

Keysight U1231A, U1232A, and U1233A Handheld Digital Multimeter

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Safety Information

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

The following symbols on the instrument and in the documentation indicate precautions which must be taken to maintain safe operation of the instrument.

| | | | |
|-----------------------------------------------------------------------------------|-------------------------------------|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|
|  | DC (Direct current or voltage) |  | Caution, risk of danger (refer to this manual for specific Warning or Caution information) |
|  | AC (Alternating current or voltage) |  | Equipment protected throughout by double insulation or reinforced insulation |
|  | Earth (ground) terminal |  | Category III 600 V overvoltage protection |

Safety Considerations

Read the information below before using this instrument.

The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards for design, manufacture, and intended use of the instrument. Keysight Technologies assumes no liability for the customer's failure to comply with these requirements.

CAUTION

- Disconnect circuit power and discharge all high-voltage capacitors before testing resistance, continuity, diodes, or capacitance.
- Use the proper terminals, function, and range for your measurements.
- This device is for use at altitudes of up to 2,000 m.
- Never measure voltage when current measurement is selected.
- Always use the specified battery type. The power for the meter is supplied with four standard AAA 1.5 V batteries. Observe the correct polarity markings before you insert the batteries to ensure proper insertion of the batteries in the meter.
- You are advised to use low leakage batteries when changing to new batteries. Please remember to remove the batteries when the meter is not in use for a long period of time. Warning on the risk of battery leakage.

WARNING

- Do not exceed any of the measurement limits defined in the specifications to avoid instrument damage and the risk of electric shock.
- Do not use the meter if it is damaged. Before you use the meter, inspect the case. Look for cracks or missing plastic. Pay particular attention to the insulation surrounding the connectors.
- Inspect the test leads for damaged insulation or exposed metal. Check the test leads for continuity. Replace damaged test leads before you use the meter.
- Do not operate the meter around explosive gas, vapor, or wet environments.

WARNING

- Do not apply more than the rated voltage (as marked on the meter) between terminals, or between terminal and earth ground.
 - If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.
 - Never use the meter in wet conditions or when there is water on the surface. If the meter is wet, ensure that the meter is dried only by trained personnel.
 - Before use, verify the meter's operation by measuring a known source, for example, voltage.
 - When measuring current, turn off the circuit power before connecting the meter in the circuit. Remember to place the meter in series with the circuit.
 - When servicing the meter, use only the specified replacement parts.
 - Use caution when working above 60 V DC, 30 V AC rms, or 42.4 V peak. Such voltages pose a shock hazard.
 - Do not use the VZ_{LOW} (low input impedance) function to measure voltages in circuits that could be damaged by this function's low input impedance of 3 k Ω (nominal).
 - When using the probes, keep your fingers behind the finger guards on the probes.
 - Connect the common test lead before you connect the live test lead. When you disconnect the leads, disconnect the live test lead first.
 - Remove the test leads from the meter before you open the battery cover.
 - Do not operate the meter with the battery cover or portions of the cover removed or loosened.
 - To avoid false readings, which may lead to possible electric shock or personal injury, replace the battery as soon as the low battery indicator appears and flashes.
-

Measurement Category

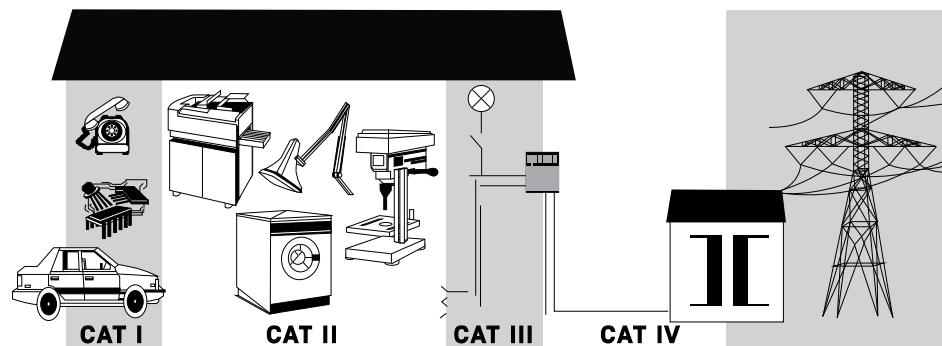
The Keysight U1231A, U1232A, and U1233A has a safety rating of CAT III 600V.

Measurement CAT I Measurements performed on circuits not directly connected to the AC mains. Examples are measurements on circuits not derived from the AC mains and specially protected (internal) mains-derived circuits.

Measurement CAT II Measurements performed on circuits directly connected to a low-voltage installation. Examples are measurements on household appliances, portable tools, and similar equipment.

Measurement CAT III Measurements performed in the building installation. Examples are measurements on distribution boards, circuit-breakers, wiring, including cables, bus-bars, junction boxes, switches, socket outlets in the fixed installation, and equipment for industrial use, and some other equipment including stationary motors with permanent connection to the fixed installation.

Measurement CAT IV Measurements performed at the source of the low-voltage installation. Examples are electricity meters and measurements on primary overcurrent protection devices and ripple control units.



Environmental Conditions

This instrument is designed for indoor use and in an area with low condensation. The table below shows the general environmental requirements for this instrument.






| Environmental condition | Requirement |
|-------------------------|--------------------------------------------------------------------------------------------------------------------|
| Operating temperature | Full accuracy from –10 °C to 55 °C |
| Operating humidity | Full accuracy up to 80% RH (relative humidity) for temperature up to 30 °C, decreasing linearly to 50% RH at 55 °C |
| Storage temperature | –40 °C to 60 °C |
| Altitude | Up to 2000 meters |
| Pollution degree | 2 |

NOTE

The U1231A/U1232A/U1233A Handheld Digital Multimeter complies with the following safety and EMC requirements:

- IEC 61010-1:2010/EN 61010-1:2010
- USA: UL 61010-1 (3rd Edition)
- Canada: CSA C22.2 No. 61010-1:2012

Regulatory Markings

| | |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  <p>The CE mark is a registered trademark of the European Community. This CE mark shows that the product complies with all the relevant European Legal Directives.</p> |  <p>The RCM mark is a registered trademark of the Australian Communications and Media Authority.</p> |
| <p>ICES/NMB-001</p> <p>ICES/NMB-001 indicates that this ISM device complies with the Canadian ICES-001. Cet appareil ISM est conforme a la norme NMB-001 du Canada.</p> |  <p>This instrument complies with the WEEE Directive (2002/96/EC) marking requirement. This affixed product label indicates that you must not discard this electrical or electronic product in domestic household waste.</p> |
|  <p>The CSA mark is a registered trademark of the Canadian Standards Association.</p> |  <p>This symbol indicates the time period during which no hazardous or toxic substance elements are expected to leak or deteriorate during normal use. Forty years is the expected useful life of the product.</p> |

Waste Electrical and Electronic Equipment (WEEE) Directive 2002/96/EC

This instrument complies with the WEEE Directive (2002/96/EC) marking requirement. This affixed product label indicates that you must not discard this electrical or electronic product in domestic household waste.

Product category:

With reference to the equipment types in the WEEE directive Annex 1, this instrument is classified as a “Monitoring and Control Instrument” product.

The affixed product label is as shown below.



Do not dispose in domestic household waste.

To return this unwanted instrument, contact your nearest Keysight Service Center, or visit <http://about.keysight.com/en/companyinfo/environment/takeback.shtml> for more information.

Sales and Technical Support

To contact Keysight for sales and technical support, refer to the support links on the following Keysight websites:

- www.keysight.com/find/u1230dmm
(product-specific information and support, software and documentation updates)
- www.keysight.com/find/assist
(worldwide contact information for repair and service)

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Keysight U1231A, U1232A, and U1233A Handheld Digital
Multimeter
User's Guide

1 Introduction

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This chapter teaches you how to set up your multimeter for the first time. An introduction to all the features of the multimeter is also given.

About This Manual

The descriptions and instructions in this manual apply to the Keysight U1231A, U1232A, and U1233A handheld digital multimeters (hereafter referred to as the multimeter).

The model U1233A appears in all illustrations.

Documentation map

The following manuals and software are available for your multimeter. For the very latest version, please visit our website at: <http://www.keysight.com/find/hhTechLib>.

Check the manual revision on the first page of each manual.

- **User's Guide.** This manual.
- **Quick Start Guide.** Printed copy for outdoor use, included with shipment.
- **Service Guide.** Free download at the Keysight website.
- **Keysight GUI Data Logger Software, Help, and Quick Start Guide.** Free download at the Keysight website.

Safety notes

Safety notes are used throughout this manual (see the [Safety Information](#) section for format examples). Familiarize yourself with each of the notes and its meaning before operating your multimeter.

More pertinent safety notes for using this product are located under the [Safety Considerations](#) section.

Do not proceed beyond a safety notice until the indicated conditions are fully understood and met.

Preparing Your Multimeter

Checking the shipment

When you receive your multimeter, check the shipment according to the following procedure.

- 1 Inspect the shipping container for damage. Signs of damage may include a dented or torn shipping container or cushioning material that indicates signs of unusual stress or compacting. Save the packaging material in case the multimeter needs to be returned.
- 2 Carefully remove the contents from the shipping container, and verify that the standard accessories and your ordered options are included in the shipment according to the standard shipped items list found in the printed copy of the *U1231A/U1232A/U1233A Quick Start Guide*.
- 3 For any question or problems, refer to the Keysight contact numbers on the back of this manual.

Installing the batteries

Your multimeter is powered by four 1.5 V AAA alkaline batteries (included with the shipment). When you receive your multimeter, the AAA alkaline batteries are not installed.

Use the following procedure to install the batteries.

CAUTION

Before you proceed with the batteries installation, remove all cable connections to the terminals and ensure that the rotary switch is at the OFF position. Use only the battery type specified in the “**Characteristics and Specifications**” on page 121.

-
- 1 **Open the battery cover.** Loosen the screw with a suitable Phillips screwdriver and remove the battery cover as shown in [Figure 1-1](#).
 - 2 **Insert the batteries.** Observe the proper battery polarity. The terminal ends of each battery are indicated inside the battery compartment.

- 3 Close the battery cover.** Place the battery cover back in its original position and tighten the screw.

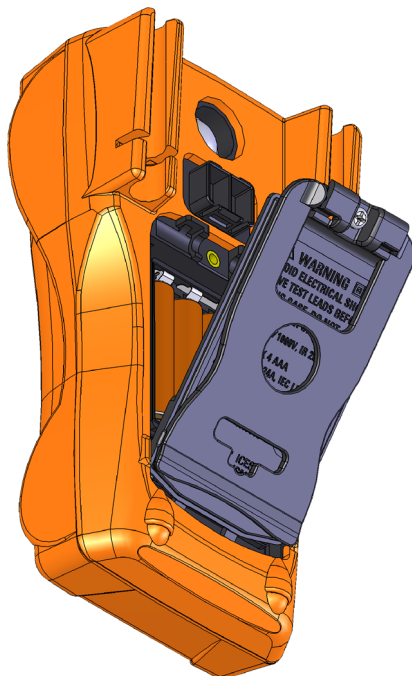






Figure 1-1 Installing the batteries

The battery level indicator in the lower right-hand corner of the display indicates the relative condition of the batteries. [Table 1-1](#) describes the various battery levels the indicator represents.

Table 1-1 Battery level indicator

| Indication | Battery capacity |
|--------------------------------------------------------------------------------------------------------------|-----------------------------|
|  | Full capacity |
|  | 2/3 capacity |
|  | 1/3 capacity |
|  (Flashing periodically) | Almost empty ^[a] |

[a] Batteries change advised. Always use the specified battery type listed in [page 121](#).

WARNING

To avoid false readings, which could lead to possible electric shock or personal injury, replace the batteries as soon as the low battery indicator appears. Do not discharge the batteries by shorting the batteries or reversing the batteries polarity.

CAUTION

- To avoid instruments being damage from battery leakage:
- Always remove dead batteries immediately.
 - Always remove the batteries and store them separately if the multimeter is not going to be used for a long period.

Turning on your multimeter

To power ON your multimeter, turn the rotary switch to any other position (other than the **OFF** position). The model number of your multimeter will be shown on the display briefly.

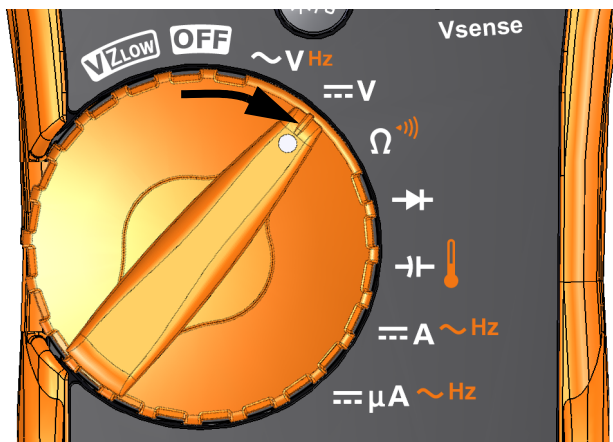


Figure 1-2 Powering on the multimeter

To power OFF your multimeter, turn the rotary switch to the **OFF** position.

Automatic Power-Off (APO)


Your multimeter automatically turns off if the rotary switch is not moved or a key is not pressed for 15 minutes (default). Pressing any key will turn the multimeter back on after it is powered off automatically.

The **APO** symbol is shown on the bottom left of the display when the automatic power-off function is enabled.

NOTE

To change the timeout period or completely disable the automatic power-off, refer to **“Changing the auto power-off (APO) timeout”** on page 108.

Enabling the backlight


If viewing the display becomes difficult in low-light conditions, press  to activate the LCD backlight.

Press  again to deactivate the LCD backlight.

NOTE

- To conserve battery life, a user-adjustable timeout controls how long the backlight stays on. The default timeout is 15 seconds. To change the timeout period or completely disable the backlight timeout, refer to **“Changing the LCD backlight timeout”** on page 109.
 - You can also adjust the backlight's intensity to conserve battery life. The default intensity is high. To change the backlight's intensity level refer to **“Adjusting the LCD backlight intensity”** on page 110.
-

Enabling the flashlight

If you are using the multimeter in dark places, press and hold  for more than 1 second to activate the LED flashlight for greater visibility on your test points.






Press  for more than 1 second to deactivate the LED flashlight.

CAUTION

VISION ADVISORY CLAIM



The LED light source is safe for normal usage. However, staring directly into the LED light source is not recommended as prolonged direct exposure may be harmful to the eyes.

NOTE

- To conserve battery life, a user-adjustable timeout can be set to control how long the flashlight stays on. To set a timeout period, refer to “**Enabling the LED flashlight timeout**” on page 111.
- You can also adjust the flashlight’s intensity to conserve battery life. The default intensity is high. To change the flashlight’s intensity level refer to “**Adjusting the LED flashlight intensity**” on page 112.
- Use the power-on option (hold  while powering on the multimeter) to enable the flashlight without multimeter operation. In this mode, you can adjust the flashlight intensity using the  or  keys, as well as cycle between the **HELP** mode, **dEMo** mode, or flashlight mode using the  or  keys. To learn more, see “**HELP and dEMo modes**” on page 28 and “**Power-on options**” on page 33.



HELP and dEMo modes

The **HELP** and **dEMo** modes can be enabled through the power-on options (see [page 33](#)).

- 1 While in the flashlight power-on mode, press  or  until **HELP** is shown to enable the **HELP** mode.




NOTE

When the **HELP** mode is enabled, the multimeter flashes the international Morse code distress signal (··· — — ···) repeatedly. Use this option to send a visual alert or notification of a distress in progress.

- 2 While in the flashlight power-on mode, press  or  until **dEñO** is shown to enable the **dEMo** mode.


NOTE

When the **dEMo** mode is enabled, the multimeter demonstrates the flashlight and beeper abilities by flashing the flashlight repeatedly accompanied by a melody tone.

- 3 Press  or  to cycle between the **HELP**, **dEMo**, or flashlight mode. Press and hold  for more than 1 second to toggle the flashlight on or off (for any of the modes — **HELP**, **dEMo**, or flashlight mode).

Selecting the range


The multimeter's selected range is always displayed above the right-hand end of the bar graph, as the range indicator.

Pressing  switches the multimeter between manual and autoranging. It also cycles through the available multimeter ranges when manual ranging is enabled.


Autoranging is convenient because the multimeter automatically selects an appropriate range for sensing and displaying each measurement. However, manual ranging results in better performance, since the multimeter does not have to determine which range to use for each measurement.

NOTE

The range is fixed for diode tests, temperature, $V_{Z_{LOW}}$, and AC/DC mV measurements.

In autorange, the multimeter selects the lowest range to display the highest available precision (resolution) for the input signal. If manual range is already enabled, press  for more than 1 second to enter the autoranging mode.

If autoranging is enabled, press  to enter the manual range mode.

Each additional press of  sets the multimeter to the next higher range, unless it is already in the highest range, at which point the range switches to the lowest range.

Alerts and warnings during measurement

Voltage alert


WARNING

For your own safety, please do not ignore the voltage alert. When the multimeter cautions you with a voltage alert, you are advised to take note of the existence of high voltage and pay closer attention when performing measurements.

Your multimeter provides a voltage alert for voltage measurements in both autoranging and manual range modes. The multimeter starts beeping periodically once the measured voltage exceeds the alert value (regardless of polarity) set in the Setup menu.

By default, this feature is turned off. Be sure to set the alert voltage according to your test requirements. To change the alert voltage level, refer to “[Enabling and changing the voltage alert level](#)” on page 106.

Hazardous voltage indication

The multimeter will also display the hazardous voltage () symbol as an early precaution when the measured voltage is equal to or greater than 30 V in all voltage measurement modes.

Adjusting the tilt stand

To adjust the multimeter to a 60° standing position, pull the tilt stand outward as shown in [Figure 1-3](#).

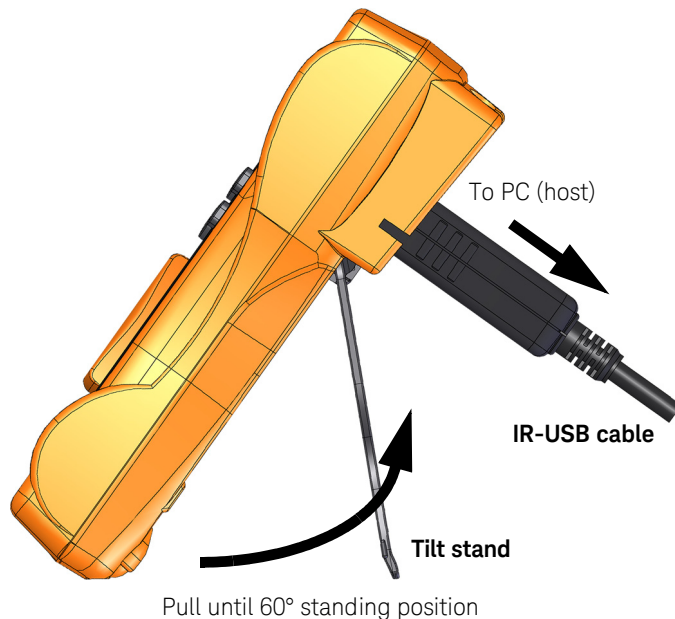


Figure 1-3 Tilt-stand adjustment and IR-USB cable connection

Connecting the IR-USB cable

You can use the IR communication link (IR communication port, located at the rear panel) and the Keysight GUI Data Logger software to control your multimeter remotely, perform data logging operations, and transfer the contents of your multimeter's memory to a PC.

Ensure that the Keysight logo on the U1173A IR-USB cable (purchased separately) connected to the multimeter is facing up. Firmly push the IR head into the multimeter's IR communication port until it snaps into place (see [Figure 1-3](#)).

NOTE**Communication settings for U1231A/U1232A/U1233A**

The baud rate, data bits, and parity bit are fixed respectively to 9600 bps, 8-bit, and none for the U1231A/U1232A/U1233A handheld digital multimeter. Ensure that the communication settings on the Keysight GUI Data Logger match the communication settings mentioned in this note.

Refer to the *Keysight GUI Data Logger Software Help* and *Quick Start Guide* for more information on the IR communication link and the Keysight GUI Data Logger software.

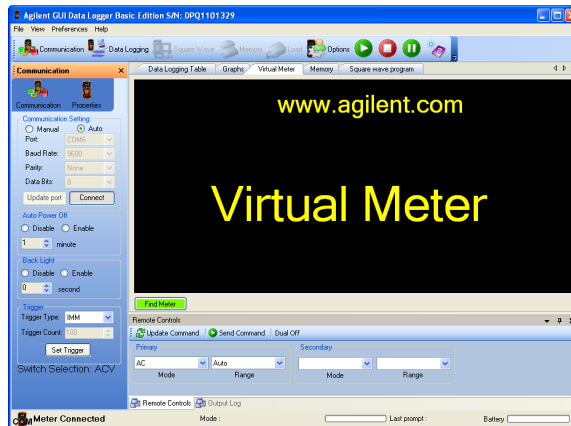


Figure 1-4 Keysight GUI Data Logger Software

The Keysight GUI Data Logger software and its supporting documents (Help and Quick Start Guide) are available as free downloads from <http://www.keysight.com/find/hhTechLib>.
















You may purchase a U1173A IR-USB cable from a Keysight Sales Office nearest to you.

Power-on options

Some options can be selected only while you turn the multimeter on. These power-on options are listed in the table below.

To select a power-on option, press and hold the specified key in [Table 1-2](#) while turning the rotary switch from OFF to any other position. Power-on options remain selected until the multimeter is turned off.

Table 1-2 Power-on options

| Key | Description |
|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>Enters the multimeter's Setup menu.</p> <p>See Chapter 4, "Multimeter Setup Options," starting on page 99 for more information. Press and hold  for more than 1 second to exit this mode.</p> |
|  | <p>Enables Smooth until the multimeter is turned off.</p> <p>To permanently enable Smooth, see "Enabling and changing the Smooth refresh rate" on page 105.</p> |
|  | <p>Tests the LCD.</p> <p>All annunciators are displayed in the LCD. Press any key to exit this mode.</p> |
|  | <p>Checks the firmware version.</p> <p>The multimeter's firmware version will be shown on the primary display. Press any key to exit this mode.</p> |
|  | <p>Enables Scale until the multimeter is turned off.</p> <p>To learn more about Scale, see "Making Scale Transfers (Scale)" on page 96.</p> |
|  | <p>Activates the LED flashlight without multimeter operation.</p> <ul style="list-style-type: none"> Press  or  to adjust the LED flashlight's intensity level (either Lo, 02, 03, ME, 05, 06, or Hi). Press  to save your changes, or press  to discard your changes. Press  or  to cycle between the flashlight's HELP mode, dEMo mode, or flashlight mode. To learn more about these modes, see "HELP and dEMo modes" on page 28. Press and hold  for more than 1 second to toggle the flashlight on or off (for any of the modes – HELP, dEMo, or flashlight mode). Press and hold  for more than 1 second to exit this mode. |

Your Multimeter in Brief

Dimensions

Front view



Figure 1-5 Width dimension

Rear and side view

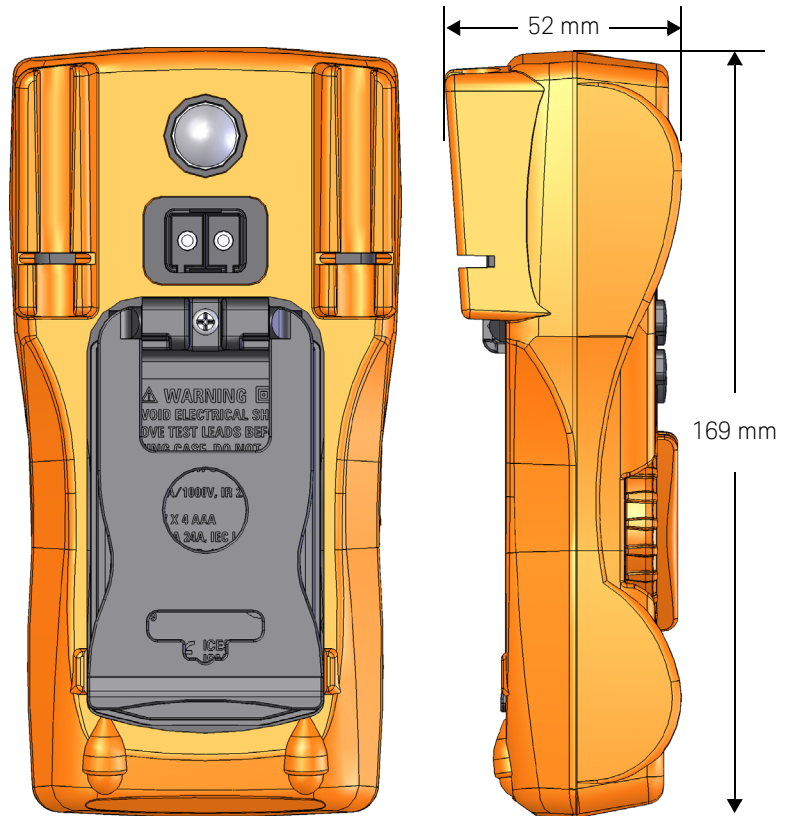


Figure 1-6 Height and depth dimensions

Overview

Front panel

The front panel parts of your multimeter are described in this section. Click the respective “Learn more” pages in [Table 1-3](#) for more information on each part.



Figure 1-7 Front panel

Table 1-3 Front panel parts

| Legend | Description | Learn more on: |
|--------|------------------------------------------|-------------------------|
| 1 | Display screen | page 43 |
| 2 | Keypad | page 41 |
| 3 | Terminals | page 46 |
| 4 | Voltage presence indicator (U1233A only) | page 86 |
| 5 | Rotary switch | page 38 |

Rear panel

The rear panel parts of your multimeter are described in this section. Click the respective “Learn more” pages in [Table 1-4](#) for more information on each part.

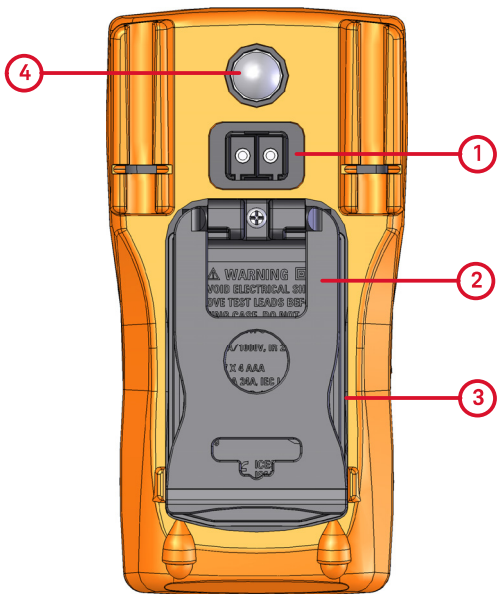


Figure 1-8 Rear panel

Table 1-4 Rear panel parts



| Legend | Description | Learn more on: |
|--------|-------------------------------|-------------------------|
| 1 | IR communication port | page 31 |
| 2 | Tilt stand | page 31 |
| 3 | Battery and fuse access cover | page 23 |
| 4 | Flashlight | page 27 |

Rotary switch

The measurement functions for each rotary switch position are described in [Table 1-5](#) on page 39. Turning the rotary switch changes the measurement function and resets all other measurement options.

Click the respective “Learn more” pages in [Table 1-5](#) for more information on each function.

NOTE

Some rotary switch positions have a *shifted* function printed in **orange**. Press  to switch between the shifted and regular function. See [page 42](#) for more information on the  key.

WARNING

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

Each position of the U1231A, U1232A, and U1233A rotary switch (shown in [Figure 1-7](#)) is described in [Table 1-5](#).

NOTE

A list of some of the abbreviations used in [Table 1-5](#) is given below.

- **VZ_{Low}**: Low input impedance voltage measurement for eliminating ghost voltages
- **AC V**: AC voltage measurement
- **DC V**: DC voltage measurement
- **AC Hz**: AC coupling frequency measurement
- **AC A**: AC current measurement
- **DC A**: DC current measurement
- **Clamp-on AC A (Aux)**: Clamp-on AC auxiliary current measurement
- **Clamp-on DC A (Aux)**: Clamp-on DC auxiliary current measurement
- **AC μ A**: AC current measurement (up to microamperes)
- **DC μ A**: DC current measurement (up to microamperes)

Table 1-5 U1231A/U1232A/U1233A rotary switch functions
































| Legend | | | Functions shown in the primary display | | Learn more on: |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|
| U1233A | U1232A | U1231A | Default | When  is pressed | |
|  |  |  | VZ _{LOW} Auto (AC/DC) V | Cycles between – VZ _{LOW} DC (AC) V, – VZ _{LOW} AC (DC) V, or – VZ _{LOW} Auto (AC/DC) V. | page 56 |
|  |  |  | Off | Off | page 25 |
|  |  |  | AC V | AC Hz | page 52 and page 82 |
|  |  |  | DC V | N/A | page 54 |
|  |  |  | Resistance measurement (Ω) | Cycles between – Short () continuity, – Open () continuity ^[a] , or – Resistance measurement (Ω) | page 59 and page 61 |
|  |  |  | Diode test (V) | N/A | page 65 |
|  |  |  | U1233A: Capacitance measurement (F) U1232A: Capacitance measurement (F) U1231A: Capacitance measurement (F) | U1233A: Temperature measurement U1232A: Auxiliary temperature measurement U1231A: N/A | page 69 and page 71 |

Table 1-5 U1231A/U1232A/U1233A rotary switch functions (continued)

| Legend | | | Functions shown in the primary display | | Learn more on: |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|--------|---------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| U1233A | U1232A | U1231A | Default | When  is pressed | |
|    | | | U1233A/U1232A: DC A U1231A: Clamp-on AC A (Aux) | U1233A/U1232A: Cycles between – AC A, – AC Hz, or – DC A U1231A: Cycles between – Clamp-on DC A (Aux), – AC Hz, or – Clamp-on AC A (Aux) | page 77 and page 82 |
|    | | | U1233A/U1232A: DC µA U1231A: Auxiliary temperature measurement | U1233A/U1232A: Cycles between – AC µA, – AC Hz, or – DC µA U1231A: N/A | |

[a] The open continuity test option must be enabled through the Setup menu. To learn more, see “Enable open continuity test by default” on page 119. The open continuity test option is disabled by default.

Keypad

The operation of each key is explained below. Pressing a key enables a function, displays a related symbol, and emits a beep. Turning the rotary switch to another position resets the current operation of the key.

Click the respective “Learn more” pages in [Table 1-6](#) for more information on each function.

Table 1-6 Keypad functions

























| Legend | Function when pressed for: | | Learn more on: |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| | Less than 1 second | More than 1 second | |
|  | <p>Sets the Null/Relative mode.</p> <ul style="list-style-type: none">While in Null mode, press  again to view the stored reference value that has been saved. The display will return to normal after 3 seconds.Pressing  while the relative value is being displayed will cancel the Null mode. | <p>Enters the Hold-Log Recall menu.</p> <ul style="list-style-type: none">Press  to jump to the last record. Press and hold  for more than 1 second to jump to the first record.Press  or  to scroll through each record.Press  for more than 1 second to store all records into the multimeter's non-volatile memory. Press  for more than 1 second to clear all records.Press  for more than 1 second to exit this mode. | page 88 and page 94 |
|  | <p>Starts the MaxMin recording.</p> <ul style="list-style-type: none">Press  again to cycle through maximum (Max), minimum (Min), average (Avg), or present (MaxMinAvg) readings.Press  to restart the recording session. | <p>Stops the MaxMin recording.</p> <ul style="list-style-type: none">Press  for more than 1 second to exit this mode. | page 90 |
|  | <p>Sets a manual range and disables autoranging.</p> <ul style="list-style-type: none">Press  again to cycle through each available measurement range. | <p>Enables autoranging.</p> | page 29 |

Table 1-6 Keypad functions (continued)

| Legend | Function when pressed for: | | Learn more on: |
|-----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| | Less than 1 second | More than 1 second | |
|  | <p>Freezes and stores the present reading in the display (Trig Hold mode).</p> <ul style="list-style-type: none">– In Trig Hold-Log mode, press  to manually trigger the holding of the next measured value.– Press  for more than 1 second to exit this mode. | <p>Automatically freezes the present reading once the reading is stable (Auto Hold mode)</p> <ul style="list-style-type: none">– In Auto Hold-Log mode, the reading is updated automatically once the reading is stable and the count setting is exceeded.– Press  for more than 1 second to exit this mode. | page 92 |
|  | Turns the LCD backlight on for 15 seconds (default) or off. | Turns the LED flashlight on or off. | page 27 and page 27 |
|  | <p>Switches between the regular and <i>shifted</i> measurement function (icon printed in orange on the rotary switch function – if available). Press  again to switch back to the regular measurement function.</p> | <p>For U1233A only: Enables the non-contact voltage presence indicator. Press  for more than 1 second to exit this mode.</p> | page 86 |

Display screen

The display annunciators of your multimeter are described in this section. See also “[Measurement units](#)” on page 45 for a list of available measurement signs and notations and “[Analog bar graph](#)” on page 46 for a tutorial on the analog bar graph located at the bottom of your display screen.

General display annunciators

The general display annunciators of your multimeter are described in the table below.

Click the respective “Learn more” pages in [Table 1-7](#) for more information on each annunciator.

Table 1-7 General annunciators














| Legend | Description | Learn more on: |
|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|-----------------------------------------------------------|
|  | Low impedance measurement enabled | page 56 |
|  | Hazardous voltage sign for measuring voltage ≥ 30 V or overload | page 30 |
|  | DC (direct current) and AC (alternating current) indication | - |
|  | – Capacitor is charging (during capacitance measurement) – Open continuity test | page 69 and page 61 |
|  | – Capacitor is discharging (during capacitance measurement) – Short continuity test | |
| Cal | Calibration enabled | - |
| Scale | Scale transfer enabled | page 96 |
|  | Smooth mode enabled | page 105 |
| APO | APO (Auto Power-Off) enabled | page 26 |
| Trig Hold | Trigger hold enabled | page 92 |

Table 1-7 General annunciators (continued)

| Legend | Description | Learn more on: |
|-------------------------------------------------------------------------------------|---------------------------------------------------------------|-------------------------|
| AutoHold | Auto hold enabled | page 93 |
| Max | Maximum reading shown on primary display | page 90 |
| Min | Minimum reading shown on primary display | |
| Avg | Averaged reading shown on primary display | |
| MaxMin Avg | Present reading shown on primary display | |
|  | Relative (Null) enabled | page 88 |
| -8888 | Primary measurement display | - |
|  | Analog bar graph | page 46 |
|  | Remote control enabled | page 31 |
| °F °C mVAnF MkΩHz | Measuring units | - |
|  | Temperature measurement without ambient compensation selected | page 71 |
| Auto | Autoranging enabled | page 29 |
|  | Diode test selected | page 65 |
| 10600 mVA | Measurement range selected | page 29 |
|  | Audible continuity test selected | page 61 |
| Rcl | Hold-Log recall mode enabled | page 94 |
|  | Battery capacity indication | page 25 |
| OL | Overload (the reading exceeds the display range) | - |

Measurement units

The available signs and notations for each measurement function in your multimeter are described in [Table 1-8](#). The units listed below are applicable to the primary display measurements of your multimeter.

Table 1-8 Measurement units display

| Sign/Notation | Description | |
|---------------|-----------------------------------------------------|---------------------|
| M | Mega | 1E+06 (1000000) |
| k | kilo | 1E+03 (1000) |
| n | nano | 1E-09 (0.000000001) |
| μ | micro | 1E-06 (0.000001) |
| m | milli | 1E-03 (0.001) |
| mV, V | Voltage units for voltage measurement | |
| A, μA | Ampere units for current measurement | |
| nF, μF, mF | Farad units for capacitance measurement | |
| Ω, kΩ, MΩ | Ohm units for resistance measurement | |
| MHz, kHz, Hz | Hertz units for frequency measurement | |
| °C | Degree Celsius, unit for temperature measurement | |
| °F | Degree Fahrenheit, unit for temperature measurement | |



Analog bar graph

The analog bar emulates the needle on an analog multimeter, without displaying the overshoot. When measuring peak or null adjustments and viewing fast-changing inputs, the bar graph provides a useful indication because it has a faster updating rate^[1] to cater for fast-response applications.

For example, when frequency is displayed on the primary display during voltage or current measurement, the bar graph represents the voltage or current value (not the frequency value).

The “-” sign indicates whether the measured or calculated value negative. Each segment represents 33.34 or 200 counts depending on the range indicated on the peak bar graph.

Table 1-9 Analog bar graph display

| Range | Counts/Segments | Used for the function |
|-----------------------------------------------------------------------------------|-----------------|--------------------------------|
|  | 33.34 | A, \rightarrow |
|  | 200 | V, A, Ω , \rightarrow |

An unstable bar graph and unmatched primary display when measuring DC voltage usually means the presence of AC voltages in the circuit.

Input terminals

The terminal connections for the different measurement functions of your multimeter are described in the table below. Observe the rotary switch position of your multimeter before connecting the test leads to the connector terminals.

WARNING

Ensure that the probe accessories are connected to the correct input terminals for the selected measurement function before starting any measurement.




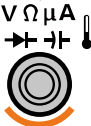
















[1] The analog bar graph display update rate is approximately 33 times/second for DC voltage, current, and resistance measurements.

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

Table 1-10 U1231A terminal connections for different measuring functions

| Rotary switch position | Input terminals | Overload protection |
|------------------------|-----------------|-----------------------------------|
| U1231A | | |
| | | 600 Vrms |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | 600 Vrms for short circuit <0.3 A |

Table 1-11 U1232A and U1233A terminal connections for different measuring functions

| Rotary switch position | | Input terminals | Overload protection |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|
| U1233A | U1232A | | |
|  |  |   | 600 Vrms 600 Vrms for short circuit <0.3 A |
|  |  | | |
|  |  | | |
|  |  | | |
|  |  | | |
|  |  | | |
|  |  |   | 11 A/1000 V, fast-acting fuse |
|  |  | | |

Cleaning Your Multimeter

WARNING

To avoid electrical shock or damage to the multimeter, ensure that the insides of the casing stay dry at all times.

Dirt or moisture in the terminals can distort readings. Follow the steps below to clean your multimeter.

- 1 Turn the multimeter off and remove the test leads.
- 2 Turn the multimeter over and shake out any dirt that may have accumulated in the terminals.

Wipe the case with a damp cloth and mild detergent – do not use abrasives or solvents. Wipe the contacts in each terminal with a clean swab dipped in alcohol.

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2 Making Measurements

| | |
|--------------------------------------------------|----|
| Measuring AC Voltage | 52 |
| Measuring DC Voltage | 54 |
| Using VZ _{LOW} for Voltage Measurements | 56 |
| Measuring Resistance | 59 |
| Testing for Continuity | 61 |
| Testing Diodes | 65 |
| Measuring Capacitance | 69 |
| Measuring Temperature | 71 |
| Measuring AC or DC Current | 77 |
| Measuring Frequency | 82 |

This chapter describes how to take measurements with your multimeter.

Measuring AC Voltage

Set up your multimeter to measure AC voltage as shown in [Figure 2-2](#). Probe the test points and read the display.

NOTE

AC voltage measurements measured with this multimeter are returned as true rms (root mean square) readings. These readings are accurate for sine waves and other waveforms (with no DC offset) such as square waves, triangle waves, and staircase waves.

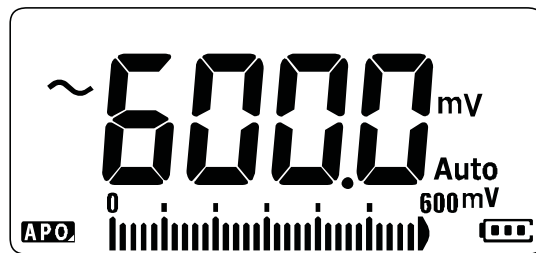


Figure 2-1 AC voltage display

NOTE


Press  to measure the frequency of the AC voltage source. See [“Measuring Frequency”](#) on page 82 to learn more.



Figure 2-2 Measuring AC voltage

Measuring DC Voltage

Set up your multimeter to measure DC voltage as shown in [Figure 2-4](#). Probe the test points and read the display.

NOTE

This multimeter displays DC voltage values as well as their polarity. Negative DC voltages will return a negative sign on the left of the display.

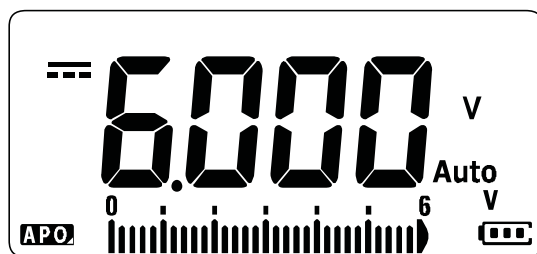





Figure 2-3 DC voltage display

Measuring AC/DC mV

You can choose to set the multimeter to measure AC or DC mV at the rotary positions shown below.

- U1233A: 
- U1232A: 
- U1231A: 

Use the Setup menu to enable AC/DC mV measurements. See [“Enable the AC/DC mV measurement”](#) on page 118 to learn more.

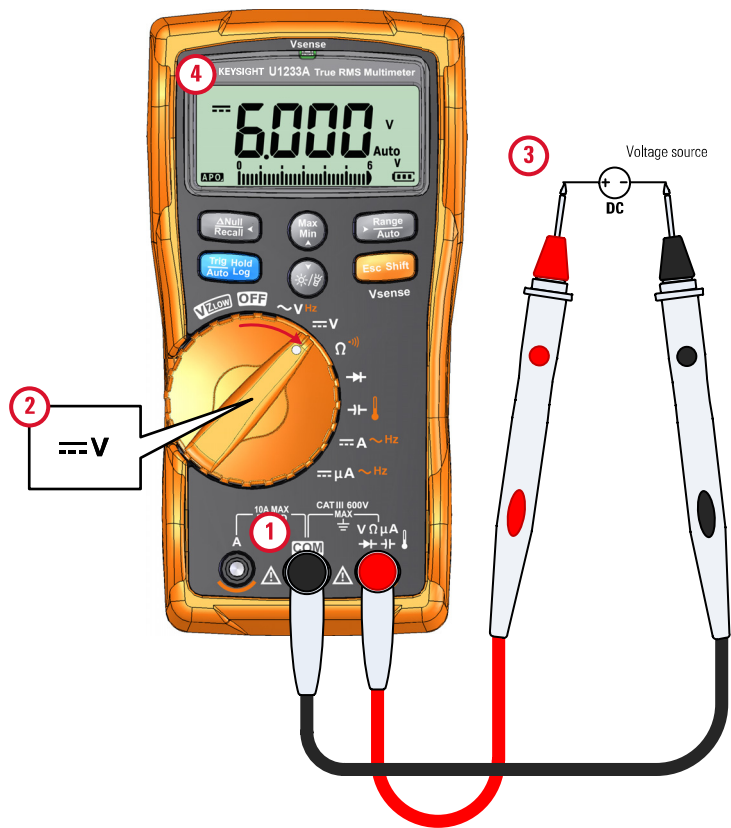


Figure 2-4 Measuring DC voltage

Using VZ_{LOW} for Voltage Measurements

Set up your multimeter to make a VZ_{LOW} (low input impedance) voltage measurement as shown in [Figure 2-6](#). Probe the test points and read the display.

CAUTION

Do not use the VZ_{LOW} function to measure voltages in circuits that could be damaged by this function's low impedance (3 k Ω (nominal)).

NOTE

Use the VZ_{LOW} function to remove ghost or induced voltages from your measurements

Ghost voltages are voltages present on a circuit that should not be energized. They are usually caused by capacitive coupling between energized wiring and adjacent unused wiring. The VZ_{LOW} function can remove ghost voltages from your measurements by dissipating the coupling voltage. Use the VZ_{LOW} function to reduce the possibility of false readings in areas where the presence of ghost voltages are suspected.

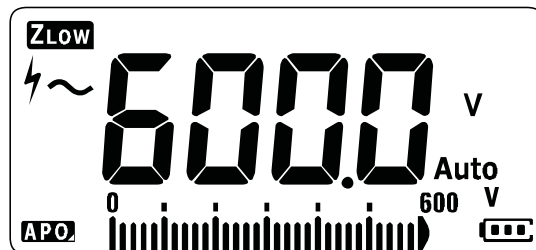


Figure 2-5 VZ_{LOW} voltage display

NOTE

During VZ_{LOW} measurements, the multimeter's range is locked to 600 V. The analog bar graph represents the AC+DC voltage value combined.

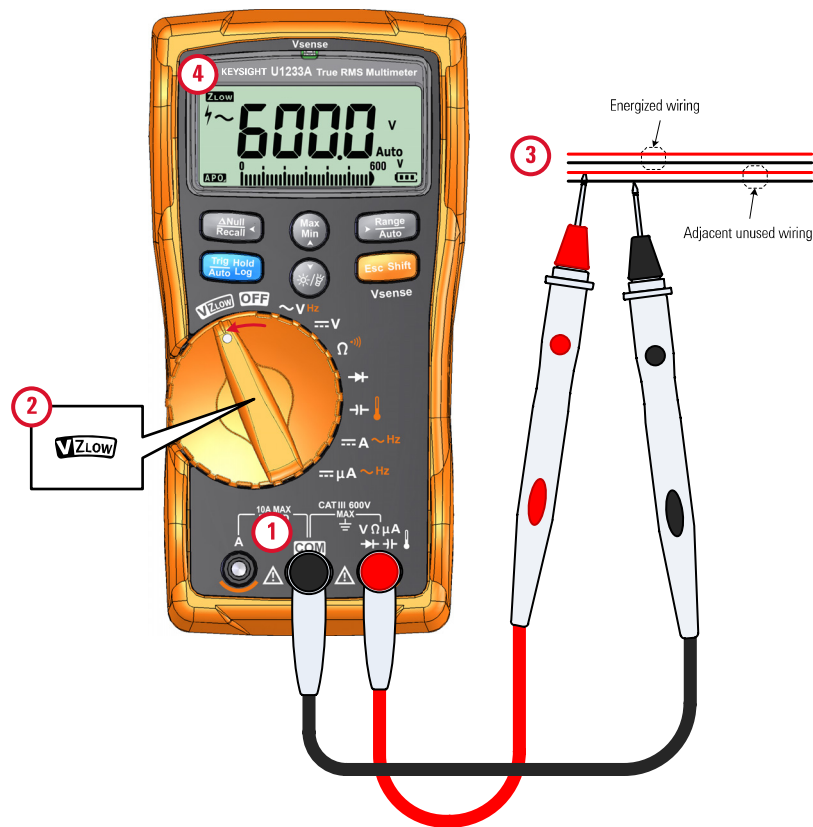


Figure 2-6 Measuring $V_{Z_{LOW}}$ voltage

NOTE

- The multimeter will automatically identify the voltage measurement based on the following criteria:
 - If $AC\ V > 0.5\ V$ or $AC\ V \geq \text{the absolute of } DC\ V$, $AC\ V$ will be selected.
 - Otherwise, $DC\ V$ will be selected.
- Press **Esc Shift** once to lock the initial signal identification ($AC\ V$ or $DC\ V$). Press **Esc Shift** again to exchange the AC and DC voltage indication on the primary display. Pressing **Esc Shift** for the third time will restart the auto identification of the signal. See Figure 2-7 to learn more.

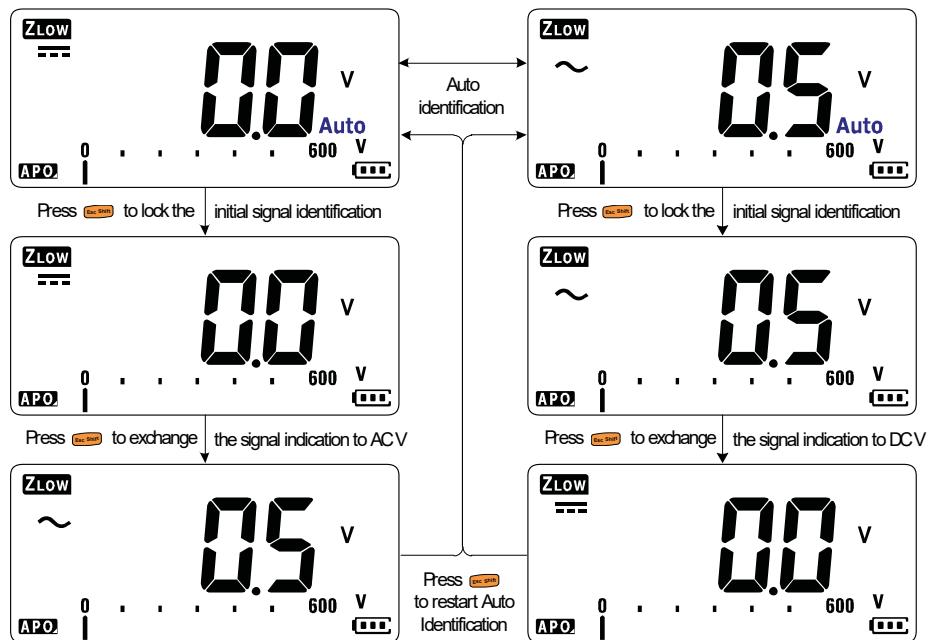


Figure 2-7 VZ_{LOW} auto identification flow

Using VZ_{LOW} to test a battery's health

Aside from reading a battery's voltage level using the DC voltage measurement function, you can also use the VZ_{LOW} function to test a battery's health.

If you detect that the measured battery's voltage shown in the VZ_{LOW} function is declining gradually, this means that the capacity of the battery-under-test is not enough to support regular functions. Use this simple and quick test to determine if a battery has enough voltage capacity to support regular activities.

NOTE

Prolonged use of the VZ_{LOW} function will consume the capacity of the battery-under-test.

Measuring Resistance

Set up your multimeter to measure resistance as shown in [Figure 2-9](#). Probe the test points and read the display.

CAUTION

To avoid possible damage to your multimeter or to the equipment under test, disconnect the circuit power and discharge all high-voltage capacitors before measuring resistance.

NOTE

Resistance (opposition to the current flow) is measured by sending a small current out through the test leads to the circuit under test. Because this current flows through all possible paths between the leads, the resistance reading represents the total resistance of all paths between the leads. Resistance is measured in ohms (Ω).

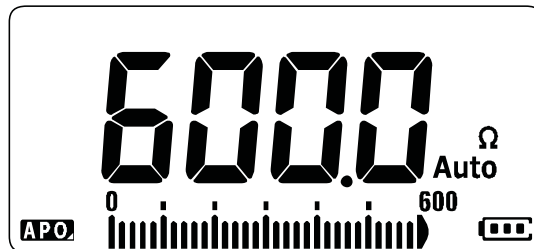




Figure 2-8 Resistance display

NOTE

Keep the following in mind when measuring resistance.

- The test leads can add 0.1 Ω to 0.2 Ω of error to resistance measurements. To test the leads, touch the probe tips together and read the resistance of the leads. To remove lead resistance from the measurement, hold the test lead tips together and press . Now the resistance at the probe tips will be subtracted from all future display readings.

NOTE

- Because the multimeter's test current flows through all possible paths between the probe tips, the measured value of a resistor in a circuit is often different from the resistor's rated value.
- The resistance function can produce enough voltage to forward-bias silicon diodes or transistor junctions, causing them to conduct. If this is suspected, press  to apply a lower current in the next higher range.

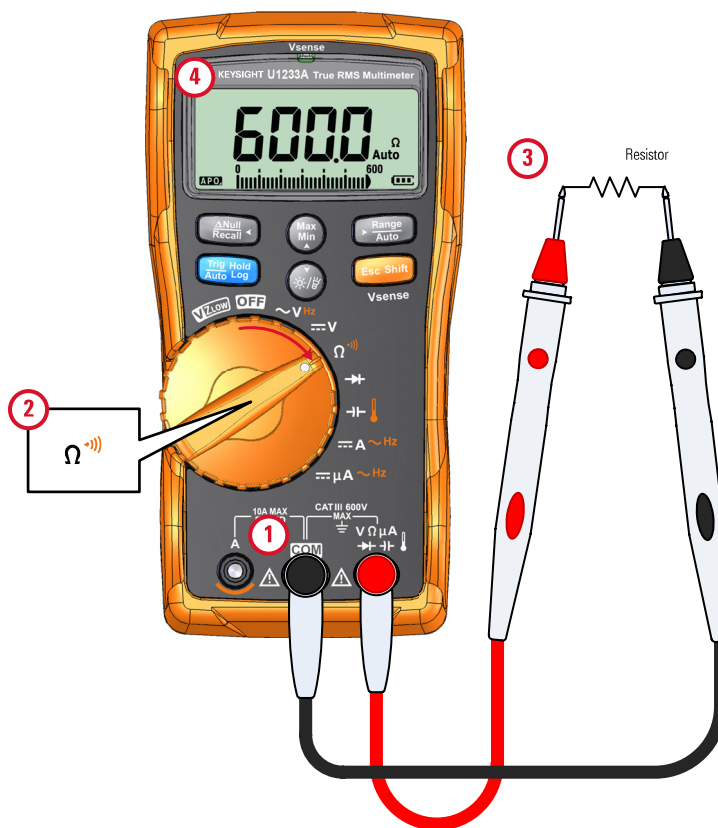


Figure 2-9 Measuring resistance

Testing for Continuity

Set up your multimeter to test for continuity as shown in [Figure 2-11](#). Probe the test points and read the display.

CAUTION

To avoid possible damage to your multimeter or to the equipment under test, disconnect the circuit power and discharge all high-voltage capacitors before testing for continuity.




NOTE

Continuity is the presence of a complete path for current flow. The continuity test features a beeper that sounds and a backlight that flashes as long as a circuit is complete if short continuity is selected (or broken if open continuity is selected). The audible and visual alert allows you to perform quick continuity tests without having to watch the display.

In continuity, a short means a measured value is less than the threshold resistance values listed in [Table 2-1](#).

Table 2-1 Threshold resistance values

| Measuring range | Threshold resistance |
|------------------|-------------------------------|
| 600.0 Ω | $<23 \pm 10 \Omega$ |
| 6.000 k Ω | $<230 \pm 100 \Omega$ |
| 60.00 k Ω | $<2.3 \pm 1 \text{ k}\Omega$ |
| 600.0 k Ω | $<23 \pm 10 \text{ k}\Omega$ |
| 6.000 M Ω | $<131 \pm 60 \text{ k}\Omega$ |
| 60.00 M Ω | $<131 \pm 60 \text{ k}\Omega$ |

Press  to switch between resistance measurement, short continuity test () , or open continuity test (). See [Figure 2-10](#) to learn more.

NOTE**Open continuity is disabled by default**

The open continuity test option must be enabled in the Setup menu before it can be selected via the **Esc Shift** key. See [“Enable open continuity test by default”](#) on page 119 to learn more.

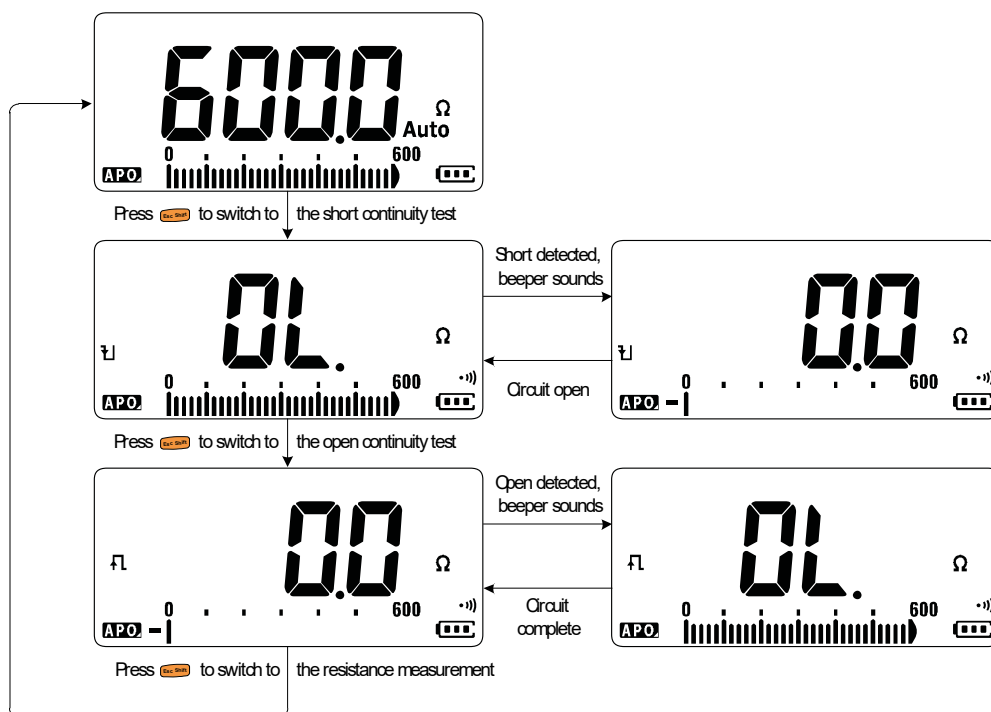


Figure 2-10 Continuity test flow

NOTE

- You can set the beeper to sound and the backlight to flash as a continuity indication whether the circuit-under-test is less than (short) or more than or equal to (open) the threshold resistance.
 - The continuity function detects intermittent shorts and opens lasting as short as 1 ms. A brief short or open causes the multimeter to emit a short beep and flash.
 - You can enable or disable the audible and visual alert via the Setup menu. See [“Changing the continuity test alerts”](#) on page 113 for more information on the audible and visual alert options.
-

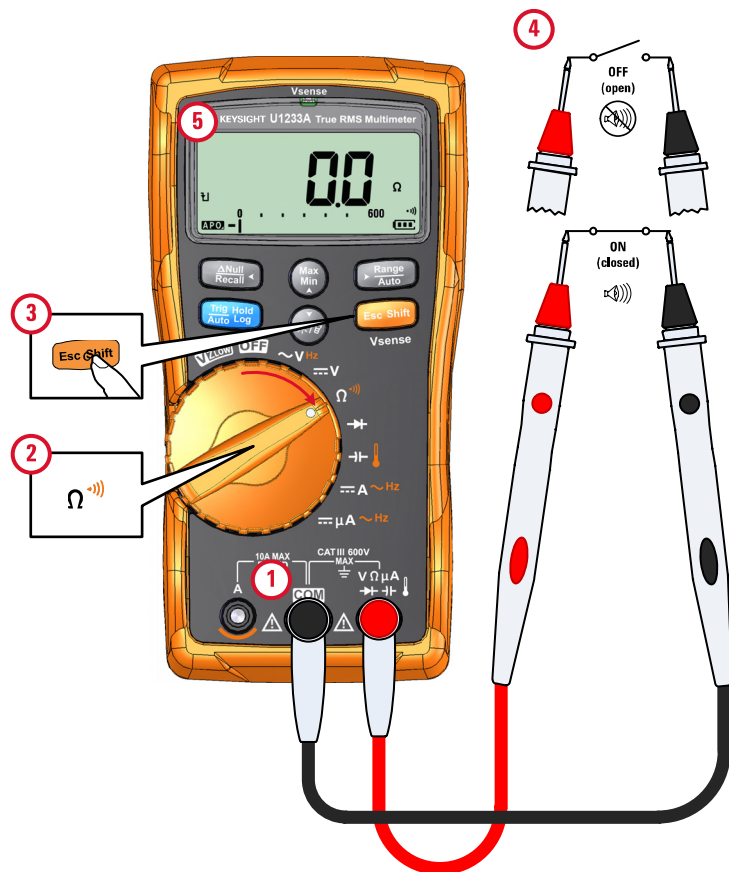


Figure 2-11 Testing for continuity

Testing Diodes

Set up your multimeter to test diodes as shown in [Figure 2-14](#). Probe the test points and read the display.

CAUTION

To avoid possible damage to your multimeter or to the equipment under test, disconnect the circuit power and discharge all high-voltage capacitors before testing diodes.

NOTE

- Use the diode test to check diodes, transistors, silicon controlled rectifiers (SCRs), and other semiconductor devices. A good diode allows current to flow in one direction only.
- This test sends a current through a semiconductor junction, and then measures the junction's voltage drop.
- Connect the red test lead to the positive terminal (anode) of the diode and the black test lead to the negative terminal (cathode). The cathode of a diode is indicated with a band.



Figure 2-12 Diode display

NOTE

Your multimeter can display the forward bias of a diode up to approximately 2.1 V. The forward bias of a typical diode is within the range of 0.3 V to 0.8 V; however, the reading can vary depending on the resistance of other pathways between the probe tips.

NOTE

If the beeper is enabled during diode test, the multimeter will beep briefly for a normal junction and sound continuously for a shorted junction, below 0.050 V. See [“Changing the beep frequency”](#) on page 107 to disable the beeper.

Reverse the probes (as shown in [Figure 2-15](#)) and measure the voltage across the diode again. Assess the diode according to the following guidelines:

- A diode is considered good if the multimeter displays **OL** in reverse bias mode.
- A diode is considered shorted if the multimeter displays approximately 0 V in both forward and reverse bias modes, and the multimeter beeps continuously.
- A diode is considered open if the multimeter displays **OL** in both forward and reverse bias modes.

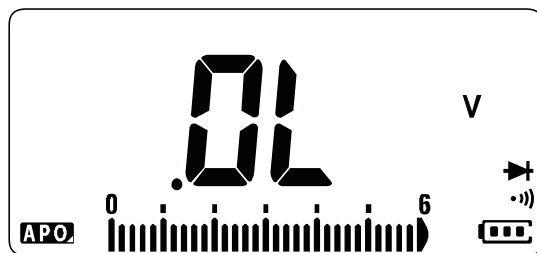


Figure 2-13 Open diode display

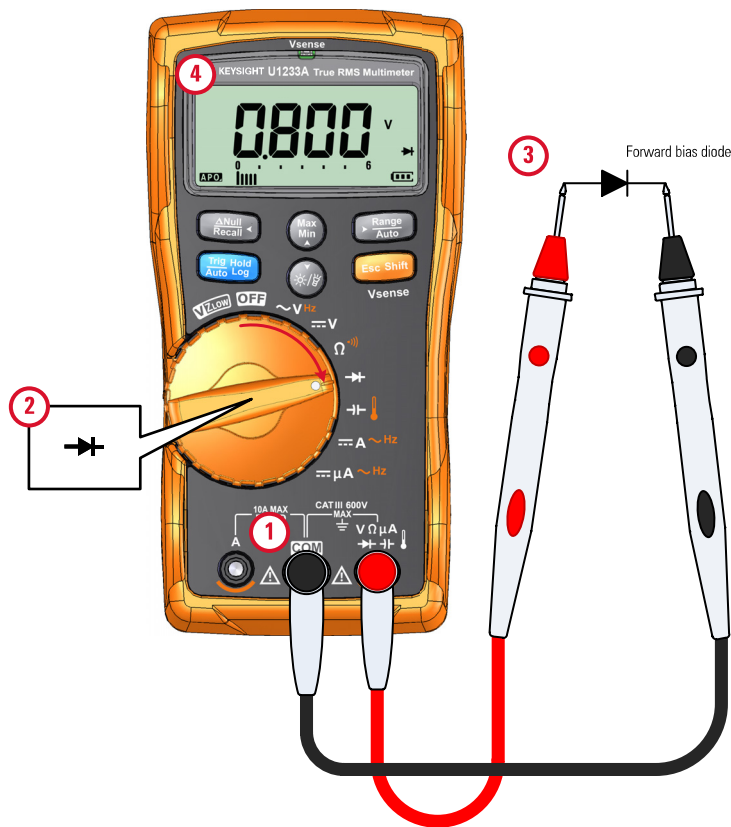


Figure 2-14 Testing forward bias diode

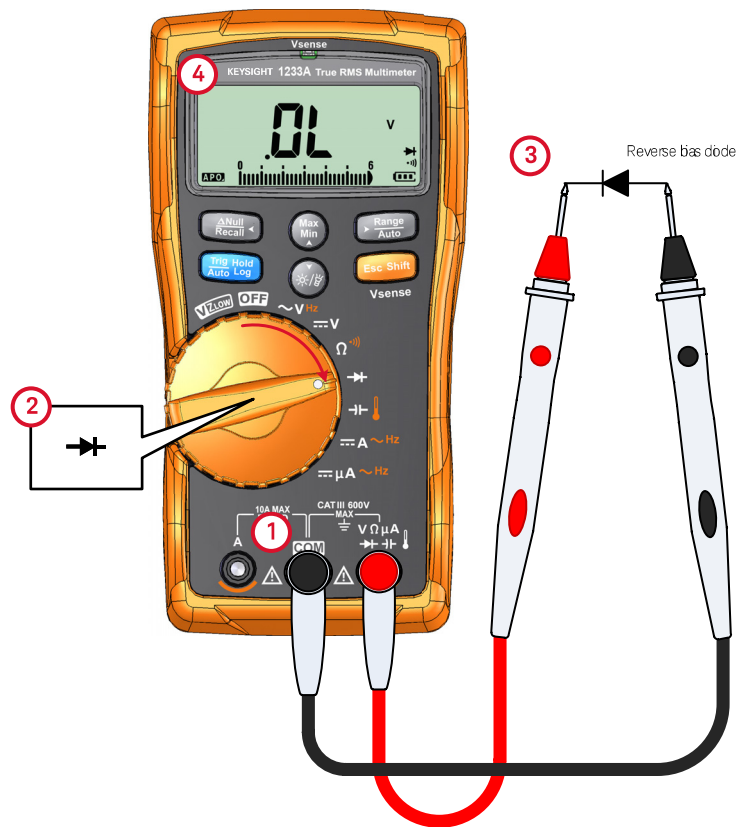


Figure 2-15 Testing reverse bias diode

Measuring Capacitance

Set up your multimeter to measure capacitance as shown in [Figure 2-17](#). Probe the test points and read the display.

CAUTION

To avoid possible damage to the multimeter or to the equipment under test, disconnect circuit power and discharge all high-voltage capacitors before measuring capacitance. Use the DC voltage function to confirm that the capacitor is fully discharged.

NOTE

- The multimeter measures capacitance by charging the capacitor with a known current for a known period of time, measuring the resulting voltage, and then calculating the capacitance.
- FL is shown on the left of the display when the capacitor is charging, and VL is shown when the capacitor is discharging.



Figure 2-16 Capacitance display

NOTE

- To improve measurement accuracy of small value capacitors, press Auto Recall with the test leads open to subtract the residual capacitance of the multimeter and leads.
- For measuring capacitance values greater than 1000 μF , discharge the capacitor first, then select a suitable range for measurement. This will speed up the measurement time and also ensures that the correct capacitance value is obtained.

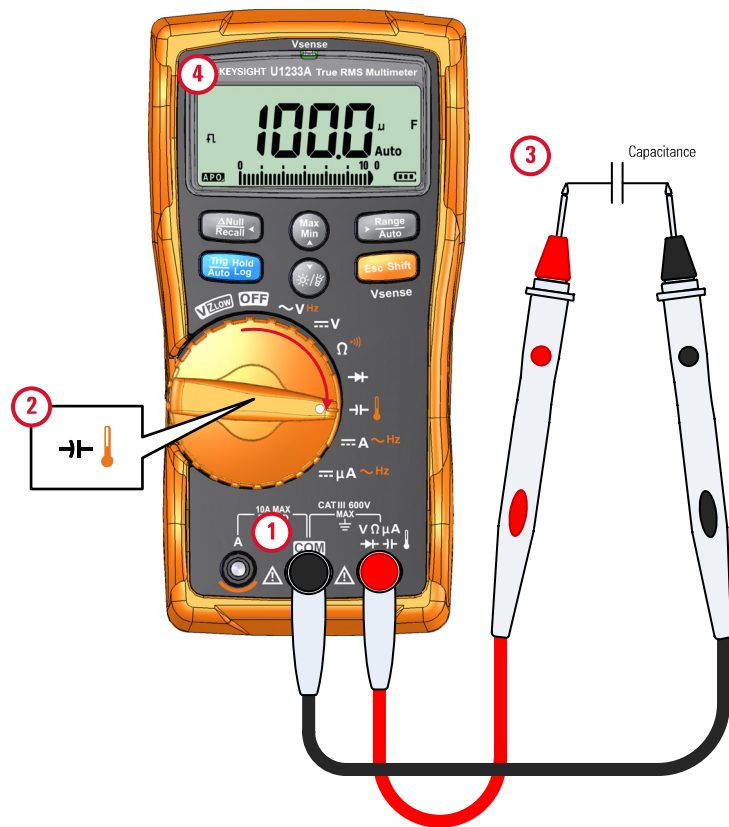


Figure 2-17 Measuring capacitance

Measuring Temperature

For the U1233A, set up your multimeter to measure temperature as shown in [Figure 2-19](#). For the U1231A and U1232A, refer to [Figure 2-20](#). Probe the test points and read the display.

WARNING

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

CAUTION

Do not bend the thermocouple leads at sharp angles. Repeated bending over a period of time can break the leads.

NOTE



- The multimeter uses a type-K (default setting) temperature probe for measuring temperature.
 - For temperature measurement on the U1233A, a type-K thermocouple probe and adapter such as the U1186A (purchased separately) is recommended. It is only compatible with the U1233A.
 - For auxiliary temperature measurement on the U1231A and U1232A, a temperature module such as the U1586B (purchased separately) is required.
 - The approximate ambient temperature (cold-junction compensation) is shown on the display when you have an open thermocouple. The open thermocouple message may be due to a broken (open) probe or because no probe is installed into the input jacks of the multimeter.
 - Shorting the  terminal to the **COM** terminal will display the temperature at the multimeter's terminals.
-



Figure 2-18 Temperature display

Press  to change the temperature units between °C or °F (you must first change the temperature unit from °C only to °C°F or °F°C). See “[Changing the temperature unit](#)” on page 119 for more information.

NOTE

The option to toggle between °C and °F is only available for the U1233A model.

CAUTION

Always set the temperature unit display per the official requirements and in compliance with the national laws of your region.

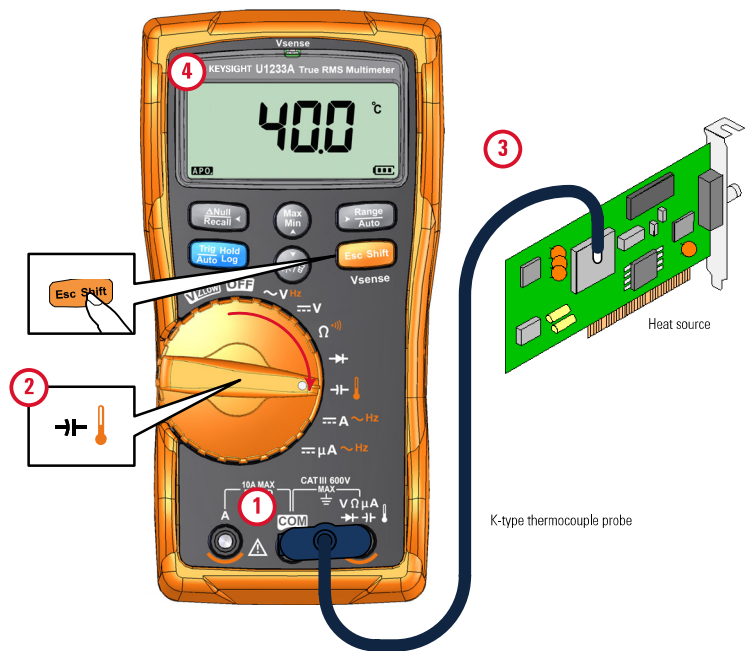


Figure 2-19 Measuring the surface temperature

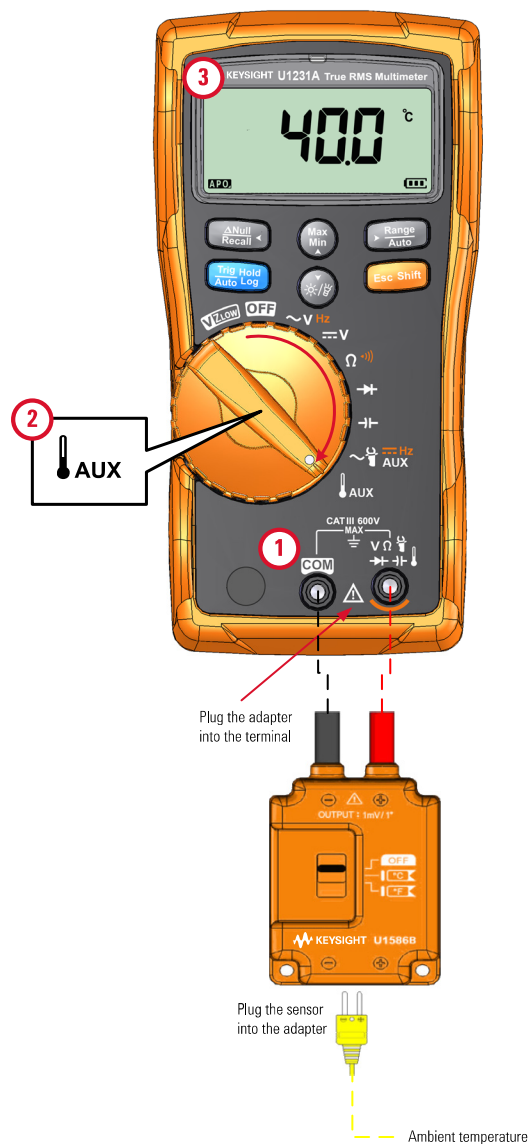




Figure 2-20 Using the Auxillary Temperature measurement function (Only applicable for the U1231A and U1232A models)

NOTE






The bead-type thermocouple probe is suitable for measuring temperatures from $-40\text{ }^{\circ}\text{C}$ to $204\text{ }^{\circ}\text{C}$ ($399\text{ }^{\circ}\text{F}$) in PTFE-compatible environments. Above this temperature range, the probe may emit toxic gas. Do not immerse this thermocouple probe in any liquid. For best results, use a thermocouple probe designed for each specific application – an immersion probe for liquid or gel, and an air probe for air measurement.

Observe the following measurement techniques:


- Clean the surface to be measured and ensure that the probe is securely touching the surface. Remember to disable the applied power.
- When measuring above ambient temperatures, move the thermocouple along the surface until you get the highest temperature reading.
- When measuring below ambient temperatures, move the thermocouple along the surface until you get the lowest temperature reading.
- Place the multimeter in the operating environment for at least 1 hour as the multimeter is using a non-compensation transfer adapter with miniature thermal probe.
- For quick measurement, use the  compensation to view the temperature variation of the thermocouple sensor. The  compensation assists you in measuring relative temperature immediately.




Changing the default temperature unit

You can change the temperature unit (Celsius only, Celsius/Fahrenheit, Fahrenheit only, or Fahrenheit/Celsius) from the Setup menu.

- 1 Press and hold  while powering on the multimeter to enter the Setup menu.
- 2 Press and hold  for more than 1 second until  is shown on the display.
- 3 Press  or  to change the default temperature unit shown on the display.

Available options:

- **°C** – Temperature measured in $^{\circ}\text{C}$ only.
- **°C°F** – During temperature measurements, press  to switch between $^{\circ}\text{C}$ and $^{\circ}\text{F}$.

- °F – Temperature measured in °F only.
 - °F°C – During temperature measurements, press  to switch between °F and °C.
- 4 Press  to save the changes. Press and hold  until the multimeter restarts

Temperature measurement without ambient compensation

If you are working in a constantly varying environment, where ambient temperatures are not constant, do the following:




- 1 Press and hold  for more than 1 second to select the 0 °C compensation (). This allows a quick measurement of the relative temperature.
- 2 Avoid contact between the thermocouple probe and the surface to be measured.
- 3 After a constant reading is obtained, press  to set the reading as the relative reference temperature.
- 4 Touch the surface to be measured with the thermocouple probe and read the display.



Figure 2-21 Temperature measurement without ambient compensation

Measuring AC or DC Current

Set up your multimeter to measure AC or DC current as shown in [Figure 2-24](#) and [Figure 2-25](#). Probe the test points and read the display.

WARNING


Never attempt an in-circuit current measurement where the open-circuit potential to earth is greater than 1000 V. Doing so will cause damage to the multimeter and possible electric shock or personal injury.

CAUTION

To avoid possible damage to the multimeter or to the equipment under test:

- Check the multimeter’s fuses before measuring current.
- Use the proper terminals, function, and range for your measurement.
- Never place the probes across (in parallel with) any circuit or component when the leads are plugged into the current terminals.

NOTE

- To measure current, you must open the circuit under test, then place the multimeter in series with the circuit.
- Insert the black test lead into the **COM** terminal. Insert the red test lead in an input appropriate for the measurement range.
 - Set the positive input terminal to the **A** terminal and set the rotary switch position to $\Rightarrow A \sim Hz$ for currents above 600 μA .
 - Set the positive input terminal to the **μA** terminal and set the rotary switch position to $\Rightarrow \mu A \sim Hz$ for currents below 600 μA .
- Press  to cycle between DC current measurement, AC current measurement, or to measure the frequency of the AC current source. See [“Measuring Frequency”](#) on page 82 to learn more.

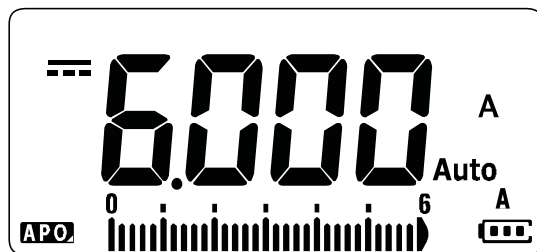


Figure 2-22 DC current display

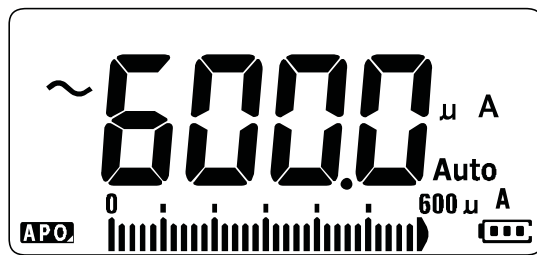


Figure 2-23 AC current display

NOTE

Reversing the leads will produce a negative reading, but will not damage the multimeter.

CAUTION

Placing the probes across (in parallel with) a powered circuit when a lead is plugged into a current terminal can damage the circuit you are testing and blow the multimeter's fuse. This happens because the resistance through the multimeter's current terminals is very low, resulting in a short circuit.

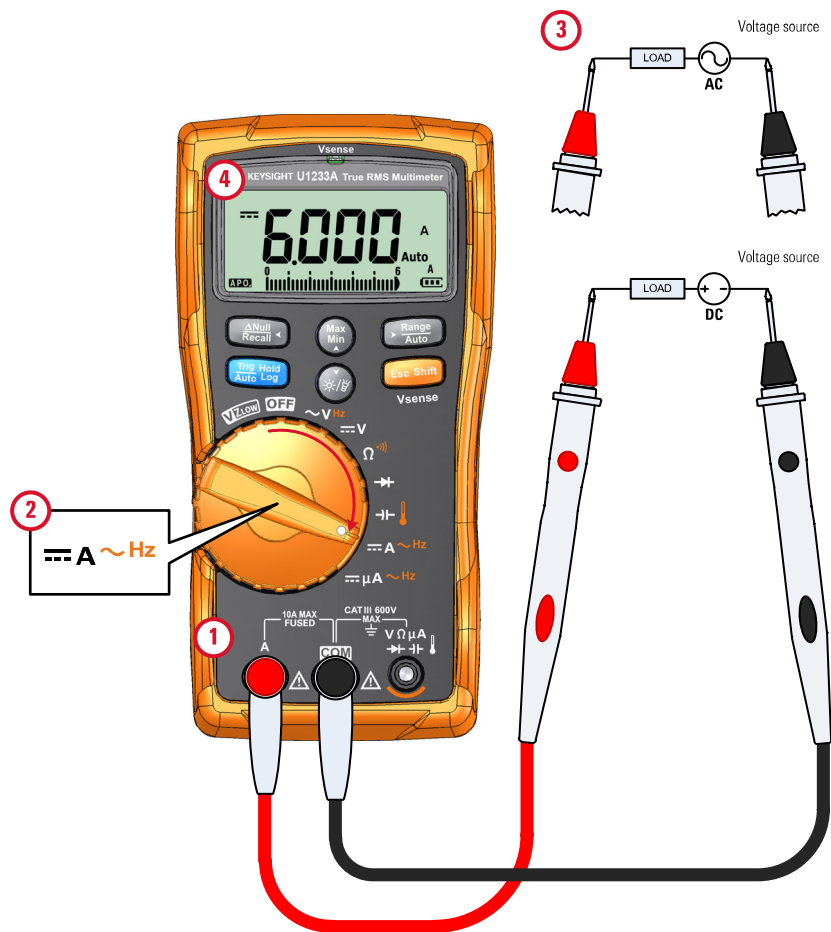


Figure 2-24 Measuring DC/AC current (up to A)

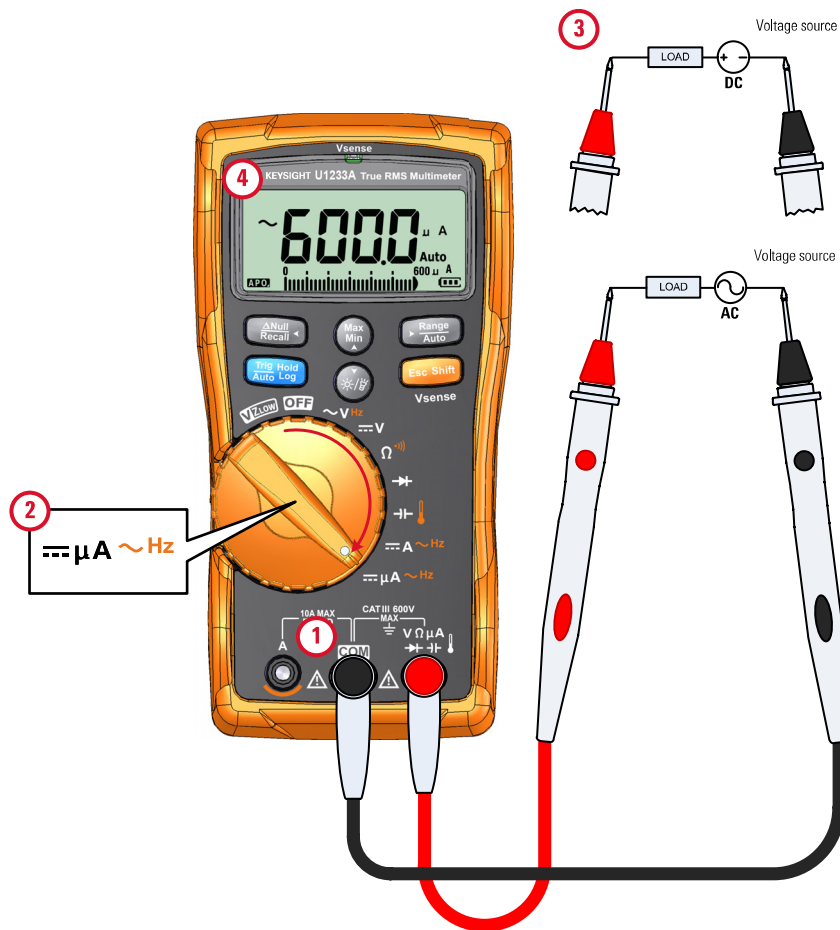


Figure 2-25 Measuring AC/DC current (up to μA)

Using the μA function to measure flame rectification circuits

The multimeter's μA measurement function can be used to measure flame rectification circuits (flame sensors) down to 0.01 μA .

Flame sensors, whether they are used in a home furnace or on a large industrial boiler, indicate the presence of a flame and are part of the safety circuit. These types of flame sensors use a process of flame rectification to sense that the flame is lit. Typically, these flame sensors must be engulfed in the burner flame to function.

Flame rectification uses the fact that a flame will rectify an AC voltage to DC voltage and allow the DC current to flow through a flame to detect a flame.

Normally, an AC voltage is applied to the flame sensor with a wire coming from the ignition module. When the flame sensor is engulfed by a flame, the AC voltage is rectified and a DC current, commonly 4 to 12 μA , flows from the ignition module through the wire to the flame sensor, through the flame to the ground on the furnace chassis.

The ignition control module has a circuit to detect the DC current, and it commonly closes a relay when the DC current is detected, that verifies that the burner is properly lit. If the burner fails to light or is extinguished for any reason, that DC current disappears and the control module takes suitable action to turn off the burner.


To measure flame rectification circuits:

- 1 Set up your multimeter to measure μA measurements as shown in [Figure 2-25](#).
- 2 Connect the multimeter between the flame sensor probe (**COM** terminal) and the ignition control module (μA terminal).
- 3 Probe the test points and read the display.

Measuring Frequency

Your multimeter allows simultaneous monitoring of real- time voltage or current with frequency measurements. [Table 2-2](#) highlights the functions allowing frequency measurements in your multimeter.

Table 2-2 Functions allowing frequency measurement

| Legend | | |
|---------|---------|--------------------------------------------------------------------------------------------------|
| U1233A | U1232A | U1231A |
| ~V Hz | ~V Hz | ~V Hz |
| ≡A ~Hz | ≡A ~Hz | ~  ≡Hz AUX |
| ≡μA ~Hz | ≡μA ~Hz | |

WARNING

Never measure the frequency where the voltage or current level exceeds the specified range. Manually set the voltage or current range if you want to measure frequencies below 20 Hz.

NOTE

- Measuring the frequency of a signal helps detect the presence of harmonic currents in neutral conductors and determines whether these neutral currents are the result of unbalanced phases or non-linear loads.
- Frequency is the number of cycles a signal completes each second. Frequency is defined as 1/Period. Period is defined as the time between the middle threshold crossings of two consecutive, like-polarity edges, as shown in [Figure 2-26](#).
- The multimeter measures the frequency of a voltage or current signal by counting the number of times the signal crosses a threshold level within a specified period of time.

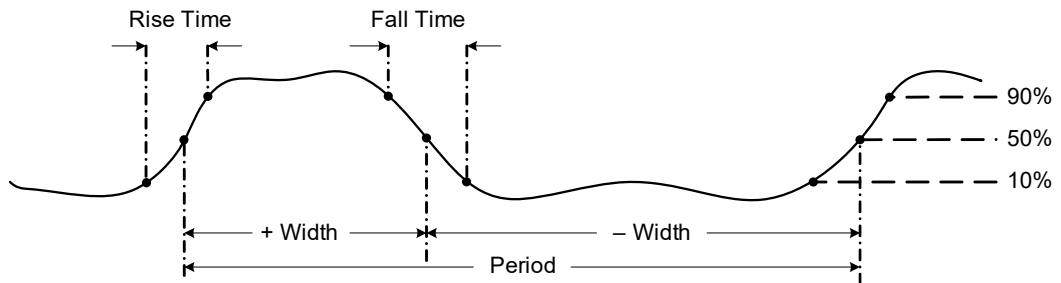



Figure 2-26 Frequency definition

NOTE

- Pressing  controls the input range of the primary function (voltage or ampere) and not the frequency range.
- The frequency of the input signal is shown in the primary display, and the bar graph does not indicate the frequency value but indicates the voltage or ampere value of the input signal.

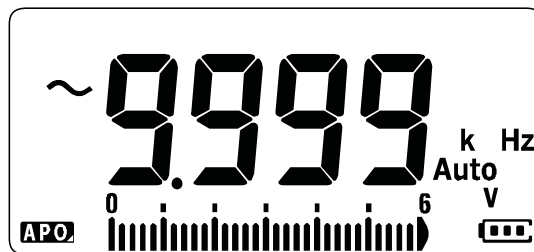


Figure 2-27 Frequency display

NOTE

Observe the following measurement techniques:

- If a reading shows as 0 Hz or is unstable, the input signal may be below or near the trigger level. You can usually correct these problems by manually selecting a lower input range, which increases the sensitivity of the multimeter.

NOTE

- If a reading seems to be a multiple of what you expect, the input signal may be distorted. Distortion can cause multiple triggerings of the frequency counter. Selecting a higher voltage range might solve this problem by decreasing the sensitivity of the multimeter. In general, the lowest frequency displayed is the correct one.

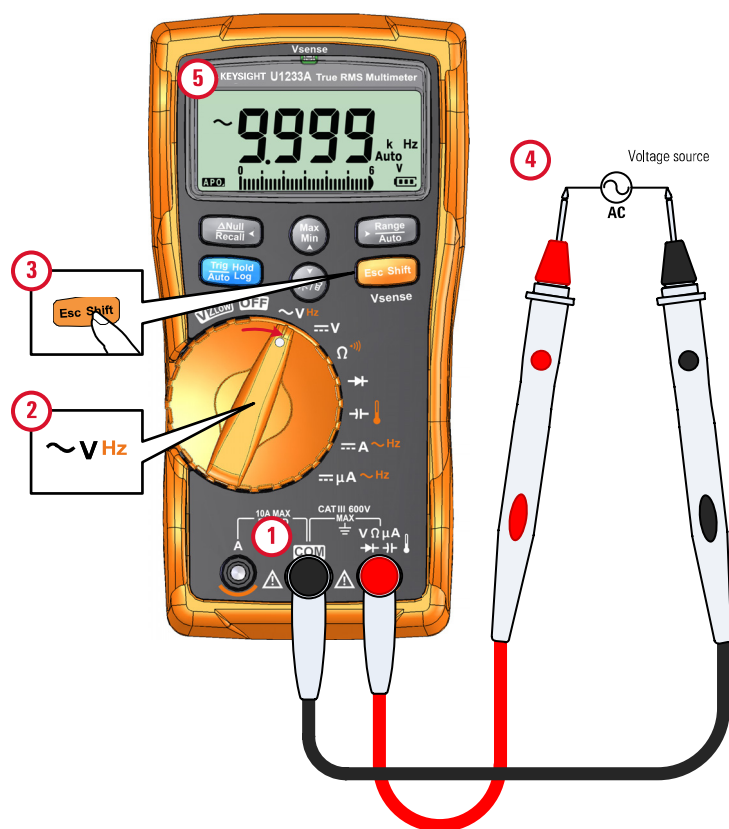


Figure 2-28 Measuring frequency

3 Multimeter Features

| | |
|--------------------------------------------------------|----|
| Detecting AC Voltage Presence (Vsense) | 86 |
| Making Relative Measurements (Null) | 88 |
| Capturing Maximum and Minimum Values (MaxMin) | 90 |
| Freezing the Display (Trig Hold-Log and Auto Hold-Log) | 92 |
| Recalling Previously Recorded Readings (Recall) | 94 |
| Making Scale Transfers (Scale) | 96 |

The chapter describes the additional features available in your multimeter.

Detecting AC Voltage Presence (Vsense)

The Vsense detector is a non-contact voltage detector (for U1233A model only) that detects the presence of AC voltages nearby.

WARNING


You are advised to test on a known live circuit within the rated AC voltage range of this product before and after each use to ensure that the Vsense detector works.

Voltage could still be present even if there is no Vsense alert indication. Do not rely on Vsense detector with shielded wire. Never touch live voltage or conductor without the necessary insulation protection or power off the voltage source.

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

CAUTION


You are advised to measure voltage by using test leads through the VZ_{LOW}, AC V, or DC V function after using the Vsense function, even if there is no alert indication.

Press and hold  for more than 1 second to enable the Vsense function (on any position of the rotary switch except **OFF**).

NOTE

If the presence of AC voltage is sensed, the multimeter's beeper will sound and the Vsense red LED at the top of the multimeter will turn on. The audible and visual alert allows you to easily sense nearby AC voltage presence.

No resolution and accuracy of voltage measurement will be displayed in this mode.

Press  to toggle the Vsense detector's sensitivity between **H₁ 5E** (high sensitivity) or **Lo 5E** (low sensitivity).

NOTE

- Place the top of the multimeter (with the **Vsense** indicator) close to a conductor when sensing for AC voltages (as low as 24 V in the **Hi.SE** setting).
- The low sensitivity setting can be used on flush mounted wall sockets or outlets and various power strips or cords.
- The high sensitivity setting allows for AC voltage sensing on other styles of recessed power connectors or sockets where the actual AC voltage is recessed within the connector itself.

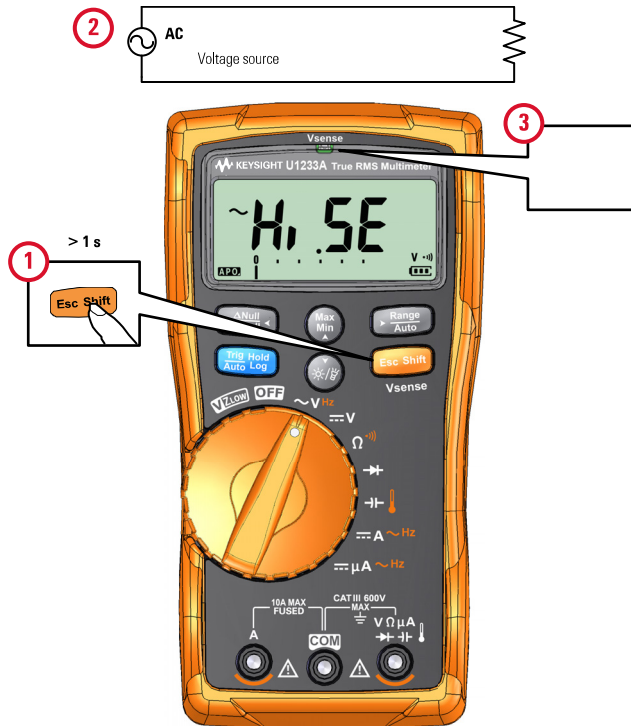


Figure 3-1 Detecting voltage presence

Press and hold **Esc Shift** for more than 1 second to disable the Vsense function.


Making Relative Measurements (Null)

When making Null measurements, also called relative, each reading is the difference between a stored (measured) null value and the input signal.

One possible application is to increase the accuracy of a resistance measurement by nulling the test lead resistance. Nulling the leads is also particularly important prior to making capacitance measurements.

NOTE

Null can be set for both auto and manual range settings, but not in the case of an overload.

- 1 To activate the relative mode, press the  key. The measurement value at the time, when Null (Δ) is enabled, is stored as the reference value.

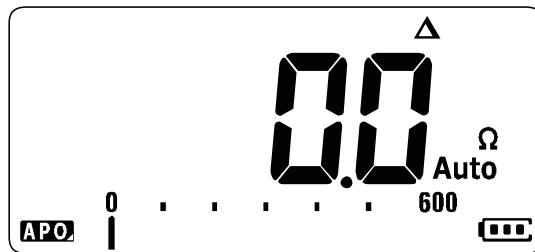






Figure 3-2 Null display

- 2 Press  again to view the stored reference value. The display will return to normal after 3 seconds.
- 3 To disable the Null function, press  while the stored reference value is shown (step 2).

For any measurement function, you can directly measure and store the null value by pressing  with the test leads open (nulls the test lead capacitance), shorted (nulls the test lead resistance), or across a desired null value circuit.

NOTE

- In resistance measurement, the multimeter will read a non-zero value even when the two test leads are in direct contact because of the resistance of these leads. Use the Null function to zero-adjust the display.
- For DC voltage measurements, the thermal effect will influence the accuracy of the measurements. Short the test leads and press  when the displayed value is stable to zero-adjust the display.

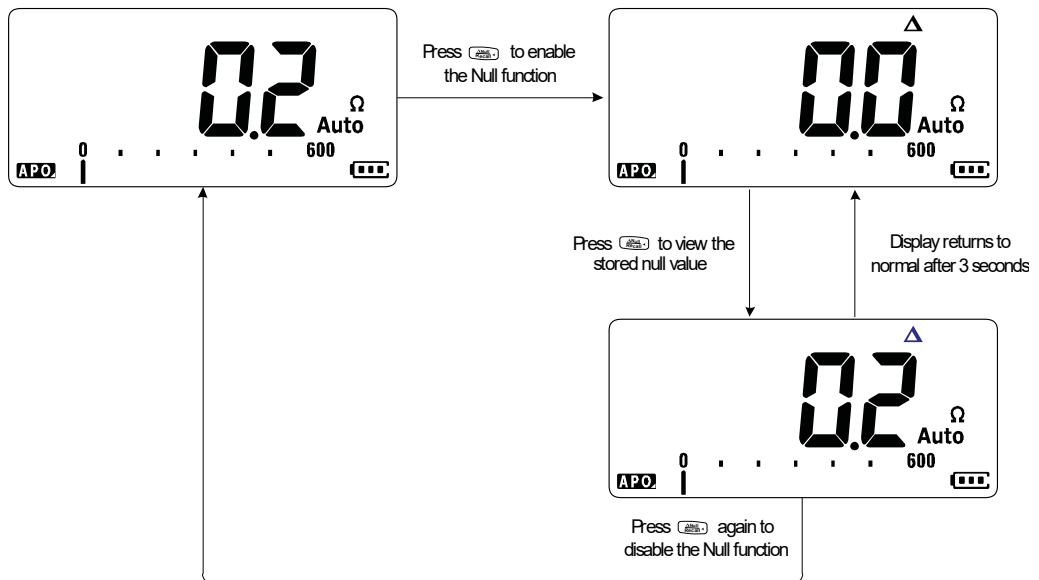


Figure 3-3 Null operation

Capturing Maximum and Minimum Values (MaxMin)

The MaxMin operation stores the maximum, minimum, and average input values during a series of measurements.





When the input goes below the recorded minimum value or above the recorded maximum value, the multimeter beeps and records the new value. The multimeter also calculates an average of all readings taken since the MaxMin mode was activated.

From the multimeter's display, you can view the following statistical data for any set of readings:

- Max: highest reading since the MaxMin function was enabled
- Min: lowest reading since the MaxMin function was enabled
- Avg: average or mean of all readings since the MaxMin function was enabled
- MaxMinAvg: present reading (actual input signal value)

NOTE

This function is applicable to all measurements except for VZ_{LOW}.

- 1 Press  to enable the MaxMin operation.
- 2 Press  again to cycle through the Max, Min, Avg, or present (MaxMinAvg) input values.
- 3 Press  to restart the recording session.
- 4 Press  for more than 1 second to disable the MaxMin function.

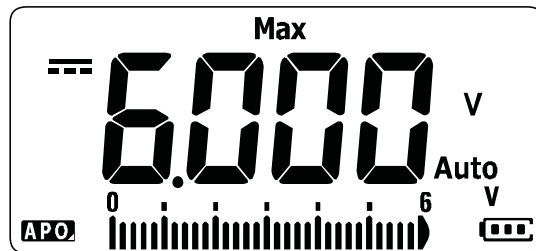



Figure 3-4 MaxMin display

NOTE

- Changing the range manually will also restart the recording session.
 - If an overload is recorded, the averaging function will be stopped.  is shown in place of the average value.
 - The APO (auto power-off) function is disabled when MaxMin is enabled.
-

This mode is useful for capturing intermittent readings, recording minimum and maximum readings unattended, or recording readings while equipment operation keeps you from observing the multimeter display.


The true average value displayed is the arithmetic mean of all readings taken since the start of recording. The average reading is useful for smoothing out unstable inputs, calculating power consumption, or estimating the percentage of time a circuit is active.

Freezing the Display (Trig Hold-Log and Auto Hold-Log)

NOTE

Trig Hold-Log and Auto Hold-Log readings are recorded automatically for future review or analysis by default. See **“Recalling Previously Recorded Readings (Recall)”** on page 94 to learn more.

Trig Hold-Log operation

To freeze the display for any function, press the  key.

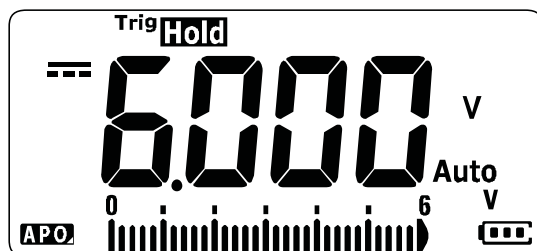



Figure 3-5 Trig Hold-Log display

Press  again to automatically update the display to reflect data that was acquired during the hold.

NOTE

The **Trig Hold** annunciator will flash while attempting to acquire a stable reading.

Press and hold  for more than 1 second to exit this mode.

Auto Hold-Log operation

Pressing the  for more than 1 second activates the Auto Hold-Log function.

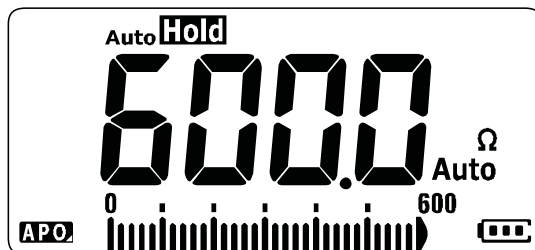







Figure 3-6 Auto Hold-Log display

NOTE

- The Auto Hold-Log operation monitors the input signal and updates the display and, if enabled, emits a beep whenever a new stable measurement is detected. The multimeter is ready to update the display once the variation of the reading exceed the setting of the variation count.
- The **Auto Hold** annunciator will flash while attempting to acquire a stable reading.

Press and hold  for more than 1 second to exit this mode.

Changing the default Auto Hold-Log variation count

- 1 Press and hold  while powering on the multimeter to enter the Setup menu.
- 2 Ensure that the **Auto Hold** annunciator is shown on the display.
- 3 Press  or  to edit the variation count value shown on the display.
- 4 Press  to save the changes. Press and hold  until the multimeter restarts.


NOTE

If the reading value is unable to reach a stable state (when exceeding the preset variation), the reading value will not be updated.


Recalling Previously Recorded Readings (Recall)

Trig Hold-Log and Auto Hold-Log readings are recorded automatically for future review or analysis by default.

NOTE

- Up to a maximum of 10 records can be stored at a time. The Trig Hold-Log and Auto Hold-Log records share the same memory space. When the memory's index is full, the next reading to be recorded will overwrite the last reading recorded (the 10th index).
- By default, each Trig Hold-Log and Auto Hold-Log reading is stored temporarily in the multimeter's volatile memory. All temporary records will be erased when the multimeter is turned OFF.
- You can choose to save the temporary records in the multimeter's nonvolatile memory by pressing and holding  for more than 1 second. Records stored through this method remains saved even when the multimeter is turned OFF or if the battery is replaced.

Recalling readings stored in the multimeter's memory is performed through the  key.

- 1 Press  for more than 1 second to enter the Recall menu. The last recorded reading is shown on the display. The analog bar graph is used to indicate the record index.

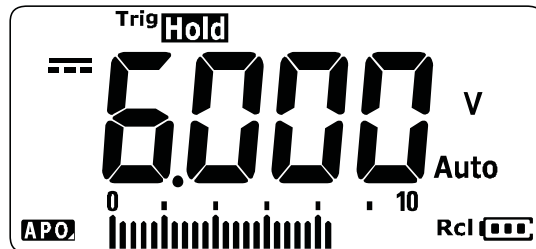


Figure 3-7 View display

If nothing has been recorded, **none** is displayed instead.

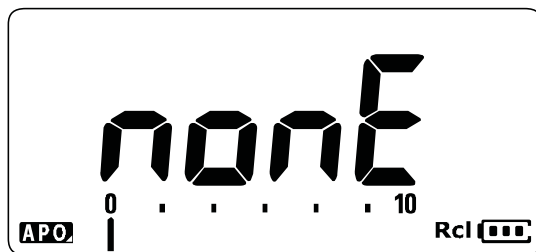


Figure 3-8 Empty view display

- 2 Use the following steps to navigate the Recall menu.
 - a Press to jump to the last stored entry, or press and hold for more than 1 second to jump to the first stored entry.
 - b Press to view the next stored entry or press to view the previous stored entry. The index number (shown by the analog bar graph) increases or decreases by one.
 - c Press for more than 1 second to permanently store all data entries in the multimeter's nonvolatile memory. **PRSS** is shown on the display if the data entries are successfully stored.
 - d Press for more than 1 second to clear the temporary data entries. **nonE** is shown on the display if the data entries are successfully cleared. Cycle the multimeter's power again to view the permanent data entries.

NOTE

To clear the permanent data entries

- 1 Press for more than 1 second until **nonE** is shown on the display.
 - 2 Then, press for more than 1 second until **PRSS** is shown on the display.
 - 3 All data entries stored in the multimeter's nonvolatile memory will be erased.
-
- 3 Press for more than 1 second to exit the Recall menu.

Making Scale Transfers (Scale)

The Scale operation emulates a transducer by helping you to convert the measured readings proportionally to the specified ratio and unit display. Use Scale to transfer voltage readings to proportional readings when using clamp-on current probes, high voltage probes, or temperature auxiliary probes. The available scale conversions are shown in the table below.

Table 3-1 Available scale conversions


| Scale item | Multiplier ^[a] | Unit | Best resolution | Start range |
|--------------------------------------------------------|---------------------------|----------------|------------------------|----------------------------|
| 1000 V/V ^[b] | 1000.0 | V | 0.1 V | 600.0 V |
| 1 °C/mV ^[c] or 1 °F/mV ^[c] | 1000.0 | °C or °F | 0.1 °C or 0.1 °F | 600.0 °C or 600.0 °F |
| 1 A/mV | 1000.0 | A | 0.1 A | 600.0 A |
| 0.1 A/mV | 100.0 | A | 0.01 A | 60.00 A |
| 0.01 A/mV | 10.0 | A | 0.001 A | 6.000 A |
| 1 mA/ mV | 1.0 | A | 0.1 mA | 600.0 mA |
| 0.1 mA/ mV | 0.1 | A | 0.01 mA | 60.00 mA |

[a] The transfer formula used is: Display = Multiplier × Measurement

[b] The scale item is selected from the Setup menu. See ["Changing the scale conversion value"](#) on page 116 for more information.

[c] Dependent on temperature unit setup.

If °C or °C°F is selected, 1 °C/mV is shown as the selected scale item. If °F or °F°C is selected, 1 °F/mV is shown as the selected scale item instead.

- 1 Press and hold  while powering on the multimeter to enable the Scale operation.
- 2 If successful, the **Scale** annunciator is shown on the left of the display. The multimeter automatically starts the conversion of the selected Scale item for all voltage measurements.
- 3 You can only change the selected Scale item from the Setup menu. See [“Changing the scale conversion value”](#) on page 116 to learn more.
- 4 The Scale operation is enabled until the multimeter’s power is cycled.

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4 Multimeter Setup Options

| | |
|----------------------|-----|
| Using the Setup Menu | 100 |
| Setup Menu Summary | 102 |
| Setup Menu Items | 104 |

The chapter describes how to change the preset features of your multimeter.


















Using the Setup Menu

The Setup menu allows you to change a number of nonvolatile preset features. Modifying these settings affects the general operation of your multimeter across several functions. Select a setting to edit to perform one of the following:



- Switch between two values, such as on or off.
- Cycle through multiple values from a predefined list.
- Decrease or increase a numerical value within a fixed range.

The contents of the Setup menu are summarized in [Table 4-2](#) on page 102.



Table 4-1 Setup menu key functions



| Legend | Description |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | Press and hold  while powering on the multimeter to access the Setup menu. Press and hold  for more than 1 second to exit this mode. |
|   | Press  or  to step through the menu items. |
|   | Press  or  at each menu item to change the preset settings. The menu item (in the secondary display) will flash to indicate that you can now change the menu item values. Press  or  again to switch between two values, to cycle through multiple values from a list, or to decrease or increase a numerical value. |
|   | While the menu item is flashing, press  to save your changes. While the menu item is flashing, press  to discard your changes. |



Editing numerical values



When editing numerical values, first press  or  to position the cursor over the first numerical digit (most right digit).

Next, use the  and  to move the cursor to the other numerical digit(s).

- Press  to move the cursor to the left, and
- Press  to move the cursor to the right.

When the cursor is positioned over a digit, use the  and  keys to change the numerical digit.

- Press  to increment the digit, and
- Press  to decrement the digit.

When you have completed your changes, save the new numerical value by pressing . (Or alternatively, if you wish to discard the changes you made, press .)

Setup Menu Summary

The Setup menu items are summarized in the table below. Click the respective “Learn more” pages in [Table 4-2](#) for more information on each menu item.

Table 4-2 Setup menu item descriptions








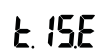

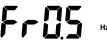



| Legend | Available settings | Description | Learn more on: |
|---------------------------------------------------------------------------------------------------------------|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|
|  050 | (001 to 999) counts | Set the multimeter's Auto Hold-Log variation count from 1 count to 999 counts. Default is 50 counts. | page 93 and page 104 |
|  009d | (001 to 999) or disabled | Set the display's settling value from 1 to 999. Enable the Smooth function by selecting E (enabled). Default is disabled (009.d). | page 33 and page 105 |
|  030d ^v | (001 to 660) V or disabled | Set the multimeter's voltage alert value from 1 V to 660 V. Enable the voltage alert function by selecting E (enabled). Default is disabled (030.d) V. | page 30 and page 106 |
|  bF38 ^{k Hz} | (3.2, 3.4, 3.8, 4.2) kHz or – (off) | Set the multimeter's beep frequency (3.2 kHz, 3.4 kHz, 3.8 kHz, 4.2 kHz, or off). Default is 3.8 kHz. | page 107 |
|  A 15E ^m | (01 to 99) mins or disabled | Set the auto power-off timeout period from 1 to 99 minutes (1 hour, 39 minutes). Disable the auto power-off function by selecting d (disabled). Default is 15 minutes. | page 26 and page 108 |
|  b. 15E | (01 to 99) s or disabled | Set the LCD backlight timeout period from 1 to 99 seconds (1 minute, 39 seconds). Disable the LCD backlight timeout by selecting d (disabled). Default is 15 seconds. | page 27 and page 109 |
|  BLH | Lo, 02, 03, ME, 05, 06, or Hi | Set the LCD backlight brightness (Lo, 02, 03, ME, 05, 06, or Hi). Default is Hi. | page 27 and page 110 |
|  L. 15E | (01 to 99) s or disabled | Set the LED flashlight timeout period from 1 to 99 seconds (1 minute, 39 seconds). Enable the LED flashlight timeout by selecting E (enabled). Default is disabled (15.d). | page 27 and page 111 |
|  ELH | Lo, 02, 03, ME, 05, 06, or Hi | Set the LED flashlight brightness (Lo, 02, 03, ME, 05, 06, or Hi). Default is Hi. | page 27 and page 112 |
|  Fr05 ^{Hz} | (0.5 or 5.0) Hz | Set the minimum measurement frequency (0.5 Hz or 5.0 Hz). Default is 0.5 Hz. | page 82 and page 113 |

Table 4-2 Setup menu item descriptions (continued)

| Legend | Available settings | Description | Learn more on: |
|---------------------------|-----------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|
| bE<i>b</i>L | bE.bL, – –.bL, to.nE, – –.– –, or bE.– – | Enable or disable the continuity test alerts (beeping sound and/or flashing backlight). Default is enabled for both beeper and backlight (bE.bL). | page 61 and page 113 |
| ME<i>L</i>o | MELo, USEr, bEEEE, or oFF | Change or disable the power-on greeting tone (melody, user, beep, or off). Default is melody (MELo). | page 25 and page 115 |
| rESn | rES.n or rES.Y | Reset the multimeter to its factory default settings. Default is no (rES.n). | page 116 |
| 1000 | 1000 A/V, 1000 °C(°F)/V, 1000 V/V, 100 A/V, 10 A/V, 1 A/V, or 0.1 A/V | Set the scale conversion value. Default is 1000 A/V. | page 96 and page 116 |
| oFF | on or oFF | Set the multimeter to measure AC or DC mV at the rotary positions shown below. Default is off. – U1233A:  – U1232A:  – U1231A:  | page 54 and page 118 |
| oP<i>n</i>d | oPn.d or oPn.E | Enable or disable the open continuity test. Default is disabled (oPn.d). | page 61 and page 119 |
| °C | °C, °C°F, °F, or °F°C | Set the multimeter's temperature unit (Celsius, Celsius/Fahrenheit, Fahrenheit, Fahrenheit/Celsius). Default is °C (Celsius). | page 71 and page 119 |

Setup Menu Items

Changing the variation count

This setting is used with the Auto Hold-Log function (see [page 93](#)). When the variation of the measured value exceeds the value of the variation count, the Auto Hold-Log function will be ready to trigger.

Use this Setup item to change the variation count for the Auto Hold-Log function between 1 to 999 counts.

| Parameter | Range | Default setting |
|-----------|---------------------|-----------------|
| AutoHold | (001 to 999) counts | 50 counts |

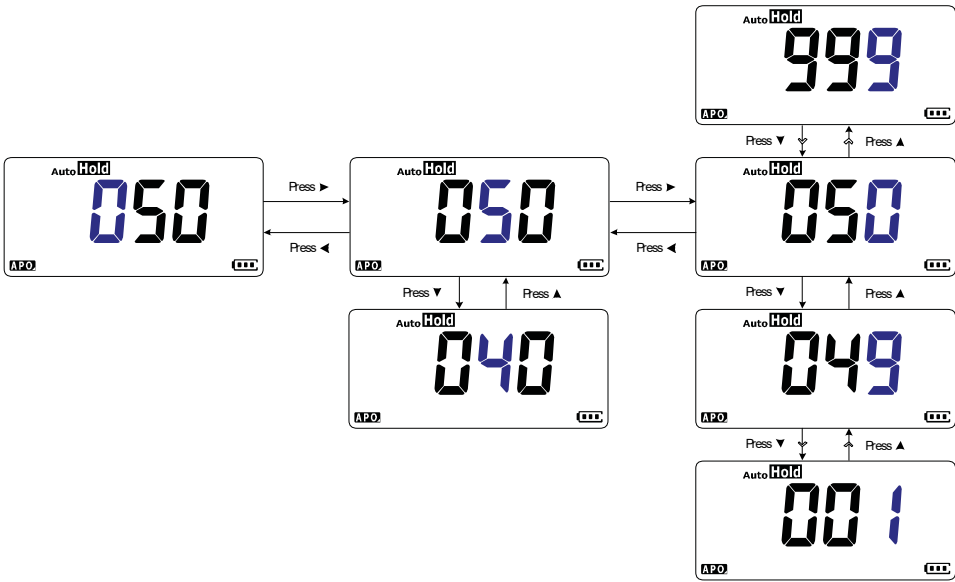


Figure 4-1 Changing the variation count


Enabling and changing the Smooth refresh rate

Smooth is used to smoothen the refresh rate of the readings in order to reduce the impact of unexpected noise and to help you achieve a stable reading.

Use this Setup item to enable or disable Smooth, and to change the refresh rate for Smooth between 1 to 999.

| Parameter | Range | Default setting |
|-----------|-----------------------|------------------|
| Smooth | (001 to 999).(d or E) | 009.d (disabled) |

NOTE

You can enable Smooth by holding  while turning on the multimeter (see [page 33](#)). This method, however, is temporary and Smooth will be turned off when the multimeter's power is cycled.

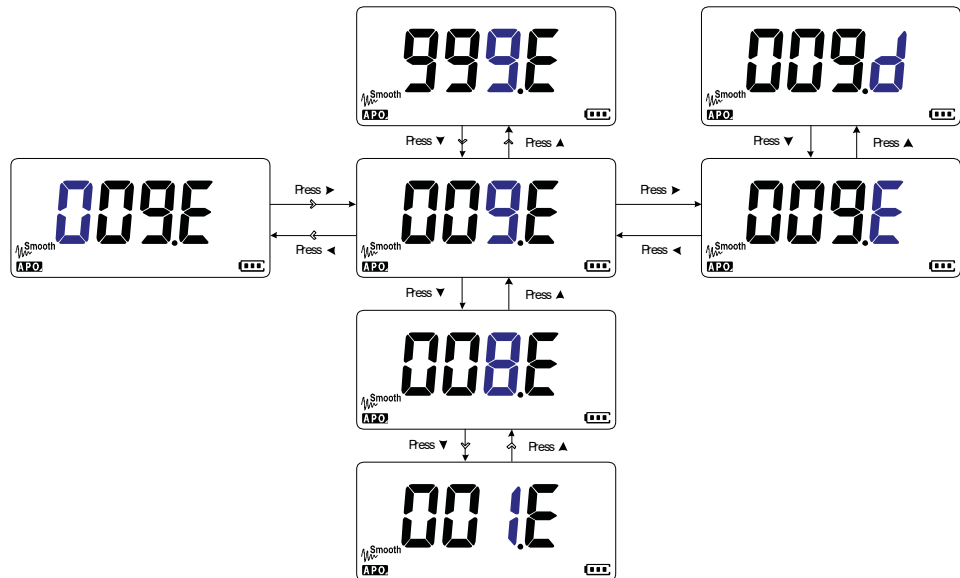


Figure 4-2 Enabling and changing the Smooth refresh rate

Enabling and changing the voltage alert level

This setting is used with the multimeter's voltage alert (see [page 30](#)). The multimeter will start beeping periodically once the measured voltage exceeds the level set, regardless of polarity.

Use this Setup item to enable or disable the voltage alert, and to change the voltage alert level between 1 to 660 V.

| Parameter | Range | Default setting |
|-----------------|-----------------------|--------------------|
| V(oltage Alert) | (1 to 660).(d or E) V | 030.d V (disabled) |

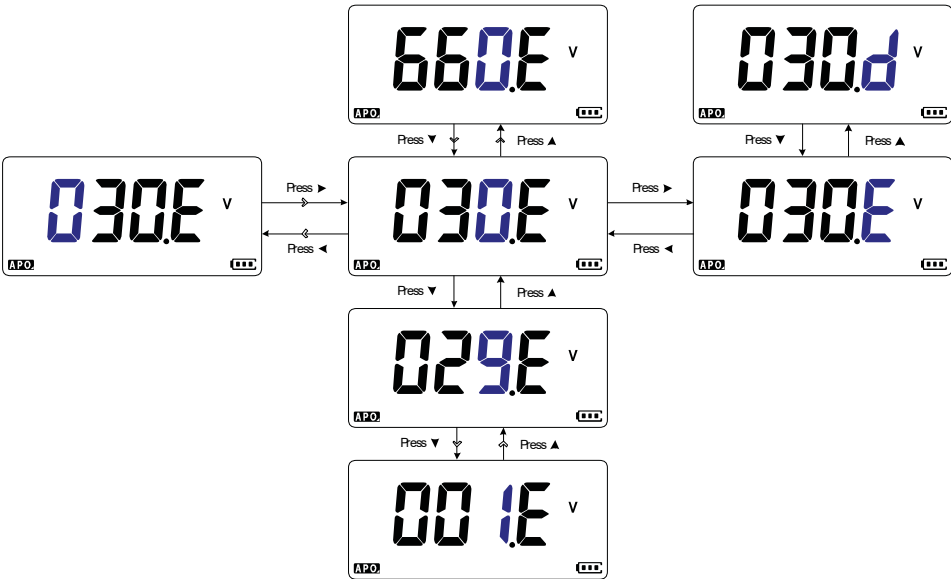


Figure 4-3 Enabling and changing the voltage alert level

Changing the beep frequency

The multimeter's beeper alerts users to the presence of newly sensed values for static recordings, sensed values that are out of tolerance or limits set, and invalid key operations.

Use this Setup item to change the driving frequency of the beeper (either 3.2, 3.4, 3.8, or 4.2 kHz), or to disable the beeper (–.–)

| Parameter | Range | Default t setting |
|-----------|---------------------------------------|-------------------|
| bF | (3.2, 3.4, 3.8, 4.2) kHz or –.– (off) | 3.8 kHz |

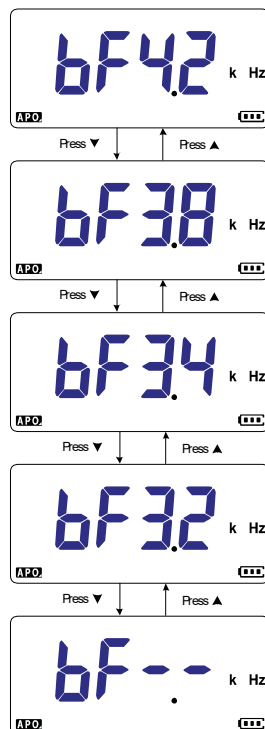


Figure 4-4 Changing the beep frequency

Changing the auto power-off (APO) timeout

The multimeter’s automatic power-off (see [page 26](#)) function uses a timer to determine when to automatically turn the multimeter off.

Use this Setup item to enable or disable the auto power-off function and to change its timeout period from 1 to 99 minutes.

| Parameter | Range | Default setting |
|-----------|-----------------------------|--------------------------|
| A(PO) | (01 to 99).(d or E) minutes | (15.E) minutes (enabled) |

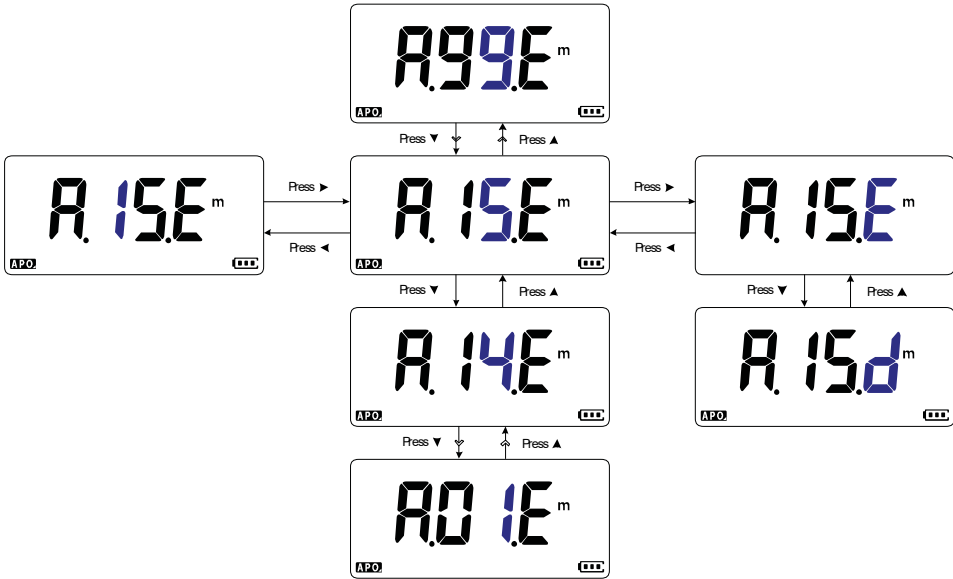


Figure 4-5 Changing the auto power-off timeout

Changing the LCD backlight timeout

The multimeter's LCD backlight (see [page 27](#)) uses a timer to determine when to turn off the LCD backlight.

Use this Setup item to adjust the LCD backlight timeout and to change its timeout period from 1 to 99 seconds.

| Parameter | Range | Default setting |
|--------------|-----------------------------|--------------------------|
| b(backlight) | (01 to 99).(d or E) seconds | (15.E) seconds (enabled) |

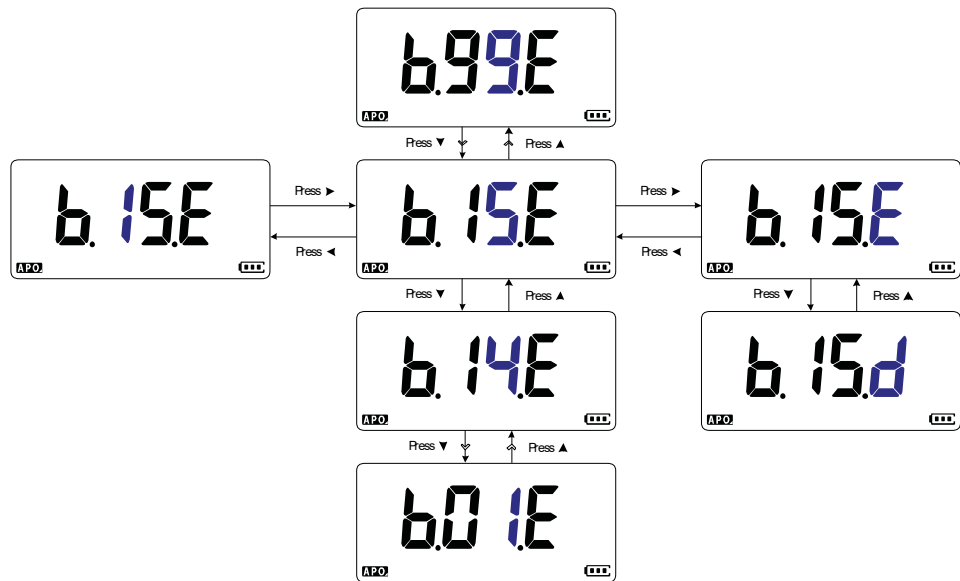


Figure 4-6 Changing the LCD backlight timeout

Adjusting the LCD backlight intensity

The multimeter's LCD backlight (see [page 27](#)) can be adjusted to seven different intensity levels.

Use this Setup item to adjust the LCD backlight's intensity level (either Lo, 02, 03, ME, 05, 06, or Hi).

| Parameter | Range | Default setting |
|-----------|-------------------------------|-----------------|
| bL | Lo, 02, 03, ME, 05, 06, or Hi | Hi |



Figure 4-7 Changing the LCD backlight intensity

Enabling the LED flashlight timeout

The multimeter's LED flashlight (see [page 27](#)) uses a timer to determine when to turn off the LED flashlight.

Use this Setup item to enable or disable the LED flashlight timeout and to change its timeout period from 1 to 99 seconds.

| Parameter | Range | Default t setting |
|--------------|-----------------------------|---------------------------|
| t(orchlight) | (01 to 99).(d or E) seconds | (15.d) seconds (disabled) |

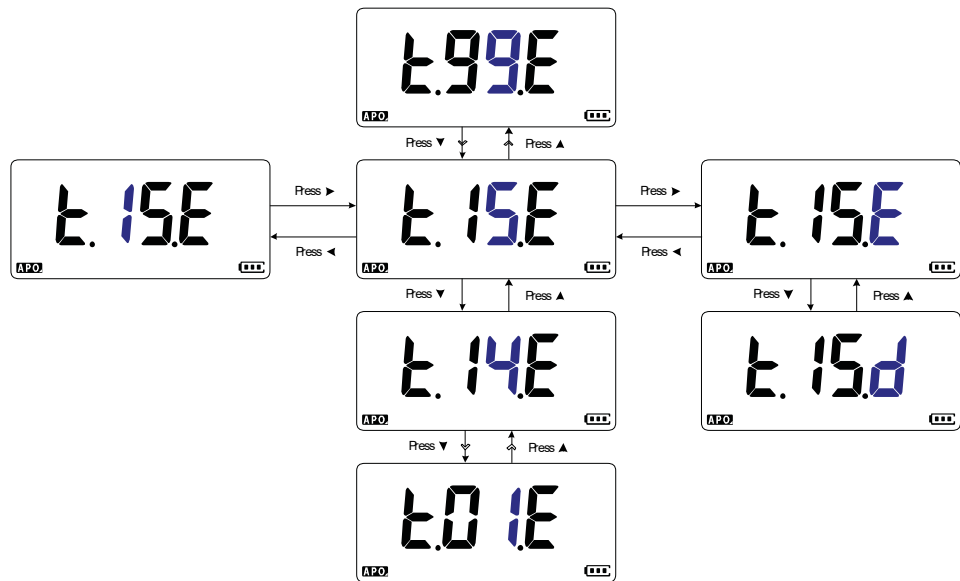


Figure 4-8 Changing the LED flashlight timeout

Adjusting the LED flashlight intensity

The multimeter's LED flashlight (see [page 27](#)) can be adjusted to seven different intensity levels.

Use this Setup item to adjust the LED flashlight's intensity level (either Lo, 02, 03, ME, 05, 06, or Hi).

| Parameter | Range | Default setting |
|-----------|-------------------------------|-----------------|
| tL | Lo, 02, 03, ME, 05, 06, or Hi | Hi |

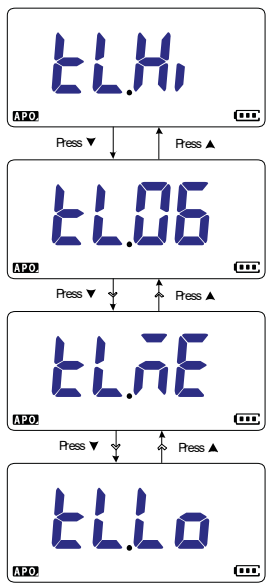


Figure 4-9 Changing the LED flashlight intensity

Changing the minimum measurable frequency

This setting is used with frequency tests (see [page 82](#)). Changing the minimum measurable frequency will influence the display update rates for frequency measurements. The typical display update rate as defined in the specification is based on a minimum measurable frequency of 0.5 Hz.

Use this Setup item to adjust the minimum measurable frequency value (either 0.5 Hz or 5.0 Hz).

| Parameter | Range | Default setting |
|-----------|------------------|-----------------|
| FrEq | 0.5 Hz or 5.0 Hz | 0.5 Hz |

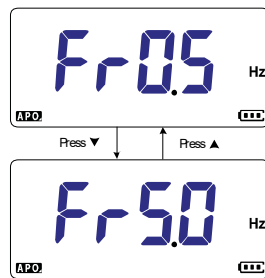


Figure 4-10 Changing the minimum measurable frequency

Changing the continuity test alerts

This setting is used with continuity tests (see [page 61](#)). You can set the beeper to sound and the backlight to flash as a continuity indication whether the circuit-under-test is less than (short) or more than or equal to (open) the threshold resistance.

Use this Setup item to change the continuity test alerts (either beeper and backlight, backlight only, tone, or beeper only), or to disable the alerts (--.--).

| Parameter | Range | Default setting |
|-----------|--------------------------------------|-----------------|
| •)) | bE.bL, --.bL, to.nE, --.--, or bE.-- | bE.bL |

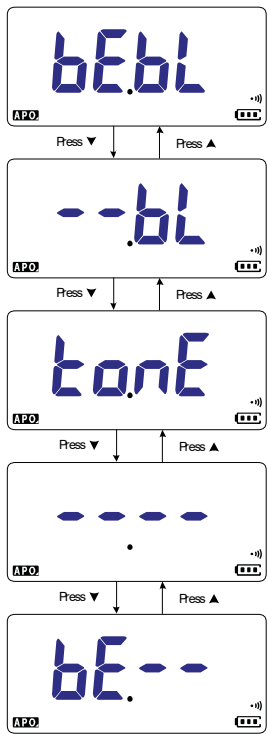


Figure 4-11 Changing the continuity test alerts

Changing the power-on greeting tone

The multimeter plays a short greeting tone each time it is powered up.

Use this Setup item to change the greeting tone (either melody, user, or beep), or to disable the greeting tone (off).

| Parameter | Range | Default t setting |
|-----------|--------------------------|-------------------|
| m(elody) | MELo, USEr, bEEE, or oFF | MELo |

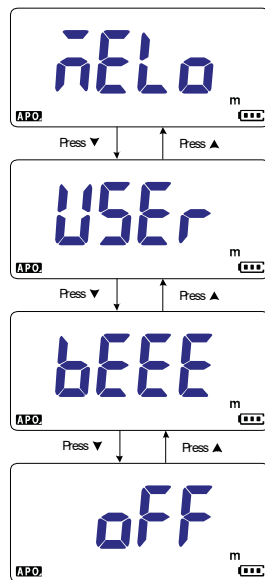



Figure 4-12 Changing the power-on greeting tone

Resetting the Setup items

The Setup items can be reset to their default values through this Setup item.

Select **rESY** and press  to perform the reset. The multimeter will beep once and return to the first Setup item.

| Parameter | Range | Default setting |
|-----------|----------------|-----------------|
| rSt | rES.n or rES.Y | rES.n |

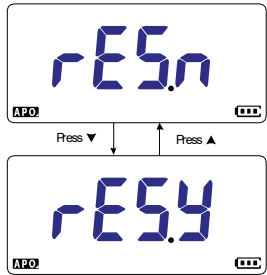


Figure 4-13 Resetting the Setup items

Changing the scale conversion value

This setting is used with the Scale function (see [page 96](#)). You can choose to set the scale conversion value from seven different selections.


Use this Setup item to change the scale conversion value (either 1000 A/V, 1000 °C(°F)/V, 1000 V/V, 100 A/V, 10 A/V, 1 A/V, or 0.1 A/V).

| Parameter | Range | Default setting |
|-----------|-----------------------------------------------------------------------|-----------------|
| Scale | 1000 A/V, 1000 °C(°F)/V, 1000 V/V, 100 A/V, 10 A/V, 1 A/V, or 0.1 A/V | 1000 A/V |

NOTE

The temperature-voltage scale conversion 1000 °C/V or 1000 °F/V is dependent on the temperature unit setup (see [page 119](#)).

- If °C or °C°F is selected, 1000 °C/V is shown during the scale conversion.
- If °F or °F°C is selected, 1000 °F/V is shown during the scale conversion.

Changing the temperature unit (via the  key) is disabled when Scale is enabled for voltage measurements.

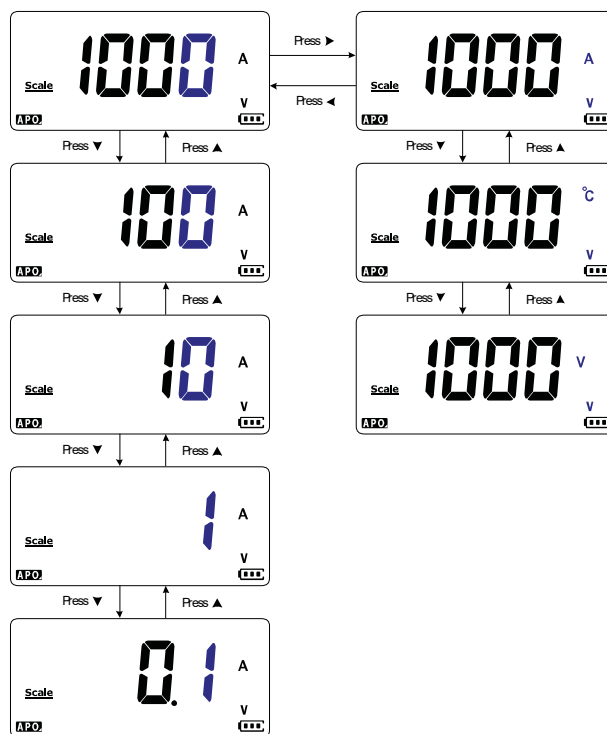


Figure 4-14 Changing the scale conversion value

Enable the AC/DC mV measurement


You can choose to set the multimeter to measure AC or DC mV at the rotary positions shown below.

- U1233A: 
- U1232A: 
- U1231A: 

Use this Setup item to enable AC/DC mV measurements. You are recommended to use the AC/DC mV measurements to precisely measure low voltages.

| Parameter | Range | Default setting |
|-----------|-----------|-----------------|
| mV | on or off | off |

NOTE

- When this Setup item is enabled, the original functions of the rotary switch positions shown above are disabled and replaced by AC/DC mV measurements.
- For AC/DC mV measurements, the measurement range is fixed at 600 mV and the input impedance is typically 10 MΩ.
- Press  to switch between DC mV, AC mV, and frequency measurements.

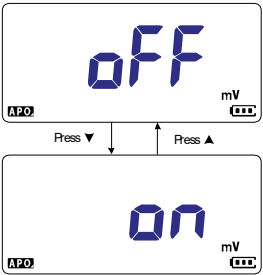


Figure 4-15 Enable the AC/DC mV measurement

Enable open continuity test by default

This setting is used with continuity tests (see [page 61](#)). Enable this option for the beeper to sound and the backlight to flash as a continuity indication when the circuit-under-test is more than or equal to (open) the threshold resistance.

Use this Setup item to enable the open continuity tests. During continuity tests, press **Esc Shift** to switch between resistance measurement, short continuity test (**⏏**), or open continuity test (**⏏**).

| Parameter | Range | Default setting |
|-----------|----------------|-----------------|
| oPn | oPn.d or oPn.E | oPn.d |

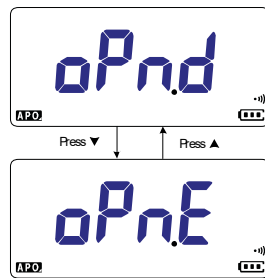



Figure 4-16 Enable open continuity test by default

Changing the temperature unit

This setting is used with temperature measurements (see [page 71](#)). Four combinations of displayed temperature unit(s) are available:

- Celsius only: Temperature measured in °C.
- Celsius/Fahrenheit: During temperature measurements, press **Range Auto** to switch between °C and °F.
- Fahrenheit only: Temperature measured in °F.
- Fahrenheit/Celsius: During temperature measurements, press **Range Auto** to switch between °F and °C.

Use this Setup item to change the default temperature unit for temperature measurements.

Press and hold  for more than 1 second to enter this Setup item.

| Parameter | Range | Default setting |
|-----------|-----------------------|-----------------|
| °C | °C, °C°F, °F, or °F°C | °C |

CAUTION Always set the temperature unit display per the official requirements and in compliance with the national laws of your region.

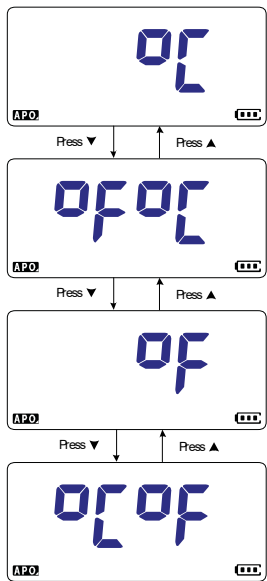


Figure 4-17 Changing the temperature unit

5 Characteristics and Specifications

For the characteristics and specifications of the U1231A, U1232A, and U1233A Handheld Digital Multimeter, refer to the datasheet at <http://literature.cdn.keysight.com/litweb/pdf/5990-7550EN.pdf>.

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

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