Original text

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Front page

7470

Digital Multimeters

instruction manual

MANUAL NUMBER FOJ-00000044A00

Applicable models
7470

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Precautions for safely handling this product

In order to fully understand the function of this instrument and to use it more effectively, be sure to read instructions before using
Please read the book. In addition, regarding the operation result caused by erroneous use, improper use etc. of this product,
Our company can not assume the responsibility Please understand.

When performing operations such as operation and maintenance of the instrument, if the instrument is used incorrectly, the protection function of the ins
there is. Always keep safe in mind and use it.

■ Danger warning labels

In Acey's products, danger warning labels are affixed to places where there are specific dangers
is. Please handle with care. Also, breaking or hurting these labels
Please do not give up. Also, when purchasing products overseas in Japan, necessary
Please attach the English version of the danger warning label according to. Question about danger warning label
Please contact us to the nearest sales office of our company. Address and phone number at the end of the book
It is described.

The signal word of the danger warning label and its definition are as follows.

Danger : Death or severe disability is imminent.
warning : Death or severe disability may occur.
Caution : There is a possibility of mild personal injury or property loss.

■ Basic notes

To prevent fire, burns, electric shocks, injuries, etc., please observe the following precautions.

● Use the power supply cable according to the power supply voltage. However, when using overseas,
Please use a power cable that conforms to the safety standards of each country. Also,
Please do not place heavy objects on the bull.

● When inserting the power plug into an outlet, turn off the power switch and then to the back
Please insert firmly.

● When unplugging the power plug from the outlet, turn off the power switch, then turn on the power
Please pulling out by pulling the cable without pulling it. At this time, with wet hands
Please do not.

● Before turning on the power supply, check that the power supply voltage of this product matches the supply voltage.
Yes.

● Connect the power cable to a power outlet that has a protective grounding terminal. Protection guidance
If you use an extension cord that does not have body terminals, protective grounding will be disabled.

● When using 3 pin - 2 pin conversion adapter (not attached to our product)
Connect the ground pin from the adapter to the ground terminal of the outlet, ground ground
please do it. Also, pay attention to the short circuit of the adapter's ground pin.

● Use a fuse that conforms to the power supply voltage.

● Do not use this instrument while opening the case.

● Use this instrument in the specified ambient environment.

● Do not put anything on the product or apply force from the top of the product. Also, a vase
Do not place containers containing liquids such as chemicals or the like near your product.

● For products with ventilation holes, insert metals or flammable materials into the ventilation holes,
Please do not drop it.

● When placing it on a dolly, please do drop prevention by a belt etc.

● When connecting peripheral devices, please turn off the power supply of this product before connecting.

■ Notation notation in the instruction manual

Signal words and their definitions concerning the notes used in the instruction manual are as follows
It is as follows.

Danger : Precautions that may cause serious personal injury (death or serious injury)
warning : Personal safety / health concerns

Caution : Notes on damage to products / equipment or restrictions on use

■ Safety mark on product

Academy's products have the following safety marks.

: Indicates handling precautions. In order to protect the human body and the product,
It is attached to places that need to be referred.

: Indicates the earth symbol. Before using the equipment to prevent electric shock, it is necessary to ground
It shows the necessary field / wiring terminal.

: Indicates a high voltage hazard. Where a voltage of 1000 V or more is input or output
It is attached to.

: Indicates electric shock warning.

■ Replacement of lifetime parts

Main life parts used for measuring instruments are as follows.
To maintain the performance and function of the product, please change it as soon as possible as a guide.
However, depending on the usage environment of the product, frequency of use and storage environment, the replacement time is longer
Please acknowledge that it may become sooner.
The user can not exchange it. If replacement is necessary, please contact our company or distributor
please contact.

Individual lifetime parts may be used for each product.
Please refer to the description of this manual, lifetime part.

Main lifetime parts and life span

Parts name	lifespan
Unit power supply	5 years
Fan motor	5 years
Electrolytic capacitor	5 years
Liquid crystal display	6 years
Backlight for liquid crystal display	2.5 years
Floppy disk drive	5 years
Battery for memory backup	5 years

■ About products with hard disks

The notes on use are shown below.

● Do not carry this product with power on, do not give shock or vibration.
In the interior of the hard disk, the information recording disc rotates at high speed, and information
It is very delicate as it is reading and writing.

● Please use and store this unit in a place that meets the following conditions.
Places where there is no extreme temperature change
Places without shock and vibration
Places with low humidity, dust and dust
A place away from the magnet or a device generating a strong magnetic field

● Be sure to back up important data.
Depending on the handling method, the data in the disc may be destroyed. Also,
Depending on the use conditions, the hard disk has a lifetime due to its structure.
Please note that we can not guarantee the lost data etc.

■ Caution on disposing of this product

When disposing of products, please handle hazardous substances properly according to the law of the country.
Hazardous substances: (1) PCB (polychlorinated biphenyl)
(2) mercury
(3) Ni - Cd (nickel - cadmium)
(4) Other

Cyan, organophosphorus, things with hexavalent chromium and those with cadmium, lead,
Things that may elute arsenic (excluding soldering lead)

Example: Fluorescent tube, battery

■ Environment

Install this product in a location that meets the following conditions.

- Places where no corrosive gas is generated
- Places not exposed to direct sunlight
- Places with little dust
- Locations without vibration
- Maximum altitude 2000 m

Precautions for safely handling this product

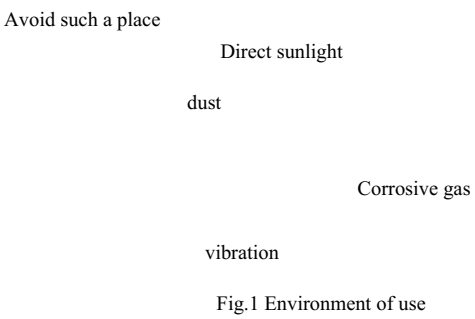


Fig.1 Environment of use

- Installation posture

  Be sure to use this instrument in a horizontal state.
  In some products, in order to suppress the internal temperature rise, a forced air cooling fan is installed
  We are. Do not block the ventilation openings of the fans and ventilation holes.

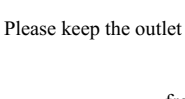


Figure 2 Installation

Storage position

Please keep the instrument as horizontally as possible.
When keeping the instrument in an upright position or when transporting, placing it in a standing position temporarily,
Be careful not to tip over. There is a risk of falling over by shock and vibration.

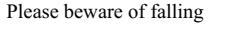


Fig. 3 Storage

- The amount of transient overvoltage and pollution degree typically found in the main power supply as defined by IEC 61010-1

  Types are as follows.
  Impulse resistance (overvoltage) category II of IEC 60364-4 - 443
  Pollution degree 2

■ Type of power cable

If the description of "type of power cable" is in the text, replace it with the table below and read Please.

plug	Applicable standard	Rating, color, length	Type name (option No.)
	PSE: Japan Electrical Appliances and Safety	125 V / 7 A Black, 2 m	Straight type A 01402 Angle type A01412
	UL: America CSA: Canada	125 V / 7 A Black, 2 m	Straight type A 01403 (Option 95) Angle type A01413
	CEE: Europe DEMKO: Denmark NEMKO: Norway VDE: Germany KEMA: Netherlands CEBEC: Belgium OVE: Austria FIMKO: Finland SEMKO: Sweden	250 V / 6 A Ash, 2 m	Straight type A 01404 (Option 96) Angle type A01414
	SEV: Switzerland	250 V / 6 A Ash, 2 m	Straight type A 01405 (option 97) Angle type A01415
	SAA: Australia new zealand	250 V / 6 A Ash, 2 m	Straight type A01406 (option 98) Angle type ----
	BS: United Kingdom	250 V / 6 A Black, 2 m	Straight type A 01407 (option 99) Angle type A01417
	CCC: China	250 V / 10 A Black, 2 m	Straight type A114009 (option 94) Angle type A114109

table of contents

7470 Digital Multimeter Operation Manual

table of contents

7470 Digital Multimeter Operation Manual

table of contents

List of Figures

List of Tables

7470 digital multimeter instruction manual

1.First of all

1. Introduction

In this chapter, in order to bring the best of this book, this book of the contents and the 7470 Digital Multimeter
This section describes the product overview.

1.1 of this document content

The product from the first time use a user, for users who have already used, this document is organized
You. The first is also possible to learn the product knowledge of one way of proceeding to read from Chapter 1 in order, the first in a table of
Browse and can also refer to the necessary information directly.
contents for each chapter.

The content[redacted] of this book is as follows.

Chapter [redacted]tion"	For your effective use of this book, this book This section describes the contents and product overview.
Chapter [redacted]	This section explains the precautions when using the instrument. Please read before use.
Chapter [redacted]	To set up from the instrument is shipped to you With and are described. To ensure the installation environment Taha When, turn on the power, the instrument is child starts successfully [redacted]m with it.
Chapter [redacted]	[redacted]ction describes the functions of the panel various parts of the instrument. The instrument [redacted]e basic method of operation.
Chapter [redacted]	[redacted]s the menu structure and functions the instrument.
Chapter [redacted]	[redacted]e instrument interface
Chapter [redacted]	[redacted] It lists the specifications of the instrument.
Chapter [redacted]	Everyday to maintain the performance and function of the instrument Care to (cleaning, calibration, storage, etc.) With and are described. In addition, it deals with troubleshooting This section describes how.

1.2 Product Overview

7470 is inspection and calibration and measurement system in an automated system, various sensors, manufacturing operations such as precision ele
Inspection so that the system can inexpensively constructed in, digital focused functionality to resistance measurement with DC voltage measureme
It is Tal multimeter.

Enhance or external interface function of the external trigger function for automatic test, minimize the impact of noise
Adoption of the AD converter of the variable integration method to suppress the, also easiness of self-diagnosis and internal calibration system sets
Optimal design has been for the write.

The main features of this unit is the following.

- DC voltage measurement, both two-wire / four-wire resistance measurement, 0.1 ppm by 7 digit half display (maximum display 11999999)
  High-precision measurement possible resolution
- The A / D converter of a multi-slope using proprietary technology can be set integration time arbitrarily, Bruno
  It can be a strong measure to size
- External calibration can in two standards of the DC voltage (10V) and a resistor (10 k.OMEGA)
- The internal calibration, is possible to eliminate the error of the internal digital multimeter according to the ambient temperature change
  Possible

2. Notes before using

In this chapter, I explained that I would like you to note the makings of a the instrument to your. Before Use
Please be sure to read.

Or use make a note this unit, it is dangerous to become unstable when stacked use.
Also, please do not put a load or push from the top.

2.1 when an abnormality has occurred

Or smoke from the unit, when you feel the smell and sound is to draw, disconnect the power cord from the AC power connector
Stomach, please disconnect the instrument and the power supply. Then, please contact us or agency immediately.

2.2 for the removal of the case

For non our service engineer, please do not open the case.

Inside the warning the instrument has a high voltage portion and the high temperature section, there is a risk of electric shock or burns.

2.3 overcurrent protection

This instrument has the overcurrent protection in the power supply fuse.
Power fuse on the rear panel, and blocks forcibly power supply when an overcurrent occurs. This power
When the fuse is disconnected, pull out the power cable from the AC power connector, the instrument and the power
Please disconnect. In this case, since it is thought that an abnormality has occurred in the instrument, to us or agency
Please have it repaired.

2.4 Radio interference

When you use the instrument, you may be radio interference occurs in the television and radio and the like. The instrument of radio interference
Cause an either, when the power of the instrument is OFF, the can be determined by the fault is resolved
You.
Attempt the following methods, please correct the interference by the instrument.

- In the direction in which failure does not occur, changing the direction of the antenna such as a TV / radio
- On the opposite side such as a TV / radio, installing the instrument
- Farther away from the television / radio or the like, and installing the instrument
- Power of the instrument, using an outlet with a separate power supply path from the television / radio, etc.

2.5 for use in a strong place of electric field strength

A strong place field strength high-frequency noise occurs in the object to be measured and input cable affects the measurement field
There is a case. If this is the case, please shield the object to be measured and input cable.

2.6 Notes on the power is turned on

When the power is turned on, please do not connect the object to be measured.

2-2

3. setup

In this chapter, from the instrument is shipped to you, the following items until the setup is complete description
To do.

3.1 inspection at the time of unpacking

Once the product has been sent to you, please check the appearance and accessories in accordance with the following procedure.

1. Please make sure the product there is no damage to the box and cushioning material that had been packed.

   If damage to important or cushioning material until the following test is finished, the box or cushioning material
   Please keep in a state of the remains.

2. Please make sure there is no damage to the product outside.

   If a warning cover panels (front and rear), a power switch, such as the connector is damaged,
   Please do not turn on the power. There is a risk of electric shock.

3. Table by standard accessory list of 3-1, or standard accessories have all, to see if the damage is not
   Please give me.

Please contact us or agency in the case of one of the following.

- If the product is damaged in a box or cushioning material had been packed, evidence there a large force to the cushioning material is applied If you
- If the product outside is damaged
- If there is a shortage or damage to the standard accessories
- If an abnormality is confirmed in operation check of the product after this

7470 digital multimeter instruction manual

3.1 inspection at the time of unpacking

Table 3-1 Standard Accessories

name	Model	quantity		Remarks
power cable	A01402	1	* 1	
Input cable (red, black)	CC010001	Each 1		
Alligator clip adapter (red, black)	CC015001	Each 1		
Power Fuse (for 100V / 120V)	DFT-AAR5A	1	* 2	T500mA / 250V
Power Fuse (for 200V / 220V)	DFT-AAR315A			T315mA / 250V
instruction manual	J7470	1		This book

* 1: Power cable, it can be changed by options specified at the time of your order (See "Notes for handling the instrument safely").

* 2: The option is specified, one or the other but comes.

note Etc. Additional order accessories, please ordering in the type name.

3.2 ensure the installation environment

This section describes the installation environment to operate normally the instrument.

3.2.1 usage environment

This instrument, please be installed in a location that meets the following conditions.

- Ambient temperature 0 ° C ~ + 45 ° C (temperature range)
  -25 ° C ~ + 70 ° C (storage temperature range)
- Relative humidity RH85% or less (no condensation)
- That does not cause the location of the corrosive gas
- Out of direct sunlight
- Dust-free location
- A vibration-free place
- Place with little noise
  This instrument, the noise of the AC power line, but has been designed with due consideration, in
  Please be used in low noise environment as long as the kill. If the noise can not be avoided, Neu
  Please use such's removal filter.

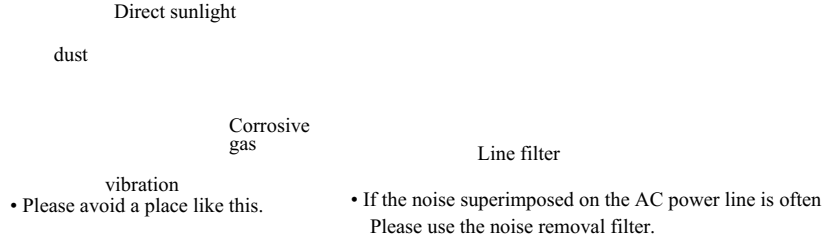


Figure 3-1 use environment

Precautions warm-up
To obtain high accuracy, warm the instrument from the familiar to room temperature power up to 60 minutes
Please go up.

3.2.2 Countermeasure against static electricity

To prevent the semiconductor component damage and destruction due to electrostatic discharge (ESD), subjected to the following measures please. It can not be said completely the use of each alone, it is recommended to be used together.
(Static electricity is easily generated by the friction of people moving or insulating material.)

Table 3-2 Electrostatic Discharge

human body	Mounting of the wrist strap (Fig. 3-2 see)
The floor of the workplace	Installation and wear conductive shoes conductive mat, and ground (Fig. 3-2 see)
Workbench	Installation conductive mat, and ground (Fig. 3-3 see)

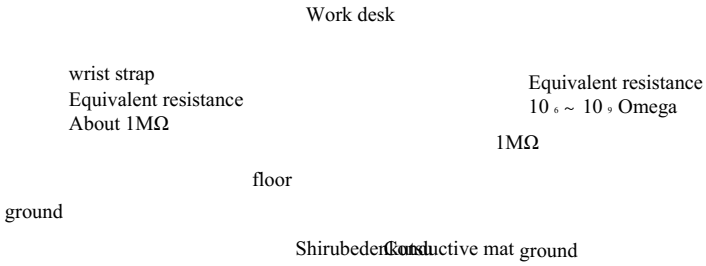


Figure 3-2 the human body and the workplace of the floor of Electrostatic Discharge

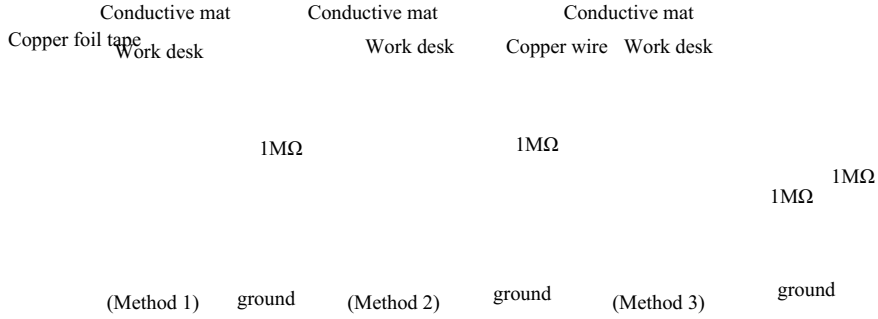


Figure 3-3 workbench of Electrostatic Discharge

3-4

3.3 Accessories

Accessory of this unit, Table 3 are shown in the 3.

This section describes the accessories needed to use the instrument.

Table 3-3 Accessories

name	Model	Remarks
Input cable	CC010001	Standard accessories
	A01035	Shielded cable Low thermal power, with guard
	A01006	4 terminal resistance measurement
Alligator clip adapter	CC015001	Standard accessories 33VAC, 70VDC or less
Terminal adapter	1111	
2U rack mount set A	A02706	With EIA standard handle
	A02707	With JIS standard handle
2U rack mount set B	A02716	None EIA standard handle
	A02717	None JIS standard handle

3.3.1 For input cable

1. standard input cable (CC010001) of this unit is an easy-to-use red / black separate type.

Caution tip of the input cable is sharp, please handle with care. Alligator clip
Rating of the adapter, 33VAC, will be less than 70VDC.

Warning probe of the input cable is has been the protection of electric shock by the barrier, danger of electric shock
In order to prevent, please do not touch the metal part of the tip.

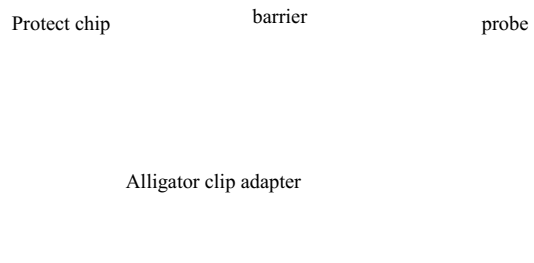
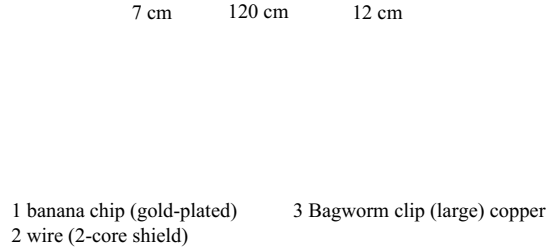


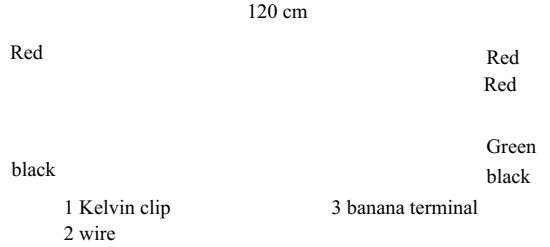
Figure 3-4 Input cable

3.3.2 Notes on the peripheral device connection

2. High sensitivity when measured in a short time stability of the (micro volts) is a problem, or Low thermal power
Please use shielded cable A01035 One.
A01035 (Optional accessories)



3. In 4-wire resistance measurements, please use the dedicated A01006.
A01006 (Optional accessories)



3.3.2 Note on the peripheral device connection

If you want to configure the system by a plurality of devices, please note the following points.

1. The instrument, the controller, before connecting peripheral devices, the device according to the instruction manual state (quasi Please check the Bei) and operation.
2. and the connecting cable and the measuring device, a cable to connect the controller does not longer than necessary Please out.
3. cable that is used to connect peripheral devices, please use shielded cable.

3.4 About Power

This section describes the power specifications and the power cable connection.

3.4.1 Confirmation of the power supply voltage

Setting the line voltage in the instrument rear panel to ensure that it matches with the commercial power source voltage to be used please. Setting of the power supply voltage has been indicated by a black marking.

Table 3-4 correspondence table set supply voltage display of the commercial power supply voltage and the instrument

The commercial power supply voltage	frequency	Setting of the instrument power supply voltage display	Supply voltage display standard
90V - 110V	48Hz-66Hz	100V	T500mA / 250V
108V - 132V		120V	
180V - 220V		200V	T315mA / 250V
198V - 242V		220V	

The instrument settings supply voltage display (rear panel)

Display of Figure 3-5 setting the power supply voltage

3.4.2 Change of power supply voltage setting

The procedure for changing the power supply voltage setting

1. Please disconnect the power cable from the instrument.
2. Press the tab, pull the fuse holder.

3. Pull out the voltage selector.

The power supply voltage (100V, 120V, 200V, 220V) has is displayed in four directions.

4. voltage display will plug so as to face the outside.
5. Insert the fuse holder back into.

3.4.3 Connecting the power cable

This instrument is, comes with a power cable of 3 core with a grounding wire. To avoid electric shock, with
Use the attributes of the power cable, please contact with the ground always the instrument via a three-prong power outlet.

1. Please make sure there is no damage to the power cable.

Power cable with a warning damage, please do not use absolutely. Of electric shock
There is a fear.

2. the AC power connector of the instrument back panel, three-prong power with a protective grounding terminal
Connect the outlet in the supplied power cable (3 -6 see).

AC power connector

Figure 3-6 Connecting the power cable

warning

1. Please use the power cable in accordance with the power supply voltage. If you want to use abroad, of each
   Please use the power cable that conforms to national safety standards ("the instrument the safe handling for
   See Notes ").
2. Power cables for protection from electrical shock, against the three-prong power outlet with a protective grounding terminal
   Please to continue to. Using an extension cord which is not provided with a protective conductor terminal, invalid protective earth
   It will be.

Four. quick start

This instrument is a multi-function digital multimeter that realizes high speed and high precision, easy to operate
Sea urchin is equipped with only the following functions as the front panel keys.

Measurement function setting

Measurement range setting

Sampling conditions

NULL arithmetic, smoothing operation of the on / off

4 Chapter In the front, describes the panel operations that do not use the description and menu of the back panel. That
Other settings, etc. are set in the hierarchical menu. Feature Description of menu operation procedures and 5 refer to Chapter
please.

4.1 Description of the panel surface

4.1.1 Description of the front panel

Front panel display unit, operation keys, consists of a measuring input terminal portion.

4.1.1.3 measurement function
Key / input terminal selection key
4.1.1.1 display unit
4.1.1.6 operation selection key
4.1.1.10 CAT II (notation)
4.1.1.5 sampling

Figure 4-1 Description of Front Panel

7470 digital multimeter instruction manual

4.1.1 Description of the front panel

4.1.1.1 Display unit

Figure 4-2 Description of the display unit

4.1.1.2 Power switch

1. POWER switch	Pressing the power switch turns on, power is supplied to the instrument You. Press again, the switch is turned off and back on the front side, the power supply It will be cut off.

4.1.1.3 Measurement function key / input terminal selection key

1. DCV	Select the DC voltage measurement (DCV).
2. 2WΩ	Select the 2-wire resistance measurement.
3. 4WΩ	Select the 4-wire resistance measurement.
4. FRONT / REAR	Select the input terminal. Selection will input terminal alternately on the front and back panels It is.
5. LO-G	Short-circuit and open the LO terminal and GUARD terminal.

4.1.1.4 Measurement range selection key

1. AUTO	Switch the auto-range and a fixed range alternately.
2. DOWN	From range being measured, fixed Les moved to under 1 Range Range It will be Nji.
3. UP	From range being measured, fixed Les moved to on 1 Range Range It will be Nji.

4.1.1.5 Sampling selection key

1. HOLD	Sets or clears the sampling mode to the hold.
2. TRIG	Directive sampling mode is the start of the measurement at the time of the hold want It is.
3. RATE	High-speed sampling rate (FAST), medium speed (MED), or Set the slow speed (SLOW).

4.1.1.6 Operation selection key

1. NULL	Set of NULL operation, or select a release.
2. SM	Setting of smoothing operation, or select a release.

4.1.1.7 **MENU / ENTER** key

1. MENU	Make the various settings to enter the menu.
2. ENTER	To confirm the setting (at the time of menu operation).
3.	It allows you to select the menu selection and hierarchy.

4.1.1.8 **EXIT / LOCAL** key

- When the setting mode

1. EXIT	To return to the measurement state display missing from the MENU. (Data in the configuration changes will not be saved.)

- During remote operation

2. LOCAL	In the case of the remote state will be the local operations.
note	From GPIB or USB interface LLO (LOCAL

If set to LOCKOUT) state, the local operation
It does not become.

4.1.1.9 Measurement input terminal portion

1. INPUT V Ω HI terminal	DC voltage measurement, is the HI terminal of the resistance measurement. (Is the source HI terminals when the 4-wire resistance measurement.)
2. INPUT V Ω LO terminal	DC voltage measurement, is the LO terminal of the resistance measurement. (Is the source LO terminals when the 4-wire resistance measurement.)
3. 4WΩ SENSE HI terminal	4 is a sense HI terminal of the wire resistance measurement.
4. 4WΩ SENSE LO terminal	4 is a sense LO terminal of the wire resistance measurement.
5. GUARD terminal	This pin is connected to the GUARD case.

4.1.1.10 **II CAT** (notation)

That satisfies the security against measurement category II defined in 2001: this unit IEC 61010-1
indicate. Catheter to the measurement category II for measurements made by the circuits directly connected to the low-voltage installation
It is Gori.

4.1.2 Description of the rear panel

Five 1 2

6 7 Four 3

Figure 4-3 Description of the rear panel

1. Power connector	AC power supply connector Connect a standard accessory power cable (A01402).
2. fuse holder assembly	Slow-blow type of fuse has been stored.
3. USB connector	Data can be output and remote control.
4. GPIB connector	GPIB connector Data can be output and remote control.
5. rear measurement input terminal portion	Connect the measuring input cable.
6. TRIGGER IN	This is an external trigger input.

7. COMPLETE OUT　　It is the end of the measurement output signal.

4.2 Basic Operations

Power supply is turned on (the power switch turned on) automatically when you perform a self-test, then, to the measurement operation enter.
"8 for the contents of the self-test . Maintenance Please refer to".
If you do not have to perform a self-test abnormal, it will be measuring operation state. If there is an abnormality, the table of error It will be shown state.

The instrument remembers the state you turn off the end to the power supply. If you want to change the measurement conditions at the time the pow
" Saving and loading of 5.11 measurement condition setting please refer to the".

4 Chapter of the explanation is due to the factory state. Please refer to Chapter 8 for initialization of the instrument.

4.2.1 The selection of input terminal

Input terminals are located on the front / rear panel.

Front panel　　DC voltage measurement, resistance measurement

The back panel　　DC voltage measurement, resistance measurement

Of the front panel **FRONT / REAR** In key to terminal selection of front / rear.

If the rear terminal has been selected, the rear indicator of the display will light up.

Terminal switching of attention front / rear is like the above voltage 1000Vpeak is applied to the input terminal
Please do not in Thailand.
Also, please do not apply a voltage higher than 200V between the front and rear of the LO terminal.

4.2.2 **GUARD** settings

Either the front or back of the GUARD terminal is selected to open (floating), LO
You can choose whether you want to connect to the terminal.

When you press the LO-G key on the front panel, open and LO terminal connection is switched alternately.

For LO terminal connection, LO-G indicator to appear on the display.

4.2.3 Measurement function

1. DC voltage measurement (DCV)

DCV Press.

Table 4-1 range configuration

range	The maximum display	Highest resolution	Input impedance
100mV	119.9999 mV	100nV	More 1GΩ
1000mV	1199.9999 mV	100nV	
10V	11.999999 V	1μV	10MΩ ± 1%
100V	119.99999 V	10μV	
1000V	1099.9999 V	100μV	

Table 4-2 maximum allowable applied voltage

Terminal	The maximum allowable applied voltage
VΩHI - between VΩLO terminal	1000Vpeak
VΩLO - between the GUARD terminal	50Vpeak
VΩLO - between the chassis	100V
GUARD - between the chassis	100V

Figure 4-4 DC voltage measurement (DCV)

2. resistance measurement (2WΩ, 4WΩ)

1. **2W** Omega Press and 2-wire, **4W** Omega Measure the press and resistance in 4-wire a.

Table 4-3 the maximum allowable applied voltage (2WΩ, 4WΩ)

Terminal	The maximum allowable applied voltage
4WΩHI - between 4WΩLO	300Vpeak
VΩLO - between the GUARD terminal	50Vpeak
VΩLO - between the chassis terminal	100V
GUARD - between the chassis	100V

Figure 4-5 resistance measurement (2WΩ, 4WΩ)

4.2.4 Setting the measurement range

UP From the range during the measurement, it becomes a fixed range to move in on 1 range range.

DOWN From the range during the measurement, it becomes a fixed range to move to under 1 range range.

AUTO Switch the auto-range and a fixed range alternately.

4.2.5 Change of the measured speed display digits

RATE Press.

Table 4 As shown -4 and display length and the measurement speed is switched.

Table 4-4 RATE setting and measurement speed, display the number of digits

1. Auto-zero OFF

RATE set	Measurement speed (time) DCV	2WΩ	4WΩ	Integration time	Display digits
FAST	212 times / s (4.7ms)	212 times / s (4.7ms)	81 times / s (12.3ms)	2ms	6 1/2
MED	20 times / s (50ms)	20 times / s (50ms)	20 times / s (50ms)	1PLC	7 1/2
SLOW	2 times / s (500ms)	2 times / s (500ms)	2 times / s (500ms)	10PLC	7 1/2

2. Auto-zero ON

RATE set	Measurement speed (time) DCV	2WΩ	4WΩ	Integration time	Display digits
FAST	119 times / s (8.4ms)	84 times / s (11.8ms)	81 times / s (12.3ms)	2PLC	6 1/2
MED	20 times / s (50ms)	20 times / s (50ms)	20 times / s (50ms)	1PLC	7 1/2
SLOW	2 times / s (500ms)	2 times / s (500ms)	2 times / s (500ms)	10PLC	7 1/2

conditions
Trigger source: IMMEDIATE
Memory Store: OFF
Range: Fixed (Auto range OFF)
Display: OFF
Other settings are initial value
2W Omega / 4W Omega is 10 Omega range

" 5.8 sampling operation please refer to the".

Setting of the hold

HOLD Sets or clears the sampling mode to the hold.

TRIG Sampling mode and commands the start of the measurement at the time of the hold.

Five. Menu operations and functions described

5.1 menu

Various functions and conditions set of this unit is done by the hierarchical menu.

5.1.1 Menu Operation

Menu has a hierarchical structure of three layers. (There is also a menu of some 4 hierarchy.)

The first floor Category Hierarchy Select the menu category.
The second hierarchy Select hierarchy Select the configuration parameters in the category.
The third hierarchy Input and execution hierarchy Enter or select the settings.

Figure 5-1 Menu operation

5.1.1 menu operation method

1. **MENU** Press.
   Category Hierarchy **1 MEAS** ~ **10 SYS** It will be of the selected display.
2. , By and select a category.
3. Press.
   Enter the selection hierarchy.

Four. , By select the parameters.

Five. Press.
Enter the input and execution hierarchy.

6. , , , ,and **TRIG** To set the parameters by a key.
7. **ENTER** Parameters you entered is confirmed by, you return to the selected hierarchy.
   Before committing **EXIT / LOCAL** When you press, to disable the settings of up to it
   To exit the menu setting Te.
   If the time to execute processing is applied, it will be displayed as "BUSY" → "DONE".

Settings for the selected parameters

The selection parameter for item selection settings, items selected in change,
ENTER And press to set.

Set of numerical parameters

In the numerical parameters for numerical input a set value,, in the numbers of digits to be changed,
Decimal point position, to move the sub-unit.

The change target , Operation by the changes.

If there is no flashing point to be changed, and press to move to the selected hierarchy.

If the number of digits is flashing, you can increase or decrease the number.

If the decimal point is flashing, you can move the decimal point position.

If the unit display is flashing, the sub-units p, n, mu, m, without, k, M, G, the order of T
Changes to.

Also, **TRIG** The key performs measurements reflect the result as the parameter value
It is possible to.

Although the input of numeric parameters can be optionally, the value of the resolution of each parameter 1
It will be rounded off under the digit.

The function of the key in each layer Table 5-1 shows in.

Table 5-1 Menu operation keys and function

Key	Category Hierarchy	Select hierarchy	Input and execution hierarchy: The numerical parameters — Parameters: Dark display, without blinking	Input and execution hierarchy: The numerical parameters — Change the subject: Numeric / decimal point / unit	Selection parameter / Action Items
	-	Move to the category hierarchy	Move to the selected hierarchy	Increase the value	Move to the selected hierarchy
	Move to the selected hierarchy	Input and to the execution hierarchy Movement	-	Decrease the value	-
	Category left movement	Changes move to the left parameters to the		Change bit the left point move	View previous choices
	Category right move	Changes moved to the right parameters to the		Change to the right bit move	Display the following choices
TRIG	-	-	Measuring run, is reflected in the parameter value * 1		-
ENTER	Move to the selected hierarchy	Input and to the execution hierarchy Movement	To confirm the value, to the selected hierarchy		To confirm the selection, To the selected hierarchy * 2
EXIT	Menu Exit	Menu Exit	Menu Exit		

* 1: HIGH / LOW value, only arithmetic constants such as NULL values
* 2: Exit the MENU in the case of execution item
ex. parameters SAVE / LOAD

5.1.2 Menu List

	Category Hierarchy	Select hierarchy	Input and execution hierarchy	Set for each function
MENU				
	1 MEAS	A.ZERO	Auto-zero OFF / ON / ONCE	
		IT	Integration time 1ms ~ 100PLC	○
		4W.CHK	4WΩ check OFF / ON	
		M.DISP	Display mode OFF / ON	
		DIGIT	Display digits 7 1/2 to 4 1/2	○

	2 TRIG	DELAY	Trigger delay 0s ~ 3600s
		N.Smpl	The number of samples 1-16000
		SI	Sampling period 3ms ~ 3600s ○
		SRC	Trigger source selection IMMED / MAN / EXT / BUS
	3 CALC	COMP	Comparison operation OFF / ON
		MATH	Other operations OFF / dB / dBm / SCL
		MX / MN	Display Select the MAX / MIN OFF / ON / MAX / MIN
		RSLT	Results of MAX · MIN operation SAMPL / MAX / MIN / AVG
		PASS	PASS condition setting LGH / __ H / _G_ / L __ / L_H / LG _ / _ GH / ___
		BEEP	The calculation result buzzer OFF / PASS / FAIL
		SM.CNT	Smoothing the number of times 2 to 100 (times)

(A)

5-4

5.1.2 Menu List

Category Hierarchy	Select hierarchy	Input and execution hierarchy	Set for each function

(A)

	4 CONST	HIGH	HIGH constant -9.9999999E + 12 ~ + 9.9999999E + 12
		LOW	LOW constant -9.9999999E + 12 ~ + 9.9999999E + 12
		ΔNULL	NULL constant (in the case of a NULL ON only) ○ -9.9999999E + 12 ~ + 9.9999999E + 12
		Val_X	Constant X (SCL) -9.9999999E + 12 ~ + 9.9999999E + 12
		Val_Y	Constant Y (SCL) -9.9999999E + 12 ~ + 9.9999999E + 12
		Val_Z	Constant Z (SCL) -9.9999999E + 12 ~ + 9.9999999E + 12
		ValDB	Constant D (dB / dBm) 0.0000001E-9 ~ 9.9999999E + 12
	5 PARAM	PON.LD	Select the parameters to be loaded when the power is turned on P.OFF/USER0
		SAVE	Parameters SAVE USER0 / USER1 / USER2 / USER3
		LOAD	Parameters LOAD USER0 / USER1 / USER2 / USER3 / DFLT
	6 INIT	PARAM	Initialization DFLT
	7 MEM	STORE	Measurement memory OFF / ON
		RCL	Recall of measurement memory Setting the recall data No.
		STAT	Performing statistical calculation and the result of the reading STAT

	8 I / F	BUS	The choice of interface GPIB / USB
		GP.Adr	GPIB address (if the interface of selection of GPIB only) 0 to 30
		USBid	USB ID (if the interface of choice is a USB only) 1-127
		ELEM	Select Output data elements FUNC / COMP / 4W.CHK / NULL / SM / MATH / Mx / Mn Individually OFF / ON
(B)		T.Only	Addressable / talk-only (interface of choice In the case of GPIB only) OFF / ON

5.1.2 Menu List

Category Hierarchy	Select hierarchy	Input and execution hierarchy	Set for each function
(B)			
9 MAINT	TEST	Self-test	
	P / KEY	Display / Key Test	
	TEMP	Internal temperature display	
	CAL	Calibration mode OFF / ON	
	Z.CAL	ZERO calibration execution (calibration mode only) FRONT / REAR	
	V.CAL	DCV external calibration run (calibration mode only)	
	Ω.CAL	OHM external calibration run (calibration mode only)	
	IN.CAL	Internal automatic calibration run ALL / DCV / OHM	
10 SYS	BEEP	Buzzer setting OFF / ON	
	C.Widt	Pulse width of the complete signal 5μs / 100μs	
	C.Sig	Complete signal output mode SGL / MULTI	
	P.Lock	Panel Lock OFF / ON	
	PWD	Password (for Panel Lock) 4-digit password	
	LINE	Display of power frequency 50Hz / 60Hz	
	QUEUE	Error record No.01 ~ No.20	

5.2 measurement function

The basic description of the measurement function 4 Please refer to Chapter.

5.3 measurement range and auto-range

5.3.1 Measurement function and range configuration

The range configuration corresponding to the measurement function Table 5-2 shows in.

Table 5-2 measurement function and range configuration

DC voltage measurement	2-wire resistance measurement / 4 wire resistance measurement
100mV	10Ω
1000mV	100Ω
10V	1000Ω
100V	10kΩ
1000V	100kΩ
	1000kΩ
	10MΩ

Range setting remembers the settings for each function.

5.3.2 Auto range

When auto range on, the range so that an optimum range, and automatically change.

Range change determination value

Range DOWN	Less than 10% of the range
Range UP	If you exceed the maximum display

Precautions Caution auto-range use

Because you may not be able to measure that was intended to use the auto-range in on, Attention Kedah . For example, in the measurement, such as the following, Shi best to measure in advance range setting You.

- In the case of the average value measurement of pulse
  Please set the maximum value of the pulse in the measurable range.
- If you want to capture the measurement data at a constant cycle
  Range measurement period will be shifted by the movement.
- If you set the sampling times to a plurality of times for one trigger
  Range measurement period will be shifted by the movement.

5.4 auto-zero operation

Auto-zero is the ability to remove the offset error of the measurement system of the instrument.

When auto-zero is on, to measure the internal offset refers to the value from the measured value of the input signal arguments Kutame offset error is removed, but the measurement time will be about twice as necessary.

Setting the auto-zero **MENU** Inside **1 MEAS** Set from 'A.ZERO'.

The measurement, the auto-zero range during the measurement for the following measurement function and range Run

It is.

Table 5-3 execution of the auto-zero

function	range	Auto-zero
DCV	All range	Execution
2WΩ	All range	Execution
4WΩ	All range	-

Under the following conditions at times other than the measurement, run the auto-zero.

- When the power is turned on
- When you change to a function to perform the auto-zero

Or measured by high, if the high throughput system is required, suitable to measurement conditions and timing
Then you can run only once the auto-zero.

Running the ONCE, perform the auto-zero only once to remove errors becomes auto-zero off
You.

4W 5.5 Omega check function

In 4-wire resistance measurement, to check whether the connection is being carried out correctly.

By using this feature, check or disconnection of the input cable, using prober, such as line
Also can you connection check in the case of a resistance measurement at.

Set of 4WΩ check

MENU Inside**1 MEAS** Select from the category '4W.CHK', in 'ON',
ENTER And confirm.

If you want to cancel, select the 'OFF',**ENTER** And confirm.

Result Display

When you perform this function, the result of the connection check is displayed on the display panel.

display	result
OK	without disconnection, normally it can be measured
VH	voltage measurement HI (4WΩHI) cable disconnection of terminal
VL	Cable disconnection of the voltage measurement LO (4WΩLO) terminal
IH	Cable disconnection of the measuring current HI (VΩHI) terminal
IV	Disconnection voltage measurement LO (4WΩLO) terminal of the cable or measuring current LO (VΩLO) terminal of the cable

Caution

1. even if the broken connection is two or more, it can not be at the same time check more than two. Therefore, the first In check after you re-connect the discovered broken into, other disconnection is checked to new You.
2. including the line resistance , 7. Please use the maximum allowable resistance below that shown in 1.2. Beyond this, correctly You may not be able to check.

5.6 setting of the display mode

The setting of the display mode

MENU Inside **1 MEAS** Select the 'ON / OFF' from the category 'M.DISP'.
ENTER To confirm by pressing.

(It is not certain by the conditions) output is about 1ms to the display device is required.

Please turn off when the high-speed sampling.

Error even if you set off the display will show.

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5.7 set of display digits

5.7 set of display digits

The setting of the display digits

MENU Inside **1 MEAS** Please set the display number of digits from the category 'DIGIT'.
ENTER To confirm by pressing.

5.8 sampling operation

The measurement sequence of the instrument Figure 5-2 shows in.
Perform the measurement of one or more times by a trigger event.
And outputs a complete signal at the end of each measurement, and starts the data output.
Measurement data is output via a display device or interface.
If the sampling rate is faster than the transfer rate of the interface, you will not be able to data output.
If this is the case, please read the data from the capture to the data memory.

- When data is output for each measurement (complete signal output: MULTI)

- If you use a data memory (complete signal output: MULTI)

Figure 5-2 measurement sequence

5.8.1 Sampling cycle **(SI)** and integration time **(IT)** Configuring

Of the front panel**RATE** Besides key, optionally set the sampling period integration time by a menu
It can be constant.

If you set the sampling period or the integration time in the menu, FMS indicator indicator vanishing
Lights.

Integration time is not only a set of seconds, you can also set in the PLC unit synchronized to the power frequency. product
If the minute time of the PLC unit, sampling period will also be a time that has been rounded to the PLC unit in the interior.

The setting range and resolution of the integration time (IT) Table 5 shows the 4.

Table 5-4 integration time setting range and resolution (IT)

Setting range	resolution
1Ms ~ 10Ms	1ms
1PLC ~ 9PLC	1PLC
10PLC ~ 100PLC	10PLC

In the case of seconds it can also input outside the above range, but it is a setting that has been rounded to the PLC unit.

Setting the integration time

MENU Inside**1 MEAS** The integration time in the category 'IT SEC' or 'IT PLC'
Enter. The changes, in moving digits, decimal point, a sub-unit, in
Please change.

ENTER Press to confirm.

If the set value is less than or equal to the resolution, it will be the value that was truncated at one digit under the resolution.

The setting range of the sampling period Table 5-5 shows in.

Table 5-5 Setting range of sampling period (SI)

Setting range
3Ms ~ 3600S

Setting of the sampling period

MENU Inside**2 TRIG** Enter the sampling period in the category 'SI'.

The changes, in moving digits, decimal point, a sub-unit, in it continue to change
.

ENTER Press to confirm.

5.8.2 Set number of times of sampling

Normally, the sampling is performed once each time it detects a trigger, to a plurality of times of sampling
You can also.
This setting is**MENU** of **2 TRIG** Done in the category of 'N.Smpl'.

The number of sampling times1 ~ 16000 sample / trigger

5.9 trigger function

The instrument detects the trigger by the trigger system, a delay of up sampling start, once the trigger
That more than on[redacted]e sampling of.
The trigger model [redacted]nd Figure 5 shows in 4.

The power is turned on
Set number of times of sampling
Setting the trigger delay

TRIG key
Or
TRIGGER input
"* TRG", GET command

Trigger event detection

Complete signal output
(In the case of SINGLE)

Sample count
The end?

Trigger delay

Complete signal output
(In the case of MULTI)

Measurement

Figure 5-3 Measurement Flow hold state

The power is turned on
Setting of the sampling period

Internal timer

Trigger event detection

Complete signal output

Figure 5-4 measurement flow of the free-run state

5.9.1 The operation of the trigger system

Trigger signal
To the external trigger terminal on the rear panel to start the measurement by entering the trigger signal.

Remote command
Trigger command "* TRG", to start the measurement and to send a GET.

Trigger key
Equipment is a case of hold-on in the local state, the panel **TRIG** Measurement when you press the key let's start doing ....

Buffer of trigger events
If the instrument is triggered entered when the measurement state, one trigger event buffer of Will. In this case, it will be the same operation as the trigger measurement is completed at the same time has occurred.

5.9.2 The selection of the trigger source

Trigger source **MENU** of **2 TRIG** Choose from the category of 'SRC'.

Trigger source
In the sampling cycle set by IMMED the instrument performs continuous measurement.

MAN **TRIG** When a key is pressed, or the trigger signal is inputted from the external trigger terminal It detects an event when was.

EXT It detects an event when the trigger signal is input from an external trigger terminal.

BUS From the bus of the enable state of the remote interface, * TRG command or It detects an event when it receives a GET.

By setting the trigger source, Hold On, off will be switched as follows.

IMMED hold off

MAN Hold On

EXT Hold On

BUS Hold On

Trigger key
Equipment is a case of hold-on in the local state, the panel **TRIG** Measurement when you press the key let's start doing .... The trigger key is valid regardless of the selection of the trigger source.

Buffer of trigger events
If the instrument is triggered entered when the measurement state, one trigger event buffer of Will. In this case, it will be the same operation as the trigger measurement is completed at the same time has occurred.

5.9.3 Trigger delay **(Td)**

By setting the trigger delay, that delay time from the trigger to the sampling start to come.

This input can be made to start the measurement from stable.

The setting resolution and trigger delay time Table 5-6 shows in.

The trigger delay **MENU** of **2 TRIG** Set in the 'DELAY'.

Table 5-6 trigger delay time, setting resolution and accuracy

Trigger delay Configuration	Resolution * 1	Delay time accuracy	
		Ext trigger	Bus trigger
0 ~ 600Ms	10µs		
600.1Ms ~ 6S	100µs	0.1Ms ~ 0.5Ms Tasu resolution	1.6Ms ~ 2.1Ms Tasu resolution
6.001S ~ 60S	1ms		
61S ~ 3600S	1s	1s	1s

* 1: If it is the following set resolution panel operation and remote command,
It will be the value that was rounded off by an order of magnitude under the resolution.

5.9.4 Setting the trigger number of times

Usually, but will return to the Idle state when it receives a trigger, birds several times to return to the trigger wait state You can also receive a moth.

Setting the trigger number of times can be set only remote command.

Trigger the number of times 1 ~ 50000

5.10 calculation function

Calculation function, you item 8 below.

item	function
NULL operation	Subtract a fixed value from the measured value
Smoothing operation	Calculating the moving average
Scaling operation	$(\frac{MY}{X}$ Performing the calculation of$) \times Z$
dB operation	M

	Log 20 $_{10}$ (D Performing the calculation of)
dBm operation	Log 10 $_{10}$ ($\frac{M^2}{D} \times \frac{1}{10^{-3}}$ Performing the calculation of)
Comparator operation	Performs a comparison operation (HI / GO / LO)
MAX · MIN operation	Maximum, minimum, an average value
Statistical computation	To the data memory, the maximum value, minimum value, average value, standard Seek quasi-deviation, the variation width

5.10 calculation function

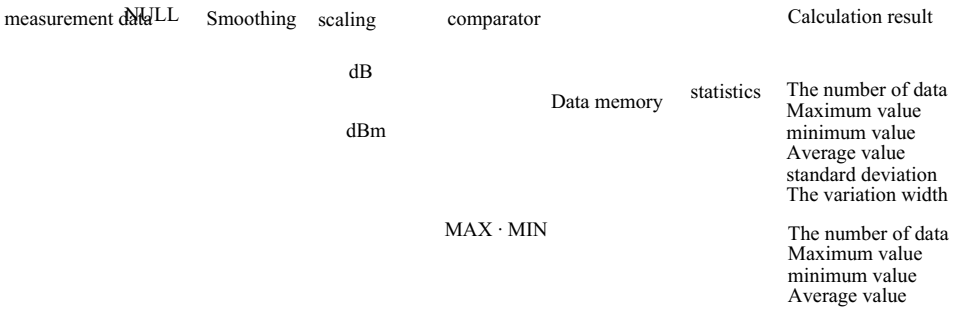


Figure 5-5 operation system diagram

Caution

1. For the data to be processed, may result in the following phenomenon. This is, the measured value, the calculation Because the internal resolution of the setting value is smaller than the resolution of the display and remote output data.
   • MAX · MIN operation, blanking when the buzzer set the MAX value or the MIN value if ON has been updated Although you will hear Heather, a buzzer will sound even if the output data of the display and the remote does not change You may.
2. If you turn on the operation setting, display of the operation result is different from the normal measurement values, decimal point and unit There does not depend on the range.

   <Example> DC voltage measurement, 1000 mV range, when a 1V input
   Measurements: 1000.00mV
   The calculation result: 1.00000V

5.10.1 **NULL** operation

1. Features

NULL operation is a value obtained by subtracting the NULL constant from the measurement value is output.

Measurement data output = measured value - NULL Constant

NULL When you press the key, NULL light on the display unit performs an operation will light. NULL Starring Again in the calculation execution **NULL** When you press the key, NULL lamp operation is released will be turned off.

Caution operation is running, the actual measurement values are not displayed.
For this reason, if you do not even notice if there is a dangerous voltage to the input connector and test leads Please note that there is.

2. NULL constant

NULL constant execution **NULL** The measurement value immediately after when pressing the key) as its value. OL You can not run the (overloaded) sometimes NULL operation. During execution, **MENU** NULL at the inner You can check the constant.

MENU

..4 .. CONST

Deruta **NULL**

The setting range is shown below.

Setting range	Setting resolution
-9.9999999E + 12 ~ + 9.9999999E + 12	0.0000001E - 9

Exponent is set in the sub-units (p, n, μ, m, k, M, G, T).

Change of 3. NULL constant

1. Display the NULL constant in step 2..
2. Was after, or the following items of change where possible flashes in the press You.
   - The least significant digit from the most significant digit of the numerical value
   - Sub-unit (setting of the exponent)
   - Decimal point

3. according to the Changes , Using, please change the set value.
   Sub-unit will switch in the following order.
   p ↔ n ↔ μ ↔ m ↔ subunits without ↔ k ↔ M ↔ G ↔ T
4. setting the end, **ENTER** Please press.

4. cancellation of the NULL operation

In any of the following conditions, NULL operation will be canceled.

- In NULL execution state **NULL** Press the key.
- * execution of the RST command.

5.10.2 Smoothing operation

1. Features

Smoothing function, the noise in the measurement signal will be used in the case such as that superimposed. Specified
And so it is taking the moving average of the number of times (smoothing number of times) measurements, small variations in the measured
Masu no longer.

The arithmetic expression of the smoothing operation is shown below.

Display = (measured value 1+,,,,, + found N) / N

SM When you press the key, to run the operation, SM of the display unit is lit or blinking.

Again in the smoothing operation execution state **SM** When you press the key, to cancel the operation, SM lamp is off
To do.

Between smoothing execution of N times previously SM lamp blinks, smoothing conditions I to N times
That the lights.
N + 1 th data is displayed as follows.

Display = (measured value 2+,,,,, + measurements N + 1) / N

From the start of smoothing, until reaching the smoothing number, measured up to that point
The average value is displayed of.

If smoothing the number of N = 3, it will be as follows.

Smoothing start

measured value	D1	D2	D3	D4	D5	D6	D7	Measurement output
								D1
								D2
								D3
								(D3 + D4) / 2
								(D3 + D4 + D5) / 3
								(D4 + D5 + D6) / 3
								(D5 + D6 + D7) / 3

"SM" Lamp blinks "SM" Lamp lighting

Smoothing operation result in the n-th measurement after smoothing D (sm) is ne as follows I will do.

$$\text{Smoothing operation result } D(sm) = \frac{1}{T}\sum_{i=n-T+1}^{n} Di$$

D (sm): Smoothing in the n-th measurement Grayed operation result
Di: Measured value (smoothing operation before execution)
T: Smoothing set number of times (2 to 100 times or In configurable)

2. Setting of smoothing number of times

Setting of smoothing number of times, **MENU** Done in the inner.

MENU

..3 .. CALC

SM. CNT

Set number of times can be set is 100 times the value from 2 times.

3. re-start of the smoothing operation

In any of the following conditions, and then re-start the smoothing operation from N = 1.

- The power is turned on.
- To change the smoothing number of times.
- To change the NULL operation.

4. cancellation of the smoothing operation

In any of the following conditions, smoothing operation will be canceled.

- In smoothing the operation execution time **SM.** Press the key.
- To change the measurement function.
- * execution of the RST command

5. smoothing operations and OL (overload)

During the smoothing process, if the measured value exceeds the OL (overload), the measurement value is ignored It will be.

(The data of the smoothing number of times with the exception of OL data and valid data.)

5.10.3 Scaling operation

1. Features

The arithmetic expression of the scaling operation is shown below.

$$\text{Display} = \frac{\text{Measurements M - Y Constant}}{\text{X constant}} \times \text{Z constant}$$

MENU Selecting SCL at MATH item inner, MATH lamp lights in the display unit, the scan Run the scaling operation.

During the execution of the scaling operation **MENU** Cancellation If you select OFF, the operation in the MATH item of the inner And, the MATH light on the display unit will be turned off.

MENU

..3 .. CALC

MATH OFF / dB / dBm / SCL

Caution scaling operation is running, the actual measurement values are not displayed. For this reason, There is a case where the input connector and test leads not notice even if there is a dangerous voltage Please note.

2. Set the scaling constant

note When you cancel the setting in the middle **EXIT / LOCAL** Please press the key.

1. **MENU** Configure the settings of the X / Y / Z constant at the inner.

MENU

..4 .. CONST

Val_X
Val_Y
Val_Z

2. After you select the constant that you want to set, it will be ready to be set by pressing.

Value setting 3. constant

Constant X, Y, the setting range of Z is shown below.

constant	Setting range	Setting resolution
X	-9.9999999E + 12 ~ + 9.9999999E + 12	0.0000001E - 9 ※
Y		0.0000001E - 9
Z		

Exponent is set in the sub-units (p, n, μ, m, k, M, G, T).
※: 0 can not be set.

1. When you press enter or the constant setting mode, you can change the following items 箇 Where it will blink.
   - The least significant digit from the most significant digit of the numerical value
   - Sub-unit
   - Decimal point
2. in accordance with the Changes , Using, be sure to change the numerical value and sub-units Yes.
   Sub-unit will switch in the following order.
   p ↔ n ↔ μ ↔ m ↔ subunits without ↔ k ↔ M ↔ G ↔ T
   When setting the measured value to the scaling constant, in this mode **TRIG** Key Press.
3. Set up at the end i, **ENTER** Please press.

4. S OL (scaling-over)

As a result of executing the scaling operation, it will be displayed if it exceeds ± 999.999E + 6 "S OL".
At this time, even running the auto-range does not range up.

(For auto range, which determines the range measured value before execution)

5. cancellation of the scaling operation

In any of the following conditions, scaling operation will be canceled.

- In scaling the operation execution state If you select OFF in the MATH item of the inner **MENU**
- To change the measurement function.
- * execution of the RST command
- If the dB / dBm operation was performed (ON)

5.10.4 **dB / dBm** operation

1. Features

dB operation, in operation to perform a decibel conversion can only be performed during voltage measurement.

dBm calculation is valid for the calculation of the power gain per 1 mV, can be executed only when voltage measurement.

If the measured value in dB operation / dBm operation execution becomes zero, becomes operational error, the error Message will be displayed.

dB operation, dBm operation and scaling operations, can not be selected at the same time. It is one either.

The dB and dBm operation of the arithmetic expression is shown below.

In the case of dB: Display $\mathrm{Log}_{10}\frac{|\text{Measurements}|}{\text{Constant D}} = 20$

In the case of dBm: Display $\mathrm{Log}_{10}\frac{(\text{measured value})^2}{10^{-3}\times\text{constant D}} = 10$

MENU When in MATH item of the inner set the dB or dBm, the MATH light on the display unit Lights.

MENU

..3 .. CALC

MATH OFF / dB / dBm / SCL

Caution dB / dBm operation is being performed, the actual measurement values are not displayed.
For this reason, if you do not even notice if there is a dangerous voltage to the input connector and test leads Please note that there is.

2. Set the constant D

The setting range of D constant is shown below.

Setting range	Setting resolution
0.0000001E - 9 ~ 9.9999999E + 12	0.0000001E - 9

Exponent is set in the sub-units (p, n, μ, m, k, M, G, T).

1. **MENU** And to set the mode of constant D at the inner.

   MENU

   ..4 .. CONST

   ValDB

2. In and press enter or the constant setting mode, the following items of changeable Noh locations will blink.
   - The least significant digit from the most significant digit of the numerical value
   - Sub-unit
   - Decimal point

3. according to the Changes , Using, be sure to change the numerical value and sub-units Yes.

   Sub-unit will switch in the following order.

   p ↔ n ↔ μ ↔ m ↔ subunits without ↔ k ↔ M ↔ G ↔ T

   When setting the measured value to the D constant, **TRIG** Press the key.

4. setting the end, **ENTER** Please press.

3. cancellation of dB / dBm operation

In any of the following conditions, dB / dBm operation will be canceled.

- dB / dBm execution state setting a scaling operation in (ON) the time
- To change the measurement function.
- * execution of the RST command

5.10.5 Comparator operation

1. Features

The arithmetic expression of the comparator operation is shown below.

HI = (set value of the measured values> HI)

LO = (measured value <the set value of LOW)

GO = (setpoint ≤ set value of the measured value ≤ HI of LO)

(Processing of special data)

- is + when the data OL of the (overloaded) to determine the HI.
- - when the data OL of (overload) is determined to LO.

MENU If you set the COMP of the inner to ON, and displays the results of the PASS (PS) or FAIL (FL).

MENU

..3 .. CALC

COMP **OFF / ON**

Judgment results can be output to the display / buzzer / status register.
(Buzzer sound, it will sound only when the buzzer setting on.)
You can apply for all measurement functions.
However, if MAX · MIN operation is on, apply to the MAX · MIN before the operation value.

2. Set the judgment conditions
High constant, an example of the setting of Low constant is shown below.

MENU

..4 .. CONST

High Setting change of High constant

Low Setting change of Low constant

Value setting 3. constant
The setting range of High constant and Low constant is shown below.

constant	Setting range	Setting resolution
High Low	-9.9999999E +12 ~ + 9.9999999E + 12	0.0000001E - 9

Exponent is set in the sub-units (p, n, μ, m, k, M, G, T).

1. In and press enter or the constant setting change mode, change of one or more of the following:
A further possible locations will blink.
   - The least significant digit from the most significant digit of the numerical value
   - Sub-unit
   - Decimal point
2. in accordance with the Changes, using, be sure to change the numerical value and sub-units
   Yes.
   Sub-unit will switch in the following order.
   p ↔ n ↔ μ ↔ m ↔ subunits without ↔ k ↔ M ↔ G ↔ T
   High constant, to set the measured value to the Low constant, in the **TRIG** key
   Press.
3. Set up at the end i, **ENTER** Please press.

With the setting of the constant setting "High Constant <Low constant", the operation result is "HI and LO" Kotogaa I will do. In this case, to display the FL.

4. buzzer set
You can set the buzzer output in accordance with the PASS / FAIL judgment.

However, when is off, the buzzer output does not run.

MENU Make the buzzer set in the BEEP of the inner.

MENU

..3 .. CALC

BEEP **OFF / PASS / FAIL**

1. with the current settings display state (BEEP), Press, and the buzzer setting mode.
2. , Use the, OFF, please select the PASS or FAIL.

7470 digital multimeter instruction manual

5.10.5 comparator operation

5. PASS condition setting

The PASS condition, not a to / as PASS respective HI / GO / LO comparator operation results
And specify.
For example, the HI comparator operation result as PASS condition, Do the LO and GO and PASS condition
If you do, when you run the comparator operation, the result will be the HI if PASS.
The results will be the LO or GO if FAIL.

HI (a PASS condition)

GO (no PASS condition)

LO (not a PASS condition)

MENU Configure the settings of the PASS conditions at the inner.

MENU

..3 .. CALC

PASS LG H / _ _ H / _ G _ / L _ _ /
L _ H / LG _ / _ GH / _ _ _

1. with the current settings display state (PASS), Press, and the PASS setting mode.
2. , It is used to select the PASS conditions.

6. release of the comparator operation

In any of the following conditions, comparator operation will be canceled.

- When OFF the comparator operation at the comparator operation execution state.
- To change the measurement function.
- * execution of the RST command

7. measurement range of the change and the comparator operation

If you change the range comparator function will continue to operate.
Determination reference value at this time, does not change from the previous setting for with the unit.

5.10.6 MAX · MIN operation

1. Features

1. The maximum value while the MAX · MIN operation is ON, the minimum value, the average value
That the operation is performed.
2. In the MAX · MIN operation, performed at the same time all of the following operations.
- The maximum value (MAX)
- The minimum value (MIN)
- The average value (AVE)
- Number of measurements
3. OL (overload), enable the measurement data excluding the data of the operation error Day
And then calculated as data.
4. If the buzzer setting is on, blanking when MAX value or MIN values are updated
Heather will sound. However, this ringing also the buzzer when the display value does not change
And there is. Originating This is because the resolution of the measurement is less than the resolution of the display
And raw.

2. Setting of operation

MENU By the selection of the MX / MN of the inner, the operation can be selected as follows.

MENU

..3 .. CALC

MX / MN OFF / ON / MAX / MIN

OFF: cancellation of the operation [MAX, MIN both off]
ON: Performing operation (measured [MAX, MIN both lighting]
MAX: execution of the operation (maximum display) [MAX flashes]
MIN: execution of operations (minimum display) [MIN flashes]

The method of calling 3. MAX · MIN operation result

1. **MENU** Select the RSLT of the inner, refer to the calculation result display.

MENU

..3 .. CALC

RSLT SAMPL (number of samples)

MAX (maximum value)
MIN (minimum value)
AVG (average value)

2. , Please select the contents to be displayed by pressing.
The number of measurements, maximum value, minimum value, and displays the average value in the order.

4. display function of the MAX · MIN calculated value during the measurement execution

1. The value in MAX · MIN operation execution, child displays selected from the following three items You bet you can.
   - Measurement value display (all lights of the MAX / MIN)
   - Maximum value display (MAX flashes)
   - Minimum value display (MIN flashes)
2. How to set
   By "2. Set the operation", and then select the display screen.
   In the screen**ENTER** When you press, it becomes a calculation result display of the selected value or It is.

5. release of the MAX · MIN operation

In any of the following conditions, MAX · MIN operation will be canceled.
• When you turn OFF the MAX · MIN operation in the execution state of the MAX · MIN operation
- To change the measurement function.
• * execution of the RST command

6. re-start of the MAX · MIN operation

In any of the following conditions, and then re-start to clear the value of the MAX · MIN operation.
- The power is turned on.
• After you turn off the MAX · MIN operation, when you turn on again
- To change the operation of the on / off other than the comparator.
• If you change the NULL constant or smoothing number of times

5.10.7 Statistical computation

1. Features

1. The maximum value of the measurement data are stored in the measurement memory, minimum, average, standard Quasi-deviation, the operation is performed to determine the variation width.
2. In the statistical calculation, perform at the same time all of the following operations.
   - The number of samples S_{CNT} = specified range of the number of data - the number of overload
   - Maximum value S_{MAX} maximum value in = object data
   - minimum value S_{MIN} minimum value in = object data
   - Average value $S_{AVE} = \frac{1}{S_{CNT}} \sum_{k=1}^{S_{CNT}} Dk$
   - The variation width $S_{PTP} = | S_{MAX} - S_{MIN} |$
   - standard deviation $S\sigma = \sqrt{\frac{1}{S_{CNT}-1} \sum_{k=1}^{S_{CNT}} (Dk - S_{AVE})^2}$
3. OL (overload), enable the measurement data excluding the data of the operation error Day And then calculated as data.

2. execution of operations

1. **MENU** Select the STAT of the inner.

   MENU

   ..7 .. MEM

2. execution selects STAT, **ENTER** Press.

If there is no data in the measured data memory to display the 'LAST'.

7470 digital multimeter instruction manual

5.10.7 statistical computation

The method of calling 3. operation result

1. **MENU** In STAT of the inner, it will be the calculation result display state.

MENU

..7 .. MEM

STAT

SAMPL (The number of samples)

MAX (Maximum value)

MIN (minimum value)

AVG (Average value)

SIGMA (standard deviation)

PP (Variation width)

2. After statistical computation performed, please select the contents to be displayed by pressing.

5.11 Saving and loading of measurement conditions set

This instrument can be stored in the USER0 ~ USER3 of the no[redacted]ers until four.

The contents of the configuration parameters, "8. 9 System rec[redacted]arameters" please refer to.

5.11.1 Automatic load of when the power is turned on

Or the instrument is activated under the measurement conditions of USER0 and the power is turned on, when the last power off You can choose whether to start the measurement conditions.

MENU Inside **5 PARAM** Please select the following in the category 'PON.LD'.

P.OFF	The last to start on the measurement conditions when you turn off the power
USER0	To load the measurement conditions of USER0

ENTER To confirm by pressing.

5.11.2 Save configuration parameters

MENU Inside **5 PARAM** One of the USER0 ~ USER3 in the category 'SAVE' Please select.

ENTER You save to the area you have selected by pressing.

5.11.3 Load of configuration parameters

MENU Inside **5 PARAM** In the category 'LOAD' USER0 ~ USER3, DFLT noise Please select or Re.

ENTER Loads from the area you have selected by pressing.

The initial value is loaded When you select a DFLT.

"8 for the initial value .9 system recovery procedures please refer to the".

5.12 store and recall of measurement data

This instrument has a built-in measurement data memory for storing measurement data up to 10000 data.

5.12.1 Memory store

MENU Inside **7 MEM** Select the ON / OFF in the category 'STORE'.

ENTER To confirm by pressing, 'ST' indicator will light up.

When you start the measurement to exit the menu, start a store to the measurement data memory
To do.

When the measurement data is 10000 data buzzer sounds 'ST' indicator is flashing
To do.

5.12.2 Memory recall

MENU Inside **7 MEM** Enter the data No. to be recalled in the category 'RCL'
You.

ENTER To confirm by pressing, 'RCL' indicator will light up.

, In you I can recall by increasing or decreasing the data No..

5.12.3 Memory clear

In any of the following conditions, measurement data memory is cleared.

- The power is turned on.
- to run the device clear from GPIB I / F.
- * to run the RST command.
- **MENU** Of mode **6 INIT** To initialize parameters by.
- It is set to on from off the memory store of the measurement data.

5.13 System Settings

5.13.1 Buzzer setting

MENU Inside **10 SYS** Select the ON / OFF in the 'BEEP'.

ON	The buzzer will sound.
OFF	The buzzer does not sound.
	Comparator operation, results of you will not even sound the buzzer.

ENTER To confirm by pressing.

Set in the case of the failure is the buzzer sounds at off.

5.13.2 Front panel invalid function

This function is to disable all of the front panel keys of the instrument.
It shows you how to set the following.

Password Settings

The Enable / Disable the front panel keys you will need a password.
The password is 4-digit number from 0000 to 9999.
Please perform the password set by the following procedure.

	operation	Character display unit
1.	**MENU** Press the,, in **10 SYS** Choose.	MENU SYS
2.	Press.	SYS BEEP
3.	And to select a 'PWD'.	SYS PWD
Four.	Press.	PWD NEW
Five.	, And press to select the digit of the numerical value input section. , In and change the value and enter the password.	PWD NEW
6.	**ENTER** Press.	PWD OLD
7.	Enter the current password in the same operation.	PWD OLD
8.	**ENTER** Press. If it is correct, set the password to display the PASS.	PWD PASS
	If the password is incorrect in step 3 is displayed as FAIL Will return. Please go the other once configured with the correct password.	PWD FAIL
9.	**EXIT** Press to exit the menu.	

Panel Lock Set

Please perform the panel lock setting in the following procedure.

	operation	Character display unit
1.	**MENU** Press the,, in **10 SYS** Choose.	MENU SYS
2.	Press.	SYS BEEP
3.	And to select the 'P.Lock'.	SYS P.Lock
Four.	Press.	P.Lock OFF
Five.	, In select ON **ENTER** Press.	P.Lock ON
6.	, And press to select the digit of the numerical value input section. , In and change the value and enter the password.	PWD
7.	**ENTER** Press. If it is correct to exit the menu to display the LOCK. If the password is not correct and return to Step 3. Please go the other once configured with the correct password.	PWD LOCK

Panel unlock

Please perform the panel unlocked by the following procedure.

	operation	Character display unit
1.	I to the input hierarchy of P.Lock If you press the key in the panel lock I will do.	PWD LOCK
2.	, And press to select the digit of the numerical value input section. , In and change the value and enter the password.	PWD LOCK
3.	**ENTER** Press.	
	If it is correct, set the password to display the PASS.	PWD PASS
	If the password is not correct to display the FAIL step 3 To return to.	PWD FAIL

If you forget the password note panel lock, the panel lock solution
You will not be able to removal. Please do not forget the password.
It is recommended that you refrain in such notes.

5.13.3 Error record

The instrument is recorded error number if an error occurs, 'ERR' indicator lights.

From the front panel menu, you can read only the error number.

When you query from GPIB or USB, error number and an error message will be read out.

Error record is up to a maximum of 20 history.

Reading error

MENU Inside **10 SYS** In 'QUEUE' When you press and displayed in order.

Clear error record

Error record is cleared by reading the error.

6. How to use the interface

This instrument, GPIB (IEEE-488) interface, USB interface is equipped as standard. However
Then, it can not be used at the same time. Please use to select one or the other.

6.1 The selection of interface

Interface selection and configuration, can only be set from the menu on the front panel.

1. selected interface is stored in non-volatile memory, an interface or the power is turned off
   It does not change and reset.
2. The interface will set the device-specific address. S in USB interface
   If you of the equipment has been connected, set the address (USB.ID) to identify each.

Address, or to turn on the power, it will be displayed in the address setting in the menu.
The setting items and the factory state of the interface is shown below.

Setting items	Factory state
GPIB address / USB.ID	1
GPIB Talker function	Addressable

The choice of interface

MENU Inside **8 I / F** Select the interface to be used in the 'BUS'.

ENTER To confirm by pressing.

6.2 GPIB

6.2.1 Overview

GPIB Using (General Purpose Interface Bus), setting of various measuring functions of the instrument, the measurement path
The setting and reading of measurement data parameters can be externally controlled, easy automatic measurement system
You can configure.
Since GPIB signal from the instrument, the measurement signal system of the body is electrically isolated, external
Do not cause impact on the value measured by the connected device.

- General Specifications

Standard:	IEEE-488.2
Use Code:	ASCII code
Logic level:	Logic 0 "High" state +2.4 V or higher Logic 1 "Low" state +0.4 V or less

Table 6-1 interface function

code	function
SH1	Source handshake function
AH1	Acceptor handshake function
T5	Basically talker function, talker release function by listener specified, Talk-only mode function, serial poll function
L4	Basic listener function, the listener release function by talker specified
SR1	Service request function
RL1	Remote / local switching function
PP0	No parallel poll function
DC1	Device clear function (SDC, the DCL command can be used)
DT1	Device trigger function (GET command can be used)

C0	No controller function
E2	3-state bus drivers use

6.2.2 **GPIB** Usage Guidelines

1. and connect the cable and the measuring device, the bus cables connecting such a controller, more than necessary
   Please do not long. Cable Please be careful not to exceed 20m. In addition, our
   In it offers the following cables as standard bus cable.

Table 6-2 standard bus cable

length	name
0.5m	408JE-1P5
1 m	408JE-101
2m	408JE-102
4m	408JE-104

2. connector of the bus cable, in Pigibakku form, male to one connector, both of female there
   Ri, it can be used repeatedly.
   If you want to connect the bus cable, please do not use stacked three or more of the connector. Up
   Was, please attach securely with the connector set screw.
3. Power conditions of each component device, make sure such as a ground state, also set in accordance with the requirements, each structure
   Please on the power of forming equipment.
   Power of all the devices that are connected to the bus, please be sure on. If, Oh the power
   If there is a device you have not down, the operation of the entire system can not be guaranteed.
4. attachment and detachment of the cable
   Before you can attach and detach the GPIB cable, please all the connected device is the power to OFF. Also,
   Please be removable in a state in which the enclosure ground of each connection is connected to ground to each other.
5. ATN interruption in the message transfer
   If ATN request during message transfer between devices have interrupted, following in favor of ATN
   The previous state is cleared.
6. If you want to use in the talk-only mode, the controller please do not connect.
7. 1 times of the transfer of program commands, recognizes up to 255 characters.
   If the program command exceeds 255 characters, an error will occur.
8. After the program commands sent out, more than 5ms, please hold the REN line to LOW.
9. * TRG command will enable acceptance of the following commands before you run is complete.
   To synchronize with the completion of the command execution, * OPC, * OPC?, Please use the * WAI command.
   * OPC, * OPC?, * WAI command, you must write the end of the program line of one line.

   Example "* TRG, * OPC"
   "* TRG, * OPC?"
   "* TRG, * WAI"

6.2.3 **GPIB** settings

Address set

1. **MENU** Inside **8 I / F**In 'GP.Adr' and enter the address of up to 0 to 30.
2. **ENTER** To confirm by pressing.

Talk-only setting

1. **MENU** Inside **8 I / F**In 'T.Only' make the following selection.
   ON: Talk-only
   OFF: Addressing
2. **ENTER** To confirm by pressing.

Setting output data elements

1. **MENU** Inside **8 I / F**ELEM', in and select the following output element You.
   Output element
   'FUNC': Function
   'COMP': comparator operation
   '4W.CHK': 4W check
   'NULL': NULL setting
   'SM': smoothing setting
   'MATH': MATH operation set
   'MX / MN': MAX / MIN operation set
2. **ENTER** In a defined, in
   ON: "on the measured value 6.5.1 output data format output character shown in" Data will be added.
   OFF: Do not be added.
3. **ENTER** And confirm.

6.3 USB

6.3.1 Overview

The instrument, a USB (Universal Serial Bus) that complies with the USB2.0 standard has been standard equipment.

With USB, the configuration and reading of the measured data of function for a plurality of the instrument on the bus, It is possible from a personal computer, it can automatic measurement system is easy to configure.

Note all of the personal computer, it does not guarantee the operation of the hub or the like.

6.3.2 **USB** specification

- standard: USB2.0 compliant
- Connector used: USB B type (female)
- Identification ID: 1 as USBid ~ can be set to 127
- Remote / Local: Yes function
- Input command: Function set by the ASCII string command, query
- Output Format: Measurement by ASCII character string data, the query response output
- driver: Using the ADC Instrument USB Driver
  (You can download from our website)

6.3.3 **USB** setup of

To use the USB interface of the instrument, Personal Mitutoyo ADC Instrument USB Driver
It must be installed on the Le computer.

ADC instrument USB driver, can be downloaded from our website at no charge.

URL http://www.adcmt.com/

How to install and use, referring to the instruction manual that is included in the download file
please.

Please correspondence OS and the corresponding language, refer to the manual of the ADC instrument USB driver.

6.3.3.1 Connection of a personal computer

Connecting the instrument back of the USB connector and (B type) the USB connector of a personal computer
Please connect a cable.

Please insert to ensure that the end of the connector is the time of connection.

When connecting a plurality of the instrument to a single personal computer, and use any USB hub
.

6.3.3.2 **USBid** set of

USBid settings menu, interface selection will be set in the case of USB.

1. **MENU** Inside **8 I / F** Enter the address of from 1 to 127 'USBID'
   It is.
2. **ENTER** To confirm by pressing.

6.4 single wire signal

6.4.1 External trigger terminal **(TRIGGER IN)**

Trigger can the instrument by entering a negative logic pulse to an external trigger terminal on the rear panel (TRIGGER IN)
It is.
If you use this terminal, please set the sampling mode to the hold.
Trigger signal, please enter the TTL level or contact signal.

Figure 6-1 trigger input terminal simplified equivalent circuit

6.4.2 Measurement end signal terminal **(COMPLETE OUT)**

It outputs a negative logic pulse at the measurement end signal terminal on the rear panel (COMPLETE OUT) at the time of measurement exit It is.
Complete signal, multi-output and single output can be selected by the output timing.

Multi-Output	And outputs for each sampling
Single Output	Output when you exit the set sampling number of times

MENU Inside **10 SYS** Please select a single (SGL) / Multi (MULTI) in the 'C.Sig'.
ENTER To confirm by pressing.

You can select the pulse width according to the requirements of the connected device.

MENU Inside **10 SYS** Please select the following by 'C.Widt'.

100µs	Pulse width 100µsec
5µs	Pulse width 5µsec

ENTER To confirm by pressing.

Measurement end signal directly contact as an input signal, such as a TTL level and a programmable controller
You can continue.

Figure 6-2 Complete output terminal simplified equivalent circuit

Complete signal output timing

It shows a representative value of the output timing of the following set conditions definitive complete signal.

Function: DCV, auto-zero: Off, Auto Range: Off

1. In the case of single output

   Time Tc from the trigger signal input of the external trigger terminal until the complete signal output

   Tc = Tin × sampling number of times + 2.5msec

   Tin: the longest time of the following:

   Sampling period (SI)
   Integration time (IT) + 30µsec
   850µsec: measurement data memory off
   1.29msec: Display on

2. In the case of multi-output

   Complete output cycle Tcp
   Tcp = Tin + 1.4msec

   Tin: same as above

6.5 Command Reference

This section describes the command reference for this instrument.

6.5.1 Output data format

Measurement data output format is as follows.

○○○ ± ddd.dddddE ± dd, ○○○, ○○○, ○○○, ○○○, ○○○ △△

Section 1 Section 2 Section 3 Section 4 Section 5 Section 6 Section 7 Section 8 Section 9

1. Section 2: measurement data
   ± ○○○○. ○○○○ E ± ○○

   Exponent: "E" + polarity + 2-digit number
   Mantissa: polarity + point + 5-8 digit number

Output the number of digits of the mantissa varies depending on the range, integration time and the number of display digits setting.

Table 6-3 Measurement data format

function	range	4-digit display and half	5-digit display and a half	6-digit display	7-digit display and a half
				1ms <IT < 1PLC	1PLC ≤ IT ≤ 100PLC
DC voltage measurement (DCV)	100mV	± ddd.ddE-03	± ddd.dddE-03	± ddd.ddddE-03	± ddd.ddddE-03
	1000mV	± dddd.dE-03	± dddd.ddE-03	± dddd.dddE-03	± dddd.ddddE-03
	10V	± dd.dddE + 00	± dd.ddddE + 00	± dd.dddddE + 00	± dd.ddddddE + 00
	100V	± ddd.ddE + 00	± ddd.dddE + 00	± ddd.ddddE + 00	± ddd.dddddE + 00
	1000V	± dddd.dE + 00	± dddd.ddE + 00	± dddd.dddE + 00	± dddd.ddddE + 00
2-wire resistance measurement (2WΩ) 4-wire resistance measurement (4WΩ)	10Ω	± dd.dddE + 00	± dd.ddddE + 00	± dd.dddddE + 00	± dd.dddddE + 00
	100Ω	± ddd.ddE + 00	± ddd.dddE + 00	± ddd.ddddE + 00	± ddd.dddddE + 00
	1000Ω	± dddd.dE + 00	± dddd.ddE + 00	± dddd.dddE + 00	± dddd.ddddE + 00
	10kΩ	± dd.dddE + 03	± dd.ddddE + 03	± dd.dddddE + 03	± dd.ddddddE + 03
	100kΩ	± ddd.ddE + 03	± ddd.dddE + 03	± ddd.ddddE + 03	± ddd.dddddE + 03
	1000kΩ	± dddd.dE + 03	± dddd.ddE + 03	± dddd.dddE + 03	± dddd.ddddE + 03
	10MΩ	± dd.dddE + 06	± dd.ddddE + 06	± dd.dddddE + 06	± dd.ddddddE + 06

- Special output value

  And then output the special valu[redacted]

  However, the mantissa digits Ta[redacted]ment data format".

Contents	value
Over-range (OL)	± 9.9000000E + 37
Result of the scaling operation is OVER	
dB / dBm calculation error	

2. Section 1, 3-8: Output data elements

Elements that are set to ON at the output data elements settings are output. Set to OFF
Constant item is not output.

Output data elements

Output item	Output content	Output character	number of characters
Claim 1 Function	DC voltage measurement (DCV)	"DCV"	Three letters
	2-wire resistance measurement (2WΩ)	"2WO"	
	4-wire resistance measurement (4WΩ)	"4WO"	
3. Comparator operation	PASS	", PAS"	comma +3 character
	FAIL	", FAL"	
	OFF	", OFF"	
Section 4 4W check	No disconnection	",OK "	
	Measured current HI terminal disconnection	", IHI"	
	Disconnection is measured voltage HI terminal	", VHI"	
	Disconnection measured voltage LO terminal	", VLO"	
	Break measured current or the measured voltage LO terminal	", VIL"	
	Function other than OFF or 4WΩ	", OFF"	
Section 5 NULL setting	ON	", NUL"	
	OFF	", OFF"	
Section 6 smoothing setting	ON	", SMO"	
	OFF	", OFF"	
Claim 7 MATH operation set	scaling	", SCL"	
	dB	", DB"	
	dBm	", DBm"	
	OFF	", OFF"	
Section 8 MAX / MIN operation set	ON	", MXN"	
	MAX	", MAX"	
	MIN	", MIN"	
	OFF	", OFF"	

If the output example) were all output

DCV + 1000.0000E-03, PAS, OFF, OFF, SMO, SCL, MAX

3. Section 9: block delimiter

End of one of the data are separated by the block delimiter.

Table 6-4 block delimiter

delimiter	Setup command	initial value
CRLF + EOI	DL0	●
LF	DL1	
EOI	DL2	

6.5.2 **ADC** Command Reference

It describes the ADC Command Reference of this instrument in this chapter.

"The initial value" refers to the state at the time of execution * RST command.

item	command	Contents	initial value
Measurement function	F1	DC voltage measurement (DCV)	●
	F3	2-wire resistance measurement (2WΩ)	
	F4	4-wire resistance measurement (4WΩ)	
	F?	Response: F01, F03, F04	
Trigger	* TRG	Trigger command	
measurement data memory	ST0	Store OFF	●
	ST1	Store ON	
	ST?	Response: ST0 or ST1	
	IRDn, m	read range setting n, m: 0 ~ 9999 • Parameters Not available	(0, 0)
	IRO?	Reading of data Response: " 6.5.1 output data format " reference	
	IRPO?	Read the number of data Response: IRPOddddd	
	IRNO?	Reading of the data range Response: IRNOdddd, dddd (If there is no data: IRNO0000, -001)	
	ICL	Initialization of the measurement data memory	

item		command	Contents	initial value
Trigger system	start	INI	Exit the IDLE state	
	Continue	INIC0	CONTINUOUS OFF	
		INIC1	CONTINUOUS ON	•
		INIC?	Response: INIC0 or INIC1	
	Trigger source Choice	TRS0	IMMEDIATE	•
		TRS1	MANUAL	
		TRS2	EXTERNAL	
		TRS3	BUS	
		TRS?	Response: TRS0 ~ TRS3	
	sampling· interval	TRTn	n: 0.003 ~ 3600 (in seconds)	(500ms)
		TRT?	Response: TRT + d.dddddE ± dd * 1	
	Trigger the number of times	TRNn	n: 1 ~ 50000 (times)	(1)
		TRN?	Response: TRNddddd	
	Trigger abort	ABO	Forced to move to the IDLE state	
	Trigger delay	TRDn	n: 0 ~ 3600 (in seconds)	(0)
		TRD?	Response: TRD + d.dddE ± dd (Decimal point position depends on the set value.)	
	The number of sampling times (In one of the trigger)	SPNn	n: 1 ~ 16000 (times)	(1)
		SPN?	Response: SPNddddd	
	Complete signal Output mode of	TRCM0	SINGLE	•
		TRCM1	MULTI	
		?	TRCM response: TRCM0 or TRCM1	
	complete Signal width	CW0	Output signal width designation of the complete signal: 5μs	•
		CW1	Output signal width designation of the complete signal: 100μs	
		CW?	Response: CW0 ~ CW1	

item		command	Contents			initial value
Measurement condition	Measurement range		DCV	2WΩ	4WΩ	
		R0	AUTO	AUTO	AUTO	•
		R2	-	10Ω	10Ω	
		R3	100mV	100Ω	100Ω	
		R4	1000mV	1000Ω	1000Ω	
		R5	10V	10kΩ	10kΩ	
		R6	100V	100kΩ	100kΩ	
		R7	1000V	1000kΩ	1000kΩ	

item		command	Contents		initial value
Measurement condition	Measurement range	R8	-	10MΩ	10MΩ	
		R?	Response: R0, R2-R8		
	Range Fix	RX	AUTO → MANUAL range switching		
	sampling· rate	PR0	FREE (if the sample period or the integration time has been changed, Responds the PR0.)		
		PR1	FAST		
		PR2	MED		
		PR3	SLOW		

	PR?	Response: PR0 ~ PR3	
Display digits	RE4	4 1/2 digit display	●
	RE5	5 1/2 digit display	
	RE6	6 1/2 digit display	
	RE7	7 1/2 digit display	
	RE?	Response: RE4 ~ RE7	
Integration time	ITPn	Set the integration time in the PLC unit (input value decomposition of the integration time Rounded by ability). n: 0.05 ~ 100 (the case of the power supply frequency 50Hz) n: 0.06 ~ 100 (the case of the power supply frequency 60Hz)	(Ten)
	ITP?	Response: ITP + d.dddddE ± dd	
	ITSn	Set the integration time in seconds (input value is the resolution of the integration time Rounded by). n: 0.001 ~ 2 (the case of the power supply frequency 50Hz) n: 0.001 ~ 1.666667 (case of power frequency 60Hz)	(0.2)
	ITS?	Response: ITS + d.ddddE ± dd	
Auto-zero	AZ0	OFF	
	AZ1	ON	●
	AZ2	ONCE (after execution, it will be auto-zero OFF.)	
	AZ?	Response: AZ0 or AZ1	
4 WΩ check	OCHK0	OFF	●
	OCHK1	ON	
	? OCHK	response: OCHK0 or OCHK1	

item	command	Contents	initial value
Calculation NULL operation	NL0	OFF	●
	NL1	ON	
	NL?	Response: NL0 or NL1	
	KNLn	Setting NULL constant -9.9999999E + 12 ~ + 9.9999999E + 12 Setting resolution: 0.0000001E-9 Note: When NULL operation OFF, not be set	(0)
	KNL?	Response: KNL ± D.DddddddE ± Dd * 1	
Smoothing operation	SM0	OFF	●
	SM1	ON	
	SM?	Response: SM0 or SM1	
	TIn	Smoothing the number of times n: 2 ~ 100 (times)	(Ten)
	TI?	Response: TIddd	
Scaling operation	SC0	OFF	●
	SC1	ON	
	SC?	Response: SC0 or SC1	
	KXn	X constant (0 (zero) is not configurable) -9.9999999E + 12 ~ + 9.9999999E + 12 Setting resolution: 0.0000001E-9	(1)
	KYn	Y constant -9.9999999E + 12 ~ + 9.9999999E + 12 Setting resolution: 0.0000001E-9	(0)
	KZn	Z constant	(1)

		-9.9999999E + 12 ~ + 9.9999999E + 12 Setting resolution: 0.0000001E-9	
	KXMD	Set the measured value to the X constant	
	KYMD	Set the measurement value Y constant	
	KZMD	Set the measurement value Z constant	
	KX?	Response: KX ± d.ddddddE ± dd * 1	
	KY?	Response: KY ± d.ddddddE ± dd	
	KZ?	Response: KZ ± d.ddddddE ± dd	
dB / dBm operation	DB0	dB operation OFF	•
	DB1	dB operation ON	
	DB2	dBm operation ON	
	DB?	Response: DB0 ~ DB2	

* 1: The decimal point position of the response is fixed.

item	command	Contents	initial value
Calculation dB / dBm operation	KDBn	D constant n: 0.0000001E-9 ~ 9.9999999E + 12	(1)
		Set the measurement value to KDBMD D constants	
	KDB?	Response: KDB ± d.ddddddE ± dd * 1	
MAX · MIN operation	MN0	MAX · MIN operation OFF	•
	MN1	MAX · MIN operation ON	
	MN?	Response: MN0 ~ MN1	
	MAX?	Read MAX value * 1 Response: MAX ± d.ddddddE ± dd	
	MIN?	MIN reading of * 1 Response: MIN ± d.ddddddE ± dd	
	AVE?	AVE read * 1 Response: AVE ± d.ddddddE ± dd	
	AVN?	Reading of the number of measurements * 1 Response: AVN ± d.ddddddE ± dd	
Comparator operation	CO0	OFF	•
	CO1	ON	
	CO?	Response: CO0 or CO1	
	HIn	HIGH constant -9.9999999E + 12 ~ + 9.9999999E + 12 Setting resolution: 0.0000001E-9	(0)
	LOn	LOW constant -9.9999999E + 12 ~ + 9.9999999E + 12 Setting resolution: 0.0000001E-9	(0)
	HIM	Set the measured value to the HIGH constant	
	LOM	Set the measured value to the LOW constant	
	HI?	Response: HI ± d.ddddddE ± dd * 1	
	LO?	Response: LO ± d.ddddddE ± dd * 1	
Path condition range setting	LOP0	Not the LO operation result and path conditions	•
	LOP1	The LO calculation result and the path condition	
	LOP?	Response: LOP0 or LOP1	
	MIP0	Not the GO of the operation result and path conditions	
	MIP1	The GO of the calculation result and path conditions	•
	MIP?	Response: MIP0 or MIP1	

* 1: The decimal point position of the response is fixed.

item	command	Contents	initial value
Calculation	Path condition range setting	HIP0 Not the HI of the operation result and path conditions	•
		HIP1 The HI calculation result and the path condition	
		HIP? Response: HIP0 or HIP1	
Statistical computation		SIRDn, range setting and execution of m statistical calculation n, m: 0 ~ 9999 Caution 1. there is data in the set range of the measurement data memory If it does not, will result in an error 2. You can not omit parameters	(0, -1)
		SIRD? Reading of the statistics calculation range Response: SIRDdddd, dddd (Initial state: SIRD + 0000, -0001)	
		Reading of the statistical computation result	
		SCNT? Reading of the number of samples Response: SCNT + d.ddddddE ± dd * 1	
		SMAX? The maximum value read Response: SMAX ± d.ddddddE ± dd * 1	
		SMIN? Minimum value read Response: SMIN ± d.ddddddE ± dd * 1	
		SAVE? The average value is read Response: SAVE ± d.ddddddE ± dd * 1	
		SSIG? Standard deviation value read Response: SSIG + d.ddddddE ± dd * 1	
		SPTP? MAX-MIN reading Response: SPTP ± d.ddddddE ± dd * 1	

* 1: The decimal point position of the response is fixed.

item		command	Contents	initial value
system	buzzer	BP0	OFF	

	BP1	When the comparator operation result is FAIL, the buzzer sounds
	BP2	When the comparator operation result is PASS, the buzzer sounds
	BP?	Response: BP0 ~ BP2
Power frequency	LF?	Response: 50Hz 60Hz
Initialization of the equipment	* RST	Initialization parameters
	CDV	Device Clear
Equipment information	* IDN?	Response: ADC Corp., 7470, nnnnnnnnn, mmm nnnnnnnnn: Serial No. mmm: Revision No.
output data· element	DFEn	Specifying the information to be added to the output data bit value (0) bit 9 7 6 5 3 2 0 :unused Output function (1) Output comparator result (4) Output 4W check the results (8) Output a NULL function ON / OFF (32) Output smoothing function ON / OFF (64) Outputs the operation setting state (128) MAX / MIN output operation state (512) You can set a plurality of items corresponding to the bit Example) When outputting function and NULL function ON / OFF DFE33
	DFE?	Response: DFEddddd
block· delimiter	DL0	CR / LF + EOI
	DL1	LF
	DL2	EOI
	DL?	Response: DL0 ~ DL2

item	command	Contents	initial value
system status	* CLS	Clear of each status byte	
	* STB?	Reading of the status byte register Response: ddd	
	* SREn	Setting the Service Request Enable register (SRER) n: 0 ~ 255 (However, bit6 is not configurable)	
	* SRE?	Response: ddd	
	* ESR?	Standard event status register read of (SESR) Look out Response: ddd	
	* ESEn	Standard Event Status Enable register Set of data (SESER) n: 0 ~ 255	
	* ESE?	Response: ddd	
	OSR?	Reading of the operation event register (OER) Response: ddddd	
	OSEn	Operation event enable register Set of (OEER) n: 0 ~ 65535	
	OSE?	Response: ddddd	

MSR?	Reading of Measurement Event Register Response: ddddd		
MSEn	Measurement Event enable register (MSE) Configuration n: 0 ~ 65535	(0)	
MSE?	Response: ddddd		
QSR?	Reading of Kuesshonaburu event register Response: ddddd		
QSEn	Kuesshonaburu event enable register (MSE) settings of n: 0 ~ 65535	(0)	
QSE?	Response: ddddd		
* PSCn	n: 0 ~ ± 32767 If n is non-zero, the following register is cleared when the power is turned on You. Service Request Enable register Standard event status enable les Register If 0 is set, the register is the power at turned Not cleared.	(1)	
* PSC?	Response: 0 or 1 (if a value other than 0 is set)		

6.5.2 ADC Command Reference

	item	command	Contents	initial value
system	The error queue	ERR?	Reading of error contents Response: ± ddd, "xxxxxxxxxx" Error string (up to 80 characters) Error code Error content of up to 20 will be saved. Error FIFO It is output in the system. • If 20 or more errors occurred, the last saved error There -350, it will be overwritten with the "Queue overflow". • If there is no error, + 0, responds with "No error".	
	Measurement data display	DS0	OFF	
		DS1	ON	•
		DS?	Response: DS0 or DS1	
	operation· complete	* OPC	All operations after the end of the standard event status register Set the "Operation complete" bit (bit0) of data.	
		* OPC?	Response: 1 (after all operation is completed)	
		* WAI	Waiting for the full operating end (GPIB only)	
	Self-test	* TST?	Execution and results reading (Execution time it takes. I will read the results after the end of execution .) response: 0: Pass 1: Fail	

item	command	Contents	initial value
system			
Proofreading	CAL0	The calibration mode to OFF (Write the calibration factor when exiting the calibration.)	●
	CAL1	The calibration mode to ON	
	CAL?	Response: CAL0 or CAL1	
	CALZF	external ZERO calibration (FRONT input) execution ※	
	CALZR	external ZERO calibration (REAR input) execution ※	
	CALDCn	DCV external calibration execution ※ n: 9.00000000 ~ 11.0000000 [V]	
	CALOHn	OHM external calibration execution ※ n: 9000.00000 ~ 11000.0000 [Ω]	
	ICAL	DCV, OHM internal calibration execution	
	ICALDC	DCV internal calibration execution	
	ICALDCT?	DCV reading of the internal temperature at the time of the internal calibration execution Response: ± d.ddddddddE ± dd	
	ICALOH	OHM internal calibration execution	
	ICALOHT?	OHM 5% 1 internal calibration reading of the run-time of the internal temperature Response: ± d.ddddddddE ± dd	
Configuration parameters	* SAVn	The configuration parameters, save to the area of non-volatile memory [n] n: 0 ~ 3	
	SINI	Set the value of the factory, to all areas of the [0] to [3]	
	* RCLn	load the configuration parameters of the non-volatile area of memory [n] n: 0 ~ 3	
	RINI	The value of the factory, loaded as setting parameters	
Input terminal	IN0	front	●
	IN1	rear	
	IN?	Response: IN0 or IN1	
GUARD set	LGU0	FLOAT	●
	LGU1	LOW	
	LGU?	Response: LGU0 or LGU1	
Internal temperature measurement	TIN?	Response: ± dd.dE + dd	

※: If it is not the calibration mode will result in an error.

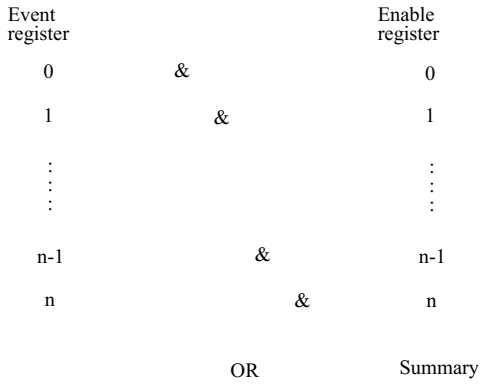
6.5.3 **SCPI** Command Reference

You can not use SCPI commands in the instrument.

6.5.4 Status register structure

In this instrument has a hierarchical status register structure conforming to IEEE standard 488.2-1987, machine
You can send a variety of state of the vessel to the controller. Here, the operation model of the status structure
This section describes the assignment of events.

Status register, the event register, and from the enable register.



- Event Register

  The event register holds latches the status corresponding to each event. (Strange
  There is also a case to hold the reduction.)
  If the register is set, or read in a query, until it is cleared by the * CLS
  In remains set.
  You can not write data to the event register.

- Enable register

  Enable register, which bits of the event registers and valid status
  Te Specifies whether to generate a summary. Enable register and event register
  Taken the AND, of the result OR is generated as a summary. Summary status
  It is written to the byte register.
  Enable register will write the data.

Status register of the instrument has the following five types.

- Status Byte Register (STB)
- Standard Lee base cement status register (SESR)
- Operation Event Register (OER)
- Kuesshonaburu Event Register (QSR)
- Measurement Event Register (MER)

1. Status Byte Register (STB)

Table 6-5 Status byte register

bit	name	Contents
0	MSB (Measurement Summary Bit)	ON: any of the events of the Measurement Event Register is generated, to 1 Was when, Measurement Event Enable Register corresponding bit of the 1 Der

This bit is set to 1 if Re
OFF: When Measurement Event Register is cleared by the reading,
It is set to 0

1 unused	Always 0
2 EAV (Error Available)	ON: when the error information is stored in the Error Queue, it is set to 1 OFF: Error Queue is read out and when it is empty, is set to 0
3 QSB (Questionable Summary Bit)	ON: any of the events of the Questionable Event Register is generated, to 1 The time, the corresponding bit is 1 der of Questionable Event Enable Register This bit is set to 1 if Re OFF: When the Questionable Event Register is cleared by the reading, It is set to 0
4 MAV (Message Available)	ON: When the output data in the output buffer is input, it is set to 1 OFF: When the output buffer is empty is read and set to 0
5 ESB (Standard Event Status)	ON: any of the events of SESR occurs, when it becomes 1, pair of SESER Response bits this bit is set to 1 if 1 OFF: (? * ESR) when SESR has been cleared by the reading, is set to 0 It is
6 MSS (Master Summary) RQS (Request Service)	ON: when any of the events of the STB has occurred, the corresponding bit of SRER 1 This bit is set to 1 if the ON: MSS generates a SRQ by become 1, RQS is 1. OFF: When the STB is read by a serial poll
7 OSB (Operation Summary Bit)	ON: any of the events of Operation Event Register is generated, has become 1 When the corresponding bit of the Operation Event Enable Register is equal to 1 This bit is set to 1 OFF: When the Operation Event Register is cleared by the read-out, 0 It is set to

6.5.4 Status register structure

- common conditions Status Byte Register is cleared

  All clear at power-up
  "* CLS" at all clear, but if the output buffer there is data, MAV bit is click
  Not rear
  "* STB?" Be read by not cleared

- conditions Service Request Enable Register is cleared

  At power on (when PSC flag is 1)
  "* SRE0" when you run the command

The structure of the status register of the instrument Figure 6-3 shows in.

Figure 6-3 Status byte structure

2. Standard Event Status Register (SESR)

Table 6-6 Standard Event Status Register

bit	name	Contents
0	OPC (Operation Complete)	ON: * is set after receiving OPC command, to 1 when the overall operation of the running is completed It is
1	unused	Always 0
2	unused	Always 0
3	DDE (Device Dependent Error)	ON: When device-dependent error occurs, it is set to 1
4	EXE (Execution Error)	ON: When the command received is currently not executable, it is set to 1
5	CME (Command Error)	ON: When the spelling of the received command was wrong, it is set to 1
6	MSS (Master Summary)	Always 0
7	PON (Power On)	ON: when the power is OFF → ON, it is set to 1

- Common conditions Standard event status register is cleared
  All clear at power-up
  * All in CLS Clear
  * Are all cleared by reading in the ESR?
- Conditions Standard event status enable register is cleared
  At power on (when PSC flag is 1)
  "* ESE0" when you run the command

3. Measurement Event Register

Table 6-7 Measurement Event Register

bit	name	Contents
0	FL (FAIL)	ON: When the comparison operation result is FAIL condition is set to 1
1	PS (PASS)	ON: when the comparison operation result coincides with PASS condition is set to 1
2	unused	Always 0
3	unused	Always 0
4	OK (4W Ohm check OK)	When 4WΩ check result is OK, it is set to 1
5	NG (4W Ohm check NG)	When 4WΩ check result is NG, it is set to 1
6	unused	Always 0
7	unused	Always 0
8	EOM (End of measure)	ON: When the measurement is completed, is set to 1
9	EOS (End of store)	ON: When the measurement data can no longer store any more measurements memory, 1 It is set to
10	SM (Smoothing)	ON: When smoothing number reaches a specified number, it is set to 1
11	STAT (Statistics)	ON: When statistical processing is completed, is set to 1
12	unused	Always 0
13	unused	Always 0
14	unused	Always 0
15	unused	Always 0

- Common conditions Measurement Event Register is cleared
  All clear at power-up
  "* CLS" command input
  When you read in the "MSR?" Command
- Conditions Measurement event enable register is cleared
  All clear at power-up
  "MSE0" when you run the command

4. Operation Event Register

Table 6-8 Operation Event Register

bit	name	Contents
0	Calibrating	When the CAL has been completed, it is set to 1
1	unused	Always 0
2	unused	Always 0

3	unused	Always 0
Four	unused	Always 0
5	Waiting for TRIG	ON: When you enter the Trigger Layer, it is set to 1
6	unused	Always 0
7	unused	Always 0
8	unused	Always 0
9	Idle	ON: when it becomes idle state, is set to 1
10	unused	Always 0
11	unused	Always 0
12	unused	Always 0
13	unused	Always 0
14	unused	Always 0
15	unused	Always 0

- Common condition that operation event register is cleared
  All clear at power-up
  "* CLS" command input
- Conditions for operation event enable register is cleared
  All clear at power-up
  "MSE0" when you run the command

6.5.4 Status register structure

5. Questionable Event register

Table 6-9 Questionable Event register

bit	name	Contents
0	Voltage Overload	ON: When OL occurs in the voltage measurement, it is set to 1
1	unused	Always 0
2	unused	Always 0
3	unused	Always 0
Four	unused	Always 0
5	Waiting for TRIG	Always 0
6	unused	Always 0
7	unused	Always 0
8	Summary of Calibration	ON: by the calibration data SUM abnormality in the check when the power is ON, default DOO calibration values, or to use the calibration values of the previous power ON, the 1 It is set
9	Ohms Overload	ON: When OL occurs in resistance measurement, it is set to 1
10	unused	Always 0
11	unused	Always 0
12	Alarm	ON: When an alarm occurs in the measurement, it is set to 1
13	unused	Always 0
14		
15	unused	Always 0

- Common conditions Questionable event register is cleared
  All clear at power-up

"* CLS" command input
"QSR?" When I read in the command

- Conditions Questionable event enable register is cleared
  All clear at power-up
  "QSE0" when you run the command

6.6サンプル・プログラム

ここでは、GPIB を使用して本器をパーソナル・コンピュータから操作する基本的なプログラム例を説明します。

【動作確認環境】

パーソナル・コンピュータ：	富士通株式会社製 FMV-5350ML3 (OS:Windows98)
GPIB ハードウェア：	NATIONAL INSTRUMENTS 社製 PCI-GPIB
モジュール：	Niglobal.bas,Vbib-32.bas（PCI-GPIB に付属のソフトウェア）
言語：	Microsoft Excel Visual Basic Application

例 1　直流電圧 10V レンジで測定し、その測定データを 7470 から読み込みます。
7470 の GPIB アドレスは 1 に設定してあります。

```
Dim DMM_ADR As Integer              '7470 の GPIB アドレス変数を宣言する
Dim dmm As Integer                  ' デバイス・ディスクリプタの変数を宣言する
Dim dt As String * 100              'GPIB データ受信用バッファの変数を宣言する

DMM_ADR = 1                         '7470 の GPIB アドレス

Call ibdev(0, DMM_ADR, 0, T10s, 1, 0, dmm)
                                    'GPIB I/F の初期化を行う
Call ibconfig(dmm, IbcUnAddr, 1)    ' 送受信ごとのアドレス設定を行う
Call ibwrt(dmm, "*RST" & Chr(10))   '7470 の初期化を行う

Call ibwrt(dmm, "DFE1" & Chr(10))   ' 出力データのヘッダを ON にする
Call ibwrt(dmm, "F1" & Chr(10))     ' 測定ファンクションを DCV に設定する
Call ibwrt (dmm, "R5" & Chr (10))   'To set the measurement range to 10V
Call ibwrt (dmm, "PR3" & Chr (10))  The set to SLOW 'sampling rate

Call ibrd (dmm, dt)                 'Substitutes the measured value to a variable

Cells (1, 1) = Left (dt, 17)        'Substitutes the measured value in cell

Call ibonl (dmm, 0)                 ' finish
```

Example 2 Set the measurement function in the 2-wire resistance measurement, the measurement is completed by the status byte Detected, reads the measurement data from 7470.
GPIB address of the 7470 It is set to 1.

```
Dim DMM_ADR As Integer              Declare the GPIB address variable of the '7470
Dim dmm As Integer                  Declare a 'device descriptor of the variable
Dim dt As String * 100              Declare a 'GPIB data of the receiving buffer variable

DMM_ADR = 1                         '7470 GPIB address of

Call ibdev (0, DMM_ADR, 0, T10s, 1, 0, dmm)
                                    Perform the initialization of 'GPIB I / F
Call ibconfig (dmm, IbcUnAddr, 1)   An address setting for each 'transmission and reception
Call ibwrt (dmm, "* RST" & Chr (10)) Perform the initialization of the '7470

Call ibwrt (dmm, "DFE1" & Chr (10)) 'Is turned ON header of the output data
Call ibwrt (dmm, "F3" & Chr (10))   'To set the measurement function to 2WΩ
Call ibwrt (dmm, "R4" & Chr (10))   'To set the measurement range to 1kΩ
Call ibwrt (dmm, "ITP1" & Chr (10)) 'To set the integration time to 1PLC
Call ibwrt (dmm, "TRS3" & Chr (10)) The 'trigger to the bus
Call ibwrt (dmm, "* CLS" & Chr (10)) To clear the 'status byte

Call ibwrt (dmm, "* TRG" & Chr (10))Make a 'trigger

Do                                  Read the status byte of the 'end of the measurement
  Call ibwrt (dmm, "* STB?" & Chr (10))
                                    To request the 'contents of the status byte
  Call ibrd (dmm, dt)               Put the contents of the status byte in the 'variable dt
  dt = dt And 16                    A logical product by 'bit4 (MAV)
Loop While (dt <> 16)

Call ibrd (dmm, dt)                 Read the 'measurement data

Cells (1, 1) = Left (dt, 17)        'Substitutes the measured value in cell

Call ibonl (dmm, 0)                 ' finish
```

specification

7.1 Performance Specifications

7.1.1 DC voltage measurement **(DCV)**

Input terminal	range	7 1/2 digit display * 1 The maximum display	7 1/2 digit display * 1 resolution	6 1/2 digit display * 1 The maximum display	6 1/2 digit display * 1 resolution	Input impedance
VΩ HI-LO	100mV	119.9999	100nV	119.9999	100nV	
	1000mV	1199.9999	100nV	1199.999	1μV	More 1GΩ
	10V	11.999999	1μV	11.99999	10μV	
	100V	119.99999	10μV	119.9999	100μV	10MΩ ± 1%
	1000V	1099.9999	100μV	1099.999	1mV	10MΩ ± 1%

* 1: 7 1/2 digit display is the integration time 1PLC more (100mV range is 6 1/2 digits)
6 1/2 digit display is the integration time 1msec more

Measurement Accuracy ± (Ppm Of Reading Tasu Digits), when the auto-zero ON

Temperature coefficient ± (ppm of reading + digits-) / ° C , when the auto-zero ON

Temperature Range ° 0 C ~ + 18 ° C , + 28 ° C ~ + 45 ° C in

• 6 1/2 digit display

Integration time	range	Measurement Accuracy 24 hours * 2 23 ◦ C ± 1 ◦ C	90 days 23 ◦ C ± 5 ◦ C	1 year 23 ◦ C ± 5 ◦ C	Temperature coefficient * 3 INTCAL None	INTCAL There
5PLC ~ 100PLC	100mV	25 + 20	25 + 20	35 + 20	4 + 3	0.8 + 3
	1000mV	15 + 4	18 + 4	25 + 4	4 + 0.3	0.8 + 0.3
	10V	10 + 2	15 + 2	20 + 2	3 + 0.2	0.6 + 0.2
	100V	15 + 4	25 + 4	35 + 4	4 + 0.3	0.8 + 0.3
	1000V	17 + 3	25 + 3	35 + 3	4 + 0.3	0.8 + 0.3

* 2: Value relative to calibration standards
* 3: INTCAL None If you do not run the INTCAL regardless of the temperature change in the ambient
INTCAL there when running INTCAL according to ambient temperature change

Added by the integral time setting error

Integration time		Additional error ± (digits + μV)
1ms ≤ IT <1PLC	Including FAST	2 + 20
1PLC ≤ IT <5PLC	Including MED	1 + 0

7.1.1 DC voltage measurement (DCV)

• 7 1/2 digit display

Integration time	range	Measurement Accuracy 24 hours * 2 23 ◦ C ± 1 ◦ C	90 days 23 ◦ C ± 5 ◦ C	1 year 23 ◦ C ± 5 ◦ C	Temperature coefficient * 3 INTCAL None	INTCAL There
5PLC ~ 100PLC	100mV	6 1/2 digits similar to the				
	1000mV					
	10V					
	100V	The digit terms in measurement accuracy of 61/2 digit tenfold				
	1000V					

* 2: Value relative to calibration standards
* 3: INTCAL None If you do not run the INTCAL regardless of the temperature change in the ambient
INTCAL there when running INTCAL according to ambient temperature change

The maximum allowable applied voltage

Between VΩHI-VΩLO terminal	1000Vpeak
VΩLO terminal - between the chassis	100V

Between VΩLO-GUARD terminal	50Vpeak
GUARD terminal - between the chassis	100V

Noise removal

Integration time	The effective CMRR 50 / 60Hz ± 0.08%	DC	NMRR 50 / 60Hz ± 0.08%
10msec or less	100dB	140dB	0dB
Integer multiple of 1PLC	160dB	140dB	60dB

Between GUARD-VLO terminals, unbalanced impedance 1kΩ

7.1.2 Resistance measurement **(2W** Omega **, 4W** Omega **)**

Input terminal	range	The maximum display 7 1/2 digits * 4	resolution 7 1/2 digits	6 1/2 digits	Measured current	inter-open-terminal voltage	The maximum allowable resistance (including line resistance)
Vomega HI-LO 4WΩHI-LO	10Ω	11.99999	10μΩ	10μΩ	10mA	23V	12Ω
	100Ω	119.99999	10μΩ	100μΩ	10mA	23V	120Ω
	1000Ω	1199.9999	100μΩ	1mΩ	1mA	23V	1200Ω
	10kΩ	11.999999	1mΩ	10mΩ	1mA	23V	12kΩ
	100kΩ	119.99999	10mΩ	100mΩ	100μA	23V	100kΩ
	1000kΩ	1199.9999	100mΩ	1Ω	10μA	17V	1000kΩ
	10MΩ	11.999999	1Ω	10Ω	1μA	17V	10MΩ

* 4: 7 1/2 digit display is the integration time 1PLC more (10Ω range is 6 1/2 digits)
6 1/2 digit display is the integration time 1msec more

Measurement Accuracy ± (Ppm Of Reading Tasu Digits), when the auto-zero ON

Temperature coefficient ± (ppm of reading + digits-) / ° C , when the auto-zero ON

Temperature Range ° 0 C ~ + 18 ° C , + 28 ° C ~ + 45 ° C in

• 6 1/2 digit display

Integration time	range	Measurement Accuracy 24 hours * 5 23 ◦ C ± 1 ◦ C	90 days 23 ◦ C ± 5 ◦ C	1 year 23 ◦ C ± 5 ◦ C	Temperature coefficient * 6 INTCAL None	INTCAL There
5PLC ~ 100PLC	10Ω	30 + 28	50 + 28	60 + 28	4 + 3	2 + 3
	100Ω	30 + 6	40 + 6	50 + 6	4 + 0.3	2 + 0.3
	1000Ω	20 + 3	30 + 3	50 + 3	4 + 0.3	2 + 0.3
	10kΩ	20 + 3	30 + 3	50 + 3	4 + 0.3	2 + 0.3
	100kΩ	20 + 3	30 + 3	50 + 3	4 + 0.3	2 + 0.3
	1000kΩ	30 + 3	50 + 3	60 + 3	4 + 0.3	2 + 0.3
	10MΩ	150 + 3	200 + 3	250 + 3	15 + 0.2	5 + 0.2

*Five Value relative to calibration standards
* 6: INTCAL None If you do not run the INTCAL regardless of the temperature change in the ambient
INTCAL there when running INTCAL according to ambient temperature change

Added by the integral time setting error

Integration time		Additional error ± (digits + mΩ)
1ms ≤ IT <1PLC	Including FAST	2 + 20
1PLC ≤ IT <5PLC	Including MED	1 + 0

7470 digital multimeter instruction manual

7.1.2 resistance measurement (2WΩ, 4WΩ)

• 7 1/2 digit display

Integration time	range	Measurement Accuracy 24 hours * 5 23 ◦ C ± 1 ◦ C	90 days 23 ◦ C ± 5 ◦ C	1 year 23 ◦ C ± 5 ◦ C	Temperature coefficient * 6 INTCAL None	INTCAL There
5PLC ~ 100PLC	10Ω	6 1/2 digits similar to the				
	100Ω					
	1000Ω					
	10kΩ	The digit terms in measurement accuracy of 61/2 digit tenfold				
	100kΩ					
	1000kΩ					
	10MΩ					

*Five-Value relative to calibration standards
* 6: INTCAL None If you do not run the INTCAL regardless of the temperature change in the ambient
INTCAL there when running INTCAL according to ambient temperature change

The maximum allowable applied voltage

Between VΩHI-VΩLO terminal	1000Vpeak
VΩLO terminal - between the chassis	100V
Between VΩLO-GUARD terminal	50Vpeak
GUARD terminal - between the chassis	100V
Between 4WΩHI-4WΩLO terminal	300Vpeak
4WΩHI, LO terminal - between the chassis	250V
4DaburyuomegaHI, between LO-GUARD terminal	200Vpeak

7.1.3 Measurement time (typical)

The time required for the trigger input to the measurement data acquisition (typical)

Measurement condition
Trigger source: IMMEDIATE
Memory Store: OFF
Range: Fixed (Auto range OFF)
Display: OFF
Other settings are initial value
2W Omega / 4W Omega is 10Ω range

1. auto-zero OFF

RATE set	Measurement speed (time) DCV	2WΩ	4WΩ	Integration time	Display digits
FAST	212 times / s (4.7ms)	212 times / s (4.7ms)	81 times / s (12.3ms)	2m	6 1/2
MED	20 times / s (50ms)	20 times / s (50ms)	20 times / s (50ms)	1PLC	7 1/2
SLOW	2 times / s (500ms)	2 times / s (500ms)	2 times / s (500ms)	10PLC	7 1/2

2. auto-zero ON

RATE set	Measurement speed (time) DCV	2WΩ	4WΩ	Integration time	Display digits
FAST	119 times / s (8.4ms)	84 times / s (11.8ms)	81 times / s (12.3ms)	2m	6 1/2
MED	20 times / s (50ms)	20 times / s (50ms)	20 times / s (50ms)	1PLC	7 1/2
SLOW	2 times / s (500ms)	2 times / s (500ms)	2 times / s (500ms)	10PLC	7 1/2

7.1.4 Arithmetic function

• NULL operation
Display value (NULL) = measured value - NULL Constant

• Smoothing operation
Display value (SM) = moving average value of the specified number of times

• Comparator operation
Judgment (HIGH) ← HIGH set value <measurement value
Judgment (LOW) ← measured value <LOW set value
Judgment (GO) ← LOW set value ≤ measurement value ≤ HIGH set value

- Scaling operation
  Display value (SCL) = (measured value - Y) / X × Z
  X, Y, Z, a constant (set value)
- MAX · MIN operation
  Display value (MAX) = maximum measurement value after the calculation start
  Display value (MIN) = minimum measured value after the calculation start
  Average (AVE) = arithmetic average after the operation start (remote output only)
- dB · dBm operation
  dB display = 20log (measured value / D)
  dBm Display value = 10 log ((measured value) ^{2} / D) / 10^{-3}
  D constant (set value)
- Statistical computation
  The number of samplesThe number of display values (SAMPLE) = measured value in the specified range in the measurement memory

Maximum value	Display value (MAX) = maximum measured value of the specified range in the measurement memory
minimum value	Display value (MIN) = minimum measured value of the specified range in the measurement memory
Average value	Display value (AVE) = average value of the specified range in the measurement memory
standard deviation	Display value (SIGMA) = standard deviation of the specified range in the measurement memory
The variation width	Display value (PP) = a specified range in the measurement memory (maximum measured value) - (minimum measure Value)

7.2 Interface Specifications

item	specification
Remote control	
Remote command	Conform to the ADC command system
interface	GPIB or USB select either
USB (for maintenance)	
standard	USB2.0 Full speed compliant
connector	Type B
GPIB	
standard	IEEE488.2 compliant
connector	24-pin Amphenol
Interface function	SH1, AH1, T5, L4, SR1, RL1, PP0, DC1, DT1, C0, E2
Output format	ASCII
Addressing	Specify the 31 types of talker / listener address from the front panel
External trigger signal	
connector	BNC
Signal level	TTL, falling edge detection
pulse width	1μs more
Complete signal output	
connector	BNC
Signal level	TTL, negative pulse
Sink current	20mA or less
pulse width	About 5μs / 100μs selection

7.3 General specifications

item	specification
Use environment range	Ambient temperature: 0 ° C ~ + 45 ° C Relative humidity: less than 85% RH, non-condensing 1 M.OMEGA, hereinafter RH 65% in 10MΩ range
Save environment range	Ambient temperature: -25 ° C ~ + 70 ° C Relative humidity: less than 85% RH, non-condensing
Warm-up time	60 minutes or more
display	Decimal 8-digit, 7-segment fluorescent display tube display
Range switching	Automatic and manual
Input Method	Floating and guarded system
Measurement method	Integration method
Excessive input display	OL display, ERR display
The maximum allowable applied voltage	Chassis: Each input terminal 4WΩ HI: 1000Vpeak VΩ HI: 1000Vpeak 150Vpeak 4WΩ LO: 150Vpeak 200Vpeak VΩ LO: 150Vpeak 1000Vpeak 150Vpeak GUARD: 150Vpeak 200Vpeak 1050Vpeak 200Vpeak Chassis: 100V 100V 250V 1100V 250V
memory	Data memory: Up to 10000 data Condition setting memory: 4 (USER0 ~ USER3)
Trigger function	External trigger: an external trigger signal Panel key BUS (GPIB, USB)
Power supply	AC power: 100V / 120V / 200V / 220V The power supply voltage can be specified by the option specified AC power supply 100/120/200 / 220V (can be switched by the user) Option No. standard OPT.32 OPT41 OPT.42 Power-supply voltage 100V 120V 200V 220V Specify when ordering If you want to change the power supply voltage by the user is, you are using a compatible cable and a fuse Please give me.
Power frequency	50Hz / 60Hz
power consumption	44VA below
External dimensions	About 424 (width) × 88 (height) × 340 (depth) mm
mass	6.6kg below
safety	IEC61010-1 compliant, measurement category II
EMC	EN61326 classA

8. maintenance

In this chapter, the order to maintain the performance of the instrument, describes the following information about the maintenance.

8.1 Replacing the fuse

The fuse of the instrument, there is a power fuse. Replace according to the following procedure.

Caution

1. In order to avoid a fire or electric shock, when replacing the fuse, Table 8 's going to use a fuse that has been described in 1 . Or using an unspecified fuses, shorting the fuse holder, Never Please out.
2. There is no sure only the Visually inspect the fuse has been cut. Measure the resistance value, the quality Please refer to the judgment. (If 15Ω or less is normal.)
3. Internal to the instrument, or cutting the external protective conductor, removing the wiring of the protective conductor terminal of the instrumen Please do not absolutely done. Impair the safety.

Table 8-1 Fuse rating and Compliance

Power-supply voltage	Maker	Manufacturer Name	Regulatory Compliance	Rating capacity / voltage
100V / 120V	Co., Ltd. Littelfuse	0218.500XP	IEC60127-2 sheet3	0.50A / 250V
200V / 220V	Co., Ltd. Littelfuse	0218.315XP	IEC60127-2 sheet3	0.315A / 250V

8.1.1 Replacing the power supply fuse

Power fuse is located in the AC power supply within the connector on the back panel.

A check and how to replace the power fuse is shown below.

Power fuse replacement method

1. Please disconnect the power cable from the instrument.
2. Press the tab, pull the fuse holder.

3. Check the fuse, if there is a need of replacement, and replace.
4. Replace the fuse holder.

8.2 cleaning

In this case, the instrument of cleaning methods procedure, describes the notes.

Warning To avoid electric shock, please disconnect it from the instrument all of the cables.
Internal cleaning of opening the lid, please do not absolutely.

8.2.1 Cabinet Cleaning

Clean the instrument, please wipe off properly with a soft cloth (or damp cloth).

Caution

1. or remain fluff of the cloth, please do not soak into the interior of the instrument water.
2. organic solvents such as to alter the plastics (e.g., benzene, toluene, xylene, Acetone, etc.) and cleanser, please do not use.

8.2.2 Other cleaning

Please do accumulation of dust on the periphery of the instrument.

WARNING AC power connector, dust adhering to the power plug, please remove regularly. Dust ye
The circle and moisture, tracking phenomenon but it may cause a fire occurs.

8.3 Calibration

The calibration of the instrument, internal calibration to be executed only by external calibration and, the instrument to be calibrated by connecting a
(INTCAL) there is. To maintain the measurement accuracy, the least for each external calibration warranty (1 year)
Please execute once also.

8.3.1 Preparation of calibration

1. Power
   The power source, table 3-4 in the commercial power supply voltage range, frequency AC power 50Hz or 60Hz
   Please use.
2. environment
   Calibration, please do the following environments.
   Temperature: + 23 ± 1 ° C
   Humidity: 65% RH or less
   Dust, vibration, wind, location that does not cause the noise
3. Warm-up time
   Before performing the calibration, please take 60 minutes or more of the warm-up time.
   In addition, please also take a warm-up time of the specified equipment required for calibration.

8.3.2 Calibration standards

External calibration standards Table 8 Please use standards of accuracy shown in 2.

Table 8-2 for calibration standards

Calibration standards	Range of use	Accuracy
zero	0 V	short
DC voltage	+ 10V	± 0.9ppm
resistance	10kΩ	± 12ppm

8.3.3 Calibration point (external calibration)

This instrument, please calibrate the calibration of the following items.

1. zero point of the front input terminals

   Done in order to remove the error of the front input portion of the instrument.

2. zero points on the rear input terminals

   Done in order to remove the error of the rear input portion of the instrument.

3. DCV

   Do the pricing of the internal reference voltage source of the instrument.
   When you run the DCV external calibration INTCAL DCV will also be performed.

4. OHM

   Do the pricing of the internal reference resistance of the instrument.
   INTCAL OHM When you run the OHM external calibration is also performed.

Table 8-3 calibration points

item	Calibration point
The zero point of the front input terminals	0V / 0Ω
Zero points on the rear input terminals	0V / 0Ω
DCV	+ 10V
OHM	10kΩ

8.3.4 Calibration procedure

8.3.4.1 External calibration procedure

Calibration, zero point, DCV, please run the calibration in the order of OHM.

1. Setting the calibration mode

   Menu / remote command to perform the external calibration, the instrument is set to calibration mode
   It will be executed only if you.

   Set to the calibration mode, **MENU** of **9 MAINT** Select the ON from the 'CAL'.

   When you migrate to the calibration mode, CAL indicator lights.

2. zero-point calibration of the front input terminals

   1. short-circuit the front input terminals with a short bar of copper.
   2. Wait heat until equilibrium can be taken. (About 5 minutes)

Figure 8-1 zero-point calibration of the front input terminal

Contents	operation	Character display unit
3. Select a maintenance	**MENU** Press the,, in **9 MAINT** The Choose.	..9 .. MENU MAINT
4. Select the zero calibration	**ENTER** Press the,, in 'Z.CAL' Choose.	MAINT ZCAL

Contents	operation	Character display unit
5. Select the front input terminals	**ENTER** Press the,, in 'FRONT' Choose.	ZCAL FRONT
6. perform the zero calibration	**ENTER** Run the calibration Press.	Frnt 100 ZEROF mV DC
	Display function during the calibration run, the range	
7. If the calibration is successful, display the DONE about 1 second, return to 4 You.		ZCAL DONE
8. If an error occurs, an error number, to return to the 5. At this time In You can check the calibration error number. The error number and its factors Table 8-9 shows in.		Err No ZCAL FRONT

If you are interrupted during calibration, **EXIT** When you press, the calibration data is missing from the menu without being updated

You.
If you want to terminate the calibration, **9 MAINT** To select OFF from the category hierarchy 'CAL'.

The execution of the front input terminals zero-point calibration will take about 1 minute and 30 seconds.

3. zero-point calibration of the rear input terminals

1. short-circuit the rear input terminals with a short bar of copper.
2. Wait heat until equilibrium can be taken. (About 5 minutes)

Figure 8-2 zero-point calibration of the rear input terminals

8.3.4 calibration procedure

Contents	operation	Character display unit
3. Select a maintenance	**MENU** Press the,, in **9 MAINT** The Choose.	..9 .. MENU MAINT
4. Select the zero calibration	**ENTER** Press the,, in 'Z.CAL' Choose.	MAINT ZCAL
5. Select the front input terminal	**ENTER** Press the,, in 'REAR' Choose.	ZCAL REAR
6. perform the zero calibration	**ENTER** Run the calibration Press. Display function during the calibration run, the range	rEAr 100 ZEROR mV DC
7. If the calibration is successful, display the DONE about 1 second, return to 4 You.		ZCAL DONE
8. If an error occurs, an error number, to return to the 5. At this time In You can check the calibration error number. The error number and its factors Table 8-9 shows in.		Err No ZCAL REAR

If you are interrupted during calibration, **EXIT** When you press, the calibration data is missing from the menu without being updated You.
If you want to terminate the calibration, **9 MAINT** To select OFF from the category hierarchy 'CAL'.

The execution of the rear input terminals zero-point calibration will take about 1 minute and 30 seconds.

4. Calibration of DCV

note Please go to the front input terminals zero point calibration before the execution of the DCV external calibration.

1. DC voltage standards in front input Figure 8 and connected as 3.
2. Wait heat until equilibrium can be taken. (About 5 minutes)

Figure 8-3 DCV calibration

Contents	operation	Character display unit
3. Select a maintenance	**MENU** Press the,, in **9 MAINT** The Choose.	..9 .. MENU MAINT
4. Select the DCV calibration	**ENTER** Press the,, in 'V.CAL' Choose.	MAINT VCAL
5. input of the calibration value	**ENTER** Press and, in moves to the next digit, , In and change the value, set the calibration value	'10.0000000 VCAL V
6. DCV perform the calibration	**ENTER** Run the calibration Press.	VCAL V
7. If the calibration is successful, display the DONE about 1 second, back to 4 I will do.	Display function during the calibration run, the range	VCAL DONE
8. If an error occurs, an error number, to return to the 5. At this time In You can check the calibration error number. The error number and its factors Table 8-9 shows in.		Err No MAINT VCAL

If you are interrupted during calibration, **EXIT** When you press, the calibration data is missing from the menu without being updated

You.
If you want to terminate the calibration, select OFF from the category hierarchy 'CAL'.
DCV will take about 2 minutes to run external calibration.

Calibration of 5. OHM

note Please go to DCV external calibration before the execution of the OHM external calibration.

1. Front input terminal to the resistor standards figure 8-4 4 terminal connection as.
2. Wait heat until equilibrium can be taken. (About 5 minutes)

Figure 8-4 OHM calibration

Contents	operation	Character display unit
3. Select a maintenance	**MENU** Press the,, in Choose.	**9 MAINT** The ..9 .. MENU MAINT
4. Select the OHM calibration	**ENTER** Press the,, in 'Ω.CAL' Choose.	MAINT Ω.CAL

Contents	operation	Character display unit
5. input of the calibration value	**ENTER** Press and, in moves to the next digit, , In and change the value, set the calibration value	'10.0000000 Ω.CAL V
6. Run the OHM calibration	**ENTER** Run the calibration Press.	Ω.CAL V
7. If the calibration is successful, display the DONE about 1 second, back to 4	Display function during the calibration run, the range	Ω.CAL

	I will do.	DONE
8. If an error occurs, an error number, to return to the 5.		Err No MAINT
	At this time In You can check the calibration error number.	Ω.CAL
	The error number and its factors Table 8-9 shows in.	

If you are interrupted during calibration, **EXIT** When you press, the calibration data is missing from the menu without being updated You.

If you want to terminate the calibration, **0 MAINT** select OFF from the category hierarchy 'CAL'.

The execution of the OHM external calibration will take about 4 minutes.

8.3.4.2 Internal calibration **(INTCAL)** procedure

Internal calibration When there is a temperature change of more than ± 5 ° C from the previous internal calibration ambient temperature, or more t Please be executed when the above passage.

The internal calibration, there are three kinds of items.

- ALL

  Perform calibration of all functions / whole range of the instrument.

- DCV

  Run the calibration of the DCV function.

  Please be sure to run because it is also required for calibration of resistance function.

- OHM

  Run the calibration of resistance function.
  If you want to use only the DCV function it can be omitted.

1. Please remove all connection of the front and back of the input terminals.
   In addition, while running the calibration, please do not touch the terminals.

Contents	operation	Character display unit
2. Select the maintenance	**MENU** Press the,, in **9 MAINT** The Choose.	..9 .. MENU MAINT
3. Select the internal calibration	**ENTER** Press the,, in 'IN.CAL' Choose.	MAINT INCAL
4. Select the calibration item	**ENTER** Press the,, in ALL / DCV / Select the OHM.	INCAL ALL
5. perform an internal calibration	**ENTER** Run the calibration Press.	10 INCAL V
	Display function during the calibration run, the range	
6. If the calibration is successful, display the DONE about 1 second, return to 3		INCAL
	You.	DONE
7. If an error occurs, an error number, and return to the 4.		Err No MAINT
	At this time In You can check the calibration error number.	INCAL
	The error number and its factors Table 8-9 shows in.	

If you are interrupted during calibration, **EXIT** When you press, the calibration data is missing from the menu without being updated You.

The execution of the internal calibration ALL it takes about 4 minutes and 30 seconds.

8.4 for the exchange of life parts

The instrument the life parts that are used in the (specific), are shown in the following table.
Please ordering the exchange referring to the recommended replacement period shown in the table below.

However, the field of use of the product environment, frequency of use, the replacement time than the lifetime that has been described by conservati
Since there is a case, please understand beforehand.

Note described to have life, recommended replacement time is a reference information, be construed as a guarantee the life of the part not.

Table 8-4 lifetime parts

Part Name	Estimated exchange
Function, range switching relay	Million times
Front / rear input terminal switching relay	Million times
Panel key	500,000 times
Fluorescent display tube	20000 hours
cooling fan	40000 hours

7470 digital multimeter instruction manual

For disposal and recycling of 8.5 products

8.5 for the disposal and recycling of products

If you want to dispose of this product, local governments, in accordance with the rules as determined by the government, please be treated properly.

Before being discarded, by pre-separation processing objects in the table below, the global environment, the human body, Oyo
To fine-ecosystem will be anti-diffusion of substances adversely affecting.

Note: If disposal skilled in the introduction is required, our business, or to the call center you Toiawaseku
Please.

Substance name or The name of the separation	Of use Whether or not	use Part	unit	parts
Polychlorinated biphenyls (PCB)	Nothing	-		
Capacitors, including the				
Components containing mercury	No	-		
battery	Nothing	-		
Printed board	Yes	Body	PANEL DIGITAL REFERENCE ANALOG	Printed circuit board
Toner cartridge	Nothing	-		
Including the brominated flame retardant plastic	Yes	Body	BPL-033603 BPK-033602X02 BPJ-033601 BPF-033740	Connector, diode, Zener diode, Photo coupler, FET, Analog IC, Logic IC, FLASH, Transistor
Including asbestos and asbestos parts	Nothing	-		
Cathode-ray tube	Nothing	-		
Carbide chlorofluorinated element (CFC), Hydrocarbons chlorofluorinated hydrocarbon (HCFC), carbide hydrogen fluoride (HFC) or hydrocarbon (HC)	Nothing	-		
Discharge lamp	Nothing	-		
Area 100 square cm or more of Liquid crystal display	Nothing	-		
Covered electrical cable	Yes	Between the body		power cable Input cable

8-14

7470 digital multimeter instruction manual

8.6 storage method

Substance name or	Of use	use	unit	parts

The name of the separation [illegible]	Without or with	Part		
Refractory ceramic fiber Parts, including	Nothing	-		
Parts, including radioactive materials	Nothing	-		
Including the substances of co[illegible] Electrolytic capacitor (Height> 25 mm, diameter> 25 mm, or those of the same volume)	Nothing	-		
Arsenic and its compounds	Yes	Body	Electronic components	Photo coupler, Logic IC
Nickel and its Compound	Yes	Body		Electronic parts, mechanical parts
Lead and its compounds	Yes	Body	BPL-033603 BPK-033602X02 BPJ-033601 BPF-033740	Printed circuit board on an electronic component
Vinyl chloride (PVC)	Yes	Body		PVC material resin parts
Antimony and its Compound	Yes	Body		Electronic components

8.6 storage method

Dust the Meter if not to be used for a long time, or covered with a vinyl cover, or put it in a cardboard box The prevents, not exposed to direct sunlight, please keep in a dry place.

Storage temperature: -25 ° C ~ + 70 ° C

8.7 transport

If you are transporting the instrument, first in the Meter deliver the packaging material, or equal to or higher than that of the packaging material (wit Use the cardboard box) of the above, please packing.

Packing procedure

1. inside the cardboard box, please put so as to wrap the instrument with a cushioning material Yes.
2. Put the accessories, please again put the cushioning material.
3. Close the cardboard box, please be fixed with a string for packing the outside.

8.8 repair, replacement, attention when you ask for, such as regular calibration

8.8.1 Before you ask for repair

Table Before you ask for repair 8 with reference to the 5, please check.

Table 8-5 before calling for service

phenomenon	What to check	treatment
can not turn on	To make sure the power cable.	To replace the power cable.
	To check the power fuse.	To replace the power fuse.
Key does not work	RMT indicator lights (Remote Operation Or to make sure not middle).	Back to the local state by pressing the LOCAL key.
	And it has a panel-lock state.	To release the panel lock.
Voltage, Do the resistance measured Yes.	Input cable is Vomega HI terminal and LO terminal Verify that you are connected properly between.	Between HI terminal of VΩ input cable and LO terminal To reliably connected.
	Be sure that the input cable is not broken .	Replace the input cable.
	4-wire during the resistance measurement is confirmed by 4WΩ check To.	
	To verify the configuration of the input terminal FRONT / REAR.	Setting the terminal side connected to input cable .
At high resistance measurements, measured It is unstable	Not overlap, induced input cable noise .	To shield the object to be measured. The use of shielded input cable.
Not sampling.	HOLD indicator lights (hold motion Make sure not to work).	Sun Press the TRIG key or HOLD key To make sure it works pulling. (remote It does not work the panel keys during operation. Re Please after releasing the remote operation Yes.)
	It has been set long trigger delay time.	To make sure the trigger delay time.

8.8.2 Commisioned work

If you want to send to the instrument repair to us or the agency, it goes with a tag that you fill out the following items .

- Your company name and address
- Contact Person Name
- Serial number (located on the rear panel)
- Work of (repair and regular calibration) request

8.8.3 Destination, contact

Please contact the call center.

8.9 system recovery procedures

Initialization settings

How to initialize the configuration parameters are shown below.

1. **MENU** From the mode **6.INIT** Select a category, press to select hierarchy
   It will move to.
2. 'PARAM' because it is the parameter is displayed, move to the press input hierarchy
   You.
3. In the 'DFLT' display of state, **ENTER** Press.

In addition, initialization child to select and execute a 'DFLT' loading the parameter setting
And you can also.
Operation "5 save and load of .11 measurement condition setting please refer to the".

Factory state

Shows how to all of the parameters except the calibration values to the factory default state below
It is.

1. **NULL** Key and **UP** Hold down the key to turn on the power.

The end of the menu

If you want to exit the menu operation **EXIT** Please press.
It is in any hierarchy of the menu, and then kill the menu.

note **ENTER** Parameter changes of cancellations in not doing a definitive
Will.

initial value

A list of conditions to be initialized of the configuration parameters and initial value Table 8-6 shows in.

Table 8-6 Initial values for configuration parameters (1/2)

Parameters		factory shipment State	MENU INIT DFLT selection	Power ON POFF selection	Parameter load DFLT	USER Settings	* RST	* CLS	CDV (DCL)
function		DCV	DCV	Retention value	DCV	USER0-3 selection DCV			
Auto-zero		ON	ON	Retention value	ON	USER0-3 selection ON			
GUARD set		FLOAT	FLOAT	Retention value	FLOAT	USER0-3 selection FLOAT			
DCV	range	Top	Top	Retention value	Top	USER0-3 select the top-level			
	Auto-range ON		ON	Retention value	ON	USER0-3 selection ON			
	sampling· rate	SLOW	SLOW	Retention value	SLOW	USER0-3 selection SLOW			
	Integration time	10PLC	10PLC	Retention value	10PLC	USER0-3 selection 10PLC			
	sampling· interval	500 ms	500 ms	Retention value	500 ms	USER0-3 Select 500 ms			
	Display digits	7 digit half	7 digit half	Retention value	7 digit half	USER0-3 Select 7-digit and a half			
	NULL operation	OFF	OFF	Retention value	OFF	USER0-3 selection OFF			
	NULL constant	0	0	Retention value	0	USER0-3 selection 0			
2WΩ 4WΩ	range	Top	Top	Retention value	Top	USER0-3 select the top-level			
	Auto-range ON		ON	Retention value	ON	USER0-3 selection ON			
	Additional functions	NORMAL	NORMAL	Retention value	NORMAL	USER0-3 Select NORMAL			
	Integration time	10PLC	10PLC	Retention value	10PLC	USER0-3 selection 10PLC			
	sampling· interval	500 ms	500 ms	Retention value	500 ms	USER0-3 Select 500 ms			
	Display digits	7 digit half	7 digit half	Retention value	7 digit half	USER0-3 Select 7-digit and a half			
	NULL operation	OFF	OFF	Retention value	OFF	USER0-3 selection OFF			
	NULL constant	0	0	Retention value	0	USER0-3 selection 0			
4WΩ check		OFF	OFF	Retention value	OFF	USER0-3 selection OFF			
Sampling mode		free RUN	free RUN	Retention value	free RUN	USER0-3 selection free RUN			
Trigger source		Auto (IMM)	Auto (IMM)	Retention value	Auto (IMM)	USER0-3 Select Auto (IMM)			
Trigger delay		0	0	Retention value	0	USER0-3 selection 0			
Sampling number		1	1	Retention value	1	USER0-3 selection 1			
Trigger the number of times		1	1	Retention value	1	USER0-3 selection 1			
Complete signal pulse width		5 µs	5 µs	Retention value	5 µs	USER0-3 selection 5 µs			
Complete signal multi-output		OFF	OFF	Retention value	OFF	USER0-3 selection OFF			
Comparator operation		OFF	OFF	Retention value	OFF	USER0-3 selection OFF			
HIGH value		0	0	Retention value	0	USER0-3 selection 0			
LOW value		0	0	Retention value	0	USER0-3 selection 0			
MAX / MIN operation		OFF	OFF	Retention value	OFF	USER0-3 selection OFF			
MAX / MIN display selection		NORMAL	NORMAL	Retention value	NORMAL	USER0-3 Select NORMAL			
Smoothing operation		OFF	OFF	Retention value	OFF	USER0-3 selection OFF			
Smoothing the number of times		Ten	Ten	Retention value	Ten	USER0-3 Select 10			
Scaling operation		OFF	OFF	Retention value	OFF	USER0-3 selection OFF			
X constant		1	1	Retention value	1	USER0-3 selection 1			
Y constant		0	0	Retention value	0	USER0-3 selection 0			
Z constant		1	1	Retention value	1	USER0-3 selection 1			

Table 8-6 Initial values for configuration parameters (2/2)

Parameters	factory shipment State	MENU INIT DFLT selection	Power ON POFF selection	Parameter load DFLT	USER Settings	* RST	* CLS	CDV (DCL)
dB operation	OFF	OFF	Retention value	OFF	USER0-3 selection OFF			
D constant	1	1	Retention value	1	USER0-3 selection 1			
Input terminal	front	front	Retention value	front	USER0-3 selection front			
Memory store	OFF	OFF	Retention value	OFF	USER0-3 selection OFF			
Block delimiter	CR / LF + EOI	CR / LF + EOI	store value	CR / LF + EOI	USER0-3 selection CR / LF + EOI			
PASS / FAIL buzzer	OFF	OFF	Retention value	OFF	USER0-3 selection OFF			
buzzer	OFF	OFF	Retention value	OFF	USER0-3 selection OFF			
interface	GPIB	GPIB	Retention value					
GPIB address	1	1	Retention value					
USB ID	1	1						

Talk-only	OFF	OFF	Retention value				
Output data elements	0	0	Retention value				
Panel Lock	OFF	-	Retention value				
PSC flag	1	1	Retention value				
password	0000		Retention value				
Measurement memory	Sky	Sky	Sky	Sky	Sky		Sky
Memory read range	0, -1	0, -1	0, -1	0, -1	0, -1	0, -1	0, -1
GPIB input and output buffer	Sky	Sky	Sky	Sky	Sky		Sky
String delimiter	("", "" Fixed)	("", "" fixed)	("", "" fixed)			("", "" Fixed)	
Display ON / OFF	ON	ON	ON	ON	ON	ON	
Calibration mode	OFF	OFF	OFF				
DESER (QuestionableEvent)	0	0	0				
OEER	0	0	0				
SEER (* ESE)	0	0	0				
SRER (* SRE)	0	0	0				
DESR (QuestionableEvent)	0	0	0			0	
SESR (* ESR?)	0	0	0			0	
STB	0	0	0			0	
OER	0	0	0			0	
ERR	0	0	0			0	
Error Queue	Sky	Sky	Sky			Sky	

Blank: No Action

Retention value: setting state it was in when you last in the power supply to the OFF

8.10 self-test

8.10.1 Self-test

You can perform a self-test from the panel and remote command. **MENU** of **10 SYS** Run from the 'TEST'. Or, run from a remote * TST? Command.

The test content Table 8 shows in 7.

Table 8-7 Self-test item

Contents	Panel / remote execution	Power-on time of execution
ROM checksum	-	○
RAM read-write check	-	○
Panel display unit check	-	○
Alarm status check	-	○
Calibration data check	○	○
parameter check	○	○
Analog - Logic communication check	○	○
Analog section AD operation check	○	○
Analog section range operation check	○	○
Analog section reference voltage check	○	○
Analog section reference current check	○	○

8.10.2 Test of the display and key

Make sure there is a lit portion not to all turn on the display device.
When you press the panel keys to display the name of the key.
Please been tested on the following procedure.

	operation	Character display unit
1.	**MENU** Press the,, in **9 MAINT** Choose.	MENU MAINT
2.	Press.	MAINT TEST
3.	Select the in 'P / KEY'.	MAINT P / KEY

8.10.2 display and key test of

	operation	Character display unit
Four.	Press.	P / KEY ENTER
Five.	**ENTER** Press.	Indicator Full lighting
	Display and a few seconds will change.	KEY Push
6.	Press the key to confirm.	KEY Pressed The name of the key
7.	If you want to exit the key test **SHIFT** Press.	KEY SHIFT
	After displaying the SHIFT, changes to DONE.	KEY DONE
8.	**EXIT** Press to exit the menu.	Measurements state

8.11 Error Message List

This section describes the error number and workarounds that are displayed in the instrument.

Table 8-8 Error Message List (1/4)

No.	error indication	Error factor []: The response of the ERR command?	Workaround
1	Err001	RAM read / write error	Malfunction
2	Err002	Display unit RAM test / communication error	Malfunction
3	Err003	Calibration data check SUM abnormal	Malfunction
Four	Err004	ROM check SUM abnormal	Malfunction
Five	Err005	Alarm check abnormality at the time of PowerON	Malfunction
6	Err006	Parameter check SUM abnormal	Malfunction
7	Err016	FLASH memory writing error	Malfunction
8	Err106	I was running the front / rear switching at a high voltage applied state [Terminal switch in high voltage]	Deal 6
9	Err161	HI alarm has occurred [+ Overload ALARM for OHM circuit]	Deal 6
Ten	Err162	LO alarm occurs [-Overload ALARM for OHM circuit]	Deal 6
11	Err150	USB communication error [Illegal packet received]	Deal 7
12	Err200	Test error of the ratio of the AD operation IR1 and IR2	Malfunction
13	Err201	Test error of the ratio of the AD operation IR2 and IR3	Malfunction
14	Err202	Test error of the ratio of the AD operation IR3 and IR4	Malfunction
15	Err203	Test error of the ratio of the AD operation IR4 and IR5	Malfunction
16	Err204	Test error of the ratio of the AD operation IR5 and IR6	Malfunction
17	Err205	Zero measurement test error of analog operation AMP × 1	Malfunction
18	Err207	Zero measurement of analog operation AMP × 10 test error.	Malfunction
19	Err208	Zero measurement test error of analog operation AMP × 100	Malfunction
20	Err210	Analog unit communication error	Malfunction
twenty one	Err212	Test error of internal ADTRG line	Malfunction
twenty two	Err213	Test error of internal ADRST line	Malfunction
twenty three	Err215	Analog operation Ref + 7.2V measurement test error.	Malfunction
twenty four	Err216	Analog operation Ref-10V measurement test error.	Malfunction
twenty five	Err217	Analog operation Ref-1V measurement test error.	Malfunction
26	Err218	Analog operation Ref-0.1V measurement test error.	Malfunction

Table 8-8 Error Message List (2/4)

No.	error indication	Error factor []: The response of the ERR command?	Workaround
27	Err219	Analog operation Ref + 5V measurement test error.	Malfunction
28	Err220	Analog operation AMP × 10 measurement test error.	Malfunction

29	Err221	Analog operation AMP × 100 measurement test error.	Malfunction
30	Err222	Analog operation ATT measurement test error.	Malfunction
31	Err223	Analog operation AMP positive saturation voltage test error.	Malfunction
32	Err224	Analog operation AMP negative side saturation voltage test error.	Malfunction
33	Err250	Zero measurement test error of analog operation CAL route 1	Malfunction
34	Err251	Zero measurement of analog operation CAL route 2 test error.	Malfunction
35	Err252	Zero measurement of analog operation CAL route 3 test error.	Malfunction
36	Err253	Analog operation CAL route 1 measurement test error.	Malfunction
37	Err254	Analog operation CAL route 2 measurement test error.	Malfunction
38	Err255	Analog operation CAL route 3 measurement test error.	Malfunction
39	Err256	Analog operation CAL route 4 measurement test error.	Malfunction
40	Err260	Analog operation shunt resistance ratio 1M / 100k test error	Malfunction
41	Err261	Analog operation shunt resistance ratio 100k / 10k test error	Malfunction
42	Err270	Zero measurement test error of analog operation OHM route	Malfunction
43	Err271	Analog operation OHMIs1mA (400Ω - 0.4V) test error.	Malfunction
44	Err272	Analog operation OHMIs2mA (400Ω - 0.8V) test error.	Malfunction
45	Err273	Analog operation OHMIs10mA (400Ω - 4V) test error.	Malfunction
46	Err274	Ratio test error of analog operation OHMVref (0.4V / 0.8V)	Malfunction
47	Err275	Ratio test error of analog operation OHMVref (0.4V / 4V)	Malfunction
48	Err276	Analog operation OHMIs1mA (4kΩ - 4V) test error.	Malfunction
49	Err277	Analog operation OHMIs2mA (4kΩ - 8V) test error.	Malfunction
50	Err278	Ratio test error of analog operation OHMRref (400Ω / 4kΩ)	Malfunction
51	Err279	Ratio test error of analog operation OHMVref (4V / 8V)	Malfunction
52	Err280	Analog operation OHMIs200μA (40kΩ - 8V) test error.	Malfunction
53	Err281	Analog operation OHMIs100μA (40kΩ - 4V) test error.	Malfunction
54	Err282	Ratio test error of analog operation OHMRref (4kΩ / 40kΩ)	Malfunction
55	Err283	Analog operation OHMIs10μA (400kΩ - 4V) test error.	Malfunction
56	Err284	Ratio test error of analog operation OHMRref (40kΩ / 400kΩ)	Malfunction

Table 8-8 Error Message List (3/4)

No.	error indication	Error factor []: The response of the ERR command?	Workaround
57	Err285	Analog operation OHMIs1μA (4MΩ - 4V) test error.	Malfunction
58	Err286	Ratio test error of analog operation OHMRref (400kΩ / 4MΩ)	Malfunction
59	Err290	Analog operation open test error of the voltage between the terminals 1	Malfunction
60	Err291	Test error of analog operation inter-open-terminal voltage 2	Malfunction
61	Err292	Test error of analog operation inter-open-terminal voltage 3	Malfunction
62	Err293	Test error of analog operation inter-open-terminal voltage 4	Malfunction
63	Err300	Test error of analog operation input bias current DCV route 1	Malfunction
64	Err301	Test error of analog operation input bias current DCV route 2	Malfunction
65	Err302	Test error of analog operation input bias current ATT path	Malfunction
66	Err310	Analog operation ATT resistance measurement test error.	Malfunction
67	Err311	Analog operation CAL resistance 1MΩ measurement test error.	Malfunction
68	Err312	Analog operation CAL resistance value 100kΩ measurement test error.	Malfunction
69	Err313	Analog operation CAL resistance 10kΩ measurement test error.	Malfunction
70	Err314	Analog operation CAL resistance value 1kΩ measurement test error.	Malfunction
71	Err315	Analog operation CAL resistance value 100Ω measurement test error.	Malfunction

72	Err350	Analog operation internal temperature measurement test error.	Malfunction
73	Err410	Abnormality occurs in the fan	Malfunction
74	Err500	External calibration error [External Calibration Error No. @@@] @@@: 0-302	Deal 1
75	Err510	Can not be external calibration is performed	Malfunction
76	Err600	Internal calibration error [Internal Calibration Error No. @@@] @@@: 400-517	Deal 1
77	Err-102	Command syntax error [Syntax error]	Action 2
78	Err-113	Command not supported [Undefined header]	Action 2
79	Err-200	Execution error (command that can not be currently executing) [Execution error]	Action 2
80	Err-213	INI command has been ignored [Init ignored]	Deal 4
81	Err-222	Insufficient input value outside the setting range or parameter [Data out of Range]	Deal 3

Table 8-8 Error Message List (4/4)

No.	error indication	Error factor []: The response of the ERR command?	Workaround
82	Err-313	Calibration data is lost [Calibration memory lost]	Deal 1
83	Err-314	* Parameters stored in the SAV command is lost [Save / recall memory lost]	Deal 3
84	Err-315	The stored parameters is lost [Configuration memory lost]	Deal 4
85	Err-350	The error queue overflows [Too many errors / Queue overflow]	Deal 5

Deal 1	Perform calibration again
Action 2	Send the correct command
Deal 3	To set again
Deal 4	To verify the configuration
Deal 5	Read the error queue
Deal 6	No voltage is applied
Deal 7	To verify the connection of the USB cable

Please ordering the repair if you even attempt to remedy does not clear the error.

8.12 calibration error number List

Here are calibration error number displayed during calibration of the instrument.

Table 8-9 Calibration error number list (1/2)

Calibration error number	Calibration error factor		Response of ERR? Command
0	Front zero calibration	DCV 100mV range	External Calibration Error No.0
1		DCV 1000mV range	External Calibration Error No.1
2		DCV 10V range	External Calibration Error No.2
3		DCV 100V range	External Calibration Error No.3
Four		DCV 1000V range	External Calibration Error No.4
Five		4WΩ 10Ω range	External Calibration Error No.5
6		4WΩ 100Ω range	External Calibration Error No.6
7		4WΩ 1000Ω range	External Calibration Error No.7
8		4WΩ 10kΩ range	External Calibration Error No.8
9		4WΩ 100kΩ range	External Calibration Error No.9
Ten		4WΩ 1000kΩ range	External Calibration Error No.10
11		4WΩ 10MΩ range	External Calibration Error No.11
twenty one		2WΩ 10Ω range	External Calibration Error No.21
twenty two		2WΩ 100Ω range	External Calibration Error No.22
twenty three		2WΩ 1000Ω range	External Calibration Error No.23
twenty four		2WΩ 10kΩ range	External Calibration Error No.24
twenty five		2WΩ 100kΩ range	External Calibration Error No.25
26		2WΩ 1000kΩ range	External Calibration Error No.26
27		2WΩ 10MΩ range	External Calibration Error No.27
45		Internal temperature measurement	External Calibration Error No.45
100	Rear zero calibration	DCV 100mV range	External Calibration Error No.100
101		DCV 1000mV range	External Calibration Error No.101
102		DCV 10V range	External Calibration Error No.102
103		DCV 100V range	External Calibration Error No.103
104		DCV 1000V range	External Calibration Error No.104
105		4WΩ 10Ω range	External Calibration Error No.105
106		4WΩ 100Ω range	External Calibration Error No.106
107		4WΩ 1000Ω range	External Calibration Error No.107
108		4WΩ 10kΩ range	External Calibration Error No.108
109		4WΩ 100kΩ range	External Calibration Error No.109
110		4WΩ 1000kΩ range	External Calibration Error No.110
111		4WΩ 10MΩ range	External Calibration Error No.111

Table 8-9 Calibration error number list (2/2)

Calibration error number		Calibration error factor	Response of ERR? Command
121	Rear zero calibration	2WΩ 10Ω range	External Calibration Error No.121
122		2WΩ 100Ω range	External Calibration Error No.122
one two three		2WΩ 1000Ω range	External Calibration Error No.123
124		2WΩ 10kΩ range	External Calibration Error No.124
125		2WΩ 100kΩ range	External Calibration Error No.125
126		2WΩ 1000kΩ range	External Calibration Error No.126
127		2WΩ 10MΩ range	External Calibration Error No.127
145		Internal temperature measurement	External Calibration Error No.145
200	DCV external calibration	External 10V or internal 7.2V	External Calibration Error No.200
201		DC10V STD input value is abnormal	External Calibration Error No.201
202		Internal temperature measurement	External Calibration Error No.202
300	OHM external calibration	External 10kΩ or internal 10kΩ	External Calibration Error No.300
301		10kΩ STD input value is abnormal	External Calibration Error No.301
302		Internal temperature measurement	External Calibration Error No.302
400	DCV internal calibration	AMP × 100 gain	Internal Calibration Error No.400
401		AMP × 10 gain	Internal Calibration Error No.401
402		AMP × 1 gain	Internal Calibration Error No.402
403		ATT × 10 gain	Internal Calibration Error No.403
408		Temperature measurement	Internal Calibration Error No.408
500	OHM internal calibration	The reference current 10mA	Internal Calibration Error No.500
503		The reference current 1mA	Internal Calibration Error No.503
504		The reference current 100μA	Internal Calibration Error No.504
505		The reference current 10μA	Internal Calibration Error No.505
506		The reference current 1μA	Internal Calibration Error No.506
509		Shunt resistance 1MΩ	Internal Calibration Error No.509
510		Shunt resistor 100kΩ	Internal Calibration Error No.510
512		Shunt resistor 1kΩ	Internal Calibration Error No.512
513		Shunt resistance 100Ω	Internal Calibration Error No.513
517		Internal temperature measurement	Internal Calibration Error No.517
519		The reference current 2mA	Internal Calibration Error No.519

7470 Dimensions

Unit: mm

Caution

This figure shows the external dimensions of the instrument.

In the presence or absence of a series of products and options,
Part of the external appearance may be different.

index

7470 digital multimeter instruction manual

index

About your use of the software that is included in this product

Please note the following things about your use of the software (the software) that is included in this product
Please.
The software here, or a computer program that are used together are included in the product,
Add that may be provided us than to our customers in the future, changes, fixes and updates
Edition computer program, and includes the accompanying article in the instruction manual for this product.

License

All rights, including copyright of this software will belong to us.
We are, as long as you use the software with this product or on the product, the customer
You will shall be licensed.

Prohibited matter

Customers should not attempt the following matters upon your use of this software.

- Be used outside of this product intended
use
- Without permission copy, modify, to perform the modified
- Reverse engineer, decompile, be carried out such as the
disassembly

Disclaimer

Customers, a problem occurs in the product by the use of this product in the usage other than the normal usage place
If, and when the dispute related to copyright, such as between you and a third party occurs, the company of any responsibility
Please note that you can not take.

The warranty period for the product, except in the case where there is a customer and otherwise arrangements, preached a period of one year from the product delive
To do.
If you want to, even during the warranty period will be excluded from the warranty.
During the warranty period, if the product fails due to a defect on the attributable p
production to our responsibility, it will be repaired free of charge. However, corres

- If you have made a remodeling or repair we do not allow
- If you use parts other than our specification
- When using the product beyond the use conditions described in the instruction manual (for example, physical stress or current-voltage exceeding the allowable range determined is applied)
- When the normal using the product outside environment of use envisaged (corrosive gases, corrosion of the electric circuit due to dusty environment, deterioration of parts
Such as when earlier obtained)
- When used without following the instructions of the instruction manual or various product documentation
- If a problem is caused by careless or improper handling
- If it based on consumables and consumable material
- Fire, in the case of force majeure of natural disasters, such as
- If it has taken out to outside Japan
- Losses and lost profits due to the not available products

Quality assurance of our products, shall be limited to the contents described in this manual.

For inquiries about maintenance

If a fault occurs, please contact the following call center.
If you have taken out a product that is sold only in Japan to overseas, you may not be able to maintain overseas. If that is taken out abroad,
Please check with your call center.

Product repair service

• Product repair period

(1) repair service period for the product, to the 10 years after the product delivery
I will do.

(2) in the sale has elapsed after the end of seven years product corresponding to one of the following.
If I might be allowed to decline the repair and calibration.

1) parts if available is difficult.

2) determines that the degradation is significantly, can not be maintained reliability after repairs
If it is.

• Repair service activities

If a failure occurs in our electronic measuring instruments, to the service center
We will correspond by the take-up repair.

Product calibration services

• Calibration Service

For your product, that to achieve the maintenance of quality and reliability
Performs the purpose, is attached to the calibration label into the product after calibration.
We guarantee the quality.

• Calibration service activities

Calibration service activities, correspond by taking calibrated to the service center
We will.

Recommended preventive maintenance

Part of the electronics components and mechanical parts in the product
Due to the use of components should be considered life, regular exchange
You need a conversion. Using past the appropriate exchange period has occurred
For failure, you may not be able to repair and performance of the guarantee
Yes you.
By regularly conducts various preventive maintenance, stable operation of the product
The aim, in order to prevent the cost occurrence of unexpected, due to annual maintenance contract
We recommend the implementation of preventive maintenance.
In addition, annual maintenance contract, the product, the usage and use environment
Ri because the content will change, contact the following call center
Please give me.

Disclaimer

Product defects, in the case of the customer due to a defect has suffered damage our
Responsibility, shall be limited to those that are specified in this manual,
And, if they are due to the customer's instructions or specifications, etc.,
Or your payment to or if due to the parts and the like that you specify,
The Company, whether direct or indirect, loss of all that has occurred to you,
Damage, we will consider it as a liability for the expenses.

★ Guidance for this instrument
(Product specifications, handling, repair and calibration, etc. measuring instruments in general)
Call center TEL: 0120-041-486
E-mail: kcc@adcmt.com

Head Office : Yubinbango 104-0031 , Chuo-ku Kyobashi 3-6-12 Shoei building
TEL (03) 6272-4433 FAX (03) 6272-4437

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TEL (0493) 56-4433 FAX (0493) 57-1092

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TEL (03) 6272-4433 FAX (03) 6272-4437

Western sales unit : Yubinbango 532-0003 Yodogawa-ku, Osaka Miyahara 2-14-14
Kansai sales office Shin-Osaka Grandville
TEL (06) 6394-4430 FAX (06) 6394-4437

Middle part sales office: Yubinbango 464-0075 , Chikusa-ku, Nagoya Uchiyama 3-18-10
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