MICRONTA®

LCD Digital Autoranging Folding Multimeter

OWNER'S MANUAL

Catalog Number 22-193

CUSTOM MANUFACTURED FOR

RADIO SHACK, A DIVISION OF TANDY CORPORATION

The MICRONTA Digital Autoranging Multimeter is a portable 3½-digit, compact-sized multimeter ideally suited for field, lab, shop, bench, and home applications. Here's a review of some of the features that qualify your new Digital Multimeter as a real "pro."

The operating and indicating sections are connected to each other by a hinge-joint with detent. This allows you to get the best angle for easy reading in all operating conditions, either in the field or on a bench top.

The test lead compartment stores the leads. You no longer have to search for them!

The power is automatically turned off when the multimeter is folded shut, even if you forget to turn off the POWER switch.

The latest IC and display technology is used to achieve the lowest possible component count. This, in turn, ensures reliability, accuracy, stability and a really rugged, easy-to-handle instrument.

Low battery voltage is automatically detected and displayed.

There is no pointer to bend, no parallax and no mechanical zero-adjust to worry about. Measurements are displayed on a large, high contrast, easy-to-read, 3½ digit, liquid crystal display.

Effective overload and transient protection exists on all ranges except AC/DC 10A ranges.

Over-range is indicated for each range.

It has full auto-polarity operation.

Dual-slope integration ensures fast, accurate, noise-free measurements.

Built-in Buzzer function for quick continuity check sounds when circuit continuity is 300 ohms nominal.

Special Diode Check function lets you safely check semiconductor junctions (for open, short or normal).

Switchable electronic Zero-adjust suppresses the two least significant digits to assure precise low-range readings in K OHM function.

Full auto-range is operational in each mode except AC/DC 200 mA and 10A ranges. The range automatically moves to a higher scale when over-range takes place in the auto-range operation.

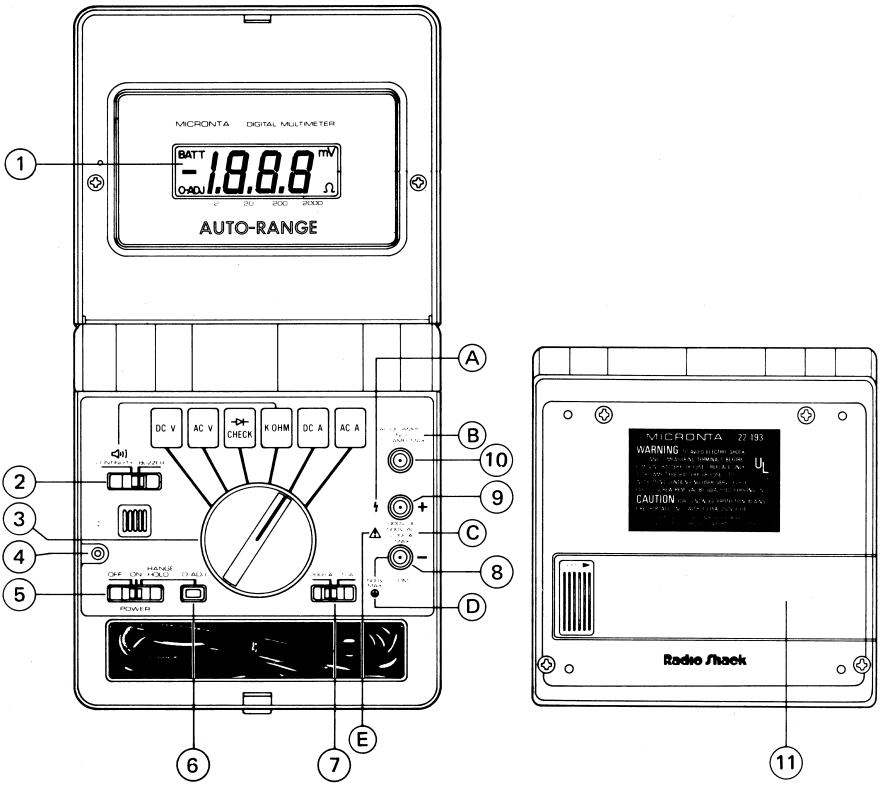
SPECIFICATIONS

Display	3½-Digit, LCD	
Accuracy		
DC VOLTS 200mV–2–20–200–2000V (Maximum measurement = 1000 Volts)	±0.8% of reading and ±0.2% of full scale, ±1 in last digit	
AC VOLTS 2–20–200–2000V (Maximum measurement = 500 Volts RMS)	±1% of reading and ±0.5% of full scale, ±1 in last digit	at 50/60 Hz
45 Hz to 1 kHz	±1.5% of reading and ±0.5% of full scale, ±1 in last digit	at 20 Volt Range
to 10 kHz	±6% of reading and ±0.5% of full scale, ±1 in last digit	at 20 Volt Range
DC-CURRENT 200mA, 10A	±1.5% of reading and ±0.2% of full scale, ±1 in last digit	
AC-CURRENT 200mA, 10A	±1.5% of reading and ±0.5% of full scale, ±1 in last digit	
RESISTANCE 200Ω–2–20–200–2000 kohm	±1.5% of reading and ±0.2% of full scale, ±1 in last digit +18 digit maximum at 200Ω	
Continuity Function	Continuity buzzer sounds at less than 300 ohms nominal (150–500 ohms limit) input resistance	
Diode Check Function	For checking if semiconductors are open, shorted or normal	
Input Impedance	10 megohm (DCV/ACV) more than 100 megohm on 200mV DC	

Range Selection	Automatic ranging with RANGE-HOLD function
Power Source	Two "AA" size 1.5V batteries
Power Consumption	6mW typical, 15mW at continuity function
Low Battery Indication	"BATT" on the left of display Below 1.2 – 1.3V per cell
Polarity	Automatic polarity
Over-range Indication	1000 with blinking "1"
Detent	90, 120, 150, 180 degrees
Operating Temperature	0°C to 50°C
Storage Temperature	–20°C to 60°C
Weight	1.1 lb. (500g)
Size	10.9 x 5.7 x 1.5 inches (fully open) 278mm x 145mm x 37mm 6 x 5.7 x 2.1 inches (fully closed) 153mm x 145mm x 52mm
Accessories	Fuse: 0.315A 250V (Radio Shack Cat. No. 270-1249) Banana Type Test leads (Radio Shack Cat. No. 278-704)

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

CONTROLS AND FUNCTIONS



ITEM NO.	NAME	FUNCTION
1	Display	A 3½-digit display (1999 max) with decimal point and minus polarity indication. Indicates measured input values and over-range and low battery condition plus 0-ADJ and mV/Ω functions.
2	BUZZER–CONTINUITY switch	Set to CONTINUITY for continuity check only. Set to BUZZER for all other measurements.
3	Function switch	For selecting functions: DCV, ACV, ⊣◀ CHECK, K OHM, DC A, AC A
4	Folding Power Switch	The power is automatically turned off by this switch when the multimeter is folded shut even if you forget to turn off the POWER switch
5	POWER switch	Turn the instrument ON and OFF. Set to RANGE HOLD to stay in one range.
6	0-ADJust switch	For K OHM function only with BUZZER-CONTINUITY switch in the BUZZER position. Press to suppress the two least significant digits when in RANGE HOLD mode. Press again (or change Function Switch position) to cancel 0-ADJ.
7	200mA–10A switch	Set to 10A when measuring current over 200mA. Set to 200mA when measuring current less than 200mA.
8	Input (–) Jack	Connect (–) black lead for all measurements.
9	Input (+) Jack	Connect (+) red lead for all voltage, 200mA and resistance measurements.
10	Input (10A) Jack	Connect (+) red lead for 10A measurement with 200mA–10A switch to the 10A position setting.
11	Battery/Fuse Compartment	Open to install/replace fuse and/or batteries.

Explanations of Special Panel Markings

Special marking has been added to the panel to remind you of the measurement limitations and safety.

A. ϟ Be especially careful when making measurements for high voltage; do not touch terminals or probe ends.

B. AC-DC AMPS ONLY 10 AMP. MAX The maximum current that can be measured is AC/DC 10A.

C. 1000V DC 500V AC 200mA MAX The maximum voltage or current that can be measured is 1000V DC, 500V AC, or 200mA.

D. 500V MAX ⏚ 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.

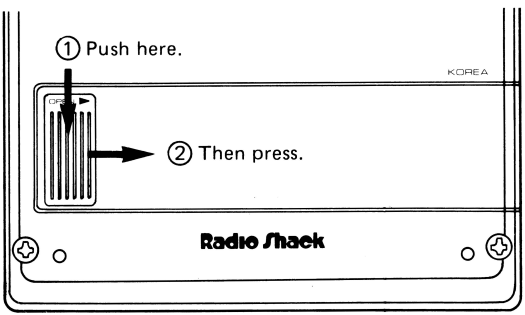
E. ⚠ Refer to complete operating instructions.

PREPARING FOR OPERATION

Your Digital Multimeter requires two 1.5-Volt "AA" batteries. We recommend that you use the Alkaline type – such as Radio Shack's 23-552. Do not use the Nickel-Cadmium type because its voltage is low.

Be sure **POWER** is OFF and test leads are disconnected.

Open the Battery/Fuse Compartment cover on the rear by pushing it first, then pressing in the direction of the arrow. (See the figure below.) Snap the batteries in place (observing polarity) and press the Battery/Fuse Compartment cover back on.



When the batteries become weak "BATT" will be displayed on the left side of the display. Always replace both batteries. Do not mix old and new batteries. NEVER LEAVE A WEAK OR DEAD BATTERY IN YOUR UNIT. Even "leak-proof" types can leak and cause damage to the circuitry. When you are not going to use your unit for several weeks, remove batteries.

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

CAUTION: Although these test leads are rated for 1200 volts, the maximum rating of this meter is 1000 volts. You should not attempt to measure any voltage greater than 1000 volts.

USE EXTREME CARE WHEN USING THESE HIGH-VOLTAGE RANGES.

CHECK BEFORE OPERATION

1. Plug the red test lead into the (+) jack, and the black test lead into the (—) jack.
2. Turn **POWER** ON.
3. Turn the Function Switch to KOHM. The markings under the display (2, 20, 200, 2000) help you determine the range.

4. With no resistance connected across the test leads (resistance infinite), the auto range function moves the range to the highest 2000 K OHM and shows the over-range, 1000, with a blinking "1." When the test leads are shorted (resistance zero), the meter moves to the lowest 200 ohm range, and only the small resistance value of the protection circuit (1.8 ohm max.) is shown.

The meter automatically moves to the range that gives the best resolution. The range (indicated by the position of the decimal in relation to the numerals below the display) can be read in volts, ohms, and amps — as illustrated by the chart on this page. (In the chart, d = digit.)

FUNCTION	RANGE	DISPLAY
DC V/AC V	200 mV	ddd.d mV
	2V	d.ddd
	20V	dd.dd
	200V	ddd.d
	2000V	dddd
DC A/AC A	200 mA	ddd.d
	10A	dd.dd
K OHM	200 Ω	ddd.d Ω
	2K	d.ddd
	20K	dd.dd
	200K	ddd.d
	2000K	dddd
⊣⊢ CHECK		ddd.d Ω

MAKING MEASUREMENTS

PLEASE NOTE

Don't set BUZZER-CONTINUITY Switch to CONTINUITY except when using K OHM range. If you set the switch to this position when measuring functions other than K OHM, the beep tone will sound to warn you of the wrong switch setting. Set the switch to the BUZZER position on all ranges except K OHM.

Range Hold

A special feature of your Auto Range DMM is the RANGE HOLD position on the POWER switch. When you want to make a series of measurements within a specific fixed range, use RANGE HOLD. To demonstrate, follow these steps.

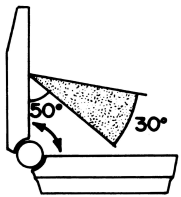
1. When you want to measure voltages that should lie within the range of 14 to 18 volts, measure the first value.
2. While the measured value is still on the display, set the POWER switch to RANGE HOLD. (Now the range is restricted to the 20 volt range.)

If you exceed the upper limit of the range you are holding, you'll hear a series of beeps, and on the display you'll see a flashing 1. This alerts you to the fact that you have reached an overflow error.

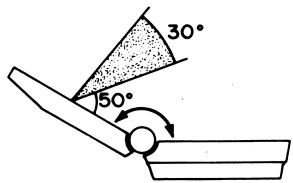
When you return the POWER switch to the ON position the range hold will be released.

Note for Reading the Display

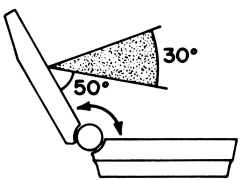
There is an optimum viewing angle which gives the highest contrast for the LCD display. We have provided several different detent positions so you can select the position that provides the clearest display.



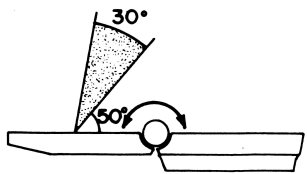
90°



150°



120°



180°

RANGE	A	B	C
200Ω	1.5V	150mV	650μA
2KΩ	0.65V	180mV	100μA
20KΩ	0.65V	300mV	23μA
200KΩ	0.65V	350mV	3μA
2000KΩ	0.65V	360mV	0.3μA

A is open circuit voltage at the jacks in volts.
B is voltage in volts across a resistance equal to full scale value.
C is current in amps through a short circuit at the input jacks.
All values are typical.

Note 2
Your unit has a circuit to protect the resistance ranges from over-voltage (500V AC 1 minute). But never connect a source of voltage when function switch is in K Ω/ →|← CHECK position.

Note 3
Your unit has a circuit to protect the resistance ranges from over-voltage. When measuring on the 200Ω range, the resistance of this circuit may affect the reading. To determine the error, short the test leads: the reading is the resistance of the circuit. Subtract this figure from the measured reading. Typically the circuit resistance is 1.8 ohms at its maximum. Or you can use 0-ADJ function. (See page 14.)

Zero Adjust Function

When resistances are measured with the conventional VOM (volt-ohm-milliammeter), the test leads have to be shorted and Zero Adjust has to be used every time you move from one range to another. But the MICRONTA Auto-Range Digital Multimeter suppresses the two least significant digits automatically from one range to the next.

Generally, the Zero Adjust function is unnecessary in any range. But the exception (which makes this an essential feature) lies in the measuring of very low resistance values – under 100 ohms. At these low levels, the readings can be influenced by the resistance of test leads, the fuse, and internal circuitry of your Multimeter.

Measuring Very Low Resistance Values

Notice, in the K OHM function, when you hold the leads together, the resistance reads about 1 ohm. The range has automatically shifted down to 200 ohm maximum. This is indicated by the ohm symbol (Ω) on the display.

When the actual resistance reading is about 1 ohm and "Ω" appears, 0-ADJ may be used. To do this, follow the procedures below.

Note: "0-ADJ" must not appear on higher " K OHM" ranges. If for any reason the sign still remains on the display without "Ω", then turn off the power switch once and turn it ON again.

1. Set the Function Switch to K OHM.
   Be sure the BUZZER-CONTINUITY switch is in the BUZZER position.
2. Short the test leads; the display will show 1.8 ohms at its maximum.
3. Set POWER switch to RANGE HOLD to stay in the 200 ohm range and keep the test leads shorted.
4. Press 0-ADJ. The display will show 00.0, and the words "0-ADJ" will appear on the display.
5. Measure the resistance, and you will get the correct reading.
6. Press 0-ADJ again or set the Function Switch to another position to release the zero-adjust function.

Notes:

1. In step 4, if the contact of the test leads is poor, the display might show minimal value (such as 00.1). Try shorting the leads again to make the display 00.0.
   The zero-adjust function "adjusts" the zero level to the value of circuit resistance, or, more precisely, the value that is shown on the display at the time 0-ADJ is pressed. If, for example, you press 0-ADJ while measuring a 1-ohm resistance, the zero level will be adjusted to the probe circuit resistance + 1 ohm (i.e. approximately 2.8 ohms total). Under this condition if you try to measure a 0.5-ohm resistance, the display will show –0.5 ohm. This won't happen often, but just in case it happens, nothing is wrong with your Meter.
2. The zero-adjust function is to be used only with K OHM.
3. Be sure to set the POWER switch to RANGE HOLD and the BUZZER-CONTINUITY switch to BUZZER. If you use the ON position, the range will shift upward when you open the test leads and zero-adjust is released.

DC Current Measurements/AC Current Measurements

To measure current, you must break the circuit and connect the leads to two circuit connection points. **Never connect the leads across a voltage source:** doing so will blow the Tester's fuse or, may damage the circuit being tested, or even your meter.

The maximum input limit for DC current/AC current measurement is 10A.

1. Place the Function Switch in the DC A or AC A position.
2. **200mA:**
   Set the 200mA—10A switch to the 200mA position.
   Plug the test leads into the correct jacks: the red lead into the + jack and the black lead to the —COM jack.
   10A:
   Set the 200mA—10A switch to the 10A position.
   Plug the test leads into the correct jacks: the red lead into the AC-DC AMPS ONLY 10 AMP. MAX jack and the black lead into the —COM jack.

   CAUTION: Always set the 200mA—10A switch to the 10A position (and use AC-DC AMPS ONLY 10 AMP. MAX jack) if you don't know the amount of current to be measured.
3. **Remove power from the circuit being tested;** then break the circuit at the appropriate point.
4. Connect probes to the circuit.
5. Apply power and read current.
6. In DC A if the polarity of the current being measured is negative, the value displayed will be preceded by a minus (—) sign.

Note: The AC/DC 200mA range is fuse-protected. If inoperative, check the fuse. The AC/DC 10A range is **not** fuse-protected.

WARNING
NEVER CONNECT THE LEADS ACROSS A VOLTAGE SOURCE WHILE FUNCTION SWITCH IS IN DC A OR AC A POSITION.

Diode Check

Since open-circuit voltage between input jacks is maintained at 1.5 Volts (when in the ⊣⊢ CHECK function), you can check continuity of most diodes, transistors, etc.

1. Set the Function Switch to the ⊣⊢ CHECK position.
2. Remove power from the circuit being tested.
3. Connect the probe to the semi-conductor device you want to check.
4. If the device is good, the display will show some value. If overrange occurs, try reversing polarity: if overrange still occurs, the device is open. If reading is very small or zero, the device is shorted.

Note: You cannot check LEDs since measurement of LED forward resistance typically requires over 2.1 volts.

Continuity Test/Buzzer

This tester has a built-in audible continuity function. Set Function Switch to K OHM and set BUZZER-CONTINUITY switch to CONTINUITY. The range is automatically set to 20K OHM. Connect probes to the circuit you want to check. If the circuit continuity is 300 ohms nominal (150–500 ohms limit), the buzzer will sound.

Do not set the BUZZER-CONTINUITY switch to the CONTINUITY position unless the function is set to K OHM. If you do, the Meter emits a warning tone. Set the switch to the BUZZER position.

In the BUZZER position the Meter sounds with function settings other than K OHM and ⊣⊢ CHECK when . . .

1. Function switch setting is changed (one short tone)
2. Range shifts upward (two short tones)

When shifting to a lower range, there is no sound.

REPLACEMENT OF BATTERY/FUSE

WARNING: TO AVOID ELECTRIC SHOCK, DISCONNECT MEASURING TERMINALS BEFORE REMOVING BATTERIES OR FUSE. REPLACE ONLY WITH SAME TYPE BATTERIES OR FUSE. DO NOT OPEN THE CASE.
THIS INSTRUMENT CONTAINS NO USER SERVICEABLE PARTS. SCREW REMOVAL BY QUALIFIED PERSONS ONLY.
CAUTION: FOR CONTINUED PROTECTION AGAINST FIRE, REPLACE ONLY WITH 0.315A, 250V FUSE.

Note:
The fuse used in your Digital Multimeter is a special size and type. Contact your local Radio Shack store for Catalog Number 270-1249.

1. Be sure **POWER** is OFF and test leads are disconnected.
2. Open the Battery/Fuse Compartment Cover.
3. Pull the red ribbon in the Fuse Compartment; the fuse will pop out.
4. Insert a new fuse on the ribbon ring. Use only a fuse of the same type/rating (0.315A, 250V, 5ϕ x 20mm Miniature fuse. Cat. No. 270-1249)
5. Install fuse (with ribbon) in the Fuse Compartment.
6. Close the Battery/Fuse Compartment Cover.

WARNING: DO NOT OPERATE YOUR UNIT UNTIL THE BATTERY/FUSE COVER IS IN PLACE AND FULLY CLOSED.

MAINTENANCE

Your Digital Multimeter is a precision electronic device. Do not touch any of the circuitry inside the Case. Do not expose to extreme temperatures [below -4°F (-20° C) or above 140°F (60°C)] ; protect it from extremely humid areas.

To avoid damage:

A. Never connect more than 1000 Volts DC or 500 Volts RMS AC.
B. Never connect a source of voltage when Function Switch is in K OHM position.
C. Never operate the DMM unless the Battery Cover is in place and fully closed.
D. Battery and/or Fuse replacement should only be done **after** the test leads have been disconnected and **POWER** is OFF.

The Micronta DMM comes to you fully calibrated and tested. Under normal use, no further adjustment should be necessary. If the meter should require repair, do NOT try to adjust by yourself; take it to your nearest Radio Shack store. SERVICE OF THE DMM BY UNAUTHORIZED PERSONNEL WILL VOID THE WARRANTY.

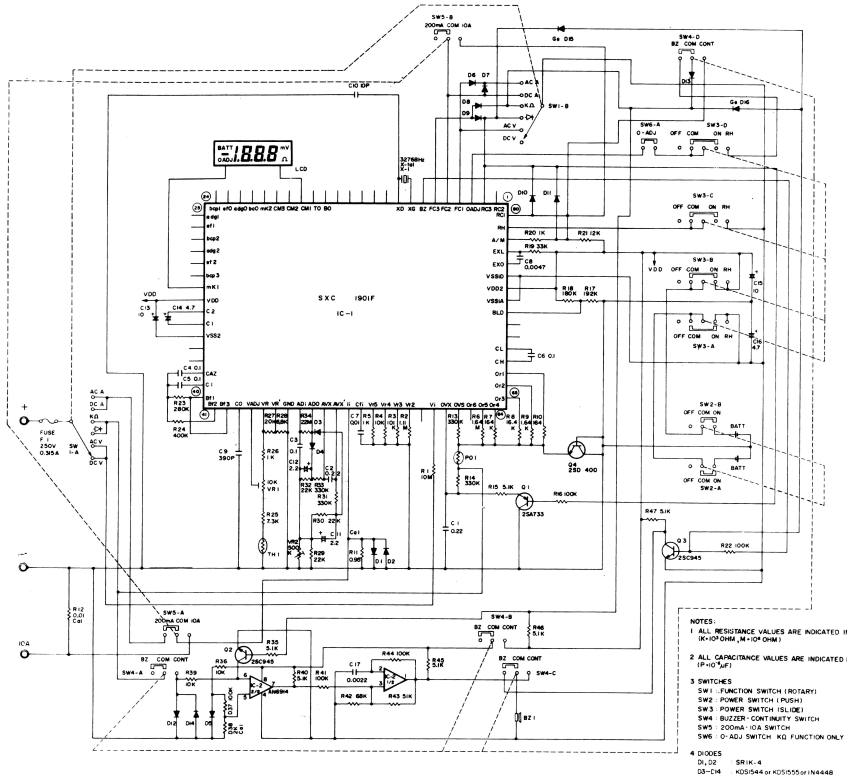
A WORD ABOUT SAFETY

Every precaution has been taken in the design of your meter to ensure that it is as safe as we can make it.

However, **safe operation depends on you.** We recommend that you follow these simple safety rules:

1. Never apply voltages to the DMM that exceed the limits given in the Specifications section. Never apply more than 1000 Volts DC or 500 Volts RMS AC between input jacks and/or ground.
2. Use extreme caution when working with voltages above 100V. Always disconnect power from the circuit being measured before connecting test leads to high-voltage points.
3. Always discharge filter capacitors before attaching test leads to a power supply.
4. Get into the habit of keeping one hand in your pocket when trouble-shooting any equipment containing high voltages. Using only one hand decreases the chance of electric shock.
5. Since many AC-DC sets have a potentially "hot" chassis, be sure that the top of your workbench and the floor underneath it is dry and is made of non-conductive material.

SCHEMATIC DIAGRAM



Note:

(1) ALL RESISTANCE VALUES ARE INDICATED IN "OHM" (K = 10^3 OHM, M = 10^6 OHM)

(2) ALL CAPACITANCE VALUES ARE INDICATED IN "μF" (P = 10^{-6} μF)

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 7JN.
In Australia, contact Tandy Australia Limited, National Parts Dept., 91 Kurrajong Avenue Mount Druitt, N.S.W. 2770.

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.

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

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Printed in Korea