PROGRAMMABLE AC/DC POWER SOURCE

Single-phase System

ES 2000S Single-phase Master
ES 2000B Booster

INSTRUCTION MANUAL

P-STATION ES

NF Corporation

---- Preface ----

Thank you for purchasing our "P-STATION/ES-series Programmable AC/DC Power Source".

For safe use of these electrical products, read "**Safety Precautions**" on the next page before using them.

■ Warning symbols appearing in this Instruction Manual

The warning symbols shown below are used in this manual. Be sure to follow the warnings and cautions indicated by these symbols to ensure users' personal safety and protect against damage to equipment.

⚠ WARNING

Together with this symbol, information is provided in order to prevent users from encountering hazards, such as electric shock, that could result in serious injury or death when they handle this device.

⚠ CAUTION

Together with this symbol, information is provided in order to prevent damage to equipment when users handle this device.

- **The Instruction Manual consists of the chapters outlined below.**
  Before using this product for the first time, read this manual, starting with Chapter 1, "Overview."

1. **Overview**
   The chapter provides confirmation items that must be made before the device is used.
2. **Part Names**
   The chapter gives the names and descriptions of parts of the device.
3. **Grounding and Connections**
   The chapter provides information you should keep in mind during installation and until equipment is turned on to prepare the device for use.
4. **Operations**
   The chapter describes basic operations and advanced functions.
5. **Specifications**
   The chapter contains specifications (on functions and performance).
6. **Maintenance**
   The chapter explains how to perform basic operational tests and describes routine maintenance.
7. **Troubleshooting**
   The chapter explains error messages and device behavior considered to be failures, and it describes the appropriate action to be taken.
8. **Supplementary Information**
   The chapter contains supplementary information to provide a better understanding of the device.

---- Safety Precautions ----

To use the device safely, be sure to follow the warnings and cautions given below.

NF Corporation takes no responsibility for and does not warranty against damage that may have occurred as a result of a failure to comply with these warnings and cautions.

The product is an insulation standard class I device (with a protective conductor terminal) as defined by the JIS and IEC standards.

- **Be sure to follow the instructions in the Instruction Manual.**

  The Instruction Manual provides users with information on the operation and safe use of this product.

  Read the manual before using the product.

  All warnings in the manual are provided to prevent hazardous situations possibly leading to serious accidents from occurring. Be sure to follow these warnings.

- **Connect the product to ground.**

  The product uses a line filter, which may cause electric shock if the product is not grounded.

  To prevent such electric shock, be sure to connect the product securely to ground.

- **Check the power supply voltage.**

  The product operates on the power supply voltage specified in "Grounding and Power Connections."

  Before connecting the product to a power supply, make sure that the power supply voltage conforms to the power supply voltage rating of the product.

  When the device operates for a long time under a load condition, the exhaust vent on the back of the device becomes hot. Be careful not to touch this part directly.

  To reduce the risk of the device being dropped during handling, do not lift it by its handle.

  The device uses dedicated accessories, peripherals, and options. Never use them for a purpose other than the installation and use of the device.

  To prevent electric shock and failures, do not turn on the device when a cord or unit is disconnected. Also, do not remove a unit when power is on.

  To prevent electric shock and failures, never allow foreign matter or liquid to enter the device.

  To prevent electric shock and failures, turn off the device before attaching a cable to or detaching it from the remote sensing terminal. When attaching a cable to the terminal, make sure that the metal part of the cable is covered after it is attached.

- **When a problem may have occurred**

  If smoke or an abnormal smell or sound is coming from the device, turn it off immediately and stop device operations.

  In such an event, disable operation of the device until it is repaired, and contact our office or agent who sold you the device.

- **Do not use the device in an environment where an explosive gas (such as propane or kerosene) is present.**

  There is a danger of explosion.

- **Do not remove the covers.**

  The device contains high-voltage parts. Never remove the covers.

  Even when the inside of the device must be checked, only authorized service engineers should handle the internal parts directly.

- **Do not retrofit the device.**

  Never retrofit the device. Otherwise, new and unforeseeable risks may arise, and NF Corporation may refuse your request for repair.

- **Safety-related symbols**

  General definitions of safety-related symbols on the device and in the Instruction Manual are given below.

Manual reference

This symbol notifies users of a potential danger, and it appears on parts that require users to refer to the Instruction Manual.

Danger of electric shock

This symbol appears on parts that could cause electric shock under certain conditions.

Protective ground terminal

This symbol appears on terminals that must be grounded to prevent electric shock.

Before using the device, be sure to connect such a terminal to ground.

⚠ WARNING

Warning

Together with this symbol, information is provided in order to prevent users from encountering hazards while handling the device, such as electric shock, that could result in serious injury or death.

⚠ CAUTION

Caution

Together with this symbol, information is provided in order to prevent damage to the device when users handle it.

- **Other symbols**

I	This symbol indicates the ON position of a power switch.
O	This symbol indicates the OFF position of a power switch.
	This symbol indicates that the external conductor of a connector is connected to the case.
	This symbol indicates that the external conductor of a connector is connected to signal ground.

Contents

Figures

Tables

1. Overview

1.1 Features

The "P-STATION/ES-series Programmable AC/DC Power Source" products can simulate power supply environments. Performance, functionality, compact and lightweight, and ease of use are emphasized in this series. Single-phase and three-phase systems can be built by combining P-STATION/ES-series products.

A single-phase system can be built with the ES 2000S single-phase master as its base and ES 2000B boosters added to obtain output power ranging from 2 kVA to 20 kVA.

A three phase system can be built using one ES 2000U three-phase master and two ES 2000P three-phase slaves as its base. By adding ES 2000B boosters to each phase, the system can have an output power ranging from 6 kVA to a maximum of 60 kVA.

Because the output voltage has low waveform distortion and features a stable voltage level and frequency, it is suitable for the power supplied in performance testing of electronic devices and EMC measurements.

The following products can be used to build a system:

ES 2000S single-phase master

ES 2000U three-phase master

ES 2000P three-phase slave

ES 2000B booster

In addition, the following options are available:

ES 0406 low-frequency immunity test program

ES 4153 reference impedance network

ES 4474 remote terminal

ES 4473 interface board

ES 4439 three-phase/single-phase switching output unit (for three-phase 6-kVA systems)

■ Component type and cabinet type

The "P-STATION/ES-series Programmable AC/DC Power Source" comes in two types: component and cabinet. The component style type allows you to use components with 2-kVA output power according to the required output format and power. With this type, you can change the output power and output format by adding components or changing combinations. The cabinet type is an integrated product with output power of 6 kVA or higher. In comparison with the component type product providing the same output power, the cabinet type requires less floor space for installation and I/O cables are easier to connect to it.

■ Compatibility with P-STATION/series [Q] system AC power sources

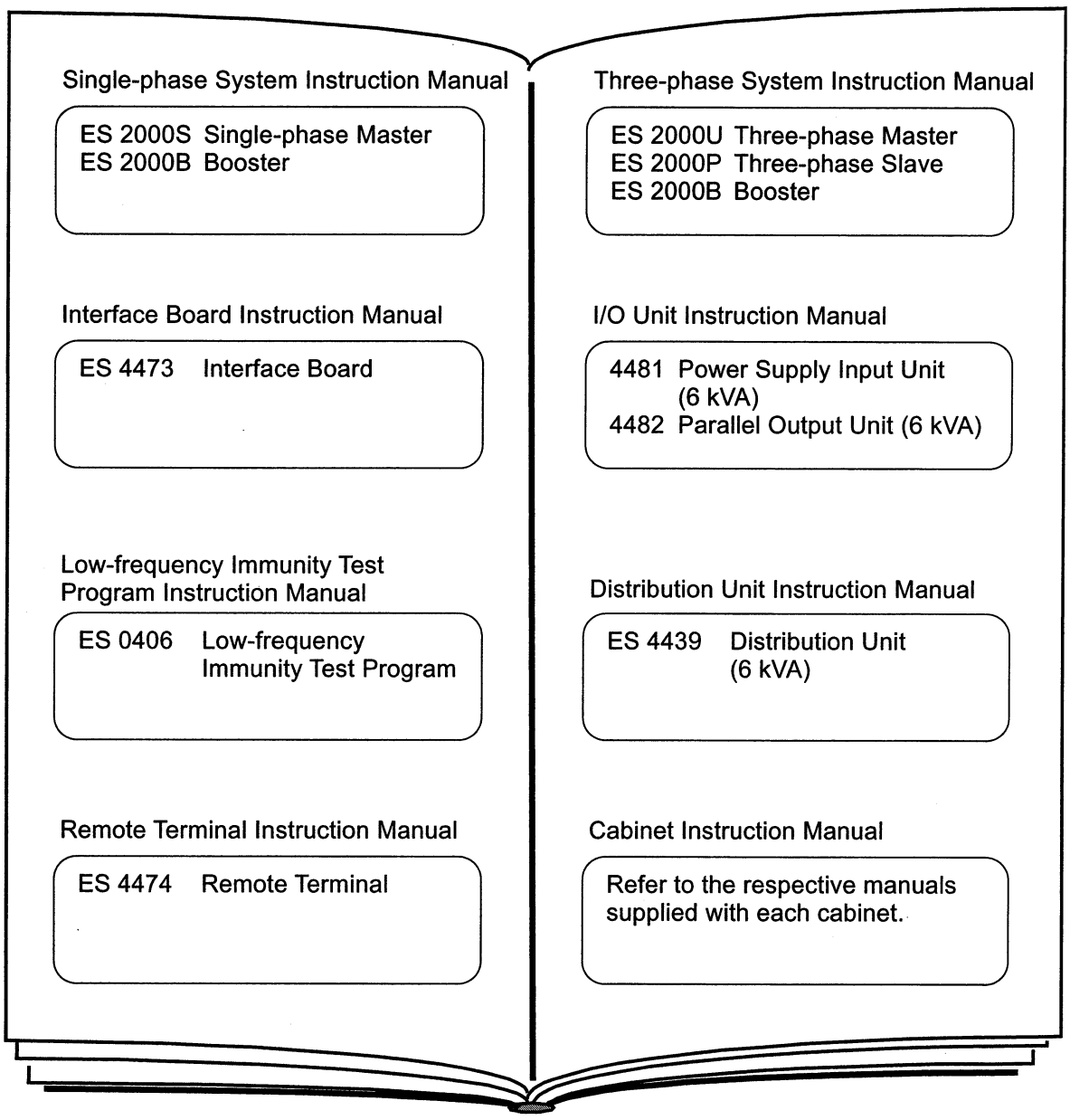
The "P-STATION/ES-series Programmable AC/DC Power Source" cannot be used in combination with the P-STATION/ series [Q] 4400-series system AC power sources.

1.2 Manual Configuration

This Instruction Manual covers single-phase systems. Manuals for these systems do not provide information about three-phase systems.

For information about options and peripherals, see the Instruction Manual supplied with the relevant product.

P-STATION/ES-series Programmable AC/DC Power Source Instruction Manuals



1.3 Accessory List Used for Confirmation

Before installing the device, check for damage caused by an accident during transport and verify that the main unit and the correct accessories are all included. If the main unit or an accessory is missing, contact the agent who sold you the device.

Table 1-1 Packing list

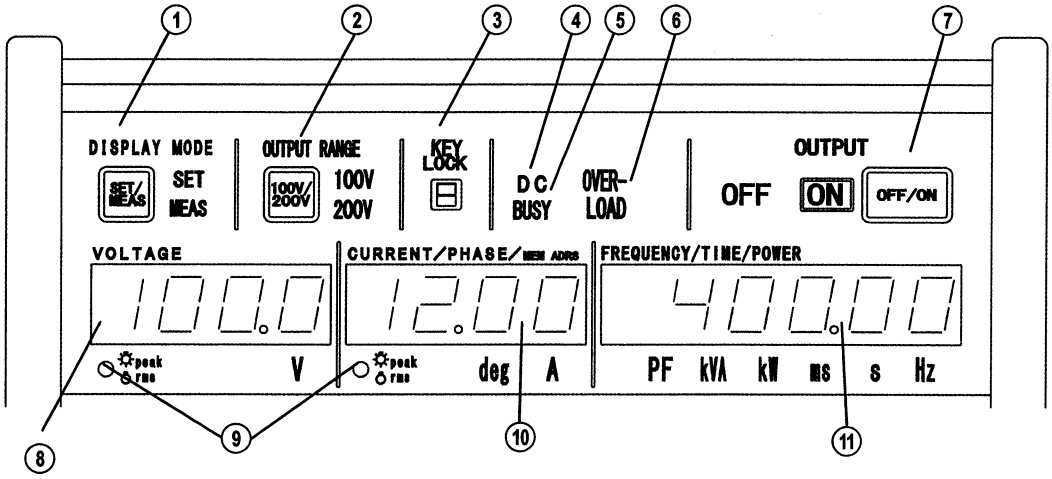
Item	Quantity
ES 2000S single-phase master	
Main unit	1
Instruction Manual (this document)	1
Power cable (3.5 mm^2 × 3 conductors × 3 m, VCT cable)	1
Flathead screwdriver for output cabling	1
ES 2000B booster	
Main unit	1
Power cable (3.5 mm^2 × 3 conductors × 3 m, VCT cable)	1
Booster cable A (with 16p connector, approx. 400 mm)	1
Booster cable B (with 6p connector, approx. 400 mm)	1

When re-packaging the device for transport, use a box that is strong enough and large enough, and place cushioning with sufficient weight tolerance into the box in order to protect the device.

2. Part Names

2.1 ES 2000S Single-phase Master

2.1.1 Controller (top)



① DISPLAY MODE

Sets the display mode to "setting value" or "measurement value."
☞ 4.2.7 Measurement function

② OUTPUT RANGE

☞ 4.2.3 Setting the output voltage and output voltage range

③ KEY LOCK

Key lock switch. Setting this switch to the top position activates the lock.
☞ 4.2.6 Key lock

④ DC

Lamp is on when DC output mode is selected.
☞ 4.2.2 Switching between DC and AC output modes

⑤ BUSY

Lamp is on during voltage range switching.
☞ 4.2.3 Setting the output voltage and output voltage range

⑥ OVERLOAD

Lamp is on when an overload is detected.
☞ 4.2.8 Protection function

⑦ OUTPUT OFF/ON

Turns output on and off. ☞ 4.2.5 Turning output on and off

⑧ VOLTAGE

Displays the setting value or measurement value of output voltage.
☞ 4.2.7 Measurement function

⑨ peak/rms

Lamps indicating whether the measurement value is a peak value or the effective value.
☞ 4.2.7 Measurement function

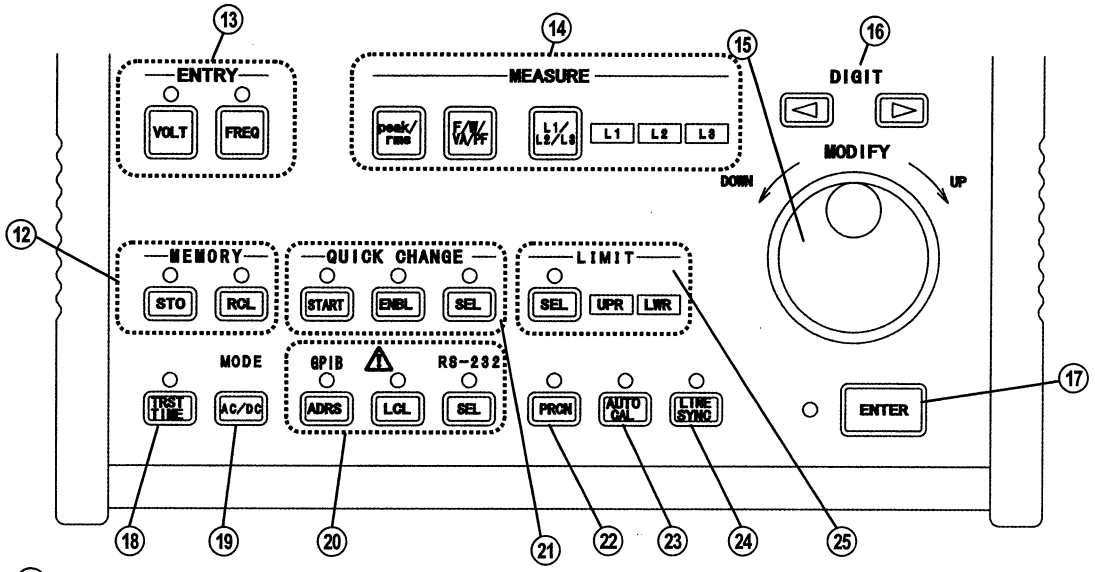
⑩ CURRENT/PHASE/MEM ADRS

Display the measurement value of output current, quick-change phase, and memory address.
☞ 4.2.7 Measurement function, 4.4.1 Quick voltage change (with the frequency unchanged), 4.3.3 Memory

⑪ FREQUENCY/TIME/POWER

Displays the output frequency, active/reactive power, power factor, quick-change time, and transition time.
☞ 4.2.4 Setting the output frequency, 4.2.7 Measurement function, 4.4.1 Quick voltage change (with the frequency unchanged), 4.4.2 Voltage variation (with a frequency variation)

2.1.2 Controller (bottom)



⑫ MEMORY

Stores and recalls settings from memory. ☞ 4.3.3 Memory

⑬ ENTRY

Sets the output voltage and output frequency.
☞ 4.2.3 Setting the output voltage and output voltage range, 4.2.4 Setting the output frequency

⑭ MEASURE

Used to select the measurement target. ☞ 4.2.7 Measurement function

⑮ MODIFY

Modify dial. It increases or decreases a setting value.

⑯ DIGIT

Moves the digit pointer in a setting to the left or right, and the digit value can be increased or decreased by the modify dial.

⑰ ENTER

Ends the input of a setting.

⑱ TRST TIME

Sets the transition time. ☞ 4.4.2 Voltage variation (with a frequency variation)

⑲ **AC/DC**

Toggles between AC output mode and DC output mode.
☞ 4.2.2 Switching between DC and AC output modes

⑳ **GPIB/RS-232**

Used to specify interface-related settings. Only effective when the ES 4473 interface board is used.

☞ 4.7.3 ES 4473 interface board

㉑ **QUICK CHANGE**

Used to specify settings for quick-change tests on output voltage.
☞ 4.4.1 Quick voltage change (with the frequency unchanged)

㉒ **PRCN**

Changes the compensation mode.
☞ 4.5.1 Precision and high stability (setting of compensation mode)

㉓ **AUTO CAL**

Performs auto calibration.
☞ 4.5.3 Auto calibration (output voltage calibration function)

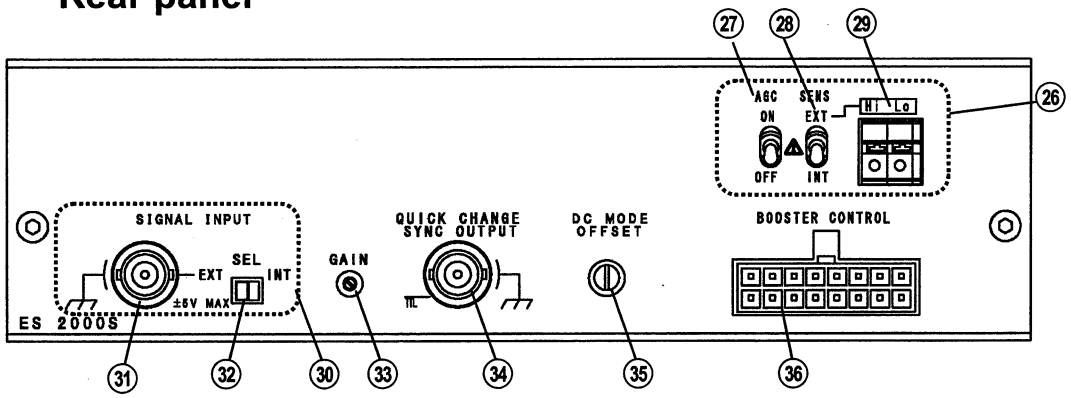
㉔ **LINE SYNC**

Causes entry into the line synchronization state.
☞ 4.3.2 Line synchronization

㉕ **LIMIT**

Sets limit values. ☞ 4.3.1 Setting limit values

2.1.3 Rear panel



㉖ **Switches and connectors related to remote sensing AGC.**
☞ 4.5.2 Remote sensing AGC (AC output mode)

㉗ **AGC**

Sets AGC operation. ☞ 4.5.2 Remote sensing AGC (AC output mode)

㉘ **SENS**

Used to select the detection point for output voltage.
☞ 4.5.2 Remote sensing AGC (AC output mode)

㉙ **Hi Lo**

Connection terminals used for external detection of output voltage.
☞ 4.5.2 Remote sensing AGC (AC output mode)

㉚ SIGNAL INPUT

External signal input option.
☞ 4.6.1 External input (AC output mode: factory-supplied option)

㉛ EXT

Connector used for input of external signals.
☞ 4.6.1 External input (AC output mode: factory-supplied option)

㉜ SEL

Switch for selecting an input signal.
☞ 4.6.1 External input (AC output mode: factory-supplied option)

㉝ GAIN

Adjusts the gain of the internal amplifier. ☞ 6.3 Gain Adjustment

㉞ QUICK CHANGE SYNC OUTPUT

Connector from which a synchronous signal is output during a quick-change operation.
☞ 4.4.1 Quick voltage change (with the frequency unchanged)

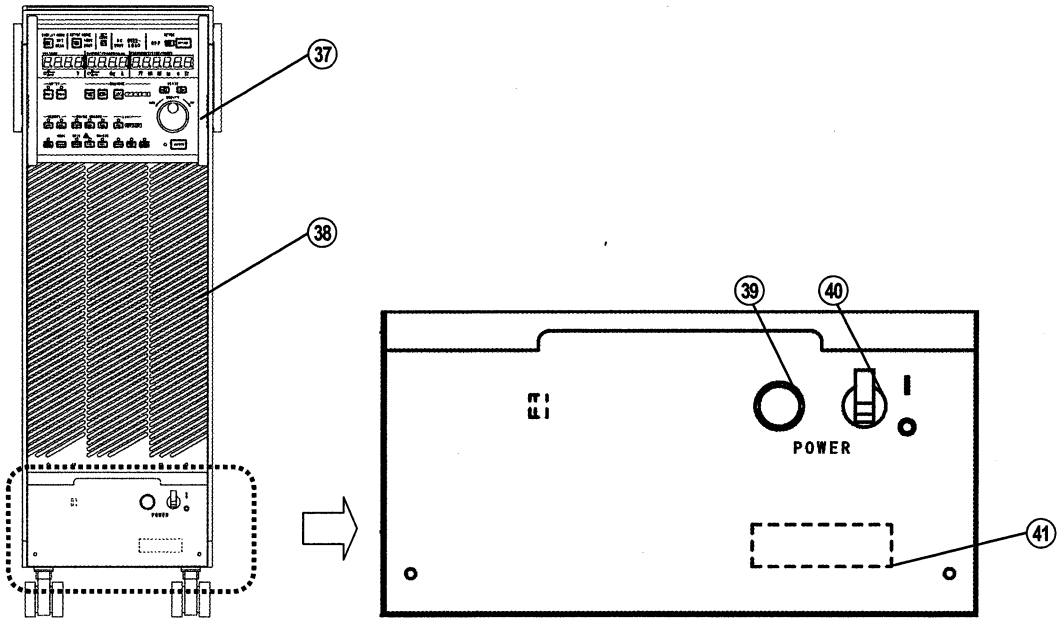
㉟ DC MODE OFFSET

Adjusts the offset voltage in DC output mode.
☞ 4.2.2 Switching between DC and AC output modes

㊱ BOOSTER CONTROL

Used for parallel connections using ES 2000B boosters.
☞ 3.5 Connections for Expansion (Single-phase Master and Boosters)

2.1.4 Front section



㊲ Controller

㊳ Intake vent

Opening through which air used for cooling enters the device.

㊴ POWER lamp

Power pilot lamp. This lamp goes on when the device is turned on.

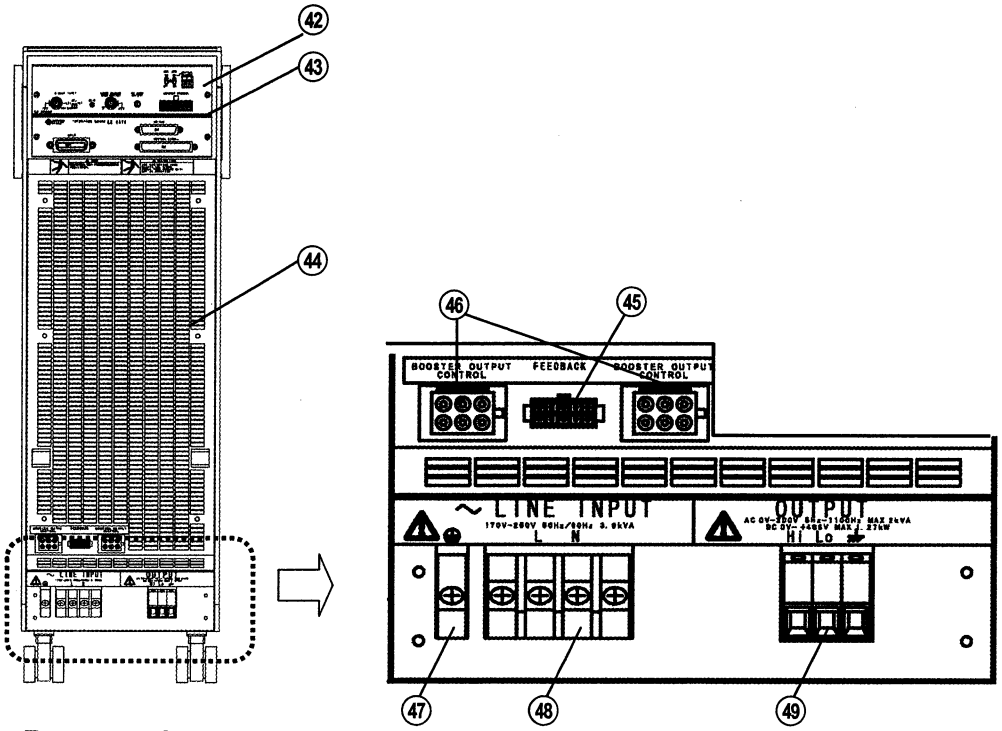
㊵ POWER switch

Power switch. This switch turns on the device.

㊶ Serial number indication

Serial number of the device.

2.1.5 Rear section



㊷ Rear panel

㊸ Optional ES4473 interface board

㊹ Exhaust vent

Opening through which air is blown out.

㊺ FEEDBACK

Connectors provided for expandability. Leave them unconnected.

㊻ BOOSTER OUTPUT CONTROL

Connector for booster output control. For parallel connections, connect it to an ES 2000B booster. ☞ 3.5 Connections for Expansion (Single-phase Master and Boosters)

㊼ ⏚

Protective ground terminal. Be sure to connect it.
☞ 3.3.1 Connection to the power input terminal

㊽ LINE INPUT

Power input terminal. Be sure to note the rated input range.

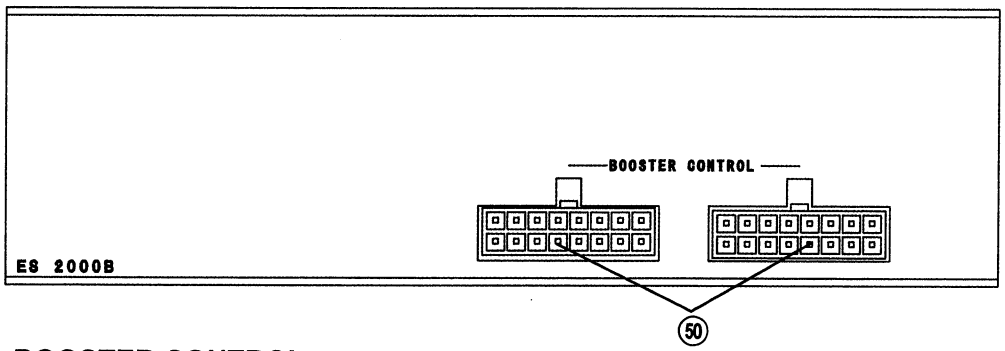
☞ 3.3.1 Connection to the power input terminal

㊾ OUTPUT

Output terminal. Use the screwdriver supplied.
☞ 3.3.2 Connections to the output terminal

2.2 ES 2000B Booster

2.2.1 Rear panel

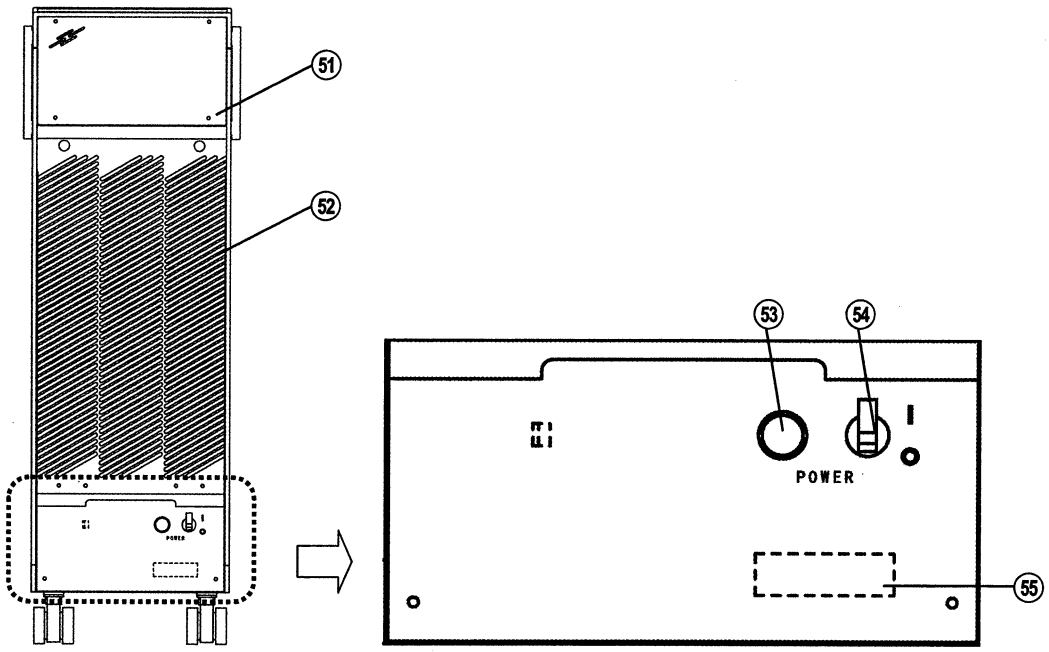


㊿ BOOSTER CONTROL

In parallel connections, one of them is connected to the ES 2000S single-phase master.

By connecting the other side to another ES 2000B booster, additional boosters can be connected (up to nine units).
☞ 3.5 Connections for Expansion (Single-phase Master and Boosters)

2.2.2 Front section



(51) Blank panel

(52) Intake vent

Opening through which air used for cooling enters the device.

(53) POWER lamp

Power pilot lamp. This lamp goes on when the device is turned on.

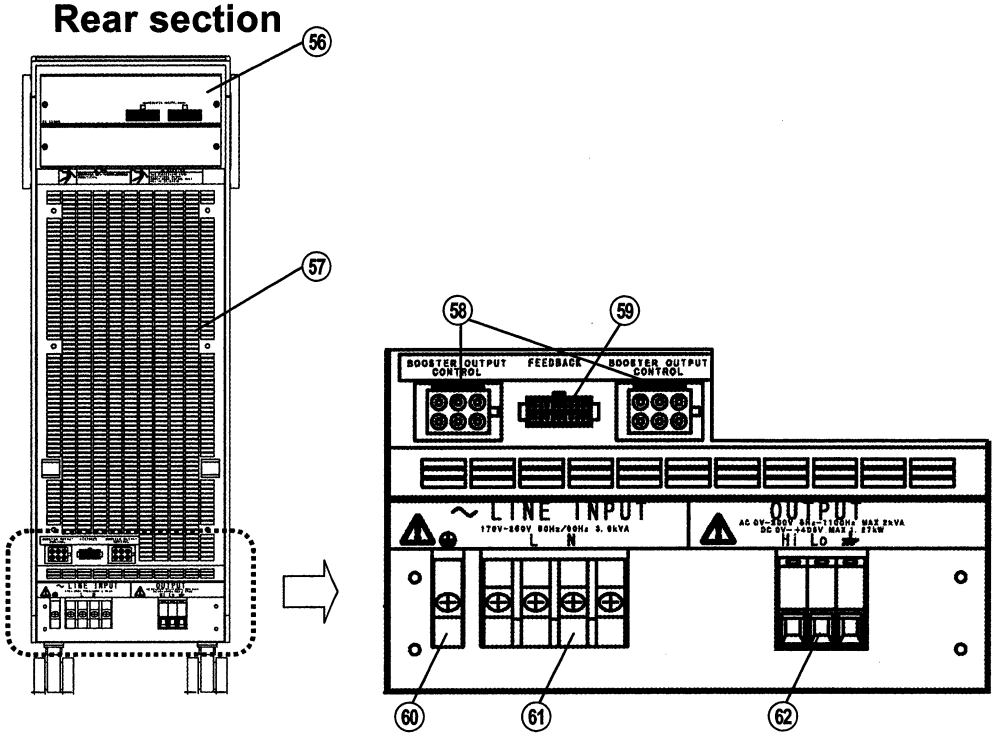
㊹ POWER switch

Power switch. This switch turns on the device.

㊺ Serial number indication

Serial number of the device.

2.2.3 Rear section



㊻ Rear panel

㊼ Exhaust vent

Opening through which air is blown out.

㊽ BOOSTER OUTPUT CONTROL

Connector for booster output control. In parallel connections, one of them is connected to the ES 2000S single-phase master (Up to nine units).

☞ 3.5 Connections for Expansion (Single-phase Master and Boosters)

㊾ FEEDBACK

Connectors provided for expandability. Leave them unconnected.

㊿ ⏚

Protective ground terminal. Be sure to connect it.

☞ 3.3.1 Connection to the power input terminal

(61) LINE INPUT

Power input terminal. Be sure to note the rated input range.

☞ 3.3.1 Connection to the power input terminal

(62) OUTPUT

Output terminal. Use the screwdriver supplied.

☞ 3.3.2 Connections to the output terminal

3. Grounding and Connections

3.1 Installation Environment

For safe use of the device and maintaining reliability, take the following into consideration:

- To prevent the device from toppling over, install it on a level floor that is vibration-free and can support its weight (approximately 48 kg per unit).
- Use the device within the following ambient temperature and humidity ranges:

Guaranteed performance	+5 to +35°C	5 to 80%RH The absolute humidity range is 1 to 25 g/m^3. No condensation is allowed.
Guaranteed operation	0 to +40°C	5 to 80%RH The absolute humidity range is 1 to 25 g/m^3. No condensation is allowed.
Storage conditions	–10 to +50°C	5 to 95%RH The absolute humidity range is 1 to 29 g/m^3. No condensation is allowed.

In an environment with an extremely high temperature or humidity, the operation of the device becomes less reliable. A temperature of around 25℃ and a relative humidity of 50% is recommended for the operating environment of the device.

- To get the full benefits of the forced air cooling function, install the device so that the intake vent (in the front section) and the exhaust vent (in the rear section) are at least 50 cm apart from walls and other obstructions, thereby ensuring sufficient air ventilation.
- Never install the device at the following locations:

  Outdoors
  Place exposed to direct sunlight
  Small area with poor ventilation
  Humid place at which condensation forms easily
  Dusty area
  Place at which corrosive, explosive, or flammable gas is present
  Places where the device is likely to come in contact with fire or water

⚠ CAUTION

In the event of a sudden change in the ambient temperature or humidity, such as during transport in winter, condensation may form inside the device.
In such cases, leave the device as is until the condensation evaporates, before connecting it to a power supply.

3.2 Grounding and Power Connections

3.2.1 Grounding

⚠ WARNING

This product uses a line filter, which may cause electric shock if the product is not grounded.
To prevent electric shock, be sure to connect the protective ground terminal (⏚) securely to ground.

3.2.2 Power supply

⚠ CAUTION

Before connecting the product to a power supply, make sure that the power supply voltage conforms to the rated supply voltage of the product.

- The power requirements of the product are as follows:

  Voltage: 170 VAC to 250 VAC

  Frequency: 48 Hz to 62 Hz

  Maximum power consumption: Approximately 3,800 VA per unit (The input current for a 170-V power supply voltage is approximately 23 A.)

- For a connection to a power supply, use the supplied power cable or an equivalent cable (with a nominal sectional area of 3.5 mm^2) whose thickness is the same or greater.
- When tightening screws and pulling cables, be very careful not to allow the power cable to loosen or detach from the terminal.

3.3 Connection to I/O Terminals

Before starting connection work, be sure to disconnect the power supply from the distribution panel to prevent electric shock.

3.3.1 Connection to the power input terminal

Use the supplied power cable to connect the power input terminal (⏦ LINE INPUT) on the back to a 200-V power supply terminal on the distribution panel.

To ensure safety, be sure to disconnect the power supply from the distribution panel before cabling.

The input terminal section of the device is labeled (⏚ L N). Connect "⏚" to protective ground. If only one side of the power supply of the distribution panel to be connected is grounded, connect "N" to the grounded side and "L" to the non-grounded side. Otherwise, you need not consider polarity.

When connecting the device to a single-phase three-wire distribution panel, make connections to the first and second phases without using the neutral phase (grounded side).

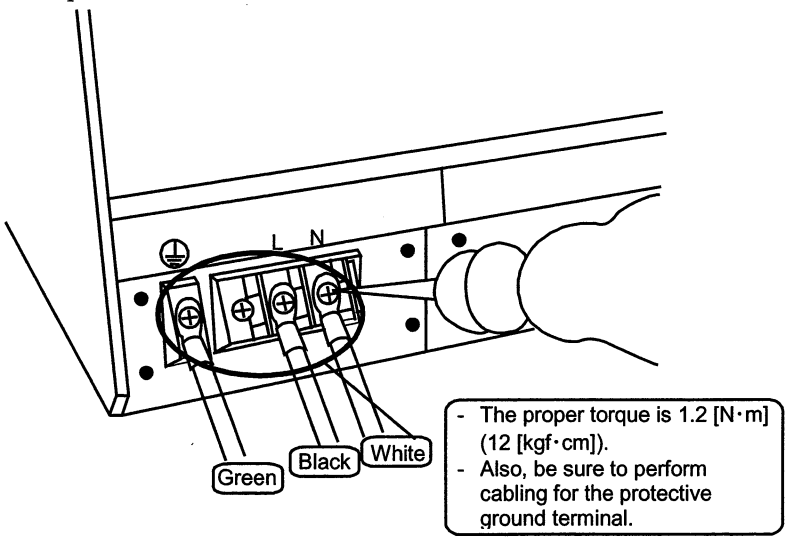
Cabling requires a Phillips screwdriver (+) used to turn the terminal block screws (M4).

Remove the safety cover of the terminal block, and remove the screw. Pass the screw through the terminal of the supplied power cable, re-insert the screw into the terminal block, and tighten the screw securely with the screwdriver.

The proper torque for tightening is 1.2 [N·m] (approximately 12 [kgf·cm])

(from IEC standard IEC947-7-1).

Be sure to perform cabling for the protective ground terminal too. After completing cabling, be sure to mount the protection cover.



⚠ WARNING

To ensure safety, be sure to disconnect the power supply from the distribution panel before cabling.

3.3.2 Connections to the output terminals

Output is insulated from power input.

Both the "Hi" and "Lo" outputs are insulated from the housing. The "Lo" terminal can be connected to the housing.

An 8-mm^2 or thinner twisted cable or a solid cable with a maximum diameter of 4 mm can be used for the output terminals on the rear.

No special preparations are required for a twisted-pair cable, but make sure that the tip of the cable does not fan out. Strip off 11 mm from the insulation jacket, insert the cable into the terminal, and fasten the terminal screws with the screwdriver supplied. The proper torque for tightening is 1.8 [N·m] (approximately 18 [kg·cm]) (the internal retaining screw is "M5").

⚠ CAUTION

- For cabling, use the supplied screwdriver to fasten the screws and prevent damage to the screw threads.
- Although the "Lo" terminal can be connected to the housing, connecting the "Hi" terminal to the housing prevents the system from achieving the specified performance levels.

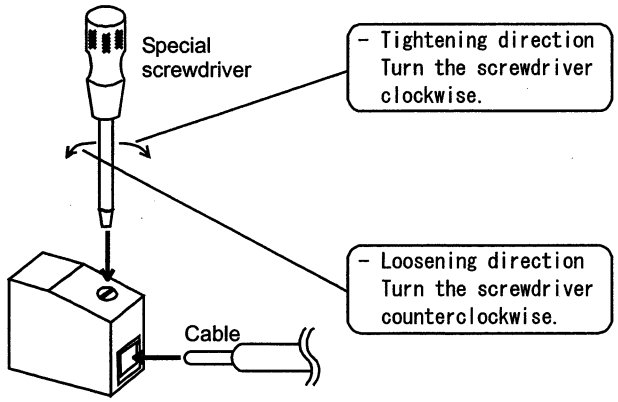
■ **The following is the procedure for connecting a cable to a screw-type (clamp) terminal block:**

Step 1: Remove the cable insulator covering the conductor.

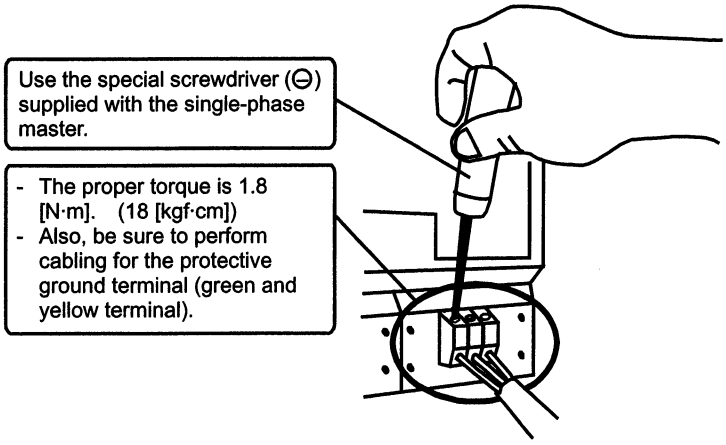
Step 2: Loosen the screw of a terminal block, and open the cable insertion opening until it reaches its maximum size.

Step 3: Insert the cable conductor.

Step 4: Tighten the screw, using the specified torque.



When attaching a cable to the screw-type (clamp) terminal block, insert the cable into the terminal block with its screw completely loosened.
When connecting a twisted cable, ensure that the tips of the conductors do not fan outward.
Turning the fastening screw counterclockwise loosens the screw, and turning the screw counterclockwise tightens the screw.



⚠ WARNING

To ensure safety, be sure to turn off power before connecting the output terminals.

⚠ CAUTION

- Do not solder conductors. Soldered conductors have higher contact resistance, which increase the temperature of the contact part, leading to burning of the terminal block.
- Insert only one cable into a single terminal block. If more than one cable is inserted, the cables may detach easily, which is dangerous.

3.4 Connection Method When the Single-phase Master Alone Is Used

This section describes the connection method used when the ES 2000S single-phase master alone is used.

(1) Connecting the power supply

See "Connecting the power supply" and connect the power supply securely.

(2) Connecting output to a load

See "Connections to the output terminals," and connect cables securely.

⚠ CAUTION

An internal circuit of this device monitors voltage on the output terminals in the rear section and controls the voltage to keep it constant.
Therefore, if output current has a large peak value, or if the output frequency is high, load regulation degrades because of the effect of impedance caused by cables to the load. Examples of such impedance are from cables and terminals. For this reason, avoid using a cable that is unnecessarily long to connect an output terminal and load, fasten the terminal screws so that there is no looseness, and use an output cable with a nominal cross section of at least about 3.5 mm^2.

⚠ WARNING

To ensure safety, be sure to turn off power before connecting output.

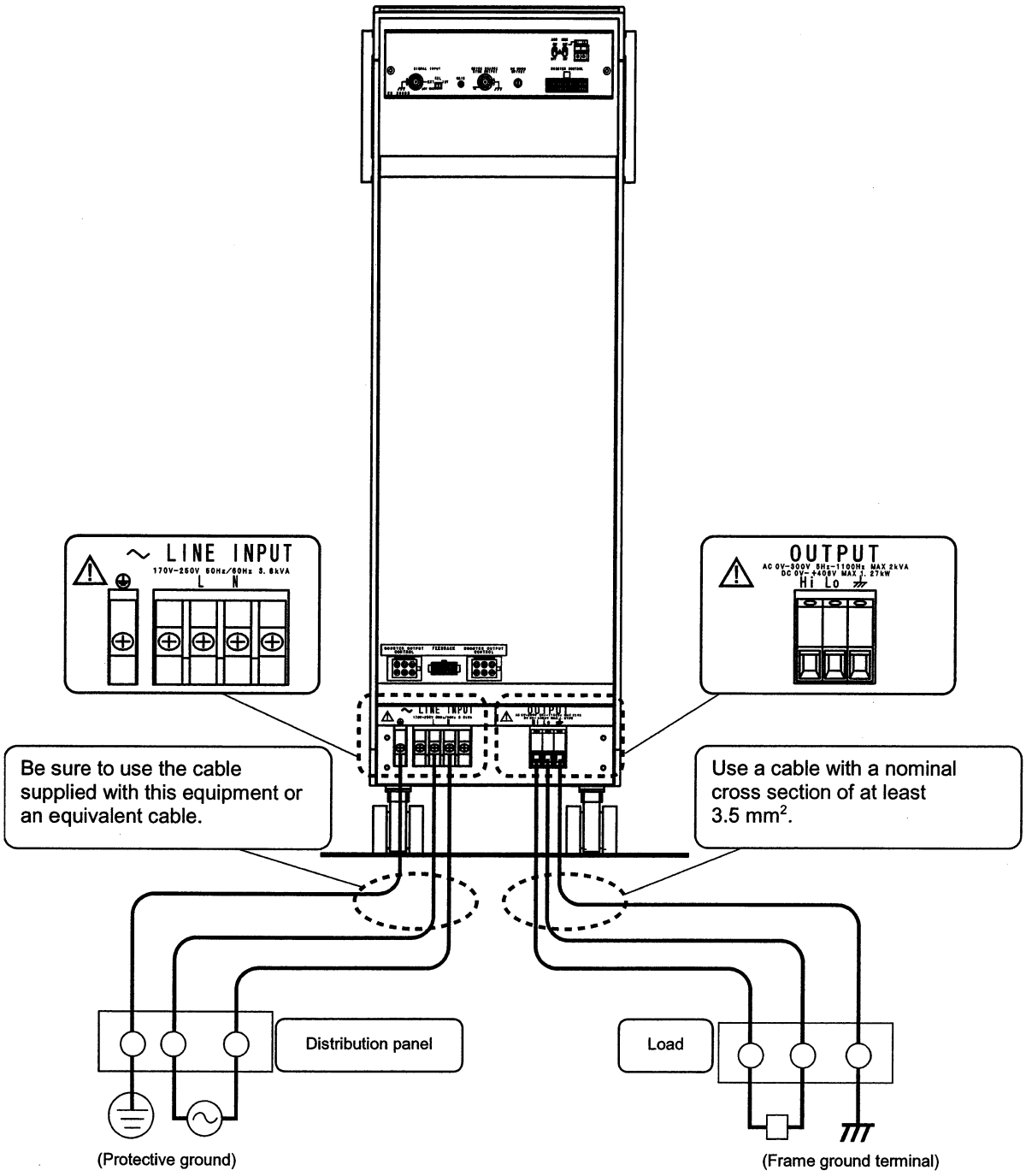


Figure 3-1 Cable connection when a single-phase master alone is used

3.5 Connections for Expansion (Single-phase Master and Boosters)

This section explains how to connect additional ES 2000B boosters to the ES 2000S single-phase master to increase output power.

Up to nine boosters can be connected to one single-phase master to build a single-phase power supply system of up to 20 kVA.

⚠ CAUTION

Before connecting cables to the power supply, check the power capacitance of the distribution panel. The maximum input power of the single-phase master and boosters is approximately 3800 VA per unit, so for an input voltage of 170 V, the input current per unit is approximately 23 A.

⚠ WARNING

To ensure safety, be sure to turn off power before connecting cables.

(1) Connecting the power supply

See "Connections to I/O Terminals", and connect cables securely.
Be sure to connect a separate power cable from the distribution panel to each power input pin.

(2) Connecting booster cables A and B

Connect the single-phase master and boosters with booster cables A and B, which are supplied with the boosters. Connect the cables in a daisy chain.

(3) Connecting output to a load

See "Connections to I/O Terminals", and connect cables securely.

■ Connection method using the power supply input unit and output parallel unit

If the 4481 power supply input unit (option) is used, input power supply can be received centrally and supplied to multiple units. Up to three units can be connected and used for expansion with parallel connections.

If the 4482 output parallel unit (option) is used, outputs of the single-phase master and boosters can be connected in parallel, and output can be obtained from just one terminal block. Up to three units can be connected.

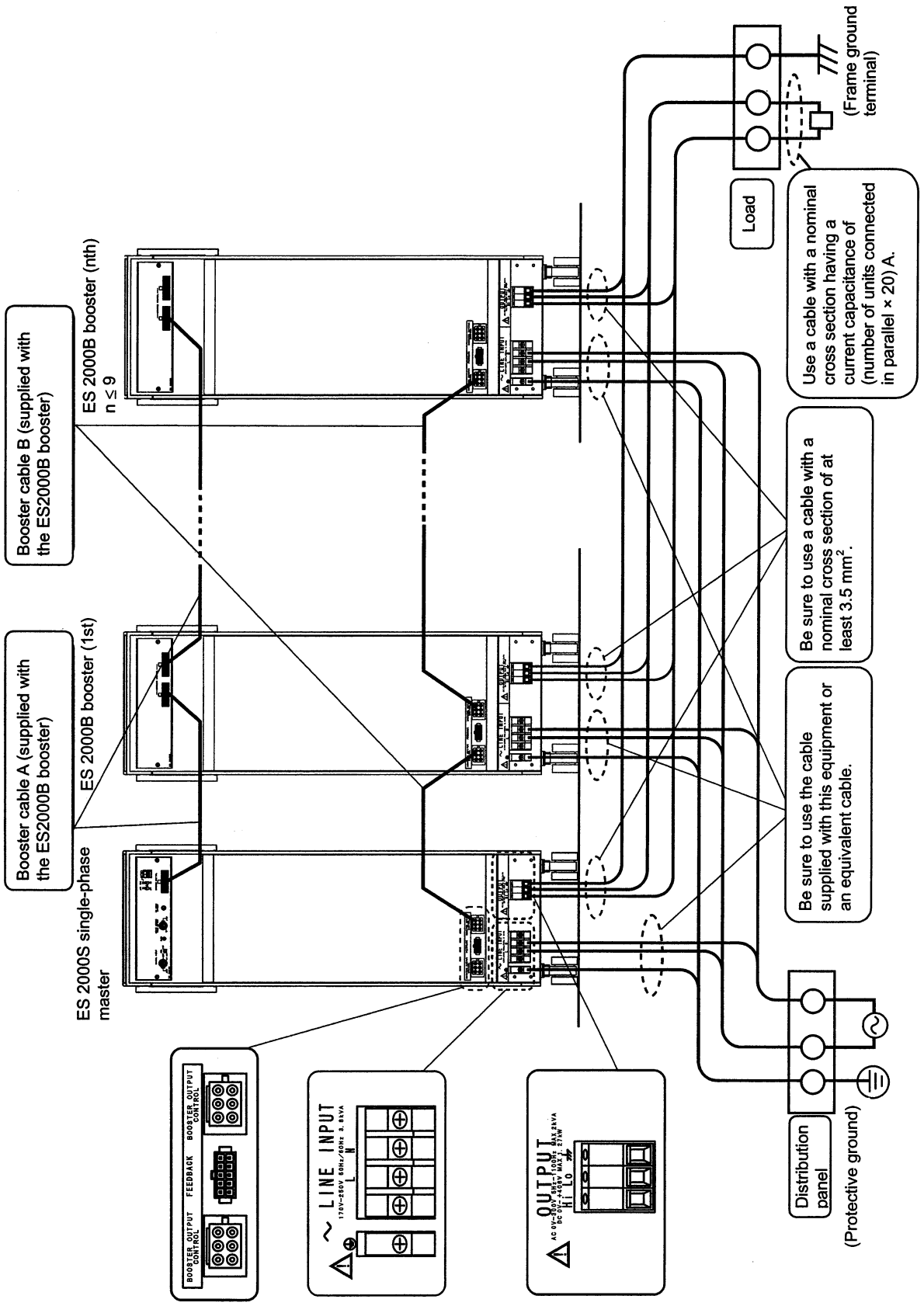


Figure 3-2 Connections for expansion (single-phase master and boosters)

⚠ CAUTION

Select cables properly by referring to the following, which shows the relationship between cables and allowable current:

■ Allowable current of 2-conductor vinyl cabtire cables (JIS C 3312 VCT cables)

Ambient temperature of 30°C or less

Number of conductors	Nominal sectional area [mm²]	Allowable current [A]
Two conductors	2	22
	3.5	32
	5.5	42
	8	51
	14	71
	22	95
	38	130
	60	170
Single conductor	60	225

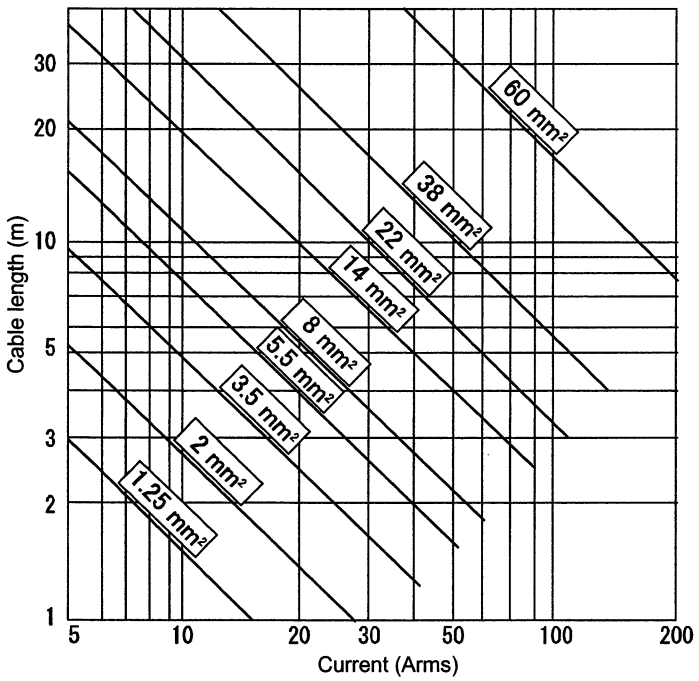
Ambient temperature exceeding 30°C

Ambient temperature [°C]	Allowable current derating factor
30	1.00
35	0.91
40	0.82
45	0.71
50	0.58

(As per JEAC 8001-1986)

* Multiply the allowable current in the left table by the derating factor in the above table.

■ Relationship between cable length and voltage drop (JIS C 3307 IV cables)



* Cable length with a voltage drop of 0.5 V caused by electric wire resistance

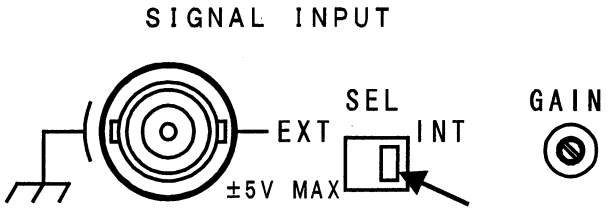
* In the graph, ☐ indicates a conductor sectional area.

3.6 Powering On and Off and Checking Operation

After cables are connected, check operation. Power on by following the procedure below.

For explanations of indications, see Chapter 4. ☞ 4.1 Notational Conventions

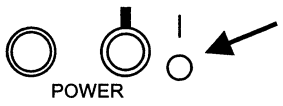
(1) If the external signal input option has been added, confirm that the SIGNAL INPUT switch on the rear panel of the single-phase master is set to INT.



(2) Verify that the cables are connected correctly according to the instructions given in the previous sections.

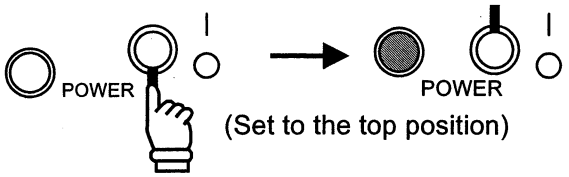
(3) If the system has been expanded (boosters are connected in parallel to the single-phase master), turn on the power switches of all boosters (the single-phase master remains powered off). The system is not yet turned on at this point.

<<All boosters>>



(4) Turn on the power switch of the single-phase master. The system is turned on, and operation starts.
If the system has been expanded, each booster is powered on at this time, and this is indicated on the controller of the single-phase master.

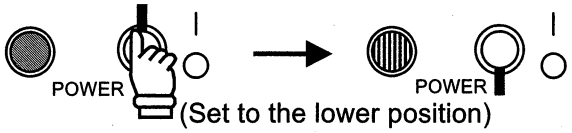
<<Single-phase master>>



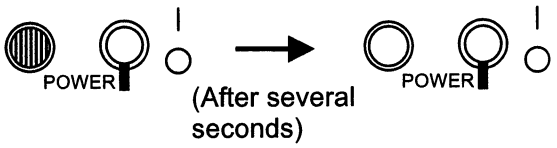
(5) Immediately after the power-on sequence, the settings stored at memory address 1 are used. When the device is turned on for the first time after its purchase, the preset defaults are used.
☞ 4.3.3 Memory

(6) To power off, turn off the power switch of the single-phase master. The supply of power is stopped, and the device is turned off.
If the system has been expanded, each booster is turned off with its power switch left in the on position.

<<Single-phase master>>



(7) After the power-off sequence, the pilot lamps of the master and boosters blink for several seconds.
Before powering on again after the blinking pilot lamps go out, wait for at least 10 seconds.



⚠ CAUTION

- Connect cables securely. An incorrect connection can result in a malfunction.
- Immediately after the power -on sequence, OVER-LOAD may go on and remain on until the internal circuit operation stabilizes.