3452

MΩ HiTESTER

INSTRUCTION MANUAL

Contents

Introduction

Thank you for purchasing the HIOKI 3452 MΩ HiTESTER. To obtain maximum performance from the instrument, please read this manual first, and keep it handy for future reference.

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.

Accessories

9292 TEST PROBE (red and black) ···· 1

9384 CARRYING CASE ····· 1

Instruction Manual ····· 1

R6P manganese battery ····· 4
(built into this instrument)

Using the carrying case

- Opening the cover
  Remove the part of the top surface where "OPEN" is written. Turn the cover you have removed round to the back, and attach for use.
- Storaging the Instruction Manual
  Can be put under the 3452.

Safety Notes

⚠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. 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.

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 sure to carefully read the following safety notes.

Safety symbols

	• 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. • In the manual, the ⚠ symbol indicates particularly important information that the user should read before using the instrument.
	Indicates a double-insulated device.
	Indicates DC (Direct Current).
	Indicates AC (Alternating Current).
	Indicates that dangerous voltage may be present at this terminal.

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.

Measurement categories (Overvoltage categories)

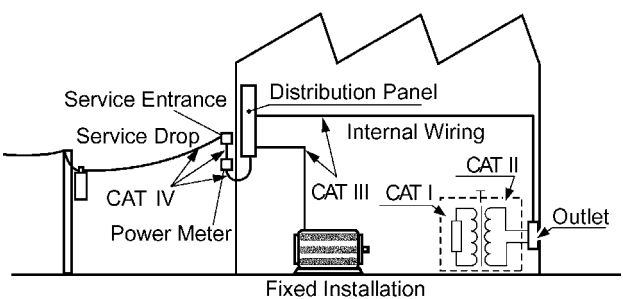
This instrument complies with CAT III safety requirements.
To ensure safe operation of measurement instruments, IEC 61010 establishes safety standards for various electrical environments, categorized as CAT I to CAT IV, and called measurement categories. These are defined as follows.

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 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).

Higher-numbered categories correspond to electrical environments with greater momentary energy. So a measurement device designed for CAT III environments can endure greater momentary energy than a device designed for CAT II.

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. Never use a CAT I measuring instrument in CAT II, III, or IV environments.

The measurement categories comply with the Overvoltage Categories of the IEC60664 Standards.



Notes on Use

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

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 probes is undamaged and that no bare conductors are improperly exposed. Using the instrument in such conditions could cause an electric shock, so contact your dealer or Hioki representative for replacements. (Model 9292 or 9293)

⚠DANGER

- **The maximum input voltage and maximum rated voltage to earth are 150 Vrms (3452-11) and 500 Vrms (3452-12, 3452-13). Exceeding these limits can damage the instrument or cause a serious accident.**
- **On the test probe there is a label stating ∼600 V, however this is only the probe's maximum rated voltage, and is not the maximum rated voltage of 3452.**
- **Before connecting probes to the instrument, check that the probes are disconnected from the object to be measured.**
- **Probe 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.**

⚠WARNING

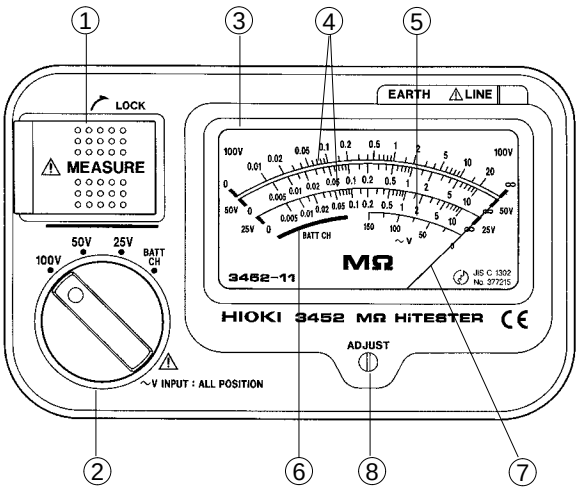
- **Do not allow the instrument to get wet, and do not take measurements with wet hands. This may cause an electric shock.**
- **To avoid electric shock when replacing the batteries, first disconnect the test probes from the object to be measured. After replacing the batteries, replace the cover and screws before using the instrument.**
- **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.**

⚠CAUTION

- If the protective functions of the instrument are damaged, either remove it from service or mark it clearly so that others do not use it inadvertently.
- Calibration and repair of this instrument should be performed only under the supervision of qualified technicians knowledgeable about the dangers involved.
- 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.
- This instrument is designed for use indoors. It can be operated at temperatures between 0°C and 40°C without degrading safety.
- For safety reasons, only use the 9292 provided with the instrument or the optional 9293 for measurement.
- For safety reasons, use the 9292 or 9293, only when the 3452 is used.
- To avoid breaking the probes, do not bend or pull them.
- To avoid damage to the instrument, protect it from physical shock when transporting and handling. Be especially careful to avoid physical shock from dropping.

NOTE When refreshing the luminous scale outdoors, keep the meter in the shade.

Chapter 1
Names and Functions of Parts



Front Panel

① MEASURE switch

Press to measure insulation resistance or check batteries.

② Function switch
Select the measurement voltage for insulation resistance testing or the battery check function.

③ Display
This scales are marked with a phosphorescent paint.

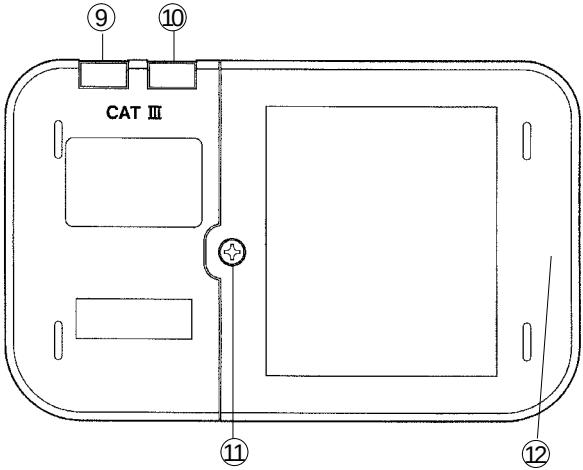
④ Resistance scale
3452-11: 100/50/25 V
3452-12: 500/250/125 V
3452-13: 1000/500/250 V

⑤ AC voltage scale

⑥ Battery effective range

⑦ Indicator needle

⑧ ADJUST (Zero adjuster)



⑨ LINE terminal (Line measurement terminal)
Connect the line probe (red).

⑩ EARTH terminal (Earth measurement terminal)
Connect the earth probe (black).

⑪ Fixing screw for the battery cover

⑫ Battery cover

Chapter 2
Measurement

2.1 Preparing for Measurement

Before use perform the following procedures.

1. Zero adjustment

   First turn the MEASURE switch off, then turn the zero adjuster (ADJUST) with a screwdriver so that the needle is at the center of the infinity mark (∞).

2. Battery check

   Check that the battery capacity is adequate. Replace with new batteries if the battery capacity is low. (Refer to Section 2.5, "Battery Check" and 4.1, "Replacing of Batteries."

3. Probe connection

   The protection cap are attached to the test probes. Remove this cap before connecting in the main unit.
   Connect the red line probe to the LINE terminal and black earth probe to the EARTH terminal.

2.2 Insulation Resistance Measurement

To investigate conduction and the insulation of the object, the instrument will measure insulation resistance. In preparing to measure, there is a need to select the voltage to be applied to the object to be measured.

⚠WARNING

- **Do not attempt to measure insulation resistance on a live line. Pressing the MEASURE switch or lifting up it with probe connecting on a live line may cause damage to the instrument or object being measured. Before measuring the insulation resistance, power off the object to be measured.**
- **To avoid electric shocks do not touch the end of probes. When measuring insulation resistance dangerous DC voltage is generated in the measurement terminals.**

⚠WARNING

- **Never touch the object being measured immediately after measuring. There is a danger of electric shock from the charge accumulating during high voltage testing.**
- **Discharge the subject conductor after measurement. (Refer to Section 2.3, "Discharging function.")**
- **Before taking a measurement, check the position of the function switch. Setting the position incorrectly may cause damage to the object being measured or any other connected equipment, since depending on the position of the function switch, the 3452 may output a high voltage.**

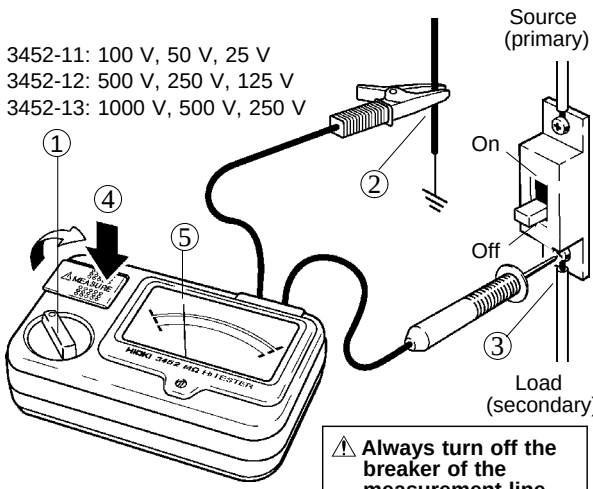
⚠CAUTION

- Always turn the MEASURE switch off after use.

NOTE

- Insulation resistance is the ratio of leakage current to applied voltage, and is therefore unstable. Depending on the circuit being measured the needle may not stabilize, but this is not a meter malfunction.
- While measuring there may be an oscillator noise from the meter, but this is not a malfunction.
- When measuring insulation with respect to ground, or if the circuit to be measured is grounded, connect the EARTH probe to the ground side. This may decrease the measured value slightly, but is satisfactory for checking insulation.
- When the object being measured contains a capacitance component, the needle may first indicate a value lower than the actual resistance value immediately after the MEASURE switch is pressed. After that the actual resistance value is indicated.
- Press the MEASURE switch fully down until a click is heard. If the switch is not pressed down fully, the needle will not move from ∞ and a proper measurement cannot be made.

2.2.1 Measurement Method



⚠ **Always turn off the breaker of the measurement line.**

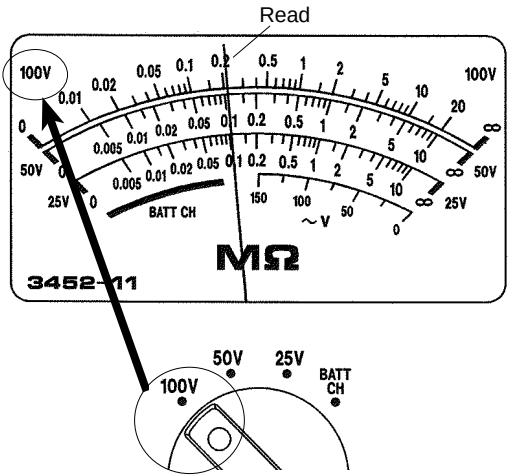
① Use the function switch to select the measurement voltage.
② Connect the black earth probe to the ground side.
③ Connect the red line probe to the line to be measured.
④ Press the MEASURE switch. (Lift up the switch for continuous measurement.)
⑤ Read display after needle stabilizes.

2.2.2 Reading the Value

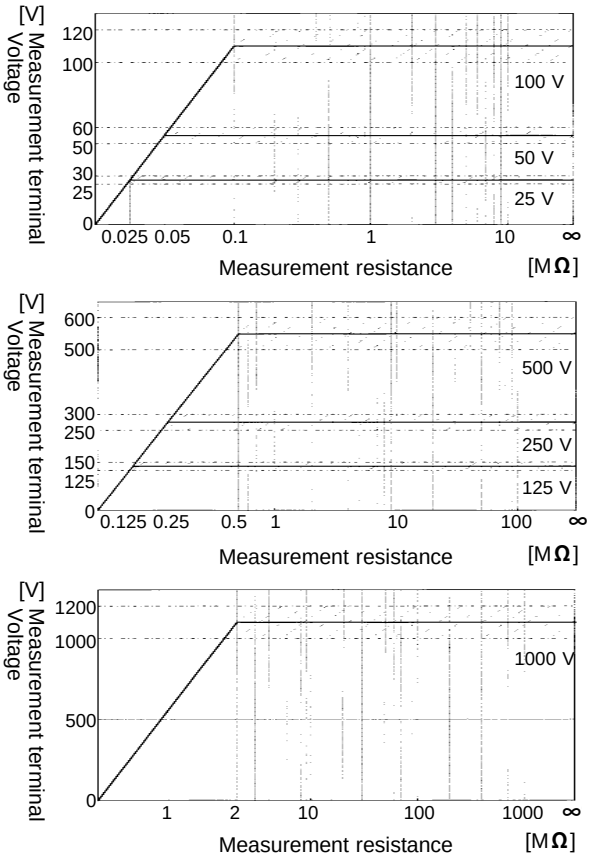
To read off the resistance value, choose the one of the outer three scales with the measurement voltage selected by the function switch written at each end. (The units are MΩ.)

Example

When selecting the 100 V range using the 3452-11.



2.2.3 Measurement Terminal Voltage Characteristics



2.3 Discharging Function

When measuring an insulation resistance that contains a capacitance element, a charge proportional to the measurement voltage accumulates, and if undischarged could lead to an electric shock accident.

After measurement carry out the following procedure.

1. Without removing the test probes from the item being measured, turn the MEASURE switch off.
2. The built-in discharge circuit automatically discharges the item. (During the discharge, the needle will return slowly to the infinity (∞) positions.)
3. The discharge is completed when the needle reaches the infinity mark. The time required for discharge depends on the capacitance value.

2.4 AC Voltage Measurement

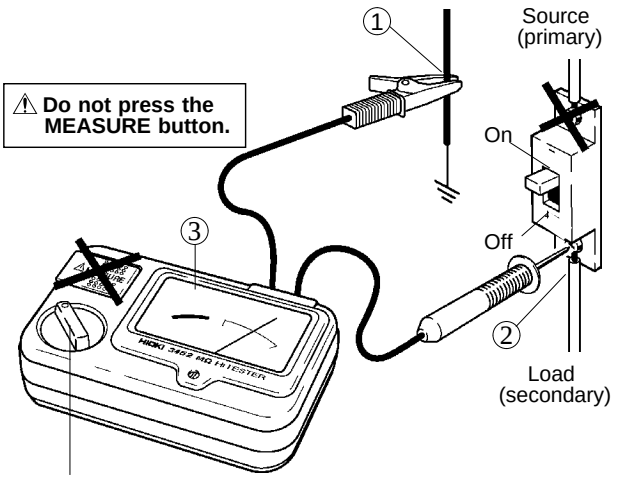
The AC voltage of commercial electrical sources can be measured. Before measuring the insulation resistance, the instrument can be used to make sure the object to be measured is not a live power line.

⚠DANGER

- **Probe 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 150 V rms (3452-11) and 500 Vrms (3452-12, 3452-13). Exceeding these limits can damage the instrument or cause a serious accident.**
- **To avoid electrical shock, be careful to avoid shorting live lines with the probes.**

⚠CAUTION

Never press the MEASURE button while measuring voltage. Doing so could damage the instruments connecting.



The AC voltage can be measured in any setting position of the function switch.

① Connect the black earth probe to the ground.
② Connect the red line probe to the line to be measured.
③ Read the voltage on the V scale after the needle stabilizes.

2.5 Battery Check

⚠WARNING

Before taking a measurement, check the position of the function switch. If the function switch setting is incorrect, it outputs a voltage for measuring insulation resistance between measurement, which may be dangerous.

NOTE The battery check function places the heaviest current drain. Check the battery promptly.

1. Remove the probes from the object being measured. The end of the disconnected may be short-circuited or open-circuited, but if an external voltage is applied, an accurate battery check will not be obtained.
2. Set the function switch to BATT CH.
3. Press the MEASURE switch. (The voltage for measuring insulation resistance is not generated.)
4. If the needle is within the range indication (battery effective range), the batteries can be used. If it is to the right of the indication, replace the batteries with new ones.

NOTE Before setting the function switch, if the MEASURE switch is pressed, the needle may first swing to the left end of the scale, but it will indicate an accurate position after about 3 seconds.

2.6 Luminous Scales

⚠CAUTION

If the instrument is exposed to direct sunlight for a long time, it may be deformed. When using it outdoors, as far as possible keep in the shade. Even if not directed toward the sun, the scale absorbs heat rapidly.

The 3452 scales are marked with a phosphorescent paint. Once this is refreshed by exposure to light, it remains luminous for a while, allowing measurement in a dark place.

The following table gives a guideline to the length of time the scale remains legible in the dark for different refreshing conditions.

Brightness and exposure of refreshing light	Length of time scale remains legible in the dark (at approx. 15 cm from the eye)
Average living room lighting at night (approx. 200 lx, for 5 minutes)	5 minutes approx.
In the office (approx. 1000 lx, for minimum 30 seconds)	10 minutes approx.
Daylight outdoors (approx. minimum 10,000 lx, for minimum 30 seconds)	15 minutes approx.

NOTE
- The position of the needle remains visible for slightly longer than the scale is legible.
- When the user moves from a light place to a dark place, because of the time eyes take to adjust to the light, the scale may not be legible immediately.

2.7 Options

⚠DANGER

To avoid electrical shock, be careful to avoid shorting live lines with the 9288.

- 9293 PIN TYPE EARTH PROBE

  The black earth probe is a pin type probe like the line probe. Use it for cases where it is not possible to clip onto the object being measured, or for measurement inside a small cavity.

- 9288 BREAKER PIN

  Attach this to the tip of the line probe or pin type earth probes. It allows the tip to be extended, when otherwise it would be too short to make a measurement. (This item does not conform to IEC 61010.)

Chapter 3
Specifications

3.1 General Specifications

Operating temperature and humidities	0 to 40℃ (32 to 104°F), 90% RH max (with no condensations)
Storage temperature and humidities	-20 to 50℃ (-4 to 122°F), 90% RH max (with no condensations)
Operating Environment	Indoors, altitude up to 2000 m (6562feet)
Effect of temperature	0 to 18℃, 28 to 40℃ (32 to 64°F, 82 to 104°F)
1st effective measurement range	±5% of reading, plus basic allowance
2nd effective measurement range	±10% of reading, plus basic allowance
0 MΩ, ∞ scale	0.7% of scale length, plus basic allowance
AC voltage measurement	±5% of maximum scale length, plus basic allowance
Effect of position (at ±90 degrees to the horizontal)	Variation of needle deflection from horizontal reading not more than 2% (1.5 mm) of scale length

Response time	Within 3 s (∞→center value, ∞→ 0 MΩ) For center value, refer to the specifications of each instrument. When using the 3452-13, 1000 V range, it may take a little time to indicate more than 1000 MΩ.
Power source	Rated power voltage: 1.5 V DC×4 (Voltage fluctuations of 10% from the rated supply voltage are taken into account.) R6P manganese battery×4
Battery check	Indicated on display
Maximum rated power	3 VA (when battery check)
Continuous operating time (at center scale value measurement)	3452-11: 30 hours approx. at 100 V 3452-12: 11 hours approx. at 500 V 3452-13: 13 hours approx. at 500 V
Degree of protection	IP40
Dielectric strength	5550 Vrms 50/60 Hz for one minute Between electric circuit and case
Dimensions	Approx. 152W×95H×47D mm (5.98"W×3.74"H×1.85"D) (excluding protrusions)
Mass	Approx. 420 g (14.8 oz) (including batteries)

Standards applying	Safety	EN61010-1:2001 EN61010-031:2002 Pollution Degree 2 Measurement Category III (anticipated transient overvoltage 6000 V)
	EMC	EN61326:1997+A1:1998+A2:2001+A3:2003
Accessories		9292 TEST PROBE 9384 CARRYING CASE Instruction Manual R6P manganese battery ×4
Options		9293 PIN TYPE EARTH PROBE 9288 BREAKER PIN

3.2 Specifications of Each Unit

Measurement tolerances are guaranteed at 23±5°C(73±9°F), 90% RH or less, no condensation, for 1 year.

3452-11

Rated measurement voltage (V DC)	25	50	100
Maximum effective reading (MΩ)	10	10	20
Center scale reading (MΩ)	0.2	0.2	0.5

Allowance of resistance measurement			
1st effective measurement range (MΩ)	0.01 - 5	0.01 - 5	0.02 - 10
	±5% of scale reading		
2nd effective measurement range (MΩ)	more than 5 - 10, 0.005 - under 0.01	more than 5 - 10, 0.005 - under 0.01	more than 10 - 20, 0.01 - under 0.02
	±10% of scale reading		
0 MΩ, ∞ scale	0.7% of 100 V scale length (When needle centerline is within width of scale markings at the extreme ends of the scale.)		
Measurement terminal voltage characteristic			
Open-circuit voltage (when no load is applied)	1 to 1.2 times of rated measurement voltage (open circuit terminal voltage)		
Lower limit measurement resistance value to be maintained rated measurement voltage (MΩ)	0.025	0.05	0.1
Rated measurement current (current to be maintained rated measurement voltage)	1 - 1.2 mA		
Short circuit current	1.2 mA max		
AC voltage measurement			
AC voltage scale (50/60 Hz) and allowance	0 to 150 V, ±5% (=±7.5 V) of maximum scale value		
Input resistance	30 kΩ min		
Maximum rated voltage to earth	150 V AC		
Input error protection for 10 seconds	200 V AC (overvoltage protection)		

3452-12

Rated measurement voltage (V DC)	125	250	500
Maximum effective reading (MΩ)	20	50	100
Center scale reading (MΩ)	0.5	1	2
Allowance of resistance measurement			
1st effective measurement range (MΩ)	0.02 - 10	0.05 - 20	0.1 - 50
	±5% of scale reading		
2nd effective measurement range (MΩ)	more than 10 - 20, 0.01 - under 0.02	more than 20 - 50, 0.01 - under 0.05	more than 50 - 100, 0.05 - under 0.1
	±10% of scale reading		
0 MΩ, ∞ scale	0.7% of 500 V scale length (When needle centerline is within width of scale markings at the extreme ends of the scale.)		
Measurement terminal voltage characteristic			
Open-circuit voltage (when no load is applied)	1 to 1.2 times of rated measurement voltage (open circuit terminal voltage)		
Lower limit measurement resistance value to be maintained rated measurement voltage (MΩ)	0.125	0.25	0.5
Rated measurement current (current to be maintained rated measurement voltage)	1 - 1.2 mA		
Short circuit current	1.2 mA max		

AC voltage measurement	
AC voltage scale (50/60 Hz) and allowance	0 to 500 V, ±5%(=±25 V) of maximum scale value
Input resistance	90 kΩ min
Maximum rated voltage to earth	500 V AC
Input error protection for 10 seconds	600 V AC (overvoltage protection)

3452-13

Rated measurement voltage (V DC)	250	500	1000
Maximum effective reading (MΩ)	50	100	2000
Center scale reading (MΩ)	1	2	50
Allowance of resistance measurement			
1st effective measurement range (MΩ)	0.05 - 20	0.1 - 50	2 - 1000
	±5% of scale reading		
2nd effective measurement range (MΩ)	more than 20 - 50, 0.01 - under 0.05	more than 50 - 100, 0.05 - under 0.1	more than 1000 - 2000, 1-under 2
	±10% of scale reading		
0 MΩ, ∞ scale	0.7% of 1000 V scale length (When needle centerline is within width of scale markings at the extreme ends of the scale.)		

Measurement terminal voltage characteristic			
Open-circuit voltage (when no load is applied)	1 to 1.2 times of rated measurement voltage (open circuit terminal voltage)		
Lower limit measurement resistance value to be maintained rated measurement voltage (MΩ)	0.25	0.5	2
Rated measurement current (mA) (current to be maintained rated measurement voltage)	1 - 1.2	1 - 1.2	0.5 - 0.6
Short circuit current (mA)	1.2 max	1.2 max	0.6 max
AC voltage measurement			
AC voltage scale (50/60 Hz) and allowance	0 to 500 V, ±5%(=±25 V) of maximum scale value		
Input resistance	150 kΩ min		
Maximum rated voltage to earth	500 V AC		
Input error protection for 10 seconds	1200 V AC (overvoltage protection)		

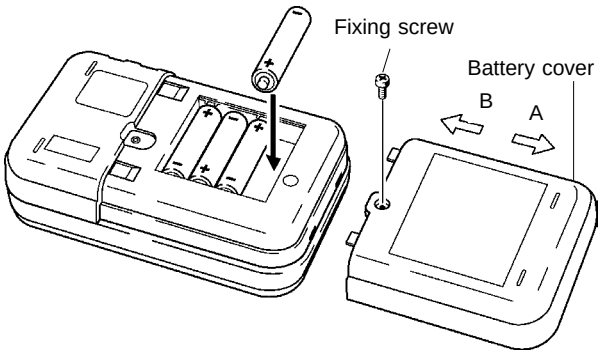
Chapter 4 Maintenance and Service

4.1 Replacing of Batteries

⚠WARNING

- **To avoid electric shock, turn the MEASURE button off and disconnect the probe 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.**
- **To avoid the possibility of explosion, do not short circuit, disassemble or incinerate batteries.**
- **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.



3452 Rear View

1. Remove the probes from the instrument.
2. Remove the screw.
3. To remove the battery cover, slide it toward A as shown in the figure above.
4. Replace all four batteries with new ones.
5. Slide the battery cover toward B to replace it.
6. Fasten the screw.

4.2 Service

⚠CAUTION

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.

4.3 Cleaning

⚠CAUTION

If the instrument seems to be malfunctioning, confirm that the batteries are not discharged, and that the probes are not open circuited before contacting your dealer or Hioki representative. When sending the instrument for repair, pack the instrument carefully so that it will not be damaged during shipment, and include a detailed written description of the problem. Hioki cannot be responsible for damage that occurs during shipment.

HIOKI

DECLARATION OF CONFORMITY

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

Product Name:	MΩ HiTESTER
Model Number:	3451-11, 3451-12, 3451-13, 3451-14, 3451-15 3452-11, 3452-12, 3452-13
Accessory:	9292 TEST PROBE
Option:	9293 PIN TYPE EARTH PROBE

The above mentioned products conform to the following product specifications:

Safety:	EN61010-1:2001 EN61010-031:2002
EMC:	EN61326:1997+A1:1998+A2:2001 +A3:2003 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 73/23/EEC and the EMC Directive 89/336/EEC.

HIOKI E.E. CORPORATION

15 September 2006

T. Yoshiike

Tatsuyoshi Yoshiike
President

3452A999-08

HIOKI

HIOKI E.E. CORPORATION

INSPECTION CERTIFICATE

HIOKI E.E. CORPORATION hereby certifies that the under-mentioned product(s) has been tested and inspected in accordance with applicable HIOKI calibration procedures, and proven to meet or exceed published measurement specifications. We also certify that the measurement standards and instruments used in the calibration procedure are traceable to the national standards organization.

Model: 3452

S/N: _____

INSPECTOR

T. Kito

T. Kito

HIOKI 3452 MΩ HiTESTER

Instruction Manual

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