HIOKI

3453, 3453-01

DIGITAL MΩ HiTESTER

Instruction Manual

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Introduction
Thank you for purchasing the HIOKI 3453, 3453-01 DIGITAL MΩ HiTESTER. To obtain maximum performance from the instrument, please read this manual first, and keep it handy for future reference.

Initial Inspection
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 dealer or Hioki representative.

Preliminary Checks
- Before using the instrument the first time, verify that it operates normally to ensure that the no damage occurred during storage or shipping. If you find any damage, contact your dealer or Hioki representative.
- Before using the instrument, make sure that the insulation on the test leads and connection cords is undamaged and confirm that the white or red portion (insulation layer) inside the cable is not exposed. If a color inside the cable is exposed, do not use the cable. Using the product in such conditions could cause an electric shock, so contact your dealer or Hioki representative for replacements (Model L9787).

Maintenance and Service
- To clean the instrument, wipe it gently with a soft cloth moistened with water or mild detergent. Never use solvents such as benzene, alcohol, acetone, ether, ketones, thinners or gasoline, as they can deform and discolor the case.
- If the instrument seems to be malfunctioning, confirm that the batteries are not discharged, and that the test leads is not open circuited before contacting your dealer or Hioki representative. When sending the instrument for repair, remove the batteries and pack carefully to prevent damage in transit. Include cushioning material so the instrument cannot move within the package. Be sure to include details of the problem. Hioki cannot be responsible for damage that occurs during shipment.
- When an indication Err.2 appears, send the instrument for repair.

HIOKI

DECLARATION OF CONFORMITY

Manufacturer's Name: HIOKI E.E. CORPORATION
Manufacturer's Address: 81 Koizumi, Ueda, Nagano 386-1192, Japan

Product Name:	DIGITAL MΩ HiTESTER
Model Number:	3453, 3453-01
Accessory:	L9787 TEST LEAD
Option:	L9787 TEST LEAD L9787-91 BREAKER PIN 9804-02 MAGNETIC ADAPTER

The above mentioned products conform to the following product specifications:

Safety:	EN61010-1:2001 EN61010-031:2002+A1:2008
EMC:	EN61326-2-2:2006 Class B equipment Portable test, measuring and monitoring equipment used in low-voltage distribution systems

Supplementary Information:
The products herewith comply with the requirements of the Low Voltage Directive 2006/95/EC and the EMC Directive 2004/108/EC.

HIOKI E.E. CORPORATION

28 March 2011 Atsushi Mizuno
Atsushi Mizuno
Director of Quality Assurance
3453A999-09

Specifications

General Specifications

Display	Max. 4000 LCD
Sampling rate	twice/second
Response time	MΩ: Within 5 s (∞→ center scale value, ∞→ 0 MΩ) ACV, Ω: Within 2 s
Input over indicator	O.F.
Operating Temperature &Humidity	0 to 40°C (32 to 104°F), 90%RH or lower (non-condensating)
Storage Temperature &Humidity	-20 to 50°C (-4 to 122°F), 90%RH or lower (non-condensating)
Operating Environment	Indoor, <2000m (6562-ft.) ASL
Degree of protection	IP40
Power source	Rated power voltage: 1.5 V DC X 4, R6P manganese battery X 4 or LR6 alkaline battery X 4
Maximum rated power	2.6 VA
Continuous operating time	MΩ∞ measurement at 125 V and 250 V for about 8 hours, at 500 V for about 6 hours, at 1000 V for about 3 hours (about 11 hours), Display lighting off (with manganese battery, time in parentheses for alkaline battery)
Additional function	Automatic power-saving mode, Buzzer sound, Memory, Comparator, Continuity, Warning indication of false voltage input, Data hold (MΩ), Display of the value after one minute (MΩ), Display lighting, 1000 V output error protection
Dielectric strength	5550 V AC 50/60 Hz for one minute Between electric circuit and case
Maximum input voltage Maximum rated voltage to earth	600 V AC
Input error protection for 10 second (overvoltage protection)	600 V AC (ACV function: 720 V AC) (MΩ-1000 V function: 1200 V AC)
Dimensions (excluding protrusions)	155W X 98H X 80D mm approx. 6.10"W X 3.86"H X 3.15"D approx.
Mass	500 g, 17.64 oz. approx. (including batteries)
Accessories	L9787 Test Lead, Instruction Manual, R6P manganese battery X 4, Strap (3453 only), 9696 Carrying Case (3453-01 only)
Options	L9787-91 Breaker Pin (use for L9787), 9804-02 Magnetic Adapter, L9787 Test Lead
Standards applying	Safety EN61010 Measurement Category III, Pollution Degree 2 (Anticipated Transient Overvoltage: 6000 V) EMC EN61326

Insulation Resistance Measurement
Guaranteed for one year under conditions not exceeding 23°C±5°C (73°F±9°F) and 90% RH.

Nominal output voltage	125 V DC	250 V DC	500 V DC	1000 V DC
Effective maximum indicated value	20 MΩ	2000 MΩ	2000 MΩ	4000 MΩ
Center scale value	0.5 MΩ	50 MΩ	50 MΩ	100 MΩ
1st effective measuring range	0.100 - 10.00 MΩ	0.200 - 20.00 MΩ	0.200 - 50.0 MΩ	0.200 - 999 MΩ
	±2%rdg.±3 dgt.			
2nd effective measuring range	10.01 - 20.00 MΩ	20.01 - 2000 MΩ	50.1 - 2000 MΩ	1000 - 4000 MΩ
	±5%rdg.			
Other measuring range	0 - 0.099 MΩ	0 - 0.199 MΩ		
	±2%rdg.±6 dgt.			
Display range and display resolution (Auto range)	4 MΩ range Resolution: 0.001 MΩ			
	40 MΩrange Resolution: 0.01 MΩ			
		400 MΩ range Resolution: 0.1 MΩ		
		2000 MΩ range Resolution: 1 MΩ		4000 MΩ range Resolution: 1 MΩ
		1000 MΩ min Resolution: 10 MΩ		
Open circuit voltage (when no load is applied)	1 to 1.2 times of nominal output voltage (open circuit terminal voltage)			
Lower limit measurement resistance value to be maintained nominal output voltage	0.125 MΩ	0.25 MΩ	0.5 MΩ	2 MΩ
Nominal current	1 - 1.2 mA			0.5 - 0.6 mA
	(current to be maintained nominal output voltage)			
Short circuit current	1.2 mA max			0.6 mA max

Effect of temperature: 0 to 18°C, 28 to 40°C (32 to 64°F, 82 to 104°F) ±2% of reading ±3 dgt, plus basic allowance
Effects of capacitance elements contained in the object being measured: Within 10% rdg. including fluctuations.

AC Voltage / Resistance Measurement
Guaranteed for one year under conditions not exceeding 23°C±5°C (73°F±9°F) and 90% RH.

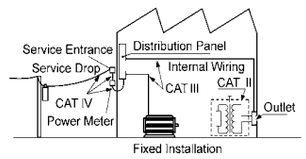
Function	AC Voltage ~V	Resistance Ω
Measuring range	0 - 600 V	0 - 400.0 Ω
Resolution	1 V	0.1 Ω
Accuracy	±3%rdg.±8 dgt.	±2%rdg.±8 dgt.
Others	Input resistance: 170 kΩ min Frequency range: 50 - 60 Hz	Open circuit terminal voltage 4 V DC min

Effect of temperature: 0 to 18°C, 28 to 40°C (32 to 64°F, 82 to 104°F) ±2% of reading ±5 dgt, plus basic allowance

Safety

DANGER
This instrument is designed to comply with IEC 61010 Safety Standards, and has been thoroughly tested for safety prior to shipment. However, mishandling during use could result in injury or death, as well as damage to the instrument. Using the instrument in a way not described in this manual may negate the provided safety features. Be certain that you understand the instructions and precautions in the manual before use. We disclaim any responsibility for accidents or injuries not resulting directly from instrument defects.

Measurement Categories
This instrument conforms to the safety requirements for CAT III measurement instruments. To ensure safe operation of measurement instruments, IEC 61010 establishes safety standards for various electrical environments, categorized as CAT II to CAT IV, and called measurement categories.
CAT I: Secondary electrical circuits connected to an AC electrical outlet through a transformer or similar device.
CAT II: Primary electrical circuits in equipment connected to an AC electrical outlet by a power cord (portable tools, household appliances, etc.). CAT II covers directly measuring electrical outlet receptacles.



CAT III: Primary electrical circuits of heavy equipment (fixed installations) connected directly to the distribution panel, and feeders from the distribution panel to outlets.
CAT IV:The circuit from the service drop to the service entrance, and to the power meter and primary overcurrent protection device (distribution panel).
Using a measurement instrument in an environment designated with a higher-numbered category than that for which the instrument is rated could result in a severe accident, and must be carefully avoided.
Use of a measurement instrument that is not CAT-rated in CAT II to CAT IV measurement applications could result in a severe accident, and must be carefully avoided.

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

⚠	In the manual, the ⚠ symbol indicates particularly important information that the user should read before using the instrument. The ⚠ symbol printed on the instrument indicates that the user should refer to a corresponding topic in the manual (marked with the ⚠ symbol) before using the relevant function.
⚠	Indicates that dangerous voltage may be present at this terminal.
⧈	Indicates a double-insulated device.
~	Indicates AC (Alternating Current).
⎓	Indicates DC (Direct Current).

The following symbols in this manual indicate the relative importance of cautions and warnings.

DANGER Indicates that incorrect operation presents an extreme hazard that could result in serious injury or death to the user.
WARNING Indicates that incorrect operation presents a significant hazard that could result in serious injury or death to the user.
CAUTION Indicates that incorrect operation presents a possibility of injury to the user or damage to the instrument
NOTE Indicates advisory items related to performance or correct operation of the instrument.

Usage Notes

Follow these precautions to ensure safe operation and to obtain the full benefits of the various functions.

DANGER
Before connecting test leads to the instrument, check that the test leads are disconnected from the object to be measured.

WARNING
- **Do not use the instrument where it may be exposed to corrosive or combustible gases. The instrument may be damaged or cause an explosion.**
- **Do not use the instrument where it may be exposed to oil, chemicals, or solvents. Contact with these substances may cause cracking in the instrument, resulting in damage or electric shock.**
- **Do not allow the instrument to get wet, and do not take measurements with wet hands. This may cause an electric shock.**
- **Do not use any other electrical source other than the batteries. The use of any other sources may result in damage of the instrument or the object to be measured and also may cause electric shock.**
- **Before using the instrument, make sure that the insulation on the test leads and connection cords is undamaged and confirm that the white or red portion (insulation layer) inside the cable is not exposed. If a color inside the cable is exposed, do not use the cable. Using the product in such conditions could cause an electric shock, so contact your dealer or Hioki representative for replacements (Model L9787).**

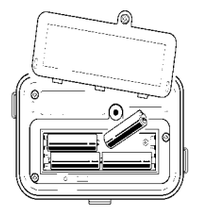
CAUTION
- This instrument is designed for use indoors. It can be operated at temperatures between 0 and 40°C without degrading safety.
- Do not store or use the instrument where it could be exposed to direct sunlight, high temperature or humidity, or condensation. Under such conditions, the instrument may be damaged and insulation may deteriorate so that it no longer meets specifications.
- For safety reasons, when taking measurements, only use the L9787 Test Lead (or oputional) provided with the instrument.
- To avoid damage to the instrument, protect it from physical shock when transporting and handling. Be especially careful to avoid physical shock from dropping.
- Removable sleeves are attached to the metal pins at the ends of the test leads. To prevent a short circuit accident, be sure to use the test leads with the sleeves attached when performing measurements in the CAT III measurementcategory. The test leads can be used with the sleeves removed when taking measurements in the CAT I and CAT II measurement categories.
  For details on measurement categories, see "Measurement categories" in the instruction manual.

NOTE
- To avoid battery depletion, turn the function selector OFF after use (the Auto Power Save feature consumes a small amount of current).

Replacing of Batteries

WARNING
- **To avoid electric shock, turn off the function switch and disconnect the test lead before replacing the batteries. After replacing the batteries, replace the cover and screws before using the instrument.**
- **Do not mix old and new batteries, or different types of batteries. Also, be careful to observe battery polarity during installation. Otherwise, poor performance or damage from battery leakage could result.**
- **Battery may explode if mistreated. Do not short-circuit, recharge, disassemble or dispose of in fire.**
- **Handle and dispose of batteries in accordance with local regulations.**

NOTE
To avoid corrosion from battery leakage, remove the batteries from the instrument if it is to be stored for a long time.

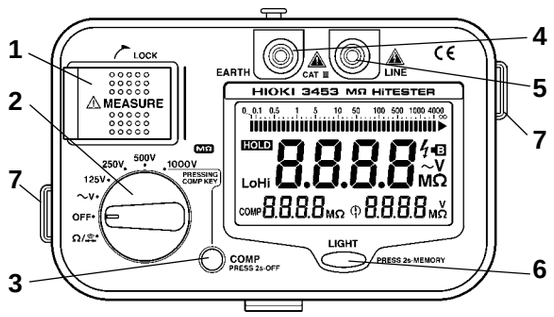


1. For safety, set the function selector to **OFF** and remove the test lead from the instrument.
2. Loosen the screw located at the center of the back of the instrument and remove the battery cover.
3. Replace all four batteries.
4. Reinstall the battery cover and fasten the screw.

Options

- **L9787-91 Breaker Pin**
(Pin length 70 mm and 48 mm from the tip has width 2.5 mm. The rest have width 3.8 mm.)
Attach this to the tip of test lead of L9787, when otherwise it would be too short to make a measurement.
- **9804-02 Magnetic Adapter**
(ø11 mm Corresponding standard screw: M6 Button head screw)
Adaptor for connecting a Test lead to the round head screw by means of magnetism. The tip of adaptor is a concave shape in order to fit the round head screw. Put an adaptor on the tip of the earth side lead of a L9787 Test Lead.
- **L9787 Test Lead (1.2 m)**

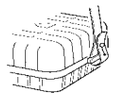
Names and Functions of Parts



1. **MEASURE** button
   Used when measuring insulation resistance. Press or pull the button to turn on. Releases the button to turn off.
2. Function selector
   Switches between ON/OFF, MΩ generated voltage, ~V, and Ω⁂ .
3. **COMP** button
   Used for the comparator function. Switches the buzzer on/off for continuity checking.
4. **EARTH** (Measurement terminal on the ground side)
   Connects to the black test lead.
5. **LINE** (Measurement terminal on the line side)
   Connects to the red test lead.
6. **LIGHT** button
   Switches the display light on/off. Switched off automatically after remaining lit for approximately eight seconds. (To turn the light on/off, press the button then immediately release it.) Also used for the memory function.
7. Belt slit
   Used to hold the carrying band.

Test lead protection cover

The safety sleeve is attached to the test lead plug. Remove the sleeve before connecting to the instrument.



Display Block

HOLD	Lights when the measured value is held during measurement of insulator resistance.
Lo	Lights if measurement < reference in the comparator function.
Hi	Lights if measurement ≥ reference in the comparator function.
COMP	Lights when the comparator function is activated.
	Lights one minute following measurement of the insulated resistance.
	Bar graph overflow indication
	Lights during measurement of insulated resistance. Flashes if a voltage above 40±20 VAC is applied.
B	Indicates battery consumption (during which time accuracy cannot be guaranteed).
O.F.	Overflow indication. Indicates when the measurement value exceeds the maximum indicated value.

Using The Cover (3453 only)

1. When not using this instrument, replace the cover for the test lead. Adjust the test lead if necessary so that the cover closes smoothly.
2. Before performing measurements, remove the cover and place upside down beneath the instrument. Secure the cover with the hook.

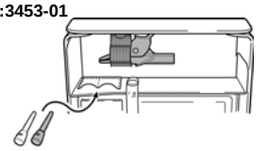
1.

2.

Case inside structure

Model:3453

Model:3453-01



Measurement Procedures

Pre-measurement inspection

Ensure that the test leads are not disconnected
1. Use the function selector to select Ω function.
2. Short the test lead tips.
3. Confirm that the reading is below 1 Ω.

● Insulation Resistance Measurement

To select 1000 V, set the function selector to 1000 V while pressing the COMP button.

O.F.: Overflow indication

An abbreviation for overflow, the display OF is analogous to a ∞ indication in an analog insulation tester. When measurements are larger than the maximum indicated values of each function, the display will indicate O.F..
[Measurement example] When the display indicates O.F. in the 500 V function, measurements are detected as larger than 2000 MΩ. When nothing is connected to the test lead, O.F. is also displayed.

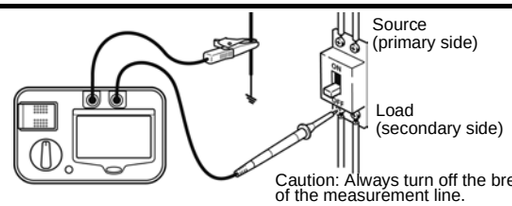
Display	Function	Maximum Indicated Value
O.F.	125 V	40 MΩ
	250 V	2000 MΩ
	500 V	
	1000 V	4000 MΩ

⚠DANGER

Observe the following precautions to avoid electric shock.
Always verify the appropriate setting of the function selector before connecting the test leads.
Disconnect the test leads from the measurement object before switching the function selector.

⚠WARNING

To avoid electric shock, short circuits and damage to the instrument, observe the following precautions:
- **When measuring insulation resistance, dangerous voltage is applied to the measurement terminals. To avoid electric shock, do not touch the test lead.**
- **Never touch the object being measured immediately after measuring. There is a danger of electric shock from the change accumulating during high voltage testing.**
- **Discharge the subject conductor after measurement.**
- **Do not attempt to measure insulation resistance on a live conductor. Doing so could damage the instrument or cause an accident that might result in injury or death. Always turn off power to the conductor being measured before starting.**



Caution: Always turn off the breaker of the measurement line.

1. Confirm that the **MEASURE** button is off.
2. Set the function selector to MΩ (one of 125 V, 250 V, 500 V, or 1000 V). The selected voltage is displayed. To select 1000 V, set the function selector to 1000 V while pressing the **COMP** button. Press the **COMP** button until 1000 V is displayed. Buzzer sounds intermittently and indicator display (1000 V) blinks when set at 1000 V without pressing the **COMP** button. In this case 1000 V is not applied when the **MEASURE** button is turned on.
3. Connect the black test lead to the measurement terminal on the earth side of the instrument. Connect the red test lead to the measurement terminal on the line side of instrument.
4. Connect the black test lead to the ground side of the object being measured. Except when measuring insulated resistance between ground and the object being measured, connect the test lead to an optional point.
5. Connect the red test lead to the object being measured.
6. Press the **MEASURE** button. (To make continuous measurements, pull the button up.)
7. Read the value after the indicator has stabilized. The resistance is also displayed on the bar graph. The unit is [MΩ].
8. If the **MEASURE** button is turned off, the digital value is automatically held (HOLD lights). The bar graph shifts to the voltage between the measurement terminals.
9. To discharge an object being measured, follow the instructions provided in 'Discharge Function.'

NOTE
- If a voltage is generated in the measured object connected to the test lead when the **MEASURE** button is off, the bar graph will light. To check an approximate voltage, set the bar graph scale to [V].
- Insulation resistance is the ratio of leakage current to input voltage, and is therefore unstable. Depending on the specific object being measured, the displayed value may fluctuate or remain high, but this is not a meter failure.
- If the measured resistance is close to the maximum display value, the resistance value appears about five seconds after " O.F. " is displayed.
- Press the **MEASURE** button fully down until a click is heard. If the button is not pressed down fully, a proper measurement cannot be made.
- One minute after starting continuous measurement of insulated resistance, a measurement value will appear at the bottom right, replacing the nominal output voltage. Insulation levels can be evaluated by comparing the measured value one minute and ten minutes after starting continuous measurement.

Discharge Function

When measuring an insulation resistance that contains a capacitance element, a charge proportional to the nominal output voltage accumulates, and if undischarged could lead to an electric shock accident.
1. Without removing the test leads from the item being measured, release the **MEASURE** button.
2. The built-in discharge circuit automatically discharges the item.
3. During a discharge, the ϟ symbol flickers and the bar graph indicates the voltage of the object being measured. To read the voltage for the charge remaining in the measured object, shift the scale instrument of the bar graph to [V].
4. The entire bar graph will disappear below approximately 10 V. Discharge time varies with capacity.

Automatic Range Function

The resistance display range automatically switches from 4 MΩ through 4000 MΩ.
Range Up : The range will switch up at 4000 dgt. or higher.
Range Down : The range will switch down at 370 dgt. or lower.

● AC Voltage Measurement

⚠DANGER

- **Test leads should only be connected to the secondary side of a breaker, so the breaker can prevent an accident if a short circuit occurs. Connections should never be made to the primary side of a breaker, because unrestricted current flow could cause a serious accident if a short circuit occurs.**
- **The maximum input voltage and maximum rated voltage to earth are 600V rms. Attempting to measure voltage in excess of the voltage could destroy the instrument and result in personal injury or death.**
- **To avoid electrical shock, be careful to avoid shorting live lines with the test leads.**

1. Set the function selector to ~ V.
2. Connect the test lead to the instrument's measurement terminal.
3. Connect the test lead to the circuit being measured and read the displayed value. Do not use the **MEASURE** button.

● Resistance and Continuity Measurement

1. Set the function selector to Ω⁂ .
2. Connect the test lead to the instrument's measurement terminal.
3. Connect the test lead to the object being measured and read the displayed value. Do not use the **MEASURE** button.
   If the display value is 30.0 Ω or less, the buzzer will sound to allow a continuity check. To stop the buzzer, press the **COMP** button. Pressing the **COMP** button toggles the buzzer ON/OFF.

Warning Indication at Faulty Voltage Input

With the Ω⁂ function, when a voltage is applied between the measurement terminals, the ϟ symbol flashes on the display and indicates '----' Although the internal circuit is protected against accidental application of a voltage of up to 600 VAC for a period of up to 10 seconds, try to halt measurement as quickly as possible if any voltage is applied.

● Comparator Function

For measurements of insulated resistance, if a measured value is less than a selected reference value, the buzzer is ready to sound if the following action is performed:

Using Comparator

1. Set the function selector to MΩ (one of 125 V, 250 V, 500 V, or 1000 V).
2. Press the **COMP** button to display the **COMP** symbol and the reference value at the bottom left. The reference value shifts every time the **COMP** button is pressed. (The **COMP** button is enabled whether the **MEASURE** button is ON or OFF.)
3. Press the **MEASURE** button to compare the measured value against the reference value.
   If measured value < reference value, Lo is displayed, and a buzzer sounds.
   If measured value ≥ reference value, Hi is displayed, and no buzzer sounds.

A reference value is available from among the predetermined values in the following table and your optional values.

Nominal output voltage	Predetermined reference value available [MΩ]
125 V	0.1/0.2/1/2/3/5/10/20
250/500 V	0.1/0.2/0.4/1/2/3/5/10/20/30/50/100/200/500/1000/2000
1000 V	1/2/3/5/10/20/30/50/100/200/500/1000/2000

For example, if the nominal output voltage is 125 V, the reference value displayed shifts every time the **COMP** button is pressed: 0.1 MΩ→ 0.2 MΩ → ...20 MΩ → optional value ('---- MΩ' if no value is set) → 0.1 MΩ.
Every time the reference value changes, the reference section of the bar graph will light for two seconds.

When Not Using Comparator

If you do not wish to use the comparator, press the **COMP** button for at least two seconds while the **COMP** symbol and the reference value are displayed. The **COMP** symbol and the reference value disappears, and the comparator function is disabled.

Setting an Optional Reference Value

(A measurement value is used as an optional value.)
1. Turn off the **MEASURE** button and set the function selector to a desired nominal output voltage.
2. Press the **COMP** button several times until '---- MΩ' or a previously set optional value appears at the bottom left.
3. Press the **COMP** button for at least two seconds to delete the **COMP** symbol and '---- MΩ' or the optional value.
4. Press the **COMP** button again for at least two seconds to display '---- MΩ' at the bottom left with the **COMP** symbol flashing.
5. Measure the resistance you want to use as a reference value and hold the measured value (refer to "Insulation Resistance Measurement").
   Only the bar corresponding to the measured resistance lights in the bar graph.
6. Press the **COMP** button for at least 2 seconds. The **COMP** symbol will stop flashing and light continuously, with the measurement value set as an optional value. The optional value is retained even in the event of power loss.

Nominal output voltage	Optional reference value available [MΩ]
125 V	One from 0 through 40.00
250/500 V	One from 0 through 2000
1000 V	One from 0 through 4000

● Memory Function

Saving Data (max. 20 data)

1. Set the function selector to MΩ (one of 125 V, 250 V, 500 V, or 1000 V).
2. Turn on the **MEASURE** button to display the measured value. (This is equivalent to holding the measured value with the **MEASURE** button off.)
3. Press the **LIGHT** button for at least two seconds.
4. A data number (**no.****) appears at the bottom left of the display. Press the **LIGHT** button to cycle through the data numbers in succession.
5. Display the data number you wish to save.
6. Press the **LIGHT** button for at least 2 seconds again. The number will disappear, and the measured value and the nominal output voltage are saved as a data set.

NOTE
- When it passes about 5 seconds, without doing the operation of "6" from "4" the number fades away automatically. At this time a data is not saved.
- If step "3" is taken after operating the function selector and before measurement of insulated resistance, no number is displayed.
- If there is no previous data saved, the new data is numbered as "**No.1**".
  If there is any previous data saved, the new data is allocated the number after that assigned to the latest previous data. When the comparator is used, the **COMP** symbol and the reference value are not displayed. To display them, use step "6" to save the data.
- If the data number assigned already belongs to a saved data set, the new data overwrites and deletes the previous data. To check for previous data remaining, refer to 'Displaying Saved Data' below.

Displaying Saved Data

1. Set the function selector to ~V.
2. When a voltage is displayed, press the **LIGHT** button for at least two seconds until the indication '**CALL 3453**' appears.
3. After the indication '**CALL 3453**' appears, the first data set (**No. 1**) is displayed. If this number hasn't been assigned to a saved data set, the indication '----' is displayed for a measured value and a nominal output voltage.
4. Quickly press and release the **LIGHT** button to change the data number. All twenty data sets will be deleted if the **LIGHT** button is pressed for longer than 5 seconds. To resume voltage measurement, set the function selector to another position, then return it to ~V.

Deleting Saved Data

1. While displaying saved data (refer to 'Displaying Saved Data' above), press the **LIGHT** button for more than five seconds.
2. The indication '**CLr**' is displayed and all 20 data sets are deleted.
   (It is not possible to delete only some of the 20 data sets.)

● Automatic Power-Saving Mode

The instrument will automatically enter power-saving mode about 10 minutes following the last operation, and all displayed values disappear.
This power-saving mode is disabled if the **MEASURE** button is on while MΩ function is activated.
To switch from power-saving mode, set the function selector to OFF before returning to the original position.