

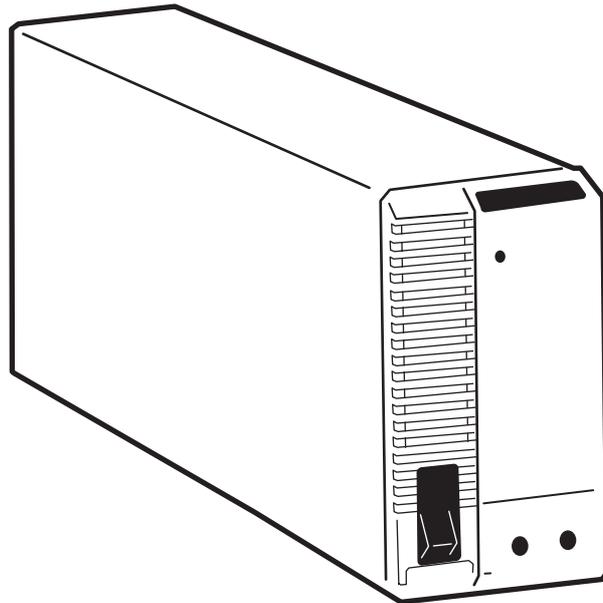
Part No. Z1-000-072, IB000024  
Nov. 2005

# OPERATION MANUAL

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Shunt Unit

# SH10 SH50



## **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 Operation Manual can be purchased. In either case, please contact your Kikusui agent, and provide the "Part No." given on cover.
- This manual has been prepared with the utmost care; however, if you have any questions, or note any errors or omissions, please contact your Kikusui agent.

The contents of this Operation Manual may not be reproduced, in whole or in part, without the prior consent of the copyright holder.

The specifications of this product and the contents of this Operation Manual are subject to change without prior notice.

# Power Requirements of this Product

Power requirements of this product have been changed and the relevant sections of the Operation Manual should be revised accordingly. (Revision should be applied to items indicated by a check mark )

## Input voltage

The input voltage of this product is \_\_\_\_\_ VAC,  
and the voltage range is \_\_\_\_\_ to \_\_\_\_\_ VAC.

Use the product within this range only.

## Input fuse

The rating of this product's input fuse is \_\_\_\_\_ A, \_\_\_\_\_ VAC, and \_\_\_\_\_.

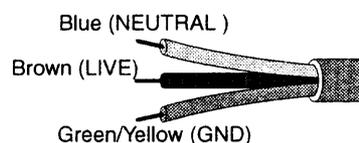
- 
- ⚠ WARNING**
- To avoid electrical shock, always disconnect the AC power cord or turn off the switch on the switchboard before attempting to check or replace the fuse.
  - Use a fuse element having a shape, rating, and characteristics suitable for this product. The use of a fuse with a different rating or one that short circuits the fuse holder may result in fire, electric shock, or irreparable damage.
- 

## AC power cord

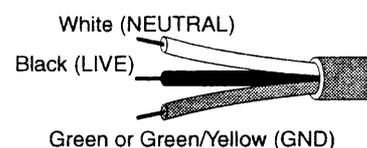
The product is provided with AC power cords described below. If the cord has no power plug, attach a power plug or crimp-style terminals to the cord in accordance with the wire colors specified in the drawing.

- 
- ⚠ WARNING**
- The attachment of a power plug or crimp-style terminals must be carried out by qualified personnel.
- 

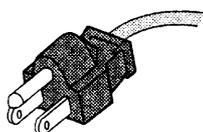
### Without a power plug



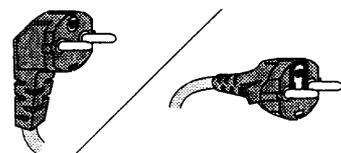
### Without a power plug



### Plugs for USA



### Plugs for Europe



### Provided by Kikusui distributor/agent

Kikusui distributor/agent can provide you with suitable AC power cord.  
For further information, contact Kikusui distributor/agent.



## 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.



Indicates a potentially hazardous situation which, if ignored, could result in death or serious injury.



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.



Indicates an earth ground terminal.



Indicates a chassis ground terminal.

# Safety Precautions

The following safety precautions must be observed to avoid fire hazard, electrical shock, accidents, and other failures. Keep them in mind and make sure that all of them are observed properly.



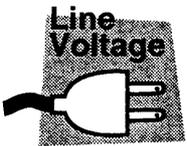
## **Users**

- This product must be used only by qualified personnel who understand the contents of this operation manual.
- If it is handled by disqualified personnel, personal injury may result. Be sure to handle it under supervision of qualified personnel (those who have electrical knowledge.)



## **Purposes of use**

- Do not use the product for purposes other than those described in the operation manual.



## **Input power**

- Use the product with the specified input power voltage.
- For applying power, use the AC power cord provided. Note that the provided power cord is not use with some products that can switch among different input power voltages or use 100 V and 200 V without switching between them. In such a case, use an appropriate power cord. For details, see the relevant page of this operation manual.



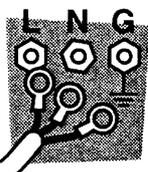
## **Fuse**

- 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**

- There are parts inside the product which may cause physical hazards. Do not remove the external cover.



## **Installation**

- When installing products be sure to observe "Precautions for Installation" described in this manual.
- To avoid electrical shock, connect the protective ground terminal to electrical ground (safety ground).

- When applying power to the products from a switchboard, be sure work is performed by a qualified and licensed electrician or is conducted under the direction of such a person.
- When installing products with casters, be sure to lock the casters.



### **Relocation**

- Turn off the power switch and then disconnect all cables when 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.
- Use extra precautions such as using more people when relocating into or out of present locations including inclines or steps. Also handle carefully when relocating tall products as they can fall over easily.
- Be sure the operation manual be included when the product is relocated.



### **Operation**

- Check that the AC input voltage setting and the fuse rating are satisfied and that there is no abnormality on the surface of the AC power cord. Be sure to unplug the AC power cord or stop applying power before checking.
- If any abnormality or failure is detected in the products, stop using it immediately. Unplug the AC power cord or disconnect the AC power cord from the switchboard. 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 AC power cord or stop applying power 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.

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# Preface

## Introduction to the Product

The SH series shunt unit is a high-precision current detecting resistor that connects to Kikusui's power supply controller PIA series (\*1) to monitor the output current of a regulated DC power supply.

This series offers two models, the SH10 (10 A) and the SH50 (50 A), which differ according to their current ratings.

## Features

- Connection to a PIA series and each regulated DC power supply requires only one cable each (for one regulated DC power supply), allowing easy connection.
- Use of this shunt allows the accuracy of the current monitoring capability of a PIA series to improve as high as 0.3% of the full scale of the rated current.
- The SH series can be connected to the following Kikusui regulated power supplies.
  - PAK-A and PAK-AM series (\*2)
  - PAN and PAN-A series (\*3)
  - PMC-A series (\*4)
  - PAD-L series (\*5)
  - PAB-A series (\*5, \*6)
  - PAE series (\*5, \*6)

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**NOTE**

\*1:Connectable to the PIA3200, PIA4810 or PIA4820. Use of the PIA4810 or PIA4820 requires an OP01-PIA control board.

\*2:Connection to the PAK-A or PAK-AM series requires an IF01-PAK-A interface board.

\*3:Connection to the PAN or PAN-A series requires a TU02-PIA (TU01-PIAS) terminal unit.

\*4:Connection to the PMC-A series requires a dedicated connection cable.

\*5:Connection to the PAD-L, PAB-A or PAE series requires a TU01-PIA terminal unit.

\*6:Connection to the PAB-A or PAE series requires a PIA3200 power supply controller.

---



This chapter presents procedures for setup, ranging from unpacking to starting the unit.

## 1.1 Checks at Unpacking

Upon receiving this product, make sure the package contains the necessary accessories and has not been damaged during transportation. If any part is damaged or missing, contact Kikusui distributor/agent.

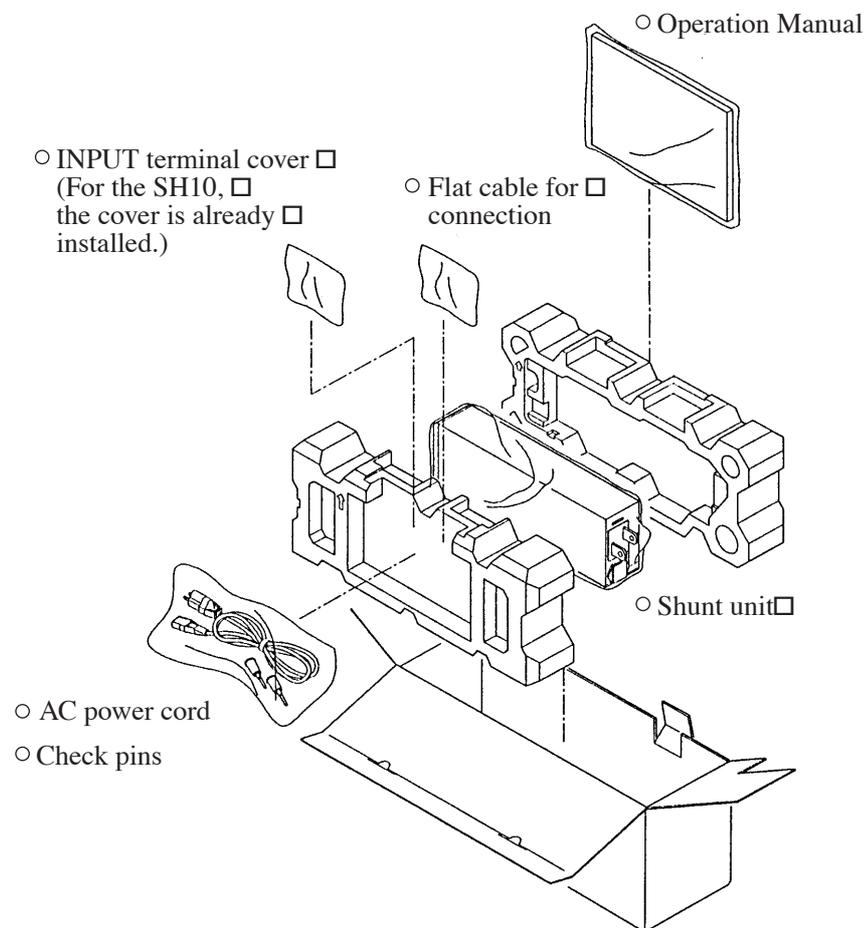
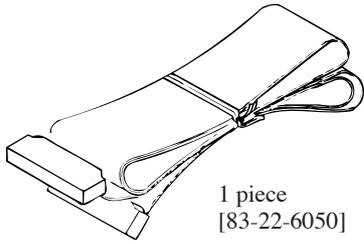


Fig. 1-1 Packing/Unpacking

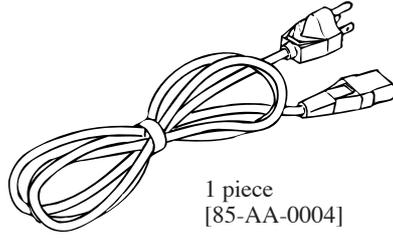
**NOTE**

- Packing materials may be used for transport of the product, so it is recommended that they be retained.



1 piece  
[83-22-6050]

Connection cable



1 piece  
[85-AA-0004]

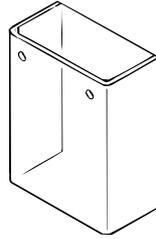
AC power cord

Different types of power cords are provided, depending on the settings of the line voltage range at the time of delivery. This power cord is for voltage of up to 125 V.



1 piece  
[99-02-0009]

Fuse  
This is provided as a reserve in the fuse holder.

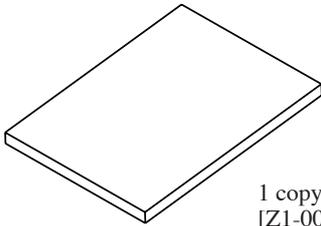


1 piece  
[Q5-000-101]

INPUT terminal cover (with two M3 x 8 mounting screws)  
For the SH10, the cover is installed on the INPUT terminal board.

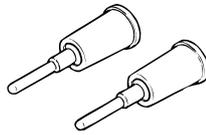


2 pieces  
[M3-000-081]



1 copy  
[Z1-000-072]

Operation manual



2 pieces  
[87-12-0000]

Check pins

Fig. 1-2 List of Accessories

## 1.2 Precautions for Installation

Be sure to observe the following precautions when installing the unit.

### ■ Do not use the unit in a flammable atmosphere.

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

### ■ Avoid locations where the unit is exposed to high temperatures or direct sunlight.

Do not locate the unit near a heater or in areas subject to drastic temperature changes.

Operating temperature range: 0°C to 40°C

### ■ Avoid humid environments.

Do not locate the unit in a high-humidity environment—near a boiler, humidifier, or water supply.

Operating humidity range: 10% to 90% R.H.  
(no dew condensation is allowed)

Condensation may occur even within the operating humidity range. In that case, do not start using the unit until the location is completely dry.

### ■ Do not place the unit in a corrosive atmosphere.

Do not install the unit in a corrosive atmosphere or one containing sulfuric acid mist or the like. This may cause corrosion of various conductors and imperfect contact with connectors, leading to malfunction and failure, or in the worst case, a fire.

### ■ Do not locate the unit in a dusty environment.

Dirt and dust in the unit may cause electrical shock or fire.

### ■ Do not use the unit where ventilation is poor.

Provide sufficient space around the unit. Otherwise, heat may accumulate in the unit, resulting in fire.

### ■ Do not place any object on the unit.

Particularly a heavy one, as doing so could result in a malfunction.

### ■ Do not place the unit on a tilted surface or in a location subject to vibrations.

If placed on a non-level surface or in a location subject to vibration, the unit may fall, resulting in damage and injury.

### ■ Do not use the unit in locations affected by strong magnetic or electric fields.

Operation in a location subject to magnetic or electric fields may cause the unit to malfunction, resulting in electrical shock or fire.

---

## 1.3 Precautions for Moving

When moving or transporting the unit to an installation site, observe the following precautions.

■ **Turn the POWER switch off.**

Moving the unit with the power on may result in electrical shock or damage.

■ **Remove all wirings connected.**

Moving the unit with cables connected may break the cables or cause the unit to fall, resulting in injury.

■ **For transportation, use the special packing material for the unit.**

Transport the unit in its original package to prevent vibration and falls, which may damage the unit. If you require packing material, contact Kikusui distributor/agent.

## 1.4 Checking Input Power and the Fuse

As shown in Fig. 1-3, four line voltage ranges are available for the unit. Check the default settings to determine whether the voltage is suitable for your unit. Use a input power fuse appropriate for your line voltage range.

- 
- ⚠ WARNING** • To prevent electric shock, be sure to unplug the AC power cord or turn the switch on the switchboard off before checking or replacing the fuse.
- ⚠ CAUTION** • Make sure that the fuse used conforms to the unit specifications, including shape, rating, and characteristics. Using a fuse with different rating or short-circuiting, the fuse holder will damage the unit.
-

When checking or changing the line voltage range, or when checking or replacing the power fuse, observe the following instructions:

1. – Turn the POWER switch off.
2. – Unplug the AC power cord from the unit.
3. – Check the input voltage range switch at the bottom of the unit to determine whether it is set at an appropriate voltage for the unit.

To change the setting, follow the instructions on the SWITCH POSITION indicator. (Fig. 1-3)

4. – Remove the cover from the fuse holder. (Fig. 1-4)
5. – Check the fuse to make sure its rated voltage is within the line voltage range, and that its pre-arcing time-current characteristic is of the time-delay type.

If necessary, replace with an appropriate fuse.

6. – Reset the cover of the fuse holder.

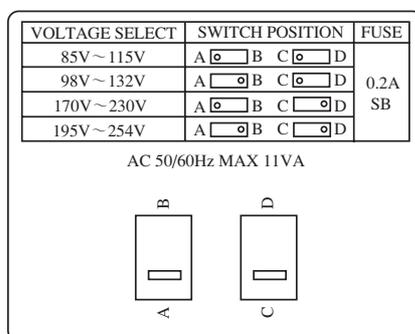


Fig. 1-3 Input Voltage Range Selector Switches on the Bottom Panel.  
The figure shows that a range of 85 V to 115 V has been selected.

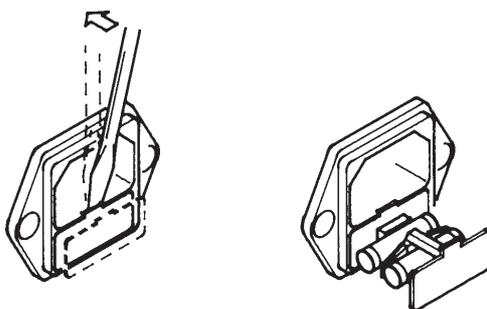


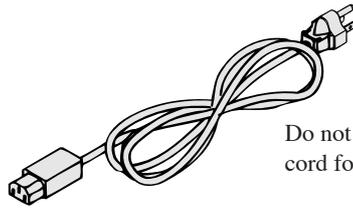
Fig. 1-4 Removing the Fuse Holder

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## 1.5 AC Power Cord Connection

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- ⚠ WARNING** • If this unit includes an AC power cord with a three-prong plug as shown in Fig. 1-5, carefully check the line voltage range. This type of power cord cannot be used for over 125 VAC. If you use the unit with line voltage over 125 VAC, replace with an appropriate power cord compatible with the voltage to be used.



Do not use this type of power cord for over 125 VAC.

Fig. 1-5 AC Power Cord with a Three-prong Plug included with the unit

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Make connections as follows:

1. – Turn the POWER switch off.
2. – Connect the AC power cord to the AC power connector on the rear panel.
3. – Plug the power cord into the receptacle.

### ■ To directly connect to the switchboard:

If the AC power cord is to be connected directly to the switchboard without using a plug, install crimp terminals on the power cord.

- ⚠ WARNING** • An AC power cord with a 3-prong plug as shown in Fig. 1-5 cannot be used for a voltage of over 125 VAC, even if its plug is cut off to be replaced with crimp terminals.
- To prevent electrical shock, turn off the switchboard before connecting the power cord.
  - Connections to the switchboard must be made by qualified personnel.
-

## 1.6 Grounding

### **⚠ WARNING**

- Not grounding the unit creates danger of electric shock.
- Connect the ground terminal to an electrical ground (safety ground).

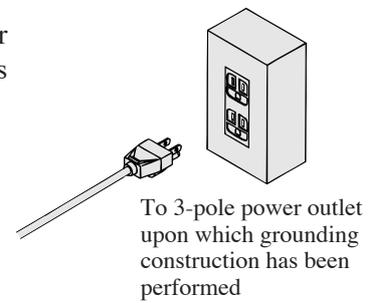
### **⚠ CAUTION**

- Not performing adequate grounding work on the unit results in malfunction or the production of large noises from the unit.

To ensure safety, provide secure grounding.

The unit can be grounded by one of the two methods specified below. Select one, and ground the unit securely.

1. Plug the AC power cord into a 3-pole power outlet upon which grounding construction has been performed.



2. Connect terminal  $\perp$  on the unit rear panel to the ground terminal (GND).

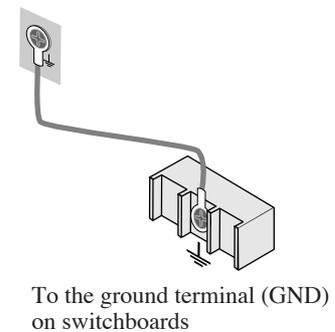


Fig. 1-6 Grounding

# 1.7 Setting the Monitor Range Selection Switch

The range monitor selector switch on the rear panel must be set to “H,” “M,” or “L,” depending on the regulated DC power supply to be connected to the unit. On the setting ranges for regulated DC power supplies, see “List of Applicable Shunt Units by Power Supply” in the Appendix.

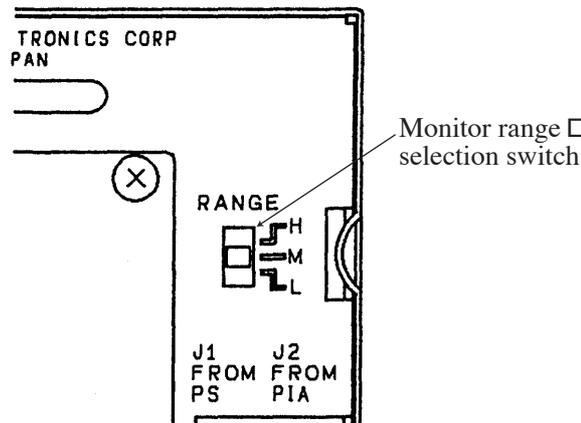


Fig. 1-7 Monitor Range Selection Switch on the Rear Panel

- DESCRIPTION**
- The current to be measured that is input to the INPUT terminals is amplified by the differential amplifier, output to the J2 connector, and then transmitted to the PIA series. The shunt unit allows you to adjust sensitivity using the range monitor selector switch, so that a wide range of currents can be measured.

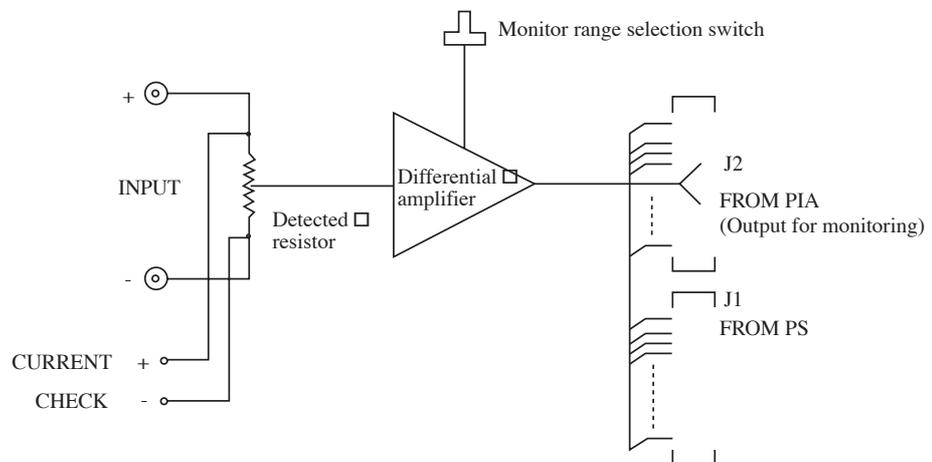


Fig. 1-8 Internal Make-up of SH Series Devices

# 1.8 Rack Mounting

For installing the unit together with the PAK-A, PAK-AM or PMC-A series on a rack

## ■ Rack adapters

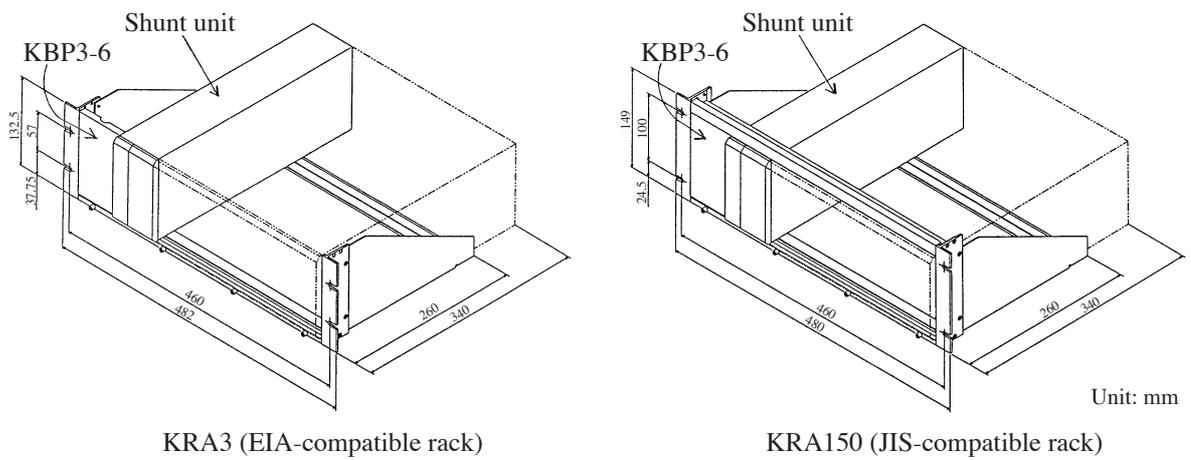


Fig. 1-9 Rack Adapters

This figure shows a configuration where the shunt unit has been installed.

## ■ Blank panels

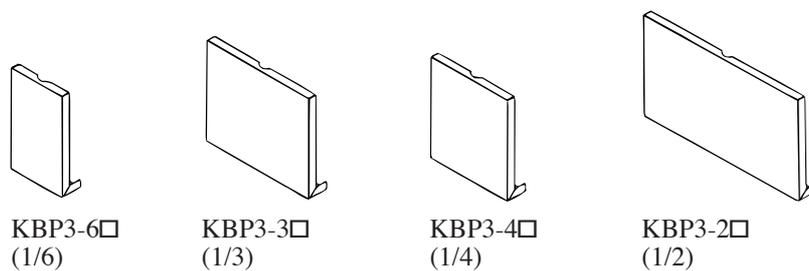


Fig. 1-10 Blank Panels

These panels are dedicated for KRA3 or KRA150.

The detailed information is indicated on rack adapters.

## For installing the unit together with the PAN, PAN-A, PAD-L, or PAB-A series on a rack

### ■ Rack adapters

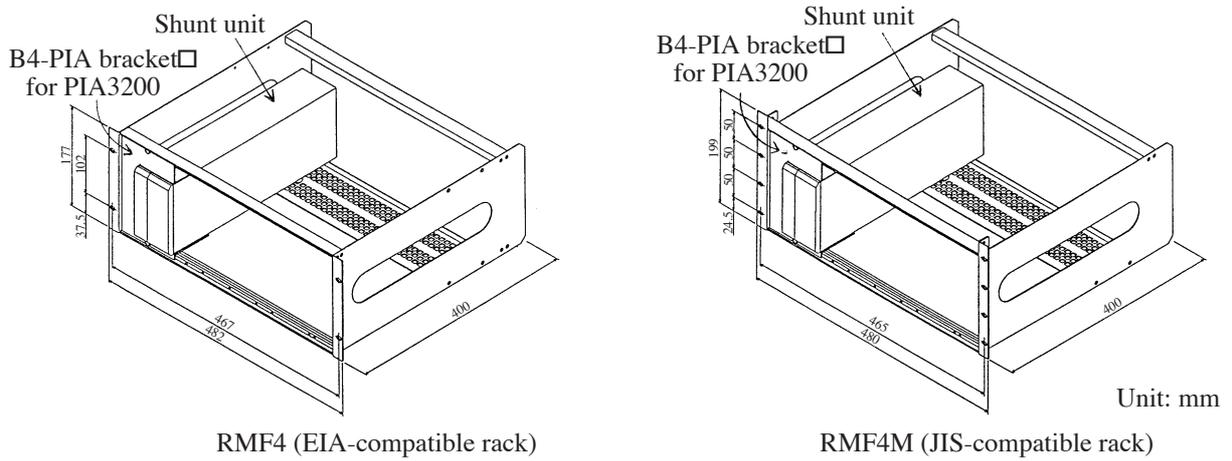


Fig. 1-11 Rack Adapters

This figure shows a configuration where the shunt unit has been installed.

### ■ Blank panels

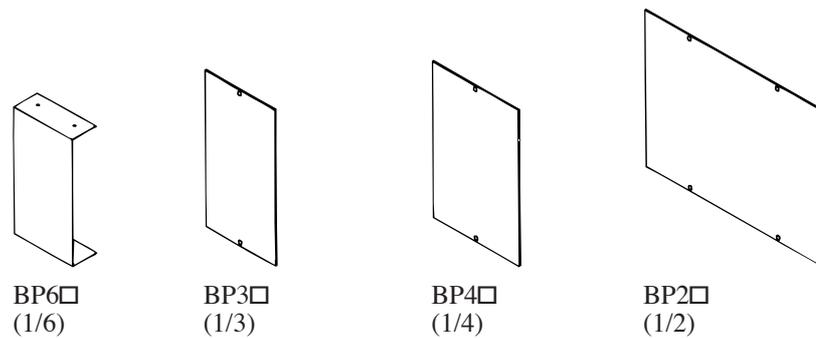


Fig. 1-12 Blank Panels

These panels are dedicated for RMF4 or RMF4M.

The detailed information is indicated on rack adapters.

This chapter describes how to connect the unit on a power supply series basis.

## 2.1 Connection

Connection is described for the following Kikusui regulated DC power supplies.

- PAK-A and PAK-AM series
- PAN and PAN-A series
- PMC-A series
- PAD-L series
- PAB-A series
- PAE series

---

**⚠ CAUTION**

- Carry out connections properly according to the power supply series to be used. Particularly, pay attention to the polarity. If the wiring is incorrect, a voltage of 10 V or more may be applied to the INPUT terminals and the common terminals of the J1 and J2 connectors. This may damage the shunt unit.
  - The range monitor selector switch on the rear panel must be set to “H”, “M,” or “L,” depending on the regulated DC power supply to be connected to the unit. See “List of Applicable Shunt Units by Power Supply” in the Appendix.
  - Use wiring material suitable for the current to be fed to the load. On materials, refer to Table 2-1.
- 

Table 2-1 Recommended Current with Respect to the Nominal Sectional Area of Wiring Material

Nominal sectional area	Kikusui's recommended current
2 mm <sup>2</sup>	10 A
5.5 mm <sup>2</sup>	20 A
8 mm <sup>2</sup>	30 A
14 mm <sup>2</sup>	50 A
22 mm <sup>2</sup>	80 A
38 mm <sup>2</sup>	100 A
80 mm <sup>2</sup>	200 A



## Connection to the PMC-A series

Wire the shunt unit to the minus terminals of the PMC-A series as shown in the figure.

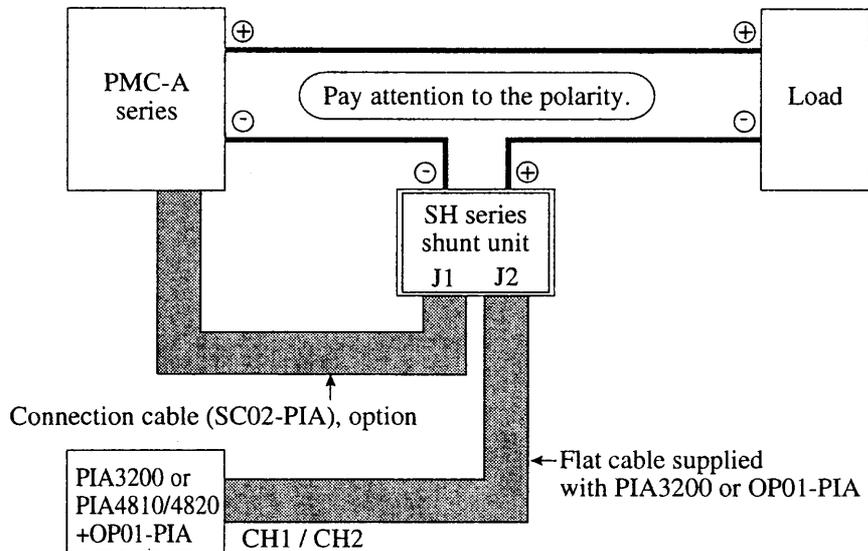


Fig. 2-3 Connection to the PMC-A Series

## Connection to the PAD-L series

Wire the shunt unit to the plus terminals of the PAD-L series as shown in the figure.

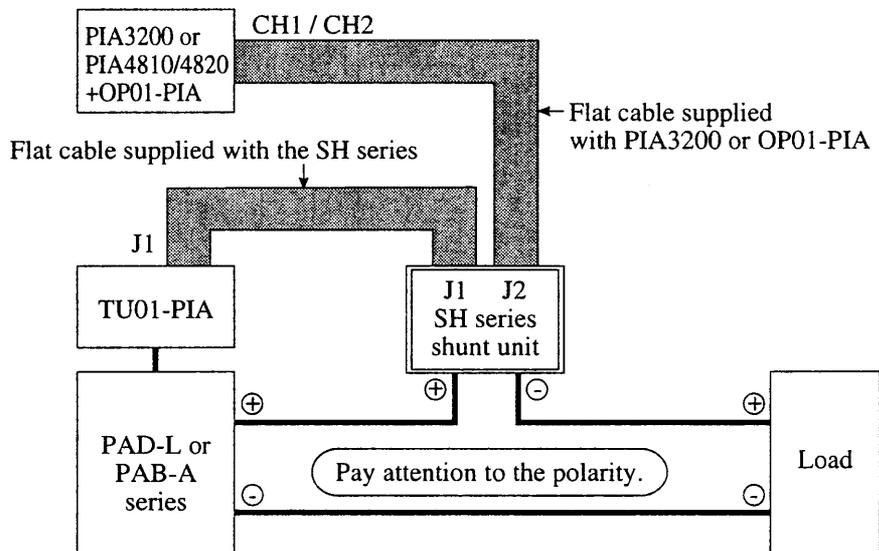


Fig. 2-4 Connection to the PAD-L Series

## Connection to the PAB-A series (Connectable to only the PIA3200)

Wire the shunt unit to the plus terminals of the PAB-A series as shown in the figure. The power supply controller which can be connected to the PAB-A series is the PIA3200.

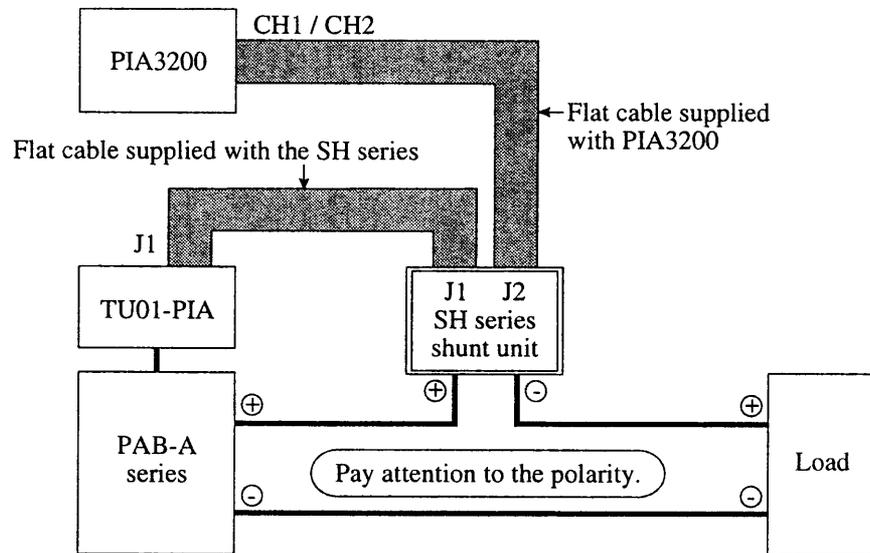


Fig. 2-5 Connection to the PAB-A Series

## Connection to the PAE series (Connectable to only the PIA3200)

Wire the shunt unit to the minus terminals of the PAE series as shown in the figure. The power supply controller which can be connected to the PAE series is the PIA3200.

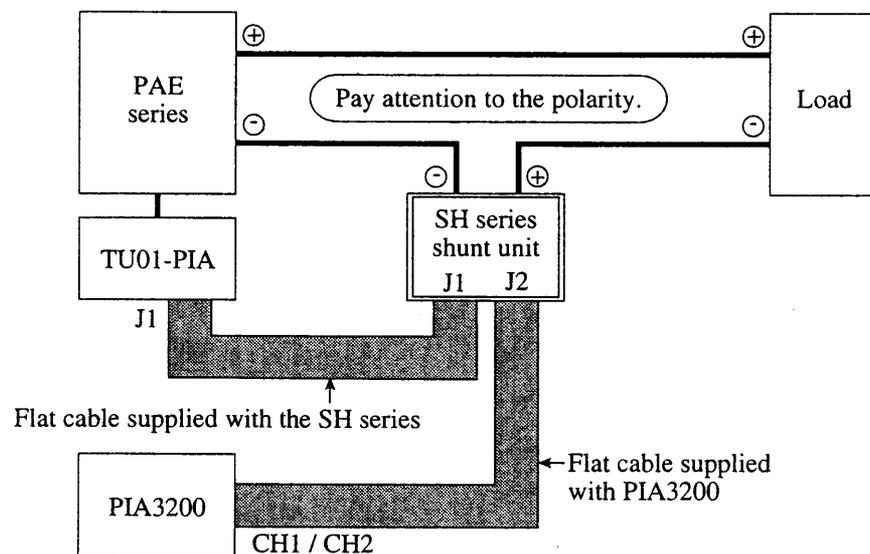


Fig. 2-6 Connection to the PAE Series

## 2.2 Installing the Cover

After completing connections, install the INPUT terminal cover.

### ■ For the SH10

Use two screws to install the cover on the INPUT terminal board directly.

### ■ For the SH50

Install the cover as shown in Fig. 2-7.

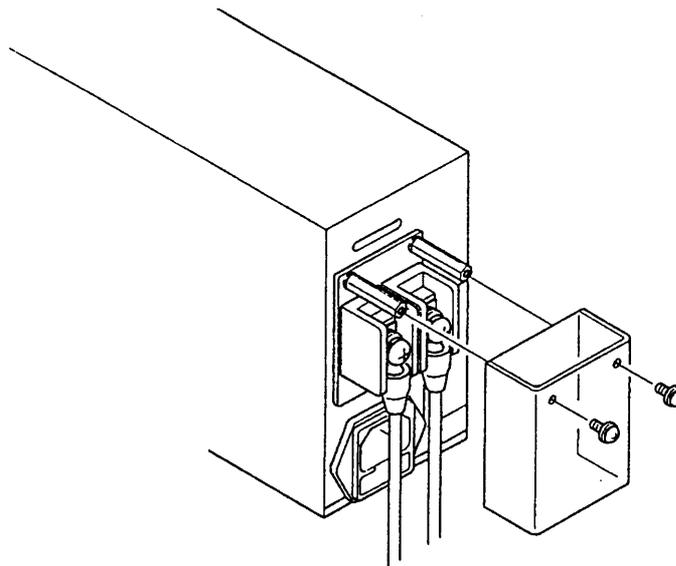


Fig. 2-7 Installing the INPUT Terminal Cover to the SH50

## 2.3 Calibrating the System

Before using the system, it must be calibrated thoroughly.

### ■ Using the PIA3200

For the calibration procedure, see Chapter 4, “Calibration in Local Mode,” in the PIA3200 Operation Manual. Note that Fig. 4-1 in the PIA3200 Operation Manual must be replaced by Fig. 2-8 below to perform calibration.

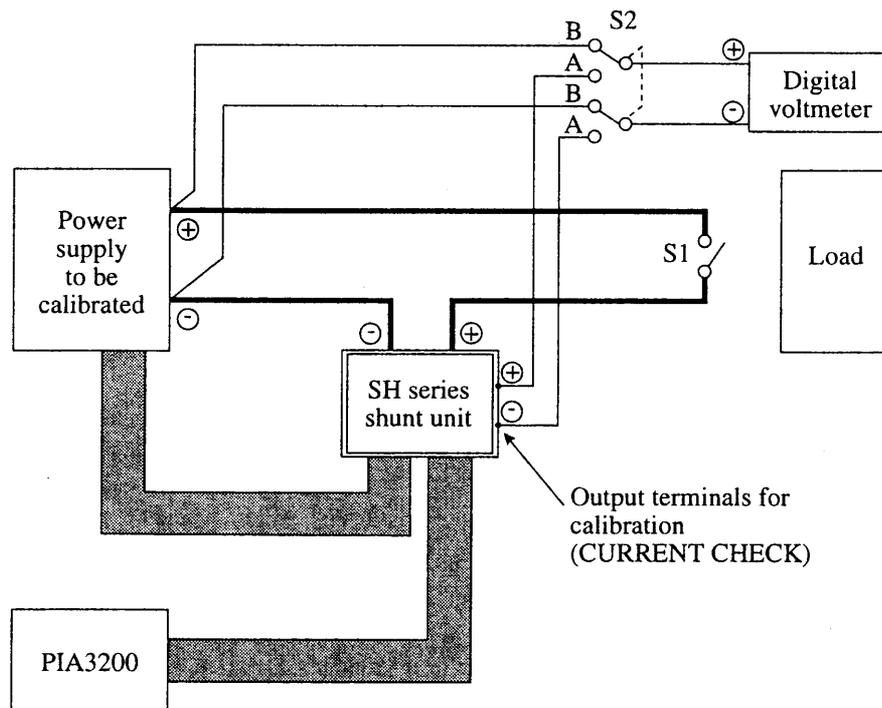


Fig. 2-8 Calibration Circuit of a System Using a Shunt Unit

#### NOTE

- In Fig. 2-8, the connection between the shunt unit and the power supply to be calibrated is simplified. For details, see the connection diagram for each power supply series.
- S1 in Fig. 2-8 may be provided on the negative side of the power supply to be calibrated.

### ■ Using the PIA480 or PIA4820

For the calibration procedure, see Chapter 3, “3.7 Calibration by Device Configuration,” in the PIA4810 Operation Manual.

# Chapter 3 Part Names and Their Functions

This chapter describes the functions of switches, indicator, connectors, and others on the front and rear panels, including their names.

## 3.1 Front Panel

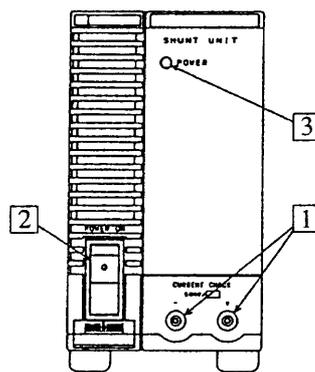


Fig. 3-1 SH Series Front Panel

- 1 Voltage output terminals for calibration**  
Outputs the actual voltage of the shunt resistor in the shut unit.  
This voltage can be used as a true value when calibrating the current of the PIA series. These terminals are for a digital voltmeter.
- 2 POWER switch**  
Turns on/off the power of the unit. Flip up the lever to turn the power ON, and flip it down to turn the power OFF.
- 3 POWER lamp**  
Lights up when the power to the unit is ON.

## 3.2 Rear Panel

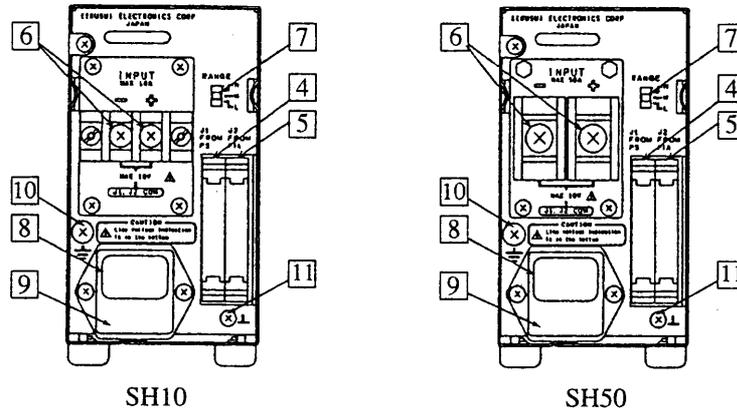


Fig. 3-2 SH Series Rear Panel

- 4 J1 connector**  
Connector for connecting a regulated DC power supply
- 5 J2 connector**  
Connector for connecting the PIA series
- 6 INPUT terminals**  
Current input and output terminals for measurements

	SH10	SH50
Size of terminal	M4	M5

- 7 Monitor range selection switch**  
Used to set the output voltage to be monitored to range H, M, or L, depending on the target regulated DC power supply.  
See “List of Applicable Shunt Units by Power Supply” in the Appendix.
- 8 AC power connector**  
Connector for connecting AC power. Insert the plug of the supplied AC power cord into this connector.

---

**⚠ WARNING** • Incorrect handling may cause electric shock. Always follow the instructions in 1.5, “AC Power Cord Connection.”

---

---

**9 Fuse holder**

Fuse holder for an AC input fuse. It also contains a spare fuse.

---

**⚠ WARNING** • Incorrect handling may cause electric shock. Always follow the instructions in 1.4, “Checking Input Power and the Fuse.”

---

**10** ⚡

Ground terminal

---

**⚠ WARNING** • Always ground this terminal. For details, see 1.6, “Grounding.”

---

**11** ⊥

Chassis ground terminal

## 3.3 Bottom Panel

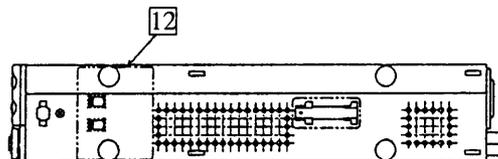


Fig. 3-3 SH Series Bottom Panel

**12 Input power voltage range selection switch**

Allows you to select the voltage range according to the input power voltage. Select the voltage range suitable for the input voltage. For details, see 1.4, “Checking Input Power and the Fuse.”



This chapter describes maintenance and calibration procedures for the unit. To maintain the unit's original performance as long as possible, conduct periodic maintenance, checks, and calibration.

## 4.1 Cleaning

- 
- ⚠ WARNING** • Before cleaning the unit, be sure to turn off the POWER switch and unplug the AC power cord or turn off the switch on the switchboard.
- 

### ■ Panel surface

If the panel surface becomes soiled, moisten a piece of soft cloth with a water-diluted neutral detergent, and wipe the surface gently.

- 
- ⚠ CAUTION** • Do not use volatile solvents such as thinner or benzine. They may discolor the unit surface coating or erase printed characters.
-

### ■ Dust filter

Clogging in the dust filter causes the cooling ability to degrade, and this may shorten the unit's life or cause a malfunction. Clean the dust filter periodically before it becomes significantly soiled or clogged.

If the filter is not heavily soiled, use a vacuum cleaner to remove dust and dirt. If it is heavily soiled, clean the louver and filter together in water.

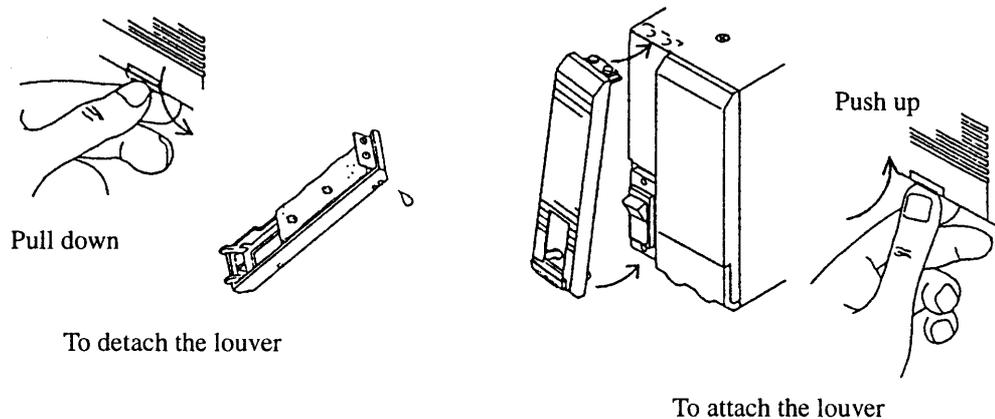


Fig. 4-1 Detaching and Attaching the Louver

---

**⚠ CAUTION** • When you clean the filter in water, dry it thoroughly after cleaning.

---

## 4.2 Inspection

### ■ AC power cord

Check that there is no damage on the insulation coating, and that the plug is securely attached and free from cracks.

---

**⚠ WARNING** • Breaks in the insulation coating may cause electric shock. If a break is found, immediately stop using the unit.

---

To purchase accessories, contact Kikusui distributor/agent.

## 4.3 Calibration

You can calibrate the entire system, including the PIA series, in accordance with 2.3, "Calibrating the System," in Chapter 2. Note that the shunt unit's voltage output terminals for calibration are used as a reference for calibration of the entire system. Thus, check these output terminals periodically. The following describes how to calibrate them.

### ■ Calibration procedure

Connect the standard shunt to the unit in series as shown in Fig. 4-2, and check that the value of the voltage output for calibration falls within 0.2% of the full scale of the rated current with respect to the current flowing in the standard shunt.

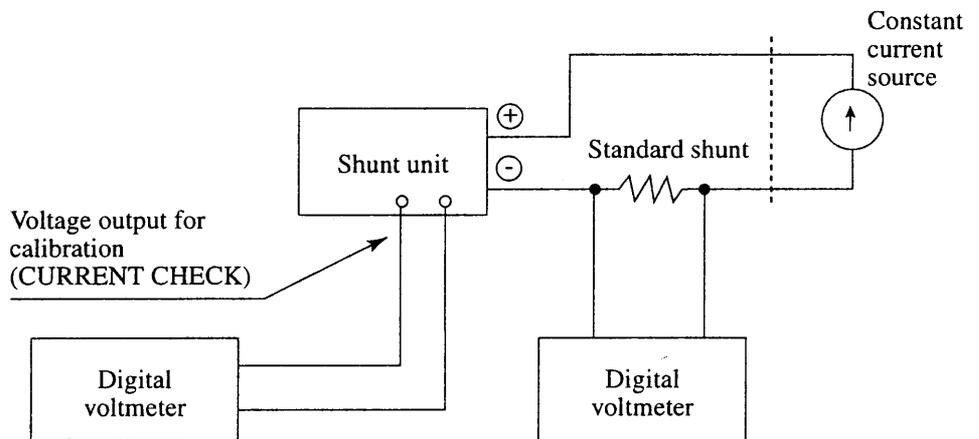


Fig. 4-2 Calibration Circuit for a Shunt Unit



This chapter describes the electrical specifications, general specifications, and accessories of the unit.

## 5.1 Specifications

### Electrical specifications

Item	SH10	SH50
Rated current	10 A	50 A
Monitoring output block		
Linearity	±0.3% of FS (*1)	
Temperature coefficient (Standard value)	±100 PPM/°C	
Output voltage (Standard value)	1 V/10 A (High range)	1 V/50 A (High range)
	1 V/7.5 A (Middle range)	1 V/37.5 A (Middle range)
	1 V/5 A (Low range)	1 V/25 A (Low range)
Output block for calibration		
Output voltage	50 mV/10 A	50 mV/50 A
Accuracy	±0.2% of FS (*1)	
Output impedance (DC)	About 100 Ω	
INPUT terminal voltage drop	100 mV or less	

\*1: FS is the rated current in each range.

## General Specifications

Item	SH10	SH50
Operating environment		
Operating temperature	0°C - 40°C	
Humidity	10% - 90%RH (No dew condensation is allowed)	
Power requirement		
Input power voltage	One of the following ranges can be selected using the input power voltage range selection switches 85 V - 115 V, 98 V - 132 V 170 V - 230 V, 195 V - 254 V	
Frequency	48 Hz - 62 Hz	
Power consumption	Approx. 10 VA	
Input terminal	Three-prong inlet type	
Insulation		
AC input terminals and chassis	30 MΩ or more at 500 V DC	
J1, J2, calibration voltage output terminals, or INPUT terminals and chassis	30 MΩ or more at 500 V DC	
Withstand voltage		
AC input terminals and chassis	1500 V AC for one minute	
AC input terminals and J1, J2, calibration voltage output terminals, or INPUT terminals	1500 V AC for one minute	
Voltage to ground		
INPUT terminals	± 250 V	
Weight	Approx. 2.2 kg	

## Accessories

Item	SH10	SH50
Connection cable (26-conductor, 50 cm)	1 piece	
AC power cord	1 piece	
Spare fuse (0.2 A, time-lag type)	1 piece (*2)	
Operation Manual	1 copy	
Terminal cover	1 piece (with two M3 x 8 mounting screws) (*3)	
Check pins	2 pieces	

\*2: Contained in the fuse holder

\*3: For the SH10, the terminal cover is installed on the INPUT terminal board.

## 5.2 Dimensions

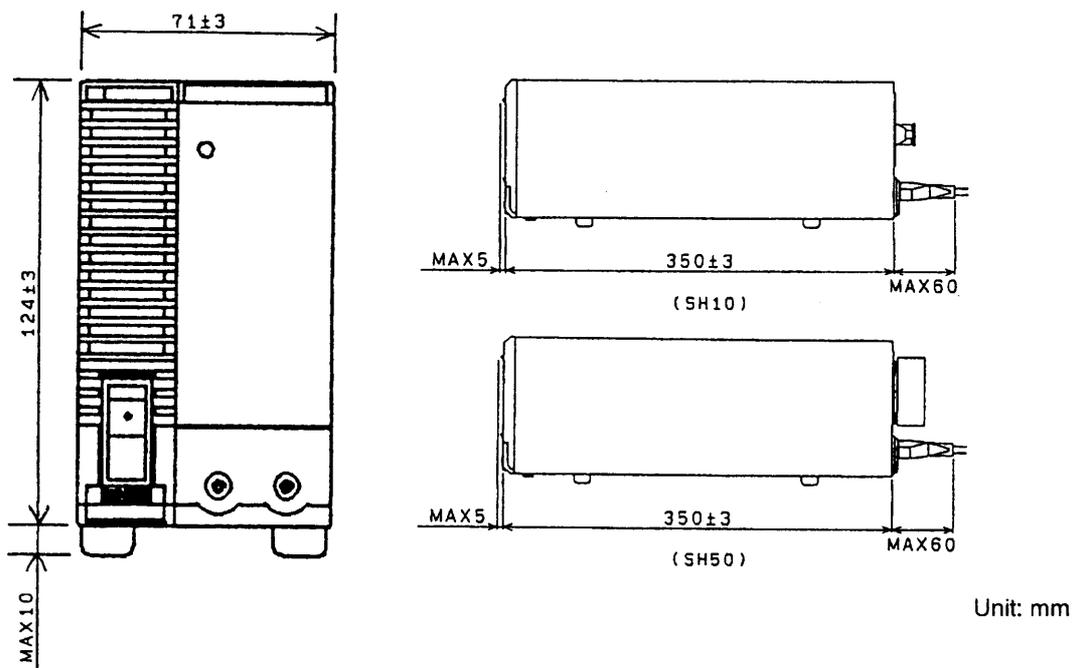


Fig. 5-1 Dimensions of the SH Series Shunt Unit



# Appendix

## List of Applicable Shunt Units by Power Supply

Table A-1 Applicable Shunt Units for the PAK-A and PAK-AM Series

ID Number	Model	Applicable unit (*1)	Monitor range (*2)
001	PAK6-60A/AM	/	/
002	PAK6-120A/AM	/	/
003	PAK6-160A/AM	/	/
004	PAK10-35A/AM	SH50	M
005	PAK10-70A/AM	/	/
006	PAK10-100A/AM	/	/
007	PAK20-18A/AM	SH50	L
008	PAK20-36A/AM	SH50	M
009	PAK20-50A/AM	SH50	H
010	PAK35-10A/AM	SH10	H
011	PAK35-20A/AM	SH50	L
012	PAK35-30A/AM	SH50	M
013	PAK60-6A/AM	SH10	M
014	PAK60-12A/AM	/	/
015	PAK60-18A/AM	SH50	L

\*1: Shunt units indicated by “/” are handled by special order.

\*2: Letters indicate the positions of the monitor range selection switch on the rear panel.

Table A-2 Applicable Shunt Units for the PAB-A Series  
(Connectable to only the PIA3200)

ID Number	Model	Applicable unit (*1)	Monitor range (*2)
016	PAB18-1A	/	/
017	PAB18-1.8A	/	/
018	PAB18-3A	SH10	L
019	PAB32-1.2A	/	/
020	PAB32-2A	/	/
021	PAB70-1A	/	/
022	PAB110-0.6A	/	/
023	PAB250-0.25A	/	/
024	PAB350-0.1A	/	/

Table A-3a Applicable Shunt Units for the PAD-L Series

ID Number	Model	Applicable unit (*1)	Monitor range (*2)
026	PAD8-20L/LP	SH50	L
027	PAD8-30L/LP	SH50	M
028	PAD8-50L/LP	SH50	H
029	PAD8-100L	/	/
030	PAD16-10L/LP	SH10	H
031	PAD16-18L/LP	SH50	L
032	PAD16-30L/LP	SH50	M
033	PAD16-50L	SH50	H
034	PAD16-100L/LP	/	/
035	PAD16-200L	/	/
036	PAD16-500L	/	/
037	PAD35-5L/LC	SH10	L
038	PAD35-10L/LP	SH10	H
039	PAD35-20L/LP	SH50	L
040	PAD35-30L/LP	SH50	M
041	PAD35-50L/LP	SH50	H
042	PAD35-60L/LP	/	/
043	PAD35-100L/LP	/	/
044	PAD35-200L/LP	/	/
045	PAD35-300LPT	/	/

Table A-3b Applicable Shunt Units for the PAD-L Series (Continued)

ID Number	Model	Applicable unit (*1)	Monitor range (*2)
046	PAD55-3L	SH10	L
047	PAD55-6L	SH10	M
048	PAD55-10L	SH10	H
049	PAD55-20L	SH50	L
050	PAD55-35L	SH50	M
051	PAD55-60L	/	/
052	PAD55-120L	/	/
053	PAD60-200LPT	/	/
054	PAD70-2.5L	SH10	L
055	PAD70-5L	SH10	L
056	PAD70-8L	SH10	H
057	PAD70-15L	SH50	L
058	PAD110-1.5L	/	/
059	PAD110-3L	SH10	L
060	PAD110-5L	SH10	L
061	PAD110-10L	SH10	H
062	PAD110-20L	SH50	L
063	PAD110-30L	SH50	M
064	PAD110-60L	/	/
065	PAD160-1L	/	/
066	PAD160-2L	/	/
067	PAD160-3.5L	SH10	L
068	PAD160-7L	SH10	M
069	PAD250-2.5L	SH10	L
070	PAD250-4.5L	SH10	L
071	PAD250-8L	SH10	H
072	PAD250-15L	SH50	L
073	PAD500-2L	/	/

\*1: Shunt units indicated by “/” are handled by special order.

\*2: Letters indicate the positions of the monitor range selection switch on the rear panel.

Table A-4 Applicable Shunt Units for the PAE Series  
(Connectable to only the PIA3200)

ID Number	Model	Applicable unit (*1)	Monitor range (*2)
075	PAE35-10	SH10	H
076	PAE35-20	SH50	L
077	PAE35-30	SH50	M

Table A-5 Applicable Shunt Units for the PMC-A Series

ID Number	Model	Applicable unit (*1)	Monitor range (*2)
080	PMC18-1A	/	/
081	PMC18-2A	/	/
082	PMC18-3A	SH10	L
083	PMC18-5A	SH10	L
084	PMC35-0.5A	/	/
085	PMC35-1A	/	/
086	PMC35-2A	/	/
087	PMC35-3A	SH10	L
088	PMC70-1A	/	/
089	PMC110-0.6A	/	/
090	PMC160-0.4A	/	/
091	PMC250-0.25A	/	/
092	PMC350-0.2A	/	/
093	PMC500-0.1A	/	/

\*1: Shunt units indicated by “/” are handled by special order.

\*2: Letters indicate the positions of the monitor range selection switch on the rear panel.

Table A-6 Applicable Shunt Units for the PAN and PAN-A Series

ID Number	Model (*3)	Applicable unit (*1)	Monitor range (*2)
094	PAN16-10 (A)	SH10	H
095	PAN16-18 (A)	SH50	L
096	PAN16-30 (A)	SH50	M
097	PAN16-50 (A)	SH50	H
098	PAN35-5 (A)	SH10	M
099	PAN35-10 (A)	SH10	H
100	PAN35-20 (A)	SH50	L
101	PAN35-30 (A)	SH50	M
102	PAN55-3 (A)	SH10	L
103	PAN55-6 (A)	SH10	M
104	PAN55-10 (A)	SH10	H
105	PAN55-20 (A)	SH50	L
106	PAN70-2.5 (A)	SH10	L
107	PAN70-5 (A)	SH10	L
108	PAN70-8 (A)	SH10	H
109	PAN70-15 (A)	SH50	L
110	PAN110-1.5 (A)	/	/
111	PAN110-3 (A)	SH10	L
112	PAN110-5 (A)	SH10	L
113	PAN110-10 (A)	SH10	H
114	PAN160-1 (A)	/	/
115	PAN160-2 (A)	/	/
116	PAN160-3.5 (A)	SH10	L
117	PAN160-7 (A)	SH10	M
118	PAN250-2.5 (A)	SH10	L
119	PAN250-4.5 (A)	SH10	L

- \*1: Shunt units indicated by “/” are handled by special order.
- \*2: Letters indicate the positions of the monitor range selection switch on the rear panel.
- \*3: When the PAN-A series is controlled with the PIA3200, the controller returns the ID and model of the PAN series for the query message of "ID?".

**SHUNT UNIT**

**SH10/SH50**

**OPERATION MANUAL**