Oriental motor

HP-5058-3

Data Setter **OPX-2A**

BXⅡ 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.

Table of contents

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 MANUAL 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 protective function is triggered, first remove the cause and then clear the protective 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 in conditions exceeding the specifications. Doing so may result in electric shock, injury or damage to equipment.

Operation

- Provide an emergency stop device or emergency stop circuit 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

- Dispose the product correctly in accordance with laws and regulations, or instructions of local governments.

2 Introduction

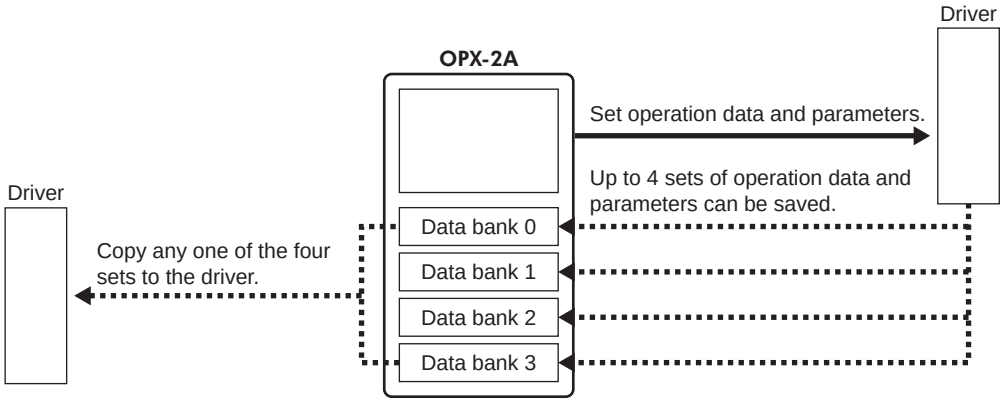
Only qualified personnel should work with the product.
Use the product correctly after thoroughly reading the section "1 Safety precautions" on page.2.
The product described in this manual has been designed and manufactured to be incorporated in general industrial equipment. Do not use for any other 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 operation data and parameters, perform monitoring, etc.
Use the **OPX-2A** properly and safely after thoroughly reading the "**BX Ⅱ** Series OPERATING MANUAL" and understanding the basic operating procedures and other details.

■ Features of OPX-2A

The **OPX-2A** can be used to save data in addition to setting of operation data and parameters.
There are four destinations (data banks) to save data.



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

- Operation data and parameters of the driver can be set.
- The operating status of the motor can be monitored.
- Operation data and parameters set in the driver can be saved to the **OPX-2A**.
- Operation data and parameters saved in the **OPX-2A** can be copied to other drivers.

■ 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)

■ RoHS Directive

The products do not contain the substances exceeding the restriction values of RoHS Directive (2011/65/EU).

3 Preparation

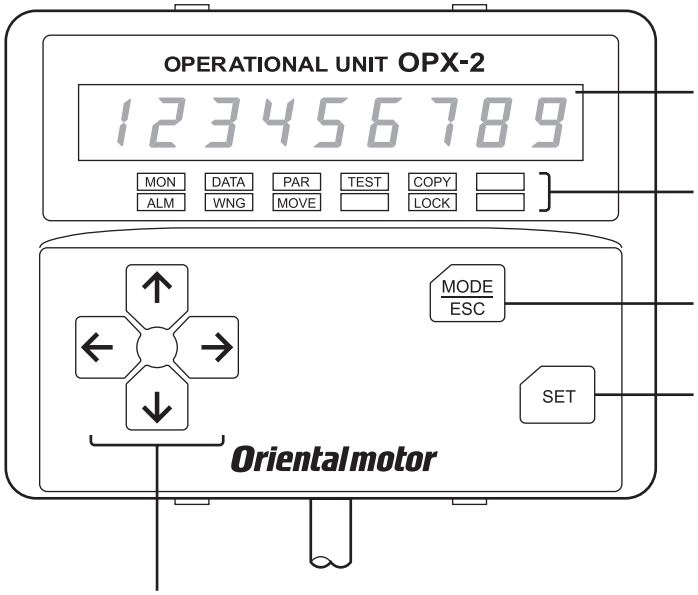
This chapter explains the items you should know before using the **OPX-2A**.

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
- 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.

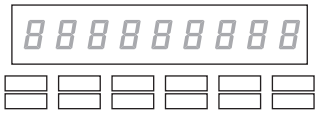
Use these buttons to change the selected item or set data and parameters.

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

1	2	3	4	5	6	7	8	9	0
1	2	3	4	5	6	7	8	9	0

• Alphabets

A	B	C	D	E	F	G	H	I	J	K	L
A	b	c	d	E	F	G	H	I	J	K	L

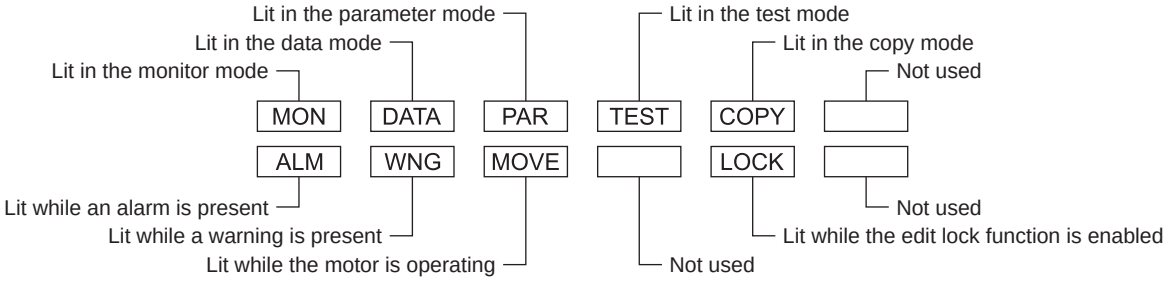
M	N	O	P	Q	R	S	T	U	V	W	Y
M	n	o	P	q	r	S	t	U	v	W	Y

• Signes

+	-
+	-

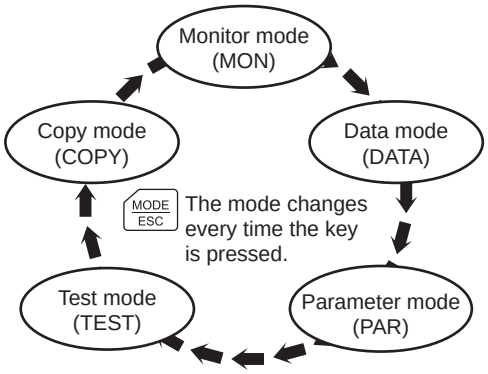
3.4 How to read the LED indicators

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 present operation mode based on the LED indicator currently lit.

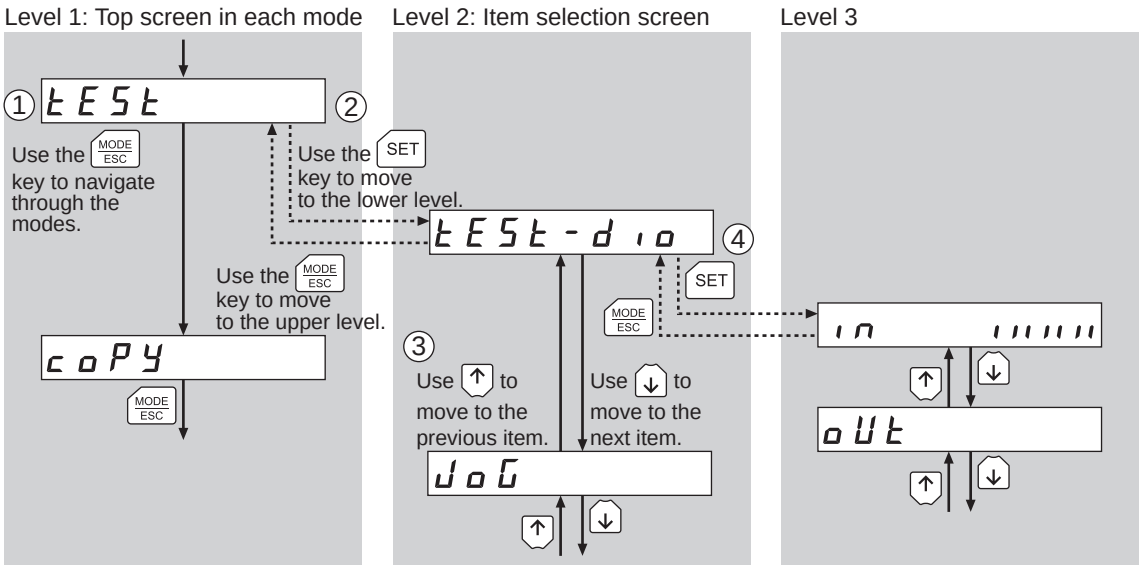


3.6 Basic operations of the OPX-2A

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.

Note If the【SET】key is pressed while the driver performs the internal processing, the screen cannot change to any lower level from the top screen, and "mEm-bUSY" is displayed.
Be sure to wait until all internal processing is completed, before pressing the【SET】key.

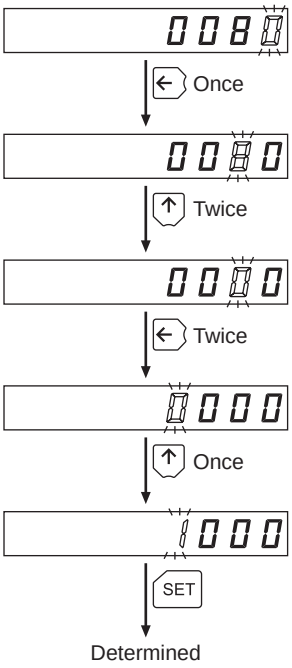
■ How to input values

As an example, how to change the rotation speed from "80" r/min to "1000" r/min 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.
- The digit currently blinking can be edited.

1. First, change the 10's place from "8" to "0."
   Press the【←】key once to move to the 10's digit you want to edit.
2. Press the【↑】key twice to change the value to "0."
3. Next, change the 1000's place from "0" to "1."
   Press the【←】key twice to move to the 1000's digit you want to edit.
4. Press the【↑】key once to change the value to "1."
5. After all digits have been changed, press the【SET】key to determine the value.
   All digits comprising the value blink for approximately 2 seconds.



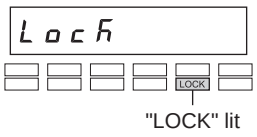
Note If the value you have input is outside the setting range, "Error" will be displayed for 1 second. If this error display appears, input a different value that falls within the setting range.

3.7 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

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

3.8 Rewriting the driver's non-volatile memory

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

- Edit any operation data or parameter
- Download data from the **OPX-2A** to the driver
- Initialize driver operation data and parameters

4 Installation and connection of the OPX-2A

4.1 Location for installation

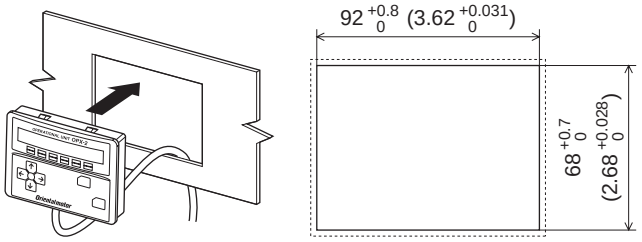
The **OPX-2A** is designed and manufactured to be incorporated in equipment.
Install it in a well-ventilated location that provides easy access for inspection. The location must also satisfy the following conditions:

- 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 (non-condensing)
- 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

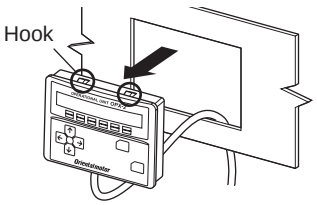
Using a metal plate of 1 to 3 mm (0.04 to 0.12 in.) in thickness, insert the **OPX-2A** into the mounting hole from the front side and securely attach it.

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



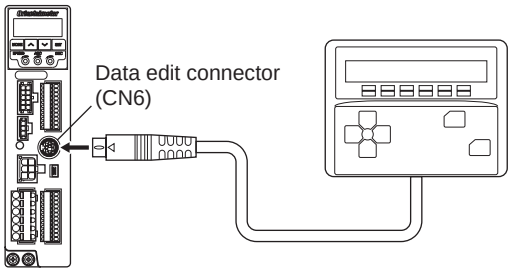
Removing method

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 data edit connector (CN6) 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.

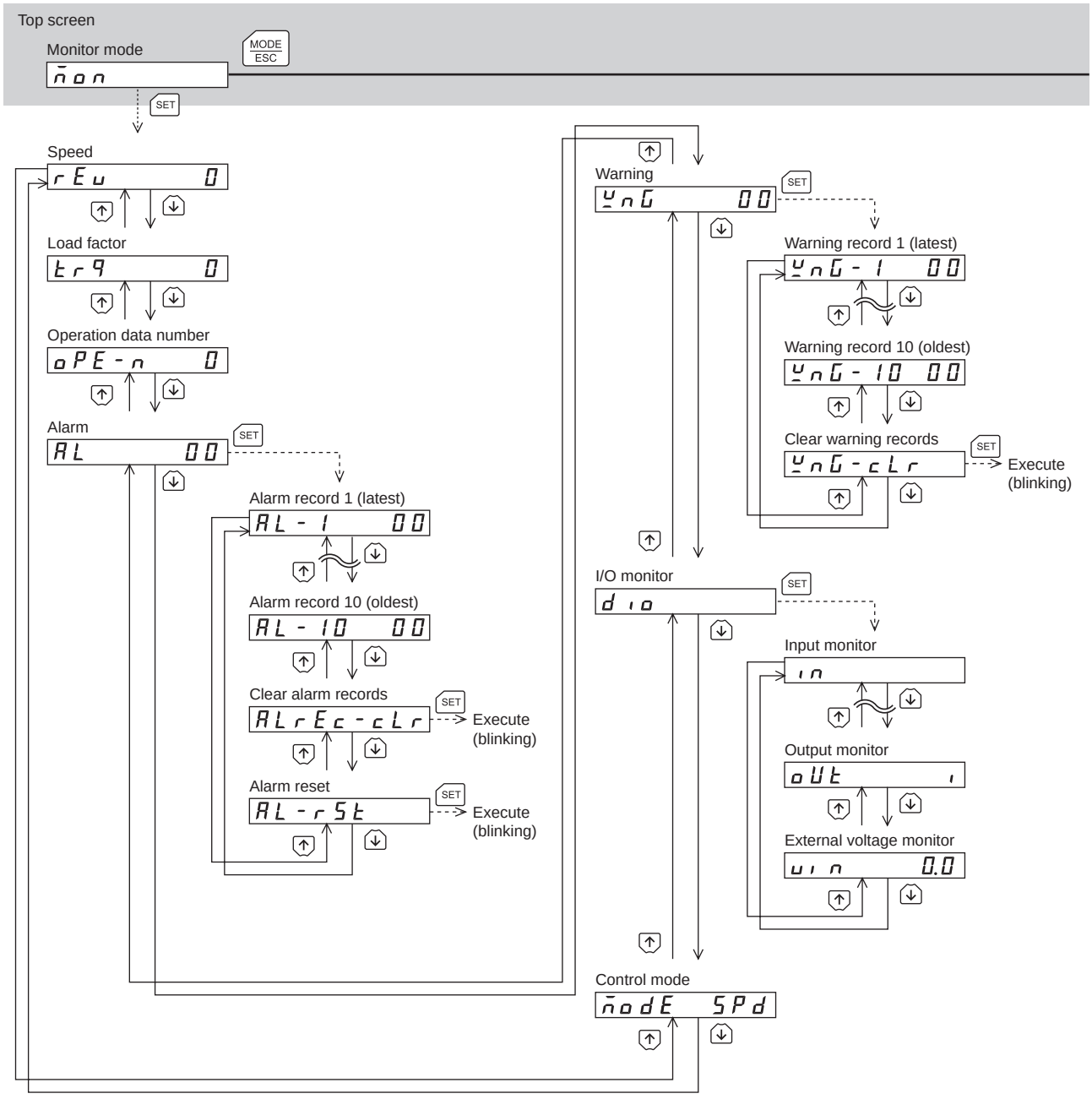
4.4 Error display on OPX-2A screen

The following error message is displayed on the **OPX-2A** screen.

Error display	Description	Remedial action
tinEoUt 1.1.	A communication error occurred between the **OPX-2A** and driver.	• Check if the **OPX-2A** is connected securely. • Check if the **OPX-2A** cable is disconnected or damaged. • The **OPX-2A** or the communication part of the driver may have damaged. Contact your nearest Oriental Motor sales office.

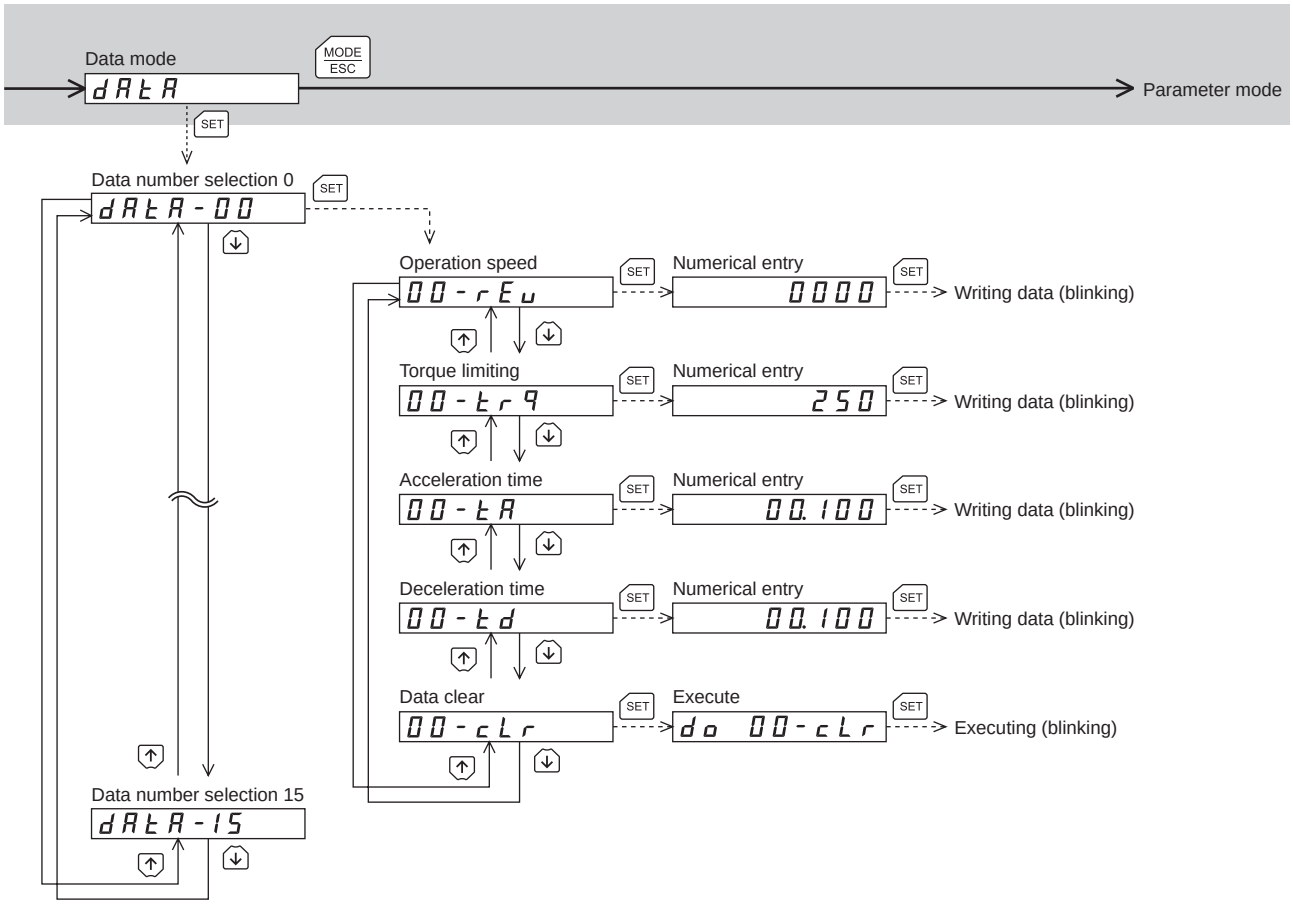
5 When using the product with the speed control mode

5.1 Screen transitions

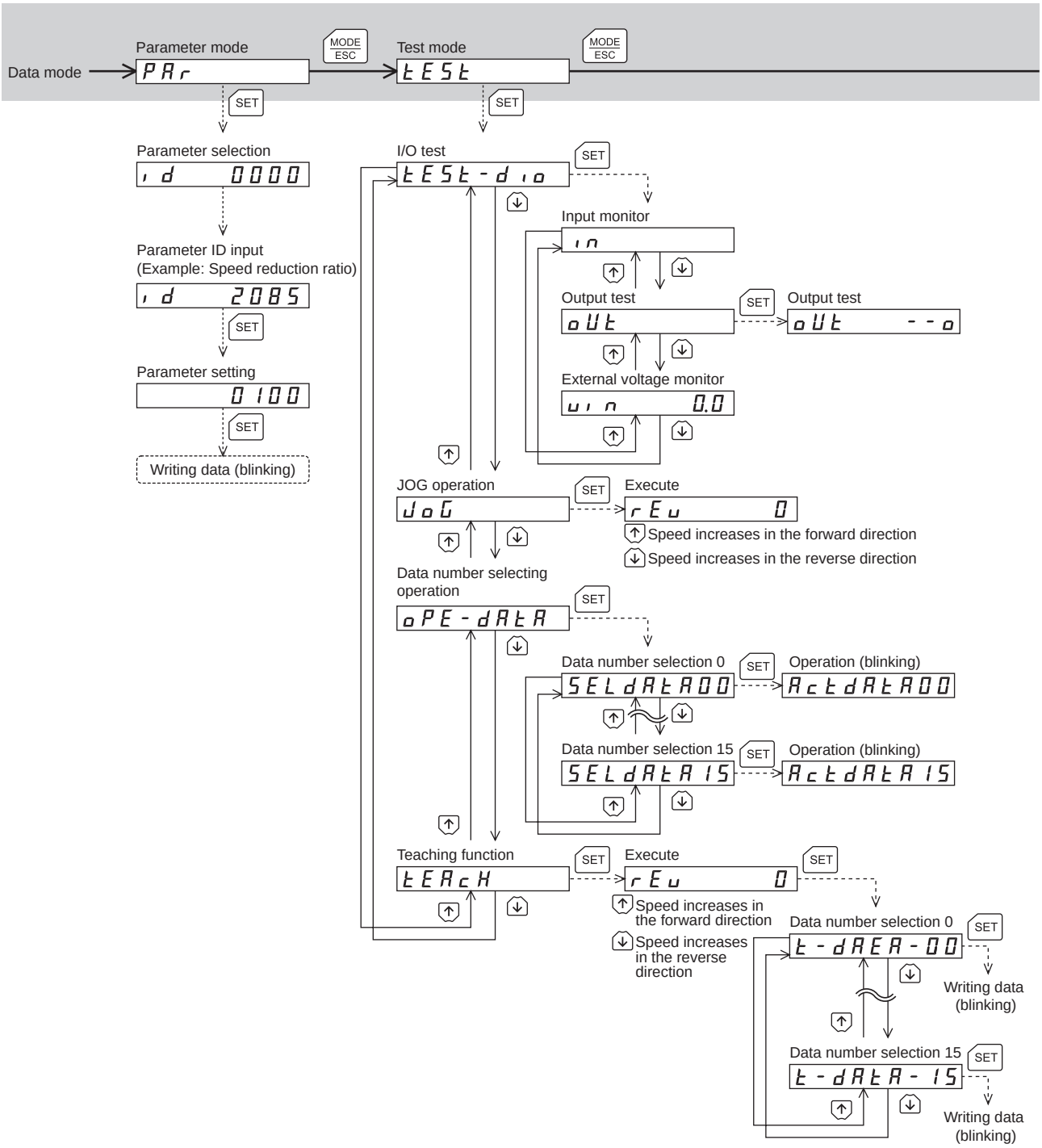


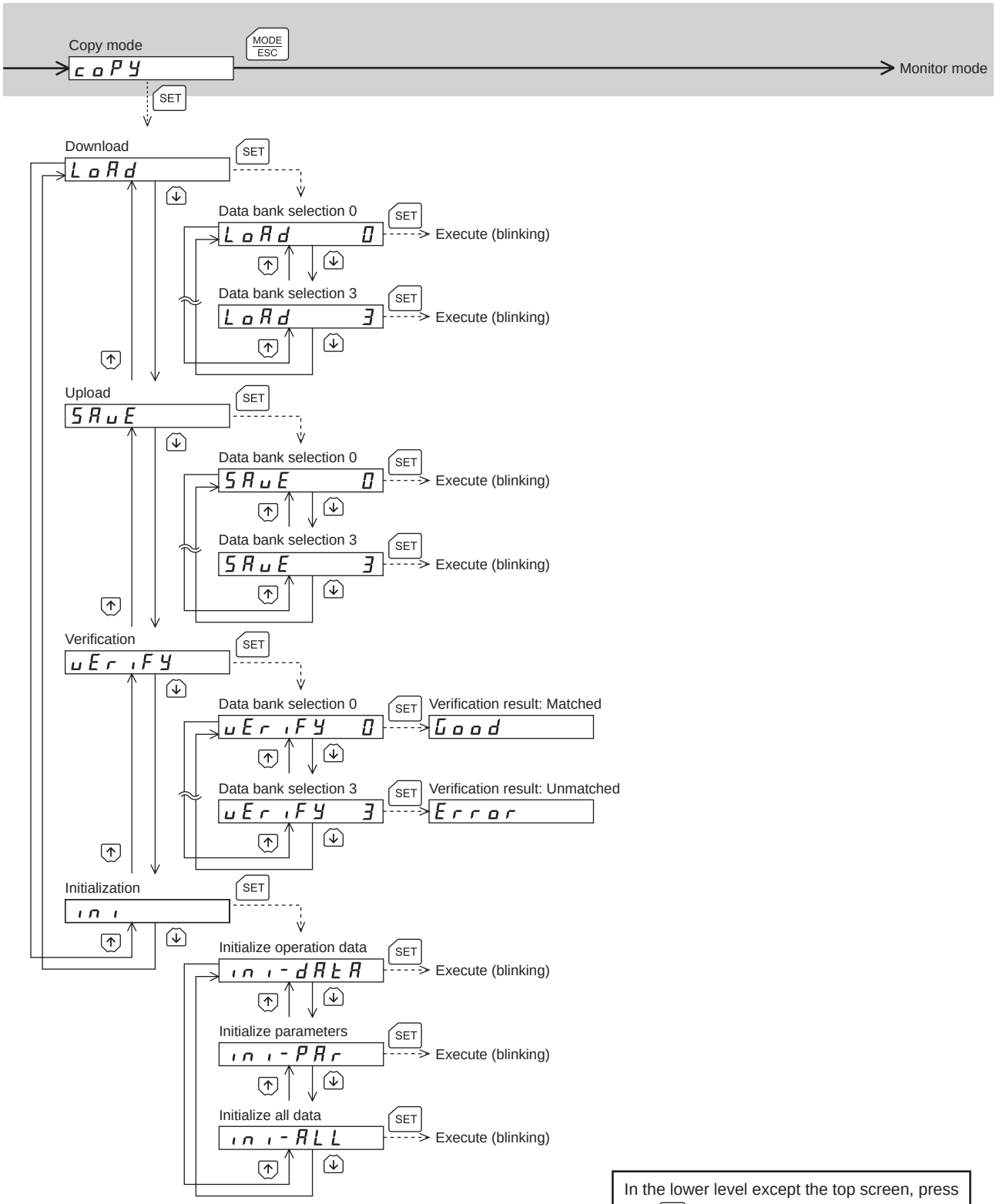
Note

- There are the following restrictions while the edit lock function is enabled.
  - Data mode, parameter mode: Although they are displayed on the screen, they are unable to operate.
  - Clearing the alarm and warning records, copy mode: They are not displayed on the screen.
- When the HMI input is in an OFF state, all functions of the test mode cannot be executed. Downloading and initializing are also disabled.



In the lower level except the top screen, press the MODE ESC key to return to the previous level.


Data mode
Parameter mode
PAr
MODE ESC
Test mode
tESt
MODE ESC
SET
SET
Parameter selection
id 0000
Parameter ID input
(Example: Speed reduction ratio)
id 2085
SET
Parameter setting
0100
SET
Writing data (blinking)
I/O test
tESt-dio
SET
Input monitor
in
Output test
oUt
SET
Output test
oUt --o
External voltage monitor
uin 0.0
JOG operation
doG
SET
Execute
rEu 0
Speed increases in the forward direction
Speed increases in the reverse direction
Data number selecting operation
oPE-dAtA
SET
Data number selection 0
SELdAtA00
SET
Operation (blinking)
ActdAtA00
Data number selection 15
SELdAtA15
SET
Operation (blinking)
ActdAtA15
Teaching function
tEAcH
SET
Execute
rEu 0
SET
Speed increases in the forward direction
Speed increases in the reverse direction
Data number selection 0
t-dAtA-00
SET
Writing data (blinking)
Data number selection 15
t-dAtA-15
SET
Writing data (blinking)



In the lower level except the top screen, press the MODE ESC key to return to the previous level.

5.2 Monitor mode

■ Overview of the monitor mode

- Monitoring the operating status

  The motor speed, load factor and operation data number corresponding to the present operation can be monitored in real time.

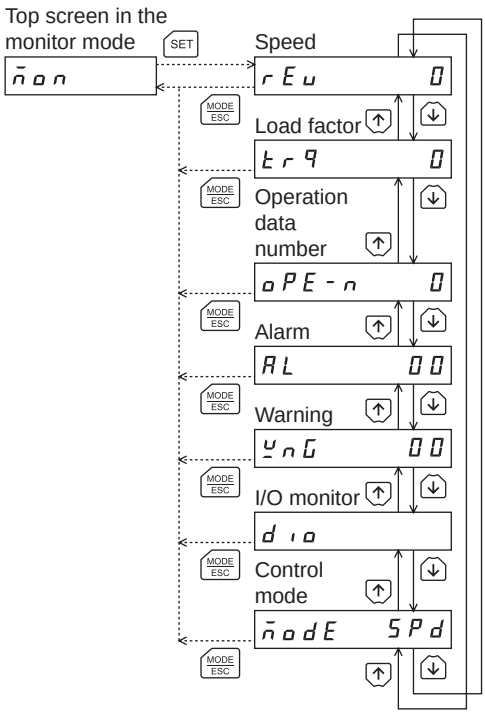
- Checking alarms/warnings, clearing alarm/warning records, and resetting alarms
  - If an alarm or warning generates, since a corresponding alarm code or warning code will be displayed, the item to identify the details of the alarm/warning can be checked.
  - Up to ten most recent alarms/warnings can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

- Checking I/O signals

  The ON/OFF status of each I/O signal of the driver can be checked.

■ Operation in the monitor mode

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



■ Monitor items

- Speed (unit: r/min)

  The motor operation speed can be checked.
  While the motor rotates in the counter clockwise direction (CCW), the "−" sign is displayed in front of the value. The value can also be displayed as the absolute value, or the "−" sign can be displayed in front of the value while the motor rotates in the clockwise direction (CW). In this case, change the setting of the "data setter speed display" parameter (ID: 480).
  The operation speed can be displayed as the rotation speed of the gear output shaft. To do this, set the "speed reduction ratio" parameter (ID: 2085) and "speed reduction ratio digit setting" parameter (ID: 2086).
  It is also possible to increase the rotation speed and display the increased speed. Set in the "speed increasing ratio" parameter (ID: 2087).

- Load factor (Unit: %)

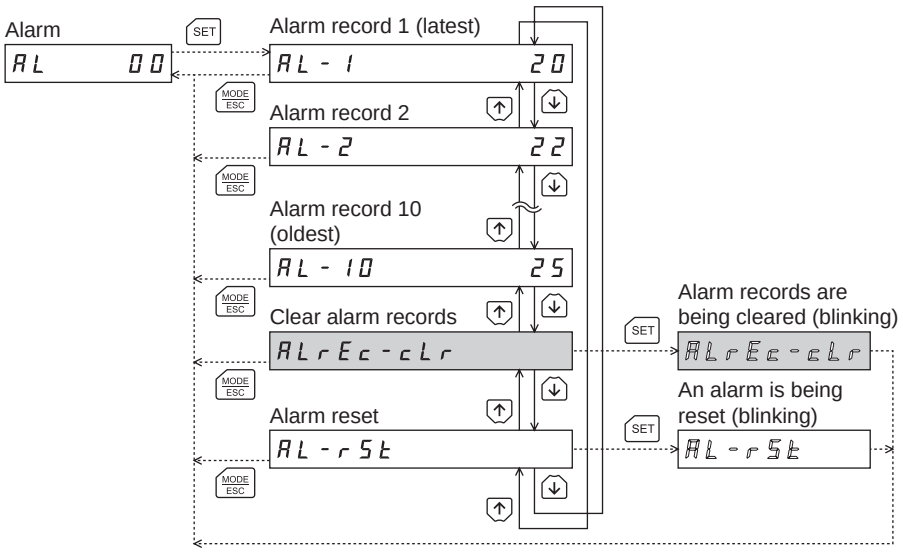
  The motor generating torque can be checked. The present load factor is displayed based on the rated torque being 100%.

- Operation data number

  The operation data number corresponding to the present operation can be checked.

- Alarm

  When an alarm generates, a corresponding alarm code will be displayed.
  The present alarm can be reset, and also alarm records can be checked or cleared.



∗ If operations are limited by the edit lock function, the screens in gray color are not displayed.

Note

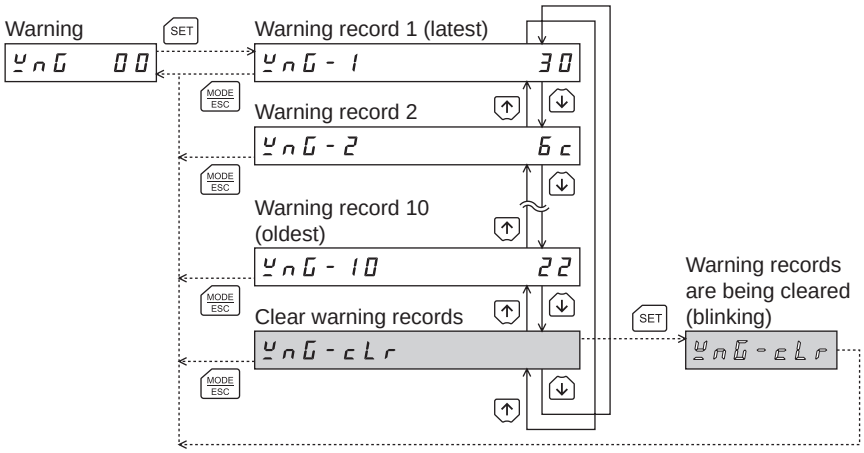
- Do not turn off the driver power while an alarm is being reset or alarm records are being cleared (=while the display is blinking). Doing so may damage the data.
- Some alarms cannot be reset using the **OPX-2A**. Check by the following table. To reset these alarms, cycle the driver power.

Alarm code list

Code	Alarm name	Reset using the **OPX-2A**
10	Excessive position deviation	Possible
20	Overcurrent	Not possible
22	Overvoltage	
25	Undervoltage	Possible
28	Sensor error	Not possible
2D	Main circuit output error	
30	Overload	Possible
31	Overspeed	
41	EEPROM error	Not possible
42	Sensor error at power-on	
46	Prevention of operation at power-on	Possible
51	Regeneration unit overheat	Not possible
67	Software overtravel	Possible
70	Operation data error	

- Warning

When a warning generates, a corresponding warning code will be displayed.
Warning records can also be checked or cleared.



∗ If operations are limited by the edit lock function, the screens in gray color are not displayed.

Note

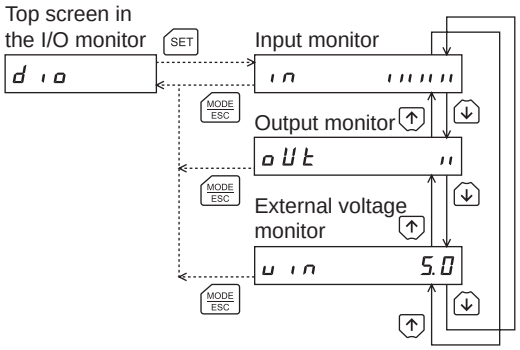
- Do not turn off the driver power while warning records are being cleared (=while the display is blinking). Doing so may damage the data.
- Warning records will automatically be cleared by turning off the driver power.

Warning code list

Code	Warning name
10	Excessive position deviation
22	Overvoltage
30	Overload
6C	Operation prohibited

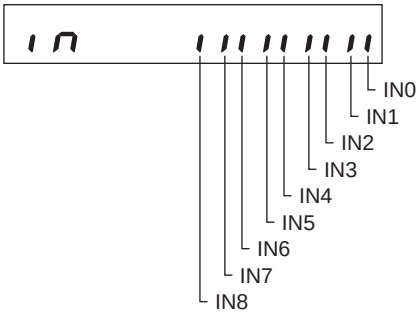
- I/O monitor

The ON/OFF status of each I/O signal of the driver can be checked.

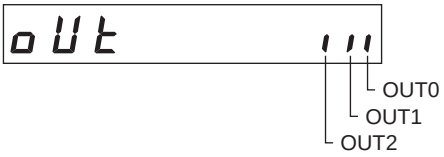


Each digit on the 7-segment LED display corresponds to a signal. The corresponding digit is lit when the signal is ON, and the digit is unlit when the signal is OFF.

- Input monitor



- Output monitor

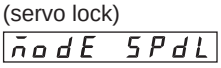


- External voltage monitor [V]

The voltage value input by the analog external setter can also be checked.

- Control mode

The present control mode can be checked.

Speed control mode	Speed control mode (servo lock)	Position control mode
		

5.3 Data mode

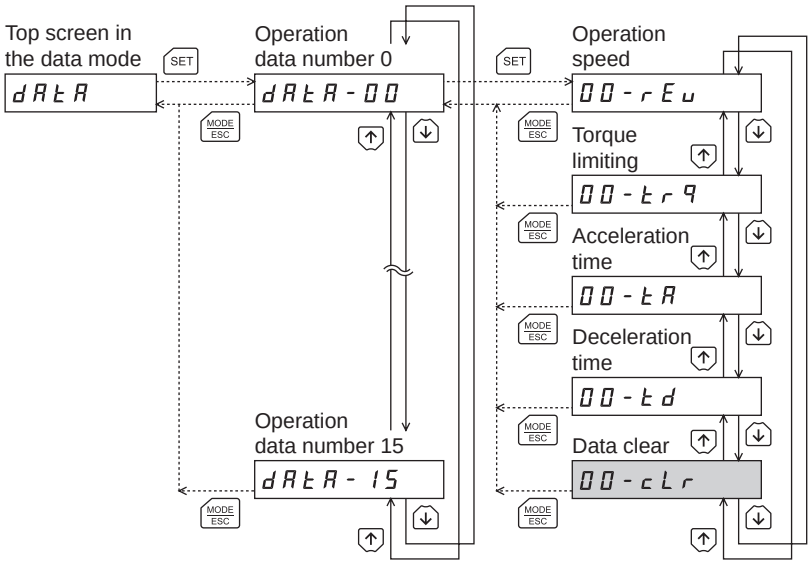
Up to 16 sets of motor operation data can be set. Once set, the operation data is stored in the driver. The data will not be lost even after the **OPX-2A** is disconnected from the driver.
Before setting operation data, read the "**BX Ⅱ** Series OPERATING MANUAL" carefully to understand the basic operations, 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, the operation data cannot be edited.
- Operation data can also be set by selecting the ID in the parameter mode.
- 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.

■ Operation in the data mode

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



∗ If operations are limited by the edit lock function, the screens in gray color are not displayed.

Note

If the【SET】key is pressed while the driver performs the internal processing, the screen cannot change to any lower level from the top screen, and "mEm-bUSY" is displayed. Be sure to wait until all internal processing is completed, before pressing the【SET】key.

■ Setting items

Item	Initial value	Setting range	Description	Setting unit
Operation speed	0	0 to 4000 r/min	Sets the operation speed for the speed control operation. Set as the rotation speed of the motor output shaft.	1
Torque limiting	250	0 to 250%∗	Sets when limiting the motor output torque. Sets the torque limiting value based on the rated torque being 100%.	1
Acceleration time	0.100	0.000 to 30.000 s	The acceleration time is set as the time needed for the motor to reach the rated rotation speed (3000 r/min) from the standstill state.	0.001
Deceleration time			The deceleration time is set as the time needed for the motor to stop from the rated rotation speed (3000 r/min).	
Data clear	–	–	Restores the operation data to the initial value.	–

∗ The motor may not start operating with the torque limiting value depending on variations in load torque, individual differences in motors, gearheads or drivers, as well as operating environment.
Set the torque limiting value with providing a margin of 20% or more as a guide.

■ Initialization of all operation data

All of the operation data saved in the driver can be restored to the initial values. Execute "Initialize operation data" of the copy mode. For details, refer to the "Initializing driver data" on page.27.

5.4 Parameter mode

Parameters relating to motor operation and control can be set. These parameters are saved in the driver.
Before setting parameters, read the "**BX Ⅱ** Series 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.
- If operations are limited by the edit lock function, parameters cannot be edited.
- 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.
- If a non-existent parameter ID is entered, "id-Err" will be displayed for 1 second. Check the ID and enter the correct one.

■ Parameter ID

There is a unique ID in each parameter. With the **OPX-2A**, set the parameter selecting the ID.

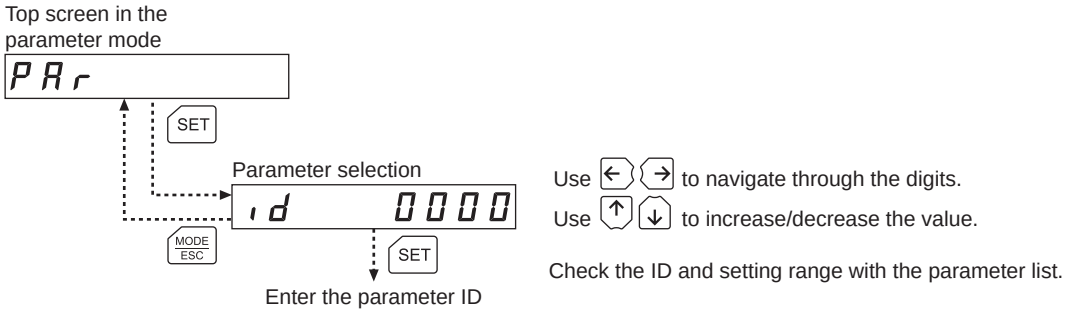
Timing for the setting value to become effective

When a parameter is changed, the timing for the new value to become effective varies depending on the parameters, which are the following three types.

- Effective immediately
  Executes the recalculation and setup immediately when writing the parameter.
- Effective after stopping the operation
  Executes the recalculation and setup after stopping the operation.
- Effective after turning the power ON again
  Executes the recalculation and setup after turning the power ON again.

Operation in the parameter mode

1. Use the【MODE/ESC】key to select the parameter mode.
2. Press the【SET】key on the top screen in the parameter mode.
   The display changes to the screen to select the parameter type.
3. Use the【↑】【↓】keys to select a desired parameter ID.
4. Press the【SET】key.
   The display changes to the parameter setting screen.



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.
- If a non-existent parameter ID is entered, "id-Err" will be displayed for 1 second. Check the ID and enter the correct one.

■ Initializing parameters

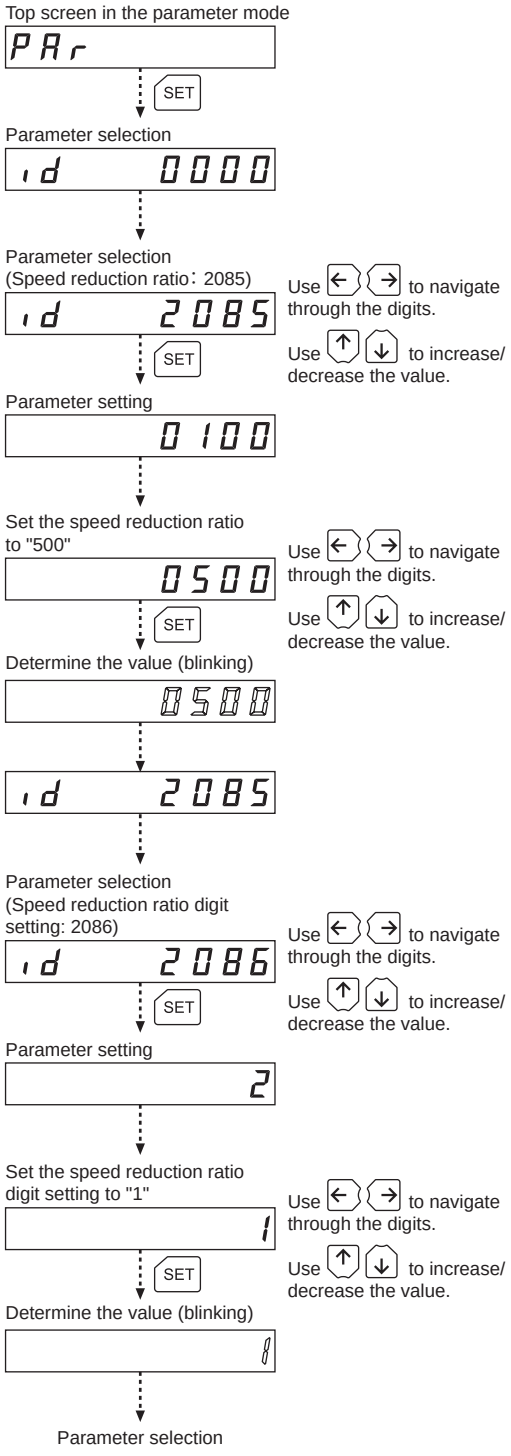
Parameters saved in the driver can be restored to their initial values. Execute "Initialize parameters" in the copy mode. For the operation, check the screen transitions of the copy mode on page 13, or "Initializing driver data" on page 27.

■ Setting example

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

Example: Set the gear ratio (ID: 2085) to "50.0"

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 parameter select screen.
3. Use the【↑】【↓】【←】【→】keys to enter "2085."
4. Press the【SET】key.
   The display changes to the parameter select screen.
5. Use the【↑】【↓】【←】【→】keys to enter "500."
6. Press the【SET】key again.
   The selected value is set, and the display returns to the parameter select screen.
7. Use the【↑】【↓】【←】【→】keys to enter "2086."
8. Press the【SET】key.
   The display changes to the parameter select screen.
9. Use the【↑】【↓】【←】【→】keys to enter "1."
10. Press the【SET】key again.
    The selected value is set, and the display returns to the parameter select screen.



5.5 Test mode

■ Overview of the test mode

- I/O test

  The ON/OFF status of each input signal of the driver can be checked on the **OPX-2A**. Also, the ON/OFF status of each output signal can be switched using the **OPX-2A**. Execute I/O test to check the connection status of the driver.

- JOG operation

  The motor can be operated using the keys on the **OPX-2A**.

- Data number selecting operation

  The motor can be operated with selecting any of the operation data No.0 to No.15.

- Teaching function

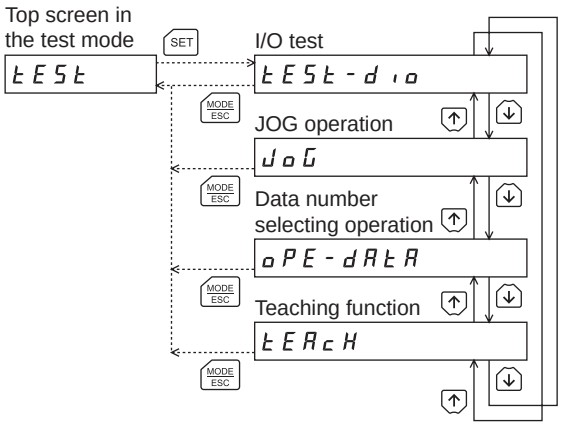
  Using the keys on the **OPX-2A**, you can operate the motor and set the operated speed in the operation data.

Note

- Stop the motor operation before changing to the test mode.
- JOG operation, data number selecting operation and teaching function cannot be executed while the FREE signal or STOP signal is being ON. Be sure to execute after turning the signal OFF.
- In I/O test, if the screen changes to the lower level, all of I/O signals and operation will be disabled.
- When the HMI input is OFF, test mode cannot be executed.

■ Operation in the test mode

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



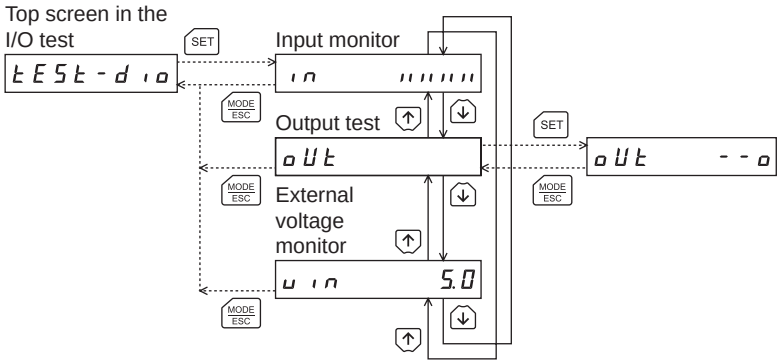
- What happens when the【SET】key is pressed while the motor is operating

  During operation, if the【SET】key is pressed on the select screen of each item in the test mode, the screen will not change to the lower level, and an error will occur, thereby displaying "oPE-Err."
  Be sure to stop the motor operation before pressing the【SET】key.

  oPE-Err

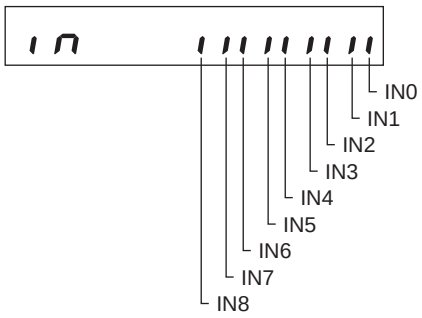
■ I/O test

Execute I/O test to check the connection status of the driver.

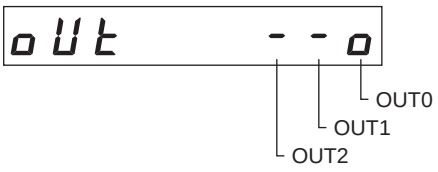


Each digit on the 7-segment LED display corresponds to a signal.
The LED is lit when the input signal is ON, and it is unlit when the input signal is OFF.
Use the【↑】【↓】keys to switch the ON-OFF state of the output signal. " 0 " is displayed when the signal is ON, while " – " is displayed when the signal is OFF.

- Input monitor



- Output test

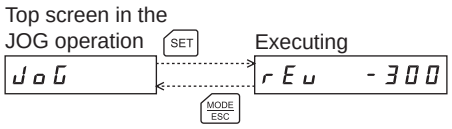


- External voltage monitor

The voltage value input by the analog external setter can also be checked.

■ JOG operation

The motor can be operated using the keys on the **OPX-2A**. The operation speed, acceleration/deceleration time and torque will correspond to the values set in the "JOG operation speed" parameter (ID: 323), "JOG acceleration/deceleration" parameter (ID: 324) and "JOG operation torque" parameter (ID: 2081) respectively.
The next example shows the display that appears when setting the rotation speed of the initial value to 300 r/min and operating the motor in the reverse direction using the【↓】key. The rotation speed is displayed while JOG operation is executed.



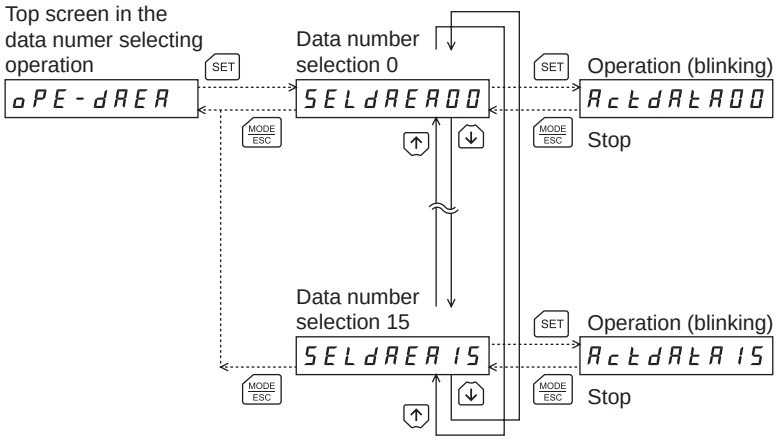
The motor rotates in the forward direction while the【↑】key is pressed.
The motor rotates in the reverse direction while the【↓】key is pressed.

Note

- During operation, the motor rotates at the specified operation speed while each applicable key is pressed. Before executing operation, consider the status of the equipment and condition of its surroundings to confirm thoroughly that motor rotation will not cause any dangerous situation.
- JOG operation cannot be executed while the FREE signal or STOP signal is being ON. Be sure to execute after turning the signal OFF.

■ Data number selecting operation

The motor can be operated with selecting any of the operation data No.0 to No.15.

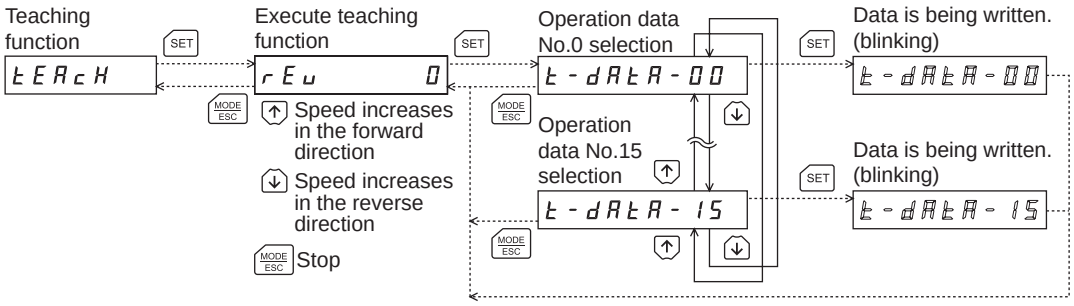


Note

- During operation, the motor rotates at the specified operation speed. Before executing operation, consider the status of the equipment and condition of its surroundings to confirm thoroughly that motor rotation will not cause any dangerous situation.
- Data number selecting operation cannot be executed while the FREE signal or STOP signal is being ON. Be sure to execute after turning the signal OFF.

■ Teaching function

Using the keys on the **OPX-2A**, you can operate the motor and set the operated speed in the operation data.
The motor rotates in the forward direction and increases the speed while the【↑】key is pressed. When decelerating the speed, press the【↓】key.
If the【↓】key is pressed when the operation speed is 0 r/min, the motor rotates in the reverse direction and increases the speed. When decelerating the speed, press the【↑】key.
The acceleration/deceleration time of the teaching function corresponds to the value set in the "JOG acceleration/deceleration rate" parameter (ID: 324), and the torque corresponds to the value set in the "JOG operation torque" parameter (ID: 2081).



Note

- Before executing operation, consider the status of the equipment and condition of its surroundings to confirm thoroughly that motor rotation will not cause any dangerous situation.
- Teaching function cannot be executed while the FREE signal or STOP signal is being ON. Be sure to execute after turning the signal OFF.
- If operations are limited by the edit lock function, teaching function cannot be executed.

5.6 Copy mode

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

■ Overview of the copy mode

- Download

  Data saved in the **OPX-2A** can be copied to the driver.

- Upload

  Data saved in the driver can be copied to the **OPX-2A**.

- Verification

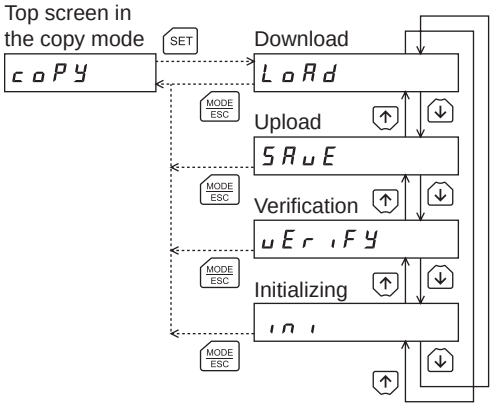
  Data in the **OPX-2A** can be verified against the corresponding data in the driver.

- Initializing driver data

  Data saved in the driver can be restored to their initial values.

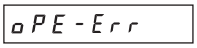
■ Operation in the copy mode

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



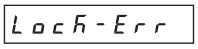
- What happens when the【SET】key is pressed while the motor is operating

  During operation, if the【SET】key is pressed on the lower level of the top screen in the copy mode, an error will occur, thereby displaying "oPE-Err."
  Be sure to stop the motor operation before pressing the【SET】key.

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

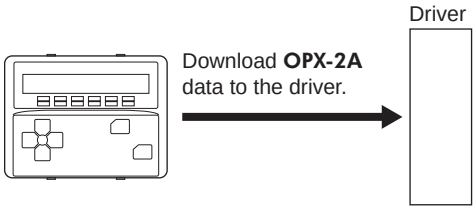
  While the edit lock function is enabled, the screen cannot change to any lower level from the top screen of the copy mode. Pressing the【SET】key will generate an error, thereby displaying "LocK-Err."
  Be sure to cancel the edit lock function before pressing the【SET】key.
  Refer to p.7 for the procedure to cancel the edit lock function.

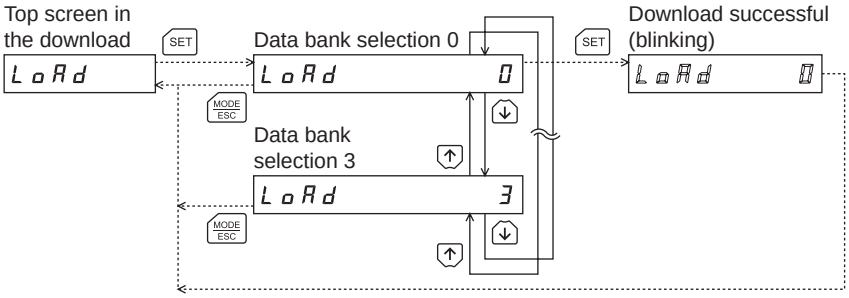
  

Note Stop the motor operation before changing to the copy mode.

■ Downloading to the driver

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





Note

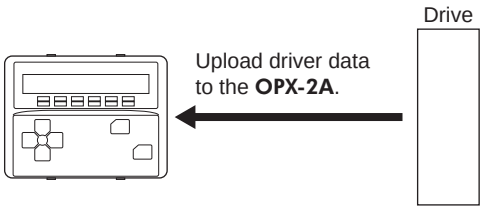
- Some parameters will become effective after cycling the power. When these parameters were changed by downloading, cycle the driver power.
- Do not turn off the driver power while the download is still in progress (=while the display is blinking). Doing so may damage the data.

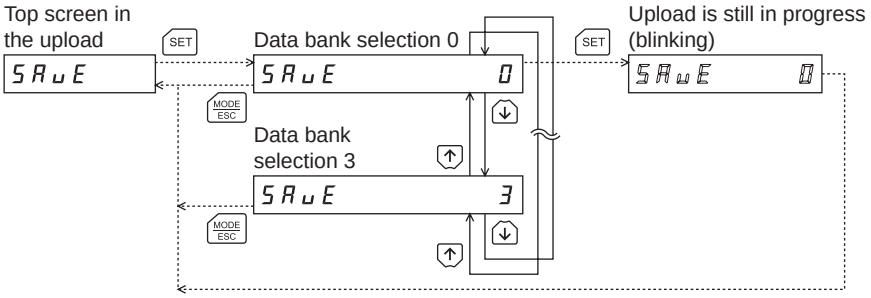
If a download error occurs, a code indicating the nature of the error will blink on the display. Download will not be performed and the display will return to the top screen of download.

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**.
HEAd-Err bcc-Err	An error occurred while data was being downloaded.	Execute 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.

■ Uploading to the OPX-2A

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



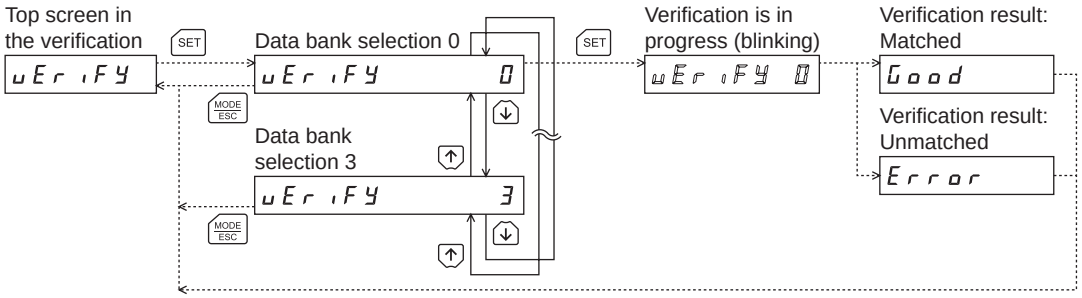


Note

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.

■ 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 for one second. If the two do not match, "Error" will be shown for one second.

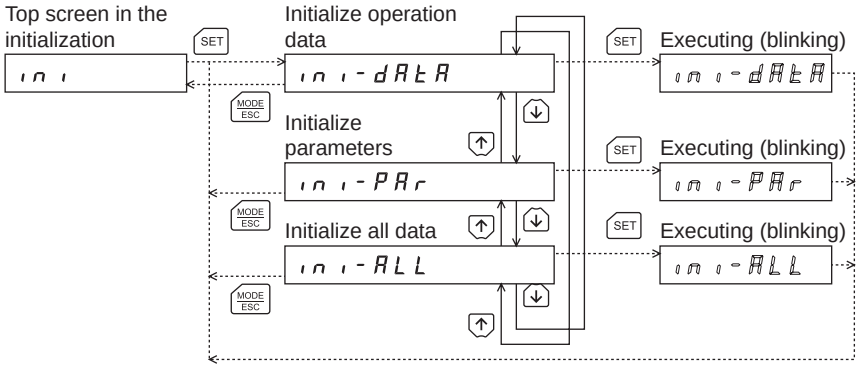


If a verification error occurs, a code indicating the nature of the error will blink on the display. Verification will not be performed and the display will return to the top screen of verification.

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**.
HEAd-Err bcc-Err	An error occurred while data was being verified.	Execute 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.

■ Initializing driver data

Data saved in the driver can be restored to their initial values.

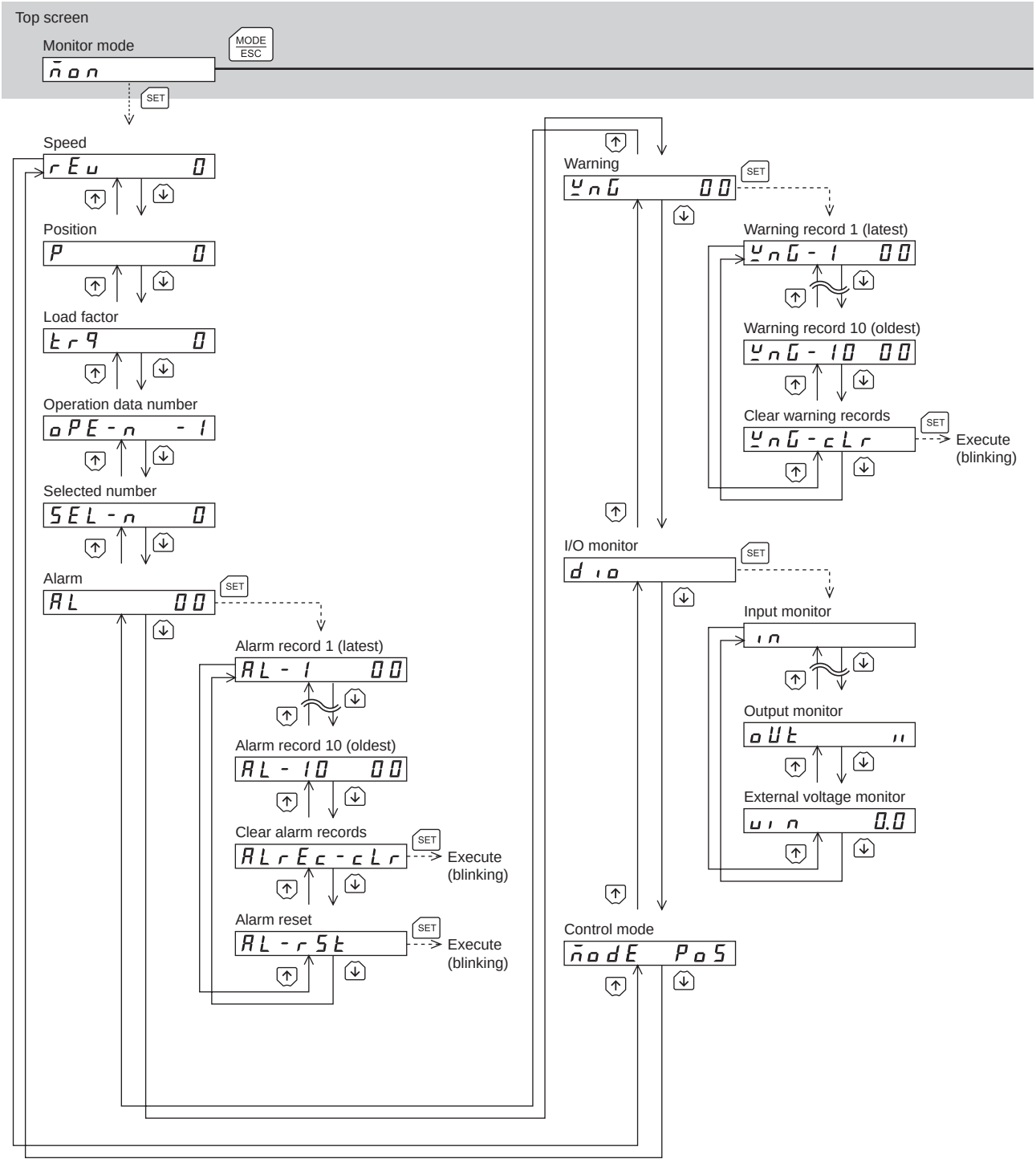


Note

- Some parameters will become effective after cycling the power. When these parameters were changed by downloading, cycle the driver power.
- 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.

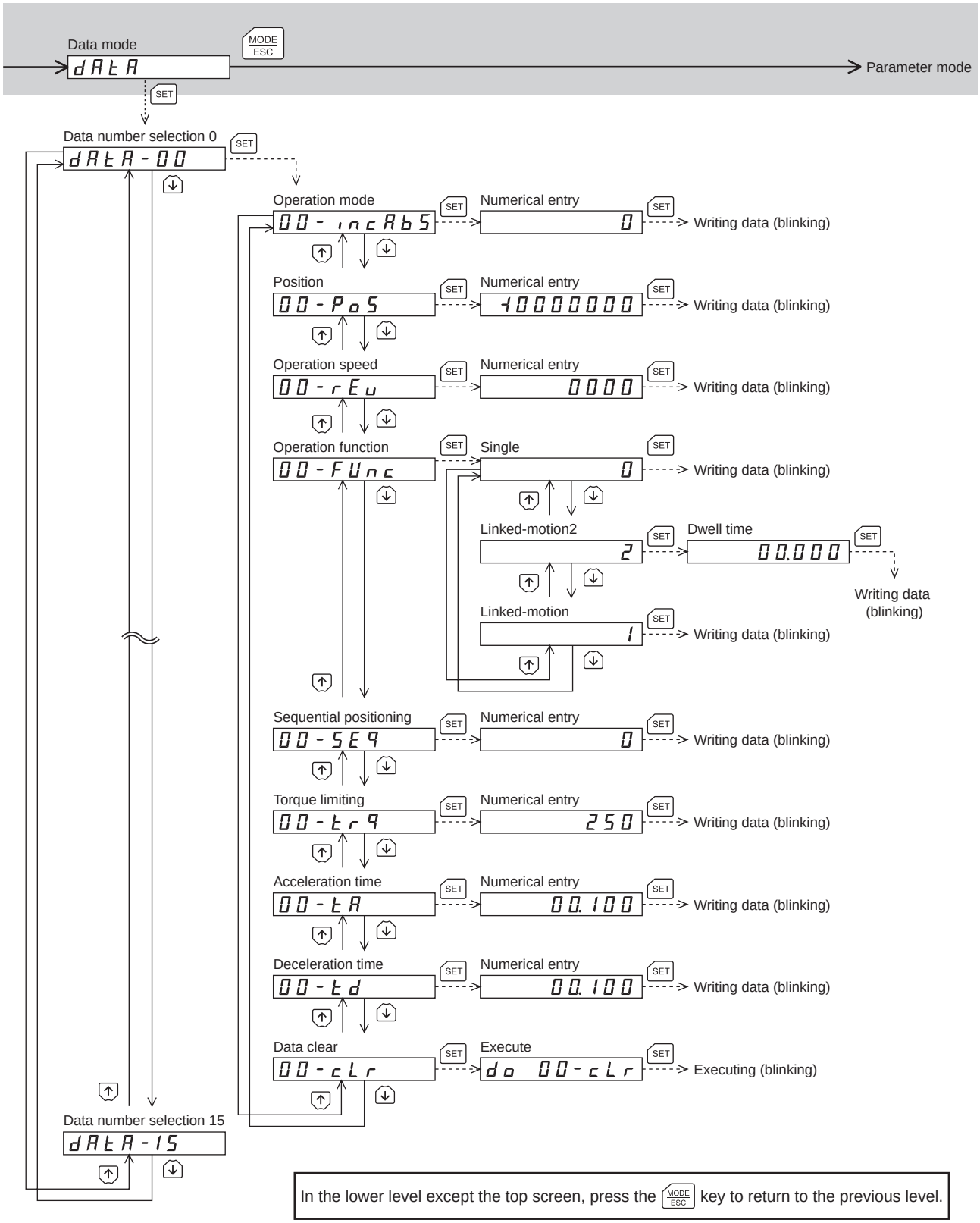
6 When using the product with the position control mode

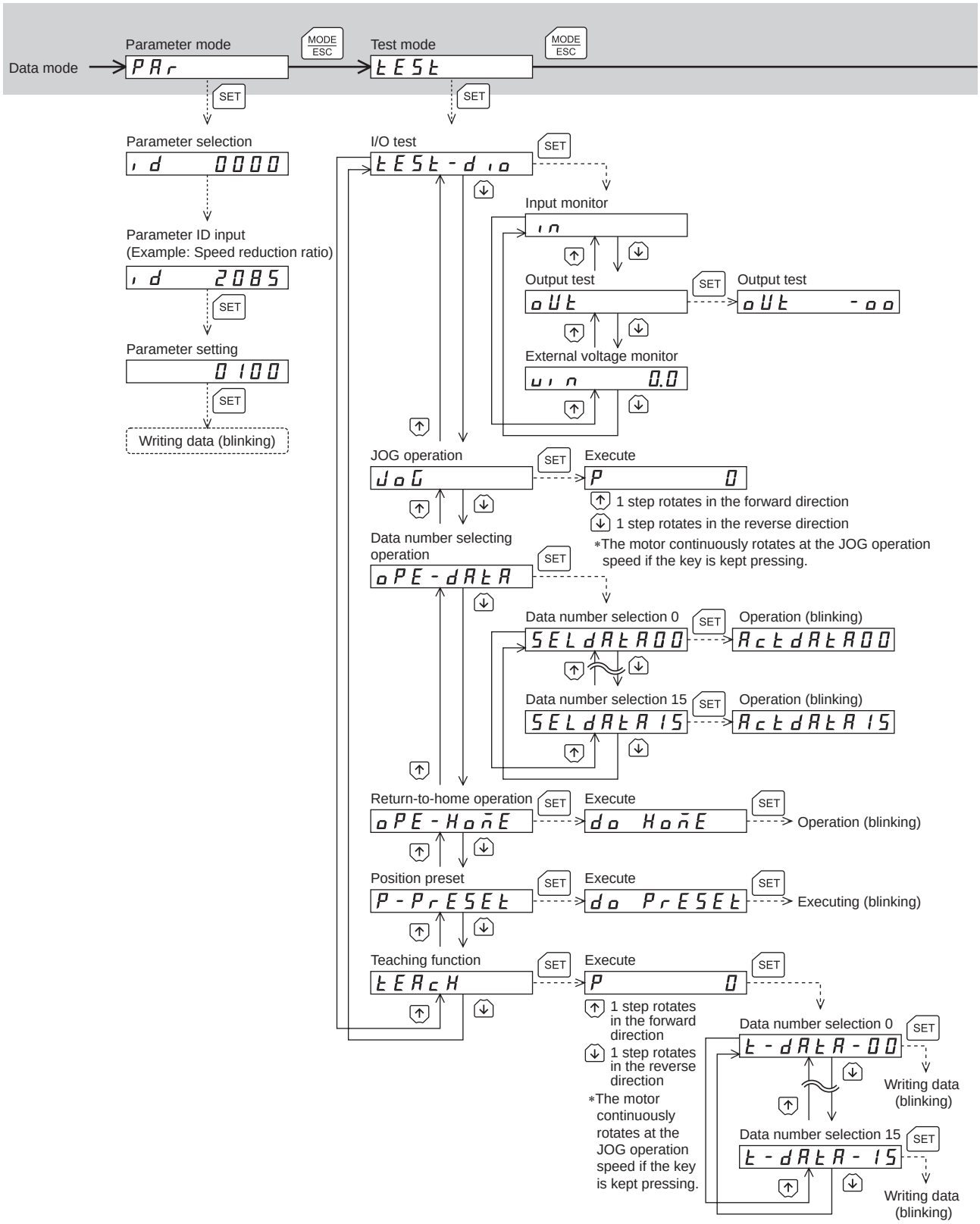
6.1 Screen transitions

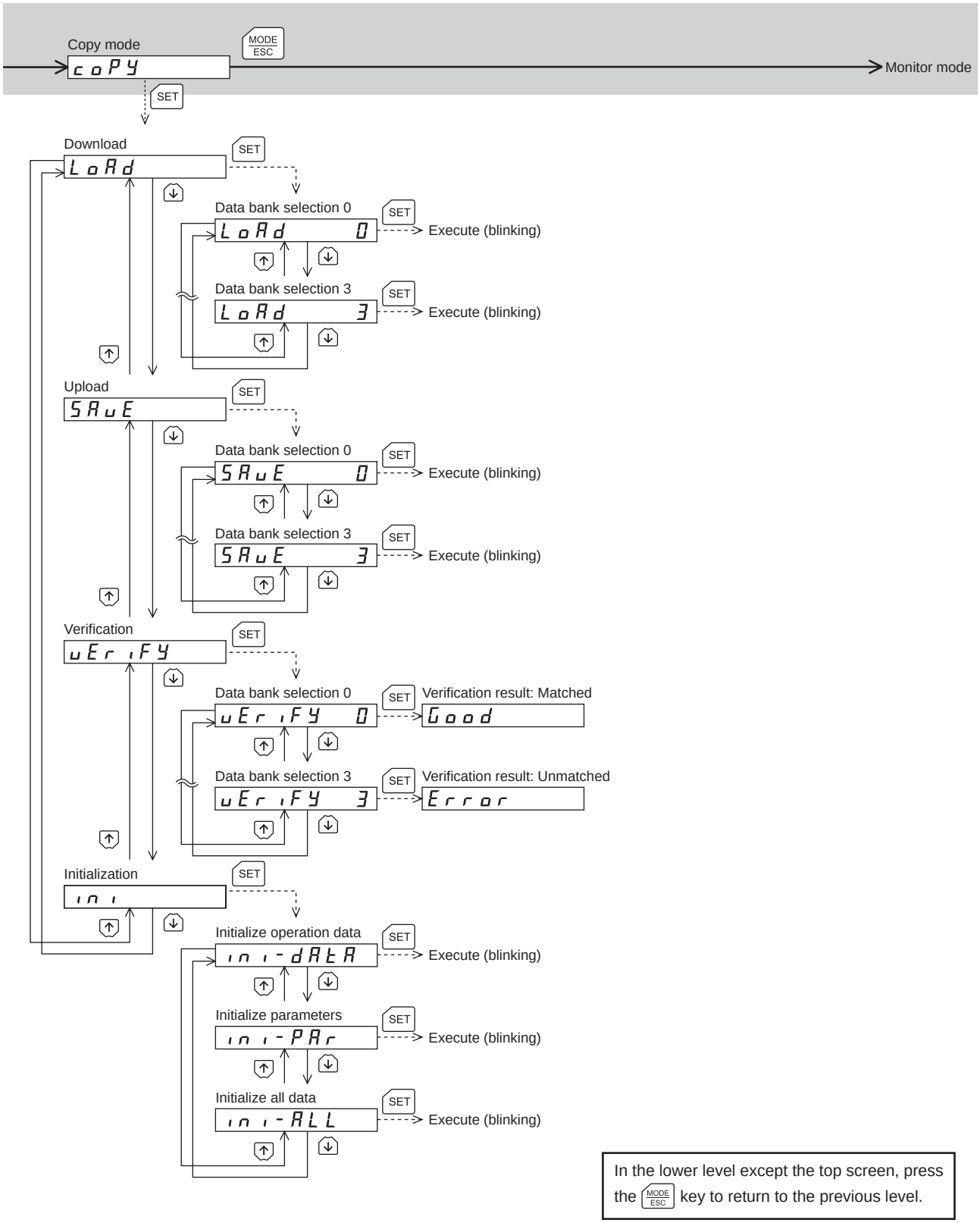


Note

- There are the following restrictions while the edit lock function is enabled.
  - Data mode, parameter mode: Although they are displayed on the screen, they are unable to operate.
  - Clearing the alarm and warning records, copy mode: They are not displayed on the screen.
- When the HMI input is in an OFF state, all functions of the test mode cannot be executed. Downloading and initializing are also disabled.




Data mode
Parameter mode
PAr
MODE ESC
Test mode
tESt
MODE ESC
SET
SET
Parameter selection
id 0000
Parameter ID input
(Example: Speed reduction ratio)
id 2085
SET
Parameter setting
0100
SET
Writing data (blinking)
I/O test
tESt-dio
SET
Input monitor
in
Output test
oUt
SET
Output test
oUt -oo
External voltage monitor
uin 0.0
JOG operation
JoG
SET
Execute
P 0
1 step rotates in the forward direction
1 step rotates in the reverse direction
∗The motor continuously rotates at the JOG operation speed if the key is kept pressing.
Data number selecting operation
oPE-dAtA
SET
Data number selection 0
SELdAtA00
SET
Operation (blinking)
ActdAtA00
Data number selection 15
SELdAtA15
SET
Operation (blinking)
ActdAtA15
Return-to-home operation
oPE-HoME
SET
Execute
do HoME
SET
Operation (blinking)
Position preset
P-PrESEt
SET
Execute
do PrESEt
SET
Executing (blinking)
Teaching function
tEAcH
SET
Execute
P 0
SET
1 step rotates in the forward direction
1 step rotates in the reverse direction
∗The motor continuously rotates at the JOG operation speed if the key is kept pressing.
Data number selection 0
t-dAtA-00
SET
Writing data (blinking)
Data number selection 15
t-dAtA-15
SET
Writing data (blinking)



In the lower level except the top screen, press the MODE ESC key to return to the previous level.

6.2 Monitor mode

■ Overview of the monitor mode

- Monitoring the operating status

  The motor speed, position, load factor, operation data number corresponding to the present operation and operation data number currently selected can be monitored in real time.

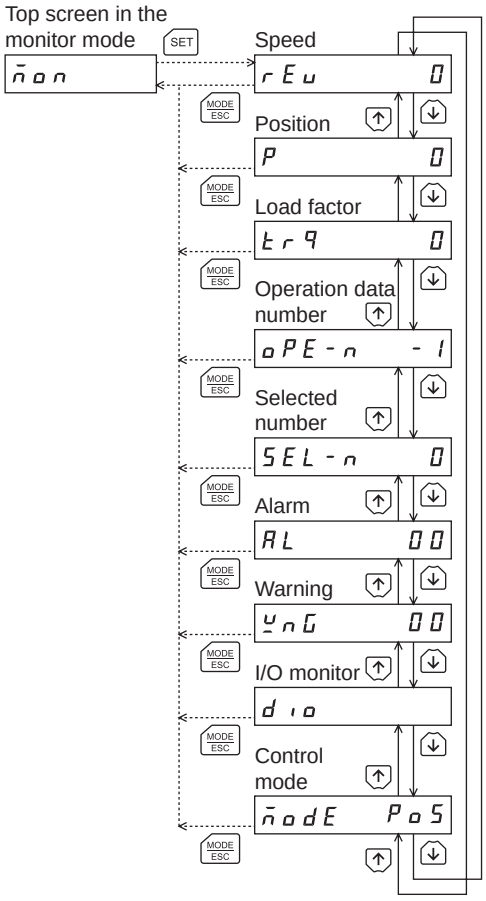
- Checking alarms/warnings, clearing alarm/warning records, and resetting alarms
  - If an alarm or warning generates, since a corresponding alarm code or warning code will be displayed, the item to identify the details of the alarm/warning can be checked.
  - Up to ten most recent alarms/warnings can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

- Checking I/O signals

  The ON/OFF status of each I/O signal of the driver can be checked.

■ 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 in the monitor mode.
3. Use the【↑】【↓】keys to select the item you want to monitor.



■ Monitor items

- Speed (unit: r/min)

  The motor speed can be checked.
  While the motor rotates in the counter clockwise direction (CCW), the "-" sign is displayed in front of the value.
  The value can also be displayed as the absolute value, or the "-" sign can be shown in front of the value while the motor rotates in the clockwise direction (CW). In this case, change the setting of the "data setter speed display" parameter (ID: 480).
  The operation speed can be displayed as the rotation speed of the gear output shaft. To do this, set the "speed reduction ratio" parameter (ID: 2085) and "speed reduction ratio digit setting" parameter (ID: 2086).
  It is also possible to increase the rotation speed and display the increased speed. Set in the "speed increasing ratio" parameter (ID: 2087).

- Position

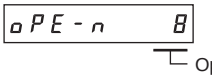
  The present position of the motor with reference to the home position can be checked.

- Load factor (Unit: %)

  The motor generating torque can be checked. The present load factor is displayed based on the rated torque being 100%.

- Operation data number

  The operation data number corresponding to the present positioning operation can be checked.

  When "oPE-n -1" is displayed

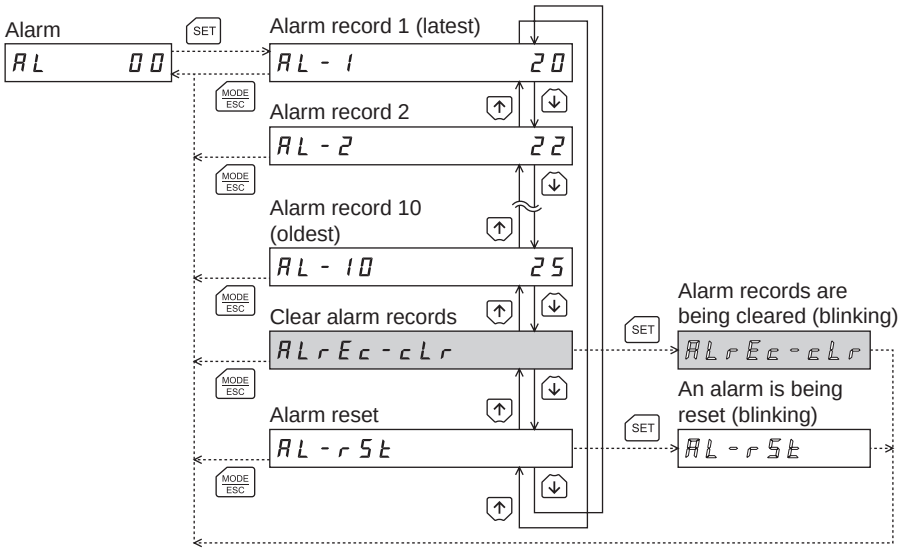
  If the operation data number is checked immediately after the power is input in the position control mode, "oPE-n -1" will be displayed.
  In addition, if the operation data number is checked by executing the following operations, "oPE-n -1" is displayed.
  - While executing return-to-home operation, continuous operation or JOG operation
  - When an alarm is generated and reset
  - When the operation is stopped by the STOP input
  - When the motor excitation is turned OFF by the FREE input or S-ON input
  - When executing the position preset

- Selected number

  The operation data number currently selected can be checked.

- Alarm

When an alarm generates, a corresponding alarm code will be displayed.
The present alarm can be reset, and also alarm records can be checked or cleared.



∗ If operations are limited by the edit lock function, the screens in gray color are not displayed.

Note

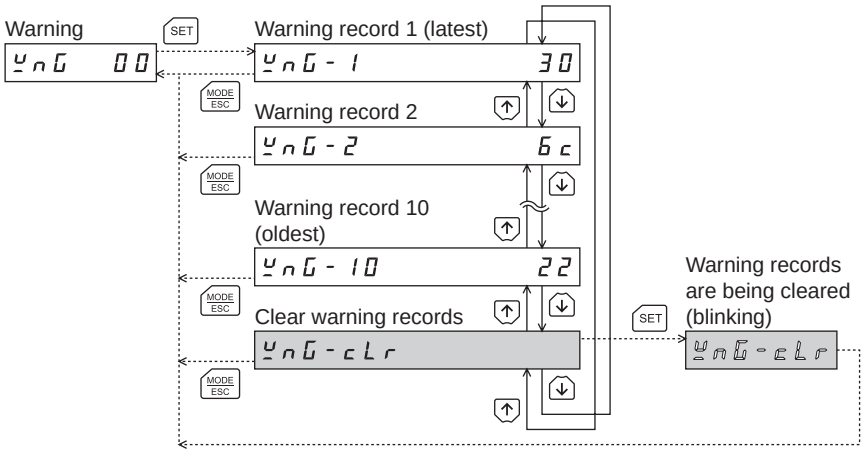
- Do not turn off the driver power while an alarm is being reset or alarm records are being cleared (=while the display is blinking). Doing so may damage the data.
- When operations are limited by the edit lock function, the alarm records cannot be cleared.
- Some alarms cannot be reset using the **OPX-2A**. Check by the following table. To reset these alarms, cycle the driver power.

Alarm code list

Code	Alarm name	Reset using the **OPX-2A**
10	Excessive position deviation	Possible
20	Overcurrent	Not possible
22	Overvoltage	
25	Undervoltage	Possible
28	Sensor error	Not possible
2D	Main circuit output error	
30	Overload	Possible
31	Overspeed	
41	EEPROM error	Not possible
42	Sensor error at power-on	
46	Prevention of operation at power-on	Possible
51	Regeneration unit overheat	Not possible
67	Software overtravel	Possible
70	Operation data error	

- Warning

When a warning generates, a corresponding warning code will be displayed.
Warning records can be checked or cleared.



∗ If operations are limited by the edit lock function, the screens in gray color are not displayed.

Note

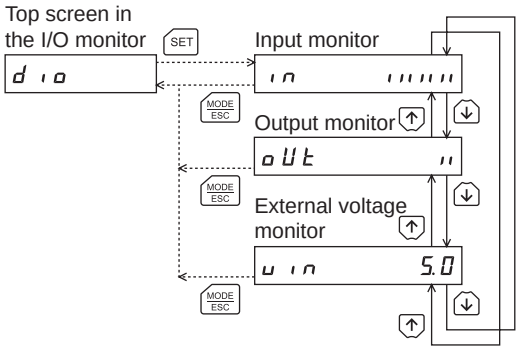
- Do not turn off the driver power while warning records are being cleared (=while the display is blinking). Doing so may damage the data.
- When operations are limited by the edit lock function, the warning records cannot be cleared.
- Warning records will automatically be cleared by turning off the driver power.

Warning code list

Code	Warning name
10	Excessive position deviation
22	Overvoltage
30	Overload
6C	Operation prohibited

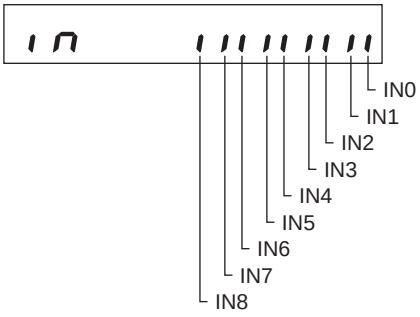
- I/O monitor

The ON/OFF status of each I/O signal of the driver can be checked.

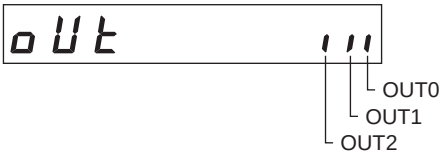


Each digit on the 7-segment LED display corresponds to a signal. The corresponding digit is lit when the signal is ON, and the digit is unlit when the signal is OFF.

- Input monitor



- Output monitor

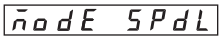


- External voltage monitor [V]

The voltage value input by the analog external setter can also be checked.

- Control mode

The present control mode can be checked.

Position control mode	Speed control mode	Speed control mode (servo lock)
		

6.3 Data mode

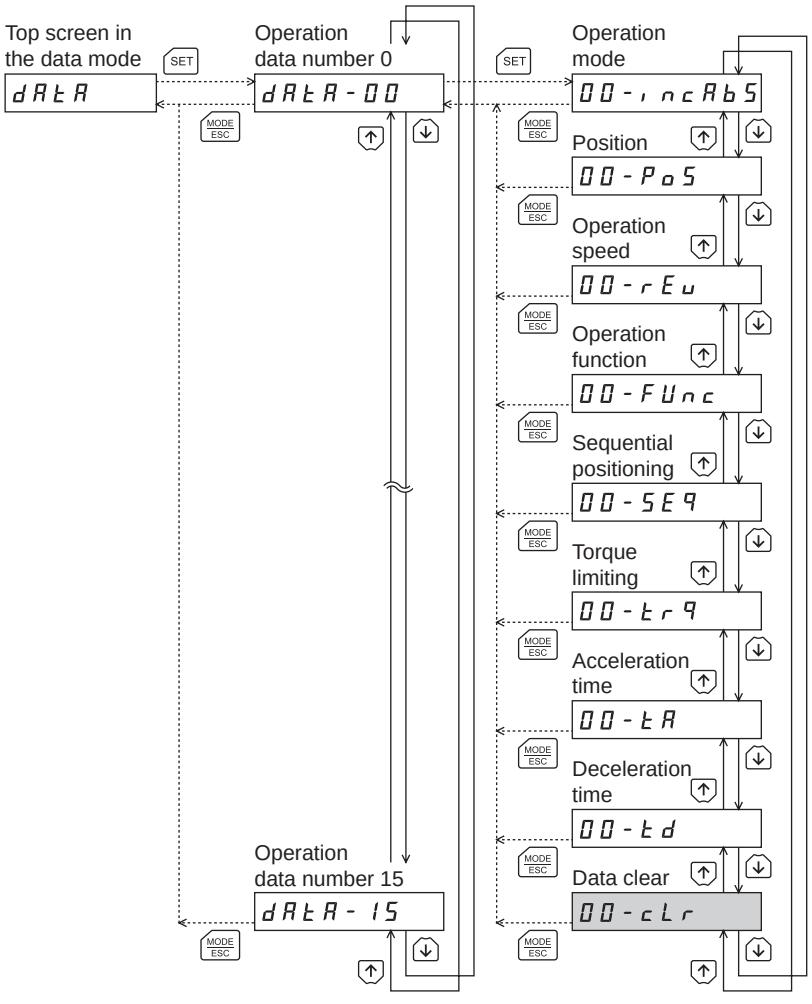
Up to 16 sets of motor operation data can be set. Once set, the operation data is stored in the driver. The data will not be lost even after the **OPX-2A** is disconnected from the driver.
Before setting parameters, read the "**BX Ⅱ** Series OPERATING MANUAL" carefully to understand the basic operations, 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 or HMI input, operation data cannot be edited.
- Operation data can also be set by selecting the ID in the parameter mode.
- 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.

■ Operation in the data mode

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



∗ If operations are limited by the edit lock function, the screens in gray color are not displayed.

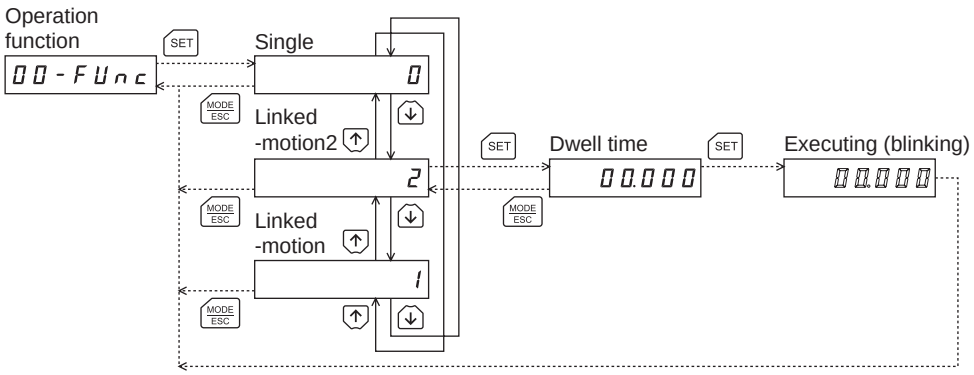
■ Setting items

Item	Initial value	Setting range	Description	Setting unit
Operation mode	0	0: Incremental 1: Absolute	Selects how to specify the position (travel amount) in positioning operation (absolute mode or incremental mode).	–
Position	0	−8,388,608 to +8,388,607 step	Sets the position (travel amount) for positioning operation. The motor shaft rotates 0.72° per one step.	1
Operation speed	0	0 to 4000 r/min	Sets the operation speed in positioning operation and continuous operation. Set as the rotation speed of the motor output shaft.	1
Operation function	0	0: Single 1: Linked-motion 2: Linked-motion2	Sets to execute positioning operation as single-motion or linked-motion operation.	–
Dwell time	0.000	0.000 to 50.000 s	Sets the waiting time between the first operation data and second operation data in linked-motion operation 2.	0.001
Sequential positioning	0	0: Disable 1: Enable	Sets whether to enable or disable sequential positioning operation.	–
Torque limiting	250	0 to 250%∗	Sets when limiting the motor output torque. Sets the torque limiting value based on the rated torque being 100%.	1
Acceleration time	0.100	0.000 to 30.000 s	Sets the acceleration time for positioning operation. The acceleration time is set as the time needed for the motor to reach the rated rotation speed (3000 r/min) from the standstill state.	0.001
Deceleration time			Sets the deceleration time for positioning operation. The deceleration time is set as the time needed for the motor to stop from the rated rotation speed (3000 r/min).	
Data clear	–	–	Restores the operation data to the initial value.	–

∗ The motor may not start operating with the torque limiting value depending on variations in load torque, individual differences in motors, gearheads or drivers, as well as operating environment.
Set the torque limiting value with providing a margin of 20% or more as a guide.

Setting method of dwell time

Select to display the "Linked-motion 2" in the "operation function" and press the【SET】key to display the setting screen of the dwell time.
Input the dwell time with the【↑】【↓】【←】【→】keys and press the [SET] key.



■ Initialization of all operation data

All of the operation data saved in the driver can be restored to the initial values. Execute "Initialize operation data" of the copy mode. For details, refer to the "Initializing driver data" on page 27.

6.4 Parameter mode

Refer to "5.4 Parameter mode."

6.5 Test mode

■ Overview of the test mode

- I/O test

  The ON/OFF status of each input signal of the driver can be checked on the **OPX-2A**. Also, the ON/OFF status of each output signal can be switched using the **OPX-2A**. Execute I/O test to check the connection status of the driver.

- JOG operation

  The motor can be operated using the keys on the **OPX-2A**.

- Data number selecting operation

  Positioning operation can be executed by selecting the operation data number.

- Return-to-home operation

  Return-to-home operation can be executed.

- Position preset

  The position preset is used to renew the command position (present position) to the value of the "preset position" parameter (ID: 454).

- Teaching function

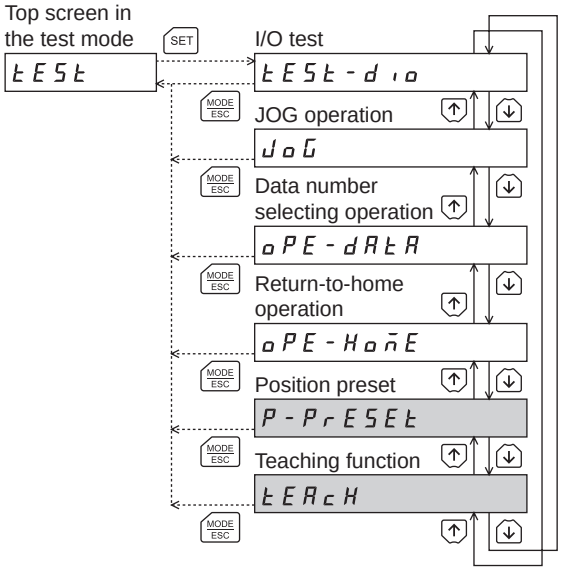
  Using the keys on the **OPX-2A**, you can operate the motor and set the attained position in the operation data.

Note

- Stop the motor operation before changing to the test mode.
- JOG operation, data number selecting operation, return-to-home operation and teaching function cannot be executed while the FREE signal or STOP signal is being ON. Be sure to execute after turning the signal OFF.
- When changing from the item selection screen to a lower level, the following inputs will be disabled. START, SSTART, HOME, ±JOG, FWD, RVS and MS0 to MS5.
- In I/O test, if the screen changes to the lower level, all of I/O signals and operations will be disabled.
- If "Error" is displayed when data number selecting operation, return-to-home operation, position preset or teaching function is executed, check whether an alarm generates.
- When the HMI input is OFF, test mode cannot be executed.

■ Operation in the test mode

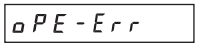
1. Use the【MODE/ESC】key to select the test mode.
2. Press the【SET】key on the top screen in the test mode.
   The display changes to the screen of each item in the test mode.
3. Use the【↑】【↓】keys to select the item you want to perform.



∗ If operations are limited by the edit lock function, the screens in gray color are not displayed.

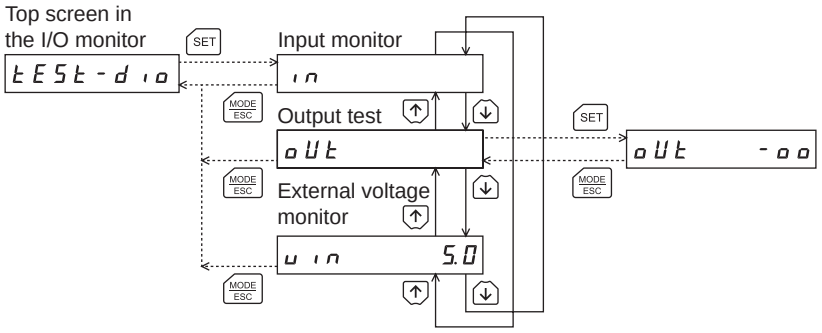
- What happens when the【SET】key is pressed while the motor is operating

During operation, if the【SET】key is pressed on the setting screen of each item in the test mode, the screen will not change to the lower level and an error will occur, thereby displaying "oPE-Err."
Be sure to stop the motor operation before pressing the【SET】key.



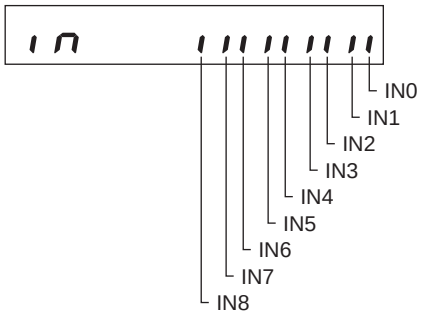
■ I/O test

Execute I/O test to check the connection status of the driver.

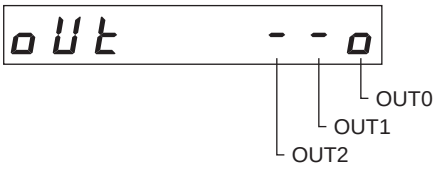


Each digit on the 7-segment LED display corresponds to a signal.
The LED is lit when the input signal is ON, and it is unlit when the input signal is OFF.
Use the【↑】【↓】keys to switch the ON-OFF state of the output signal. " 0 " is displayed when the signal is ON, while " - " is displayed when the signal is OFF.

- Input monitor



- Output test

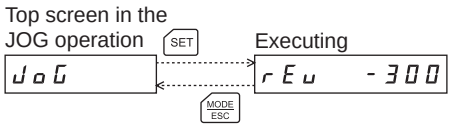


- External voltage monitor

The voltage value input by the analog external setter can also be checked.

■ JOG operation

The motor can be operated using the keys on the **OPX-2A**.
The operation speed, acceleration/deceleration time and torque will correspond to the values set in the "JOG operation speed" parameter (ID: 323), "JOG acceleration/deceleration" parameter (ID: 324) and "JOG operation torque" parameter (ID: 2081) respectively.
The next example shows the display that appears when operating the motor in the reverse direction using the【↓】key. The present position is displayed while JOG operation is executed.



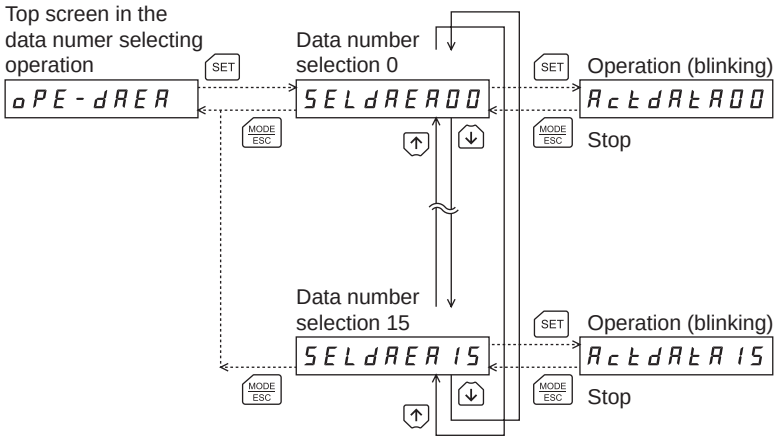
When pressing the【↑】key once, the motor rotates by one step in the forward direction.
If the key is kept pressing, the motor continuously rotates at the JOG operation speed in the forward direction.
When pressing the【↓】key once, the motor rotates by one step in the reverse direction.
If the key is kept pressing, the motor continuously rotates at the JOG operation speed in the reverse direction.

Note

- During operation, the motor rotates at the specified operation speed while each applicable key is pressed. Before executing operation, consider the status of the equipment and condition of its surroundings to confirm thoroughly that motor rotation will not cause any dangerous situation.
- JOG operation cannot be executed while the FREE signal or STOP signal is being ON. Be sure to execute after turning the signal OFF.

■ Data number selecting operation

Positioning operation can be executed with selecting any of the operation data No.0 to No.15. If no data has input in the operation data, the operating data error alarm will generate.

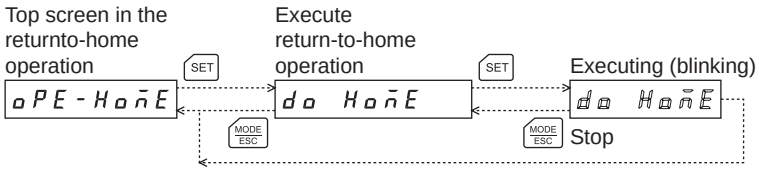


Note

- During operation, the motor rotates at the specified operation speed. Before executing operation, consider the status of the equipment and condition of its surroundings to confirm thoroughly that motor rotation will not cause any dangerous situation.
- Data number selecting operation cannot be executed while the FREE signal or STOP signal is being ON. Be sure to execute after turning the signal OFF.

■ Return-to-home operation

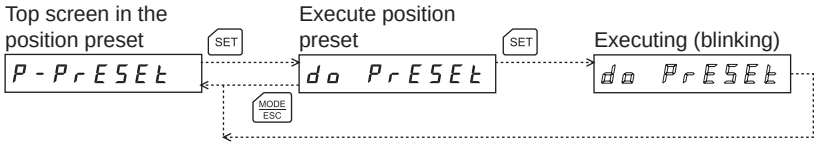
Return-to-home operation can be executed.
The operation speed corresponds to the value set in the "operating speed of home-seeking" parameter (ID: 353).
The motor will stop operation when pressing the【MODE/ESC】key or inputting the HOMES input.



Note
- During operation, the motor rotates at the specified operation speed. Before executing operation, consider the status of the equipment and condition of its surroundings to confirm thoroughly that motor rotation will not cause any dangerous situation.
- Return-to-home operation cannot be executed while the FREE signal or STOP signal is being ON. Be sure to execute after turning the signal OFF.

■ Position preset

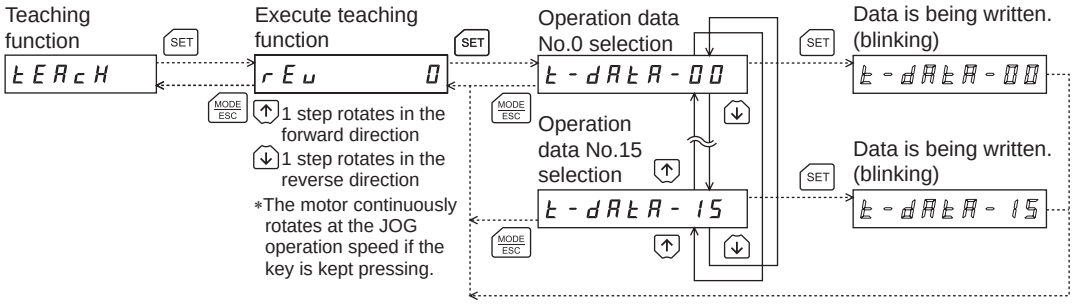
In this operation, the command position is preset by rewriting the value in the "preset position" parameter (ID: 454).



Note If operations are limited by the edit lock function, the preset function cannot be performed.

■ Teaching function

Using the keys on the **OPX-2A**, you can operate the motor and set the attained position in the operation data.
The absolute mode will be automatically selected as the operation mode of any position data set in teaching function.
The operation speed, acceleration/deceleration time and torque for teaching function will correspond to the values set in the "JOG operation speed" parameter (ID: 323), "JOG acceleration/deceleration" parameter (ID: 324) and "JOG operation torque" parameter (ID: 2081) respectively.



Note
- In teaching function, the motor rotates while the key is pressed. Before executing operation, consider the status of the equipment and condition of its surroundings to confirm thoroughly that motor rotation will not cause any dangerous situation.
- Teaching function cannot be executed while the FREE signal or STOP signal is being ON. Be sure to execute after turning the signal OFF.
- If operations are limited by the edit lock function, teaching function cannot be executed.

6.6 Copy mode

Refer to "5.6 Copy mode."

7 Parameter

■ Operation data parameter

ID	Parameter name	Setting range	Initial value
512 to 527	Position No.0 to No.15	−8,388,608 to +8,388,607 step The motor shaft rotates 0.72° per one step.	0
576 to 591	Operating speed No.0 to No.15	0 to 4000 r/min	0
640 to 655	Operation mode No.0 to No.15	0: Incremental 1: Absolute	0
704 to 719	Operation function No.0 to No.15	0: Single-motion 1: Linked-motion 2: Linked-motion2	0
768 to 783	Acceleration time No.0 to No.15	0.000 to 30.000 s	0.100
832 to 847	Deceleration time No.0 to No.15		
896 to 911	Torque limiting No.0 to No.15	0 to 250%∗	250
960 to 975	Sequential positioning No.0 to No.15	0: Disable 1: Enable	0
1024 to 1039	Dwell time No.0 to No.15	0.000 to 50.000 s	0.000

∗ The motor may not start operating with the torque limiting value depending on variations in load torque, individual differences in motors, gearheads or drivers, as well as operating environment. Set the torque limiting value with providing a margin of 20% or more as a guide.

■ I/O parameter

All parameters can be set in both the speed control mode and position control mode.
The parameters that can be used vary depending on the control mode.

ID	Parameter name	Description	Setting range	Initial value	Effective ∗1	Control mode ∗2	
						Speed control	Position control
256	STOP input action	Sets how the motor should stop when the STOP input is turned ON.	0: Immediate stop 1: Deceleration stop 2: Immediate stop + current OFF 3: Deceleration stop + current OFF Speed control mode (disable servo lock) 0, 2: Immediate stop 1, 3: Deceleration stop	0	A	○	○
258	Overtravel action	Sets how the motor should stop when an overtravel has occurred.	0: Immediate stop 1: Deceleration stop	0		×	
259	Positioning completion signal range	Sets the output range that the END output is turned ON. The motor shaft rotates 0.72° per one step.	1 to 100 step	1			
2048	MS0 operation number selection	Sets the operation data number corresponding to the MS0 to MS5 inputs.	0 to 15	0	B		
2049	MS1 operation number selection			1			
2050	MS2 operation number selection			2			
2051	MS3 operation number selection			3			
2052	MS4 operation number selection			4			
2053	MS5 operation number selection			5			
2054	HOME-P output function selection	Sets the timing to output the HOME-P output.	0: Home output 1: Return-to-home complete output	0	A		
2215	Rotation speed attainment band	Sets the output range for the VA output.	0 to 400 r/min	200		○	
2290	BUSY/TLM switching	Uses in the **BX**-compatible mode. Switches the BUSY output and TLM output.	0: BUSY 1: TLM (TLC)	0	C		

∗1 Indicates the timing for the data to become effective.
(A: Effective immediately, B: Effective after stopping the operation, C: Effective after turning on the power again)
∗2 ○ : Possible to use.
× : Not possible to use.

■ Operation parameter

All parameters can be set in both the speed control mode and position control mode.
The parameters that can be used vary depending on the control mode.

ID	Parameter name	Description	Setting range	Initial value	Effective ∗1	Control mode ∗2	
						Speed control	Position control
323	JOG operation speed	Sets the operation speed for JOG operation.	0 to 4000 r/min	300	B	○	○
324	JOG acceleration/ deceleration rate	Sets the acceleration and deceleration time for JOG operation.	0.00 to 30.000 s	0.100			
2069	Servo lock at motor standstill	Uses in the speed control mode. If the holding force is required while the motor stops, set to "1" to enable the servo lock. However, when the “STOP input action” parameter (ID: 256) is set to 2 or 3, the holding force will not generate even if “1: Servo lock” is set.	0: Free (disable servo lock) 1: Servo lock	0	C	○	×
2081	JOG operation torque	Sets the maximum torque based on the rated torque being 100% in JOG operation.	0 to 250%	100	B		○
2084	JOG travel amount	Sets the travel amount for JOG operation. The motor shaft rotates 0.72° per one step.	1 to 8,388,607 step	1		×	
2085	Speed reduction ratio	The speed reduction ratio can be set by multiplying the value in "speed reduction ratio" parameter by the value in "speed reduction ratio digit setting" parameter. If the speed reduction ratio is set, the rotation speed that is calculated based on the actual speed of the motor will be displayed.	100 to 9999	100	A	○	
2086	Speed reduction ratio digit setting		0: ×1 1: ×0.1 2: ×0.01	2			
2087	Speed increasing ratio	If the speed increasing ratio is set, the rotation speed that is calculated based on the actual speed of the motor will be displayed.	1 to 5	1			
2289	Continuous operation	Uses in the **BX**-compatible mode (position control). Sets whether to enable or disable the continuous operation.	0: Disable 1: Enable	0	C	×	

∗1 Indicates the timing for the data to become effective.
(A: Effective immediately, B: Effective after stopping the operation, C: Effective after turning on the power again)
∗2 ○ : Possible to use.
× : Not possible to use.

- How to set the speed reduction ratio

Set the speed reduction ratio as a combination of the "speed reduction ratio" parameter (ID: 2085) and "speed reduction ratio digit setting" parameter (ID: 2086).
The relationships of speed reduction ratio and decimal position are explained by the combinations shown below.

Actual speed reduction ratio	"Speed reduction ratio" parameter	"Speed reduction ratio digit setting" parameter
1.00 to 9.99	100 to 999	2
10.0 to 99.9		1
100 to 999		0
10.00 to 99.99	1000 to 9999	2
100.0 to 999.9		1
1000 to 9999		0

- Display after setting the speed reduction ratio

  - Speed reduction ratio

    Speed reduction ratio 1.00 to 9.99

    0000 r/min

    Speed reduction ratio 10.00 to 99.99

    000.0 r/min

    Speed reduction ratio 100.0 to 999.9

    00.00 r/min

    Speed reduction ratio 1000 to 9999

    0.000 r/min

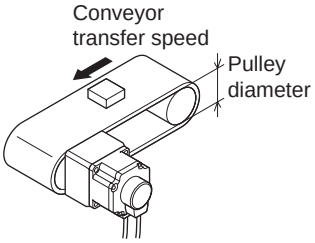
  - Speed increasing ratio

    Speed increasing ratio 2 to 5

    00000 r/min

- Display the conveyor transfer speed

To display the conveyor transfer speed on **OPX-2A**, set the conveyor gear ratio by using the formula below:



$$\text{Conveyor speed reduction ratio} = \frac{1}{\text{Feed rate per motor revolution}} = \frac{\text{Gear ratio of gearhead}}{\text{Pulley diameter [m]} \times \pi}$$

When the calculated conveyor speed reduction ratio is used, the conveyor transfer speed is converted as follows.

$$\text{Conveyor transfer speed [m/min]} = \frac{\text{Rotation speed of motor output shaft [r/min]}}{\text{Conveyor speed reduction ratio}}$$

Example:

The pulley diameter is 0.1 m and gear ratio (speed reduction ratio) of the gear head is 20

$$\text{Conveyor speed reduction ratio} = \frac{\text{Gear ratio of gearhead}}{\text{Pulley diameter [m]} \times \pi} = \frac{20}{0.1\ \text{[m]} \times \pi} \fallingdotseq 63.7$$

From the conversion formula, the conveyor speed reduction ratio is calculated as 63.7 in this example. This means that the "speed reduction ratio" parameter (ID: 2085) is 637, while the "speed reduction ratio digit setting" parameter (ID: 2086) is 1.
When the speed reduction ratio is 63.7 and the motor rotation speed is 1300 r/min, the conveyor transfer speed is converted as follows:

$$\text{Conveyor transfer speed [m/min]} = \frac{1300}{63.7} \fallingdotseq 20.4$$

"20.4" is displayed on the **OPX-2A**.

■ Motor parameter

All parameters can be set in both the speed control mode and position control mode.
The parameters that can be used vary depending on the control mode.

ID	Parameter name	Description	Setting range	Initial value	Effective ∗1	Control mode ∗2	
						Speed control	Position control
290	Position loop gain	Adjusts the motor response in reaction to the position deviation.	1 to 100 Hz	7	A	○ ∗3	○
291	Speed loop gain	Adjusts the motor response in reaction to the speed deviation.	1 to 1000 Hz	200		○	
292	Speed loop integral time constant	Adjusts the deviation that cannot be adjusted with the speed loop gain.	0 to 1000 ms	33			
293	Speed filter	Adjusts the motor response.	0 to 200 ms	1	B	○ ∗3	
294	Moving average time	Sets the time constant for the moving average filter.	1 to 200 ms	1			
2064	Speed filter selection	Sets the filter function to adjust the motor response.	0: Without speed filter 1: Speed filter 2: Moving average	0	C		

∗1 Indicates the timing for the data to become effective.
(A: Effective immediately, B: Effective after stopping the operation, C: Effective after turning on the power again)
∗2 ○ : Possible to use.
× : Not possible to use.
∗3 Possible to use when the "servo lock at motor standstill" parameter (ID: 2069) is set to "1: Servo lock."

- Position loop gain, speed loop gain, speed loop integral time constant

Vibration that occurs while the motor is accelerating/decelerating or at standstill can be adjusted to an optimal value. (The optimal value varies depending on the equipment or operating conditions.)

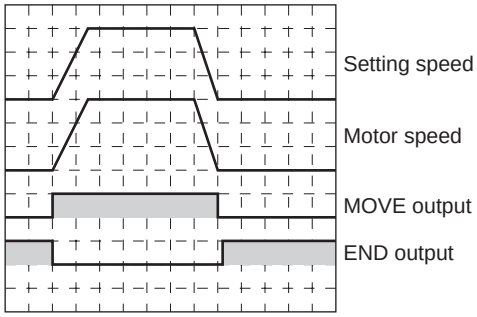
Related parameters

Position loop gain	Adjusts the motor response in reaction to the position deviation. When this value is increased, the deviation between the command position and actual position will be small. An excessively high value may increase the motor overshooting or cause the motor to vibrate.
Speed loop gain	Adjusts the motor response in reaction to the speed deviation. When this value is increased, the deviation between the command speed and actual speed will be small. An excessively high value may increase the motor overshooting or cause the motor to vibrate.
Speed loop integral time constant	Decreases the deviation that cannot be adjusted with the speed loop gain. An excessively long value may slow the motor response. Too short value may cause the motor to vibrate.

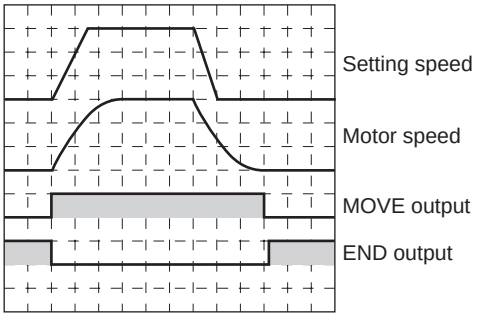
- Speed filter

When setting the "speed filter" parameter (ID: 293) while the "speed filter selection" parameter (ID: 2064) is set to "1: speed filter," the command position is filtered and the motor response can be adjusted.
When the speed filter level is increased, the motor operation at starting/stopping will become smooth. Note, however, that an excessively long filter level will result in lower synchronization against the commands. Set an appropriate value according to the specific load and application.

- When the "speed filter" parameter is set to 0 ms



- When the "speed filter" parameter is set to 200 ms

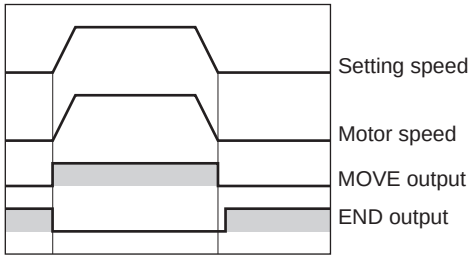


Note
- If the "speed filter" parameter (ID: 293) is set to 0, the speed filter will be disabled.
- When the "servo lock at motor standstill" parameter (ID: 2069) is set to "0: Free" in the speed control mode, the speed filter will be disabled.

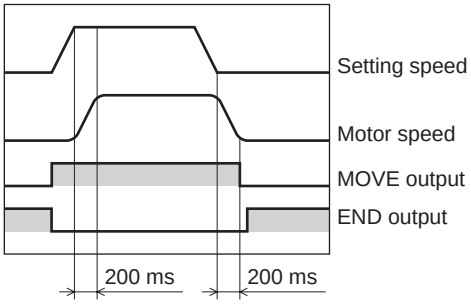
- Moving average filter

When setting the "moving average time" parameter (ID: 294) while the "speed filter selection" parameter (ID: 2064) is set to "2: moving average," the motor response can be adjusted. The positioning time can be shortened by suppressing the residual vibration for positioning operation.
Optimum value for the "moving average time" parameter varies depending on the load or operating condition. Set a suitable value based on the load or operating condition.

- When the "moving average filter" is not used



- When the "moving average filter" parameter is set to 200 ms



■ Alarm/warning parameter

All parameters can be set in both the speed control mode and position control mode.
The parameters that can be used vary depending on the control mode.

ID	Parameter name	Description	Setting range	Initial value	Effective ∗1	Control mode ∗2	
						Speed control	Position control
385	Excessive position deviation alarm	Sets the condition in which an excessive position deviation alarm generates.	0.01 to 300.00 rev	20.00	A	×	○
419	Overvoltage warning	Sets the condition in which an overvoltage warning generates.	120 to 440 V	435		○	
421	Excessive position deviation warning	Sets the condition in which an excessive position deviation warning generates.	0.01 to 300.00 rev	20.00		×	
2113	Prevention of operation at power-on alarm function	Sets whether to enable or disable the "prevention of operation at power-on alarm function."	0: Disable 1: Enable	0		○	
2129	Overload warning function	Sets whether to enable or disable the overload warning function.		0			
2133	Overload warning level	Sets the condition in which the overload warning generates.	50 to 100%	100			

∗1 Indicates the timing for the data to become effective. (A: Effective immediately)
∗2 ○ : Possible to use.
× : Not possible to use.

■ Return-to-home parameter

All parameters can be set in both the speed control mode and position control mode.
The parameters that can be used vary depending on the control mode.

ID	Parameter name	Description	Setting range	Initial value	Effective ∗1	Control mode ∗2	
						Speed control	Position control
353	Operating speed of home-seeking	Set the operation speed of return-to-home operation.	0 to 4000 r/min	300	B	×	○ ∗3
354	Acceleration/ deceleration of home-seeking	Sets the acceleration and deceleration time for return-to-home operation.	0.000 to 30.000 s	0.100			
356	Position offset of home-seeking	Sets the amount of offset from home position. The motor shaft rotates 0.72° per one step.	−8,388,608 to +8,388,607 step	0			
357	Starting direction of home-seeking	Sets the starting direction for home detection.	0: Negative direction 1: Positive direction	1			○

∗1 Indicates the timing for the data to become effective. (B: Effective after stopping the operation)
∗2 ○ : Possible to use.
× : Not possible to use.
∗3 Not possible to use in the **BX**-compatible mode.

■ Coordination parameter

All parameters can be set in both the speed control mode and position control mode.
The parameters that can be used vary depending on the control mode.

ID	Parameter name	Description	Setting range	Initial value	Effective ∗1	Control mode ∗2	
						Speed control	Position control
450	Motor rotation direction	Sets the rotation direction of the motor output shaft.	0: Positive direction=CCW 1: Positive direction=CW	1	C	○	○
451	Software overtravel	Sets whether to enable or disable software overtravel detection using software limits.	0: Disable 1: Enable	1	A	×	
452	Positive software limit	Sets the value of software limit in positive direction. The motor shaft rotates 0.72° per one step.	−8,388,608 to +8,388,607 step	+8,388,607			
453	Negative software limit	Sets the value of software limit in negative direction. The motor shaft rotates 0.72° per one step.		−8,388,608			
454	Preset position	Sets the preset position. The motor shaft rotates 0.72° per one step.		0			
455	Wrap setting	Sets whether to enable or disable the wrap function.	0: Disable 1: Enable	0	C		
456	Wrap setting range	Sets the wrap setting range. The motor shaft rotates 0.72° per one step.	1 to 8,388,607 step	1000			

∗1 Indicates the timing for the data to become effective. (A: Effective immediately, C: Effective after turning on the power again)
∗2 ○ : Possible to use.
× : Not possible to use.

■ Analog adjustment parameter

All parameters can be set in both the speed control mode and position control mode.
The parameters that can be used vary depending on the control mode.

ID	Parameter name	Description	Setting range	Initial value	Effective ∗1	Control mode ∗2	
						Speed control	Position control
2256	Analog operation speed command gain	Sets the speed command per 1 VDC of the input voltage by the analog external setter.	0 to 4000 r/min/V	850 (635)∗3	A	○	×
2257	Analog operation speed command offset	Sets the offset of the speed command input by the analog external setter.	−2000 to +2000 r/min	0			
2258	Analog torque limiting gain	Sets the torque limiting per 1 VDC of the input voltage by the analog external setter.	0 to 250%/V	54			○
2259	Analog torque limiting offset	Sets the offset of the torque limiting input by the analog external setter.	−50 to +50%	0			
2261	Analog operation speed maximum value	Sets the maximum value of the rotation speed by the analog external setter.	0 to 4000 r/min	4000 (3150)∗3			×
2263	Analog torque limiting maximum value	Sets the maximum value of the torque limiting by the analog external setter.	0 to 250%	250			○

∗1 Indicates the timing for the data to become effective. (A: Effective immediately)
∗2 ○ : Possible to use.
× : Not possible to use.
∗3 When the **BX**-compatible mode is used

■ Common parameter

All parameters can be set in both the speed control mode and position control mode.
The parameters that can be used vary depending on the control mode.

ID	Parameter name	Description	Setting range	Initial value	Effective ∗1	Control mode ∗2	
						Speed control	Position control
480	Data setter speed display	Sets the display method of the speed monitor for the **OPX-2A**.	0: Plus sign 1: Absolute value 2: Minus sign	0	A	○	○
2160	Data setter initial display	Sets the initial screen to display on the **OPX-2A** when the driver power is turned on.	0: Speed 1: Detected position 2: Load factor 3: Operation data number 4: Selection number 5: Top screen of monitor mode	0			
2161	Analog speed/ torque	Changes the setting method of operation speed and torque limiting. Refer to the next clause for details.	• Speed control mode 0: Digital setting 1: Analog setting 2: Analog torque limiting • Position control mode 0 or 1: Digital setting 2: Analog torque limiting	1	C		
2162	Analog acceleration/ deceleration	Changes the setting method of acceleration/deceleration time. Refer to the next page for details.	0: Digital setting 1: Analog setting	1			×
2164	Panel initial view	Sets the initial screen to display on the operation panel when the driver power is turned on.	0: Speed 1: Detected position 2: Load factor 3: Operation data number 4: Selection number 5: Top screen of monitor mode	0	A		○

∗1 Indicates the timing for the data to become effective. (A: Effective immediately, C: Effective after turning on the power again)
∗2 ○ : Possible to use.
× : Not possible to use.

■ Analog speed/torque parameter (ID: 2161)

The setting method of operation data can be changed using "analog speed/torque" parameter (ID: 2161) and "analog acceleration/deceleration" parameter (ID: 2162).

- Analog setting .....Internal potentiometer (SPEED), **PAVR-20KZ** (sold separately), external DC voltage
- Digital setting.....**OPX-2A**, Operation panel, **MEXE02**

• Speed control mode

The setting method of operation speed and torque limiting can be changed between the analog setting and digital setting.

<table>
<tr><th rowspan="2">Operation data</th><th colspan="2">When the parameter is 0</th><th colspan="2">When the parameter is 1</th><th colspan="2">When the parameter is 2</th></tr>
<tr><th>Operation speed</th><th>Torque limiting</th><th>Operation speed</th><th>Torque limiting</th><th>Operation speed</th><th>Torque limiting</th></tr>
<tr><td>No.0</td><td rowspan="3">Digital setting</td><td rowspan="3">Digital setting</td><td>Internal potentiometer</td><td rowspan="3">Digital setting</td><td rowspan="3">Digital setting</td><td rowspan="3">PAVR-20KZ
External DC voltage</td></tr>
<tr><td>No.1</td><td>PAVR-20KZ
External DC voltage</td></tr>
<tr><td>No.2
to
No.5</td><td>Digital setting</td></tr>
</table>

Setting example

- When all operation data is set by the digital setting: Set the "analog speed/torque" parameter to 0.
- When the operation speed of the operation data Nos. 0 and 1 is set by the analog setting: Set the "analog speed/torque" parameter to 1.

• Position control mode

The operation speed is set by the digital setting. Note, however, that the torque limiting can also be set by the analog setting.

<table>
<tr><th rowspan="2">Operation data</th><th colspan="2">When the parameter is 0</th><th colspan="2">When the parameter is 1</th><th colspan="2">When the parameter is 2</th></tr>
<tr><th>Operation speed</th><th>Torque limiting</th><th>Operation speed</th><th>Torque limiting</th><th>Operation speed</th><th>Torque limiting</th></tr>
<tr><td>No.0
to
No.15</td><td>Digital setting</td><td>Digital setting</td><td>Digital settingr</td><td>Digital setting</td><td>Digital setting</td><td>PAVR-20KZ
External DC voltage</td></tr>
</table>

Setting example

- When all operation data is set by the digital setting: Set the "analog speed/torque" parameter to 0 or 1.
- When the torque limiting is set by the analog setting: Set the "analog speed/torque" parameter to 2.

■ Analog acceleration/deceleration parameter (ID: 2162)

This parameter is effective in the speed control mode.
The setting method of acceleration time and deceleration time can be changed between the analog setting and digital setting.

- Analog setting .....Acceleration time potentiometer (ACC), Deceleration time potentiometer (DEC)
- Digital setting.....**OPX-2A**, Operation panel, **MEXE02**

<table>
<tr><th rowspan="2">Operation data</th><th colspan="2">When the parameter is 0</th><th colspan="2">When the parameter is 1</th></tr>
<tr><th>Acceleration time</th><th>Deceleration time</th><th>Acceleration time</th><th>Deceleration time</th></tr>
<tr><td>No.0
No.1</td><td rowspan="2">Digital setting</td><td rowspan="2">Digital setting</td><td>Analog setting</td><td>Analog setting</td></tr>
<tr><td>No.2
to
No.5</td><td>Digital setting</td><td>Digital setting</td></tr>
</table>

■ I/O function parameter

All parameters can be set in both the speed control mode and position control mode.
The parameters that can be used vary depending on the control mode.

ID	Parameter name	Description	Setting range	Initial value	Effective ∗1	Control mode ∗2	
						Speed control	Position control
2176	IN0 input function selection	Assigns the input signals to the input terminals IN0 to IN8.	Refer to the next table.	1 [3] ∗3	C	○	○
2177	IN1 input function selection			2 [4] ∗3			
2178	IN2 input function selection			48			
2179	IN3 input function selection			49			
2180	IN4 input function selection			50			
2181	IN5 input function selection			16			
2182	IN6 input function selection			18			
2183	IN7 input function selection			24			
2184	IN8 input function selection			0 [62] ∗3			
2192	IN0 input logic level setting	Changes the logic level setting for the input terminals IN0 to IN8.	0: Normal 1: Invert	0			
2193	IN1 input logic level setting						
2194	IN2 input logic level setting						
2195	IN3 input logic level setting						
2196	IN4 input logic level setting						
2197	IN5 input logic level setting						
2198	IN6 input logic level setting						
2199	IN7 input logic level setting						
2200	IN8 input logic level setting						
2208	OUT0 output function selection	Assigns the output signals to the output terminals OUT0 to OUT2.	Refer to the next table.	65			
2209	OUT1 output function selection			68 [67] ∗3			
2210	OUT2 output function selection			66 [70] ∗3			

∗1 Indicates the timing for the data to become effective. (C: Effective after turning on the power again)
∗2 ○ : Possible to use.
× : Not possible to use.
∗3 This is the initial value for the speed control mode. The value in the brackets [ ] is applied for the position control mode.
Refer to the **BX Ⅱ** Series OPERATING MANUAL for when using the product in the **BX**-compatible mode.

- Setting range of the function selection parameter

IN input function selection parameter

0: Not used	7: −JOG	16:FREE	48: M0
1: FWD ∗	8: MS0	17: S-ON	49: M1
2: RVS ∗	9: MS1	18: STOP ∗	50: M2
3: HOME	10: MS2	22: TH	51: M3
4: START	11: MS3	24: ALM-RST	54: TL
5: SSTART	12: MS4	25: P-PRESET	62: HOMES ∗
6: +JOG	13: MS5	27: HMI	

∗ For the **BX**-compatible mode, the name of each signal changes as follows.
FWD→ CW, RVS→ CCW, STOP→ BRAKE, HOMES→ HOME-LS

OUT output function selection parameter

0: Not used	69: END
65: ALM	70: HOME-P
66: WNG	71: TLC ∗
67: READY	77: VA
68: MOVE	85: ZSG

∗ For the **BX**-compatible mode, the name of each signal changes as follows.
TLC→ TLM

Note The signals that can be used vary depending on the control mode. Use signals after setting correctly.

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• Please contact your nearest Oriental Motor office for further information.

ORIENTAL MOTOR U.S.A. CORP.
Technical Support Tel:800-468-3982
8:30am EST to 5:00pm PST (M-F)
www.orientalmotor.com

ORIENTAL MOTOR (EUROPA) GmbH
Schiessstraße 44, 40549 Düsseldorf, Germany
Technical Support Tel:00 800/22 55 66 22
www.orientalmotor.de

ORIENTAL MOTOR (UK) LTD.
Tel:+44-1256347090
www.oriental-motor.co.uk

ORIENTAL MOTOR (FRANCE) SARL
Tel:+33-1 47 86 97 50
www.orientalmotor.fr

ORIENTAL MOTOR ITALIA s.r.l.
Tel:+39-02-93906347
www.orientalmotor.it

ORIENTAL MOTOR ASIA PACIFIC PTE. LTD.
Singapore
Tel:1800-842-0280
www.orientalmotor.com.sg

ORIENTAL MOTOR (MALAYSIA) SDN. BHD.
Tel:1800-806-161
www.orientalmotor.com.my

ORIENTAL MOTOR (THAILAND) CO., LTD.
Tel:1800-888-881
www.orientalmotor.co.th

ORIENTAL MOTOR (INDIA) PVT. LTD.
Tel:1800-120-1995 (For English)
1800-121-4149 (For Hindi)
www.orientalmotor.co.in

TAIWAN ORIENTAL MOTOR CO., LTD.
Tel:0800-060708
www.orientalmotor.com.tw

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Tel:400-820-6516
www.orientalmotor.com.cn

INA ORIENTAL MOTOR CO., LTD.
Korea
Tel:080-777-2042
www.inaom.co.kr

ORIENTAL MOTOR CO., LTD.
4-8-1 Higashiueno, Taito-ku, Tokyo
110-8536 Japan
Tel:+81-3-6744-0361
www.orientalmotor.co.jp