

Keysight U1461A Insulation Multimeter/ U1453A Insulation Tester

Quick Start
Guide

Contacting Keysight

www.keysight.com/find/assist
(worldwide contact information for repair and service)

Safety and EMC Information

This meter is safety-certified in compliance with IEC/EN 61010-1, IEC/EN 61010-2-030, IEC/EN 61010-2-033, CAN/CSA-C22.2 No. 61010-1, CAN/CSA-C22.2 No. 61010-2-030, CAN/CSA-C22.2 No. 61010-2-033, UL Std. No. 61010-1, UL Std. No. 61010-2-030 and UL Std. No. 61010-2-033.

EMC designed in compliance with IEC 61326-1/EN 61326-1, CISPR11/EN55011 Group 1 Class A, ICES/NMB-001, and AS/NZS CISPR 11. Use with standard or compatible test probes.

Safety Notices






CAUTION

A CAUTION notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a CAUTION notice until the indicated conditions are fully understood and met.

WARNING

A WARNING notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

Safety Symbols

	Earth (ground) terminal
	Equipment protected throughout by double insulation or reinforced insulation
	Caution, risk of electric shock
	Caution, risk of danger (refer to the instrument manual for specific Warning or Caution information)
CAT III 1000 V	Category III 1000 V overvoltage protection
CAT IV 600 V	Category IV 600 V overvoltage protection
	Do not use in distribution systems with voltages higher than 600 V

For further safety information details, refer to the *Keysight U1461A Insulation Multimeter/U1453A Insulation Tester User's Guide*.

Standard Accessories Included In Your Purchase

The following accessories are shipped standard with the U1461A and U1453A testers:

- ✓ Hard carrying case
- ✓ Alligator clips (red and black)
- ✓ Test leads (red and black)
- ✓ 19 mm probes (red and black)
- ✓ 4 mm probes (red and black)
- ✓ Remote switch probe and adapter
- ✓ Four 1.5 V AA lithium batteries
- ✓ IR to USB cable
- ✓ Certificate of Calibration

Model U1461A also includes the following accessories:

- ✓ Thermocouple adapter (J/K-Type)
- ✓ Thermocouple bead (J-Type)
- ✓ Thermocouple bead (K-Type)

If any item is missing or damaged, keep the shipping materials and contact the nearest Keysight Sales Office.

NOTE

The descriptions and instructions in this guide apply to the U1461A Insulation Multimeter and U1453A Insulation Tester.

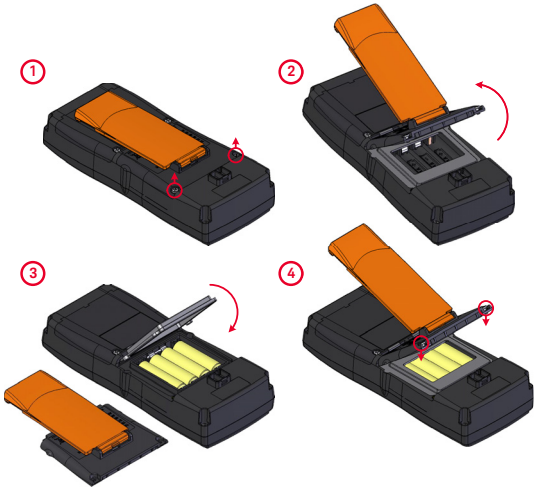
Model U1461A appears in all illustrations. The word *tester* is used to represent both models.

All related documents and software are available for download at www.keysight.com/find/hhTechLib.

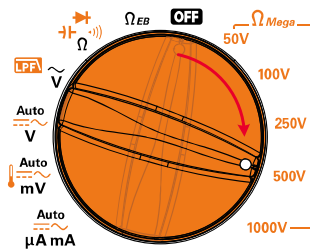
Install or Change the Batteries

The tester is powered by four 1.5 V AA lithium batteries (included in the shipment).

Before installing or changing the batteries, pull from a corner and stretch the orange rubber holster to remove it.

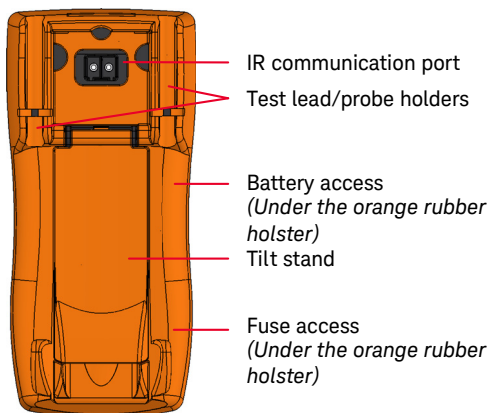
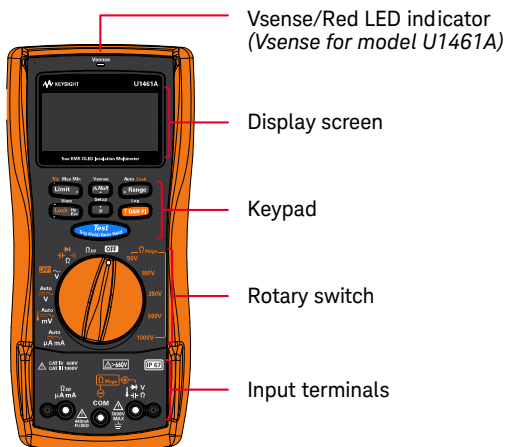


Turn On the Tester



Turn the rotary switch from the **OFF** position to any other position to begin making measurements.













The Tester at a Glance



Using the Rotary Switch

NOTE

Press [**T DAR PI**] to select the alternate measurement function(s) or test methods for insulation resistance tests.







Legend	Measurement function	U1461A	U1453A
	50 V insulation resistance, T, DAR, PI	✓	✓
	100 V insulation resistance, T, DAR, PI	✓	✓
	250 V insulation resistance, T, DAR, PI	✓	✓
	500 V insulation resistance, T, DAR, PI	✓	✓
	1000 V insulation resistance, T, DAR, PI	✓	✓
	Earth-bond resistance, T	✓	✓
	Resistance, Continuity, Diode, Capacitance	✓	✓
	AC V, AC V with LFP	✓	-
	AC V	-	✓
	Auto (V), DC V, AC V	✓	✓
	Auto (mV), DC mV, AC mV, Temperature	✓	-
	Auto (μ A mA), DC μA mA, AC μA mA	✓	-




WARNING

Remove the test leads from the measuring source or target before changing the rotary switch position.

Refer to the *U1461A/U1453A User's Guide* for a complete list and description of all rotary switch labels.

Using the Keypad


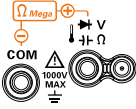
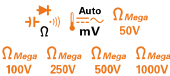



Legend	Key response when pressed for:	
	Less than 1 second	More than 1 second
	<p>IR Test: Initiates an insulation test^[a] as long as [Test] is held ( is shown) – the tester sources (outputs) a high voltage and measures insulation resistance</p>	
	<p>EBR Test: Initiates an earth-bond resistance test^[b] as long as [Test] is held ( is shown)</p>	
	<p>Trig Hold: Freezes the present reading in the display^[c]</p>	<p>Auto Hold: Automatically freezes the present reading once the reading is stable^[c]</p>
	<p>Lock: Locks the insulation test or earth-bond resistance test^[d]</p>	
	<p>Hz: Displays the frequency (when the rotary switch is in the V, mV (U1461A), or µA mA (U1461A) position)</p>	<p>View: Enters the Log review menu</p>
	<p>Esc: Discards the changes made in the Setup menu</p>	
	<p>Selects the alternate measurement function(s)</p>	
	<p>T: Configures the tester for a timed test^{[d][e]}</p>	
	<p>DAR: Configures the tester for a dielectric absorption ratio test^{[a][e]}</p>	<p>Log: Starts the data Log</p>
	<p>PI: Configures the tester for a polarization index test^{[a][e]}</p>	
	<p>Limit: Enables Limit comparison</p>	
	<p>Trip: Configures the tester for Leakage Current, Scan, or Ramp Trip tests^{[d][e]}</p>	<p>Max Min: Enables Max Min recording^[f]</p>

Legend	Key response when pressed for:	
	Less than 1 second	More than 1 second
	Range: Sets a manual range Leak: Displays the leakage current ^[d]	Auto: Enables autoranging
	Null: Enables Null	Vsense (U1461A): Enables the non-contact voltage detector
	* : Increases or decreases the OLED brightness – this option must first be enabled in the Setup	Setup: Enters the Setup menu

- [a] When the rotary switch is in one of the Ω Mega position.
- [b] When the rotary switch is in the Ω EB position.
- [c] When the rotary switch is **NOT** in one of the Ω Mega or the Ω EB position.
- [d] When the rotary switch is in one of the Ω Mega or the Ω EB position.
- [e] Press [Test] to start the test.
- [f] **Max Min** is disabled when **Trip** is enabled.

Using the Input Terminals

WARNING To avoid damaging this device, do not exceed the input limit.

Rotary position	Input terminals	Overload protection
		1000 Vrms
		1000 Vrms for short circuit <0.3 A
		440 mA/1000 V, 30 kA fast-acting fuse

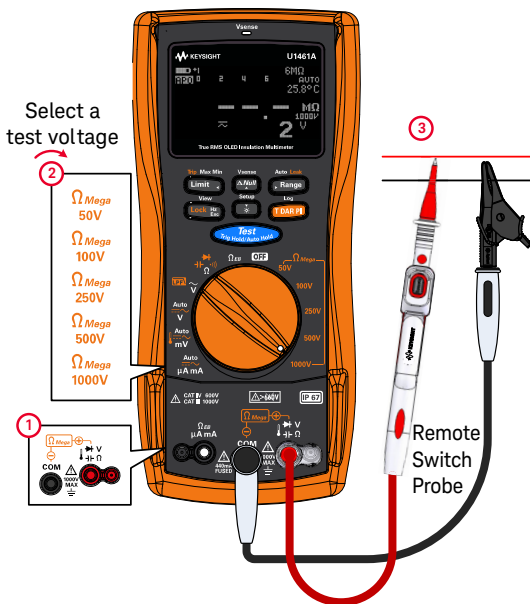
Insulation Resistance (IR) Test

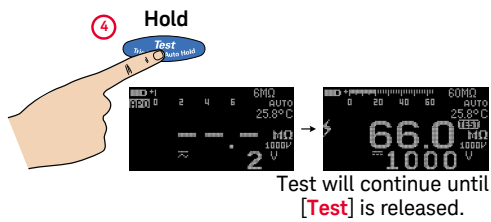
Ensure that the device-under-test (DUT) is de-energized before performing any resistance measurement.

The tester automatically detects if the circuit is energized. If the external voltage is detected to be greater than 30 V, the test is inhibited and the voltage hazard symbol (⚡) is shown on the display.

CAUTION

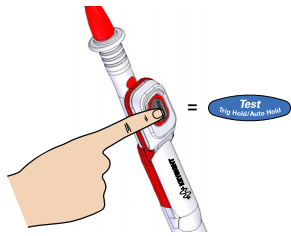
DO NOT perform insulation resistance test in distribution systems with voltages higher than 600 V.



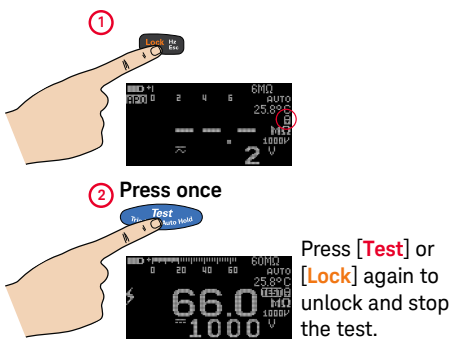


NOTE When an insulation test is in progress, the red LED indicator at the top of the tester will blink every 2 seconds (if the Limit function is not enabled).

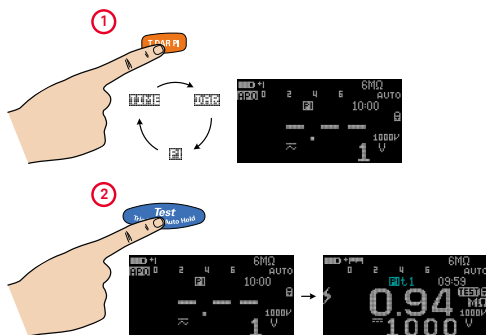
Using the Remote Switch Probe



Locking the Test for IR/EBR Tests



Performing PI/DAR/T for IR Tests



Polarization Index (PI) = IR 10 minutes / IR 1 minute

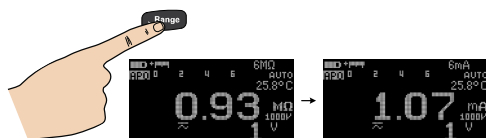
Dielectric Absorption Ratio (DAR) = IR 60 seconds / IR 30 seconds (default; can be changed to IR 60 seconds / IR 15 seconds in Setup)

Timed (T) for IR and EBR = IR 1 minute (default; can be changed in Setup)

NOTE

Error is shown on the display if the IR is greater than the maximum range or less than 0.001 M Ω after t1/t15/t30; if the test is interrupted by the user; or if the tester's battery is low.

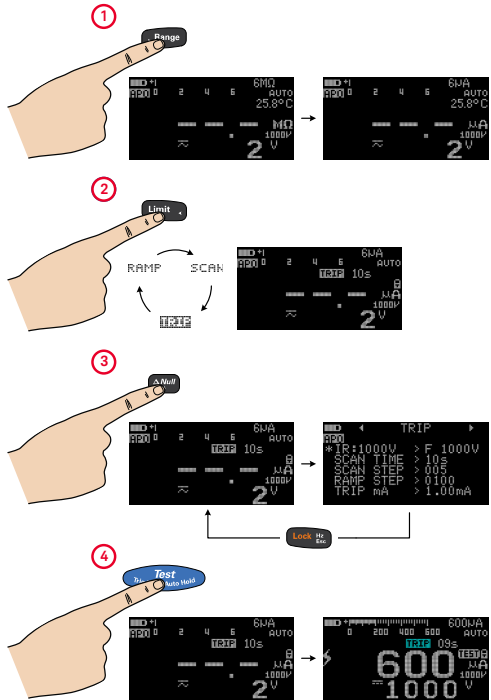
Viewing Leakage Current



Performing Leakage Current/Scan/Ramp Trip Tests

Use the Leakage Current Trip Test, Scan Trip Test, and Ramp Trip Test to test MOVs (Metal Oxide Varistors), gas discharge tubes, voltage arresters, or sparking gaps.

The voltage source will be stopped when the current is greater than the trip current you set in the Setup.



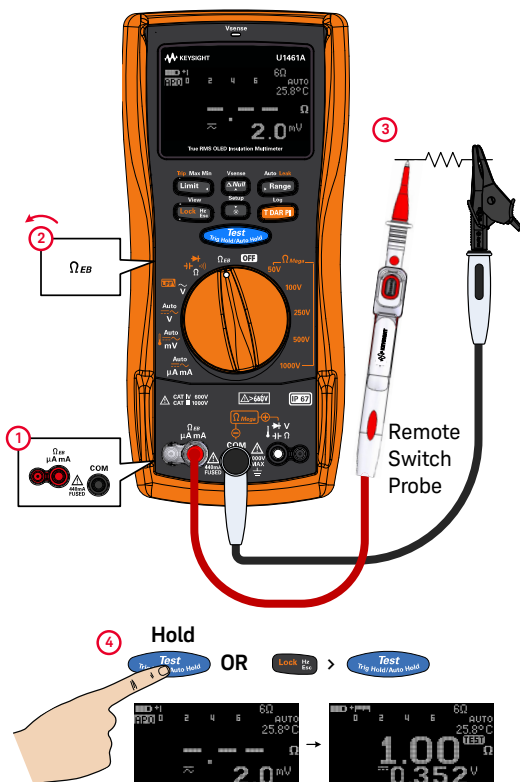
NOTE

For more information on the Leakage Current Trip Test, Scan Trip Test, and Ramp Trip Test, refer to the respective sections in the *U1461A/U1453A User's Guide*.

Earth-Bond Resistance (EBR) Test

CAUTION

The tester automatically detects if the circuit is energized. If the external voltage is detected to be greater than 2 V, the test is inhibited and $\Delta V_{e} > 2V$ is shown on the display. Disconnect the tester and remove power before proceeding.

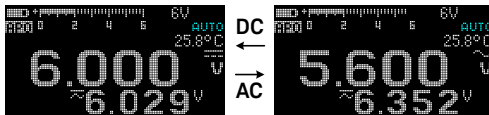


Voltage Measurement

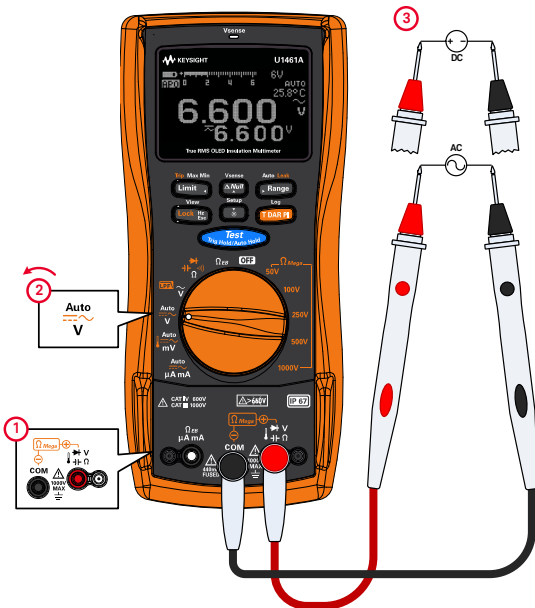
The **Auto** function is able to automatically

- identify the signal component (AC or DC) of an electrical source to be indicated on the primary display, and
- select a suitable measurement range according to the AC+DC reading

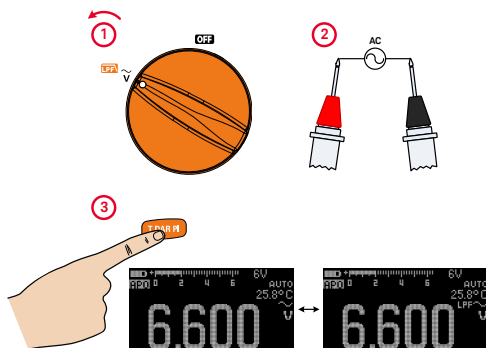
The symbol **AUTO** blinks during the identification



The AC+DC value is shown in the secondary display



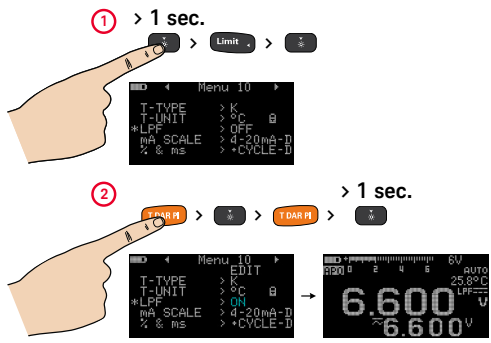
Measuring AC Voltage with a Low-Pass Filter (LPF)



WARNING

- To avoid possible electric shock or personal injury, ensure that you are aware of the voltage level without the LPF enabled. There may be a possible presence of hazardous voltage, and voltages measured with the LPF enabled may be greater than indicated. For your safety, take note of the **L P F** symbol. Disable the LPF when you have finished your measurement.
- When the LPF option is selected, the measurement function will switch to the manual range mode (defaults to 600 V) for variable speed drive (VSD) applications. It is recommended only to use 600 V and 1000 V in the manual range for VSD testing.

Enable the LPF in the Setup to filter out higher frequencies with (AC/DC path) V, mV, μ A, or mA measurements.

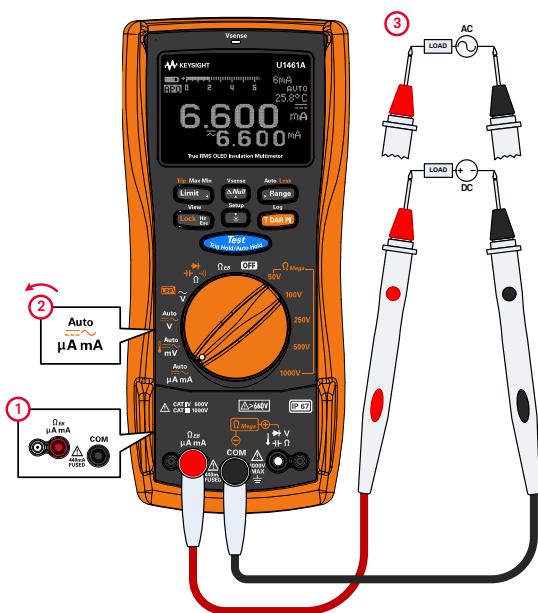


Current Measurement

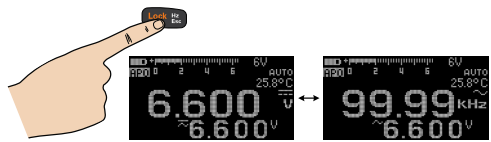
WARNING Never attempt an in-circuit current measurement where the open-circuit potential to earth is greater than 1000 V.

- CAUTION**
- Current can be measured up to 440 mA (maximum) continuously. You can measure current more than 440 mA and up to 600 mA for 120 seconds maximum.
 - Cool down the tester for twice the measuring time taken before proceeding to another current measurement.

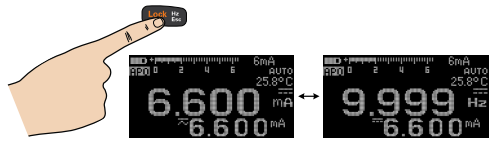
Refer to [Voltage Measurement](#) for more information on how the **Auto** function works.



Measuring Voltage Frequency



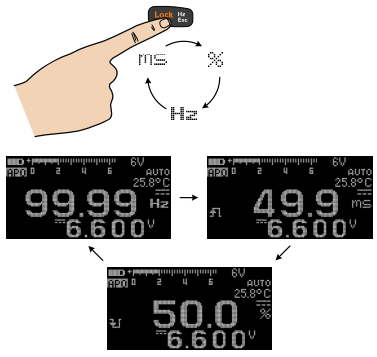
Measuring Current Frequency



Measuring Frequency/Pulse Width/Duty Cycle

For model U1461A only. This option must first be enabled in the Setup.

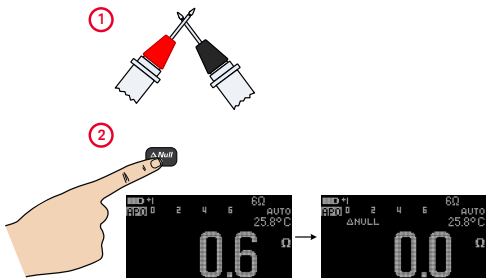
Press and hold [*] to enter the Setup. Browse to **Menu 10 > % & ms** and change the option from **+CYCLE-D** to **+CYCLE-E** or **-CYCLE-E**.



Resistance Measurement

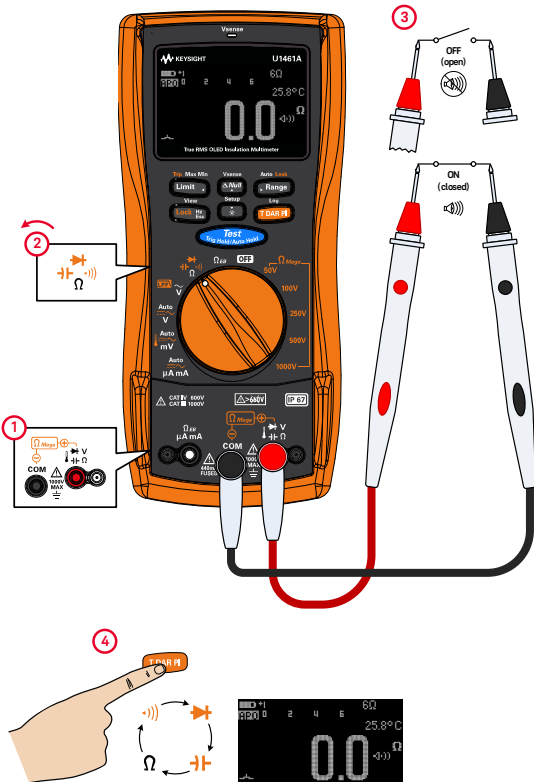


Removing Test Lead Resistance

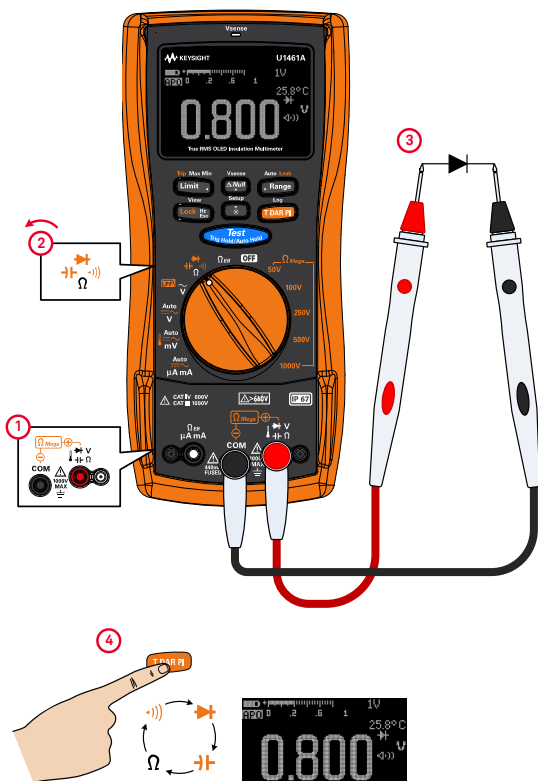


Continuity Test

CAUTION To avoid possible damage to your tester or to the equipment under test, disconnect the circuit power and discharge all high-voltage capacitors before performing continuity tests.



Diode Test

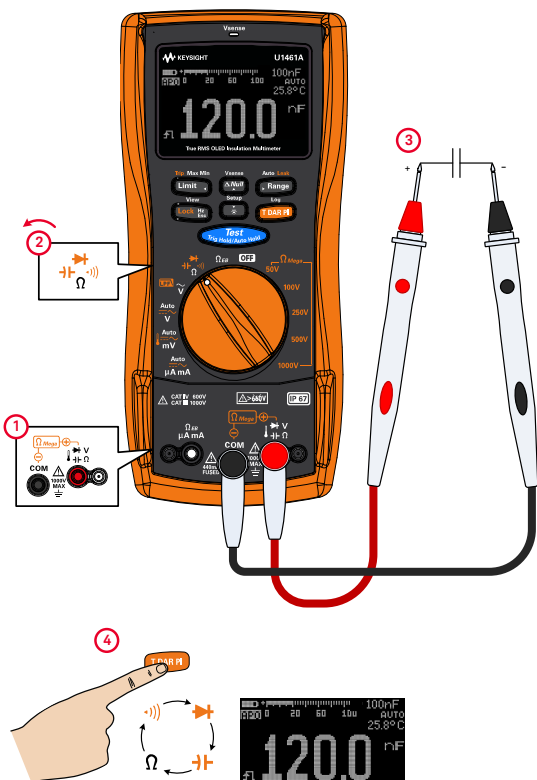


NOTE

Press and hold **[Range]** to enable **Auto-diode**. The Auto-diode feature will help you test both forward- and reverse-bias directions simultaneously. You do not need to change the measuring direction to identify the diode's condition.

Capacitance Measurement

Before proceeding with capacitance measurements, first use the **DC V** function to confirm that the capacitor is fully discharged.

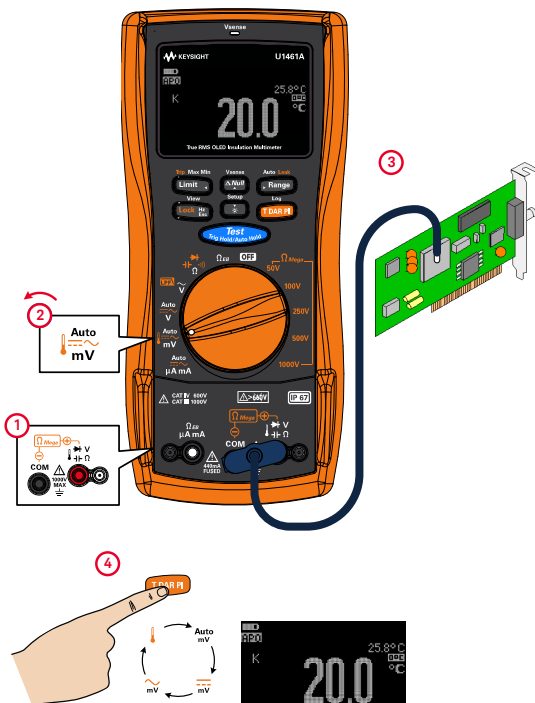


NOTE

Press [**Lock Esc**] to temporarily display the cable length of the circuit under test in the secondary display.

Temperature Measurement

WARNING Do not connect the thermocouple to electrically live circuits. Doing so will potentially cause fire or electrical shock.



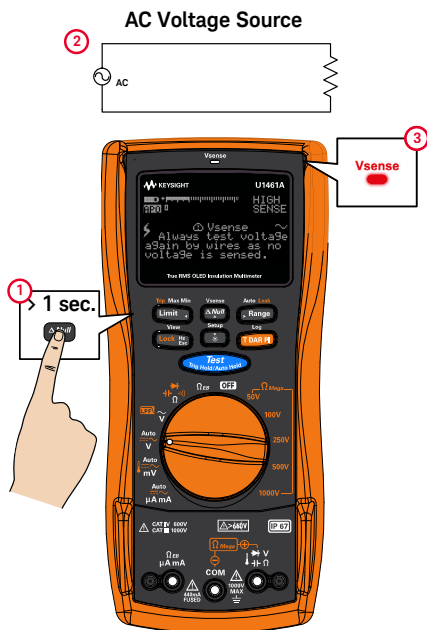
NOTE

Press and hold **[Range]** to remove the ambient compensation for temperature measurements.

Non-Contact Voltage Detector (Vsense)

WARNING Voltage could still be present even if there is no alert indication. Do not rely on the Vsense detector with shielded wires. Never touch live voltage or conductors without the necessary insulation protection.

The Vsense detector may be affected by differences in socket design, insulation thickness, and insulation type.



NOTE

Press [**Range**] to change the Vsense detector's sensitivity from **HIGH SENSE** to **LOW SENSE**.

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This information is subject to change without notice. Always refer to the Keysight website for the latest revision.

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