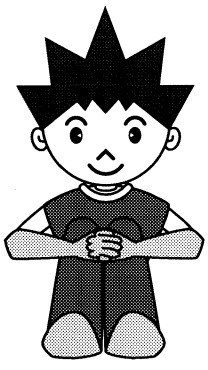
4

Fundamental Use

- for beginners -

■ In this chapter, I explain fundamental use of the system.If this is the first time to use the system for you, please read this chapter first.

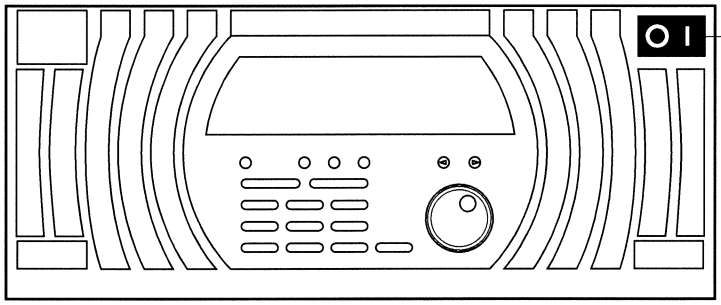


Attention!

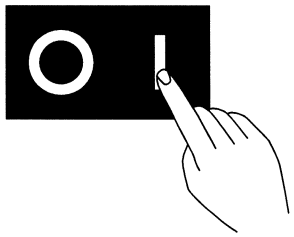
This chapter particularly describes a system of single-phase 2 kVA (one EPO 2000S/EPO 2000X unit is used).

With an enhanced system that combines two or three EPO 2000X units, operation is partly different. For this configuration, refer to Chapter 6 "Use of Enhanced EPO 2000X System - increase the system output capacity or use units in a three-phase or single-phase three-wire configuration -".

Turning ON/OFF power supply

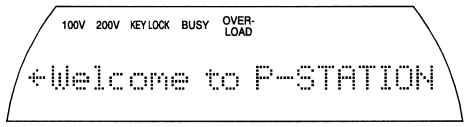


Turning on the power

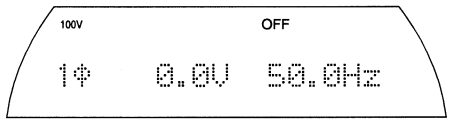


Press the I side of the power switch.

All lamps light up and the display shows a running message.



Then a normal screen appears on the display.



Turning off the power

Press the ◎ side of the power switch.

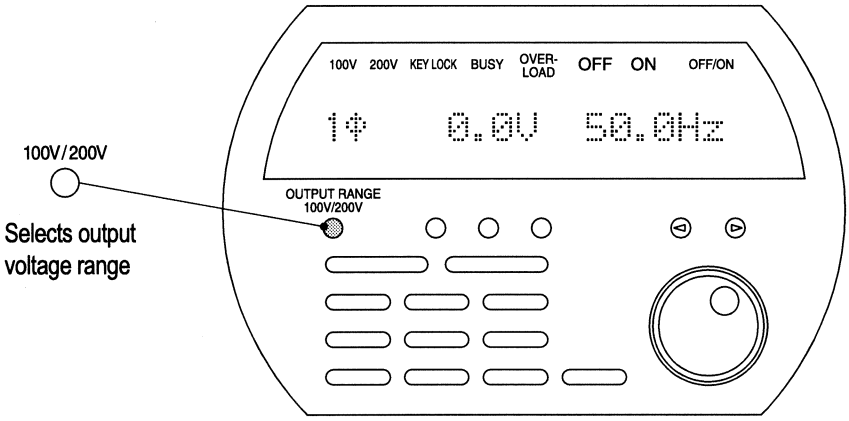
All indications go out. Cooling fan continues running for a moment until ....

Complete stop comes several seconds later.

Memo

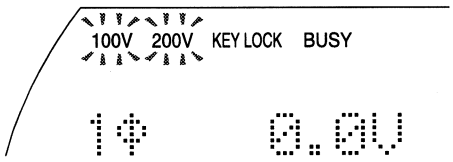
- Just after the power energizing, the settings are those stored at Address 1 of the memory.
  You can enter familiar settings in Address 1 of the memory for your convenience in operation.
- You may turn on the power switch again when the cooling fan is running after power turning off. This causes no problem.

Setting the output voltage range

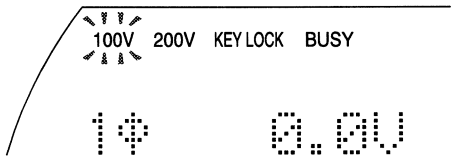


100V/200V

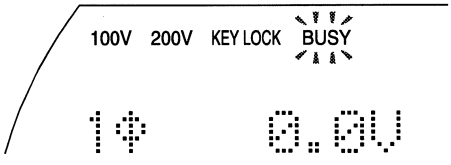
1 Every press on the ◯ button toggles the range between 100 V and 200 V.



2 Select the desired voltage range for output.



BUSY keeps lighting during the selection process; any button operation is not accepted at the moment.



Attention!

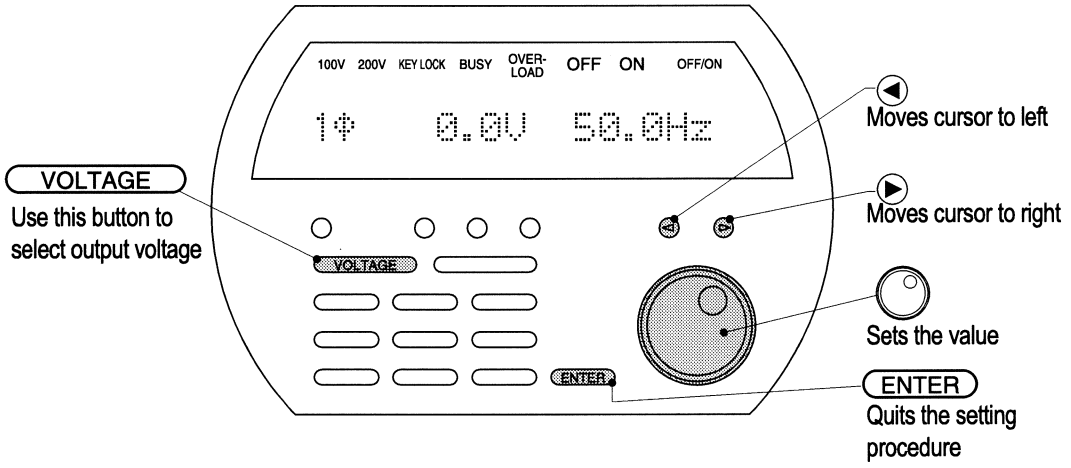
The maximum output current depends on the selected range.

Voltage range	Output range
100 V range	< 150V < 20A
200 V range	< 300V < 10A

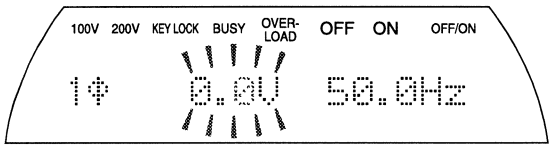
Attention!

- When the range is changed, the output is turned off.
- If the setting of output voltage is out of the range of 100 V range, the 100 V range cannot be selected. Lower the voltage setting first before changing the range.

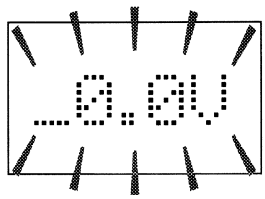
Setting the output voltage



1 Press VOLTAGE and the voltage indication blinks.



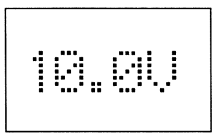
2 Press ◀ and ▶ to locate the cursor.



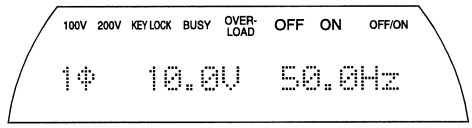
3 Turn ◯ to set the voltage.

◯ Clockwise turn increases the value.

◯ Counterclockwise turn decreases the value.



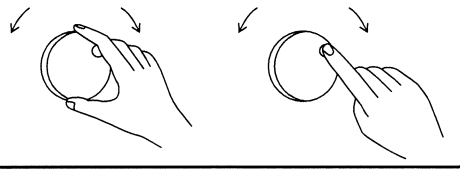
4 Press ENTER to quit the setting procedure.



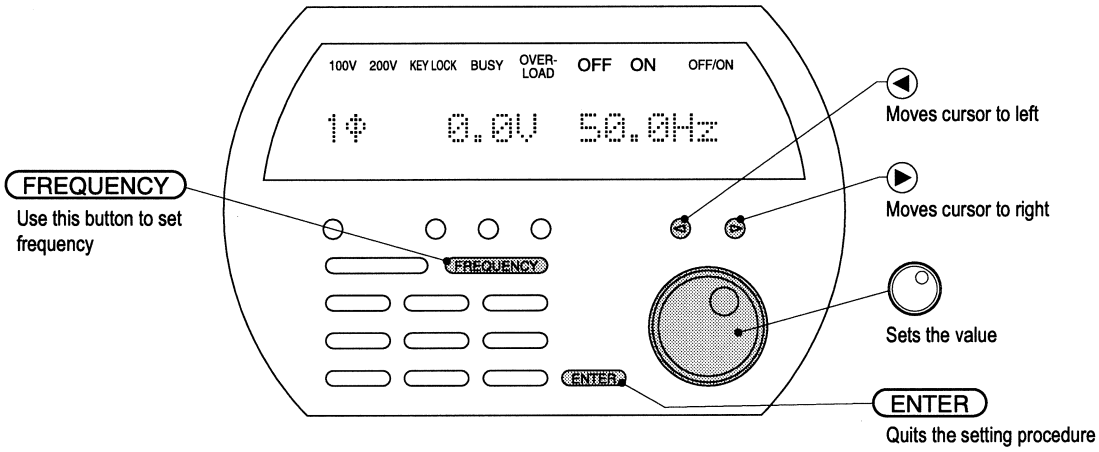
Memo

How to turn the rotary dial

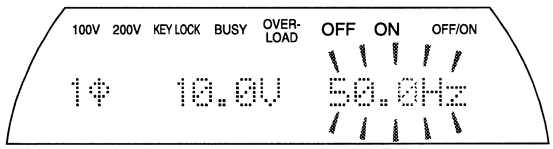
[Moderate turn] [Quick turn]



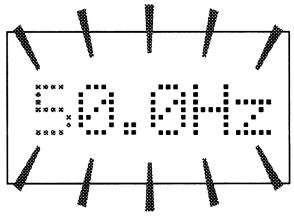
Setting the output frequency



1 Press FREQUENCY and the frequency indication blinks.



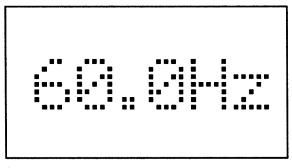
2 Press ◀ and ▶ to locate the cursor.



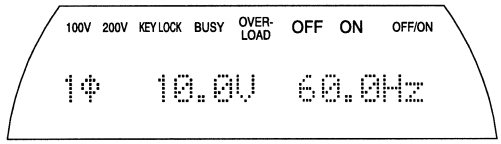
3 Turn ◯ to set the frequency.

Clockwise turn increases the value.

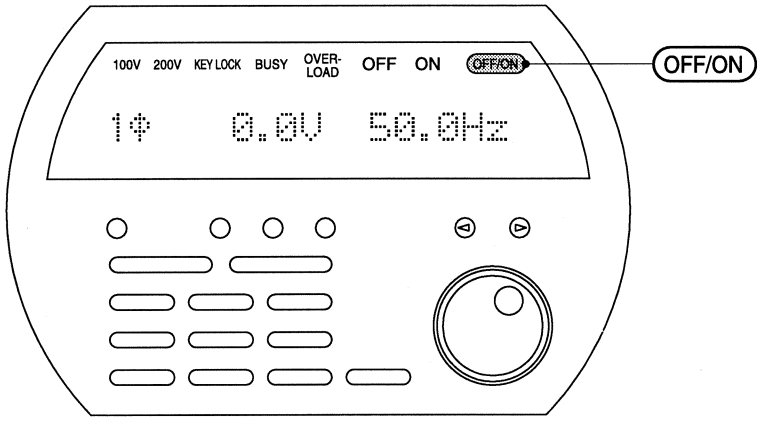
Counterclockwise turn decreases the value.



4 Press ENTER to quit the setting procedure.

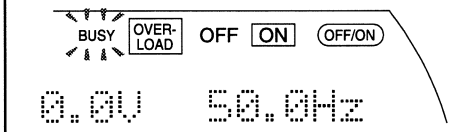


Turning ON/OFF the output



1 Every press on (OFF/ON) toggles the output between ON and OFF.

BUSY keeps lighting during switching process.



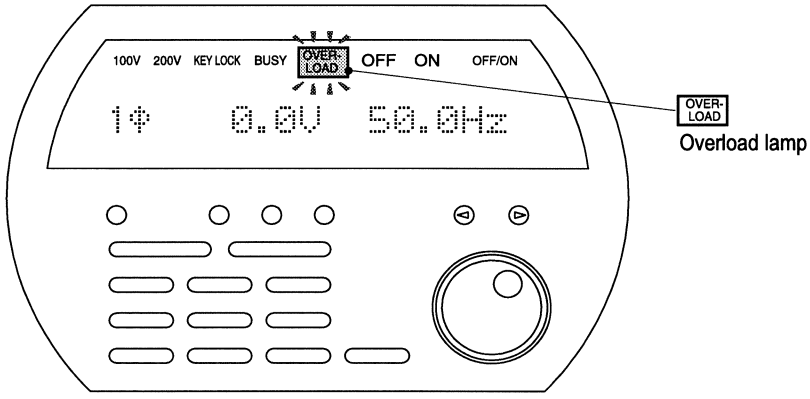
Output is ON

ON keeps lighting.

Output is OFF

OFF keeps lighting.

Indication of overload

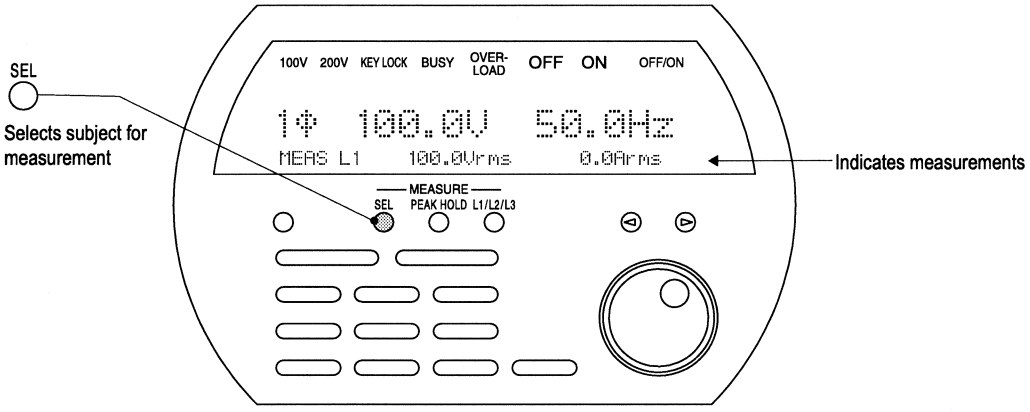


When output current exceeds the rated value, or if the output is short-circuited accidentally, control restrains the output current. The overload lamp keeps lighting during output restraint and the output voltage waveform is distorted.

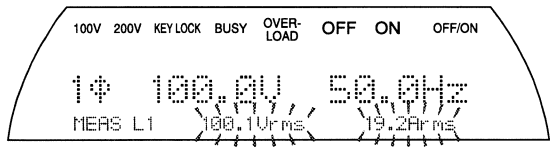
Memo

This protective function will be automatically released when the cause is eliminated.
When a high current flows, for example, on motor startup, the system is temporerily set in an overload atate.
When the current decreases to the rated value or lower, the normal output is restored, with the over load lamp going out.
However, the system may turn off the output to protect the internal circuit depending on the degree of overload.

Using measuring functions



1 Every press on SEL changes the indication of measurement in turn.



Measurements are shown in the bottom line of the display. The user can carry out setting while monitoring the real output value shown in the measurement field.
The display shows the following values in turn:
[RMS values of voltage and current]
[Peak values of voltage and current]
[Apparent power and effective power]
[Power factor]

[Example]

RMS values of voltage and current
MEAS L1 100.1Vrms 19.2Arms

Peak values of voltage and current
MEAS L1 141.6Vpk 27.2Apk

Apparent power and effective power
MEAS L1 1.92kVA 1.92kW

Power factor
MEAS L1 PF 1.000

Attention!

- The measurement range is automatically changed by detection of the peak values of the voltage and current RMS values.
- The measurement range cannot be fixed.

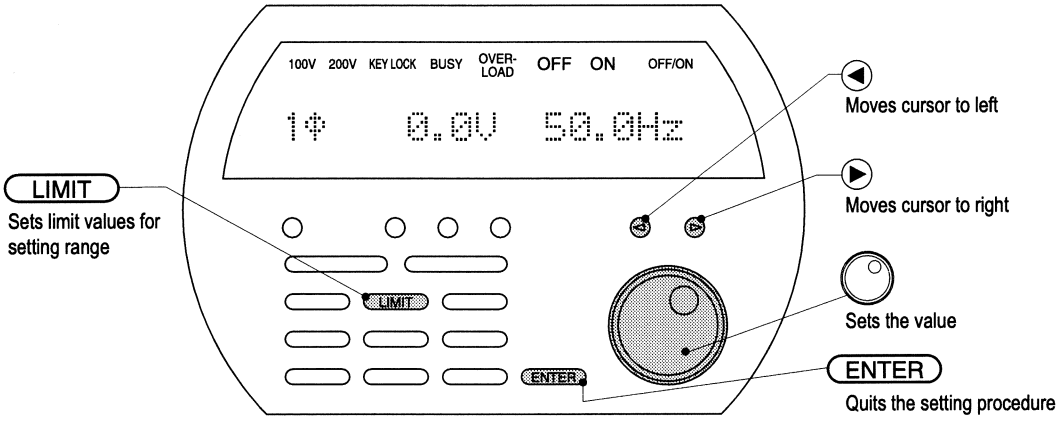
Attention!

- Voltage and current are measured properly only when the frequency is in the range of 40 to 500 Hz.
- Effective power is measured properly only when the frequency is in the range of 45 to 65 Hz.

Memo

- The display shows the peak value in positive or that in negative whichever is greater.
- Apparent power and power factor are determined through calculation from other measurements.

Setting limits to output



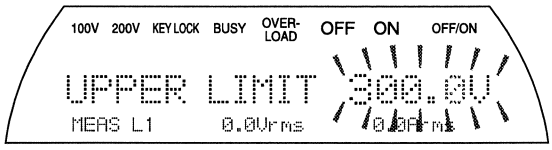
Setting of limit values can limit the setting range of output voltage and output frequency. If the user sets in advance a limit(s) according to the allowable input range of the connected load, it can prevent failure of the load caused by application of excessive voltage or other factors.
Three types of limits are available for setting: upper limit to output voltage, upper limit to output frequency, and lower limit to output frequency.

Memo

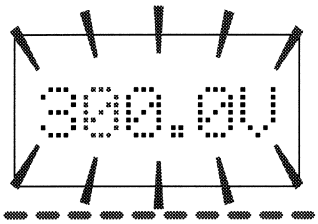
Once a limit value is entered, press (ENTER) to quit the setting procedure, and the display returns to the normal screen. If you want to enter another limit setting, then press (LIMIT) instead of (ENTER) and go to the next limit entry.

Setting an upper limit to output voltage

1 Press LIMIT , and the display shows a screen for setting an upper limit to output voltage.



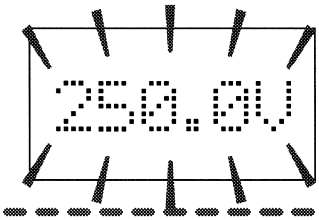
2 Press ◀ and ▶ to locate the cursor.



3 Turn ◯ to set the desired upper limit to the output voltage.

◯ Clockwise turn increases the value.

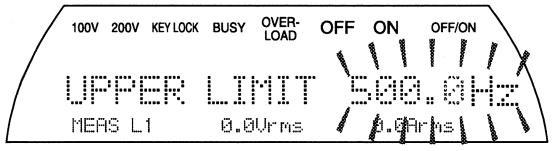
◯ Counterclockwise turn decreases the value.



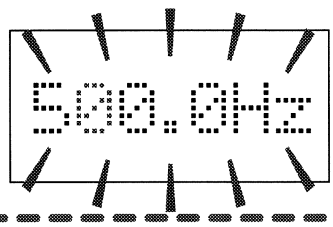
Press ENTER to quit the setting procedure.

Setting an upper limit to output frequency

1 While the display keeps showing the screen for setting an upper limit to output voltage, press LIMIT , and the display shows a screen for setting an upper limit to output frequency.



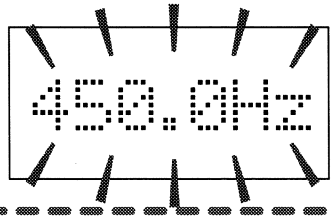
2 Press ◀ and ▶ to locate the cursor.



3 Turn ◯ to set the desired upper limit to the output frequency.

◯ Clockwise turn increases the value.

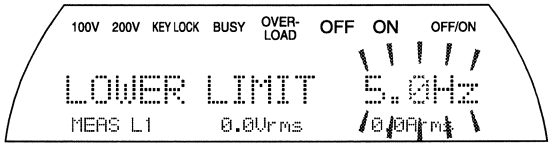
◯ Counterclockwise turn decreases the value.



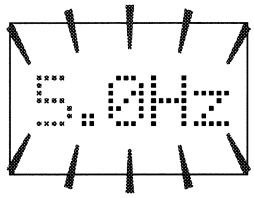
Press ENTER to quit the setting procedure.

Setting a lower limit to output frequency

1 While the display keeps showing the screen for setting an upper limit to output frequency, press (LIMIT), and the display shows a screen for setting a lower limit to output frequency.

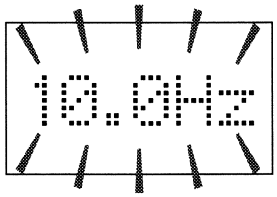


2 Press ◀ and ▶ to locate the cursor.

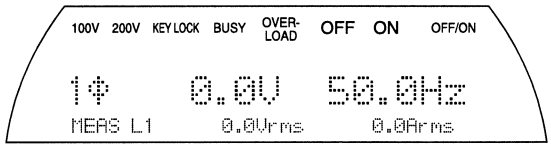


3 Turn ◯ to set the desired lower limit to the output frequency.

- Clockwise turn increases the value.
- Counterclockwise turn decreases the value.



4 Press (LIMIT) or (ENTER) to quit the setting procedure and the display returns to the normal screen.



Attention!

When setting a voltage limit value, you cannot specify a value that is lower than the already set output voltage. Similarly for output frequency limit value, you cannot make setting that will exclude the then set frequency from the intended range.

Attention!

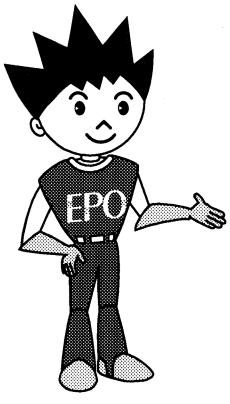
When the system is in a line-synchronized condition or in DC output mode, setting a limit to output frequency is not available.
(In the above situation, only output voltage upper limit can be set with (LIMIT).)

5

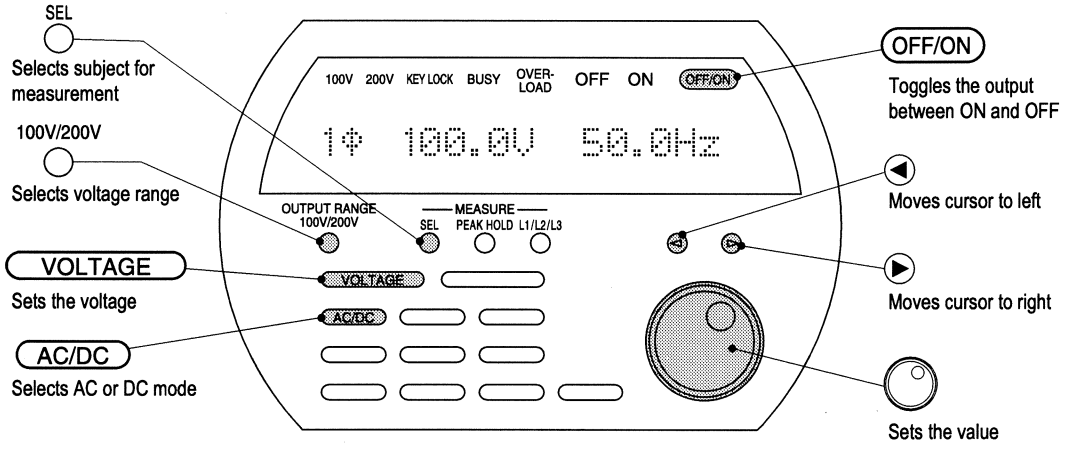
Versatile Use

- for advanced users -

■ In this chapter, I will explain versatile use of the system.



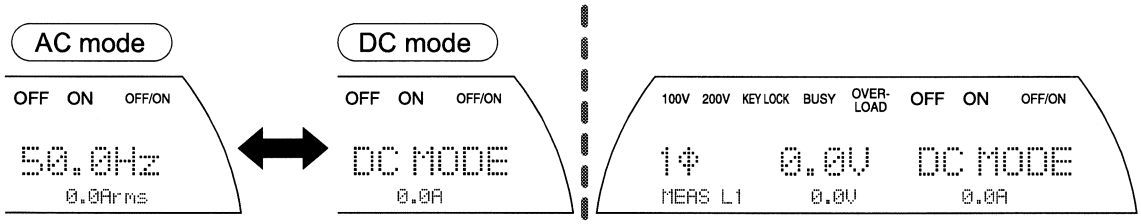
Using the unit as a DC power supply



Selecting DC output mode

1 Pressing this AC/DC button toggles the output mode between AC and DC.

2 Press AC/DC to select the DC output mode.



Memo

- The unit supplies only AC current in AC output mode and DC current in DC output mode.

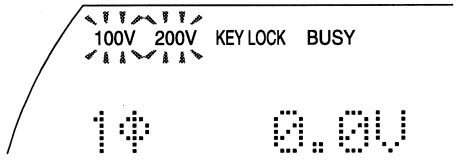
Attention!

- The output mode cannot be switched to DC when line synchronization is enabled.
- The output mode cannot be switched to DC when the system is in three-phase mode or single-phase three-wire mode.
- Output will be turned off if AC/DC switching operation is attempted while output current is supplied.

Setting an output voltage range

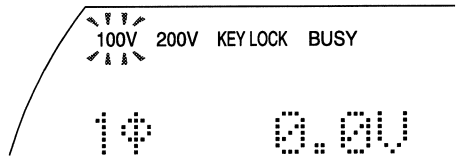
1 100V/200V

This ◯ button toggles the output voltage range between 100 V and 200 V.



2 100V/200V

Press ◯ to select the desired voltage range.



Attention!

The maximum output current depends on the selected range as follows;

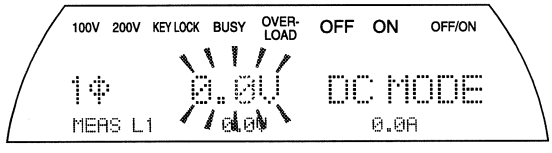
Voltage range	Maximum output power	Maximum voltage	Rated voltage	Maximum output current
100 V range	1270W	212. 0V	141. 0V	9A
200 V range		424. 0V	282. 0V	4. 5A

For EPO 2000X units:

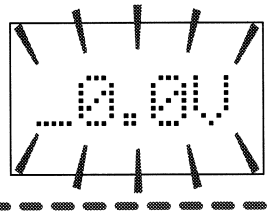
* The maximum output power and maximum output current in the above table are values for a single EPO 2000X unit system. The values will be twice the shown values if two EPO 2000X units are used, and three times if three units are used.

Setting an output voltage

1 Press (VOLTAGE), and the voltage indication will blink.



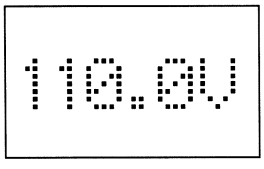
2 Press ◀ and ▶ to locate the cursor.



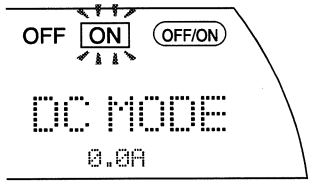
3 Turn ◯ to set the desired voltage.

Clockwise turn increases the value.

Counterclockwise turn decreases the value.

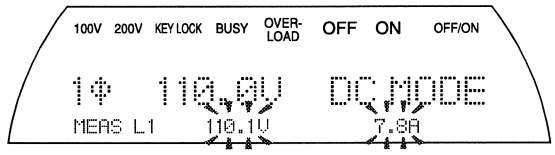


4 Press (OFF/ON) to turn ON the output.



Using the measurement functions

1 Every press on SEL ◯ changes the indication of measurement in turn.



Measurements are shown in the bottom line of the display.

* Measurements of "Voltage", "Current" and "Power" are displayed when in DC output mode.

[Example] (Mean value of voltage and current)

MEAS L1	110. 1V	7. 8A
(Effective power)	↕	
MEAS L1		0. 86kW

Attention!

- The measurement range is switched automatically.
- The measurement range cannot be fixed.

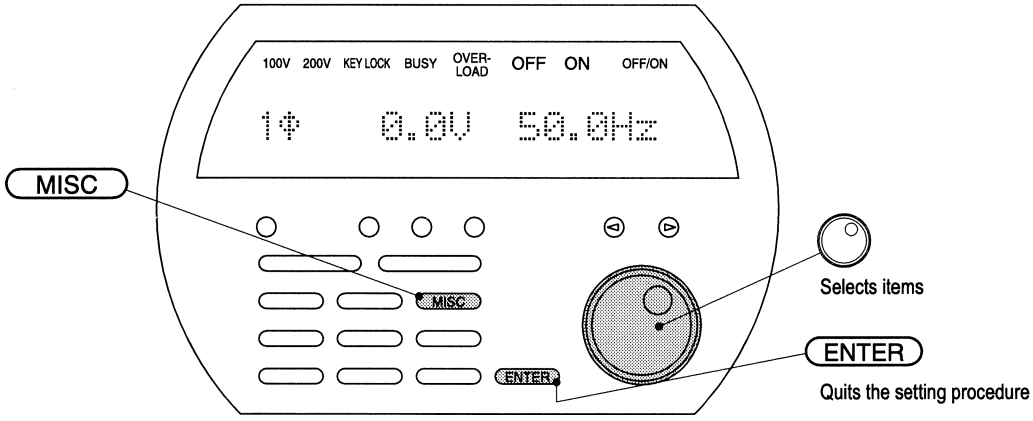
Attention!

- Mean values are displayed for voltage and current in DC output mode, and AC components are not measured.

Memo

- If the current contains an AC component, a peak value will be detected and this switches the DC measurement range to a higher range.

Settings for output compensation mode



This function selects a high or low level of the compensation sensitivity to maintain the output voltage at a constant value against load current and its fluctuation.

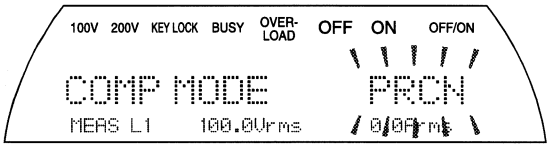
If you select high sensitivity (or precision), then high-precision control is secured against the fluctuation of load current, with the variation of the output voltage restrained to a low level. However, this tends to allow unstable operation under a high capacitive load (e.g., capacitor).

If you select low sensitivity (or high stability), on the contrary, improved stability can be maintained under a capacitive load although the output voltage fluctuates in a wider range.

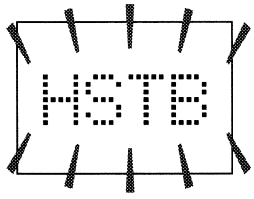
The unit is set to low sensitivity (or high stability) on shipping.

Selecting low sensitivity (or high stability)

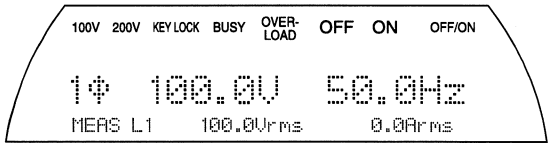
1 Press MISC couples of times until an output compensation mode setting screen appears.



2 Turn the dial and select HSTB.

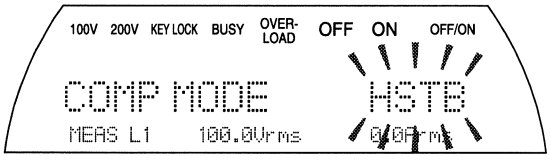


3 Press ENTER to quit the selection procedure, and the display returns to the normal screen.

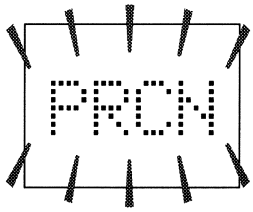


Selecting high sensitivity (or precision)

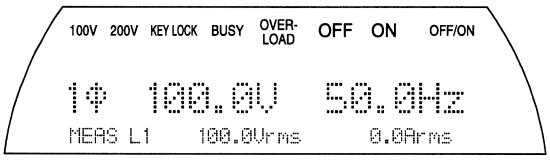
1 Press (MISC) couples of times until an output compensation mode setting screen appears.



2 Turn the dial and select PRCN.



3 Press (ENTER) to quit the selection procedure, and the display returns to the normal screen.



Memo

【Stability under capacitive load】

The upper limit of capacitive load that allows stable control is about 5 μF in precision mode. In high stability mode, the unit allows stable control up to 150 μF or so.

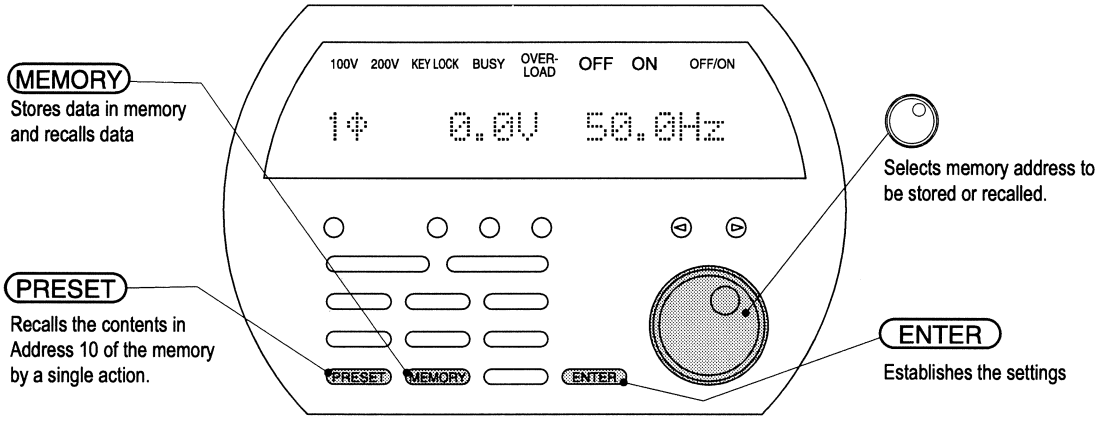
Memo

If a line filter is used in an RF anechoic chamber, select high stability mode.

Memo

To reduce waveform distortion near a voltage peak under the load of the capacitor input type rectifier, use the equipment in precision mode.

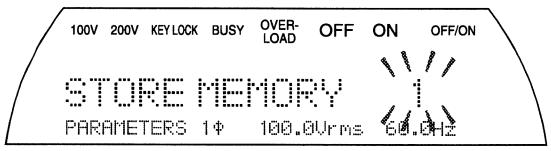
Using storage function



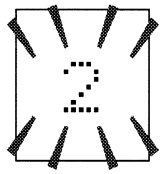
This function stores setting values or statuses. Pieces of data are stored in the incorporated memory backed up by a battery, and they can be recalled as necessary.

Storing settings

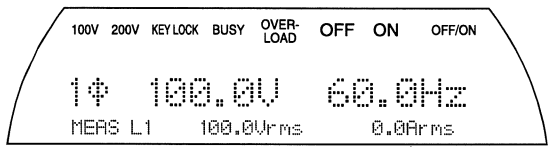
1 Press (MEMORY) once, and a store execution screen appears.



2 Turn the dial to select the desired memory address (from 1 to 10).



3 Press (ENTER) and the current status is stored and the display returns to the normal screen.



Attention!

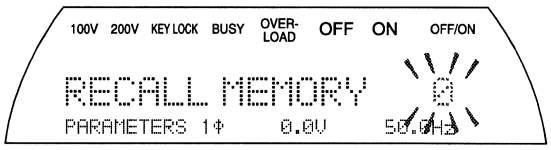
The unit has eleven memory addresses from 0 to 10. Addresses 1 to 10 allow the user to store a desired specified status.

The user can recall Address 0 to reduce all settings in the memory to those set on shipping. Address 0 does not allow the user to store any data.

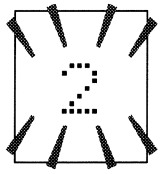
Recalling settings

1 Press (MEMORY) twice, and a recall execution screen appears.

* Repeat pressing (MEMORY), and the display shows in turn a store execution screen, a recall execution screen, and the normal screen.

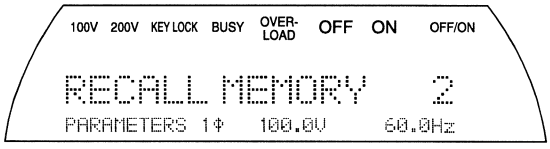


2 Turn the dial to select the desired memory address (from 0 to 10).

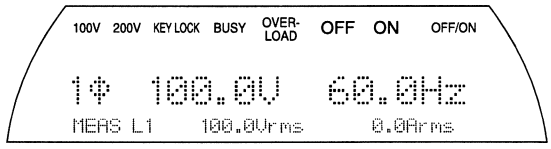


3 The bottom line of the display shows the phase mode, output voltage, and output frequency stored at that address.

* Phase mode: 1 ϕ, 2 ϕ, and 3 ϕ stand for single-phase, single-phase three-wire and three-phase, respectively.



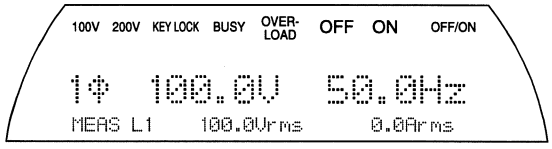
4 Press (ENTER) and the data at the address is recalled and then the display returns to the normal screen.



Recalling at one action with preset key

1 Press (PRESET), and the data stored at Address 10 is recalled.

【Example】



Memo

Store your favorite (or frequently used) settings or status at Address 10. You can press (PRESET) to retrieve the data immediately.

Retrieving on-shipping settings

1. Recall Address 0 of the memory to reinstate the unit into the status of settings made on shipping.

Memo

When the unit is powered, the settings stored at Address 1 are automatically recalled. Thus, if the status of normal operation is stored at Address 1, you will be released from the setting works every time in the beginning of operation.

Memo

Use of the optional numeric keypad enables the user to recall any of Addresses 1 to 9 with a single button action.
This will be useful in operation of inspecting power voltage range.

Setting items for memory storage and on-shipping settings

Setting items		On-shipping settings
Output voltage range	AC	100 V range
	DC	100 V range
Output voltage	AC	0.0[V]
	DC	0.0[Vdc]
AC voltage setting mode		Phase-voltage setting
Output frequency		50.0[Hz]
Selection of AC/DC output mode		AC output mode
Output compensation mode		High stability
ON/OFF of line synchronization		OFF
Resetting frequency from line synchronization		50.0[Hz]
Limit value	Upper limit to AC phase voltage	300.0[V]
	Upper limit to AC line-to-line voltage (three-phase)	519.6[V]
	Upper limit to AC line voltage (single-phase three-wire)	600.0[V]
	Upper limit to DC voltage	424.0[Vdc]
	Upper limit to frequency	550.0[Hz]
	Lower limit to frequency	5.0[Hz]
Power-on phase when output is ON		0[deg]
Phase mode		Single-phase mode

Attention!

When any memory is recalled, the output is always turned OFF for safety reason. Depending on settings, however, memory can be recalled with the output maintained ON. This function can be used to quickly change the output voltage or frequency against the load.

(Settings for memory recall with the output kept ON)

◎Before and after memory recall, the following parameters must be the same:

(1) AC/DC output mode

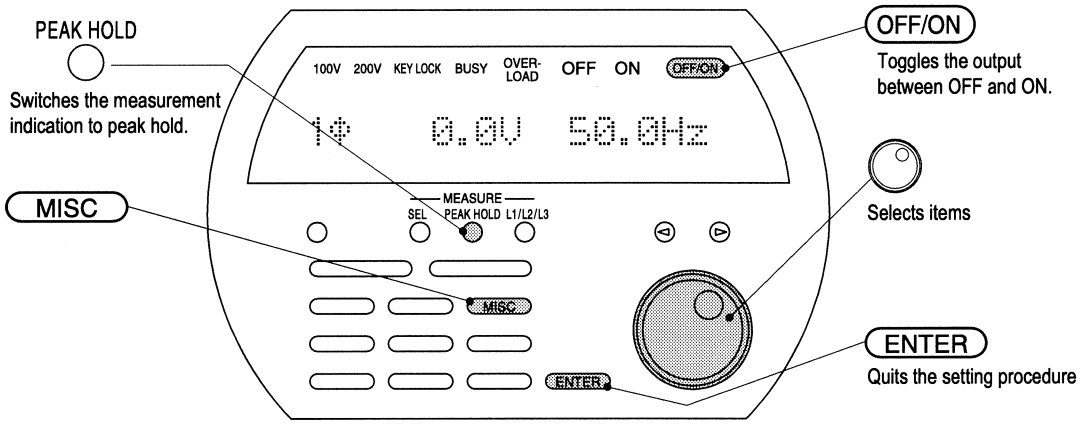
(2) Line-synchronization status

(3) Output voltage range

Attention!

- In an EPO 2000X unit, you cannot recall the address at which different phase mode is stored. Such operation will be ignored.
- Note that contents in the memory of the master unit will be cleared when system cable connection is altered.

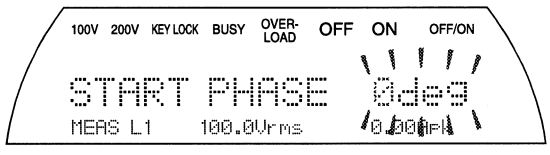
Measuring rush current



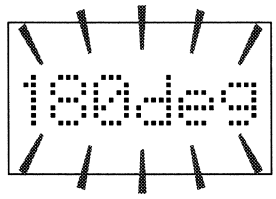
This function can measure the amount of rush current flowing in a load such as a cleaner and air conditioner that entails a rush current flow.
In addition, the user can observe the change in the flow of rush current because the system allows the user to set the power-on phase at the time of output turn-on by the step of 90 degrees.

Setting the power-on phase on output turn-on

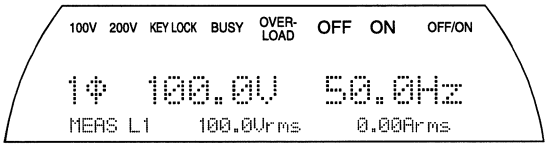
1 Press (MISC) couples of times until a power-on phase setting screen appears.



2 Turn the dial and select the desired power-on phase.



3 Press (ENTER) to establish the setting, and the display returns to the normal screen.

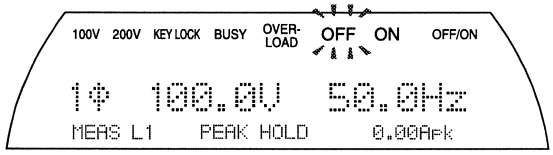


You can select the power-on phase out of 0, 90, 180 and 270 degrees.

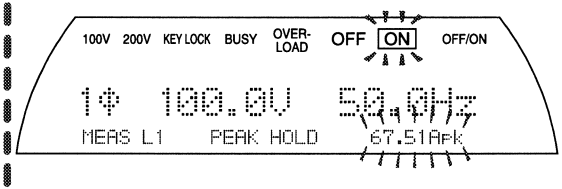
Using the peak hold function

1 Press PEAK HOLD ◯ when the output remains turned OFF.

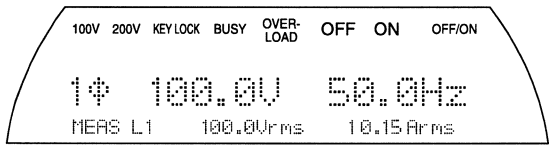
* The measurement indication in the bottom line of the display changes to peak hold (PEAK HOLD).



2 Press the (OFF/ON) button to turn ON the output, and the display shows the maximum value of the rush current that flowed at the moment.



3 Press PEAK HOLD ◯, and the display returns to the normal screen.



Attention!

This peak current holding function shows the maximum value out of the peak values detected during the five cycles after turning on the output.

Therefore, normal measurement may not be achieved if you try to detect the peak current through ON/OFF operation on the load with the output being kept ON.

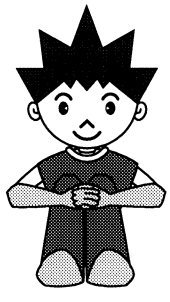
6

Use of Enhanced EPO 2000X System

- increase the system output capacity or use units in

a three-phase or single-phase three-wire configuration -

■With the optional system cable, you can combine up to three EPO 2000X units to enhance the system capacity. In this chapter, I will explain the necessary operation for the above configuration.



Attention!

- The operation described in this chapter is applicable to EPO 2000X only.
- EPO 2000S units cannot be used in the system enhancement, not even through combination of EPO 2000S and EPO 2000X units.

What functions are available by system enhancement?

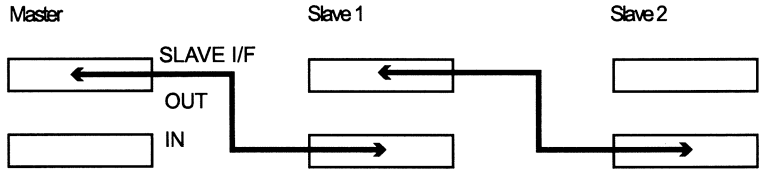
Two combined EPO 2000X units can provide a single-phase/single-phase three-wire 4 kVA power supply while three combined EPO 2000X units can provide a single-phase/three-phase 6 kVA power supply.

Number of EPO 2000X units	Number of optional system cables required	Systems available	DC output mode	Remarks
2	1	Single-phase 4 kVA	Yes	
		Single-phase three-wire 4 kVA	No	
3	2	Single-phase 6 kVA	Yes	
		Three-phase 6 kVA	No	
		Single-phase three-wire 4 kVA	No	The third unit is inoperative.

DC output mode is available only in single-phase mode.

Connection of system cable

In a system consisting of two or more units, one of EPO 2000X units will be the master and others will be slaves. The status of the master or slave depends on the connection of system cable.



Phase mode

The phase modes of system include three modes: single-phase, single-phase three-wire and three-phase. The phase mode of the system is shown on the master's display.

Indication	Phase mode
1ϕ	Single-phase
2ϕ	Single-phase three-wire
3ϕ	Three-phase

Once the units are connected with a system cable(s), the phase mode of the system can be changed on the master unit. To change the phase mode, it is necessary to first make setting, then turn off the power and turn it on again.

Restraints on memory

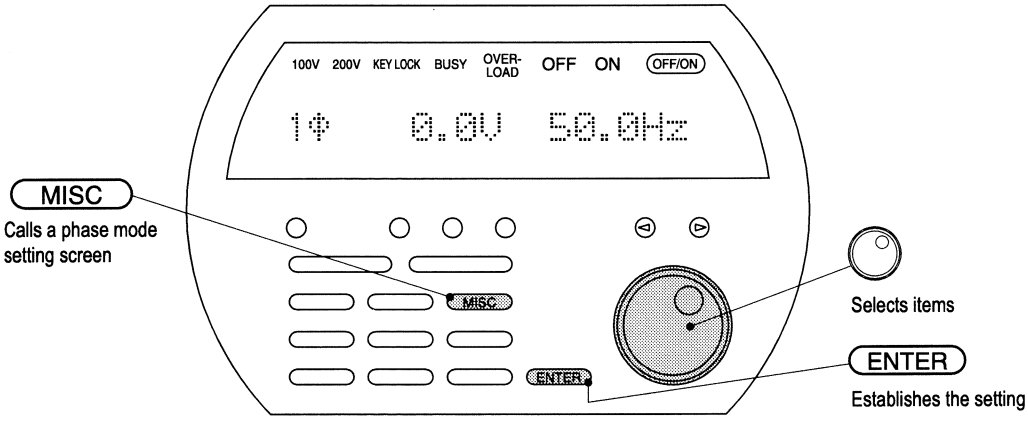
If the system cable connection is modified, the contents stored in the master's memory will be initialized. However, slave's memory will not be changed.

If the phase mode is modified, the contents in the memory will not be changed. However, the phase mode at Adders 1 of the master unit will be rewritten with the phase mode that was newly set.

If the stored phase mode differs from the current phase mode, the memory cannot be recalled.

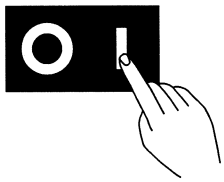
Using the system as a single-phase 4 or 6 kVA power supply

If two or three EPO 2000X units are connected with an optional system cable(s), a single-phase 4 or 6 kVA power system will be achieved.
Refer to Chapter 3 "Installation and Connection" first and carry out proper connection over two or three EPO 2000X.



Turning ON/OFF the power

1 Turn ON the power switches on all EPO 2000X units.



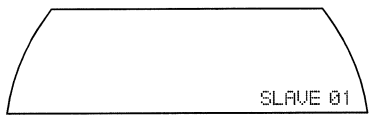
2 The system will be available as a single-phase 4 (or 6) kVA power supply, with only the master unit being operable.

Master's display

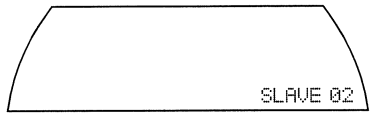
Normal screen

* If the phase mode is not 1 ϕ, then carry out the "Changing to single-phase mode" procedure in the following section.

Slave's display



or



3 To shut off the power input, turn off the power switch on each EPO 2000X unit.

Attention!

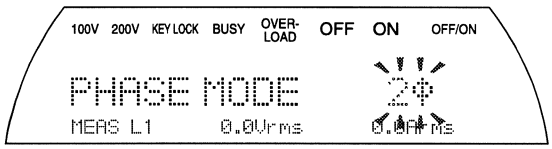
- Power switches may be turned on in any order. However, all switches must be turned on within 15 seconds to secure normal startup. If you failed in this, turn off all switches then turn them on again after several seconds.
- Power switches may be turned off in any order as well.

Memo

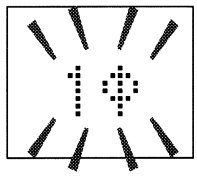
- Operation is performed only on the master's panel.
- On slave's panel, any operation will not be accepted.

Changing to single-phase mode

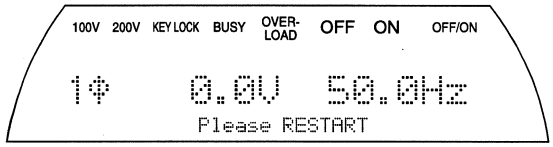
1 Press (MISC) couples of times until a phase setting screen appears.



2 Turn the dial and select 1 ϕ .



3 Press (ENTER), and a message will prompt you: "Please RESTART".

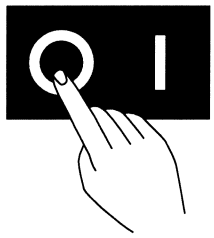


The indication denotes the phase mode of "single-phase", "single-phase three-wire" and "three-phase" as follows:

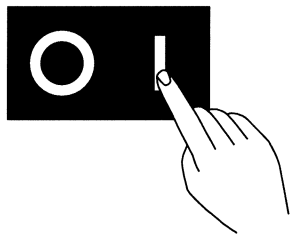
Indication	Phase mode
1 ϕ	Single-phase
2 ϕ	Single-phase three-wire
3 ϕ	Three-phase

At this moment, any button is not operable.

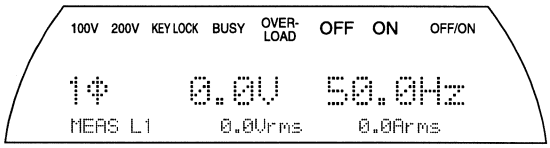
4 Turn off the power switches on all the EPO 2000X units.



5 When all indications have disappeared, turn on all power switches.



6 The system is started in single-phase mode afresh.



Attention!

When the power is turned on, the system starts up with the contents stored at Address 1 of the memory. Just after the change of phase mode, the phase mode field at Address 1 is rewritten with the newly selected phase mode.

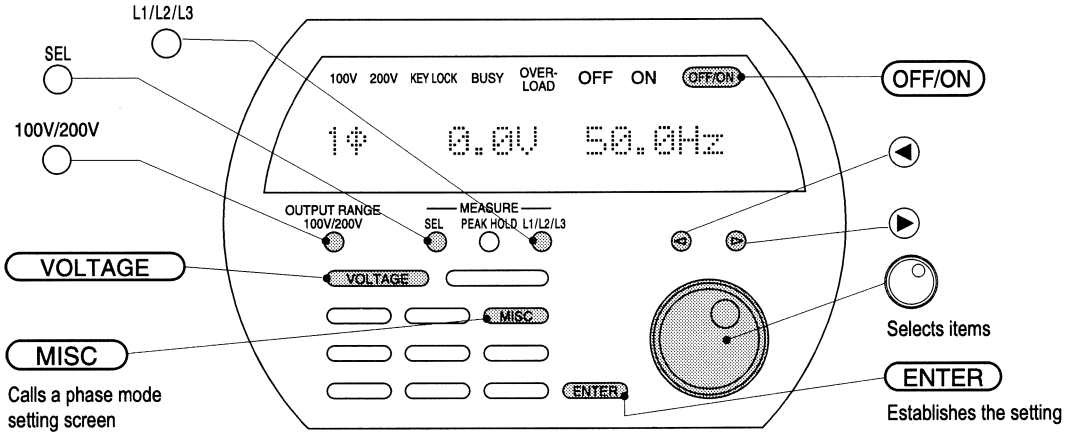
Store afresh the status of normal use into Address 1.

Using the system as a three-phase 6 kVA power supply

If three EPO 2000X units are connected with optional system cables, a three-phase 6 kVA power system will be achieved.

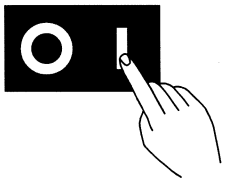
The output voltage can be set via the phase voltage or line-to-line voltage.

Refer to Chapter 3 "Installation and Connection" first and carry out proper connection over three EPO 2000X.



Turning ON/OFF the power

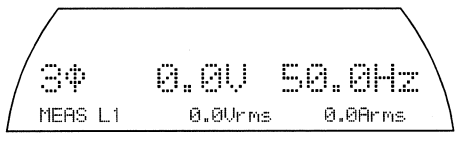
1 Turn ON the power switches on all EPO 2000X units.



2 The system will be available as a three-phase 6 kVA power supply, with only the master unit being operable.

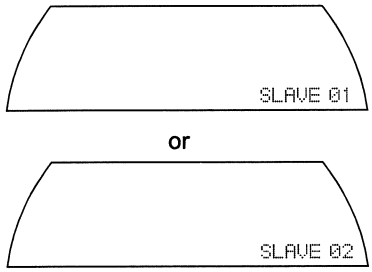
Master's display

Normal screen



* If the phase mode is not 3 ϕ , then carry out the "Changing to three-phase mode" procedure in the following section.

Normal screen



3 To shut off the power input, turn off the power switch on each EPO 2000X unit.

Attention!

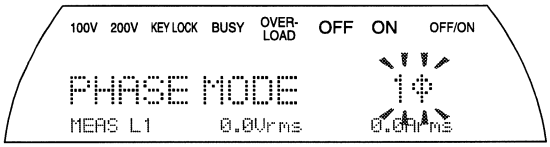
- Power switches may be turned on in any order. However, all switches must be turned on within 15 seconds to secure normal startup. If you failed in this, turn off all switches then turn them on again after several seconds.
- Power switches may be turned off in any order as well.

Memo

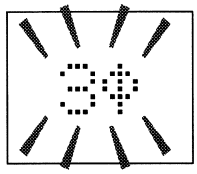
- Operation is performed only on the master's panel.
- On slave's panel, any operation will not be accepted.

Changing to three-phase mode

1 Press MISC couples of times until a phase setting screen appears.



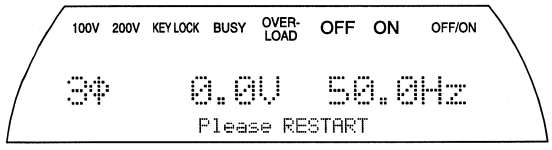
2 Turn the dial and select 3 ϕ.



The indication denotes the phase mode of "single-phase", "single-phase three-wire" and "three-phase" as follows:

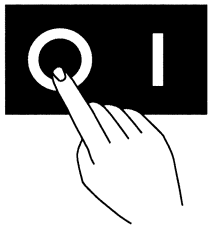
Indication	Phase mode
1 ϕ	Single-phase
2 ϕ	Single-phase three-wire
3 ϕ	Three-phase

3 Press ENTER , and a message will prompt you: "Please RESTART"

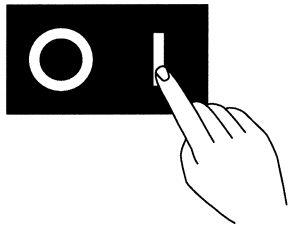


At this moment, any button is not operable.

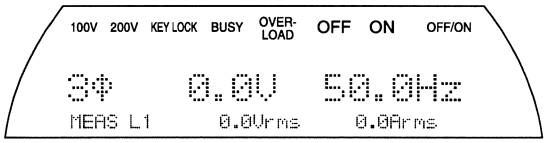
4 Turn off the power switches on all the EPO 2000X units.



5 When all indications have disappeared, turn on all power switches.



6 The system is started in three-phase mode afresh.



Attention!

When the power is turned on, the system starts up with the contents stored at Address 1 of the memory. Just after the change of phase mode, the phase mode field at Address 1 is rewritten with the newly selected phase mode.

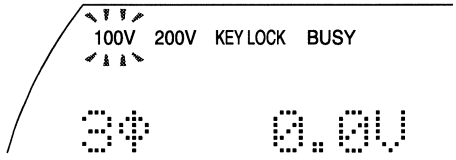
Store afresh the status of normal use into Address 1.

Exemplary voltage setting: supplying three-phase 200 V output

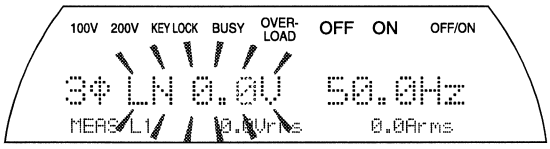
100V/200V

1 Press ◯ on the master unit to select the voltage range.

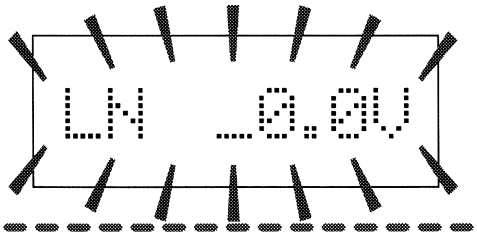
* To supply three-phase 200 V (line-to-line voltage of 200 V) output, select the 100 V range.



2 Repeat pressing (VOLTAGE) on the master unit, and the display toggles showing a "Phase voltage setting" and "Line-to-line voltage setting" screens while the voltage indication blinks.

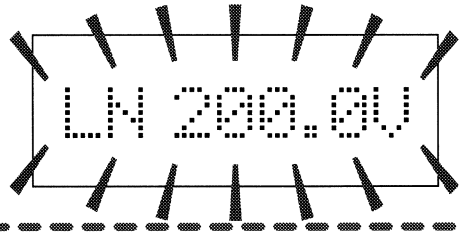


3 Press (◀) and (▶) to locate the cursor.



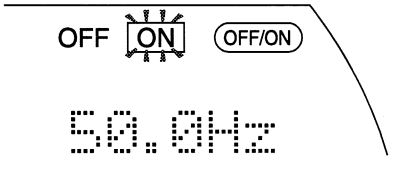
4 Turn the dial ◯ to select the desired output voltage.

* To supply three-phase 200 V output, select 115.5 V in phase voltage or 200.0 V in line-to-line voltage.

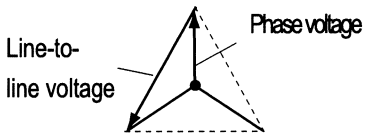


5 Press (OFF/ON) to turn on the output.

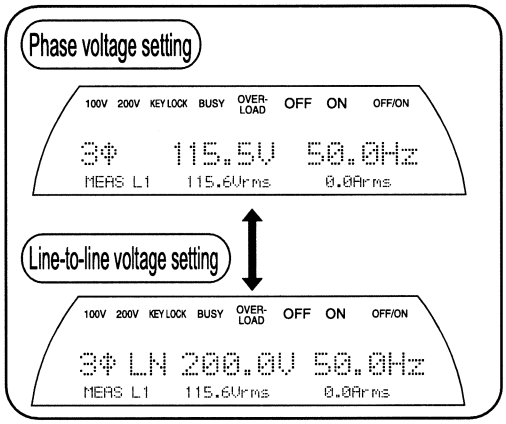
* Now the system is ready to provide three-phase power.



Attention!



Voltage range	Maximum phase voltage	Maximum line-to-line voltage
100 V range	150. 0V	259. 8V
200 V range	300. 0V	519. 6V



Memo

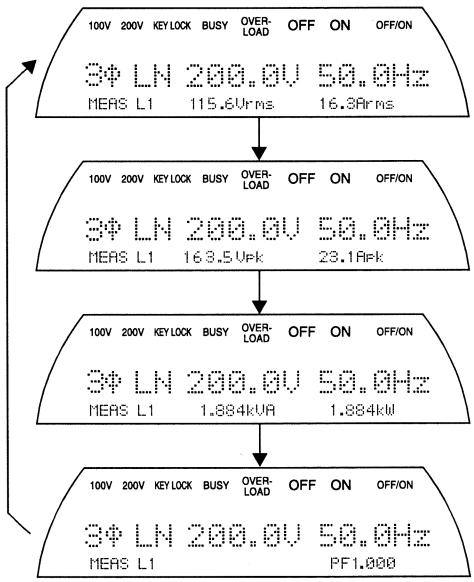
- If voltage setting is selected in line-to-line voltage, then the normal screen and the upper limit to output voltage are also shown in line-to-line voltage.
- Line-to-line voltage setting is made in 0.2 V resolution.

Using a measuring function in three-phase configuration

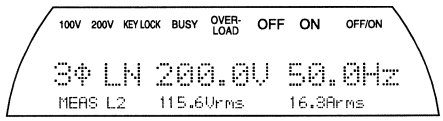
This function measures and displays “RMS value of voltage and current”, “peak value of voltage and current”, “apparent power”, “effective power”, and “power factor”.

It is possible to change the phase of measurement.

1 Every press on SEL ◯ shows in turn different measurements in the bottom line as follows:



2 A press on L1/L2/L3 ◯ changes the phase of measurement.



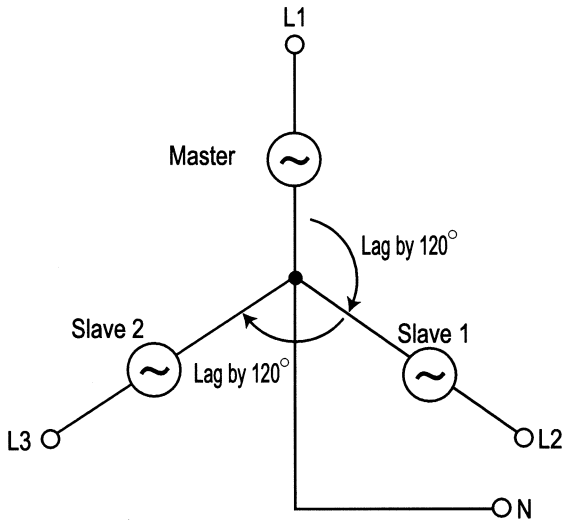
Different measurements are displayed one after another as shown below.

Measurement phase changes by press on L1/L2/L3 ◯	Indication of measurements			
	Vrms、Arms	Vpk、Apk	kVA、kW	PF
L1	L1-phase voltage, L1-phase current		L1-phase apparent power L1-phase effective power	L1-phase power factor
L2	L2-phase voltage, L2-phase current		L2-phase apparent power L2-phase effective power	L2-phase power factor
L3	L3-phase voltage, L3-phase current		L3-phase apparent power L3-phase effective power	L3-phase power factor
L1–L2	L1-L2 line-to-line voltage, L1-phase current		Phase-total apparent power Phase-total effective power	All-phase power factor
L2–L3	L2-L3 line-to-line voltage, L2-phase current			
L3–L1	L3-L1 line-to-line voltage, L3-phase current			

Different functions in three-phase mode

Output limit setting	If the normal screen is shown in line-to-line voltage, the upper limit to output voltage is also indicated and can be set in line-to-line voltage.
DC output mode	Not available.
Storage function	Recall is not possible to the address at which different phase mode is stored.
Setting the power-on phase on output turn-on	L1-phase power-on phase can be set.
Peak current retaining function	Measurement is available similarly to that in single-phase mode. The phase of measurement can be changed as well.

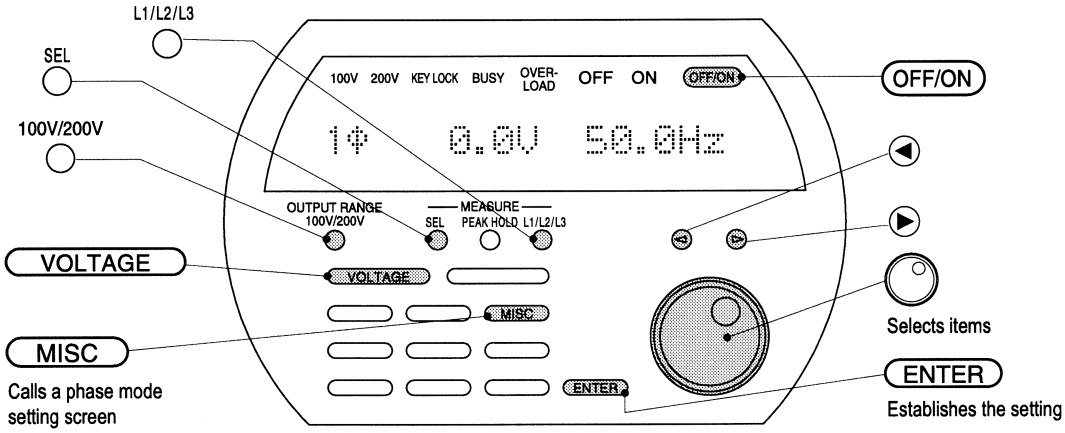
Phase indication and phases



Using the system as a single-phase three-wire 4 kVA power supply

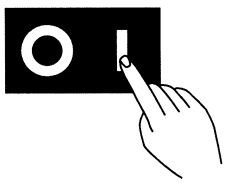
If two EPO 2000X units are connected with an optional system cable, a single-phase three-wire 4 kVA power system will be achieved.
The output voltage can be set via the phase voltage or line voltage.

Refer to Chapter 3 "Installation and Connection" first and carry out proper connection over two EPO 2000X.



Turning ON/OFF the power

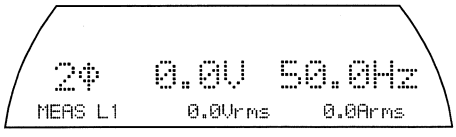
1 Turn ON the power switches on all EPO 2000X units.



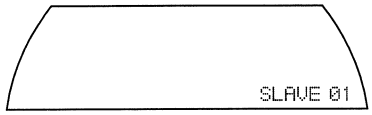
2 The system will be available as a single-phase three-wire 4 kVA power supply, with only the master unit being operable.

Master's display

Normal screen

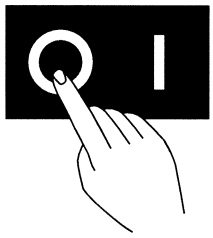


Slave's display



* If the phase mode is not 2 ϕ , then carry out the "Changing to single-phase three-wire mode" procedure in the following section.

3 To shut off the power input, turn off the power switch on each EPO 2000X unit.



Attention!

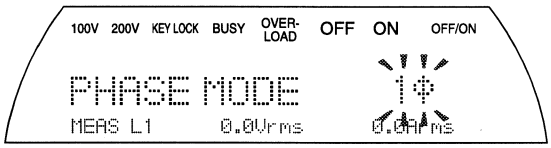
- Power switches may be turned on in any order. However, all switches must be turned on within 15 seconds to secure normal startup. If you failed in this, turn off all switches then turn them on again after several seconds.
- Power switches may be turned off in any order as well.

Memo

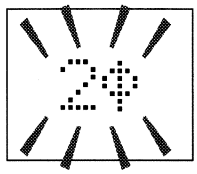
- Operation is performed only on the master's panel.
- On slave's panel, any operation will not be accepted.

Changing to single-phase three-wire mode

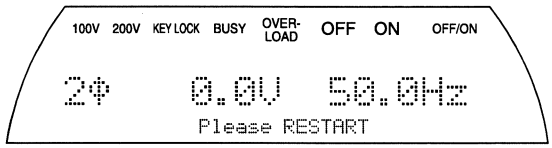
1 Press MISC couples of times until a phase setting screen appears.



2 Turn the dial and select 2φ.



3 Press ENTER, and a message will prompt you: "Please RESTART"

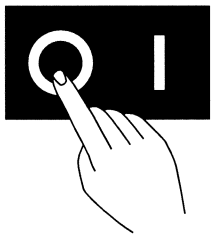


The indication denotes the phase mode of "single-phase", "single-phase three-wire" and "three-phase" as follows:

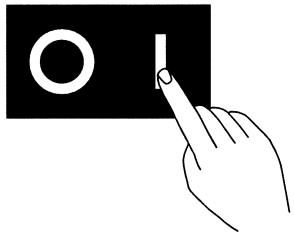
Indication	Phase mode
1φ	Single-phase
2φ	Single-phase three-wire
3φ	Three-phase

At this moment, any button is not operable.

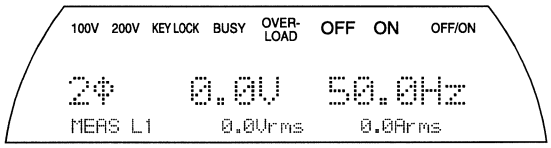
4 Turn off the power switches on all the EPO 2000X units.



5 When all indications have disappeared, turn on all power switches.



6 The system is started in single-phase three-wire mode afresh.



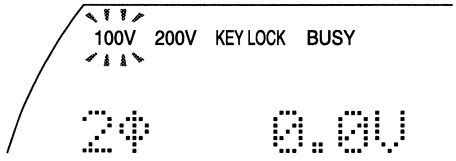
Attention!

When the power is turned on, the system starts up with the contents stored at Address 1 of the memory. Just after the change of phase mode, the phase mode field at Address 1 is rewritten with the newly selected phase mode.
Store afresh the status of normal use into Address 1.

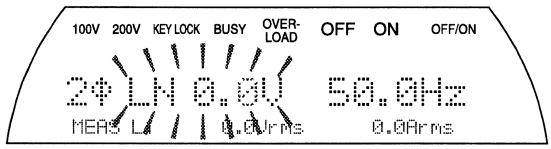
Exemplary voltage setting: supplying single-phase three-wire 200 V output

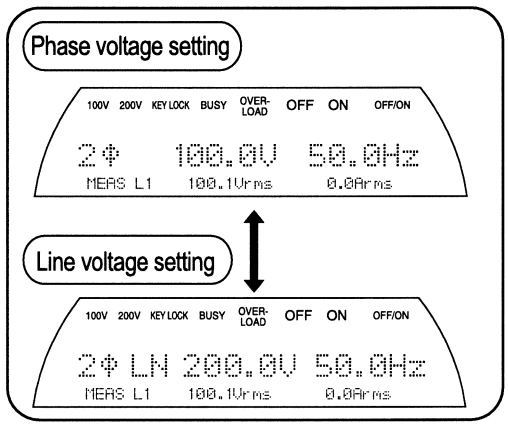
1 Press 100V/200V ◯ on the master unit to select the voltage range.

* To supply single-phase three-wire 200 V (line voltage of 200 V) output, select the 100 V range.

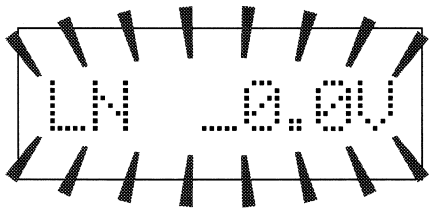


2 Repeat pressing VOLTAGE on the master unit, and the display toggles showing a "Phase voltage setting" and "Line voltage setting" screens while the voltage indication blinks.



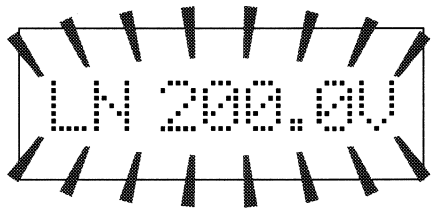


3 Press ◀ and ▶ to locate the cursor.



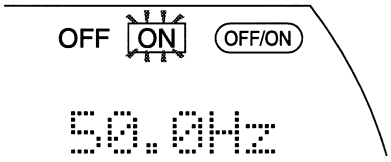
4 Turn the dial ◯ to select the desired output voltage.

* To supply single-phase three-wire 200 V output, select 100.0 V in phase voltage or 200.0 V in line voltage.

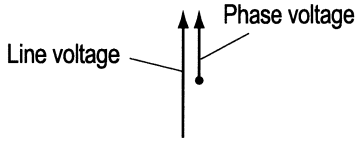


5 Press OFF/ON to turn on the output.

* Now the system is ready to provide single-phase three-wire power.



Attention!



Voltage range	Maximum phase voltage	Maximum line voltage
100 V range	150.0V	300. 0V
200 V range	300. 0V	600. 0V

Memo

- If voltage setting is selected in line voltage, then the normal screen and the upper limit to output voltage are also shown in line voltage.
- Line-to-line voltage setting is made in 0.2 V resolution.

Memo

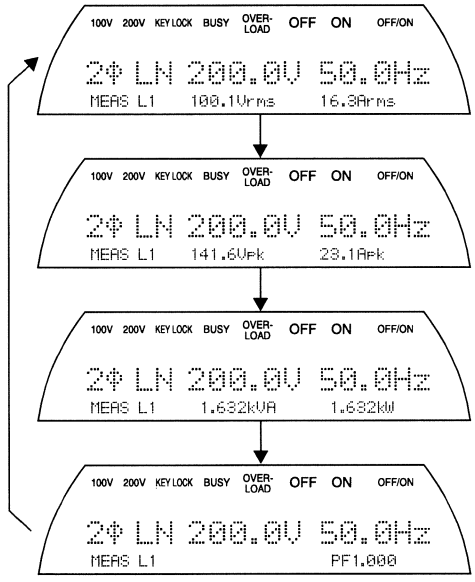
- If the user needs an AC power supply with 300 V or higher voltage, then configure a single-phase three-wire system. This can supply up to line 600 Vac power.

Using a measuring function in single-phase three-wire configuration

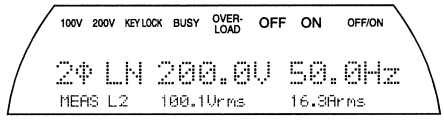
This function measures and displays "RMS value of voltage and current", "peak value of voltage and current", "apparent power", "effective power", and "power factor".

It is possible to change the phase of measurement.

1 Every press on SEL ○ shows in turn different measurements in the bottom line as follows:



2 A press on L1/L2/L3 ○ changes the phase of measurement.



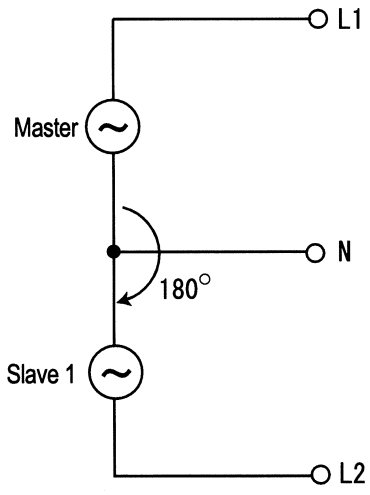
Different measurements are displayed one after another as shown below.

Measurement phase changes by press on L1/L2/L3 ○	Indication of measurements			
	Vrms、Arms	Vpk、Apk	kVA、kW	PF
L1	L1-phase voltage, L1-phase current		L1-phase apparent power L1-phase effective power	L1-phase power factor
L2	L2-phase voltage, L2-phase current		L2-phase apparent power L2-phase effective power	L2-phase power factor
L1–L2	L1-L2 line-to-line voltage, L1-phase current		Phase-total apparent power Phase-total effective power	All-phase power factor

Different functions in single-phase three-wire mode

Output limit setting	If the normal screen is shown in line-to-line voltage, the upper limit to output voltage is also indicated and can be set in line-to-line voltage.
DC output mode	Not available.
Storage function	Recall is not possible to the address at which different phase mode is stored.
Setting the power-on phase on output turn on	L1-phase power-on phase can be set.
Peak current retaining function	Measurement is available similarly to in single-phase mode. The phase of measurement can be changed as well.

Phase indication and phases



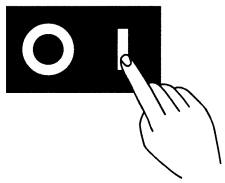
Reducing the system into a singular unit operation

1. Disconnect the optional system cable(s) and modify the output cable connection.

(☞ Refer to Chapter 3 "Installation and Connection")

2. Turn on the power switch.

* Now a singular unit operation is available.



Attention!

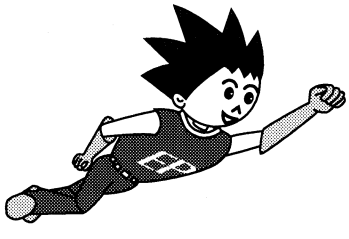
- When the system cable connection is changed, the contents stored via master's storage function will be initialized.
- Contents in slave's memory remains unchanged.

7

Useful Functions

- versatile functions are ready for use -

■ In this chapter, I will show you how to use advantageous functions that EPO 2000S/EPO 2000X provides.



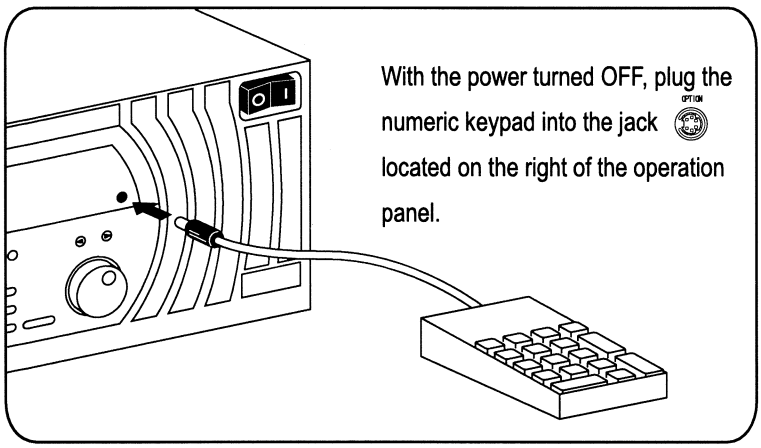
Using numeric keypad for setting

With the optional numeric keypad, the user can directly enter values to set the output voltage, output frequency and other setting items. In addition, memory can be recalled by a single touch on the keypad.

⚠ Caution!

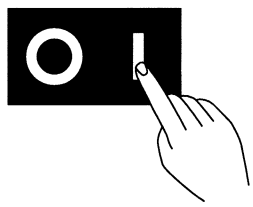
The numeric keypad must be connected prior to power charging. With the power being supplied, connection or disconnection of the numeric keypad may cause malfunction.

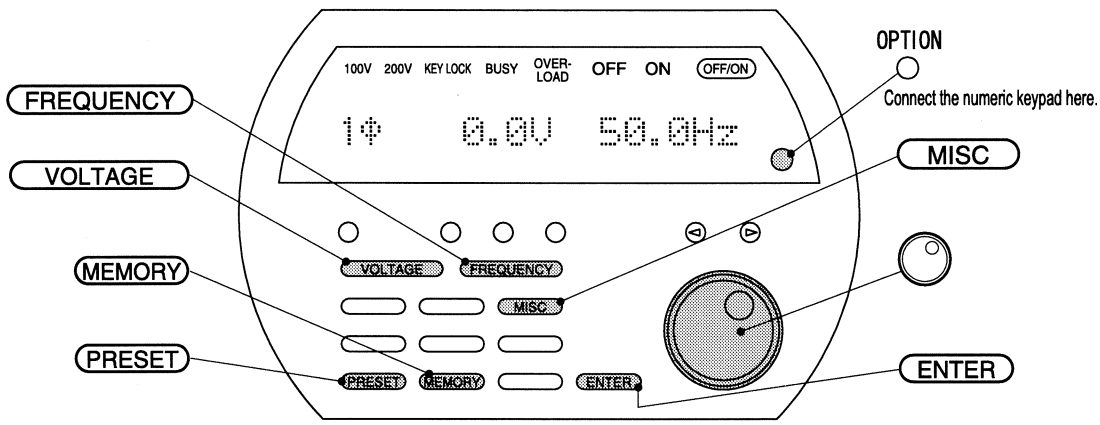
Connecting the numeric keypad



With the power turned OFF, plug the numeric keypad into the jack (OPTION) located on the right of the operation panel.

Turn on the power switch.

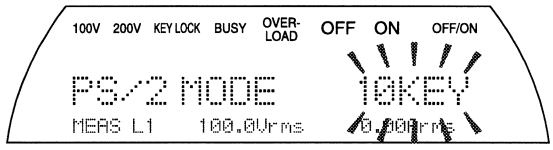




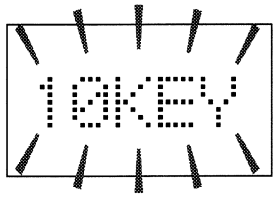
Selecting operation mode of numeric keypad

Select either of two operation modes of the numeric keypad.
The "10KEY" mode allows the user to directly entry the value of output voltage, output frequency and other items (this mode is selected on shipping).
The other "RECALL" mode can recall the contents stored in the memory by a single button touch on the numeric keypad. This mode is effective in sequential tests under preset conditions.

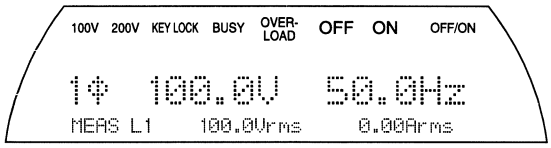
1 Press (MISC) couples of times until a numeric keypad operation setting screen appears.



2 Turn the dial and select either of "10KEY" and "RECALL".



3 Press (ENTER) to establish the selection, and the display returns to the normal screen.



Memo

If "10KEY" is selected for operation mode, numeric entry is available for the following setting items:

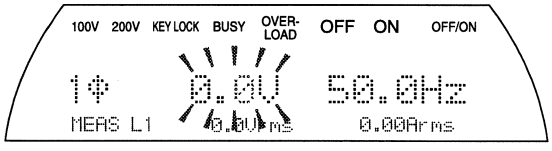
- Output voltage (phase/line/DC)
- Output frequency
- Upper limit to output voltage (phase/line/DC)
- Upper limit to output frequency
- Lower limit to output frequency
- Storage memory number
- Recall memory number
- GPIB address

Operation in numeric entry (10KEY) mode

The following section describes operation by taking "output voltage" and "memory recall address" as example.

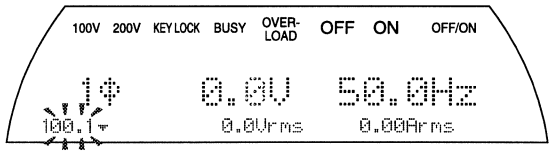
Setting the output voltage by numeric entry

1 Press VOLTAGE to show the output voltage setting screen.



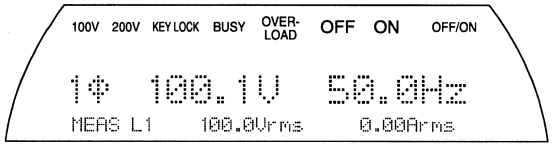
2 From the numeric keypad, enter the desired value for setting (values appears in the bottom line).

Example: To specify 100.1 V, enter on the keypad.
[1] [0] [0] [.] [1] on the keypad.



3 Press ENTER on the keypad to establish the entered value.

* Here, press ENTER on the keypad instead of that on the operation panel.



Attention!

Dissimilar to setting on rotary dial, just numeric entry does not establish the entered value.
Be sure to press ENTER on the numeric keypad at the end of entry.

Memo

If any wrong number is entered, press the slash [/] button. This cancels the last entered number and allows you to continue setting.

Memo

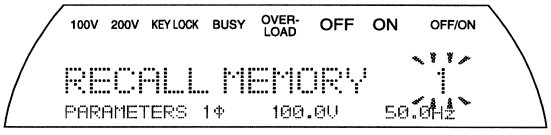
If you press ENTER on the operation panel during value setting on the numeric keypad, the numbers that have been entered so far will be discarded. The output voltage setting prior to starting this setting will become effective and the display returns to the normal screen.

Memo

Even if you attempt to set a value that is out of the setting range or a value that exceeds the upper limit to the output voltage, numeric entry is accepted. However, when your press ENTER on the keypad, the numbers that have been entered so far will be discarded and the display returns to the output voltage setting screen.

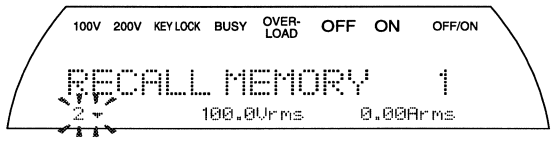
Setting memory recall address by numeric entry

1 Press (MEMORY) twice to show the memory recall setting screen.



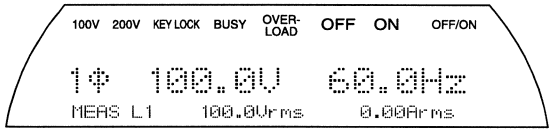
2 From the numeric keypad, enter the desired value for setting (values appears in the bottom line).

Example: To specify 2, enter [2] on the keypad.



3 Press (ENTER).

* You may press either (ENTER) on the operation panel or on the numeric keypad to establish the entered value.



Memo

If any wrong number is entered, press the slash [/] button. This cancels the last entered number and allows you to continue setting.

Memo

If you press (ENTER) on the operation panel during value setting on the numeric keypad, this recalls the memory at the address of the numbers that have been entered so far and the display returns to the normal screen.

Memo

Even if you attempt to set a value that is out of the setting range numeric entry is accepted. However, when your press [ENTER] the keypad, the numbers that have been entered so far will be discarded and the display returns to the memory recall setting screen.

Operation in memory recall (RECALL) mode

Recalling the contents in memory by a single button touch on the numeric keypad

1. Press the desired memory address for recall.

   Example: To recall memory 3, then enter [3].

This numeric keypad operation can recall memory at Addresses 0 to 9.
To recall memory address 10, press (PRESET).

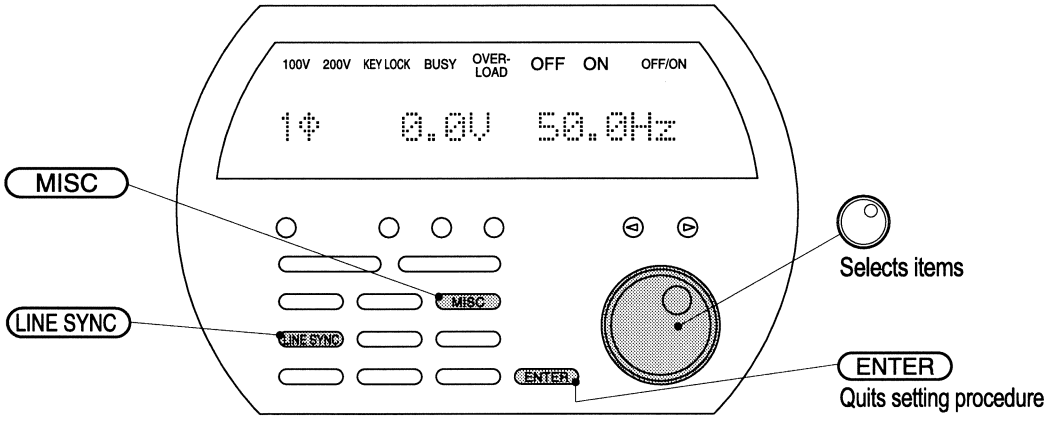
Memo

You do not have to press (ENTER) to recall memory dissimilar to numeric entry of output voltage.
On the other hand, you cannot correct wrong entry of memory address on the keypad.

Memo

Similarly to memory call on the operation panel, some memory cannot be recalled depending on the conditions of AC/DC, phase mode (single-phase/single-phase three-wire/three-phase) and other factors.
For further information, refer to Chapter 5 "Versatile Use - for advanced users -".

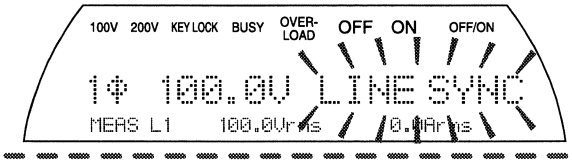
Line synchronization



This function synchronizes the output frequency to the frequency of the AC power supply line. Synchronization is available to the power supply line in the range of 48 to 62 Hz frequency.
It is possible to specify 50 Hz or 60 Hz for the reset frequency at the moment of disabling the line synchronization.

Enabling line synchronization

1. Press (LINE SYNC), and the system enters a status of enabled line synchronization and a line synchronization screen appears.

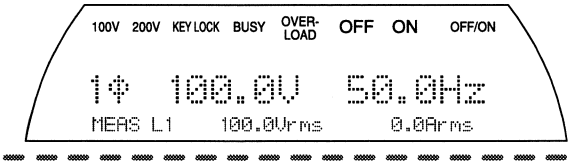


Memo

* If line synchronization is switched between ON and OFF with the output supply being kept ON, the output will be turned OFF.

Disabling line synchronization

1. Press (LINE SYNC), and the system quits the status of line synchronization and the display returns to the normal screen.



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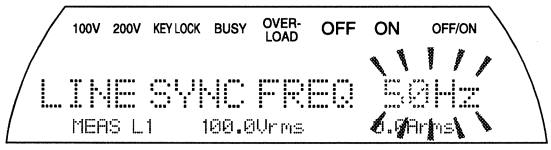
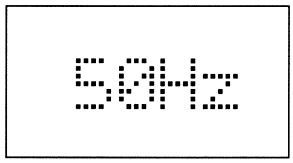
Setting the reset frequency at the line synchronization OFF moment

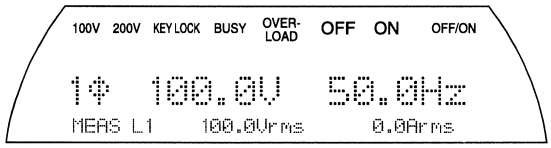
1 Press (MISC) couples of times until a screen for setting the reset frequency at the line synchronization OFF moment appears.



2 Turn the dial and select the reset frequency at the line synchronization OFF moment.



3 Press (ENTER) to quit the selection procedure, and the display returns to the normal screen.

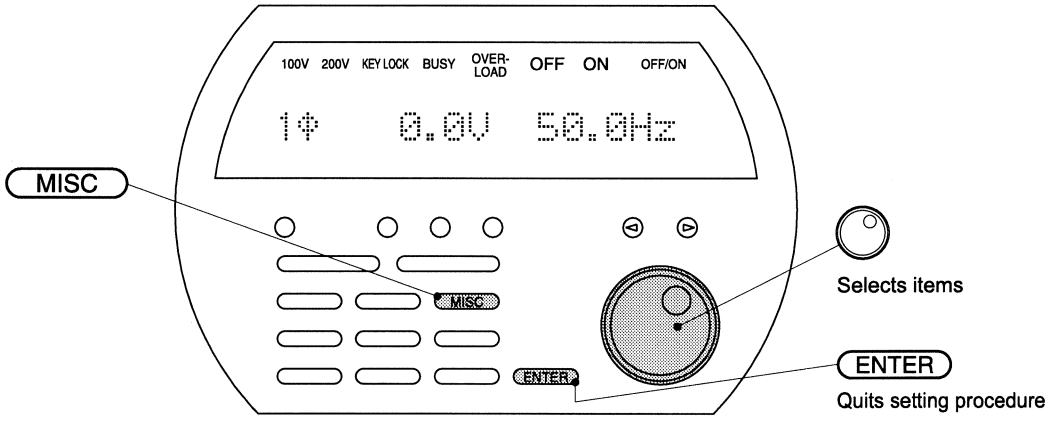


Frequency of 50 or 60 Hz is available for setting.

Attention!

If the frequency setting range defined by the setting of frequency limiting value(s) does not contain the range from 50 or 60 Hz, line synchronization cannot be enabled.

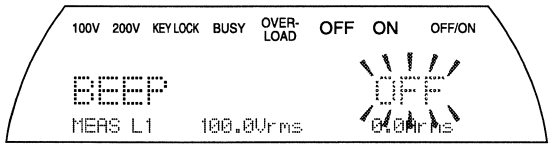
Switching ON/OFF beep warning



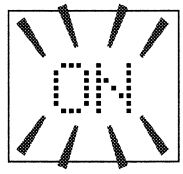
A beep is issued for warning if any impermissible setting is attempted or when the system suffers overload. This function can be disabled if the beep warning is not necessary.

Enabling/disabling beep warning

1 Press MISC couples of times until a beep warning setting screen appears.

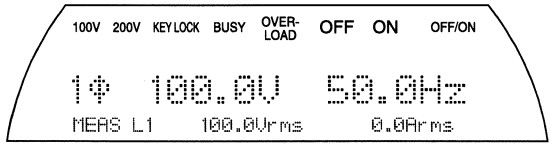


2 Turn the dial and select "ON" or "OFF".

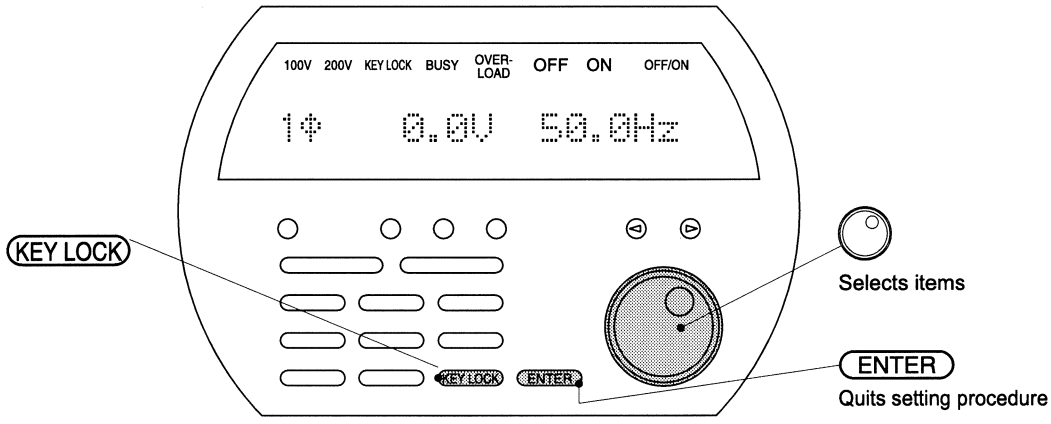


"ON" for enabling beep warning.
"OFF" for disabling beep warning.

3 Press ENTER to quit the selection procedure, and the display returns to the normal screen.



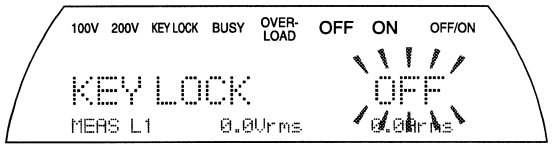
Key lock



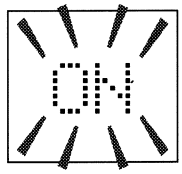
This function prevents settings from accidental modification caused by wrong operation.

Enabling key lock

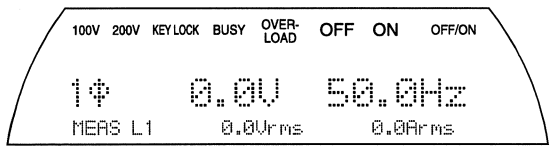
1 Press (KEY LOCK) to show the key lock setting screen.



2 Turn the dial and select "ON".

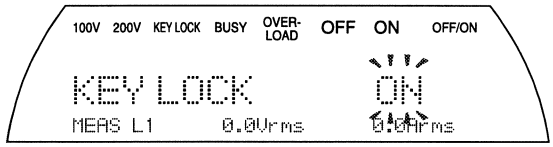


3 Press (ENTER) to quit the selection procedure, and the display returns to the normal screen.

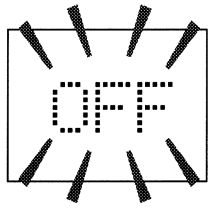


Disabling key lock

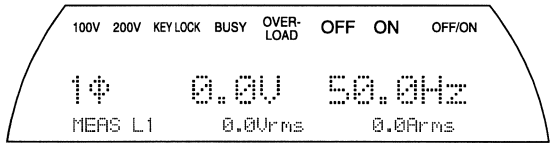
1 Press (KEY LOCK) to show the key lock setting screen.



2 Turn the dial and select "OFF.



3 Press (ENTER) to quit the selection procedure, and the display returns to the normal screen.



Attention!

When the key lock function is ON, the system accepts only the operation to disable the key lock (i.e., operation of (KEY LOCK) , (ENTER) and rotary dial).

Operation with 100 V input

EPO 2000S/EPO 2000X units can operate with a 100 V power input. However, the output capacity is limited to about 800 VA.
Power supply from 100 V wall outlet can energize the system for check of operation or can be used for contribution to stabilizing 100 Vac.

Attention!

Operation with nominal 100 V input means a power input voltage range of 85 to 132 V.

Attention!

Operation with nominal 100 V input limits the output capacity to about 800 VA. If the output exceeds this level, the system will limit the output, with the overload lamp lighting up.