Part No. Z1-002-392, IB002832
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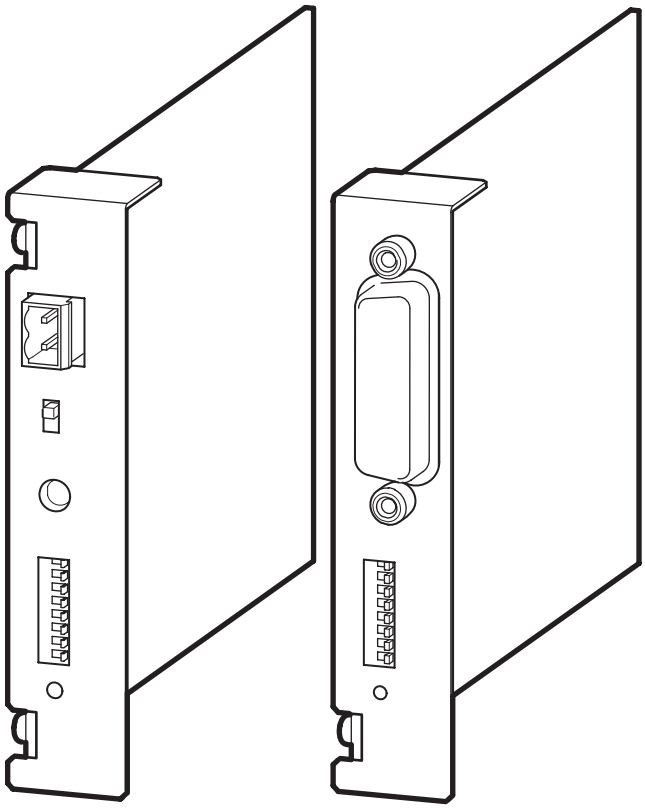
OPERATION MANUAL

PAM Series 2kW/4kW Model

GPIB Interface
TP-BUS Interface
Option



KIKUSUI

Use of Operation Manual

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

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

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.

⚠ Safety Symbols

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

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

Contents

Preface

About This Manual

This is the operation manual for the GPIB and TP-BUS interface options of the PAM Series, in which the operation of GPIB and TP-BUS interface options is described.

To use the GPIB and TP-BUS interface option function, first read the operation manual for the PAM Series (the main unit) to ensure that you fully understand the operation of, and all necessary information relating to, the unit. Then you may proceed to reading this manual.

In this manual, a PAM Series model equipped with a GPIB or TP-BUS interface option is called “the unit.”

Outline of Product

GPIB interface option

The GPIB interface option is a factory-installed option that adds a function to the PAM Series allowing for remote control by a personal computer connected via GPIB.

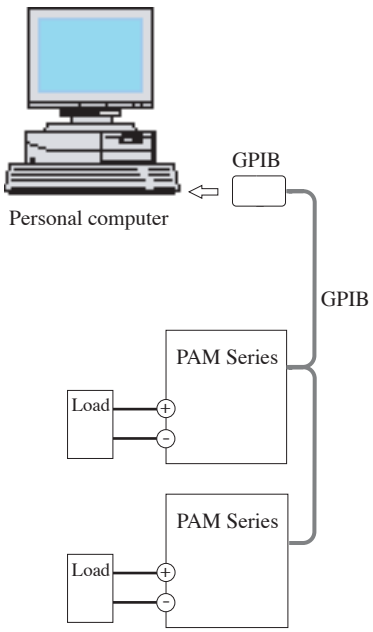


Fig.P-1 An example of a system using the GPIB interface option

TP-BUS interface option

The TP-BUS interface option is a factory-installed option that enables connection (via TP-BUS) of the PAM Series to Kikusui's PIA4830 or PIA4810 power-supply controllers. The PAM Series is remote-controlled by a personal computer via the power-supply controller, connected with a GPIB or RS-232C cable.

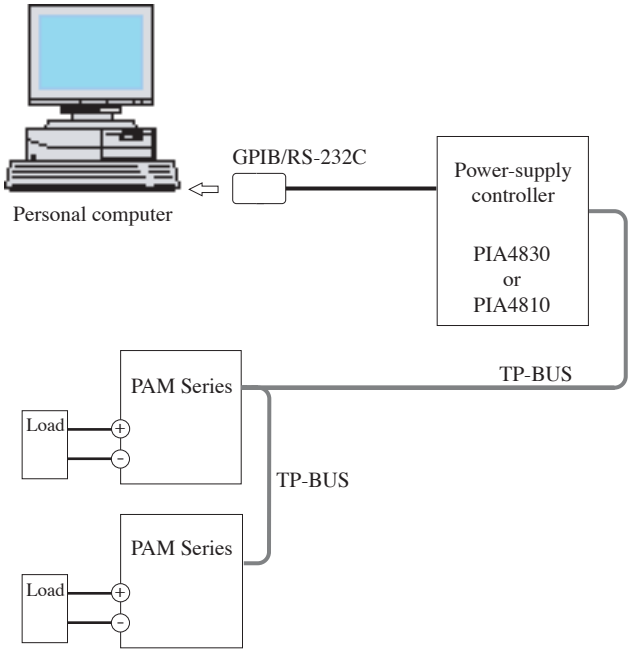


Fig. P-2 An example of a system using the TP-BUS interface option

NOTE

- Before using this system, read the operation manual for the power-supply controller.
- To permit the power-supply controller to control the TP-BUS interface option, the ROM version of the power supply controller must be "2.1" or later.

  The ROM version can be checked using the "*IDN?" message.

Chapter 1 Preparation for Control

This chapter explains the arrangements to be made for initiating GPIB and TP-BUS control.

1.1 Preparation for GPIB control

The electrical and mechanical specifications for the GPIB interface of the unit conform to IEEE standard 488.1-1987.

1.1.1 Connecting the GPIB cable

1. Turn OFF the POWER switches of all devices comprising the GPIB system, including the unit.
2. Connect the GPIB cable to the 24-pin GPIB connector on the rear panel of the unit.

1.1.2 Setting the GPIB address

The GPIB address is factory-set to "1." To change it, take the following steps:

1. Turn OFF the POWER switch.
2. On the DIP switch (ADDRESS) on the rear panel of the unit, set the GPIB address of the unit.

   To set an address, combine DIP switches as follows.

   The sum of all figures of the switches turned ON (onto the left) constitutes an address. When all switches are OFF, the address is "0."

   For example, if you want to set the address to "6," turn ON switches 4 and 2 (6 = 4 + 2). See Fig. 1-1.
3. Turn ON the POWER switch.

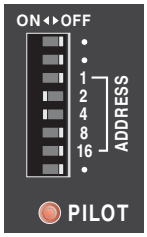


Fig.1-1 Setting the GPIB address to "6"

1.2 Preparation for TP-BUS control

1.2.1 Connecting TP-BUS cables

Using a TP-BUS cable, connect the unit to the power-supply controller. Up to 31 devices can be connected to the TP-BUS cable. For TP-BUS cable, connect the twisted-pair cable to the provided TP-BUS connector (plug) by bus connection. See Fig. 1-2.

■ Cables and tools necessary for connection

1. Cable

   Twisted wire: 0.32 mm^2 (AWG22)

2. Flat-head screwdriver

   Shank diameter: ϕ 3

   Tip width: 2.6 mm

3. Wire stripper

   Wire stripper which is appropriate for the cable mentioned above

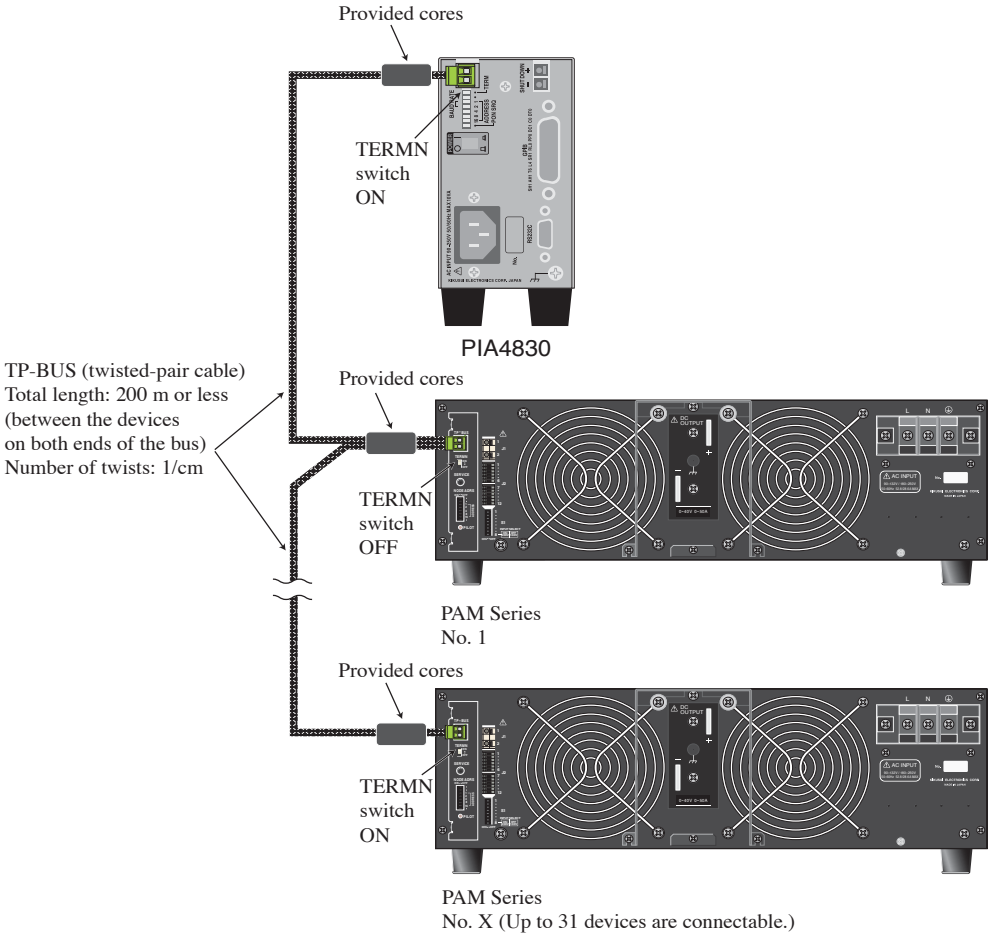


Fig. 1-2 Connecting the TP-BUS cable

Connection procedure

■ Wiring to TP-BUS connectors

1. Turn OFF the POWER switches of all devices to be connected.
2. Insert the provided TP-BUS connector (plug) to the TP-BUS connector on the rear panel. See Fig. 1-3 (a).

   Securely fix the connector, to facilitate further connection work.
3. With the wire stripper, remove 7 mm of insulation from the cable.
4. As shown in Fig. 1-3 (b) and (c), insert the cable in the connector.

   The TP-BUS cable is non-polarized. You do not have to take the polarity of devices into consideration.
5. With the screwdriver, turn the connector screw to secure the cable.
6. Check that the cable is securely connected.

⚠CAUTION
- Check that the cable is not short-circuited.
- Check that the live part of the cable is kept off the chassis. Contact with the chassis can cause damage to the unit and to other connected devices.

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7. Make the connections to other connectors in the same way.

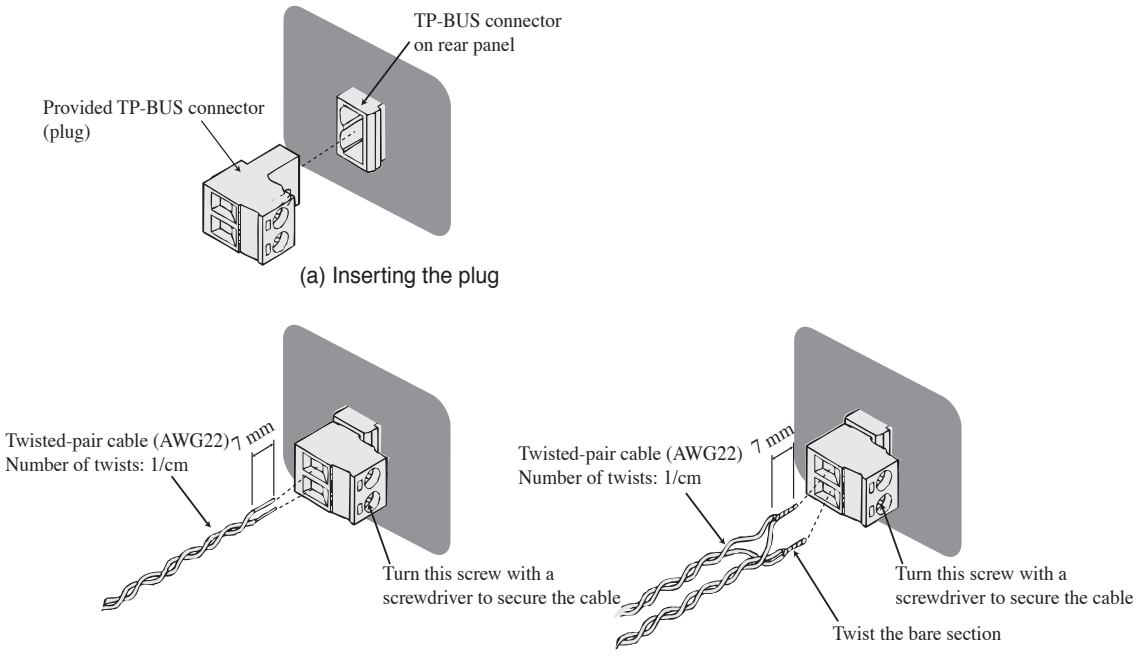

Fig. 1-3 Connecting to TP-BUS connectors

Connecting TP-BUS cables (cont'd)

■ Installing TP-BUS cores

1. As shown in Fig. 1-4 (a), unlock the core to open it.
2. Wind the twisted-pair cable once around one half of the core.
   Keep the distance between the core and the connector within 30 mm. See Fig. 1-4 (b).
3. Close the core. Check that the cable is fully within the core. See Fig. 1-4 (c).
4. Check that the core is securely locked.
5. Install the other cores in the same way.

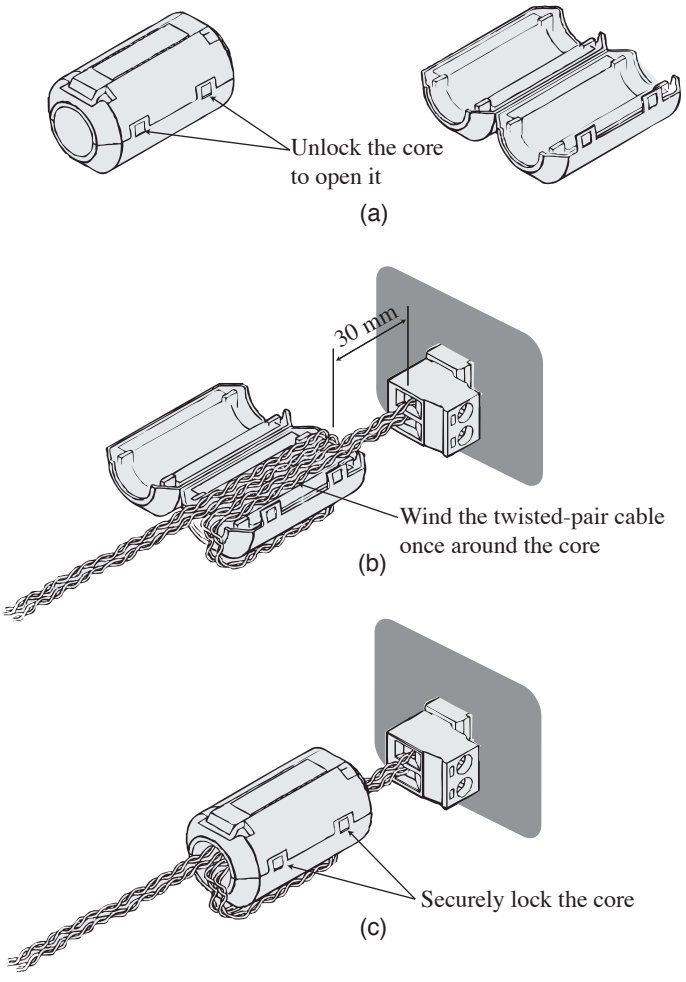

Fig. 1-4 Installing a TP-BUS core

■ Setting the TERMN switch

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

In Fig. 1-2, for example, set the TERMN switches of the PIA4830 and the PAM Series on one end of the bus to ON, and the TERMN switches of other PAM Series systems to OFF.

⚠CAUTION • Incorrect settings of the TERMN switches can cause inconsistent communication, leading to malfunctions.

1.2.2 Setting the node address

To enable the power-supply controller to identify devices connected on TP-BUS, you need to set a node address for each such device on the TP-BUS.

The node address is factory-set to "1." To change it, take the following steps:

1. Turn OFF the POWER switch.
2. With the DIP switch (NODE ADRS) of the rear panel of the unit, set the node address for the unit.

   Do not use the same addresses for different devices inside the same system.

   To set an address, combine DIP switches as follows.

   The sum of all figures of the switches turned ON (onto the left) constitutes an address. When all switches are OFF, the address is "0."

   For example, if you want to set the address to "6," turn ON switches 4 and 2 (6 = 4 + 2). See Fig. 1-5.
3. Turn ON the POWER switch.

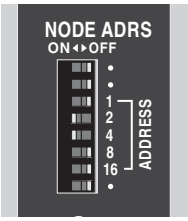

Fig. 1-5 Setting the node address to "6"

NOTE • The node address of the unit is factory-set to "1." An error occurs if two or more PAM Series systems are connected on the TP-BUS with the preset values unchanged, thus preventing the power-supply controller from controlling the PAM Series units.

Chapter 2 GPIB/TP-BUS Control

This chapter explains the messages exchanged between the controller and the unit and the registers used for the exchange.

2.1 Messages and terminators

The communication between the controller and devices is explained in terms of the names and contents in this manual. See Fig. 2-1.

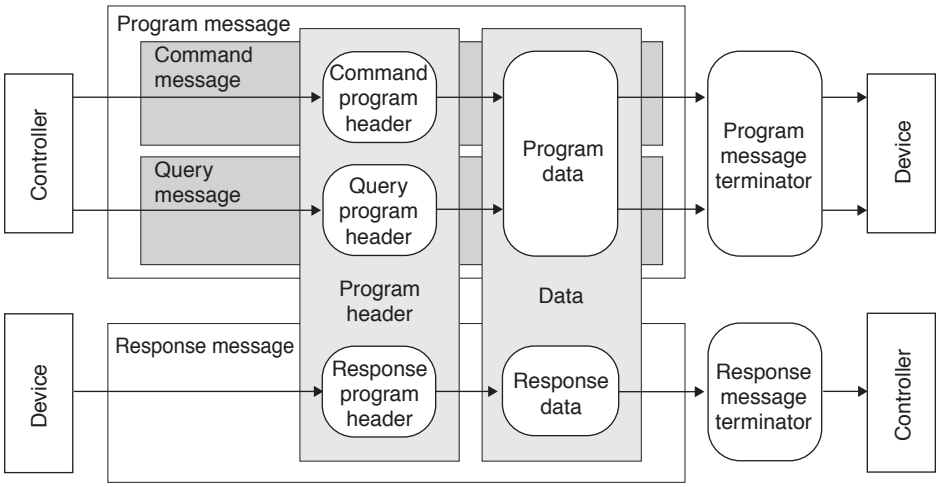

Fig.2-1 Messages and terminators

Messages

Data sent from the controller to a device are called program messages. Data sent from a device to the controller are called response messages.

Each message is composed of a program header and a data section.

■ Program messages

Program messages are categorized into command messages and query messages.

A command message is used to execute specified device functions and to alter settings.

A query message is used to inquire about the settings and the status of a device.

Messages and terminators (cont'd)

■ Describing a program message

- Allow a space (ASCII: 20 h) between the program header and the data section.

Fig. 2-2 Composition of a program message

- When there are two or more program data, they can be connected using "," (ASCII: 2C h).

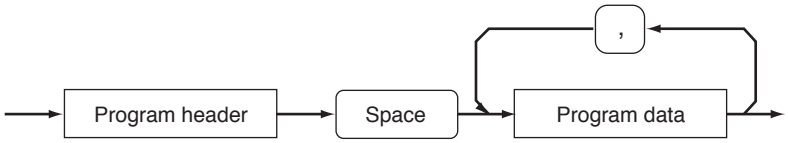

Fig. 2-3 Connection of program data

- Program messages can be connected using ";" (ASCII: 3B h).

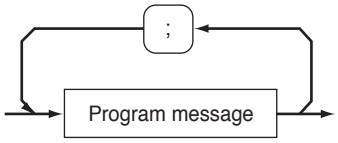

Fig. 2-4 Connection of program messages

Terminators

The character that ends a program message is called the program message terminator. The character that ends a response message is called the response message terminator.

Program message terminator

As a program message terminator, one of the following can be used. No presetting is necessary.

LF, LF+EOI, EOI, CR+EOI

Response message terminator

"CR+LF+EOI" is set by default. By using a TRM command message, you can alter the terminator to one of the following:

CR+LF+EOI, LF+EOI, EOI, CR+EOI

2.2 Device messages

Program messages and response messages supported by a device are called device messages.

The following explains the individual device messages supported by the unit.

NOTE

- When program data is written in hexadecimals, place "#H" at the head of the program data.

■ Special symbols and characters

Table 2-1 shows the special symbols and characters used in this manual to describe program messages and response messages.

Table2-1 Definition of special symbols and characters

Symbol and character	Description
< >	These parentheses indicate a program datum. When writing a program, do not use these parentheses.
{ }	Choose one of the characters or figures separated by "|" in these parentheses. When writing a program, do not use these parentheses.
_	Signifies a space.

*CLS

Sets each bit of the status byte register, fault register, and error register to "0."

Table2-2

Register	Bit
Status byte register	0
Fault register	0
Error register	0

Program message

- Configuration

  Command message: ・`*CLS`

*IDN?

■ GPIB interface

Inquires about the model name of the PAM Series.

Program message

- Configuration
  Query message: `*IDN?`

Response message

To *IDN?, the model name of the PAM Series is returned as follows:

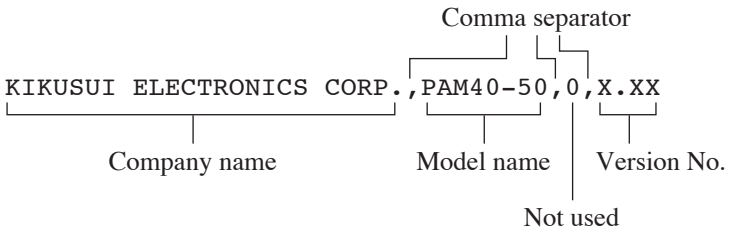

Fig. 2-5

■ TP-BUS interface

Inquires about the model name of the power-supply controller.

Program message

- Configuration
  Query message: `*IDN?`

Response message

To *IDN?, the model name of the power-supply controller is returned as follows:

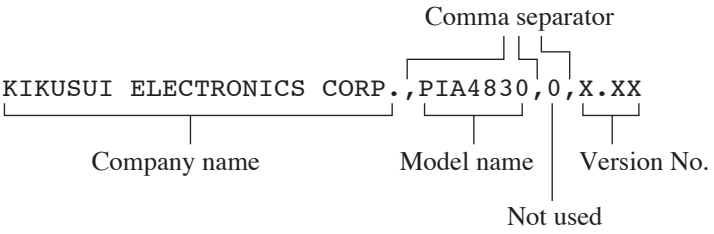

Fig. 2-6

NOTE

- To permit the power-supply controller to control the TP-BUS interface option, the ROM version of the power-supply controller must be “2.1” or later.

*RST

Implements a procedure equivalent to the one taken when DCL or SDC is received in a GPIB bus line message. Also used to implement a procedure equivalent to the one taken when DCL is received from RS-232C.

This command message sets program data in the following messages to the initial value, sets each bit of the following registers to "0," and turns outputs OFF.

NOTE

- RS-232C control works only with the TP-BUS interface using power-supply controller PIA4830 or PIA4810.

Table2-3

Message header	Program data (Initial value)
TRM	0
FUNMASK	0 h
HEAD	0
*SRE	0 h
SILENT *1	1

Register	Bit
Status byte register	0
Fault register	0
Error register	0

*1. Valid only with the TP-BUS interface.

Program message

- Configuration

  Command message: `*RST`

*SRE

Sets or resets each bit of the service request enable register. Also used to inquire about the content of the register.

For details concerning the service request enable register, see “"2.3 Registers"” in this manual.

Program message

- Configuration
  Command message: `*SRE_<value>`
  Query message: `*SRE?`
- Program data
  Data format: hexadecimals or decimals
  Set value: 00 h to FF h
  Resolution: 1 h

(Example) Setting the service request enable register to “01 h”:

```
*SRE #H01
```

Response message

To *SRE?, the content of the service request enable register is returned.

(Example) If the datum is 01 h,
“001” is returned.

*STB?

Inquires about the content of the status byte register.

For details concerning the status byte register, see "2.3 Registers" in this manual.

Program message

- Configuration
  Query message: `*STB?`

Response message

To *STB?, the content of the status byte register is returned.

(Example) When Bit 5 of the status byte register is set,
“032” is returned.

&INI? (only with the GPIB interface)

Inquires about the maximum voltage or current value that can be set on the model.

Program message

- Configuration
  Query message: `*&INI?`

Response message

To &INI?, the maximum voltage or current value that can be set on the model is returned.

(Example) With the PAM40-100,
40.40 or 102.0 is returned.
40.40: Maximum voltage value
102.0: Maximum current value

ERR?

The details of an error are operated upon by the OR function for each bit in the error register. The error register is reset when read with the ERR? message.

The following shows the bit assignment in the error register:

Table2-4 Bit assignment in the error register

Bit		Description
7 to 5	Not used	
4	COMM (Communication)	Indicates a communication error in the internal CPU.
3	EXE (Execution) in the GPIB interface	Indicates that the received data is not currently able to be executed.
	CONN (Connect) in the TP-BUS interface	Indicates that an unrecognized device has been accessed.
2	VAL (Value)	Indicates an error outside the allowable range.
1	ARMT (Argument)	Indicates that the number of program data following the program header is incorrect (Argument error).
0	HEAD (Header)	Indicates a header error.

Program message

- Configuration
  Query message: `ERR?`

Response message

To ERR?, the content of the error register is returned.

(Example) When a message character string is incorrect,
Bit 0 of the error register is set.

FAU?

Inquires about the content of the fault register.

The fault register is used to latch events indicated by the status register. For details concerning the fault register, see "2.3 Registers" in the manual.

Program message

- Configuration
  Query message: `FAU?`

Response message

To FAU?, the content of the fault register is returned.

(Example) When Bit 2 of the fault register is set,
004 is returned.

FUNMASK

Sets or resets each bit of the fault unmask register. Or, inquires about the content of the fault unmask register.

To latch the details of an event occurring in the status register in the fault unmask register, the corresponding bit is set. For details concerning the register, see "2.3 Registers" in this manual.

Program message

- Configuration
  Command message: `FUNMASK_<`*value*`>`
  Query message: `FUNMASK?`
- Program data
  Data format: hexadecimals or decimals
  Set value: 00 h to FF h
  Resolution: 1 h
  Initial value: 0 h

Response message

To FUNMASK?, the content of the fault unmask register is returned.

(Example) If Bit 1 of the fault unmask register is set,
“002” is returned.

HEAD

Specifies whether to attach a header (including a channel header) and a unit data as read-back data. Also inquires about the value specified in the HEAD message.

Program message

- Configuration
  Command message: `HEAD_<{0|1}>`
  Query message: `HEAD?`
- Program data
  Data format: Integers
  Set value: 0: Do not attach header or unit data.
  1: Attach header and unit data.
  Initial value: 0

Response message

To HEAD?, the value set for the HEAD message is returned.

(Example) If the switch of the HEAD message is set to ON,
"1" is returned.

IOUT?

Inquires about the output current value.

Program message

- Configuration
  Query message: `IOUT?`

Response message

To IOUT?, the output current value is returned.

(Example) If the output current is 12.34 A,
"12.34" is returned.

ISET

■ GPIB interface

Sets the output current and inquires about the preset current value.

Program message

- Configuration
  Command message: `ISET_<`*current value*`>`
  Query message: `ISET?`
- Program data
  Data format: Real numbers
  Set value: Minimum value: The minimum value for the connected PAM Series unit
  Maximum value: The maximum value for the connected PAM Series unit
  Resolution: The minimum resolution of the connected PAM Series unit

Response message

To ISET?, the preset current value is returned.

(Example) If the preset current is 12.34 A,
"12.34" is returned.

■ TP-BUS interface

Sets the output current and turns the LOCK switch ON (equivalent to LOCK ON in a LOCK command message).

ISET? is not defined.

Program message

- Configuration
  Command message: `ISET_<`*current value*`>`
- Program data
  Data format: Real numbers
  Set value: Minimum value: The minimum value for the connected PAM Series unit
  Maximum value: The maximum value for the connected PAM Series unit
  Resolution: The minimum resolution of the connected PAM Series unit

LOCK

Enables (LOCK OFF) or disables (LOCK ON) the control of switches and dials on the front panel.

With LOCK ON, the LOCK switch is turned ON. LOCK ON can be released with the LOCK switch on the front panel.

Program message

- Configuration
  Command message: `LOCK_<{0|1}>`
- Program data
  Data format: Integers
  Set value: 0: LOCK OFF
  1: LOCK ON

NOTE
- With the TP-BUS interface, the instant that any device message is sent, LOCK ON is automatically set. Therefore, in effect this message is used only to switch to LOCK OFF.

  With the GPIB interface, LOCK ON is not set unless this message is sent.

NODE (only for the TP-BUS interface)

Designates a node address and turns the LOCK switch ON (equivalent to LOCK ON in a LOCK command message). Also inquires about a node address.

The LOCK switch is turned ON only when this command message is issued for the first time after the power is turned ON. Until the power is turned OFF, the LOCK switch is not turned ON, even if this command message has been issued.

Program message

- Configuration
  Command message: `NODE_<{`*address*`}>`
- Program data
  Data format: Integers
  Set value: 1 to 31
  Initial value: 0

Response message

Returns the designated node address.

⚠CAUTION
- The node address of a connected PAM Series system is written in EEPROM in the power supply controller. When a PAM Series system is replaced with another PAM Series system, or is added to the TP-BUS line, recheck the node address.

OUT

■ GPIB interface

Establishes the ON/OFF settings for the output and inquires about these settings.

Program message

- Configuration
  Command message: `OUT_<{0|1}>`
  Query message: `OUT?`
- Program data
  Data format: Integers
  Set value: 0: Output OFF
  1: Output ON
  Initial value: 0

Response message

To OUT?, the ON/OFF settings for the output are returned.

(Example) If the output is ON,
"0" is returned.

■ TP-BUS interface

Establishes ON/OFF settings for the output and turns the LOCK switch ON (equivalent to LOCK ON in a LOCK command message).

OUT? is not defined.

Program message

- Configuration
  Command message: `OUT_<{0|1}>`
- Program data
  Data format: Integers
  Set value: 0: Output OFF
  1: Output ON
  Initial value: 0

NOTE

- In the PAM Series, the OFF command always has top priority in the ON/OFF settings for OUT. For this reason, to conduct the ON/OFF control of OUT by using the GPIB or TP-BUS interface, the following must be noted:
- The OUTPUT switch on the panel must be set to ON.
- Once OUT OFF is set on the GPIB or TP-BUS interface, the ON/OFF settings for the output cannot be changed, even if the OUTPUT switch is turned ON or OFF on the panel. To enable the OUTPUT switch on the panel, turn OFF the POWER switch and then turn it ON again.

SILENT (only for the TP-BUS interface)

When controlled with RS-232C, SILENT is used to specify whether to return an acknowledge message to a message separated by a response message terminator. It also inquires about the value set, to determine whether to return an acknowledge message.

The acknowledge message returns “OK” or “ERROR.” To receive an acknowledge message, RS-232C must be set to the full duplex transmission mode (*1).

Program message

- Configuration
  Command message: `SILENT_<{0|1}>`
  Query message: `SILENT?`
- Program data
  Data format: Integers
  Set value: 0: An acknowledge message is returned.
  1: An acknowledge message is not returned.
  Initial value: 1

Response message

To SILENT?, the preset value for SILENT messages is returned.

(Example) If an acknowledge message is not set to be returned, “1” is returned.

DESCRIPTION •*1Full duplex transmission: A data communication method that allows two parties to send data in both directions, at all times. For full-duplex settings, see the operation manual for your personal computer.

STS?

Inquires about the content of the status register. Once set, a bit maintains the same status until the cause is removed. For details concerning the status register, see "2.3 Registers" in the manual.

Program message

- Configuration
  Query message: `STS?`

Response message

To STS?, the content of the status register is returned.

(Example) If Bit 3 of the status register is set,
“008” is returned.

TRM

Designates a response message terminator or inquires about it. EOI, which is a GPIB uni-line message, is valid only in GPIB communication.

Program message

- Configuration
  Command message: `TRM_<{0|1|2|3}>`
  Query message: `TRM?`
- Program data
  Data format: Integers
  Set value: 0: CR+LF+EOI
  1: LF+EOI
  2: EOI
  3: CR+EOI
  Initial value: 0

(Example) To set the response message terminator to LF+EOI,
"`TRM 1`" is specified.

Response message

To TRM?, the currently set response message terminator is returned.

(Example) If the response message terminator is set to LF+EOI,
"1" is returned.

VOUT?

Inquires about the output voltage value.

Program message

- Configuration
  Query message: `VOUT?`

Response message

To VOUT?, the output voltage value is returned.

(Example) If the output voltage is 12.34 V,
"12.34" is returned.

VSET

■ GPIB interface

Sets the output voltage and inquires about the preset voltage value.

Program message

- Configuration
  Command message: `VSET_<`*voltage value*`>`
  Query message: `VSET?`
- Program data
  Data format: Real numbers
  Set value: Minimum value: The minimum value for the connected PAM Series unit
  Maximum value: The maximum value for the connected PAM Series unit
  Resolution: The minimum resolution of the connected PAM Series unit
  Initial value: 0.0

Response message

To VSET?, the preset voltage value is returned.

(Example) If the preset voltage is 12.34 V,
"12.34" is returned.

■ TP-BUS interface

Set the output voltage and turns the LOCK switch ON (equivalent to LOCK ON in a LOCK command message).

VSET? is not defined.

Program message

- Configuration
  Command message: `VSET_<`*voltage value*`>`
- Program data
  Data format: Real numbers
  Set value: Minimum value: The minimum value for the connected PAM Series unit
  Maximum value: The maximum value for the connected PAM Series unit
  Resolution: The minimum resolution of the connected PAM Series unit
  Initial value: 0.0

2.3 Registers

The following shows the register structure:

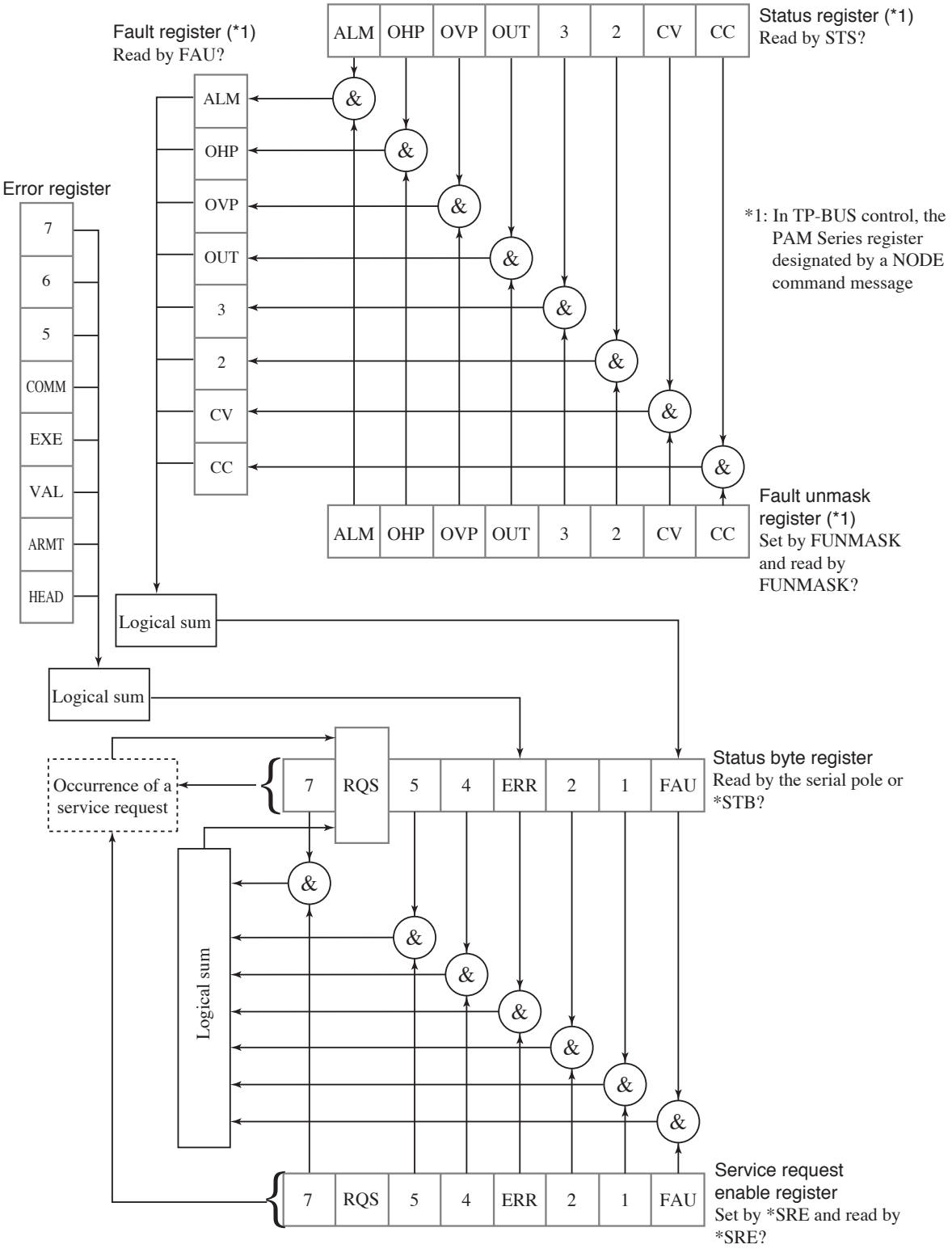

Fig. 2-7 Register structure

Table2-5 Function of register bits

Bit		Description
Status register, Fault register, Fault unmask register		
7	ALM	Indicates that an alarm has occurred (except for OHP and OVP)
6	OHP	Indicates that the overheat protective (OHP) circuit has been activated.
5	OVP	Indicates that the overvoltage protective (OVP) circuit has been activated.
4	OUT	Indicates that outputs are OFF.
3	Not used	
2	Not used	
1	CV	Indicates constant voltage (CV) operation mode.
0	CC	Indicates constant current (CC) operation mode.
Status byte register, Service request enable register		
7	Not used	
6	RQS (Request)	Indicates that a service request has occurred. Read and reset by the serial pole.
5	Not used	
4	Not used	
3	ERR (Error)	Indicates an error.
2	Not used	
1	Not used	
0	FAU (Fault)	Indicates that a bit has been set on the fault unmask register of the connected device.
Error register		
7	Not used	
6	Not used	
5	Not used	
4	COMM (Communication)	Indicates a communication error in the internal CPU.
3	In the GPIB interface, EXE (Execution)	Indicates that the received data are currently unable to be executed.
	In the TP-BUS interface, CONN (Connect)	Indicates that an unrecognized device has been accessed.
2	VAL (Value)	Indicates an error outside the allowable range.
1	ARMT (Argument)	Indicates that the number of program data following the program header is different from the number indicated in the header (Argument error).
0	HEAD (Header)	Indicates a header error.

2.4 Sample program

The following shows a sample program used with GPIB control of the PAM Series in Microsoft's Visual Basic, using a GPIB board that is based on National Instruments' NI-488.2 Specifications.

' After the necessary parameters are set, the measured voltage and current are shown
' only once.

```
Dim ud As Integer

'Opening GPIB devices
'• When using the GPIB interface, specify the GPIB address set on the GPIB
'   interface.
'• When using the TP-BUS interface, specify the PIA4800's GPIB address.
'-----------------------------------------------------
Call ibfind("DEV1", ud)


'Acquiring model information (maker name, model name, and version
'information)
'-----------------------------------------------------
Call ibwrt(ud, "*IDN?")          'Send a model information
                                 'acquisition message.
Dim strModelInfo As String
strModelInfo = Space(128)
Call ibrd(ud, strModelInfo)      'Read the model information and
                                 ''store it as a variable.
MsgBox Left(strModelInfo,
ibcntl)


'Messages are necessary only when the TP-BUS interface is used.
'-----------------------------------------------------
Call ibwrt(ud, "NODE 5")         'Specify a node number.


'Set values for voltage and current, and turn outputs ON.
'-----------------------------------------------------
Call ibwrt(ud, "VSET 5")         'Set the voltage to 5V.
Call ibwrt(ud, "ISET 1")         'Set the current to 1A.
Call ibwrt(ud, "OUT 1")          'Turn outputs ON.
```

```
'Acquiring information on output voltage and output current values
'-----------------------------------------------------
Call ibwrt(ud, "VOUT?")          'Send an output-voltage
                                 'information acquisition message.

Dim strVoltOut As String
strVoltOut = Space(128)
Call ibrd(ud, strVoltOut)        'Read the output-voltage
                                 'information and store it in as a
                                 'variable.

Dim dVoltOut As Double
dVoltOut = Val(strVoltOut)

Call ibwrt(ud, "VOUT?")          'Send an output-current
                                 'information acquisition message.

Dim strCurrOut As String
strCurrOut = Space(128)
Call ibrd(ud, strCurrOut)        'Read the output-current
                                 'information and store it as a
                                 'variable.

Dim CurrOut As Double
dCurrOut = Val(strCurrOut)
```

Chapter 3 Names and Functions of Components

This chapter describes the name and function of each switch, indicator, and connector on the GPIB and TP-BUS interface options.

3.1 GPIB interface option

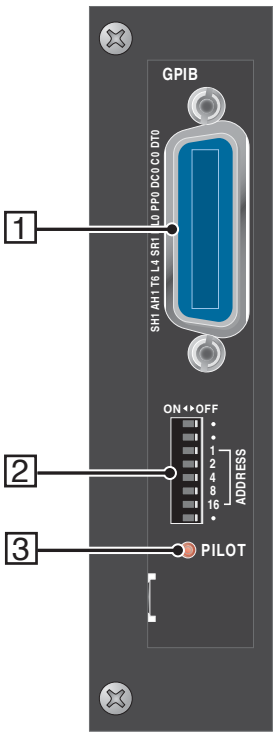

Fig.3-1 GPIB interface option

[1] GPIB

The connector used to install a GPIB cable.

[2] ADDRESS

The switch used to set the GPIB address. For details, see "1.1.2 Setting the GPIB address" in this manual.

[3] PILOT

Lights in the event of a communication error on the bus.

3.2 TP-BUS interface option

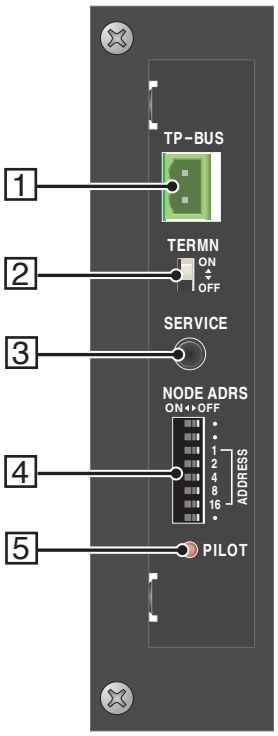

Fig. 3-2 TP-BUS interface option

[1] TP-BUS

The connector used to install a TP-BUS cable.

[2] TERMN

The switch used to turn ON/OFF the termination of the TP-BUS. For details, see "1.2.1 Connecting TP-BUS cables" in this manual.

[3] SERVICE

The switch used for maintenance. You may press this switch during ordinary operation without any problems.

[4] NODE ADRS

The switch used to set the node address. For details, see "1.2.2 Setting the node address" in this manaual.

[5] PILOT

Lights in the event of a communication error on the bus.

Chapter 4 Malfunctions and Causes

This chapter explains problem details and provides countermeasures to correct problems related to malfunctions of GPIB or TP-BUS controls.

In GPIB and TP-BUS control, some problems may be traced to the unit itself. Therefore, the user is advised to also read the operation manual for the main unit "6.4 Malfunctions and Causes".

The following list shows some common problems and check points for them. Some problems may be solved easily.

When you identify your problem from among those on the list, take the corrective action shown. If the problem still remains unresolved, or if it is not shown on the list, please contact Kikusui distributor/agent.

Symptom1: GPIB or TP-BUS is not controllable.

Check point	Cause and corrective action
☐ The PILOT LED is lit.	• There is a communication error inside the device. Reset the power. If the PILOT LED remains lit, contact Kikusui distributor/agent.

Chapter 5 Specifications

This chapter provides the specifications for the options.

GPIB interface option

Code	Interface function
SH1	Full source–handshake functions
AH1	Full acceptor–handshake functions
T6	Talker function (Basic output, serial pole, release of the talker by the specified listener)
L4	Listener function (Basic input, release of the listener by the specified talker)
SR1	Full service request functions
RL0	Remote/local function not provided
PP0	Parallel pole function not provided
DC1	Full device clear functions
C0	Control function not provided
DT0	Device trigger function not provided

TP-BUS interface option

Item	Description
Terminal	2P connector. No polarity. Connected via the provided TP-BUS connector.
TP-BUS	Up to 31 units can be connected on the bus. Total length of 200 m or less. Twisted-pair cable used.

Message List

Message	Data	Function	GPIB	TP-BUS
*CLS		Resets registers.	○	○
*IDN?		Inquires about the model name of the PAM series or the power-supply controller.	○	○
*RST		Initializes program data and resets registers.	○	○
*SRE	0 to 255	Sets or resets the service request enable register.	○	○
*SRE?		Inquires about the content of the service request enable register.	○	○
*STB?		Inquires about the content of the status byte register.	○	○
&INI?		Inquires about the maximum configurable voltage and current of a model.	○	
ERR?		Inquires about the content of the error register.	○	○
FAU?		Inquires about the content of the fault register.	○	○
FUNMASK	0 to 255	Sets or resets the fault unmask register.	○	○
FUNMASK?		Inquires about the content of the fault unmask register.	○	○
HEAD	0 or 1	Specifies the header and unit.	○	○
HEAD?		Inquires about the value specified by HEAD.	○	○
IOUT?		Inquires about the output current value.	○	○
ISET	Depends on the device.	Specifies an output current.	○	○
ISET?		Inquires about the preset current value.	○	
LOCK	0 or 1	Enables/disables panel operations.	○	○
NODE	1 to 31	Specifies a node address.		○
NODE?		Inquires about a node address.		○
OUT	0 or 1	Turns outputs ON/OFF.	○	○
OUT?		Inquires about the ON/OFF status of the output.	○	
SILENT	0 or 1	In cases of RS-232C connection, switches acknowledge messages.		○
SILENT?		Inquires about the value specified by SILENT.		○
STS?		Inquires about the content of the status register.	○	○
TRM		Specifies a response message terminator.	○	○
TRM?		Inquires about a response message terminator.	○	○
VOUT?		Inquires about the output voltage.	○	○
VSET	Depends on the device.	Inquires about the preset voltage.	○	○
VSET?		Inquires the preset voltage value.	○	

PAM series GPIB/TP-BUS Interface Option Operation Manual