OPERATION MANUAL

REMOTE CONTROLLER

RC02-PCR-L

KIKUSUI

Part No. Z1-000-232, IA002234

The product specifications and the contents of this operation manual are subject to change without notice.

Printed in Japan

RC02-PCR-E

This manual applies to the RC02-PCR-L Remote Controller connected to a PCR-L AC Power Supply with ROM version 1.00 or higher. When you inquire about the product, be prepared to provide us with the following information:

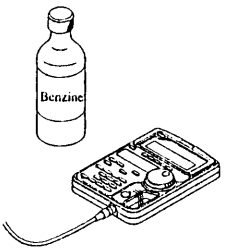
- PCR-L AC Power Supply model number
- PCR-L AC Power Supply ROM version
- PCR-L AC Power Supply serial number and revision number (indicated on the lower rear part of the equipment)
- Remote Controller model number
- Remote Controller serial number and revision number (indicated on the back of the Remote Controller)

* Before using this Remote Controller, be sure to read the PCR-L AC Power Supply Operation Manual.

This device is a dedicated option for the PCR-L Series. It cannot be used for any other equipment.

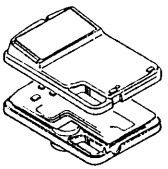
FOR SAFETY USE

Always observe the following warnings and precautions when handling or using the Remote Controller.



○ Take proper precautions against explosion or fire.

- Do not use the device in an explosive atmosphere or near flammable substances.



○ Do not touch the device interior.

- Never attempt to remove the device cover.
- Note that touching the device interior may cause electrical shock.
- Part replacement or inspection/adjustment of components in the device interior should be done only by qualified service personnel.

○ Do not use substitute components or otherwise modify the device.

- The device uses no parts that can be replaced by the customer.

○ Ensure safety first in the events of a problem.

- If the device is damaged or becomes defective, immediately disconnect the PCR-L AC Power Supply input plug from the electrical outlet or cut off power from the power distribution board.
- Take appropriate measures to ensure that the device will not be used by mistake until repair has been completed.

Warning and Precaution Symbols Indicated on the Remote Controller and in the Operation Manual.

The following symbols are indicated where special caution is required in handling the device.

Remote Controller	Operation manual	Description
	WARNING	Indicates the existence of a personnel hazard. • Never fail to follow the applicable operating procedure. Incorrect operating procedures may result in personal (bodily) injury. • Do not proceed beyond a WARNING sign until the indicated conditions are fully understood and met.
	Caution	Indicates the existence of a hazard. • Always follow the applicable operating procedure. Incorrect operating procedures may damage the device or other equipment. • Do not proceed beyond a CAUTION sign until the indicated conditions are fully understood and met.
⚠		Operation manual reference symbol • If this mark is indicated on the device, see the relevant section of this Operation Manual.

CONFIGURATION OF THE OPERTAION MANUAL

This operation manual is structured as follows:

Chapter 1. GENERAL	Describes the basics of the Remote Controller use. Be sure to read this information.
Chapter 2. CONNECTION TO A PCR-L AC POWER SUPPLY	
Chapter 3. OPERATION CHECK	
Chapter 4. OPERATION METHOD	Describes the basic operating procedures.
Chapter 5. PART NAMES AND OPERATIONS	Describes the part names and their functions in detail.
Chapter 6. MAINTENACE	Describes how to handle the Remote Controller in the event of a problem. Always read this chapter before requesting a repair.
Chapter 7. SPECIFICATIONS AND OPERATING CHARACTERISTICS	
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Chapter 1
GENERAL

Describes the Remote Controller use and features.

Contents

1.1 Outline

This device (RC02-PCR-L) is a remote controller for the PCR-L Series AC Power Supplies. Use of the RC02-PCR-L with a PCR-L AC Power Supply significantly extends the power supply functions.

1.2 Features

Using the RC02-PCR-L allows the PCR-L AC Power Supplies to utilize the following enhanced functions in addition to the PCR-L Power Supply's standard functions.

(1) Power-line abnormality simulation
This function enables simulation of power failure, fast voltage decrease (DIP) or fast voltage increase (POP). The function is used to test switching power supplies or microprocessor-based devices.

(2) Sequence operation
Sequence operation permits automatic operation by combining output voltage and frequency or other parameters with duration time. This function can be used to test the power supply environment of a variety of devices and equipment.

(3) Harmonic current analysis function
Harmonic current analysis is available for output current. The conventional approach uses an FFT analyzer for measurement. The PCR-L AC Power Supplies, however, do not require an FFT analyzer. This function can be used for harmonic current analysis of various equipment.

(4) Special waveform output
This function allows the "peak clipped waveform," in which the peak of a sine wave is suppressed, to be output as standard. This function can be used not only for a variety of electronics devices but also for chemical experiments and production equipment.

(5) Output impedance setting
The PCR-L AC Power Supplies have almost 0 ohm output impedance (output resistance); an actual commercial power line has several milliohm to several ohm impedance (resistance). When the Remote Controller is connected to a PCR-L AC Power Supply, the PCR-L Power Supply can vary the output impedance. This allows simulation of an environment similar to that of an actual commercial power line.

(6) Measurements of power-factor, VA, and peak holding current
Although the PCR-L AC Power Supplies have diverse measurement fuctions, these can be extended by connecting the Remote Controller. The additional functions include the measurement of power-factor, VA, and the peak holding current.
The peak holding current measurement function is useful for measuring a rush current.

(7) Output ON/OFF phase setting
Output ON/OFF phase setting is available separately. This function is used when output ON/OFF phase setting is required.

(8) AC + DC mode

This function allows the PCR-L AC Power Supply to output voltage waveforms in which AC voltage is superimposed on DC voltage. The function can be used in chemical experiments and for production equipment.

(9) Expansion of the Memory Function

The PCR-L AC Power Supplies allow nine sets of voltage and frequency settings to be stored as standards in the memory, enabling the data to be read for output as necessary.
Connecting the Remote Controller enables the equipment to store up to 99 sets of voltage and frequency set values.

(10) Regulation adjustment

With regulation adjustment, the output voltage is adjusted automatically to compensate for a voltage drop caused by the output current. This function is used for the same purpose as the sensing function. The sensing function measures the sensing-point voltage in order to maintain a constant sensing-point voltage; with regulation adjustment, the voltage drop caused by the output current is calculated, and the output voltage is raised by an amount equivalent to the drop.
The function ensures stabilized voltage at the load end without using sensing cables even if there is a substantial distance between the load and the PCR-L AC Power Supply.

[Description] When regulation adjustment is performed, the PCR-L AC Power Supply's voltage stability accuracy, distortion factor, and response speed decrease below the normal capability. Therefore, this function may not be suitable for some applications. Check the load conditions and other factors before use.

Chapter 2
CONNECTION TO A PCR-L AC POWER SUPPLY

Describes how to install the Remote Controller card in a PCR-L AC power supply and how to connect and handle the remote controller.

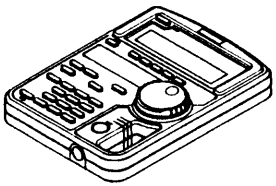
Contents

2.1 Check at Unpacking

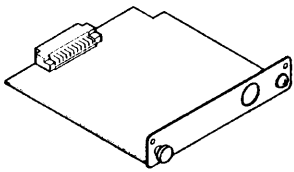
The RC02-PCR-L Remote Controller was carefully tested and inspected, both mechanically and electrically, before shipment to ensure its normal operation. Check the Remote Controller upon receipt for damage that might have occurred during transportation. Also, check that all items listed in the table below have been provided. If the device appears to be damaged or if any accessory missing, notify your Kikusui agent.

Items to be checked at unpacking

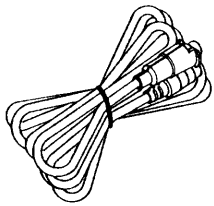
Items	Q'ty	Check
Remote controller box	1	
Remote controller card	1	
Remote controller cable (2m)	1	
Magnet sheet	1	
Mounting screws (M3)	2	
Split cores (with stopper bands)	2	
Connector cover	1	
Operation Manual	1	



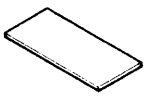
Remote controller box



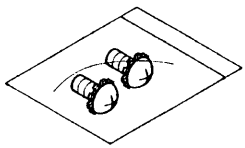
Remorte controller card



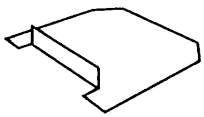
Remote controller cable



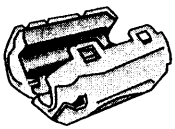
Magnet sheet



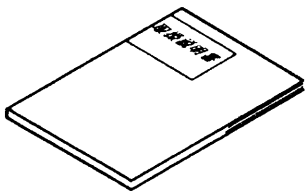
Mounting screws



Connector cover



Split core



Operation Manual

2.2 Remote Controller Handling Precautions

The Remote Controller (RC02-PCR-L) consists of the remote controller card (interface card for the PCR-L AC Power Supply) installed in a PCR-L AC Power Supply, remote controller box used for operation, and remote controller cable that connects the controller card to the controller box. Observe the following handling precautions for these items.

(1) Handling of remote controller card

Always take the following cautions when handling the remote controller card since its PCB is exposed.

(Caution)

- *Never touch any of the electronics parts installed on the PCB.*
- *Never handle the card under conditions where static electricity might accumulate.*
- *After unpacking the Remote Controller carton, promptly install the remote controller card in a PCR-L AC Power Supply.*
- *When storing the remote controller card, always take measures to prevent static electricity, such as storing it in the bag used for the packing.*
- *Do not drop the card or subject it to other impact.*
- *Do not place the card where it could be exposed to water or other liquid.*

(2) Handling of remote controller box

(Caution)

- *Do not drop the controller box or subject it to other impact.*
- *Do not place the controller box where it could be exposed to water or other liquid.*
- *Do not use or store the controller box in direct sunlight.*
- *Do not use of store the controller box in an area susceptible to rapid temperature changes.*
- *When the remote controller box is used with the provided magnet sheet, which attaches to the back of the controller box, never place the controller box near magnetic-susceptible items, such as floppy disks and credit cards.*

2.3 Combination with Other Options

The PCR-L Series has various other options in addition to the Remote Controller. Note that the following options cannot be used in conjunction with the Remote Controller. However, one of the following interfaces may be simultaneously mounted in a PCR-L AC Power Supply slot.

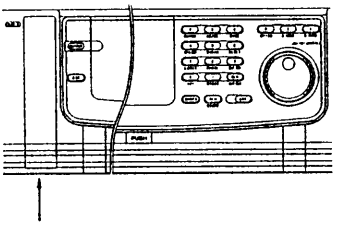
Option name	Model
GP-IB Interface	IB11-PCR-L
RS-232C Interface	RS11-PCR-L

(Caution) *Only one remote controller card can be inserted into a power supply slot.*

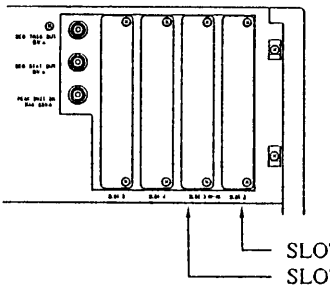
2.4 Installing the Remote Controller Card into a Slot

The remote controller card can be inserted into any of the following slots (not including SLOTs 4 and 5). It achieves the same performance, in any slot.

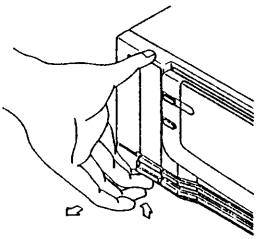
Upper front part of a PCR-L AC Power Supply

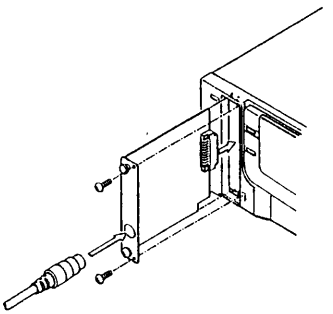


Upper rear part of a PCR-L AC Power Supply



How to Install the Remote Controller Card into a Slot





Caution *Before installing the controller card, always turn OFF the PCR-L AC Power Supply POWER switch.*

Step 1 Remove a slot cover.

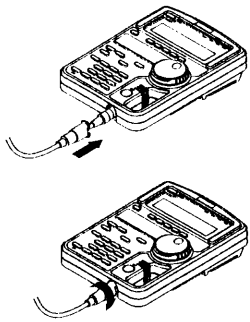
Step 2 Hold the panel part of the remote controller card.

Step 3 Orient the controller card so that the parts-mounted side of the PCB is at the right, and place the PCB into the slot grooves.

Step 4 Carefully insert the controller card into the slot so that the PCB does not come out of the grooves.

Step 5 Insert the card all the way, then fix the card to the PCR-L AC Power Supply using the screws provided. This completes installation of the remote controller card.

2.5 Connecting the Remote Controller Cable



Caution *Before connecting the controller cable, always turn OFF the PCR-L AC Power Supply POWER switch.*

Step 1 Connect the controller cable connector with a protection cover to one of the two connectors (see the figure at the left) in the remote controller box. Exercise care that the orientation of the connector is correct. Insert the protection cover, cover the connector and turn the cover clockwise to fix it securely.

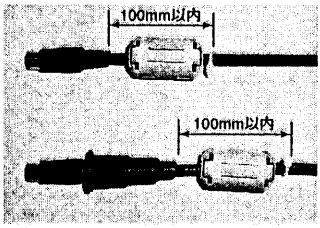
Step 2 Connect the other connector of the controller cable to the remote controller card connector. Exercise care that the orientation of the connector is correct.

2.6 Installation the split cores

Step 1 Unlock the core and open it.

Step 2 Close the core so that the cable is not caught in it.

Step 3 As shown below, tie up the cable with the accompanying stopper band. Keep the distance between the plug and the core below 100 mm.



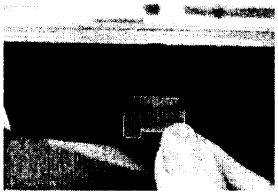
2.7 Installation the connector cover

Install the connector cover of the 8P mini plug connector which is not used.

Installation

Step 1 As shown in Fig.2, insert the accompanying connector cover from the lower part of the connector.

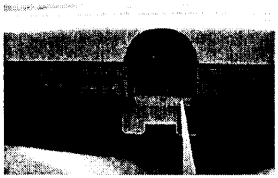
Step 2 Insert the cover till the it is locked.



Removal

Step 1 Unlock the connector cover with tweezers.

Step 2 Slowly pulled down the connector cover.

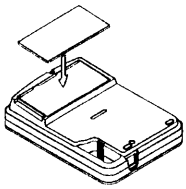


2.8 Moving Precautions

(Caution)

- *Moving a PCR-L AC Power Supply with this device connected may place unreasonable stress on the remote controller cable or cause the remote controller box to fall. Before moving the PCR-L AC Power Supply, always disconnect the controller cable.*
- *When the magnet sheet is used, do not move a PCR-L AC Power Supply with the remote controller box attached to the side of the equipment. Vibration during movement may cause the remote controller box to fall.*
- *When moving the equipment, follow the instructions given in the PCR-L AC Power Supply Operation Manual.*

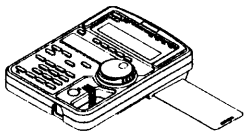
2.9 How to Use the Magnet Sheet



The Remote Controller has a magnet sheet that can be attached to the back of the remote controller box. This allows the remote controller box to be placed on the side panel of the PCR-L AC Power Supply or other steel surface.

(Caution) *When the provided magnet sheet is on the back of the remote controller box, never place the controller box near magnetic-susceptible items, such as floppy disks and credit cards.*

2.10 Quick Reference Card



The remote controller box has a quick reference card that briefly describes keys and simulation waveforms. This card is useful when using the memory, sequence, or special waveform output functions.

Chapter 3
OPERATION CHECK

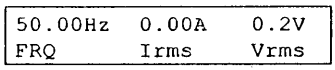
Describes the operation check that must be conducted before operating the Remote Controller.

Contents Page

After connecting the Remote Controller by the steps described in Chapter 2, check the Initial Setup Status and make an operation check. Always make an operation check as described in this chapter, if you have installed a new Remote Controller or changed its location, if the operator changes, or if the Remote Controller has not been used for a long time.

3.1 Checking the Initial Setup Status

The condition in which a PCR-L AC Power Supply and this device are simultaneously purchased and power is fed for the first time (factory shipment status) is called Initial Setup Status. The following figure shows the remote control box LCD display under this condition.



The main setting in the Initial Setup Status are as follows:

- OUTPUT OFF
- RANGE 100V
- AC/DC AC
- Frequency 50.00Hz
- Voltage 0.0V
- Voltage display mode RMS
- Current display mode RMS

If the Remote Controller is not in the Initial Setup Status, use the reset function to activate the Initial Setup Status. Reset can be performed either on the PCR-L AC Power Supply or via the Remote Controller. To perform a reset on the PCR-L AC Power Supply, see instructions in the PCR-L AC Power Supply Operation Manual.

- Note that performing a reset cancels all settings made thus far and activates the Initial Setup Status.

Resetting Procedure using the Remote Controller

Check that the PCR-L AC Power Supply is in the key-lock mode, then take the following steps.

Steps 1 Call the Home Position. (See the Home Position description given below.)

Steps 2 Press [SHIFT] + [6] (RESET).

Steps 3 Verify that the [ENTER] LED blinks, activating ENTER wait status.

Steps 4 Press [SHIFT] + [ENTER]. This executes a reset.

The above procedure also cancels the PCR-L Power Supply key lock mode. To use the Remote Controller, set the PCR-L AC Power Supply to the key-lock mode again.

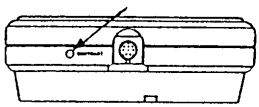
Description **Home Position**

The status in effect immediately after the POWER switch is turned ON is called the Home Position (regardless of OUTPUT ON/OFF). To return to the Home Position from another mode, press [ESC].

Description **ENTER Wait**

This is the condition in which [ENTER] has not yet been pressed to initiate the operations performed thus far. In this condition, the [ENTER] LED on the Remote Controller blinks. To cancel a operation before pressing [ENTER], press [ESC].
ENTER Wait for this device has the same meaning as the ENT Wait of the PCR-L AC Power Supplies.

Description **LCD (Liquid Crystal Display) Contrast Adjustment**



To adjust the contrast of the Remote Controller LCD unit, use a small screwdriver to turn the part shown in the figure. Adjust LCD contrast to match lighting conditions at the operating location to obtain an easy-to-see display.

3.2 Operation Check

Caution *Remote Controller operation must be checked after the operation check of the PCR-L AC Power Supply has been completed.*

Operation Check Procedure

The following describes how to make an operation check from the Initial Setup Status.

Step 1 Turn the PCR-L AC Power Supply POWER switch ON.

Step 2 The remote controller box LCD displays the following Initial Setup Status for a few seconds (the example shown is for PCR1000L with ROM version 1.00).

```
PCR1000L
Ver 1.00
```

If a different display appears, see the description on the next page.

Step 3 After a few seconds, the Home Position appears.

```
50.00Hz 0.00A      0.2V
FRQ     Irms       Vrms
```

F1 F2 F3 F4 F5

If the PCR-L AC Power Supply is not in the key-lock mode, set the equipment to the key-lock mode.

Step 4 Press F5 (Vrms) to enter the voltage setting mode. This changes the F5 Vrms indication to Vset.

```
50.00Hz 0.00A      0.0V
FRQ     Irms       Vset
```

F1 F2 F3 F4 F5

Step 5 Turn JOG or SHUTTLE to check that the voltage changes on the display.

Step 6 This completes the operation check.

This operation check does not check all functions. However, if the operation check has been complete, the main functions operate correctly.

[Description]
If the following display or other messages appear, wait for about ten seconds, then the display should change to the Initial Setup Status. In this condition, the PCR-L AC Power Supply back-up data has been lost for some reasons. Re-check the steps described in sections 2.4 to 2.6. If this still does not remedy the condition, notify you Kikusui agent.

```
PANEL BACK UP LOST
   INITIAL SET !!!
```

Chapter 4
OPERATION METHOD

Describes the operation and functions of the RC02-PCR-L.

Contents

4.1 Basic Operation of the Remote Controller

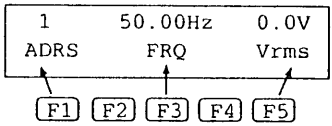
Remote controller operation is designed to be as much as possible the same as that of the PCR-L AC Power Supply control panel. However, part of the operation and operation of new functions provided by the Remote Controller differ from that of the PCR-L Power Supply control panel.

The basic operating method of the Remote Controller is as follows:

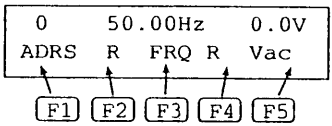
- Confirm that the PCR-L AC Power Supply is in the key-lock mode.

Step 1 To enter main function setting or execution status, press the relevant key ([MEM], [SEQ], [SIM], [WAVE], or [MODE]). Note that these keys are accepted only in the Home Position. For information on how to use JOG and SHUTTLE, see 6.7, How to Use JOG and SHUTTLE, in the PCR-L AC Power Supply Operation Manual.

Step 2 After entering each function setting or execution status, press the [F1] to [F5] function keys (located right below the items displayed at the lower part of the display). The function keys correspond to the displayed items. For example, in the following display (memory edit display), [F1] corresponds to "ADRS", [F3] to "FRQ", and [F5] to "Vrms". Note that there are slight deviations between the displayed letters and key positions.



In the figure below (sequence setting display), [F1] to [F5] correspond to the five items displayed at the lower part of the display respectively.



In this operation manual, pressing of one of the [F1] to [F5] function keys is indicated by a circle around a function key number, such as [F1] (Vrms). The item in parentheses corresponds to the indication at the lower part of the display. Also, use items separated by "/" in parentheses, such as (Vrms/Vpk/Vset/Vave), means that one of such items will be displayed depending on the status at the time.

Step 3 If there are several operation displays, the MENU LED lights. Press MENU to access the next display.
For three or more operation displays, press SHIFT + MENU to return to the previous display.

Step 4 To exit the current status, press ESC.

Step 5 Blinking of the ENTER LED during operation means that the ENTER wait status is activated.

Step 6 In the ENTER wait status, operation input thus far is not initiated until ENTER is pressed. Pressing ESC cancels the ENTER Wait status.

4.2 Functions in Common with the PCR-L AC Power Supply

This section discusses the functions common to the Remote Controller and the PCR-L AC Power Supply control panel. The functions are separated into those that can be accomplished in the same way as on the PCR-L AC Power Supply and those requiring different key operation.

4.2.1 Functions Whose Key Operation is the Same as That of the PCR-L AC Power Supply

The following functions are the same key operation as that of the PCR-L AC Power Supply control panel. For details about operation, refer to the PCR-L AC Power Supply Operation Manual.

Functions whose key operation is the same as that of the PCR-L AC Power Supply

Functions	Key operation
OUTPUT ON/OFF	OUTPUT
Self-test function	SHIFT + 3 (SELF TEST)
Key-lock function	SHIFT + 4 (KEYLOCK)
Sensing function	SHIFT + 5 (SENSING)
Reset function	SHIFT + 6 (RESET)
Output voltage range change	SHIFT + 7 (RANGE)
Synchronization function	SHIFT + 9 (SYNC)

4.2.2 Functions Whose Key Operation Differs from That of the PCR-L AC Power Supply

Some functions available on the PCR-L AC Power Supply control panel require slightly different key operation on the Remote Controller because of the device's key arrangement.

Functions whose key operation differs from that of the PCR-L AC Power Supply

Functions	PCR-L AC Power Supply	Remote Controller
Voltage setting function	V	F5 (Vrms/Vpk/Vset/Vave)
Frequency setting function	F	F1 (FRQ)
Limit value setting function	V	F5 (Vmax/Vmin)
	F	F1 (Fmax/Fmin)
	I	F3 (Imax)
Voltage display mode change	SHIFT + V	SHIFT + F5 (Vrms/Vpk/Vset/Vave)
Current display mode change	SHIFT + I	SHIFT + F3 (Irms/Ip/Iph/WATT/Iave)

The meaning of the abbreviations Vrms, Vpk, Vset, etc, are as follows:

Vrms	= rms voltage	Fmax	= maximum frequency
Vpk	= peak voltage	Fmin	= minimum frequency
Vset	= set voltage	Imax	= maximum current
Vave	= average voltage	Irms	= rms current
FRQ	= frequency	Ip	= peak current
Vmax	= maximum voltage	Iph	= peak holding current
Vmin	= minimum voltage	WATT	= power
		Iave	= average current

For an explanation of set values, rms, peak values, and average values, see the Description "Voltage Display Mode" in 6.8.1, Switching the Voltage Display Mode, of the PCR-L AC Power Supply Operation Manual.

- Voltage setting function
  To enter the voltage setting mode on the Remote Controller, press [F5] (Vrms/Vpk/Vset/Vave) in the Home Position. (On the PCR-L AC Power Supply, press [V].)

- Frequency setting function
  To enter the frequency setting mode on the Remote Controller, press [F1] (FRQ) in the Home Position. (On the PCR-L AC Power Supply, press [F].)

- Limit value setting function
  To enter the voltage, frequency, or current limit setting mode on the Remote Controller, press [SHIFT] + [1] (LIMIT) to enter the limit value display mode, then press [F5] (Vmax/Vmin), [F1] (Fmax/Fmin), or [F3] (Imax). (On the PCR-L AC Power Supply, press [SHIFT] + [1] (LIMIT) to enter the limit value display mode, then press [V], [F], or [I].) This function is valid only in AC or DC mode.

- Voltage display mode change
  To switch the voltage display mode on the Remote Controller, press [SHIFT] + [F5] (Vrms/Vpk/Vset/Vave). (On the PCR-L AC Power Supply, press [SHIFT] + [V].)

- Current display mode change
  To switch the current display mode on the Remote Controller, press [SHIFT] + [F3] (Irms/Ip/Iph/WATT/Iave). (On the PCR-L AC Power Supply, press [SHIFT] + [I].) The PCR-L AC Power Supply control panel has no "Iph" display mode. This function is added by the Remote Controller. For details, see 4.3.4, Peak Holding Current Display Mode.

4.3 Functions Extended by Using the Remote Controller

The Remote Controller extends some of the PCR-L AC Power Supply functions. This section describes the extended functions and how to use them.

4.3.1 AC + DC Mode

The PCR-L AC Power Supplies allow two output voltage modes, AC and DC. Use of the Remote Controller allows an additional output voltage mode, AC + DC mode. The AC + DC mode is a function that superimposes DC voltage on AC voltage or vice versa.

Output Voltage Mode Change Procedure
The output voltage mode can be changed only when [OUTPUT] is OFF in the Home Position.

- Confirm that the PCR-L AC Power Supply is in the key-lock mode.

Step 1 Press [OUTPUT] to turn output OFF ([OUTPUT] LED is OFF on the Remote Controller).

Step 2 Press [ESC] to call the Home Position.
The figure below shows the Home Position in the Initial Setup Status. The display differs depending on the content stored.

50.00Hz	0.01A	0.2V
FRQ	Irms	Vrms

Step 3 Press [SHIFT] + [8] (AC/DC) to activate the ENTER Wait status. Then press [ENTER] to establish the output voltage mode.

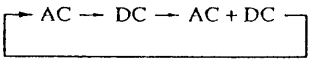
The control panel display in the ENTER wait status changes as follows depending on the mode at the time.

Current Mode	PCR-L Power Supply	Remote Controller
AC	AC -+DC-	AC - DC -
DC	- AC - - +DC -	- AC - - DC -
AC + DC	- AC - +DC	- AC - DC

- indicates blinking.

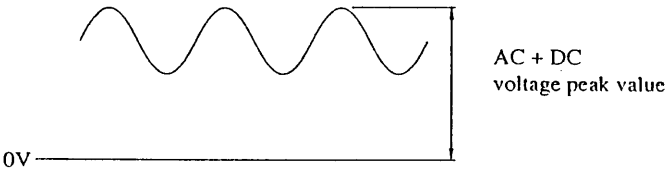
Output Voltage Mode Selection

The AC, DC, and AC + DC output voltage modes are selected in the order of



whenever [SHIFT] + [8] (AC/DC) and then [ENTER] are pressed.

In the AC + DC mode, the AC + DC voltage peak value can be set in the DC voltage setting range.



- In the AC + DC mode, the voltage and frequency limit values respectively set in the AC or DC modes are valid. The AC + DC mode does not allow current limit change. This limit is fixed to the maximum value in the DC mode.
- In the AC + DC mode, the PCR-L AC Power Supply key-lock mode cannot be canceled.

Output Voltage Setting Procedure

Step 1 Press [ESC] to call the Home Position.

Step 2 Press [F5] to activate the voltage setting mode.

Step 3 Press [F5] again. This causes the power supply to enter the AC/DC voltage setting switching mode. Then, "AC" blinks in the Remote Controller's MODE display area. Set AC output voltage using the numeric keys or JOG/SHUTTLE. (For setting using the numeric keys, press [ENTER] after setting an AC output voltage value to fix the value.)

Step 4 Press [F5] again. This causes "DC" to blink in the Remote Controller's MODE display area. Then, set DC voltage using the numeric keys or JOG/SHUTTLE. (For setting using the numeric keys, press [ENTER] after setting a DC voltage value to fix the value.)

Step 5 When [F5] is pressed, the AC and DC voltage setting modes are toggled. Change the mode as desired.

4.3.2 Memory Function

The PCR-L AC Power Supplies have the memory function that stores nine sets of voltage and frequency settings in memory addresses up to 9 and allows them to be read for output whenever necessary. Connecting the Remote Controller to a PCR-L AC Power Supply allows the number of set values stored in the memory (memory addresses) to be extended to 99. The Remote Controller also offers memory operation in the AC + DC mode, allowing simultaneous output of AC and DC voltages stored in the same memory address. For memory addresses 1 to 9, setting is common to both the PCR-L AC Power Supply and the Remote Controller.
The procedure to store datas in the memory is as follow:

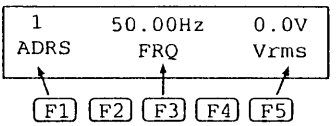
Memory Setting Procedure

Memory setting is available only in the Home Position.

- Confirm that the PCR-L AC Power Supply is in the key-lock mode.

Step 1 Press [ESC] to call the Home Position.

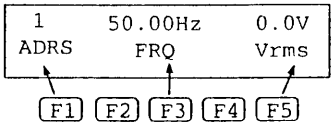
Step 2 Press [SHIFT] + [MEM](M-EDIT) to enter the memory edit mode. This causes the LCD to display the following:



Step 3 Using the [F1], [F3], and [F5] function keys and [MENU], select the desired item. Selectable items are as follows. To select an item, follow steps 4 onward.

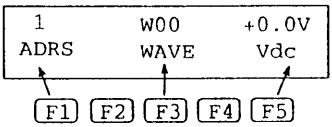
Key	Setting items	Mode available
[F1] (ADRS)	Memory address (step 4)	
[F3] (FRQ)	Frequency (step 4)	AC or AC + DC mode
[F5] (Vrms)	AC voltage (step 4)	AC or AC + DC mode
[MENU], then [F1] (ADRS)	Memory address	
[MENU], then [F3] (WAVE)	Waveform bank (step 5)	AC or AC + DC mode
[MENU], then [F5] (Vdc)	DC voltage (step 5)	DC or AC + DC mode

Step 4 The cursor blinks at "1" of ADRS. Enter the desired address and press [ENTER] to fix it.



Next, press [F3] to set frequency or [F5] to set AC voltage. The cursor moves to "FRQ" or "Vrms". Set the value you wish to store in the memory using the numeric keys or JOG/SHUTTLE.

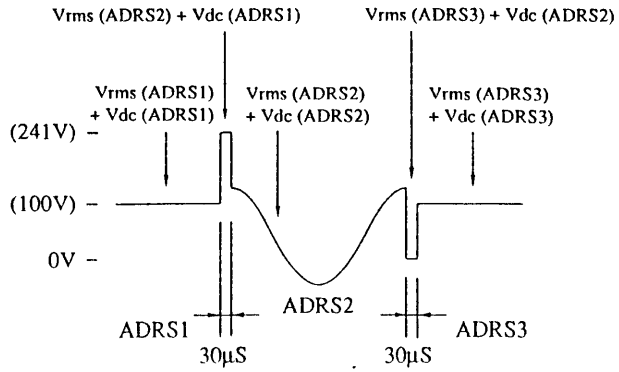
Step 5 To set waveform bank or DC voltage, press [MENU] to call the following display, then set waveform bank ([F3]) or DC voltage ([F5]).



Step 6 Press [ESC] to quit the memory edit mode.

Caution *Note that when voltage data is read from the memory in the AC + DC mode for output, output voltage changes as follows:*
An AC voltage set value (Vrms) and DC voltage set value (Vdc) are independently stored in the memory. When they are read, the AC voltage value (Vrms) is output slightly faster (approximately 30μs) than the DC voltage value (Vdc).
Therefore, output voltage changes as follows:

Example
ADRS 1: Vrms = 0V, Vdc = +100V
ADRS 2: Vrms = 100V, Vdc = 0V
ADRS 3: Vrms = 0V, Vdc = +100V



In the actual case, the duration of 30 μs shown in the above figure is very short in comparison with each ADRS time. Output voltage changes like pulse.

Memory Read Procedure

Set the mode (AC, DC, or AC + DC) in the same condition as that of setting data in the memory.

To read data set in each address ("ADRS"), take the following steps.

Step 1 Press [ESC] to call the Home Position.

Step 2 Press [MEM] to display the memory content. This causes the following display to appear.

1	50.00Hz	0.0V
ADRS	FRQ	Vrms

(First display)
(Example of Initial Setup Status)

Step 3 Using the numeric keys or JOG/SHUTTLE, set the address and press [ENTER] ([ENTER] should also be pressed if using JOG/SHUTTLE). This causes the frequency and AC voltage set in the relevant address to appear.

2	100.0Hz	100V
ADRS	FRQ	Vrms

(First display)
(Example of the display showing that FRQ = 100 Hz and Vrms = 100 V are set in ADRS2)

Step 4 To display waveform bank and DC voltage set in the same address, press [MENU]. This causes the following display to appear.

2	W00	+0.0V
ADRS	WAVE	Vdc

(Second display)
(Example of the display showing that waveform bank W00 and DC voltage +0 V are set in ADRS2)

Set an address by using the numeric keys or JOG/SHUTTLE, and pressing [ENTER] to fix the address in this way, allows the data set in such address to appear. Use [MENU] to select the first or second display.

Step 5 Press [ESC] to quit the memory content display.

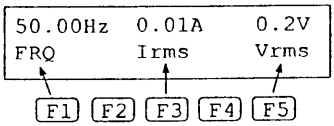
4.3.3 Power, Power-Factor, and Volt-ampere Measurement Mode

The PCR-L AC Power Supplies have a power display function. However, using the Remote Controller allows simultaneous display of power, power-factor, and voltampere (VA).

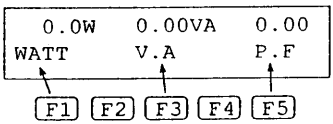
Procedure for Switching to Power, Power-Factor, and Volt-ampere Display

- Confirm that the PCR-L AC Power Supply is in the key-lock mode.

Step 1 Press [ESC] to call the Home Position.



Step 2 Press [MENU]. This causes the power (WATT), volt-ampere (V.A) and power factor (P.F) display to appear.



- Press [MENU] again, or press [ESC] to call the Home Position.

4.3.4 Peak Holding Current Measurement Mode

The PCR-L AC Power Supplies have the peak current display function. However, using the Remote Controller allows peak holding current display in addition to peak current display. The difference between peak value and peak holding value measurements is as follows:

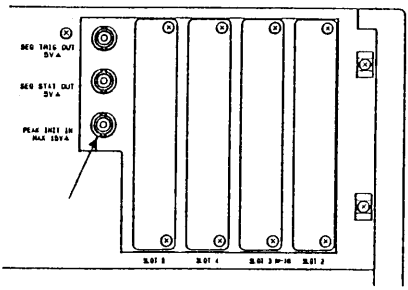
Description — Peak Value and Peak Holding Value Measurements

■ Peak current measurement
In peak value measurement, the peak value is cleared for every measurement cycle. The Remote Controller's peak value measurement measures the current peak using the analog peak holding circuit and obtains the maximum absolute value of that data. Therefore, peak current display shows an absolute value (no positive or negative symbol). A peak value can be measured in the AC, DC, or AC + DC mode.

■ Peak holding value measurement
Peak holding value measurement holds the maximum peak value until a peak clear signal is received. One of the following signal applies to generate a peak clear operation. Peak holding current measurement is useful in measuring rush current of a load occurring at power ON.

- Signal from the PEAK INIT IN terminal (BNC connector) at the upper rear part of the PCR-L AC Power Supply (figure below).
- Peak clear operation (press [F4] (clr)) using the Remote Controller.
- Peak clear command via the GP-IB Interface or RS-232C Interface (see the IB11-PCR-L or RS11-PCR-L Operation Manual).

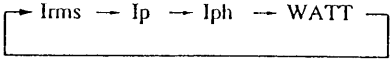
Upper rear part of PCR-L AC Power Supply



The Remote Controller's peak holding value measurement measures peak current using the analog peak holding circuit. It obtains the maximum absolute value of that data. Therefore, peak current display shows an absolute value, which has no positive or negative symbol. The peak holding value can be measured in the AC, DC, or AC + DC mode.

Peak Holding Current Measurement Mode Operating Procedure

Press [SHIFT] + [F3] in the same way as current measurement mode change. This causes the indication to change in the following order in the AC mode.



In the DC or AC + DC mode, the indication changes as follows:

Irms → Ip → Iph → WATT → Iave →

Where "Iph" is peak current value display and "Iph" is peak holding current value display.

Peak Clear Procedure

To execute a peak clear in the peak holding current measurement, press F4 (clr).

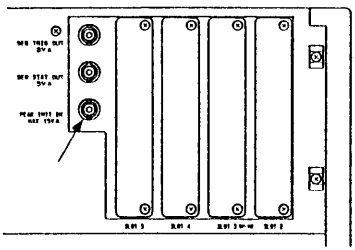
Description — Peak Initializing Signal

To execute a peak clear, input to the PEAK INIT IN terminal (BNC connector) at the rear of the PCR-L Power Supply is shorted. The time required can be two or more output current measurement cycles (approximately 1 to 2 sec). The circuit in this part (the inside of the PCR-L AC Power Supply) is as shown in the figure at the right.

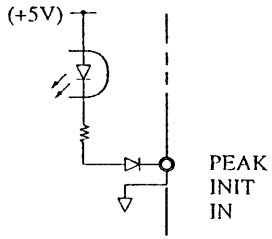
Approximately 5 V appears when the PEAK INIT IN terminal is open. The impedance (resistance) of the circuit to be shorted should be to ohm or less.

The BNC connector is isolated from the INPUT and OUTPUT terminal boards in the PCR-L AC Power Supply. However, since the common line for the PEAK INIT, TRRG, and STAT signals are connected together in the PCR-L AC Power Supply, the peak initial signal is not isolated from the other two signals. Also, the BNC connector is not isolated the slot internal circuit.

Upper rear part of the PCR-L AC Power Supply



PCR-L AC Power Supply internal circuit

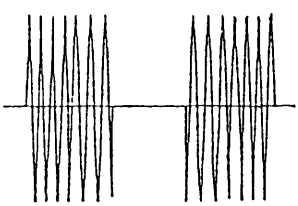


4.4 Functions Added by Using the Remote Controller

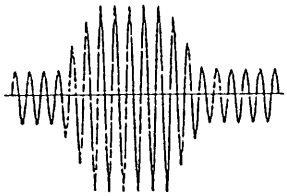
Some functions are available only by using the Remote Controller. This section describes how to use such functions.

4.4.1 Power Line Abnormality Simulation

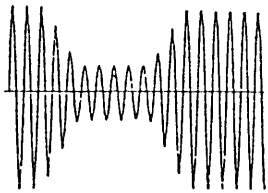
This function allows the PCR-L AC Power Supply to simulate a power failure, fast voltage drops (DIP), and fast voltage rises (POP) to generate power line abnormalities.



Power interruption waveform

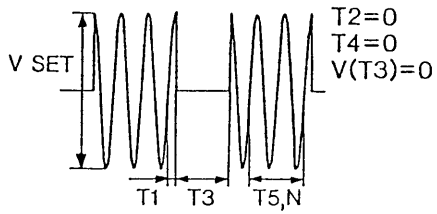


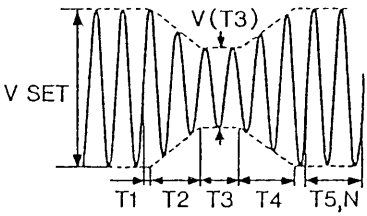
Fast voltage rise (POP)



Fast voltage drop (DIP)

Power line abnormality simulation allows sine waveform output only. Even if a special waveform is selected as described in 4.4.4, Special Waveform Output, performing power line abnormality simulation causes the waveform to be output as a sine waveform.
Operation of power line abnormality simulation consists of the parameter setting and execution modes. The parameter setting mode is used for switching the display among the first to third displays using [MENU] and for selecting items T1 to T3 (shown in the figure below) using the [F1] to [F5] function keys. Setting is then accomplished using the numeric keys or JOG/SHUTTLE (for setting using the numeric keys, press [ENTER] to fix the selected value).





First display	T1	Voltage change start time (phase) Time or phase before starting the change. Time or phase from the point that the waveform crosses the zero level to the starting point of abnormal change, such as voltage increase or decrease. Select ms or deg as the unit.
	T2	Slope time 1 Interval of time for the voltage to increase (POP) or decrease (DIP) from the initial value to the final value specified as abnormal voltage
	T3	Voltage change duration Interval of the time which elapses from the end of previous voltage change to the beginning of the next voltage change the voltage is maintained for Variation Voltage during the interval. Specifying zero(0) for this T3 disables this function.
Second display	T4	Slope time 2 Interval of time for the voltage to increase (POP) or decrease (DIP) from the value specified as abnormal voltage (Variation Voltage) to the initial value.
	T5	Restoration duration The time during the condition that the voltage recovered to the initial value and has been maintained.
	N	Restoration cycle The number of cycles during the condition that the voltage recovered to the initial value and has been maintained. The number of cycles should be specified at current frequency.
	V(T3)	Variation voltage The final voltage value increased (POP) or decreased (DIP). This value is specified at the interval of T3.
Third display	RPT	Repetition count The number of repetitions from T1 to T5 (N).

- For items T5 or N, specify one

The table below shows the settable data items and setting ranges. Magnification for display can be selected from among the alternatives shown in the table.

Display item	Magnification	Setting range
T1	x1ms	0.0~999.9ms
	x1deg	0~360deg
T2	x1	0~9999ms
	x10	0.00~99.99s
T3	x1	0.0~999.9ms
	x10	0~9999ms
T4	x1	0~9999ms
	x10	0.00~99.99S
T5	x1	0~9999ms
	x10	0.00~99.99s
N	x1	0~9999
	x10	0~99990
	x100	0~999900
V(T3)		0 to rated voltage
RPT		0~9998, ∞
		(Set 9999 to select ∞.)

- T5 and/or N may lead or lag by one cycle depending on the setting of T1 to T4.

  Set the start and end of power line abnormality simulation using the execution mode display following the final setting mode display (third display).

- When T5 is set to other than an integral multiple of 1 cycle, the real restoration duration gets longer than the set T5 time because the voltage change is started after the waveform crossed the zero level.

Power Line Abnormality Simulation Operating Procedure

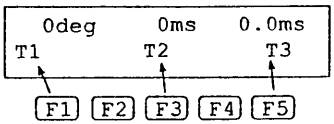
- Confirm that the PCR-L AC Power Supply is in the key-lock mode.
- Preset the steady status voltage and frequency.

Step 1 Press [ESC] to call the Home Position.

Step 2 Set [OUTPUT] to OFF.

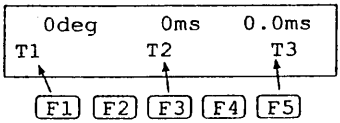
Step 3 Set the output voltage mode to AC using [SHIFT] + [0](AC/DC), and then press [ENTER].

Step 4 Press [SIM]. This causes the first display to appear as shown below.



(First display)

Step 5 Press the [F1], [F3], or [F5] function key to move the cursor to the desired item.



(First display)

Step 6 Set a value using the numeric keys or JOG/SHUTTLE (for setting using the numeric keys, press [ENTER] to fix the value). To change polarity, use [SHIFT] + [0] (+/–).

Step 7 Select the desired magnification for item T1 to T5 and N using keys as shown below.

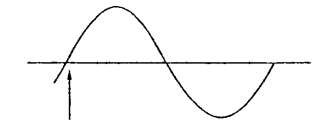
Item	Magnification	Key operation
T1	X1ms/X1deg	[SHIFT] + [F1] (T1)
T2	X1/X10	[SHIFT] + [F3] (T2)
T3	X1/X10	[SHIFT] + [F5] (T3)
T4	X1/X10	[SHIFT] + [F1] (T4)
T5	X1/X10	[SHIFT] + [F3] (T5)
N	X1/X10/X100	[SHIFT] + [F3] (T5)

Step 8 Voltage change start polarity (POL) is positive (+) in the Initial Setup Status. To change the polarity to negative (–), press [SHIFT] + [0] (+/–).

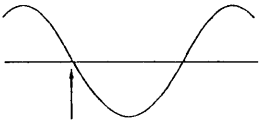
Description Voltage Variation Start Polarity (POL)

Switching the voltage variation start characteristic (POL) causes zero crossing (the time at which voltage reaches the zero level), which is the start point of T1 to be set to a positive zero crossing or negative zero crossing shown in the figure below. This function changes phase by 180 degrees. In this case, the output voltage (waveform) of L is based on N of the PCR-L AC Power Supply OUTPUT terminal board.

Waveform

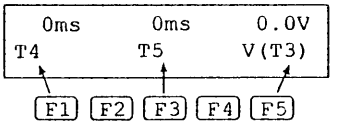


Positive zero crossing



Negative zero crossing

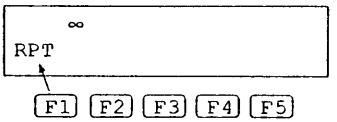
Step 9 Press [MENU] to call the second display.



(Second display)

Set each item in the same way as in steps 5 and 6.

Step 10 Press [MENU] to display the third display.

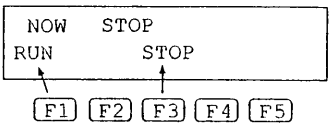


(Third display)

Set each item in the same way as in steps 5 and 6.

- The display is switched in the order of the first to third and the execution mode display whenever [MENU] is pressed.
- To return to the previous display, press [SHIFT] + [MENU].

Step 11 Press [MENU] to display the execution mode, which is the 4th display.



Step 12 Set [OUTPUT] to ON.

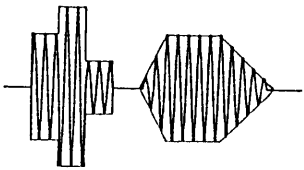
Step 13 Press [F1] (RUN). This starts the simulation of power line abnormality.
- During execution of power line abnormality simulation, "1" blinks in the PCR-L Power Supply control panel S-MODE area.

Step 14 Press [F3] (STOP). This stops simulation of power line abnormality.

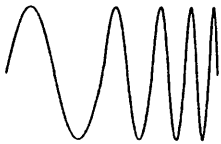
Step 15 Press [ESC] to exit the power line abnormality simulation function.

4.4.2 Sequence Operation

Specifying sequence operation, by combining output voltage and frequency or other parameters with time setting, allows automatic operation. Sequence operation is accomplished by setting sequence content in the sequence setting mode, and then executing operation in the sequence execution mode.



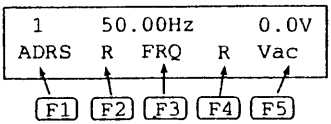
Voltage change



Frequency change

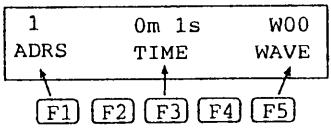
The sequence setting mode has the four displays. There are 10 sequence setting items, including address designation, AC voltage, DC voltage, specifying ramp for AC voltage and frequency change characteristics (see Description below), time, and waveform. Set the desired items from among these. The setting items contained on each display are as shown below.
In sequence operation, the set values become valid or invalid during sequence execution depending on the mode. The figure below shows this relationship as well as the setting items.

First display



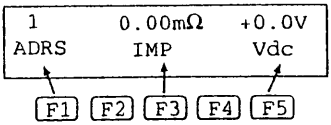
Function key	Mode validity AC	DC	AC + DC	Setting items
F1 (ADRS)	O	O	O	Sequence address
F2 (R)	O	X	O	Frequency change characteristic [ramp/step] (See Description below.)
F3 (FRQ)	O	X	O	Frequency
F4 (R)	O	X	O	AC voltage change characteristic [ramp/step] (See Description below.)
F5 (Vac)	O	X	O	AC voltage

Second display



Function key	Mode validity AC	DC	AC + DC	Setting items
F1 (ADRS)	O	O	O	Sequence address
F3 (TIME)	O	O	O	Time (*1)
F5 (WAVE)	O	X	O	Waveform

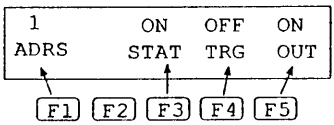
Third display



Function key	Mode validity AC	DC	AC + DC	Setting items
F1 (ADRS)	O	O	O	Sequence address
F3 (IMP)	O	X	X	Output impedance (resistance)
F5 (Vdc)	X	O	O	DC voltage

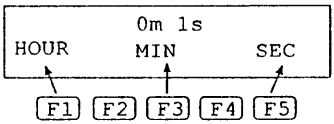
O: Valid X: Invalid

Fourth display



Function key	Mode validity AC	DC	AC + DC	Setting items
F1 (ADRS)	O	O	O	Sequence address
F3 (STAT)	O	O	O	Status signal ON/OFF
F4 (TRG)	O	O	O	Trigger signal ON/OFF
F5 (OUT)	O	O	O	OUTPUT ON/OFF

(1*) When you select F3 (TIME), the display below appears.
Then press any of F1 (HOUR), F3 (MIN), or F5 (SEC) to select timing setting unit.

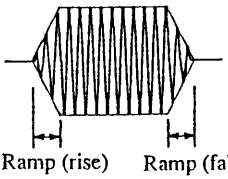


		Setting range
TIME	HOUR	0 hr to 999 hrs 59 min
	MIN	0 min to 999 min 59 sec
	SEC	0 sec to 999.999 sec

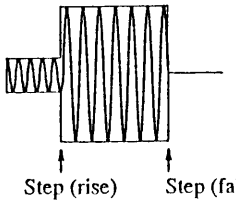
Description AC Voltage Change Characteristics

Changing the frequency or AC voltage linearly over the set time is called "ramp." When ramp is specified, frequency or AC voltage changes from the value set in an address one before to the set value at the Ramp-specified address, taking the time specified for ramp. Ramp specification causes "R" to appear in the F2 or F4 display area.

(For ramp specification)



(For no ramp specification)



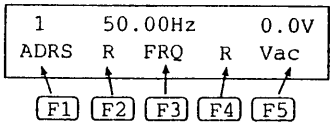
- If ramp is not specified, AC voltage changes by steps to the value set at the specified address.
- Address 0 does not allow ramp specification.
- Ramp specified at the start address is ignored during execution, and frequency or AC voltage changes by steps.

Sequence Setting Mode Operating Procedure

- Confirm that the PCR-L AC Power Supply is in the key-lock mode.
- Select the AC, DC, or AC + DC mode for voltage output.
  (See "Output Voltage Setting Procedure" on page 4-7.)

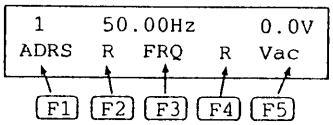
Step 1 Press [ESC] to call the Home Position.

Step 2 Press [SHIFT] + [SEQ] (S-EDIT). This causes the first display to appear, as follows.



(First display)

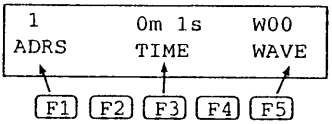
Step 3 Use the [F1] to [F5] function keys to move the cursor to the desired item.



(First display)

Step 4 For the items corresponding to [F1], [F3], and [F5], use the numeric keys or JOG/SHUTTLE to set a value (for setting using the numeric keys, press [ENTER] to fix the value). For the items corresponding to [F2] and [F4], select whether "R" (ramp) is specified, or not (step).

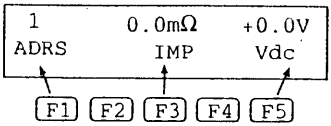
Step 5 Press [MENU] to display the second display.



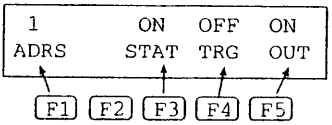
(Second display)

Set each item in the same way as in steps 3 and 4.
Set "TIME" in minutes and seconds. For example, set [1][.][3][0] for 1 min and 30 sec.

Step 6 Then, press [MENU] to display the third and forth displays, and set each item of these in the same way as in steps 3 and 4.



(Third display)



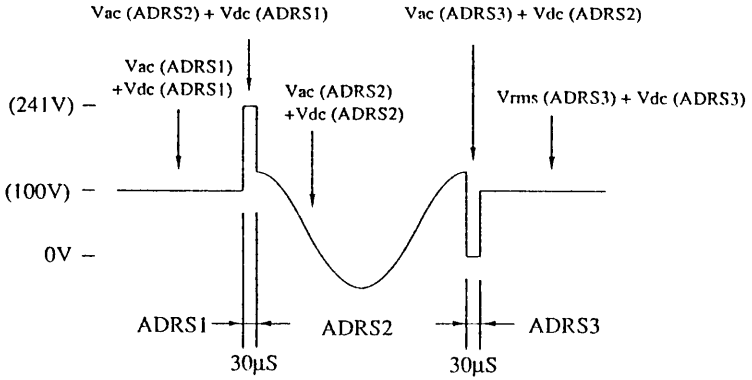
(Fourth display)

- The display can be switched in the order of the first to fourth displays whenever [MENU] is pressed.
- To return to the previous display, press [SHIFT] + [MENU].

Step 7 Press [ESC] to exit the sequence setting mode.

Caution *Note that when voltage data is read from memory in the AC + DC mode for output, the output voltage changes as shown below:*
An AC voltage set value (Vac) and DC voltage set value (Vdc) are stored independently in the memory. When they are read, AC voltage (Vac) is output slightly faster (approximately 30μs) than DC voltage (Vdc). Therefore, output voltage changes as follows:

Example	ADRS1:	Vac = 0V,	Vdc = +100V
	ADRS2:	Vac = 100V,	Vdc = 0V
	ADRS3:	Vac = 0V,	Vdc = +100V



In the actual waveform, since the 30 μs shown in the above figure is very short in comparison with each ADRS time, output voltage changes like pulse.

[Description] Since the sequence address (ADRS) setting time (TIME) is not synchronized with output frequency (FRQ), output phase may deviate during long-term operation because of the difference in their setting accuracy.

Example ADRS1: FRQ50Hz, Vac 100V, TIME 30MIN (20msx50x60x30)
ADRS2: FRQ50Hz, Vac 0V, (TIME _ _ MIN)

Setting is made such that ADRS is switched at a zero crossing point.

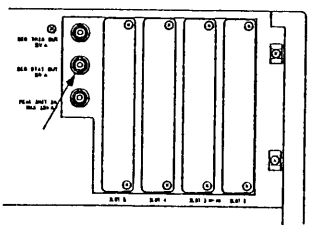
The figure above shows an extreme example.

- Address 0 allows no ramp specification. Ramp specified for the start address is ignored, and frequency or AC voltage changes in step form.
- Starting sequence operation in the DC mode causes frequency and AC voltage setting to be ignored.

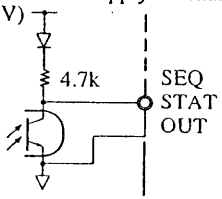
Description Status Signal

Specifying "ON" for status signal causes the "L-signal" to be output to the SEQ STAT OUT terminal (BNC connector) at the rear of the PCR-L Series Power Supply over the set time of the relevant address. Setting the status signal to OFF causes the "H-signal" to be output. The "H-signal" is approximately 5V; the "L-signal" is approximately 0 V.
The BNC connector is isolated from the INPUT and OUTPUT terminal boards in the PCR-L Power Supply. However, since the common line for the PEAK INIT, TRG, and STAT signals are connected together inside the PCR-L Power Supply, the status signal is not isolated from the other two signals. Also, the BNC connector is not isolated from the slot internal circuit. There is a slight time difference (approximately 100 µs) between status signal output and actual power output change.

Upper rear part of the PCR-L AC Power Supply



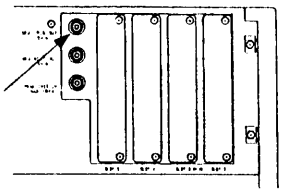
PCR-L AC Power Supply internal circuit



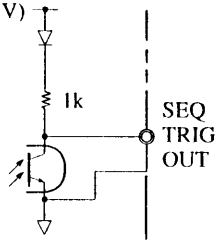
Description Trigger Signal

Specifying "ON" for the trigger signal causes the "L-signal" to be output for approx. 20 µs to the SEQ TRIG OUT terminal (BNC connector) at the rear of the PCR-L Series AC Power Supply when the relevant address set value is reached. Setting the trigger signal to OFF causes the "H-signal" to be output. The "H-signal" is approximately 5 V; the "L-signal" to approximately 0 V.
The BNC connector is isolated from the INPUT and OUTPUT terminal boards in the PCR-L Power Supply. However, since the the common line for the PEAK INIT, TRG, and STAT signals are connected together in the PCR-L Power Supply, the trigger signal is not isolated from the other two signals. Also, the BNC connector is not isolated from the slot internal circuit.
There is a slight time difference (approximately 100 µs) between trigger signal output and actual power output change.

Upper rear part of the PCR-L AC Power Supply



PCR-L AC Power Supply internal circuit

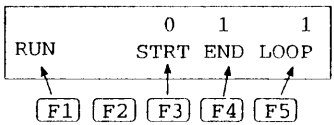


Sequence Execution Mode Operating Procedure

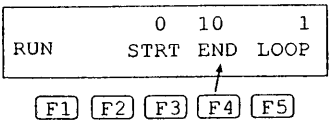
The sequence execution mode allows the items set in the sequence setting mode to be executed in order. Specify the sequence start address, end address, and repetition count to execute the sequence.

Step 1 Press [ESC] to call the Home Position.

Step 2 Press [SEQ] This causes the following display to appear.

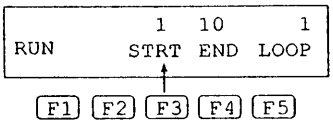


Step 3 Press [F4] to move the cursor to the "END" area on the upper part of the display, and set a sequence end address value using the numeric keys or JOG/SHUTTLE (for setting using the numeric keys, press [ENTER] to fix the value).
Setting is established as long as the start address is less that the end address. When setting the start and end addresses, always ensure this relationship is satisfied.



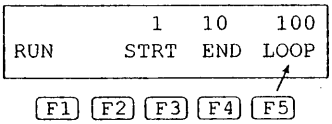
(Example of setting the end address to "10")

Step 4 Press [F3] to move the cursor to the "START" area, and set a sequence start address value in the same way as the sequence end address.



(Example of setting the start address to "1")

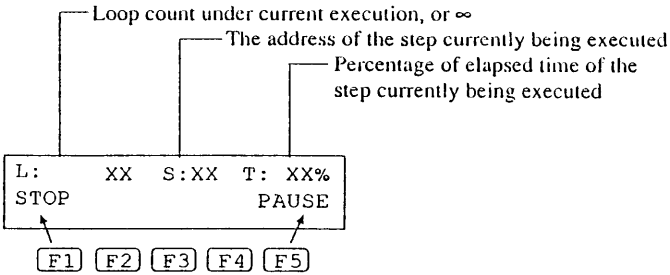
Step 5 Press [F5] to set the number of repetitions from the sequence start address to end address in the same way as the above steps.



(Example of setting the number of repetitions to "100")

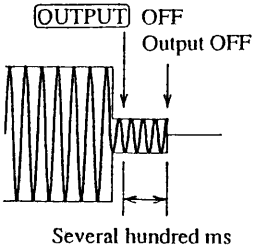
Step 6 Press [F1] (RUN). This start the sequence.

Display during execution of sequence operation



- Press [F1] (STOP), [ESC], or [OUTPUT] to stop the sequence.

[Description] Stopping a sequence by pressing [OUTPUT] is by internally activates [F1] (STOP) and then sets OUTPUT to OFF.
Therefore, OUTPUT is not set to OFF until after the step being executed when [OUTPUT] was pressed has been output for several hundred ms.



- Pause a sequence, press [F5] (PAUSE). To cancel the pause status, press [F5] (PAUSE) again.
- Setting [OUTPUT] to OFF or pressing [ESC] in the pause status causes the sequence to stop.

Example of Sequence Operation

Sequence operation allows output of a variety of simulation waveforms, such as output frequency/voltage sweep, power line environment change (such as voltage variation, instantaneous power interruption, voltage drop, and voltage rise), and AC + DC output. Also, output of a peak clip waveform in addition to sine wave allows various tests of the power supply environment.

(Caution) *Displayed output voltage/current value is calculated from data obtained by sampling of the output voltage/current. There are following three sampling methods for set-frequency. When you set the output frequency which goes across following three frequency-ranges in the sequence mode, sampling method is fixed in the method for the highest frequency in frequencies which you have set. When you set address set-up time which did not meet the measurement cycle in sequence setting, waveform of the address is not measured correctly.*

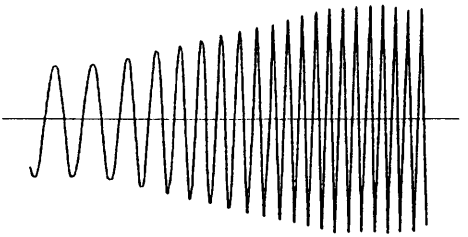
1. *Set-frequency is between ≥1 Hz and <16 Hz.*
   256 points are sampled in one period of waveform as actual time. Because data for calculation are obtained in one period of waveform, measurement cycle is one period.

2. *Set-frequency is between ≥16 Hz and <256 Hz.*
   16 points are sampled in one period of waveform. This sampling is repeated 16 times, and 256 points of data are obtained. Because 16 periods of waveform is required to obtain data for calculation, measurement cycle is 16 periods.

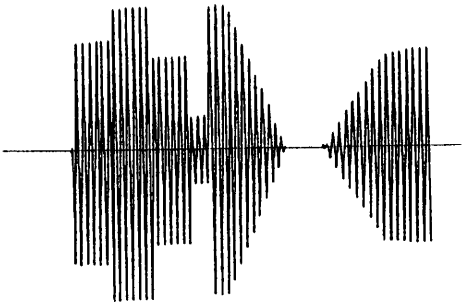
3. *Set-frequency is between ≥256 Hz and <1 kHz*
   One point is sampled in one period of waveform. This sampling is repeated 256 times, and 256 points of data are obtained. Because 256 periods of waveform is required to obtain data for calculation, measurement cycle is 256 periods.

The following are examples of sequence operations and their sequence set values.

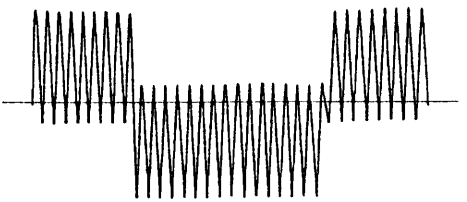
1. Output frequency/voltage sweep
   This example shows that a voltage of 50 V at 20 Hz was output for 0.2 sec, both voltage and frequency were ramp changed to 100 V and 60 Hz over 0.3 sec, and then an output of 100 V at 60 Hz was held for 0.2 sec.



2. Automatic power line environment test
   In this example, voltage was first changed from 0 V (for 0.2 sec) to 100 V, 132 V, and then to 85 V at 0.1 second intervals, instantaneously dropped to 30 V for 0.05 second, and recovered to 132 V. Then, 0.05 second later, the voltage was ramp changed to 0 V over 0.15 second and held at 0 V for 0.1 second. Finally, the voltage was ramp changed to 85 V over 0.15 second and held at 85 V for 0.2 second.



3. AC + DC Output
   In this example, 16 Hz, 50 VAC voltage was superimposed on +48 VDC voltage and output for one second. Then 16 Hz, 50 VAC voltage was superimposed on –48 V DC voltage and output for one second.



The set values of these sequence operation examples are given in the setting sheet on the next page. The setting sheet is included in the APPENDIX.

Sequence Operation Setting Sheet

PCR-L Series
TITLE: Example of Sequence Operation DATE:_____ No._____

ADR	R	F	R	Vac	Th	Tm	Ts	WAVE	IMP	Vdc	STRT	TRG	OUT
1	—	20	—	50			0.2						
2	R	60	R	100			0.3						
3	—	60	—	100			0.2						
4	—	60	—	0			0.2						
5	—		—	100			0.1						
6	—		—	132			0.1						
7	—		—	85			0.1						
8	—		—	30			0.05						
9	—		—	132			0.05						
10	—		R	0			0.15						
11	—		—	0			0.1						
12	—		R	85			0.15						
13	—	↓	—	85			0.2						
14	—	16	—	50			1			+48			
15	—	16	—	50			1			–48			

MEMO

① ADR 1 to 3 Output frequency/voltage sweep (20 Hz, 50 V to 60 Hz, 100 V)
② ADR 4 to 13 Automatic power line environment test (voltage variation, instantaneous power interruption voltage drop, and voltage rise)
③ ADR 14 to 15 AC + DC output (50 Vrms AC at 16 Hz, +48 V/–48 V DC)

4.4.3 Harmonic Current Analysis Function

Use of the Remote Controller allows load current harmonic analysis. This function enables harmonic analysis measurement without using an FFT analyzer, which is conventionally required for harmonic analysis.

Harmonic Current Analysis Function Operating Procedure

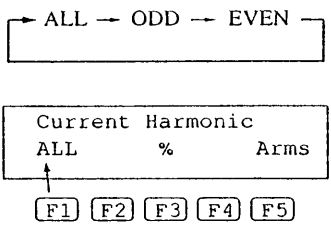
The harmonic current analysis function is available only in the AC mode.

- Confirm that the PCR-L AC Power Supply is in the key-lock mode.

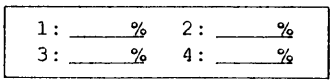
Step 1 Press [ESC] to call the home position.

Step 2 Press [SHIFT] + [SIM] (CUR HMNC).

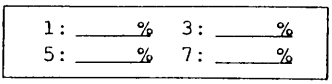
Step 3 Press [F1] (ALL/ODD/EVEN) to select "ALL" (all harmonics), "ODD" (odd number harmonics), or "EVEN" (even number harmonics.
- Selection changes in the following order whenever [F1] is pressed.



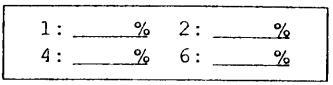
Step 4 Press [F3] (%) or [F5] (Arms) to select "%" or "Arms".
- For [F3] (%), a harmonic current value is indicated in percentage. The current value of the fundamental component is regarded as 100%.



(First display for ALL)



(First display for ODD)



(First display fro EVEN)

- For [F5] (Arms), the each harmonic component is indicated as a current value. The unit is Arms.

1: ____A	2: ____A
3: ____A	4: ____A

(First display for ALL)

Step 5 Press [MENU] to switch the display and change the displayed harmonic order.

- If "ALL" is selected in step 3, ten displays (up to the 40th order) are available. For "ODD" or "EVEN", five displays are provided.
- The display changes whenever [MENU] is pressed.

5: ____%	6: ____%
7: ____%	8: ____%

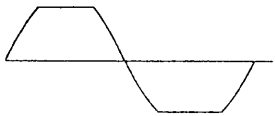
(Second display for ALL. Percentage display)

- To return to the previous display, press [SHIFT] + [MENU].
- To exit the harmonic current analysis mode, press [ESC].

[Description] Harmonic analysis can be performed using the PCR-L Series only. However, harmonic analysis generally requires that line impedance is adjusted to the standard value. Therefore, the Line Impedance Network (LIN Series) is also necessary.

4.4.4 Special Waveform Output

Use of the Remote Controller allows the PCR-L AC Power Supply to output any waveform in addition to a sine wave.
The peak clipped waveform, in which the peak of a sine wave is suppressed, is provided as the standard waveform. This function can be used not only for a variety of electronics devices but also for chemical experiments and production facilities. In special waveform output, the waveform is set to a waveform bank (see Description below) in the special waveform setting mode, and the desired waveform bank is selected for output in the special waveform output mode.



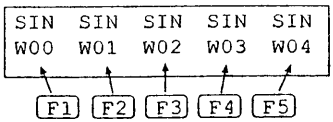
Special Waveform Setting Procedure

A special waveform can be set only when [OUTPUT] is OFF in the Home Position.

- Special waveform setting is available only in the AC or AC + DC mode.
- Confirm that the PCR-L AC Power Supply is in the key-lock mode.

Step 1 Press [ESC] to call the Home Position.

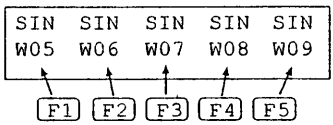
Step 2 Press [SHIFT] + [WAVE] (W-EDIT). In the Initial Setup Status, the following display (first display) appears.



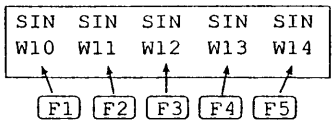
(Sine waves have already been set to waveform banks W00 through W04.)

Step 3 Press [MENU] to select the display to change the waveform banks to be displayed (see Description).

Three displays are provided. These are selected in turn whenever [MENU] is pressed.



(Second display)



(Third display)

- To return to the previous display, press [SHIFT] + [MENU].

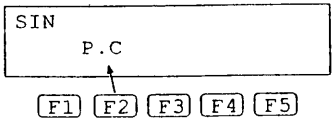
Description Waveform Bank

The Remote Controller stores output voltage waveform data in the internal memory and generates the reference waveform for output voltage by D/A conversion of such data. An area of the memory for one waveform of such waveform data is called a waveform bank. A waveform banks for 15 waveforms are provided; these are numbered W00 to W14. A waveform is selected using such a number. Waveform bank W00 stores the sine wave, which is the reference voltage waveform of the PCR-L AC Power Supply. The W00 content cannot be re-stored. In the Initial Setup Status, the same waveform as that of W00 (that is, a sine wave) is stored in all the waveform banks.

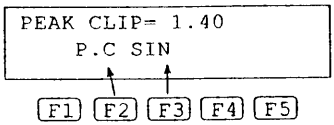
Waveform bank display

SIN: Sine waveform
P.C: Peak clipped waveform
USR: User defined waveform (see the IB11-PCR-L/RS11-PCR-L Operation Manual.)

Step 4 Press one of [F1] to [F5] to select the bank (waveform bank) in which you wish to store waveform data.
This causes the following display to appear.

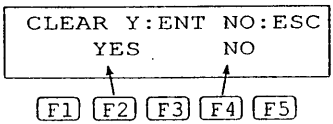


Step 5 Press [F2] (PC) to activate the peak clipped waveform setting mode. This causes the following display to appear.



Step 6 Using the numeric keys or JOG/SHUTTLE, set the peak clipped waveform crest factor (see Description) in the range of 1.10 to 1.40 (for setting using the numeric keys, press [ENTER] to fix the value).

Step 7 To return the peak clipped waveform to a sine wave, press [F3] (SIN). This causes the following display to appear. The press [ENTER] or [F2].



- To return to the screen in step 4, press [ESC].

Step 8 Press [ESC] to exit the special waveform setting mode.

Description Crest Factor

Crest factor is the ratio between AC waveform rms and peak values.

Crest factor = Peak value ÷ rms value

For a sine wave, the crest factor is 1.41.
For a commercial power line voltage waveform, the sine wave crest factor should be 1.41. However, since the peak of the actual waveform is suppressed, the crest factor is between 1.2 and 1.4.

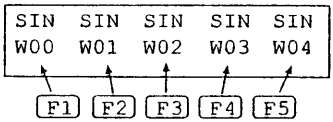
Special Waveform Output Mode Operating Procedure

- Special waveform output is available only in the AC or AC + DC mode.

Step 1 Press [ESC] to call the Home Position.

Step 2 Press [WAVE].

Step 3 Press [MENU] to select the display and change the displayed waveform banks. Three displays are provided. These can be selected in turn whenever [MENU] is pressed.



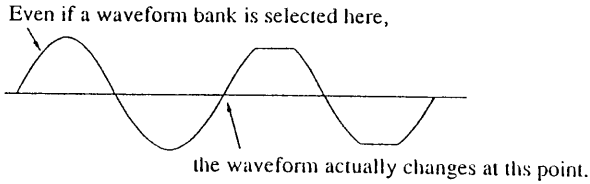
- To return to the previous display, press [SHIFT] + [MENU].

Step 4 Press one of [F1] to [F5] to select the waveform bank you wish to output.

Step 5 This activates the ENTER wait status. Press [ENTER] to initiate operation. Set [OUTPUT] to ON (if [OUTPUT] is not already ON) to output the selected waveform. When any waveform bank other than "W00" is selected, "3" lights in the PCR-L AC Power Supply S-MODE area.

Step 6 Press [ESC] to exit the special waveform output mode.

[Description] The waveform always switches to the selected one after completing a single cycle.



4.4.5 Output Impedance Setting

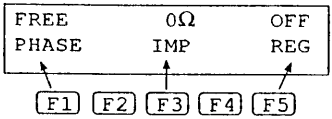
The PCR-L AC Power Supplies have almost 0 ohm output impedance (output resistance); an actual commercial power line has several milliohm to several ohm impedance (resistance). When the Remote Controller is connected to a PCR-L AC Power Supply, the equipment allows output impedance to vary. This enables simulation of an environment similar to that of an actual commercial power line.

Output Impedance Setting Procedure

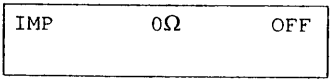
- Output impedance setting is available only in the AC mode.
- Confirm that the PCR-L AC Power Supply is in the key-lock mode.

Step 1 Press [ESC] to call the Home Position.

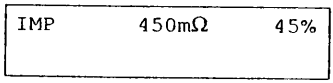
Step 2 Press [MODE]. This causes the following display to appear.



Step 3 Press [F3] (IMP) to select the output impedance setting mode.



Step 4 Using the numeric keys of JOG/SHUTTLE, set output impedance in steps of 1% by regarding the maximum value as 100%. A resistance value equivalent to the set % value is simultaneously displayed.



(Example of the 100 V output range of PCR2000L)

- Setting 0 ohm cancels output impedance setting.
- Switching the PCR-L AC Power Supply output range always sets output impedance to 0 ohm.
- When the output impedance setting function is operating, "2" lights up in the PCR-L AC Power Supply S-MODE area.

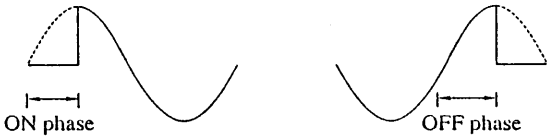
Step 5 Press [ESC] to exit the output impedance setting mode.

This function is backed up inside the PCR-L AC Power Supply. Therefor, once a setting is made using the Remote Controller, the power supply can operate in the same condition continuously even if the device is disconnected, as long as the setting conditions remain the same.

[Description] For the impedance needed for harmonic current analysis, an impedance component is specified. However, only a resistance component is available for this output impedance. Therefore, data obtained by output impedance setting can be used only as a approximation of harmonic current analysis. Accurate data acquisition requires that the Line Impedance Network (LIN Series) should be used.

4.4.6 Output ON/OFF Phase Setting

Output ON/OFF phase setting is available separately. In the Initial Setup Status, no output ON/OFF phase is set in the Remote Controller (phase is random). This function is used if output ON/OFF phase setting is required for a case such as rush current simulation.

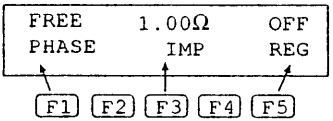


Output ON/OFF Phase Setting Procedure

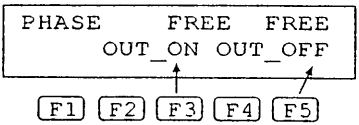
- Output impedance setting is available only in the AC mode.
- Confirm that the PCR-L AC Power Supply is in the key-lock mode.

Step 1 Press [ESC] to call the Home Position.

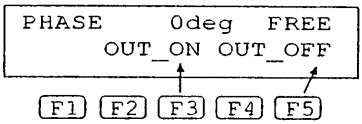
Step 2 Press [MODE]. This causes the following display to appear.



Step 3 Press [F1] (PHASE) to select the output ON/OFF phase setting mode. The following display appears.



Step 4 Press [F3] (OUT_ON) or [F5] (OUT_OFF) to select ON or OFF phase. If [F3] (OUT_ON) is pressed, the following display appears.



If either [F3] (OUT_ON) or [F5] (OUT_OFF) is pressed, the "FREE" (no setting) and "_deg" (setting) indications appears alternately.

Step 5 For selection of "_deg" (setting), set phase using the numeric keys or JOG/SHUTTLE (for setting using the numeric keys, press [ENTER] to fix the selection).
When the output ON/OFF phase setting function is operating, "4" lights in the PCR-L AC Power Supply S-MODE area.

Step 6 Press [ESC] to exit the output ON/OFF phase setting mode.

The set content is backed up inside the PCR-L AC Power Supply. Therefore, once a setting is made using the Remote Controller, the power supply can operate in the same condition continuously even if the device is disconnected, as long as the setting conditions remain the same.

4.4.7 Regulation Adjustment

With regulation adjustment, the output voltage is adjusted automatically in accordance with output current. This function is used for the same purpose as the sensing function. The sensing function measures the sensing-point voltage in order to maintain a constant sensing-point voltage; with regulation adjustment, the voltage drop caused by the output current is calculated in order to raise the output voltage by an amount equivalent to the drop.
This function is used to stabilize voltage at the load end without using sensing cables if there is a considerable distance between the load and the PCR-L AC Power Supply.

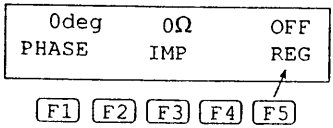
- When regulation adjustment is performed, the PCR-L Power Supply's voltage stability accuracy, distortion factor, and response time decrease below the normal capability. Therefore, this function may not be suitable for some applications. Check the load conditions and other requirements carefully before use.

Regulation Adjustment Setting Procedure

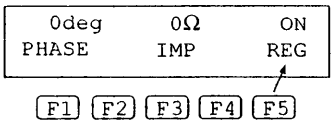
- Connect a load to the PCR-L AC Power Supply in accordance with Chapter 5 of the PCR-L AC Power Supply Operation Manual. Set [OUTPUT] to ON, and set output voltage to the level required at the load end. At the load end, the voltage falls below the voltage level at the PCR-L Power Supply because of a voltage drop caused by the load cable. Prepare a voltmeter to check if the voltage at the load end has the required level. To perform regulation adjustment, the output current must be at least 1/10 of the PCR-L Power Supply rated current
- The voltage that can be corrected using the regulation adjustment function is up to +10% of the PCR-L Power Supply output voltage.
- Confirm that the PCR-L AC Power Supply is in the key-lock mode.

Step 1 Press [ESC] to call the Home Position.

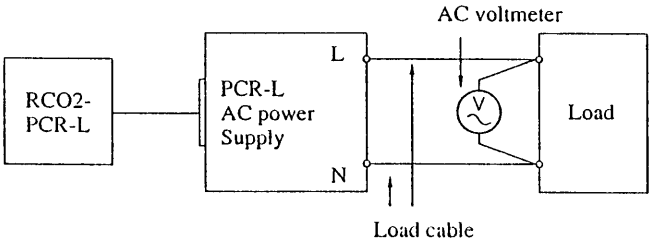
Step 2 Press [MODE]. This causes the following display to appear.



Step 3 Press F5 (pressing this key toggles between ON and OFF) to set regulation adjustment to ON.



Step 4 When this function is set ON, flow current to the load. By observing the voltmeter connected to the load end, adjust the voltage using JOG/SHUTTLE so that the voltage at the load end attains the required voltage value.



Step 5 Press ESC to exit the regulation adjustment setting mode.

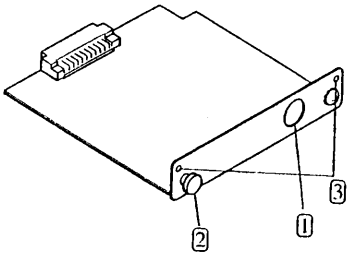
Chapter 5

PART NAMES AND OPERATIONS

Indicates the names of the parts of the RC02-PCR-L and describes these functions of these parts.

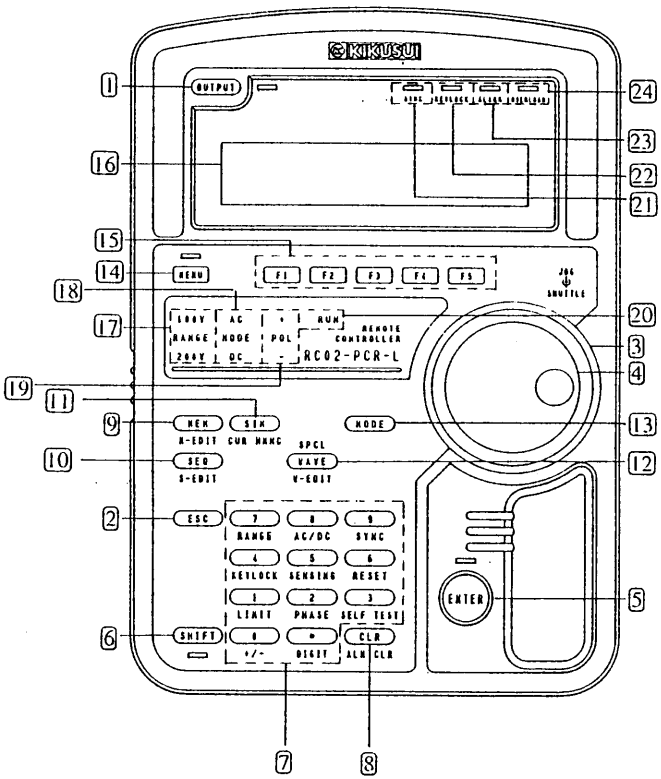
Contents

5.1 Remote Controller Card



1. 8-contacts mini-plug connector
   Used for connecting the remote controller cable.
2. Pull-out knob
   Used to extract the remote controller card from a slot in the PCR-L AC Power Supply.
3. Screw holes
   Holes for screws when installing the remote controller card.

5.2 Remote Controller Box



[1] [OUTPUT]

Selects output ON/OFF. (Whenever this switch is pressed, output ON/OFF is switched alternately.) When output is ON, the LED at the right of the key lights up. Inmediately after the POWER switch is turned ON, output is OFF.

[2] [ESC]

Used to end or cancel each operation.

[3] JOG

Used to set voltage, frequency, and other parameters. This is a rotary encoder with 10 clicks per rotation. The encoder increses the set value when it is turned clockwise; it decreses the set value when it is turned counterclockwise.

[4] SHUTTLE

Used to set voltage, frequency, and other parameters. You can choose from among four levels by setting the change speed, which varies with the angle to which the SHUTTLE is turned. The set value increases when the SHUTTLE is turned clockwise; it decreses when the SHUTTLE is turned counterclockwise.

[5] [ENTER]

Establishes the key operation. The LED above this key blinks during ENTER wait.
This key has the same function as ENT on the PCR-L AC Power Supply control panel.

[6] [SHIFT]

Enables the function set in blue letters below each key. If [SHIFT] is pressed, the LED below this key lights up.

[7] [0],[1],[2],[3], ...[9] (numeric keys) and "[.]"

Used to directly enter the voltage, current and frequency values. ([.]: Decimal point)

- An input value is confirmed when [ENTER] is pressed. It is canceled if [ESC] or [CLR] is pressed.

[SHIFT] + [0] (+/–)

Switches polarity of the DC mode voltage (+/–).
For power line abnormality simulation, this switches the simulation start phase.

[SHIFT] + [1] (LIMIT)

Selects the limit value display mode for voltage, frequency, and current.

[SHIFT] + [2] (PHASE)

Currently not used.

[SHIFT] + [3] (SELFTEST)

Selects the self-test mode in the event of an alarm or overload.

[SHIFT] + [4] (KEYLOCK)

Selects the key lock mode.
In the key lock mode, KEYLOCK lights up, and all keys except [OUTPUT] and [SHIFT] + [4] (KEYLOCK) are disabled.

[SHIFT] + [5] (SENSING)

Selects the sensing mode.

To set the sensig mode, connect the sense wires to the sensing terminals, set the voltage, and press SHIFT + 5 the sening mode allows no voltage change.

[SHIFT] + [6] (RESET)

Reset all set values (including those in the PCR-L AC Power Supply memory). When a reset is performed, all set values return to their Initial Setup Status (factory shipment status).

- A reset can be established by pressing [SHIFT] + [ENTER].

[SHIFT] + [7] (RANGE)

Selects output voltage range.

The "100V" indication in the RANGE area lights up when equipment is in the 100V range, "200V" lights up when it is in the 200V range.

- When [SHIFT] + [7] is pressed, the range indication to be selected blinks. Press [ENTER] to confirm the mode selection.

[SHIFT] + [8] (AC/DC)

Switches the mode among the AC, DC, and AC + DC modes.

The "AC" indication in the MODE area lights up in the AC mode, "DC" lights up in the DC mode, and both "AC" and "DC" light up in the AC + DC mode.

- When [SHIFT] + [8] is pressed, the mode to be selected blinks. Press [ENTER] to confirm the mode selection.

[SHIFT] + [9] (SYNC)

Selects synchronized operation.

[SHIFT] + [.] (DIGIT)

Selects the digit mode that enables a specified or higher digits to change in the voltage setting or frequency setting mode.

In the digit mode, the cursor (under bar) blinks below the digit to change in the LCD's voltage or frequency display area, thereby allowing the relevant digit and higher digits (left of the relevant digit) to be changed.

[8] [CLR]

Cancels the set value and recalls the previous value.

[SHIFT] + [CLR] (ALMCLR)

Clears the alarm status in the event of an alarm.

[9] [MEM]

Calls voltage (and frequency) value (or values) from the memory.

- Pressing [MEM] and then selecting a memory address using the numeric keys or JOG/SHUTTLE will call the address and the voltage (and frequency) value (or values) stored in that address on the LCD.
- Press [ENTER] to confirm the called voltage (and frequency).

SHIFT + MEN (M-EDIT)
Stores the voltage (and frequency) value (or values) in the memory.
Set the voltage (and frequency) you wish to store and the relevant address, then press ENTER. This will store the value (or vlaues) in the memory.

10 SEQ
Selects the sequence execution mode.
- To start the sequence, press SEQ. Then, press F4 (END) to set the end address, F3 (STRT) to set start address, and F5 (LOOP) to set the sequence repetition count. Finally, press F1 (RUN) to start the sequence.

SHIFT + SEQ (S-EDIT)
Selects the sequence setting mode.
In the sequence setting mode, press MENU to change the setting display select the desired item using F1 to F5 and set the sequence data.

11 SIM
Selects the power line abnormality simulation mode.
In the power line abnormality simulation mode, press MENU to switch to the setting display, then select the desired item using F1 to F5 for data setting.

SHIFT + SIM (CUR HMNC)
Selects the harmonic current analysis mode.
In the harmonic current analysis mode, press F1 (ALL/ODD/EVEN) to set the display degree to all degrees, odd-number degrees, or even-number degrees. Then, press F3 (%) or F5 (Arms) to select the harmonic current display method.

12 WAVE
Selects the special waveform output mode.
Special waveform used a peak clipped waveform as the standard.

SHIFT + WAVE (W-EDIT)
Selects special waveform setting mode.

13 MODE
Allows switching of output ON/OFF phase, output impedance setting, and regulation adjustment.

14 MENU
Selects the next display if there are two or more displays.

SHIFT + MENU
Selects the previous screen if there are two or more displays.

15 F1, F2, F3, F4, F5 (function keys)
Used to selct the items displayed on the LCD.

16 **Liquid Crystal Display (LCD)**
A display unit with backlight.

[17] RANGE indication

Displays the output voltage range.
"100V" lights up above the RANGE indication for the 100V range; "200V" lights up for the 200V range.

[18] MODE indication

Displays the output voltage mode.
"AC" lights up in the AC mode, "DC" in the DC mode, and both "AC" and "DC" in the AC + DC mode.

[19] POL indication

Displays the voltage change start polarity. For positive polarity, "+" lights up; for negative polarity, "–" lights up.

[20] RUN indication

Lights up while a sequence is in operation.

[21] SYNC indication

Lights up during execution of synchronized operation.
If synchronized operation is not conducted properly, this indication blinks.

[22] KEYLOCK indication

Lights up in the key-lock mode.

[23] ALARM indication

In the event of alarm, this indication blinks, and an intermittent buzzer tone sounds.

[24] OVERLOAD indication

Lights in the event of an overload (over current).
If the overload continues for a few seconds, output goes OFF. This generates an alarm and sounds intermittent buzzer tones.

[25] Contrast

Used to adjust the brightness of text displayed on the LCD.

[26] 8-contacts mini-plug connectors.

Used for connecting the remote controller cable. Use one of these connectors.

[27] Magnet sheet attachment area

The provided magnet sheet is attached here. Use of the magnet sheet allows the remote controller box to stick on the side of a PCR-L AC Power Supply or other vertical steel surface.

[28] Quick reference card

Briefly describes keys and simulation waveforms.

Chapter 6
MAINTENANCE

Contents Page

6.1 Before Requesting a Repair

If a problem occurs in the RC02-PCR-L, check that problem in accordance with the following table. Also, disconnect the Remote Controller from the PCR-L AC Power Supply and check if the power supply alone operates normally. If it is not possible to recover a normal status, contact your Kikusui agent to request repairs.

Problem	Check item	Results	Possible causes
LCD display does not appear, or display content is not normal.	Check if the remote controller card is correctly inserted into a slot.	NO	Improper remote controller card intallation (see 2.4)
	Check if the remote controller cable is correctly connected	NO	Improper remote controller cable connection (see 2.5)
	Check the contrast adjustment.	NO	Improper contrast adjustment (see 3.1)
The Remote Controller cannot be operated.	Check if the remote controller card is correctly inserted into a slot.	NO	Improper remote controller card installation (see 2.4)
	Check if the remote controller cable has been correctly connected.	NO	Improper remote controller cable connection (see 2.5)
	Check if the PCR-L AC Power Supply is in the key-lock mode.	NO	Operation via the Remote Controller is invalid. (Countermeasure: Press [SHIFT] + [4] (KEYLOCK) on the PCR-L Power Supply control panel.)
	Check if the PCR-L AC Power Supply display unit indicates "GP-IB" or "RS-232C."	YES	The PCR-L AC Power Supply is under control of the GP-IB Interface or RS-232C Interface.

Chapter 7
SPECIFICATIONS

List the specifications.

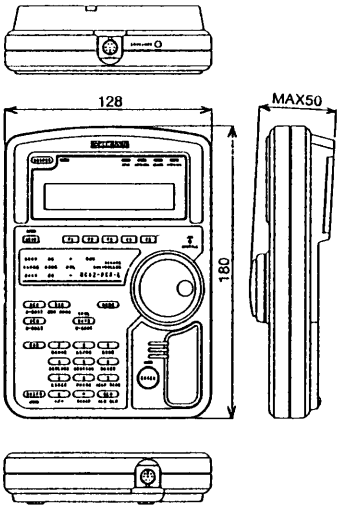
Contents Page

7.1 Specifications

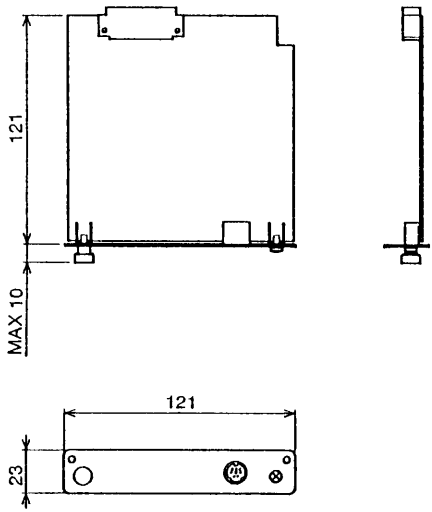
Item		Setting range	Resolution	Setting accuracy
Setting functions				
Power line abnormality simulation				
T1	× 1deg	0deg ~ 360deg	1deg	For T2 = T4 = 0, 1 deg For T2 ≠ 0 or T4 ≠ 0, 1 mS
	× 1mS	0mS ~ 999.9mS	0.1ms	For T2 = T4 = 0, ±(1 × 10 $^{-3}$ + 0.1 mS) For T2 ≠ 0 or T4 ≠ 0, ± (1 × 10^{-3} + 1 mS)
T2	× 1	0mS ~ 9999mS	1mS	± (1 × 10^{-3} + 1 mS)
	× 10	0.00mS ~ 99.99S		
T3	× 1	0.0mS ~ 999.9mS	0.1mS	For T2 = T4 = 0, ±(1 × 10^{-3} + 0.1 mS) For T2 ≠ 0 or T4 ≠ 0, ± (1 × 10^{-3} + 1 mS)
	× 10	0mS ~ 9999mS	1mS	
T4	× 1	0mS ~ 9999mS	1mS	± (1 × 10^{-3} + 1 mS)
	× 10	0.00mS ~ 99.99S		
T5	× 1	0mS ~ 9999mS	1mS	1 cycle
	× 10	0.00S ~ 99.99mS	10mS	
N	× 1	0 to 9999 cycles	1 cycle	1 cycle
	× 10	0 to 99990 cycles	10 cycles	
	× 100	0 to 999900 cycles	100 cycles	
V (T3)		Same as output voltage setting range	0.1V	—
RPT		0 to 9998 times or ∞	Once	Once
Sequence operation				
ADR		0 ~ 99	1	—
FRQ		Same as output frequency setting range	Same as at the left	Same as at the left
Vac		Same as output voltage setting range	Same as at the left	Same as at the left
TIME	HOUR	0 hr to 999 hrs 59 min	1 min	± (1 × 10^{-3} + 0.5 min)
	MIN	0 min to 999 min 59 sec	1 S	± (1 × 10^{-3} + 0.5 S)
	SEC	0 sec to 999.999 sec	1 mS	± (1 × 10^{-3} + 0.5 mS)
WAVE		Same as special waveform output	Same as at the left	—
IMP		Same as output impedance	Same as at the left	Same as at the left
Vdc		Same as output voltage setting range	Same as at the left	Same as at the left

Item		Setting range	Resolution	Setting accuracy
AC + DC mode				
Voltage setting		AC voltage setting range is the same as that of AC mode. DC voltage setting range is the same as that of DC mode. However, the peak value for AC + DC voltage should be within the DC voltage setting range.	Same as AC and DC modes	—
Maximum current		Same as that of DC mode	—	—
Power capacity		Same as that of DC mode	—	—
Frequency		Same as that of AC mode	Same as at the left	—
Special waveform output				
Waveform bank		0 to 14 (0 for read only)	0	—
Crest factor		1.10 ~ 1.40	0.01	0.01
Output impedance setting				
PCR500L	100 V range,	0Ω ~ 4.0Ω	40 m Ω	± (20% + 80 m Ω)
	200 V range	0Ω ~ 16.0Ω	160 m Ω	± (20% + 320 m Ω)
PCR1000L	100 V range,	0Ω ~ 2.0Ω	20 m Ω	± (20% + 40 m Ω)
	200 V range	0Ω ~ 8.0Ω	80 m Ω	± (20% + 160 m Ω)
PCR2000L	100 V range,	0Ω ~ 1.0Ω	10 m Ω	± (20% + 20 m Ω)
	200 V range	0Ω ~ 4.0Ω	40 m Ω	± (20% + 80 m Ω)
PCR4000L	100 V range,	0Ω ~ 0.5Ω	5 m Ω	± (20% + 10 m Ω)
	200 V range	0Ω ~ 2.0Ω	20 m Ω	± (20% + 40 m Ω)
PCR6000L	100 V range,	0Ω ~ 0.333Ω	3.33 m Ω	± (20% + 6.67 m Ω)
	200 V range	0Ω ~ 1.333Ω	13.33 m Ω	± (20% + 26.67 m Ω)
Output ON/OFF phase setting		0deg ~ 360deg	1deg	1deg
Measurement function				
Harmonic current analysis				
Arms indication		—	Same as that of ammeter	Same as that of ammeter
% indication		—	0.1%	0.5%
Indicator				
Voltampere measurement		—	0.01 VA minimum (changes with VA value)	Same as that of wattmeter
Power-factor measurement		—	0.01	Same as that of wattmeter
Peak holding current measurement		—	Same as that of peak ammeter	Within ± (2% of r.d.g + 16 d) (from 5% of maximum rated current to maximum rated peak current at normal temperature)

7.2 Dimensions



Remote controller box



Unit: mm

Remote controller card

APPENDIX

Appendix 1 Hierarchy of Remote Controller Key Operating Menus

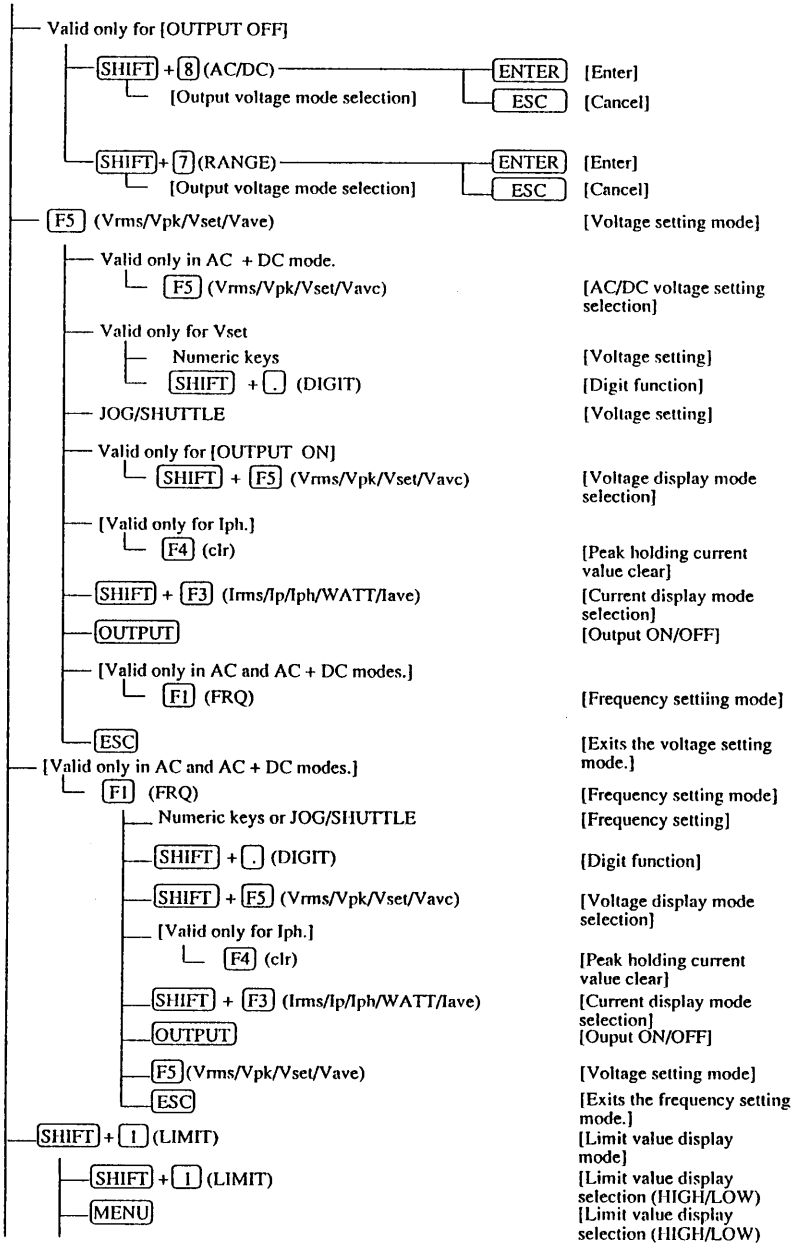
Contents

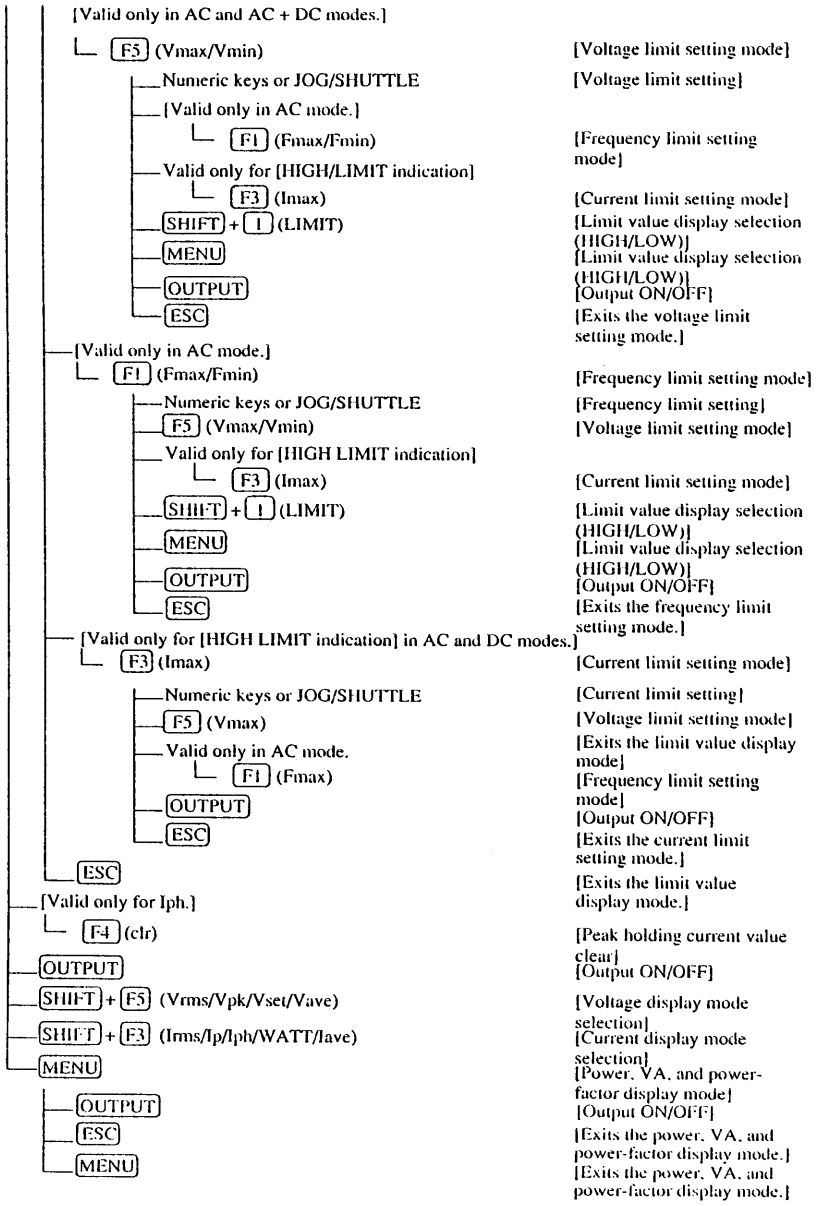
Appendix 2 Power Line Abnormality Simulation Operation Setting Sheet

Appendix 3 Sequence Operation Setting Sheet

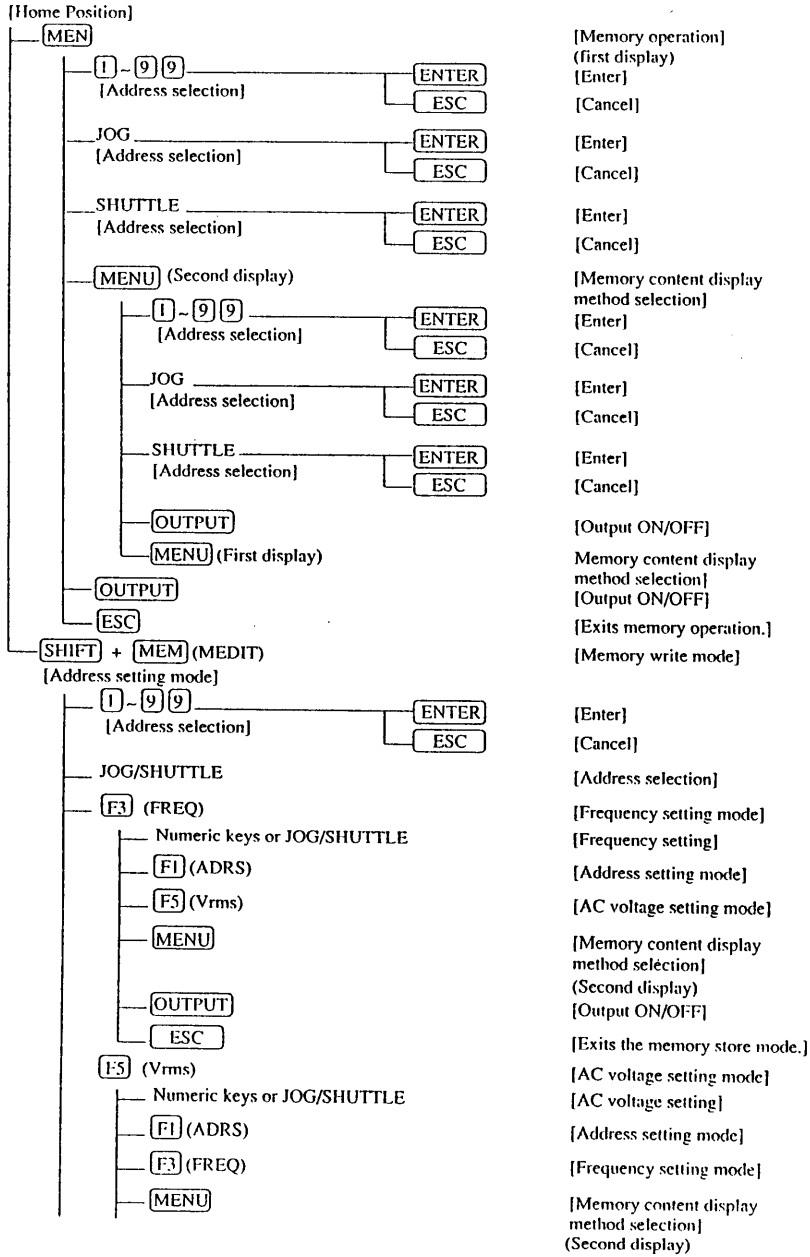
Appendix 1 Hierarchy of Remote Controller Key Operating Menus

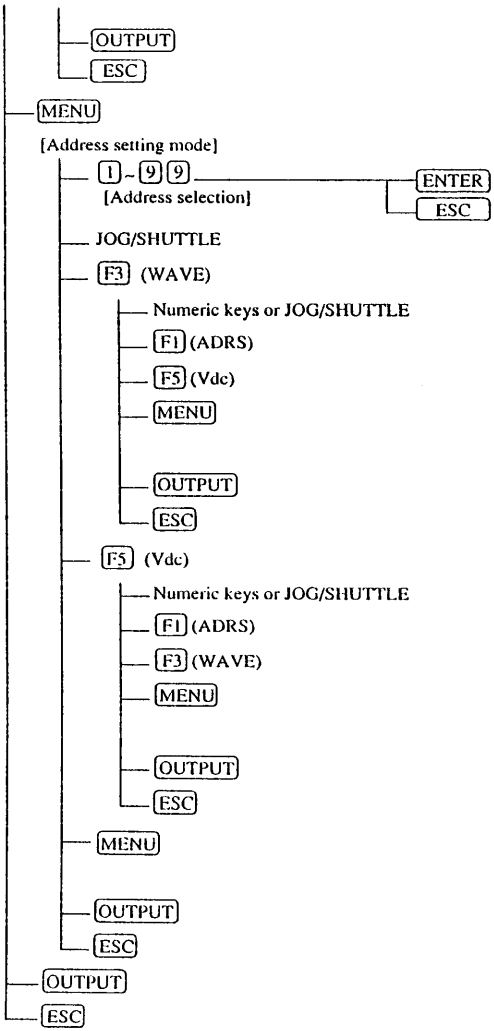
(1) Hierarchy of Voltage, Current, Frequecy and Other Factor Setting and Display Operating Menus



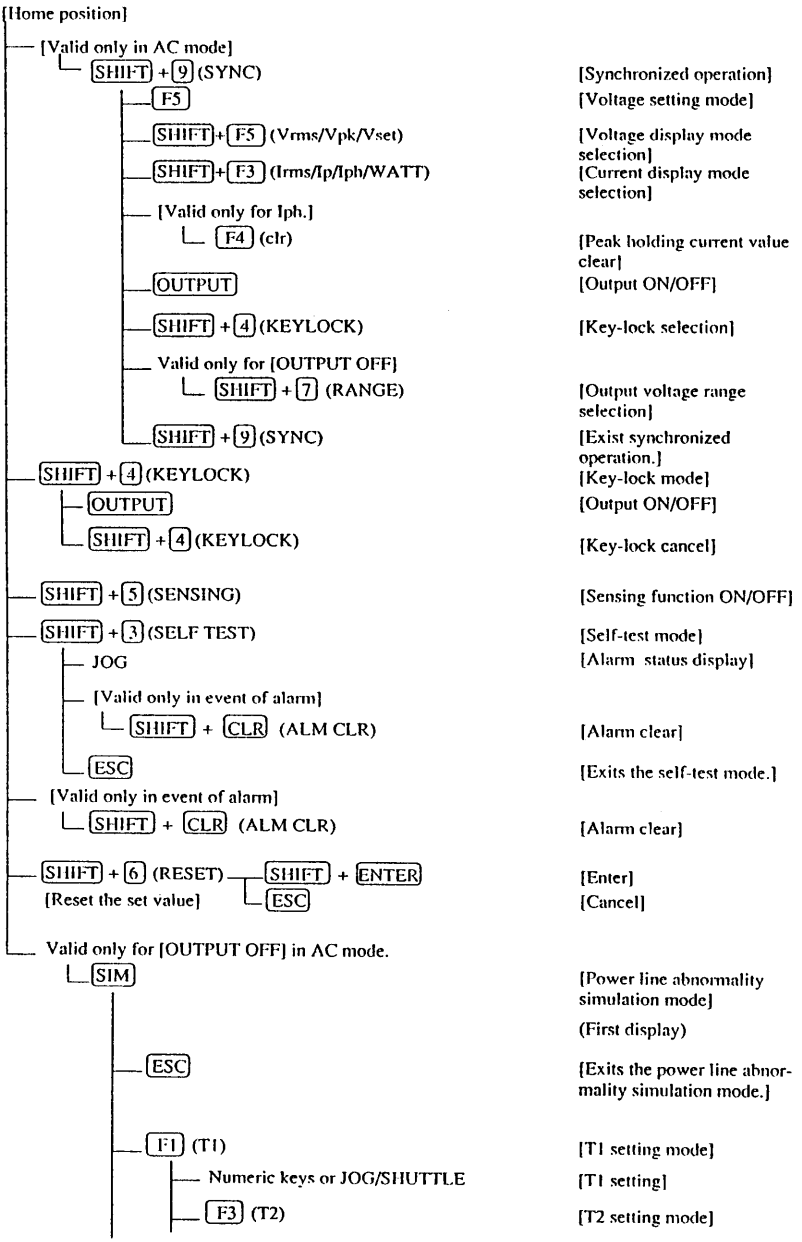

[Valid only in AC and AC + DC modes.]
F5 (Vmax/Vmin) [Voltage limit setting mode]
Numeric keys or JOG/SHUTTLE [Voltage limit setting]
[Valid only in AC mode.]
F1 (Fmax/Fmin) [Frequency limit setting mode]
Valid only for [HIGH/LIMIT indication]
F3 (Imax) [Current limit setting mode]
SHIFT + 1 (LIMIT) [Limit value display selection (HIGH/LOW)]
MENU [Limit value display selection (HIGH/LOW)]
OUTPUT [Output ON/OFF]
ESC [Exits the voltage limit setting mode.]
[Valid only in AC mode.]
F1 (Fmax/Fmin) [Frequency limit setting mode]
Numeric keys or JOG/SHUTTLE [Frequency limit setting]
F5 (Vmax/Vmin) [Voltage limit setting mode]
Valid only for [HIGH LIMIT indication]
F3 (Imax) [Current limit setting mode]
SHIFT + 1 (LIMIT) [Limit value display selection (HIGH/LOW)]
MENU [Limit value display selection (HIGH/LOW)]
OUTPUT [Output ON/OFF]
ESC [Exits the frequency limit setting mode.]
[Valid only for [HIGH LIMIT indication] in AC and DC modes.]
F3 (Imax) [Current limit setting mode]
Numeric keys or JOG/SHUTTLE [Current limit setting]
F5 (Vmax) [Voltage limit setting mode]
Valid only in AC mode. [Exits the limit value display mode]
F1 (Fmax) [Frequency limit setting mode]
OUTPUT [Output ON/OFF]
ESC [Exits the current limit setting mode.]
ESC [Exits the limit value display mode.]
[Valid only for Iph.]
F4 (clr) [Peak holding current value clear]
OUTPUT [Output ON/OFF]
SHIFT + F5 (Vrms/Vpk/Vset/Vave) [Voltage display mode selection]
SHIFT + F3 (Irms/Ip/Iph/WATT/Iave) [Current display mode selection]
MENU [Power, VA, and power-factor display mode]
OUTPUT [Output ON/OFF]
ESC [Exits the power, VA, and power-factor display mode.]
MENU [Exits the power, VA, and power-factor display mode.]

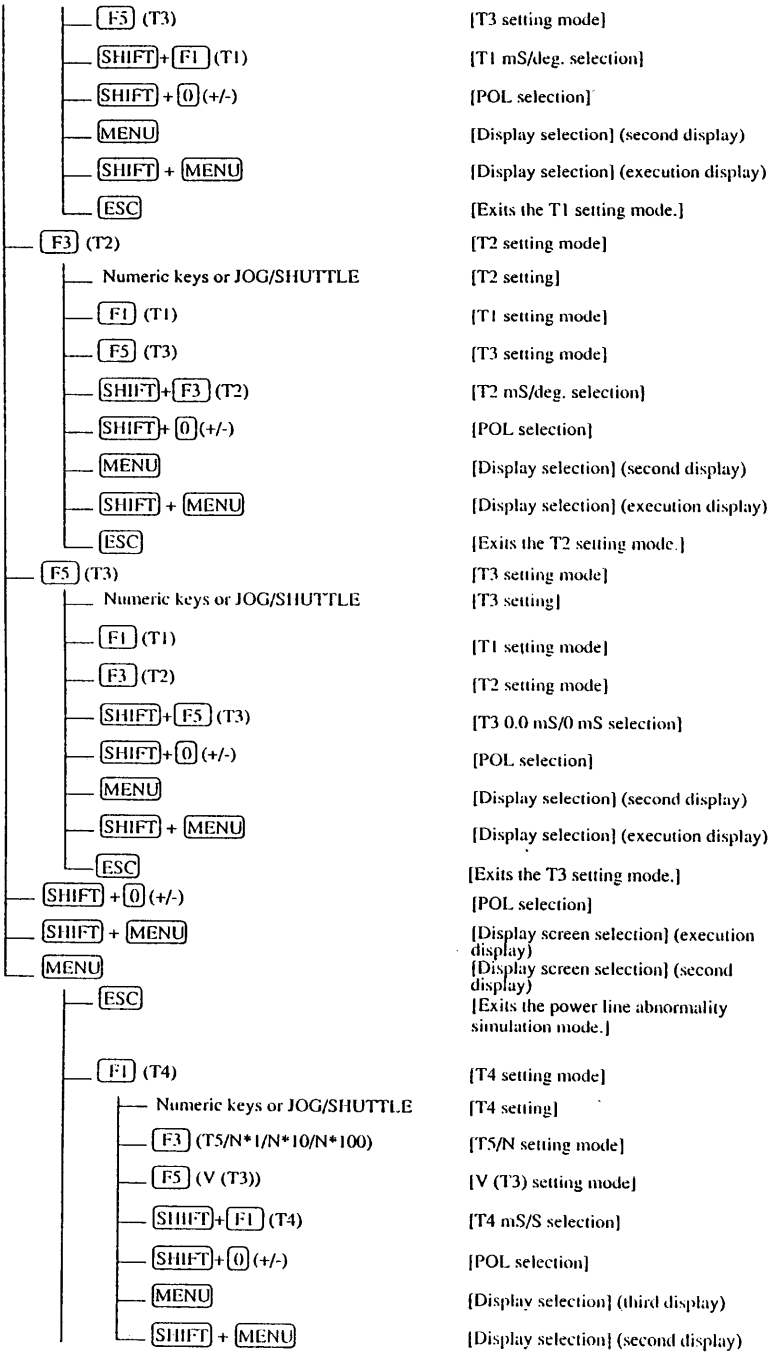
(2) Hierarchy of Memory Operating Menu

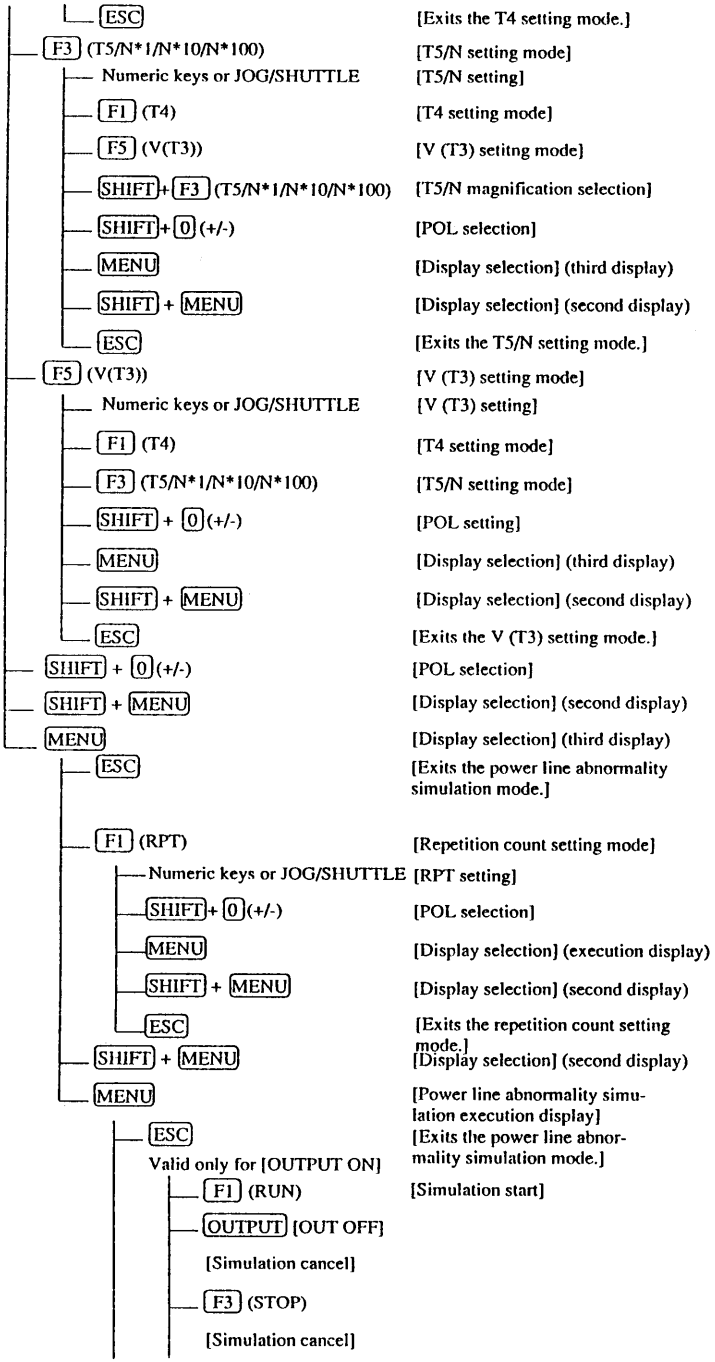


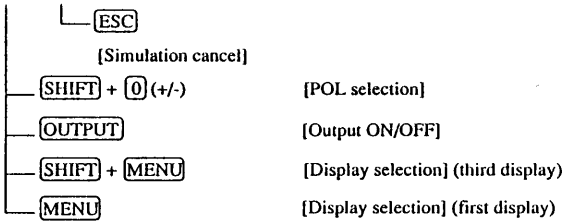

OUTPUT
[Output ON/OFF]
ESC
[Exits the memory store mode]
MENU
[Memory content display method selection]
(Second display)
[Address setting mode]
1 - 9 9
[Address selection]
ENTER
[Enter]
ESC
[Cancel]
JOG/SHUTTLE
[Address selection]
F3 (WAVE)
[Waveform bank setting mode]
Numeric keys or JOG/SHUTTLE
[Waveform bank setting]
F1 (ADRS)
[Address setting mode]
F5 (Vdc)
[DC voltage setting mode]
MENU
[Memory content display method selection]
(First screen)
OUTPUT
[Output ON/OFF]
ESC
[Exits the memory store mode]
F5 (Vdc)
[DC voltage setting mode]
Numeric keys or JOG/SHUTTLE
[DC voltage setting]
F1 (ADRS)
[Address setting mode]
F3 (WAVE)
[Waveform bank setting mode]
MENU
[Memory content display method selection]
(First display)
OUTPUT
[Output ON/OFF]
ESC
[Exits the memory store mode.]
MENU
[Memory display method selection]
(First display)
OUTPUT
[Output ON/OFF]
ESC
[Exits the memory store mode.]
OUTPUT
[Output ON/OFF]
ESC
[Exits the memory store mode.]

(3) Hierarchy of Power Line Abnormality Simulation and Other Operating Menus

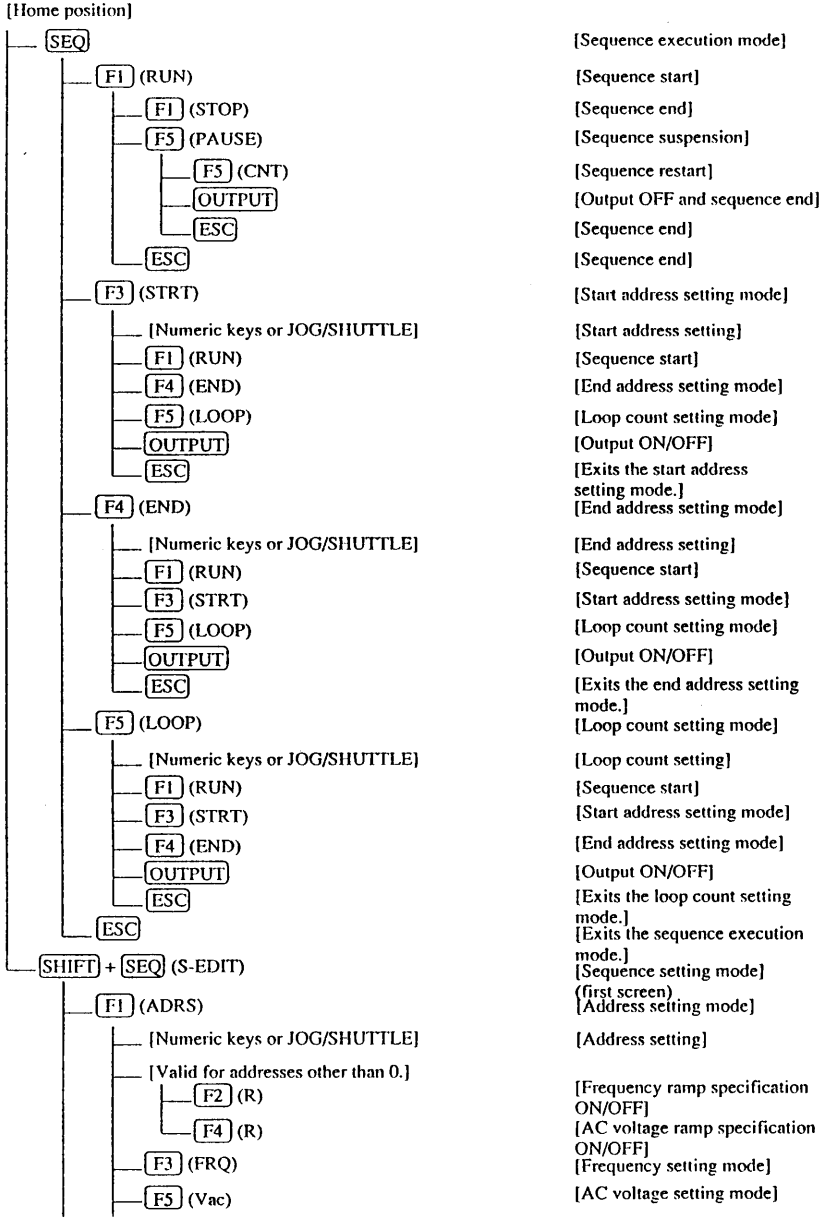


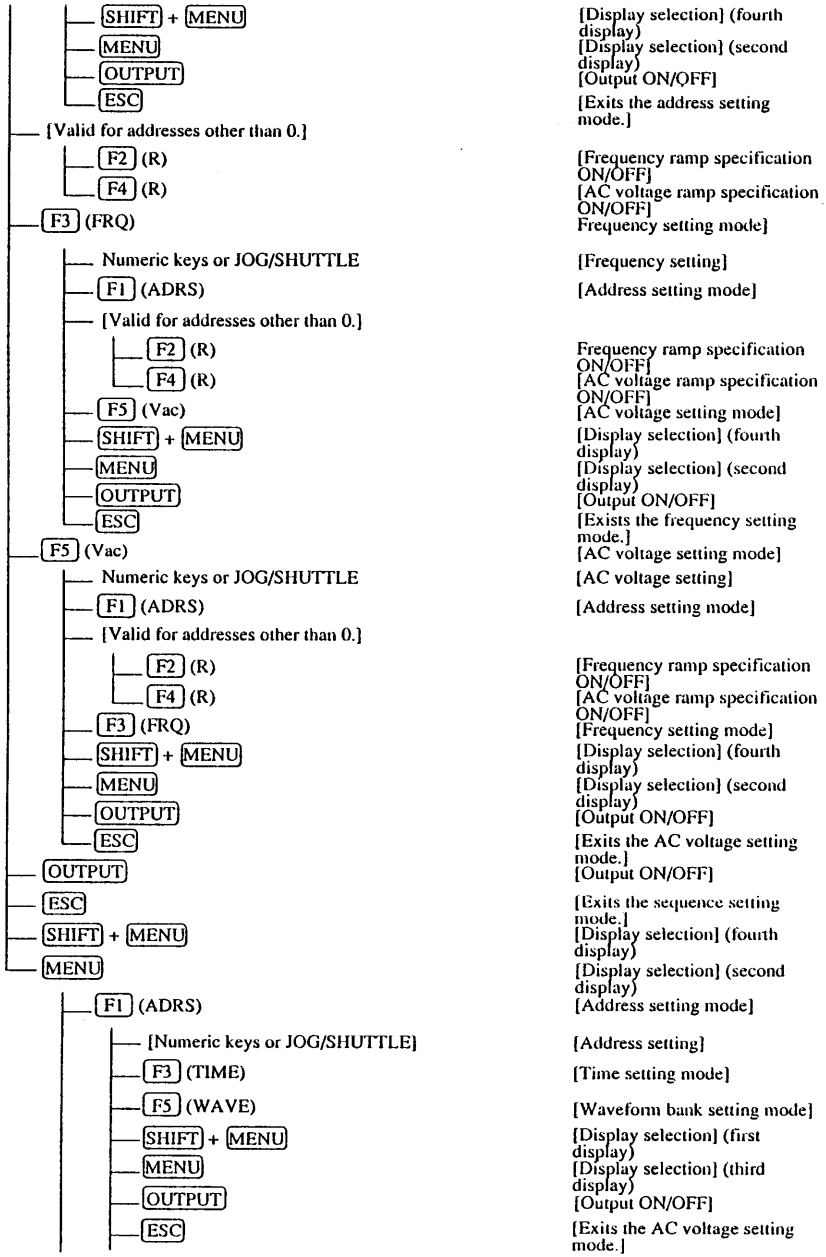

F5 (T3) [T3 setting mode]
SHIFT+F1 (T1) [T1 mS/deg. selection]
SHIFT + 0 (+/-) [POL selection]
MENU [Display selection] (second display)
SHIFT + MENU [Display selection] (execution display)
ESC [Exits the T1 setting mode.]
F3 (T2) [T2 setting mode]
Numeric keys or JOG/SHUTTLE [T2 setting]
F1 (T1) [T1 setting mode]
F5 (T3) [T3 setting mode]
SHIFT+F3 (T2) [T2 mS/deg. selection]
SHIFT+ 0 (+/-) [POL selection]
MENU [Display selection] (second display)
SHIFT + MENU [Display selection] (execution display)
ESC [Exits the T2 setting mode.]
F5 (T3) [T3 setting mode]
Numeric keys or JOG/SHUTTLE [T3 setting]
F1 (T1) [T1 setting mode]
F3 (T2) [T2 setting mode]
SHIFT+F5 (T3) [T3 0.0 mS/0 mS selection]
SHIFT+0 (+/-) [POL selection]
MENU [Display selection] (second display)
SHIFT + MENU [Display selection] (execution display)
ESC [Exits the T3 setting mode.]
SHIFT +0 (+/-) [POL selection]
SHIFT + MENU [Display screen selection] (execution display)
MENU [Display screen selection] (second display)
ESC [Exits the power line abnormality simulation mode.]
F1 (T4) [T4 setting mode]
Numeric keys or JOG/SHUTTLE [T4 setting]
F3 (T5/N*1/N*10/N*100) [T5/N setting mode]
F5 (V (T3)) [V (T3) setting mode]
SHIFT+F1 (T4) [T4 mS/S selection]
SHIFT+0 (+/-) [POL selection]
MENU [Display selection] (third display)
SHIFT + MENU [Display selection] (second display)

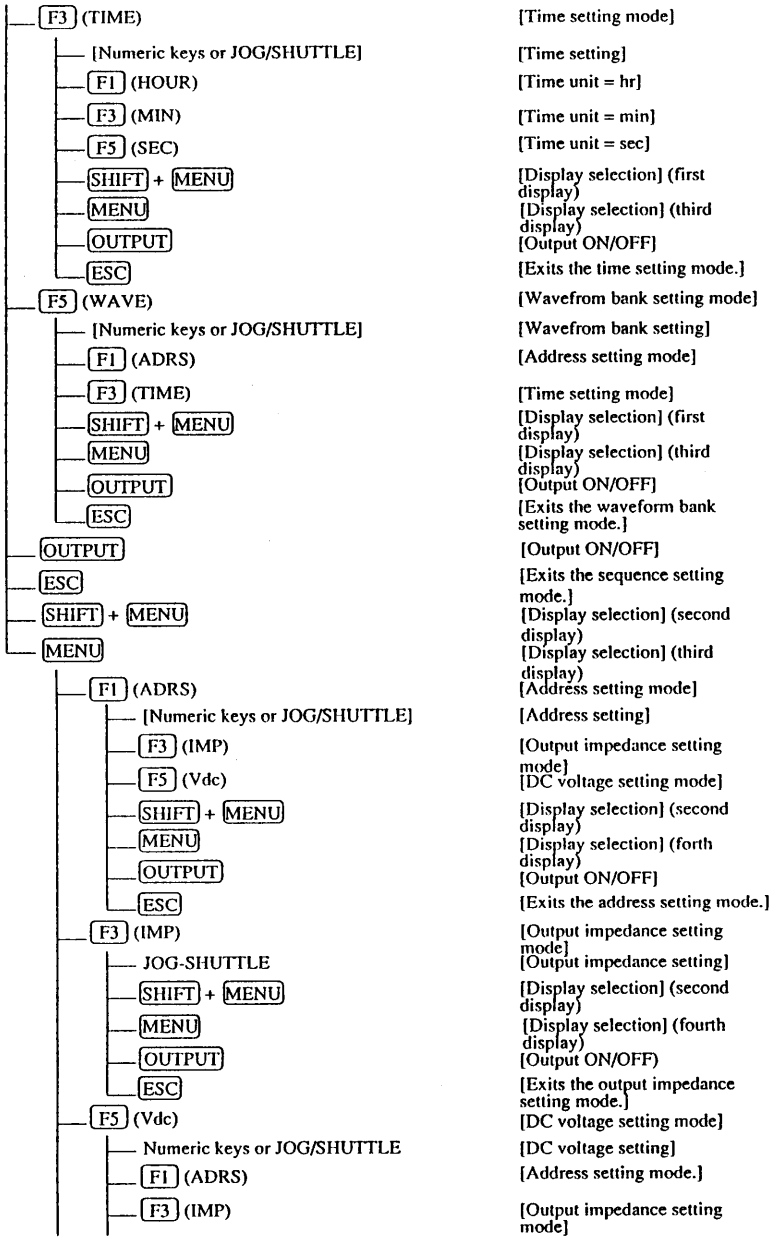

ESC
[Exits the T4 setting mode.]
F3 (T5/N*1/N*10/N*100)
[T5/N setting mode]
Numeric keys or JOG/SHUTTLE
[T5/N setting]
F1 (T4)
[T4 setting mode]
F5 (V(T3))
[V (T3) setitng mode]
SHIFT+F3 (T5/N*1/N*10/N*100)
[T5/N magnification selection]
SHIFT+0 (+/-)
[POL selection]
MENU
[Display selection] (third display)
SHIFT + MENU
[Display selection] (second display)
ESC
[Exits the T5/N setting mode.]
F5 (V(T3))
[V (T3) setting mode]
Numeric keys or JOG/SHUTTLE
[V (T3) setting]
F1 (T4)
[T4 setting mode]
F3 (T5/N*1/N*10/N*100)
[T5/N setting mode]
SHIFT + 0 (+/-)
[POL setting]
MENU
[Display selection] (third display)
SHIFT + MENU
[Display selection] (second display)
ESC
[Exits the V (T3) setting mode.]
SHIFT + 0 (+/-)
[POL selection]
SHIFT + MENU
[Display selection] (second display)
MENU
[Display selection] (third display)
ESC
[Exits the power line abnormality simulation mode.]
F1 (RPT)
[Repetition count setting mode]
Numeric keys or JOG/SHUTTLE
[RPT setting]
SHIFT+0 (+/-)
[POL selection]
MENU
[Display selection] (execution display)
SHIFT + MENU
[Display selection] (second display)
ESC
[Exits the repetition count setting mode.]
SHIFT + MENU
[Display selection] (second display)
MENU
[Power line abnormality simulation execution display]
ESC
[Exits the power line abnormality simulation mode.]
Valid only for [OUTPUT ON]
F1 (RUN)
[Simulation start]
OUTPUT [OUT OFF]
[Simulation cancel]
F3 (STOP)
[Simulation cancel]

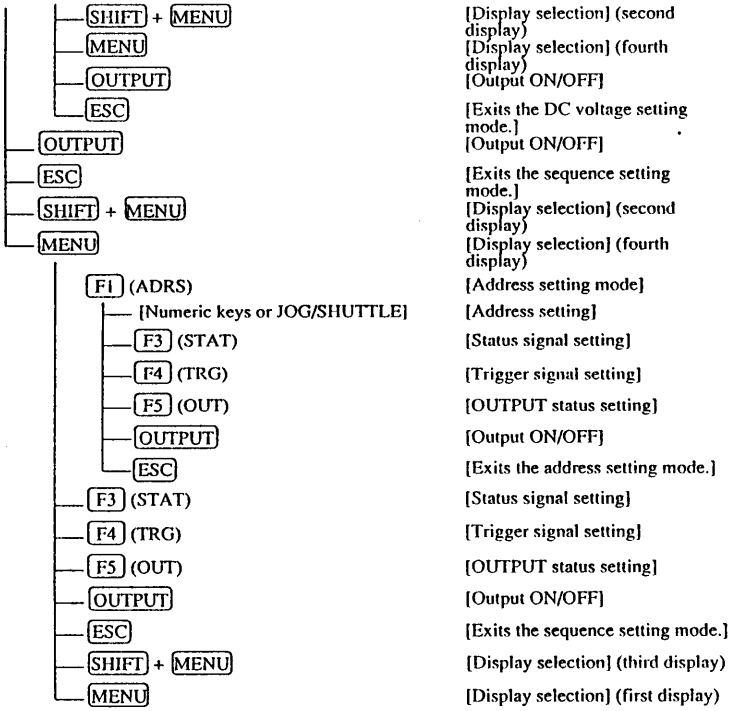

ESC
[Simulation cancel]
SHIFT + 0 (+/-)
[POL selection]
OUTPUT
[Output ON/OFF]
SHIFT + MENU
[Display selection] (third display)
MENU
[Display selection] (first display)

(4) Hierarchy of Sequence Operating Menu

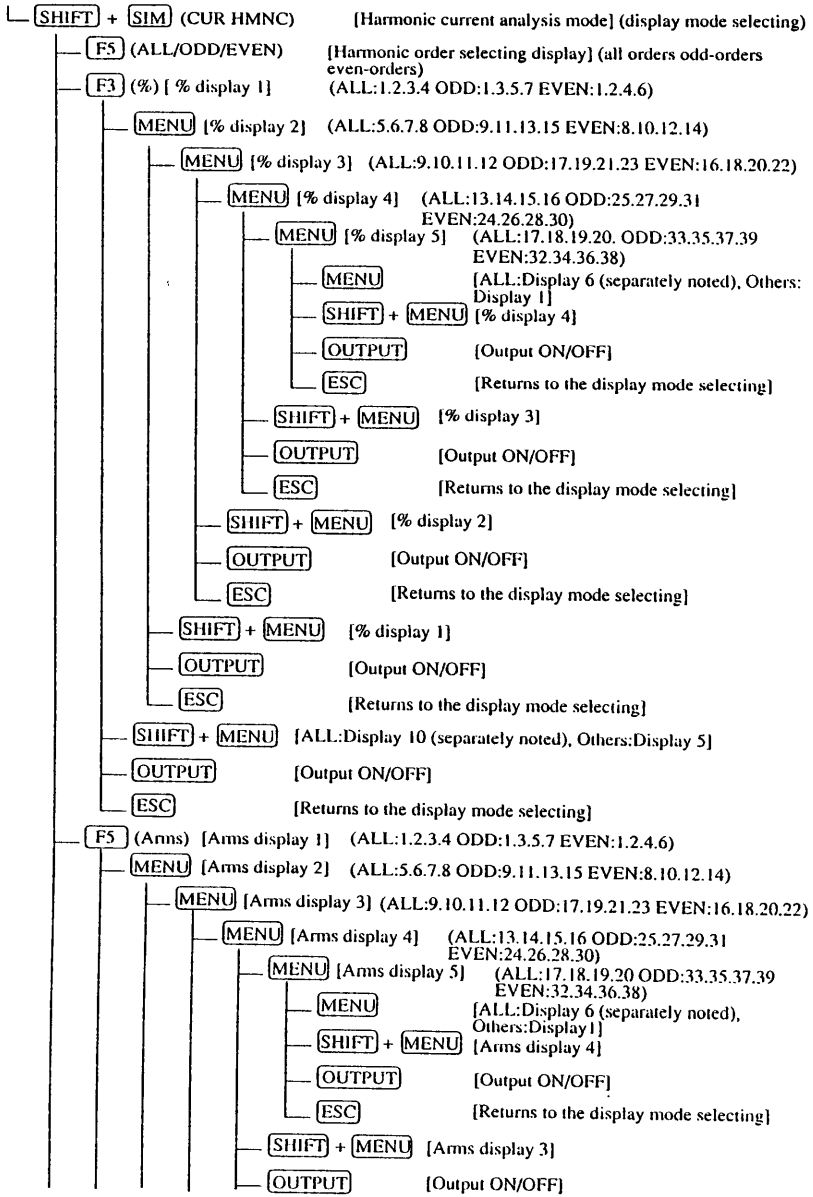


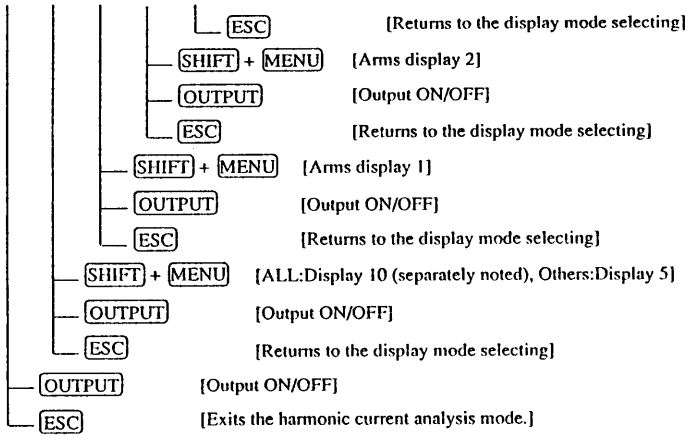

SHIFT + MENU
[Display selection] (fourth display)
MENU
[Display selection] (second display)
OUTPUT
[Output ON/OFF]
ESC
[Exits the address setting mode.]
[Valid for addresses other than 0.]
F2 (R)
[Frequency ramp specification ON/OFF]
F4 (R)
[AC voltage ramp specification ON/OFF]
F3 (FRQ)
Frequency setting mode]
Numeric keys or JOG/SHUTTLE
[Frequency setting]
F1 (ADRS)
[Address setting mode]
[Valid for addresses other than 0.]
F2 (R)
Frequency ramp specification ON/OFF]
F4 (R)
[AC voltage ramp specification ON/OFF]
F5 (Vac)
[AC voltage setting mode]
SHIFT + MENU
[Display selection] (fourth display)
MENU
[Display selection] (second display)
OUTPUT
[Output ON/OFF]
ESC
[Exists the frequency setting mode.]
F5 (Vac)
[AC voltage setting mode]
Numeric keys or JOG/SHUTTLE
[AC voltage setting]
F1 (ADRS)
[Address setting mode]
[Valid for addresses other than 0.]
F2 (R)
[Frequency ramp specification ON/OFF]
F4 (R)
[AC voltage ramp specification ON/OFF]
F3 (FRQ)
[Frequency setting mode]
SHIFT + MENU
[Display selection] (fourth display)
MENU
[Display selection] (second display)
OUTPUT
[Output ON/OFF]
ESC
[Exits the AC voltage setting mode.]
OUTPUT
[Output ON/OFF]
ESC
[Exits the sequence setting mode.]
SHIFT + MENU
[Display selection] (fourth display)
MENU
[Display selection] (second display)
F1 (ADRS)
[Address setting mode]
[Numeric keys or JOG/SHUTTLE]
[Address setting]
F3 (TIME)
[Time setting mode]
F5 (WAVE)
[Waveform bank setting mode]
SHIFT + MENU
[Display selection] (first display)
MENU
[Display selection] (third display)
OUTPUT
[Output ON/OFF]
ESC
[Exits the AC voltage setting mode.]

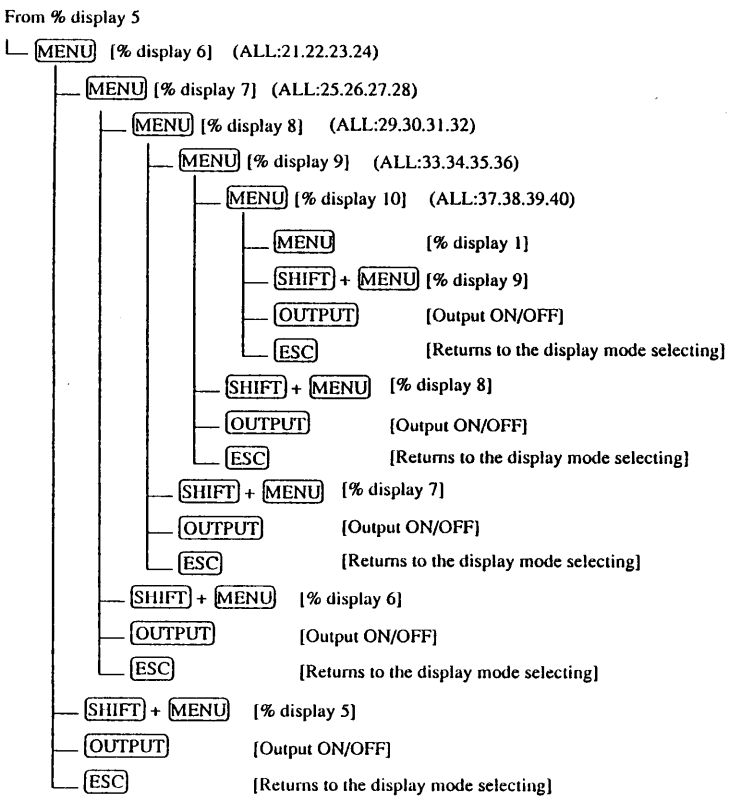

F3 (TIME)
[Time setting mode]
[Numeric keys or JOG/SHUTTLE]
[Time setting]
F1 (HOUR)
[Time unit = hr]
F3 (MIN)
[Time unit = min]
F5 (SEC)
[Time unit = sec]
SHIFT + MENU
[Display selection] (first display)
MENU
[Display selection] (third display)
OUTPUT
[Output ON/OFF]
ESC
[Exits the time setting mode.]
F5 (WAVE)
[Wavefrom bank setting mode]
[Numeric keys or JOG/SHUTTLE]
[Wavefrom bank setting]
F1 (ADRS)
[Address setting mode]
F3 (TIME)
[Time setting mode]
SHIFT + MENU
[Display selection] (first display)
MENU
[Display selection] (third display)
OUTPUT
[Output ON/OFF]
ESC
[Exits the waveform bank setting mode.]
OUTPUT
[Output ON/OFF]
ESC
[Exits the sequence setting mode.]
SHIFT + MENU
[Display selection] (second display)
MENU
[Display selection] (third display)
F1 (ADRS)
[Address setting mode]
[Numeric keys or JOG/SHUTTLE]
[Address setting]
F3 (IMP)
[Output impedance setting mode]
F5 (Vdc)
[DC voltage setting mode]
SHIFT + MENU
[Display selection] (second display)
MENU
[Display selection] (forth display)
OUTPUT
[Output ON/OFF]
ESC
[Exits the address setting mode.]
F3 (IMP)
[Output impedance setting mode]
JOG-SHUTTLE
[Output impedance setting]
SHIFT + MENU
[Display selection] (second display)
MENU
[Display selection] (fourth display)
OUTPUT
[Output ON/OFF]
ESC
[Exits the output impedance setting mode.]
F5 (Vdc)
[DC voltage setting mode]
Numeric keys or JOG/SHUTTLE
[DC voltage setting]
F1 (ADRS)
[Address setting mode.]
F3 (IMP)
[Output impedance setting mode]


SHIFT + MENU
[Display selection] (second display)
MENU
[Display selection] (fourth display)
OUTPUT
[Output ON/OFF]
ESC
[Exits the DC voltage setting mode.]
OUTPUT
[Output ON/OFF]
ESC
[Exits the sequence setting mode.]
SHIFT + MENU
[Display selection] (second display)
MENU
[Display selection] (fourth display)
F1 (ADRS)
[Address setting mode]
[Numeric keys or JOG/SHUTTLE]
[Address setting]
F3 (STAT)
[Status signal setting]
F4 (TRG)
[Trigger signal setting]
F5 (OUT)
[OUTPUT status setting]
OUTPUT
[Output ON/OFF]
ESC
[Exits the address setting mode.]
F3 (STAT)
[Status signal setting]
F4 (TRG)
[Trigger signal setting]
F5 (OUT)
[OUTPUT status setting]
OUTPUT
[Output ON/OFF]
ESC
[Exits the sequence setting mode.]
SHIFT + MENU
[Display selection] (third display)
MENU
[Display selection] (first display)

(5) Hierarchy of Harmonic Current Analysis Operating Menu



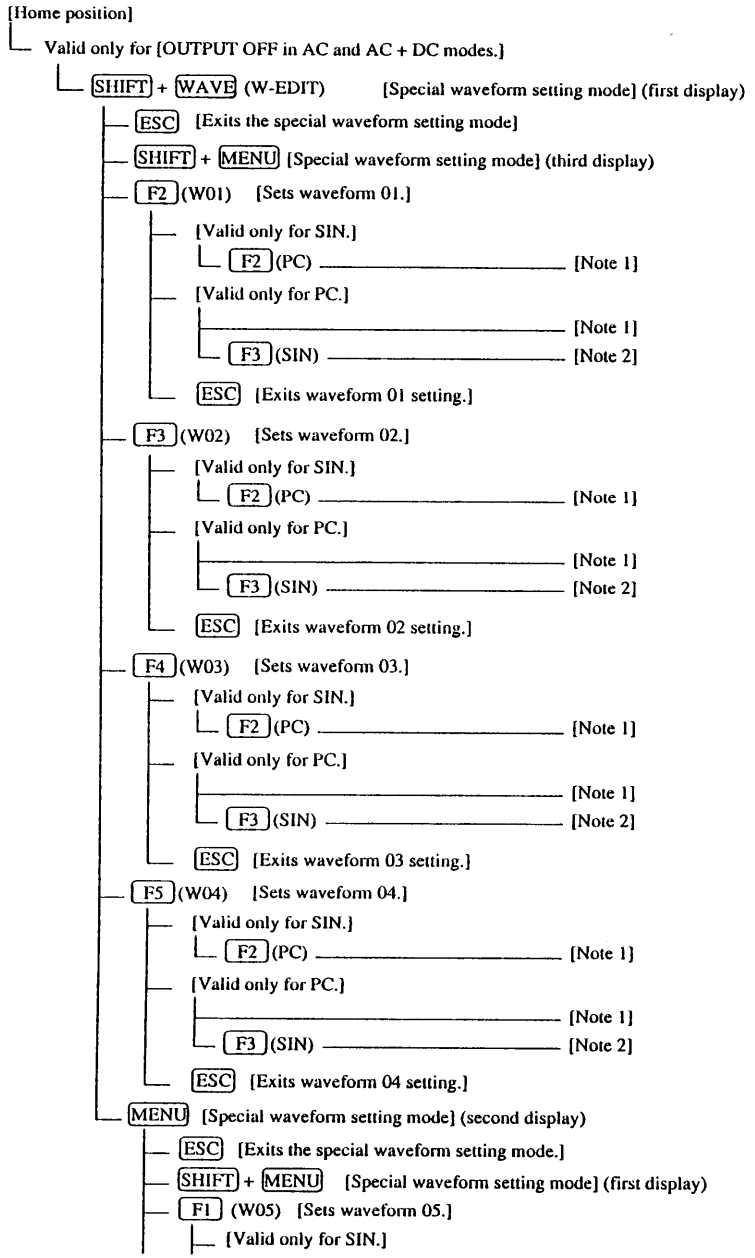

ESC [Returns to the display mode selecting]
SHIFT + MENU [Arms display 2]
OUTPUT [Output ON/OFF]
ESC [Returns to the display mode selecting]
SHIFT + MENU [Arms display 1]
OUTPUT [Output ON/OFF]
ESC [Returns to the display mode selecting]
SHIFT + MENU [ALL:Display 10 (separately noted), Others:Display 5]
OUTPUT [Output ON/OFF]
ESC [Returns to the display mode selecting]
OUTPUT [Output ON/OFF]
ESC [Exits the harmonic current analysis mode.]

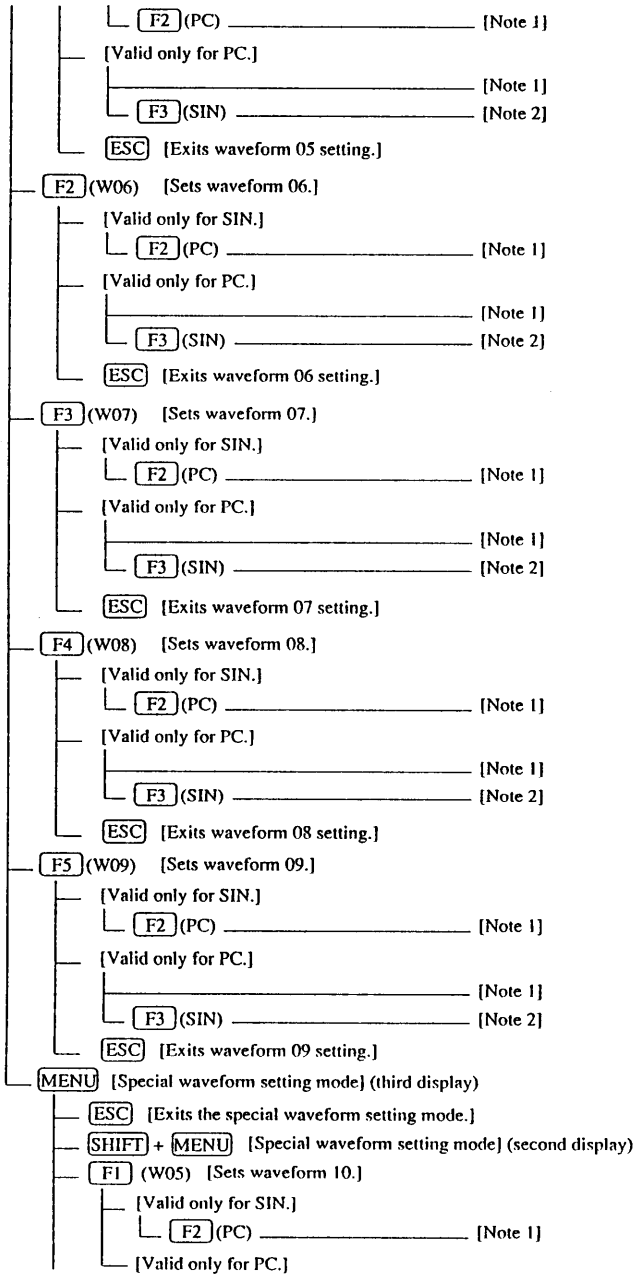

From % display 5
MENU [% display 6] (ALL:21.22.23.24)
MENU [% display 7] (ALL:25.26.27.28)
MENU [% display 8] (ALL:29.30.31.32)
MENU [% display 9] (ALL:33.34.35.36)
MENU [% display 10] (ALL:37.38.39.40)
MENU [% display 1]
SHIFT + MENU [% display 9]
OUTPUT [Output ON/OFF]
ESC [Returns to the display mode selecting]
SHIFT + MENU [% display 8]
OUTPUT [Output ON/OFF]
ESC [Returns to the display mode selecting]
SHIFT + MENU [% display 7]
OUTPUT [Output ON/OFF]
ESC [Returns to the display mode selecting]
SHIFT + MENU [% display 6]
OUTPUT [Output ON/OFF]
ESC [Returns to the display mode selecting]
SHIFT + MENU [% display 5]
OUTPUT [Output ON/OFF]
ESC [Returns to the display mode selecting]

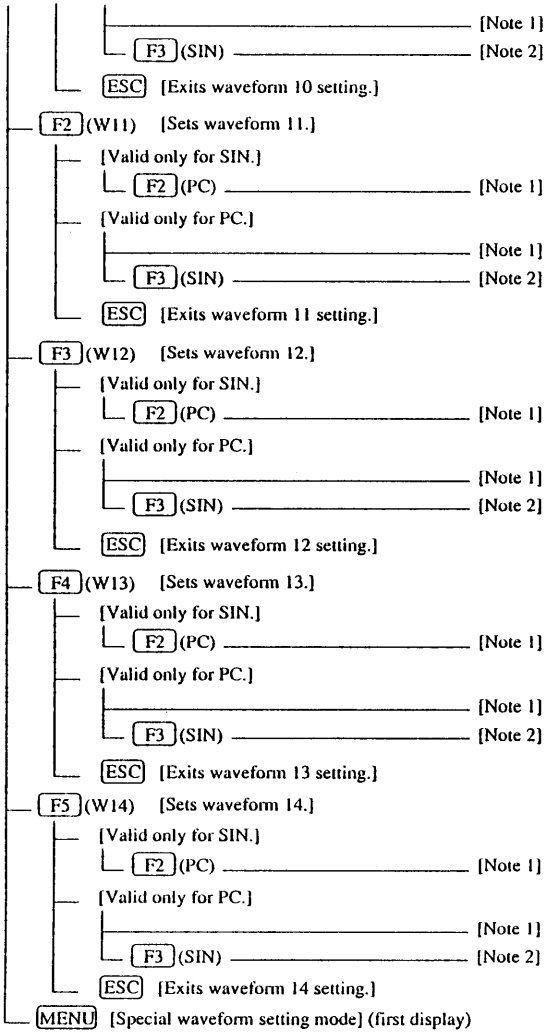
From Arms display 5

- MENU [Arms display 6] (ALL:21.22.23.24)
  - MENU [Arms display 7] (ALL:25.26.27.28)
    - MENU [Arms display 8] (ALL:29.30.31.32)
      - MENU [Arms display 9] (ALL:33.34.35.36)
        - MENU [Arms display 10] (ALL:37.38.39.40)
          - MENU [Arms display 1]
          - SHIFT + MENU [Arms display 9]
          - OUTPUT [Output ON/OFF]
          - ESC [Returns to the display mode selecting]
        - SHIFT + MENU [Arms display 8]
        - OUTPUT [Output ON/OFF]
        - ESC [Returns to the display mode selecting]
      - SHIFT + MENU [Arms display 7]
      - OUTPUT [Output ON/OFF]
      - ESC [Returns to the display mode selecting]
    - SHIFT + MENU [Arms display 6]
    - OUTPUT [Output ON/OFF]
    - ESC [Returns to the display mode selecting]
  - SHIFT + MENU [Arms display 5]
  - OUTPUT [Output ON/OFF]
  - ESC [Returns to the display mode selecting]

(6) Hierarchy of Special Waveform Setting Menu



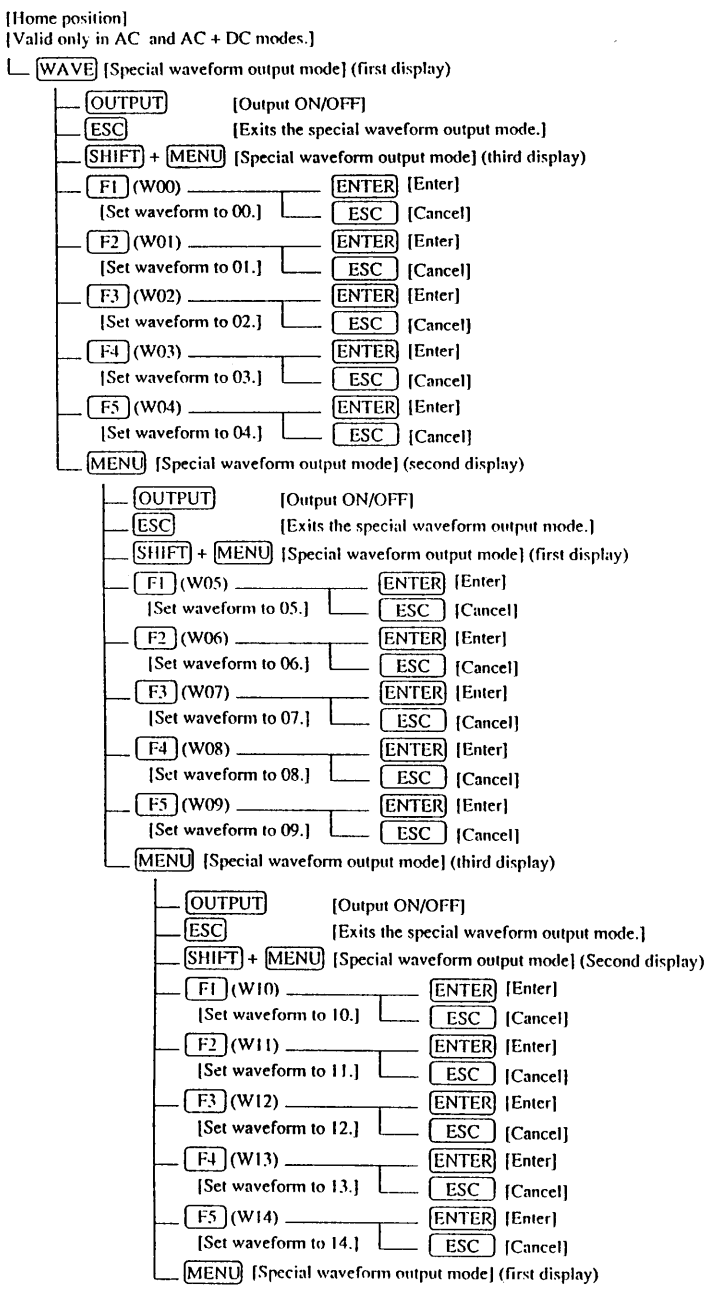

F2 (PC) [Note 1]
[Valid only for PC.]
[Note 1]
F3 (SIN) [Note 2]
ESC [Exits waveform 05 setting.]
F2 (W06) [Sets waveform 06.]
[Valid only for SIN.]
F2 (PC) [Note 1]
[Valid only for PC.]
[Note 1]
F3 (SIN) [Note 2]
ESC [Exits waveform 06 setting.]
F3 (W07) [Sets waveform 07.]
[Valid only for SIN.]
F2 (PC) [Note 1]
[Valid only for PC.]
[Note 1]
F3 (SIN) [Note 2]
ESC [Exits waveform 07 setting.]
F4 (W08) [Sets waveform 08.]
[Valid only for SIN.]
F2 (PC) [Note 1]
[Valid only for PC.]
[Note 1]
F3 (SIN) [Note 2]
ESC [Exits waveform 08 setting.]
F5 (W09) [Sets waveform 09.]
[Valid only for SIN.]
F2 (PC) [Note 1]
[Valid only for PC.]
[Note 1]
F3 (SIN) [Note 2]
ESC [Exits waveform 09 setting.]
MENU [Special waveform setting mode] (third display)
ESC [Exits the special waveform setting mode.]
SHIFT + MENU [Special waveform setting mode] (second display)
F1 (W05) [Sets waveform 10.]
[Valid only for SIN.]
F2 (PC) [Note 1]
[Valid only for PC.]



[Note 1]
- Numeric keys or JOG/SHUTTLE
- [Peak clipped voltage waveform setting]
- ESC [Exits the peak clipped voltage waveform setting mode.]

[Note 2]
- F2 (YES) [Waveform clear (change to sine wave)]
- ENTER [Waveform clear (change to sine wave)]
- F4 (NO) [Waveform clear/cancel]
- ESC [Waveform clear/cancel]

(7) Hierarchy of Special Waveform Output Operating Menu



(8) Hierarchy of Special Function Operating Menu

[Home position]
[Valid only in AC mode.]

- [MODE] [Special function mode]
  - [F1] (PHASE) [OUTPUT ON/OFF phase setting mode]
    - [F3] (OUT ON) [ON phase setting mode]
      - [F3] (OUT ON) [FIX/FREE selection]
      - Numeric keys [ON phase setting]
      - JOG [ON phase setting]
      - SHUTTLE [ON phase setting]
      - [OUTPUT] [Output ON/OFF]
      - [ESC] [Exits the ON/OFF phase setting mode.]
    - [F5] (OUT OFF) [OFF phase setting mode]
      - [F5] (OUT ON) [FIX/FREE selection]
      - Numeric keys [ON phase setting]
      - JOG [ON phase setting]
      - SHUTTLE [ON phase setting]
      - [OUTPUT] [Output ON/OFF]
      - [ESC] [Exits the ON/OFF phase setting mode.]
    - [OUTPUT] [Output ON/OFF]
    - [ESC] [Exits the ON/OFF phase setting mode.]
  - [F3] (IMP) [Output impedance setting mode]
    - Numeric keys [Output impedance setting (in %)]
    - JOG [Output impedance setting (in %)]
    - SHUTTLE [Output impedance setting (in %)]
    - [OUTPUT] [Output ON/OFF]
    - [ESC] [Exits the output impedance setting mode.]
  - [F5] (REG) [Regulation adjustment ON/OFF]
    - [Valid only for REG ON, OUT, ON and when current value is 10% or more.]
      - JOG [Sets regulation adjustment rate.]
  - [OUTPUT] [Output ON/OFF]
  - [ESC] [Exits the special function mode.]

Appendix 2 Power Line Abnormality Simulation Operation Setting Sheet

PCR-L Series

TITLE_____ DATE_____ NO._____

No	T1	T2	T3	T4	T5/N	V(T3)	RPT	POL	MEMO

MEMO

Appendix 3 Sequence Operation Setting Sheet

PCR-L Series

TITLE_____ DATE_____ NO._____
START_____ END_____ LOOP_____

ADR	R	F	R	Vac	Th	Tm	Ts	WAVE	IMP	Vdc	STRT	TRG	OUT

MEMO

INDEX

Alphabetical order

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