	The items under this heading contain important handling instructions that the user should observe to ensure safe use of the product.

⚠ Warning

General

- Do not use the product in explosive or corrosive environments, in the presence of flammable gases, locations subjected to splashing water, or near combustibles. Doing so may result in fire, electric shock or injury.
- Assign qualified personnel the task of installing, wiring, operating/controlling, inspecting and troubleshooting the product. Failure to do so may result in fire, electric shock or injury.
- When the driver's protection function is triggered, first remove the cause and then clear the protection function. Continuing the operation without removing the cause of the problem may cause malfunction of the motor and driver, leading to injury or damage to equipment.

Repair, disassembly and modification

- Do not disassemble or modify the data setter. This may cause electric shock or injury. Refer all such internal inspections and repairs to the branch or sales office from which you purchased the product.

⚠ Caution

General

- Do not use the motor, gearhead and driver beyond their specifications, or electric shock, injury or damage to equipment may result.

Operation

- Provide an emergency stop device or emergency stop circuit external to the equipment so that the entire equipment will operate safely in the event of a system failure or malfunction. Failure to do so may result in injury.

Disposal

- To dispose of the data setter, disassemble it into parts and components as much as possible and dispose of individual parts/components as industrial waste.

2 Introduction

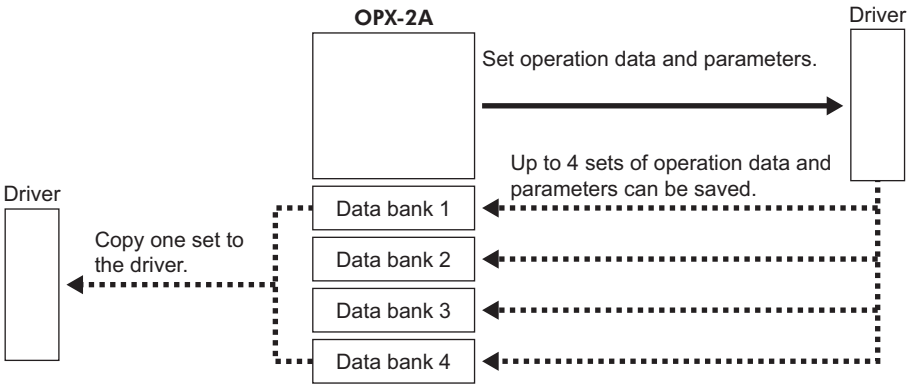
Only qualified personnel should work with the product. Use the product correctly after thoroughly reading the section “1 Safety precautions” on p.5.
The product described in this manual has been designed and manufactured for use in general industrial machinery, and must not be used for any other purpose. Oriental Motor Co., Ltd. is not responsible for any damage caused through failure to observe this warning.

■ Overview of the product

The **OPX-2A** is a data setter that lets you set operating data and parameters, perform monitoring, etc. So that the **OPX-2A** is used correctly and safely, thoroughly read the operating manual that came with product you are using and understand the basic operating procedures and other details of the driver.

■ Features of OPX-2A

The **OPX-2A** can be used not only to set driver operation data and parameters, but it also serves as a storage location for driver data. Driver data is saved in the areas called “data banks.” Four data banks are provided.



The **OPX-2A** can be used for the following purposes:

- Set driver operation data and parameters
- Monitor the operating status of the motor
- The data and parameters set in the driver can be saved to the **OPX-2A**.
- The data and parameters saved in **OPX-2A** can be copied to another driver connected to the **OPX-2A**.

■ Specifications

Connection	Mini DIN, 8 pins
External dimensions	96（W）× 72（H）× 21.5（D） mm [3.78 (W) × 2.83 (H) × 0.85 (D) in.]
Cable length	5 m (16.4 ft.)
Mass	0.25 kg (8.8 oz)

■ Hazardous substances

RoHS (Directive 2002/95/EC 27Jan.2003) compliant

3 Preparation

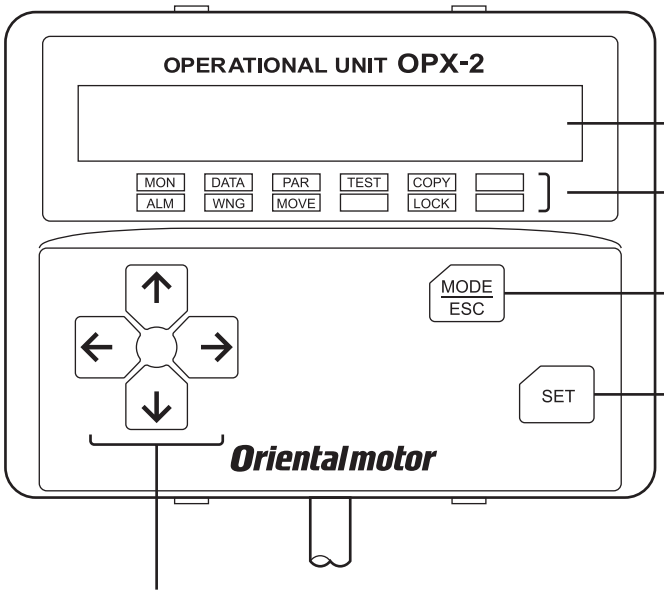
This chapter explains the items you should know before using the data setter **OPX-2A**.

3.1 Checking the product

Verify that the items listed below are included. Report any missing or damaged items to the branch or sales office from which you purchased the product.

- Data setter **OPX-2A**.....1 unit
- OPERATING MANUAL (CD-ROM) .....1 pc.
- Information.....1 copy

3.2 Names and functions of parts



Display
This area shows the motor position, operation data, parameters, alarms, etc.

LED indicators
These LED indicators are used to indicate the operation mode of the **OPX-2A** and the driver status.

Use this button to change the operation mode or move to the upper level.

Use this button to select data or change the displayed item or move to the lower level.

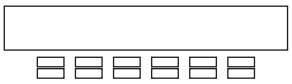
Use these buttons to change the selected item or set data and parameters.

Use these buttons to increase or decrease the value or change the selected item

Use these buttons to navigate through each data or parameter to a desired digit.

■ Notation

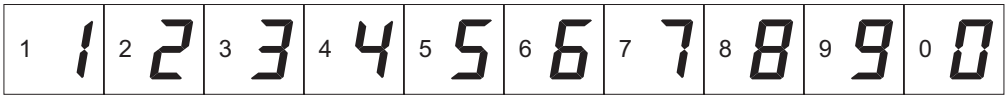
In this manual, keys are denoted by symbols, such as 【MODE/ESC】【SET】【↑】【↓】【←】【→】.
In figures, a simplified illustration of the display and LED indicators is used, as shown below.



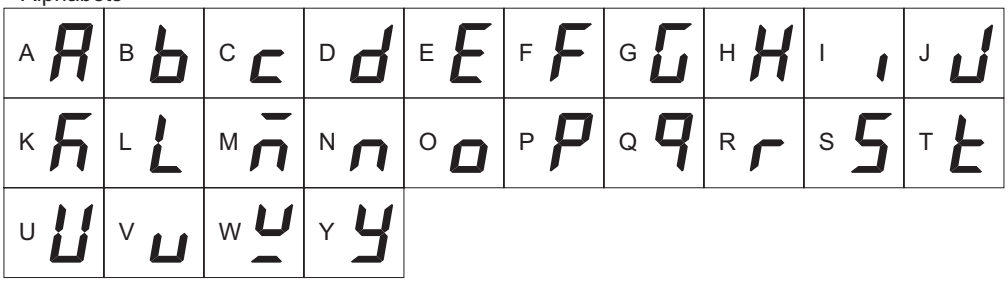
3.3 How to read the display

The display consists of 7-segment LEDs. (The number “5” and alphabet “S” are the same.)

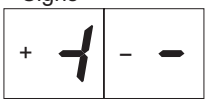
• Numbers



• Alphabets

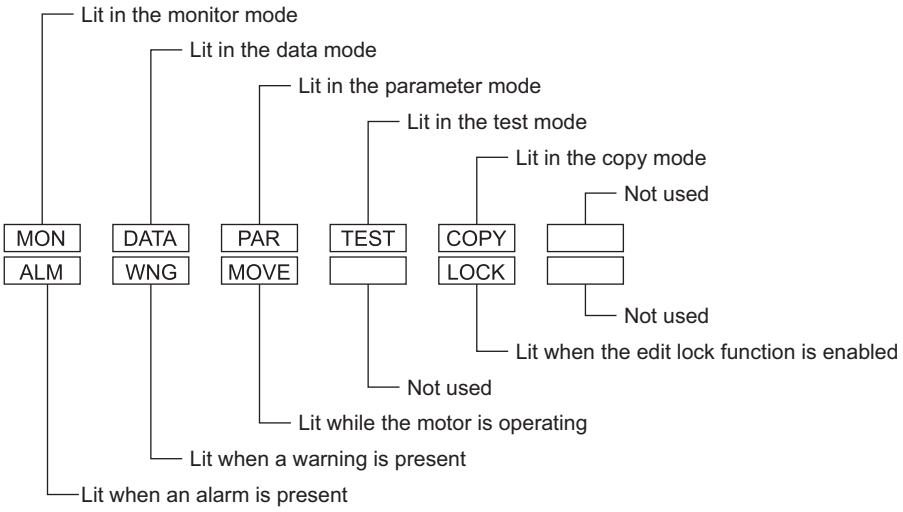


• Signs



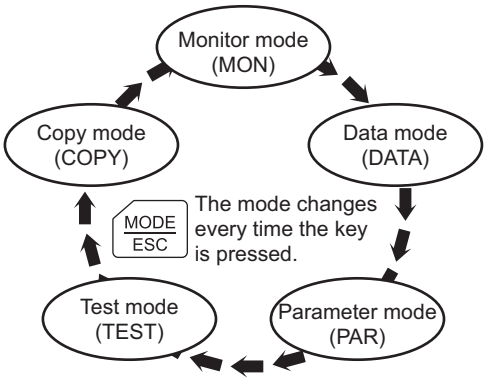
3.4 How to read the LED indicators

When the operation mode is changed or an alarm or warning generates, a corresponding LED will be lit. While the motor is operating or the edit lock function is enabled, the condition is also indicated by the illumination of a corresponding LED.



3.5 Types of operation modes

The **OPX-2A** has multiple operation modes. The operation mode will change every time the 【MODE/ESC】 key is pressed. The display starts in the monitor mode when the power is turned on.



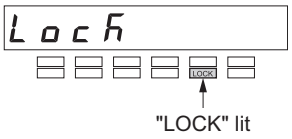
When the operation mode is changed, the LED indicator corresponding to the previous mode will turn off and the one corresponding to the new mode will be lit.
Identify the current operation mode based on the LED indicator currently lit.

3.6 Edit lock function

Enable the edit lock function if you want to prevent operation data and parameters from being edited or cleared. Operation data and parameters cannot be changed or deleted while the edit lock function is enabled.

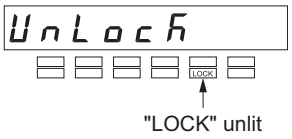
- Setting the edit lock function

In the top screen of each operation mode, press the 【MODE/ESC】 key for at least 5 seconds.
The display will show “LocK” and the edit lock function will be enabled.
The “LOCK” LED in the LED indicator area will also be lit.



- Canceling the edit lock function

Again in the top screen of each operation mode, press the 【MODE/ESC】 key for at least 5 seconds.
The display will show “UnLocK” and the edit lock function will be cancelled.
The “LOCK” LED in the LED indicator area will turn off.

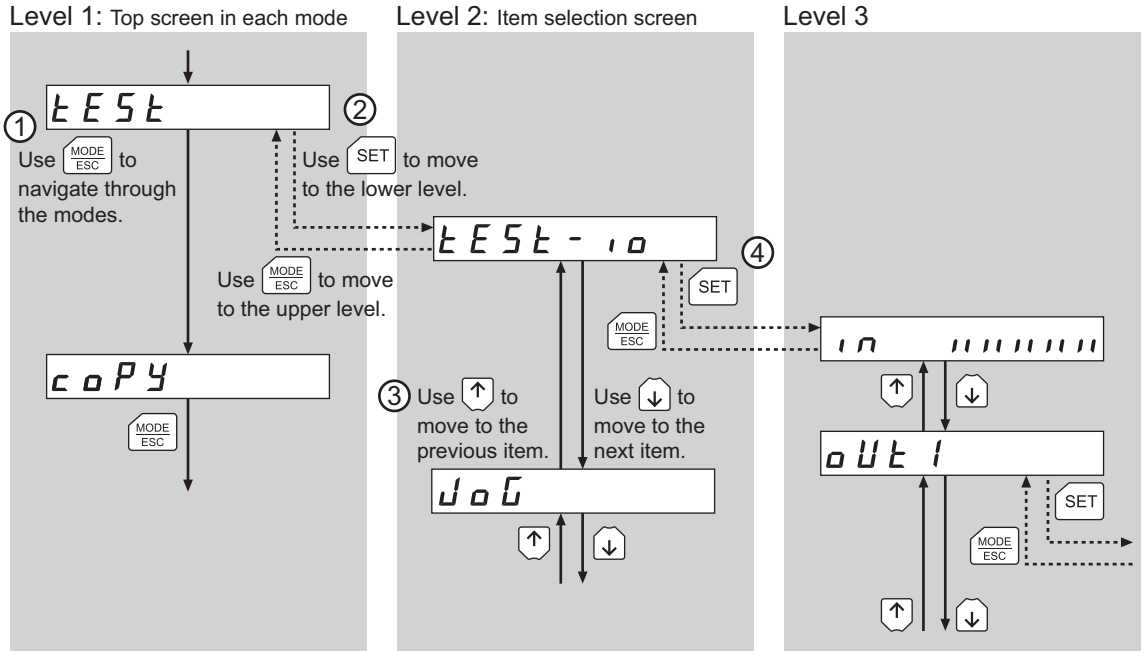


3.7 Basic operations of the OPX-2A

Use the six keys 【MODE/ESC】【SET】【↑】【↓】【←】【→】 to set data and operate the motor.

■ Operation flow

The **OPX-2A** is operated according to the flow shown below.



① Use the 【MODE/ESC】 key to select a desired operation mode appropriate for your intended operation.
Example: If you want to use a function in the test mode, press the 【MODE/ESC】 key to select the test mode (indicated by a lit "TEST" LED). The top screen of the test mode is displayed.

② Press the 【SET】 key to move to the lower level.

③ Use the 【↑】【↓】 keys to select a desired item.

④ To move to the lower level, press the 【SET】 key.
To return to the previous level, press the 【MODE/ESC】 key.

As explained above, use the 【SET】 key to navigate through the levels and use the 【↑】【↓】 keys to select a desired item. This is the basic operation flow.

■ How to input values

As an example, how to change "+30" to "−100" is explained.

Basic operations

- Use the【↑】【↓】keys to increase/decrease the value or change the sign.
  Use the【←】【→】keys to move to the digit you want to edit.
- If positive and negative values are differentiated, each value is preceded by a sign.
- You can edit the digit currently blinking.

1. First, change the 10's place from "3" to "0."
   Press the【←】key once to move to the 10's digit you want to edit.

2. Press the【↓】key three times to change the value to "0."

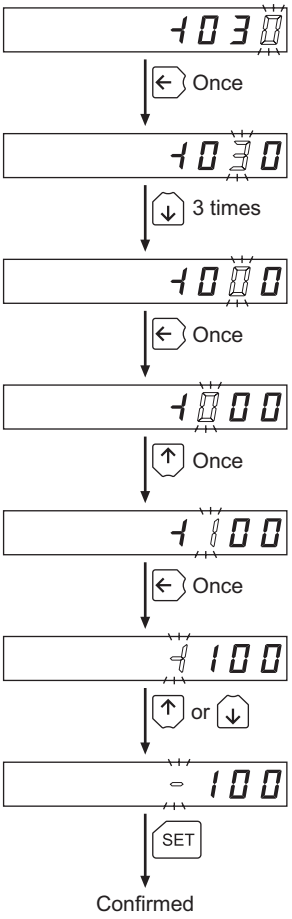
3. Next, change the 100's place from "0" to "1."
   Press the【←】key once to move to the 100's digit you want to edit.

4. Press the【↑】key to change the value to "1."

5. Next, change the sign.
   Press the【←】key once to move to the sign digit you want to edit.

6. Press the【↑】or【↓】key once to change the sign to "−."

7. After all digits have been changed, press the【SET】key to confirm the value.
   All digits comprising the value blink for approx. 2 seconds.



3.8 Rewriting the driver's EEPROM

Operation data and parameters are saved to the driver's EEPROM. The EEPROM can be rewritten approx. 100,000 times.
The EEPROM will be rewritten after one of the following operations is performed:

- Change any operation data or parameter
- Download data from the **OPX-2A** to the driver
- Initialize driver data
- Preset the current position
- Preset Z-phase
- Offset the analog speed input
- Offset the analog torque input

4 Installation and connection of the OPX-2A

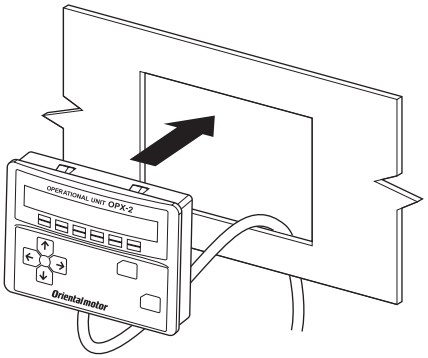
4.1 Location for installation

The **OPX-2A** is designed and manufactured for installation in equipment.
Install it in a well-ventilated location that provides easy access for inspection. The location must also satisfy the following conditions:

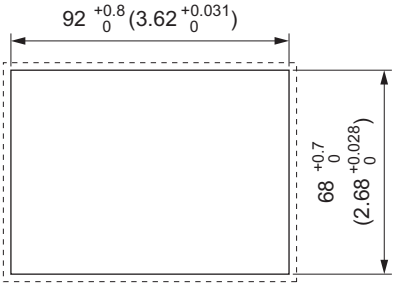
- Inside an enclosure that is installed indoors (provide vent holes)
- Operating ambient temperature 0 to +40 °C (+32 to +104 °F) (non-freezing)
- Operating ambient humidity 85% or less (no condensation)
- Area that is free of explosive atmosphere or toxic gas (such as sulfuric gas) or liquid
- Area not exposed to direct sun
- Area free of excessive amount of dust, iron particles or the like
- Area not subject to splashing water (rain, water droplets), oil (oil droplets) or other liquids
- Area free of excessive salt
- Area not subject to continuous vibration or excessive shocks
- Area free of excessive electromagnetic noise (from welders, power machinery, etc.)
- Area free of radioactive materials, magnetic fields or vacuum
- 1000 m (3300 ft.) or less above sea level

4.2 Installation method

Using a metal plate of 1 to 3 mm (0.04 to 0.12 in.) in thickness, insert the **OPX-2A** into the mounting hole from the front side and securely affix the **OPX-2A**.

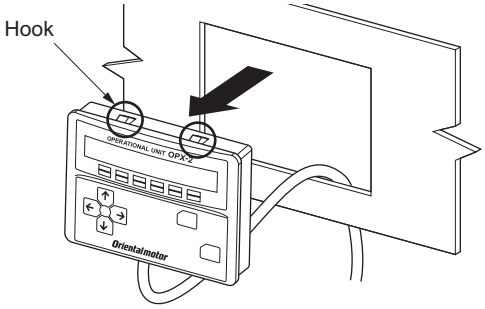


• Dimension of mounting hole [mm (in.)]



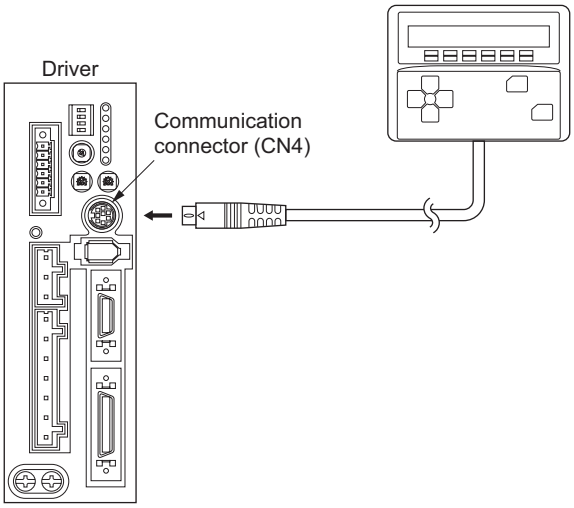
Removing method

Press all of the four hooks provided on top and bottom of the **OPX-2A**. In this condition, press the **OPX-2A** forward to release.



4.3 Connecting to the driver

Plug the connector attached to the end of the **OPX-2A** cable into the communication connector (CN4) on the driver, and then turn on the power to the driver.



Note

- When operation data and parameters are set on the **OPX-2A**, they will be stored in the driver. Once stored in the driver, the data will not be cleared even after the **OPX-2A** is disconnected from the driver.
- Turning on the power to the driver will also turn on the power to the **OPX-2A**. Turning off the driver power will turn off the **OPX-2A** power.
- Turn off the driver power before connecting or disconnecting the **OPX-2A** cable. If 24 VDC power is being supplied, also turn off the 24 VDC power supply.

Have you installed and connected your data setter **OPX-2A** correctly?
How you should operate the **OPX-2A** hereafter varies depending on the control mode you are using.
Refer to the applicable pages.

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Operation in the position control mode

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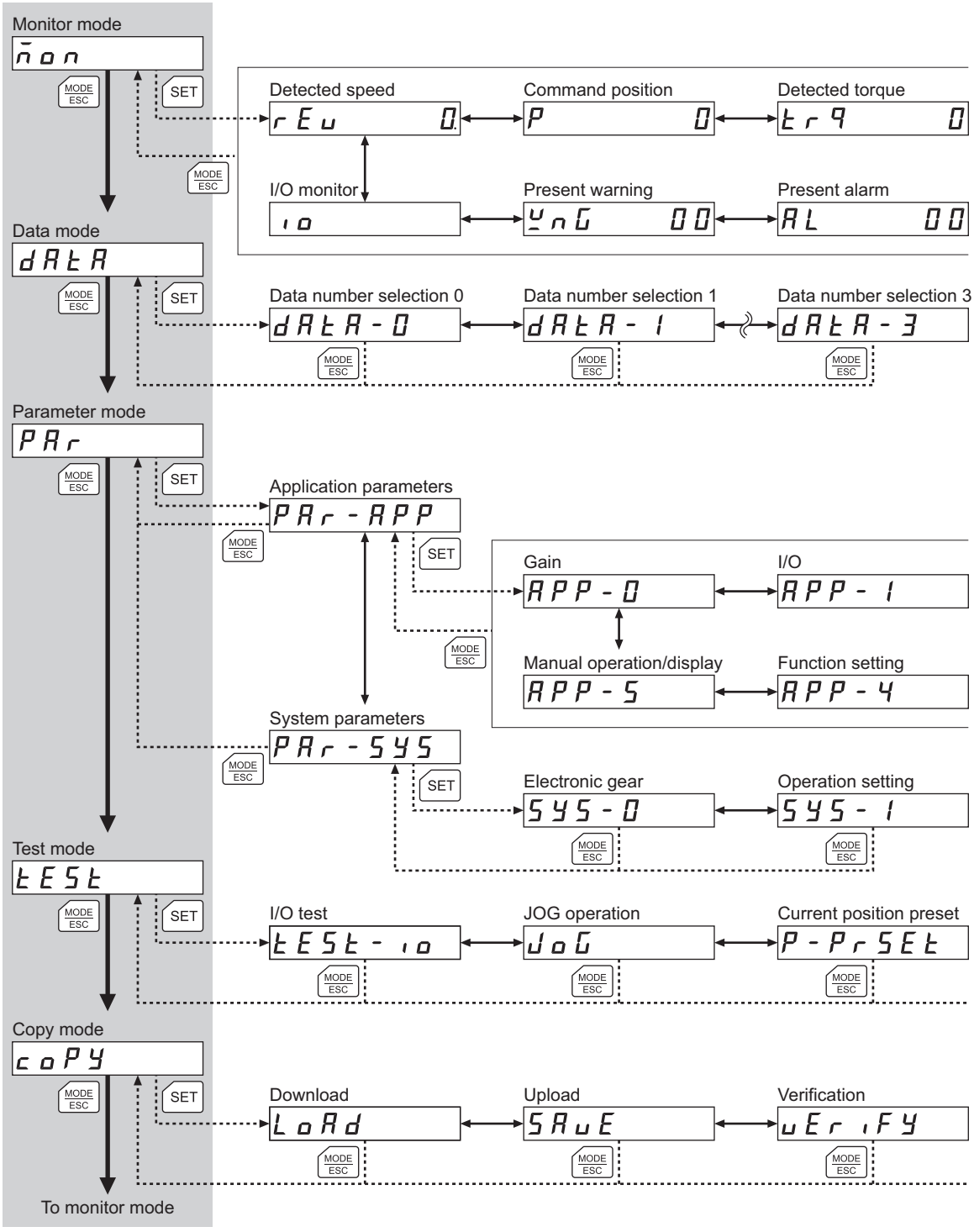
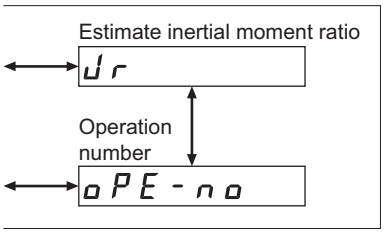
1 Screen transitions in the position control mode

Top screen

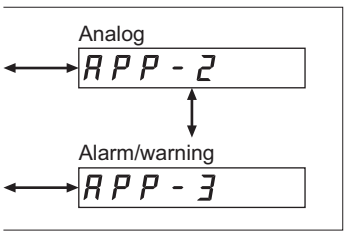


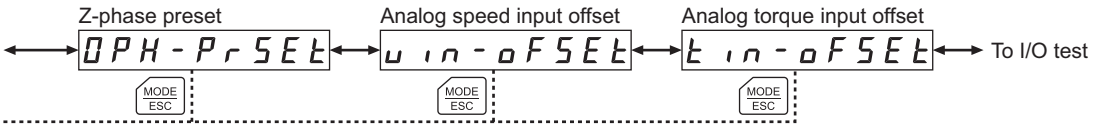
Note The following operations cannot be performed while the edit lock function (p.9) is enabled:
Edit operation data, edit parameters, clear alarm/warning records, preset the current position, preset Z-phase, offset the analog speed input, offset the analog torque input, perform operations in the copy mode

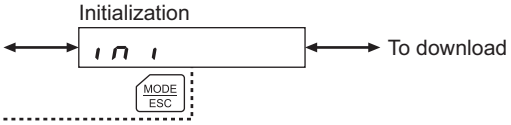
←→ : Use ↑ ↓ to navigate through the items.



←→ To data number selection 0







2 Monitor mode

2.1 What you can do in the monitor mode

- Monitoring the operating status

  You can monitor the detected motor speed, command position, detected torque, estimate inertial moment ratio and current operation number in real time.

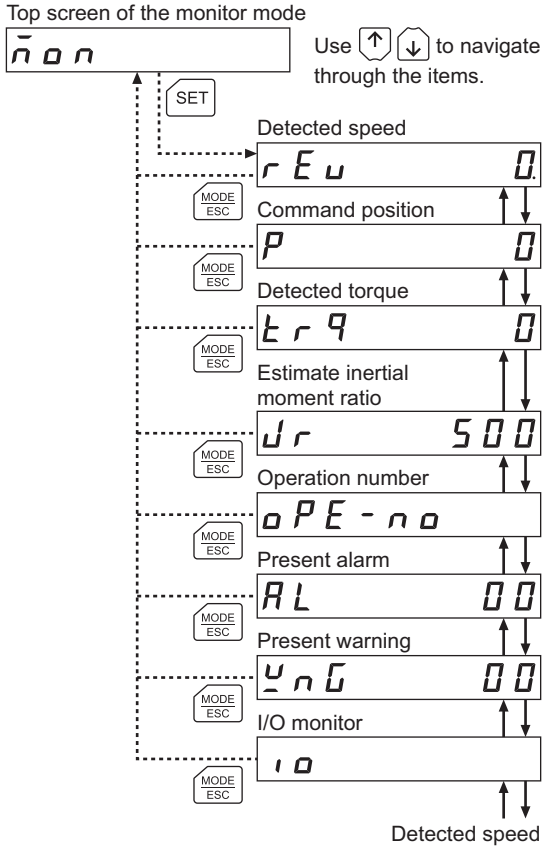
- Checking alarms/warnings, clearing alarm/warning records, and resetting alarms
  - If an alarm or warning generates, a corresponding alarm code or warning code will be displayed. You can check the code to identify the details of the alarm/warning.
  - Up to ten most recent alarms/warnings can be displayed, starting from the latest one.
  - You can reset the alarms currently present.
  - You can clear alarm/warning records.

- Checking I/O signals

  You can check the ON/OFF status of each I/O signal of the driver, as well as the analog input voltage.

2.2 Operation in the monitor mode

1. Use the【MODE/ESC】key to select the monitor mode.
2. Press the【SET】key in the top screen of the monitor mode.
   The display changes to the monitor mode item screen.
3. Use the【↑】【↓】keys to select the item you want to monitor.



2.3 Monitored items

■ Detected speed

You can check the speed of the motor (unit: r/min).
While the motor is rotating in the CCW direction, "–" is shown in front of the displayed value. If the speed is indicated by an absolute value, no sign is shown to indicate the rotating direction. You can select the value display format using the displayed speed on OPX-2 parameter [APP-5-02] (p.35).
You can also display the motor speed as revolutions of the gear output shaft. For this setting, use the deceleration rate of speed monitor parameter [APP-4-05] (p.35).

■ Command position

You can check the current position of the motor with reference to the home position.
If a resolution is set, an appropriate value based on the resolution is shown as steps.

■ Detected torque

You can check the generated motor torque.
The generated torque is indicated as a percentage of the rated torque being 100%.

■ Estimate inertial moment ratio

You can check the load inertial moment ratio estimated internally by the driver.
The estimate inertial moment ratio indicates the percentage of the load inertial moment to the rotor inertial moment of the motor. If the rotor inertial moment is the same as the load inertial moment, "100%" is shown.

■ Operation number

You can check the operation data number corresponding to the data used in the current operation.

■ Present alarm

When an alarm generates, a corresponding alarm code will be displayed.
You can also reset alarms or check and clear alarm records.

Note Do not turn off the driver power while an alarm is being reset or alarm records are being cleared (= while the display is blinking). Doing so may damage the data.

- How to reset an alarm

1. While an alarm is displayed, press the【SET】key to move to the lower level.
2. Press the【↑】key twice to select the alarm reset screen.
3. Press the【SET】key.
   The alarm is reset.

Note Some alarms cannot be reset on the **OPX-2A**. For details, refer to "Alarm code list" on p.20. To reset these alarms, you must cycle the power.

- How to check an alarm record

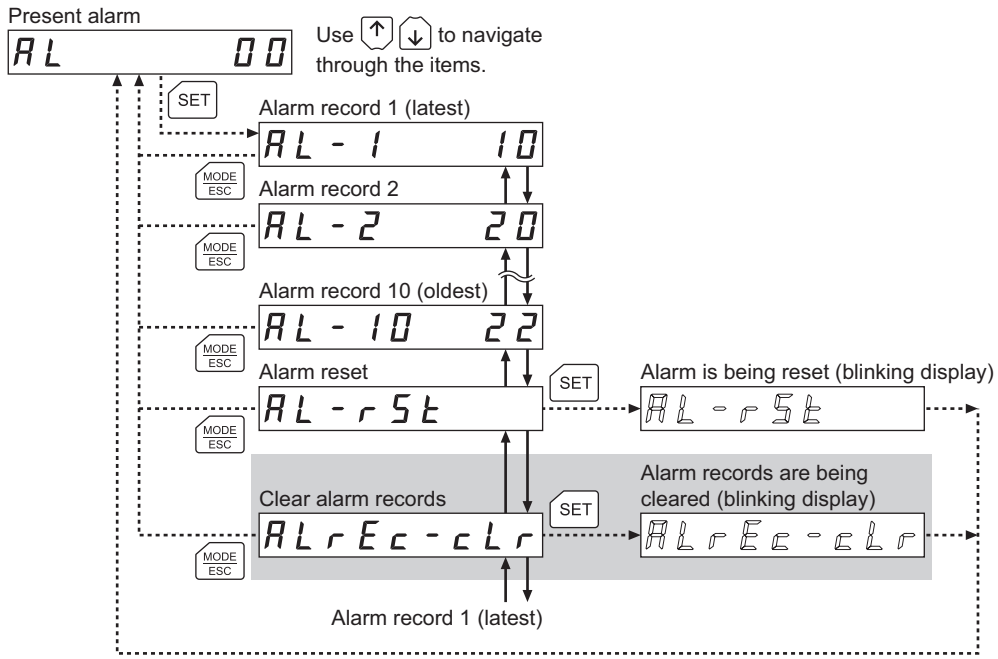
You can check up to ten most recent alarms, starting from the latest one.

1. While an alarm is displayed, press the【SET】key to move to the lower level.
   The latest alarm is displayed.
2. Press the【↓】key.
   The second latest alarm is displayed.
3. Every time the【↓】key is pressed, the next older alarm will be displayed. Use the【↑】【↓】keys to select the alarm record you want to check.

- How to clear all alarm records

You can clear all alarm records at once.

1. While an alarm is displayed, press the【SET】key to move to the lower level.
2. Press the【↑】key and select the alarm record clear screen.
3. Press the【SET】key.
   All alarm records are cleared.



∗ If operations are limited by the edit lock function (p.9), the screen text in gray is not shown.

Alarm code list

Code	Alarm name	Resetting on the **OPX-2A**	Number of times the driver's ALARM LED blinks
10	Excessive position deviation	Possible	4
20	Overcurrent protection	Not possible	5
21	Overheat protection	Possible	2
22	Overvoltage protection	Not possible	3
23	Main power supply error	Possible	
25	Undervoltage	Possible	
26	Motor overheat protection	Not possible	2

Code	Alarm name	Resetting on the **OPX-2A**	Number of times the driver's ALARM LED blinks
28	Sensor error during operation	Not possible	8
2A	Encoder communication error	Not possible	
30	Overload	Possible	2
31	Overspeed	Possible	
32	Position range error	Possible	7
33	Absolute position loss	Possible	
34	Command pulse error	Possible	2
41	EEPROM error	Not possible	9
42	Sensor error during initialization	Not possible	8
43	Rotor rotation during initialization	Not possible	
44	Encoder EEPROM error	Not possible	
45	Motor combination error	Not possible	
47	ABS not supported	Possible	7
48	No battery	Possible	
51	Regeneration resistor overheat	Not possible	2
71	Electronic gear setting error	Not possible	7

■ Present warning

When a warning generates, a corresponding warning code will be displayed.
You can also check or clear warning records.

Note Do not turn off the driver power while warning records are being cleared (= while the display is blinking). Doing so may damage the data.

- How to check a warning record

You can check up to ten most recent warnings, starting from the latest one.

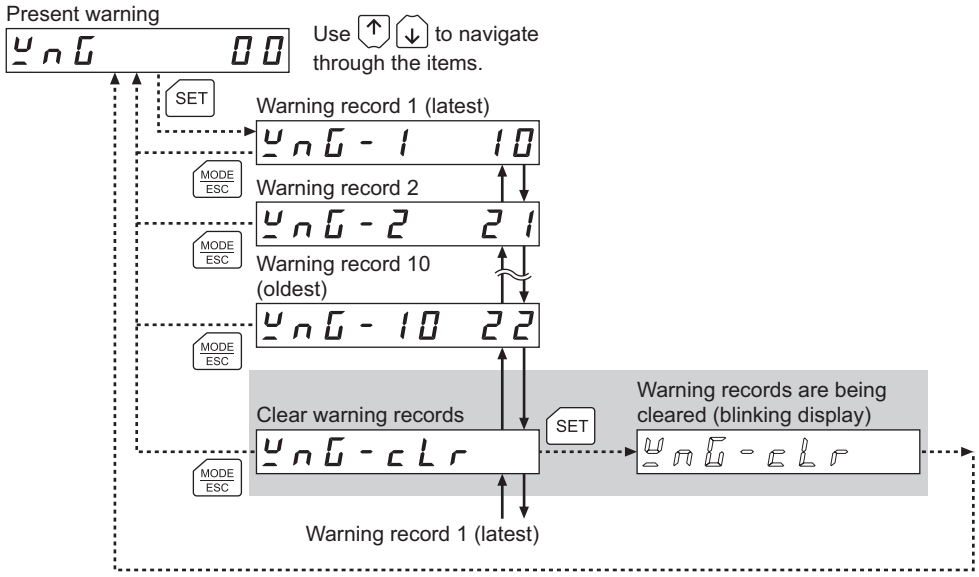
1. While a warning is displayed, press the【SET】key to move to the lower level.
   The latest warning is displayed.
2. Press the【↓】key.
   The second latest warning is displayed.
3. Every time the【↓】key is pressed, the next older warning will be displayed. Use the【↑】【↓】keys to select the warning record you want to check.

- How to clear all warning records

You can clear all warning records at once.

1. While a warning is displayed, press the【SET】key to move to the lower level.
2. Press the【↑】key and select the warning record clear screen.
3. Press the【SET】key.
   All warning records are cleared.

Note You can also clear warning records by turning off the driver power.



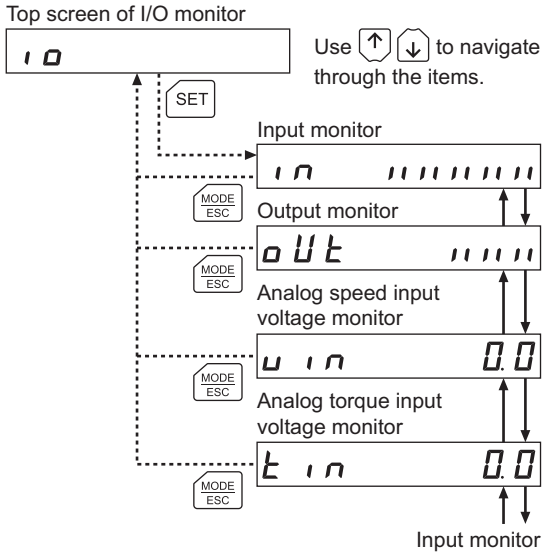
∗ If operations are limited by the edit lock function (p.9), the screen text in gray is not shown.

Warning code list

Code	Warning name	Code	Warning name
10	Excessive position deviation	27	Battery voltage low
21	Overheat	30	Overload
22	Overvoltage	31	Overspeed
23	Main power supply	33	Absolute position loss
25	Undervoltage	71	Electronic gear setting error

■ I/O monitor

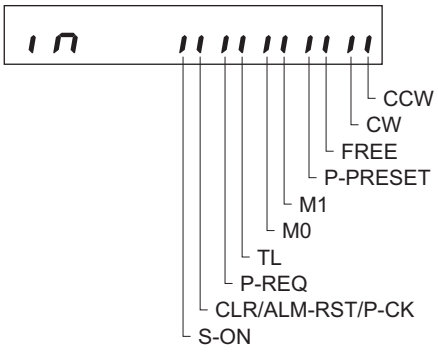
You can check the ON/OFF status of each I/O signal of the driver (Lit: ON, Unlit: OFF).
You can also monitor the analog input voltage.
Use the【↑】【↓】to select the item you want to monitor.



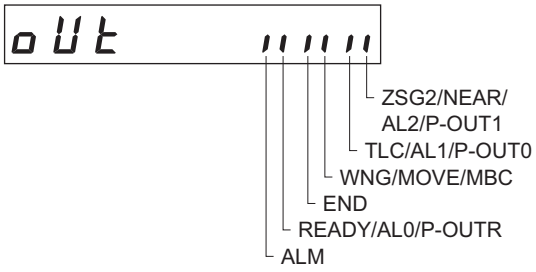
- Monitoring I/O signals

  On the I/O signal monitor screen, each digit on the 7-segment LED display corresponds to a signal. If the signal is ON, the corresponding digit is lit. If the signal is OFF, the digit is unlit.

  • Input signals



  • Output signals



- Monitoring the analog input voltage

  The analog speed input voltage and analog torque input voltage are shown.
  Each voltage is indicated in units of 0.1 V.

3 Data mode

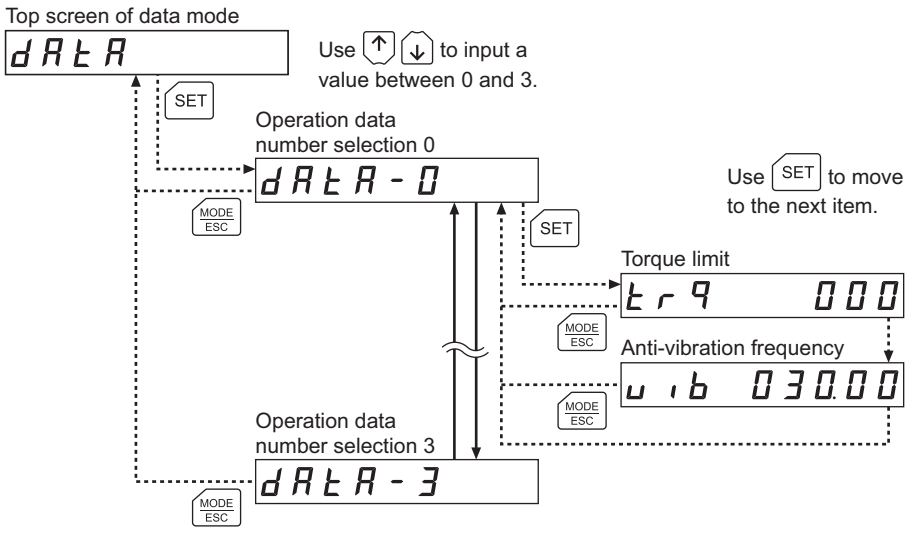
Up to four sets of motor operation data can be set. Once set, the operation data is stored in the driver. The data will not be lost even after the **OPX-2A** is disconnected from the driver.
Before setting operation data, read the **NX** Series Driver OPERATING MANUAL carefully to understand the basic operations, functions and other details of the driver.

Note

- Operation data has significant bearing on motor operation. Before setting any operation data, make sure you fully understand the content of the operation data.
- If operations are limited by the edit lock function (p.9), operation data cannot be edited.

3.1 Operation in the data mode

1. Use the【MODE/ESC】key to select the data mode.
2. Press the【SET】key in the top screen of the data mode.
3. Use the【↑】【↓】keys to select a desired operation data number.
4. Press the【SET】key.
   The display changes to the operation data setting screen.
5. Use the【SET】key to select the operation data item you want to set.
6. Pressing the【SET】key on the screen showing the last operation data item will return the display to the operation number selection screen.



You can select a desired operation data set based on a combination of ON/OFF statuses of M0 and M1 inputs of the driver.

Operation data number	M1 input	M0 input
0	OFF	OFF
1	OFF	**ON**
2	**ON**	OFF
3	**ON**	**ON**

3.2 Setting items

Item	Initial value	Setting range	Description
Torque limit	0	0 to 300 [%]	Sets the torque limit value.
Anti-vibration frequency	30.00	7.00 to 100.00 [Hz]	Sets the anti-vibration control frequency.

Note If the value you have input is outside the setting range, “Error” will be displayed for 1 second. If this error display appears, input a different value that falls within the setting range.

3.3 Initializing operation data

You can revert operation data saved in the driver to their initial values.
For details, refer to 6.6, “Initializing driver data” on p.47.

4 Parameter mode

You can set parameters relating to motor operation and control. These parameters are saved in the driver. Before setting parameters, read the **NX** Series Driver OPERATING MANUAL carefully to understand the basic operations, functions and other details of the driver.

Note Parameters have significant bearing on motor operation. Before setting any parameter, make sure you fully understand the content of the parameter.

4.1 Types of parameters

Application parameters and system parameters are handled in the parameter mode.

■ Application parameters

When an application parameter is changed, the new parameter becomes effective immediately.
Six types of parameters are available on the levels below the application parameter screen. These parameters are classified as follows.

Parameter classification	Description
Gain	Set the gain. The available parameter items vary depending on the tuning method.
I/O	Set the parameters relating to I/O signals.
Analog	Set the parameters relating to analog I/Os.
Alarm/warning	Set the condition under which each alarm or warning generates.
Function setting	Set the mechanical rigidity setting switch and parameters relating to anti-vibration control.
Manual operation/ display	Set the operating speed used in JOG operation in the test mode, as well as the display method of monitored speed on the data setter.

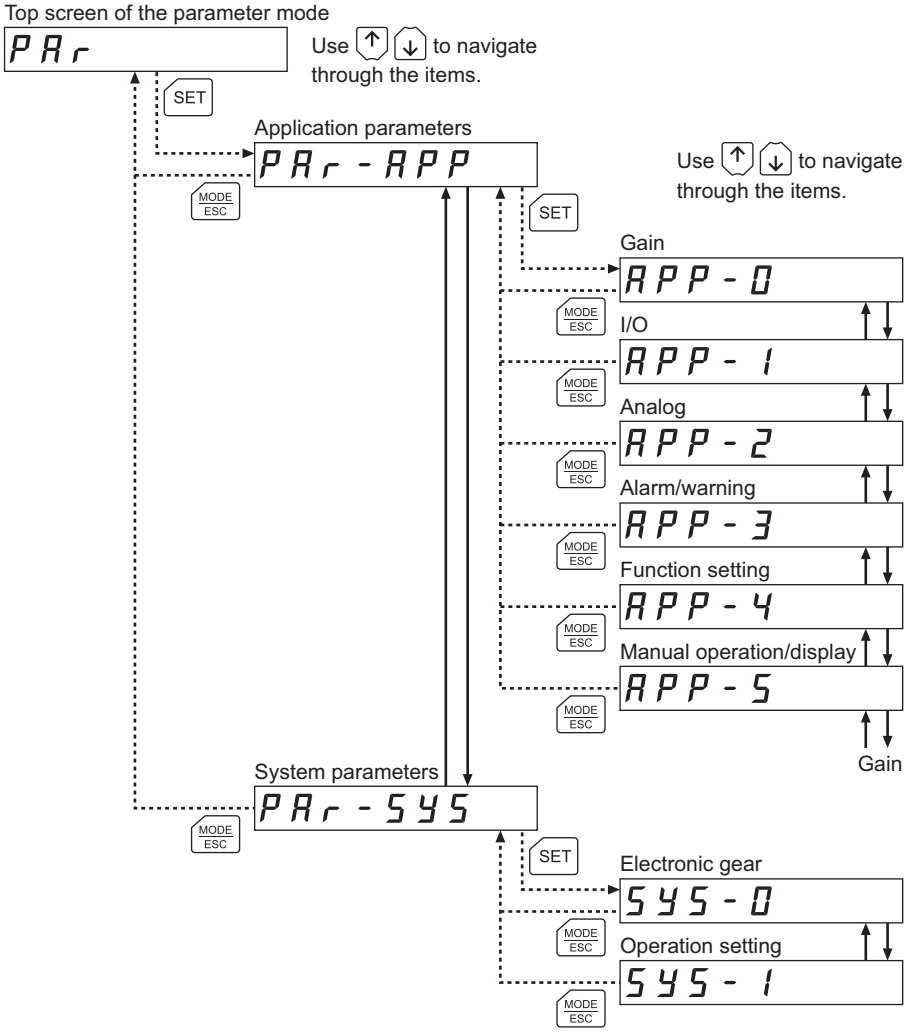
■ System parameters

When a system parameter is changed, the new parameter will become effective only after the power is cycled. If a 24 VDC power supply is used, also cycle the 24 VDC power supply.
Two types of parameters are available on the levels below the system parameter screen. These parameters are classified as follows.

Parameter classification	Description
Electronic gear	Set the electronic gear.
Operation setting	Set the pulse input mode, how the motor should operate after the absolute position loss alarm is reset, whether to enable/disable analog input, motor rotation direction, and initial display on the data setter.

4.2 Operation in the parameter mode

1. Use the 【MODE/ESC】 key to select the parameter mode.
2. Press the 【SET】 key in the top screen of the parameter mode, and use the 【↑】【↓】 keys to select the application parameters or system parameters.
3. Press the 【SET】 key again to move to the parameter item screen.
4. Use the 【↑】【↓】 keys to select the parameter you want to change.



Note If the value you have input is outside the setting range, “Error” will be displayed for 1 second. If this error display appears, input a different value that falls within the setting range.

4.3 Setting example

Pressing the【SET】key in the parameter item screen enables parameter setting.
How a parameter is set are explained below.

Example: Set the gain tuning mode to “semi-auto”

1. Use the【MODE/ESC】key to select the parameter mode.
   The “PAR” LED is lit.

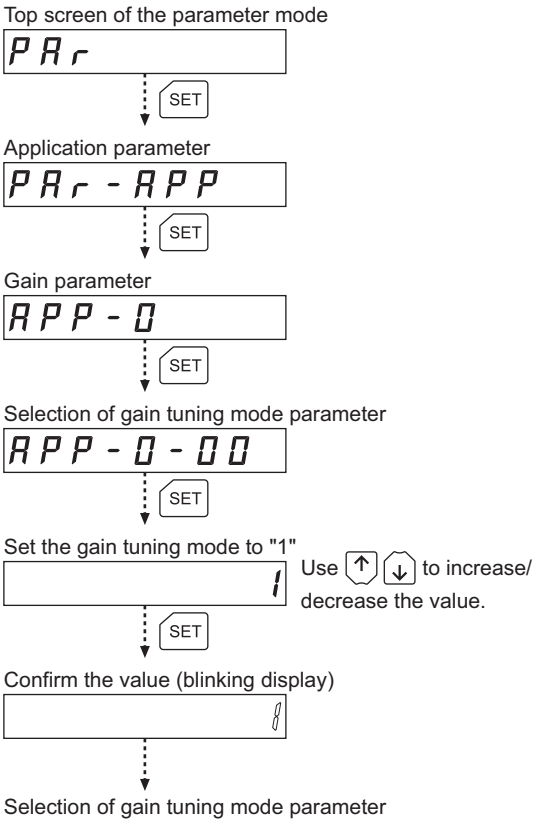
2. Press the【SET】key.
   The display changes to the application parameter screen.

3. Press the【SET】key.
   The display changes to the gain parameter screen.

4. Press the【SET】key.
   The screen for setting the gain tuning mode is displayed.

5. Press the【SET】key, and use the【↑】key to select “1.”
   “1” indicates the semi-auto mode.

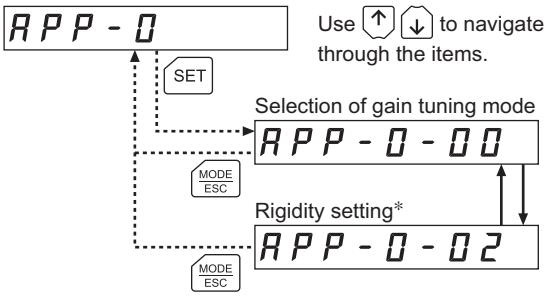
6. Press the【SET】key again.
   The selected value is set, and the display returns to the screen for setting the gain tuning mode.



Note If the value you have input is outside the setting range, “Error” will be displayed for 1 second. If this error display appears, input a different value that falls within the setting range.

4.4 Description of application parameters

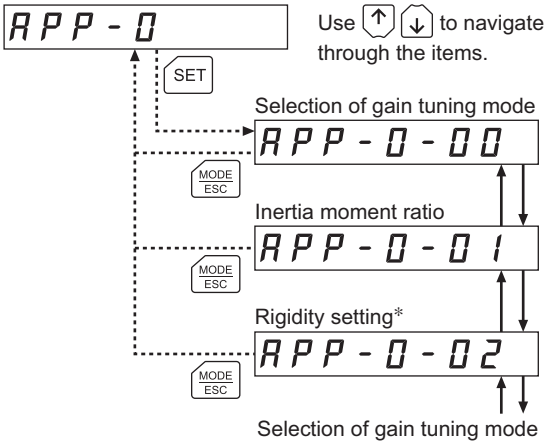
■ Gain parameters (automatic tuning)



Initial value	Setting range	Description
0	0: Auto 1: Semi-auto 2: Manual	Selects the gain tuning mode.
6	0 to 15	Selects the mechanical rigidity for automatic, semi-auto or manual tuning.

∗ This parameter is used when the rigidity setting SW parameter [APP-4-00] is set to "0: Disable." If this parameter is set to "1: Enable," the mechanical rigidity setting switch (SW2) on the driver is used to set the mechanical rigidity.

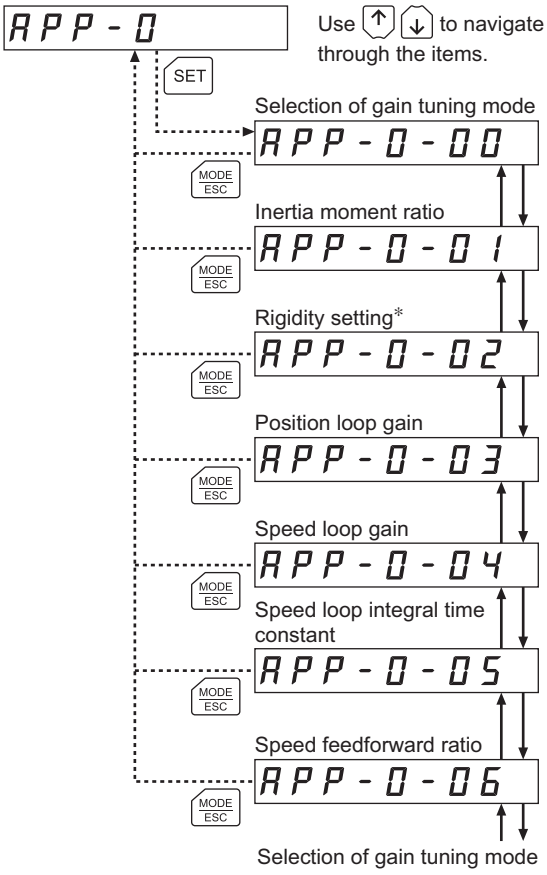
■ Gain parameter (semi-auto tuning)



Initial value	Setting range	Description
0	0: Auto 1: Semi-auto 2: Manual	Selects the gain tuning mode.
500	0 to 10000 [%]	Sets the ratio of load inertial moment and motor inertial moment.
6	0 to 15	Selects the mechanical rigidity for automatic, semi-auto or manual tuning.

∗ This parameter is used when the rigidity setting SW parameter [APP-4-00] is set to "0: Disable." If this parameter is set to "1: Enable," the mechanical rigidity setting switch (SW2) on the driver is used to set the mechanical rigidity.

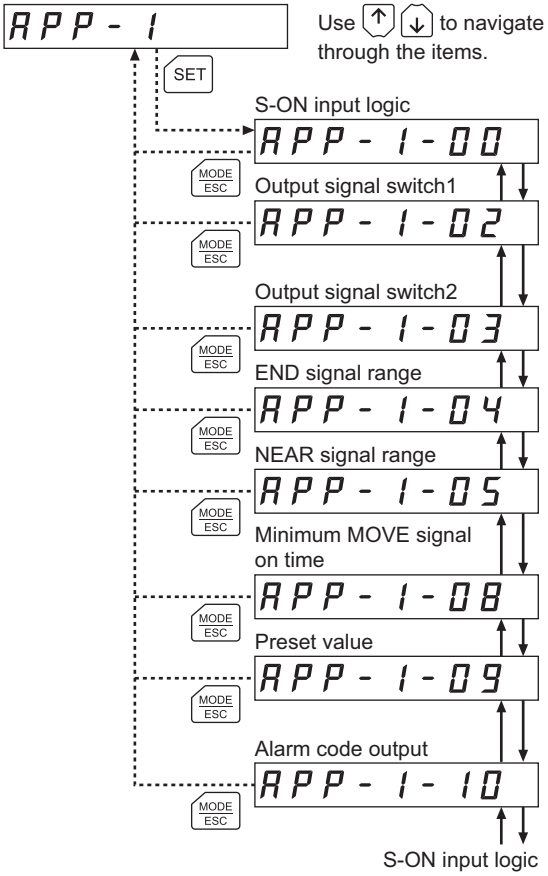
■ Gain parameter (manual tuning)



Initial value	Setting range	Description
0	0: Auto 1: Semi-auto 2: Manual	Selects the gain tuning mode.
500	0 to 10000 [%]	Sets the ratio of load inertial moment and motor inertial moment.
6	0 to 15	Selects the mechanical rigidity for automatic, semi-auto or manual tuning.
10	1 to 200 [Hz]	Sets the position loop gain. When this value is increased, the response will increase.
50	1 to 1000 [Hz]	Sets the speed loop gain. When this value is increased, the response will increase.
31.8	1.0 to 500.0 [ms]	Sets the speed loop integral time constant. When this value is decreased, the response will increase.
0	0 to 100 [%]	Sets the speed feedforward ratio. This setting can be used to shorten the positioning time.

∗ This parameter is used when the rigidity setting SW parameter [APP-4-00] is set to "0: Disable." If this parameter is set to "1: Enable," the mechanical rigidity setting switch (SW2) on the driver is used to set the mechanical rigidity.

■ I/O parameters

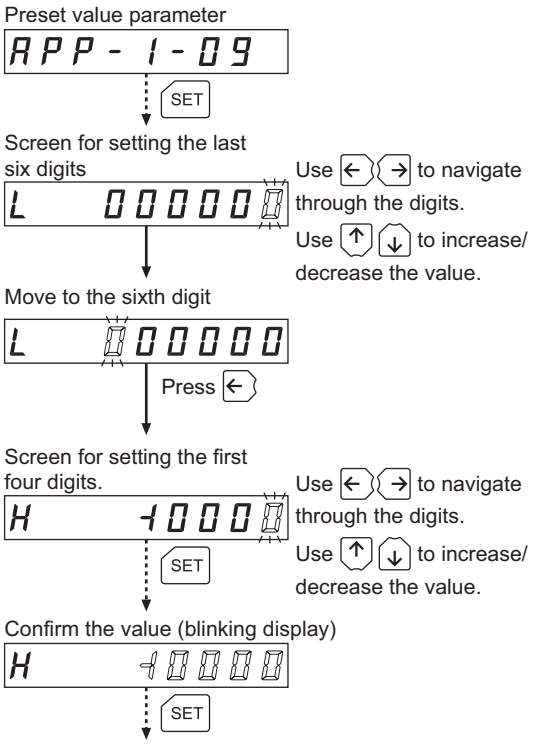


Initial value	Setting range	Description
0	0: N.O. set 1: N.C. set	Changes the S-ON input logic.
0	0: WNG 1: MOVE 2: MBC	Selects an output signal.
0	0: ZSG2 1: NEAR	Selects an output signal.
0.36	0.01 to 36.00 [°]	Sets the output condition for END output.
1.80	0.01 to 36.00 [°]	Sets the output condition for NEAR output.
5	0 to 255 [ms]	Sets the minimum ON time for MOVE output.
0	−2,147,483,648 to 2,147,483,647 [step]	Sets the preset position. Refer to p.41 for the setting procedure.
0	0: Disable 1: Enable	Changes the setting to enable/disable alarm code output.

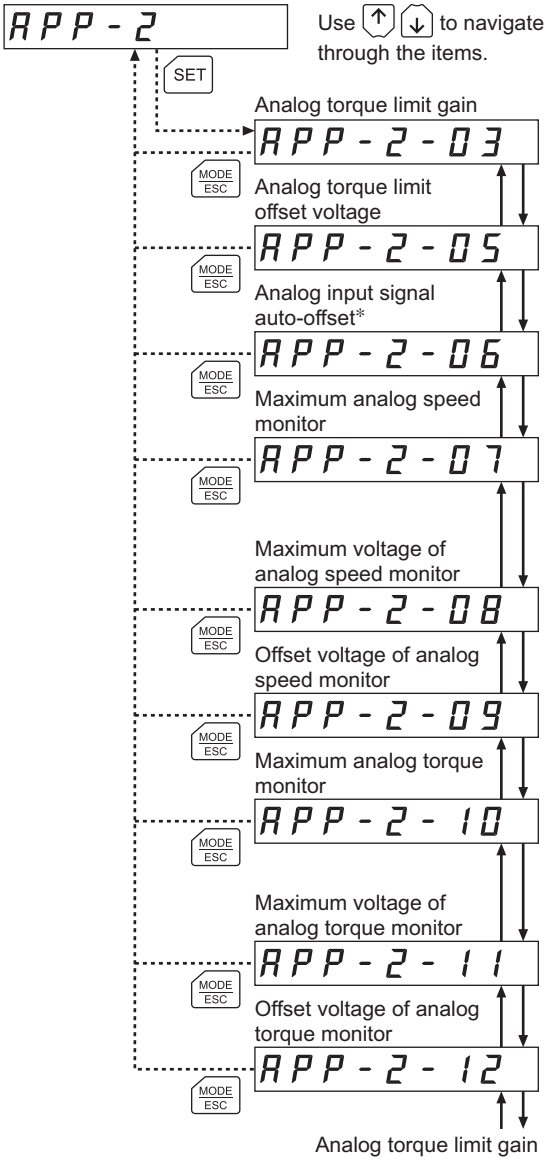
How to set a preset value

A preset value is set in two steps. The last six digits are set first, followed by the first four digits.
A positive/negative sign is set together with the first four digits.

1. Press the【SET】key in the preset value parameter screen.
   The screen for setting the last six digits is displayed.
2. Input the values of last six digits.
3. After the last six digits have been set, move to the sixth digit.
4. Press the【←】key.
   The screen for setting the first four digits is displayed.
5. Input the first four digits and the sign.
   Move to the first digit and press the【→】key. The display changes to the screen for setting the last six digits.
6. Press the【SET】key.
   The input value is set.
7. Press the【SET】key again.
   The display returns to the preset value parameter screen.



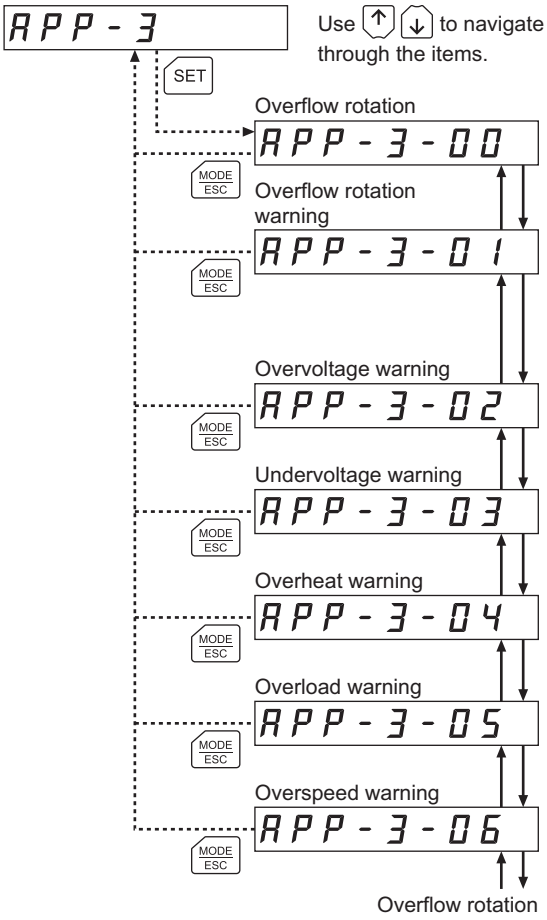
■ Analog parameters



Initial value	Setting range	Description
30	0 to 300 [%]	Sets the torque limit per 1 V of analog input voltage.
0	−1.00 to 1.00 [V]	Sets the offset voltage for analog torque limit input.
0	0: Disable 1: Enable	Changes the setting to enable/disable the automatic offset for analog input signal.
5500	1 to 6000 [r/min]	Sets the maximum value of monitored analog speed. This setting determines the slope of monitored analog speed output.
10	1 to 10 [V]	Sets the monitor output voltage at the maximum value of monitored analog speed.
0	−1.00 to 1.00 [V]	Sets the offset value for monitored analog speed.
300	1 to 300 [%]	Sets the maximum value of monitored analog torque. This setting determines the slope of monitored analog torque output.
10	1 to 10 [V]	Sets the monitor output voltage at the maximum value of monitored analog torque.
0	−1.00 to 1.00 [V]	Sets the offset voltage for monitored analog torque.

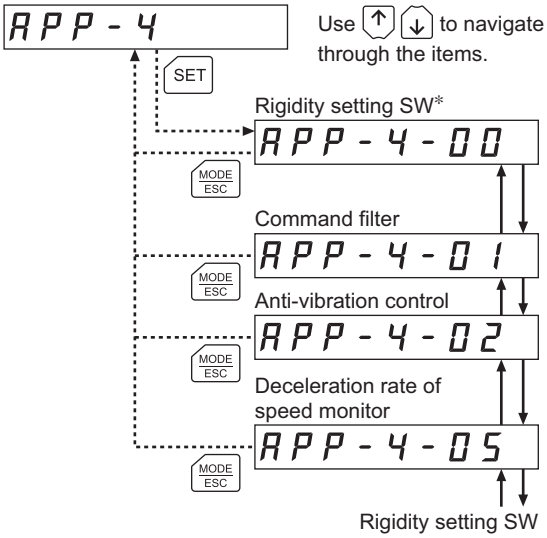
∗ When the analog input signal auto-offset parameter [APP-2-06] is set to "1: Enable," the analog speed input offset (p.42) or analog torque input offset (p.42) is enabled in the test mode.

■ Alarm/warning parameters



Initial value	Setting range	Description
10	1 to 1000 [rev]	Sets the condition under which an overflow rotation generates, as an amount of rotation of the motor shaft.
9	1 to 1000 [rev]	Sets the condition under which an overflow rotation warning generates, as an amount of rotation of the motor shaft.
390	320 to 400 [V]	Sets the voltage at which an overvoltage warning generates.
125	120 to 280 [V]	Sets the voltage at which an undervoltage warning generates.
80	40 to 85 [°C]	Sets the temperature at which an overheat warning generates.
90	1 to 100 [%]	Sets the condition under which an overload warning generates.
5800	1 to 6000 [r/min]	Sets the speed at which an overspeed warning generates.

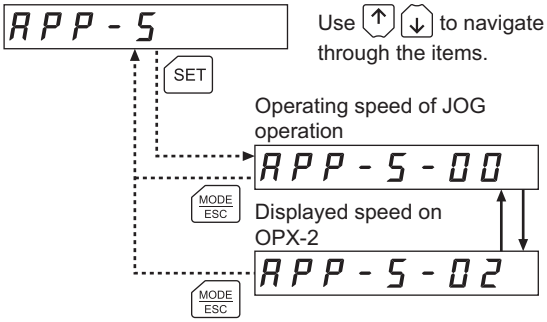
■ Function setting parameters



Initial value	Setting range	Description
1	0: Disable 1: Enable	Changes the setting to enable/disable the mechanical rigidity setting switch (SW2) on the driver.
3	0 to 100 [ms]	Sets the time constant for command filter.
1	0: Disable 1: Enable	Changes the setting to enable/disable anti-vibration control.
1	1.0 to 100.0	Sets the gear ratio of geared motor for speed monitor.

∗ When the rigidity setting SW parameter [APP-4-00] is set to "0: Disable," the value in the rigidity setting parameter [APP-0-02] is enabled.

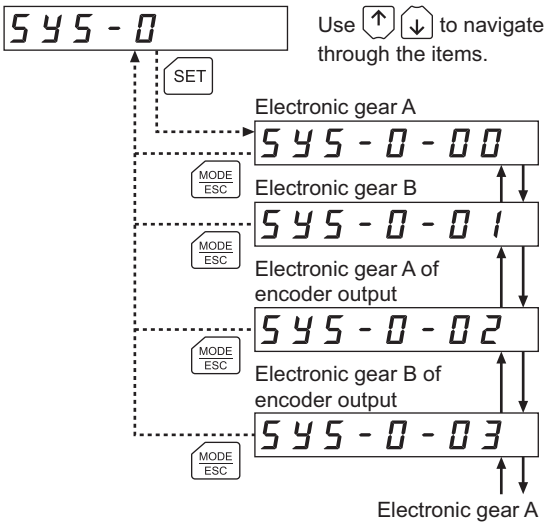
■ Manual operation and display parameters



Initial value	Setting range	Description
30	1 to 300 [r/min]	Sets the operating speed for JOG operation.
0	0: Signed 1: Unsigned	Sets the display method of monitored speed.

4.5 Description of system parameters

■ Electronic gear parameters



Initial value	Setting range	Description
1	1 to 1000	Sets the denominator of electronic gear.
1	1 to 1000	Sets the numerator of electronic gear.
1	1 to 1000	Sets the denominator of electronic gear for encoder output.
1	1 to 1000	Sets the numerator of electronic gear for encoder output.

Resolution

The resolution can be changed as follows by using the electronic gear parameters [SyS-0-00] and [SyS-0-01]. Note that the calculated value must be inside the setting range specified below:
Resolution setting range: 100 to 100,000 P/R

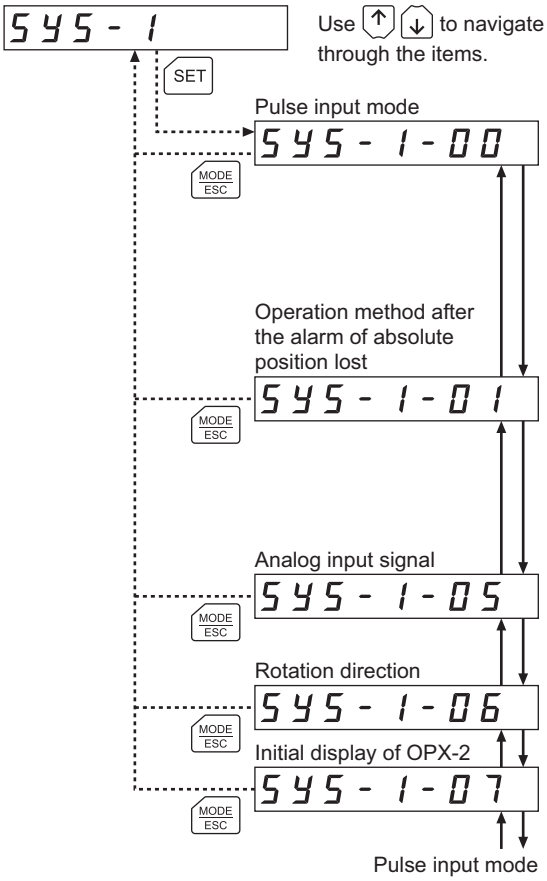
$$\text{Resolution [P/R]} = 1000 \times \frac{\text{Electronic gear B [SyS-0-01]}}{\text{Electronic gear A [SyS-0-00]}}$$

Encoder output resolution

The value of encoder output resolution can be changed as follows using the electronic gear parameters [SyS-0-02] and [SyS-0-03]. Note that the calculated value must be inside the setting range specified below:
Resolution setting range: 100 to 10,000 P/R

$$\text{Encoder output resolution [P/R]} = 1000 \times \frac{\text{Electronic gear B of encoder output [SyS-0-03]}}{\text{Electronic gear A of encoder output [SyS-0-02]}}$$

■ Operation setting parameters



Initial value	Setting range	Description
0	0: Setting by function switch 1: 2-pulse N.O. 2: 2-pulse N.C. 3: 1-pulse N.O. 4: 1-pulse N.C. 5: Phase difference × 1 6: Phase difference × 2 7: Phase difference × 4	Selects the pulse input mode.
0	0: Enable pulse input by on-edge of P-REQ input after resetting the alarm 1: Enable pulse input after resetting the alarm	Selects the operation method to be applied after resetting the absolute position loss alarm.
1	0: Disable 1: Enable	Change the setting to enable/disable the analog input signal.
1	0: + = CCW 1: + = CW	Selects the motor rotation direction.
0	0: Operating speed [r/min] 1: Position [step] 2: Torque [%] 3: Estimated inertia moment ratio [%] 4: Operation number 5: Selection number 6: Tension [%] 7: Rotation counter [rev] 8: Shaft diameter [mm] 9: Top display of monitor mode	Selects the initial screen to be displayed when the data setter starts communicating with the driver. If the selected item is not supported in the position control mode, the top screen of the monitor mode is displayed as the initial display.

4.6 Initializing parameters

You can revert parameters saved in the driver to their initial values.
For details, refer to 6.6, “Initializing driver data” on p.47.

5 Test mode

5.1 What you can do in the test mode

- I/O test

  You can check the ON/OFF status of each input signal of the driver, or switch the ON/OFF status of each output signal on the **OPX-2A**. You can also check the analog input voltage and set a desired analog output voltage.
  There is also an I/O test function with which you can check the connection status of the driver.

- JOG operation

  You can operate the motor using the keys on the **OPX-2A**.

- Position preset

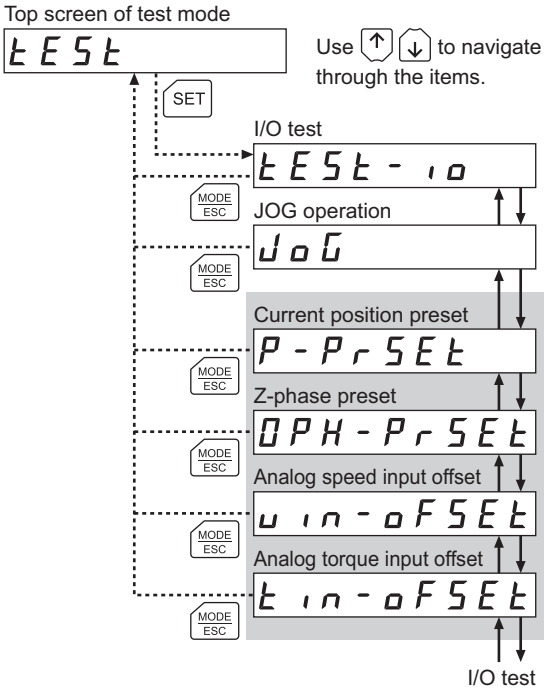
  You can preset the current position and Z-phase position.

- Analog input offset

  You can offset the analog speed input and analog torque input.

5.2 Operation in the test mode

1. Use the 【MODE/ESC】 key to select the test mode.
2. Press the 【SET】 key in the top screen of the test mode.
   The display changes to the test mode item screen.
3. Use the 【↑】【↓】 keys to select the item you want to perform.



∗ If operations are limited by the edit lock function (p.9), the screen text in gray is not shown.

Note

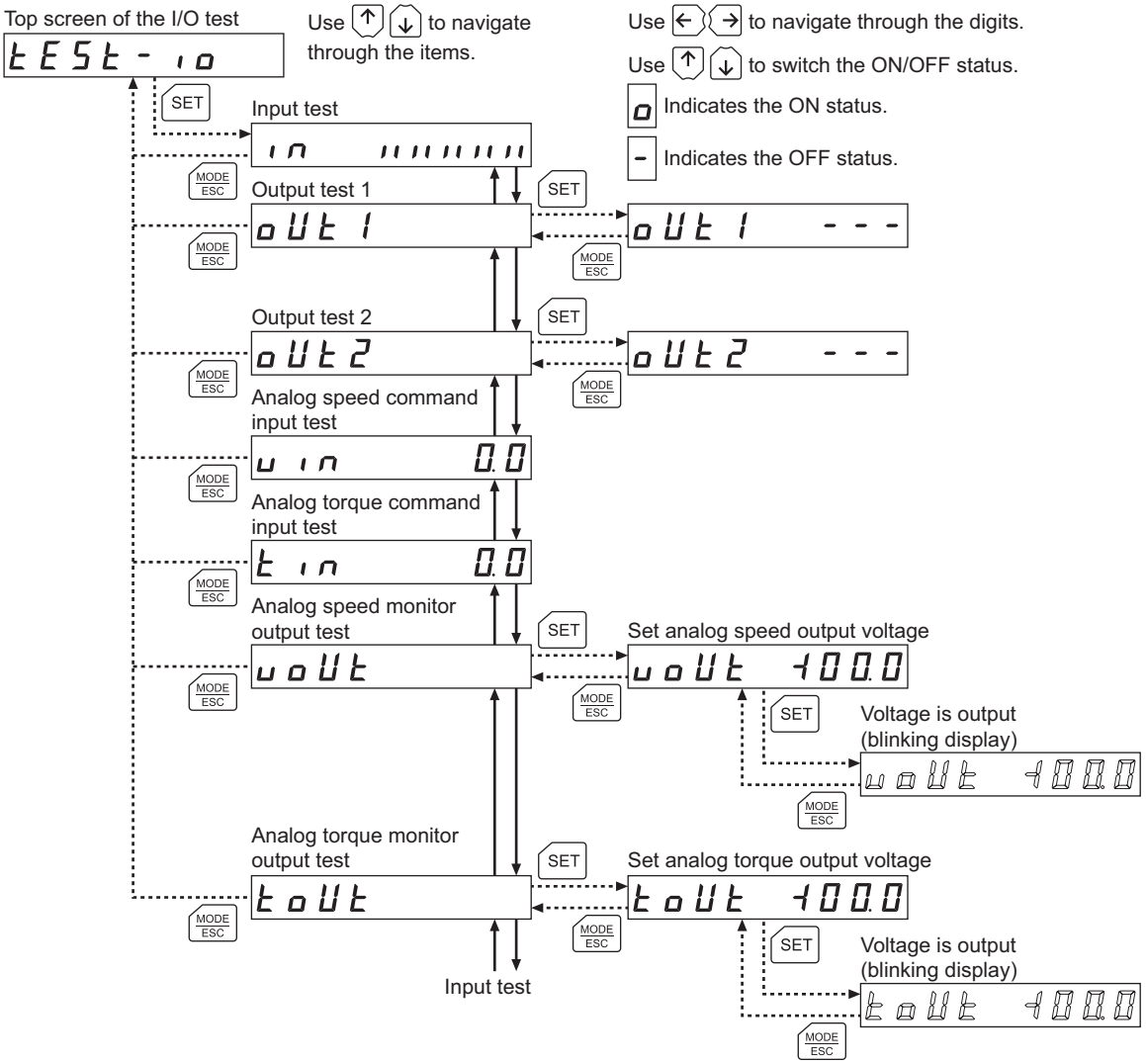
- Stop the motor operation before changing to the test mode.
- When you move from the top screen of the test mode to a lower level, the CW/CCW input and RETURN input will be disabled.
- When you move from a non-JOG-operation item to a lower level, all I/O signals and operations will be disabled.

What happens when the【SET】key is pressed while the motor is operating

While the motor is operating, you cannot move to any lower level from the top screen of the test mode. Pressing the【SET】key will generate an error, and "oPE-Err" will be shown.
Be sure to stop the motor operation before pressing the【SET】key.

5.3 I/O test

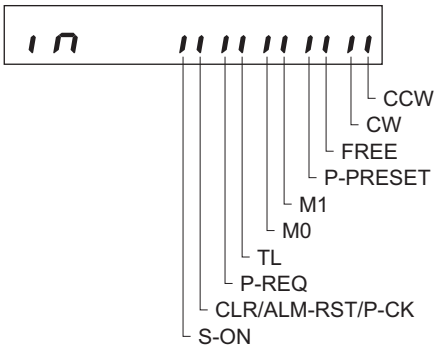
You can check the ON/OFF status of each input signal of the driver, or switch the ON/OFF status of each output signal on the **OPX-2A**. You can also check the analog input voltage and set a desired analog output voltage.
There is also an I/O test function with which you can check the connection status of the driver.



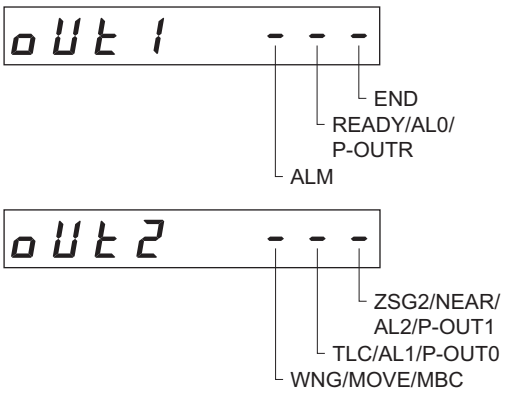
- Checking I/O signals

  On the I/O signal check screen, each digit on the 7-segment LED display corresponds to a signal. If the signal is ON, the corresponding digit is lit. If the signal is OFF, the digit is unlit.

  • Input signals



  • Output signals



- Analog input test

  The analog speed input voltage and analog torque input voltage are shown.
  Each voltage is indicated in units of 0.1 V.

- Analog output test

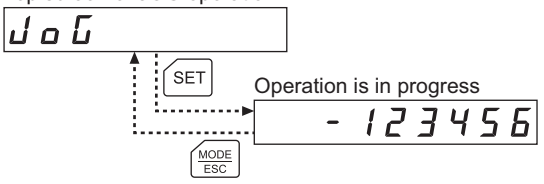
  When an output voltage is set and the【SET】key is pressed, the specified voltage will be output from the analog monitor terminal of the driver. The setting range is −10.0 to +10.0 V.

5.4 JOG operation

You can operate the motor using the keys on the **OPX-2A**.
The operating speed corresponds to the value set in the operating speed of JOG operation parameter [APP-5-00].

Note During JOG operation, the motor rotates at the specified operating speed while each applicable key is pressed. Before commencing JOG operation, consider the status of the equipment and condition of its surroundings to confirm thoroughly that motor rotation will not cause any dangerous situation.

Top screen of JOG operation



Pressing once causes the motor to rotate one step in the forward direction.
Pressing and holding the key causes the motor to rotate continuously in the forward direction.

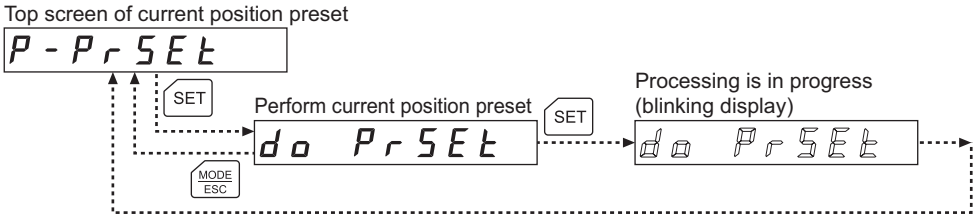
Pressing once causes the motor to rotate one step in the reverse direction.
Pressing and holding the key causes the motor to rotate continuously in the reverse direction.

5.5 Presetting the current position

In this operation, the current position is preset by rewriting the value in the preset value parameter [APP-1-09].

Note

- If operations are limited by the edit lock function (p.9), the preset function cannot be performed.
- If the preset function is performed while the absolute function is enabled, the home position will be written to the driver's EEPROM. The EEPROM can be rewritten approx. 100,000 times.

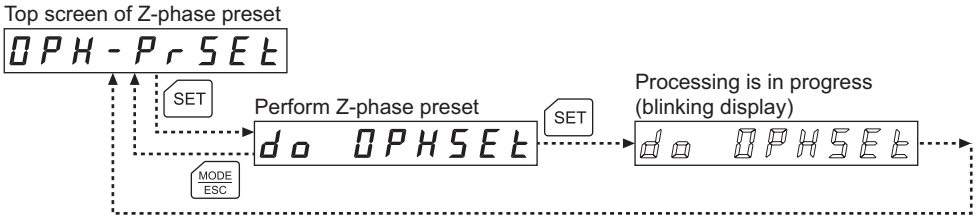


5.6 Presetting Z-phase

In this operation, a Z-phase signal is output at the current position.

Note

- If operations are limited by the edit lock function (p.9), the preset function cannot be performed.
- When Z-phase preset is performed, the Z-phase position will be tentatively written to the driver's EEPROM. When the power is turned on the next time, the Z-phase position that was written earlier will be reflected in the motor encoder. The EEPROM and encoder memory can be rewritten approx. 100,000 times.
- When a different motor is connected, the content of the encoder memory of the new motor will be read into the driver. Accordingly, the Z-phase position will also change to reflect the new motor.

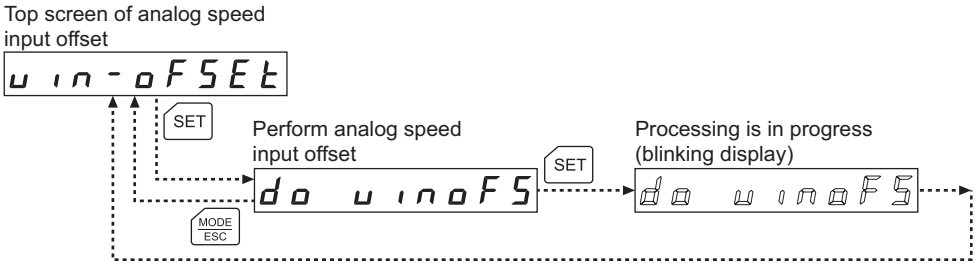


5.7 Offsetting the analog speed input

This function cannot be used when the analog input signal auto-offset parameter [APP-2-06] is set to "1: Enable." When a voltage of 0 V is input to the analog speed input terminal and the offset function is performed, the offset voltage will be adjusted automatically and the adjusted voltage will be saved in the driver.

Note

- If operations are limited by the edit lock function (p.9), the offset function cannot be performed.
- If the offset function is performed, the offset voltage will be written to the driver's EEPROM. The EEPROM can be rewritten approx. 100,000 times.

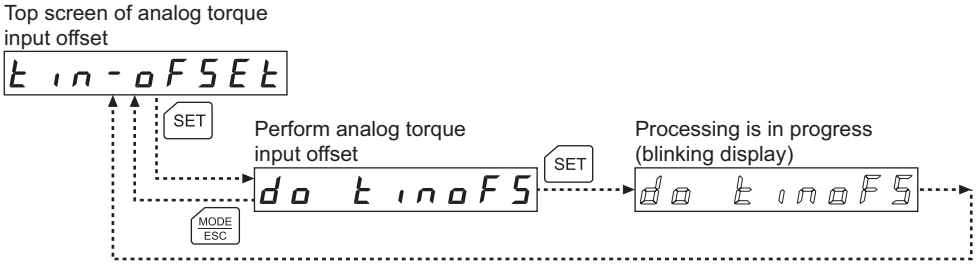


5.8 Offsetting the analog torque input

This function cannot be used when the analog input signal auto-offset parameter [APP-2-06] is set to "1: Enable." When a voltage of 0 V is input to the analog torque input terminal and the offset function is performed, the offset voltage will be automatically adjusted and the adjusted voltage will be saved in the driver.

Note

- If operations are limited by the edit lock function (p.9), the offset function cannot be performed.
- If the offset function is performed, the offset voltage will be written to the driver's EEPROM. The EEPROM can be rewritten approx. 100,000 times.



6 Copy mode

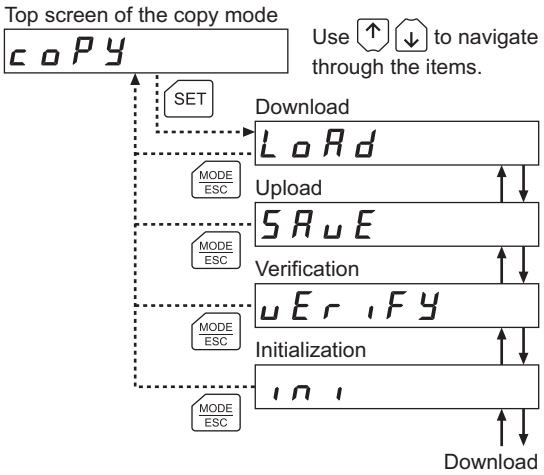
The **OPX-2A** has four data banks, and operation data and parameters can be saved in each of these data banks. Since an EEPROM is used as the data memory element, stored data will be retained even after the power is turned off.
In the copy mode, you can download data saved in the **OPX-2A** to the driver. You can also upload data saved in the driver to the **OPX-2A**.
It is also possible to verify data in the **OPX-2A** against the corresponding data in the driver, or revert driver data to their initial values.

6.1 What you can do in the copy mode

- Download
  Copy data saved in the **OPX-2A** to the driver.
- Upload
  Copy data saved in the driver to the **OPX-2A**.
- Verification
  Verify data in the **OPX-2A** against the corresponding data in the driver.
- Initializing driver data
  Revert data saved in the driver to their initial values.

6.2 Operation in the copy mode

1. Use the【MODE/ESC】key to select the copy mode.
2. Press the【SET】key in the top screen of the copy mode.
   The display changes to the copy mode item screen.
3. Use the【↑】【↓】keys to select the item you want to perform.



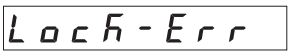
Note
- Stop the motor operation before changing to the copy mode.
- When you move from the top screen of the copy mode to a lower level, the CW/CCW input will be disabled.

- What happens when the【SET】key is pressed while the motor is operating

  While the motor is operating, you cannot move to any lower level from the top screen of the copy mode. Pressing the【SET】key will generate an error, and "oPE-Err" will be shown.
  Be sure to stop the motor operation before pressing the【SET】key.

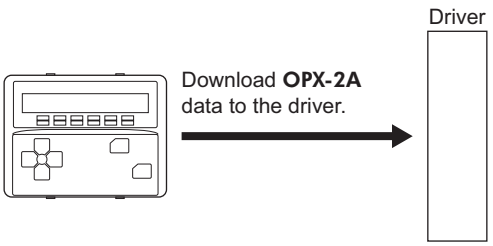
- What happens when the【SET】key is pressed while the edit lock is enabled

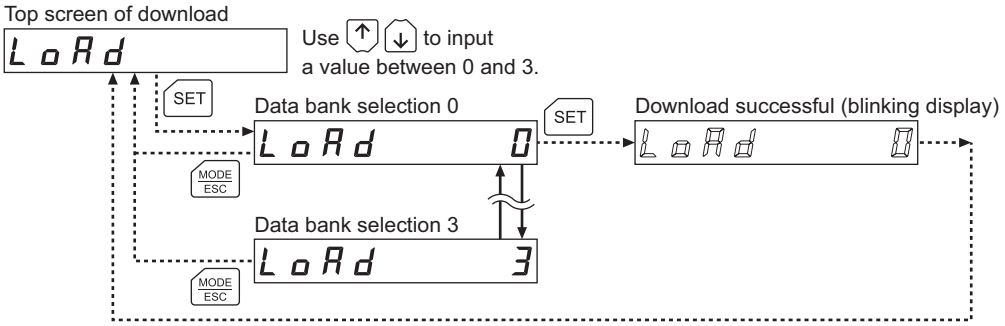
  While the edit lock is enabled, you cannot move to any lower level from the top screen of the copy mode. Pressing the【SET】key will generate an error, and "LocK-Err" will be shown.
  Be sure to cancel the edit lock before pressing the【SET】key. Refer to p.9 for the procedure to cancel the edit lock.



6.3 Downloading to the driver

In this operation, data in the specified data bank number are downloaded to the driver.





Note

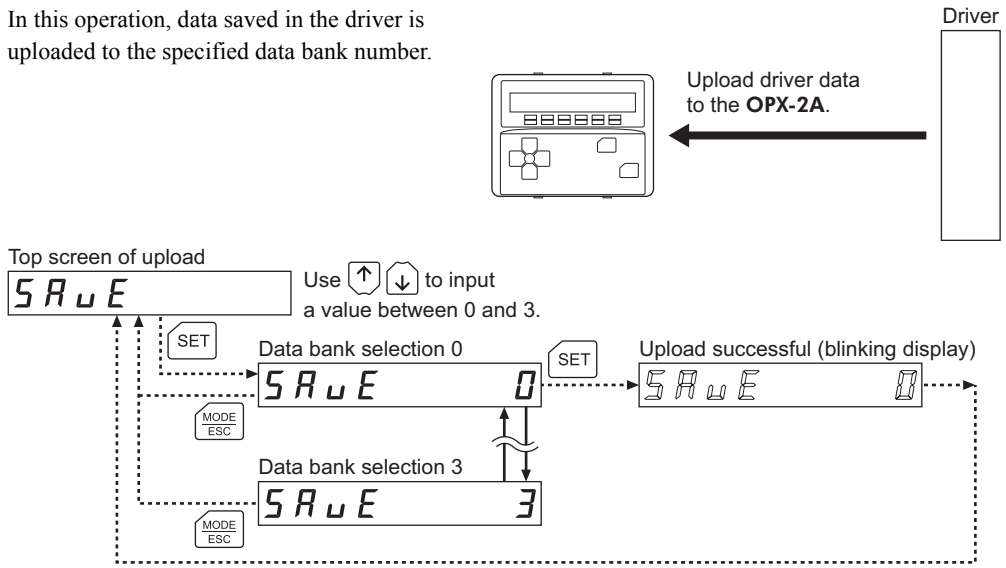
- System parameters that have been changed will become effective after the power is cycled. If the system parameters have been changed as a result of the download, cycle the driver power. If a 24 VDC power supply is used, also cycle the 24 VDC power supply.
- Do not turn off the driver power while the download is still in progress (= while the display is blinking). Doing so may damage the data.

If a download error occurs, a code indicating the nature of the error will blink on the display. Download will not be performed and the display will return to the top screen of download.

Blinking display	Description	Action
Prod-Err	The product series of the driver to which data is downloaded is wrong.	• Check the product series of the driver. • Check the data bank number on the **OPX-2A**.
ctL-Err	The control mode of the driver is different from that of the **OPX-2A**.	Check the control mode of the driver.
HEAd-Err bcc-Err	An error occurred while data was being downloaded.	Perform download again. If the same error occurs, the data saved in the **OPX-2A** may be damaged. Upload the applicable data to set the **OPX-2A** data again.
no-dAtA	The specified data bank number does not contain data.	Check the data bank number.
dAtA-Err	An error occurred while data was being written.	Perform download again.

6.4 Uploading to the OPX-2A

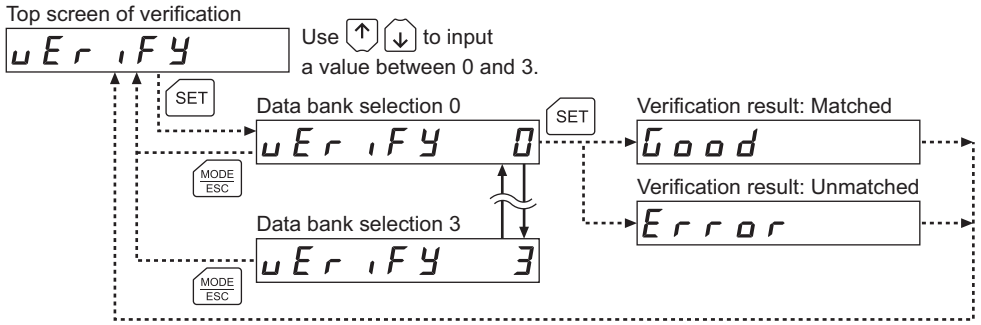
In this operation, data saved in the driver is uploaded to the specified data bank number.



Note Do not turn off the driver power while the upload is still in progress (= while the display is blinking). Doing so may damage the data.

6.5 Verifying data

In this operation, data in the specified data bank number are verified against the corresponding data saved in the driver.
If the verification finds that the two sets of data match, “Good” will be shown. If the two do not match, “Error” will be shown.

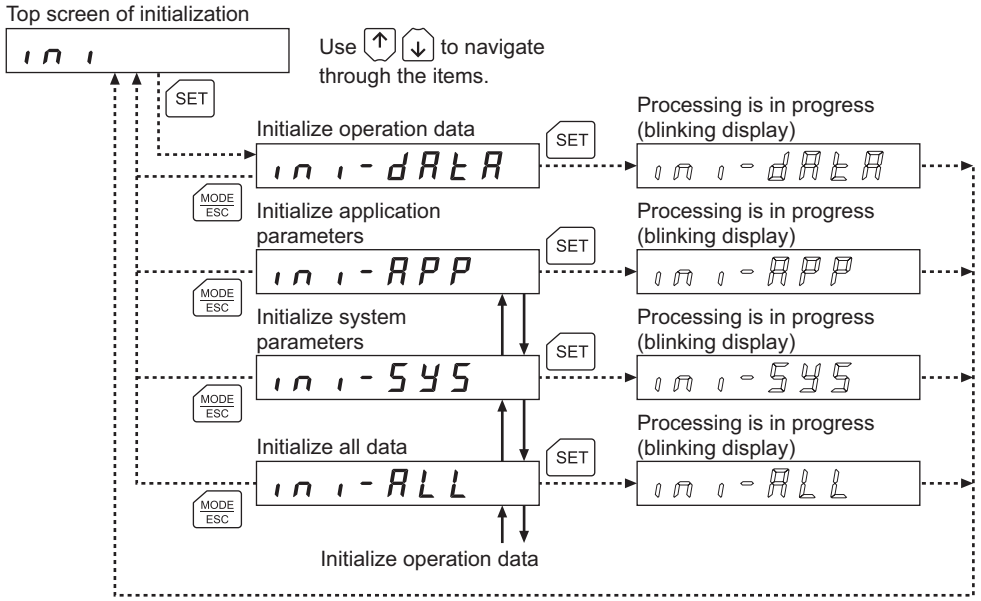


If a verification error occurs, a code indicating the nature of the error will blink on the display.
Verification will not be performed and the display will return to the top screen of verification.

Blinking display	Description	Action
Prod-Err	The product series of the driver against which data is verified is wrong.	• Check the product series of the driver. • Check the data bank number on the **OPX-2A**.
ctL-Err	The control mode of the driver is different from that of the **OPX-2A**.	Check the control mode of the driver.
HEAd-Err bcc-Err	An error occurred while data was being verified.	Perform verification again. If the same error occurs, the data saved in the **OPX-2A** may be damaged. Upload the applicable data to set the **OPX-2A** data again.
no-dAtA	The specified data bank number does not contain data.	Check the data bank number.

6.6 Initializing driver data

In this operation, data saved in the driver are reverted to their initial values.



Note

- System parameters that have been changed will become effective after the power is cycled. If the system parameters have been changed as a result of the initialization, cycle the driver power. If a 24 VDC power supply is used, also cycle the 24 VDC power supply.
- Do not turn off the driver power while the initialization is still in progress (= while the display is blinking). Doing so may damage the data.

Operation in the speed control mode

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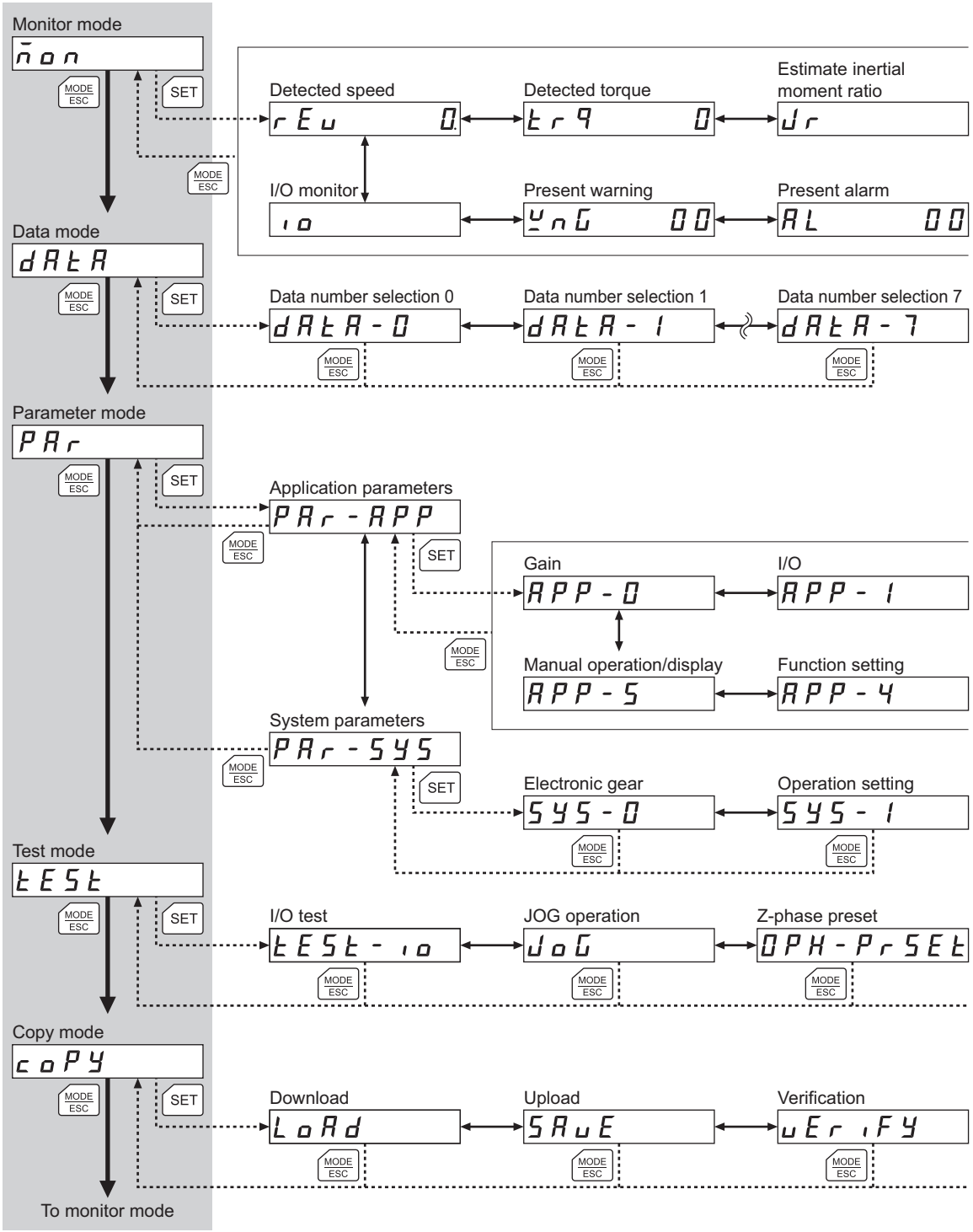
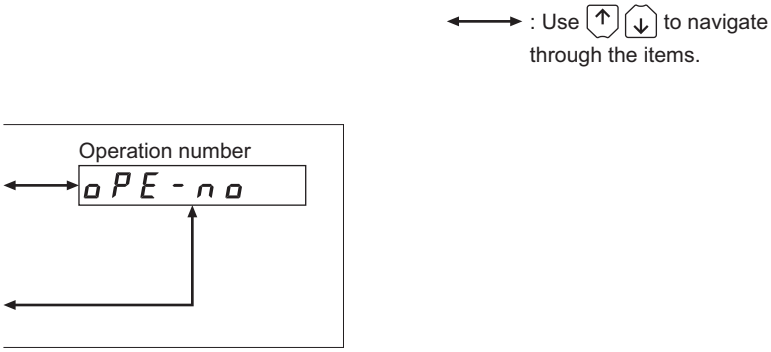
1 Screen transitions in the speed control mode

Top screen



Note The following operations cannot be performed while the edit lock function (p.9) is enabled: Edit operation data, edit parameters, clear alarm/warning records, preset Z-phase, offset the analog speed input, offset the analog torque input, perform operations in the copy mode



2 Monitor mode

2.1 What you can do in the monitor mode

- Monitoring the operating status

  You can monitor the detected motor speed, detected torque, estimate inertial moment ratio and current operation number in real time.

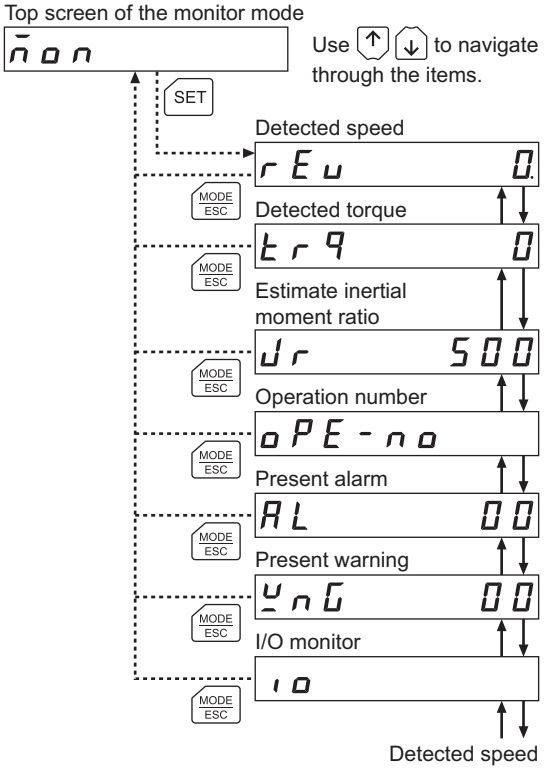
- Checking alarms/warnings, clearing alarm/warning records, and resetting alarms
  - If an alarm or warning generates, a corresponding alarm code or warning code will be displayed. You can check the code to identify the details of the alarm/warning.
  - Up to ten most recent alarms/warnings can be displayed, starting from the latest one.
  - You can reset the alarms currently present.
  - You can clear alarm/warning records.

- Checking I/O signals

  You can check the ON/OFF status of each I/O signal of the driver, as well as the analog input voltage.

2.2 Operation in the monitor mode

1. Use the【MODE/ESC】key to select the monitor mode.
2. Press the【SET】key in the top screen of the monitor mode.
   The display changes to the monitor mode item screen.
3. Use the【↑】【↓】keys to select the item you want to monitor.



2.3 Monitor items

■ Detected speed

You can check the speed of the motor (unit: r/min).
While the motor is rotating in the CCW direction, "–" is shown in front of the displayed value. If the speed is indicated by an absolute value, no sign is shown to indicate the rotating direction. You can select the value display format using the displayed speed on OPX-2 parameter [APP-5-02] (p.67).
You can also display the motor speed as revolutions of the gear output shaft. For this setting, use the deceleration rate of speed monitor parameter [APP-4-05] (p.67).

■ Detected torque

You can check the generated motor torque.
The generated torque is indicated as a percentage of the rated torque being 100%.

■ Estimate inertial moment ratio

You can check the load inertial moment ratio estimated internally by the driver.
The estimate inertial moment ratio indicates the percentage of the load inertial moment to the rotor inertial moment of the motor. If the rotor inertial moment is the same as the load inertial moment, "100%" is shown.

■ Operation number

You can check the operation data number corresponding to the data used in the current operation.

■ Present alarm

When an alarm generates, a corresponding alarm code will be displayed.
You can also reset alarms or check and clear alarm records.

Note Do not turn off the driver power while an alarm is being reset or alarm records are being cleared (= while the display is blinking). Doing so may damage the data.

- How to reset an alarm

1. While an alarm is displayed, press the【SET】key to move to the lower level.
2. Press the【↑】key twice to select the alarm reset screen.
3. Press the【SET】key.
   The alarm is reset.

Note Some alarms cannot be reset on the **OPX-2A**. For details, refer to "Alarm code list" on p.54. To reset these alarms, you must cycle the power.

- How to check an alarm record

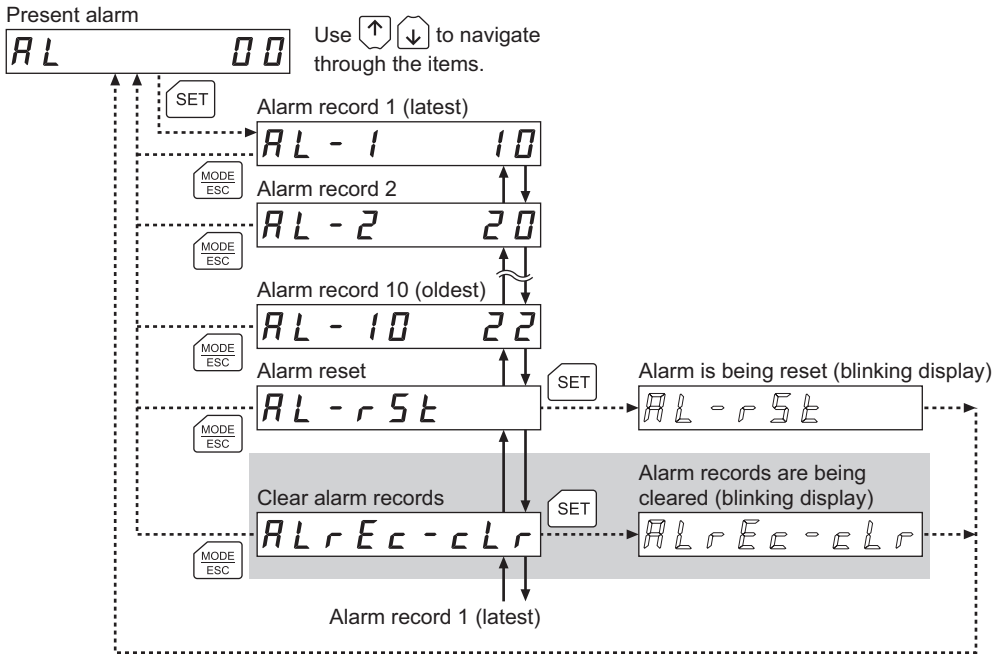
You can check up to ten most recent alarms, starting from the latest one.

1. While an alarm is displayed, press the【SET】key to move to the lower level.
   The latest alarm is displayed.
2. Press the【↓】key.
   The second latest alarm is displayed.
3. Every time the【↓】key is pressed, the next older alarm will be displayed. Use the【↑】【↓】keys to select the alarm record you want to check.

- How to clear all alarm records

You can clear all alarm records at once.

1. While an alarm is displayed, press the【SET】key to move to the lower level.
2. Press the【↑】key and select the alarm record clear screen.
3. Press the【SET】key.
   All alarm records are cleared.



∗ If operations are limited by the edit lock function (p.9), the screen text in gray is not shown.

Alarm code list

Code	Alarm name	Resetting on the **OPX-2A**	Number of times the driver's ALARM LED blinks
10	Excessive position deviation	Possible	4
20	Overcurrent protection	Not possible	5
21	Overheat protection	Possible	2
22	Overvoltage protection	Not possible	3
23	Main power supply error	Possible	
25	Undervoltage	Possible	
26	Motor overheat protection	Not possible	2
28	Sensor error during operation	Not possible	8
2A	Encoder communication error	Not possible	
30	Overload	Possible	2
31	Overspeed	Possible	
32	Position range error	Possible	7
33	Absolute position loss	Possible	
34	Command pulse error	Possible	2
41	EEPROM error	Not possible	9

Code	Alarm name	Resetting on the **OPX-2A**	Number of times the driver's ALARM LED blinks
42	Sensor error during initialization	Not possible	8
43	Rotor rotation during initialization	Not possible	
44	Encoder EEPROM error	Not possible	
45	Motor combination error	Not possible	
47	ABS not supported	Possible	7
48	No battery	Possible	
51	Regeneration resistor overheat	Not possible	2
71	Electronic gear setting error	Not possible	7

■ Present warning

When a warning generates, a corresponding warning code will be displayed.
You can also check or clear warning records.

Note Do not turn off the driver power while warning records are being cleared (= while the display is blinking). Doing so may damage the data.

- How to check a warning record

You can check up to ten most recent warnings, starting from the latest one.

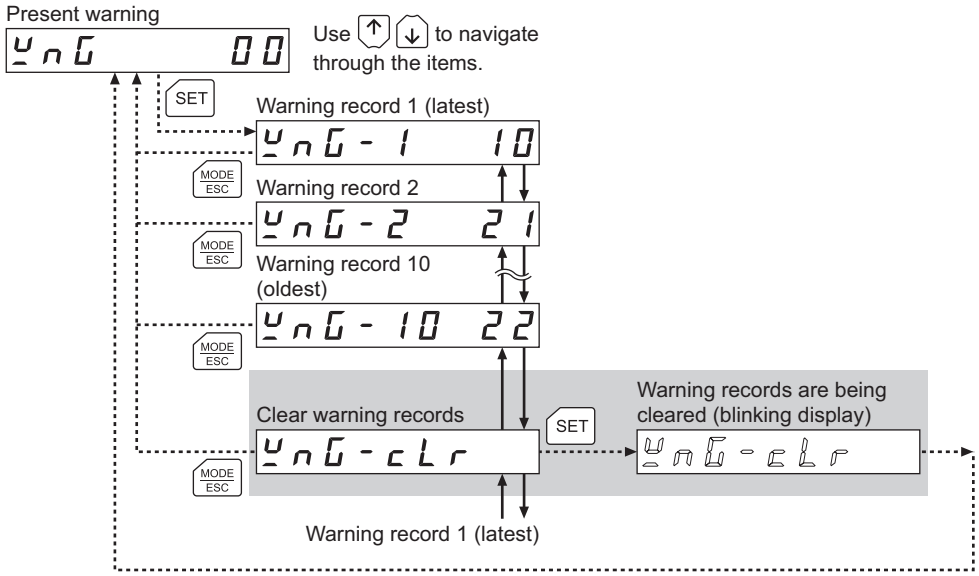
1. While a warning is displayed, press the【SET】key to move to the lower level.
   The latest warning is displayed.
2. Press the【↓】key.
   The second latest warning is displayed.
3. Every time the【↓】key is pressed, the next older warning will be displayed. Use the【↑】【↓】keys to select the warning record you want to check.

- How to clear all warning records

You can clear all warning records at once.

1. While a warning is displayed, press the【SET】key to move to the lower level.
2. Press the【↑】key and select the warning record clear screen.
3. Press the【SET】key.
   All warning records are cleared.

Note You can also clear warning records by turning off the driver power.



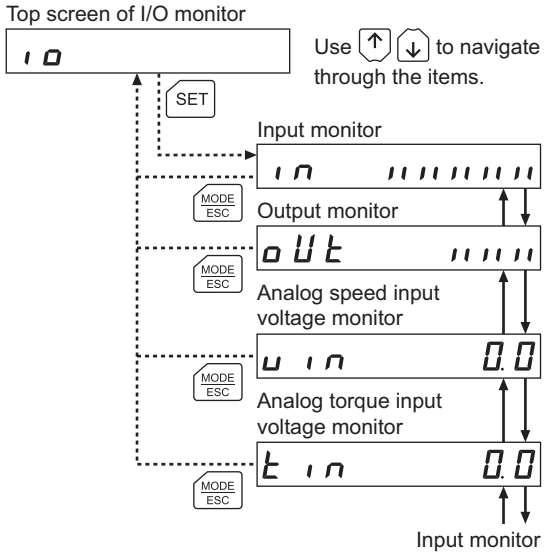
∗ If operations are limited by the edit lock function (p.9), the screen text in gray is not shown.

Warning code list

Code	Warning name	Code	Warning name
10	Excessive position deviation	27	Battery voltage low
21	Overheat	30	Overload
22	Overvoltage	31	Overspeed
23	Main power supply	33	Absolute position loss
25	Undervoltage	71	Electronic gear setting error

■ I/O monitor

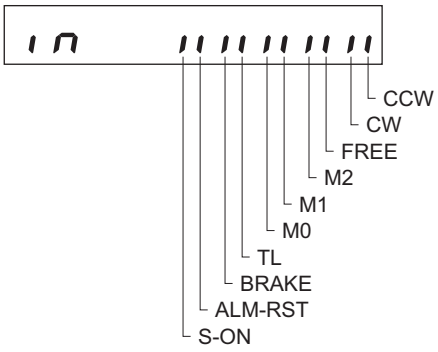
You can check the ON/OFF status of each I/O signal of the driver (Lit: ON, Unlit: OFF).
You can also monitor the analog input voltage.
Use the【↑】【↓】to select the item you want to monitor.



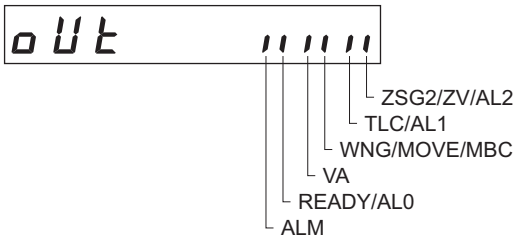
- Monitoring I/O signals

  On the I/O signal monitor screen, each digit on the 7-segment LED display corresponds to a signal. If the signal is ON, the corresponding digit is lit. If the signal is OFF, the digit is unlit.

  • Input signals



  • Output signals



- Monitoring the analog input voltage

  The analog speed input voltage and analog torque input voltage are shown.
  Each voltage is indicated in units of 0.1 V.

3 Data mode

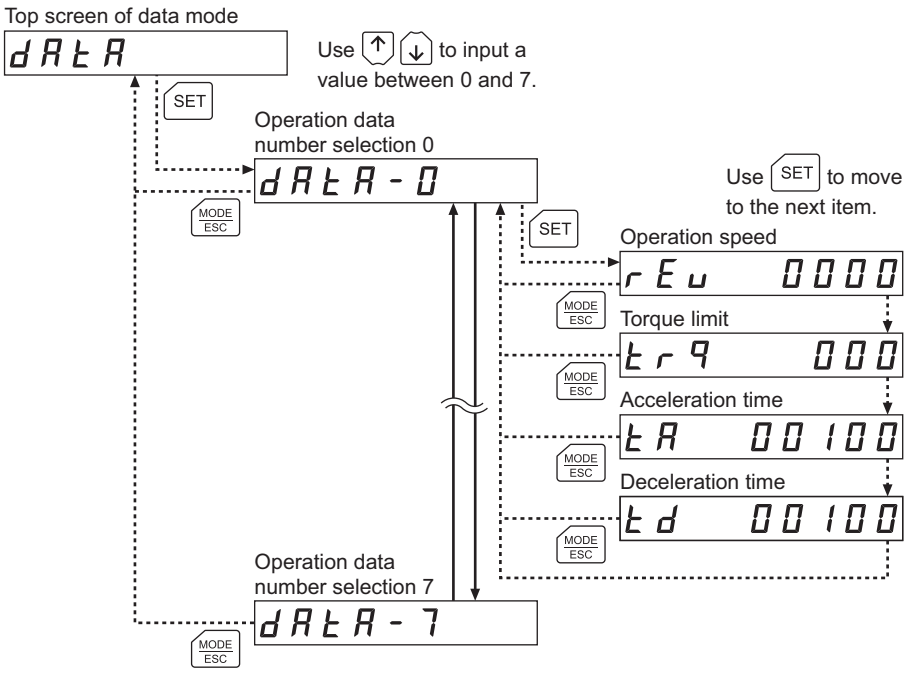
Up to eight sets of motor operation data can be set. Once set, the operation data is stored in the driver. The data will not be lost even after the **OPX-2A** is disconnected from the driver.
Before setting operation data, read the **NX** Series Driver OPERATING MANUAL carefully to understand the basic operations, functions and other details of the driver.

Note

- Operation data has significant bearing on motor operation. Before setting any operation data, make sure you fully understand the content of the operation data.
- If operations are limited by the edit lock function (p.9), operation data cannot be edited.

3.1 Operation in the data mode

1. Use the【MODE/ESC】key to select the data mode.
2. Press the【SET】key in the top screen of the data mode.
3. Use the【↑】【↓】keys to select a desired operation data number.
4. Press the【SET】key.
   The display changes to the operation data setting screen.
5. Use the【SET】key to select the operation data item you want to set.
6. Pressing the【SET】key on the screen showing the last operation data item will return the display to the operation number selection screen.



You can select a desired operation data set based on a combination of ON/OFF statuses of M0 to M2 inputs of the driver.

Operation data number	M2 input	M1 input	M0 input
0	OFF	OFF	OFF
1	OFF	OFF	**ON**
2	OFF	**ON**	OFF
3	OFF	**ON**	**ON**
4	**ON**	OFF	OFF
5	**ON**	OFF	**ON**
6	**ON**	**ON**	OFF
7	**ON**	**ON**	**ON**

3.2 Setting items

Item	Initial value	Setting range	Description
Operation speed	0	0 to 5500 [r/min]	Sets the operating speed.
Torque limit	0	0 to 300 [%]	Sets the torque limit value.
Acceleration time	100	5 to 10,000 [ms/(1000 r/min)]	Sets the acceleration time per 1000 r/min.
Deceleration speed	100	5 to 10,000 [ms/(1000 r/min)]	Sets the deceleration time per 1000 r/min.

Note If the value you have input is outside the setting range, “Error” will be displayed for 1 second. If this error display appears, input a different value that falls within the setting range.

3.3 Initializing operation data

You can revert operation data saved in the driver to their initial values.
For details, refer to 6.6, “Initializing driver data” on p.79.

4 Parameter mode

You can set parameters relating to motor operation and control. These parameters are saved in the driver. Before setting parameters, read the **NX** Series Driver OPERATING MANUAL carefully to understand the basic operations, functions and other details of the driver.

Note Parameters have significant bearing on motor operation. Before setting any parameter, make sure you fully understand the content of the parameter.

4.1 Types of parameters

Application parameters and system parameters are handled in the parameter mode.

■ Application parameters

When an application parameter is changed, the new parameter becomes effective immediately.
Six types of parameters are available on the levels below the application parameter screen. These parameters are classified as follows.

Parameter classification	Description
Gain	Set the gain. The available parameter items vary depending on the tuning method.
I/O	Set the parameters relating to I/O signals.
Analog	Set the parameters relating to analog I/Os.
Alarm/warning	Set the condition under which each alarm or warning generates.
Function setting	Set the mechanical rigidity setting switch and parameters relating to anti-vibration control.
Manual operation/ display	Set the operating speed used in JOG operation in the test mode, as well as the display method of monitored speed on the data setter.

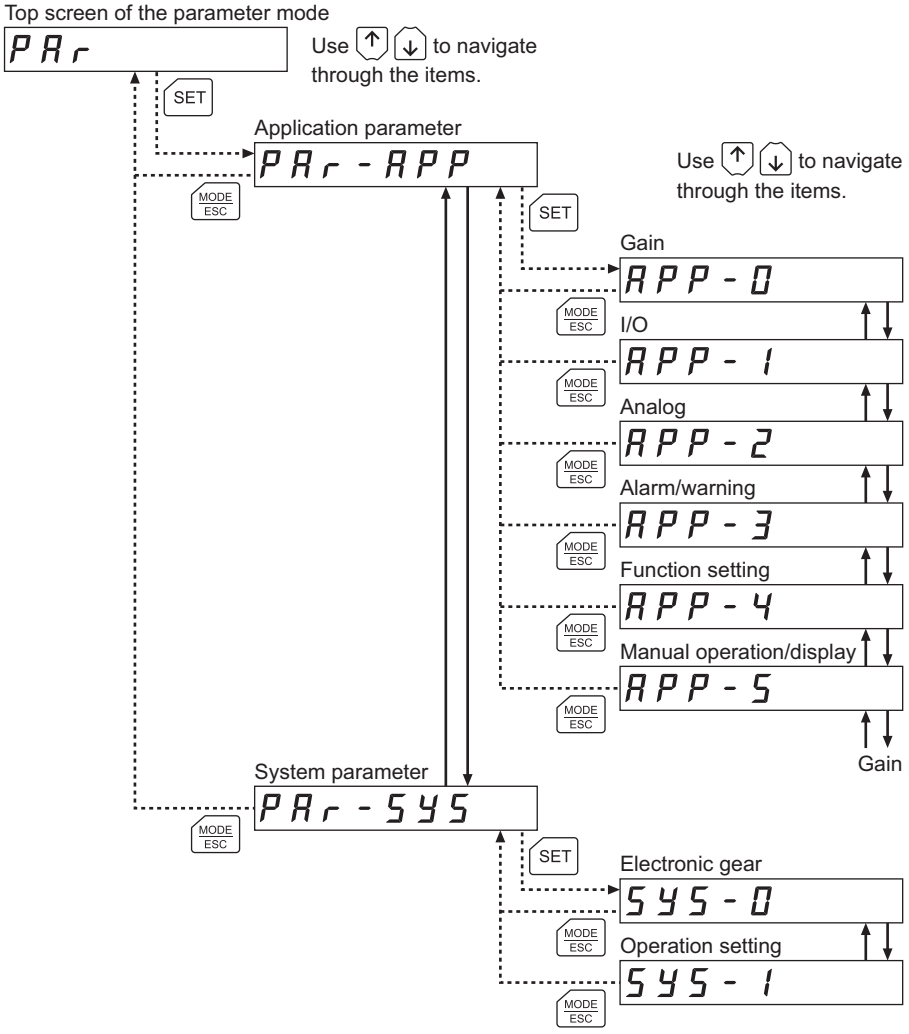
■ System parameters

When a system parameter is changed, the new parameter will become effective only after the power is cycled. If a 24 VDC power supply is used, also cycle the 24 VDC power supply.
Two types of parameters are available on the levels below the system parameter screen. These parameters are classified as follows.

Parameter classification	Description
Electronic gear	Set the electronic gear.
Operation setting	Set the stopping operation in the speed control mode, motor rotation direction, etc.

4.2 Operation in the parameter mode

1. Use the 【MODE/ESC】 key to select the parameter mode.
2. Press the 【SET】 key in the top screen of the parameter mode, and use the 【↑】【↓】 keys to select the application parameters or system parameters.
3. Press the 【SET】 key again to move to the parameter item screen.
4. Use the 【↑】【↓】 keys to select the parameter you want to change.



Note If the value you have input is outside the setting range, “Error” will be displayed for 1 second. If this error display appears, input a different value that falls within the setting range.

4.3 Setting example

Pressing the【SET】key in the parameter item screen enables parameter setting.
How a parameter is set are explained below.

Example: Set the gain tuning mode to “semi-auto”

1. Use the【MODE/ESC】key to select the parameter mode.
   The “PAR” LED is lit.

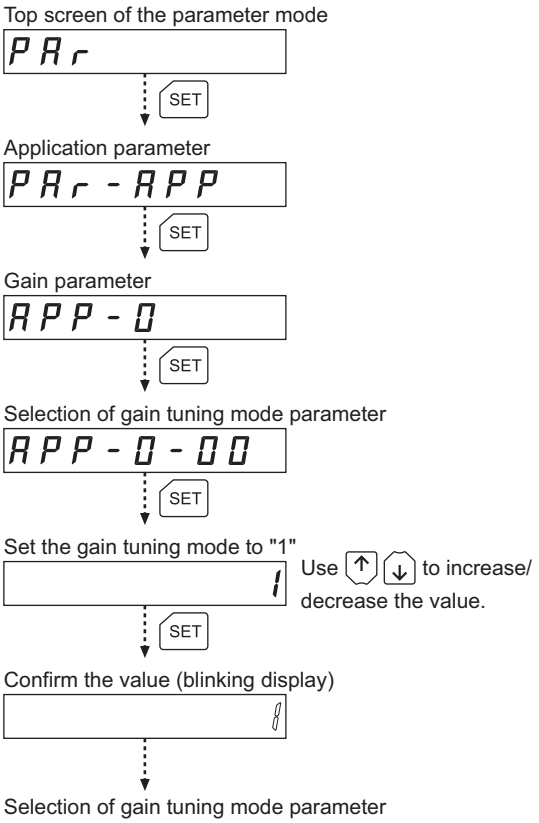
2. Press the【SET】key.
   The display changes to the application parameter screen.

3. Press the【SET】key.
   The display changes to the gain parameter screen.

4. Press the【SET】key.
   The screen for setting the gain tuning mode is displayed.

5. Press the【SET】key, and use the【↑】key to select “1.”
   “1” indicates the semi-auto mode.

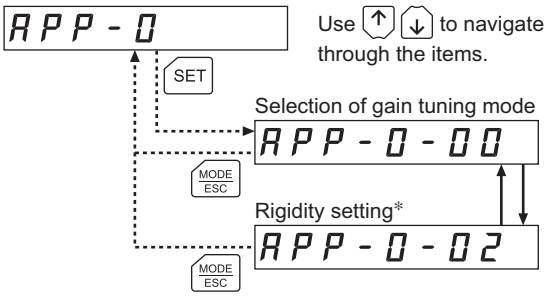
6. Press the【SET】key again.
   The selected value is set, and the display returns to the screen for setting the gain tuning mode.



Note If the value you have input is outside the setting range, “Error” will be displayed for 1 second. If this error display appears, input a different value that falls within the setting range.

4.4 Description of application parameters

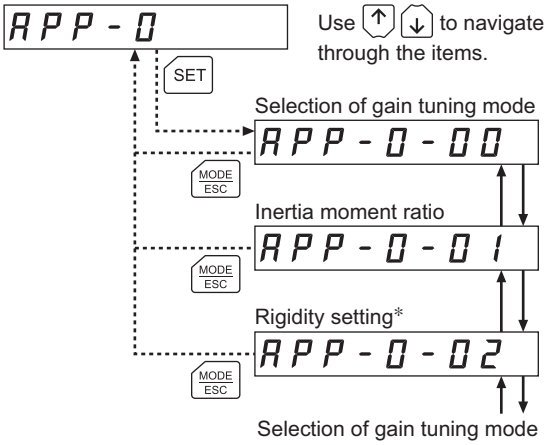
■ Gain parameters (automatic tuning)



Initial value	Setting range	Description
0	0: Auto 1: Semi-auto 2: Manual	Selects the gain tuning mode.
6	0 to 15	Selects the mechanical rigidity for automatic, semi-auto or manual tuning.

∗ This parameter is used when the rigidity setting SW parameter [APP-4-00] is set to "0: Disable." If this parameter is set to "1: Enable," the mechanical rigidity setting switch (SW2) on the driver is used to set the mechanical rigidity.

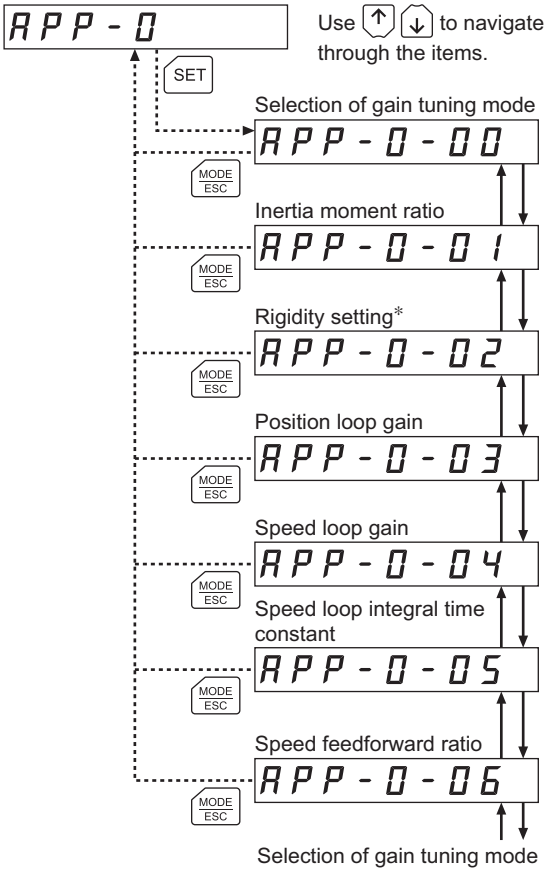
■ Gain parameter (semi-auto tuning)



Initial value	Setting range	Description
0	0: Auto 1: Semi-auto 2: Manual	Selects the gain tuning mode.
500	0 to 10000 [%]	Sets the ratio of load inertial moment and motor inertial moment.
6	0 to 15	Selects the mechanical rigidity for automatic, semi-auto or manual tuning.

∗ This parameter is used when the rigidity setting SW parameter [APP-4-00] is set to "0: Disable." If this parameter is set to "1: Enable," the mechanical rigidity setting switch (SW2) on the driver is used to set the mechanical rigidity.

■ Gain parameter (manual tuning)

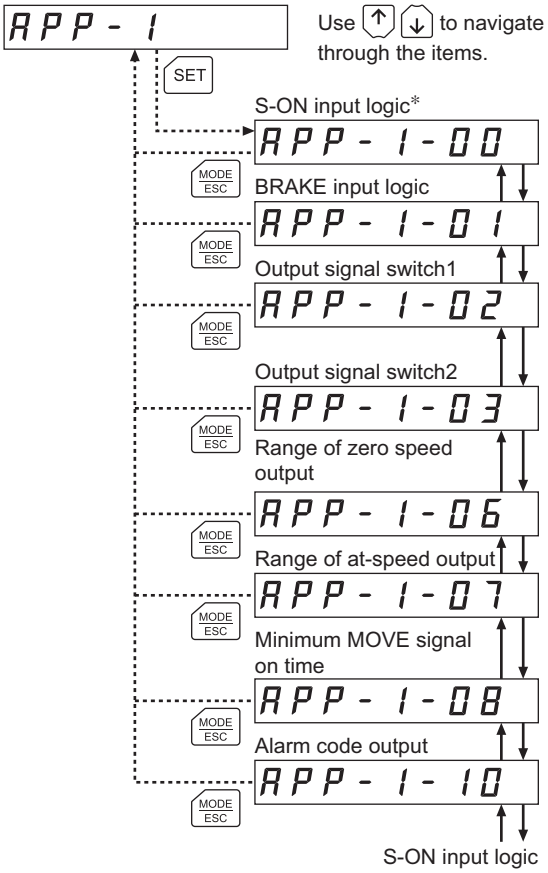


Initial value	Setting range	Description
0	0: Auto 1: Semi-auto 2: Manual	Selects the gain tuning mode.
500	0 to 10000 [%]	Sets the ratio of load inertial moment and motor inertial moment.
6	0 to 15	Selects the mechanical rigidity for automatic, semi-auto or manual tuning.
10	1 to 200 [Hz]	Sets the position loop gain. When this value is increased, the response will increase.
50	1 to 1000 [Hz]	Sets the speed loop gain. When this value is increased, the response will increase.
31.8	1.0 to 500.0 [ms]	Sets the speed loop integral time constant. When this value is decreased, the response will increase.
0	0 to 100 [%]	Sets the speed feedforward ratio. This setting can be used to shorten the positioning time.

∗1 This parameter is used when the rigidity setting SW parameter [APP-4-00] is set to "0: Disable." If this parameter is set to "1: Enable," the mechanical rigidity setting switch (SW2) on the driver is used to set the mechanical rigidity.

∗2 This parameter is displayed when the action at halt for speed control mode parameter [SyS-1-02] is set to "1: Servo lock."

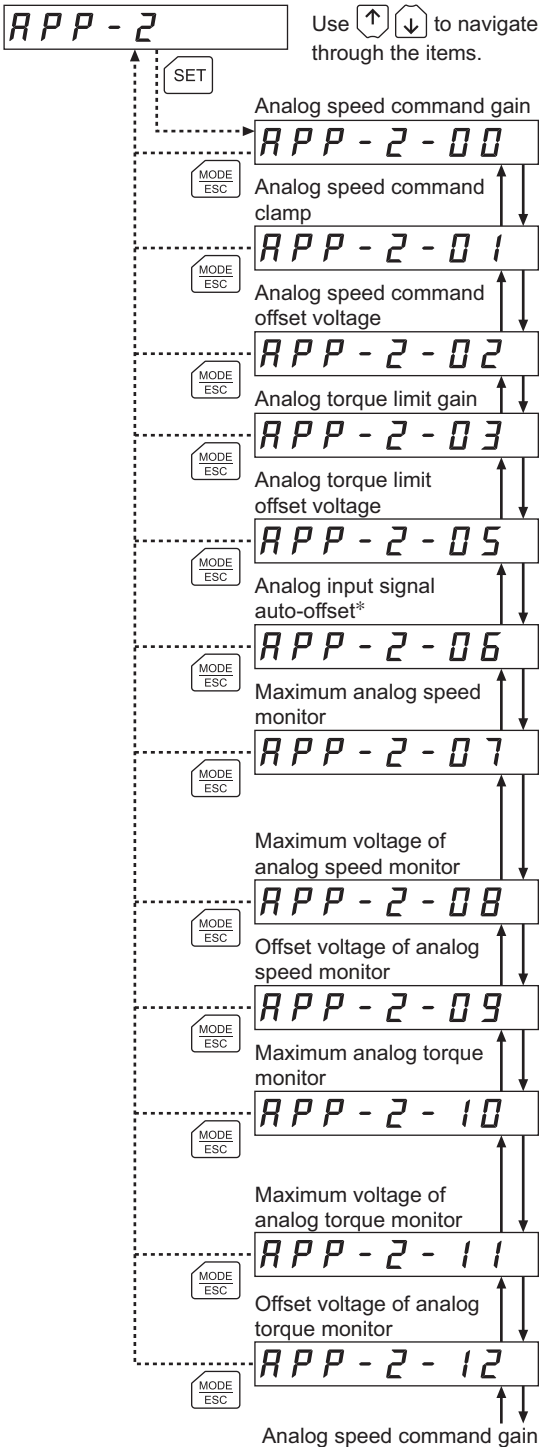
■ I/O parameters



Initial value	Setting range	Description
0	0: N.O. set 1: N.C. set	Changes the S-ON input logic.
1	0: N.O. set 1: N.C. set	Changes the BRAKE output logic.
0	0: WNG 1: MOVE 2: MBC	Selects an output signal.
0	0: ZSG2 1: ZV	Selects an output signal.
10	1 to 5500 [r/min]	Sets the output condition for ZV output.
30	1 to 5500 [r/min]	Sets the output condition for VA output.
5	0 to 255 [ms]	Sets the minimum ON time for MOVE output.
0	0: Disable 1: Enable	Changes the setting to enable/disable alarm code output.

* This parameter is displayed when the action at halt for speed control mode parameter [SyS-1-02] is set to "1: Servo lock."

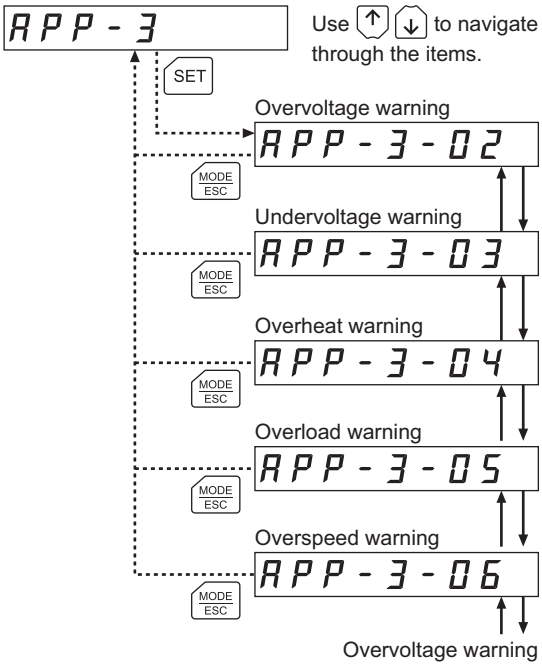
■ Analog parameters



Initial value	Setting range	Description
550	0 to 5500 [r/min]	Sets the speed command per 1 V of analog input voltage.
10	0 to 500 [r/min]	Sets the speed at which the analog speed command is clamped to zero.
0	−1.00 to 1.00 [V]	Sets the offset voltage for analog speed command input.
30	0 to 300 [%]	Sets the torque limit per 1-V of analog input voltage.
0	−1.00 to 1.00 [V]	Sets the offset voltage for analog torque limit input.
0	0: Disable 1: Enable	Changes the setting to enable/disable the automatic offset for analog input signal.
5500	1 to 6000 [r/min]	Sets the maximum value of monitored analog speed. This setting determines the slope of monitored analog speed output.
10	1 to 10 [V]	Sets the monitor output voltage at the maximum value of monitored analog speed.
0	−1.00 to 1.00 [V]	Sets the offset value for monitored analog speed.
300	1 to 300 [%]	Sets the maximum value of monitored analog torque. This setting determines the slope of monitored analog torque output.
10	1 to 10 [V]	Sets the monitor output voltage at the maximum value of monitored analog torque.
0	−1.00 to 1.00 [V]	Sets the offset voltage for monitored analog torque.

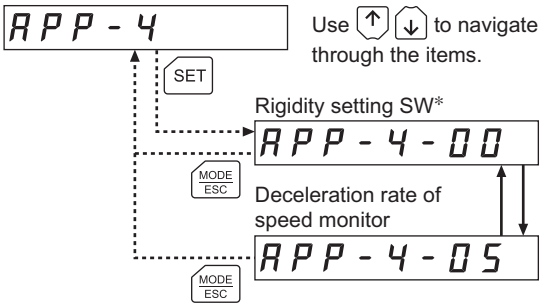
∗ When the analog input signal auto-offset parameter [APP-2-06] is set to "1: Enable," the analog speed input offset (p.73) or analog torque input offset (p.74) is enabled in the test mode.

■ Alarm/warning parameters



Initial value	Setting range	Description
390	320 to 400 [V]	Sets the voltage at which an overvoltage warning generates.
125	120 to 280 [V]	Sets the voltage at which an undervoltage warning generates.
80	40 to 85 [°C]	Sets the temperature at which an overheat warning generates.
90	1 to 100 [%]	Sets the condition under which an overload warning generates.
5800	1 to 6000 [r/min]	Sets the speed at which an overspeed warning generates.

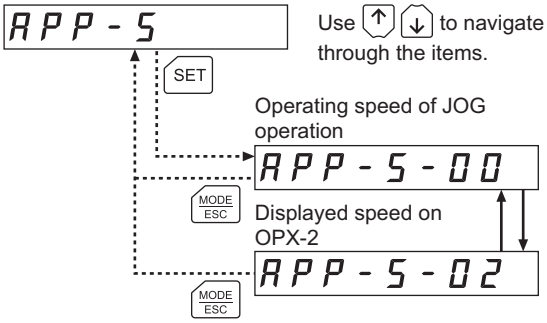
■ Function setting parameters



Initial value	Setting range	Description
1	0: Disable 1: Enable	Changes the setting to enable/disable the mechanical rigidity setting switch (SW2) on the driver.
1	1.0 to 100.0	Sets the gear ratio of geared motor for speed monitor.

∗ When the rigidity setting SW parameter [APP-4-00] is set to "0: Disable," the value in the rigidity setting parameter [APP-0-02] is enabled.

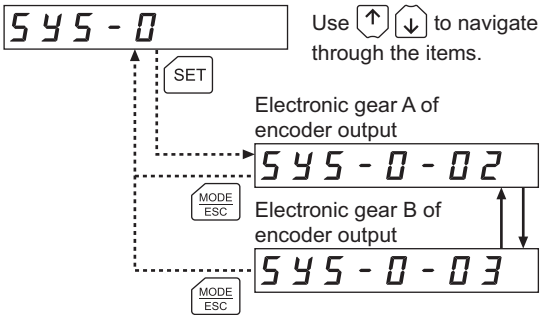
■ Manual operation and display parameters



Initial value	Setting range	Description
30	1 to 300 [r/min]	Sets the operating speed for JOG operation.
0	0: Signed 1: Unsigned	Sets the display method of monitored speed.

4.5 Description of system parameters

■ Electronic gear parameters



Initial value	Setting range	Description
1	1 to 1000	Sets the denominator of electronic gear for encoder output.
1	1 to 1000	Sets the numerator of electronic gear for encoder output.

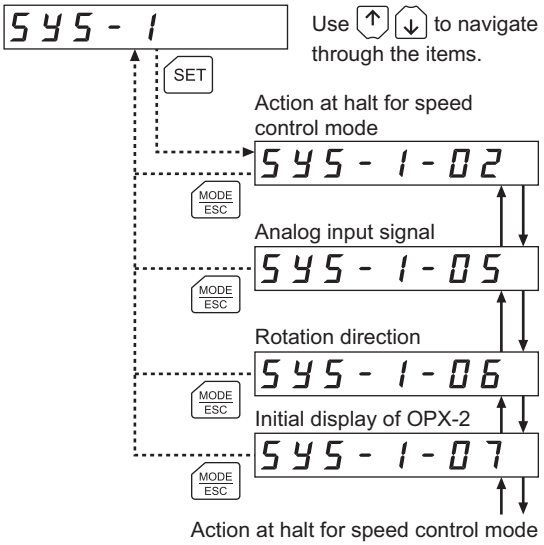
Encoder output resolution

The value of encoder output resolution can be changed as follows using the electronic gear parameters [SyS-0-02] and [SyS-0-03]. Note that the calculated value must be inside the setting range specified below:

Resolution setting range: 100 to 10,000 P/R

$$\text{Encoder output resolution [P/R]} = 1000 \times \frac{\text{Electronic gear B of encoder output [SyS-0-03]}}{\text{Electronic gear A of encoder output [SyS-0-02]}}$$

■ Operation setting parameters



Initial value	Setting range	Description
0	0: Free 1: Servo lock	Sets the stopping operation in the speed control mode.
1	0: Disable 1: Enable	Change the setting to enable/disable the analog input signal.
1	0: + = CCW 1: + = CW	Selects the motor rotation direction.
0	0: Operating speed [r/min] 1: Position [step] 2: Torque [%] 3: Estimated inertia moment ratio [%] 4: Operation number 5: Selection number 6: Tension [%] 7: Rotation counter [rev] 8: Shaft diameter [mm] 9: Top display of monitor mode	Selects the initial screen to be displayed when the data setter starts communicating with the driver. If the selected item is not supported in the speed control mode, the top screen of the monitor mode is displayed as the initial display.

4.6 Initializing parameters

You can revert parameters saved in the driver to their initial values.
For details, refer to 6.6, “Initializing driver data” on p.79.

5 Test mode

5.1 What you can do in the test mode

- I/O test

  You can check the ON/OFF status of each input signal of the driver, or switch the ON/OFF status of each output signal on the **OPX-2A**. You can also check the analog input voltage and set a desired analog output voltage.
  There is also an I/O test function with which you can check the connection status of the driver.

- JOG operation

  You can operate the motor using the keys on the **OPX-2A**.

- Z-phase preset

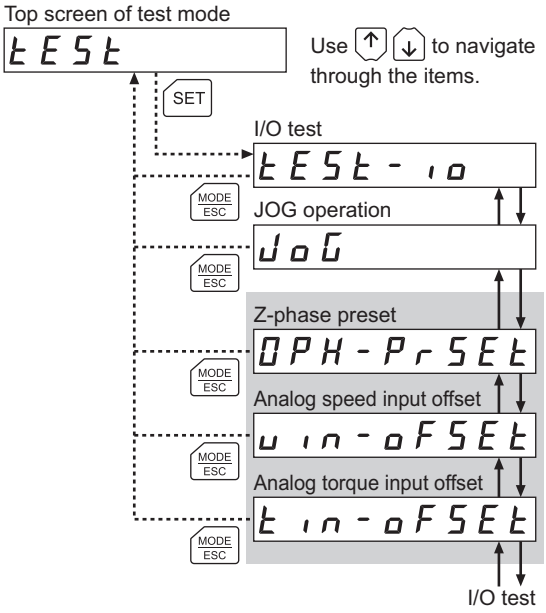
  You can preset the Z-phase position.

- Analog input offset

  You can offset the analog speed input and analog torque input.

5.2 Operation in the test mode

1. Use the 【MODE/ESC】 key to select the test mode.
2. Press the 【SET】 key in the top screen of the test mode.
   The display changes to the test mode item screen.
3. Use the 【↑】【↓】 keys to select the item you want to perform.



∗ If operations are limited by the edit lock function (p.9), the screen text in gray is not shown.

Note

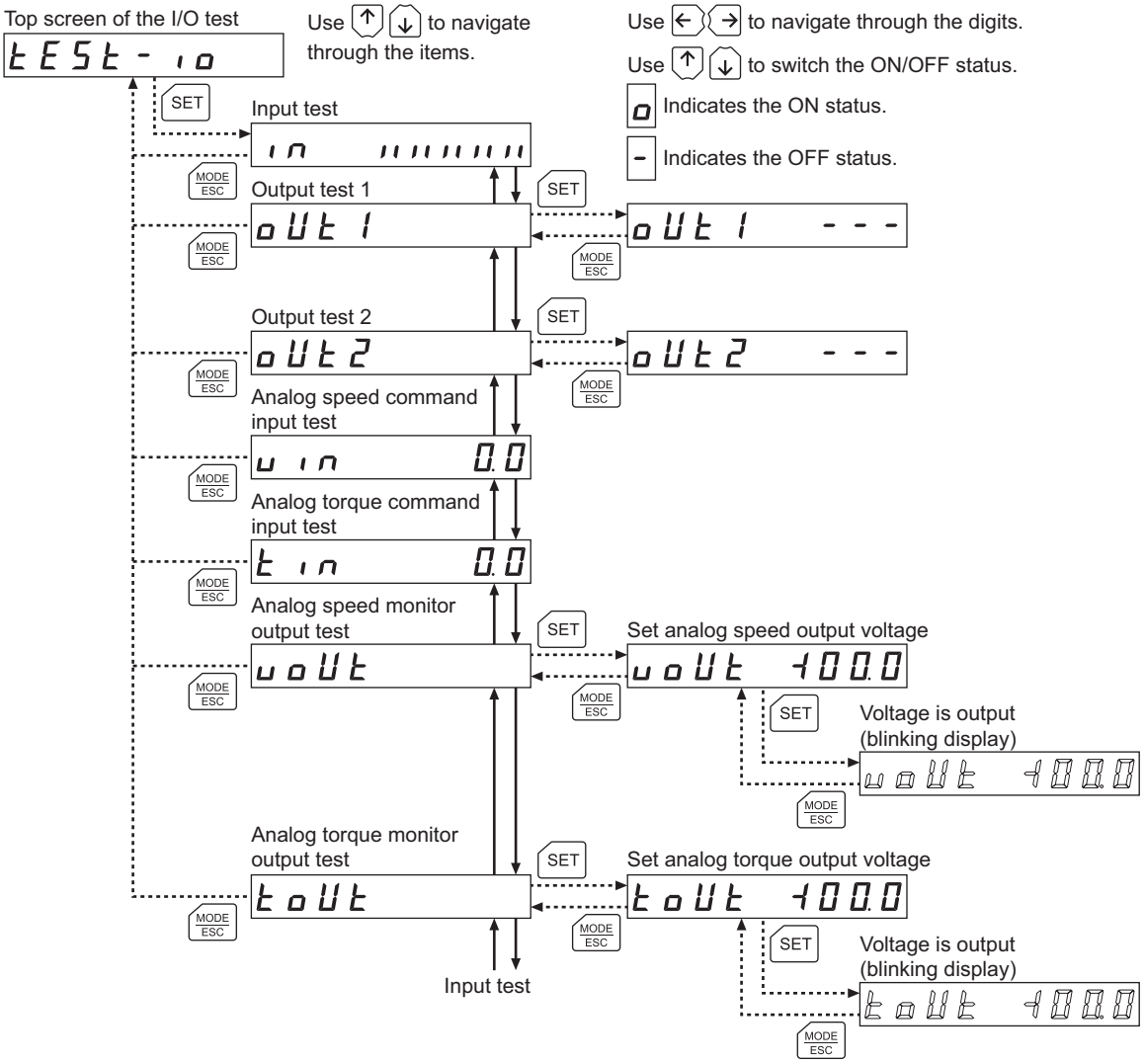
- Stop the motor operation before changing to the test mode.
- When you move from the top screen of the test mode to a lower level, the CW/CCW input will be disabled.
- When you move from a non-JOG-operation item to a lower level, all I/O signals and operations will be disabled.

What happens when the【SET】key is pressed while the motor is operating

While the motor is operating, you cannot move to any lower level from the top screen of the test mode. Pressing the【SET】key will generate an error, and “oPE-Err” will be shown.
Be sure to stop the motor operation before pressing the【SET】key.

5.3 I/O test

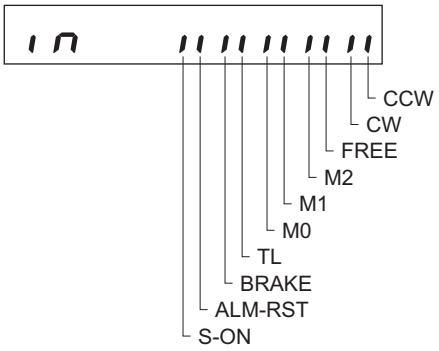
You can check the ON/OFF status of each input signal of the driver, or switch the ON/OFF status of each output signal on the **OPX-2A**. You can also check the analog input voltage and set a desired analog output voltage.
There is also an I/O test function with which you can check the connection status of the driver.



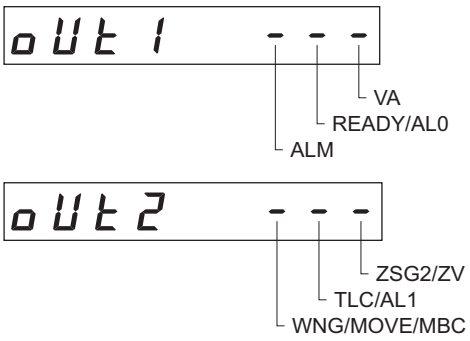
- Checking I/O signals

  On the I/O signal check screen, each digit on the 7-segment LED display corresponds to a signal. If the signal is ON, the corresponding digit is lit. If the signal is OFF, the digit is unlit.

  • Input signals

  • Output signals

- Analog input test

  The analog speed input voltage and analog torque input voltage are shown.
  Each voltage is indicated in units of 0.1 V.

- Analog output test

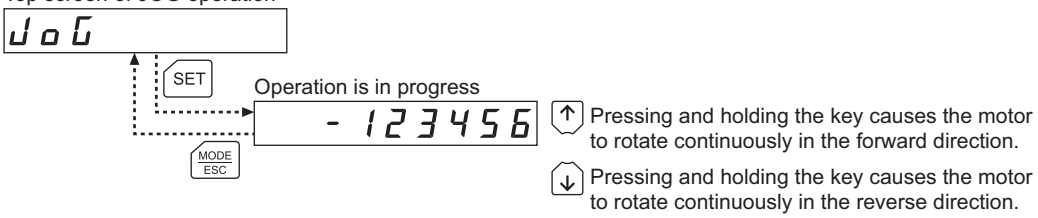
  When an output voltage is set and the【SET】key is pressed, the specified voltage will be output from the analog monitor terminal of the driver. The setting range is −10.0 to +10.0 V.

5.4 JOG operation

You can operate the motor using the keys on the **OPX-2A**.
The operating speed corresponds to the value set in the operating speed of JOG operation parameter [APP-5-00].

Note During JOG operation, the motor rotates at the specified operating speed while each applicable key is pressed. Before commencing JOG operation, consider the status of the equipment and condition of its surroundings to confirm thoroughly that motor rotation will not cause any dangerous situation.

Top screen of JOG operation

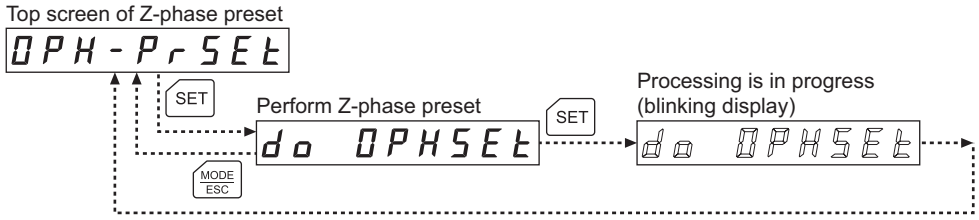


5.5 Presetting Z-phase

In this operation, a Z-phase signal is output at the current position.

Note

- If operations are limited by the edit lock function (p.9), the preset function cannot be performed.
- When Z-phase preset is performed, the Z-phase position will be tentatively written to the driver's EEPROM. When the power is turned on the next time, the Z-phase position that was written earlier will be reflected in the motor encoder. The EEPROM and encoder memory can be rewritten approx. 100,000 times.
- When a different motor is connected, the content of the encoder memory of the new motor will be read into the driver. Accordingly, the Z-phase position will also change to reflect the new motor.

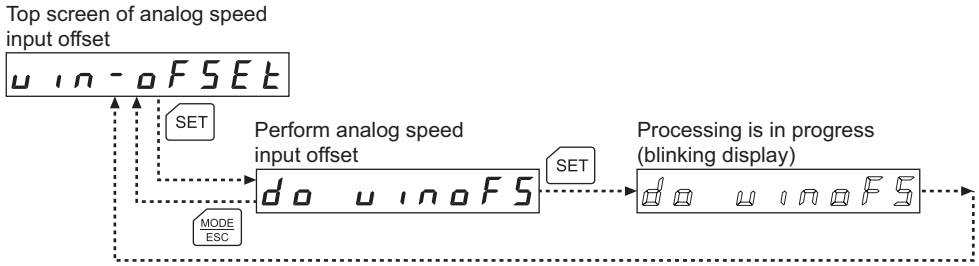


5.6 Offsetting the analog speed input

This function cannot be used when the analog input signal auto-offset parameter [APP-2-06] is set to "1: Enable." When a voltage of 0 V is input to the analog speed input terminal and the offset function is performed, the offset voltage will be adjusted automatically and the adjusted voltage will be saved in the driver.

Note

- If operations are limited by the edit lock function (p.9), the offset function cannot be performed.
- If the offset function is performed, the offset voltage will be written to the driver's EEPROM. The EEPROM can be rewritten approx. 100,000 times.

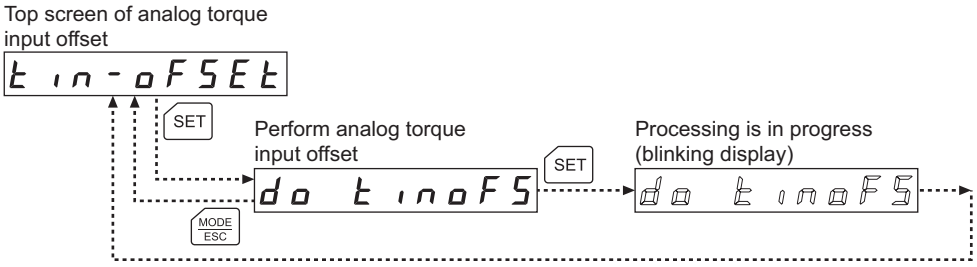


5.7 Offsetting the analog torque input

This function cannot be used when the analog input signal auto-offset parameter [APP-2-06] is set to "1: Enable." When a voltage of 0 V is input to the analog torque input terminal and the offset function is performed, the offset voltage will be automatically adjusted and the adjusted voltage will be saved in the driver.

Note

- If operations are limited by the edit lock function (p.9), the offset function cannot be performed.
- If the offset function is performed, the offset voltage will be written to the driver's EEPROM. The EEPROM can be rewritten approx. 100,000 times.



6 Copy mode

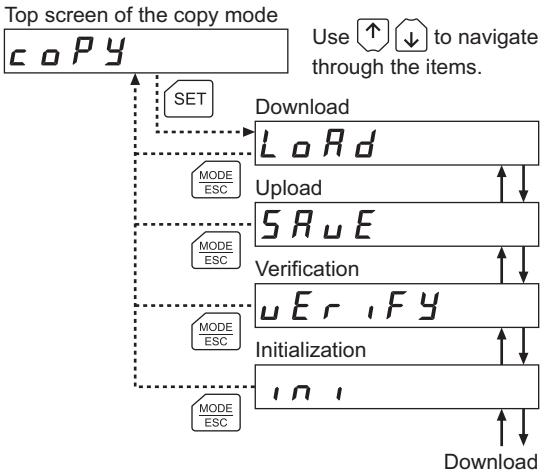
The **OPX-2A** has four data banks, and operation data and parameters can be saved in each of these data banks. Since an EEPROM is used as the data memory element, stored data will be retained even after the power is turned off.
In the copy mode, you can download data saved in the **OPX-2A** to the driver. You can also upload data saved in the driver to the **OPX-2A**.
It is also possible to verify data in the **OPX-2A** against the corresponding data in the driver, or revert driver data to their initial values.

6.1 What you can do in the copy mode

- Download
  Copy data saved in the **OPX-2A** to the driver.
- Upload
  Copy data saved in the driver to the **OPX-2A**.
- Verification
  Verify data in the **OPX-2A** against the corresponding data in the driver.
- Initializing driver data
  Revert data saved in the driver to their initial values.

6.2 Operation in the copy mode

1. Use the【MODE/ESC】key to select the copy mode.
2. Press the【SET】key in the top screen of the copy mode.
   The display changes to the copy mode item screen.
3. Use the【↑】【↓】keys to select the item you want to perform.



Note
- Stop the motor operation before changing to the copy mode.
- When you move from the top screen of the copy mode to a lower level, the CW/CCW input will be disabled.

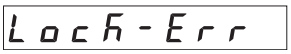
- What happens when the【SET】key is pressed while the motor is operating

  While the motor is operating, you cannot move to any lower level from the top screen of the copy mode. Pressing the【SET】key will generate an error, and "oPE-Err" will be shown.
  Be sure to stop the motor operation before pressing the【SET】key.

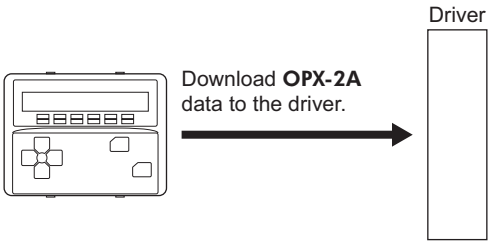
- What happens when the【SET】key is pressed while the edit lock is enabled

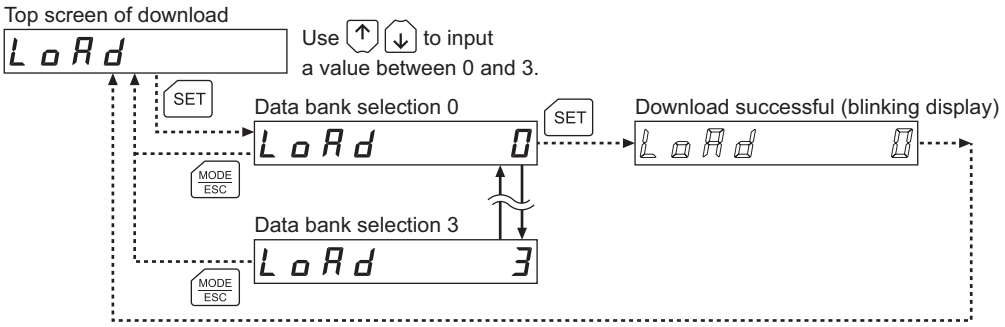
  While the edit lock is enabled, you cannot move to any lower level from the top screen of the copy mode. Pressing the【SET】key will generate an error, and "LocK-Err" will be shown.
  Be sure to cancel the edit lock before pressing the【SET】key. Refer to p.9 for the procedure to cancel the edit lock.

6.3 Downloading to the driver

In this operation, data in the specified data bank number are downloaded to the driver.





Note

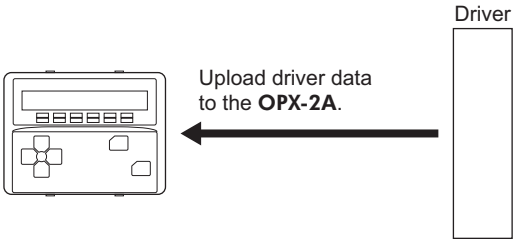
- System parameters that have been changed will become effective after the power is cycled. If the system parameters have been changed as a result of the download, cycle the driver power. If a 24 VDC power supply is used, also cycle the 24 VDC power supply.
- Do not turn off the driver power while the download is still in progress (= while the display is blinking). Doing so may damage the data.

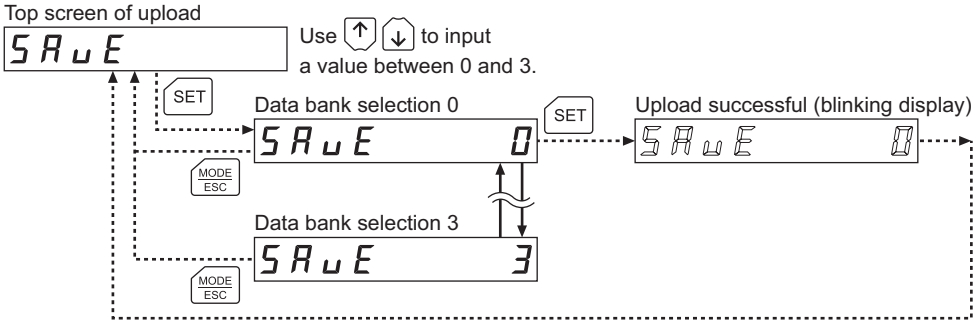
If a download error occurs, a code indicating the nature of the error will blink on the display. Download will not be performed and the display will return to the top screen of download.

Blinking display	Description	Action
Prod-Err	The product series of the driver to which data is downloaded is wrong.	• Check the product series of the driver. • Check the data bank number on the **OPX-2A**.
ctL-Err	The control mode of the driver is different from that of the **OPX-2A**.	Check the control mode of the driver.
HEAd-Err bcc-Err	An error occurred while data was being downloaded.	Perform download again. If the same error occurs, the data saved in the **OPX-2A** may be damaged. Upload the applicable data to set the **OPX-2A** data again.
no-dAtA	The data bank of the specified data bank number does not contain data.	Check the data bank number.
dAtA-Err	An error occurred while data was being written.	Perform download again.

6.4 Uploading to the OPX-2A

In this operation, data saved in the driver is uploaded to the specified data bank number.

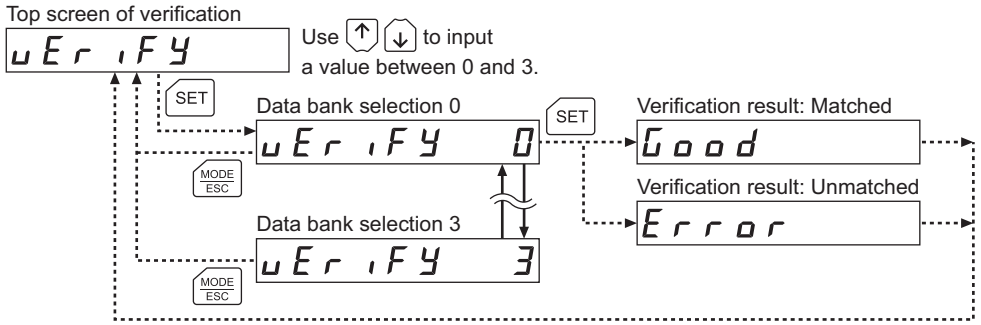




Note Do not turn off the driver power while the upload is still in progress (= while the display is blinking). Doing so may damage the data.

6.5 Verifying data

In this operation, data in the specified data bank number are verified against the corresponding data saved in the driver.
If the verification finds that the two sets of data match, “Good” will be shown. If the two do not match, “Error” will be shown.

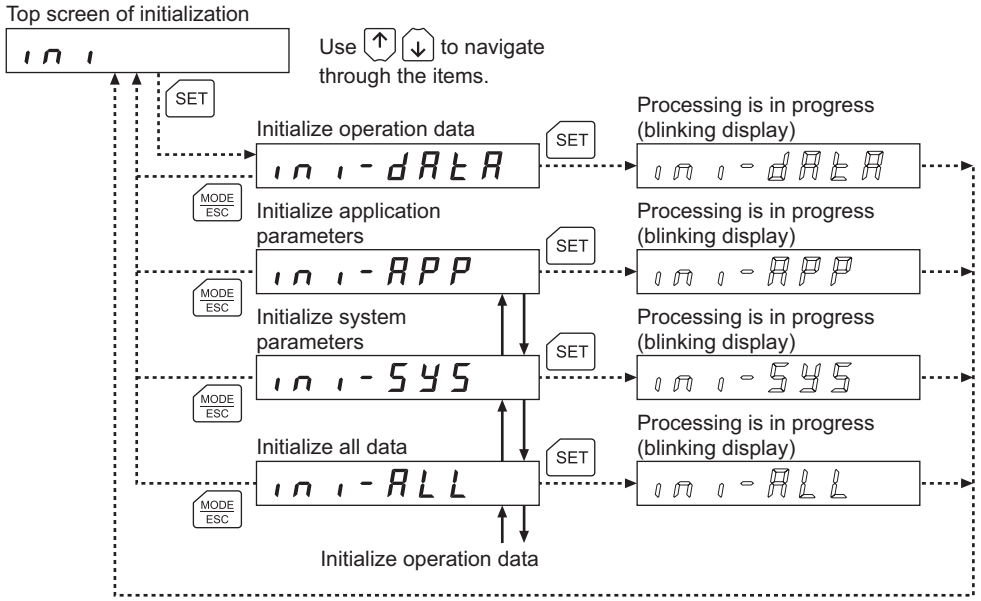


If a verification error occurs, a code indicating the nature of the error will blink on the display.
Verification will not be performed and the display will return to the top screen of verification.

Blinking display	Description	Action
Prod-Err	The product series of the driver against which data is verified is wrong.	• Check the product series of the driver. • Check the data bank number on the **OPX-2A**.
ctL-Err	The control mode of the driver is different from that of the **OPX-2A**.	Check the control mode of the driver.
HEAd-Err bcc-Err	An error occurred while data was being verified.	Perform verification again. If the same error occurs, the data saved in the **OPX-2A** may be damaged. Upload the applicable data to set the **OPX-2A** data again.
no-dAtA	The specified data bank number does not contain data.	Check the data bank number.

6.6 Initializing driver data

In this operation, data saved in the driver are reverted to their initial values.



Note

- System parameters that have been changed will become effective after the power is cycled. If the system parameters have been changed as a result of the initialization, cycle the driver power. If a 24 VDC power supply is used, also cycle the 24 VDC power supply.
- Do not turn off the driver power while the initialization is still in progress (= while the display is blinking). Doing so may damage the data.

Operation in the torque control mode

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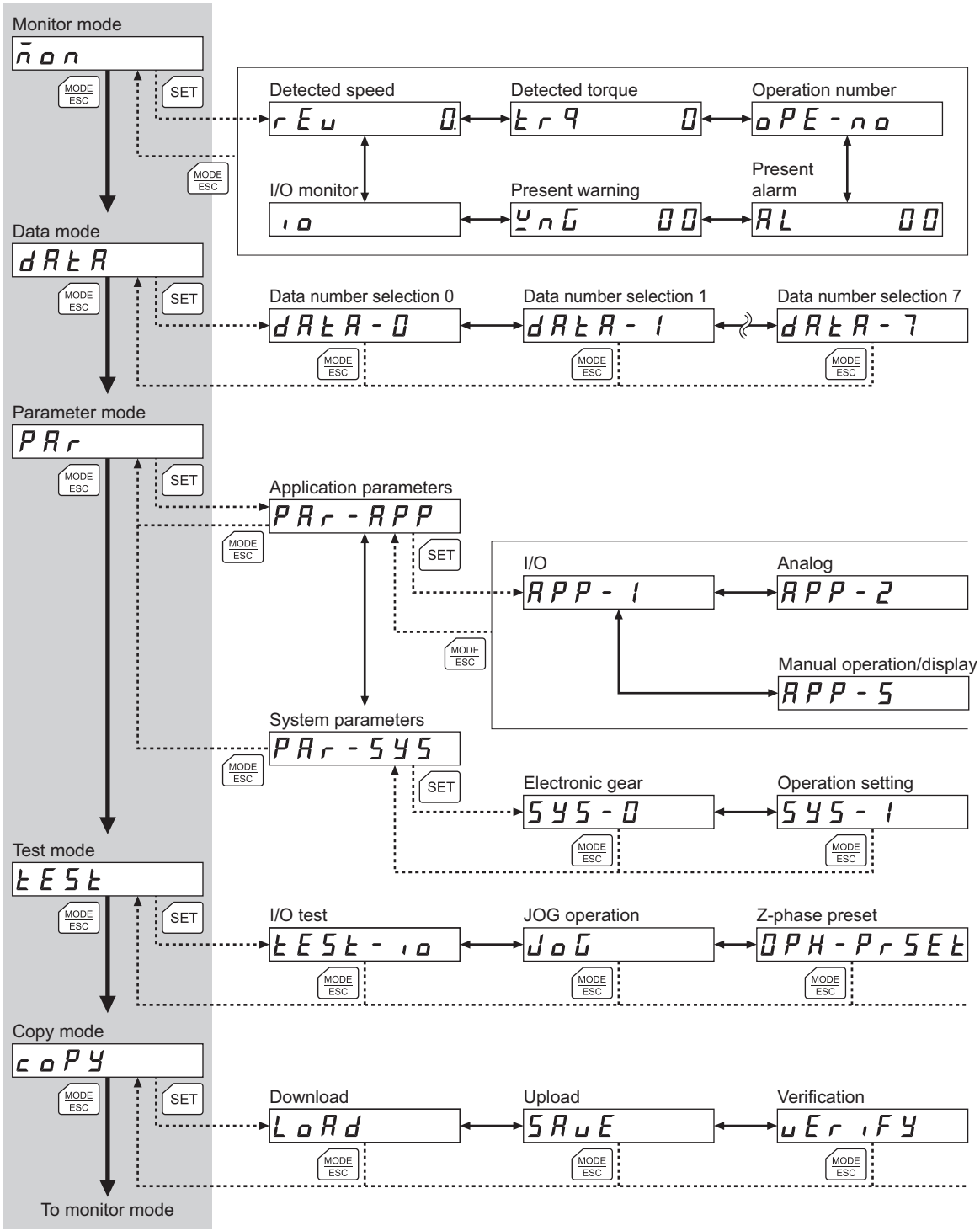
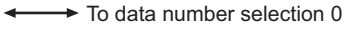
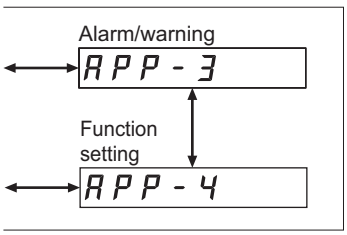
1 Screen transitions in the torque control mode

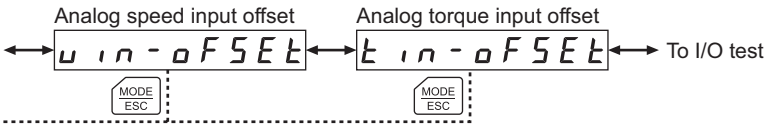
Top screen

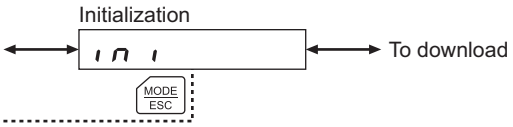


Note The following operations cannot be performed while the edit lock function (p.9) is enabled: Edit operation data, edit parameters, clear alarm/warning records, preset Z-phase, offset the analog speed input, offset the analog torque input, perform operations in the copy mode









2 Monitor mode

2.1 What you can do in the monitor mode

- Monitoring the operating status

  You can monitor the detected motor speed, detected torque and current operation number in real time.

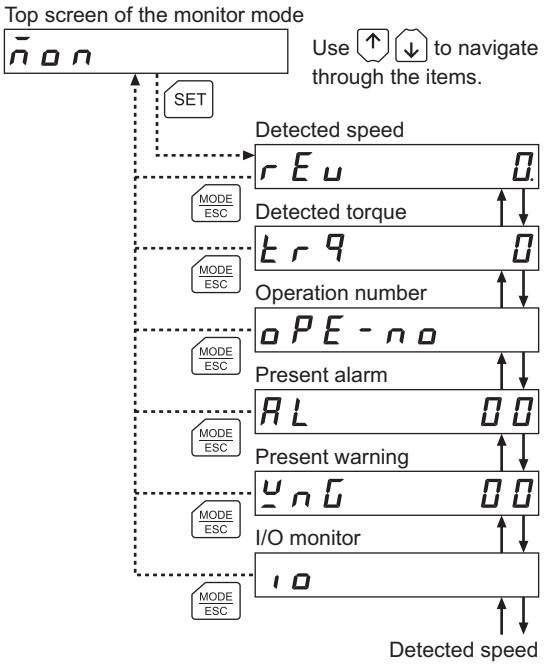
- Checking alarms/warnings, clearing alarm/warning records, and resetting alarms
  - If an alarm or warning generates, a corresponding alarm code or warning code will be displayed. You can check the code to identify the details of the alarm/warning.
  - Up to ten most recent alarms/warnings can be displayed, starting from the latest one.
  - You can reset the alarms currently present.
  - You can clear alarm/warning records.

- Checking I/O signals

  You can check the ON/OFF status of each I/O signal of the driver, as well as the analog input voltage.

2.2 Operation in the monitor mode

1. Use the【MODE/ESC】key to select the monitor mode.
2. Press the【SET】key in the top screen of the monitor mode.
   The display changes to the monitor mode item screen.
3. Use the【↑】【↓】keys to select the item you want to monitor.



2.3 Monitor items

■ Detected speed

You can check the speed of the motor (unit: r/min).
While the motor is rotating in the CCW direction, "–" is shown in front of the displayed value. If the speed is indicated by an absolute value, no sign is shown to indicate the rotating direction. You can select the value display format using the displayed speed on OPX-2 parameter [APP-5-02] (p.96).
You can also display the motor speed as revolutions of the gear output shaft. For this setting, use the deceleration rate of speed monitor parameter [APP-4-05] (p.96).

■ Detected torque

You can check the generated motor torque.
The generated torque is indicated as a percentage of the rated torque being 100%.

■ Operation number

You can check the operation data number corresponding to the data used in the current operation.

■ Present alarm

When an alarm generates, a corresponding alarm code will be displayed.
You can also reset alarms or check and clear alarm records.

Note Do not turn off the driver power while an alarm is being reset or alarm records are being cleared (= while the display is blinking). Doing so may damage the data.

- How to reset an alarm

1. While an alarm is displayed, press the【SET】key to move to the lower level.
2. Press the【↑】key twice to select the alarm reset screen.
3. Press the【SET】key.
   The alarm is reset.

Note Some alarms cannot be reset on the **OPX-2A**. For details, refer to "Alarm code list" on p.86. To reset these alarms, you must cycle the power.

- How to check an alarm record

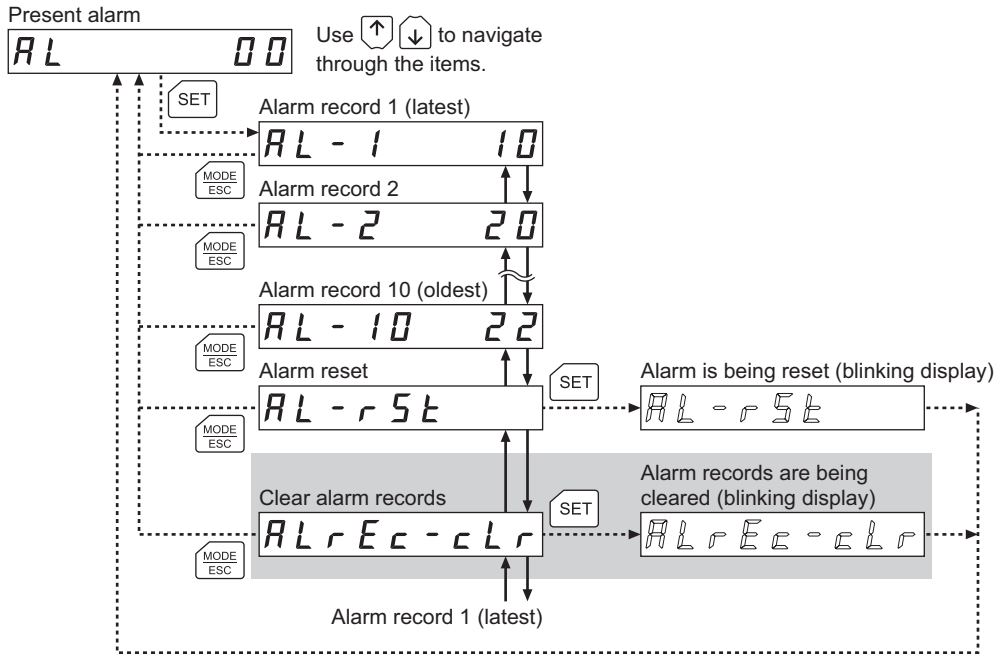
You can check up to ten most recent alarms, starting from the latest one.

1. While an alarm is displayed, press the【SET】key to move to the lower level.
   The latest alarm is displayed.
2. Press the【↓】key.
   The second latest alarm is displayed.
3. Every time the【↓】key is pressed, the next older alarm will be displayed. Use the【↑】【↓】keys to select the alarm record you want to check.

- How to clear all alarm records

You can clear all alarm records at once.

1. While an alarm is displayed, press the【SET】key to move to the lower level.
2. Press the【↑】key and select the alarm record clear screen.
3. Press the【SET】key.
   All alarm records are cleared.



∗ If operations are limited by the edit lock function (p.9), the screen text in gray is not shown.

Alarm code list

Code	Alarm name	Resetting on the **OPX-2A**	Number of times the driver's ALARM LED blinks
10	Excessive position deviation	Possible	4
20	Overcurrent protection	Not possible	5
21	Overheat protection	Possible	2
22	Overvoltage protection	Not possible	3
23	Main power supply error	Possible	
25	Undervoltage	Possible	
26	Motor overheat protection	Not possible	2
28	Sensor error during operation	Not possible	8
2A	Encoder communication error	Not possible	
30	Overload	Possible	2
31	Overspeed	Possible	
32	Position range error	Possible	7
33	Absolute position loss	Possible	
34	Command pulse error	Possible	2
41	EEPROM error	Not possible	9
42	Sensor error during initialization	Not possible	8
43	Rotor rotation during initialization	Not possible	
44	Encoder EEPROM error	Not possible	
45	Motor combination error	Not possible	
47	ABS not supported	Possible	7
48	No battery	Possible	
51	Regeneration resistor overheat	Not possible	2
71	Electronic gear setting error	Not possible	7

■ Present warning

When a warning generates, a corresponding warning code will be displayed.
You can also check or clear warning records.

Note Do not turn off the driver power while warning records are being cleared (= while the display is blinking). Doing so may damage the data.

- How to check a warning record

You can check up to ten most recent warnings, starting from the latest one.

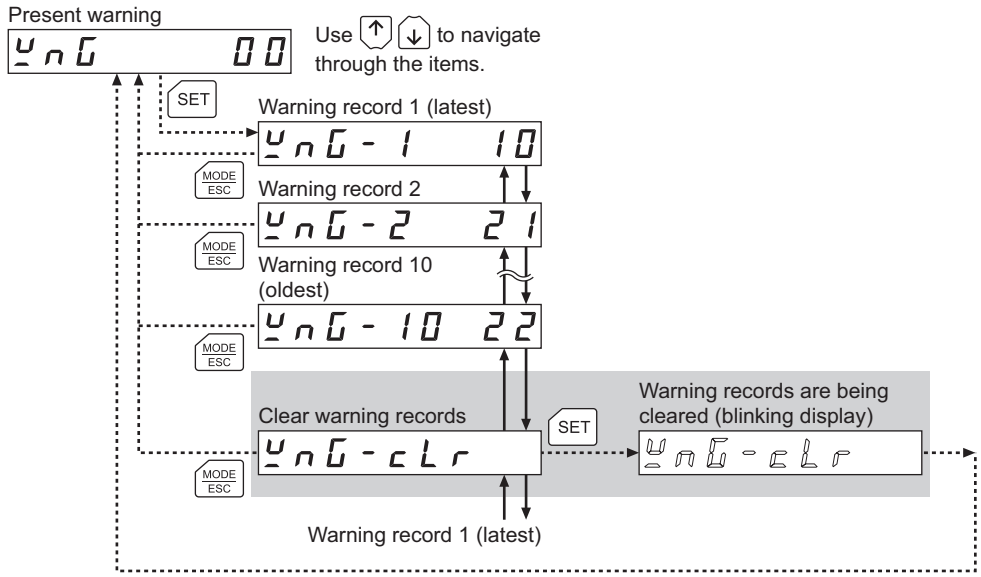
1. While a warning is displayed, press the【SET】key to move to the lower level.
   The latest warning is displayed.
2. Press the【↓】key.
   The second latest warning is displayed.
3. Every time the【↓】key is pressed, the next older warning will be displayed. Use the【↑】【↓】keys to select the warning record you want to check.

- How to clear all warning records

You can clear all warning records at once.

1. While a warning is displayed, press the【SET】key to move to the lower level.
2. Press the【↑】key and select the warning record clear screen.
3. Press the【SET】key.
   All warning records are cleared.

Note You can also clear warning records by turning off the driver power.



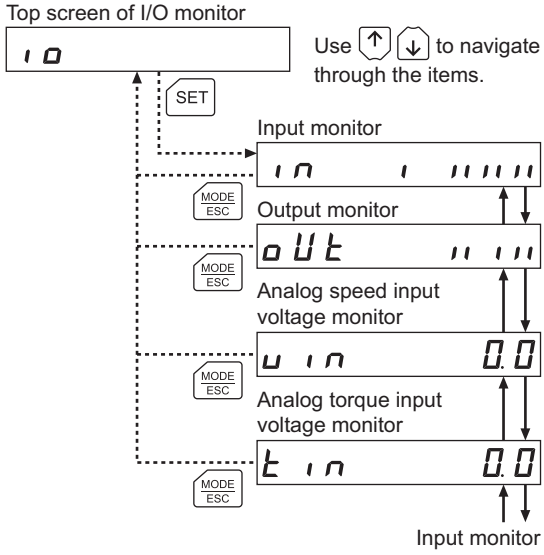
∗ If operations are limited by the edit lock function (p.9), the screen text in gray is not shown.

Warning code list

Code	Warning name	Code	Warning name
10	Excessive position deviation	27	Battery voltage low
21	Overheat	30	Overload
22	Overvoltage	31	Overspeed
23	Main power supply	33	Absolute position loss
25	Undervoltage	71	Electronic gear setting error

■ I/O monitor

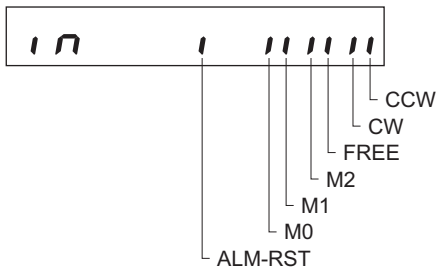
You can check the ON/OFF status of each I/O signal of the driver (Lit: ON, Unlit: OFF).
You can also monitor the analog input voltage.
Use the【↑】【↓】to select the item you want to monitor.



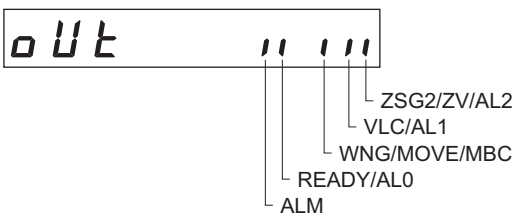
- Monitoring I/O signals

On the I/O signal monitor screen, each digit on the 7-segment LED display corresponds to a signal. If the signal is ON, the corresponding digit is lit. If the signal is OFF, the digit is unlit.

• Input signals



• Output signals



- Monitoring the analog input voltage

The analog speed input voltage and analog torque input voltage are shown.
Each voltage is indicated in units of 0.1 V.

3 Data mode

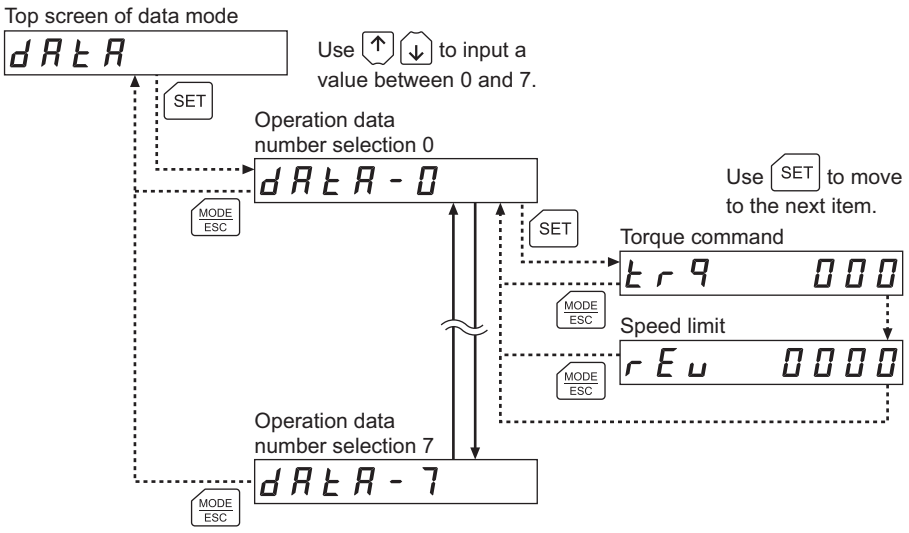
Up to eight sets of motor operation data can be set. Once set, the operation data is stored in the driver. The data will not be lost even after the **OPX-2A** is disconnected from the driver.
Before setting operation data, read the **NX** Series Driver OPERATING MANUAL carefully to understand the basic operations, functions and other details of the driver.

Note

- Operation data has significant bearing on motor operation. Before setting any operation data, make sure you fully understand the content of the operation data.
- If operations are limited by the edit lock function (p.9), operation data cannot be edited.

3.1 Operation in the data mode

1. Use the【MODE/ESC】key to select the data mode.
2. Press the【SET】key in the top screen of the data mode.
3. Use the【↑】【↓】keys to select a desired operation data number.
4. Press the【SET】key.
   The display changes to the operation data setting screen.
5. Use the【SET】key to select the operation data item you want to set.
6. Pressing the【SET】key on the screen showing the last operation data item will return the display to the operation number selection screen.



You can select a desired operation data set based on a combination of ON/OFF statuses of M0 to M2 inputs of the driver.

Operation data number	M2 input	M1 input	M0 input
0	OFF	OFF	OFF
1	OFF	OFF	**ON**
2	OFF	**ON**	OFF
3	OFF	**ON**	**ON**
4	**ON**	OFF	OFF
5	**ON**	OFF	**ON**
6	**ON**	**ON**	OFF
7	**ON**	**ON**	**ON**

3.2 Setting items

Item	Initial value	Setting range	Description
Torque command	0	0 to 300 [%]	Sets the torque command value. “100%” indicates a value equivalent to the rated torque.
Speed limit	0	0 to 5500 [r/min]	Sets the speed limit value.

Note If the value you have input is outside the setting range, “Error” will be displayed for 1 second. If this error display appears, input a different value that falls within the setting range.

3.3 Initializing operation data

You can revert operation data saved in the driver to their initial values.
For details, refer to 6.6, “Initializing driver data” on p.108.

4 Parameter mode

You can set parameters relating to motor operation and control. These parameters are saved in the driver. Before setting parameters, read the **NX** Series Driver OPERATING MANUAL carefully to understand the basic operations, functions and other details of the driver.

Note Parameters have significant bearing on motor operation. Before setting any parameter, make sure you fully understand the content of the parameter.

4.1 Types of parameters

Application parameters and system parameters are handled in the parameter mode.

■ Application parameters

When an application parameter is changed, the new parameter becomes effective immediately.
Five types of parameters are available on the levels below the application parameter screen. These parameters are classified as follows.

Parameter classification	Description
I/O	Set the parameters relating to I/O signals.
Analog	Set the parameters relating to analog I/Os.
Alarm/warning	Set the condition under which each alarm or warning generates.
Function setting	Set the gear ratio for speed monitor.
Manual operation/ display	Set the operating speed used in JOG operation in the test mode, as well as the display method of monitored speed on the data setter.

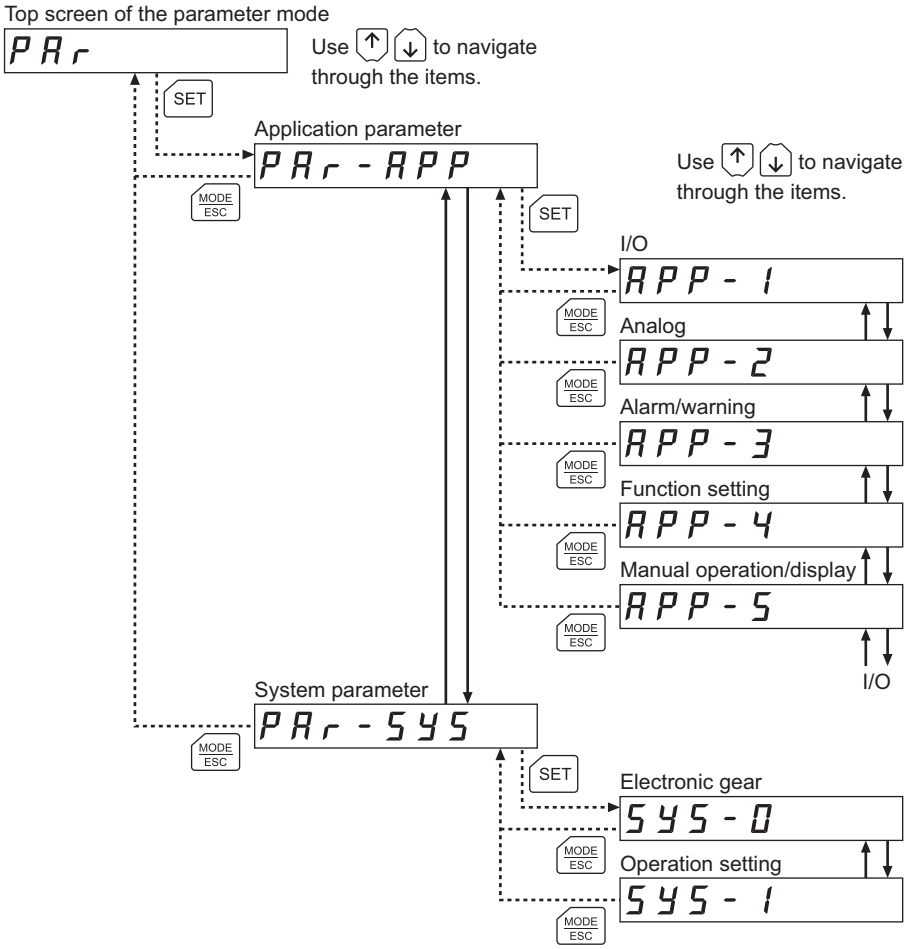
■ System parameters

When a system parameter is changed, the new parameter will become effective only after the power is cycled. If a 24 VDC power supply is used, also cycle the 24 VDC power supply.
Two types of parameters are available on the levels below the system parameter screen. These parameters are classified as follows.

Parameter classification	Description
Electronic gear	Set the electronic gear.
Operation setting	Set whether to enable/disable analog input, as well as the motor rotation direction and initial display on the data setter.

4.2 Operation in the parameter mode

1. Use the 【MODE/ESC】 key to select the parameter mode.
2. Press the 【SET】 key in the top screen of the parameter mode, and use the 【↑】【↓】 keys to select the application parameters or system parameters.
3. Press the 【SET】 key again to move to the parameter item screen.
4. Use the 【↑】【↓】 keys to select the parameter you want to change.



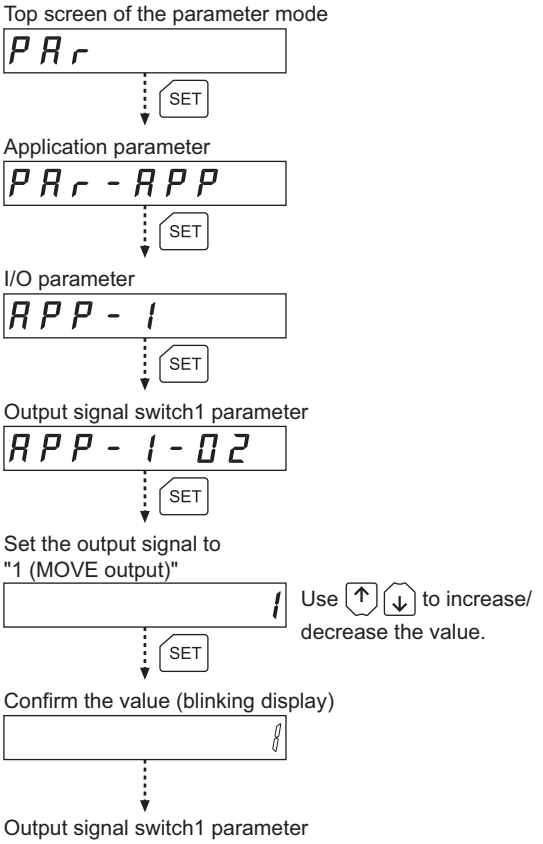
Note If the value you have input is outside the setting range, “Error” will be displayed for 1 second. If this error display appears, input a different value that falls within the setting range.

4.3 Setting example

Pressing the【SET】key in the parameter item screen enables parameter setting.
How a parameter is set are explained below.

Example: Set the output signal to “MOVE output”

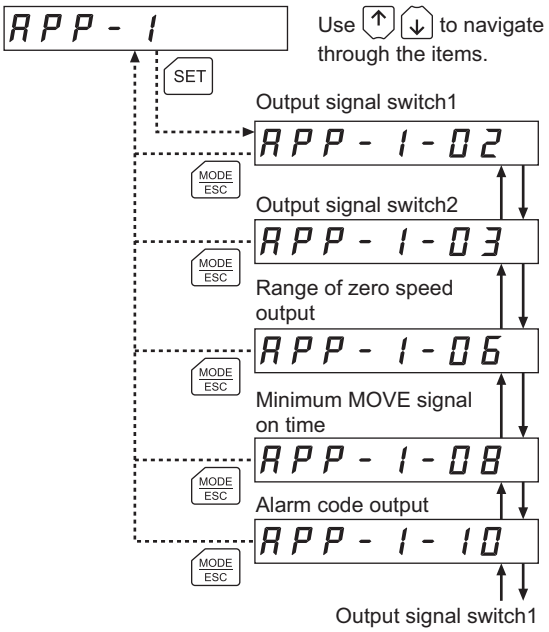
1. Use the【MODE/ESC】key to select the parameter mode.
   The “PAR” LED is lit.
2. Press the【SET】key.
   The display changes to the application parameter screen.
3. Press the【SET】key.
   The display changes to the I/O parameter screen.
4. Press the【SET】key.
   The screen for selecting an output signal is displayed.
5. Press the【SET】key, and use the【↑】key to select “1.”
   “1” indicates the MOVE output.
6. Press the【SET】key again.
   The selected value is set, and the display returns to the screen for selecting an output signal.



Note If the value you have input is outside the setting range, “Error” will be displayed for 1 second. If this error display appears, input a different value that falls within the setting range.

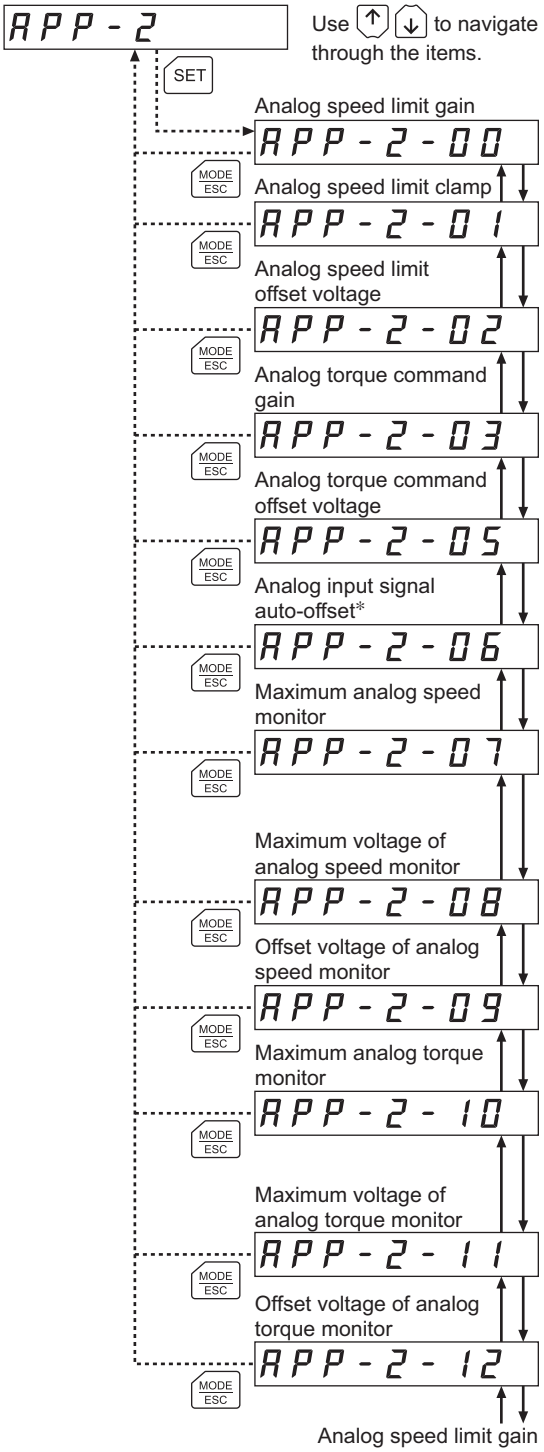
4.4 Description of application parameters

■ I/O parameters



Initial value	Setting range	Description
0	0: WNG 1: MOVE 2: MBC	Selects an output signal.
0	0: ZSG2 1: ZV	Selects an output signal.
10	1 to 5500 [r/min]	Sets the output condition for ZV output.
5	0 to 255 [ms]	Sets the minimum ON time for MOVE output.
0	0: Disable 1: Enable	Changes the setting to enable/disable alarm code output.

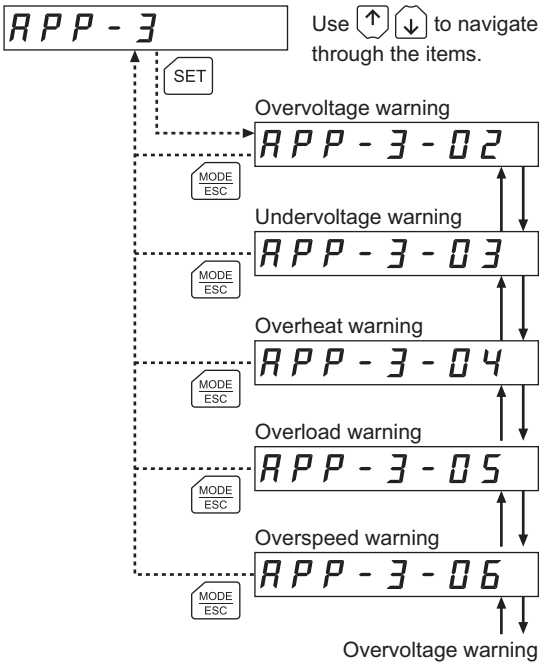
■ Analog parameters



Initial value	Setting range	Description
550	0 to 5500 [r/min]	Sets the speed command per 1 V of analog input voltage.
10	0 to 500 [r/min]	Sets the speed at which the analog speed command is clamped to zero.
0	−1.00 to 1.00 [V]	Sets the offset voltage for analog speed command input.
30	0 to 300 [%]	Sets the torque limit per 1 V of analog input voltage.
0	−1.00 to 1.00 [V]	Sets the offset voltage for analog torque limit input.
0	0: Disable 1: Enable	Changes the setting to enable/disable the automatic offset for analog input signal.
5500	1 to 6000 [r/min]	Sets the maximum value of monitored analog speed. This setting determines the slope of monitored analog speed output.
10	1 to 10 [V]	Sets the monitor output voltage at the maximum value of monitored analog speed.
0	−1.00 to 1.00 [V]	Sets the offset value for monitored analog speed.
300	1 to 300 [%]	Sets the maximum value of monitored analog torque. This setting determines the slope of monitored analog torque output.
10	1 to 10 [V]	Sets the monitor output voltage at the maximum value of monitored analog torque.
0	−1.00 to 1.00 [V]	Sets the offset voltage for monitored analog torque.

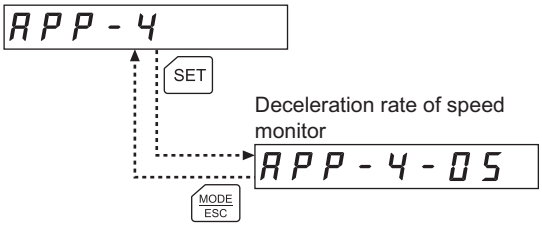
∗ When the analog input signal auto-offset parameter [APP-2-06] is set to "1: Enable," the analog speed input offset (p.102) or analog torque input offset (p.103) is enabled in the test mode.

■ Alarm/warning parameters



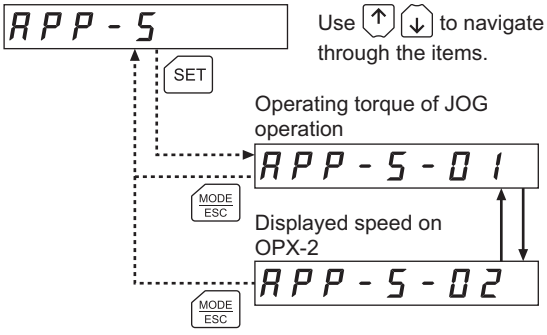
Initial value	Setting range	Description
390	320 to 400 [V]	Sets the voltage at which an overvoltage warning generates.
125	120 to 280 [V]	Sets the voltage at which an undervoltage warning generates.
80	40 to 85 [°C]	Sets the temperature at which an overheat warning generates.
90	1 to 100 [%]	Sets the condition under which an overload warning generates.
5800	1 to 6000 [r/min]	Sets the speed at which an overspeed warning generates.

■ Function setting parameters



Initial value	Setting range	Description
1	1.0 to 100.0	Sets the gear ratio of geared motor for speed monitor.

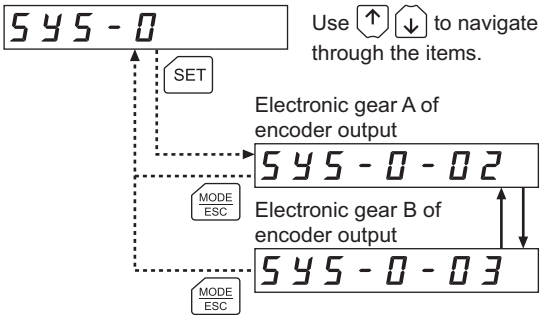
■ Manual operation and display parameters



Initial value	Setting range	Description
30	1 to 100 [%]	Sets the torque command for JOG operation. “100%” indicates a value equivalent to the rated torque.
0	0: Signed 1: Unsigned	Sets the display method of monitored speed.

4.5 Description of system parameters

■ Electronic gear parameters



Initial value	Setting range	Description
1	1 to 1000	Sets the denominator of electronic gear for encoder output.
1	1 to 1000	Sets the numerator of electronic gear for encoder output.

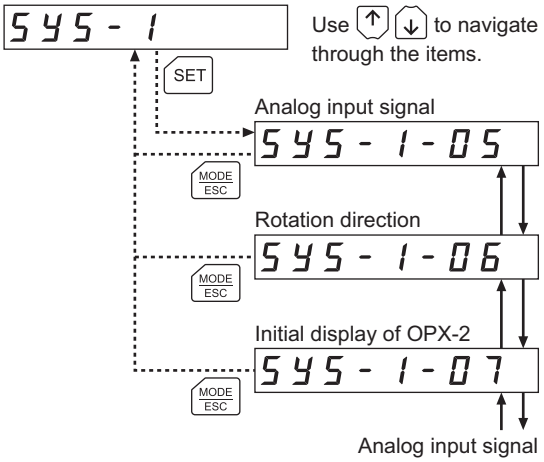
Encoder output resolution

The value of encoder output resolution can be changed as follows using the electronic gear parameters [SyS-0-02] and [SyS-0-03]. Note that the calculated value must be inside the setting range specified below:

Resolution setting range: 100 to 10,000 P/R

$$\text{Encoder output resolution [P/R]} = 1000 \times \frac{\text{Electronic gear B of encoder output [SyS-0-03]}}{\text{Electronic gear A of encoder output [SyS-0-02]}}$$

■ Operation setting parameters



Initial value	Setting range	Description
1	0: Disable 1: Enable	Change the setting to enable/disable the analog input signal.
1	0: + = CCW 1: + = CW	Selects the direction in which motor torque is generated.
0	0: Operating speed [r/min] 1: Position [step] 2: Torque [%] 3: Estimated inertia moment ratio [%] 4: Operation number 5: Selection number 6: Tension [%] 7: Rotation counter [rev] 8: Shaft diameter [mm] 9: Top display of monitor mode	Selects the initial screen to be displayed when the data setter starts communicating with the driver. If the selected item is not supported in the torque control mode, the top screen of the monitor mode is displayed as the initial display.

4.6 Initializing parameters

You can revert parameters saved in the driver to their initial values.
For details, refer to 6.6, “Initializing driver data” on p.108.

5 Test mode

5.1 What you can do in the test mode

- I/O test

  You can check the ON/OFF status of each input signal of the driver, or switch the ON/OFF status of each output signal on the **OPX-2A**. You can also check the analog input voltage and set a desired analog output voltage.
  There is also an I/O test function with which you can check the connection status of the driver.

- JOG operation

  You can operate the motor using the keys on the **OPX-2A**.

- Z-phase preset

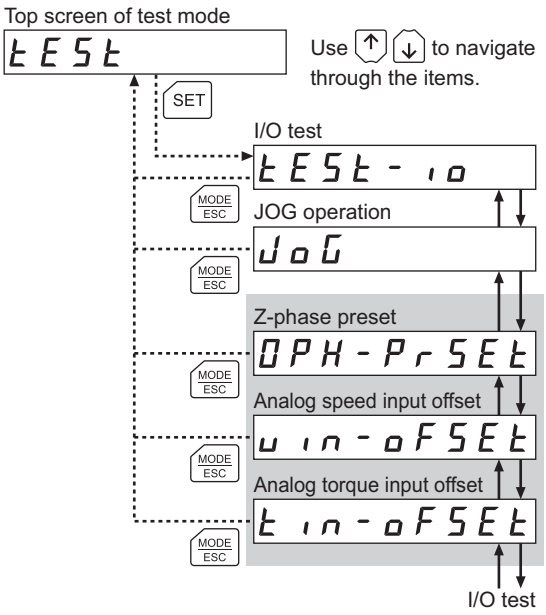
  You can preset the Z-phase position.

- Analog input offset

  You can offset the analog speed input and analog torque input.

5.2 Operation in the test mode

1. Use the 【MODE/ESC】 key to select the test mode.
2. Press the 【SET】 key in the top screen of the test mode.
   The display changes to the test mode item screen.
3. Use the 【↑】【↓】 keys to select the item you want to perform.



∗ If operations are limited by the edit lock function (p.9), the screen text in gray is not shown.

Note

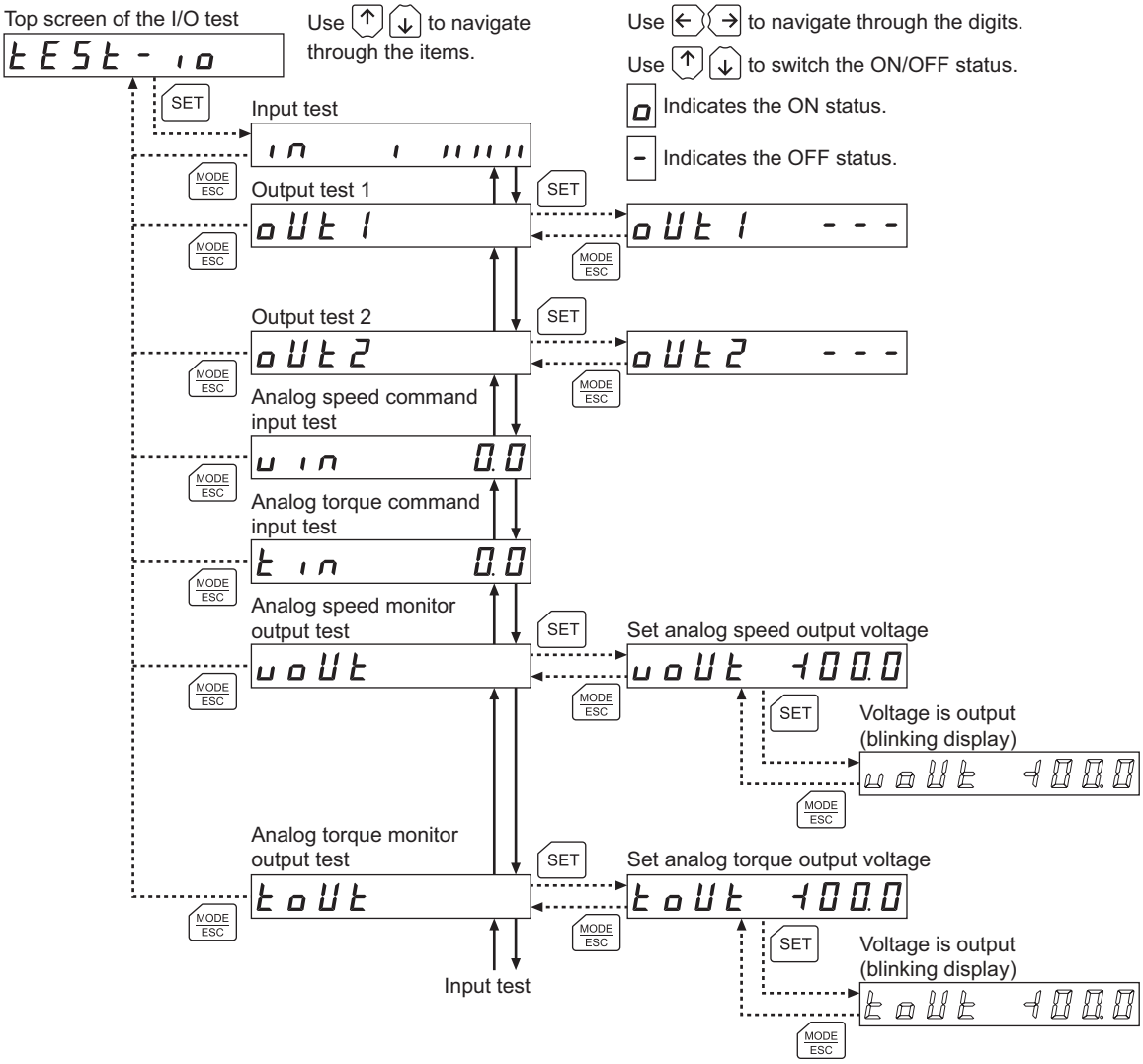
- Stop the motor operation before changing to the test mode.
- When you move from the top screen of the test mode to a lower level, the CW/CCW input will be disabled.
- When you move from a non-JOG-operation item to a lower level, all I/O signals and operations will be disabled.

What happens when the【SET】key is pressed while the motor is operating

While the motor is operating, you cannot move to any lower level from the top screen of the test mode. Pressing the【SET】key will generate an error, and "oPE-Err" will be shown.
Be sure to stop the motor operation before pressing the【SET】key.

5.3 I/O test

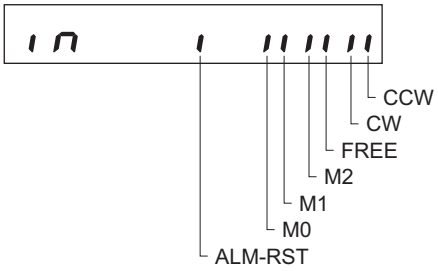
You can check the ON/OFF status of each input signal of the driver, or switch the ON/OFF status of each output signal on the **OPX-2A**. You can also check the analog input voltage and set a desired analog output voltage.
There is also an I/O test function with which you can check the connection status of the driver.



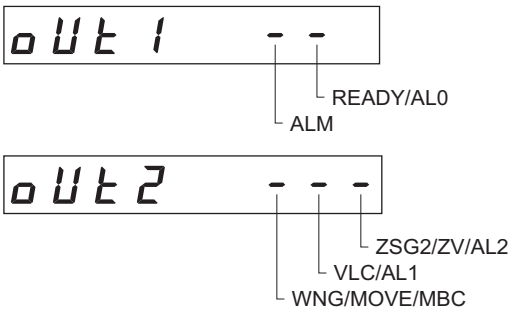
- Checking I/O signals

  On the I/O signal check screen, each digit on the 7-segment LED display corresponds to a signal. If the signal is ON, the corresponding digit is lit. If the signal is OFF, the digit is unlit.

  • Input signals

  • Output signals

- Analog input test

  The analog speed input voltage and analog torque input voltage are shown.
  Each voltage is indicated in units of 0.1 V.

- Analog output test

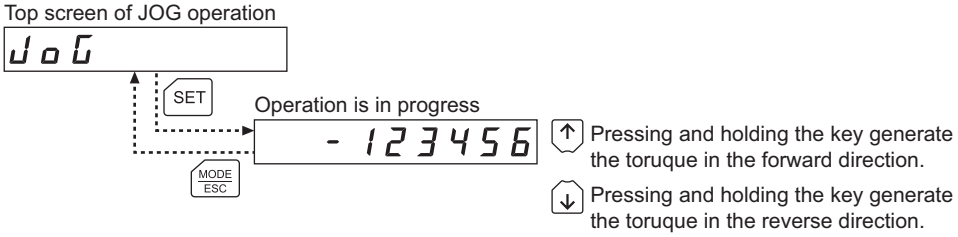
  When an output voltage is set and the【SET】key is pressed, the specified voltage will be output from the analog monitor terminal of the driver. The setting range is −10.0 to +10.0 V.

5.4 JOG operation

You can operate the motor using the keys on the **OPX-2A**.
The torque command corresponds to the value set in the operating torque of JOG operation parameter [APP-5-01].

Note During JOG operation, the motor rotates at the specified operating speed while each applicable key is pressed. Before commencing JOG operation, consider the status of the equipment and condition of its surroundings to confirm thoroughly that motor rotation will not cause any dangerous situation.

Top screen of JOG operation

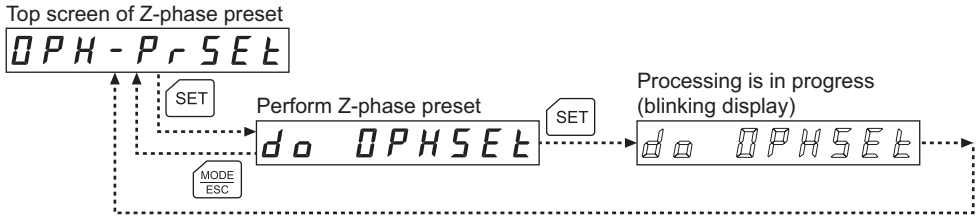


5.5 Presetting Z-phase

In this operation, a Z-phase signal is output at the current position.

Note

- If operations are limited by the edit lock function (p.9), the preset function cannot be performed.
- When Z-phase preset is performed, the Z-phase position will be tentatively written to the driver's EEPROM. When the power is turned on the next time, the Z-phase position that was written earlier will be reflected in the motor encoder. The EEPROM and encoder memory can be rewritten approx. 100,000 times.
- When a different motor is connected, the content of the encoder memory of the new motor will be read into the driver. Accordingly, the Z-phase position will also change to reflect the new motor.

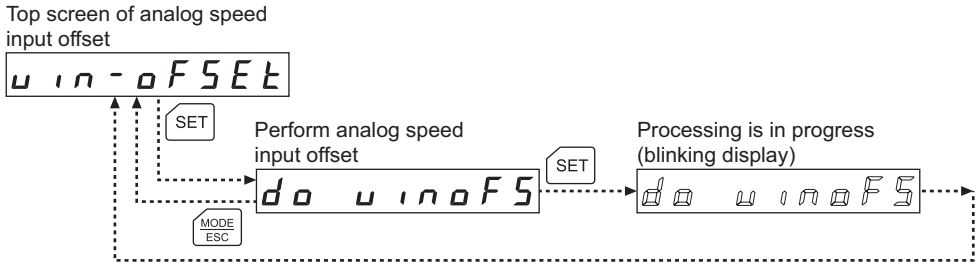


5.6 Offsetting the analog speed input

This function cannot be used when the analog input signal auto-offset parameter [APP-2-06] is set to "1: Enable." When a voltage of 0 V is input to the analog speed input terminal and the offset function is performed, the offset voltage will be adjusted automatically and the adjusted voltage will be saved in the driver.

Note

- If operations are limited by the edit lock function (p.9), the offset function cannot be performed.
- If the offset function is performed, the offset voltage will be written to the driver's EEPROM. The EEPROM can be rewritten approx. 100,000 times.

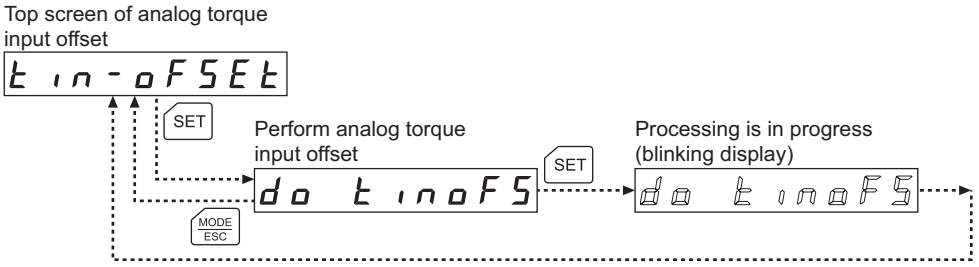


5.7 Offsetting the analog torque input

This function cannot be used when the analog input signal auto-offset parameter [APP-2-06] is set to "1: Enable." When a voltage of 0 V is input to the analog torque input terminal and the offset function is performed, the offset voltage will be automatically adjusted and the adjusted voltage will be saved in the driver.

Note

- If operations are limited by the edit lock function (p.9), the offset function cannot be performed.
- If the offset function is performed, the offset voltage will be written to the driver's EEPROM. The EEPROM can be rewritten approx. 100,000 times.



6 Copy mode

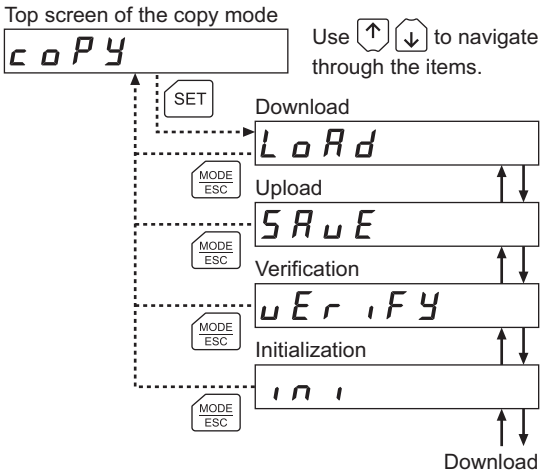
The **OPX-2A** has four data banks, and operation data and parameters can be saved in each of these data banks. Since an EEPROM is used as the data memory element, stored data will be retained even after the power is turned off.
In the copy mode, you can download data saved in the **OPX-2A** to the driver. You can also upload data saved in the driver to the **OPX-2A**.
It is also possible to verify data in the **OPX-2A** against the corresponding data in the driver, or revert driver data to their initial values.

6.1 What you can do in the copy mode

- Download
  Copy data saved in the **OPX-2A** to the driver.
- Upload
  Copy data saved in the driver to the **OPX-2A**.
- Verification
  Verify data in the **OPX-2A** against the corresponding data in the driver.
- Initializing driver data
  Revert data saved in the driver to their initial values.

6.2 Operation in the copy mode

1. Use the【MODE/ESC】key to select the copy mode.
2. Press the【SET】key in the top screen of the copy mode.
   The display changes to the copy mode item screen.
3. Use the【↑】【↓】keys to select the item you want to perform.



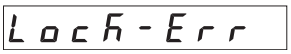
Note
- Stop the motor operation before changing to the copy mode.
- When you move from the top screen of the copy mode to a lower level, the CW/CCW input will be disabled.

- What happens when the【SET】key is pressed while the motor is operating

While the motor is operating, you cannot move to any lower level from the top screen of the copy mode. Pressing the【SET】key will generate an error, and "oPE-Err" will be shown.
Be sure to stop the motor operation before pressing the【SET】key.

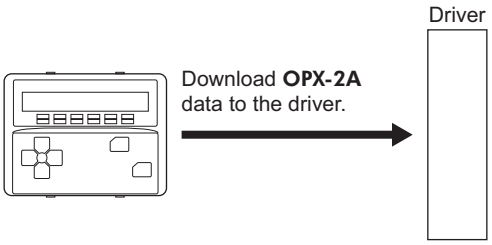
- What happens when the【SET】key is pressed while the edit lock is enabled

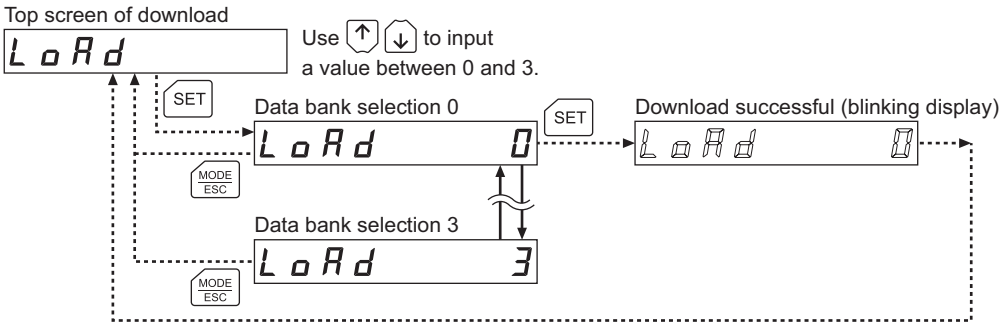
While the edit lock is enabled, you cannot move to any lower level from the top screen of the copy mode. Pressing the【SET】key will generate an error, and "LocK-Err" will be shown.
Be sure to cancel the edit lock before pressing the【SET】key. Refer to p.9 for the procedure to cancel the edit lock.



6.3 Downloading to the driver

In this operation, data in the specified data bank number are downloaded to the driver.





Note

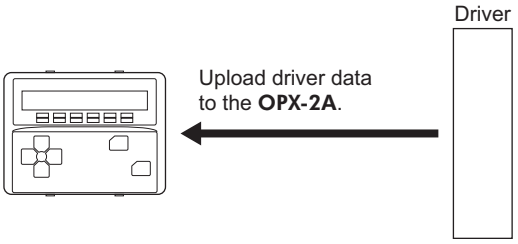
- System parameters that have been changed will become effective after the power is cycled. If the system parameters have been changed as a result of the download, cycle the driver power. If a 24 VDC power supply is used, also cycle the 24 VDC power supply.
- Do not turn off the driver power while the download is still in progress (= while the display is blinking). Doing so may damage the data.

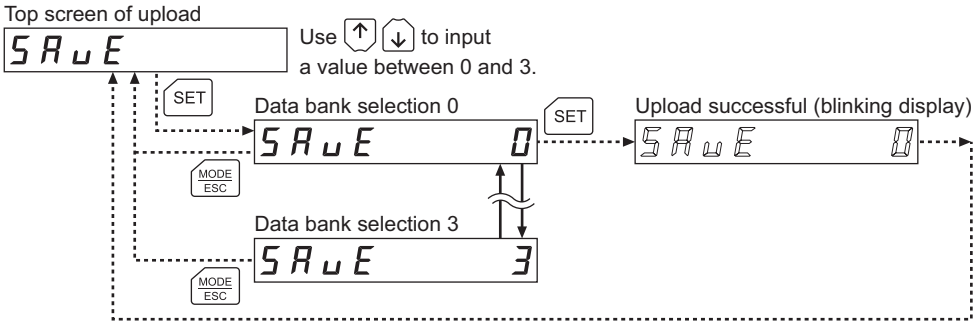
If a download error occurs, a code indicating the nature of the error will blink on the display. Download will not be performed and the display will return to the top screen of download.

Blinking display	Description	Action
Prod-Err	The product series of the driver to which data is downloaded is wrong.	• Check the product series of the driver. • Check the data bank number on the **OPX-2A**.
ctL-Err	The control mode of the driver is different from that of the **OPX-2A**.	Check the control mode of the driver.
HEAd-Err bcc-Err	An error occurred while data was being downloaded.	Perform download again. If the same error occurs, the data saved in the **OPX-2A** may be damaged. Upload the applicable data to set the **OPX-2A** data again.
no-dAtA	The specified data bank number does not contain data.	Check the data bank number.
dAtA-Err	An error occurred while data was being written.	Perform download again.

6.4 Uploading to the OPX-2A

In this operation, data saved in the driver is uploaded to the specified data bank number.

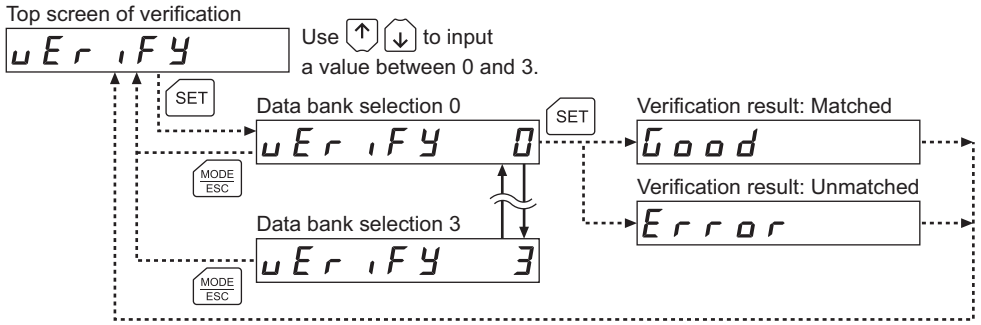




Note Do not turn off the driver power while the upload is still in progress (= while the display is blinking). Doing so may damage the data.

6.5 Verifying data

In this operation, data in the specified data bank number are verified against the corresponding data saved in the driver.
If the verification finds that the two sets of data match, “Good” will be shown. If the two do not match, “Error” will be shown.

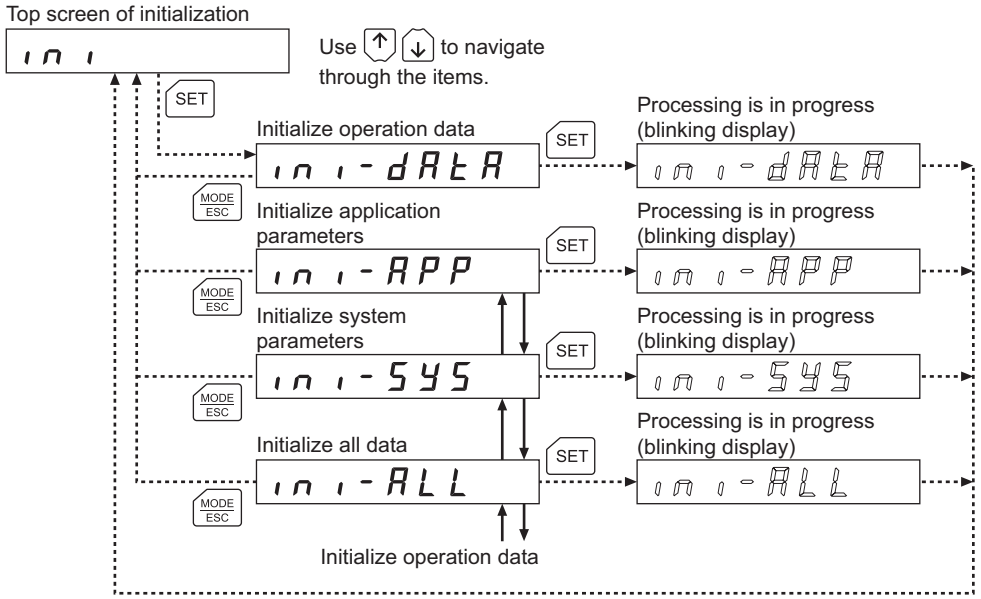


If a verification error occurs, a code indicating the nature of the error will blink on the display.
Verification will not be performed and the display will return to the top screen of verification.

Blinking display	Description	Action
Prod-Err	The product series of the driver against which data is verified is wrong.	• Check the product series of the driver. • Check the data bank number on the **OPX-2A**.
ctL-Err	The control mode of the driver is different from that of the **OPX-2A**.	Check the control mode of the driver.
HEAd-Err bcc-Err	An error occurred while data was being verified.	Perform verification again. If the same error occurs, the data saved in the **OPX-2A** may be damaged. Upload the applicable data to set the **OPX-2A** data again.
no-dAtA	The specified data bank number does not contain data.	Check the data bank number.

6.6 Initializing driver data

In this operation, data saved in the driver are reverted to their initial values.



Note

- System parameters that have been changed will become effective after the power is cycled. If the system parameters have been changed as a result of the initialization, cycle the driver power. If a 24 VDC power supply is used, also cycle the 24 VDC power supply.
- Do not turn off the driver power while the initialization is still in progress (= while the display is blinking). Doing so may damage the data.

Operation in the tension control mode

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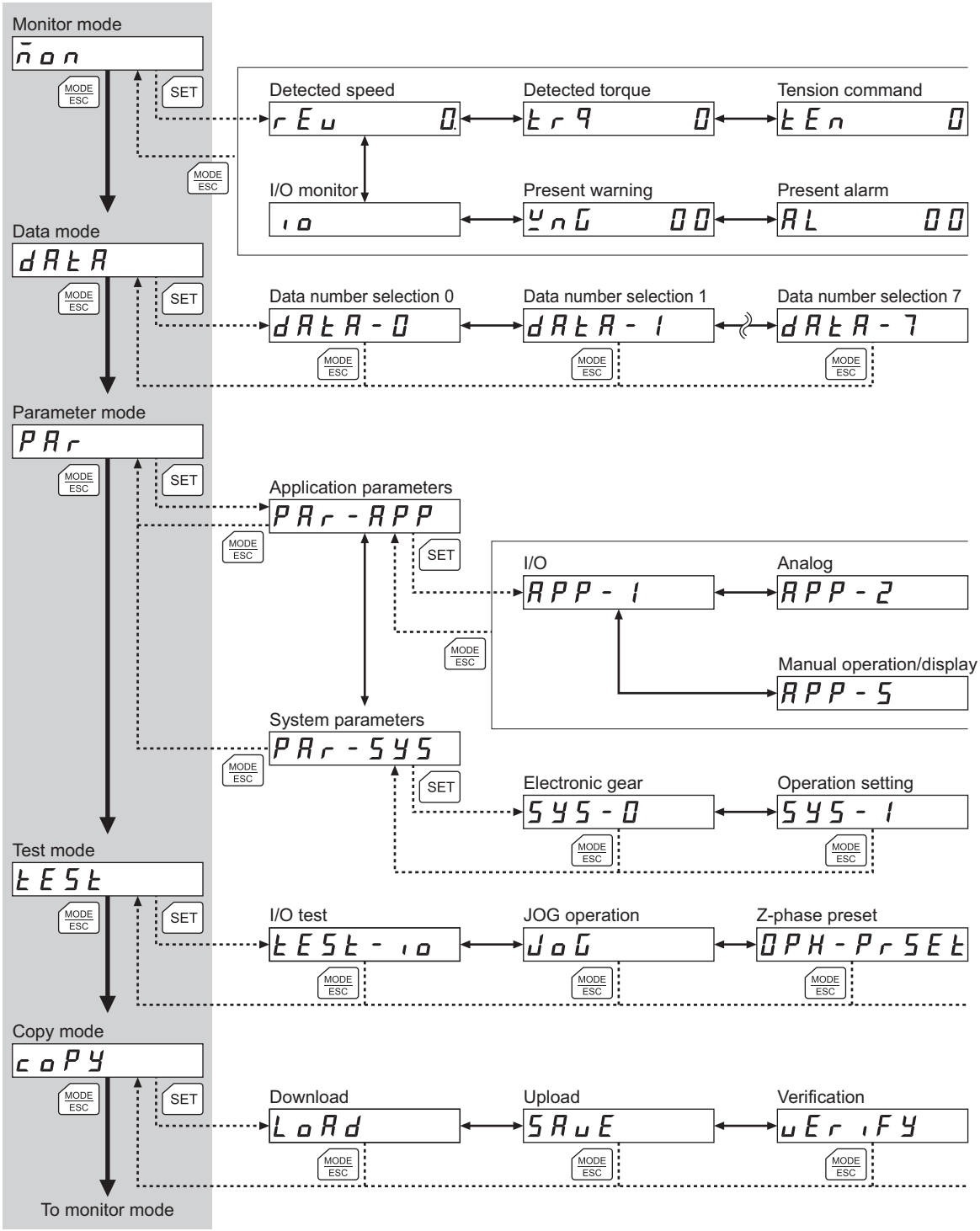
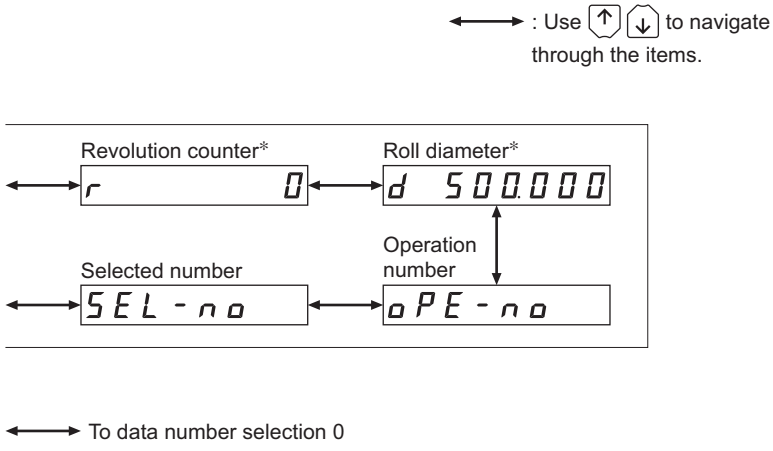
1 Screen transitions in the tension control mode

Top screen



Note The following operations cannot be performed while the edit lock function (p.9) is enabled: Edit operation data, edit parameters, clear alarm/warning records, preset Z-phase, offset the analog speed input, offset the analog torque input, perform operations in the copy mode



∗ This parameter is displayed when the selection of tension control mode parameter [SyS-1-03] is set to "1: High function I" or "2: High function II."

2 Monitor mode

2.1 What you can do in the monitor mode

- Monitoring the operating status

  You can monitor the detected motor speed, detected torque, tension command, revolution counter, roll diameter, and operation number corresponding to the current operation, in real time.

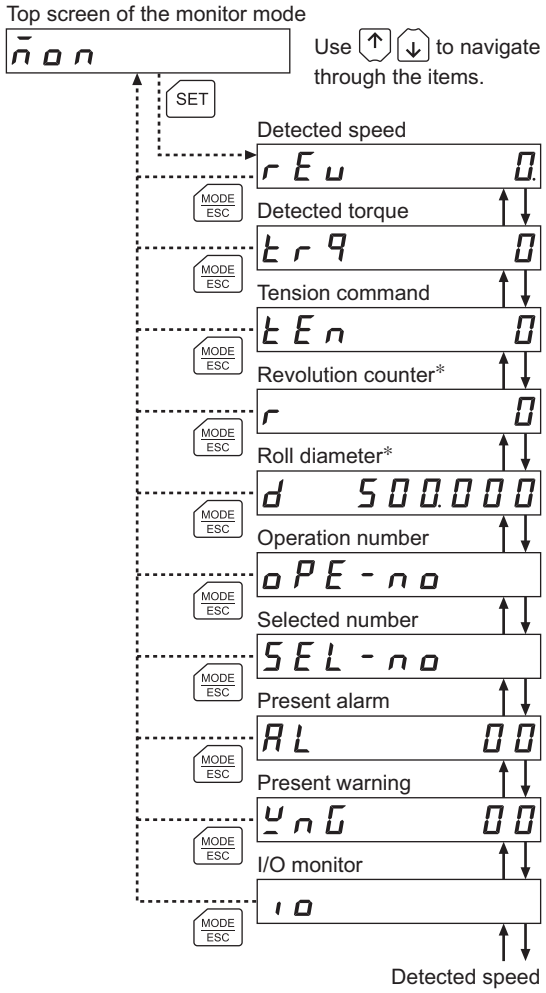
- Checking alarms/warnings, clearing alarm/warning records, and resetting alarms
  - If an alarm or warning generates, a corresponding alarm code or warning code will be displayed. You can check the code to identify the details of the alarm/warning.
  - Up to ten most recent alarms/warnings can be displayed, starting from the latest one.
  - You can reset the alarms currently present.
  - You can clear alarm/warning records.

- Checking I/O signals

  You can check the ON/OFF status of each I/O signal of the driver, as well as the analog input voltage.

2.2 Operation in the monitor mode

1. Use the【MODE/ESC】key to select the monitor mode.
2. Press the【SET】key in the top screen of the monitor mode.
   The display changes to the monitor mode item screen.
3. Use the【↑】【↓】keys to select the item you want to monitor.



∗ This parameter is displayed when the selection of tension control mode parameter [SyS-1-03] is set to "1: High function I" or "2: High function II."

2.3 Monitor items

■ Detected speed

You can check the speed of the motor (unit: r/min).
While the motor is rotating in the CCW direction, "–" is shown in front of the displayed value. If the speed is indicated by an absolute value, no sign is shown to indicate the rotating direction. You can select the value display format using the displayed speed on OPX-2 parameter [APP-5-02] (p.128).
You can also display the motor speed as revolutions of the gear output shaft. For this setting, use the deceleration rate of speed monitor parameter [APP-4-05] (p.127, 128).

■ Detected torque

You can check the generated motor torque.
The generated torque is indicated as a percentage of the rated torque being 100%.

■ Tension command

You can check the tension command value sent to the motor.

■ Revolution counter

You can check the amount of rotation of the winding shaft.

■ Roll diameter

You can check the current roll diameter.

■ Operation number

You can check the operation data number corresponding to the data used in the current operation.

■ Selected number

You can check the operation data number currently selected by the M0 to M2 inputs of the driver.

■ Present alarm

When an alarm generates, a corresponding alarm code will be displayed.
You can also reset alarms or check and clear alarm records.

Note Do not turn off the driver power while an alarm is being reset or alarm records are being cleared (= while the display is blinking). Doing so may damage the data.

- How to reset an alarm

1. While an alarm is displayed, press the【SET】key to move to the lower level.
2. Press the【↑】key twice to select the alarm reset screen.
3. Press the【SET】key.
   The alarm is reset.

Note Some alarms cannot be reset on the **OPX-2A**. For details, refer to “Alarm code list” on p.115. To reset these alarms, you must cycle the power.

- How to check an alarm record

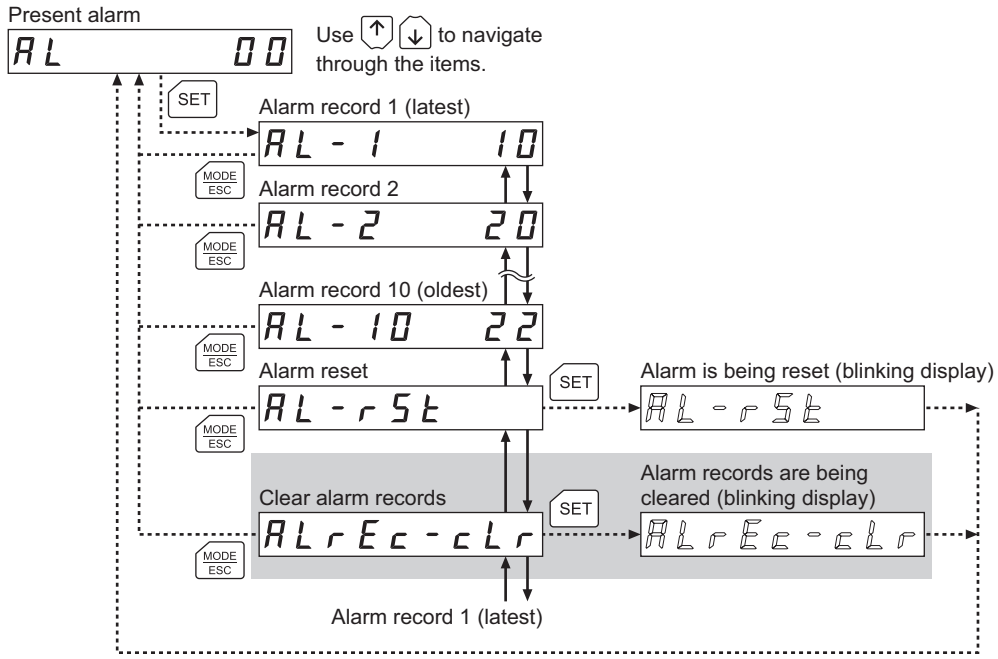
You can check up to ten most recent alarms, starting from the latest one.

1. While an alarm is displayed, press the【SET】key to move to the lower level.
   The latest alarm is displayed.
2. Press the【↓】key.
   The second latest alarm is displayed.
3. Every time the【↓】key is pressed, the next older alarm will be displayed. Use the【↑】【↓】keys to select the alarm record you want to check.

- How to clear all alarm records

You can clear all alarm records at once.

1. While an alarm is displayed, press the【SET】key to move to the lower level.
2. Press the【↑】key and select the alarm record clear screen.
3. Press the【SET】key.
   All alarm records are cleared.



∗ If operations are limited by the edit lock function (p.9), the screen text in gray is not shown.

Alarm code list

Code	Alarm name	Resetting on the **OPX-2A**	Number of times the driver's ALARM LED blinks
10	Excessive position deviation	Possible	4
20	Overcurrent protection	Not possible	5
21	Overheat protection	Possible	2
22	Overvoltage protection	Not possible	3
23	Main power supply error	Possible	
25	Undervoltage	Possible	
26	Motor overheat protection	Not possible	2
28	Sensor error during operation	Not possible	8
2A	Encoder communication error	Not possible	
30	Overload	Possible	2
31	Overspeed	Possible	
32	Position range error	Possible	7
33	Absolute position loss	Possible	
34	Command pulse error	Possible	2
41	EEPROM error	Not possible	9
42	Sensor error during initialization	Not possible	8
43	Rotor rotation during initialization	Not possible	
44	Encoder EEPROM error	Not possible	
45	Motor combination error	Not possible	
47	ABS not supported	Possible	7
48	No battery	Possible	
51	Regeneration resistor overheat	Not possible	2
71	Electronic gear setting error	Not possible	7

■ Present warning

When a warning generates, a corresponding warning code will be displayed.
You can also check or clear warning records.

Note Do not turn off the driver power while warning records are being cleared (= while the display is blinking). Doing so may damage the data.

- How to check a warning record

You can check up to ten most recent warnings, starting from the latest one.

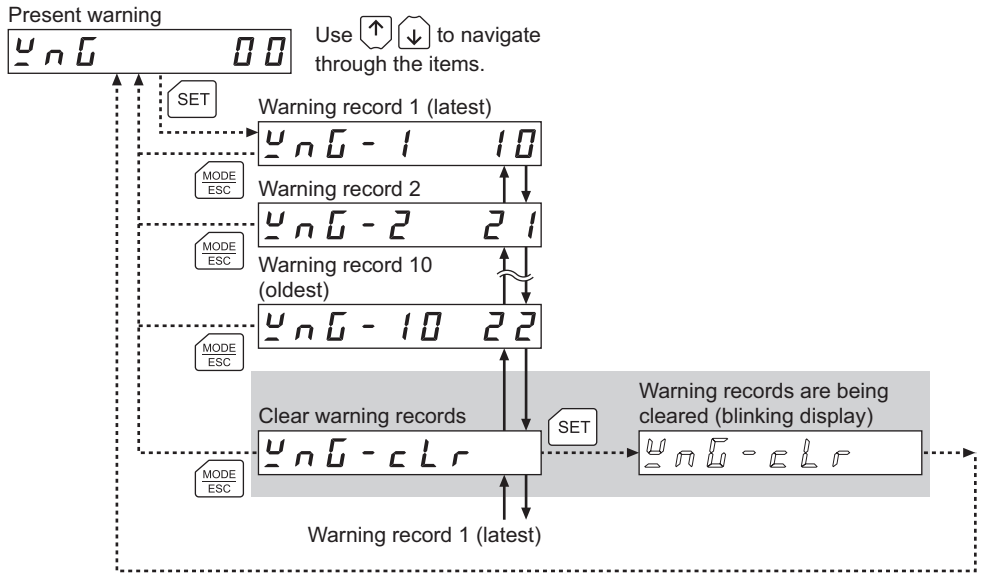
1. While a warning is displayed, press the【SET】key to move to the lower level.
   The latest warning is displayed.
2. Press the【↓】key.
   The second latest warning is displayed.
3. Every time the【↓】key is pressed, the next older warning will be displayed. Use the【↑】【↓】keys to select the warning record you want to check.

- How to clear all warning records

You can clear all warning records at once.

1. While a warning is displayed, press the【SET】key to move to the lower level.
2. Press the【↑】key and select the warning record clear screen.
3. Press the【SET】key.
   All warning records are cleared.

Note You can also clear warning records by turning off the driver power.



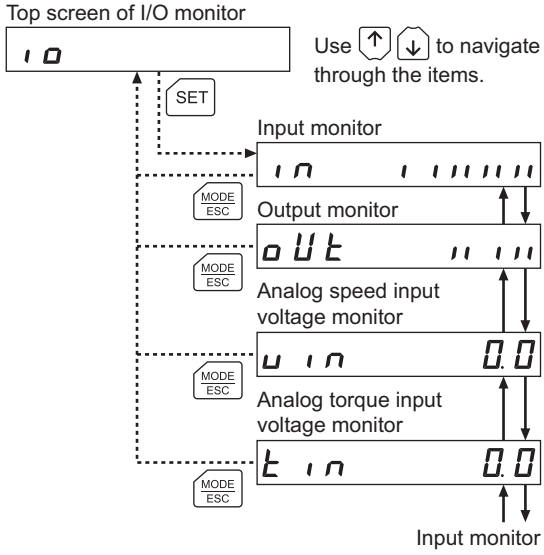
∗ If operations are limited by the edit lock function (p.9), the screen text in gray is not shown.

Warning code list

Code	Warning name	Code	Warning name
10	Excessive position deviation	27	Battery voltage low
21	Overheat	30	Overload
22	Overvoltage	31	Overspeed
23	Main power supply	33	Absolute position loss
25	Undervoltage	71	Electronic gear setting error

■ I/O monitor

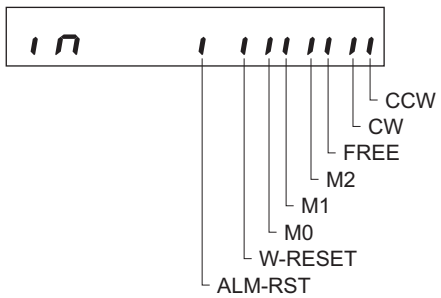
You can check the ON/OFF status of each I/O signal of the driver (Lit: ON, Unlit: OFF).
You can also monitor the analog input voltage.
Use the【↑】【↓】to select the item you want to monitor.



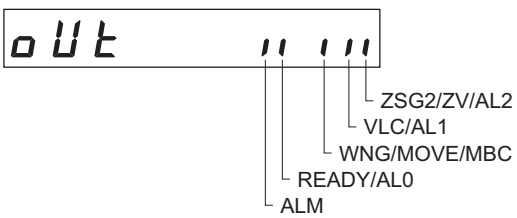
- Monitoring I/O signals

On the I/O signal monitor screen, each digit on the 7-segment LED display corresponds to a signal. If the signal is ON, the corresponding digit is lit. If the signal is OFF, the digit is unlit.

- Input signals



- Output signals



3 Data mode

Up to eight sets of motor operation data can be set. Once set, the operation data is stored in the driver. The data will not be lost even after the **OPX-2A** is disconnected from the driver.
Before setting operation data, read the **NX** Series Driver OPERATING MANUAL carefully to understand the basic operations, functions and other details of the driver.

Note

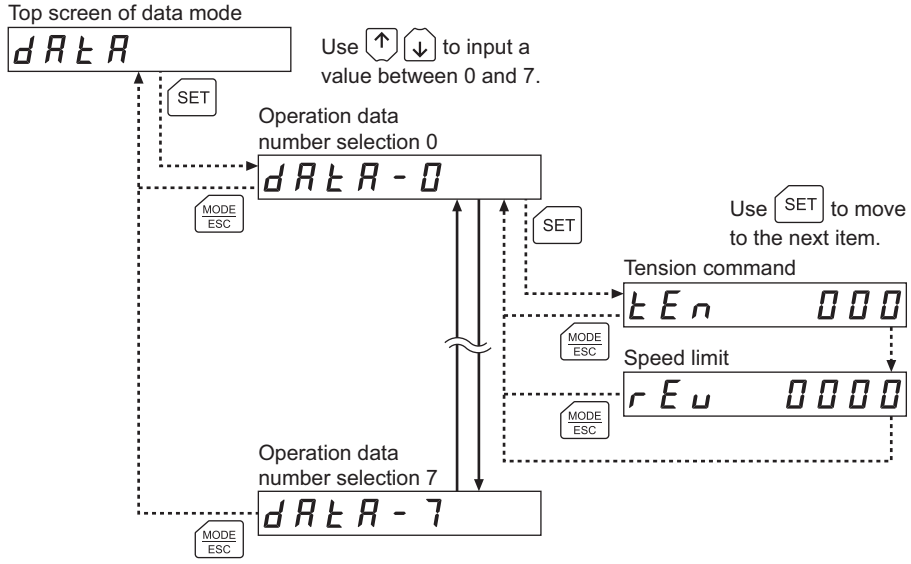
- Operation data has significant bearing on motor operation. Before setting any operation data, make sure you fully understand the content of the operation data.
- If operations are limited by the edit lock function (p.9), operation data cannot be edited.

3.1 Operation in the data mode

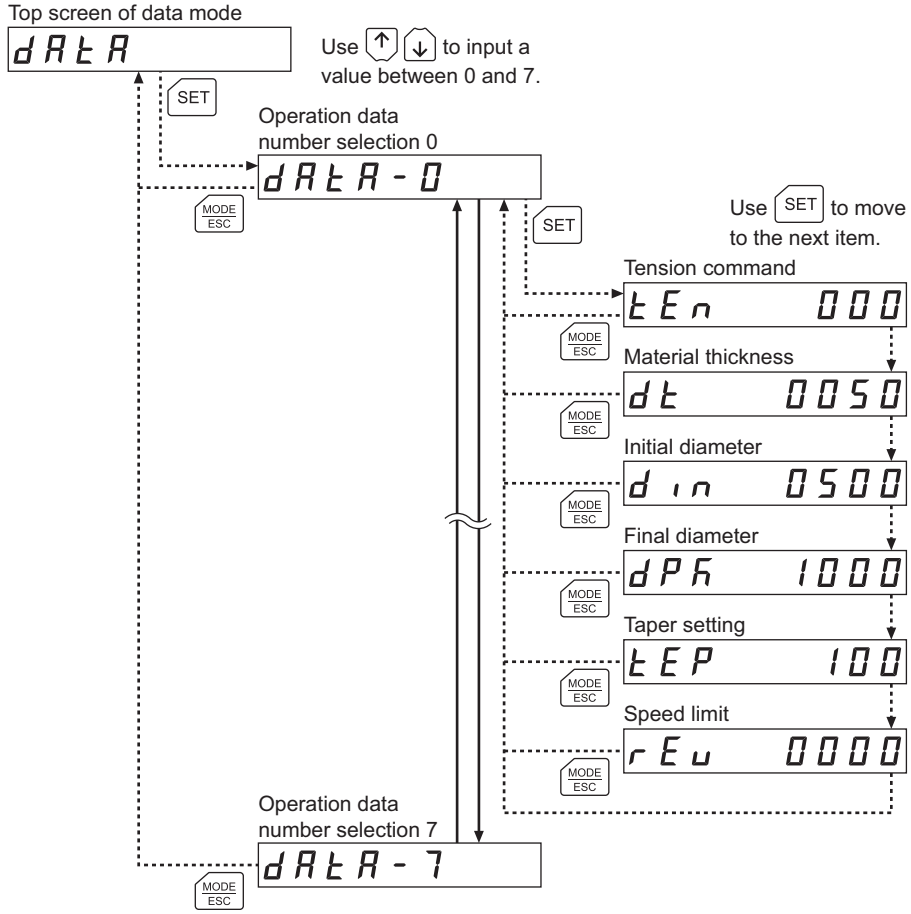
The available setting items vary depending on whether the simple mode, high function mode I or high function mode II is selected.

1. Use the【MODE/ESC】key to select the data mode.
2. Press the【SET】key in the top screen of the data mode.
3. Use the【↑】【↓】keys to select a desired operation data number.
4. Press the【SET】key.
   The display changes to the operation data setting screen.
5. Use the【SET】key to select the operation data item you want to set.
6. Pressing the【SET】key on the screen showing the last operation data item will return the display to the operation number selection screen.

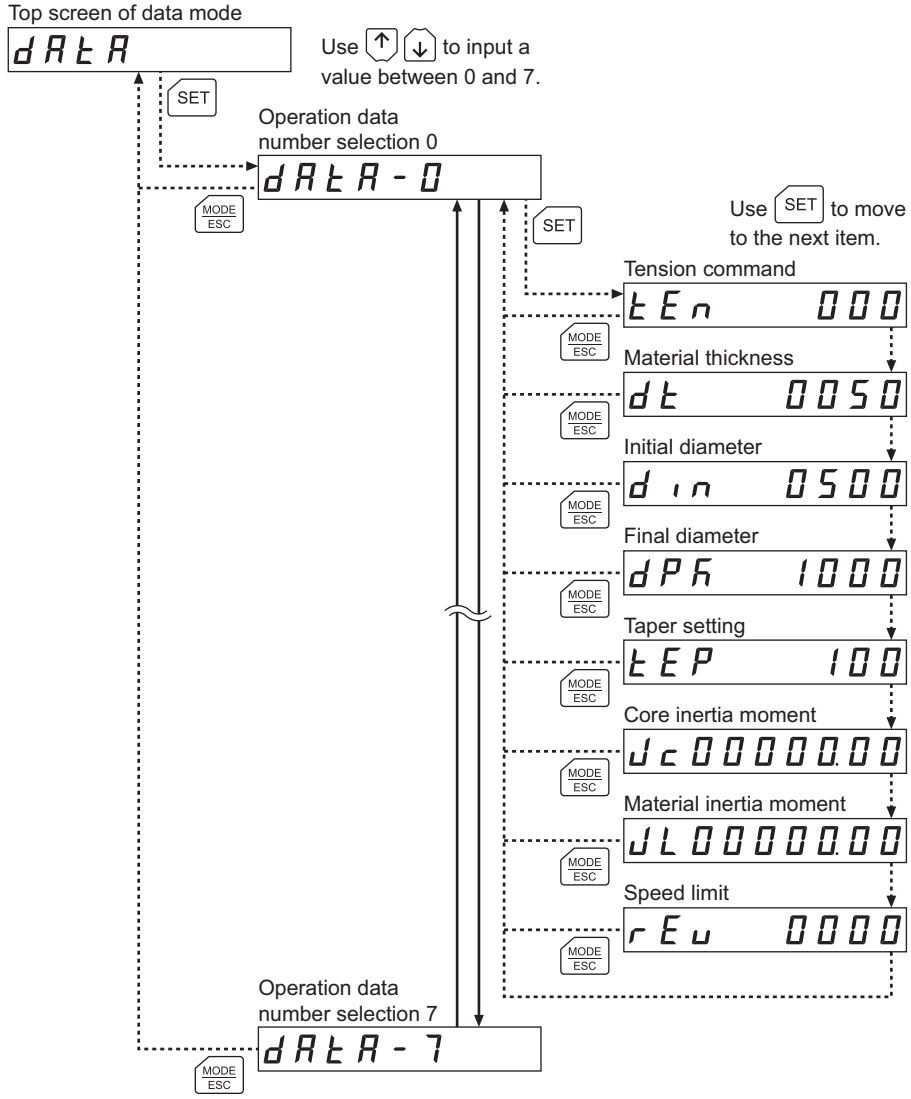
- Operations in the simple mode



- Operations in high function mode I



- Operations in high function mode II



- How to select operation data

You can select a desired operation data set based on a combination of ON/OFF statuses of M0 to M2 inputs of the driver.

Operation data number	M2 input	M1 input	M0 input
0	OFF	OFF	OFF
1	OFF	OFF	**ON**
2	OFF	**ON**	OFF
3	OFF	**ON**	**ON**
4	**ON**	OFF	OFF
5	**ON**	OFF	**ON**
6	**ON**	**ON**	OFF
7	**ON**	**ON**	**ON**

3.2 Setting items

Item	Initial value	Setting range	Description
Tension command	0	0 to 100 [%]	Sets the tension command. “100%” indicates a value equivalent to the rated torque.
Material thickness *1*2	50	1 to 5000 [μm]	Sets the material thickness.
Initial diameter *1*2	500	1 to 1000 [mm]	Sets the initial diameter at winding or unwinding.
Final diameter *1*2	1000	1 to 1000 [mm]	Sets the final diameter at winding or unwinding.
Taper setting *1*2	100	0 to 100 [%]	This function is used to prevent excessively tight winding. As the roll diameter increases, the tension will be lowered to adjust the winding force. If the value is set to “100%,” the tension will remain constant.
Core inertia moment *2	0	0.00 to 99999.99 [× 10^{-4} kgm^2]	Sets the inertial moment of the core.
Material inertia moment *2	0	0.00 to 99999.99 [× 10^{-4} kgm^2]	Sets the material inertial moment at the maximum material diameter.
Speed limit	0	0 to 5500 [r/min]	Sets the speed limit value.

∗1 This item is set when the selection of tension control mode parameter [SyS-1-03] is set to “1: High function I.”

∗2 This item is set when the selection of tension control mode parameter [SyS-1-03] is set to “2: High function II.”

Note

- Set the initial diameter and final diameter in a manner that satisfies the specified relationship in the applicable condition as shown below. If the magnitude correlation of the two diameters is reversed, the tension will not remain constant:
  Winding: Initial diameter < Final diameter
  Unwinding: Initial diameter > Final diameter
- If the value you have input is outside the setting range, “Error” will be displayed for 1 second. If this error display appears, input a different value that falls within the setting range.

3.3 Initializing operation data

You can revert operation data saved in the driver to their initial values.
For details, refer to 6.6, “Initializing driver data” on p.140.

4 Parameter mode

You can set parameters relating to motor operation and control. These parameters are saved in the driver. Before setting parameters, read the **NX** Series Driver OPERATING MANUAL carefully to understand the basic operations, functions and other details of the driver.

Note Parameters have significant bearing on motor operation. Before setting any parameter, make sure you fully understand the content of the parameter.

4.1 Types of parameters

Application parameters and system parameters are handled in the parameter mode.

■ Application parameters

When an application parameter is changed, the new parameter becomes effective immediately.
Five types of parameters are available on the levels below the application parameter screen. These parameters are classified as follows.

Parameter classification	Description
I/O	Set the parameters relating to I/O signals.
Analog	Set the parameters relating to analog I/Os.
Alarm/warning	Set the condition under which each alarm or warning generates.
Function setting	Set the gear ratio for speed monitor, friction torque correction and acceleration/deceleration correction filter.
Manual operation/ display	Set the JOG operation tension used in JOG operation in the test mode, as well as the display method of monitored speed on the data setter.

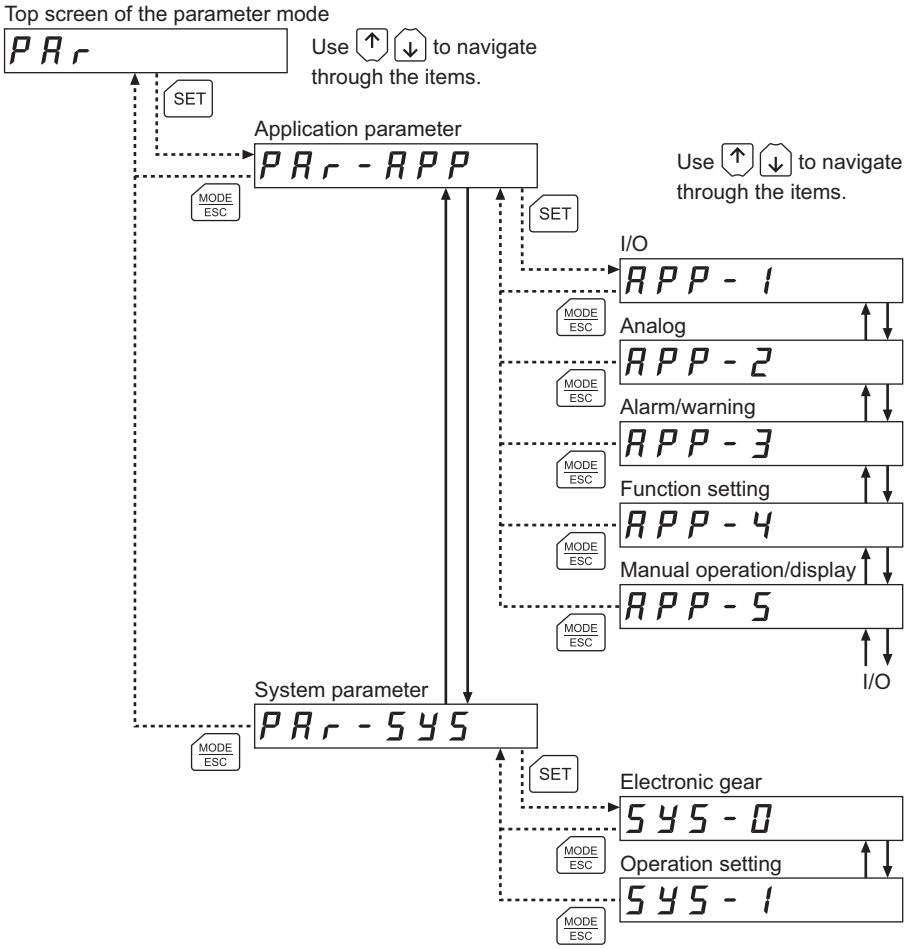
■ System parameters

When a system parameter is changed, the new parameter will become effective only after the power is cycled. If a 24 VDC power supply is used, also cycle the 24 VDC power supply.
Two types of parameters are available on the levels below the system parameter screen. These parameters are classified as follows.

Parameter classification	Description
Electronic gear	Set the electronic gear.
Operation setting	Set the tension control mode, gear ratio for tension control, whether to enable/disable analog input, motor rotation direction, and initial display on the data setter.

4.2 Operation in the parameter mode

1. Use the 【MODE/ESC】 key to select the parameter mode.
2. Press the 【SET】 key in the top screen of the parameter mode, and use the 【↑】【↓】 keys to select the application parameters or system parameters.
3. Press the 【SET】 key again to move to the parameter item screen.
4. Use the 【↑】【↓】 keys to select the parameter you want to change.



Note If the value you have input is outside the setting range, “Error” will be displayed for 1 second. If this error display appears, input a different value that falls within the setting range.

4.3 Setting example

Pressing the【SET】key in the parameter item screen enables parameter setting.
How a parameter is set are explained below.

Example: Set the output signal to “MOVE output”

1. Use the【MODE/ESC】key to select the parameter mode.
   The “PAR” LED is lit.

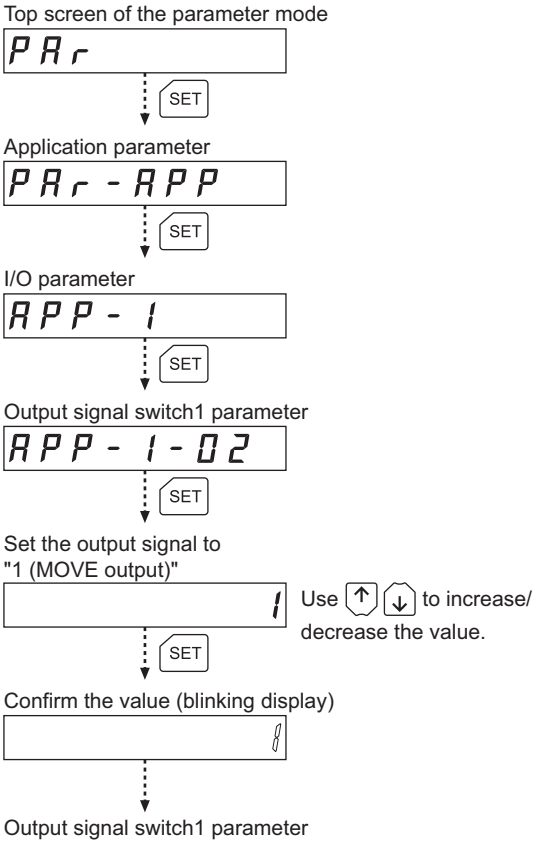
2. Press the【SET】key.
   The display changes to the application parameter screen.

3. Press the【SET】key.
   The display changes to the I/O parameter screen.

4. Press the【SET】key.
   The screen for selecting an output signal is displayed.

5. Press the【SET】key, and use the【↑】key to select “1.”
   “1” indicates the MOVE output.

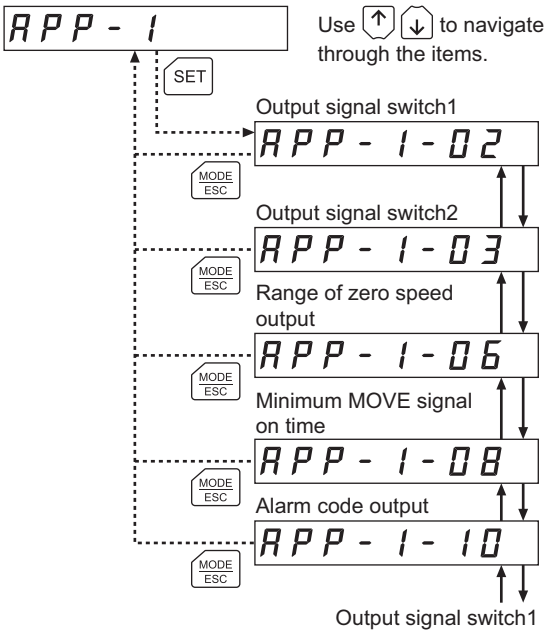
6. Press the【SET】key again.
   The selected value is set, and the display returns to the screen for selecting an output signal.



Note If the value you have input is outside the setting range, “Error” will be displayed for 1 second. If this error display appears, input a different value that falls within the setting range.

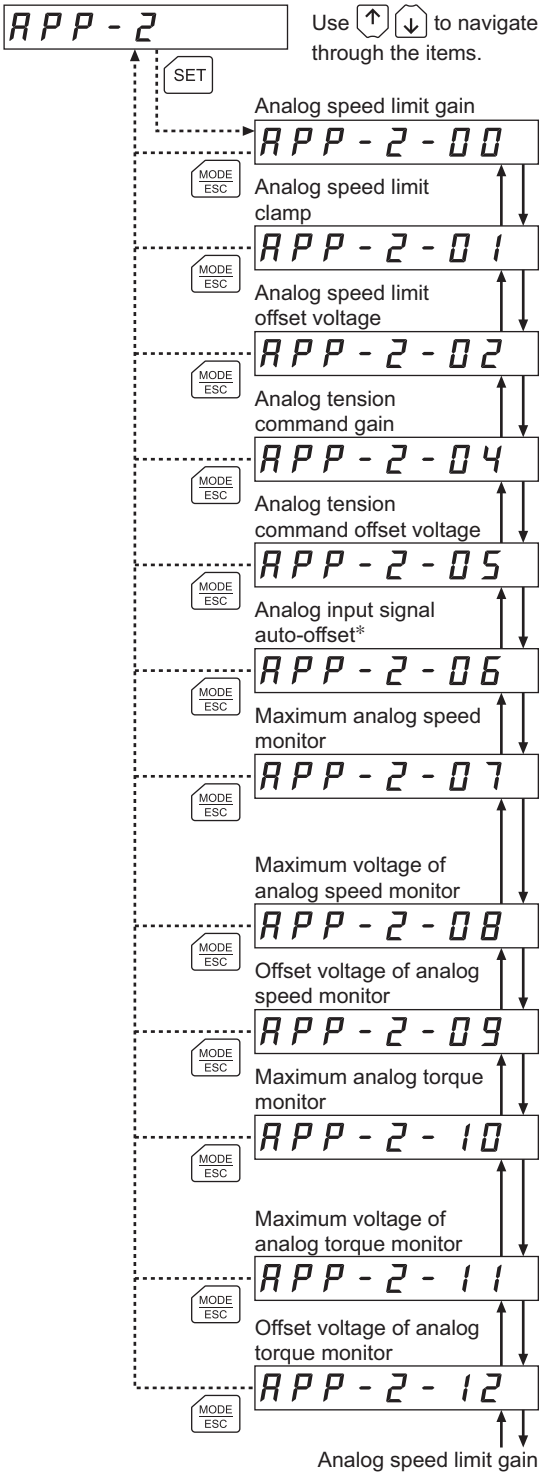
4.4 Description of application parameters

■ I/O parameters



Initial value	Setting range	Description
0	0: WNG 1: MOVE 2: MBC	Selects an output signal.
0	0: ZSG2 1: ZV	Selects an output signal.
10	1 to 5500 [r/min]	Sets the output condition for ZV output.
5	0 to 255 [ms]	Sets the minimum ON time for MOVE output.
0	0: Disable 1: Enable	Changes the setting to enable/disable alarm code output.

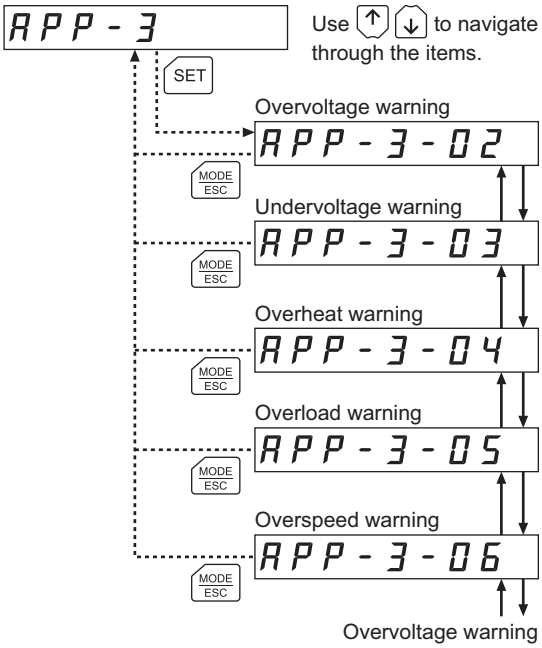
■ Analog parameters



Initial value	Setting range	Description
550	0 to 5500 [r/min]	Sets the speed command per 1 V of analog input voltage.
10	0 to 500 [r/min]	Sets the speed at which the analog speed command is clamped to zero.
0	−1.00 to 1.00 [V]	Sets the offset voltage for analog speed command input.
10	0～100[%]	Sets the tension command per 1 V of analog input voltage.
0	−1.00 to 1.00 [V]	Sets the offset voltage for analog tension command input.
0	0: Disable 1: Enable	Changes the setting to enable/disable the automatic offset for analog input signal.
5500	1 to 6000 [r/min]	Sets the maximum value of monitored analog speed. This setting determines the slope of monitored analog speed output.
10	1 to 10 [V]	Sets the monitor output voltage at the maximum value of monitored analog speed.
0	−1.00 to 1.00 [V]	Sets the offset value for monitored analog speed.
300	1 to 300 [%]	Sets the maximum value of monitored analog torque. This setting determines the slope of monitored analog torque output.
10	1 to 10 [V]	Sets the monitor output voltage at the maximum value of monitored analog torque.
0	−1.00 to 1.00 [V]	Sets the offset voltage for monitored analog torque.

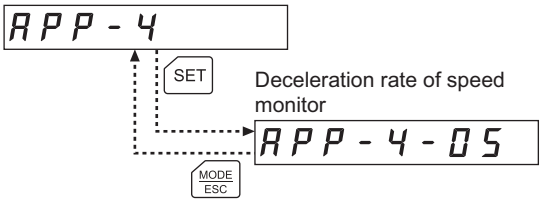
∗ When the analog input signal auto-offset parameter [APP-2-06] is set to "1: Enable," the analog speed input offset (p.134) or analog torque input offset (p.135) is enabled in the test mode.

■ Alarm/warning parameters



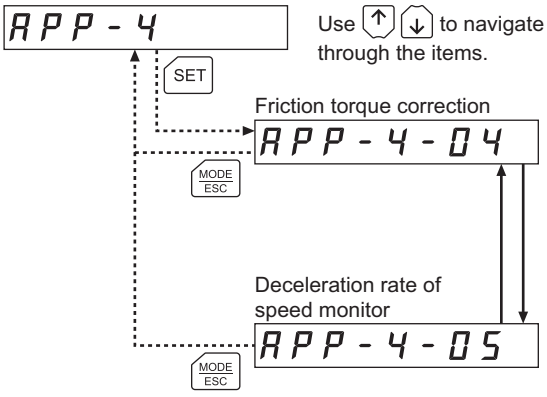
Initial value	Setting range	Description
390	320 to 400 [V]	Sets the voltage at which an overvoltage warning generates.
125	120 to 280 [V]	Sets the voltage at which an undervoltage warning generates.
80	40 to 85 [°C]	Sets the temperature at which an overheat warning generates.
90	1 to 100 [%]	Sets the condition under which an overload warning generates.
5800	1 to 6000 [r/min]	Sets the speed at which an overspeed warning generates.

■ Function setting parameters (simple mode)



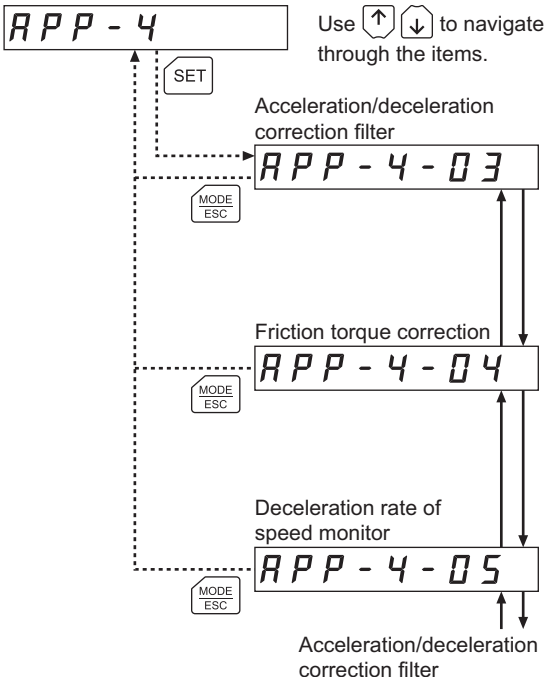
Initial value	Setting range	Description
1	1.0 to 100.0	Sets the gear ratio of geared motor for speed monitor.

■ Function setting parameters (high function I mode)



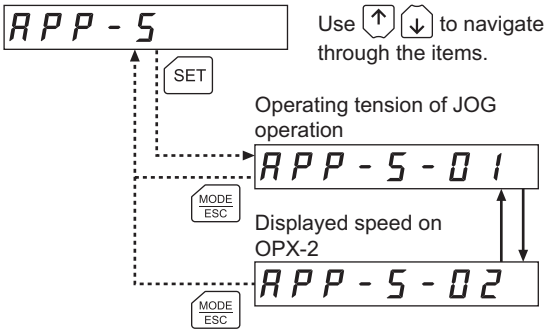
Initial value	Setting range	Description
0	0 to 50 [%]	Sets how friction torque is corrected. The torque load generated by friction of mechanical parts is corrected. This parameter is based on the value of the torque detected in idle operation.
1	1.0 to 100.0	Sets the gear ratio of geared motor for speed monitor.

■ Function setting parameters (high function II mode)



Initial value	Setting range	Description
100	10 to 500 [ms]	Sets the correction filter time constant to be applied during acceleration/deceleration. Increase the value if vibration occurs during winding operation while the motor is accelerating/decelerating.
0	0 to 50 [%]	Sets how friction torque is corrected. The torque load generated by friction of mechanical parts is corrected. This parameter is based on the value of the torque detected in idle operation.
1	1.0 to 100.0	Sets the gear ratio of geared motor for speed monitor.

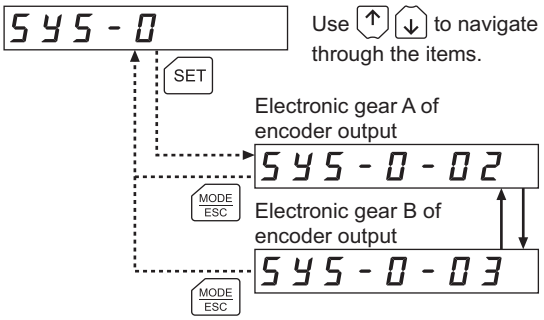
■ Manual operation and display parameters



Initial value	Setting range	Description
30	1 to 100 [%]	Sets the tension command for JOG operation. “100%” indicates a value equivalent to the rated torque.
0	0: Signed 1: Unsigned	Sets the display method of monitored speed.

4.5 Description of system parameters

■ Electronic gear parameters



Initial value	Setting range	Description
1	1 to 1000	Sets the denominator of electronic gear for encoder output.
1	1 to 1000	Sets the numerator of electronic gear for encoder output.

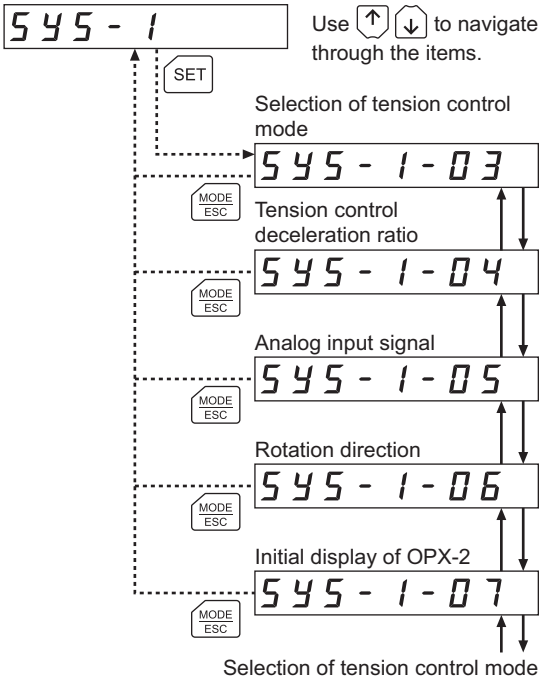
Encoder output resolution

The value of encoder output resolution can be changed as follows using the electronic gear parameters [SyS-0-02] and [SyS-0-03]. Note that the calculated value must be inside the setting range specified below:

Resolution setting range: 100 to 10,000 P/R

$$\text{Encoder output resolution [P/R]} = 1000 \times \frac{\text{Electronic gear B of encoder output [SyS-0-03]}}{\text{Electronic gear A of encoder output [SyS-0-02]}}$$

■ Operation setting parameters



Initial value	Setting range	Description
0	0: Simple 1: High function I 2: High function II	Sets the tension control mode.
10	1.0 to 1000.0	Sets the gear ratio to be applied to the motor shaft with respect to the winding
1	0: Disable 1: Enable	Change the setting to enable/disable the analog input signal.
1	0: + = CCW 1: + = CW	Selects the direction in which motor torque is generated.
0	0: Operating speed [r/min] 1: Position [step] 2: Torque [%] 3: Estimated inertia moment ratio [%] 4: Operation number 5: Selection number 6: Tension [%] 7: Rotation counter [rev] 8: Shaft diameter [mm] 9: Top display of monitor mode	Selects the initial screen to be displayed when the data setter starts communicating with the driver. If the selected item is not supported in the tension control mode, the top screen of the monitor mode is displayed as the initial display.

4.6 Initializing parameters

You can revert parameters saved in the driver to their initial values.
For details, refer to 6.6, “Initializing driver data” on p.140.

5 Test mode

5.1 What you can do in the test mode

- I/O test

  You can check the ON/OFF status of each input signal of the driver, or switch the ON/OFF status of each output signal on the **OPX-2A**. You can also check the analog input voltage and set a desired analog output voltage.
  There is also an I/O test function with which you can check the connection status of the driver.

- JOG operation

  You can operate the motor using the keys on the **OPX-2A**.

- Z-phase preset

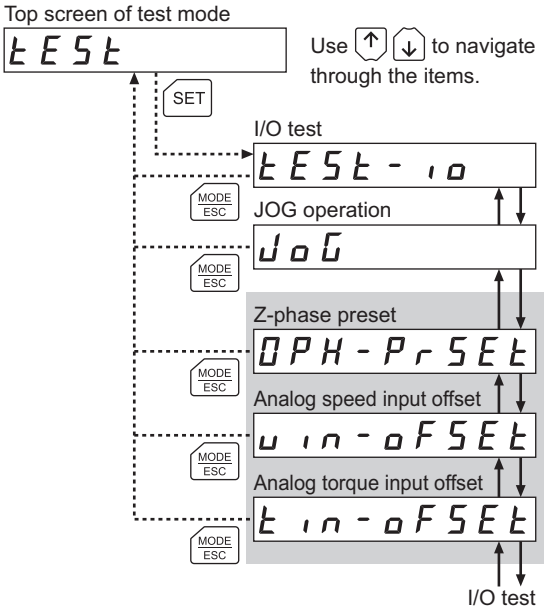
  You can preset the Z-phase position.

- Analog input offset

  You can offset the analog speed input and analog torque input.

5.2 Operation in the test mode

1. Use the 【MODE/ESC】 key to select the test mode.
2. Press the 【SET】 key in the top screen of the test mode.
   The display changes to the test mode item screen.
3. Use the 【↑】【↓】 keys to select the item you want to perform.



∗ If operations are limited by the edit lock function (p.9), the screen text in gray is not shown.

Note

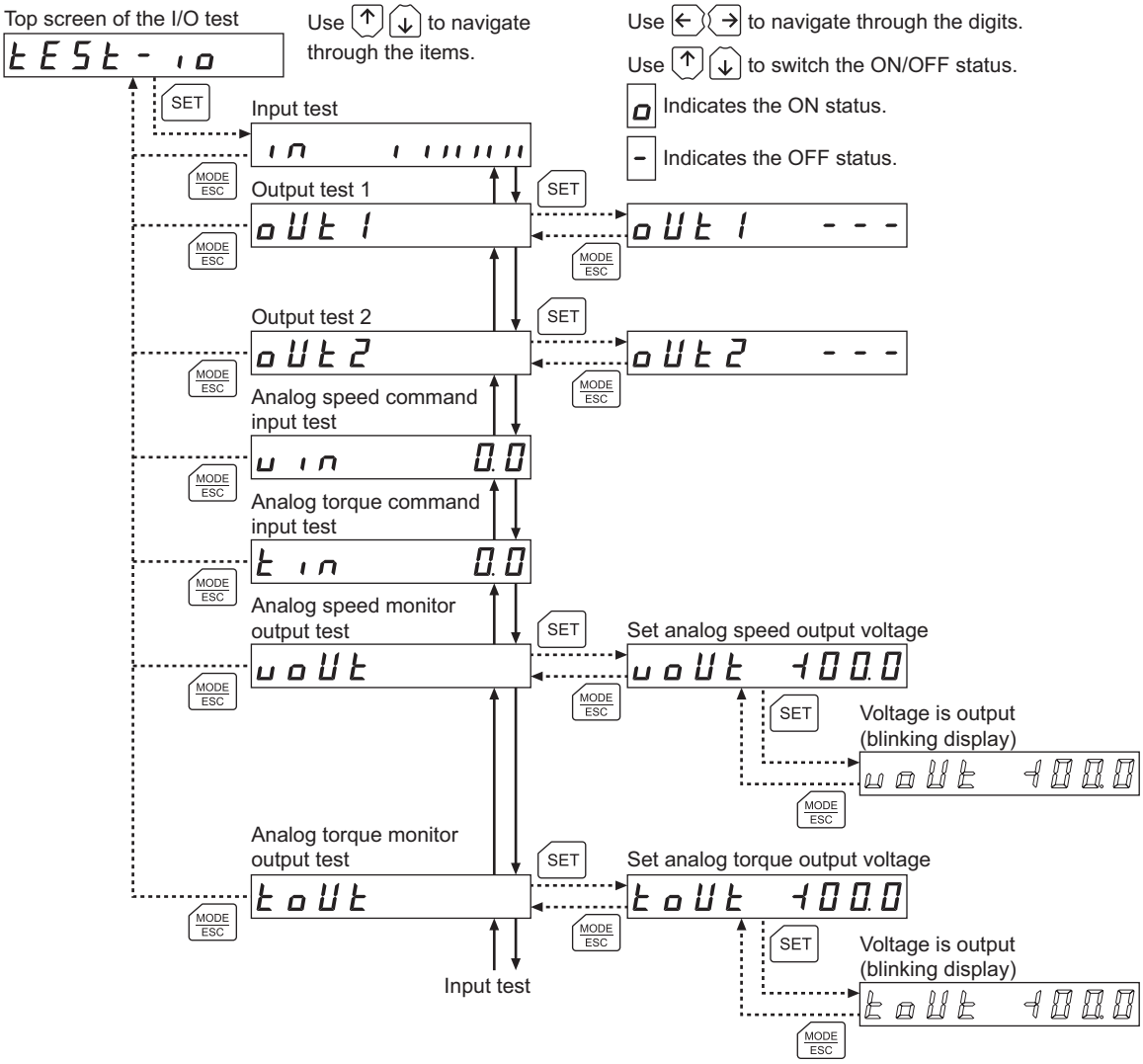
- Stop the motor operation before changing to the test mode.
- When you move from the top screen of the test mode to a lower level, the CW/CCW input will be disabled.
- When you move from a non-JOG-operation item to a lower level, all I/O signals and operations will be disabled.

What happens when the【SET】key is pressed while the motor is operating

While the motor is operating, you cannot move to any lower level from the top screen of the test mode. Pressing the【SET】key will generate an error, and "oPE-Err" will be shown.
Be sure to stop the motor operation before pressing the【SET】key.

5.3 I/O test

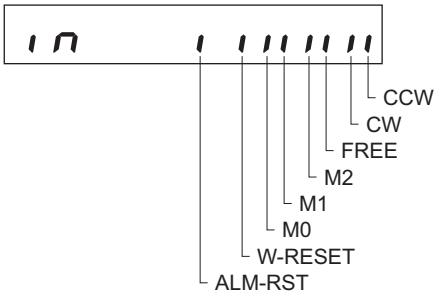
You can check the ON/OFF status of each input signal of the driver, or switch the ON/OFF status of each output signal on the **OPX-2A**. You can also check the analog input voltage and set a desired analog output voltage.
There is also an I/O test function with which you can check the connection status of the driver.



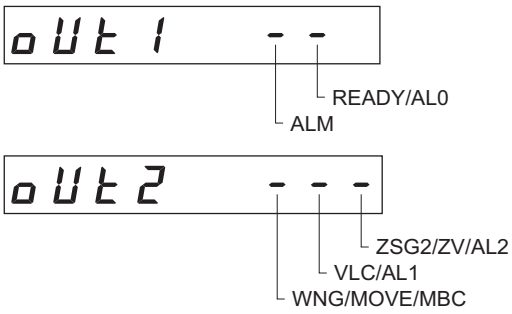
- Checking I/O signals

  On the I/O signal check screen, each digit on the 7-segment LED display corresponds to a signal. If the signal is ON, the corresponding digit is lit. If the signal is OFF, the digit is unlit.

  • Input signals

  • Output signals

- Analog input test

  The analog speed input voltage and analog torque input voltage are shown.
  Each voltage is indicated in units of 0.1 V.

- Analog output test

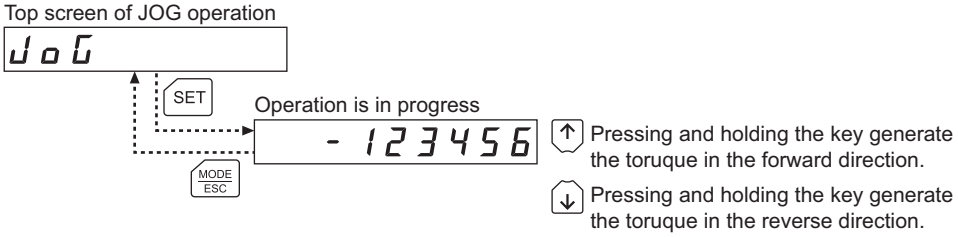
  When an output voltage is set and the【SET】key is pressed, the specified voltage will be output from the analog monitor terminal of the driver. The setting range is −10.0 to +10.0 V.

5.4 JOG operation

You can operate the motor using the keys on the **OPX-2A**.
The tension command corresponds to the value set in the operating tension of JOG operation parameter [APP-5-01].

Note During JOG operation, the motor rotates at the specified operating speed while each applicable key is pressed. Before commencing JOG operation, consider the status of the equipment and condition of its surroundings to confirm thoroughly that motor rotation will not cause any dangerous situation.

Top screen of JOG operation

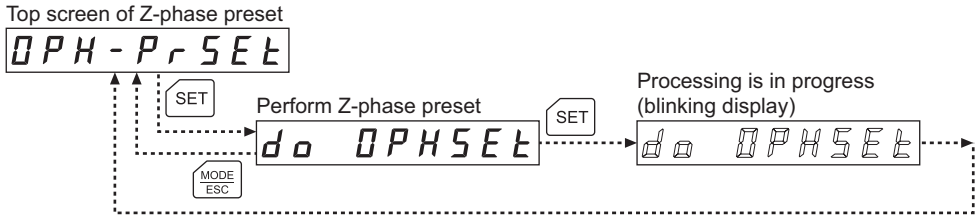


5.5 Presetting Z-phase

In this operation, a Z-phase signal is output at the current position.

Note

- If operations are limited by the edit lock function (p.9), the preset function cannot be performed.
- When Z-phase preset is performed, the Z-phase position will be tentatively written to the driver's EEPROM. When the power is turned on the next time, the Z-phase position that was written earlier will be reflected in the motor encoder. The EEPROM and encoder memory can be rewritten approx. 100,000 times.
- When a different motor is connected, the content of the encoder memory of the new motor will be read into the driver. Accordingly, the Z-phase position will also change to reflect the new motor.

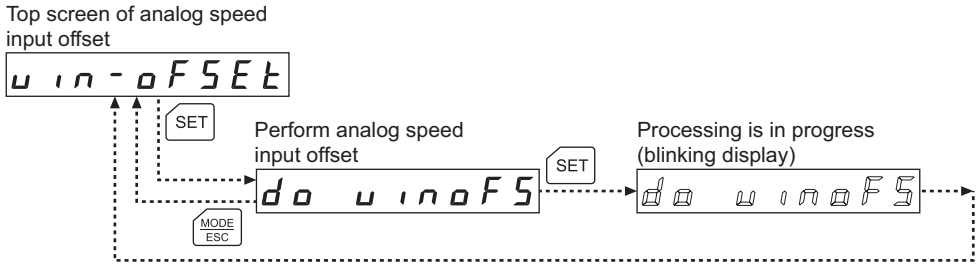


5.6 Offsetting the analog speed input

This function cannot be used when the analog input signal auto-offset parameter [APP-2-06] is set to "1: Enable." When a voltage of 0 V is input to the analog speed input terminal and the offset function is performed, the offset voltage will be adjusted automatically and the adjusted voltage will be saved in the driver.

Note

- If operations are limited by the edit lock function (p.9), the offset function cannot be performed.
- If the offset function is performed, the offset voltage will be written to the driver's EEPROM. The EEPROM can be rewritten approx. 100,000 times.

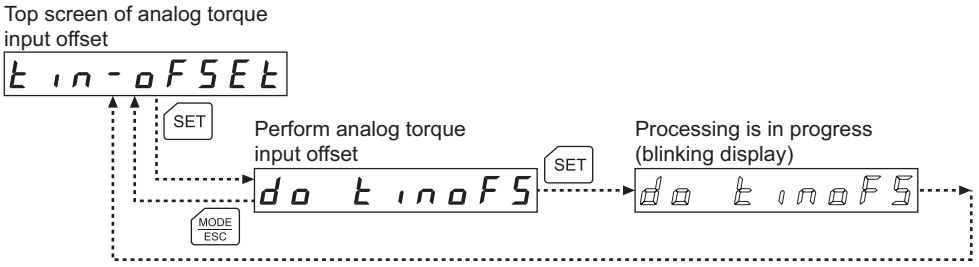


5.7 Offsetting the analog torque input

This function cannot be used when the analog input signal auto-offset parameter [APP-2-06] is set to "1: Enable." When a voltage of 0 V is input to the analog torque input terminal and the offset function is performed, the offset voltage will be automatically adjusted and the adjusted voltage will be saved in the driver.

Note

- If operations are limited by the edit lock function (p.9), the offset function cannot be performed.
- If the offset function is performed, the offset voltage will be written to the driver's EEPROM. The EEPROM can be rewritten approx. 100,000 times.



6 Copy mode

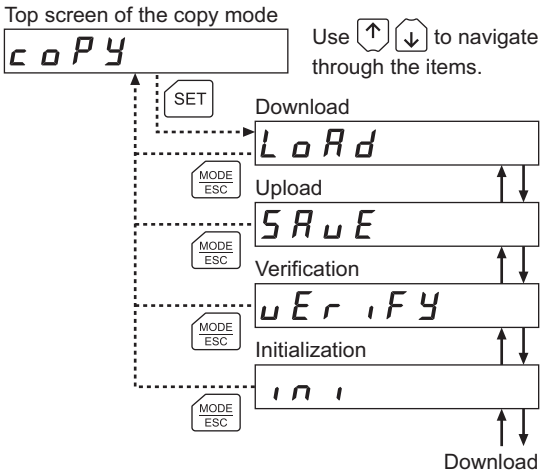
The **OPX-2A** has four data banks, and operation data and parameters can be saved in each of these data banks. Since an EEPROM is used as the data memory element, stored data will be retained even after the power is turned off.
In the copy mode, you can download data saved in the **OPX-2A** to the driver. You can also upload data saved in the driver to the **OPX-2A**.
It is also possible to verify data in the **OPX-2A** against the corresponding data in the driver, or revert driver data to their initial values.

6.1 What you can do in the copy mode

- Download
  Copy data saved in the **OPX-2A** to the driver.
- Upload
  Copy data saved in the driver to the **OPX-2A**.
- Verification
  Verify data in the **OPX-2A** against the corresponding data in the driver.
- Initializing driver data
  Revert data saved in the driver to their initial values.

6.2 Operation in the copy mode

1. Use the【MODE/ESC】key to select the copy mode.
2. Press the【SET】key in the top screen of the copy mode.
   The display changes to the copy mode item screen.
3. Use the【↑】【↓】keys to select the item you want to perform.



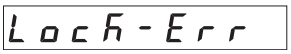
Note
- Stop the motor operation before changing to the copy mode.
- When you move from the top screen of the copy mode to a lower level, the CW/CCW input will be disabled.

- What happens when the【SET】key is pressed while the motor is operating

While the motor is operating, you cannot move to any lower level from the top screen of the copy mode. Pressing the【SET】key will generate an error, and "oPE-Err" will be shown.
Be sure to stop the motor operation before pressing the【SET】key.

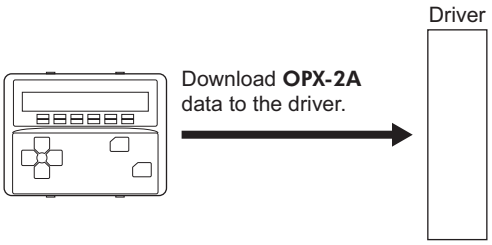
- What happens when the【SET】key is pressed while the edit lock is enabled

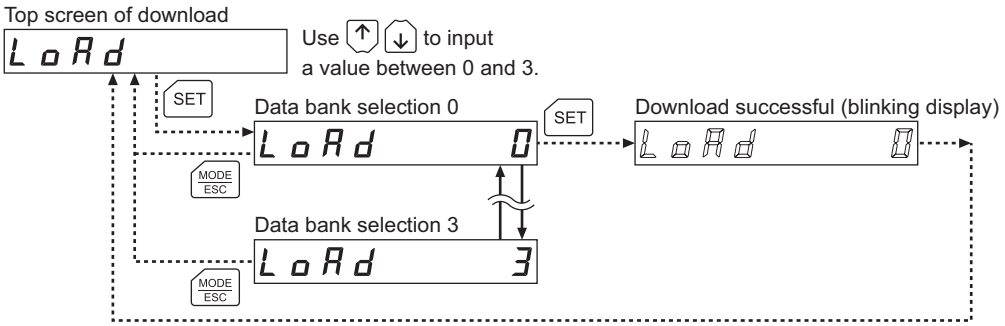
While the edit lock is enabled, you cannot move to any lower level from the top screen of the copy mode. Pressing the【SET】key will generate an error, and "LocK-Err" will be shown.
Be sure to cancel the edit lock before pressing the【SET】key. Refer to p.9 for the procedure to cancel the edit lock.



6.3 Downloading to the driver

In this operation, data in the specified data bank number are downloaded to the driver.





Note

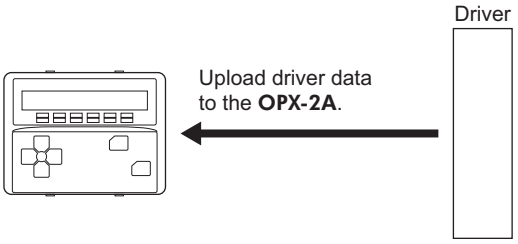
- System parameters that have been changed will become effective after the power is cycled. If the system parameters have been changed as a result of the download, cycle the driver power. If a 24 VDC power supply is used, also cycle the 24 VDC power supply.
- Do not turn off the driver power while the download is still in progress (= while the display is blinking). Doing so may damage the data.

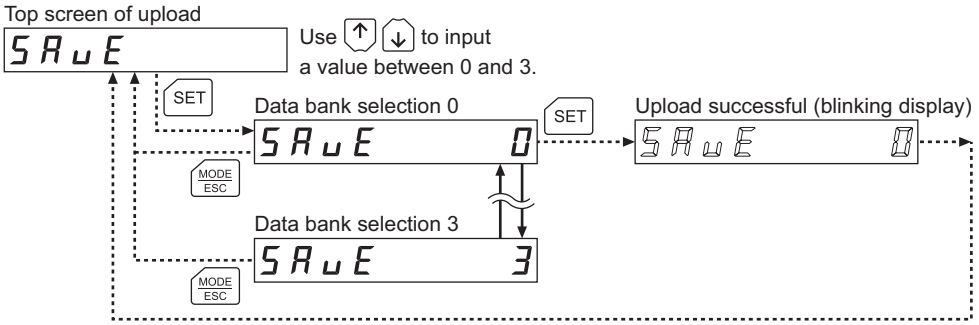
If a download error occurs, a code indicating the nature of the error will blink on the display. Download will not be performed and the display will return to the top screen of download.

Blinking display	Description	Action
Prod-Err	The product series of the driver to which data is downloaded is wrong.	• Check the product series of the driver. • Check the data bank number on the **OPX-2A**.
ctL-Err	The control mode of the driver is different from that of the **OPX-2A**.	Check the control mode of the driver.
HEAd-Err bcc-Err	An error occurred while data was being downloaded.	Perform download again. If the same error occurs, the data saved in the **OPX-2A** may be damaged. Upload the applicable data to set the **OPX-2A** data again.
no-dAtA	The specified data bank number does not contain data.	Check the data bank number.
dAtA-Err	An error occurred while data was being written.	Perform download again.

6.4 Uploading to the OPX-2A

In this operation, data saved in the driver is uploaded to the specified data bank number.

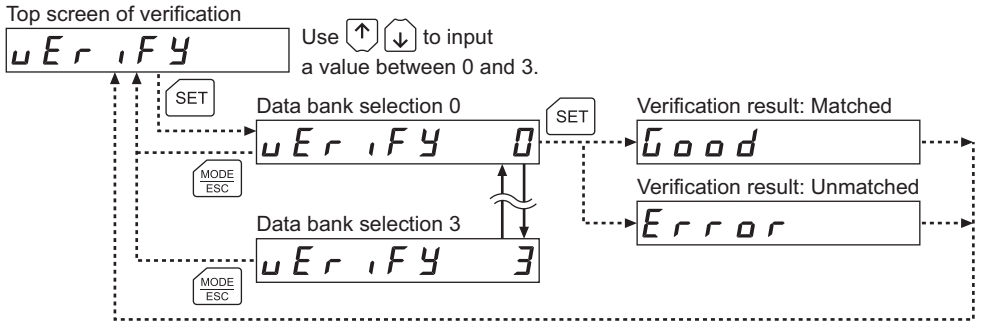




Note Do not turn off the driver power while the upload is still in progress (= while the display is blinking). Doing so may damage the data.

6.5 Verifying data

In this operation, data in the specified data bank number are verified against the corresponding data saved in the driver.
If the verification finds that the two sets of data match, “Good” will be shown. If the two do not match, “Error” will be shown.

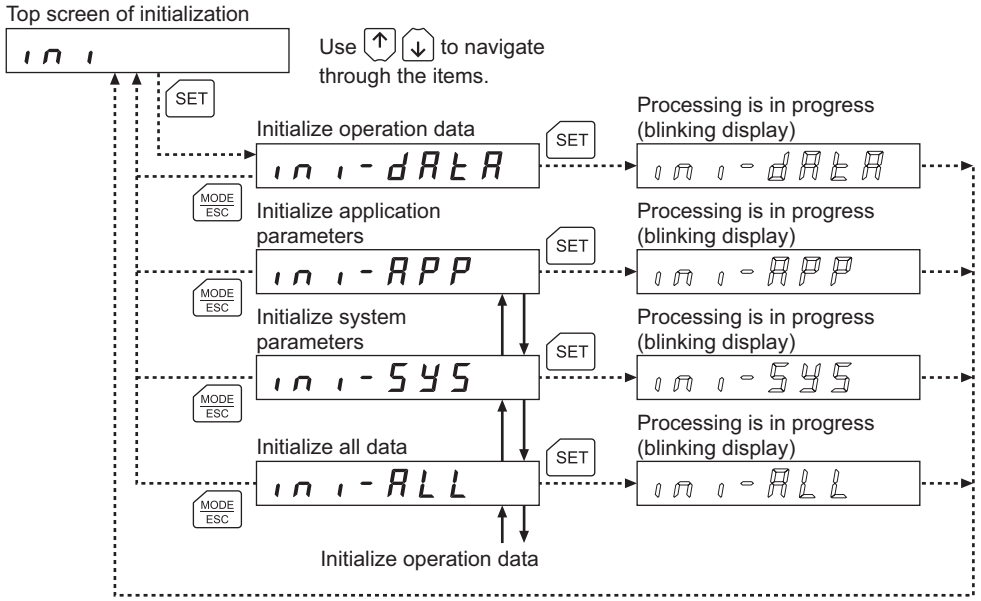


If a verification error occurs, a code indicating the nature of the error will blink on the display.
Verification will not be performed and the display will return to the top screen of verification.

Blinking display	Description	Action
Prod-Err	The product series of the driver against which data is verified is wrong.	• Check the product series of the driver. • Check the data bank number on the **OPX-2A**.
ctL-Err	The control mode of the driver is different from that of the **OPX-2A**.	Check the control mode of the driver.
HEAd-Err bcc-Err	An error occurred while data was being verified.	Perform verification again. If the same error occurs, the data saved in the **OPX-2A** may be damaged. Upload the applicable data to set the **OPX-2A** data again.
no-dAtA	The specified data bank number does not contain data.	Check the data bank number.

6.6 Initializing driver data

In this operation, data saved in the driver are reverted to their initial values.



Note

- System parameters that have been changed will become effective after the power is cycled. If the system parameters have been changed as a result of the initialization, cycle the driver power. If a 24 VDC power supply is used, also cycle the 24 VDC power supply.
- Do not turn off the driver power while the initialization is still in progress (= while the display is blinking). Doing so may damage the data.

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