

# MICRONTA<sup>®</sup>

## 50,000 OHMS/VOLT MULTITESTER

### with Range Doubler

## INSTRUCTION MANUAL



**CAT. NO. 22-204C**

CUSTOM MANUFACTURED FOR  
RADIO SHACK, A DIVISION OF TANDY CORPORATION

This high-sensitivity MICRONTA Multitester is designed to measure AC and DC voltages, DC current and resistance with accuracy and ease. The large, single-knob range/function control is easy to use and read. The range doubler switch (V-A/2 – V-Ω-A) effectively doubles the number of AC and DC scales available. This means you can obtain meter readings in the upper half of the scale, resulting in consistent accuracy. An off position is provided to ensure meter protection during transit.

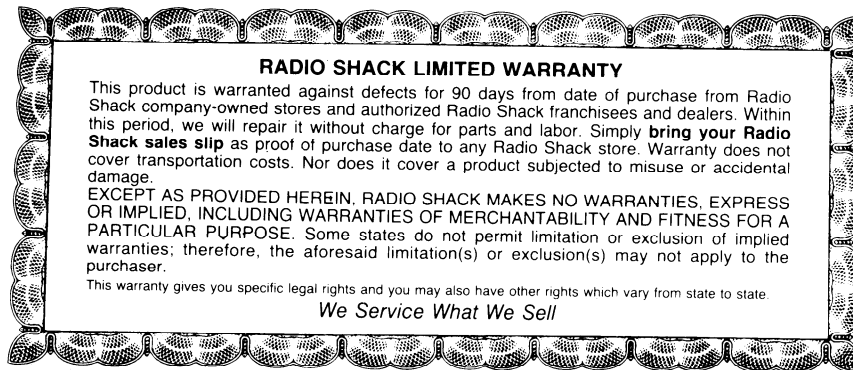
The meter circuit incorporates a fuse to protect the delicate meter movement and other internal parts in case of short-term inadvertent overload or improper function selection.

**Caution:** Permanent damage can occur to your Multitester from exceeding the specified limits and attempting to make measurements with the selector in wrong position.

The sensitive  $18\mu\text{A}$  meter movement with 4-1/4" (10.8 cm) face and mirrored scale makes accurate reading a simple matter. The meter scales are in three colors for rapid identification. The lowest DC ranges – 125mV and  $25\mu\text{A}$  – are great for solid-state circuit work. The handle can be flipped around to the back to support the meter at an easy-to-read angle.

These features combined with rugged design and quality parts ensure you of many years of accurate measurements.

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## SPECIFICATIONS

<b>Ranges</b>	43
<b>DC Voltage</b>	0-125-250mV – 1.25-2.5-5-10-25-50-125-250-500-1000 volts
<b>AC Voltage</b>	0-5-10-25-50-125-250-500-1000 volts
<b>DC Current</b>	0-25-50 $\mu$ A-2.5-5-25-50-250-500mA-5-10 amperes
<b>Resistance</b>	0-2K-20K-200K-2 Meg.-20Meg ohms (center scale 10)
<b>Decibels</b>	–20 to + 62 in dB 8 ranges
<b>Accuracy</b>	$\pm$ 3% DC except as noted $\pm$ 4% AC, and 125mV to 2.5 volts, and 500 to 1000 volts DC $\pm$ 3% of scale length on resistance
<b>Sensitivity</b>	DC: 50,000 ohms/volt (V-A/2) or 25,000 ohms/volt (V- $\Omega$ -A) AC: 10,000 ohms/volt (V-A/2) or 5,000 ohms/volt (V- $\Omega$ -A)
<b>Meter Movement</b>	4-1/4" (10.8 cm), 3-color, mirrored scale, 18 $\mu$ A full scale
<b>Batteries</b>	Requires one type AA penlight cell and one 9-volt rectangular type for Ohms function
<b>Leads</b>	44" (110 cm) banana plug style (Cat. No. 278-704)
<b>Fuse</b>	0.75A 250V

## CAUTION

ALTHOUGH THESE PROBES ARE RATED FOR UP TO 1200V MAX., SOME MULTIMETERS HAVE LOWER MAXIMUM RATINGS. YOU SHOULD NOT ATTEMPT TO MEASURE ANY VOLTAGE BEYOND THE METERS RATING. (PLEASE REFER TO EACH METERS OWNERS MANUAL AND MAXIMUM VOLTAGE CAUTION OF THE FRONT PANEL OF EACH METER).

## USING YOUR MULTITESTER

You'll need one 9-volt battery for the 20 Megohm range, one AA penlight cell for other resistance ranges. We recommend our 23-583/553 for 9V, 23-582/552 for AA. Remove the back cover and install batteries in the correct compartment. Observe proper polarity. Replace the back cover. If you can't adjust the pointer to "0" on the OHMS scale, replace the battery with a new one.

**Remember:** Never leave weak or dead batteries in your unit. Even "leak-proof" ones may leak damaging chemicals. Also, if you are not going to use your unit for a week or more, remove the batteries.

For most accurate readings, keep the meter lying flat on a non-metallic surface. Also, use a range and range doubler switch setting that results in a reading in the upper 1/3rd of the meter scale.

To read the scale, look at it from the point where the pointer and its reflection on the mirror come together; otherwise, the parallax will cause an error in the reading.

If the pointer does not normally rest exactly over "0" at the left side of the scale, adjust the plastic screw in the lower center of the meter face to bring the needle to "0."

Always observe correct test lead polarity when making DC measurements: black into the  $\ominus$  COM and red into the  $\oplus$  V- $\Omega$ -A (or  $\oplus$  DC 1000V or  $\oplus$  DC 10A) jacks.

The maximum input limit for voltage and current measurement between  $\oplus$  V- $\Omega$ -A and  $\ominus$  COM is 1000V AC, 250V DC and 500mA DC.

Exercise extreme caution when measuring voltages of 150 and above.

When not in use, always leave the range switch in the OFF position.

### **Use the range doubler switch as follows:**

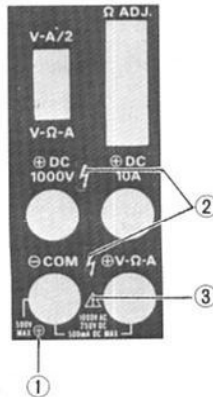
For resistance readings, always use the V- $\Omega$ -A position.

When using the V-A/2 position for all other functions, divide the range switch setting by 2 and read on an appropriate scale. For example: range set to 250 AC V and V-A/2 — the range is 125 volts (250 divided by 2) and you should read the red scale, following the 0 to 125 markings. Another example: lead in  $\ominus$  COM and  $\oplus$  DC 10A with range set to 10A and V-A/2 — the range is 5 amperes (10 divided by 2) and you should read the black scale, following the 0 to 50 markings.

## TEST LEADS

Use only the same type of test leads as are supplied with your unit. These test leads are rated for 1200 volts; replacements are available from your local Radio Shack store. (Cat. No. 278-704)

## EXPLANATION OF SPECIAL PANEL MARKINGS



Special markings have been added to the panel to remind you of safety.

- ⊖1. To avoid electrical shock and/or instrument damage, do not connect the common input terminal (– jack) to any source of more than 500 volts with respect to earth/ground.
- ⚡2. Be extra careful when making measurements for high voltage; do not touch terminals or probe ends.
- ⚠3. Refer to the following complete operating instructions.

## DC VOLTAGE MEASUREMENTS

**WARNING ⚡ : USE EXTREME CARE WHEN MAKING MEASUREMENTS FOR HIGH VOLTAGE; DO NOT TOUCH TERMINAL OR PROBE ENDS.**

1. Plug the test leads into the correct jacks (black into ⊖ COM and red into ⊕ V-Ω-A).
2. Set the range switch to one of the DC V positions; it is best to start at the top and work down.

If you're uncertain about the level of voltage, start with 1000 volt range as stated on step 5. Then set the range doubler switch to V-A/2 position (now 500V range), etc.

3. Connect the test probe tips to the circuit under test; be sure to observe correct polarity. Set the range and the range doubler switches as required to obtain a meter reading in the upper 1/2 or 1/3rd of the scale.
4. Read the voltage on the black DC scales. If the range doubler switch is in the V-A/2 position, be sure to divide the range switch setting by 2 and read on the appropriate scale.
5. For voltages between 250 and 1000, set the range switch to 250 & 1000 and plug the red test lead into the 1000 Volt DC only jack. For voltages between 250 and 500, set the range doubler switch to V-A/2. (The range is then 500 volts.) For voltages between 500 and 1000, set the range doubler switch to V- $\Omega$ -A. (The range is then 1000 volts.)

**Note:** The 1000 Volt DC only jack is for use only with DC voltages of 250 to 1000.

USE EXTREME CARE WHEN USING THESE HIGH-VOLTAGE RANGES.

## AC VOLTAGE MEASUREMENTS

**WARNING ⚡ : USE EXTREME CARE WHEN MAKING MEASUREMENTS FOR HIGH VOLTAGE; DO NOT TOUCH TERMINAL OR PROBE ENDS.**

1. Plug the test leads into the correct jacks (black into  $\ominus$  COM and red into  $\oplus$  V- $\Omega$ -A).
2. Set the range switch to one of the ACV positions; it is best to start at the top and work down.
3. Connect the test probe tips to the circuit under test. Set the range and the range doubler switches as required to obtain a meter reading in the upper 1/2 or 1/3rd of the scale.
4. Read the voltage on the red AC scale, following black numbers printed below the red scale. If the range doubler switch is in the V-A/2 position, be sure to divide the range switch setting by 2 and read the appropriate scale.

## RESISTANCE MEASUREMENTS

**WARNING: DO NOT APPLY VOLTAGE TO MEASURING TERMINAL WHILE RANGE SWITCH IS IN OHM POSITION.**

BEFORE TAKING ANY RESISTANCE MEASUREMENTS, DISCONNECT POWER TO THE UNIT UNDER TEST AND DISCHARGE THE CAPACITORS. It is best to remove batteries and unplug line cords.

1. Plug the test leads into the  $\ominus$  COM and  $\oplus$  V- $\Omega$ -A jacks.
2. Leave the range doubler switch in the V- $\Omega$ -A position. Set the range switch to one of the  $\Omega$  positions; touch the test probe tips together and adjust the OHM ADJ. control to bring the pointer to "0" on the top (green) OHMS scale.
3. Now, connect the probe tips across the circuit or part under test.
4. Read the resistance on the green OHMS scale; use the proper multiplier to obtain the correct value (R "times" 1, 10, 100, 1000, or 10,000 depending on the position of the range switch).

**Notes:** When you are unable to adjust the pointer to "0" on the OHMS scale in the R x 1, R x 10, R x 100 or R x 1K positions, the penlight battery must be replaced. When you are unable to adjust the pointer to "0" on the OHMS scale when in the R x 10K position, replace the 9-volt battery. When measuring resistance, it is best to disconnect one side of the part under test (so the remainder of the circuit will not interfere with the readings).

THE RANGE DOUBLER SWITCH MUST BE LEFT IN THE V- $\Omega$ -A POSITION FOR ALL RESISTANCE MEASUREMENTS.

## DC CURRENT MEASUREMENTS

**WARNING: DO NOT APPLY VOLTAGE TO MEASURING TERMINAL WHILE RANGE SWITCH IS IN CURRENT POSITION.**

1. Plug the test leads into the correct jacks (black into  $\ominus$  COM and red into  $\oplus$  V- $\Omega$ -A).
2. Set the range switch to the 500m DC A position (500 milliamp). Or, if the current will be greater than 500mA, use the  $\oplus$  DC 10A jack (instead of the  $\oplus$  V- $\Omega$ -A) and set the range to 10A. Always start at the top and work down.
3. Open up the circuit in which you want to measure current and connect the black lead to the negative side and the red lead to the positive side of the circuit.
4. Apply power to the circuit under test.  
Set the range and the range doubler switches as required to obtain a meter reading in the upper 1/2 or 1/3rd of the scale.
5. Read the current on the black DC scales. If the range doubler switch is in the V-A/2 position, be sure to divide the range switch setting by 2 and read the appropriate scale.

**Notes:** Do not attempt to read AC current. For currents above 500 milliamps, use the 10A range switch setting and the  $\oplus$  DC 10A jack (instead of the  $\oplus$  V- $\Omega$ -A jack). Use the appropriate setting of the range doubler switch.

## DECIBEL MEASUREMENTS

1. Plug the test leads into the correct jacks (black into  $\ominus$  COM and red into  $\oplus$  V- $\Omega$ -A).
2. Set the range and the range doubler switches as required to obtain a meter reading in the upper 1/2 of the scale.
3. Read dB on the dB scale, adding the appropriate number of dB to the dB scale reading as noted on the chart at the lower right on the meter face.

**Note:** For absolute dB measurements, circuit impedance must be 600 ohms. 0 dB = 1 milliwatt dissipated in a 600 ohm impedance (equivalent to 0.775 volts across 600 ohms).



## REPLACEMENT OF BATTERY/FUSE

**WARNING:** TO AVOID ELECTRIC SHOCK, DISCONNECT MEASURING TERMINALS BEFORE REMOVING BATTERY OR FUSE. REPLACE ONLY WITH SAME TYPE BATTERY OR FUSE. OPEN CABINET ONLY WHEN REPLACING BATTERY OR FUSE. DO NOT TOUCH ANY AREA INSIDE OTHER THAN BATTERY OR FUSE.  
**CAUTION:** FOR CONTINUED PROTECTION AGAINST FIRE, REPLACE ONLY WITH 0.75A, 250V FUSE.

**Note:** The fuse will blow when voltage is applied in resistance or current mode. In this case, there will be no meter movement. (Replace the fuse.)

To install or replace the battery or fuse:

1. **Disconnect the test leads.**
2. Open the cabinet by loosening the three screws.
3. Replace the battery if necessary.
4. If the fuse has blown, remove it.
5. Insert a new fuse, using only one of the same type/rating (0.75A, 250V).
6. Close the cabinet and replace the screws.

**WARNING:** DO NOT OPERATE THE UNIT UNTIL THE CABINET IS FULLY CLOSED.

## GOOD METER MEASUREMENT PRACTICES

There are some good general rules that apply to the use of electrical meters. Some are common-sense; others are important safety precautions.

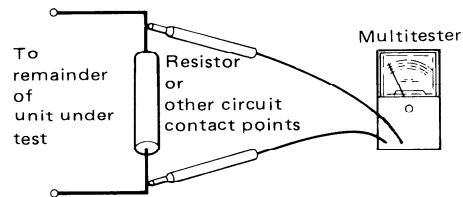
1. **CAUTION:** There is always the possibility of dangerous voltages being present in any piece of electrical/electronic equipment. Always use extreme caution when making measurements — high voltage may appear at unexpected points in a suspected defective circuit.
2. When making measurements, never stand on a wet or damp floor. Do not work on or even near any grounded metal object — for example, a metal work table, metal water or gas pipes, metal electrical conduit. Accidental contact between the grounded metal object and the circuit under test can be lethal.

3. Always use only well insulated test leads. Never use test leads without insulated test prods. Never allow your fingers to touch the bare metal part of the test probes (or circuit points).
4. Never use test leads with frayed or broken insulation; voltages will appear at all exposed contact points on the leads.
5. Never attempt to measure voltages or currents above the specified maximum the meter is designed for; refer to specifications section.
6. For safety's sake, disconnect leads as soon as you've completed measurements.
7. Always turn off power to the unit before connecting test leads. This is especially true when working on circuits with 100 or more volts.
8. Get into the habit of keeping one hand in your pocket when troubleshooting any equipment containing high voltage circuitry.
9. You should remember that even a small shock can be dangerous, because your body's reaction to a minor shock can cause you to bump or fall against a higher voltage contact.
10. Discharge filter capacitors before connecting test leads; such capacitors can retain hazardous charges in units with high voltage circuits.
11. When making voltage and current measurements always start with the highest range available.
12. Never attempt to measure a voltage when the function is set to resistance or current. (It may burn out the meter movement or other circuitry.) Never attempt to measure current with the meter set for resistance.
13. Never attempt to measure AC voltages or current with the meter set to a DC mode. (Meter circuitry can be damaged.)
14. Do not attempt to measure RF voltages with the Meter. (It can be damaged, or at best the readings will be meaningless.)
15. Do not expose your meter to moisture; avoid high humidity and excessive dust and dirt.
16. Avoid vibration or mechanical shock; the Meter might be damaged or its accuracy affected.
17. Avoid using meters in locations with high magnetic fields. (Inaccurate measurements can result.)

18. Remember that voltage and resistance measurements are made with the Meter connected in parallel. Current measurements are made with the Meter connected in series.

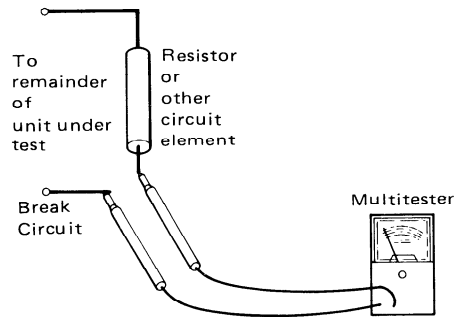
### PARALLEL METER CONNECTION

For Voltage and Resistance Measurements

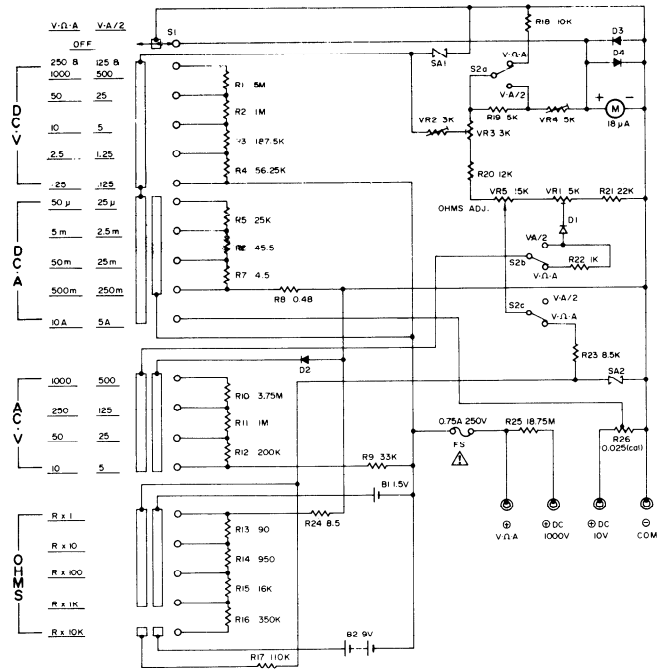


### SERIES METER CONNECTION


For Current Measurements



# SCHEMATIC DIAGRAM



NOTES: (1) ALL RESISTANCE VALUES ARE INDICATED IN "OHM" (K = 10<sup>3</sup> OHM, M = 10<sup>6</sup> OHM)  
 (2) ALL CAPACITANCE VALUES ARE INDICATED IN "µF" (P = 10<sup>-9</sup> µF)

CAUTION:  
 THE COMPONENTS MARKED BY  ARE CRITICAL FOR SAFETY.

Schematic subject to change without notice. For most accurate Schematic (and parts) contact Radio Shack, National Parts Dept., Fort Worth, TX 76101

In UK, contact Tandy Electronics, National Parts Dept., Bilston Road Wednesbury West Midlands WS10 7 JN

In Australia, contact Tandy Australia Limited, National Parts Dept., 91 Kurrajong Road, Mount Druitt, N.S.W. 2770

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