

Part No. Z1-002-082, IB00091H

Jun. 2008

# Operation Manual

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PIA4800 Series

POWER-SUPPLY CONTROLLER/EXPANTION UNIT

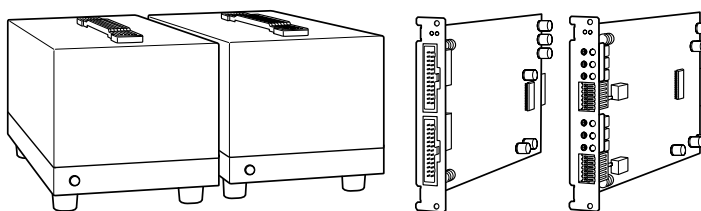
**PIA4810**

**PIA4820**

CONTROL BOARD

**OP01-PIA**

**OP02-PIA**



## 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 “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.

## Disposing of used Kikusui products in the EU

Under a law adopted by member nations of the European Union (EU), used electric and electronic products carrying the symbol below must be disposed of separately from general household waste.

This includes the power cords and other accessories bundled with the products. When disposing of a product subject to these regulations, please follow the guidance of your local authority, or inquire with your Kikusui distributor/agent where you purchased the product.

The symbol applies only to EU member nations.



## Disposal outside the EU

When disposing of an electric or electronic product in a country that is not an EU member, please contact your local authority and ask for the correct method of disposal.

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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.

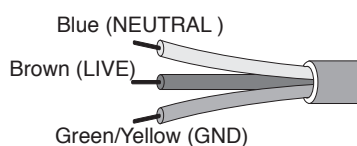
## ☐ AC power cord

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.

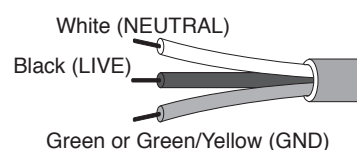
### WARNING

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

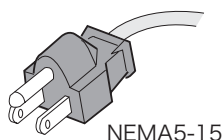
#### ☐ Without a plug



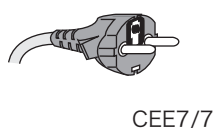
#### ☐ Without a plug



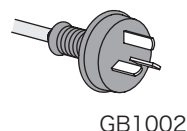
#### ☐ Plug for USA



#### ☐ Plug for Europe



#### ☐ Plug for China



#### ☐ Provided by Kikusui distributor/agent

Kikusui agents can provide you with suitable 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 a protective conductor terminal.



Indicates a chassis(frame) 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.



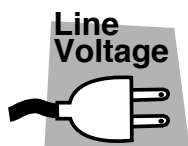
## **Users**

- 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.



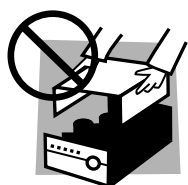
## **Input power**

- 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.



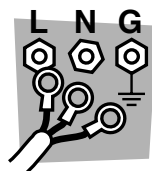
## **Fuse**

- 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

## About this Manual

This Operation Manual applies to the Power-Supply Controllers PIA4810 and the Expansion Unit PIA4820.

Either of the two models is referred to as “the controller.” The controller can control the DC power-supply unit and the electronic load manufactured by Kikusui. In this manual, the DC power-supply unit may also be referred to as the “DC power-supply unit.” If the electronic load is to be used, read “DC power-supply unit” for “electronic load.”

The setup procedure to be performed before starting control is described in three chapters, as follows:

- For unpacking, installation, and AC power-cord connection, see Chapter 1, “Unpacking and Installation.”
- For the connecting configurations, setup, and commands with DC power supplies, refer to the "Connecting & Programming Guide" in the CD-ROM as an attached accessory which describes detail of remote control in specific products. The latest version of the "Connecting & Programming Guide" can be downloaded from Web site ([http://www.kikusui.co.jp/en/kiku\\_manuals/](http://www.kikusui.co.jp/en/kiku_manuals/)).
- For logical system connections and calibration of the DC power-supply unit after completing the connection of the DC power-supply unit, see Chapter 3, “Calibration by Device Configuration.”

To control the DC power-supply unit, see Chapter 4, “Remote Control,” and the "Connecting & Programming Guide."

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**NOTE**

- Chapters 8 and 9 explain the control boards OP01-PIA and OP02-PIA, which are used in four slots of the controller to expand the channels. To install a control board or replace a DC power-supply unit, see these two chapters.
- 

### ■ ROM Version of the product applicable to this manual

- PIA4810  
Ver. 2.2X

The version can be checked using the \*IDN? message. For details, see the "Connecting & Programming Guide."

When inquiring about your product, identify the version number and the manufacturer's serial number indicated on the rear panel.

## Product Outline

The PIA4810 and 4820 are controllers designed to control Kikusui's DC power-supply units and electronic loads via GPIB or RS-232C. They can be used to control multiple DC power-supply units via your personal computer (hereinafter referred to as a "PC").

### ■ Features

#### Multi-channel Compatibility

The PIA4810 can control up to 32 DC power-supply units(31: PMR series) with a digital remote-control function, and it can control up to eight DC power-supply units with an analog remote-control function when it is equipped with four control boards. Further, the PIA4810 can be connected to up to three expansion units, enabling control of up to 32 DC power-supply units with an analog remote-control function.

The PIA4810 can be directly connected using a twisted-pair cable TP-BUS (Twisted-Pair BUS) to Kikusui's DC power-supply unit, which has a digital remote-control function.

#### GPIB/RS-232C

In addition to the GPIB, the PIA4810 support the RS-232C (up to 19200 bps) to provide a simple interface with a notebook PC.

#### PIA4820 expansion using TP-BUS

The PIA4810 can be used to connect to up to three expansion units of the PIA4820. (If more than three units are to be used, contact us.)

The TP-BUS has a total length of 200 m.

### ■ Applications

The PIA4810 and 4820 are controllers designed exclusively for use with a DC power-supply unit or electronic load manufactured by Kikusui.

When used in combination with some of other products which can be controlled with the PIA4810/4820, these controller play a central role in multi-channel control systems such as battery charge/discharge testers, testing equipment for electrical components, electroplating controllers, and electron accelerator controllers.

# System Configuration

The following explains the relationships between the controller and a DC power-supply unit and peripheral subsystems.

A control board is installed in the controller, and a DC power-supply unit is then connected to the controller. The controller can be fully controlled from your PC via the GPIB or RS-232C.

Fig. 1 shows an example of a system configuration. First, a PC is connected to the PIA4810 via GPIB or RS-232C. To enabling control of more than one DC power-supply unit with an analog remote-control function, the units are connected to the expansion unit PIA4820 with a TP-BUS. To enabling control of a DC power-supply unit with a digital remote-control function, the unit is directly connected to the PIA4810 with a TP-BUS.

Depending on the control parameters, either the control board OP01-PIA or OP02-PIA is used in the controller to increase the number of channels.

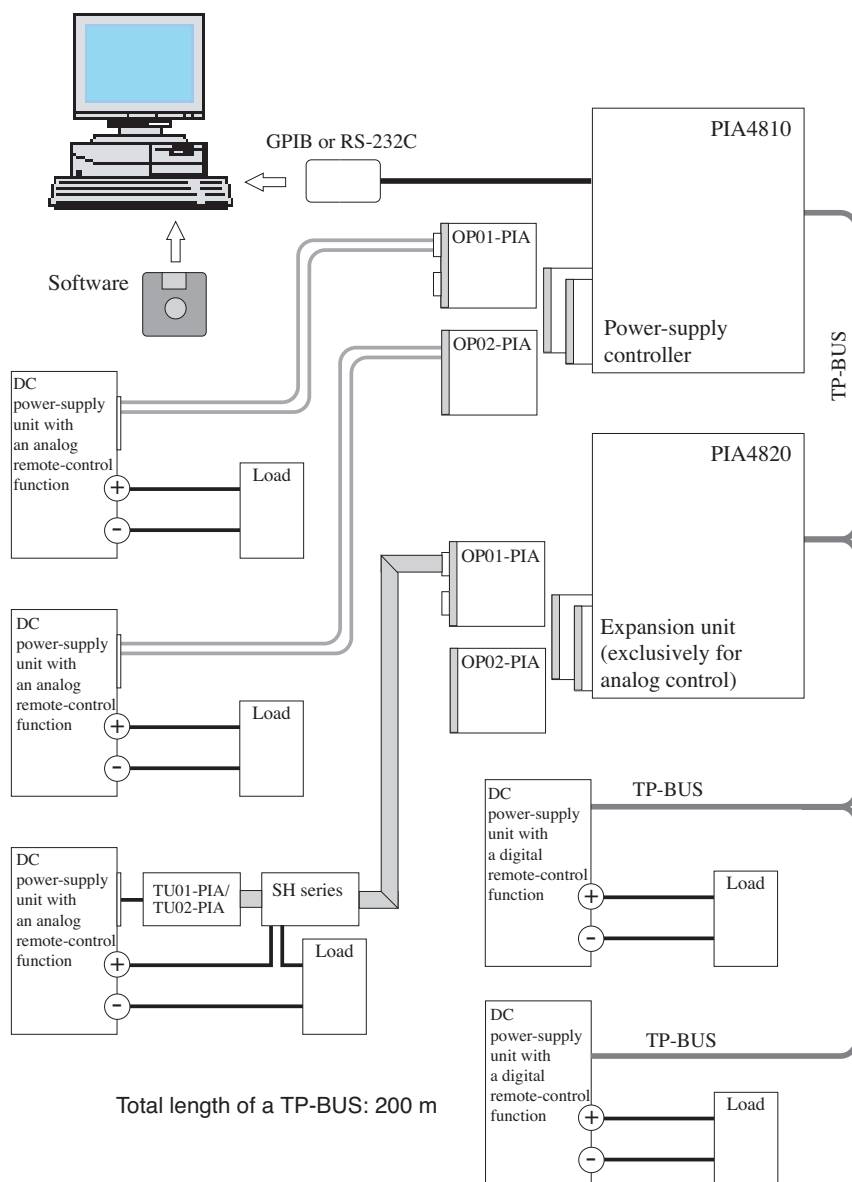


Fig. 1 System Configuration

## ■ PIA4810 Power-Supply Controller

The PIA4810 is the central system for controlling Kikusui's DC power-supply units via GPIB or RS-232C. It can accommodate up to four units of the control board OP01-PIA or OP02-PIA.

When connected to the PIA4820 (up to three units) with a TP-BUS, the controller can increase the number of control channels. If the DC power-supply unit has a digital remote-control function as in the multi-output power-supply unit PMR series, it can be controlled through direct connection to the PIA4810 with a TP-BUS.

## ■ PIA4820 Expansion Unit

The PIA4820 is an expansion unit designed to connect the controller to Kikusui's DC power-supply units, which have an analog remote-control function. Up to three units of the PIA4820 can be connected to the PIA4810 with a TP-BUS, and up to four units of the control board OP01-PIA or OP02-PIA can be mounted on each expansion unit.

## ■ OP01/OP02-PIA Control Board

The control board has two channels, enabling two DC power-supply units to be controlled simultaneously.

Either OP01-PIA or OP02-PIA is selected, depending on the control parameters. For details on the control parameters, see the "Connecting & Programming Guide."

## ■ TU01-PIA/TU02-PIA Terminal Unit

By connecting the TU01-PIA or TU02-PIA between a DC power-supply unit and power-supply controller, the number of control parameters can be increased. The TU01-PIA connects to the PAD-L series of DC power-supply units, and the TU02-PIA connects to the PAN/PAN-A series of DC power-supply units. For details, see the "Connecting & Programming Guide."

No settings are required for the ID switch on the terminal unit.

## ■ SH Series Shunt Resistor

When the SH-series connected to the load line, it allows the accuracy of the current monitoring of the controller to improve.

The SH-series can be connected to the PAK-A series, PAD-L series, PAN/PAN-A series, and PMC-A series. In regard to the SH series, see the "Connecting & Programming Guide."

# Optional Equipment

## PAK-A Interface Card IF01-PAK-A (Factory options)

Interface card to be mounted on the PAK-A series. This card is necessary to control the PAK-A series using the controller.

## Terminal Unit TU01-PIA/TU02-PIA

These terminal units can increase control functions with connecting either PAD-L Series or PAN/PAN-A Series. For details, refer to the "Connecting & Programming Guide" in the CD-ROM as an attached accessory.

### TU01-PIA

Terminal unit for the PAD-L series.

### TU02-PIA

Terminal unit for the PAN/PAN-A series.

## SH-Series Shunt Unit

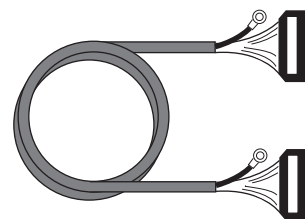
Used for the PAK-A series, PAD-L series, PAN/PAN-A series, and PMC-A series. Connecting the SH series to the load line enables more accurate current reading

## 26-Core Shielded Flat Cable SC01-10/SC01-20

Cable used to connect control board OP01-PIA to the PAD-L series, PAK-A series, or PAN/PAN-A series

SC01-10: Approximately 1 m

SC01-20: approximately 2 m



## Shielded Cable SC03-PIA/SC05-PIA

Cable used to connect control board OP01-PIA to the PMC-A series

SC03-PIA: Approximately 1 m

SC05-PIA: Approximately 1 m

## Shielded Cable SC04-PIA

Cable used to connect control board OP02-PIA to the PMC-A series

SC04-PIA: Approximately 1 m

## GPIB Cable

GPIB interface cable used to connect your PC to the controller

GPIB cable 408J-101: Approximately 1 m

GPIB cable 408J-102: Approximately 2 m

GPIB cable 408J-104: Approximately 4 m

## Optional equipment for rack incorporation

Kikusui offers several options for incorporation into a rack. For details, contact Kikusui distributor/agent.

- Rack adapter           KRA3 (Inch rack, EIA standard)  
                              KRA150 (Millimeter rack, JIS)
- Rack-mount frame    RMF4 (Inch rack, EIA standard)  
                              RMF4M (Millimeter rack, JIS)
- Blank panel           KBP3-2, KBP3-3, KBP3-4, KBP3-6 (for KRA3/KRA150)  
                              B2-PIA4810/4820 (for RMF4/RMF4M)  
                              BP2, BP4, BP5, BP6 (for RMF4/RMF4M)  
                              BP191 (one unit panel inch rack, EIA standard)  
                              BP1H (one unit panel millimeter rack, JIS)

For one unit blank panels BP191 and BP1H, a mesh type is also available.

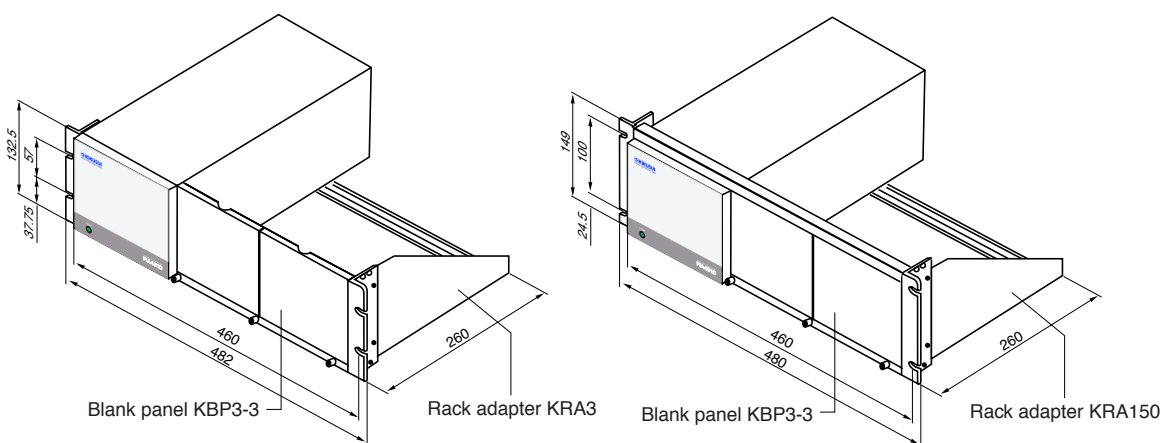


Fig. 2      KRA3 and KRA150

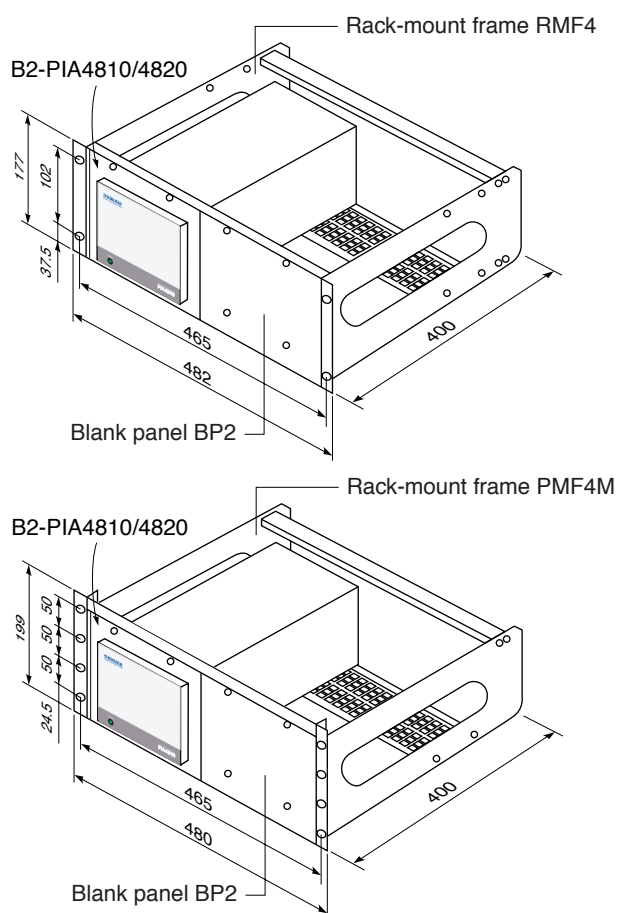


Fig.3 RMF4 and RMF4M

**NOTE**

- To install the controller in a rack, provide one unit panel for radiation of heat. (one unit panel width: 44.45 mm on EIA, 50 mm on JIS)

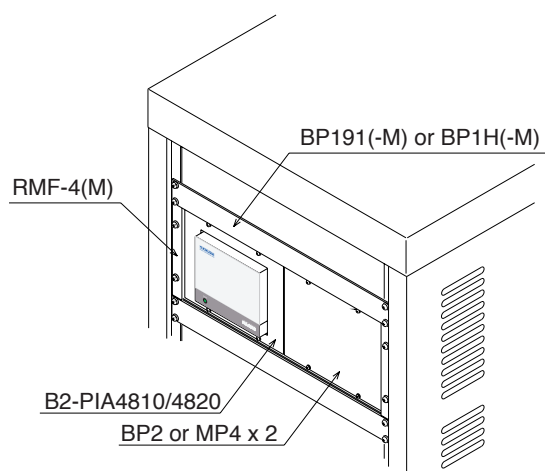


Fig. 4 One unit blank panel (for RMF4)





This chapter describes the steps from unpacking of the controller through connection of the AC power cord.

## 1.1 Unpacking Checks

Upon receiving the product, make sure the package contains the necessary accessories, and that the product has not been damaged during transportation.

If any damage or imperfection is found, contact Kikusui distributor/agent.

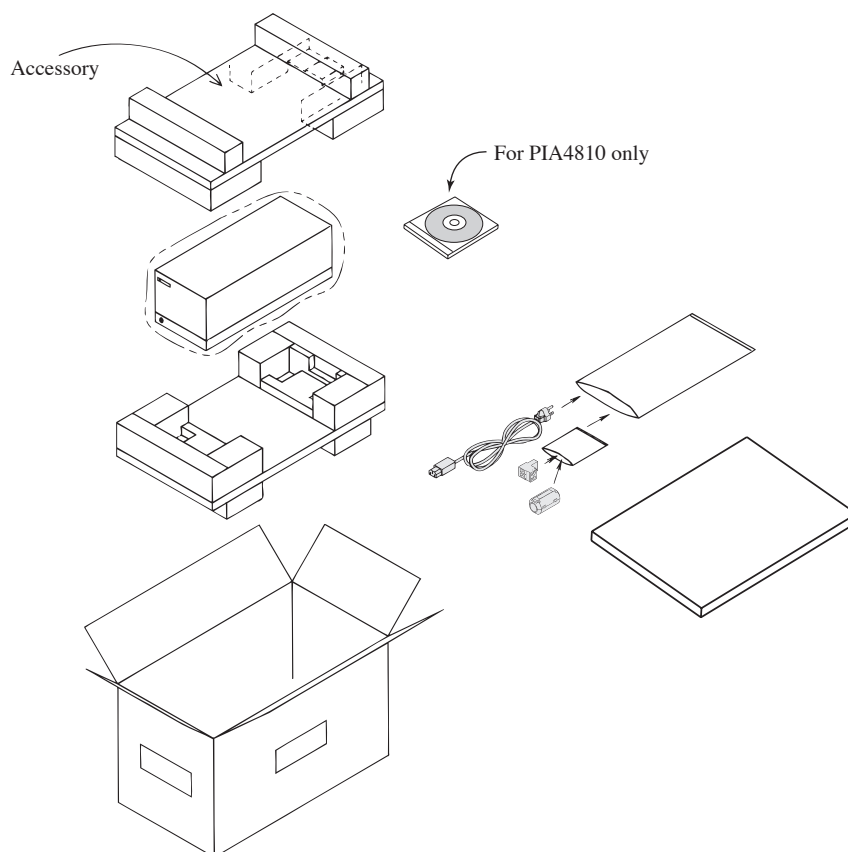


Fig. 1-1 Packing and Unpacking

### NOTE

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

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



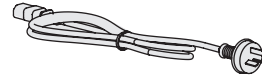
Rated voltage: 125 Vac  
PLUG: NEMA5-15  
[85-AA-0004]

or



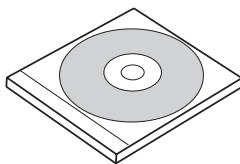
Rated voltage: 250 Vac  
PLUG: CEE7/7  
[85-AA-0005]

or

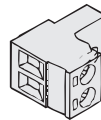


Rated voltage: 250 Vac  
PLUG: GB1002  
[85-10-0790]

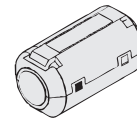
☐ AC Power cord (1 cord)



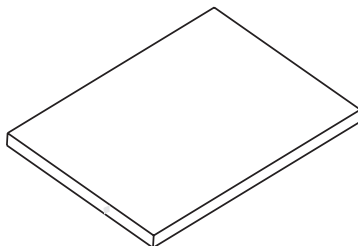
☐ PIA4800 Utilities CD  
(1 CD only in PIA4810)  
[SA-6002]



☐ TP-BUS connector  
(1 piece)  
[84-61-5102]



☐ TP-BUS core  
(1 piece)  
[67-90-0080]



☐ Operation Manual for  
the controller (1 copy)  
[Z1-002-082]

Table 1-1 List of Accessories

It is necessary for the user to obtain a GPIB interface cable and RS-232 interface cable (cross type), which are not included with the product.

For the interface cables, see 3.2.3, “Communication Cable.”

## 1.2 Precautions for installation

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

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

To prevent 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 temperatures or direct sunlight.

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

Operating temperature range: 0°C to 40°C

Storage temperature range: -20°C to +70°C

### ■ Avoid humid environments.

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

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

Storage humidity range: 10% R.H 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 product until the location is completely dry.

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

Do not install the product 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 product in a dusty environment.

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

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

Prepare sufficient space around the product. Otherwise, heat may accumulate in the product, resulting in fire.

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

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

### ■ Do not place the product 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 product may fall, resulting in damage and injury.

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- **Do not use the product in locations affected by strong magnetic or electric fields.**

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

- **Secure adequate space around the power plug.**

Do not insert the power plug to an outlet where accessibility to the plug is poor. And, do not place objects near the outlet that would result in poor accessibility to the plug.

## 1.3 Precautions for moving

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

- **Turn the POWER switch off.**

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

- **Remove all wirings connected.**

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

- **For transportation, use the special packing material for the product.**

Transport the product in its original package to prevent vibration and falls, which may damage the product.

If you require packing material, contact Kikusui distributor/agent.

## 1.4 Connecting the AC Power Cord

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

### **⚠ WARNING**

- This instrument is designed to operate from the overvoltage category II. Do not operate it from the overvoltage category III or IV.
- The AC power cord for 100 V system shown in Fig. 1-2 has a rated voltage of 125 VAC. If this AC power cord is used at the line voltage of a 200 V system, replace the power cord with that satisfying that line voltage. Appropriate power code must be selected by qualified personnel (those who have electrical knowledge). If such a power cord cannot be obtained, contact your Kikusui distributor/agent.

*Do not use the power code attached to this product for the power code of other instruments.*

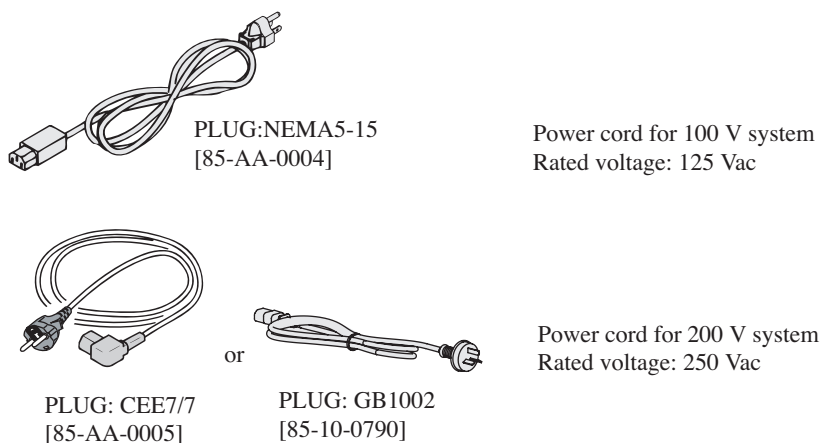


Fig. 1-2 Power Cord

The Input Voltage switch is located at the bottom of the controller. Before connecting the power cord, check the power voltage range.

### Connection Procedure

1. Check the power voltage to be supplied to the controller.
2. Turn off the POWER switch.
3. Using the Input Voltage switch at the bottom of the controller, select the voltage range appropriate for the voltage identified in the check.

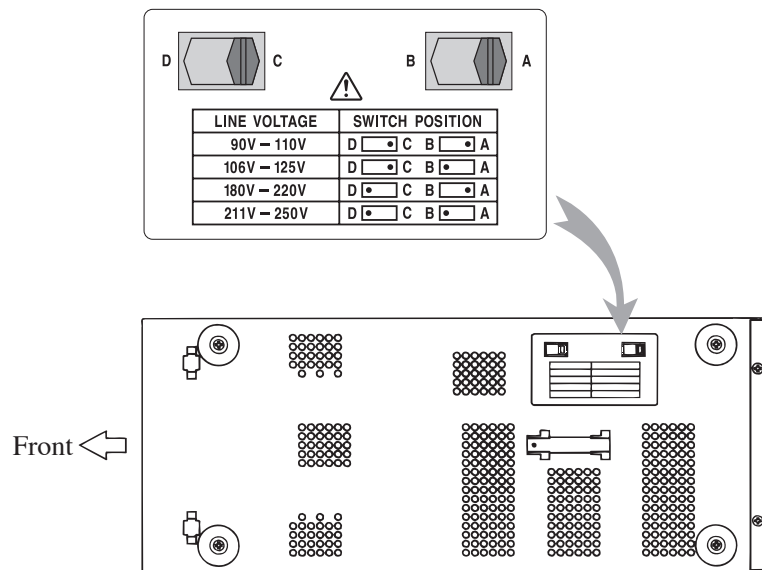


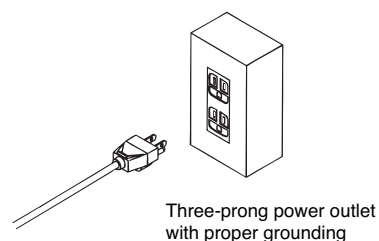
Fig. 1-3 Input Voltage switch

4. Connect the accompanying AC power cord to the AC INPUT connector on the rear panel.  
Use the provided power code or power code that is selected by qualified personnel.
5. Plug the power cord into the socket.

## 1.5 Grounding

- 
- ⚠ WARNING** • To prevent electric shock, be sure to ground (earth) the unit.
- Connect the ground terminal to earth ground.
- ⚠ CAUTION** • If you do not ground the PIA4800 series, malfunction may occur due to external noise, or the noise generated by the PIA4800 series may become large.
- 

Connect the power cord to a three-prong power outlet with proper grounding.



## Chapter 2

# Connection to the DC Power-Supply Unit

This chapter describes an outline for connecting configurations between the controllers and Kikusui's DC Power Supply units and for settings on the rear panel of controllers.

---

### WARNING

- Before starting connection, turn OFF the POWER switches on all devices and unplug the AC power cord to prevent electric shock.
- Before starting connection, read the operation manuals of the devices to be connected.

### CAUTION

- Before executing a program, send a device message to the DC power-supply unit to make sure connections are secure.  
If a device message is sent to other DC power-supply units than those specified, an excessively large output voltage or current is set, resulting in damage to peripheral devices.
- Do not turn only the POWER switch of the controller to OFF, when a DC power-supply unit is connected to the controller.

The DC power-supply unit may output unexpected voltage and current in an instant. The output cause a failure of the peripheral device and an alarm malfunction.

---

---

### NOTE

- It may be necessary for us to modify the PAD-L series and PAN/PAN-A series, depending on the control parameters.
  - The PAK-A series requires the factory-optional interface card IF01-PAK.
- 

This controller requires different connections, depending on the control parameters and the type of DC power-supply unit used. To make connections, follow these steps:

1. Refer to the "PIA4800 Utilities" CD-ROM as an attached accessory and open the "Connecting & Programming Guide" [index.html], and then click on the specified DC Power Supply product to open the PDF file. To view the PDF file, it is required "Adobe Reader 6.0" or later version.
2. Read the relevant sections of the operation manual for the DC power-supply unit to be connected.
3. Referring to Chapter 8, "OP01-PIA," or Chapter 9, "OP02-PIA," install the control board OP01-PIA or OP02-PIA in the controller.
4. On the rear panel of the controller, make settings for ADDRESS, PON SRQ, TERMN (only for PIA4820), BAUD RATE, and SHUTDOWN.
5. Follow the instruction of "Connection of Power supply" and "Connecion of PIA4820" specified in the PDF file.
6. Install the configuration and calibration software in your PC.
7. Following the instructions in Chapter 3, "Calibration by Device Configuration," perform configuration and calibration.

## Settings on Rear Panel

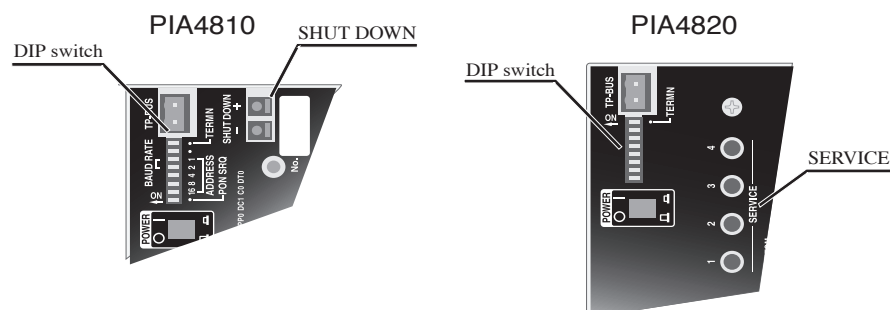


Fig. 2-1 Settings on the rear panel

### DIP switch

Using the dip switch on the rear panel, make the settings specified below. When any change has been made in the settings, reset the power. With the PIA4820, set only TERMN (Termination).

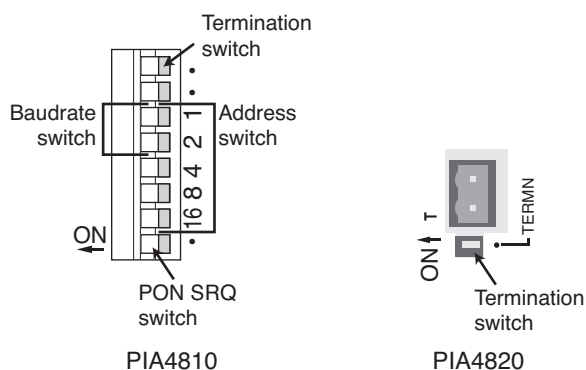


Fig. 2-2 DIP switch

#### ■ Setting PON SRQ (during GPIB control)

To use the PON SRQ (Power ON Service Request), turn the PON SRQ switch ON. This enables the status byte register to be used to check whether the POWER switch has been activated.

#### ■ Setting ADDRESS (during GPIB control)

Using the ADDRESS switch (1, 2, 4, 8, 16), set the GPIB address for the PIA4810. Do not use the same address more than once for the same system. The GPIB address can be determined by adding the figures located to the right of the switch that is ON.



## ■ Setting BAUD RATE (during RS-232C control)

Using the Baudrate switch, set a baud rate for RS-232C control.

GPIB address setting switches		BAUD RATE
1	2	
ON	ON	19200 bps
ON	OFF	9600 bps
OFF	ON	4800 bps
OFF	OFF	2400 bps

Table 2-1 Baud rate settings

## ■ Setting TERMN (Termination)

---

**⚠ CAUTION** • Incorrect TERMN switch setting may cause unstable communication and malfunction.

---

Set the TERMN (Termination) switch to ON for the devices on both ends of the bus.

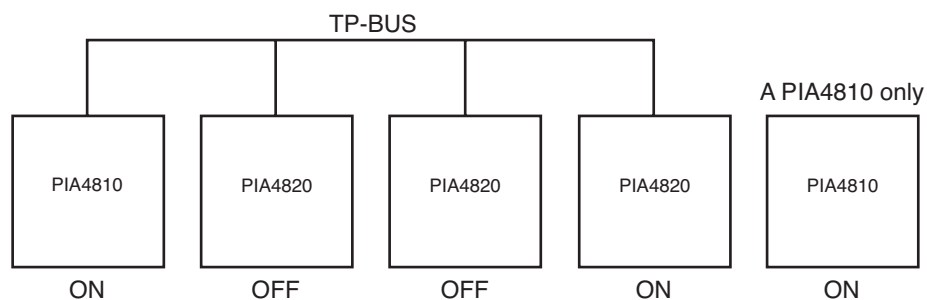


Fig. 2-3 Termination settings

## SHUT DOWN

If the contact signal is input for at least one second, the outputs on all connected DC power-supply units are turned OFF. The positive (+) terminal on the SHUT DOWN connector is pulled up to +5 V through 4.7 k $\Omega$ .

### Example of a circuit

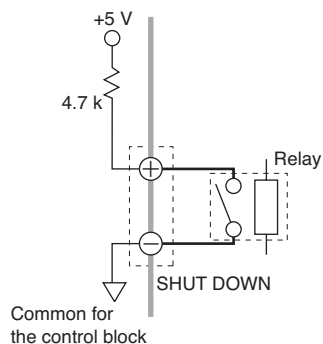


Fig. 2-4 Example of a shutdown circuit

### Connection Procedure

Applicable wires

- Single wire:  $\varnothing 0.65$  (AWG22)
- Stranded wire: 0.32 mm<sup>2</sup> (AWG22), with an element wire diameter of  $\varnothing 0.18$  or greater

1. Turn OFF the POWER switch of the controller.
2. Using a wire stripper, remove 10 mm of insulation from the cable end.
3. As shown in Fig. 2-5, while pressing Point A with a slotted screwdriver, insert the cable.
4. Remove the screwdriver from Point A, and make sure the cable is securely fixed.

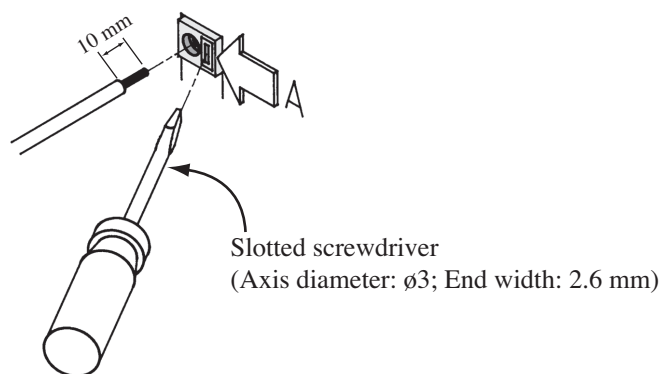


Fig. 2-5 SHUT DOWN connection

---

**NOTE**

- The MS-DOS version software products do not accompany the controller. When you use the controller with MS-DOS PC, contact your Kikusui distributor/agent. To use the MS-DOS version software products, refer to Chapter 3, “Calibration by Device Configuration (MS-DOS edition)” – “Chap3\_DOS\_E.pdf” in the PIA4800 Utilities CD.
- 

This chapter describes the logical connection procedures to be performed after the controller is connected electrically to the DC power-supply unit.

There are two procedures in the logical connection procedures: setting on the control board such as a node address, and the calibration of the DC power-supply unit. The software accompanying the PIA4810 must be used to perform these procedures.

The devices specified below are necessary for calibration.

## **Voltage calibration**

Digital voltmeter with an accuracy of at least 0.01%

Screwdriver for adjustment (if the OP02-PIA is used)

## **Current calibration**

Digital voltmeter with an accuracy of at least 0.01%

Shunt resistor with an accuracy of at least 0.2%

(With the SH series, the shunt resistance accuracy must be 0.1% or better.)

Screwdriver for adjustment (if the OP02-PIA is used)

DC power-supply unit for calibration (if an electronic load is used)

## 3.1 Accompanying Software

The PIA4810 includes the software products specified below. Note that the PIA4820 does not include.

Configuration software	Caption	PIA4800 Configuration Wizard
	EXE	wPIACONF.EXE
Calibration software	Caption	PIA4800 Calibration
	EXE	wPIACAL.EXE
Node address checking software		NCHK.EXE

Table 3-1 Software products accompanying the controller

### ■ Configuration software

Configuration software is used to configure a new system or replace devices such as the DC power-supply unit. This software is used to logically connect the controller to other devices by setting the controller address, the node address of the control board, and the ID of the DC power-supply unit.

### ■ Calibration software

Calibration software is used to calibrate the output voltage, output current, and OVP (Overvoltage Protection) for the connected DC power-supply unit.

Calibration is performed upon completion of logical connection using the configuration software.

### ■ Node address check software

Configuration software is used to configure your system, this software helps to check the results of the configuration.

---

## 3.2 Operating Environment for Software

### 3.2.1 Required Environment

#### ■ IBM-PC/AT compatible PC Unit

- Microprocessor of at least Pentium 90 MHz
- At least 16 MB of memory
- Hard disk drive (12 MB required for installation)
- Color display monitor of at least 800 x 600 x 256
- CD-ROM drive
- Microsoft mouse or equivalent pointing device

#### ■ Operating system

- Windows 95/98/Me/NT4.0/2000/XP  
(Windows 95 requires installation of IE4.0 or later. Windows NT 4.0 requires installation of Service Pack 6a or later.)

#### ■ GPIB card (recommended)

Necessary for control using a GPIB.

- VISA-compatible GPIB card (by National Instruments, Agilent Technologies, Contec Co., LTD. or Interface Corp.)
- NI-VISA Ver.2.5 or later, Agilent I/O Library K.01.00 or later or KI-VISA2.2.3 or later.

#### ■ Serial communication port

Necessary for control using an RS-232C.

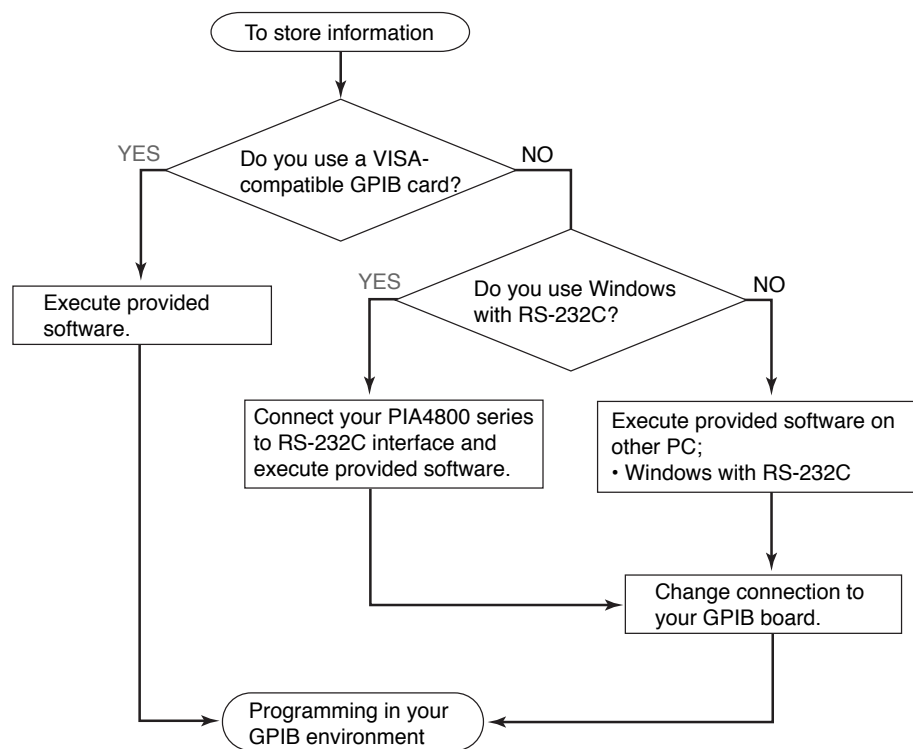
## 3.2.2 Using a GPIB card except VISA-compatibles

The software for PIA4800 series is constructed on the precondition that use of a VISA-compatible GPIB card or RS-232C interface.

To execute your program by using a GPIB card except VISA-compatibles, you must store connection information on your system and calibration values of DC power supply to the nonvolatile memory on the control board after starting provided software once in the required environment.

To store connection information and calibration values, start provided software according to the following flowchart and execute the following items.

- 3.4 "Configuration Software"
- 3.6 "Calibration by Device Configuration"



If you have stored connection information and calibration values to the control board, you can use your GPIB card unless you change your system.

---

**NOTE**

- 3.2.1 "Required Environment"

This is an environment to start provided software and not an environment to execute your program.

---

### 3.2.3 Communication Cables

An interface cable is used to connect the controller to your PC. Use a cable compatible with the interface to be employed.

**NOTE**

- The controller does not include an interface cable for connection to your PC. GPIB cables are available from Kikusui. Contact Kikusui distributor/agent.

GPIB cable, 1 m (code: 92080)

GPIB cable, 2 m (code: 92070)

GPIB cable, 4 m (code: 92090)

#### ■ GPIB cable

If control is performed via GPIB, a GPIB cable is used to connect the GPIB card on your PC to the PIA4810.

If a GPIB interface is to be used, GPIB address settings must be made on the controller. For the GPIB address setting procedure, see 2.1, “Settings on the Rear Panel.”

#### ■ RS-232C cross cable

If control is performed via an RS-232C, an RS-232C cross cable is used to connect your PC to the PIA4810.

For an RS-232C cross cable, use a D-sub 9-pin female-female AT type.

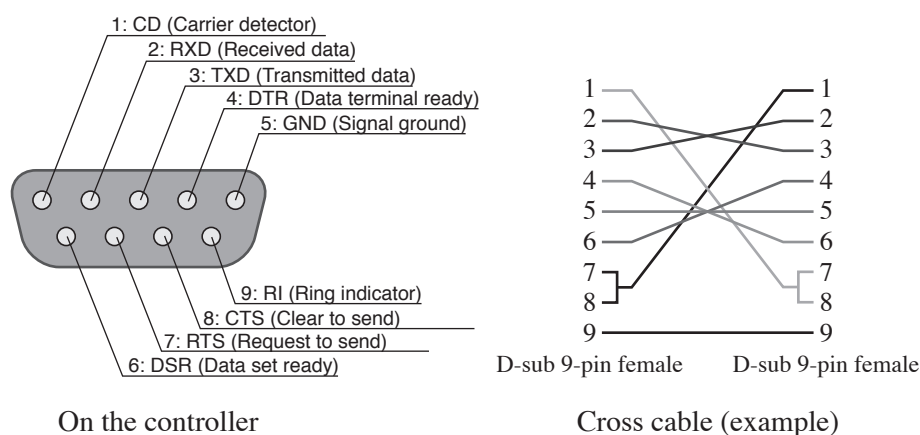


Fig.3-1 9-Pin AT type connector

## 3.3 Installation of Utility Software

---

**NOTE**

- Before starting installation, exit all other applications.
  - If you are reinstalling or upgrading the software, be sure to uninstall the software first. If you repeatedly install the software without uninstalling it, a portion of the files will remain on the hard disk when you uninstall the software later.
  - For basic Windows operations, see the manual for Operating system or On-line help.
  - Use IE 4 or later on Windows 95. Use Service Pack 6a or later on Windows NT 4.0.
  - On Windows NT 4.0, 2000, or XP, log on as an administrator to install the software.
- 

You can use RS-232C and GPIB. To use GPIB, you must install the GPIB card and the GPIB driver for the card. Install the GPIB driver appropriate for the OS according to the manual of your GPIB card.

### GPIB or RS-232C setup procedure

#### ■ When using a VISA-compatible GPIB card

##### When using a GPIB card from National Instruments

1. Install the NI-GPIB driver.  
For details on the GPIB card driver, contact National Instruments.
2. Install the NI-VISA.  
Use Version 2.5 or later. For details, contact National Instruments.
3. Install the Windows version utility software.  
See "Installation of Windows version utility software" on page 3-9.

##### When using a GPIB card from Agilent

1. Install the Agilent I/O library.  
Use Version K0100 or later. For details, contact Agilent.
2. Install the Windows version utility software.  
See "Installation of Windows version utility software" on page 3-9.



## When using a GPIB card from Contec

1. Install the GPIB card driver.  
Contec API-GPIB Ver4.01 or later is required.  
For details on the GPIB card driver, contact Contec.
2. Install the KI-VISA. (You may need to restart Windows depending on the OS.)  
KI-VISA supports the following Contec GPIB cards.  
GPIB(PCI)L, GPIB(PCI)F, GPIB(CB)F, and GPIB(PM)  
  
KI-VISA is included in the PIA4800 Utilities CD. The newest version can be downloaded from the KIKUSUI Website (<http://www.kikusui.co.jp>) free of charge.
3. Configure KI-VISA.
  - 3-1. Start Kikusui IO Software-VISA-IO Config.
  - 3-2. Select the GPIB(CONTEC) tab.
  - 3-3. Select the Use GPIB Instruments (CONTEC API-GPIB Ver4.01+required) check box.
  - 3-4. Select the model and index of the GPIB card that you are using, and check that the Use this board check box is selected.
  - 3-5. Click the Enable VISA C API... button.

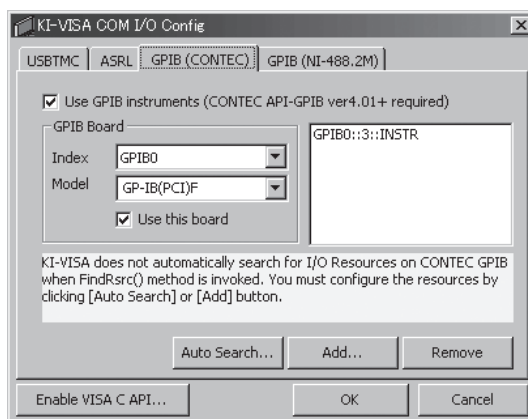


Fig. 3-2 KI-VISA CONFIG (Contec)

4. Install the Windows version utility software.  
See "Installation of Windows version utility software" on page 3-9.

## When using a GPIB card from Interface

1. Install the GPIB card driver for LabVIEW.  
For details on the GPIB card driver, contact Interface.
2. Install the KI-VISA. (You may need to restart Windows depending on the OS.)  
KI-VISA supports the following Contec GPIB cards.

PCI-4301

KI-VISA is included in the PIA4800 Utilities CD. The newest version can be downloaded from the KIKUSUI Website (<http://www.kikusui.co.jp>) free of charge.

3. Configure KI-VISA.
  - 3-1. Start Kikusui IO Software-VISA-IO Config.
  - 3-2. Select the GPIB(NI-488.2M) tab.
  - 3-3. Select the Use GPIB Instruments (NI-488.2M compatible API) check box.
  - 3-4. Select the model and index of the GPIB card that you are using, and check that the Use this board check box is selected.
  - 3-5. Click the Enable VISA C API... button.

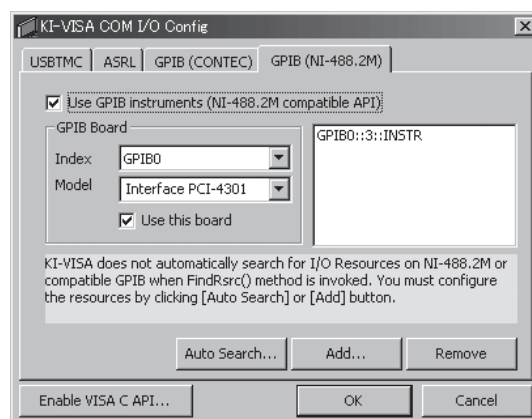


Fig. 3-3 KI-VISA CONFIG (Interface)

4. Install the Windows version utility software.  
See "Installation of Windows version utility software" on page 3-9.

## ■ When using a RS-232C

1. Install the KI-VISA. (You may need to restart Windows depending on the OS.)  
KI-VISA is included in the PIA4800 Utilities CD. The newest version can be downloaded from the KIKUSUI Website (<http://www.kikusui.co.jp>) free of charge.
2. Configure KI-VISA.
  - 2-1. Start Kikusui IO Software-VISA-IO Config.
  - 2-2. Select the ASRL tab.
  - 2-3. Select the Use ASRL(Serial) instruments check box.
  - 2-4. Click the Enable VISA C API... button.

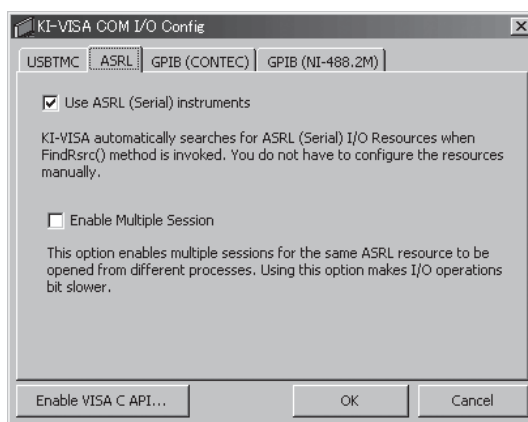


Fig. 3-4 KI-VISA CONFIG (RS-232C)

3. Install the Windows version utility software.  
See "Installation of Windows version utility software" on page 3-9.

## Installation of utility software

1. Start up Windows.
2. Insert the PIA4800 Utilities CD into a CD-ROM drive.
3. An HTML file opens through the Auto Run function. Install the utilities program according to the instructions.

PIA4800 Utilities will be installed in the folders, "c:\Program Files\Kikusui\PIA4800 Utils.V2," and "c:\Program Files\Common Files\Kikusui Shared."

---

## 3.4 Configuration Software

The configuration software is used to logically connect the instruments by setting node addresses of control boards and ID of the DC power supply to be controlled, which are required when you have newly configured the system or replaced DC power supply instruments. The configuration software configures the following two items:

- Node addresses of control boards
- Model ID of DC power supplies (or electronic loads)

### Node Address

A control board (OP01-PIA or OP02-PIA) equipped onto the PIA4810 must have its specific node address (or descriptor) being set. Each of slots #1 to #4 of the PIA4810 is assigned to the fixed node address #1 to #4 for each, and no other addresses can be set. When one or more PIA4820 is added, node addresses #5 to #16 can be assigned to control boards equipped on the PIA4820 slots. Even when in a combination of PIA4820 units and a PIA4830, the node address range available for the PIA4820 slots are the same.

---

**⚠ CAUTION** • Use a different node address for each control board. If a control command is sent when the same node address is used for more than one control board, operations become unpredictable.

---

### Model ID

In the PIA4800 series, ID that correspond to each of DC power supply models (or electronic load models) are defined. These ID are required for the control boards to keep track with information about the DC power supplies (or electronic loads) to be controlled. The model ID have to be set to the control boards as well as above mentioned node addresses.

- 
- NOTE**
- A control board can control up to two DC power supplies (or electronic loads). Therefore up to two model ID can be set to a control board.
  - The node address of a control board and the ID of the target models are stored in the nonvolatile memory unit on the board. Once a node number and/or model IDs are set, it is recommended that the control board panel be marked with a node address seal.
  - Check the control boards to make sure the switches are properly set for the DC power supply unit to be connected. For the checking procedure, see 8.4, "Switch Settings," or 9.4, "Switch Settings."

- By carrying out a configuration, calibration values will be initialized. Perform a calibration after all the node addresses of the connected control boards have been set. When the system configuration has been changed, a recalibration work must be performed.
- GPIB address is 1 as the factory default.
- When the settings of the ADDRESS switches on the rear panel of the controller have been changed, you need turn the power on again.
- When an RS-232C is used, set the baudrate (communication settings) of the PIA4810 to 19200bps.

### 3.4.1 Setting Communication port/Node Address

Configuration software is a wizard-style application. Now we explain the instruction of it.

#### Setting Communication Port

1. Start the PIA4800 Configuration Wizard.

The following dialog is displayed:



Fig. 3-5 VISA Resource

2. You will be prompted to input a VISA Resource. You need specify a VISA resource string according to the interface type, address number, and communication port number, with which the PIA4810 is connected. VISA resources available for communication with the controller have the following syntaxes:

For GPIB: GPIB[<board#>]::<address>[::INSTR]

For RS-232C: ASRL[<port#>][::INSTR]

<board#> specifies a GPIB board index. If using only one GPIB board, it is normally 0. <address> specifies the GPIB address of the controller in decimal format. <port#> specifies a serial communication port number through which the controller is being connected. Parts enclosed with square brackets [] can be omitted. If omitting <board#> and/or <port#>, it is considered that you specified 0.

Examples are shown below:

    GPIB(board 0), address 1    GPIB0::1::INSTR  
    RS-232C port COM1        ASRL1::INSTR

## Definition of a Node Address

To assign a node address to a control board, repeat the steps 5 through 7 below for each node address.

First, specify all control boards to be used. Then, in accordance with steps 10 and 11, specify the DC power-supply unit to be connected to CH1 or CH2.

Slots 1 to 4 on the PIA4810 are fixed to node addresses 1 to 4, respectively.

### Setting procedure

1. In the VISA Resource setting dialog, click on the Next button.  
The following dialog is displayed:

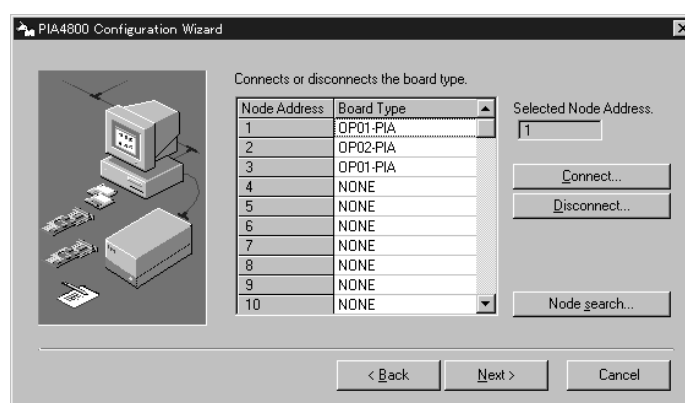


Fig. 3-6 Connects or disconnects the board type

2. To check the current connection status, click on Node search.  
The Board Type box displays the connected control board or DC power-supply unit with a digital control function.
3. To initialize the connected control board, click on the Board Type No. corresponding to its node address. When the node address is displayed in the Selected Node Address. box, click on the [Disconnect..] button.  
The control board then undergoes initialization, deleting the node address.
4. To set a new node address for a control board, click on the Board Type No. corresponding to its node address.  
A new node address is then displayed in the Selected Node Address. box.
5. With the node address displayed as specified above, click on the [Connect..] button.  
The Board Type box then displays the connected control board or DC power-supply unit with a digital control function.  
If no device is connected, “NONE” is displayed.

**NOTE**

- When the control board is in the factory default state, Node search operation does not display anything. Make node address settings.

6. With the expansion unit PIA4820, click on the [Connect...] button. The dialog shown below is then displayed.

With the power-supply controller PIA4810, no dialog is displayed. Proceed to Step 7.



Fig. 3-7 Push the service button

Press the SERVICE button with the same number as that of the slot connected to the control board that requires node address setting. Once the SERVICE button is pressed, the message automatically disappears and Board Type displays the control board.

(The SERVICE button is located on the rear panel of the PIA4820.)

**NOTE**

- Be sure to press the correct SERVICE button. A node address is set for the control board connected to the slot corresponding to the button pressed.

If an incorrect slot has been selected, reset both the correct and incorrect slots.

7. After specifying node addresses for all control boards to be used, click on the Next button.

The following dialog is displayed:

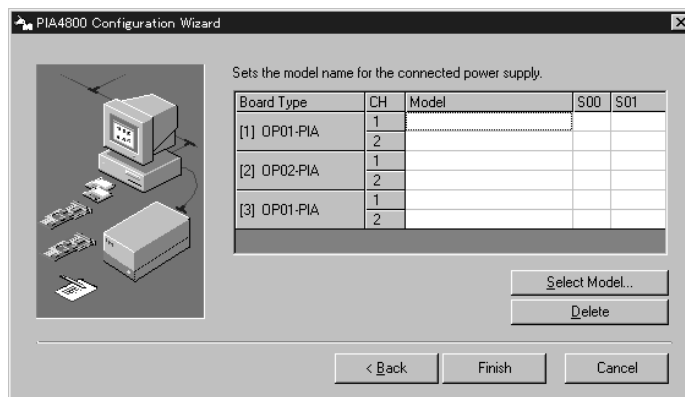


Fig. 3-8 Set the model name for the connected power supply

---

**NOTE**

- In the dialog shown in Fig. 3-8, the S00 and S01 boxes display the settings for the switches on the control board. S00 represents S100 or S200, and S01 represents S101 or S201.

If " \* " is displayed, see the "Connection of Power supply" of "Connecting & Programming Guide." For details on the switches, see Chapter 8 "OP01-PIA," and chapter 9 "OP02-PIA."

- The dialog shown in Fig. 3-8 does not display DC power-supply units with a digital remote-control function, such as those in the PMR series.
  - Some DC power-supply units are incompatible with certain types of control boards. Before making connections, see the "Connecting & Programming Guide."
- 

8. In the dialog shown in Fig. 3-8, specify the DC power-supply unit to be connected to each channel.

Click on the Model box to the right of the channel to be set. The following dialog is then displayed:

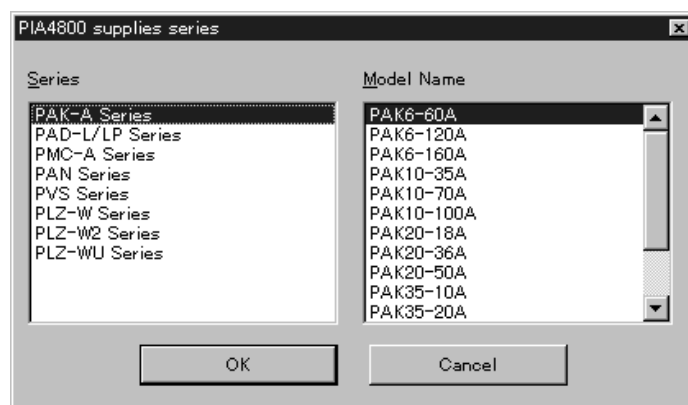


Fig. 3-9 Series and Model Name

9. In the dialog shown in Fig. 3-9, click on the DC power-supply unit to be connected, and then click on the [OK] button. The DC power-supply units selected in the Model box in the dialog shown in Fig. 3-8 are then displayed.

The above steps complete the setting of node addresses and the definition procedure for DC power-supply units.



## 3.5 Node Address Check Software

The node address check software permits you to search for the board type of a node address (1–35) currently set, and for the DC power-supply unit connected to each channel.

### Displaying the system configuration

1. In the [Start] menu, select [Programs]\_Node Address Check to start up the node address check program.

Upon startup of the node address check program, the following dialog is displayed:

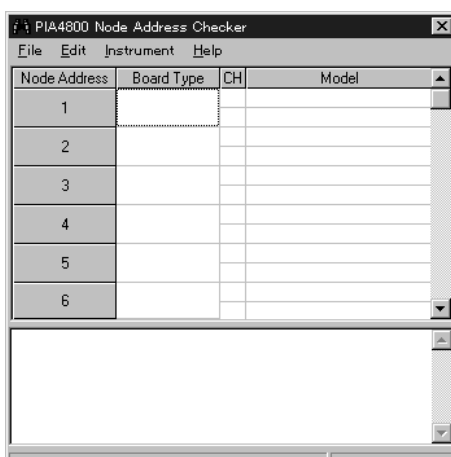


Fig. 3-10 Node Address Check dialog

2. In the [Instrument] menu, select [Options...].

The following dialog is displayed:

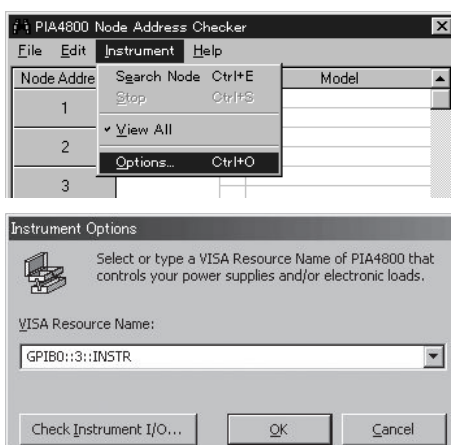


Fig. 3-11

3. As the Device Name, select the GPIB address or RS-232C port of the power-supply controller that requires connection checks. With the GPIB, select the device with the number corresponding to the GPIB address that has been set using the dip switch on the rear panel of the PIA4810. With the RS-232C, select the COM port connected to the PIA4810.
4. Press the OK button.
5. The Device box opens. In the [Instrument] menu, select [Node Search]. Search through the node addresses (1–35) individually.

Following a search, the Information Window displays the total number of board types and models.

Node Address	Board Type	CH	Model
1	OP01-PIA	1	PAK20-18A
		2	PAK35-10A
2	OP02-PIA	1	PAN35-10/A
		2	PAN55-10/A
3	Nothing	-	
4	Nothing	-	
5	Nothing	-	
6	Nothing	-	

Total	
Board Type	Number(s)
OP01-PIA	1
OP02-PIA	1

Fig. 3-12

### Ending a search

To stop searching for node addresses, select [Stop] in the [Instrument] menu.

### Displaying only the board types searched

To display the node address of only the searched Board Type, uncheck [View All] in the [Instrument] menu.

### Copying to a clipboard

Upon completion of a search for node addresses, [Copy] in the [Edit] menu becomes selectable. Select [Copy]. Board types and models for each node address and the total number of board types and models are then copied onto the clipboard.

### Exiting the node address checking software

To exit the node address check program, select [Exit] in the [File] menu.

## ■ Status Message

The following specifies the status messages used and their meanings:

### **Node Address searching...**

Node addresses are now being searched.

### **Please Device Select...**

In the [Instrument] menu, no device has yet been selected using [Options...].

### **Open Device “DEVICE NAME”**

Connection is made using “DEVICE NAME.”

### **ABORTED**

The search for node addresses has been suspended.

### **END**

The search for node addresses has been completed.

---

#### **NOTE**

- The following control boards are not searched: the board which is equivalent to condition at the time of shipment, and the board which has been disconnected and initialized in the PIA4800 configuration.
-

## 3.6 Calibration by Device Configuration

For calibration, use the calibration software PIACAL.EXE .

Following a new system configuration or replacement of a control board or DC power supply, be sure to perform calibration. The calibration value for the connected DC power-supply unit is saved in the control board.

To reduce calibration errors caused by an increase in temperature, warm up the controller, DC power-supply units, shunt resistor, and peripheral devices for at least 30 minutes prior to calibration.

For connections of the DC power-supply unit, see the "Connecting & Programming Guide."

- 
- ⚠ CAUTION** • If control is performed without conducting calibration, an exceedingly high voltage or current may be generated, depending on the system configuration, resulting in damage to devices connected to the DC power-supply unit.
- 

Calibration can be performed for three parameters: output voltage, output current, and OVP (overvoltage protection). The parameters to be calibrated depend on the control parameters, which differ according to the configuration of the control boards and DC power-supply units.

For detail, see the "Connecting & Programming Guide."

### 3.6.1 Connection Circuit

Before starting connection for calibration, turn OFF the power-supply controller, expansion units, and DC power-supply units.

#### ■ Voltage calibration

As shown in Fig. 3-13, connect a digital voltmeter to the output terminal of the DC power-supply unit.

Turn the output voltage setting knob clockwise until it stops.

Digital voltmeter: Accuracy of at least 0.01%

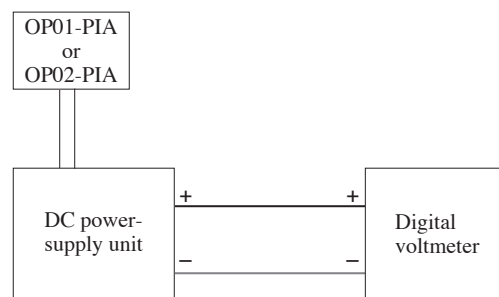


Fig. 3-13 Voltage calibration

## ■ Current calibration

### DC power-supply unit

As shown in Fig. 3-14, short-circuit the output terminal of the DC power-supply unit using a shunt resistor compatible with the rated output. Then, connect a digital voltmeter between the terminals on the shunt resistor.

Turn the output current setting knob clockwise until it stops.

To connect the output terminal of the DC power-supply unit to the shunt resistor, use the thickest and shortest possible cable. Securely connect the cable to the terminal. Note that contact resistance and a voltage drop in the cable may cause calibration errors.

Use of a cable with a cross-sectional area of at least 0.25 mm<sup>2</sup> per ampere of the rated current for the DC power-supply unit, is recommended.

Digital voltmeter: Accuracy of 0.01% or better

Shunt resistor: Accuracy of 0.2% or better

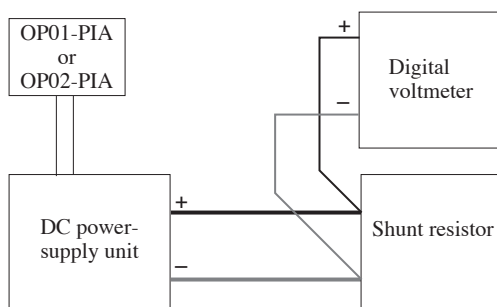


Fig. 3-14 Current calibration using the SH resistor

### Using the SH-Series Shunt Unit

As shown in Fig. 3-15, in which a compatible shunt resistor is used, short-circuit the output terminal on the DC power-supply unit using the SH-series shunt unit. Then, connect a digital voltmeter to the SH series.

Turn the output current setting knob clockwise until it stops.

For connection between the output terminals on the DC power-supply unit and the SH series, use a cable as thick and short as possible. Connect each terminal securely. Note that contact resistance and a voltage drop in the cable may cause calibration errors.

Use of a cable with a cross-sectional area of at least  $0.25 \text{ mm}^2$  per ampere of the rated current of the DC power-supply unit, is recommended.

Digital voltmeter: Accuracy of 0.01% or better

Shunt resistor: Accuracy of 0.1% or better

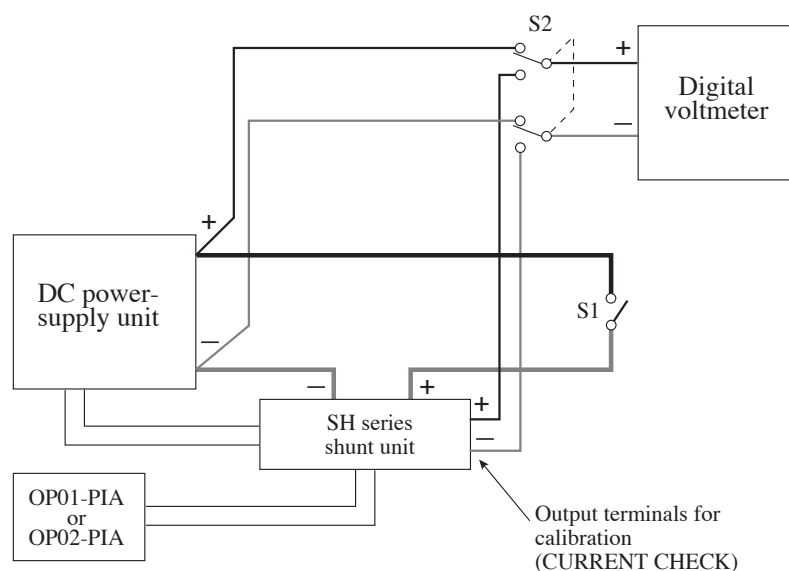


Fig. 3-15 Current calibration using the SH series

## Electronic load

A DC power-supply unit that can generate a rated current for the electronic load is necessary to calibrate said load.

As shown in Fig. 3-16, install a shunt resistor between the electronic load and the positive (+) terminal of the DC power-supply unit for electronic load calibration.

Then, connect a digital voltmeter between the terminals on the shunt resistor.

Turn the load current setting knob clockwise until it stops. To connect the load terminal of the electronic load to the shunt resistor and to the DC power-supply unit for electronic load calibration, use the thickest and shortest possible cable. Securely connect the cable to each terminal. Note that contact resistance and a voltage drop in the cable may cause calibration errors.

Use of a cable with a cross-sectional area of 0.25 mm<sup>2</sup> per ampere of the rated current for the electronic load is recommended.

Digital voltmeter: Accuracy of 0.01% or better

Shunt resistor: Accuracy of 0.2% or better

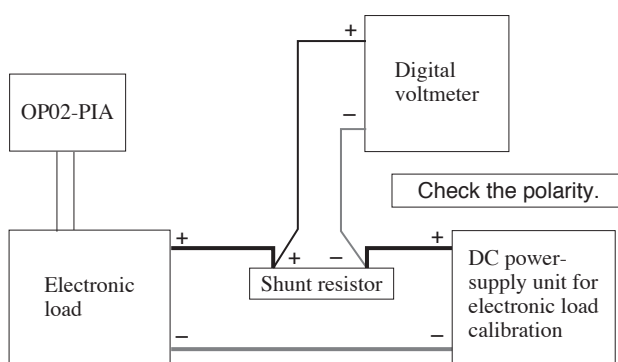


Fig. 3-16 Calibration of an electronic load

## ■ OVP calibration

OVP calibration does not require connection to a device. Simply connect the control board to the DC power-supply unit.

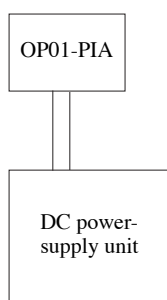


Fig. 3-17 OVP calibration

## 3.6.2 Calibration Software

### ■ Specifying devices to be calibrated

1. Start wPiaCal.EXE.

The following dialog will appear:

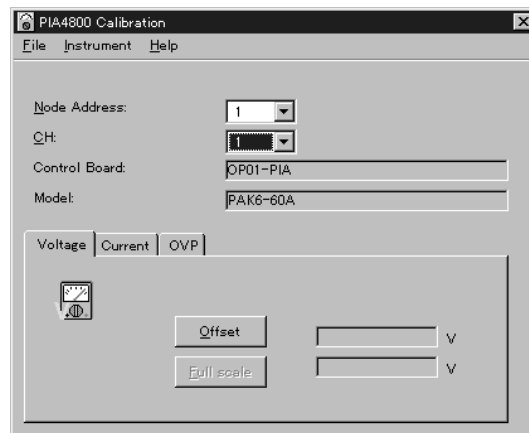


Fig. 3-18 Calibration

2. From “Instruments” in the menu, select “Options.” The VISA Resource dialog will be displayed.

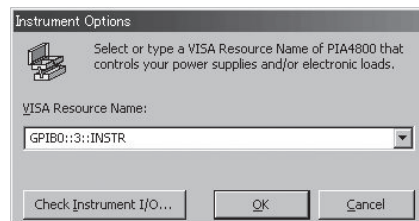


Fig. 3-19 VISA Resource

3. Select the GPIB address specified on the rear panel of the PIA4810 Power Supply Controller or the RS-232C port connected to the PIA4810.
4. After selecting or entering a device name, click on OK.

The screen will return to the Calibration dialog as shown in Fig. 3-18.

5. In the Node Address box, select the node address of the control board connected to the DC power-supply unit to be calibrated.

The model name of the control board with the selected node address will be displayed in the Control Board box.

6. In the CH box, select the channel connected to the DC power-supply unit to be calibrated.

The DC power-supply unit connected to the selected channel will be displayed in the Model box.

The above steps complete the selection of the DC power-supply unit to be calibrated. Now, move on to the calibration procedure for each parameter.



## ■ OP01-PIA

### NOTE

- When the calibration is performed with OP01-PIA, wPiaCal.EXE stores the calibration value to the hard disk. Even if the calibration value has been initialized by executing configuration, you can reproduce it with wPiaCal.EXE. wPiaRecv.EXE is installed in c:\Program Files\Kikusui\PIA4800 Utils.V2.

### Voltage calibration

1. Turn OFF the POWER switch on the DC power-supply unit.
2. As shown in Fig. 3-13, connect only a digital voltmeter to the output terminal.
3. Turn ON the POWER switch on the DC power-supply unit.
4. Turn ON the output of the DC power-supply unit.
5. In the Calibration dialog shown in Fig. 3-18, open the Voltage page.  
(This page is open at a startup.)
6. Click on the Offset button.

The Voltage offset dialog will appear, and the software will control the DC power-supply unit so that its voltage becomes about 10% of the rated voltage.

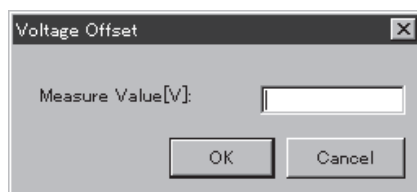


Fig. 3-20 Voltage Offset

7. Enter the value on the digital voltmeter connected to the output terminal in the Measure Value box.
8. Click on the OK button to return to the Voltage page.
9. Click on the Full Scale button.

The Voltage Full Scale dialog will appear, and the software will keep the DC power-supply unit at about 90% of the rated voltage.

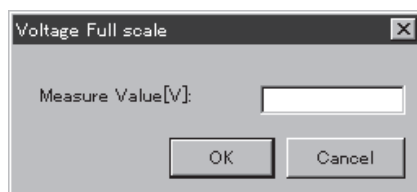


Fig. 3-21 Voltage Full Scale

10. Enter the value on the digital voltmeter connected to the output terminal in the Measure Value box.
11. Click on the OK button.

### Current calibration

1. Turn OFF the POWER switch on the DC power-supply unit.
2. As shown in Fig. 3-14, connect the shunt resistor to the digital voltmeter.
3. Turn ON the POWER switch on the DC power-supply unit.
4. Turn ON the output of the DC power-supply unit.
5. In the Calibration dialog shown in Fig. 3-18, open the Current page.
6. Click on the Offset button.

The Current Offset dialog will appear, and the software will control the DC power-supply unit so that its voltage becomes about 10% of the rated current.

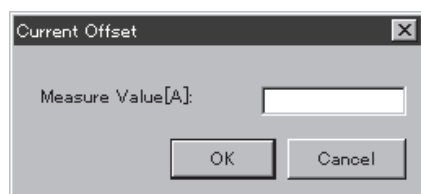


Fig. 3-22 Current Offset

7. Convert the value on the digital voltmeter connected to the shunt resistor into a current equivalent. Then, enter the value in the Measure Value box.
8. Click on the OK button to return to the Current page.
9. Click on the Full Scale button.

The Current Full Scale dialog will appear, and the software will set the DC power-supply unit to about 90% of the rated current.

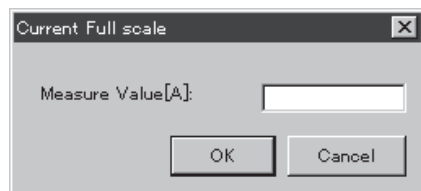


Fig. 3-23 Current Full Scale

10. Convert the value on the digital voltmeter connected to the shunt resistor into a current equivalent. Then, enter the value in the Measure Value box.
11. Click on the OK button.

### OVP calibration

Perform OVP calibration following voltage calibration. OVP calibration allows the calibrated output voltage to change so that the OVP activation point can be searched for.

1. Turn OFF the POWER switch on the DC power-supply unit.
2. As shown in Fig. 3-17, free the output terminal.
3. Turn ON the POWER switch on the DC power-supply unit.
4. Turn ON the output of the DC power-supply unit.
5. In the calibration dialog shown in Fig. 3-18, open the OVP page.
6. Click on the Offset button.

The next dialog will appear, and OVP calibration will begin.

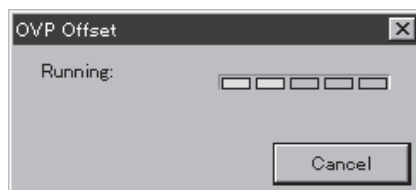


Fig. 3-24 OVP Offset

OVP will be activated in the DC power-supply unit, and the dialog will disappear.

7. Turn ON the output of the DC power-supply unit again.
8. Click on the Full Scale button.

The next dialog will appear, and OVP calibration will begin.



Fig. 3-25 OVP Full Scale

OVP will be activated in the DC power-supply unit, and the dialog will disappear.

9. Turn ON the output of the DC power-supply unit again.

The above steps complete the calibration procedure for the OP01-PIA. Turn OFF the DC power-supply unit.

To calibrate DC power-supply units connected to other channels or control boards with other node addresses, specify a CH or node address in the Calibration dialog shown in Fig. 3-18.

To calibrate DC power-supply units connected to power-supply controllers with other GPIB addresses, start with the Calibration dialog menu shown in Fig. 3-18. To set a VISA Resource, select Options in the Instruments box.

## ■ OP02-PIA

Variable resistor for adjustment on the control board must be adjusted using a screwdriver.

### NOTE

- With the calibration software in OP02-PIA, output settings are made internally (to 0 or rated output) using VSET and ISET messages. With some DC power-supply units, however, the output may not be reduced to 0 V or 0 A. In such a case, instead of the calibration software, use a variable resistor to make adjustments. At 10% and 90% of the rated output (using VSET and ISET messages), adjust the resistor to bring the output to the preset value.

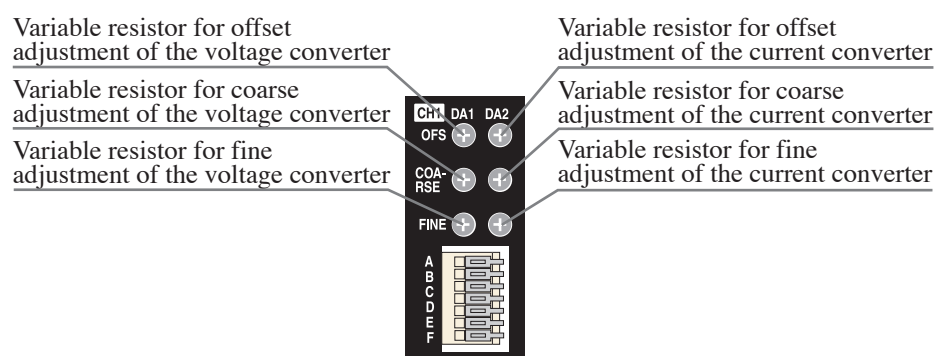


Fig. 3-26 Variable resistor for adjustment

## Voltage calibration

1. Turn OFF the POWER switch on the DC power-supply unit.
2. As shown in Fig. 3-13, connect only a digital voltmeter to the output terminal.
3. Turn ON the POWER switch on the DC power-supply unit.
4. Turn ON the output of the DC power-supply unit.
5. In the Calibration dialog shown in Fig. 3-18, open the Voltage page.
6. Click on the Offset button.

The following message box will be displayed:

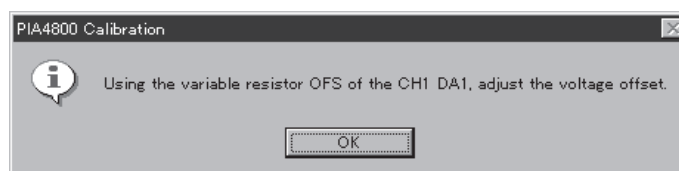


Fig. 3-27 Voltage Offset message

7. Turn the OFS variable resistor of DA1 on the relevant channel until the digital voltmeter connected to the output terminal indicates 0 V.
8. Upon completion of the adjustment, click on the OK button.  
The screen will return to the Calibration dialog box shown in Fig. 3-18.
9. Click on the Full Scale button. The following message box will appear:

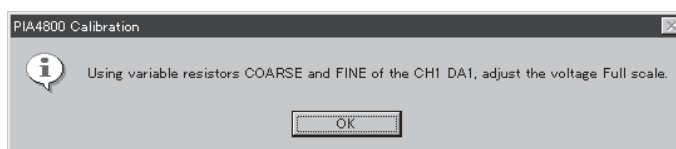


Fig. 3-28 Voltage Full Scale message

10. Turn the COARSE (Coarse adjustment) variable resistor or FINE (Fine adjustment) variable resistor on DA1 of the relevant channel until the value on the digital voltmeter connected to the output terminal indicates the maximum rated voltage of the DC power-supply unit.
11. Upon completion of the adjustment, click on the OK button.

### Current calibration

1. Turn OFF the POWER switch on the DC power-supply unit.
2. As shown in Fig. 3-14, connect the shunt resistor to the digital voltmeter.
3. Turn ON the POWER switch on the DC power-supply unit.
4. Turn ON the output of the DC power-supply unit.
5. In the Calibration dialog shown in Fig. 3-18, open the Current page.
6. Click on the Offset button.

The next dialog will be displayed:

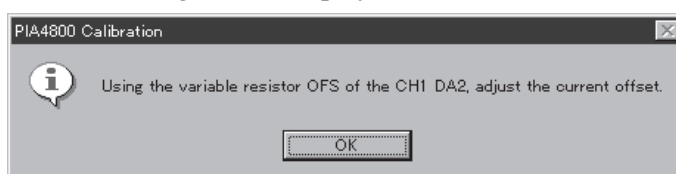


Fig. 3-29 Current Offset message

7. Turn the OFS variable resistor on DA2 of the relevant channel until the digital voltmeter connected to the shunt resistor indicates 0 V.
  8. Upon completion of the adjustment, click on the OK button.
- The screen will return to the Calibration dialog shown in Fig. 3-18.
9. Click on the Full Scale button.

The following message box will be displayed:

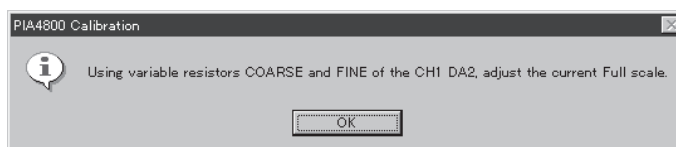


Fig. 3-30 Voltage Full Scale message

10. Turn the COARSE (Coarse adjustment) variable resistor or FINE (Fine adjustment) variable resistor on the DA2 of the relevant channel until the converted value on the digital voltmeter connected to the output terminal reaches the maximum rated current of the DC power-supply unit.
11. Upon completion of the adjustment, click on the OK button.

---

The above steps complete the calibration of the OP02-PIA.

To calibrate DC power-supply units connected to other channels or control boards with other node addresses, specify a CH or node address in the Calibration dialog shown in Fig. 3-18.

To calibrate DC power-supply units connected to power-supply controllers with other GPIB addresses, start with the Calibration dialog menu shown in Fig. 3-18. To set a VISA Resource, select Options in the Instruments box.

---

**NOTE**

- A variable resistor for COARSE adjustment of the voltage and current can be set to a value exceeding the rated output of the DC power-supply unit. If the OVP or other protection circuits are inadvertently activated by setting the resistor too high, turn the resistor counterclockwise until it stops, and then gradually turn it clockwise until the desired level is reached.
-

This chapter describes the remote control of DC power supplies by using this controller via GPIB or RS-232C.

## 4.1 Interface

This controller is provided with two interfaces: GPIB and RS-232C. If DC power-supply units are to be remotely controlled using the controller, one of them must be used.

### 4.1.1 GPIB Interface

To use the GPIB interface, set a GPIB address on the PIA4810. To set a GPIB address, see Chapter 2, "Connection to the DC Power-Supply Unit."

### 4.1.2 RS-232C Interface

To use the RS-232C interface, make the following settings:

#### **Baud rate**

For baud rate settings, see Chapter 2, "Connection to the DC Power-Supply Unit."

#### **Data bit/stop bit/parity bit**

The number of bits used is fixed as shown below. Make settings for these bits. For bit settings, see the manual for your PC.

- Data bit: 8 bits
- Stop bit: 1 bit
- Parity bit: None

Control communication via RS-232C using flow control or acknowledgement messages. One-way transmission may make proper communication difficult. For acknowledgement messages, see the "Connecting & Programming Guide."

# RS-232C pin layout

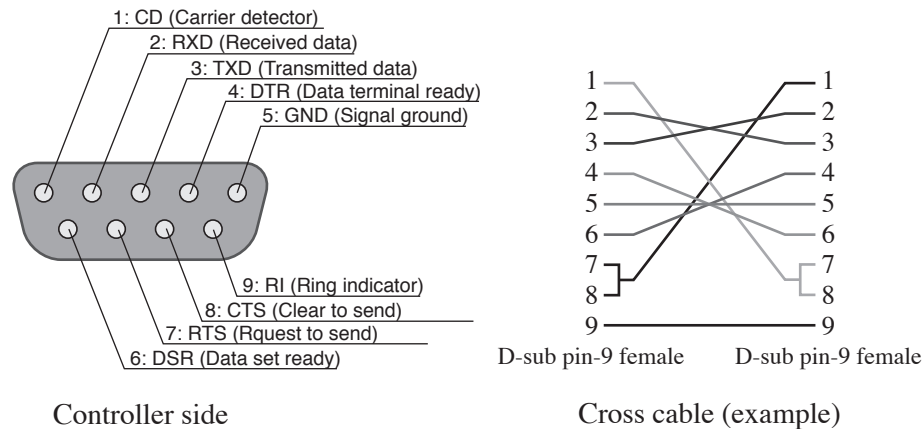


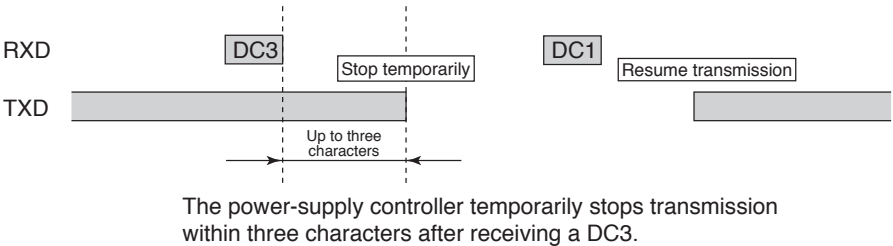
Fig. 4-1 Pin-9 AT-type connector

# RS-232C flow control

By executing Xon/Xoff, communication among power-supply controllers can be controlled. For control, DC (device control) codes are used.

	Function	ASCII code
DC1	Request transmission	11 h
DC3	Request termination of transmission	13 h

Control of transmission from the RS-232C terminal to the power-supply controller



Control of transmission from the power-supply controller to the RS-232C terminal

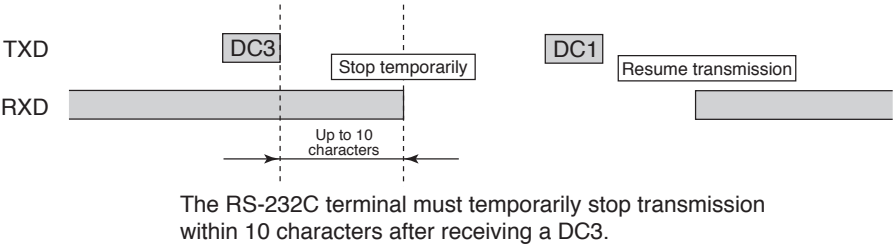


Fig. 4-2 Control of transmission between the RS-232C terminal and the power-supply controller



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## 4.2 Commands Details

For the command details, refer to the "Connecting & Programming Guide" in the CD-ROM as an attached accessory.

The "Connecting & Programming Guide" is provided on the HTML format with the following browser.

OS requirement: Window 2000 or later

Browser: Microsoft Internet Explorer 5.5 or later

The message list included in the "Connecting & Programming Guide" is provided on the PDF format. To view the PDF file, it is required "Adobe Reader 6.0" or later version.

The PIA4810/PIA4820 can also control the DC power supplies equipped with the digital remote control function, however, the description of device messages are different from this manual, so please refer to the operation manual of those individual power supplies.

## List of messages

Applicability: The 1 through 3 as indicated follows are used in combination with the DC power supply with analog remote control function and the control board.

1: OP01-PIA/ 2: OP01-PIA+SH SERIES/ 3: OP02-PIA/ 4: PAM/ 5: PAS/ 6: PMR/ 7: PWR

✓: Available, No mark: Not available

R/W: Query message (R) / Command message (W)

Message	Data	Description	Applicability							R/W
			1	2	3	4	5	6	7	
*CLS	-	Reset registers.	✓	✓	✓	✓	✓	✓	✓	W
*IDN	-	Return the Model Name of the controller.	✓	✓	✓	✓	✓	✓	✓	R
*RST	-	Set or reset the fault unmask register.	✓	✓	✓	✓	✓	✓	✓	W
*SRE	0 to 255	Set or reset the service request enable register. (Equivalent to UNMASK)	✓	✓	✓	✓	✓	✓	✓	R/W
*STB	-	Return the contents of the status byte register.	✓	✓	✓	✓	✓	✓	✓	R
CH	1 to 4	Specify a channel.	✓	✓	✓			✓		R/W
CLR	-	Clear the input buffer. (Equivalent to DCL and SDC)	✓	✓	✓	✓	✓	✓	✓	W
DELIMITER	0 to 3	Specify a response message terminator. (Equivalent to TRM)	✓	✓	✓	✓	✓	✓	✓	R/W
DIN	-	Return the port value of the digital control input.	✓	✓						R
DISP	1 to 4	Specify the output which displays on the panel.						✓		W
DSET	0 to 127	Set the value output to the digital control output port.	✓	✓						W
ERR	-	Return the contents of the error register.	✓	✓	✓	✓	✓	✓	✓	R
FAU	-	Return the contents of the fault register.	✓	✓	✓	✓	✓	✓	✓	R
FUNMASK	0 to 255	Set or reset the fault unmask register.	✓	✓	✓	✓	✓	✓	✓	R/W
HEAD	0 or 1	Specify a header and a unit.	✓	✓	✓	✓	✓	✓	✓	R/W
IOUT	-	Return the monitored value of the output current.	✓*1	✓*1		✓	✓	✓	✓	R
ISSET	Depends on device.	Set an output current.	✓*1	✓*1	✓*1	✓	✓	✓	✓	R/W*2
LOCK	0 or 1	Set to valid or invalid of the panel operation.				✓	✓	✓	✓	W
NODE	1 to 36	Specify the node address.	✓	✓	✓	✓	✓	✓	✓	R/W
OCSET	Depends on device.	Set OCP for a currently effective device.					✓		✓	R/W
OUT	0 or 1	Turn ON/OFF the output of a currently effective device.	✓*3	✓*3	✓*3	✓	✓	✓	✓	W
OVSET	Depends on device.	Set OVP for a currently effective device.	✓	✓			✓		✓	R/W*4
POUT	-	Return the monitored value of the output power.							✓	R
POW	-	Cut off power to a currently effective device.	✓	✓			✓		✓	W
REM	0 or 1	Set REMOTE/LOCAL for a currently effective device.	✓*5	✓*5						W
SILENT	0 or 1	Switch acknowledgement messages when using RS-232C.	✓	✓	✓	✓	✓	✓	✓	R/W
STS	-	Return the contents of the status register.	✓	✓	✓	✓	✓	✓	✓	R
TRM	-	Specify a response message terminator. (Equivalent to DELIMITER)	✓	✓	✓	✓	✓	✓	✓	R/W
UNMASK	0 to 255	Set or reset the service request enable register. (Equivalent to *SRE)	✓	✓	✓	✓	✓	✓	✓	R/W
VOUT	-	Return a set value of the output voltage.	✓*1	✓*1		✓	✓	✓	✓	R
VSET	Depends on device.	Set the output voltage.	✓	✓	✓	✓	✓	✓	✓	R/W*2

\*1: Excluding the PLZ series.

\*2: The Query is invalid for the DC power supply with analog remote control function, the PMR series or the PAM series.

\*3: Excluding the PAK-A series, the PLZ-W2 series, the PLZ152WA, the PVS series or the PVD-T series.

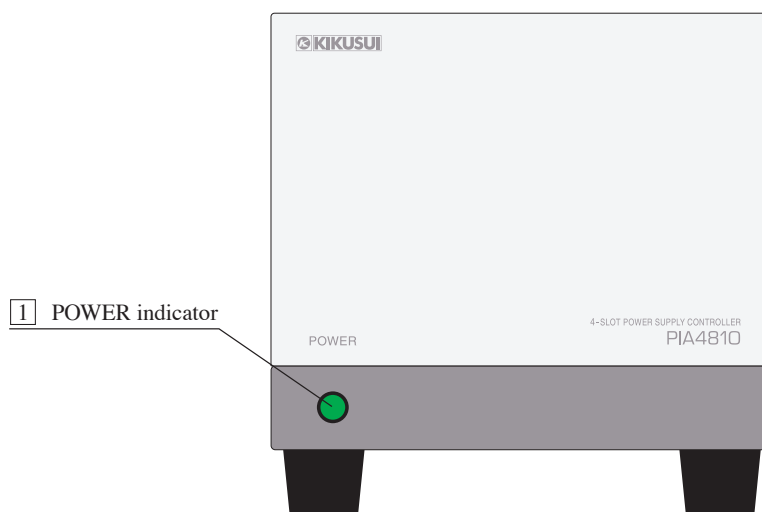
\*4: The Query is invalid for the DC power supply with analog remote control function.

\*5: Only the PAK-A series.

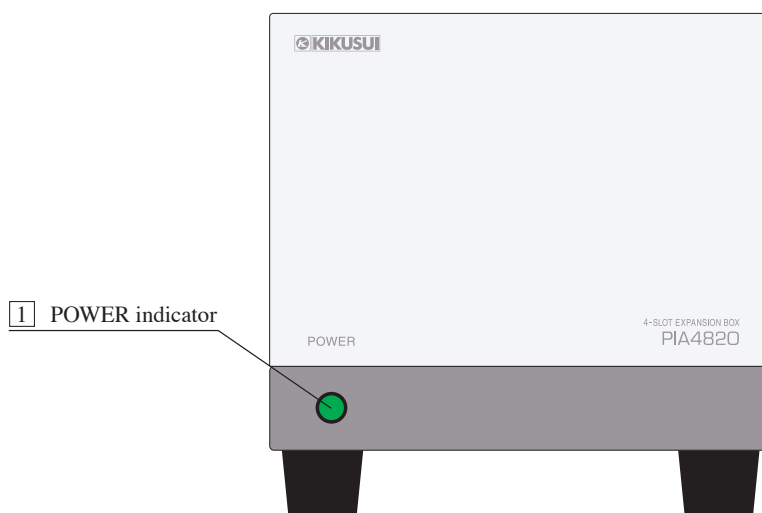
This chapter explains the switches, indicators, and connectors on the front and rear panels.

## 5.1 Front/Rear Panels

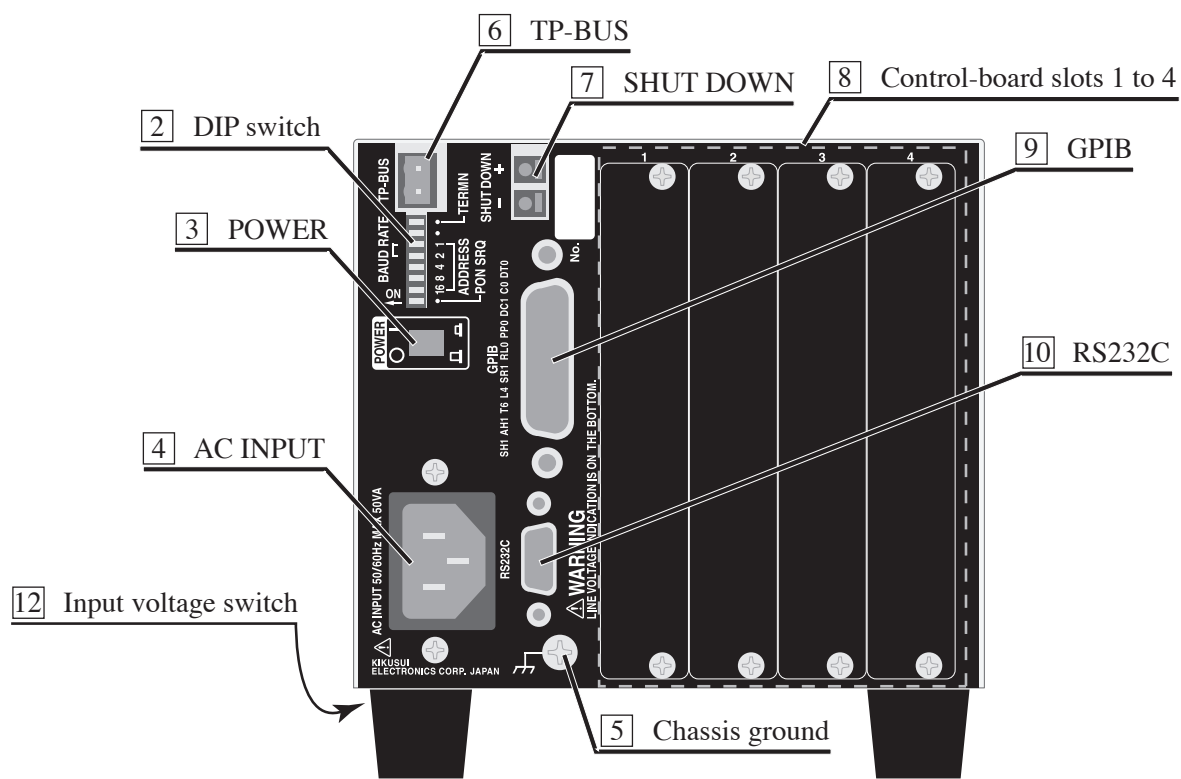
### 1) PIA4810 Front Panel



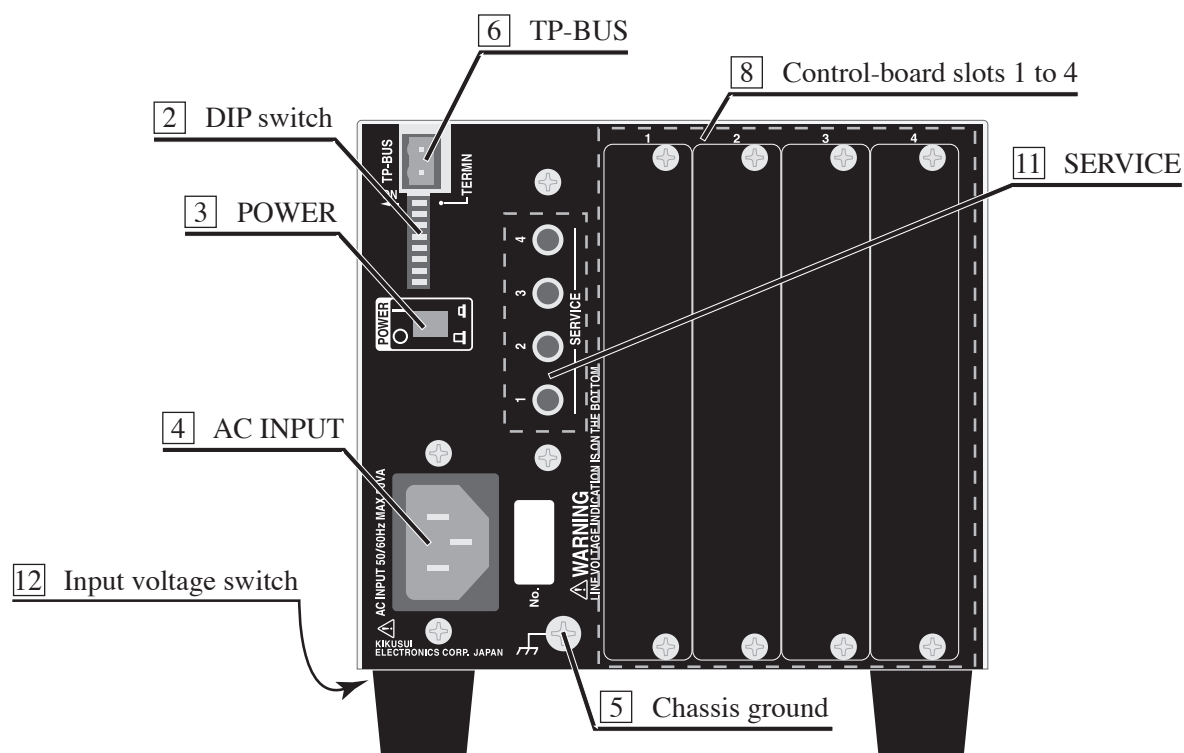
### 2) PIA4820 Front Panel



### 3) PIA4810 Rear panel



### 4) PIA4820 Rear panel



## 5.2 Panels

### **1 POWER indicator**

Supplies power to the controller. Lights up when the POWER switch on the rear panel is ON.

### **2 DIP switch**

Used to set the device address for GPIB control and the ON/OFF mode of PON SRQ (Power ON Service Request). Also used to set the baud rate for RS-232C control and the ON/OFF mode for termination.

### **3 POWER**

Turns the power of the controller ON and OFF. The power is ON (I) when the switch is in the pressed position, and OFF (O) when the switch is in the raised position.

### **4 AC INPUT ⚠**

Connector for the power cord used to supply power to the controller.

---

#### **⚠ WARNING**

- Improper handling may result in electric shock. In accordance with the instructions in 1.4, “Connecting the AC Power Cord,” operate within the acceptable input voltage range.
  - To ensure safety, be sure to provide an adequate ground.  
For details, see 1.5, “Grounding.”
- 

### **5 Chassis ground**

Connected to the chassis of the controller.

### **6 TP-BUS**

Using an AWG22 twisted-pair cable, connect the TP-BUS to the power-supply controller, expansion unit, or Kikusui’s DC power-supply unit with a digital remote-control function.

### **7 SHUT DOWN (PIA4810 only)**

Turns OFF the output of a connected power supply through the use of a contact input.

### **8 Control-board slots 1 to 4**

Slots used to mount the OP01-PIA or OP02-PIA on the control board.

Up to four control boards of the OP01-PIA or OP02-PIA type can be mounted.

### **9 GPIB (PIA4810 only)**

A connector used to install a GPIB cable.

---

**10 RS-232C (PIA4810 only)**

A connector used to install a RS-232C cable.

**11 SERVICE (PIA4820 only)**

A button used to specify the node address of an inserted control board, as instructed by the software.

**12 Input Voltage Switch**

A switch used to change the voltage supplied to the controller.



- Improper handling may result in electric shock. Be sure to operate within the proper input-voltage range specified in 1.4, “Connecting the AC Power Cord.”
-

This chapter explains the maintenance and inspection of the controller. To maintain high performance for an extended period, perform maintenance and inspect the controller regularly.

## 6.1 Cleaning

If the panel surface is stained, lightly wipe the stain using a cloth moistened with a water-diluted neutral detergent.

- 
- ⚠ WARNING** • Before cleaning, be sure to turn OFF the POWER switch and to unplug the power cord or turn OFF the switchboard.
  - ⚠ CAUTION** • Do not use volatile substances such as thinner or benzene for cleaning, as they may cause discoloration or erase printed characters.
- 

## 6.2 Inspection

### ■ Power cord

Check the power cord for tearing of the insulation and loosening or cracking of the plug.

- 
- ⚠ WARNING** • Tearing of the insulation or other faults may cause electric shock. In such a case, discontinue use immediately.
- 

To obtain accessories, contact Kikusui distributor/agent.





# Chapter 7

# Specifications

This chapter provides the specifications for the controller.

## General Specifications

Item		Description	
		PIA4810	PIA4820
TP-BUS	Connection	Using the accompanying TP-BUS connector, connect the following: DC power-supply unit with a digital remote-control function: Up to 31 units Expansion unit PIA4820: Up to three units (Total cable length: Up to 200 m; Number of twists: 1 or more/cm)	
	Polarity	None	
	Applicable cable	Stranded wire: 0.32 mm <sup>2</sup> (AWG22)	
SHUT DOWN	Input signal	The output of all connected DC power-supply units is turned off when a contact signal is input for at least 1 second.	
	+ terminal	Pulled up to +5 V with 4.7 kΩ	
	- terminal	Common for the control block	
	Applicable cable	Single wire: ϕ0.65 (AWG22) Stranded wire: 0.32 mm <sup>2</sup> (AWG22) Element wire diameter of at least ϕ0.18	
Input	Voltage range	The following ranges can be selected using the Voltage switch on the bottom of the unit: •90 VAC to 110 VAC •106 VAC to 125 VAC •180 VAC to 220 VAC •211 VAC to 250 VAC	
	Frequency	48 Hz to 62 Hz	
Power consumption		Up to 50 VA	
Installation location		Indoors and altitude of up to 2000 m	
Operating ambient temperature and humidity		0℃ to 40℃, 10% to 90% (No dew condensation)	
Storage ambient temperature and humidity		-20℃ to 70℃, 10% to 90% (No dew condensation)	
Insulation resistance	Input - chassis	30 MΩ or more at 500 VDC	
	CH terminal - chassis	30 MΩ or more at 500 VDC	
	TP-BUS - chassis	30 MΩ or more at 1000 VDC	
Withstand voltage	Input - chassis	1500 VAC, 1 minute	
	Input - CH terminal	1500 VAC, 1 minute	
	Input - TP-BUS	1500 VAC, 1 minute	
	CH terminal - chassis	600 VAC, 1 minute	
	TP-BUS - chassis	600 VAC, 1 minute	

Item	Description	
	PIA4810	PIA4820
Safety (*1, *2)	Conforms to the requirements of the following directive and standard. Low Voltage Directive 73/23/EEC EN 61010-1 Class I Pollution degree 2	
Electromagnetic compatibility (EMC) (*1)	Conforms to the requirements of the following directive and standard. EMC Directive 89/336/EEC EN 61326 EN 61000-3-2 EN 61000-3-3	
Weight	Approximately 5 kg	
Dimensions	See Fig. 7-1.	
Accessories	AC power cord: 1	AC power cord: 1
	PIA4800 Utilities CD: 1	_____
	TP-BUS connector: 1	TP-BUS connector: 1
	TP-BUS core: 1	TP-BUS core: 1
	Operation Manual for the controller: 1	Operation Manual for the controller: 1

\*1: Only on models that have CE marking on the panel.

Not applicable to custom order models.

\*2: This instrument is a Class I equipment. Be sure to ground the protective conductor terminal of the instrument. The safety of the instrument is not guaranteed unless the instrument is grounded properly.

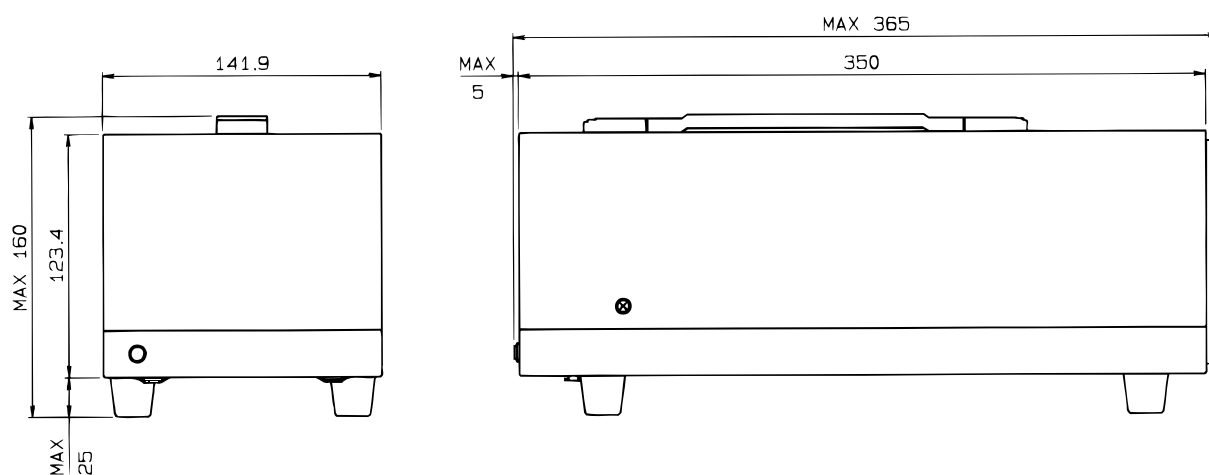
## GPIB Interface

Code	Function
SH1	All source handshake functions
AH1	All acceptor handshake functions
T6	Talker function (basic outputs, serial poll, and talker cancellation by specifying a listener)
L4	Listener function (basic inputs, listener cancellation by specifying a talker)
SR1	All service request functions
RL0	No remote/local function
PP0	No parallel-polling function
DC1	No device-clear function
C0	No control function
DT0	No device-trigger function

## RS-232C Interface

Item	Description
Baud rate	One of 19200 bps, 9600 bps, 4800 bps, and 2400 bps can be selected using the DIP switch on the rear panel.
Data bit	8 bits (fixed)
Stop bit	1 bit (fixed)
Parity bit	None
Transmission/reception	Flow control or acknowledgement message
Cable	D-sub 9-pin, female-female AT type

## External dimensions



Unit: mm

Fig. 7-1 External dimensions



This chapter explains the control board OP01-PIA.

## 8.1 Outline of Product

The OP01-PIA is an A/D and D/A control board exclusively for use with the power-supply controller PIA4810 and the expansion unit PIA4820. This product is not compatible with any other devices.

One board can control up to two DC power-supply units. For control parameters, see the "Connecting & Programming Guide."

The OP01-PIA is not compatible with DC power-supply units that have a rated output voltage exceeding 500 V. For such units, use the OP02-PIA.

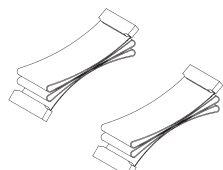
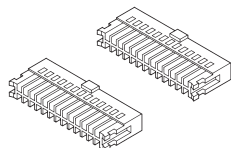

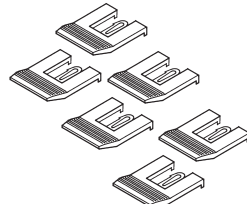
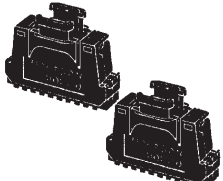

- 
- ⚠ CAUTION** • The withstand voltage between terminals on the OP01-PIA is 500 VAC. Connection of a DC power-supply unit with a rated output voltage exceeding 500 V may result in a control board breakdown.
- 

## 8.2 Unpacking Inspection

Upon reception of the OP01-PIA, check it to make sure the proper accessories are included and that all articles are free from damage incurred in transit.

Should any damage or deficiency be found, contact Kikusui distributor/agent.

### Accessories

- |  |   |  |
|--|---|--|
| <br><input type="checkbox"/> Flat cable for connection<br>(2 cables)<br>[83-22-6050]  | <br><input type="checkbox"/> Connector for connection<br>(2 pieces)<br>[84-49-0160]                 | <br><input type="checkbox"/> J1/J2 protection dummy plug (2 pcs.)<br>(Attached to the product. No contact pin.)<br>[84-49-0110] |
| <br><input type="checkbox"/> Connector lock lever (6 pieces)<br>(Two of six are attached to<br>J1/J2 protection dummy plugs.)<br>[83-06-5060] | <br><input type="checkbox"/> Connector hood cover with<br>a binding band (2 pieces)<br>[84-49-0140] | <br><input type="checkbox"/> Fastening screw M3 x 0.5 x 6<br>(2 pieces) [M3-112-012]<br>Lock washer (2 pieces)<br>[M5-102-002]  |

## 8.3 Precautions in Handling

### Handling the control board

The printed circuit board of the OP01-PIA is not covered. In handling the control board, follow these precautions:

- **Do not touch any electronic components other than the switches.**

To protect electronic components against damage from static electricity, do not touch any electronic components or patterns other than the switches.

- **Do not operate in an environment susceptible to static electricity.**

Do not operate in an environment susceptible to static electricity, as static electricity may damage electronic components. To protect these components against damage from static electricity, install them on the controller as soon as they are unpacked.

- **For storage, use antistatic bags.**

For storage of the OP01-PIA, provide antistatic measures such as antistatic bags, as static electricity may damage electronic components.

- **Avoid falls and collisions.**

Falls and collisions may damage the printed circuit board and other electronic components.

- **Do not install or remove the board with power ON.**

Do not install or remove the OP01-PIA with the power ON, as the power-supply controller and the OP01-PIA itself may be damaged.

### Handling the connection cable

In handling the flat cable for connection accompanying the OP01-PIA, follow these precautions:

- **Prevent the cable from being damaged.**

Damage and disconnection may cause malfunction or control failure.

- **Avoid placing too much stress on the cable (such as by bending it).**

Placing too much stress on the cable (such as by bending it) may result in disconnection of the cable.

## 8.4 Switch Settings

Before the OP01-PIA is installed on the controller, switch settings must be made on the printed circuit board through the use of a connected DC power-supply unit or electronic load.

The switch "S100" and "S101" are for the Channel 1, and the switch "S200" and "S201" are for Channel 2. For the setting position of these switches, refer to the "Connecting & Programming Guide" in the CD-ROM as an attached accessory.

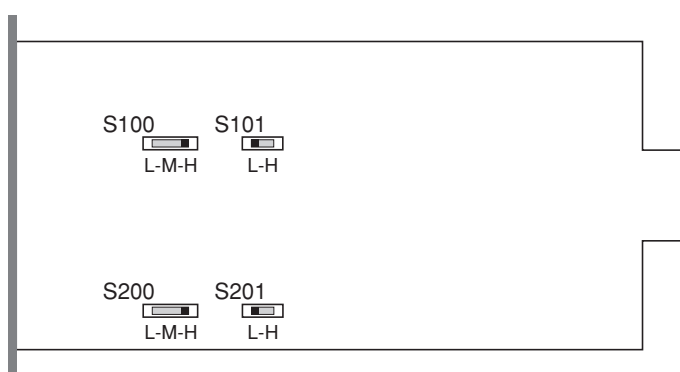


Fig. 8-1 Switch settings (Default settings at the time of shipment)

### **S100/S200**

Switches used to change the output range of the OP01-PIA for controlling the output current of the DC power-supply unit. Settings appropriate for the DC power-supply unit to be controlled must be made.

### **S101/S201**

Switches used to change the range for measuring the output current of a DC power-supply unit.

## 8.5 Installation

An M3 Phillips screwdriver is required to install the OP01-PIA.



- **WARNING** To ensure safety, when installing the OP01-PIA or removing it from the slot, turn OFF the POWER switch on the power-supply controller or expansion unit.

### Installation procedure

1. Turn OFF the POWER switch on the power-supply controller or expansion unit.
2. Make sure the switch settings for the connected device are correct. See 8.4, “Switch Settings.”
3. Remove the two screws from the relevant slot and remove the slot cover.  
Save the screws and the slot cover for use in the removal of the control board.
4. While keeping the printed circuit board of the OP01-PIA in the slot grooves, slowly insert the OP01-PIA until the controller panel and the OP01-PIA panel are completely aligned.
5. Using the accompanying screws and lock washers, securely fix the OP01-PIA.

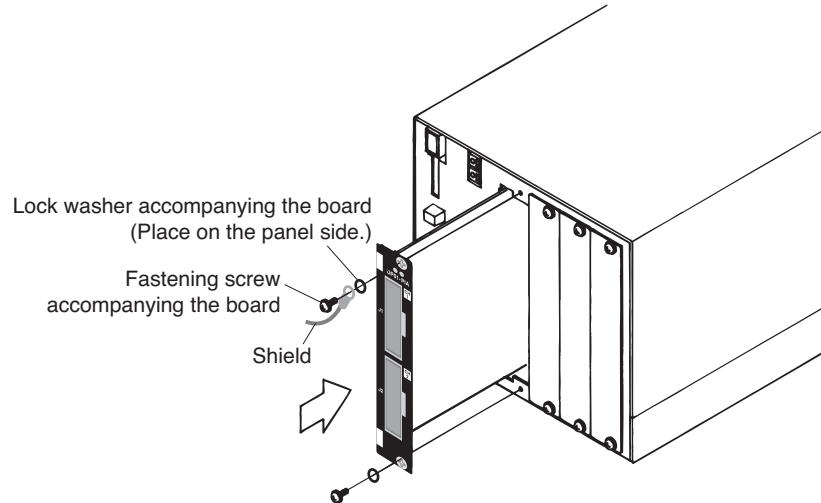


Fig. 8-2 Installation



## Removal

1. Turn OFF the POWER switch on the controller.
2. Remove the two fixing screws.  
Fastening screws and lock washers are needed to install the control board; keep them in a safe place.
3. As shown in Fig. 8-3, insert long-nose pliers into the drawing hole and slowly draw out the control board.
4. Using the screws saved with the slot cover, fix the slot cover.

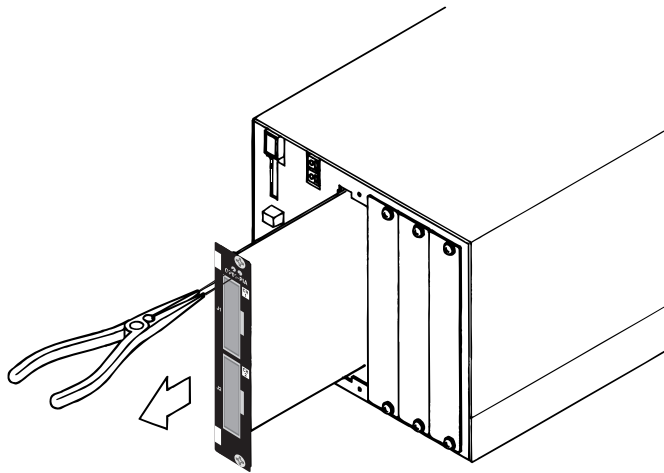


Fig. 8-3 Removal

## 8.6 Connection to J1/J2 Connectors

To connect the OP01-PIA to the device, either use the flat cable accompanying the OP01-PIA or fabricate a cable, depending on the control parameters. For details, see the "Connecting & Programming Guide."

### Fabricating a J1/J2 connector

#### ■ Preparation

For fabrication of a cable, prepare the type of cable, tool, and Omron connector with contact pins specified below. The connector accompanies the OP01-PIA.

For details about cable fabrication, see the catalog provided by Omron.

#### NOTE

- J1 and J2 connectors are of the MIL-based standard type. Their equivalents may also be used.

Connector .....	XG5M-2632N (Omron)
Cable .....	AWG24 (Maximum external diameter of $\phi 1.3$ mm with seven core wires)
Pressure welder .....	XY2B-7006 (Omron)

To make wiring again, the following tool is necessary to draw out contacts:

Contact drawer ..... XY2E-0001 (Omron)

For new replaceable part, use the contact pins specified below.

Contact ..... XG5W-0031 (Omron)

#### Pin layout

The following table shows the pin layout of the J1 and J2 connectors for the OP01-PIA. Output ON/OFF operation may not be controllable, depending on the type of DC power-supply unit connected. For details, see the "Connecting & Programming Guide."

Pin No.	Function of the terminal
2	Common for output-voltage remote control
3	Common for output-current remote control
4	Output-voltage remote control
6	Output-current remote control
10	Common for output ON/OFF
11	Output ON/OFF

Table 8-1 Pin arrangement

### Fabrication procedure

1. Cut the cable to the proper length and connect it to the contact by pressure welding.
2. Process the other end of the cable to fit into each DC power-supply unit or electronic load. For details, see the "Connecting & Programming Guide."

### Installing the hood cover

1. Insert the hook of part A on the hood cover into part B of the socket.
2. Insert hook C on the hood cover into hook D on the other hood cover.
3. Fasten using the binding band.  
(If there is not enough wire, provide filler around the wire to protect the pin from direct impact.)

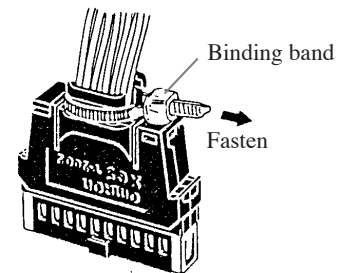
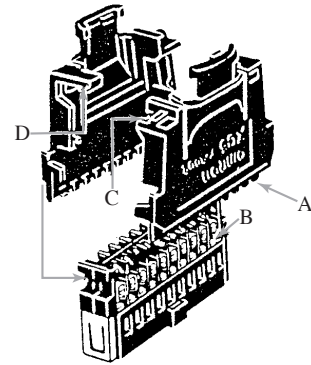


Fig. 8-4

### Connecting the J1/J2 connectors

Before installing the connector, mount a lock lever on it to prevent the connector from loosening.

1. As shown in Fig. 8-5, mount the accompanying lock lever on the connector.
2. Insert the connector into J1 or J2 on the control board.

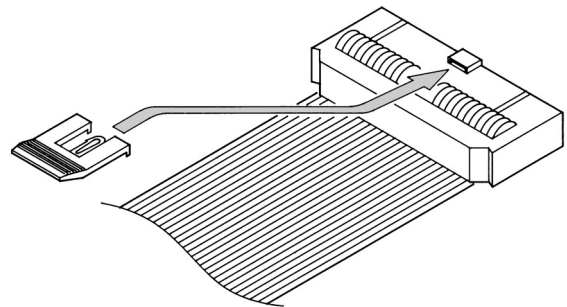


Fig. 8-5

#### NOTE

- For safety, install a protection dummy plug to the J1/J2 connector which is not used.
- To extend a cable by more than 50 cm, use a shielded cable connector. Connect the shield end to the fixing screw and fasten it. Optional 1-meter and 2-meter shielded cables are available.

Note that 2 m is the maximum acceptable length of the J1/J2 connector cable.

## 8.7 Components and Functions

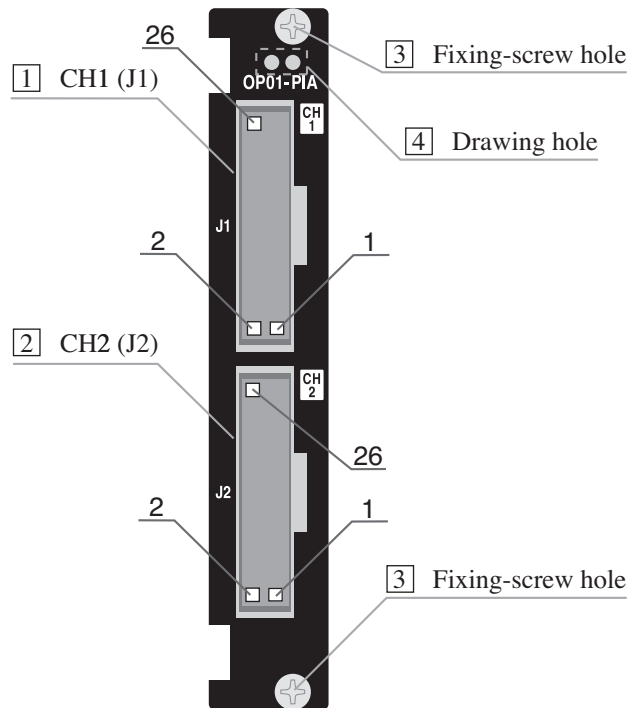


Fig. 8-6 Front panel

### **1 CH1 (J1)**

Connector for Channel 1. Connected to the connection flat cable accompanying the OP01-PIA, or to a cable fabricated by the user.

### **2 CH2 (J2)**

Connector for Channel 2. Connected to the connection flat cable accompanying the OP01-PIA, or to a cable fabricated by the user.

### **3 Fixing-screw hole**

Screw hole used to fix the OP01-PIA in the controller slot.

### **4 Drawing hole**

Used to hold long-nose pliers in removal of the OP01-PIA.

## 8.8 Specifications

### Electrical Specifications

Function of terminal		Terminal No.	Details						
Analog output			Symbol	Setting range	Output current	Resolution	Linearity *1	Ripple	Temperature coefficient *2
	Output-voltage setting	4	DA1	0 to +10 V	2 mA	0.025% of FS	0.0125% of FS	0.5 mVrms (10 to 500 kHz)	50 ppm/ °C of FS
	Output-current-1 setting	5	DA2	0 to +10 V					
	Output-current-2 setting	6	DA4(H)	0 to +10 V					
			DA4(M)	0 to +1.5 V					
			DA4(L)	0 to +0.4 V					
Overvoltage-protection setting	7	DA3	0 to +10 V	2 mA	0.1% of FS	0.1% of FS	0.5 mVrms	50 ppm/ °C of FS	
Analog input			Symbol	Setting range	Input resistance	Resolution	Linearity *1		Temperature coefficient *2
	Output-voltage readback	8	AD1	0 to +10 V	1 MΩ	0.025% of FS	0.025% of FS		100 ppm/ °C of FS
	Output-current readback	9	AD2(H) AD2(L)	0 to +10 V 0 to +1 V					
Digital-control output			DSET	Logic	Circuit	Maximum voltage	Maximum current		
	Output ON/OFF	11	DO0 (LSB)	ON at LOW	Open corrector	24 V	10 mA		
	Power-switch cutoff	12	DO1	OFF at LOW					
	Not used	13	DO2	Active at LOW					
	Remote/local switching	14	DO3	Remote at LOW					
	Not used	15	DO4	Active at LOW					
	Not used	16	DO5	Active at LOW					
	Not used	17	DO6 (MSB)	Active at LOW					
Digital input			DIN	Logic	Circuit	Threshold level			
	C.V mode monitoring	18	D10 (LSB)	Active at LOW	Pulled up to +5 V with 4.7 kΩ	CMOS level			
	C.C mode monitoring	19	D11	Active at LOW					
	Activation of overvoltage protection	20	D12	Active at LOW					
	Overhead monitoring	21	D13	Active at LOW					
	Power OFF	22	D14	OFF at LOW					
	Output OFF	23	D15	OFF at LOW					
	Remote/local	24	D16	Remote at LOW					
	Completion of output	25	D17 (MSB)	Active at LOW					
Common shield									
	Analog common	2	Common for DA1, DA2, DA3, AD1, and AD2						
	Digital common	10	Common for D10 to D17, DO0 to DO6, and +5 V						
	Common for output current 2	3	Common for DA4						
	+5 V	26	Not to be used						
	Shield	1							

\*1: After 30 minutes of warm-up at 23°C ± 5°C and below 80% RH

\*2: Standard value

## General Specifications

Item	Details
Installation location	Indoors and altitude of up to 2000 m
Operating ambient temperature and humidity	0 °C to 40 °C, 10% RH to 90% RH (No dew condensation)
Storage ambient temperature and humidity	-20 °C to 70 °C, 10% RH to 90% RH (No dew condensation)
Insulation resistance	CH terminal - chassis: 30 MΩ at 500 VDC
Withstand voltage	CH terminal - chassis: 500 VAC, 1 minute
	CH terminal - CH terminal: 500 VAC, 1 minutes
Weight	Approximately 0.2 kg
External dimensions	W: 20 x H: 116 x D: 211 (mm)
Accessories	Flat cables for connection: 2 Connectors for connection: 2 Lock levers: 6 (Two of six are attached to protection dummy plugs.) J1/J2 protection dummy plugs: 2 (Attached to the product.) Hood covers: 2 Locking screws: 2 Lock washers: 2

This chapter explains the control board OP02-PIA.

## 9.1 Outline of Product

The OP02-PIA is a D/A control board exclusively for the power-supply controller PIA4810 and the expansion unit PIA4820. This product is not compatible with any other devices.

One board can control up to two DC power-supply units. For control parameters, see the "Connecting & Programming Guide."

## 9.2 Unpacking Inspection

Upon reception the OP02-PIA, check it to make sure that the proper accessories are included and that all articles are free from damage caused in transit.

Should any damage or deficiency be found, contact Kikusui distributor/agent.

### Accessories



- ☐ Fastening screw M3 x 0.5 x 6 (2 pieces)  
[M3-112-012]
- Lock washer (2 pieces)  
[M5-102-002]

## 9.3 Precautions in Handling

### Handling the control board

The printed circuit board of the OP02-PIA is not covered. In handling the control board, follow these precautions:

- **Do not touch any electronic components other than the switches.**

To protect electronic components from damage caused by static electricity, do not touch any electronic components or pattern other than the switches.

- **Do not operate in an environment susceptible to static electricity.**

Do not operate in an environment susceptible to static electricity, as static electricity may damage electronic components. To protect these components against damage from static electricity, install them on the controller as soon as they are unpacked.

- **For storage, use an antistatic bags.**

For storage of the OP02-PIA, provide antistatic measures such as antistatic bags, as static electricity may damage electronic components.

- **Avoid falls and collisions.**

Falls and collisions may damage the printed circuit board and other electronic components.

- **Do not install or remove the board with power ON.**

Do not install or remove the OP02-PIA with the power ON, as the power-supply controller or the OP02-PIA itself may be damaged.



## 9.4 Switch Settings

Before the OP02-PIA is installed on the controller, switch settings must be made on the printed circuit board through the use of a connected DC power-supply unit or electronic loader.

The switch "S100" and "S101" are for the Channel 1, and the switch "S200" and "S201" are for Channel 2. For the setting position of these switches, refer to the "Connecting & Programming Guide" in the CD-ROM as an attached accessory.

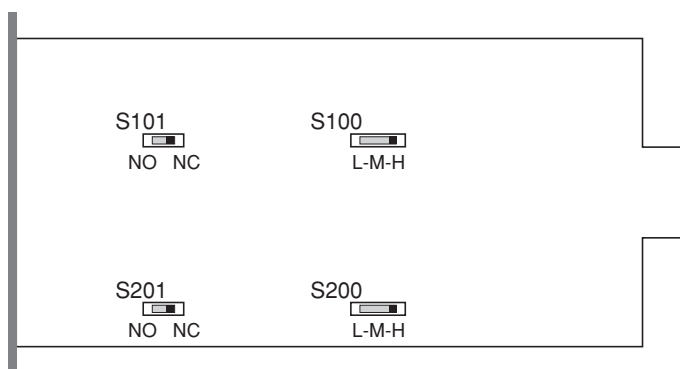


Fig. 9-1 Switch settings (Default settings at the time of shipment)

### S100/S200

Switches used to change the output range of the OP02-PIA for controlling the output current of the DC power-supply unit. Settings appropriate for the DC power-supply unit to be controlled must be made.

### S101/S201

Switches used to change the relay output of the OP02-PIA between the NO (Normal Open) and NC (Normal Close) modes.

## 9.5 Installation

An M3 Phillips screwdriver is required to install the OP02-PIA.



- **WARNING** To ensure safety, when installing the OP02-PIA or removing it from the slot, turn OFF the POWER switch on the power-supply controller or expansion unit.

### Installation procedure

1. Turn OFF the POWER switch on the power-supply controller or expansion unit.
2. Make sure switch settings appropriate for the device are made. See 9.4, “Switch Settings.”
3. Remove the two screws from the relevant slot, and also remove the slot cover. Save the screws and the slot cover for use when the control board is removed.
4. While keeping the printed circuit board of the OP02-PIA in the slot grooves, slowly insert the OP02-PIA until the controller panel and OP02-PIA panel are fully aligned.
5. Using the accompanying screws and the lock washers, securely fix the OP02-PIA.

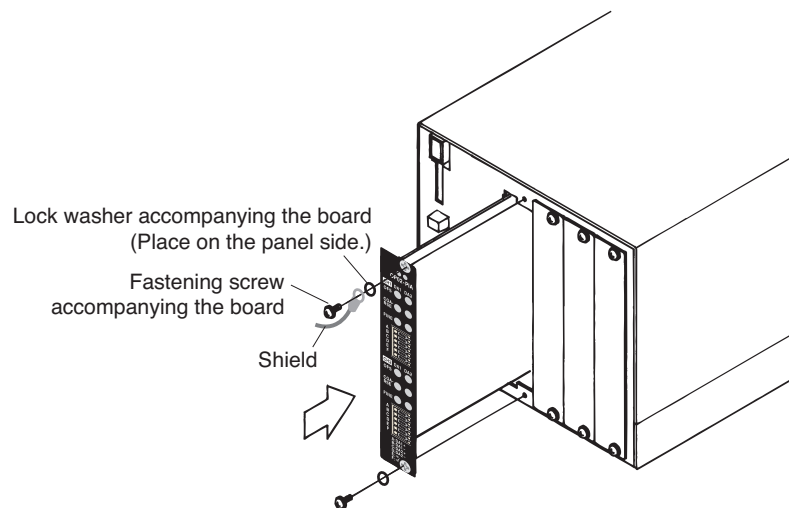


Fig. 9-2 Installation

## Removal

1. Turn OFF the POWER switch on the controller.
2. Remove the two fixing screws.  
Fastening screws and lock washers are needed to install the control board; keep them in a safe place.
3. As shown in Fig. 9-3, insert long-nose pliers into the drawing hole and slowly draw out the control board.
4. Using the screws saved with the slot cover, fix the slot cover.

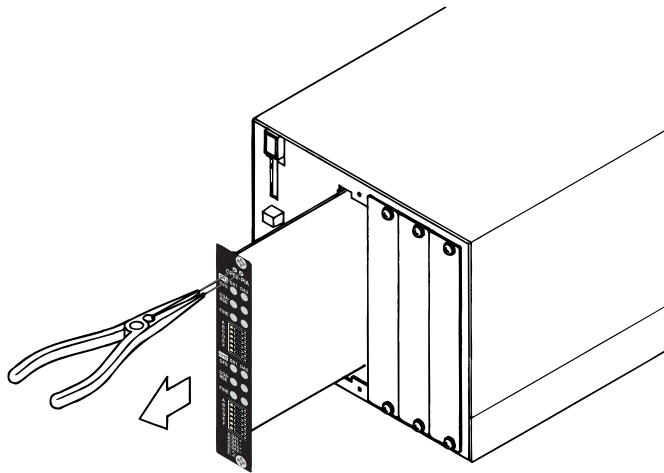


Fig. 9-3 Removal

## 9.6 Connection to CH1/CH2 Connectors

To connect the OP02-PIA to the device, insert the cable directly into the CH1 or CH2 connector. Connect in accordance with following procedure.

---

**NOTE**

- To extend a cable by more than 50 cm, use a shielded cable connector. Connect the shield end to the fixing screw and fasten it. Note that 2 m is the maximum acceptable length of the CH1/CH2 connector.
- 

### ■ Cables and tools for connection

#### Cable

Single wire:  $\varnothing 0.32$  to  $\varnothing 0.65$  (AWG28 to 22)

Stranded wires:  $0.08 \text{ mm}^2$  to  $0.32 \text{ mm}^2$  (AWG28 to 22)

#### Slotted screwdriver

Axis diameter:  $\varnothing 3$

End width:  $2.6 \text{ mm}^2$

#### Wire stripper

One compatible with the cables specified above

### ■ Connection procedure

1. Using a wire stripper, remove 10 mm of insulation from the cable end. To ensure adequate removal, use of the strip gauge shown in Fig. 9-4 is recommended.
2. Turn ON the POWER switch on the PIA4810 or PIA4820.

---

**⚠ WARNING**

- Never make connections to the CH1 or CH2 connector with the POWER switch ON, as electric shock or damage to the internal circuit may result.
- 

3. As shown in Fig. 9-4, insert the cable into the CH1 or CH2 connector. Output ON/OFF operation may not be controllable, depending on the type of DC power-supply unit to be connected. For details, see the "Connecting & Programming Guide."

Pin No.	Function of terminal
A	Output-voltage control
B	Common for output-voltage control
C	Output-current control
D	Common for output-current control
E	Output ON/OFF
F	Common for output ON/OFF

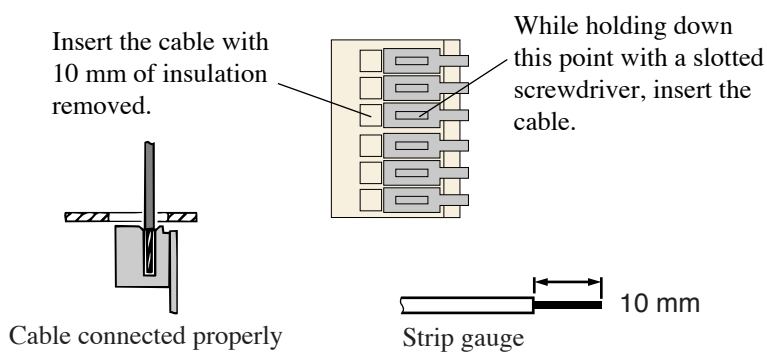
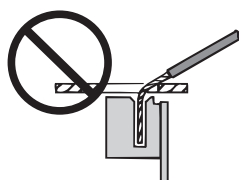


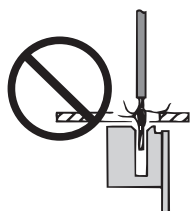
Fig. 9-4 Connection to the CH1 or CH2 connector

**NOTE**

- Insulation scraps from the CH1/CH2 connector may cause malfunction when in contact with the chassis. Fully insert the uncovered section of the cable into the terminal.



Too much insulation has been removed, leaving the uncovered wire in contact with the chassis. Remove 10 mm of insulation.



Insulation scraps are in contact with the chassis. Twist the wire prior to insertion.

Fig. 9-5 Precautions in cable connection

- Keeping the screwdriver away from the terminal, lightly pull on the cable to make sure it is securely fixed.

## 9.7 Components and Functions

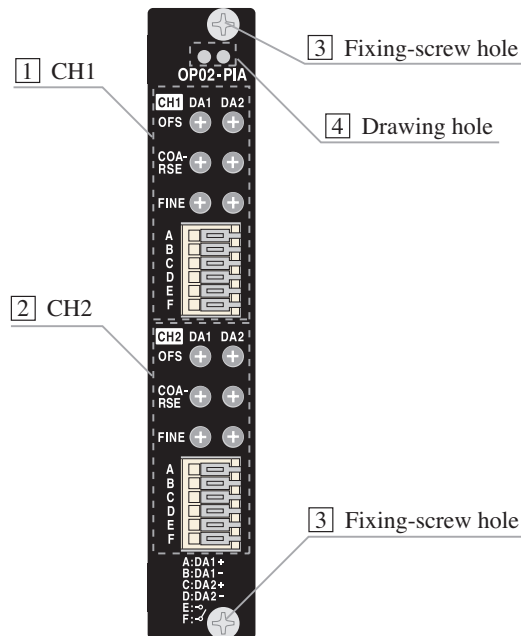
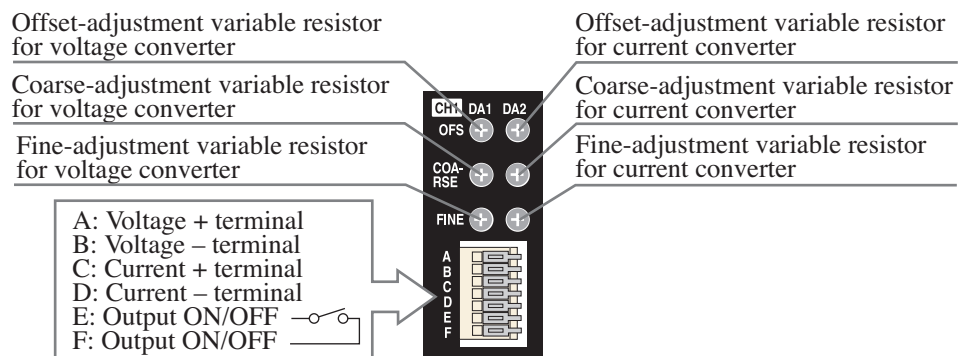


Fig. 9-6 Front panel

### 1 CH1

Connector and adjustment variable resistor for Channel 1. For details, see below.



### 2 CH2

Connector and adjustment variable resistor for Channel 2. For details, see the figure for CH1.

### 3 Fixing-screw hole

Used to fix the OP02-PIA in the controller slot.

### 4 Drawing hole

Used to hold long-nose pliers in removal of the OP02-PIA.

## 9.8 Specifications

### Electrical Specifications

Function of terminal		Termi- nal No.	Details						
Analog output			Symbol	Setting range	Output current	Resolution	Linearty *1	Ripple	Temperature coefficient *2
	Output-voltage setting	A	DA1	0 to +10 V	5 mA	0.025% of FS	0.0125% of FS	1 mVrms (10 to 500 kHz)	50 ppm/ °C of FS
	Output-current setting	C	DA2(H)	0 to +10 V			0.025% of FS		100 ppm/ °C of FS
			DA2(M)	0 to +1.5 V					
DA2(L)			0 to +0.4 V						
Digital control output				Logic	Circuit	Maximum voltage	Maximum current		
	Output ON/OFF	E	DO	Normal open/ Normal close Selectable	Contact output	30 V	1 A		
Common									
	Analog common 1	B	Common for DA1						
	Analog common 2	D	Common for DA2						
	Digital common	F	Common for DO						

\*1: After 30 minutes of warm-up at 23°C ± 5°C and below 80% RH

\*2: Standard value

### General Specifications

Item	Details
Installation location	Indoors and altitude of up to 2000 m
Operating ambient temperature and humidity	0 °C to 40 °C, 10% RH to 90% RH (No dew condensation)
Storage ambient temperature and humidity	-20 °C to 70 °C, 10% RH to 90% RH (No dew condensation)
Insulation resistance	CH terminal - chassis: 100 MΩ at 600 VDC
Withstand voltage	CH terminal - chassis: 600 VAC, 1 minute CH terminal - CH terminal: 600 VAC, 1 minute
Weight	Approximately 0.2 kg
External dimensions	W: 20 x H: 116 x D: 211 (mm)
Accessories	Locking screws: 2 Lock washers: 2





# Appendix

## Appendix 1 List of Error Messages

Error No.	Message	Corrective action
1220	Unable to open instrument in device x	The GPIB board failed to open. Properly install the GPIB board.
1230	Error writing to instrument in device x	Writing has failed. Check the GPIB cable and the GPIB address of the controller (or the RS-232C cable and the baud rate).
1231	Error reading from instrument in device x	Reading has failed. Check the GPIB cable and the GPIB address of this controller (or the RS-232C cable and the baud rate).
1223	Different model access in device x	Models other than the PIA4800 are connected. Check the GPIB address of the controller.
3101	The invalid data is entered.	Illegal data has been entered. Enter an acceptable value.
3102	The entered measure value is out of range.	The measured value exceeds the limit. Enter an acceptable value.
3103	No power supply is connected to this channel.	The power-supply unit is not connected. Reset with PIANONE.
3105	Voltage or current calibration is not performed yet. Calibrate the voltage or current.	Voltage or current calibration has not been performed. (Perform voltage calibration prior to OVP calibration.)
3107	No Control Board is installed in this Node Address.	The control board is not installed. Reset the control board using PIACONF.
3108	Select a channel.	Make the channel settings.
3109	The entered Channel No. is out of range.	An incorrect channel has been set. Enter a correct channel value.
3110	This software cannot calibrate OVP for the power supply connected to this channel.	This system does not allow OVP calibration.
3111	There is not information about power supply.	No information on the power supply is available. Reset using PIACONF.
4801	Database file PIMDRV.LOG not found, or invalid contents.	The PIMDRV.LOG file cannot be found. Reinstall the accompanying software.
4802	Cannot update PIMCFG.LOG file.	Writing in the PIMDRV.LOG is not possible. Reinstall the accompanying software.
4806	There is no Module in the Slot.	The control board cannot be found. Reset using PIACONF.
6001	PMR series is already using this Node Address.	Configuration is unworkable. The node address is in use by the PMR series. Change the address.



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