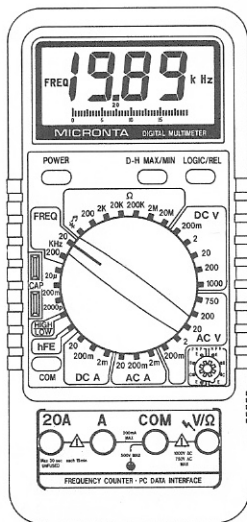


OWNER'S MANUAL

LCD DIGITAL MULTIMETER

11/26/93 \$90

Please read before using this equipment.



No. 22-182
MICRONTA®

INTRODUCTION

Your MICRONTA LCD Digital Multimeter is a portable 3-1/2 digit, compact-sized test instrument ideally suited for use in the field, lab, shop, and home. Here are some of the professional features of your new digital multimeter.

FEATURES

Computer Interface & Software — let you interface the meter with your PC-compatible computer so you can log measurements.

Frequency Check Function — measures frequencies up to 200 kHz.

Transistor Check Function — measures gain **hFE** of small-signal, bipolar transistors and identifies pin-out and type.

Capacitor Check Function — measures the capacitance of low-voltage capacitors.

Analog Bargraph Display — indicates the magnitude of the input compared to the full-scale value of the measurement range.

Max / Min Hold Function — stores a maximum and minimum measured value memory.

Data Hold Function — freezes the display so you can keep the measured value on the display even after you disconnect the probes.

Relative Offset — stores a value in memory and displays the difference between the stored value and subsequent readings.

Continuity Function — makes it easy to check fuses, alarm wiring, cables, and connections.

Auto-Polarity Operation — protects your meter and gives valid measurements when you connect the leads in reverse polarity.

© 1992 Tandy Corporation.
All Rights Reserved.

Micronta and Radio shack are registered trademarks used by Tandy Corporation.

Diode Check Function — safely checks semiconductor junctions for open, short, or normal.

Combined Function and Range Selector Switch — makes it easy for you to use your meter.

Latest IC and Display Technology — ensures reliability, accuracy, stability, and ease of operation.

Auto Power Shut-off — helps conserve battery power.

Beeper — sounds tones for overload-warning, continuity function, range selection, and end of self-test.

Logic Test Function — checks logic levels without extra logic probes.

Overload and Transient Protection — helps protect the meter from accidental overload on most ranges.

Low-Battery Indicator — appears when you need to replace the batteries.

Memory Recording — stores five measurements which you can download to a computer.

UL Listed — passes the stringent tests required by Underwriters Laboratories for safety.

Cautions:

- Completely read this manual before you use the meter.
- If you are not familiar with meters and testing procedures, we suggest you obtain and read a book about the subject, such as "Using Your Meter" (Radio Shack Cat. No. 62-2039).

CONTENTS

A Word About Safety	6
Specifications	8
Special Panel Markings	13
Preparing for Operation	14
Installing the Battery	14
Using the Test Probes	15
Using the Stand	16
Propping Up the Meter	16
Hanging the Meter	16
Pre-Operation Check	17
Making Measurements	18
Understanding Phantom Readings	18
Measuring High Voltage Circuits	18
Overrange Indication	18
AC/DC Voltage Measurement	19
Measuring an AC Voltage on a DC Bias	20
Measuring 3-Phase AC Voltages	21
Measuring AC/DC Current	22
Measuring Capacitance	24
Measuring Resistance	25
Checking Diodes	27
Checking Continuity	29
Checking Transistors	30

Measuring Frequency	32
Logic Test	34
Using the Max/Min Memory Function	36
Using Data Hold	37
Using the Relative Function	37
Using the Meter with a Computer	38
Interfacing the Meter with a Computer	38
Using the Supplied Software	38
Hints for Writing Your Own Software	39
Data Format	39
Communication Parameters	39
Replacing the Fuse	40
Care and Maintenance	41
FCC Statement	42

A WORD ABOUT SAFETY

This meter has been manufactured and tested in accordance with IEC 348 and DIN57411/VDE 0411 Part 1: Safety Requirements for Electronic Measuring Apparatus, Safety Class II.

We have taken every precaution in designing and manufacturing this meter to ensure that it is as safe as we can make it. But safe operation depends on you, the operator. We recommend that you follow these simple safety rules:

- Never apply voltages to the meter that exceed the given limits. (See "Specifications.") Never apply more than 1000V DC or 750V RMS AC between any terminals or between any input jacks and ground.
- Use extreme caution when working with voltages above 30 Volts AC or 60 Volts DC. Always disconnect power from the circuit you are measuring before you connect the test probes to high-voltage points.

- Never connect the test probes to a source of voltage when you select diode, OHM, continuity, current measurement, capacitance, or hFE functions.
- Always turn off the meter's power and disconnect the test probes before you replace the battery or fuse.
- Never operate the meter unless the back cover is in place and fully closed.
- Because some AC/DC sets have a hot chassis, be sure the top of your work bench and the floor underneath it are made of non-conductive materials.

The multimeter is fully calibrated and tested. Under normal use, no further adjustment should be necessary. If the meter should require repair, do not try to adjust it yourself. Take it to your local Radio Shack store. Service by unauthorized personnel voids the warranty.

WARNING: USE EXTREME CAUTION IN THE USE OF THIS DEVICE. IMPROPER USE OF THIS DEVICE CAN RESULT IN INJURY OR DEATH. FOLLOW ALL SAFEGUARDS SUGGESTED IN THIS OWNER'S MANUAL IN ADDITION TO NORMAL SAFETY PRECAUTIONS IN DEALING WITH ELECTRICAL CIRCUITS. DO NOT USE THIS DEVICE IF YOU ARE UNFAMILIAR WITH ELECTRICAL CIRCUITS AND TESTING PROCEDURES. NOT FOR COMMERCIAL OR INDUSTRIAL USE.

SPECIFICATIONS

RESOLUTION

DC VOLTS (Maximum Measurement = 1000V)

200mV-2-20-200-1000V	200mV - 100μV 2V - 1mV 20V - 10mV 200V - 100mV 1000V - 1V	±0.8% of Reading and ±0.3% of Full Scale ±1 in Last Digit
----------------------------	---	---

AC VOLTS (Maximum Measurement = 750V)

200mV-2-20-200V	200mV - 100μV 2V - 1mV 20V - 10mV 200V - 100mV	±1.2% of Reading and ±0.8% of Full Scale ±3 in Last Digit
750V	750V - 1V	±1.5% of Reading and ±1.2% of Full Scale ±3 in Last Digit

DC CURRENTS (Maximum Measurement = 20A)

2mA	1μA	±1.0% of Reading and ±0.5% of Full Scale ±1 in Last Digit
200mA	100μA	±1.5% of Reading and ±1.2% of Full Scale ±1 in Last Digit
20A	10mA	±2.5% of Reading and ±2.0% of Full Scale ±5 in Last Digit

RESOLUTION

AC CURRENTS (Maximum Measurement = 20 A)

2mA	1 mA	±1.5% of Reading and ±1.0% of Full Scale ±3 in Last Digit
200mA	100 μA	±2.3% of Reading and ±1.8% of Full Scale ±5 in Last Digit
20A	10 mA	±3.5% of Reading and ±3.0% of Full Scale ±7 in Last Digit

CAPACITANCE

2000pF-200nF	2000 pF - 1 pF 200 nF - 0.1 μF	±2.5% of Reading and ±2.0% of Full Scale ±3 in Last Digit
20μF	0.01 μF	±3.5% of Reading and ±3.0% of Full Scale ±5 in Last Digit

RESISTANCE

200ohm	100 mΩ	±1% of Reading and ±0.5% of Full Scale ±3 in Last Digit
--------	--------	---

RESOLUTION

2Kohm-20K-200K-2Mohm	2K Ω - 1 Ω 20K Ω - 10 Ω 200K Ω - 100 Ω 2M Ω - 1K Ω 20M Ω - 10K Ω	$\pm 1\%$ of Reading and $\pm 0.5\%$ of Full Scale ± 1 in Last Digit
20Mohm		$\pm 1.5\%$ of Reading and $\pm 1.0\%$ of Full Scale ± 2 in Last Digit

FREQUENCY

20kHz-200KHz	20kHz - 100Hz 200kHz - 10Hz	$\pm 2.5\%$ of Reading and $\pm 2.0\%$ of Full Scale ± 3 in Last Digit
--------------------	--------------------------------	--

DIODE CHECK FUNCTION^{1mV}For checking semiconductors open, short, or normal

CONTINUITY TESTContinuity buzzer sounds at less than 30 ohms

hFE MEASUREMENT0-1000 hFE values either PNP or NPN transistor.
Base DC Current 10uA approx.
VCE 3.0V Approx.

COMMUNICATION	Transmission Rate: 1200 baud Character Coding: 7-Bit ASCII Parity Bit: None Stops Bit: 2 Stop Bit RS-232 Serial Interface
INPUT IMPEDANCE	10 megohm (DCV/ACV all ranges)
RANGE SELECTION	Manual (rotary-type switch)
POWER SOURCE	9V battery (such as Radio Shack Cat No. 23-553, not supplied)
POWER CONSUMPTION	45mW typical
LOW BATTERY INDICATION	A battery symbol on the right of the display indicates when battery voltage drops below 6.5V-7.5V
POLARITY	Automatic polarity selection


OVERRRANGE INDICATION	“OL” appears, the bargraph flashes, and beeps sound
OPERATING TEMPERATURE	32°F to 104°F (0°C to 40°C)
STORAGE TEMPERATURE	14°F to 122°F (-10°C to 50°C)
WEIGHT	12.35 oz (350 grams)
SIZE	$7\frac{3}{8} \times 3\frac{7}{16} \times 1\frac{1}{3}$ inches (187mm × 87mm × 34mm) (L × W × H)
ACCESSORIES	Fuse 2A/250V (Fast-Blow Type) Shrouded Banana-type probes

SPECIAL PANEL MARKINGS

We have placed the following special markings on the panel to remind you of the measurement limitations and safety.

20A The maximum current that you can measure at this terminal is 20 amps DC/AC. This terminal is NOT fuse protected. For your safety during continuous measurements, keep the duty cycle as 30 seconds in use and 15 minutes in rest.

A The maximum current that you can measure at this terminal is 200mA DC/AC. This terminal is limited to 2A by a protected fuse.

MAX
 **500V**
To avoid electrical shock or instrument damage, do not connect the Common Input Terminal COM to any source of more than 500 Volts with respect to earth/ground.

MAX
== 1000V
~ 750V
The maximum voltage this meter can measure is 1000V DC or 750V AC.



Be extra careful when making high-voltage measurements. DO NOT TOUCH THE TERMINALS OR PROBE ENDS.



Refer to the complete operating instructions.



Indicates protection class II, double insulation.

PREPARING FOR OPERATION

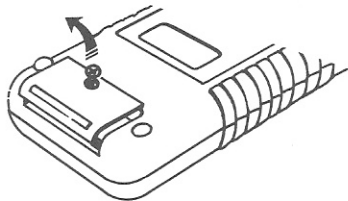
INSTALLING THE BATTERY

Your meter requires a 9V battery (not supplied) for power. For reliable operation, we recommend an alkaline type battery, such as Radio Shack's Cat. No. 23-553.

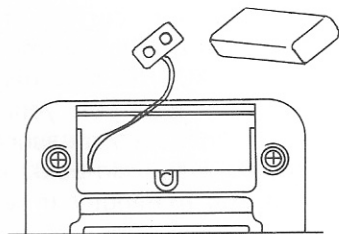
WARNING: TO AVOID ELECTRIC SHOCK, DISCONNECT BOTH LEADS FROM ANY EQUIPMENT BEFORE YOU REMOVE OR INSTALL THE BATTERY.

Follow these steps to install the battery :

1. Turn off POWER and disconnect the two test probes.
2. Remove the screw to open the battery compartment.



3. Snap the 9V battery into place.

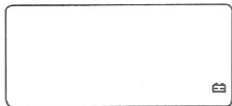


4. Replace the battery compartment cover and the screw.

WARNING: DO NOT OPERATE THE METER UNTIL YOU REPLACE THE BATTERY AND CLOSE THE BATTERY COMPARTMENT COVER.

Notes:

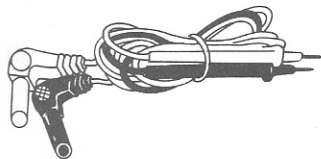
- When the battery indicator appears, replace the battery.



- Never leave a weak or dead battery in your meter. Even a “leakproof” battery can leak damaging chemicals. When you are not going to use your meter for a week or more, remove the battery.

USING THE TEST PROBES

Use only the type of test probes supplied with your meter. These test probes are rated for 1200 volts. You can purchase replacement probes from your local Radio Shack store.



Cautions :

- Although the replacement test probes are rated for 1200 volts, the maximum rating of your meter is 1000 volts DC and 750 volts AC. If you try to measure DC voltages above 1000 volts or AC voltages above 750 volts RMS, you might damage your meter and expose yourself to a serious shock hazard. Use extreme care when you measure high voltages.

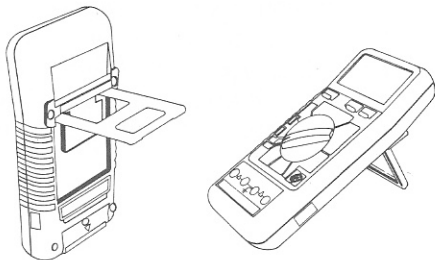
- Never connect the probe you plug into the COM terminal to a source of voltage greater than 500 volts with respect to earth ground. This creates a serious shock hazard.

USING THE STAND

Use your meter's stand to prop up or hang the meter.

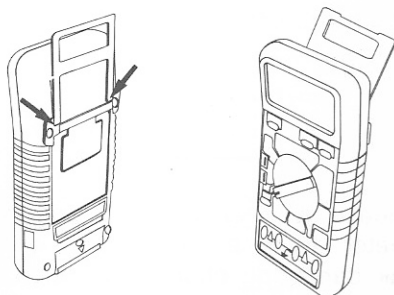
Propping Up the Meter

If you prop up your meter on a benchtop, the stand helps provide a better viewing angle. To use the stand as a prop, just open it away from the meter and set it on a flat surface.



Hanging the Meter

To hang the meter, remove the stand by pressing the lower parts of the stand together. Then insert the stand into the top 2 holes, as indicated below.



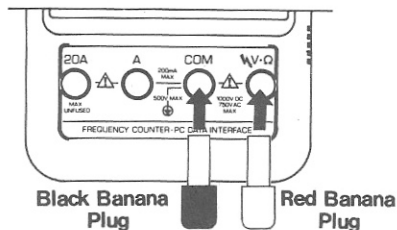
PRE-OPERATION CHECK

To ensure correct operation and familiarize yourself with the meter, follow these steps before you use it:

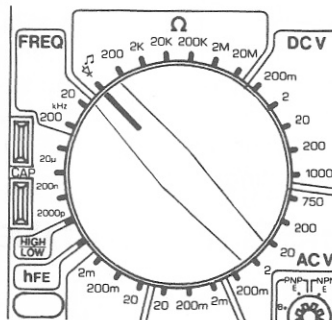
1. Set power to **ON**. All the display elements appear for 1-2 seconds. Then the meter beeps.



2. Plug the black probe into the meter's **COM** terminal and the red probe into the meter's **V \cdot Ω** terminal.



3. Rotate the function selector to $\rightarrow \Omega$. Your meter displays **OL** and the analog bargraph flashes.



4. Touch the probe tips together. Your meter sounds a tone.
5. Rotate the function selector to one of the other Ω positions. Your meter displays a value of less than 1 ohm when you touch the probe tips together.

MAKING MEASUREMENTS

UNDERSTANDING PHANTOM READINGS

In some DC and AC voltage ranges, when the probes are not connected to any circuit, the display might show a “phantom” reading. This is normal. The meter’s high input sensitivity produces a wandering effect. When you connect the probes to a circuit, accurate readings appear.

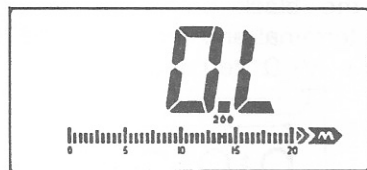
MEASURING HIGH-VOLTAGE CIRCUITS

When you use the meter to check a high-voltage circuit, do not try to position both probes at once. Instead, clamp one probe to the neutral or ground lead of the circuit (usually a bare, green, or white lead in AC wiring circuits) using insulated Slip-On Alligator Clips (Cat. No. 270-354). Then probe for voltages with the other probe. This helps prevent you from accidentally touching a hot wire, because you need to concentrate on only one test probe.

Warning: Never clamp onto a hot wire, (usually red, black, or blue in AC wiring circuits.) If you clamp onto a hot wire and touch the other probe, you could receive a shock.

OVERRANGE INDICATION

The following display appears when the measurement exceeds the meter’s range. If you are measuring volts or amps, disconnect the meter from the circuit you are measuring or change the meter’s measuring range.



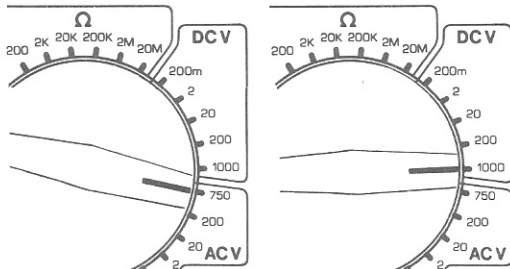
AC/DC VOLTAGE MEASUREMENT

WARNING: DO NOT TRY TO MEASURE A VOLTAGE GREATER THAN 1000 VOLTS DC OR 750 VOLTS AC. YOU MIGHT DAMAGE YOUR METER AND EXPOSE YOURSELF TO A SEVERE SHOCK HAZARD.

Note: All the figures on the display blink when more than the maximum voltage (DC 1000/AC 750 VOLTS) is supplied. If this happens, DISCONNECT THE PROBES IMMEDIATELY.

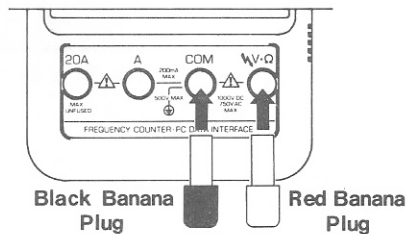
Follow these steps to measure AC/DC Voltage:

1. Rotate the function selector to the desired ACV/DCV position.

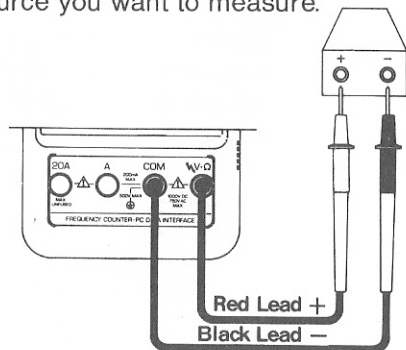


Select the range as required for the voltage level to be measured. If you do not know the voltage level, start with the range switch set to the highest voltage position and reduce the setting as needed to get a reading.

2. Plug the black probe into the meter's COM terminal and the red probe into the meter's $V \cdot \Omega$ terminal.



3. Connect the probes to the AC/DC voltage source you want to measure.



The voltage appears on the display.

Notes:

- If polarity is negative, a “-” appears on the left of display.
- For the most accurate measurement, select the lowest voltage range possible without getting an overload reading.

Measuring an AC Voltage on a DC Bias

To measure an AC voltage superimposed on a DC voltage source bias, follow the steps for measuring AC voltage.

Caution: Never try to measure an AC voltage that is riding on a DC voltage level where the peak AC voltage exceeds 1000V with respect to earth ground.

MEASURING 3-PHASE AC VOLTAGES

We designed this meter to measure household AC voltage. It is not intended for commercial or industrial use. If you want to measure 3-phase, line-to-line voltages, please note the following.

Warning: Because of the dangers inherent in measuring three-phase circuits, we strongly recommend that you do not use this meter for such applications.

- If you choose to make the measurements, use extreme care. The actual voltage can be greater than the circuit's rated voltage (line-to-ground).
- To determine the line-to-line voltage, multiply the rated line-to-ground voltage by 1.732.

For example, if the rated voltage is 462 volts, the line-to-line voltage is:

$$462 \text{ Volts} \times 1.732 = 800 \text{ Volts}$$

This voltage exceeds the meter's range and you should not connect the meter to this circuit. See "Measuring High-Voltage Circuits".

MEASURING AC/DC CURRENT

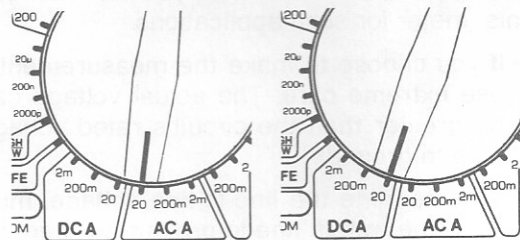
WARNINGS:

- DO NOT APPLY VOLTAGE DIRECTLY ACROSS TERMINALS. YOU MUST CONNECT THE METER IN SERIES WITH THE CIRCUIT.
- THE 20A TERMINAL IS NOT FUSED. A SEVERE FIRE HAZARD AND SHORT CIRCUIT DANGER EXISTS IF YOU APPLY A VOLTAGE WITH HIGH-CURRENT CAPABILITY TO THIS TERMINAL. THE METER CAN BE DESTROYED UNDER SUCH CONDITIONS.

To measure current, break the circuit and connect the probes to two circuit connection points. Never connect the probes across a voltage source in parallel. Doing so can blow the fuse or damage the circuit under test.

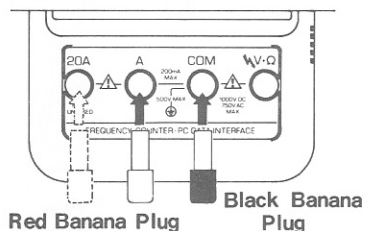
Note: The maximum input current is 2A or 20A depending on the terminal used. In the 2A range, excessive current blows the fuse, which you must replace. The 20A range is NOT protected by the fuse — excessive current can destroy the meter.

1. Rotate the function selector to the desired AC A or DC A range.

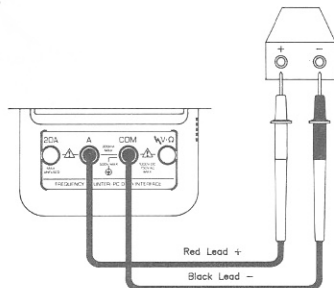


If you do not know the current level, set it to the highest position and reduce the setting as needed to get a reading.

2. Plug the black probe into your meter's COM terminal, and the red probe into your meter's **A** or **20A** terminal.



3. Remove power from the circuit under test and then break the circuit at the appropriate point.
4. Connect the probes in series with the circuit.



5. Apply power and read the current.
Your meter displays the current value.

Note: If you set the meter for DC current, — appears or disappears to indicate the polarity of the measured current.

MEASURING CAPACITANCE

Follow these steps to measure normal capacitance:

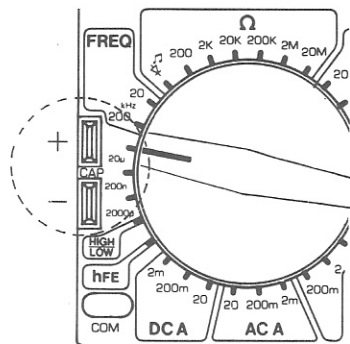
1. Discharge each capacitor before testing by shorting its leads together. Use caution when handling some capacitors, as they can be charged with considerable electricity.

Caution: If you attempt to measure the capacitance of a charged capacitor, you might damage your meter.

2. Rotate the function selector to the desired CAP range. If you do not know the approximate capacitance value, set the range to the highest position and reduce the setting as required to get a valid reading. The display shows a residual value. To obtain a 000 display, press **LOGIC REL.**

3. Insert the discharged capacitor into the CAP + and - clips connectors. Your meter displays the capacitance value.

Note: For polarized capacitors, be sure to insert the negative lead in the - clip.



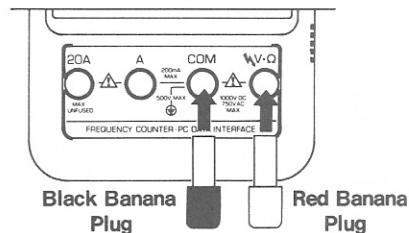
MEASURING RESISTANCE

Warning :

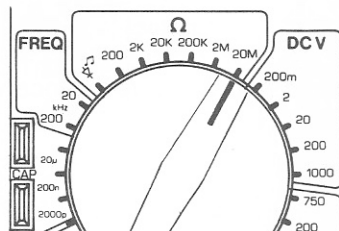
- NEVER CONNECT THE TEST PROBES TO A SOURCE OF VOLTAGE WHEN YOU HAVE SELECTED THE OHMS FUNCTION AND PLUGGED THE PROBES INTO THE $V \cdot \Omega$ TERMINAL.
- BE SURE THAT THE CIRCUIT UNDER TEST HAS ALL POWER REMOVED AND THAT ANY ASSOCIATED CAPACITORS ARE FULLY DISCHARGED BEFORE YOU MAKE A RESISTANCE MEASUREMENT.

The resistance measuring circuit compares the voltage gained through a known resistance (internal) with the voltage developed across the unknown resistance. So, when you check in-circuit resistance, be sure the circuit under test has all power removed (all capacitors are fully discharged).

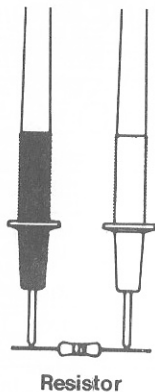
1. Plug the black probe into your meter's COM terminal and the red probe into your meter's $V \cdot \Omega$ terminal.



2. Rotate the function selector to the desired Ω range.



3. Connect the probes to the device you want to measure.



Your meter displays the resistance value.

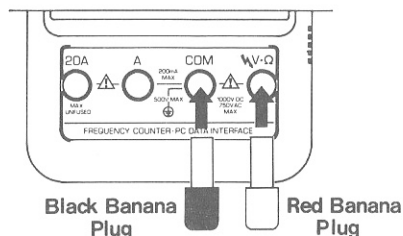
Notes:

- If the measured resistance value exceeds the maximum value of the range selected, **OL** displays to indicate overload and the bar graph flashes. Select a higher range. In this mode, the beeper does not sound.
- When you short the test probes in the $200\ \Omega$ range, your meter displays a small value (no more than 0.3 ohms). This value is due to your meter's internal resistance measurements. To obtain 000 display at this time, press **LOGIC REL** on the meter while shorting the test leads.
- For resistance of approximately 1 Megohm and above, the display might take a few seconds to stabilize. This is normal for high resistance readings.

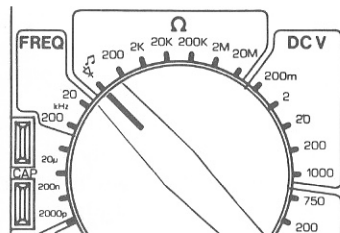
CHECKING DIODES

This function lets you check diodes and other semiconductors for opens and shorts. It also lets you determine the forward voltage for diodes. You can use this function when you need to match diodes.

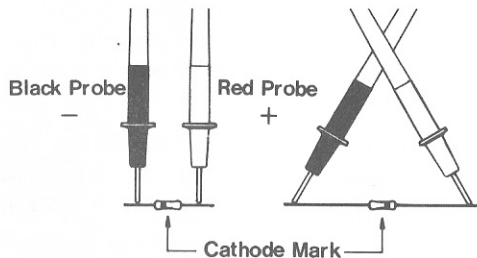
1. Plug the black probe into your meter's COM terminal and the red probe into your meter's $V \cdot \Omega$ terminal.




2. Rotate function selector to the $\rightarrow \Omega$.




3. Connect the probes to the diode you want to check and note the meter reading.



-
- If the display shows a value, for example 0.2 for germanium diode or 0.5 for a silicon diode, reverse the diode. If the meter indicates an overrange, the diode is good. The displayed number is the diode's actual forward voltage (up to 2.5 volts).
 - If the display indicates an overrange condition, reverse the polarity of the connection. If the display shows a value, the device is good. The displayed value is the component's actual forward voltage (up to 2.5 volts). If the display still indicates an overrange condition, the device is open.
 - If the display shows a value both before and after you reverse the polarity, the device is shorted or the meter's $\frac{1}{16}$ amp fuse is blown.

When you connect the diode to the meter and the meter displays the device's forward voltage, the red test probe or  socket is

connected to the diode's anode, and the black probe or  socket is connected to the diode's cathode.

This meter supplies enough forward voltage to light most LEDs. However, if the LED's forward voltage is greater than 2.5 volts, the meter incorrectly indicates that the device is open.

The bar graph shows a maximum reading of 24, even during an overrange.

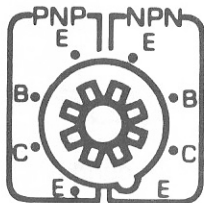
CHECKING TRANSISTORS

Follow these steps to determine a transistor's base gain:

1. Rotate the function selector to the **hFE** position.
2. Insert the transistor you want to measure into the appropriate transistor socket. Your meter displays the transistor's hFE value.

Notes:

- Insert the base, collector, and emitter pins in the correct sockets, as marked.



- Do not take the hFE reading as an absolute measurement, but rather as an indication that the transistor is operating. The true gain of a transistor depends on its operating current. This meter applies 500 to 1000 μA to the emitter and collector and measures the base current to calculate the base gain.
- Even though the meter turns off the test probes during the hFE measurement, a voltage connection might affect the hFE reading. Do not connect the test probes to a voltage source during this measurement.
- You cannot measure the hFE of a transistor that is connected in a circuit.
- You cannot measure the hFE of an FET or other non-bipolar transistor.

-
- Some power Darlington transistors contain internal base-to-emitter resistors. Because the meter uses two current readings to calculate hFE , any internal transistor resistance causes undependable readings.
 - High-voltage junctions in power transistors prevent correct readings. Also, the larger leads of the power transistor can damage the test socket.
 - Do not try to determine type, pin-out, or hFE for power transistors with this meter.
 - hFE is affected by temperature. Try not to warm the transistor with your hand when you install the device in the socket. If the hFE reading is not stable when you first measure it, let the transistor's temperature stabilize.

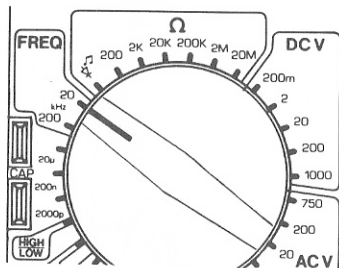
Warning: The transistor socket is not protected against overload. You can damage the meter and void your warranty if you build and use external leads for the transistor socket.

MEASURING FREQUENCY

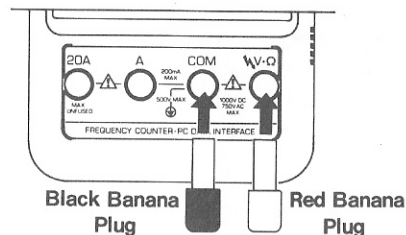
WARNING: IF YOU TRY TO MEASURE THE FREQUENCY OF A SIGNAL THAT EXCEEDS 250 VOLTS AC RMS, YOU MIGHT DAMAGE YOUR METER AND EXPOSE YOURSELF TO SEVERE SHOCK HAZARD.

Follow these steps to measure the frequency of a signal:

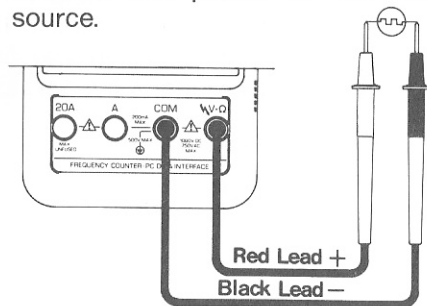
1. Rotate the function selector to the **FREQ** range.



2. Plug the black probe into your meter's **COM** terminal and the red probe into your meter's **V·Ω** terminal.



3. Connect the probe to the frequency source.



Notes:

- When the test probes are connected to an AC outlet, do not turn the function selector switch to another range. It may damage the internal components, or you.
- Overload Protection : 250V DC/AC RMS.

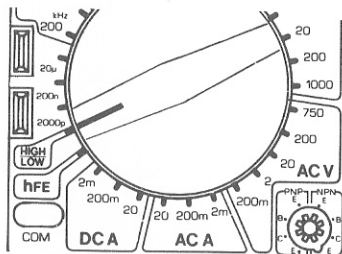
LOGIC TEST

The logic function lets you easily check digital circuits to determine the logic state of different parts of the circuit. Rather than display an absolute voltage, this function displays **HI**, **LO**, or --- to indicate logic high, logic low, or undetermined, respectively.

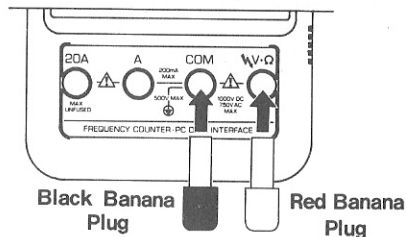
Follow these steps to perform a logic test:

1. Rotate the function selector to the logic range.

rdy appears on the display.



2. Plug the black probe into your meter's **COM** terminal and the red probe into your meter's **V· Ω** terminal.



3. Connect the black probe to the ground point (GND) of the test circuit and the red probe to the supplying voltage point (V+). While keeping the test probes firmly connected to each point, press **LOGIC REL**.

-
4. While keeping a connection between the black probe and the circuit's GND point, move the red probe to the other desired points. The meter immediately displays one of the 3 modes, as follows :
- If value exceeds 70 % of the stored (V+) value, **Hi** (HIGH) appears.
 - If value falls below 30 % of the stored (V+) value, **Lo** (LOW) appears.
 - If value is between 30 % and 70 %, the --- segment appears.

Notes:

- In this mode, the Data-Hold and Max/Min-Hold functions do not work.
- The supplying voltage from 0.5V up to 19.9V is limited for testing logic.

USING THE MAX / MIN MEMORY FUNCTION

The **MAX/MIN** button holds a recorded value on the display, records the maximum value currently measured, and/or records the minimum value currently measured. Follow these steps to store the readings :

1. Press **MAX/MIN**. The meter displays **MAX** and displays the highest measured reading. The meter updates the display as the reading changes.

Even though the meter only displays **MAX**, it stores both the maximum and minimum readings.

2. To display the minimum measured reading, press **MAX/MIN** again. The meter displays **MIN** and the lowest measured reading. The meter updates the display as the reading changes.

Even though the meter only displays **MIN**, it stores both the minimum and maximum readings.

Notes :

- You cannot use the **MAX/MIN** mode and the relative mode at the same time. If you select the relative mode, the **MAX/MIN** function turns off. If the relative mode is already active, the meter ignores the **MAX/MIN** key.
- The meter exits the **MAX/MIN** mode if you try to measure a value that is outside the currently set range or if you manually change the range.

USING DATA HOLD

The data hold function lets you hold the current reading on the meter's display.

During any reading, press **D-HOLD** to prevent changes in the measured value from updating the display. The meter displays **HOLD**. Press **D-HOLD** again to resume normal operation.

USING THE RELATIVE FUNCTION

The relative feature lets you set a reference measurement and measure additional values relative to the reference. For example, if you set the reference at 100 ohms, the meter displays a 123 ohm resistor at 23 ohms, and displays a 75 ohm resistor as -25 ohms.

Follow these steps to set a reference:

1. Make a reference measurement.
2. While you measure the reference value, hold down **LOGIC REL** for about 2 seconds. The meter beeps. After 2 seconds, the meter displays **REL** and sets the reading to 000.

The meter displays additional measurements relative to the reference value.

The meter displays values greater than the reference as positive values and values less than the reference as negative values.

Note: You cannot use the MAX/MIN mode and relative mode at the same time.

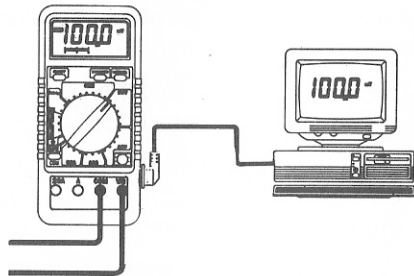
USING THE METER WITH A COMPUTER

DVMPC121.EXE

INTERFACING THE METER WITH A COMPUTER

Follow these steps to interface the meter with a computer:

1. Connect the RS-232C cable between the meter's and the computer's serial ports.



2. Turn on the meter.

USING THE SUPPLIED SOFTWARE

The supplied software runs on PC-compatible computers only.

Follow these steps to use the supplied software:

1. Place the diskette in the drive. Copy the files from the diskette to the computer's hard drive or make a back-up copy of the diskette to use.
2. Type Enter.

Note: The software automatically defaults to color monitors.

3. To stop execution or to escape from a device I/O error status, press **CTRL + BREAK** on the computer at the same time.

Notes:

- You must turn off the meter's **COM** switch when transmitting data to the computer.
- Do not activate the meter's COM function and the computer's transmission commands at the same time.

-
- To release the COM function, turn the range switch or press **COM**. **COM** disappears.

HINTS FOR WRITING YOUR OWN SOFTWARE

If you write your own program, you must include these steps:

1. The host computer must give the meter the D command to activate data transmission.
2. The host computer must give the meter the C Memory-Clear command to clear memories on the meter.
3. The host computer must give the meter the M Memory-Call command to transmit the memories on the meter to the software.

Data Format

The data format consists of a frame of 14 bytes. The frames are set as follows:

BYTE) 1 2 3 4 5 6 7 8 9 A B C D E
Ex.1) DC-1.9999 V CR
Ex.2) 1.9999M ohm CR

The following program is an example of a BASIC program that gets a single reading from the meter:

```
10 OPEN "COM1:1200, N, 7, 2, RS, CS, DS,  
    CD" AS #2  
20 A$="D"  
30 PRINT #2, A$  
40 IN$=INPUT$(14, #2)  
50 PRINT IN$  
60 CLOSE #2  
70 END
```

Communication parameters

- Transmission rate: 1200 baud
- Character coding : 7-bit ASCII
- Parity : None
- Stop Bits : 2

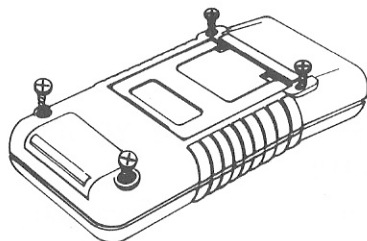
REPLACING THE FUSE

WARNING: TO AVOID ELECTRIC SHOCK, DISCONNECT THE TEST PROBES BEFORE REMOVING THE BATTERY OR THE FUSE. REPLACE ONLY WITH THE SAME TYPE OF BATTERY OR FUSE. DO NOT REMOVE THE TOP COVER. SERVICE SHOULD BE PERFORMED ONLY BY QUALIFIED PERSONNEL.

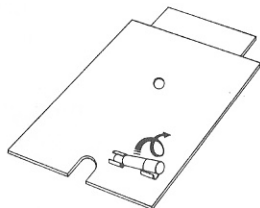
CAUTION: FOR CONTINUED PROTECTION AGAINST FIRE OR OTHER HAZARD, REPLACE ONLY WITH A 2A 250V FUSE.

Follow these steps to replace the fuse:

1. Set power to OFF and disconnect the test probes.
2. Remove the back cover by unscrewing the four screws and pulling off the meter's cover.



3. Remove the blown fuse.



4. Install the new fuse in the fuse compartment.
5. Replace the back cover and secure it with the screws.

WARNING: DO NOT OPERATE YOUR METER UNTIL THE BACK COVER IS IN PLACE AND FULLY CLOSED.

CARE AND MAINTENANCE

Your Micronta LCD Digital Multimeter is an example of superior design and craftsmanship. The following suggestions will help you care for your meter so you can enjoy it for years.



Keep your meter dry. If it does get wet, wipe it dry immediately. Liquids might contain minerals that can corrode the electronic circuits.



Use and store your meter only in normal temperature environments. Extreme temperatures can shorten the life of electronic devices, damage batteries, and distort or melt plastic parts.



Handle your meter gently and carefully. Dropping it can damage circuit boards and cases and can cause the meter to work improperly.



Keep your meter away from dust and dirt, which can cause premature wear of parts.



Wipe your meter with a damp cloth occasionally to keep it looking new. Do not use harsh chemicals, cleaning solvents, or strong detergents to clean the meter.



Use only a fresh battery of the recommended size and type. Always remove an old or weak battery. It can leak chemicals that destroy electronic circuits.

Modifying or tampering with your meter's internal components can cause a malfunction and might invalidate its warranty and void your FCC authorization to operate it. If your meter is not performing as it should, take it to your local Radio Shack store for assistance.

FCC STATEMENT

This meter complies with the limits for a Class B digital device as specified in Part 15 of FCC Rules. These limits provide reasonable protection against radio and TV interference in a residential area.

However, your meter might cause TV or radio interference even when it is operating properly. To eliminate interference, increase the distance between the meter and the radio or TV.

Consult your local Radio Shack store or an experienced radio/TV technician if the problem still exists.



DTR MUST BE H1 FOR DVM TO XMIT.

1	RD	2 →
2	DTR	4 ← must!
3	RTS	7 ←
4	TD	3 ←
5	SG	5 -

Multimeter With PC Interface

(1) 32 Ranges. Included PC-compatible cable and software on 3 1/2" disk allow you to interface the meter with your PC-compatible computer to log measurements. Features 41-dot bargraph, frequency counter to 200 kHz, continuity buzzer, transistor-gain and capacitor measurement, data hold, minimum/maximum hold, automatic power-off and more. 7 3/8 x 3 1/2 x 1 3/8". Requires 9V battery. 22-182 129.99

(1)



RADIO SHACK LIMITED WARRANTY

This product is warranted against defects for 90 days from date of purchase from Radio Shack company-owned stores and authorized Radio Shack franchisees and dealers. Within this period, we will repair it without charge for parts and labor. Simply **bring your Radio Shack sales slip** as proof of purchase date to any Radio Shack store. Warranty does not cover transportation costs. Nor does it cover a product subjected to misuse or accidental damage.

EXCEPT AS PROVIDED HEREIN, RADIO SHACK MAKES NO WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Some states do not permit limitation or exclusion of implied warranties; therefore, the aforesaid limitation(s) or exclusion(s) may not apply to the purchaser.

This warranty gives you specific legal rights and you may also have other rights which vary from state to state.

We Service What We Sell

RADIO SHACK
A Division of Tandy Corporation
Fort Worth, Texas 76102