

multicomp PRO



PORTABLE BATTERY TESTER

MP700499 - MP700502

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Introduction

Thank you for purchasing Multicomp-Pro MP700499 Battery Tester. To obtain maximum performance from the product, please read this manual first, and keep it handy for future reference.

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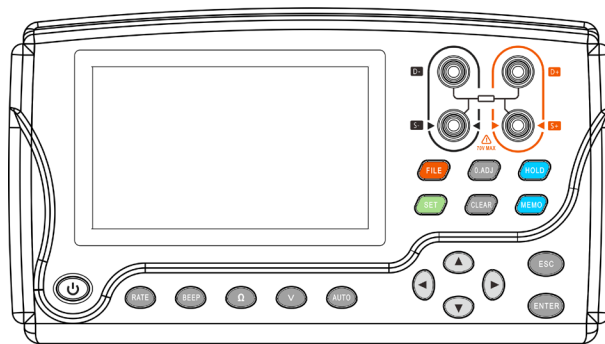
Checking Package Contents

When you receive the instrument, inspect it carefully to ensure that no damage occurred during shipping. In particular, check the accessories, panel switches, and connectors. If damage is evident, or if it fails to operate according to the specifications, contact your authorized Multicomp-Pro distributor or reseller.

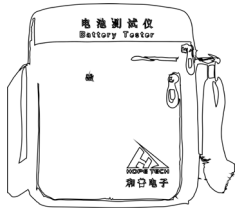
When transporting the instrument, use the same packaging materials used for the delivery to you.

Check the package contents as follows

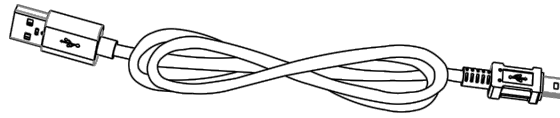
No.	Item	Quantity
1	Battery Tester	1
2	User's Manual	1
3	9803 USB Cable	1
4	9363-B Pin Type test lead	1
5	Strap	1
6	Lithium battery	1
7	Carrying Bag	1



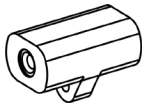
MP700499 Battery Tester



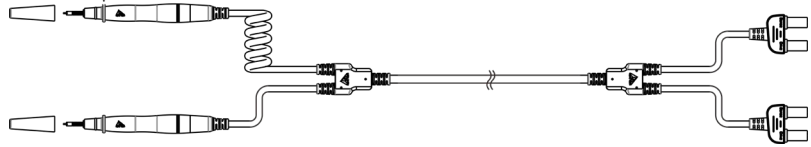
Carrying Bag



9803 USB Cable



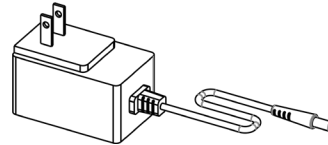
zero adjustment block



9363-B Pin Type test lead

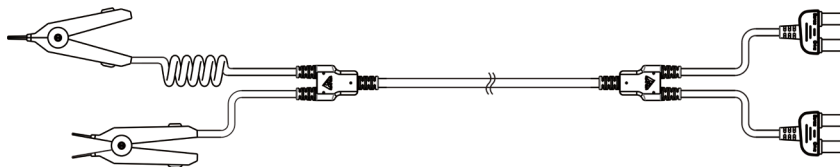


Lithium battery

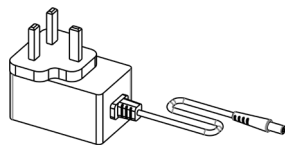


Battery Charger (Chinese standard)

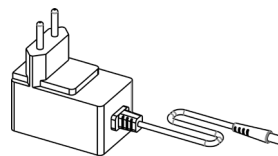
Option



9363-A Test Clip



(British standard)



(European standard)

Battery Charger

Safety Notes

The instrument is designed to conform to IEC 61010 Safety Standards, and has been thoroughly tested for safety prior to shipment. However, using the instrument in a way not described in this manual may negate the provided safety features.

Before using the instrument, be certain to carefully read the following safety notes.

Note

Mishandling during use could result in injury or death, as well as damage to the instrument. Be certain that you understand the instructions and precautions in the manual before use.

Notation

This manual contains information and warnings essential for safe operation of the instrument and for maintaining it in safe operating condition. Before using the instrument, be certain to carefully read the following safety notes.



Indicates very important message in this manual. When the symbol is printed on the instrument, refer to a corresponding topic in the Instruction Manual.



Indicates DC (direct current)



Indicates a fuse



Indicates earth terminal

In this manual, the risk seriousness and the hazard levels are classified as follows.



Indicates an imminently hazardous situation that will result in death or serious injury to the operator.



Indicates a potentially hazardous situation that will result in death or serious injury to the operator.



Indicates a potentially hazardous situation that may result in minor or moderate injury to the operator or damage to the instrument or malfunction.



Indicates functions of the instrument or relative suggestion of a correct operation.

Accuracy

We define measurement tolerances in terms of f.s. (full scale), rdg. (reading) and dgt. (digit) values, with the following meanings:

f.s.	(Maximum display value)
	This is usually the maximum display value. In the instrument, this indicates the currently used range.
rdg.	(Reading or displayed value)
	The value currently being measured and indicated on the measuring instrument.
dgt.	(Resolution)
	The smallest displayable unit on a digital measuring instrument, i.e., the input value that causes the digital display to show a "1".

Usage Notes

Installation environment


- ✧ Operating temperature and humidity ranges
0°C to 40°C 80%RH or less (no condensation)
- ✧ Storage temperature and humidity ranges
23 ±5°C 80%RH or less (no condensation)

Installing the instrument in inappropriate locations may cause a malfunction of instrument or may give rise to an accident. Avoid the following locations.





- ✧ Exposed to direct sunlight or high temperature
- ✧ Exposed to corrosive or combustible gases
- ✧ Exposed to water, oil, chemicals, or solvents
- ✧ Exposed to high humidity or condensation
- ✧ Exposed to a strong electromagnetic field or electrostatic charge
- ✧ Exposed to high quantities of dust particles
- ✧ Near induction heating systems (such as high-frequency induction Heating systems)
- ✧ Susceptible to vibration

Checking before use

Before using the instrument the first time, verify that it operates normally to ensure that no damage occurred during storage or shipping. If you find any damage, contact your authorized Multicomp-Pro distributor or reseller.


 CAUTION	<p>Before using the instrument, check that the coating of the test leads or cables are neither ripped nor torn and that no metal parts are exposed. Using the instrument under such conditions could result in electrocution. Contact your authorized Multicomp-Pro distributor or reseller in this case</p>
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Handling Precautions

 DANGER	<p>Do not modify, disassemble, or repair the instrument. This may result in fire, electric shock accident, or injury.</p>
 CAUTION	<p>Do not place the instrument on an unstable or slanted surface. It may drop or fall, causing injury or instrument failure.</p>
 NOTE	<p>To avoid corrosion and/or damage to the instrument due to battery leakage, remove the batteries from the instrument if it is to be kept in storage for an extended period. Be sure to turn the power off after using it.</p>
 DANGER	<p>To avoid electric shock accident and short circuit, please operate the instrument as following: Do not test the voltage over 60 VDC</p>

	<p>Do not test the terminal-to-ground voltage over 70 VDC.</p> <p>Do not test AC voltage.</p> <p>Be sure to connect the test lead correctly.</p> <p>Wear gloves of rubber or similar materials during measurement.</p> <p>Ensure sufficient ventilation when testing batteries in the measurement room to prevent explosions. Sparks may occur when the test leads are connected to batteries, which can ignite any accumulated inflammable gases such as hydrogen.</p>
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Handling leads and cables

 CAUTION	<p>When using the instrument, use only the test line 9363-B or test leads specified by our company.</p> <p>To avoid damaging the cables, do not bend or pull the base of cables and the leads.</p> <p>The ends of pin type leads are sharp. Be careful to avoid injury.</p> <p>To avoid damage to the test leads, when plug/pull the test line, don't hold the cable but connector.</p>
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Chapter 1 Overview

1.1 Overview

The MP700499 measures internal resistance, voltage, and terminal temperature of lead-acid, nickel-cadmium, nickel-hydrogen, and other types of batteries, enabling you to determine if the battery is worn out.

The measurement data can be copied to a computer by connecting the instrument to a computer after measurement with the USB cable provided.

1.2 Features

Enables measurement without shutting down UPS systems

This instrument uses high-precision AC resistance measurement technology. Time required for measurement is reduced since the instrument is capable of measuring live wires without requiring the UPS system to be shut down.

Reliable measurement values

This instrument is capable of obtaining reliable measurement values without being affected by lead or connector resistance because it uses the AC 4-terminal method to measure internal resistance.

Simultaneous display of resistance, voltage, and temperature

Without changing functions, this instrument can display battery internal resistance, voltage, and terminal temperature simultaneously.

Comparator function

The comparator function enables you to set threshold values for internal resistance and voltage. This can determine battery wear more easily.

Large memory capacity

This instrument can store up to 2400 sets of data combining presently measured values (resistance, voltage, temperature, and comparator measurement results). It can be used to measure up to 12 units of 200-cell cubicles.

Auto-memory function

Turning this function on stores the measurement values in the instrument's internal memory automatically, the instant when each set of data is held. This can lead to increased operational efficiency.

PC interface

Measurement data can be loaded into a computer.

Small size

The instrument has a similar size with A5 paper, easy to carry.

Users will be not tired after long time operation since the instrument gross weight is only 800g.

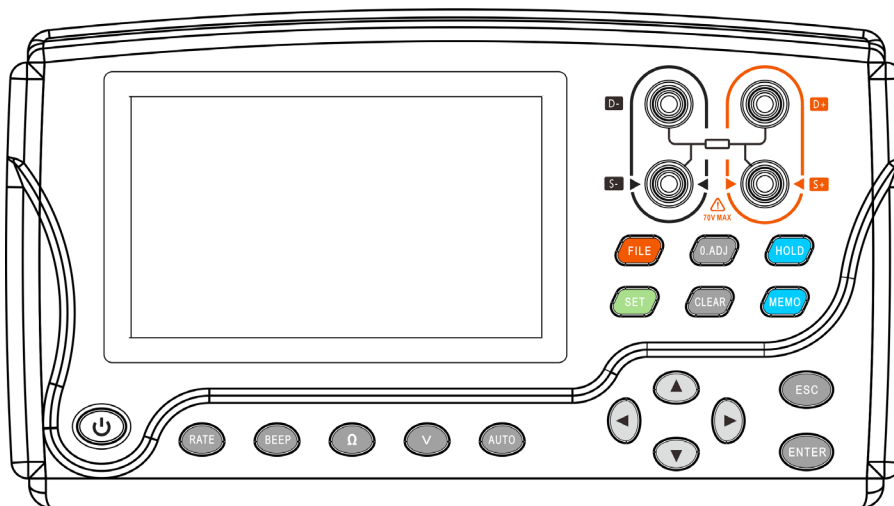
Model 9363B Pin Type Lead

Using the model 9363B Pin Type Lead with a pin tip designed to fit in holes of $\phi 5$ mm enables measurement without removing terminal covers. Measurement is possible in virtually any location because the pin can be inserted diagonally in hard-to-reach places.






Remote Control Switch (optional) for storing measurement values











The Remote Control Switch makes it possible to hold and store measurement values by pressing a key. This is useful when both hands of the operator are busy.

1.3 Names and Functions of Parts

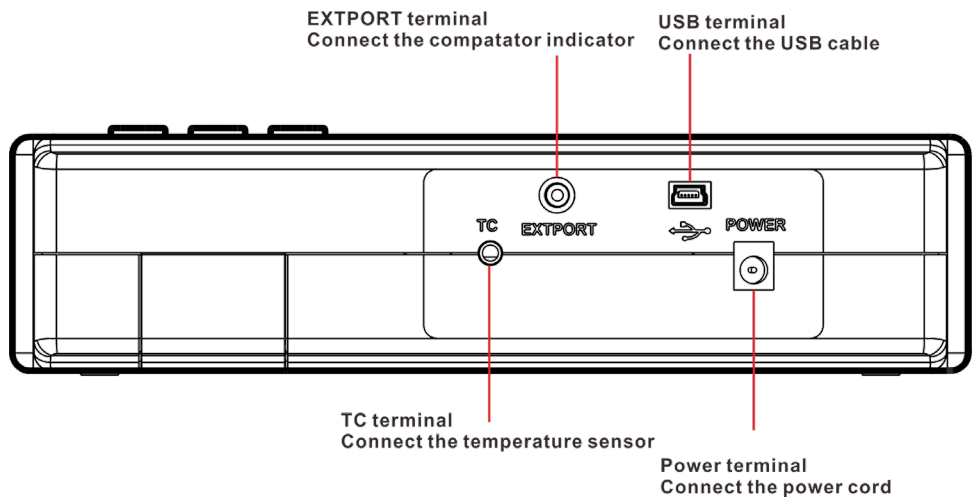


Front Panel

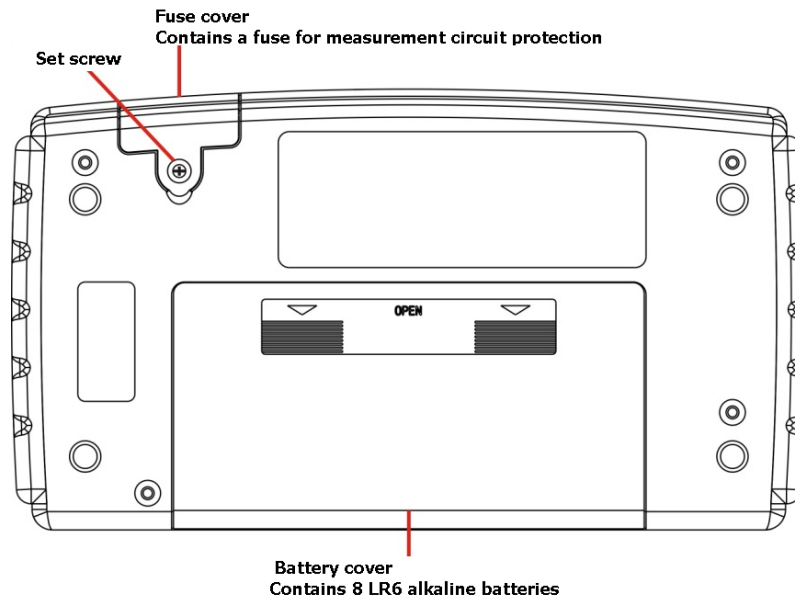
	Turn the power ON/OFF.
	Set test speed
	Turn the comparator buzzer ON/OFF.
	Changes the resistance range. Press the key to change the range by the loop.
	Changes the voltage range. Press the key to change the range by the

	loop.
	Set up automatic range test
	Invokes the stored test value
	Execute zero adjustment function
	Holds or cancels the measurement values
	Switch system setup interface
	Deletes the settings
	Stores display value to memory
	Selects a configuration setting or changes the value.
	Exit the Settings
	Confirms the settings.

Top view



Rear view

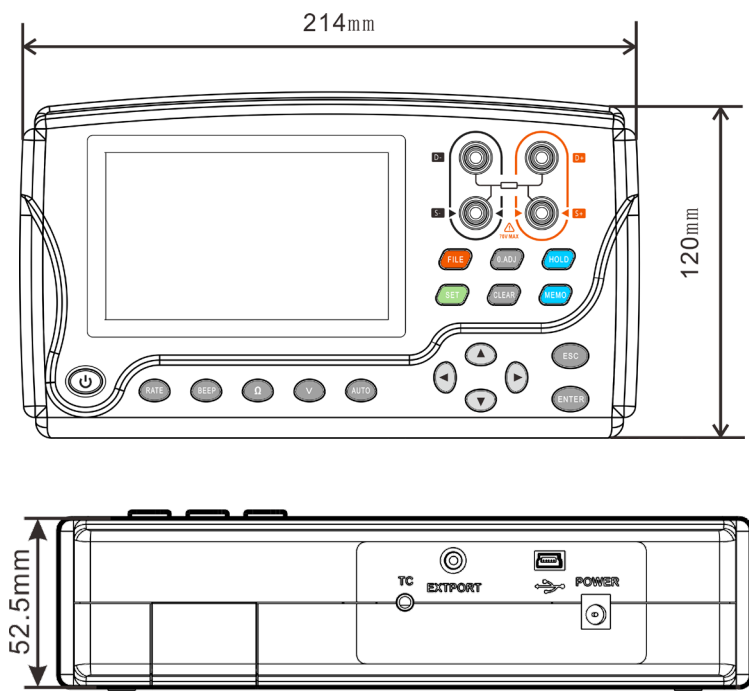


1.4 Measurement steps

The measurement process is shown as below:

Measurement preparation	<ol style="list-style-type: none"> 1. Install the neck strap 2. Check the remaining batteries of the instrument 3. Connect the test lead 4. Turning the Power ON/OFF 5. Set the clock
Setting the Measurement range	<ol style="list-style-type: none"> 1. Set resistance range 2. Set voltage range
Zero Adjustment	Performing zero adjustment is according to the zero adjusting method required by specified test leads
Start of the test	<ol style="list-style-type: none"> 1. Connect the test leads to the battery 2. Read the measurement values 3. To retain measurement values 4. To store measurement values
End of the test	<ol style="list-style-type: none"> 1. Disconnect the test lead and turn off the power 2. By using the USB cable included with the instrument you can send the stored data to a computer.(data transmission software needs to be installed).

1.5 Dimensions

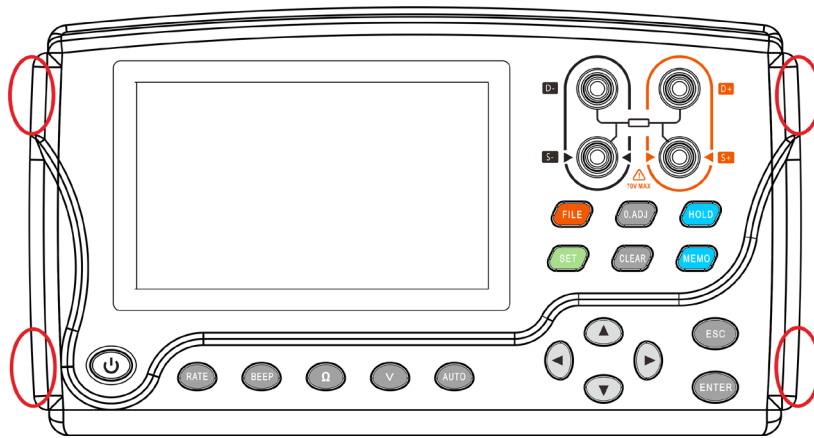


Chapter 2 Preparing for Measurement

2.1 Attaching the Strap

Attaching the strap to the instrument allows you to use it with the strap around your neck. Follow the procedure below to attach the strap.

1. Switch off the instrument and remove the test leads.
2. Pass the neck strap through the attachments marked in red circle and fasten it in place with the buckles.



3. Adjust the length of the neck strap.

Note:

Use the four attachment points on the instrument to attach the strap securely. Otherwise, the instrument may drop during carrying, damaging the instrument and the operator may get hurt.

2.2 Installing/Replacing Alkaline Batteries

Before using the instrument for the first time, load the eight alkaline batteries (LR6) or the lithium rechargeable battery. Before measurement, check that the instrument has sufficient remaining battery power. If the remaining battery level is low, replace the batteries. See the battery indicator to check the remaining battery level.



WARNING

- ✧ Do not short circuit, charge, disassemble, or incinerate batteries. Doing so may cause an explosion and is dangerous.
- ✧ To avoid electric shock accident, remove any test leads before replacing batteries.
- ✧ After the replacement, be sure to reattach the cover.
- ✧ Poor performance or damage from battery leakage could result. Observe the cautions listed below.
- ✧ Do not use both old and new batteries or different types of batteries together.
- ✧ Be careful to observe battery polarity. Otherwise, poor performance or damage from battery leakage could result.
- ✧ Do not use batteries after their recommended expiry date.
- ✧ Dispose of batteries in accordance with local regulations.

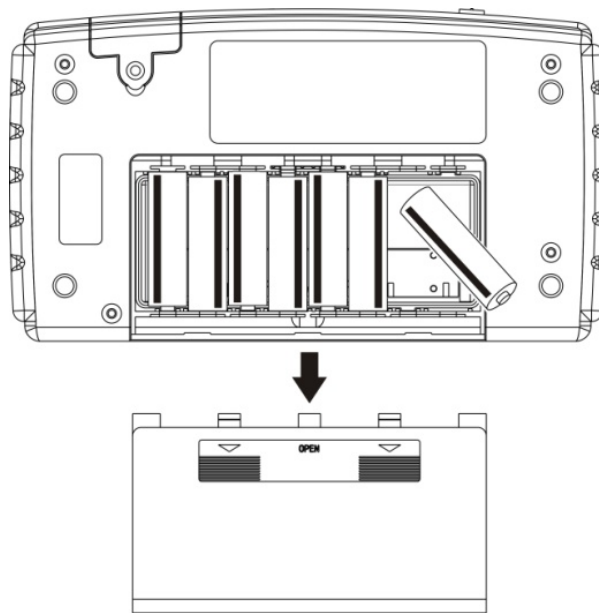
NOTE

- ✧ When the remaining battery indicator is lit, the battery becomes low. Charge or replace the batteries as soon as possible.

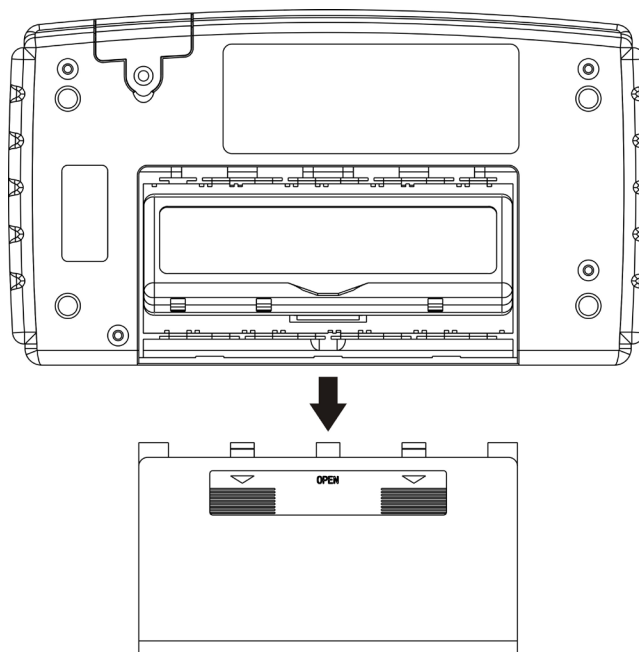
Replacing the battery steps:

1. Turn the power off. Remove any test leads.
2. Remove the battery cover on the back for the instrument.
3. Load the LR6*8 batteries or the lithium battery. Be careful of their polarity.
4. Reattached the battery cover on the back of the instrument.

LR6 battery replacement



Lithium battery replacement



2.3 Connecting the Test Leads


WARNING

✧ To avoid electric shock accident, connect the test leads correctly.


NOTE

- ✧ To be safe, do not use any test lead other than the ones specified by our company.
- ✧ The ends of leads are sharp. Be careful to avoid injury.
- ✧ Connect the test leads to the instrument. Connect the four terminals: DRIVE (+, -) and SENSE (+, -).

2.4 Turning the Power On/Off


Press the **[POWER]** key  to turn the power on or off. Check the clock settings when using the instrument for the first time.

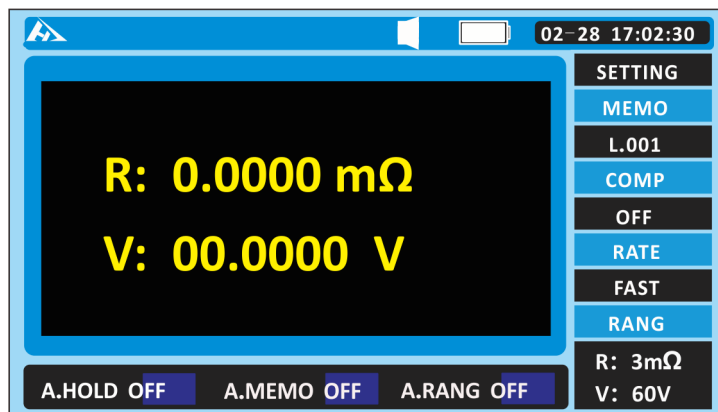
Turning the power on

Press the **[POWER]** key  to turn the power on. Hold the key down until the entire display turns on:

1. Display model and version number;
2. Entire display lit.

Turning the power off

Press the **[POWER]** key  to turn the power off. Hold the key down until the entire display turns off: Entire display off.

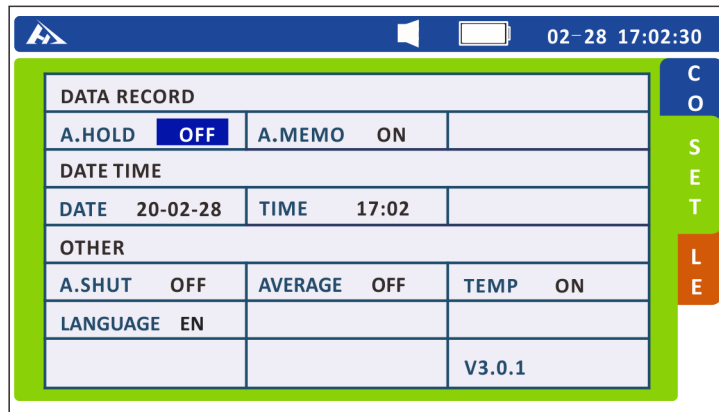


2.5 Clock Function

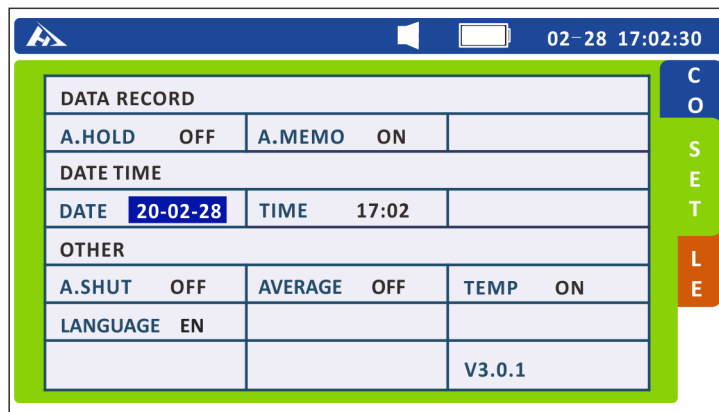
Date and time can be set in the system setup interface. Check the clock Settings the first time you use this device.

2.5.1 Set the date

1. Press the **[SET]** key on the test page twice to switch to the system setting interface.



2. Select relevant options.

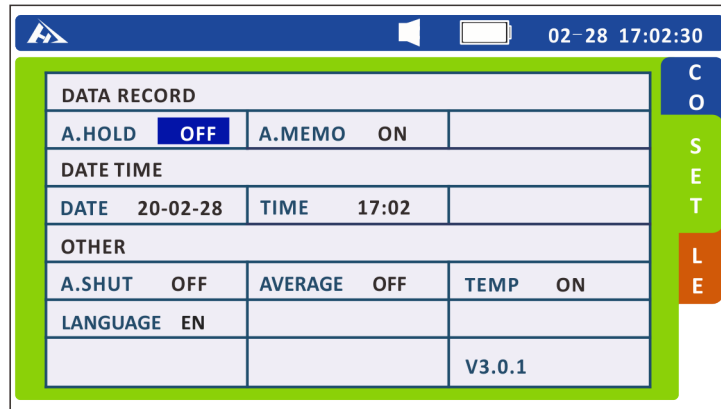


Press the direction key to move the cursor position, press the **[ENTER]** key to select the date, and then press the direction key to adjust the value at the corresponding position.

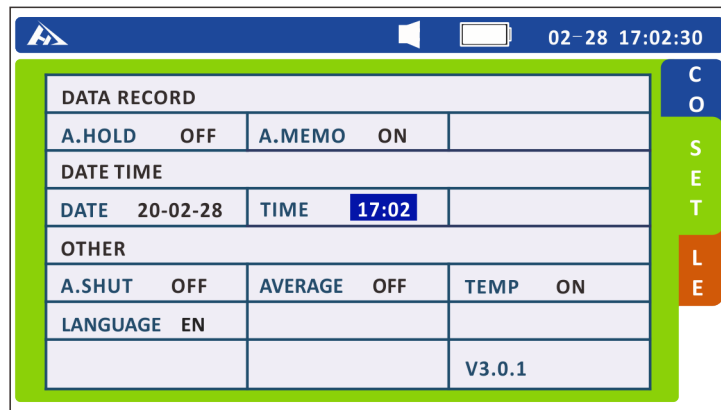
3. Press the **[ENTER]** key to store the date and time Settings.

2.5.2 Set the clock

1. Press the **[SET]** key on the test page twice to switch to the system Settings interface.



2 Select the relevant options.



Press the direction key to move the cursor position, press the **[ENTER]** key to select the time, and then press the direction key to adjust the value at the corresponding position.

3. Press the **[ENTER]** key to store the date and time Settings.

Chapter 3 Basic Measurement

Before measurement, be sure to read this chapter.



To avoid electric shock accident and short circuit, please operate the instrument as following:

- ✧ Do not test the voltage over 70 VDC
- ✧ Do not test the terminal-to-ground voltage over 70 VDC.
- ✧ Do not test AC voltage.



- ✧ If a voltage or current is applied beyond the rated range, the instrument will be damaged.
- ✧ After measuring the high voltage battery, you should put the test leads together and make them shored first, and then test the low voltage batteries. In this way, the power of DC cutoff capacitance can be removed, otherwise the overvoltage may damage the low-voltage battery.



- ✧ Internal battery resistance varies considerably depending on charge or discharge status. To increase measurement accuracy, make measurements under similar conditions (for example, a fully charged battery).
- ✧ Lead-acid batteries (measuring objects) have high levels of terminal resistance. For this reason, resistance values may differ between the case and the tip of the terminal. Be sure to connect the test lead to the terminals at a fixed location.
- ✧ Use the optional Clip Type Lead with Temperature Sensor to measure the battery temperature. Or, use a non- contact thermometer, such as a radiation thermometer, for safety.
- ✧ Measurement may not be possible for insulated terminals, due to insufficient flow of current for measurement. In such a case, clean the terminal (remove the insulation) before measurement.

3.1 Pre-operation Inspection

Inspection item	Action
Is the fuse burned out? Is the test lead disconnected?	Touch the test lead to the zero adjustment board. If the resistance display still shows [----], the fuse might be burned out or the test lead may be disconnected. If so, replace it with a new one.
Is the battery level sufficient?	At the upper left-hand area of the screen, indicates the present alkaline battery status.
Inspecting batteries	Measurement may not be possible for insulated terminals, due to insufficient flow of current for measurement. In such a case, clean the terminal (remove the insulation) before measurement.

3.2 Setting the Measurement Range

Set resistance and voltage measurement ranges as described below.

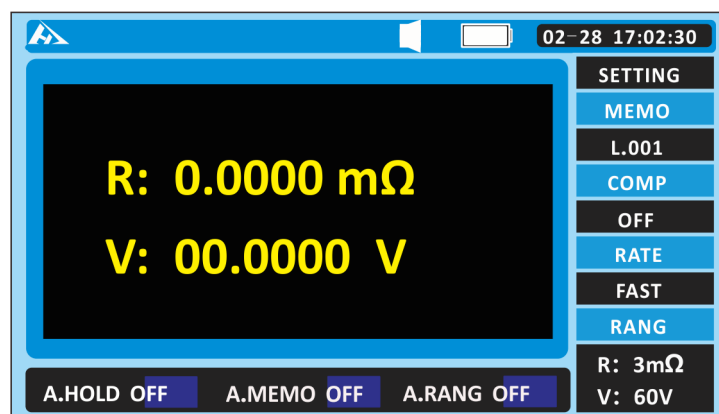
Resistance range	3 mΩ / 30 mΩ / 300 mΩ / 3 Ω
Voltage range	6 V / 60 V

Resistance range

Press the [**Ω**] key to set the current range. Press the key repeatedly to cycle through the ranges.

Voltage range

Press the [**V**] key to set the current range. Press the key repeatedly to cycle through the ranges.



Manual range switching is effective even when the automatic range function is turned on (the automatic range function is automatically turned off when the automatic range function is turned on and the manual range function is turned off when the automatic range function is turned on). At the measuring interface, press the [**AUTO**] key to switch the automatic range.

3.3 Zero Adjustment

The zero adjustment function displays subsequent measurement results using the measured value (correction value) obtained when it was performed as zero.

The function is able to get a more reliable accurate measurement result. It is recommended to use zero function before measurement.

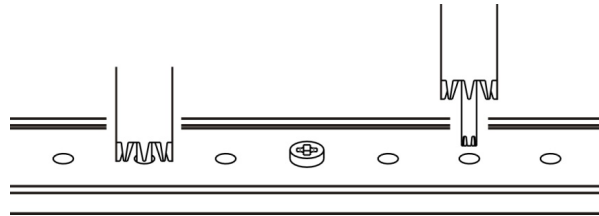


- ✧ Performing zero adjustment adjusts the zero points of all ranges.
- ✧ It takes 5 seconds to perform the zero adjustment
- ✧ Even after the instrument is turned off, the correction values are retained and the zero adjustment function is not canceled.
- ✧ After replacing the test lead, be sure to perform zero adjustment prior to measurement.
- ✧ Be sure to use the included zero adjustment block 9363-B when performing zero adjustment.
- ✧ Be sure to keep the test lead shorted during zero adjustment.

3.3.1 Shorting Methods for Various Test Leads

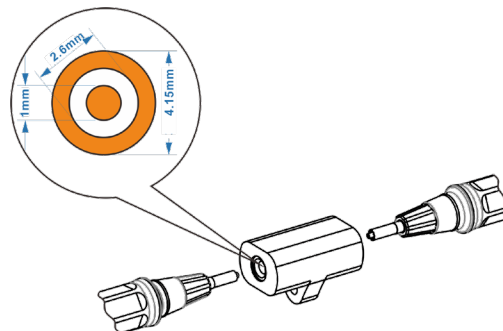
For Pin Type Leads 9363-B

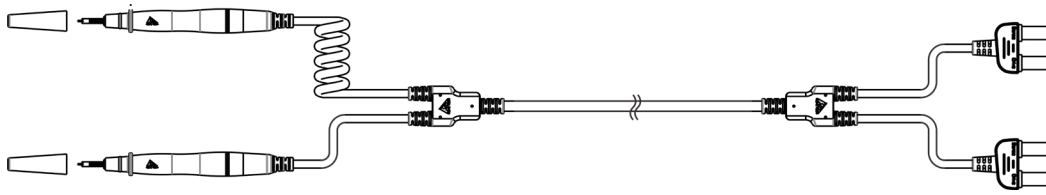
Use the zero adjustment board included with the instrument. The zero adjustment can be achieved using the AC 4-terminal method. Select the holes corresponding to the distance between the battery ports, center on the center screw of the zero adjustment plate, and press down the test probes symmetrically at both ends. The zeroing plate is at least 10 cm away from the instrument.



9365 zero adjustment plate

Or, using the zero adjustment block, insert the two ends of the probe into the middle hole of the zero adjustment block and press down symmetrically.





9363-B pin type test lead

Be sure to connect each of the DRIVE and SENSE terminals by inserting the tip of the pin into the holes on the zero adjustment board. (See the figure above.)

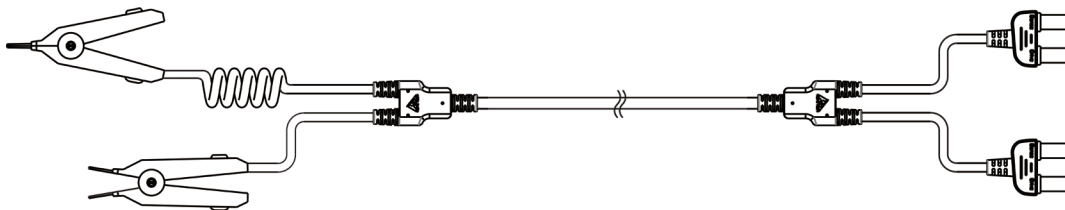
Do not place the zero adjustment board on top of the battery or any metal. Electromagnetic induction effect could result in unstable measurement values. In such a case, keep the zero adjustment board away from any metal.

Be sure to use the included zero adjustment board when performing zero adjustment.

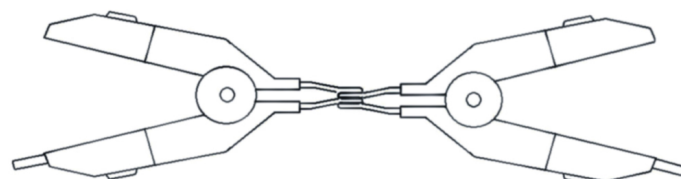
When the distance between the terminals on the battery (measurement target) is more than the distance between the holes on the zero adjustment board, use the holes at both corners to perform zero adjustment.

For Clip Type Leads

Perform zero adjustment by engaging red and black clips together.

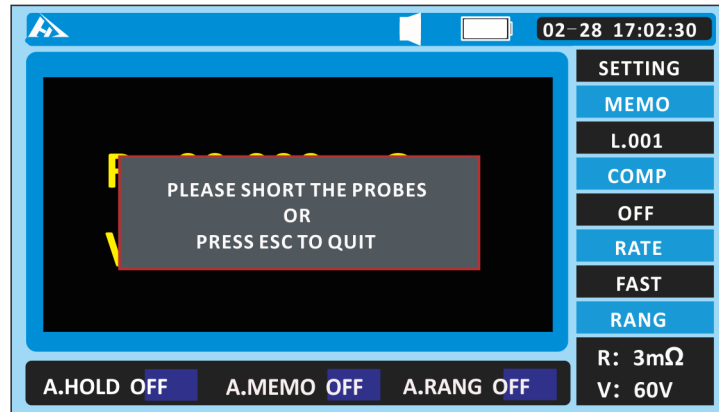


9363-A test clip



3.3.2 Performing Zero Adjustment

1. Check to ensure that the test leads are connected properly. Disconnect any leads connected to the measurement target.
2. Press the **[0.ADJ]** key.



3. Press the key **[ENTER]** to perform zero adjustment.

If the test leads are not shorted while the display is blinking, it will result in an error.

When the screen shows error information: The error message is displayed without the correct compensation value. The error may be caused by:

- for resistance or voltage values, the compensation value is over 300 units.
- Ensure that the test lead is properly connected to the instrument.
- The test lead is likely to be damaged. Try new test leads.
- Try to clean the zero adjustment board.

4. The instrument automatically begins obtaining correction values. When the zero adjustment operation is complete, **[0.ADJ]** is lit up and the instrument returns to the measurement mode:

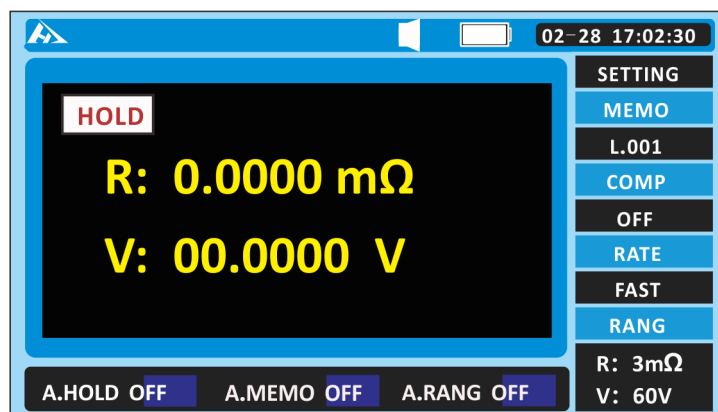
3.3.3 Canceling the Zeros Operation

When the zeroing function is performed, press **[ESC]** to cancel the zeroing adjustment operation.

3.4 Retaining the Displayed Values

3.4.1 Retaining the measurement values

Measurement values displayed on the screen can be retained. Pressing the **[HOLD]** key will light up **[HOLD]**, and retain the measurement values.



3.4.2 Canceling the Retaining State

Pressing the **[HOLD]** key again cancels the retaining state.



When the warning display or voltage is displayed as [----], the values cannot be retained.

- ✧ Changing any of the settings cancels retaining.
- ✧ Turning off the power cancels retaining.

3.5 Determining Battery-wear Judgment Values

1. Please refer to "pre-operation inspection of section 3.1" to set the range and zero operation.
2. The test lead is connected to a new or well-conditioned battery.
3. Read the measurement values.
4. Press the **[HOLD]** key to retain the measurement values.



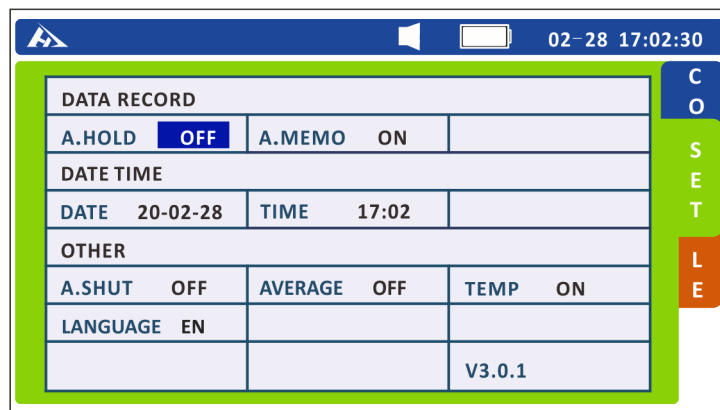
- when the test value shows "OF", it indicates that the resistance or voltage value shown exceeds the corresponding test range.
- when the resistance value is "--", it indicates that the test line is open or disconnected, or that the current is unstable for other reasons and cannot be tested.
"--" will also be displayed when the test line is not properly connected to the measured object or when the resistance of the measured object is far beyond the test range.
- when measuring the resistance of a relay or a connector, note the maximum open circuit voltage (approx. 27 V) of the instrument. Measurements may damage the contact or oxide layer of the object being measured, resulting in measurement errors.

End test

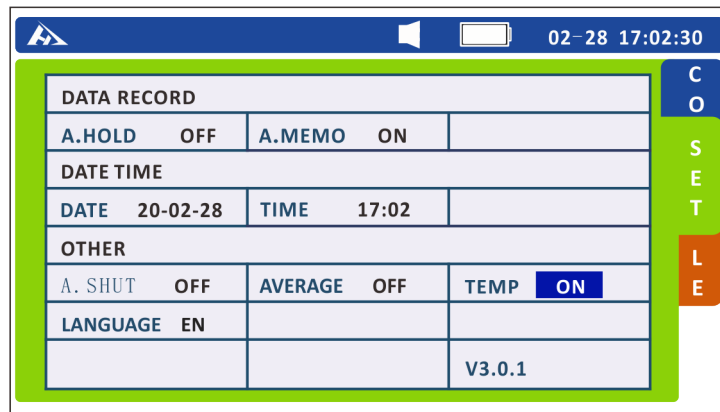
Press the **[POWER]** button to turn off the POWER of the instrument and remove the test line from the instrument.

3.6 Measuring the Temperature

Press the **[SET]** key on the test page twice to switch to the system Settings interface.



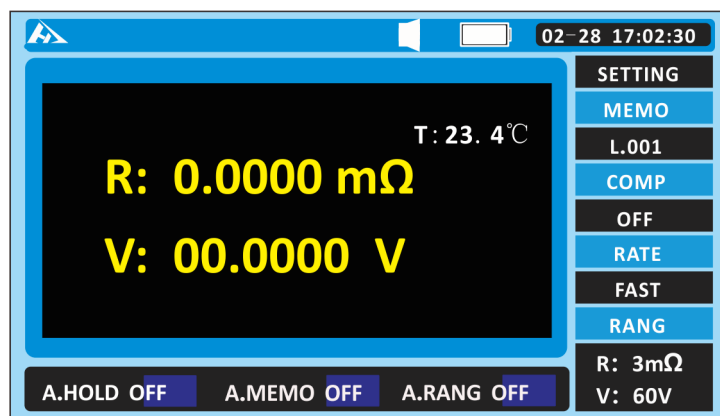
Select relevant options



Press the direction key to move the cursor position, press **[ENTER]** to select the temperature measurement, and then press the left and right keys to turn on and off the temperature measurement function.

3. Press **[ENTER]** to store the setting of temperature measurement function, and press **[ESC]** to return to the measurement interface.

Use the optional model PT1000 Clip Type Lead with Temperature Sensor to measure the battery temperature.



Chapter 4 Comparator Function

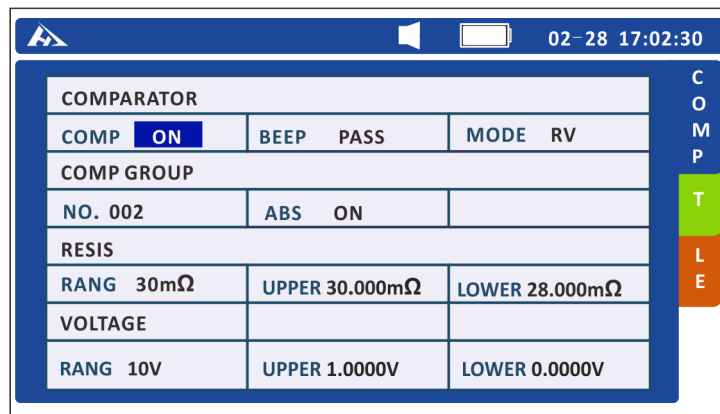
4.1 Overview

The battery measurement values can be compared with the present threshold values using the comparator function to determine the ranges in which the values fall within: PASS, or FAIL. Up to 200 comparator conditions can be set.

A buzzer sounds when the test result is not qualified in the range.

4.2 Turning On the Comparator Function

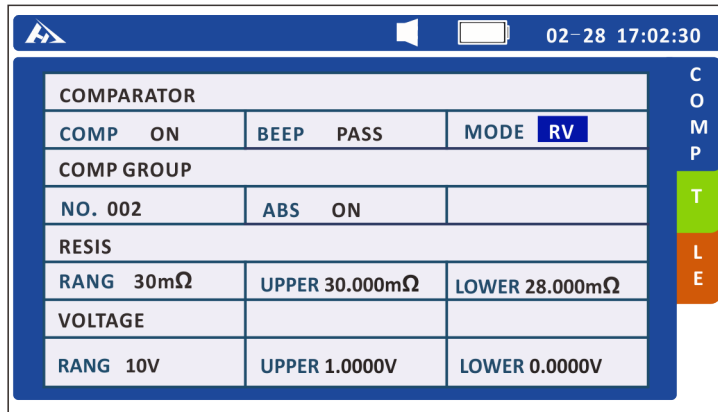
1. Press **[SET]** on the test page. Switch to the comparator interface.



2. Press the / / keys to move the cursor to the comparator switch position, press **[ENTER]** to select the comparator switch, and then press the / keys to set the comparator ON or OFF.

4.3 Select comparison mode

1. Press **[SET]** on the test page. Switch to the comparator interface.



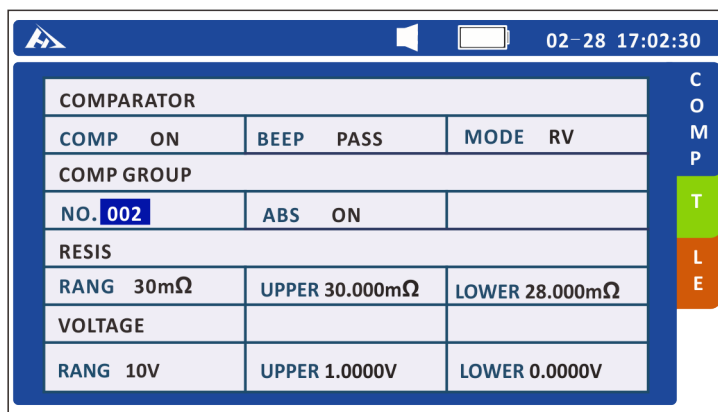
Press the direction key to move the cursor to the mode position, press the **[ENTER]** key to select the comparison mode, and then press the left and right keys to set the comparison mode R, V or RV. Press **[ENTER]** to store the comparison mode.

Mode R: compare resistance only, mode V: compare voltage only, mode RV: compare voltage resistance.

4.4 Set the comparator group number

The instrument has the function of preserving 200 record groups.

1. Press **[SET]** on the test page. Switch to the comparator interface.

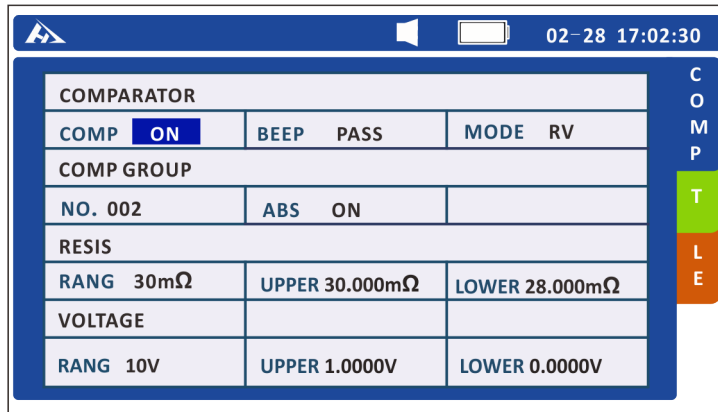


Press the direction key to move the cursor to the comparator group number, press the **[ENTER]** key to set the group number, and then press the left and right keys to set the record group 1-200. Press **[ENTER]** to store the comparator record group number.

4.5 Set comparator

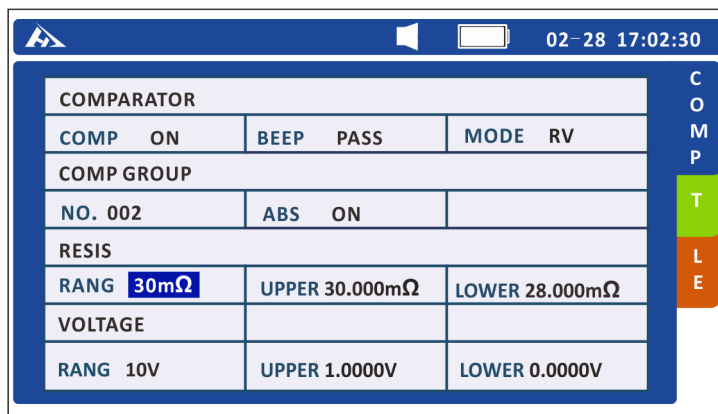
Set the comparator threshold

1. Press **[SET]** on the test page. Switch to the comparator interface.



Press the direction key to move the cursor, press [ENTER] to select the comparator switch, and then press the left and right keys to turn the comparator on or off.

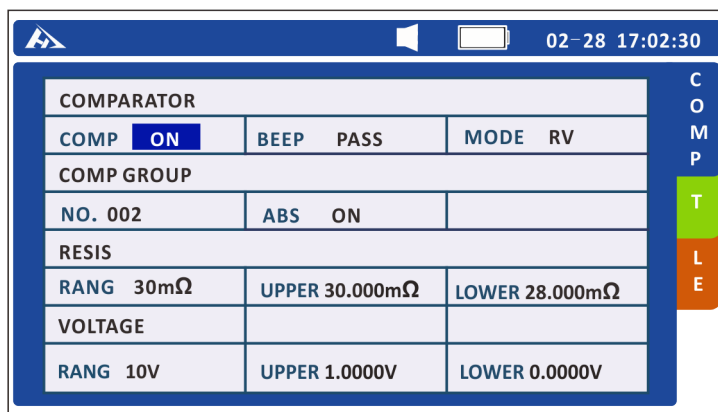
2. Press the direction key to move the cursor to the resistance range position.



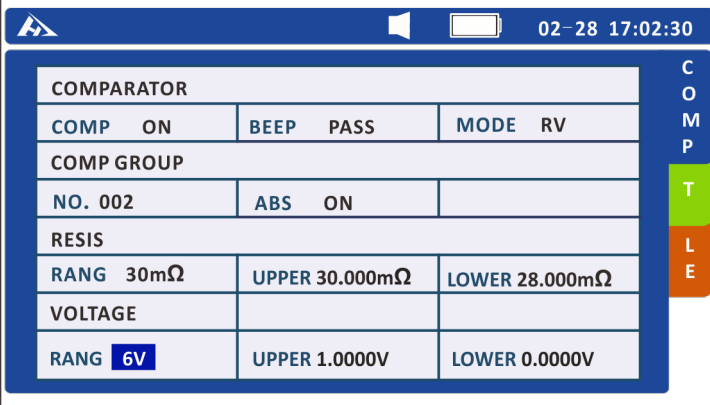
Press [ENTER] to select the resistance range to be set, and then press left and right to set the resistance range. Press [ENTER] again to complete. Press [ESC] to return to the measurement interface.

Set the comparator voltage threshold

1. Press [SET] on the test page. Switch to the comparator interface.



2. Press the direction key to move the cursor to the voltage range position.



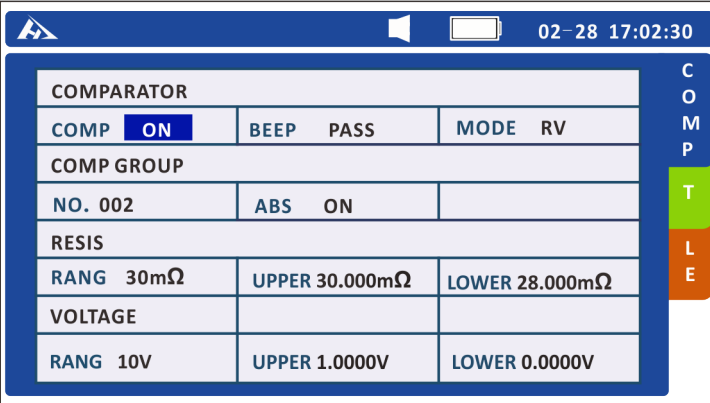
The screenshot shows the 'COMP' interface with a table of settings. The 'VOLTAGE' section is highlighted, and the 'RANG' value is set to '6V'. The 'RESIS' section shows 'RANG 30mΩ', 'UPPER 30.000mΩ', and 'LOWER 28.000mΩ'. The 'VOLTAGE' section shows 'RANG 6V', 'UPPER 1.0000V', and 'LOWER 0.0000V'. The 'COMP' label is on the right side of the screen.

COMPARATOR		
COMP ON	BEEP PASS	MODE RV
COMP GROUP		
NO. 002	ABS ON	
RESIS		
RANG 30mΩ	UPPER 30.000mΩ	LOWER 28.000mΩ
VOLTAGE		
RANG 6V	UPPER 1.0000V	LOWER 0.0000V

Press [ENTER] to select the voltage range to be set, and then press the left and right keys to set the voltage range. Press [ENTER] again to complete. Press [ESC] to return to the measurement interface.

Set the comparator resistance threshold

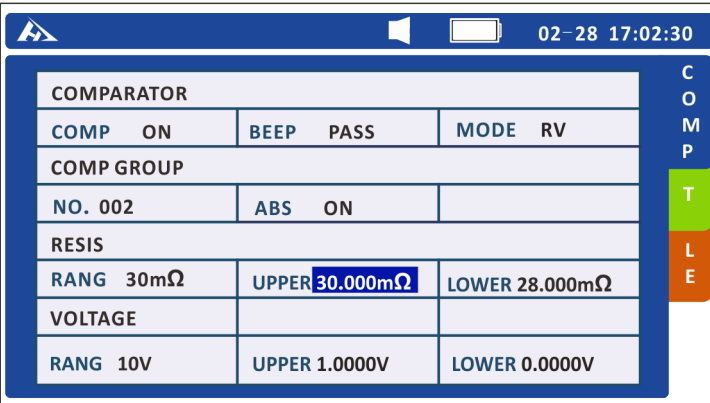
1. Press [SET] on the test page. Switch to the comparator interface.



The screenshot shows the 'COMP' interface with a table of settings. The 'RESIS' section is highlighted, and the 'RANG' value is set to '10V'. The 'RESIS' section shows 'RANG 30mΩ', 'UPPER 30.000mΩ', and 'LOWER 28.000mΩ'. The 'VOLTAGE' section shows 'RANG 10V', 'UPPER 1.0000V', and 'LOWER 0.0000V'. The 'COMP' label is on the right side of the screen.

COMPARATOR		
COMP ON	BEEP PASS	MODE RV
COMP GROUP		
NO. 002	ABS ON	
RESIS		
RANG 30mΩ	UPPER 30.000mΩ	LOWER 28.000mΩ
VOLTAGE		
RANG 10V	UPPER 1.0000V	LOWER 0.0000V

2. Press the direction key to move the cursor to the upper resistance position.

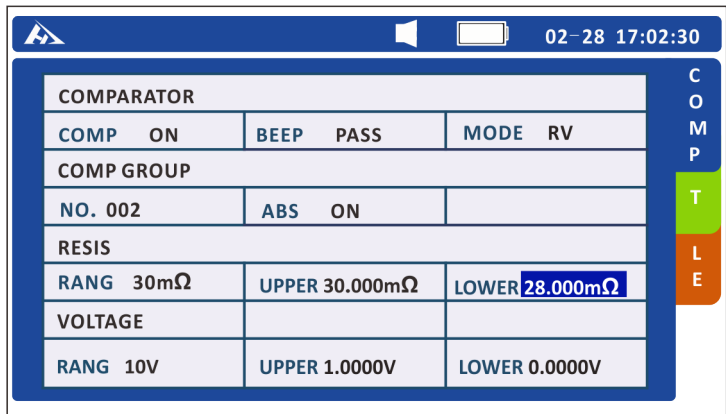


The screenshot shows the 'COMP' interface with a table of settings. The 'UPPER' value in the 'RESIS' section is highlighted, and the value is '30.000mΩ'. The 'RESIS' section shows 'RANG 30mΩ', 'UPPER 30.000mΩ', and 'LOWER 28.000mΩ'. The 'VOLTAGE' section shows 'RANG 10V', 'UPPER 1.0000V', and 'LOWER 0.0000V'. The 'COMP' label is on the right side of the screen.

COMPARATOR		
COMP ON	BEEP PASS	MODE RV
COMP GROUP		
NO. 002	ABS ON	
RESIS		
RANG 30mΩ	UPPER 30.000mΩ	LOWER 28.000mΩ
VOLTAGE		
RANG 10V	UPPER 1.0000V	LOWER 0.0000V

Press **[ENTER]** to select the upper limit of resistance to be set, press left and right keys to move the cursor, and press up and down keys to set the upper limit of resistance. Press **[ENTER]** again to complete.

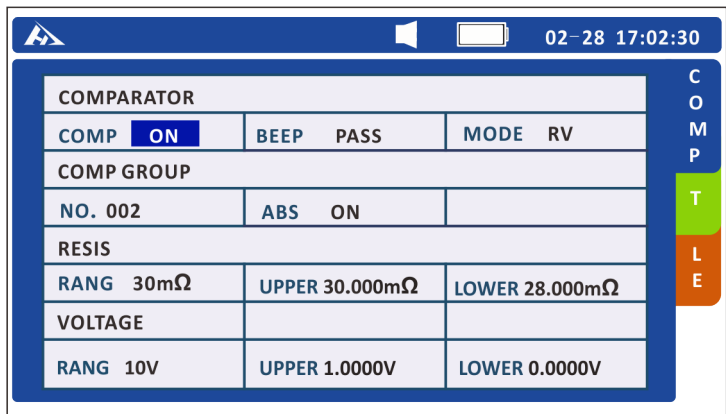
3. Press the direction key to move the cursor to the lower resistance position.



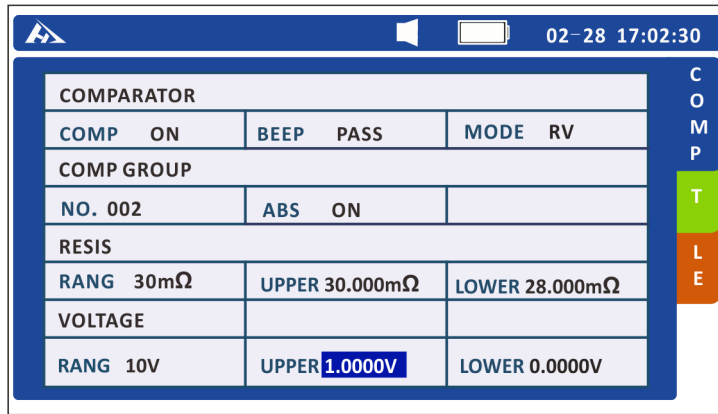
Press **[ENTER]** to select the lower limit of resistance to be set, press left and right keys to move the cursor, and press up and down keys to set the lower limit of resistance. Press **[ENTER]** again to complete.

Set the comparator voltage threshold

1. Press **[SET]** on the test page. Switch to the comparator interface.

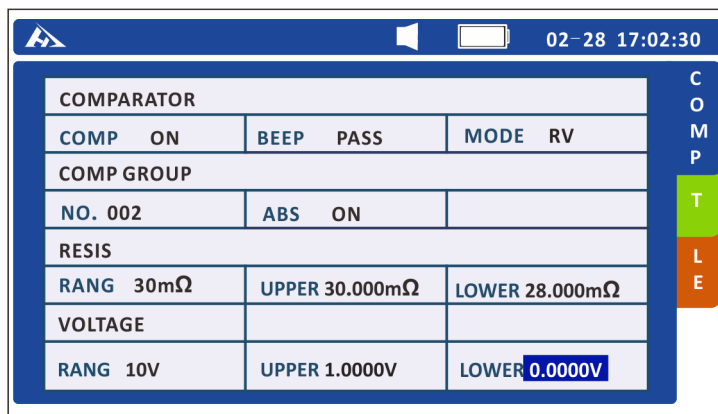


2. Press the direction key to move the cursor to the upper voltage position.



Press **[ENTER]** to select the voltage upper limit to be set, press left and right to move the cursor, and press up and down to set the voltage upper limit. Press **[ENTER]** again to complete.

3. Press the direction key to move the cursor to the lower voltage position.



Press **[ENTER]** to select the voltage lower limit to be set, press left and right to move the cursor, and press up and down to set the voltage lower limit. Press **[ENTER]** again to complete. Press **[ESC]** to return to the measurement interface.

4.6 Setting the Comparator Buzzer

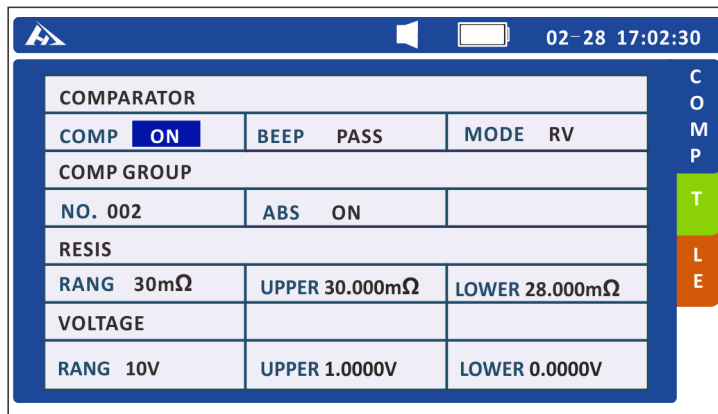
The buzzer can be enabled in accordance with comparison results when the comparator function is used. The buzzer can be set to sound in the following states. By default, the buzzer is configured to sound when the comparison result is WARNING or FAIL.

OFF	The buzzer will not sound regardless of comparison results.
PASS(ON)	The buzzer sounds when comparison results are PASS.
FAIL(ON)	The red backlight turns on, along with the buzzer sounds when comparison results are WARNING or FAIL.

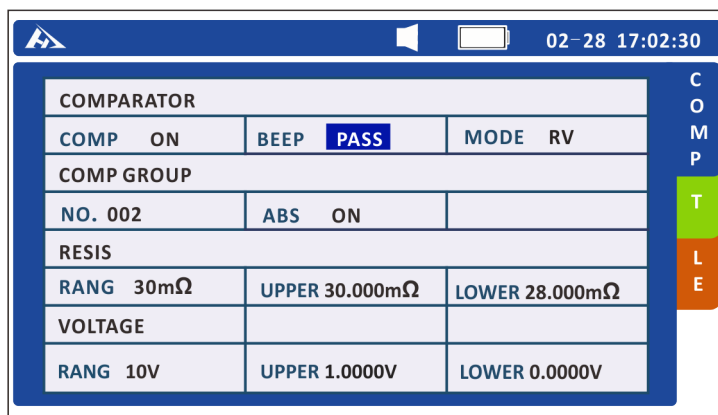
When you press the **[BEEP]** key, the present comparator buzzer setting is displayed. Press the key repeatedly to cycle through the settings.



1. Press **[SET]** on the test page. Switch to the comparator interface.



2. Press the direction key to move the cursor to the signal.



Press **[ENTER]** to select the mode of message ringing that needs to be set, and press the left and right keys to switch between qualified ringing and unqualified ringing. Press **[ENTER]** again to complete.



- The range keys cannot be used while the comparator function is turned on.
- If there are no measurement values, [----] is displayed and a comparator judgment cannot be performed.
- Even when the power is turned off, the comparator settings are saved and the comparator will be restored to on when the power is again turned on.

Chapter 5 Storage function

5.1 Overview

This instrument can store up to 2400 sets of data combining presently measured values*(Date and time, resistance, voltage, temperature, comparator threshold values, and results of judgment). After measurement, saved data can be displayed or transferred to a computer.

The structure of the internal memory is as follows:

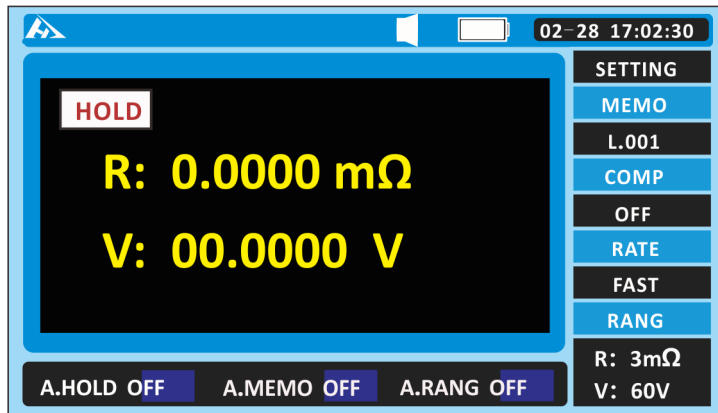
Memory Structure

Unit name (12 units)	Memory number (200 cells)						
A	1	2	3	.....	198	199	200
b	1	2	3	.....	198	199	200
C	1	2	3	.....	198	199	200
d	1	2	3	.....	198	199	200
E	1	2	3	.....	198	199	200
F	1	2	3	.....	198	199	200
G	1	2	3	.....	198	199	200
H	1	2	3	.....	198	199	200
J	1	2	3	.....	198	199	200
L	1	2	3	.....	398	199	200
n	1	2	3	.....	198	199	200
P	1	2	3	.....	198	199	200

5.2 Storing Data in the Memory

Pressing the **[HOLD]** key and then press the **[MEMO]** key to save the current measurement values.

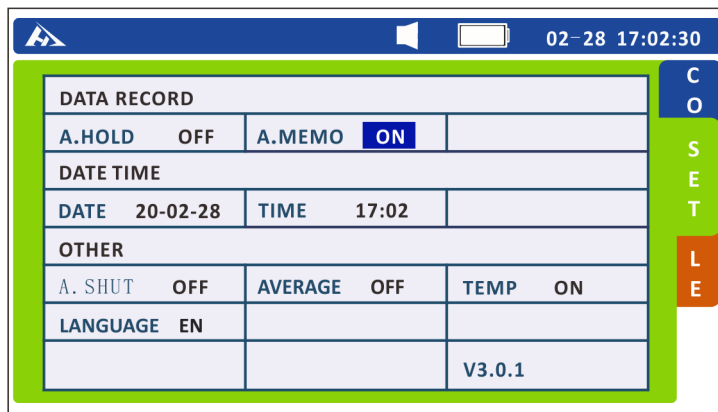
1. If the data is stored at a different address than the memory address shown, use the \uparrow / \downarrow key to change the address cell number. This can be done at any time as long as storage is enabled.
2. Retain the measurement values by pressing the **[HOLD]** key.



3. Using the key **[MEMO]** to store the measurement values. The measurement values are stored in the cell with the selected memory number.
4. After the data is stored, the next available memory number is displayed.

5.3 Canceling the Memory Function

1. Press the **[SET]** key on the test page. Switch to the system Settings interface.
2. Press the direction key to move the cursor to automatic storage.



3. Press the **[ENTER]** key to select ON or OFF to set the automatic storage function, and press the left and right keys to switch OFF. Press **[ENTER]** again to turn off automatic storage. Press **[ESC]** to return to the measurement interface.

5.4 Reading Out Stored Data

The stored measurement values are displayed after they are read out.

1. Press the **[FILE]** key on the test page. Switch to the file reading interface.

RECORD FILE.		
QUERY NO. A.001	MEMO GROUP L	
RECORD TIME		
DATE 03-01	TIME 10:59:54	
RECORD DATE		
TEMP----		
RES 000.01mΩ	UPP 300.00mΩ	LOW 288.00mΩ
VOLT 0.00010V	UPP 01.00000V	LOW 00.00000V

2. Use the key / to select the memory number to be read out. Use the key / to locate the memory number. The measurement values for the selected memory number are displayed.



- Press the DATE key to check the date and time when the data was stored.
- The comparator result for the data being read out is also displayed.
- You cannot select the number of the memory location in which no data is stored.
- If no data has been stored, [----] is displayed in the memory number display area and the instrument returns to the measurement screen.
- For data measured using the optional model PT1000 Clip Type Lead with Temperature Sensor, the temperature is also displayed.

5.5 Clearing Stored Data

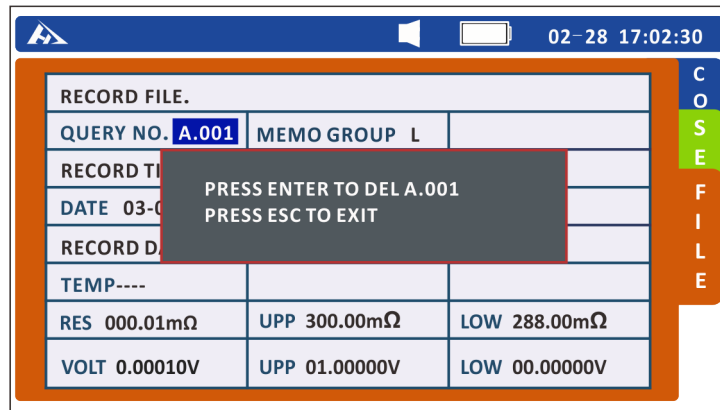
5.5.1 Clearing a group of data

1. Press [FILE] on the test page. Switch to the file reading interface.

RECORD FILE.		
QUERY NO. A.001	MEMO GROUP L	
RECORD TIME		
DATE 03-01	TIME 10:59:54	
RECORD DATE		
TEMP----		
RES 000.01mΩ	UPP 300.00mΩ	LOW 288.00mΩ
VOLT 0.00010V	UPP 01.00000V	LOW 00.00000V

2. Press / to select the memory address unit. Press / to select a place.

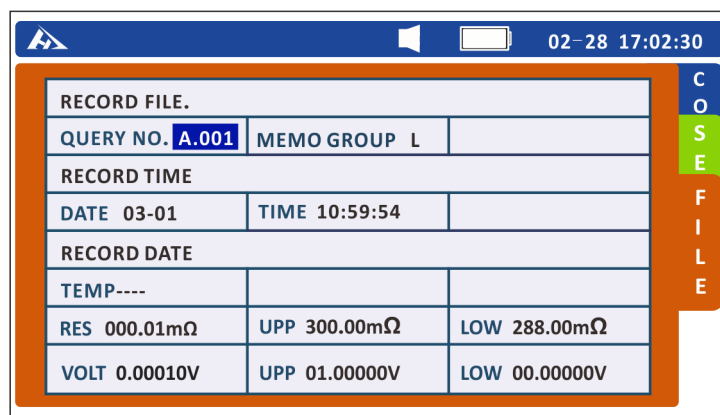
3. Press **[CLEAR]** to delete the current group of data.



4. Press **[ENTER]** again to confirm that the data stored in the selected memory address is deleted.

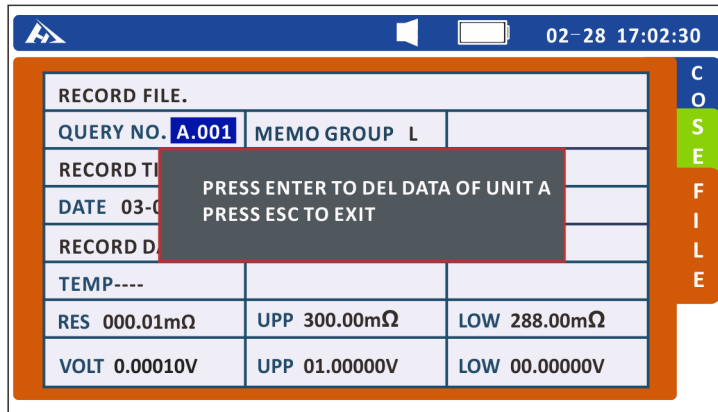
5.5.2 Clearing a cell (200 groups) of data

1. Press **[FILE]** on the test page. Switch to the file reading interface.



2. Press / to select the memory address unit. Press / to select a place.

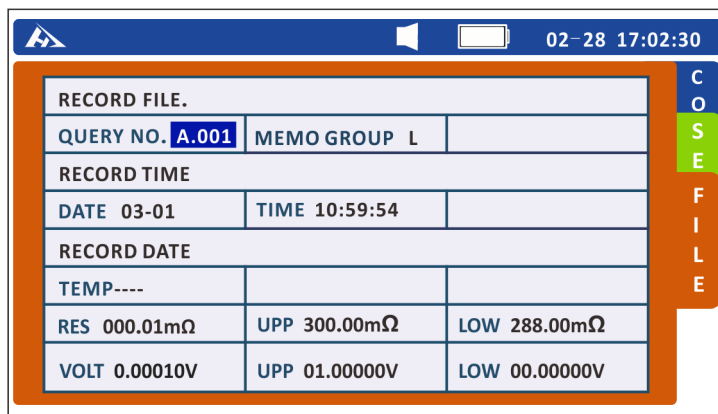
3. Press **[CLEAR]** twice to delete the cell data.



4. Press **[ENTER]** again to confirm that the data stored in the selected cell is deleted.

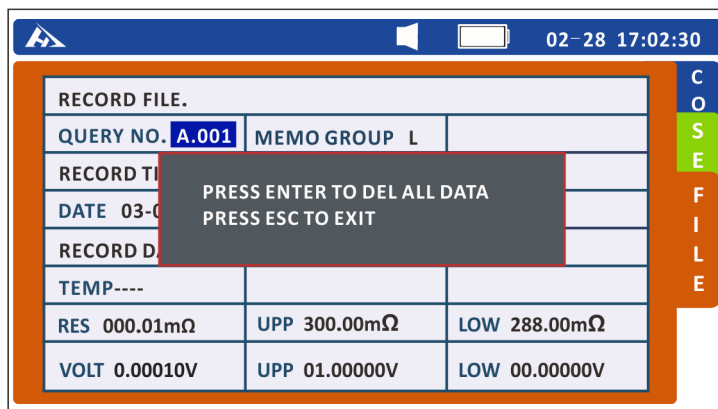
5.5.3 Clearing All Data

1. Press **[FILE]** on the test page. Switch to the file reading interface.



2. Press **▲** / **▼** to select the memory address unit. Press **◀** / **▶** to select a place.

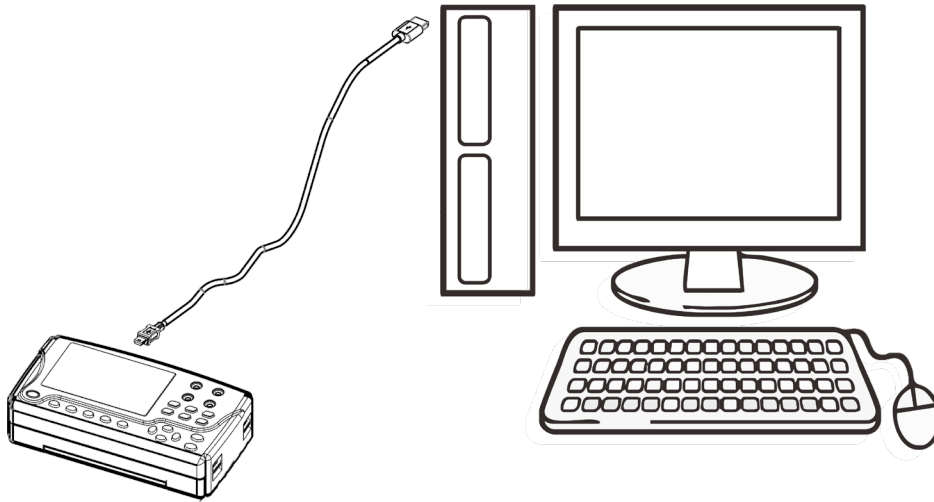
3. Press **[CLEAR]** 3 times to delete all data.



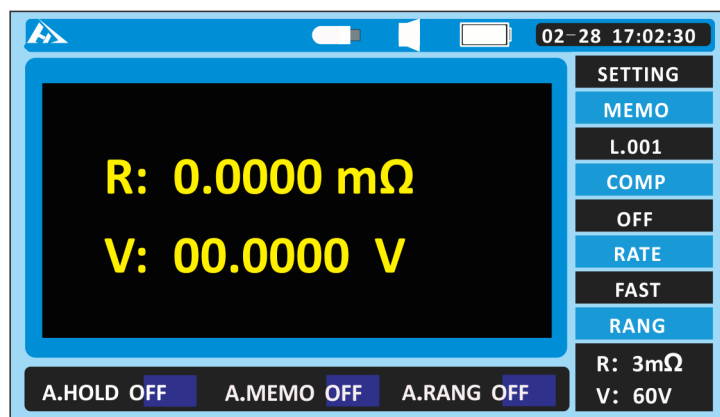
4. Press **[ENTER]** again to delete all the stored data.

5.6 Download stored data

The test is complete and the stored test data can be downloaded to the computer.



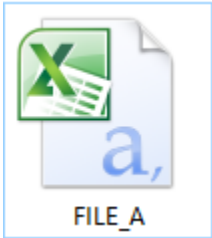
1. Connect one end of the 9803 USB communication cable to the personal computer and the other end to the PC interface above the MP700499.



2. When the cable is connected, USB small icon appears in the status bar above the tester, and the 3554 DISK disk is found on the computer.



3. Open the 3554DISK, the data is stored in the FILE_A、 FILE_B and other files inside, which can be downloaded according to the need.



Open as follows:

Battery Test									
Serial Number	HP3554								
Test Start Date&Time	00-268470120 05:00:15469								
Memory Location	A								
Battery Location									
Battery Type									
Battery No.	Resistanc	Low Setti	High Sett	Voltage(V	Low Settir	High Setti	Pass/Fail	Temp(°C)	Test Date&Time
1	1.5192	1.0000	2.0000	4.05856	3.60000	4.30000	PASS	21.0	2020/4/30 10:59
2	1.5170	1.0000	2.0000	4.05850	3.60000	4.30000	PASS	21.1	2020/4/30 10:59
3	1.5167	1.0000	2.0000	4.05860	3.60000	4.30000	PASS	21.2	2020/4/30 10:59
4	1.5130	1.0000	2.0000	4.05959	3.60000	4.30000	PASS	21.0	2020/4/30 11:00
5	1.4950	1.0000	2.0000	4.05753	3.60000	4.30000	PASS	20.9	2020/4/30 11:00
6	1.5000	1.0000	2.0000	4.05844	3.60000	4.30000	PASS	21.0	2020/4/30 11:02
7	2.1078	1.0000	2.0000	4.05851	3.60000	4.30000	FAIL	21.3	2020/4/30 11:03

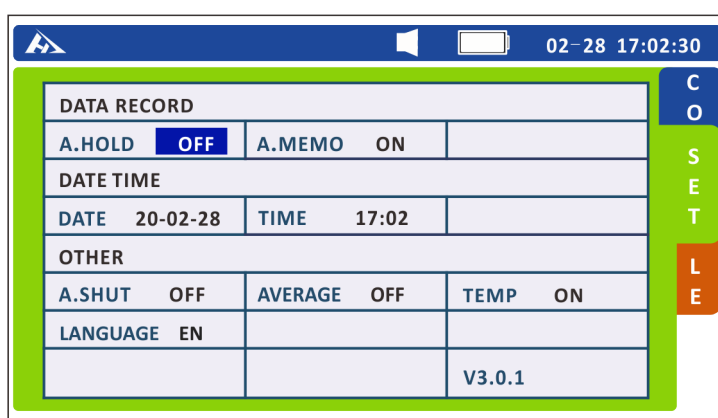
Chapter 6 Other Function

6.1.Averaging Function

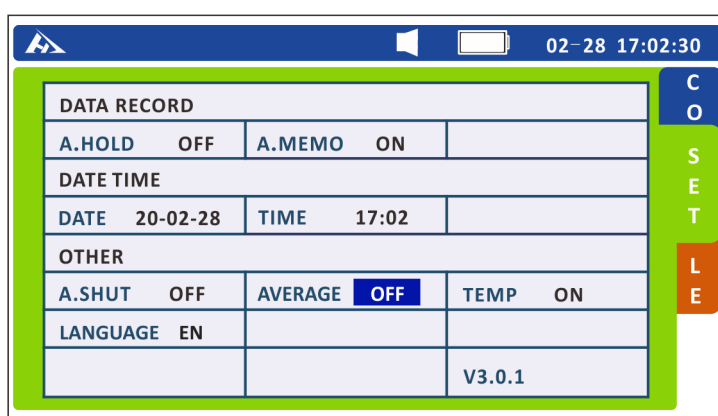
This function averages the measurement values in order to display a single value. It helps to stabilize fluctuations in the measured values.

When the test value is not stable, the average function can be used. The average number can be selected as 2, 3, or 4.

1. Press **[SET]** on the test page. Switch to the system Settings interface.



2. Press the direction key to move the cursor to the average number of times.



Press **[ENTER]** to select the average number of times you want to set, and press left and right to switch OFF, 2,3,4. Press **[ENTER]** again to complete. Press **[ESC]** to return to the measurement interface.



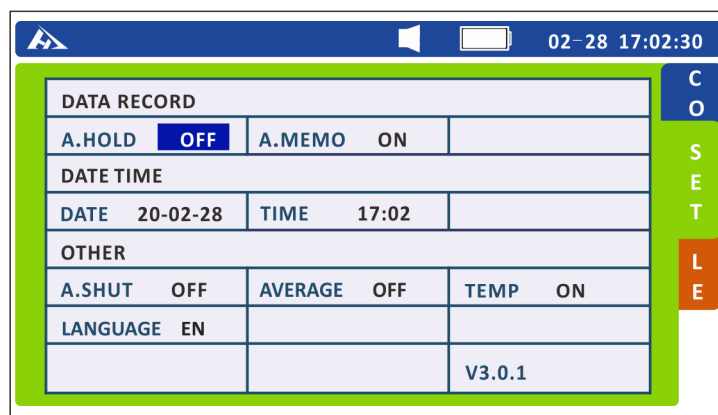
- The average function can be used when measure resistance values.
- The average function is used to change the display update rate of the test value.
- When the average function is not used, select "OFF".

6.2 Auto-hold Function

This function automatically recognizes the stability of measurement values and retains them.

Set auto hold function

1. Press **[SET]** on the test page. Switch to the system Settings interface.



Press the **[ENTER]** key to select whether to turn ON the auto save function, and press the left and right keys to switch OFF, ON. Press **[ENTER]** again to complete. Press **[ESC]** to return to the measurement interface.



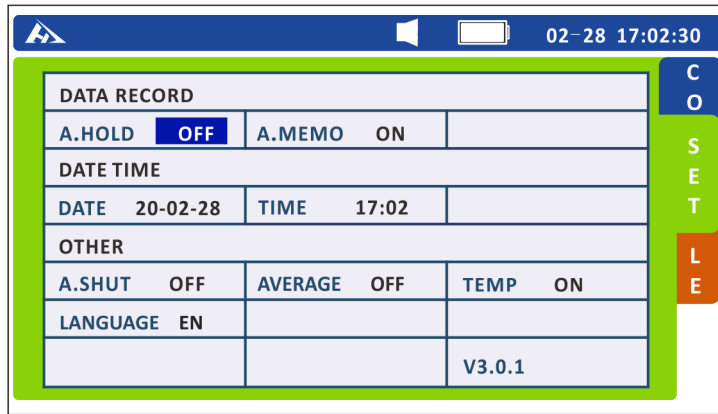
- When [----] is displayed, data is not retained automatically.
- The instrument retains and stores measurement values automatically when the auto-memory function is used together with this function.

6.3 Auto-memory Function

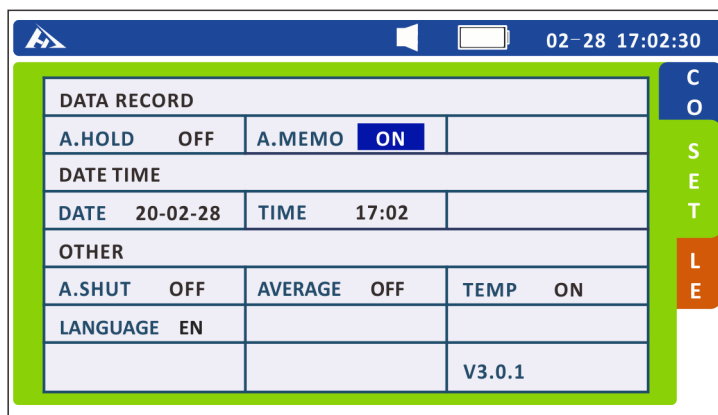
This function automatically stores measurement values in memory immediately after they are retained.

Set up automatic storage

1. Press **[SET]** on the test page. Switch to the system Settings interface.



2. Press the direction key to move the cursor to the automatic storage function.



Press the **[ENTER]** key to turn ON or OFF the automatic storage function, and press the left and right keys to switch OFF, ON. Press **[ENTER]** again to complete. Press **[ESC]** to return to the measurement interface.



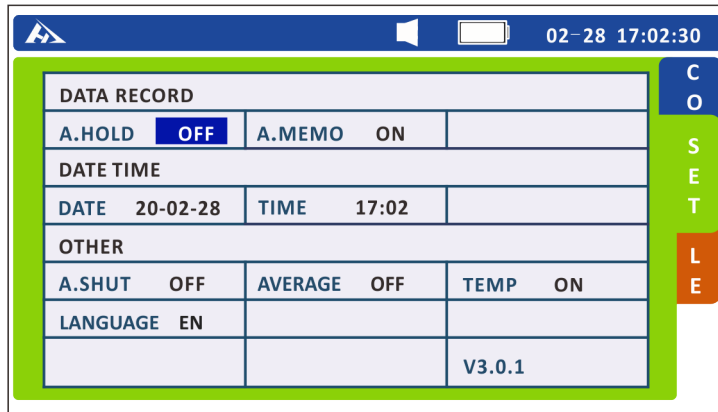
The instrument retains and stores measurement values automatically when the auto-memory function is used together with auto-hold function.

6.4 Auto Power Save Function

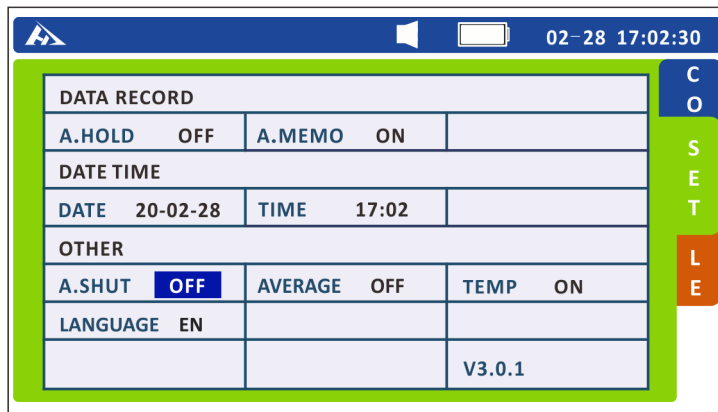
The auto power save function can be used to reduce power consumption of the instrument. The instrument is turned off automatically if any of the following conditions continues for approximately 10 minutes with no key operation:

- [----] is displayed as a resistance value.
- Data is being retained. (Measurement is suspended.)
- A state other than measurement state. (Any of the setup screens or the data readout screen is displayed.)
- After completion of communication.

1. Press **[SET]** on the test page. Switch to the system Settings interface.







2. Press the direction key to move the cursor to automatic shutdown.



Press **[ENTER]** to select the automatic shutdown function, and press the left and right keys to switch OFF, ON. Press **[ENTER]** again to complete. Press **[ESC]** to return to the measurement interface.

6.5 Battery Level Warning

The battery level of the instrument is displayed at the upper-right corner of the screen.

Battery level indicator	Battery status
	Battery fully charged.
	Battery status when it is used about 4 hours
	Battery status when it is used about 6 hours Battery level is low. Charge the battery timely
	(Flashing) Battery status when it is used about 8 hours Battery level is low. Charge the battery as soon as possible

Chapter 7 Specifications

7.1 General Specifications

Model		MP700499	MP700500	MP700501	MP700502
Display		4.3" VFD display	4.3" TFT LCD Display		
Measurements		ESR, DCV			
Resistance	Accuracy	±1%	±0.5%		
	Range	0.001mΩ~3.100Ω	0.001mΩ ~ 30.100Ω		
Voltage	Accuracy	±0.02%	±0.02%		
	Range	0.0001V~60.000V	0.00001V~100.000V	0.00001V~300.000V	0.00001V~1000.000V
Signal Source		AC 1kHz test current: <150mA	AC 1kHz open circuit voltage: <5V Test current <150mA		
Range		3mΩ/30mΩ/300mΩ/3Ω; 4 ranges in all	3mΩ/30mΩ/300mΩ/3Ω/30Ω; Auto and manual test mode in 5-level range		
Sampling Rate		1 meas/sec (the average number optional)	20 meas/sec, 3 meas/sec		
Temperature		Range:-10°C ~60°C Accuracy:±1°C			
Correction		Short circuit test for all ranges			
Comparator		200set WARNING//FAIL/PASS sorting	200set Storage data		
Internal Store	Data	Store up to 2400 set data	Store up to 2400 set test data (upgradable to 4800 set)		
Trigger		Internal/auto trigger			
Interface		USB, EXPORT (port execute the hold function)			
Power Supply		12V/1700mAh Lithium battery or AA (LR6) Alkaline batteries x8			
Maximum rated power		4VA			
Dimensions		(L) 208 x (W)120 x (D)52.5mm without sleeve			
Weight		0.81kg			

Timer

Feature	24-hour clock; leap years are adjusted automatically
Accuracy	About ± 4 min per month.
Other	Built-in backup lithium battery Battery life: about 2 years

Operation keys	Plastic keys
Display	LCD screen
Accuracy guarantee	1 year
Operating temperature and humidity	0°C to 40°C 80%RH (no condensation)
Storage temperature and humidity	-10°C to 60°C 80%RH (no condensation)
Operating environment	Indoor, maximum altitude 2000 M
Power	lithium battery 2500 mAh
Voltage	12V
Maximum rated power	4VA
Continuous working hours	about 8 hours
Size	about 205x110x55
Weight	about 810g
Maximum input voltage Positive and negative test terminals:	DC 70V

Chapter 8 Maintenance and Service

8.1 Repair, Inspection, Cleaning



Customers are not allowed to modify, disassemble, or repair the instrument. Doing so may cause fire, electric shock, or injury.



When the instrument is being repaired, batteries and parts should be removed to prevent damage during transportation. Add gasket material to prevent the instrument from moving in the box. Try to clarify in detail the problems encountered. The company is not responsible for damages that occur during transportation.

Before Returning for Repair

If the instrument is not operating correctly, check the following:

Error	Cause and Solution
Nothing is displayed on the screen even after the POWER key is pressed.	The battery is drained. → Charge the battery The batteries are inserted incorrectly. → C Reinsert the batteries correctly
Incorrect measurement values are displayed [----] is displayed on the screen [OF] is displayed on the screen	The test lead is not connected correctly. → Connect the test lead correctly. The test lead is disconnected. → Replace with a new test lead. Zero adjustment is not performed correctly. → Perform zero adjustment correctly An appropriate range is not selected. → Select the appropriate range using the range key.
Pressing the Ω or V key has no effect.	The comparator function is turned on. → Use the COMP key to turn off the comparator function.
Pressing the MEMO key has no effect.	The data is not retained → Use the HOLD key to retain the data.
Nothing is displayed on the screen even after the READ key is pressed.	This key cannot be used when no data has been stored.
The comparison result of the comparator is not correct.	The comparator threshold values are not set correctly. → Set the correct threshold values.

Chapter 9 Appendix

9.1 Effect of extended test line and induced voltage

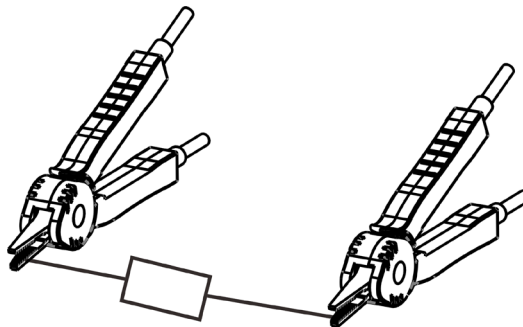
Test lines can usually be extended by customization. If you want to extend the test line, please contact the dealer or Multicomp-Pro. The user can not extend the test line privately.

Reduce induction voltage

Because the instrument under AC power to test resistance with very small resistance, the inductive voltage will affect the test. The inductive voltage makes the current in the instrument produce inductive coupling inside the wire, which will affect the in-line signal. Because the AC current (reference signal) is 90 degrees different from the phase of the induced voltage, the synchronous detector circuit can remove the induced voltage when the voltage is low. But when the voltage is high, the inductive voltage will distort the signal and produce the wrong synchronous detection signal. The instrument detects the internal inductive voltage, if the voltage rises to a certain height, will produce the wrong test signal. Reducing the length of the test line, especially the length of the branch part, will weaken the inductive voltage. When the standard test line is used, the induced voltage will affect the deviation of the result value by about 15 dgt.. if the zero adjustment and the test wiring are extremely different in 3 mΩ range.

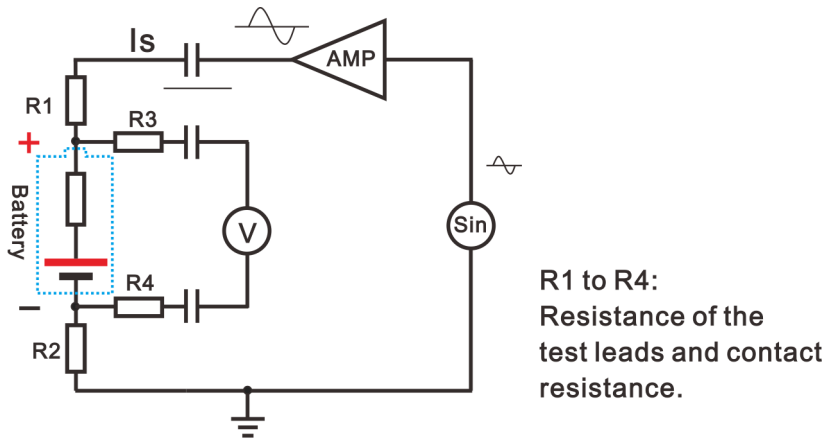
9.2 Influence of Eddy Current

The AC current in the instrument will generate eddy current around the metal plate, and the eddy current will generate inductive voltage inside the test line. Because the phase of the induced voltage is 180 degrees different from the phase of the AC current (reference current), the synchronous detection current can not eliminate the induced voltage, which leads to a test error. Eddy effect is unique to the ohmmeter of AC power supply. The distance between the metal parts including the metal plate and the test line (branch part) should be reduced to avoid the influence of eddy current.



9.3 AC 4-terminal Measurement Method

The instrument uses AC four-terminal measurement method, so when measuring resistance, it is not necessary to consider the internal resistance of the test line and the contact resistance between the test line and the object under test.



The AC current (I_s) flowing from the SOURCE port of the instrument flows through the tested battery. The voltage drop (V_{IS}) of the internal resistance of the battery is measured by the SENSE port. At this point, since the SENSE port is connected to an internal voltmeter with a high impedance, there is no current passing on the R_2 and R_3 representing the resistance and contact resistance in the test line. Therefore, there is no voltage drop on the resistance R_2 and R_3 , because the voltage drop of the resistance and contact resistance in the test line is very small, which can be ignored. In the instrument, using a synchronous detection system, the internal resistance is divided into impedance and reactance, showing only the actual part.

if the resistance within the test line, the contact resistance between the object under test and the test line or the contact resistance between the test line and the instrument increases, then the instrument will be supplied to the abnormal current of the object under test, which will cause the test state error, showing the "-----" symbol where the resistance is tested.

INFORMATION ON WASTE DISPOSAL FOR CONSUMERS OF ELECTRICAL & ELECTRONIC EQUIPMENT.

When this product has reached the end of its life it must be treated as Waste Electrical & Electronics Equipment (WEEE). Any WEEE marked products must not be mixed with general household waste, but kept separate for the treatment, recovery and recycling of the materials used. Contact your local authority for details of recycling schemes in your area.



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