

Thank you for purchasing your 42-Range Digital Multimeter from **RadioShack**. Please read this user's guide before installing, setting up, and using your new multimeter.

### 1 Install the battery

Before installing battery, make sure the function switch is set to **OFF** and test leads are disconnected.

1. Remove the screw on the back to open the battery compartment cover. Install one 9V battery (not included).
2. Replace the cover and secure it with the screw.



### 2 Connect the test leads

1. Remove the rubber caps from the test leads.
2. Plug the black lead into the **-COM** jack and the red lead into the **+V.Ω.mA** jack.

To measure current greater than 400mA, plug the red test lead into **+10A MAX**.

**Note:** The buzzer sounds after connecting to the **+10A MAX** jack to measure anything except current. This reminds you not to touch the test leads to the circuit.



### 3 Set the function switch

**V $\overline{\sim}$**  — Measures AC and DC voltages.

**$\mu$ A/A $\overline{\sim}$ , mA/A $\overline{\sim}$**  — Measures AC and DC amperage.

**$\Omega$ /Hz** — Measures resistance and capacitance.

**$\overline{\sim}$ /|>** — Checks continuity and diodes.

**Hz/Duty** — Measures frequency and duty cycle.

**EF** — Checks electric fields.

**OFF** — Turns off the meter.

### 4 Use the buttons

**SELECT** — Toggles among functions.

**RANGE** — Selects manual mode and ranges.

**RELA** — Takes relative measurements.

**HOLD** — Tests display and holds a reading.

### Whats Included

42-Range Digital Multimeter  
Test Leads (2)  
Spare Fuse (in the case)  
User's Guide

### WARNINGS:

- To avoid electric shock, disconnect both test leads from the circuit under test before you replace the battery and fuse.
- Do not operate the meter until the battery is properly installed and the back cover and battery compartment cover are in place and secured.
- The supplied test leads are rated 1000V. Use only test leads of the same rating, but do not use the meter to measure voltages greater than 600V DC or AC.

### Care and Service

- Keep your meter dry and clean. If it gets wet or dirty, wipe it dry or clean immediately with a cloth lightly dampened with water. Do not use harsh chemicals, cleaning solvents, or strong detergents to clean the meter.
- Use and store the meter in normal temperature environments only. Handle your meter carefully. Do not drop it.
- Modifying or tampering the meter's internal components can cause malfunction and might invalidate its warranty. If your meter is not performing as it should, take it to your local RadioShack store for assistance.

### Battery Notes:

- When  $\overline{\sim}$  displays or the meter stops operating properly, replace the battery.
- Use only a fresh battery of the required size and type. Dispose

of old batteries promptly and properly. Do not burn or bury them.

- If you do not plan to use your meter for a month or more, remove the battery. Batteries can leak chemicals that may damage electronic parts.

### Range Display

Ranges are indicated as below on the display:

Position	Range	Display	Position	Range	Display
<b>V<math>\overline{\sim}</math></b>	400mV	000.0mV	<b><math>\Omega</math>/Hz</b>	400 $\Omega$	000.0 $\Omega$
	4V	0.000V		4K $\Omega$	0.000K $\Omega$
	40V	00.00V		40K $\Omega$	00.00K $\Omega$
	400V	000.0V		400K $\Omega$	000.0K $\Omega$
	600V	000V		4M $\Omega$	0.000M $\Omega$
<b><math>\mu</math>A/A<math>\overline{\sim}</math></b>	400 $\mu$ A	000.0 $\mu$ A	<b>Hz/Duty</b>	40M $\Omega$	00.00M $\Omega$
	4mA	0.000mA		4nF	0.000nF
	4A	0.000A		40nF	00.00nF
<b>mA/A<math>\overline{\sim}</math></b>	10A	00.00A		400nF	000.0nF
	40mA	00.00mA		4 $\mu$ F	0.000 $\mu$ F
	400mA	000.0mA		40 $\mu$ F	00.00 $\mu$ F
	4A	0.000A			
	10A	00.00A			

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## Using Measurement Settings

### Selecting Ranges

1. Set the function switch to a position.
2. Press **SELECT** to choose a function (such as continuity  $\text{diode}$ ) or diode  $\text{check}$  function under  $\text{diode}$ . The meter is in auto mode. The word **AUTO** displays, and the meter automatically selects a range according to the rating of the circuit under test. You can press **RANGE** to enter manual mode. **AUTO** disappears.
3. In manual mode, press **RANGE** to select a range. The measuring unit and decimal point position together denote a range.

Refer to the Range Display table on page 1 for range indications on the display.

To return to auto mode, press and hold **RANGE** for 2 seconds.

### Using Zero Offset

This applies to the  $V_{\text{AC}}$ ,  $\mu A/A_{\text{AC}}$ ,  $mA/A_{\text{AC}}$ ,  $\Omega/H$ , and  $Hz$  functions.

The meter shows zero offset for some ranges, especially the 4nF range of the capacitance ( $H$ ) function. You can use **RELA** to remove zero offset.

To take measurements without zero offset:

1. Remove the test leads from any circuit for the capacitance function, or touch them together for other functions.
2. When you see a small value (zero offset), press **RELA**. The meter is in manual mode.
3. Take measurements with **RELA** displayed. You get exact measured values.

### Using Relative Measurements

You can take measurements relative to a reference value. This applies to the  $V_{\text{AC}}$ ,  $\mu A/A_{\text{AC}}$ ,  $mA/A_{\text{AC}}$ ,  $\Omega/H$ , and  $Hz$  functions. Take resistance measurement as an example.

1. Set the function switch to  $\Omega/H$  to measure a resistor whose value you want to use as the reference value.
2. When you see the resistance reading, press **RELA**.
3. Measure another resistor with **RELA** displayed. You get the tolerance of this resistor from the reference value.

To exit the relative measurement function, press **RELA** again.

### Testing the Display

Press and hold the **HOLD** button when you turn on the meter. The meter turns on and all segments on the display appear. Release **HOLD** to finish testing.

### Holding a Reading

When you see a reading you want to keep on the display, press **HOLD**. The reading stays until you press a button or set the function switch to another position.

### Operating the Meter

Always set the function switch to **OFF** when you are not using the meter. Your meter automatically turns off after 30 minutes when left unattended.

To deactivate auto power-off, press and hold both **HOLD** and **SELECT** and turn on the meter.  $PL_{AC}$  displays until you release **HOLD** and **SELECT**. Then the meter does not turn off automatically. To activate auto power-off, turn off the meter and turn on again.

Accurate reading condition:  
temperature: 65°F to 83°F (18°C to 28°C); relative humidity: <75%.

#### WARNINGS:

- Do not connect the test leads to a voltage source while the function switch is set to anything other than  $V_{\text{AC}}$ . Doing so could damage the meter.
- If 0.F displays, it indicates the measured value exceeds the range rating. This is normal when you measure resistance or a diode or when you keep the test leads disconnected. If you are measuring voltage or current when 0.F displays, disconnect the test leads from the circuit immediately.

### Measuring DC/AC Voltage

Do NOT try to measure voltages greater than 600V DC or AC.

1. Set the function switch to  $V_{\text{AC}}$ .
2. Press **SELECT** to choose AC voltage ( $\sim$  appears before readings) or DC voltage.
3. Connect the test leads to the circuit under test. For DC voltage, red = higher potential point, black = lower potential point; otherwise you get a negative value ( $-$  appears before readings).
4. Power on the circuit and read the DC or AC voltage.

**WARNING:** Never clamp a test lead to a hot wire (usually red, black, or blue in AC wiring circuits). If one lead is clamped to a hot wire and you touch the meter's other lead, you could receive an electric shock.

**Caution:** When measuring high-voltage circuits, do not position both test leads at once. Connect the black test lead first to the circuit's neutral or ground lead. Then, using one hand only, probe for voltages with the other test lead. This helps prevent you from accidentally touching a hot wire.

### Measuring AC Voltage Riding on a DC Source Bias

**WARNING:** To avoid injury to yourself or damage to your meter, never try to measure an AC voltage that is riding on a DC source bias where the peak AC voltage exceeds 100V with respect to earth ground.

1. Set the function switch to  $V_{\text{AC}}$ . The meter is ready for measuring DC voltage.
2. Measure the DC voltage of the circuit under test to ensure that the value does not exceed 100V.
3. Press **SELECT** to choose the AC voltage function ( $\sim$  appears before readings).
4. Power off the circuit.
5. Connect the black test lead to the neutral or ground end of the circuit.
6. Connect a 0.1 microfarad/100V mylar capacitor in series with the positive terminal of the circuit and the red test lead.
7. Power on the circuit and read the AC voltage.
8. Power off the circuit and remove the mylar capacitor.

### Measuring DC/AC Current

The current measurement is limited to 10A. If you are unsure of the amperage of the circuit under test, always plug the red test lead to the **+10A MAX** jack.

1. Set the function switch to  $\mu A/A_{\text{AC}}$  or  $mA/A_{\text{AC}}$ .
2. Press **SELECT** to choose the AC current ( $\sim$  appears before readings) or DC current function.
3. Power off the circuit and discharge all capacitors.
4. Break the electrical path of the circuit. Connect the test leads to the electrical path. The connection must be in series with the circuit. For DC current, red = higher potential point, black = lower potential point; otherwise you get a negative value.
5. Power on the circuit and read the current.

**Note:** The  $+V_{\text{AC}}$  mA jack is fuse-protected for current measurement. If there is no reading for the 400 $\mu A$ , 4mA, 40mA, and 400mA ranges, check the fuse.

### Measuring Resistance

1. Set the function switch to  $\Omega/H$ .
2. Press **SELECT** to choose the resistance function ( $\Omega$ ,  $K\Omega$ , or  $M\Omega$  appears after readings).
3. Power off the circuit under test and discharge all capacitors.
4. Connect the test leads across the circuit. Or remove one of the component's leads from its circuit and touch the test leads across the component.
5. Read the measurement.

**Note:** The meter has an internal resistance of small value (zero offset). To get accurate measurements, you can simply touch the test leads together to measure the internal resistance, and then subtract the internal resistance from a measurement. Also refer to "Using Zero Offset" on page 2.

### Measuring Capacitance

1. Set the function switch to  $\Omega/H$ .
2. Press **SELECT** to choose the capacitance function ( $nF$  or  $\mu F$  appears after readings).
3. Power off the circuit under test and discharge all capacitors.
4. Connect the test leads to the capacitor, matching the polarities of the capacitor; or remove one of the leads of the capacitor from its circuit and touch the test leads across the capacitor.
5. Read the measurement.

#### Notes:

- Electrolytic capacitors have polarities. Be sure the test leads match the polarities of such capacitors.
- The voltages applied across electrolytic capacitors affect the measured values. That is, a measurement taken with a low voltage is lower than that taken with a voltage that approaches the capacitor's voltage rating. This meter cannot use high voltage to set the electrolyte; it cannot measure the absolute capacitance value.
- Measurements of low-value capacitors might match or be close to the actual input capacitance of the meter. To measure such capacitors, use the relative measurement function (see Using Relative Measurements on page 2).
- The accuracy of capacitance measurement depends on the measurement method and type of a capacitor. The meter gives reference measurements only.

### Checking Continuity

You can check for open or shorted electric circuits.

1. Set the function switch to  $\rightarrow/\leftarrow$ .
2. Repeatedly press **SELECT** to choose the continuity function ( $\rightarrow/\leftarrow$  appears).
3. Power off the circuit under test and discharge all capacitors.
4. Connect the test leads across the circuit.
  - *Shrt* appears and the buzzer sounds if the circuit resistance is less than  $50\Omega$ , meaning the circuit is continuous or shorted.
  - *opEn* appears if the circuit resistance is greater than  $50\Omega$ , meaning the circuit is not continuous.

### Checking Diodes

You can check diodes, transistors, and other semiconductors for opens, shorts, and normal operation, and determine the forward voltage and polarity for diodes. You can also check LEDs.

1. Set the function switch to  $\rightarrow/\leftarrow$ .
2. Press **SELECT** to choose the diode function ( $\rightarrow/\leftarrow$  appears).
3. Power off the circuit under test and discharge all capacitors.
4. Connect the test leads across the device, or remove one of the component's leads from its circuit and touch the test leads across the component. Observe the first reading.
5. Reverse the test leads and observe the second reading.
  - If one reading shows a value and the other shows 0.F, then the device is good. As the meter shows a value reading, the anode (+) side is where the red test lead is connected.
  - If 0.F displays for both readings, then the device is open.
  - If both readings show small values or zero, then the device is shorted.

#### Notes:

- The values that display during the diode check show the actual forward voltage (Max. 2.0V). If the voltage exceeds 2.0V, then 0.F appears, meaning this meter cannot check the diode.
- When you check a silicon-type semiconductor, the values might vary according to the temperature.

### Measuring Frequency/Duty Cycle

You can measure frequencies from 10Hz to 4MHz and a duty cycle with signal frequencies from 10Hz to 100KHz. The amplitude of a signal is under the peak value of 10V.

1. Set the function switch to Hz/Duty.
2. Press **SELECT** to choose the frequency function (Hz, KHz, or MHz displays) or the duty cycle function (% displays).
3. Connect the black test lead to a ground reference for the signal, and the red test lead to the signal source.
4. Read the measurement.

### Measuring an Electric Field

You can detect the presence of AC voltage near AC power cords, wall switches, or cabling behind a wall. This lets you easily detect a break in an electric circuit or locate the source of an electric field.

1. Set the function switch to EF.
2. Remove the test leads from the meter.
3. Hold the meter and point its top (where the built-in antenna is) to the object under test. For best sensitivity, hold the meter behind the function switch.

If the meter detects an electric field, 1 to 5 bars display (corresponding to strength of the field) and the buzzer sounds.

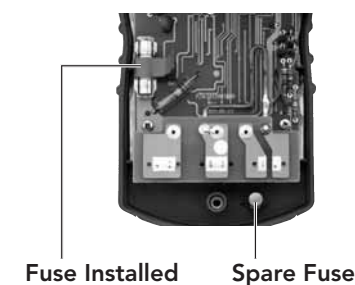
### Replacing the Fuse

If the meter stops working, you might need to replace the fuse. Use the spare fuse or a 500mA, 250V, 5 × 20mm fast-acting ceramic fuse.

To replace the fuse:

**WARNING:** Before replacing the fuse, make sure both test leads are disconnected from the circuit under test.






1. Set the function switch to **OFF** and disconnect the test leads.
2. Remove the top and bottom screws on the back to open the case.
3. Remove the blown fuse and wrap the red ribbon around the new fuse. Replace the fuse.
4. Replace the back cover and secure it with the screws.



## Safety Precautions

- Do not use the meter if you are unfamiliar with electric circuits and testing procedures.
- This meter is for measuring household AC voltages. Do NOT try to measure 3-phase, line-to-line voltages. Use extreme caution when measuring current and voltage in commercial electrical panels; always wear protective leather gloves, a face shield, and fireproof arm and upper body protection.
- To reduce the risk of fire or shock hazard, do not expose the meter to rain or moisture. It is for indoor use only.
- Use extreme caution when working with voltages above 30V. Always power off the circuit under test before you connect the test leads to high-voltage points.
- Never apply voltages to the meter that exceed the limits given in the specifications. Never apply more than 600V DC and AC between the input jacks and ground.
- Never try to probe with both test leads at the same time or hold both test leads in one hand.
- Always discharge any capacitors of the circuit under test before you attach the test leads.
- Because many AC/DC sets have a potentially hot chassis, be sure the top of your workbench and the floor underneath it are made of non-conductive materials.
- Use the meter as instructed here, or the protection it provides may be impaired. To avoid damage, have the meter repaired by qualified service personnel only.

## Special Panel Markings

<b>500V MAX</b> 	To avoid electric shock and damage to the meter, do not connect the common input terminal (the -COM jack) to any source that exceeds 500V with respect to ground.
<b>600V</b>  <b>400mA MAX</b>	The maximum input limit for voltage measurement is 600V AC or DC, and the maximum input limit for current measurement is 400mA DC or AC at the +V.Ω.mA jack.
	<b>Caution:</b> RISK OF ELECTRIC SHOCK! Refer to the complete operating instructions.
	<b>Caution:</b> Be extremely careful when taking high-voltage measurements. DO NOT TOUCH TERMINALS OR TEST LEAD ENDS.
<b>CAT II</b>	This equipment is rated for installation category II (3600 VA max.).
<b>+10A MAX UNFUSED</b>	The maximum input limit for current measurement using this jack is 10A DC or AC. This jack is not fuse-protected.
	The meter is protected by double insulation.

**Note:** The UL mark does not indicate that this product has been evaluated by Underwriters Laboratories for the accuracy of its readings.

## Specifications

Power Supply.....	One 9V battery (not included)
Low Battery Indication.....	6.3V ± 0.3V
Maximum Common Mode Voltage.....	500V DC or RMS AC
Input Impedance.....	10MΩ (DCV/ACV)
Diode Check.....	Open circuit voltage: <2.8V DC Test current: 1mA (typical)
Continuity Beeper.....	Continuity (short): ≤50 ± 30Ω Open: >50 ± 30Ω Open circuit voltage: <2.8V Short circuit current: <2.0mA
Operating Temperature.....	41 to 104°F (5 to 40°C)
Storage Temperature.....	-4 to 140°F (-20 to 60°C)
Relative Humidity.....	80% (Max.) for temperatures up to 87.8°F (31°C), decreasing linearity to 50% at 104°F (40°C)
Pollution Degree.....	2
Dimensions (HWD).....	6¼ × 3¼ × 1½ inch (160 × 80 × 39mm)
Weight (with battery and test leads).....	10.5 oz (298 g)

### Accuracy

DC Voltage.....	(400mV) ±0.5% of reading, ±4 in last digit (4V – 40V, 400V) ±0.8% of reading, ±3 in last digit (600V) ±1.0% of reading, ±4 in last digit
AC Voltage (Max. measurement: 600V at 50/60Hz, average response, RMS calibrated, DC coupled).....	(400mV) ±0.8% of reading, ±4 in last digit (4V) ±0.5% of reading, ±3 in last digit (40V – 400V) ±1.0% of reading, ±3 in last digit (600V) ±1.2% of reading, ±4 in last digit
DC Current.....	(400µA) ±0.8% of reading, ±5 in last digit (4mA) ±0.8% of reading, ±3 in last digit (40mA, 4A) ±1.0% of reading, ±5 in last digit (400mA) ±1.0% of reading, ±3 in last digit (10A) ±1.2% of reading, ±5 in last digit
AC Current (average response, RMS calibrated, 10A Max. DC coupled).....	(400µA) ±1.0% of reading, ±5 in last digit (4mA) ±1.0% of reading, ±3 in last digit (40mA, 4A) ±1.2% of reading, ±5 in last digit (400mA) ±1.2% of reading, ±3 in last digit (10A) ±1.5% of reading, ±5 in last digit
Resistance.....	(400Ω) ±0.8% of reading, ±5 in last digit (4KΩ – 40KΩ – 400KΩ) ±0.8% of reading, ±3 in last digit (4.0MΩ) ±1.0% of reading, ±3 in last digit (40MΩ) ±2.0% of reading, ±5 in last digit
Capacitance.....	(4nF) ±4.0% of reading, ±40 in last digits (40nF) ±4.0% of reading, ±10 in last digits (400nF – 40µF – 400µF) ±3.0% of reading, ±4 in last digit
Frequency.....	(400Hz – 4KHz – 40KHz – 400KHz – 4 MHz) ±0.1% of reading, ±4 in last digit
Duty Cycle.....	10% – 90% (square wave at +5V/-0V) ±2 digits/KHz, ±2 in last digit
Frequency Sensitivity.....	400Hz – 4KHz – 40KHz..... 50 mVrms 400KHz..... 100 mVrms 4MHz..... 350 mVrms

### Notes:

- For film capacitors or better, accuracy is specified from 9.5% of full scale to full scale, except for the 4.0nF range (its accuracy is from 0.5nF to full scale).
- Duty cycle accuracy depends on the input signal frequency.

Specifications are subject to change and improvement without notice. Actual product may vary from the images found in this document.

## Limited Warranty

**RadioShack** warrants this product against defects in materials and workmanship under normal use by the original purchaser for **ninety (90) days** after the date of purchase from a **RadioShack** owned store or an authorized **RadioShack** franchisee or dealer. **RadioShack** MAKES NO OTHER EXPRESS WARRANTIES.

This warranty does not cover: (a) damage or failure caused by or attributable to abuse, misuse, failure to follow instructions, improper installation or maintenance, alteration, accident, Acts of God (such as floods or lightning), or excess voltage or current; (b) improper or incorrectly performed repairs by persons who are not a **RadioShack** Authorized Service Facility; (c) consumables such as fuses or batteries; (d) ordinary wear and tear or cosmetic damage; (e) transportation, shipping or insurance costs; (f) costs of product removal, installation, set-up service, adjustment or reinstallation; and (g) claims by persons other than the original purchaser.

Should a problem occur that is covered by this warranty, take the product and the **RadioShack** sales receipt as proof of purchase date to any **RadioShack** store in the U.S. **RadioShack** will, at its option, unless otherwise provided by law: (a) repair the product without charge for parts and labor; (b) replace the product with the same or a comparable product; or (c) refund the purchase price. All replaced parts and products, and products on which a refund is made, become the property of **RadioShack**. New or reconditioned parts and products may be used in the performance of warranty service. Repaired or replaced parts and products are warranted for the remainder of the original warranty period. You will be charged for repair or replacement of the product made after the expiration of the warranty period.

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