

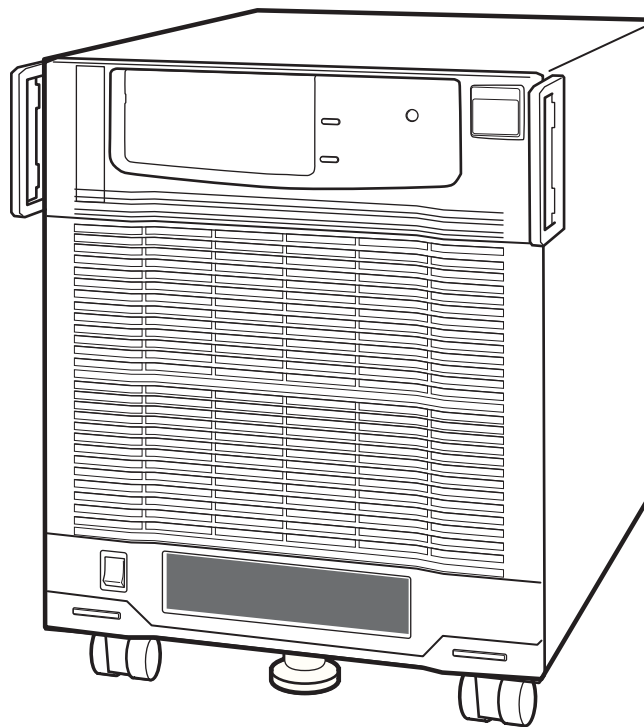
Part No. Z1-003-682, IB010133

Jun. 2006

OPERATION MANUAL

LINE IMPEDANCE NETWORK

LIN40MA-PCR-L



Use of Operation Manual

Please read through and understand this Operation Manual before operating the product. After reading, always keep the manual nearby so that you may refer to it as needed. When moving the product to another location, be sure to bring the manual as well.

If you find any incorrectly arranged or missing pages in this manual, they will be replaced. If the manual gets lost or soiled, a new copy can be provided for a fee. In either case, please contact Kikusui distributor/agent, and provide the “Kikusui Part No.” given on the cover.










This manual has been prepared with the utmost care; however, if you have any questions, or note any errors or omissions, please contact Kikusui distributor/agent.

Reproduction and reprinting of this operation manual, whole or partially, without our permission is prohibited.

Both unit specifications and manual contents are subject to change without notice.

Safety Symbols

For the safe use and safe maintenance of this product, the following symbols are used throughout this manual and on the product. Understand the meanings of the symbols and observe the instructions they indicate (the choice of symbols used depends on the products).

	Indicates that a high voltage (over 1 000 V) is used here. Touching the part causes a possibly fatal electric shock. If physical contact is required by your work, start work only after you make sure that no voltage is output here.
DANGER	Indicates an imminently hazardous situation which, if ignored, will result in death or serious injury.
 WARNING	Indicates a potentially hazardous situation which, if ignored, could result in death or serious injury.
 CAUTION	Indicates a potentially hazardous situation which, if ignored, may result in damage to the product and other property.
	Shows that the act indicated is prohibited.
	Is placed before the sign “DANGER,” “WARNING,” or “CAUTION” to emphasize these. When this symbol is marked on the product, see the relevant sections in this manual.
	Protective conductor terminal.
	Chassis (frame) terminal.
	On (supply)
○	Off (supply)
	In position of a bi-stable push control
	Out position of a bi-stable push control

Safety Precautions

The following safety precautions are intended to avoid fire hazard, electrical shock, and other accidents or failures. Use of the product in a method not specified in this manual may impair the effectiveness of built-in protective functions.



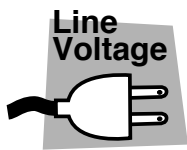
Users

- This product must be used only by qualified personnel who understand the contents of this Operation Manual.
- If this product is handled by unqualified personnel, personal injury may result. Ensure that the product is handled under the supervision of qualified personnel (i.e., those experienced in electrical applications).



Purposes of use

- Do not use the product for any purpose other than those specified.
- This product is not designed or manufactured for home use or for general consumers.



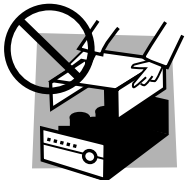
Input power

- Always connect the product to a power supply in line with the product's input rating.
- Use the provided power cord to supply input power.
- This product is designed as equipment falling under Overvoltage Category II of the IEC Standards (energy-consuming equipment to be supplied from fixed installation).



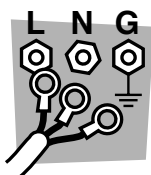
Fuse

- With products with a fuse holder on the exterior surface, the fuse can be replaced with a new one. When replacing a fuse, use the one which has appropriate shape, ratings, and specifications.



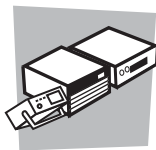
Cover

- Components inside the instrument may present physical hazards. Do not remove the external cover.



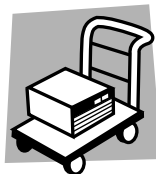
Grounding

- The product is equipment falling under Safety Class I of the IEC Standards (equipment with a protective conductor terminal). Always ground the product's protective conductor terminal to prevent electric shock.



Installation

- This product is designed for indoor use. Only use it indoors.
- When installing products be sure to observe “1.2 Installation” described in this manual.
- When installing products with casters, be sure to lock the casters.



Relocation

- Turn off the POWER switch and disconnect all cables before relocating the product.
- Use two or more persons when relocating the product which weights more than 20 kg. The weight of the products can be found on the rear panel of the product and/or in this operation manual.
- Be sure the operation manual be included when the product is relocated.



Operation

- Before using the product, check that there are no abnormalities on the surface of the power cord. (Before doing this, always disconnect the power cord from the electrical outlet.)
- If any abnormality or failure is detected in the products, stop using it immediately. Unplug the power cord. Be careful not to allow the product to be used before it is completely repaired.
- For output wiring or load cables, use connection cables with larger current capacity.
- Do not disassemble or modify the product. If it must be modified, contact Kikusui distributor/agent.



Maintenance and checking

- To avoid electrical shock, be absolutely sure to unplug the power cord before performing maintenance or checking.
- Do not remove the cover when performing maintenance or checking.
- To maintain performance and safe operation of the product, it is recommended that periodic maintenance, checking, cleaning, and calibration be performed.



Service

- Internal service is to be done by Kikusui service engineers. If the product must be adjusted or repaired, contact Kikusui distributor/agent.

How to Read This Manual

Introduction

This manual is intended for first-time users of the LIN40MA-PCR-L. It gives an overview of the LIN40MA-PCR-L and describes various settings, operation procedures, maintenance, safety precautions, etc.

Read this manual thoroughly to use the functions of the LIN40MA-PCR-L effectively.

You can also review this manual when you are confused about an operation or when a problem occurs.

How to read this manual

This manual is designed to be read from beginning to end. We recommend that you read the manual thoroughly from the beginning before using the LIN40MA-PCR-L for the first time.

Related manuals

The product allows to be used in conjunction with AC power supply PCR2000LA, PCR4000LA, PCR2000L or PCR4000L. The basic information only described in this manual for AC power supply PCR-L/PCR-LA series. For details, see each product manual.

Intended readers of this manual

This manual is intended for users of the LIN40MA-PCR-L Line Impedance Network or persons teaching other users on how to operate the LIN40MA-PCR-L.

It assumes that the reader has knowledge about electrical aspects of Line impedance network.

Notations used in the manual

In the interest of brevity, the LIN40MA-PCR-L line impedance network shall be hereafter referred to as the "LIN40MA-PCR-L" or the "impedance network".

In the interest of brevity, the PCR2000LA or PCR4000LA AC power supplies shall be hereafter referred to as the "PCR-LA AC power supply" or the "PCR-LA".

When you use the product in conjunction with AC power supply PCR2000L or PCR4000L, replace word of PCR-LA, PCR2000LA or PCR4000LA with PCR-L, PCR2000L or PCR4000L and read this operation manual.

Organization of the Operation Manual

The information in this manual is organized into the following chapters:

Chapter 1 Installation and Preparation

This chapter describes the procedures from unpacking to installation.

Chapter 2 Operation Check

This chapter explains operation check to be performed upon completion of wiring.

Chapter 3 Connecting A Load

This chapter explains connection of loads to the impedance network.

Chapter 4 Using the Current Monitor Terminal Board

This chapter explains connection of the current monitor terminal.

Chapter 5 Operating Procedures

This chapter explains the operation and name of controls.

Chapter 6 Maintenance

This chapter explains repair and maintenance of the impedance network.

Chapter 7 Specifications

This chapter explains electrical and mechanical specifications of the impedance network.

Contents

Safety Symbols	I
Safety Precautions	II
How to Read This Manual	IV
Organization of the Operation Manual	V
Preface	VIII

Chapter 1 Installation and Preparation

1.1	Check at Unpacking	1-1
1.2	Installation	1-2
1.2.1	Precautions Concerning Installation Location	1-2
1.2.2	Precautions for Installation	1-3
1.2.3	Precautions to Be Taken When Moving the Product	1-4
1.3	Setting Up the Impedance Network	1-5
1.4	Setting Up the PCR-LA	1-7
1.4.1	Connecting the Input Cable	1-7
1.4.2	Installing the Control Card	1-7
1.5	Rack mount frame	1-8

Chapter 2 Operation Check

2.1	Operation Check	2-1
2.2	Manual Mode	2-2
2.2.1	Single-phase circuitry (Z1, Z2, and Z3)	2-2
2.2.2	Three-Phase Circuit (Z4 and Z5)	2-3
2.3	Auto Mode	2-4
2.4	Power-ON/OFF Sequences	2-6

Chapter 3 Connecting A Load

3.1	Connection to Output Terminal Board	3-1
3.2	Selecting a Suitable Receptacle	3-2
3.3	Rated Current	3-3

Chapter 4 Using the Current Monitor Terminal Board

Chapter 5 Operating Procedures

5.1	Impedance Selection Procedure	5-1
5.1.1	Auto mode	5-1
5.1.2	Manual Mode	5-3
5.2	Using Two Impedance Networks for a Three-Phase Load	5-4

5.2.1	Connection method (three-phase, three-wire connection) -----	5-4
5.2.2	Impedance Selection -----	5-6
5.2.3	Rated current -----	5-7
5.2.4	Special usage (three-phase, four-wire connection) -----	5-7
5.3	Using Two Impedance Networks for Single-Phase Three-Wire Loads -----	5-8
5.3.1	Connection method (Single-phase, three-wire connection) -----	5-8
5.3.2	Impedance Selection -----	5-10
5.3.3	Rated current -----	5-10
5.4	Impedance Bypass (Through) Switch -----	5-11
5.4.1	Switch Operation -----	5-11
5.5	Name and Function of Controls -----	5-12
5.5.1	Front Panel -----	5-12
5.5.2	Rear Panel -----	5-14

Chapter 6 Maintenance

6.1	Before Requesting Repair Service -----	6-1
6.2	Calibration and Inspection -----	6-1
6.3	Cleaning the Air-intake Filters -----	6-2

Chapter 7 Specifications

7.1	Specifications -----	7-1
7.2	Dimensions -----	7-2

INDEX

Preface

Overview

This unit is an impedance network designed for use in harmonic current evaluation or voltage fluctuation and flicker evaluation produced by electrical or electronic equipment. The impedance network is used in conjunction with the PCR2000LA or PCR4000LA^{*1} AC power supplies from Kikusui.

Although different impedance values are specified for different commercial power voltages, a single impedance-network unit can handle any of the following single-phase voltages: 100 V, 200 V, or 230 V. An automatic switch over operation makes the change. Only the voltage setting on the PCR-LA series AC power supply needs to be adjusted; the suitable impedance for the given conditions will be automatically selected. Furthermore, connections to three-phase loads or single-phase three-wire loads are also possible: two LIN40MA-PCR-LA impedance networks are used together. In such cases, impedance switchovers must be performed manually.

For harmonic current evaluation, the impedance network satisfies the requirements of JIS C61000-3-2; for voltage fluctuation and flicker evaluation, it satisfies the requirements of IEC 61000-3-3.

Features

- Automatic impedance switch over feature
 - Accommodates JIS C61000-3-2
 - Single-phase 100 V: $0.4 \Omega + 0.37 \text{ mH}$
 - Single-phase 200 V: $0.38 \Omega + 0.46 \text{ mH}$
 - Accommodates IEC 61000-3-3
 - Single-phase 230 V: $0.4 \Omega + jn 0.25 \Omega$ ^{*2}
- By means of the impedance bypass (through) switch, accommodates harmonic current measurement according to IEC 61000-3-2.
- Single-phase load capacity of 4 kVA
- Maximum single-phase load capacity of 6 kVA (for 10 min.)
- Voltage monitoring accuracy of $\pm 1 \%$ (50 Hz/60 Hz)
- Multiple receptacles are provided, allowing virtually any kind of (For single-phase two-wire loads) plugs currently being used in the world to be inserted.
- Accommodates three-phase loads or single-phase three-wire loads by using two impedance networks.
 - Accommodates JIS C61000-3-2
 - Three-phase 200 V: $0.19 \Omega + 0.23 \text{ mH} / \text{phase}$ or $0.21 \Omega + 0.14 \text{ mH} / \text{phase}$
 - Load capacity of 6.9 kVA
 - Accommodates IEC 61000-3-3
 - Three-phase 400 V: $0.24 \Omega + jn 0.15 \Omega / \text{phase}$ or $0.16 \Omega + jn 0.1 \Omega / \text{phase}$ ^{*2}
 - Load capacity of 12 kVA

*1. It is available to use in conjunction with PCR2000L or PCR4000L.

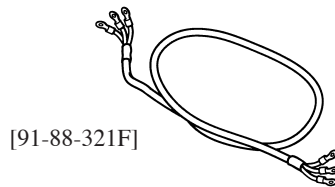
*2. n : Harmonic order

This chapter describes the procedures from unpacking to installation.

1.1 Check at Unpacking

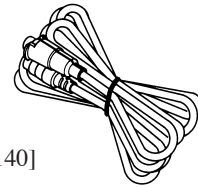
When you receive the product, check that all accessories are included and that the product and accessories have not been damaged during transportation.

If any of the accessories are damaged or missing, Contact your Kikusui agent or distributor.



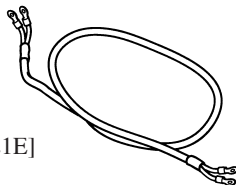
[91-88-321F]

Input cable A: 3-conductor cable (1.5 m), 1 pce.



[85-50-0140]

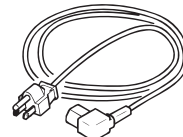
Control cable (2 m), 1 pce.



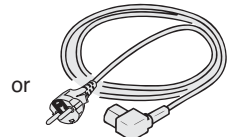
[91-88-321E]

Input cable B: 2-conductor cable (1.5 m), 1 pce.

The AC cable that is provided varies depending on the destination for the product at the factory-shipment.

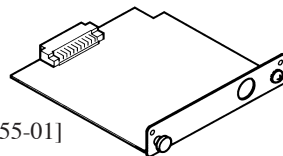


[85-AA-0003]



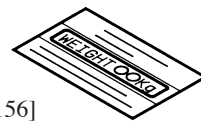
[85-AA-0005]

AC cable (for power to control circuitry) (2.5 m), 1 pce.



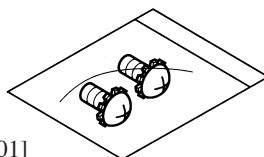
[PA-2955-01]

Control card, 1 pce.



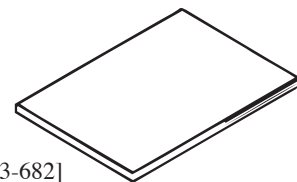
[A8-900-156]

Weight sticker, 1 pce.



[M3-101-001]

Control card mounting screws M3, 2 pcs.



[Z1-003-682]

Operation manual, 1 pce.

Fig.1-1 Accessory

1.2 Installation

1.2.1 Precautions Concerning Installation Location

■ **Do not use the product in a flammable atmosphere.**

To prevent the possibility of explosion or fire, do not use the product near alcohol, thinner or other combustible materials, or in an atmosphere containing such vapors.

■ **Avoid locations where the product is exposed to high temperature or direct sunlight.**

Do not install the product near a heater or in areas subject to drastic temperature changes.

Operating temperature range: 18 °C to 28 °C

■ **Avoid humid environments.**

Do not install the product in high-humidity locations--near a boiler, humidifier, or water supply.

Operating humidity range: 85 %rh or less (no condensation)

Condensation may occur even within the operating humidity range. In such cases, do not use the LIN40MA-PCR-L until the condensation dries up completely.

■ **Be sure to use it indoors.**

This product is designed for safe indoor use.

■ **Do not install the product in a corrosive atmosphere.**

Do not install the product in a corrosive atmosphere or in environments containing sulfuric acid mist, etc. This may cause corrosion of various conductors and bad contacts of connectors inside the power supply leading to malfunction and failure, or in the worst case, a fire.

■ **Do not install the product in a dusty location.**

Accumulation of dust can lead to electric shock or fire.

■ **Do not use the product where ventilation is poor.**

Secure adequate space around the product so that air can circulate around it.

Allow at least 20 cm of space between the air inlet/outlet and the wall (or obstacles).

■ **Do not place objects on the LIN40MA-PCR-L.**

Placing objects on top of the product can cause failures (especially heavy objects).

■ **Do not install the product on an inclined surface or location subject to vibrations.**

The product may fall or tip over causing damages and injuries.

■ **Do not use the product in a location where strong magnetic or electric fields are nearby or a location where large amount of distortion and noise is present on the input power supply waveform.**

The product may malfunction.

1.2.2 Precautions for Installation

When fixing the power supply in an installation location:

To prevent the LIN40MA-PCR-L from being accidentally moved during use, lock the stopper to fix the LIN40MA-PCR-L in the installation location.

1. Turn the stopper clockwise until the power supply is fixed.

The stopper is raised by turning it counterclockwise as viewed from above, and lowered by turning it clockwise.

2. Lock the caster by pressing the lock lever down.

The caster is locked or unlocked by adjusting the lock lever down or up independently.

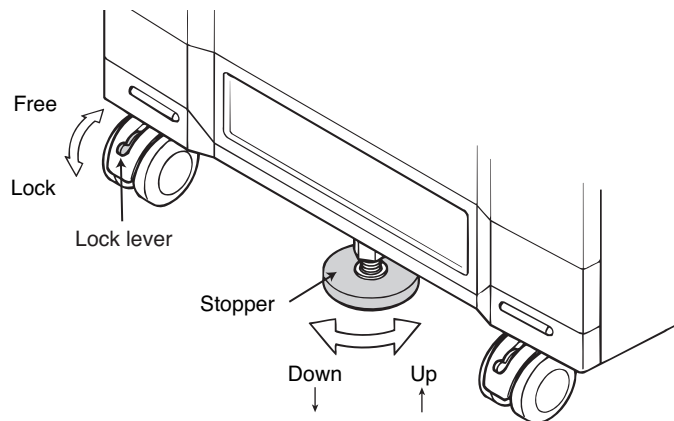


Fig. 1-2 Locking a Caster and Operating a Stopper

Weight sticker

Affix the supplied weight sticker to an easy-to-see location on the impedance network. The weight of the impedance network is approx. 60 kg.



Fig. 1-3 WEIGHT sticker

1.2.3 Precautions to Be Taken When Moving the Product

Note the following points when moving or transporting the product to the installation location.

- **Turn off the POWER switch.**

Moving the product while the power is turned on can cause electric shock or damage to it.

- **Remove all wiring.**

Moving the product with the cables connected can cause wires to break or injuries due to the product falling over.

- **Never lift the impedance network using the grips.**

The grips are provided only for use in moving the impedance network, and are not strong enough to bear the weight of the unit.

- **When lifting the product by hand, be sure to use at least two people and to support the product from below.**

- **Unlock the casters, and move the product on flat surfaces as much as possible.**

Extreme caution must be exercised when moving over inclined surfaces or abrupt rises and drops.

- **When transporting the product, be sure to use the original packing materials.**

Otherwise, damage may result from vibrations or from the product falling during transportation.

- **Be sure to include this manual.**

How to Handle the Grips:

When the grip is used to remove the product on a flat surface with the caster, pull out toward you.

Never lift the impedance network using the grips. These grips are intended as handrests to be used when moving the impedance network over flat surfaces, and are not strong enough to bear the weight of the unit.

To shift a grip, simultaneously slide the two locks to the UNLOCK direction. Pull a grip toward you or push it forward until you hear a clicking sound.

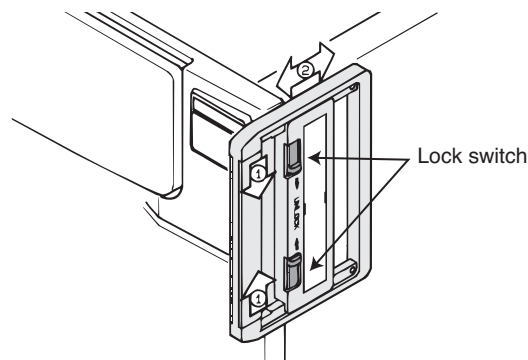


Fig. 1-4 Operating a Grip

1.3 Setting Up the Impedance Network

-
- ⚠ WARNING**
- Tighten the terminal screws securely. Otherwise, the cable may come off or the loose connections may overheat to create a fire hazard.
 - To avoid electrical hazards, be sure to connect the protective grounding terminal to a good ground.
 - Use the impedance network with the rear panel covered by the transparent cover.
 - Avoid connecting the INPUT terminal of the impedance network to the commercial power supply. The internal circuit of the INPUT terminal is not designed for connection to the commercial power supply. Be sure to use the input cable supplied and connect it to the OUTPUT terminal of the PCR-LA. The impedance characteristics of the impedance network are prescribed taking the PCR-LA and connection cables into consideration.
-

1. Turn OFF the [POWER] switches of the impedance network and the PCR-LA AC power supply to shut down the power supplied from the switchboard.
2. Remove the transparent cover on the rear panel of the impedance network.
3. Connect input cable A to the INPUT terminal board of the impedance network, according to Fig. 1-5.

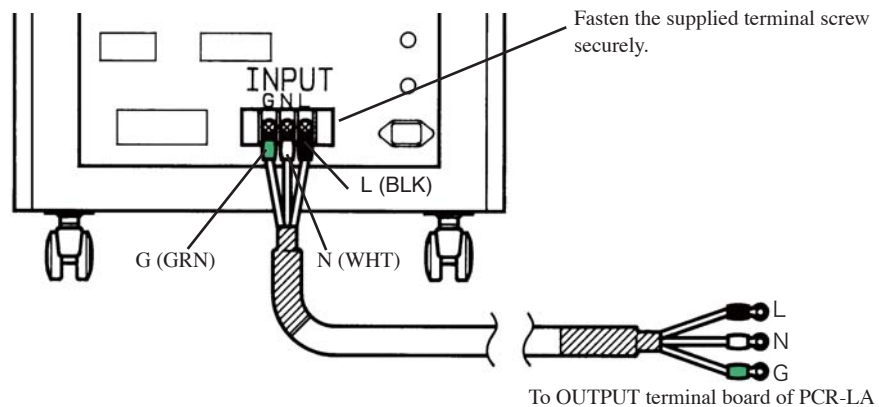


Fig. 1-5 Input Cable Connection

4. Plug one end of the control cable into the CONTROL I/O connector on the rear panel of the impedance network.
5. Plug the socket of the supplied AC cable into the AC INPUT connector on the rear panel of the impedance network.
6. Plug the AC cable to the commercial power supply.
 Rated voltage :85 V to 250 V
 Rated frequency :50 Hz/60 Hz

NOTE

- Use the supplied AC cable to connect to the commercial power supply. If the supplied AC cable cannot be used due to the rated voltage or the plug shape, have a qualified engineer replace it with an appropriate AC cable of length 3 m or less. If obtaining a AC cable is difficult, consult your Kikusui agent or distributor.
- Do not plug the AC cable into the OUTPUT receptacle of the PCR-LA or the OUTPUT receptacle (multiple receptacles) of the impedance network.
- Do not use the supplied AC cable on other instruments.

7. Replace the transparent cover, which was removed in step 2

1.4 Setting Up the PCR-LA

1.4.1 Connecting the Input Cable

Follow the steps below to connect input cable A, which was connected to the INPUT terminal board of the impedance network, to the OUTPUT terminal board of the PCR-LA.

-
- ⚠ WARNING**
- Tighten the terminal screws securely. Otherwise, the cable may come off or the loose connections may overheat to create a fire hazard.
 - To avoid electrical hazards, be sure to connect the protective grounding terminal to a good ground.
-

1. Turn OFF the [POWER] switches of the impedance network and the PCR-LA to shut down the power supplied from the switchboard.
2. Make sure that the input ground terminal of the PCR-LA is connected to a ground.
If it is not connected to a ground, see section 2.4, "Grounding" and 2.5, "Input Connections" in the operation manual of the PCR-LA series.
3. Connect the other end of the input cable to the OUTPUT terminal board of the PCR-LA.
For details, see 2.8, "Connecting a Load" in the operation manual of the PCR-LA series.

1.4.2 Installing the Control Card

Insert the control card into slot 3 or slot 4 on the PCR-LA (slot 4 or slot 5 on the PCR-L).

-
- ⚠ CAUTION**
- Avoid touching the printed-circuit board of the control card because it may be damaged by static electricity.
-

1. Turn off the [POWER] switches of the impedance network and the PCR-LA to shut down the power supplied from the switchboard.
2. Remove the slot cover. (Store the cover and screws.)
3. Hold the control-card with the component side of the control-card (printed-circuit board) facing toward the right, and insert the printed-circuit board into the slot's guide grooves.
4. Gently slide in the control card, keeping the card in contact with the grooves.

5. Push the card in as far as it will go. Then, fix the card to the PCR-LA with the supplied screws.
6. Plug the control cable into the connector of the control-card.

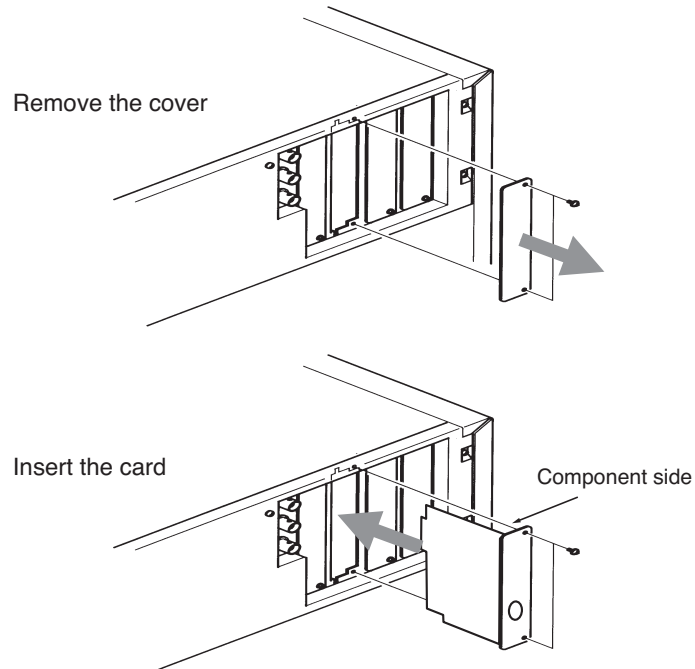


Fig. 1-6 Installing the Control Card

This completes the control-card installation work.

1.5 Rack mount frame

The rack built-in options are available for the LIN40MA-PCR-L. For details on the rack built-in options, contact your Kikusui agent or distributor.

This chapter explains operation check to be performed upon completion of wiring.

2.1 Operation Check

When connection of the input cable and the AC cable is completed, check the operations.

Operation check must be done when the impedance network is installed for the first time, moved to other locations, or left unused for a long period of time.

When conducting operational checks, the PCR-LA AC power supply must also be used. Be sure to read the operation manual for the PCR-LA series along with this manual.

Manual mode

In the manual mode, impedance of single-phase and three-phase circuits can be selected and the operation of the impedance network becomes independent of the PCR-LA settings.

Automatic mode

In the automatic mode, only the single-phase circuit operation is possible and the impedance network is controlled by the PCR-LA.

Control signals in auto mode are transmitted through the control cable connecting the impedance network and PCR-LA. When the control cable is not connected, manual mode is active.

-
- ⚠ CAUTION** • When performing operation check, do not connect any load to the impedance network. Connecting any load may cause damage to the impedance network or load.
-

2.2 Manual Mode

2.2.1 Single-phase circuitry (Z1, Z2, and Z3)

1. Remove the transparent cover on the rear panel of the impedance network.
2. Make sure that terminal board connection is made as shown in Fig. 2-1. If it is not made as shown, make connection again. The short bar can be removed upward by releasing the screw of the terminal board. Move it to the specified position and then fasten the screw securely.

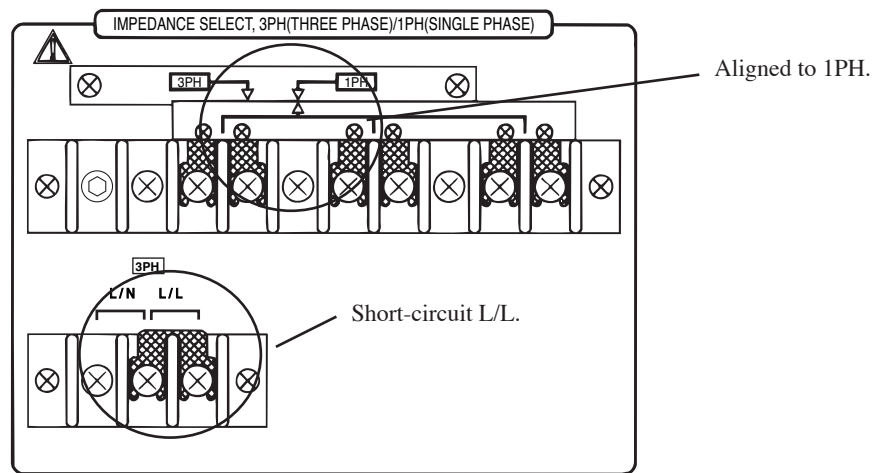


Fig.2-1 Single-Phase Circuit Settings

3. Be sure to turn OFF the [POWER] switch of the PCR-LA.
4. Disconnect the control cable from the impedance network. If the control cable is connected, the impedance network does not enter the manual mode.
5. Turn ON the [POWER] switch of the impedance network. The cooling fan will start running.
6. Check to see that the following LEDs on the front panel light up: [POWER], [Z1], [IN](IMPEDANCE) and [MANUAL].

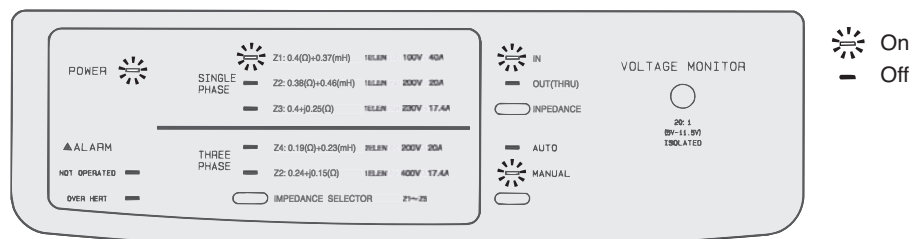


Fig. 2-2 Manual mode, Single-phase circuitry

7. By pressing the [IMPEDANCE SELECTOR] button, check to see that the LEDs go on one at a time in the following sequence: Z1, Z2, Z3, Z1, Z2, ...

8. Press the [IMPEDANCE] button to make sure that the IN indicator goes off and the [OUT(THRU)] indicator goes on. When [OUT(THRU)] is on, make sure that neither the Z1, Z2, nor Z3 LED is on.

This completes the operation check of the single-phase circuit. Turn off the [POWER] switch of the impedance network and then proceed with the "2.2.2 Three-Phase Circuit (Z4 and Z5)".

2.2.2 Three-Phase Circuit (Z4 and Z5)

1. Make sure that terminal board connection is made as shown in Fig. 2-3.
If it is not made as shown, make connection again. The short bar can be removed upward by releasing the screw of the terminal board. Move it to the specified position and then fasten the screw securely.

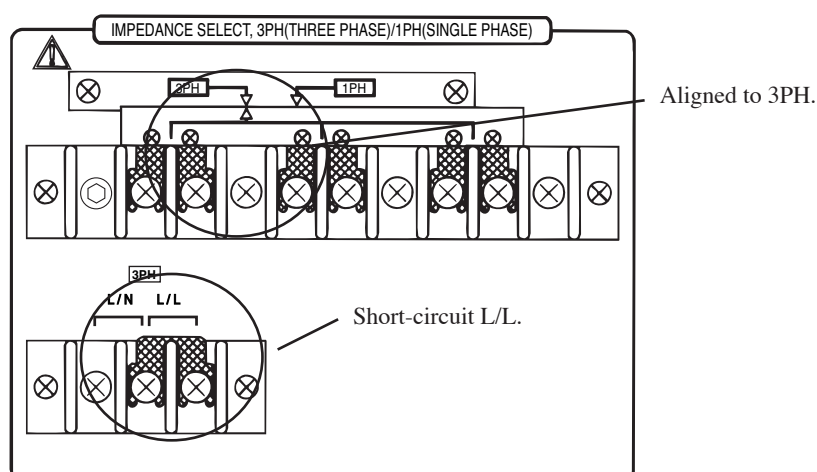


Fig. 2-3 Three-Phase Circuit Settings

2. Be sure to turn OFF the [POWER] switch of the PCR-LA.
3. Disconnect the control cable from the impedance network.
If the control cable is connected, the impedance network does not enter the manual mode.
4. Turn ON the [POWER] switch of the impedance network.
The cooling fan will start running.
5. Check to see that the following LEDs on the front panel light up: [POWER], [Z4], [IN](IMPEDANCE) and [MANUAL].
6. Press the [IMPEDANCE] button to make sure that the IN indicator goes off and the OUT(THRU) indicator goes on. When OUT(THRU) is on, make sure that neither the Z4, nor Z5 LED is on.

This completes the operation check of the three-phase circuit. Turn OFF the [POWER] switch of the impedance network. When performing operation check only for the manual mode, attach the transparent cover; when performing operation check for the automatic mode (AUTO), proceed with the "2.3 Auto Mode".

2.3 Auto Mode

Auto-mode operation is possible only in single-phase circuit configurations. Only the voltage setting on the PCR-LA series AC power supply needs to be adjusted; the suitable impedance (Z1, Z2 or Z3) for the given conditions will be automatically selected.

1. Remove the transparent cover on the rear panel of the impedance network.
2. Make sure that terminal board connection is made as shown in Fig. 2-4. If it is not made as shown, make connection again. The short bar can be removed upward by releasing the screw of the terminal board. Move it to the specified position and then fasten the screw securely.

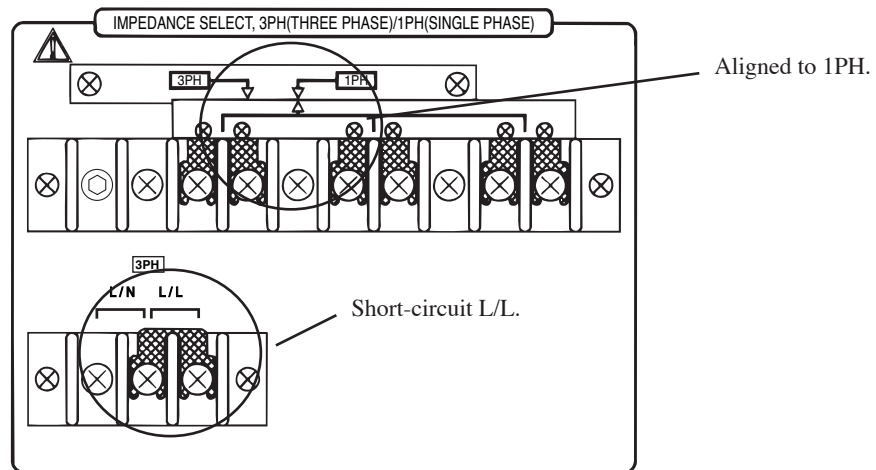


Fig. 2-4 Single-Phase Circuit Settings

3. Be sure to turn OFF the [POWER] switch of the PCR-LA.
4. Following the steps described in "1.3 Setting Up the Impedance Network" and "1.4 Setting Up the PCR-LA", install the control card and connect the control cable.

This places the impedance network into auto mode.

⚠ WARNING • When the [POWER] switches of the impedance network and the PCR-LA are turned ON, never touch the following sections because high voltage is applied to them.

OUTPUT terminal
CURRENT MONITOR terminal

5. Turn ON the impedance network's [POWER] switch. Next, turn ON the [POWER] switch of the PCR-LA.
The cooling fan will start running.
6. Check to see that the following LEDs on the front panel light up: [POWER], [Z1], [IN](IMPEDANCE) and [AUTO].

-
7. Make the following settings on the PCR-LA: 100 V range, Output voltage: 100 V, Frequency: 50 Hz.

The following settings will be automatically established on the impedance network :Z1

8. Make the following settings on the PCR-LA: 200 V range, Output voltage: 200 V, Frequency: 50 Hz.

The following settings will be automatically established on the impedance network : Z2

9. Make the following settings on the PCR-LA: 200 V range, Output voltage: 230 V, Frequency: 50 Hz.

The following settings will be automatically established on the impedance network : Z3

10. Turn OFF the [POWER] switch of the PCR-LA, followed by the [POWER] switch of the impedance network.

The auto-mode operation check is now complete.

Replace the transparent cover, which was removed in step 1.

2.4 Power-ON/OFF Sequences

-
- ⚠ CAUTION** • The impedance network uses relays for impedance switching. Therefore, do not turn OFF the [POWER] switch when electric current is flowing through the load.
-

The basic sequence of the ON/OFF operation for the [POWER] switches of the PCR-LA and the impedance network is as follows:

Power-ON: Turn ON the impedance network first, then the PCR-LA.

Power-OFF: Turn OFF the PCR-LA first, then the impedance network.

There are a total of six combinations of the power-ON/OFF operation. When the ON3 and OFF3 operations are performed, an alarm sounds at PCR-LA. If this occurs, turn OFF the [POWER] switch of the impedance network and then operate it according to its alarm reset procedure. (See the operation manual of the PCR-LA series.)

Table2-1 Power Switch Sequences

	Initial [POWER] switch operation	Subsequent [POWER] switch operation
ON1	Turn ON the impedance network.	Turn ON the PCR-LA.
ON2	Turn ON the PCR-LA, and leaving its OUTPUT turned OFF.	Turn ON the impedance network.
ON3	Turn ON the PCR-LA and turn ON its OUTPUT.	Turn ON the impedance network.
OFF1	Turn OFF the PCR-LA.	Turn OFF the impedance network.
OFF2	Turn OFF the PCR-LA's OUTPUT first, then turn OFF the impedance network.	Turn OFF the PCR-LA.
OFF3	With the PCR-LA's OUTPUT left ON, turn OFF the impedance network.	Turn OFF the PCR-LA.

-
- ⚠ CAUTION** • When using two impedance networks for three-phase loads or single-phase three-wire loads, the control card cannot be used and therefore an alarm is not generated. Follow the basic operation to protect relay contacts.
-

This chapter explains connection of loads to the impedance network.

After the operation checks described in Chapter 2 have been completed, a load may be connected to the impedance network.

⚠ WARNING • To avoid electrical hazards, turn OFF the [POWER] switch of the PCR-LA before performing the following operations.

3.1 Connection to Output Terminal Board

1. Remove the transparent cover on the rear panel of the impedance network.
2. Securely connect the output cable for the load to the OUTPUT terminal board.

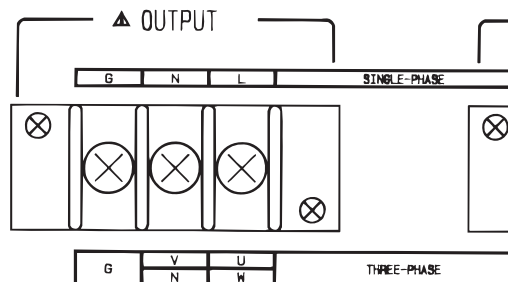


Fig.3-1 Output Terminal Board

3. If a load is equipped with a grounding terminal, be sure to connect it to terminal G of the OUTPUT terminal board located on the impedance network.

DESCRIPTION • The line impedance characteristics of the impedance network are defined on the above OUTPUT terminal board.

4. Replace the transparent cover, which was removed in step 1.

3.2 Selecting a Suitable Receptacle

Connect the AC plug of the load to a suitable receptacle on the impedance network.

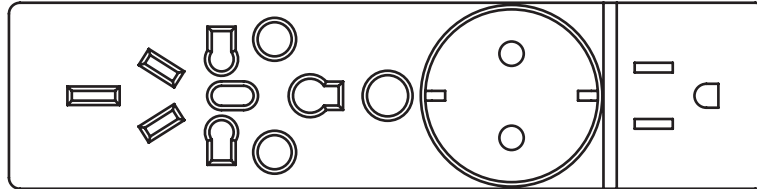


Fig. 3-2 Multiple Receptacle

Table3-1 At-a-glance guide to connectable plugs

Counteris	Standards	Plug Configuration	Rating	
Japan, USA, Canada	JIS UL CSA		2P 15A 125V	○
			Two pins and a ground 15A 125V	○
Australia	AS		2P 10A 250V	○
			2P 7.5A 250V	○
			Two pins and a ground 10A 250V	○
			Two pins and a ground 15A 250V	○
Swiss	SEV		2P 10A 250V	○
			Two pins and a ground 10A 250V	○
Italy	CEI		Two pins and a ground 10A 250V	○
Europe	CEE DIN		2P 2.5A 250V	○
			2P 10/16A 250V	○
			Two pins and a ground 10A /16A 250V Side-part earth	○
			Two pins and a ground 10A /16A 250V Double earth	○
United Kingdom	BS		2P 5A 250V	○
			Two pins and a ground 5A 250V	○
			Two pins and a ground 15A 250V	○
			Two pins and a ground 13A 250V	○

○ : available, × : not available

Excerpt from a catalog of Matsushita Electric Works

CAUTION • Never use more than one plug at a time. All receptacles are energized at the same time. The maximum load current is 15 A.

DESCRIPTION • The line impedance characteristics of the impedance network are defined on the above OUTPUT terminal board.

3.3 Rated Current

The rated current for the OUTPUT terminal board and multiple receptacle is shown in Table 3-2.

In normal conditions, use the impedance network with currents not exceeding the value in Table 3-2. However, within 10 minutes, the OUTPUT terminal board can draw current which is up to 1.5 times the rated rms current. Value (Arms) in the table.

-
- ⚠ CAUTION**
- When power must be drawn from the OUTPUT terminal board and an integrated receptacle at the same time, the total current value should be kept within the rated current value for the OUTPUT terminal board.
 - Subsequent to any operation at 1.5 times the rated rms current (within 10 minutes), cool the impedance network for more than 30 minutes. Do not pass any load current through the network, but leave the [POWER] switch ON to keep the fan running.
-

The values given above, in terms of Apeak (peak amperage), apply to capacitor-input-type rectifier loads.

Table3-2 Rated Current

	Z1	Z2, Z4	Z3, Z5
OUTPUT terminal board	40.0 Arms	20.0 Arms	17.4 Arms
	160.0 Apeak	80.0 Apeak	69.6 Apeak
Multiple receptacle	15.0 Arms		

For single-phase load power, the impedance network can handle up to 4 kVA. For three-phase load power, it is capable of handling up to 6.9 kVA and 12 kVA at three-phase voltages of 200 V and 400 V, respectively.



Chapter 4 Using the Current Monitor Terminal Board

This chapter explains connection of the current monitor terminal.

The CURRENT MONITOR terminals provide a break in the current path leading to the front-mounted multiple receptacles. With the help of a current probe, the terminals can be used to measure the load current

-
- ⚠ WARNING**
- To avoid electrical hazards, turn OFF the [POWER] switch of the PCR-LA before performing the following operations.
 - High voltage which is the same as the output voltage is applied to this terminal. Never touch the terminal during conduction.
 - Avoid using naked wire for the current measuring probe.
- ⚠ CAUTION**
- Use an electric wire whose nominal cross-sectional area is in excess of 2 mm². Its length should be less than 30 cm.
 - To either end of the wire, attach a crimp-style terminal which is suitable for fastening with an M4 screw and commensurate with the wire's nominal cross-sectional area.
 - The CURRENT MONITOR terminals are designed only for measurements with a current probe. Never connect an ordinary ammeter or a current transformer to these terminals.
 - Large impedance between the terminals affects the impedance characteristics of the impedance network.
-

1. Remove the transparent cover on the rear panel of the impedance network.
2. Remove the shorting bar from the CURRENT MONITOR terminal board.
Be careful not to lose the short bar. When the current probe is not used, use the short bar for short-circuiting.
3. Connect an electrical wire for a current-measuring probe as Fig. 4-1.

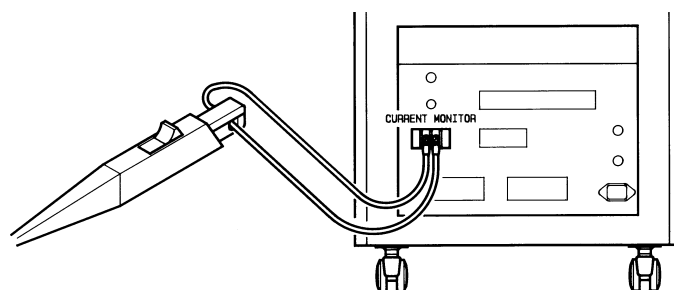


Fig.4-1 Connect an electrical wire for a current-measuring probe

4. Replace the transparent cover, which was removed in step 1.



This chapter explains the operation and name of controls.

⚠ WARNING • When performing operations described in this chapter, it is necessary to remove the cover of each terminal board. As high voltage is applied to the terminal, be sure to replace it upon completion of wiring to maintain safety.

⚠ CAUTION • Certain sequences should be followed when turning on or off the impedance network and PCR-LA AC power supply. These are given in "2.4 Power-ON/OFF Sequences".

5.1 Impedance Selection Procedure

This section describes the procedure to be followed for impedance selection for single-phase loads (from among Z1, Z2, and Z3).

5.1.1 Auto mode

This mode is dedicated to single-phase loads only.

In this mode, impedance selection is controlled by the PCR-LA.

1. Make sure that the connection procedures in Chapter 1, 3, and 4 are completed.

When the impedance network is installed or left unused for a long period of time, perform the operation check in Chapter 2.

2. Turn ON the [POWER] switch of the impedance network, followed by the [POWER] switch of the PCR-LA.

The cooling fan will start running.

3. Check to see that the following LEDs on the front panel light up: [POWER] , [Z1] , [IN](IMPEDANCE) , and [AUTO].

4. Adjust the settings on the PCR-LA based on the connected load.

One of the impedance levels, Z1 through Z3, will be automatically selected. The Table 5-1 shows the relationship between the settings on the PCR-LA and the impedance selected.

Table5-1 Impedance selected

Setting on the PCR-LA			Setting on the Impedance network
Range	Output voltage	Frequency	Impedance selected
100 V	100 V	50 Hz/60 Hz	Z1
200 V	200 V	50 Hz/60 Hz	Z2
200 V	230 V	50 Hz/60 Hz	Z3

NOTE

- When selecting Z1, the range setting on the PCR-LA must be set to 100 V.
- When the output voltage on the PCR-LA is set to 100 V in the 200 V range, Z2 is selected.
- When selecting Z2 or Z3, if you set the voltage on the PCR-LA to $200\text{ V} \pm 10\%$ or $230\text{ V} \pm 10\%$ in order to assess the characteristics of the load, your desired impedance may not be selected. If this problem occurs, put the impedance network into manual mode.
- If the control cable comes off, the impedance network is forcibly placed into manual mode.

DESCRIPTION

- The reason why impedance selection mentioned above is cannot be made as you expect is that Z3 cannot be selected for higher voltages because $200\text{ V} + 10\%$ is larger than $230\text{ V} - 10\%$. With the impedance network, switching between Z2 and Z3 is made as follows:
Switching from Z2 to Z3: Approx. 218 V
Switching from Z3 to Z2: Approx. 207 V

5. Turn ON the [OUTPUT] switch of the PCR-LA.

Power will be supplied to the load through the impedance network.

For measurement methods, such as harmonic-current measurement procedures, refer to the operation manual for the PCR-LA series.

NOTE

- To select another impedance, turn OFF the [OUTPUT] switch of the PCR-LA. If settings are changed on the PCR-LA with the [OUTPUT] switch left ON, the impedance on the impedance network remains unchanged. (Resetting takes place when the [OUTPUT] switch of the PCR-LA is turned OFF.)
- Impedance selection is active only while the PCR-LA's [OUTPUT] switch is OFF.

6. When all works have been done, turn OFF the [POWER] switch of the PCR-LA first and then the [POWER] switch of the impedance network.

5.1.2 Manual Mode

In this mode, impedance selection is unaffected by the settings on the PCR-LA.

1. Make sure that the connection procedures in Chapter 1, 3, and 4 are completed.

When the impedance network is installed or left unused for a long period of time, perform the operation check in Chapter 2.

2. Turn ON the [POWER] switch of the impedance network, followed by the [POWER] switch of the PCR-LA.

The cooling fan will start running.

3. Check to see that the following LEDs on the front panel light up: [POWER] , [Z1] , [IN](IMPEDANCE) , and [AUTO].

4. Select MANUAL mode by pressing the [AUTO/MANUAL] button.

Select the appropriate impedance on the impedance network based on the voltage ratings of the load.

5. Turn ON the [OUTPUT] switch of the PCR-LA.

In this condition, power is supplied to the load through the impedance network.

For measurement methods, such as harmonic-current measurement procedures, refer to the operating manual for the PCR-LA series.

NOTE

- When the [OUTPUT] switch of the PCR-LA is ON, the buttons mounted on the front panel are disabled; pressing them produces no effect. This feature is intended to protect the contacts of the network's inner relays from possible damage. Since no settings cannot be changed as long as power is being applied, turn OFF the [OUTPUT] switch of the PCR-LA.

6. When all works have been done, turn OFF the [POWER] switch of the PCR-LA first and then the [POWER] switch of the impedance network.

5.2 Using Two Impedance Networks for a Three-Phase Load

By using two units of the impedance network, connections to a three-phase load are possible. When doing so, use a three-phase PCR-LA series AC power supply (Three PCR-LA units with a 3P03-PCR-LA card).

Although a pair of impedance networks are used, the method of installation is the same as that described in Chapter 1. However, the control card and control cable are not used.

If the PCR-LA and the impedance network have been used for a single-phase load, turn OFF their [POWER] switches.

5.2.1 Connection method (three-phase, three-wire connection)

1. Pull out the control card from the slot of the PCR-LA, and unplug the control cable.

CAUTION • When storing the control card, take antistatic measures. For example, put it in a static-protective poly bag.

2. Remove the transparent cover on the rear panel of the impedance network.
3. Make sure that terminal board connections on both units is made as shown in Fig. 5-1.

If it is not made as shown, make connection again. The short bar can be removed upward by releasing the screw of the terminal board. Move it to the specified position and then fasten the screw securely.

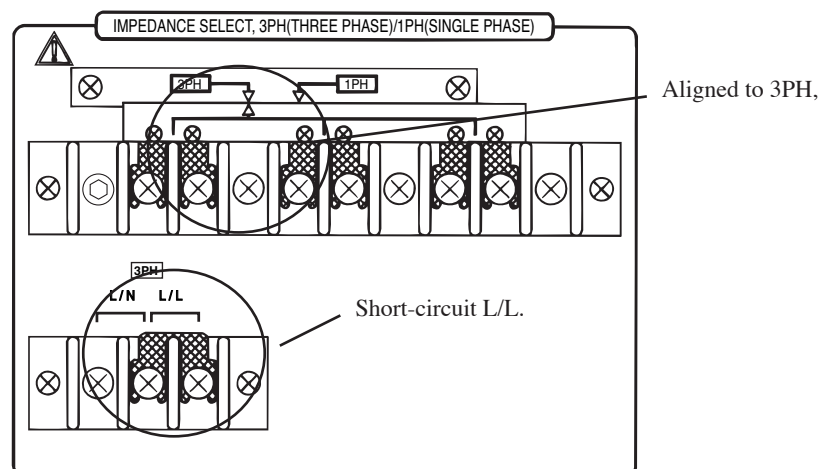


Fig.5-1 Three-Phase Circuit Settings

4. Be sure to turn OFF the [POWER] switch of the PCR-LA.

5. As shown in Fig. 5-2, use one input cable A and two input cable Bs to connect the INPUT terminal board of two impedance networks and the OUTPUT terminal board of three PCR-LAs, as shown below.
6. Securely connect the output cable, which goes to the load, to the impedance network's OUTPUT terminal board, as shown in Fig. 5-2.

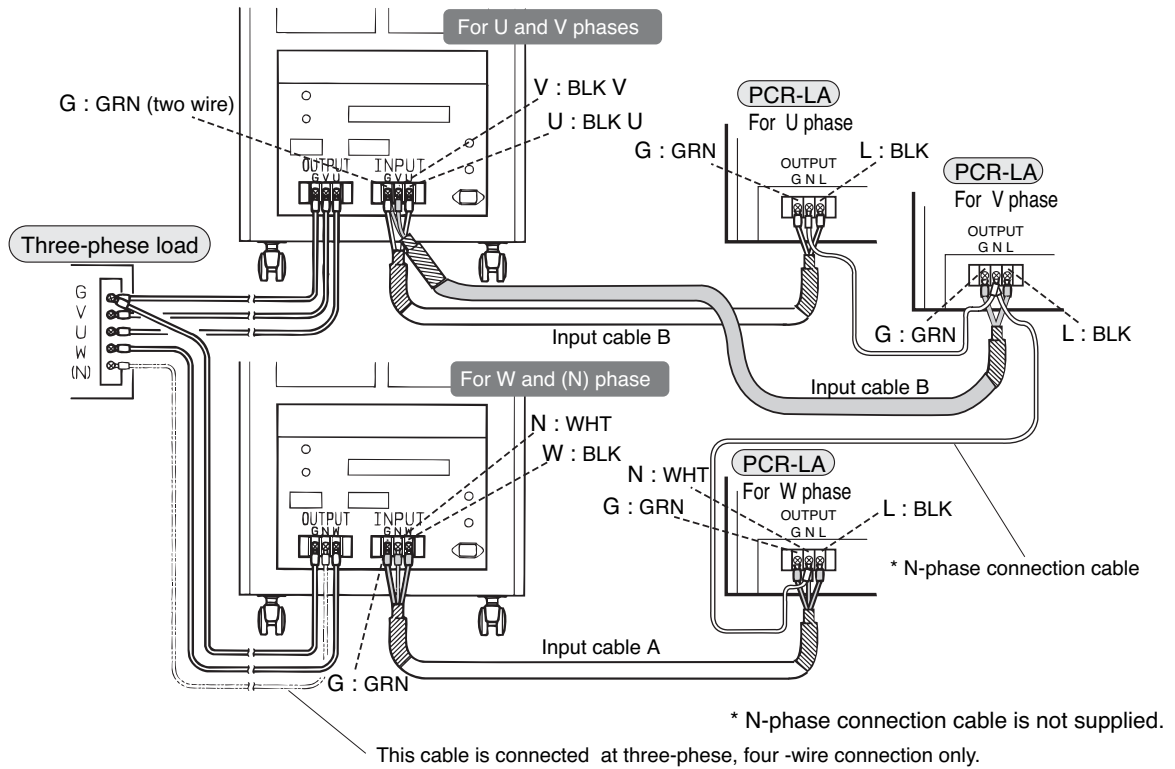


Fig. 5-2 Three-Phase Wiring Diagram

- ⚠ CAUTION**
- If the load is equipped with a grounding terminal, be sure to connect it to terminal G of the OUTPUT terminal board on both impedance networks.
 - Even for three-phase three-wire loads (without N-phase terminal), make connection between PCR-LAs for each phase and connection for the N-phase terminal.

7. Replace the transparent cover, which was removed in step 2.

5.2.2 Impedance Selection

When a pair of impedance networks are used for a three-phase load, they are placed in manual mode. In contrast to auto mode, the settings on the three-phase PCR-LA are irrelevant to impedance selection.

⚠ WARNING • Current monitor terminals and multiple receptacles contain high voltage. Never touch them while power is applied.

1. Turn ON the [POWER] switch of the impedance network.
The cooling fan will start running.
2. Check to see that the following LEDs on the front panel light up: [POWER] , [Z4] , [IN](IMPEDANCE) , and [MANUAL].
3. By pressing the [IMPEDANCE SELECTOR] button, check to see that the Z4 and Z5 LEDs go on alternately.
4. Select impedance according to the power voltage of the load.
The [AUTO/MANUAL] selection button remains locked in the manual mode.
5. Turn ON the [OUTPUT] switch of the PCR-LA.
In this condition, power is supplied to the load through the impedance network.
For measurement methods, such as harmonic-current measurement procedures, refer to the operation manual for the PCR-LA and to other sources.

-
- NOTE**
- When the [OUTPUT] switch of the PCR-LA is ON, the buttons mounted on the front panel are disabled; pressing them produces no effect. This feature is intended to protect the contacts of the relays from possible damage. Since settings cannot be changed as long as power is being applied, turn OFF the [OUTPUT] switch of the PCR-LA.
 - When two sets of the impedance network are used for a three-phase load, the following cannot be used: current-monitor terminals, voltage-monitor terminals, and multiple receptacles.
-

6. When all works have been done, turn OFF the [POWER] switch of the PCR-LA first and then the [POWER] switch of the impedance network.

5.2.3 Rated current

The rated current depends on the impedance selected.

Use the impedance network with currents not exceeding the rated current shown in Table 5-2.

Table5-2 Impedance and Rated Current

Impedance	Rated current
Z4	20 A
Z5	17.4 A

5.2.4 Special usage (three-phase, four-wire connection)

Connection method

Remove the transparent cover on the rear panel of the impedance network. Set the W-phase and N-phase connections on the terminal board as shown in Fig. 5-3.

(For U and V phases, make the same setting as step 3 in "5.2.1 Connection method (three-phase, three-wire connection)".)

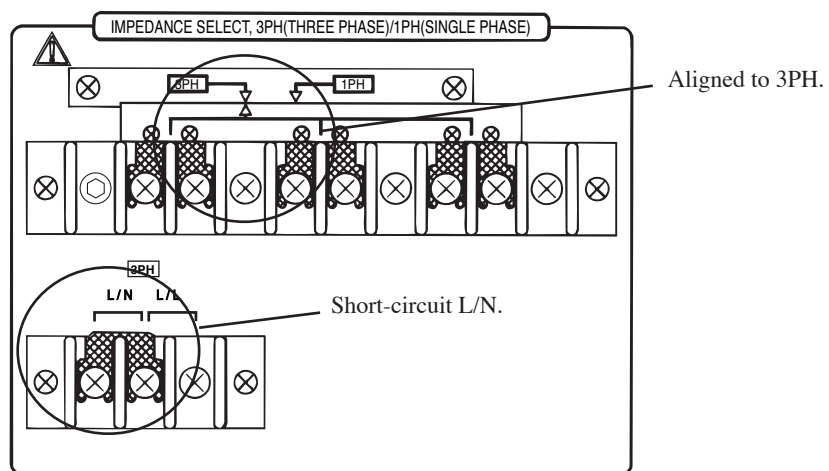


Fig. 5-3 Three-phase, four-wire circuit Settings (for the phase-W and phase-N)

All other preparatory connections are the same as those described in sections 5.2.1 through 5.2.3.

5.3 Using Two Impedance Networks for Single-Phase Three-Wire Loads

By using two units of the impedance network, connections to a Single-Phase three-wire load are possible. When doing so, use a three-phase PCR-LA series AC power supply (Three PCR-LA units with a 3P03-PCR-LA card).

Although a pair of impedance networks are used, the method of installation is the same as that described in Chapter 1. However, the control card and control cable are not used.

If the PCR-LA and the impedance network have been used for a single-phase load, turn OFF their [POWER] switches.

5.3.1 Connection method (Single-phase, three-wire connection)

1. Pull out the control card from the slot of the PCR-LA, and unplug the control cable.

CAUTION • When storing the control card, take antistatic measures. For example, put it in a static-protective poly bag.

2. Remove the transparent cover on the rear panel of the impedance network.
3. Make sure that terminal board connections the L1/L2-phase and N-phase unit is made as shown in Fig. 5-4 and Fig. 5-5, respectively.

It is not made as shown, make connection again.

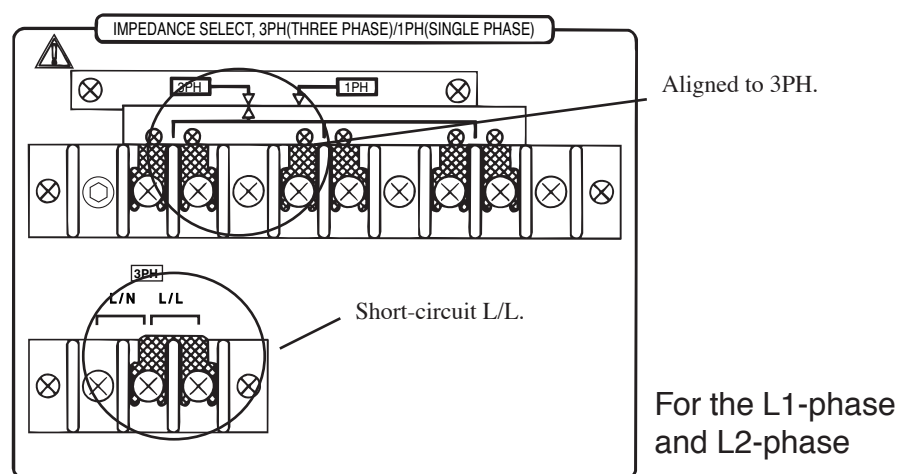


Fig. 5-4 L1-phase and L2-phase Circuit Settings

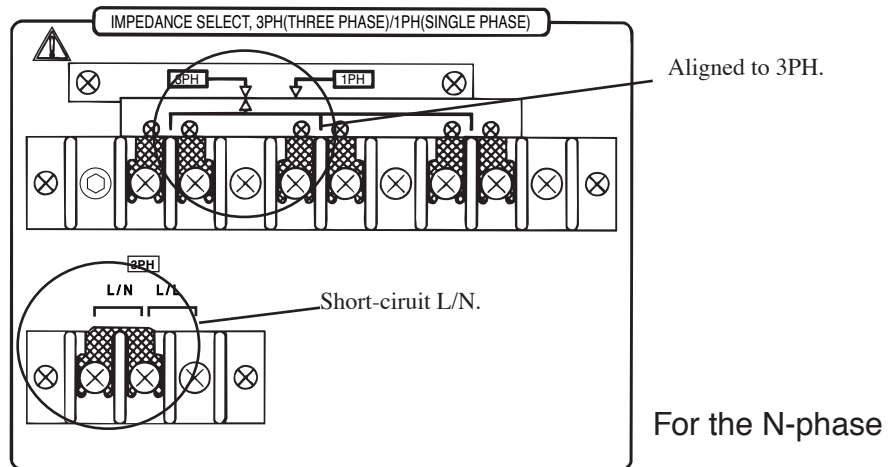


Fig. 5-5 N-phase Circuit Settings

4. Be sure to turn OFF the [POWER] switch of the PCR-LA.
5. According to Fig. 5-6, use one input cable A and one input cable B to connect the INPUT terminal board of the impedance network to the OUTPUT terminal board of two PCR-LAs.
6. Securely connect the output cable, which goes to the load, to the impedance network's OUTPUT terminal board, as shown in Fig. 5-6.

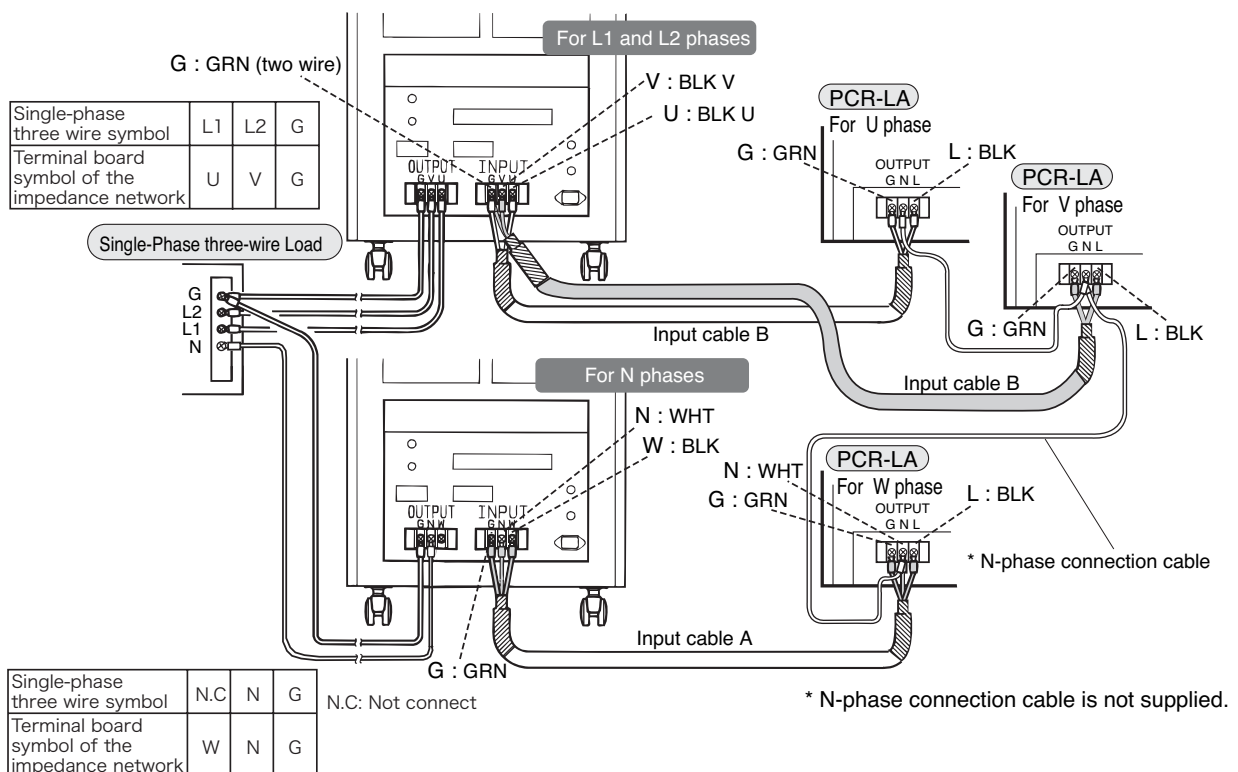


Fig. 5-6 Single-phase Three-wire Load Wiring Diagram

CAUTION • If the load is equipped with a grounding terminal, be sure to connect it to terminal G of the OUTPUT terminal board on both impedance networks.

To avoid effects of N-phase impedance, use an N-phase connection cable with a cross section of 8 mm² or more and make the cable length between phases 1 m or less.

7. Replace the transparent cover, which was removed in step 2.

5.3.2 Impedance Selection

When a pair of impedance networks are used for a single-Phase Three-wire load, they are placed in manual mode. In contrast to auto mode, the settings on the three-phase PCR-LA are irrelevant to impedance selection.

⚠ WARNING • Current monitor terminals and multiple receptacles contain high voltage. Never touch them while power is applied.

1. Turn ON the [POWER] switch of the impedance network.
The cooling fan will start running.
2. Check to see that the following LEDs on the front panel light up: [POWER] , [Z4] , [IN] (IMPEDANCE) , and [MANUAL].
3. Press the [IMPEDANCE SELECTOR] button to select Z4.
The [AUTO/MANUAL] selection button remains locked in the manual mode.
4. Turn ON the [OUTPUT] switch of the PCR-LA.
In this condition, power is supplied to the load through the impedance network.
For measurement methods, such as harmonic-current measurement procedures, refer to the operation manual for the PCR-LA series.

NOTE

- When the [OUTPUT] switch of the PCR-LA is ON, the buttons mounted on the front panel are disabled; pressing them produces no effect. This feature is intended to protect the contacts of the relays from possible damage. Since settings cannot be changed as long as power is being applied, turn OFF the [OUTPUT] switch of the PCR-LA.
- When two sets of the impedance network are used for a single-phase three-wire load, the following cannot be used: current-monitor terminals, voltage-monitor terminals, and multiple receptacles.

5. When all works have been done, turn OFF the [POWER] switch of the PCR-LA first and then the [POWER] switch of the impedance network.

5.3.3 Rated current

The rated current is 20 A. Use the impedance network with currents not exceeding it.

5.4 Impedance Bypass (Through) Switch

The impedance network is provided with the function to bypass the built-in impedance. The function is used for harmonic current measurement conforming to IEC 61000-3-2 and effective when any of the following methods is used:

- Impedance Selection Procedure" (single-phase two-wire loads)
- Using Two Impedance Networks for a three-phase loads
- Using Two Impedance Networks for single-phase three-wire loads

5.4.1 Switch Operation

1. Turn OFF the [OUTPUT] switch of the PCR-LA.
2. Press the [IMPEDANCE] button to select OUT(THRU).

NOTE

- When the [OUTPUT] switch of the PCR-LA is on, front panel operation of the impedance network is disabled. This function is provided to protect relay contacts. Be sure to turn OFF the [OUTPUT] switch of the PCR-LA. To enable front panel operation, turn OFF the [OUTPUT] switch of the PCR-LA (because it cannot be enabled during conduction.)

-
3. Turn ON the [OUTPUT] switch of the PCR-LA.

In this condition, the power is supplied through the impedance network to the load.

For measurement methods, such as harmonic-current measurement procedures, refer to operation manual of the PCR-LA series.

4. Turn OFF the [OUTPUT] switch of the PCR-LA, followed by pressing the [IMPEDANCE] button to select IN.

It cannot be enabled during conduction.

5.5 Name and Function of Controls

5.5.1 Front Panel

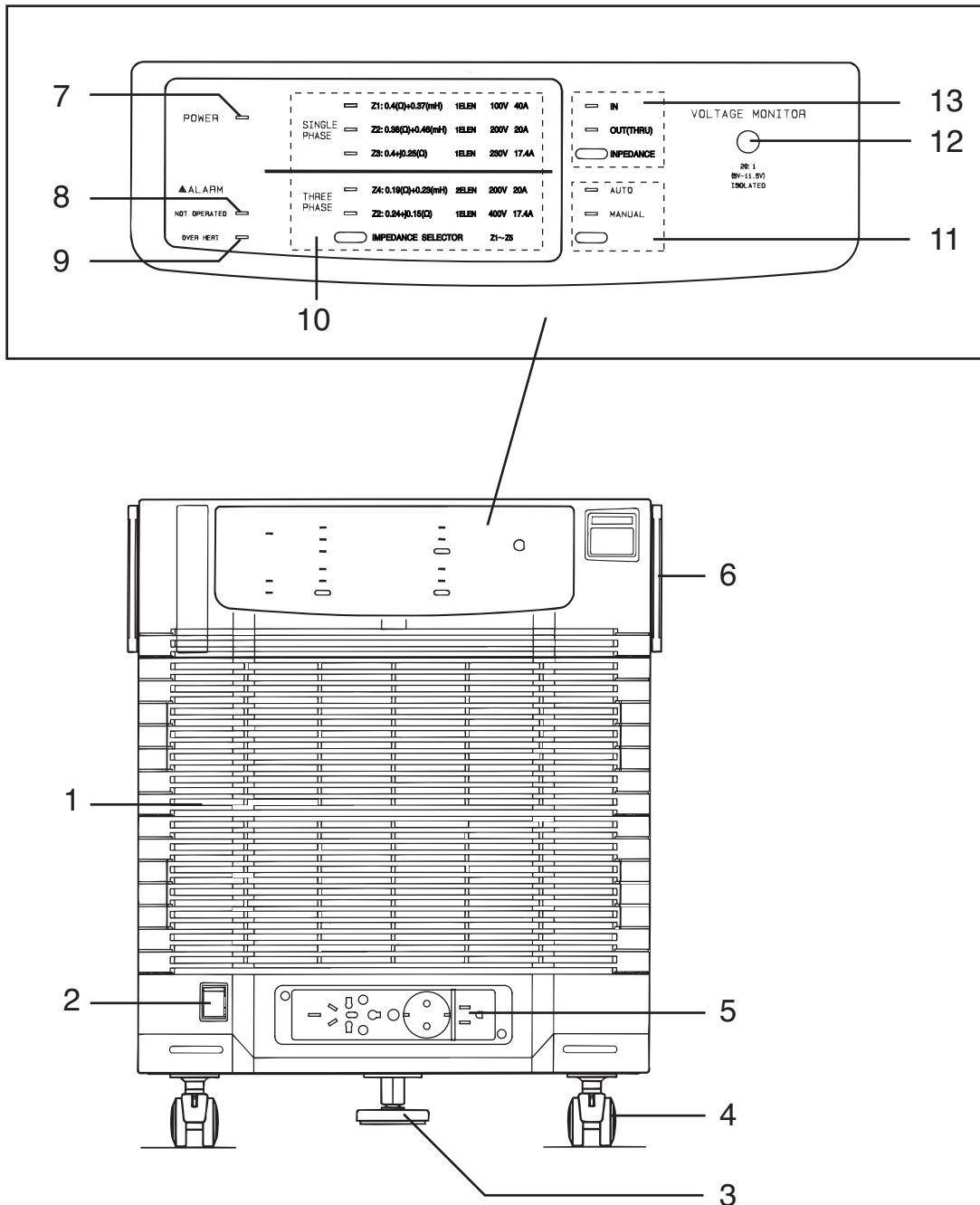


Fig. 5-7 Front Panel

[1] Air intake port

Takes in fresh air to cool the interior. The incorporated air filters must be cleaned at regular intervals.

[2] Power switch

This is a power switch for the incorporated control circuitry. Since the established switch-ON and switch-OFF sequences must be followed when turning ON/OFF the impedance network and the PCR-LA, see "2.4 Power-ON/OFF Sequences".

[3] Stopper

Used to lock the impedance network to a flat floor surface. When installing the impedance network, be sure to apply the stopper; when moving, release it.

[4] Casters

All four casters can change direction freely and are equipped with a locking mechanism.

⚠ CAUTION • Be sure to lock the casters when installing the impedance network.

[5] OUTPUT (multiple receptacles)

A cluster of multiple receptacles. If the power cord of the load equipment has an AC plug, it can be plugged into a matching receptacle here. The various-shaped receptacles can accept almost any kind of AC plug currently used in the world. The plugs that can be connected are shown in an at-a-glance table in "3.2 Selecting a Suitable Receptacle".

The rated current is 15 A. When two impedance networks are used for three-phase loads or single-phase three-wire loads, this output cannot be used.

[6] Grips

The grips are provided only for use in moving the impedance network, and are not strong enough to bear the weight of the unit.

[7] POWER

A pilot lamp

[8] ALARM, NOT OPERATED

Lights up when the [OUTPUT] switch of the connected PCR-LA is turned ON and a voltage higher than 30 V is applied to the impedance network while the network's control is not energized (and its [POWER] switch is in the OFF position).

Turn OFF the [OUTPUT] switch of the PCR-LA, and then turn ON the [POWER] switch of the impedance network.

[9] ALARM, OVER HEAT

Lights up when internal overheating is detected. Upon detection, the PCR-LA's [OUTPUT] switch is immediately turn OFF. When the control cable is not connected, this LED lights up; however, the PCR-LA's [OUTPUT] switch does not turn OFF.

If the [OUTPUT] switch of the PCR-LA does not turn OFF automatically even when the LED lights up, turn it OFF manually.

When this alarm is raised, let the impedance network cool off for at least 30 minutes before passing load current through again. (However, leave the [POWER] switch of the impedance network ON to keep the cooling fan running).

[10] IMPEDANCE SELECTOR button

For selecting an impedance. For single-phase circuits, Z1, Z2, or Z3 can be selected. For three-phase circuits and single-phase three-wire circuits, Z4 or Z5 can be selected.

[11] AUTO/MANUAL switch

This is an auto/manual switch over button.

[12] VOLTAGE MONITOR

For monitoring the voltage appearing on the output terminals. The voltage on this terminal is insulated by a transformer from the source power.

The voltage division ratio is $20:1 \pm 1\%$

When two impedance networks are used for three-phase loads or single-phase three-wire loads, this monitor cannot be used.

[13] IMPEDANCE button

This button is used to switch impedance bypass.

When IN is selected, impedance is enabled; when OUT(THRU) is selected, it is bypassed.

5.5.2 Rear Panel

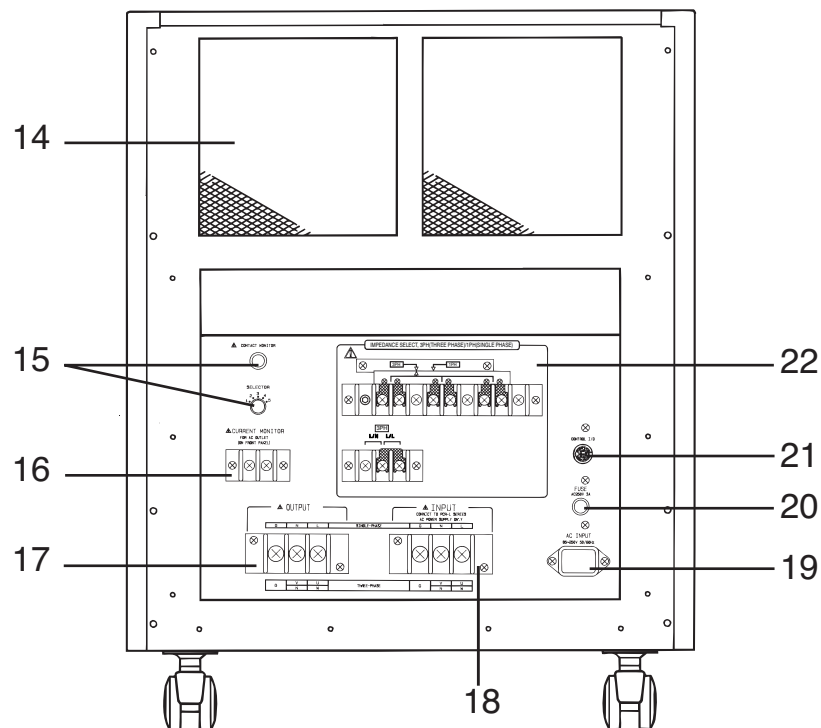


Fig. 5-8 Rear Panel

[14] Exhaust ports

Discharges cooling air from the interior.

Leave a clearance of 20 cm or more around the exhaust ports; do not place any object within this zone.

[15] CONTACT MONITOR, SELECTOR

In the impedance network, relays are used for impedance selection. This terminal and change-over switch are intended for use by service personnel only, and allow the condition of the relay contacts to be checked. After extended periods of network use, a checkup by service personnel is required. To arrange one, contact your Kikusui agent.

(The position of the SELECTOR knob is irrelevant to the operation and characteristics of the impedance network.)

⚠ WARNING • Never touch the CONTACT MONITOR. It carries high voltage.

[16] CURRENT MONITOR terminal board

These terminals are part of the current path. In conjunction with a current probe, they can be used to measure the load current connected to the multiple receptacles.

To measure the load current, remove the shorting bar and connect an electric wire for current measurement using a current probe.

When two impedance networks are used for three-phase loads or single-phase three-wire loads, this monitor cannot be used.

⚠ WARNING • High voltage which is the same as the output voltage is applied to this terminal. Never touch the terminal during conduction.

- Avoid using naked wire for the current measuring probe.

[17] OUTPUT terminal board

The impedance network's output terminal board. Connect the load to be tested to this terminal board.

[18] INPUT terminal board

The impedance network's input terminal block. Using the supplied input cable, connect the block to the OUTPUT terminals of the PCR-LA.

⚠ WARNING • Do not connect the INPUT terminal of the impedance network to the commercial power supply. The internal circuit of the INPUT terminal is not designed for connection to the commercial power supply.

[19] AC INPUT

An AC power input socket for the control circuitry. Use the supplied AC cable.

[20] FUSE

A power-supply fuse for the control circuitry. A glass-tube-encapsulated fuse with an 250 VAC, 3 A rating is used.

[21] CONTROL I/O

In auto mode, impedance selection is controlled by the PCR-LA through this cable. If the interior of the impedance network overheats, this cable also carries an alarm signal to the PCR-LA.

[22] IMPEDANCE SELECT, 3PH/1PH

A terminal board-type selector that defines the impedance network's operating mode. There are three different settings: single-phase two-wire circuits, three-phase circuit U/V-phase (L1/L2-phase of single-phase three-wire circuits), three-phase circuit W/N-phase (N-phase of single-line three-wire circuits).

This chapter explains repair and maintenance of the impedance network.

6.1 Before Requesting Repair Service

If you find a problem with the functioning of the impedance network, before ordering repair service, check the problem by referring to the following checklist. If the impedance network appears to be faulty, contact your Kikusui agent.

Table6-1 Symptoms and Check items

Symptom	Check item
No voltage applied to load.	Is the [POWER] switch of the impedance network turned ON? Is the [OUTPUT] switch of the PCR-LA turned ON? Is the three-phase/single-phase terminal board-type selector, located on the rear panel, correctly configured?
Automatic impedance is not possible.	Is the control card inserted in slot 4 or slot 5 of the PCR-LA? Is the control cable connected? Are the output voltage and frequency setting on the PCR-LA?
Impedance selection is impossible in manual mode.	Is the [OUTPUT] switch of the PCR-LA left ON?

6.2 Calibration and Inspection

- It is recommended that the impedance network be calibrated periodically (once a year).

Impedance including DC resistance and inductance is calibrated.

- The impedance network employs relays for impedance selection.

To maintain favorable impedance characteristics, the contact resistance of relays must be small enough. Preventive processing for derating and contact protection are made for maintaining the contact rating; however, it cannot be retained perfectly.

After a long operating period, relay replacement may be required. In this case, relays must be inspected by service personnel. (Whether or not relay inspection is necessary can be determined with simple measurement by service personnel.)

For details on calibration and inspection, contact your Kikusui agent.

6.3 Cleaning the Air-intake Filters

Clean the air-intake filters periodically to ensure proper operation of the impedance network.

CAUTION • before cleaning the filter, turn off the [POWER] switch.

Removing the Louver

Press the latches at both ends of the louver, and pull out the entire louver to remove it from the impedance network.

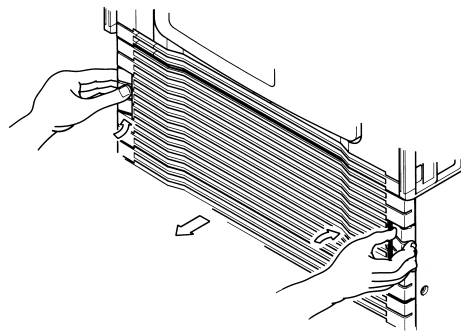


Fig. 6-1 Removing the Louver

Cleaning the Air-intake Filters

1. Remove the two air-intake filters by disengaging them from the louver catch.

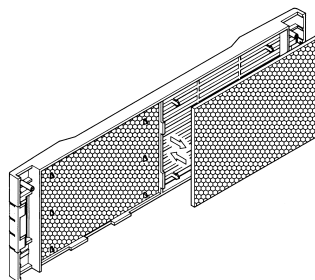


Fig. 6-2 Removing the Air-intake Filters

2. Using a vacuum cleaner or similar tool, remove any dust, dirt and lint from the air-intake filters. If the filters are badly soiled, clean them using a neutral detergent. Dry them thoroughly prior to reinstallation.

CAUTION • During operation, fresh air is drawn into the network through the air-intake filters. If these filters are wet, the humidity inside the cabinet will rise, which in turn may cause problems.

3. Replace the air-intake filters into the louver frame. Push in the filters until the louver's catch hold them down in place.

Reinstalling the Louver

1. Orientate the louver correctly (i.e., so that the guide pins are at the upper right and upper left corners). Hold the louver at both ends and fit the guide pins into the guide holes on the cabinet.

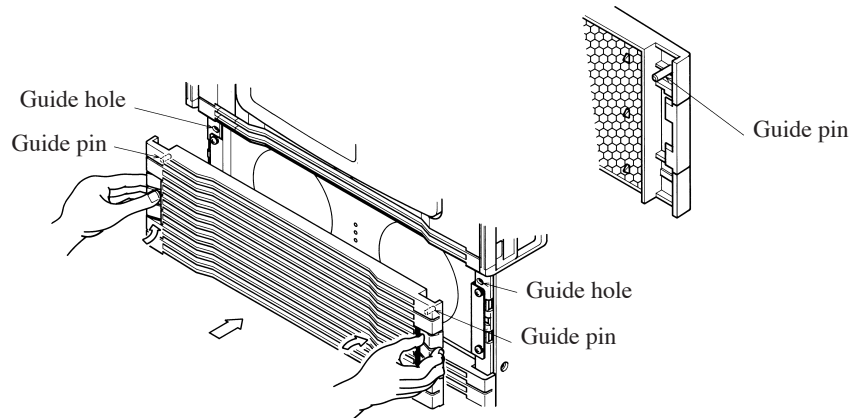


Fig. 6-3 Reinstalling the Louver

2. Pressing the latches at both ends, and secure the louver to the cabinet.



This chapter explains electrical and mechanical specifications of the impedance network.

7.1 Specifications

		LIN40MA-PCR-L
Impedance (The impedance values given above are valid only when the impedance network is used in conjunction with the supplied input cable and a PCR2000LA or PCR4000LA.)	Z1	0.4 Ω + 0.37 mH 100 V Single-phase
	Z2	0.38 Ω + 0.46 mH, 200 V Single-phase
	Z3	0.4 Ω + jn0.25 Ω ^{*1} , 230 V Single-phase
	Z4	0.19 Ω + 0.23 mH ^{*2} , 2 Dual-device configuration (0.21 Ω + 0.14 mH can be set for only one-device.)
	Z5	0.24 Ω + jn0.15 Ω ^{*1, *2} , 2 Dual-device configuration (0.16 Ω + jn0.1 Ω can be set for only one-device.)
Impedance error (At the OUTPUT terminal.)	Resistance component (DCR)	Z1, Z2, Z3 : \pm 3 % Z4, Z5 : \pm (3 % + 0.01 Ω)
	Reactance component (45 Hz to 3 kHz)	Z1, Z2, Z3 : \pm 5 % Z4, Z5 : \pm (5 % jn0.01 Ω) ^{*1}
Rated voltage, frequency, and current	Z1	100 V (50 Hz / 60 Hz) 40.0 A, 160.0 Apeak ^{*3}
	Z2, Z4	200 V (50 Hz / 60 Hz) 20.0 A, 80.0 Apeak ^{*3}
	Z3, Z5	230 V (Z3), 400 V (Z5) 17.4 A, 69.6 Apeak ^{*3}
Short-time rated current		1.5 times the rated current (for up to 10 min.)
Voltage monitor		One twentieth of the output terminal voltage with a tolerance of \pm 1 % (at 50 Hz/60 Hz), Isolated from impedance circuitry.
Current monitor		For measurement with a clamp-type ammeter. Located in the current path leading to the built-in receptacles.
Output terminals	Terminal board	M6 screws used
	AC receptacles	Accepts AC power plugs used in Japan, the United States, Canada, Australia, Switzerland, Italy, European countries adopting DIN-based standards, Great Britain and other countries.
Protection against overheating		Upon detection of overheating in the interior, output from the PCR-LA will be cut off.
Power input for control circuitry		85 VAC to 250 VAC (No voltage selection required) 50 Hz/60 Hz, approx. 45 VA
Operating temperature and humidity		23 $^{\circ}$ C \pm 5 $^{\circ}$ C, less than 85 %rh
Withstand voltage	1.5 kVAC applied for 1 min.	Between the control-circuitry power input and the housing.
	500 VAC applied for 1 min.	Between the input side and the housing, between the output side and the housing, between the voltage monitor side and the input, between the voltage monitor side and the output.

		LIN40MA-PCR-L
Insulation resistance	500 VDC, over than 30 MΩ	between the input side and the housing, between the output side and the housing, between the control-circuitry power input and the housing, between the voltage monitor side and the input, between the voltage monitor side and the output.
Dimensions		See "7.2 Dimensions"
Weight		Approx. 60 kg
Accessories		Input cable A: 1.5 m 1 Input cable B: 1.5 m 1 Control card 1 Control card mounting screws (M3) 2 Control cable: 2 m 1 AC cable for control power: 2.5 m 1 Operation manual 1 Weight sticker 1

- *1. n: Order of harmonic
- *2. Two impedance networks accommodate three-phase three-wire, four-wire, and single-phase three-wire circuits. Provided with the impedance bypass (through) function.
- *3. For loads with capacitor-input-type rectifier circuitry.

7.2 Dimensions

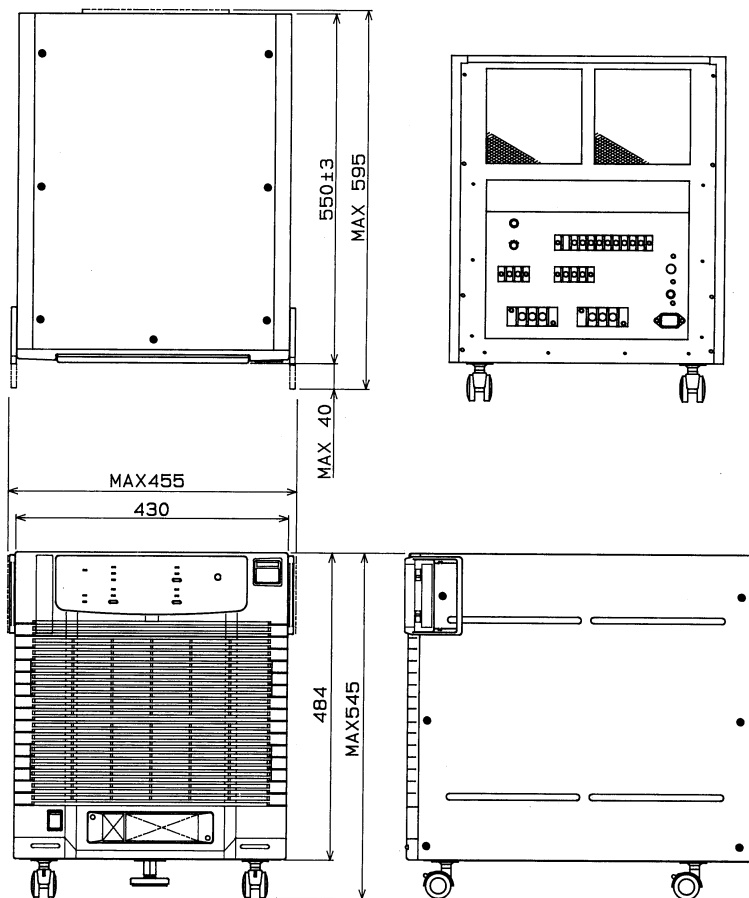


Fig. 7-1 Dimensions

Unit: mm

INDEX

A

AC cable 1-6
AC INPUT 1-6, 5-16
Air intake port 5-12
Air-intake filters 6-2
ALARM
 NOT OPERATED 5-13
 OVER HEAT 5-13
Alarm 2-6
Auto mode 2-4, 5-1
AUTO/MANUAL switch 5-14

C

Calibration 6-1
Casters 5-13
Cleaning 6-2
CONTACT MONITOR 5-15
Control cable 1-6, 2-2, 2-3, 5-2
Control card 1-7, 5-4
CONTROL I/O 1-6, 5-16
Current monitor 4-1
CURRENT MONITOR terminal board 5-15
Current-measuring probe 4-1

D

Dimensions 7-2

F

FUSE 5-16

G

Grips 5-13

I

IMPEDANCE button 5-14

Impedance Bypass (Through) 5-11
IMPEDANCE SELECT, 3PH/1PH 5-16
Impedance Selection 5-6, 5-10
IMPEDANCE SELECTOR button 5-14
Input cable A 1-5, 1-7
INPUT terminal board 5-15
Inspection 6-1
Installation 1-2

L

L1-phase and L2-phase Circuit Settings 5-8
Louver 6-2

M

Manual mode 2-1, 2-2, 5-3
Moving the Product 1-4
Multiple receptacle 3-2
Multiple receptacles 5-13

N

N-phase Circuit Settings 5-9

O

OUTPUT 5-13
OUTPUT terminal board 3-3, 5-15
Output terminal board 3-1
OVER HEAT 5-13

P

Power switch 5-13
Power Switch Sequences 2-6

R

Rated current 3-3, 5-10

Receptacle 3-2

Repair 6-1

S

SELECTOR 5-15

Setting Up

the Impedance Network 1-5

the PCR-LA 1-7

Single-Phase

Circuit Settings 2-2, 2-4

Three-Wire Loads 5-8

Single-phase

Three-wire Load Wiring Diagram 5-9

Specifications 7-1

Stopper 1-3, 5-13

T

Terminal 3-1

Three-Phase

Circuit Settings 2-3, 5-4

Load 5-4

Wiring Diagram 5-5

Three-phase

four-wire 5-7

three-wire 5-4

U

Unpacking 1-1

V

VOLTAGE MONITOR 5-14

W

WEIGHT sticker 1-3



