Agilent U1461A Insulation Multimeter/U1453A Insulation Tester

Quick Start 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
- ✔ U1117A IR to Bluetooth adapter
- ✔ Printed copy of the U1117A Operating Instructions
- ✔ Printed copy of the U1461A/U1453A Quick Start Guide (this document)

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 Agilent Sales Office.

NOTE

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

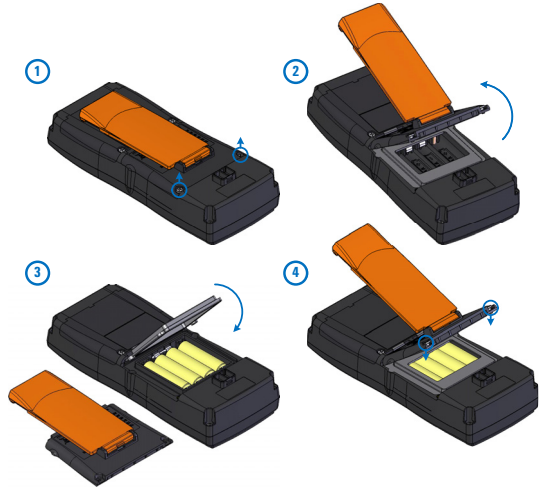
Model U1461A appears in all illustrations. The word *tester* is used to represent both models.

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

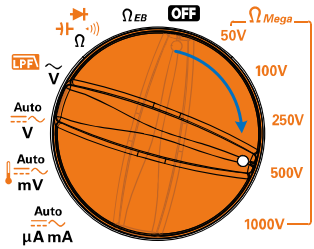
Install or Change the Batteries

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

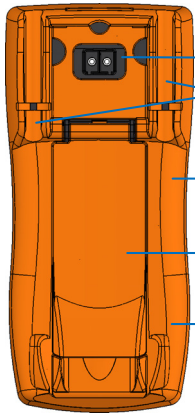
Vsense/Red LED indicator
(Vsense for model U1461A)

Display screen

Keypad

Rotary switch

Input terminals



IR communication port

Test lead/probe holders

Battery access
(Under the orange rubber holster)

Tilt stand

Fuse access
(Under the orange rubber holster)

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
Ω Mega 50V	50 V insulation resistance, T, DAR, PI	✔	✔
Ω Mega 100V	100 V insulation resistance, T, DAR, PI	✔	✔
Ω Mega 250V	250 V insulation resistance, T, DAR, PI	✔	✔
Ω Mega 500V	500 V insulation resistance, T, DAR, PI	✔	✔
Ω Mega 1000V	1000 V insulation resistance, T, DAR, PI	✔	✔
Ω_{EB}	Earth-bond resistance, T	✔	✔
Ω	Resistance, Continuity, Diode, Capacitance	✔	✔
LPF V	AC V, AC V with LPF	✔	-
V	AC V	-	✔
Auto V	Auto (V), DC V, AC V	✔	✔
Auto mV	Auto (mV), DC mV, AC mV, Temperature	✔	-
Auto µA mA	Auto (µA 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**
	**IR Test:** Initiates an insulation test[1] as long as **[Test]** is held (is shown) — the tester sources (outputs) a high voltage and measures insulation resistance	
	EBR Test: Initiates an earth-bond resistance test[2] as long as **[Test]** is held (is shown)	
	Trig Hold: Freezes the present reading in the display[3]	**Auto Hold:** Automatically freezes the present reading once the reading is stable[3]
	**Lock:** Locks the insulation test or earth-bond resistance test[4]	**View:** Enters the Log review menu
	Hz: Displays the frequency (when the rotary switch is in the **V**, **mV (U1461A)**, or **µA mA (U1461A)** position)	
	Esc: Discards the changes made in the Setup menu	
	Selects the **alternate** measurement function(s)	**Log:** Starts the data Log
	T: Configures the tester for a timed test[4][5]	
	DAR: Configures the tester for a dielectric absorption ratio test[1][5]	
	PI: Configures the tester for a polarization index test[1][5]	
	**Limit:** Enables Limit comparison	**Max Min:** Enables Max Min recording[6]
	Trip: Configures the tester for Leakage Current, Scan, or Ramp Trip tests[4][5]	
	**Range:** Sets a manual range	**Auto:** Enables autoranging
	Leak: Displays the leakage current[4]	

Legend	Key response when pressed for:	
	Less than 1 second	**More than 1 second**
Vsense ΔNull	**Null:** Enables Null	**Vsense (U1461A):** Enables the non-contact voltage detector
Setup ☼	☼: Increases or decreases the OLED brightness — this option must first be enabled in the Setup	**Setup:** Enters the Setup menu

[1] When the rotary switch is in one of the Ω Mega position.

[2] When the rotary switch is in the Ω EB position.

[3] When the rotary switch is **NOT** in one of the Ω Mega or the Ω EB position.

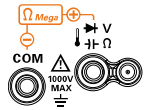
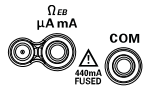
[4] When the rotary switch is in one of the Ω Mega or the Ω EB position.

[5] Press **[Test]** to start the test.

[6] **Max Min** is disabled when **Trip** is enabled.

Using the Input Terminals

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

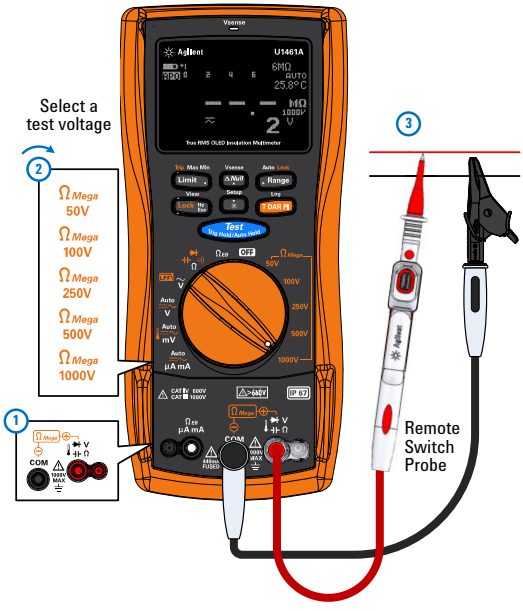
Rotary position	Input terminals	Overload protection
V~ LPF V~ Auto V⎓		1000 Vrms
Ω Auto mV 50V Ω Mega 100V Ω Mega 250V Ω Mega 500V Ω Mega 1000V		1000 Vrms for short circuit <0.3 A
Ω EB Auto μA mA		440 mA/1000 V, 30 kA fast-acting fuse

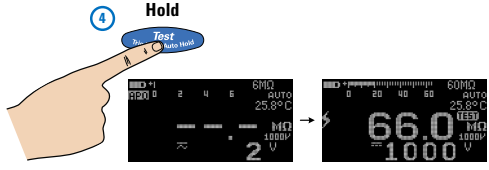
Insulation Resistance (IR) Test

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.

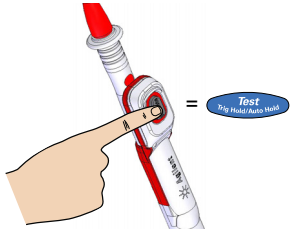




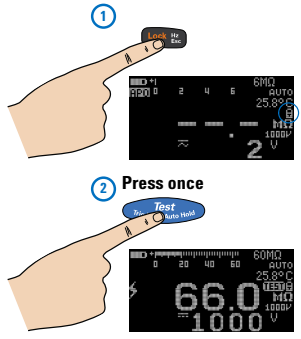
Test will continue until [Test] is released.

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

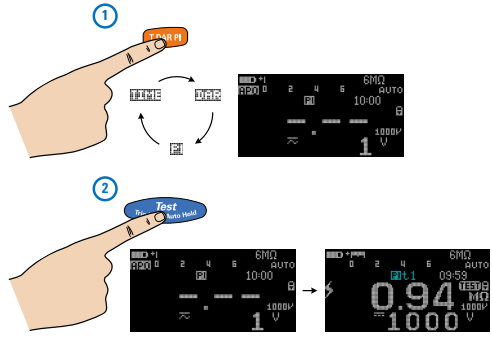


Locking the Test for IR/EBR Tests



Press [Test] or [Lock] again to unlock and stop the test.

Performing PI/DAR/T for IR Tests



Polarization Index (PI) = **IR** $_{\textbf{10 minutes}}$/**IR** $_{\textbf{1 minute}}$

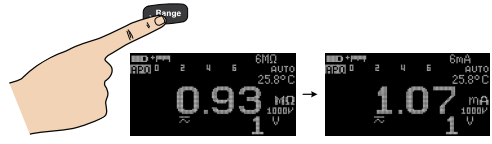
Dielectric Absorption Ratio (DAR) = **IR** $_{\textbf{60 seconds}}$/**IR** $_{\textbf{30 seconds}}$ (default; can be changed to IR $_{60\ seconds}$/IR $_{15\ seconds}$ in Setup)

Timed (T) for IR and EBR = **IR** $_{\textbf{1 minute}}$ (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 MΩ after t1/t15/t30; if the test is interrupted by the user; or if the tester's battery is low.

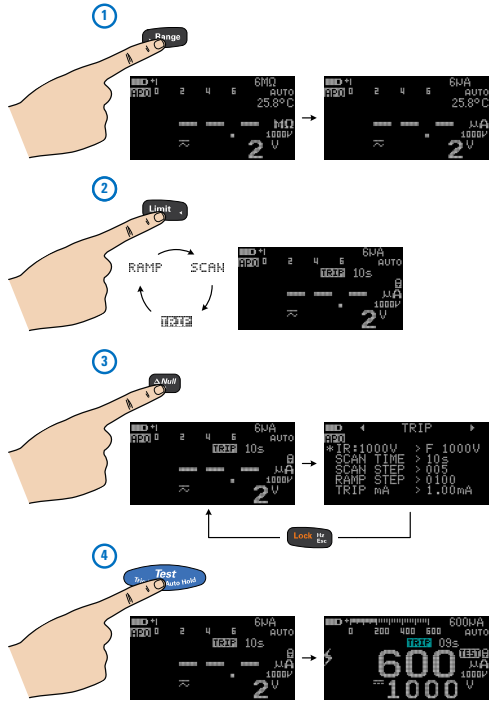
Viewing Leakage Current



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.

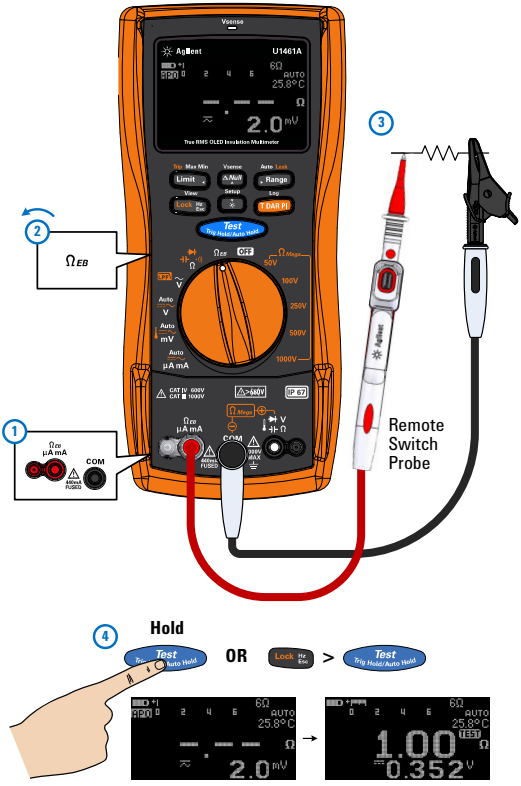
The voltage source will be stopped when the current is greater than the trip current you set in the Setup.



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 ⚠V⎓ > 2V is shown on the display. Disconnect the tester and remove power before proceeding.



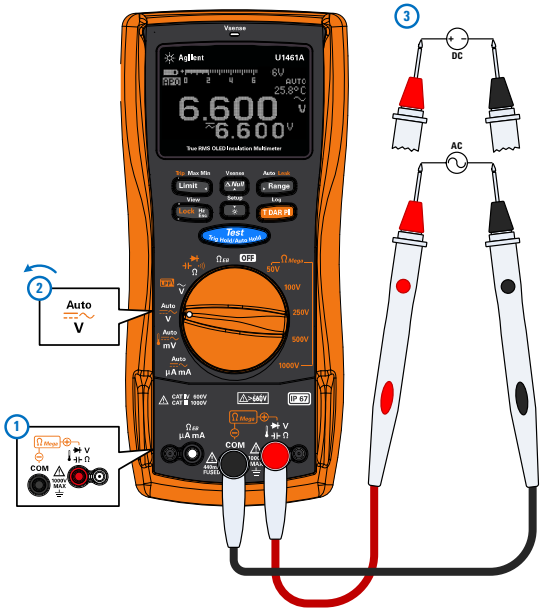
Voltage Measurement

The **Auto** function is able to automatically

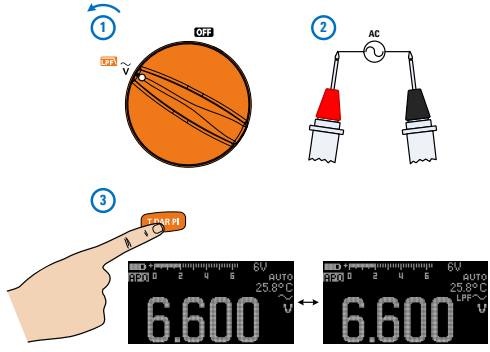
- identify the signal component (AC or DC) of an electrical source to be indicated on the primary display, and
- select a suitable measurement range according to the AC+DC reading

The symbol AUTO blinks during the identification

The AC+DC value is shown in the secondary display



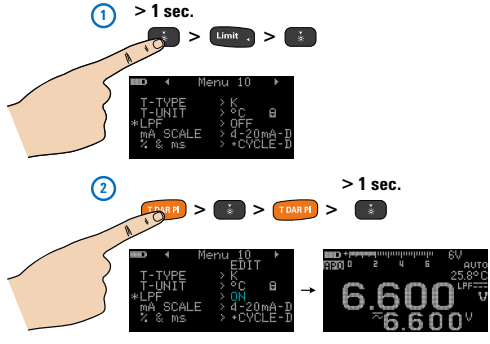
Measuring AC Voltage with a Low-Pass Filter (LPF)



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 LPF 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, µA, or mA measurements.



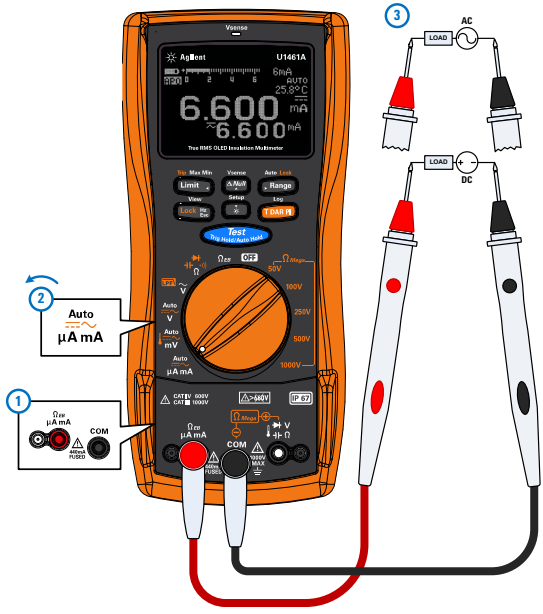
Current Measurement

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

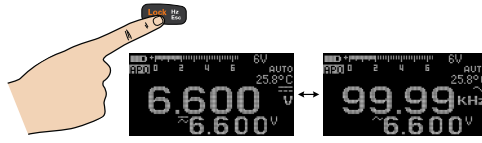
CAUTION

- 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

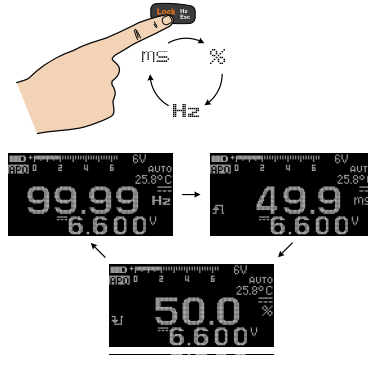


Measuring Current Frequency

Measuring Frequency/Pulse Width/Duty Cycle

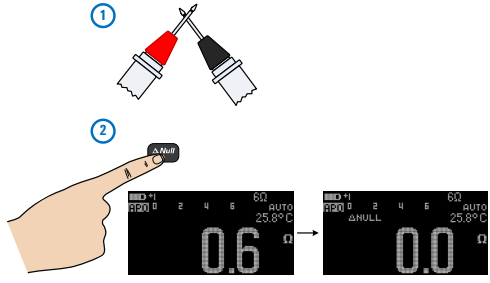
For model U1461A only. This option must first be enabled in the Setup.

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**.



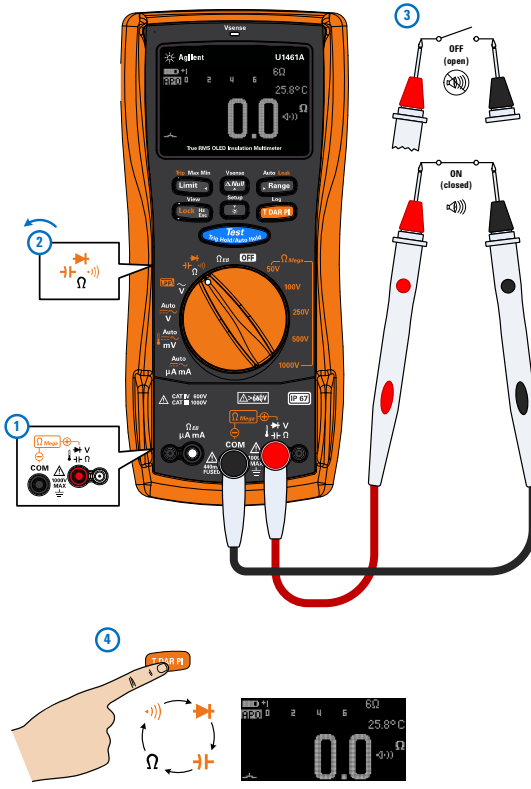
Resistance Measurement

Removing Test Lead Resistance

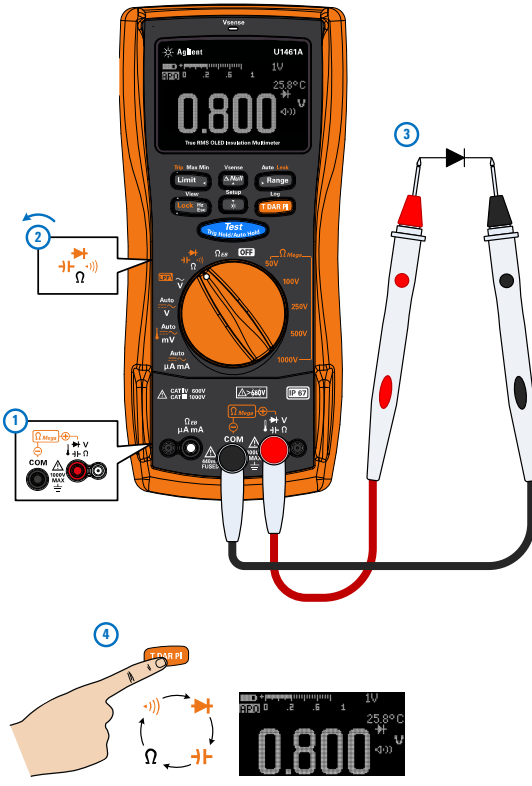


Continuity Test

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.



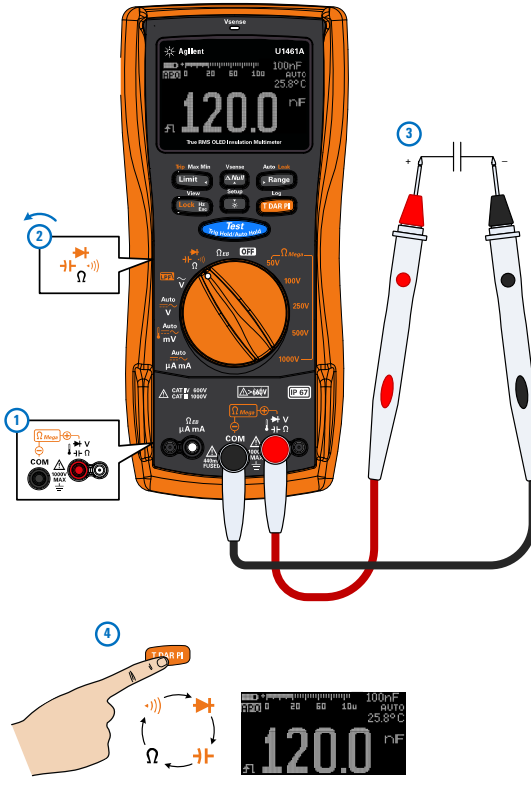
Diode Test



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** $\frac{Hz}{Esc}$] 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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Contacting Agilent

You can contact Agilent Technologies at one of the following telephone numbers for warranty, service, or technical support information:

- In the United States: +1 800 829-4444
- In Canada: +1 877 894-4414
- In China: 800-810-0189
- In Europe: 31 20 547 2111
- In Japan: 0120-421-345

Or use our Web link for information on contacting Agilent worldwide: www.agilent.com/find/assist

Or contact your Agilent Technologies Representative.

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 and EMC Information

This meter is safety-certified in compliance with IEC/EN 61010-1:2010 for Category III 1000 V and Category IV 600 V; and IEC/EN 61557-1, IEC/EN 61557-2, IEC/EN 61557-4. EMC designed in compliance with IEC 61326-1:2005/EN 61326-1:2006. Use with standard or compatible test probes.

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 more details on any information not found in this document, refer to the *Agilent U1461A Insulation Multimeter/U1453A Insulation Tester User's Guide***.**

Printed in Malaysia

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Agilent Technologies