

# HIOKI

## 3481-20

### VOLTAGE DETECTOR

#### INSTRUCTION MANUAL

Feb. 2015 Edition 1  
Printed in Japan  
3481D980-00 15-02H



# HIOKI

HIOKI E. E. CORPORATION

#### Headquarters

81 Koizumi, Ueda, Nagano 386-1192, Japan  
TEL +81-268-28-0562 FAX +81-268-28-0568

E-mail: os-com@hioki.co.jp <http://www.hioki.com/>  
(International Sales and Marketing Department)

1407

Please visit our website at <http://www.hioki.com/> for the following:

- Regional contact information
- The latest revisions of instruction manuals and manuals in other languages.
- Declarations of Conformity for instruments that comply with CE mark requirements.

Visual and audible  
voltage detection indication

Auto Power OFF

Model 3481-20  
Ideal for 100 V to 120 V installations.



Sensitivity-adjustable

### Introduction

Thank you for purchasing the HIOKI "Model 3481-20 VOLTAGE DETECTOR." To obtain maximum performance from the instrument, please read this manual first, and keep it handy for future reference.

### Overview

This non-contact type of voltage detector unit enables the hot-line state of AC voltage to be checked through the wire or cable covering.

### Initial Inspection

When you receive the instrument, inspect it carefully to ensure that no damage occurred during shipping. If damage is evident, or if it fails to operate according to the specifications, contact your dealer or Hioki representative.

### 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, before contacting your dealer or Hioki representative.

### Safety

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.

#### **⚠ 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.**

#### Safety Symbol

	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 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.

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

#### Symbols for Various Standards

	Indicates the Waste Electrical and Electronic Equipment Directive (WEEE Directive) in EU member states.
	Indicates that the product conforms to regulations set out by the EC Directive.

#### Measurement categories (Overvoltage categories)

This instrument complies with CAT IV (600 V) 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.

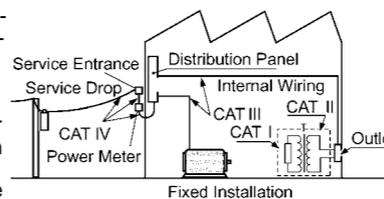
**CAT II:** Primary electrical circuits in equipment connected to an AC electrical outlet by a power cord (portable tools, household appliances, etc.)

**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.



### Usage Notes

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

#### **⚠ WARNING**

**This instrument is measured on a live line. To avoid electric shock when measuring live lines, wear appropriate protective gear, such as insulated rubber gloves, boots and a safety helmet.**

#### **⚠ CAUTION**

- This instrument is designed for use indoors. It can be operated at temperatures between 0 and 40°C without degrading safety.
- This instrument is not designed to be entirely water- or dust-proof. Do not use it in an especially dusty environment, nor where it might be splashed with liquid. This may cause damage.
- To avoid damage to the instrument, protect it from physical shock when transporting and handling. Be especially careful to avoid physical shock from dropping.
- Do not look directly into the penlight nor shine the light at another person's eye. Doing so may cause damage to the eye.

### Detection

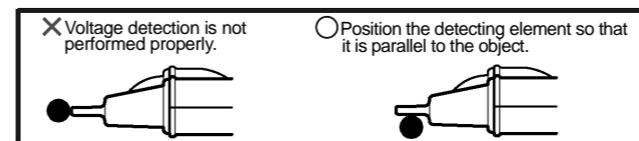
#### Performance Check and Voltage Detection

#### **⚠ DANGER**

**The maximum rated voltage between input terminals and ground is 600 V AC. Attempting to measure voltages exceeding 600 V with respect to ground could damage the instrument and result in personal injury.**

#### NOTE

- The white LED indicates battery consumption but is not a guarantee of the performance of the instrument. Be sure to check its performance using a known power source (e.g., AC outlet) prior to use.
- The instrument voltage detector works using a live AC circuit. It will not work using an earthed wire or neutral point. If there are several lines, such as 2-phase wires and 3-phase wires, perform voltage detection on each line separately.
- The instrument cannot perform voltage detection on a shielded wire.
- Be sure to grip the instrument firmly during measurement. But, do not touch the portion beyond the barrier. It will not produce any detection.
- Make sure the detecting element properly contacts the object to be measured. (See the below figure.)



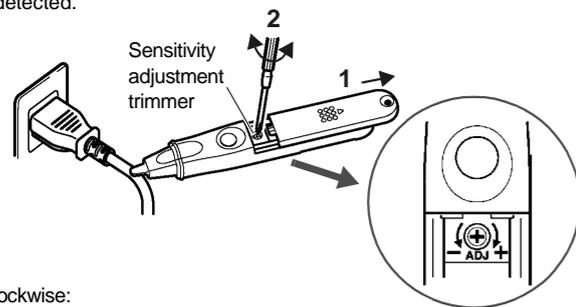
### Performance Check

**Be sure to check the following before and after use to avoid electrical shock.**

1. Inspect the instrument carefully to ensure that no damage. There is no damage.	The instrument is damaged.	
OK	NG Contact your dealer or Hioki representative.	
2. Turn the switch ON. The white LED lights up.	The white LED does not light up or is dim. NG The batteries are running low. Replace the batteries.	
OK	NG	
3. Grip the instrument firmly and apply the detecting element to a known power supply (e.g., AC outlet) in order to check the performance. The red LED flashes and the buzzer sounds.	The red LED and buzzer sound are getting off.	The red LED does not flash or the buzzer does not sound. NG
OK	NG	NG
The instrument is operating properly. It can be used.	The batteries are running low. Replace the batteries.	The instrument may be malfunctioning. Do not use it.
<b>Detection</b>		
Turn on the switch. In the state that the white LED is lighting up, apply the detecting element to the object to be detected. If there are several wires, conduct a voltage check of each wire separately. (Check some points for bundle of wires.)		
The red LED flash and the buzzer sounds.	The white LED is still lighting up.	
The object is live.	The object cannot perform voltage detection. (It is not live or the earth potential is below the Operating-voltage range)	
<b>VOLTAGE DETECTOR</b>		<b>Object to be Measured</b>
The white LED still lighting up, and the red LED flashes and the buzzer sounds.		Live.
Only the white LED lights up.		Not live or below the Operating-voltage range.

## Adjusting sensitivity

- Slide the battery cover to the position where the sensitivity adjustment trimmer appears.
- Turn the trimmer with a precision screwdriver to adjust the sensitivity, placing the detecting element into contact with an object to be detected.



Clockwise:  
Increase the sensitivity to detect a relatively low voltage.  
Counterclockwise:  
Decrease the sensitivity to detect a relatively high voltage

## NOTE

The sensitivity will vary according to wire types or operating environments. Please adjust the sensitivity appropriately depending on your operating environment.

## Replacing the batteries

### WARNING

- 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.
- Keep batteries away from children to prevent accidental swallowing.

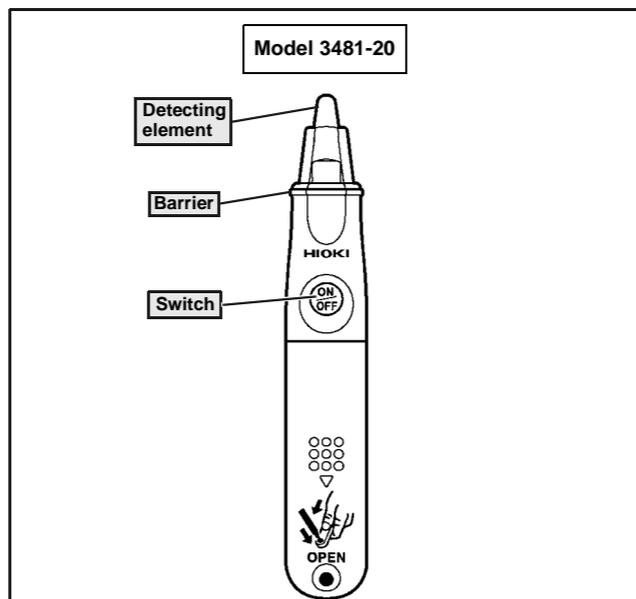
## NOTE

- Use LR44 button alkaline battery.
- After use, always turn OFF the power to prevent battery drain.

## Replacing the batteries

- Turn the switch off.
- Unlock the battery cover by pressing in the opening with the tip of a pen, screwdriver or other thin apparatus and slide the cover towards the end of the voltage detector.
- Replace the old batteries with new ones. Confirm correct polarity when installing the new batteries.
- Slide the battery cover back into locked position.

## Name of Parts



## Specifications

### Basic Specifications

Function	Detection
Operating Voltage Range	40 to 600 V AC (When brought into contact with a 2-mm <sup>2</sup> insulated cable equivalent to 600 V polyvinyl chloride insulated wire ) Maximum sensitivity variable range 40 to 80 V AC
Operating frequency	50 Hz/60 Hz
Pilot light	The red LED flashes and the buzzer sounds when the wire is live.
Additional Functions	Light Battery check (The white LED is dim or out when the batteries are low.)
Power supply	Three LR44 button alkaline batteries.
Dimensions	Approx. 20W x 126H x 15D mm (0.79"W x 4.96"H x 0.59"D)(excluding projections)
Mass	Approx. 30 g (1.1 oz.) (including three LR44 button alkaline batteries)
Operating environment	Indoors, altitude up to 2000 m (6562 ft.)
Operating temperature and humidity	0°C to 40°C (32°F to 104°F), 80%RH or less. (no condensation)
Storage temperature and humidity	-20°C to 60°C (-4°F to 140°F), 80%RH or less. (no condensation)
Product warranty period	3 years
Accessories	Instruction manual Three LR44 button alkaline batteries (Installed in the instrument, for operation check)
Standards	<b>Safety</b> EN61010, Pollution degree 2, Measurement category IV 600 V (anticipated transient overvoltage 8000 V) <b>EMC</b> EN61326

## Electrical Specifications

Maximum rated voltage to earth	600 V AC
Dielectric strength	8.54 kV rms(between the detecting element and main body)
Rated supply voltage	1.5 V DC x 3
Operating supply-voltage range	From 4.95 V to the voltage at which the white LED goes out (central value: 3.6 V)
Maximum rated power	550 mVA (Max.)
Continuous operating time	Approx.5 hours (Power ON Standby state)
Auto power off	The power will be turned off automatically if the instrument remains idle for 3 minutes after the power is turned on. To reset, turn the power on again using the Power ON switch.

## If a malfunction is suspected

Although the following phenomena, which are unavoidable in the detection principle, can be observed, the instrument has no malfunction.

Phenomenon	Cause
Even after the sensitivity adjustment or at a distance of tens of millimeters from circuits, the instrument detects the live circuits with a voltage of 200 V AC or higher.	Model 3481-20 is intended mainly to detect circuits with a voltage of 100 V AC. The sensitivity variable range is specified as from 40 V to 80 V AC in consideration of safety. Thus, the instrument may detect circuits with a voltage of 200 V AC or higher even after the sensitivity adjustment or at a distance from the circuit.
The instrument incorrectly detects metalware including steel desks as live.	Metalware close to AC power may charge AC potential (induced potential) to ground due to the influence of electrostatic capacitance, resulting in incorrectly detecting.
If the instrument is rapidly moved closer to or away from non-live circuits or DC circuits, the instrument detects live state temporarily.	The non-live circuits or DC circuits may charge static electricity, temporarily resulting in incorrectly detecting.

## Warranty Certificate

Model	Serial No.	Warranty period
		Three (3) years from date of purchase ( _ / _ / _ )
This product passed a rigorous inspection process at Hioki before being shipped.		
In the unlikely event that you experience an issue during use, please contact the distributor from which you purchased the product, which will be repaired free of charge subject to the provisions of this Warranty Certificate. This warranty is valid for a period of three (3) years from the date of purchase. If the date of purchase is unknown, the warranty is considered valid for a period of three (3) years from the product's date of manufacture. Please present this Warranty Certificate when contacting the distributor. Accuracy is guaranteed for the duration of the separately indicated guaranteed accuracy period.		
<ol style="list-style-type: none"> <li>Malfunctions occurring during the warranty period under conditions of normal use in conformity with the Instruction Manual, product labeling (including stamped markings), and other precautionary information will be repaired free of charge, up to the original purchase price. Hioki reserves the right to decline to offer repair, calibration, and other services for reasons that include, but are not limited to, passage of time since the product's manufacture, discontinuation of production of parts, or unforeseen circumstances.</li> <li>Malfunctions that are determined by Hioki to have occurred under one or more of the following conditions are considered to be outside the scope of warranty coverage, even if the event in question occurs during the warranty period: <ol style="list-style-type: none"> <li>Damage to objects under measurement or other secondary or tertiary damage caused by use of the product or its measurement results</li> <li>Malfunctions caused by improper handling or use of the product in a manner that does not conform with the provisions of the Instruction Manual</li> <li>Malfunctions or damage caused by repair, adjustment, or modification of the product by a company, organization, or individual not approved by Hioki</li> <li>Consumption of product parts, including as described in the Instruction Manual</li> <li>Malfunctions or damage caused by transport, dropping, or other handling of the product after purchase</li> <li>Changes in the product's appearance (scratches on its enclosure, etc.)</li> <li>Malfunctions or damage caused by fire, wind or flood damage, earthquakes, lightning, power supply anomalies (including voltage, frequency, etc.), war or civil disturbances, radioactive contamination, or other acts of God</li> <li>Damage caused by connecting the product to a network</li> <li>Failure to present this Warranty Certificate</li> <li>Failure to notify Hioki in advance if used in special embedded applications (space equipment, aviation equipment, nuclear power equipment, life-critical medical equipment or vehicle control equipment, etc.)</li> <li>Other malfunctions for which Hioki is not deemed to be responsible</li> </ol> </li> </ol>		
<p>*Requests</p> <ul style="list-style-type: none"> <li>Hioki is not able to reissue this Warranty Certificate, so please store it carefully.</li> <li>Please fill in the model, serial number, and date of purchase on this form.</li> </ul>		
<p><b>HIOKI E.E. CORPORATION</b> 81 Koizumi, Ueda, Nagano 386-1192, Japan TEL: +81-268-26-0555 FAX: +81-268-26-0559</p>		
		13-09