

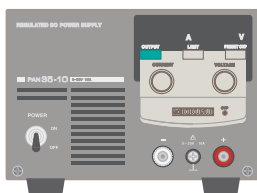
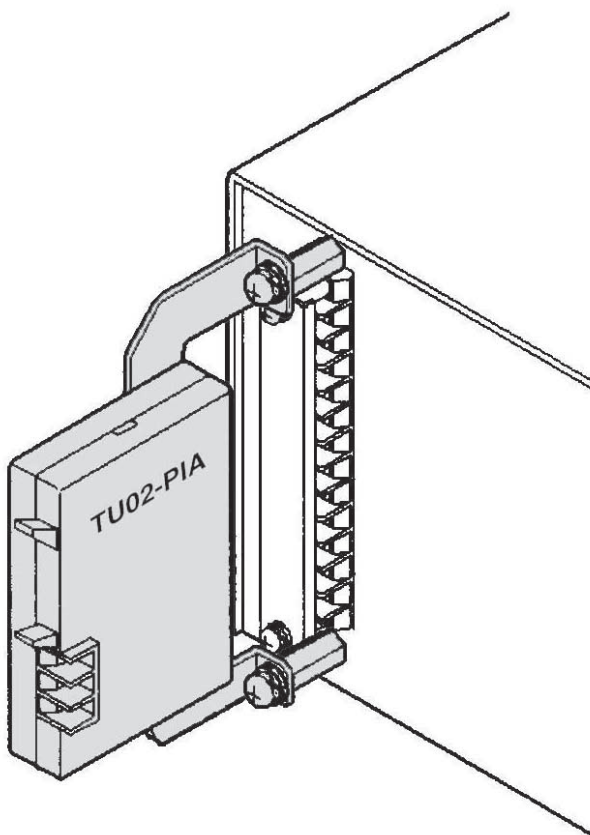
TERMINAL UNIT

Electronic Test
Instruments &
Power Supplies



TU02-PIA

OPERATION MANUAL



For PAN/PAN-A Series



Part No. Z1-001-030, IA000407
Jan, 2014

About This Manual

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

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.

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

Terminal Unit

TU02-PIA

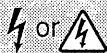
Operation Manual

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Safety Symbols

This operation manual and this product use the following safety symbols. Note the meaning of each of the symbols to ensure safe use of the product. (As using symbols depend on the product, all of symbols may not be used.)



Indicates the presence of 1000V or higher. Never attempt to touch this part when the power switch of the product is turned on. If you need to touch, turn off the power switch and then check the voltage of the terminal.



Indicates the possibility of personal injury or death. Never fail to follow the operating procedure. Do not proceed beyond a WARNING sign until the noted conditions are fully understood and met.



Indicates the existence of damage to the product or connected equipment. Always follow the operating procedure. Do not proceed beyond a CAUTION sign until the indicted conditions are fully understood and met.



Indicates additional information such as operating procedure.



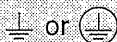
Describes technical terms used in this manual.



Indicates action prohibited.



Indicates general warning, caution, risk of danger. When this mark is indicated on the product, refer the relevant section of the Operation Manual.



Indicates a grounding (earth) terminal.



Indicates a chassis grounding terminal.

Preface

About This Manual

This Operation Manual describes the handling of the TU02-PIA terminal unit, which is connected between a Kikusui PAN/PAN-A Series regulated-DC power supply and a PIA series (PIA3200 or PIA4810/4820) power supply controller. Before reading this Manual, be sure to read the Operation Manuals for both the associated the PAN/PAN-A Series and the PIA series.

Overview of the Product

The TU02-PIA terminal unit is connected between a Kikusui PAN/PAN-A Series regulated-DC power supply and a PIA series power supply controller, which adds to the power supply various features including GPIB control and sequence operations

NOTE

- The TU02-PIA is exclusive to PAN/PAN-A Series regulated-DC power supplies. (However, it can not be used for PAN600-2A.) For connection to other Kikusui regulated-DC power supplies, use TU01-PIAs.
- To use a TU02-PIA connected to a PAN/PAN-A Series power supply, the PIA3200 must have ROM version 1.20 or higher.
- Functions of a DC power supply unit which PIA series can control vary with the type of DC power supply unit. See the following operation manual

Using PIA3200

PIA3200 operation manual Chapter2 table2-1

"PIA3200 Functions by connected Equipments"

Using PIA4810/4820

PIA4800 series operation manual Chapter2 table2-1

"Control Parameters for OP01-PIA"

Features

1. When connected to the remote control terminal at the rear of a PAN/PAN-A Series regulated-DC power supply, the TU02-PIA allows the power supply to be easily systematized.
2. Connection to a PIA series requires only a flat cable, thereby allowing the TU02-PIA to be easily connected or disconnected.
3. The TU02-PIA has a built-in circuit that generates the model ID of the PAN/PAN-A Series power supply. Once this ID is set after installation of the TU02-PIA, the PIA3200 is able to read the model ID automatically.
(For PIA4810/4820, you do not need to set the ID by using TU02-PIA, because it is set with the software is attached to the controller.)
4. When the SH Series shunt unit (optional) is used, read-back monitoring of highly accurate output currents can be obtained.

Control Contents

In a full system featuring a PAN/PAN-A Series power supply used in combination with the TU02-PIA, PIA series, and SH Series shunt unit, the following items can be controlled:

- Setting of output voltage
- Setting of output current
- Read-back of output voltage
- Read-back of output current
- Setting of undervoltage/overvoltage protection *1
- Output ON/OFF
- Switching between remote/local control *2
- Monitoring of power status *3
- Monitoring of CV mode *3
- Monitoring of CC mode *3

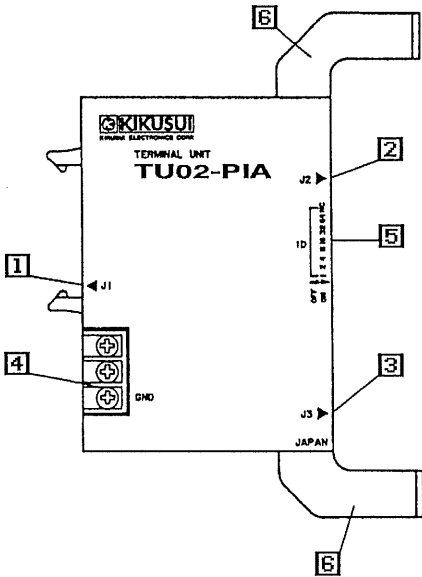
NOTE

*1 PIA4810/4820 can not set it.

*2 With the TU02-PIA, you can switch between local/remote control using a command. However, the PAN/PAN-A Series power supply requires manual switching.

*3 This requires an optional modification which we perform. Specifically, a 6-pin DIN connector is added to the rear panel of a PAN/PAN-A Series power supply. For more information, contact Kikusui distributor/agent.

Appearance (Part Names and Functions)



- | | |
|-------------|--|
| 1 J1 | Connector for the PIA series |
| 2 J2 | Connector for the PAN/PAN-A Series |
| 3 J3 | Connector for the PAN/PAN-A Series |
| 4 GND | Grounding terminal |
| 5 ID switch | DIP switches for setting model ID |
| 6 Stays | Fittings for installing the unit on a PAN/PAN-A Series power supply. (These are not attached to the case before the unit is shipped from the factory.) |

1.1 Checks upon Unpacking

The unit should be checked upon receipt for damage that might have occurred during transportation. Also, check that all accessories have been provided.

Should the unit be damaged or any accessory missing, notify your Kikusui agent.

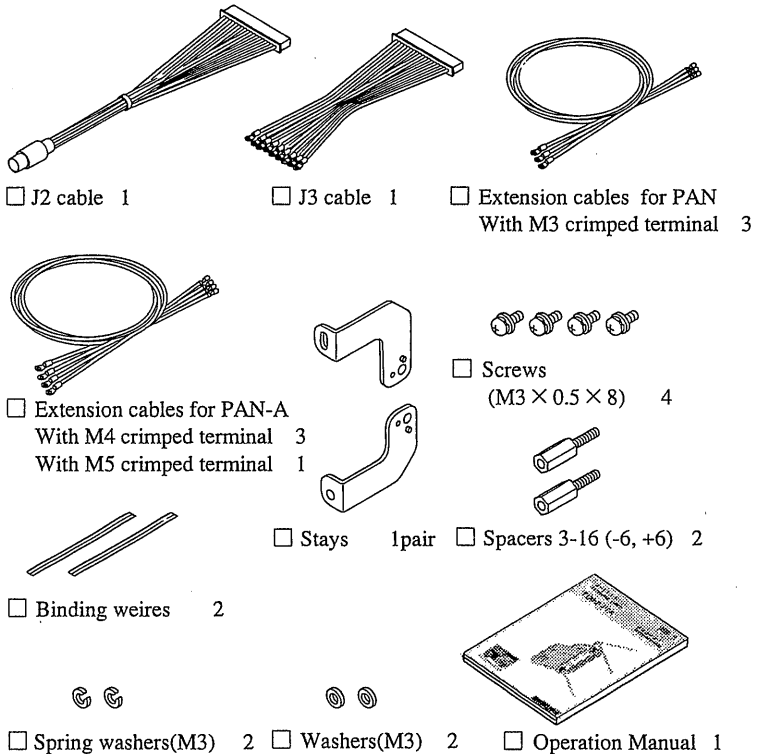


Fig. 1-1 List of Accessories

1.2 Precautions in Moving

When the TU02-PIA is installed on a PAN/PAN-A Series power supply, it projects from the rear panel of the power supply. When moving a power supply with a TU02-PIA unit installed, take care so that it does not interfere with any surrounding items. Also refer to Section 1.2, "Precautions for Moving" in the Operation Manual for PAN/PAN-A Series Regulated-DC Power Supply.

CAUTION

- When you move a PAN/PAN-A Series power supply with a TU02-PIA unit installed, remove the flat cable from the unit's J1 connector.
- When transporting a PAN/PAN-A Series power supply, always first remove the TU02-PIA from the power supply.

1.3 Setting a Model ID

Model ID setting is necessary to use PIA3200. For PIA4810/4820 user, see a PIA4810/4820 operation manual 3.4 "Configuration soft".

Use of the TU02-PIA requires that the model ID of the PAN/PAN-A Series power supply to which the unit is to be connected be set into the unit.

By referring to Table 1-1, set the model ID of the PAN/PAN-A Series power supply using the ID switch on the unit. The model ID will be read when the PIA3200's power is turned on.

Table 1-1 List of PAN/PAN-A Series Model IDs

Model ID	PAN Series PAN-A Series model	ID switches								Pin number of J3 connector to be used	Remarks IDhex
		↓ : ON, ↑ : OFF									
		1	2	3	4	5	6	7	8		
094	PAN16-10(A)	↑	↓	↓	↓	↓	↓	↑	↓	7pin (20V)	5E
095	PAN16-18(A)	↓	↓	↓	↓	↓	↓	↓	↑	7pin (20V)	5F
096	PAN16-30(A)	↑	↑	↑	↑	↑	↓	↓	↑	7pin (20V)	60
097	PAN16-50(A)	↓	↑	↑	↑	↑	↓	↓	↑	7pin (20V)	61
098	PAN35-5(A)	↑	↓	↑	↑	↑	↓	↓	↑	8pin (100V)	62
099	PAN35-10(A)	↓	↓	↑	↑	↑	↓	↓	↑	8pin (100V)	63
100	PAN35-20(A)	↑	↑	↓	↑	↑	↓	↓	↑	8pin (100V)	64
101	PAN35-30(A)	↓	↑	↓	↑	↑	↓	↓	↑	8pin (100V)	65
102	PAN55-3(A)	↑	↓	↓	↑	↑	↓	↓	↑	8pin (100V)	66
103	PAN55-6(A)	↓	↓	↓	↑	↑	↓	↓	↑	8pin (100V)	67
104	PAN55-10(A)	↑	↑	↑	↓	↑	↓	↓	↑	8pin (100V)	68
105	PAN55-20(A)	↓	↑	↑	↓	↑	↓	↓	↑	8pin (100V)	69
106	PAN70-2.5(A)	↑	↓	↑	↓	↑	↓	↓	↑	8pin (100V)	6A
107	PAN70-5(A)	↓	↓	↑	↓	↑	↓	↓	↑	8pin (100V)	6B
108	PAN70-8(A)	↑	↑	↓	↓	↑	↓	↓	↑	8pin (100V)	6C
109	PAN70-15(A)	↓	↑	↓	↓	↑	↓	↓	↑	8pin (100V)	6D
110	PAN110-1.5(A)	↑	↓	↓	↓	↑	↓	↓	↑	10pin (500V)	6E
111	PAN110-3(A)	↓	↓	↓	↓	↑	↓	↓	↑	10pin (500V)	6F
112	PAN110-5(A)	↑	↑	↑	↑	↓	↓	↓	↑	10pin (500V)	70
113	PAN110-10(A)	↓	↑	↑	↑	↓	↓	↓	↑	10pin (500V)	71
114	PAN160-1(A)	↑	↓	↑	↑	↓	↓	↓	↑	10pin (500V)	72
115	PAN160-2(A)	↓	↓	↑	↑	↓	↓	↓	↑	10pin (500V)	73
116	PAN160-3.5(A)	↑	↑	↓	↑	↓	↓	↓	↑	10pin (500V)	74
117	PAN160-7(A)	↓	↑	↓	↑	↓	↓	↓	↑	10pin (500V)	75
118	PAN250-2.5(A)	↑	↓	↓	↑	↓	↓	↓	↑	10pin (500V)	76
119	PAN250-4.5(A)	↓	↓	↓	↑	↓	↓	↓	↑	10pin (500V)	77

Note: When a model ID checking command (ID? for PIA3200 or NODE? for PIA4810/4820) is sent for PAN-A series, PIA series returns the ID and model of PAN series.

TU02-PIA can not be used for PAN600-2A.

1.4 Connecting to a PAN/PAN-A Series Power Supply

There are two cables: the J3 and J2 cables. If you do not use any of the following features, the J2 cable does not need to be connected.

- Monitoring of power status, CV mode, or CC mode

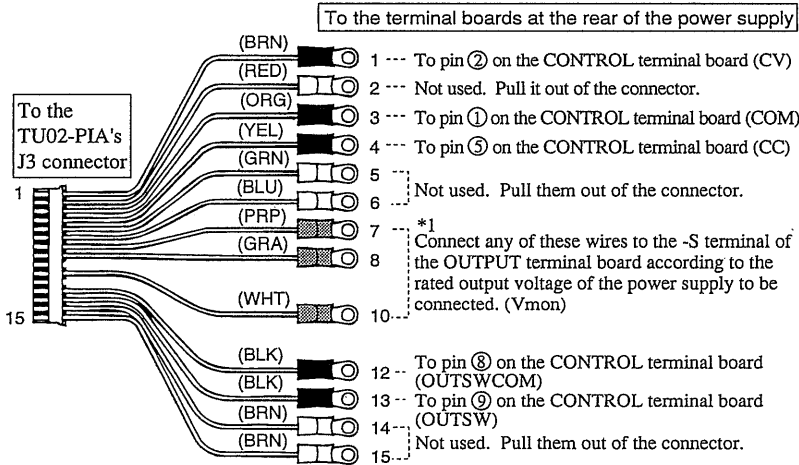
1.4.1 J3 Cable

Connect the J3 cable supplied with the TU02-PIA to the CONTROL and OUTPUT terminal boards at the rear of the PAN/PAN-A Series power supply.

J3 cable connection procedure:

- ① First, check the model number of the PAN/PAN-A Series power supply to be connected. The connection procedure for the J3 cable differs depending on the rated output voltage of the power supply. For PAN Series user, See Fig. 1-2. For PAN-A Series user, see Fig. 1-3.

For PAN Series



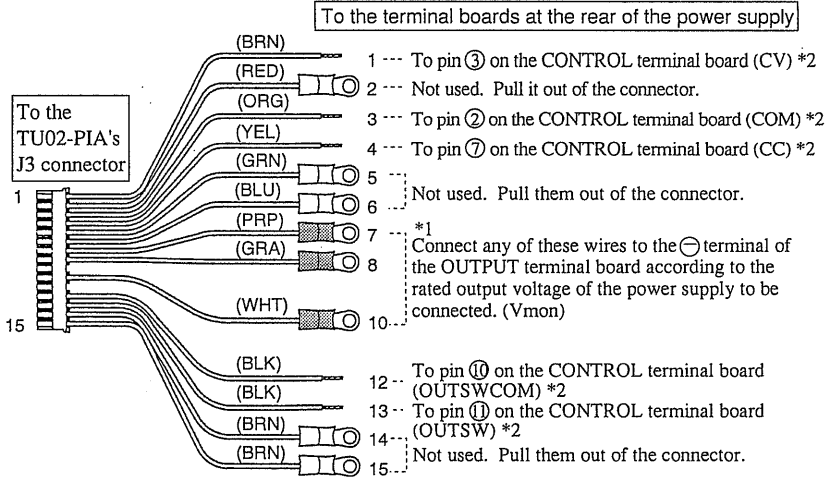
*1 J3 connector pin No.	Rated output voltage of the power supply to be connected
-------------------------	--

7 pin	16V
8 pin	35V, 55V, 70V
10 pin	110V, 160V, 250V

When the J3 connector connect to a PAN Series 1000W model, replace 7, 8 or 10 pin with an extension cable (with M3 crimped terminal) for PAN provided with the TU02-PIA.

Fig. 1-2 J3 Cable (PAN Series)

For PAN-A Series



*1 J3 connector pin No.	Rated output voltage of the power supply to be connected
7 pin	16V
8 pin	35V, 55V, 70V
10 pin	110V, 160V, 250V

TU02-PIA can not be used for PAN600-2A.

Replace 7, 8 or 10 pin with an extension cable for PAN-A provided with the TU02-PIA. Use the cable with M5 crimped terminal for PAN16-50A, or the cable with M4 crimped terminal for the other models of PAN-A Series.

- *2 Cut the crimped terminal from the wire and remove the covering of the wire according to chapter 3 Applied Operation "3.1 CONTROL terminal board" in the operation manual for PAN-A Series.

Fig. 1-3 J3 Cable (PAN-A Series)

- ② Pull any unnecessary wires out of the J3 cable connector. For information on how to pull out these wires, see Fig. 1-4.

CAUTION

- The J3 cable is also supplied with terminal units other than the TU02-PIA, and includes wires not used for connection to the PAN/PAN-A Series power supply. For safety, pull out these unnecessary wires (pins 2, 5, 6, 14, and 15, and two pins out of pins 7, 8, and 10) from the J3 cable connector.

NOTE

- If the TU02-PIA is also expected to be connected to another PAN/PAN-A Series power supply with a different rated output voltage, save the two unnecessary wires out of pins 7, 8, and 10.

■ Connection to a PAN Series 1000W model

-S terminal of the PAN Series 1000W model is on the SENSING terminal board. Thus, the J3 cable provided as part of the factory shipment of the TU02-PIA is too short for this connection. Replace it with an extension cable (with M3 crimped terminal) provided with the TU02-PIA, after first taking note of the rated output voltage of the 1000W model to be connected.

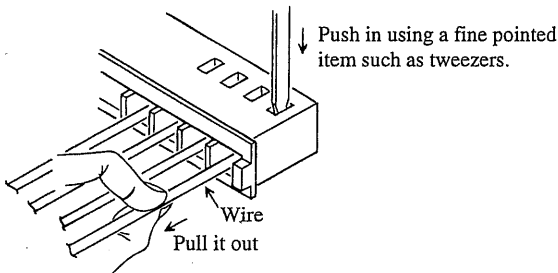


Fig. 1-4 Pulling a Wire out of a J3 Cable

■ Connection to a PAN-A Series

The diameter of screws on the OUTPUT terminal of PAN-A Series is different from that of PAN Series. Thus, the J3 cable provided as part of the factory shipment of the TU02-PIA does not apply to the ⊖OUTPUT terminal of PAN-A Series.

Replace it with an extension cable for PAN-A provided with the TU02-PIA. Use the cable with M5 crimped terminal for PAN16-50A, or the cable with M4 crimped terminal for the other models of PAN-A Series.

- ③ Connect the J3 cable to the PAN series power supply in accordance with Fig. 1-2 or the PAN-A Series power supply in accordance with Fig. 1-3.

CAUTION

- Always replace the terminal cover of the PAN Series power supply after removing it to connect the cable.

NOTE

- Do not yet connect the TU02-PIA-side connector of the J3 cable. This connector may be connected only after mechanically installing the TU02-PIA onto the power supply.

1.4.2 J2 Cable

Connect the J2 cable supplied with the TU02-PIA to the DIN connector at the rear panel of the PAN/PAN-A Series power supply.

NOTE

- Do not yet connect the TU02-PIA-side connector of the J2 connector. This connector may be connected only after mechanically installing the TU02-PIA onto the power supply.

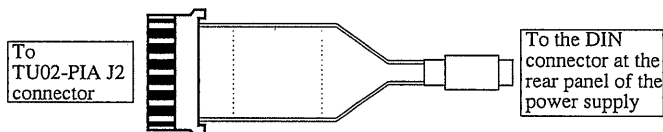


Fig. 1-5 J2 Cable

1.5 Installing onto the PAN/PAN-A Series Power Supply

CAUTION

- To use the TU02-PIA, install it mechanically onto the PAN/PAN-A Series power supply in accordance with the following procedure. Never attempt to use a unit that has been connected only electrically.

Installation procedure:

- ① Install the stays as shown in Fig. 1-7.

CAUTION

- For safety, use the mounting screws provided with the unit. Other screws may interfere with its internal parts.

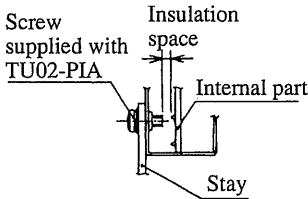


Fig. 1-6

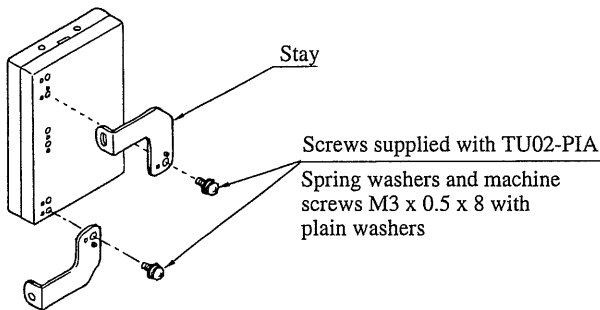


Fig. 1-7

- ② Remove screws from the upper and lower parts of the CONTROL terminal board as shown in Fig. 1-8.

CAUTION

- Save the removed screws. They are required if the TU02-PIA is removed from the PAN/PAN-A Series power supply. If they are not re-installed, the CONTROL terminal board will not be fixed to the rear panel.

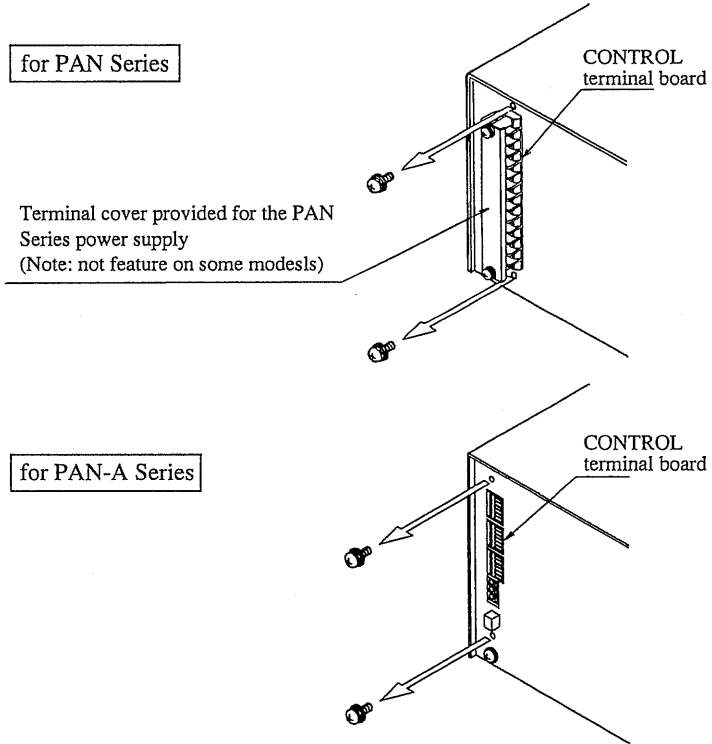


Fig. 1-8

- ③ Install the TU02-PIA on the power supply as shown in Fig. 1-9.

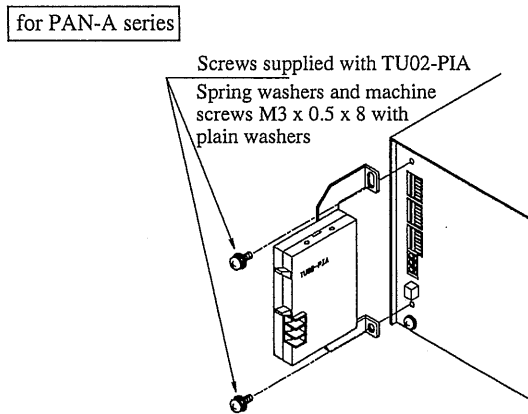
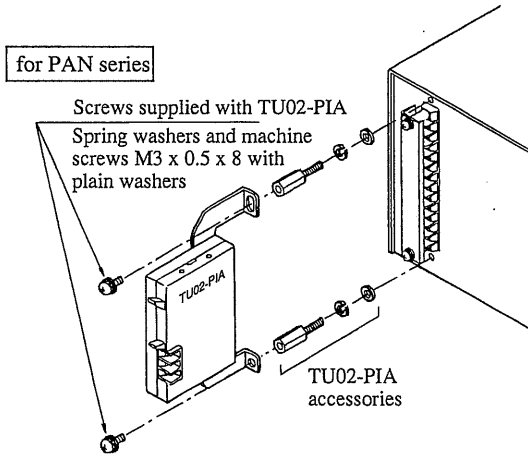


Fig. 1-9

1.6 Completing Connections

After mechanically installing the TU02-PIA on the PAN/PAN-A Series power supply, connect the J2 and J3 connectors to the unit and bind the cables using the binding wires supplied with the unit. This completes the connection of the TU02-PIA to the power supply. Next, connect the unit to a PIA series. For information on how to perform this connection, see the following operation manual.

Using PIA3200

PIA3200 operation manual(supplement) 2.1,

"Connecting to a PAN/PAN-A Series DC Power Supply"

Using PIA4810/4820

PIA4800 series operation manual 2.6,

"Connecting to a PAN/PAN-A Series DC Power Supply"

Chapter 2 Preparation Before Use

2.1 Setting to Remote/Local Mode

To actually control the PAN/PAN-A Series power supply using the PIA series, the TU02-PIA must be set to remote mode. If the power supply is used independently, the unit must be set to local mode. This section describes how to set the unit to remote or local mode.

Procedure for setting to remote mode:

- ① Turn OFF the POWER and OUTPUT switches of the PAN/PAN-A Series power supply.
- ② Set the S1 and S3 control switches of the power supply to their upper positions (ON). (See sections 3.2.2 and 3.2.4 in the Operation Manual for the PAN Series DC Power Supply or see sections 3.3.2 and 3.3.4 in the Operation Manual for the PAN-A Series DC Power Supply.)

CAUTION

- Before switching the control switches upward or downward, turn OFF the POWER switch of the PAN/PAN-A Series power supply.
- ③ Turn the VOLTAGE and CURRENT controls of the power supply fully clockwise.
 - ④ Turn ON the POWER switches of all connected equipment.
 - ⑤ Turn ON the OUTPUT switch of the power supply.
 - ⑥ Send the REM 1 command to the PIA series. This will set the TU02-PIA to remote mode. The REM 1 command sets the TU02-PIA to remote mode, and the REM 0 command sets it to local mode. See the following operation manual.

Using PIA3200

PIA3200 operation manual 6-4-2,

Using PIA4810/4820

PIA4800 series operation manual 4.3 "REM".

This completes the setting of the TU02-PIA and PAN/PAN-A Series power supply to remote mode. By sending a desired command to the PIA3200, you can now control the power supply.

WARNING

- If the REM 0 command is sent to the PIA series while the output of the PAN/PAN-A Series power supply is set using the VSET and ISET commands, the set values are output even when output is OFF. In such cases, there may be an unexpected output, causing the risk of an electrical shock or load breakage. Thus, before sending the REM 0 command to the instrument, always turn OFF the OUTPUT switch of the power supply.

NOTE

- During remote operation, the OUTPUT switch on the front panel has precedence governing the ON/OFF output status of the power supply. Use the system with the power supply's OUTPUT switch turned ON.

Procedure for setting to local mode:

WARNING

- When used in remote mode, the VOLTAGE and CURRENT controls of the PAN/PAN-A Series power supply is usually in a fully clockwise position. Thus, the control switches must be switched to local mode in the proper way. Otherwise, maximum output may be generated, causing an electrical shock or load breakage. Always follow the procedure below.
- ① Turn OFF the OUTPUT switch of the PAN/PAN-A Series power supply.
 - ② Send the REM 0 command to the PIA series. This will set the TU02-PIA to local mode.
 - ③ Turn OFF the POWER switch of the power supply.
 - ④ Set the S1 and S3 control switches of the power supply to their down position (OFF). (See sections 3.2.2 and 3.2.4 in the Operation Manual for the PAN Series DC Power Supply or see sections 3.3.2 and 3.3.4 in the Operation Manual for the PAN-A Series DC Power Supply.)

CAUTION

- Before switching the control switches upward or downward, turn OFF the POWER switch of the PAN/PAN-A Series power supply.

This completes the setting of the TU02-PIA and PAN/PAN-A Series power supply to local mode.

WARNING

- Under this arrangement, the VOLTAGE and CURRENT controls of the power supply is in a fully clockwise position. Thus, turn ON the POWER switch of the power supply, press the LIMIT switch to set the desired voltage or current, and then turn ON the OUTPUT switch.

2.2 Checking Operations

In remote mode, you can send the following commands to check overall system operations.

Command	Read-back command	Contents of check
	ID? *1	The ID of the connected model must be read back.
OUT 1		Output must be turned ON.
	STS?	Output ON must be read back.
VSET xxx		Output voltage must be controlled.
ISET xxx		Output current must be controlled.
	VOUT?	Output voltage must be read back.
OUT 0		Output must be turned OFF.
	STS?	Output OFF must be read back.

- *1 For PIA4810/4820, check the ID code to send the NODE? command.

WARNING

- If the REM 0 command is sent to the PIA3200 while the output of the PAN/PAN-A Series power supply is set using the VSET and ISET commands, the set values are output even when output is OFF. In such cases, there may be an unexpected output, causing the risk of an electrical shock or load breakage. Thus, before sending the REM 0 command to the instrument, always turn OFF the OUTPUT switch of the power supply.

NOTE

- If a new model ID is set, the values of VSET, ISET, and VOUT? will not yet have been calibrated. Approximate values will thus be output. To output accurate values, you need to calibrate the PIA series.

2.3 Calibration

The items from "ITEM1" to "ITEM4" must be calibrated.

For information on calibration procedures, see the following operation manual.

Using PIA3200

PIA3200 operation manual Chapter 4,
"Calibration in Local Mode"

Using PIA4810/4820

PIA4800 series operation manual 3.7,
"Calibration by Device Configuration"

3.1 Functions

1. Automatic readout of a regulated-DC power supply ID *1
2. PAN/PAN-A Series power supply output allowance control using the REM command
3. Output voltage control using the VSET command
4. Output current control using the ISET command
5. Overvoltage protection using the OVSET command *1
6. Undervoltage protection using the UVSET command *1
7. Voltage monitoring read-back using the VOUT? read back command
8. Output ON/OFF control using the OUT command
9. Output ON/OFF status checking using the STS? read-back command *2

*1 These functions are available by using PIA3200.

*2 The CV, CC, and POW statuses of the STS? read-back command are valid only in PAN/PAN-A Series power supplies that have been modified to cope with a full system configuration.

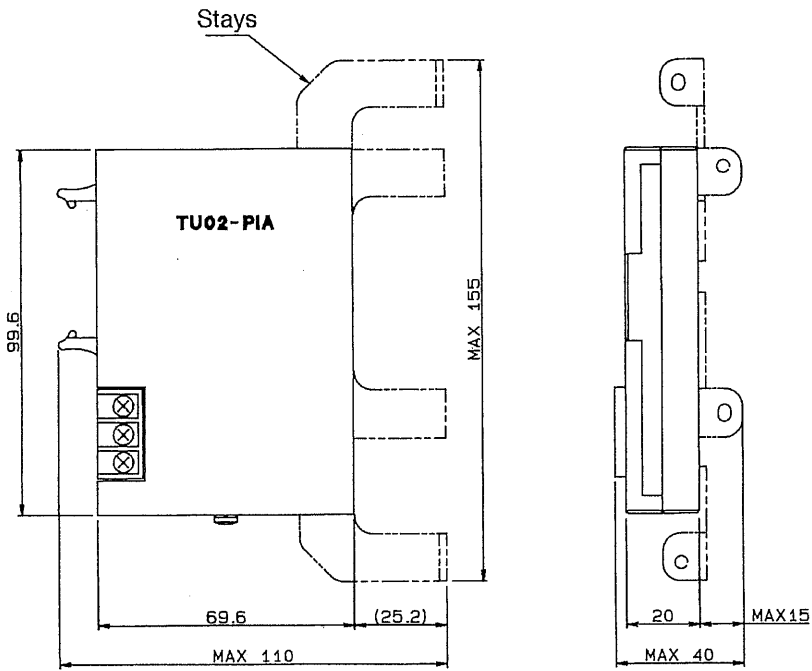
3.2 General Specifications

Operating environment	Operating temperature	0 to 40°C
	Humidity	10 to 90% R.H (no condensation)
Insulation and withstand voltage	500 V DC, 30 M ohm or more (between the case and each signal wire, and between the relay contact and each signal wire)	
Weight	Approx. 250 g (not including cables)	
External dimensions	See the Outline Drawing.	

3.3 Accessories

	Item	Qty		Item	Qty
1	J2 cable	1	7	Screws (M3 x 0.5 x 8)	4
2	J3 cable	1	8	Spacer 3-16 (-6, +6)	2
3	Extension cables for PAN	3	9	Spring washers (M3)	2
4	Extension cables for PAN-A	4	10	Washers (M3)	2
5	Binding wires	2	11	Operation Manual	1
6	Stay	One pair			

3.4 Outline Drawing



Unit: mm

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