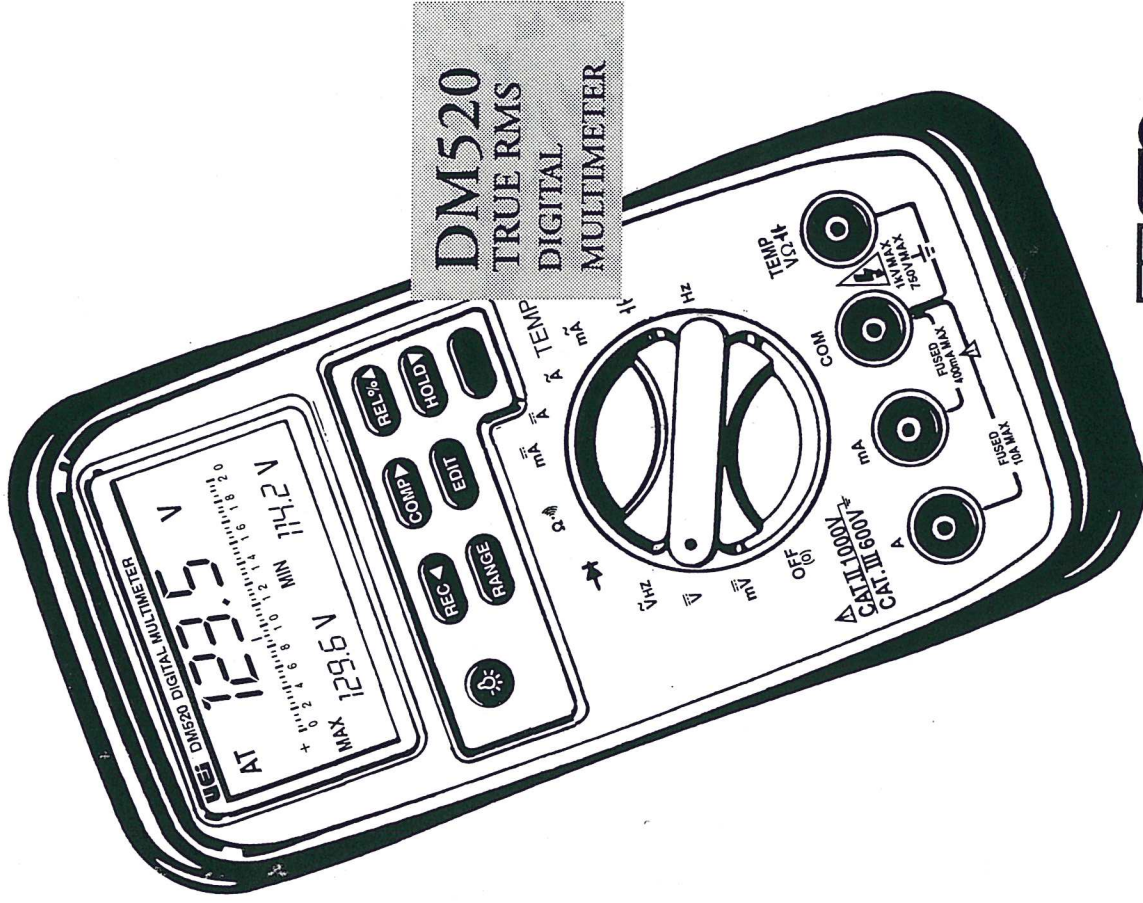


INSTRUCTION MANUAL



**DM520
TRUE RMS
DIGITAL
MULTIMETER**



UNIVERSAL ENTERPRISES, INC.

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(503) 644-8723 • Fax: (503) 643-6322

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MADE IN KOREA

ZDM520 (8/97)



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MADE IN KOREA









INTRODUCTION

SAFETY RULES

Warning!

Observe all safety precautions when measuring higher voltages and/or currents. Turn off power to the circuit under test, set the DM520 to the desired function and range, connect the test leads to the DM520 and then to the circuit under test. Reapply power. If an erroneous reading is observed, disconnect power immediately and recheck all settings and connections. Transient voltages (e.g. lightning) and harmonics can result in peak voltages that exceed the voltage rating of this instrument. Do not use it if you suspect either of these conditions exist.

INTERNATIONAL SYMBOLS

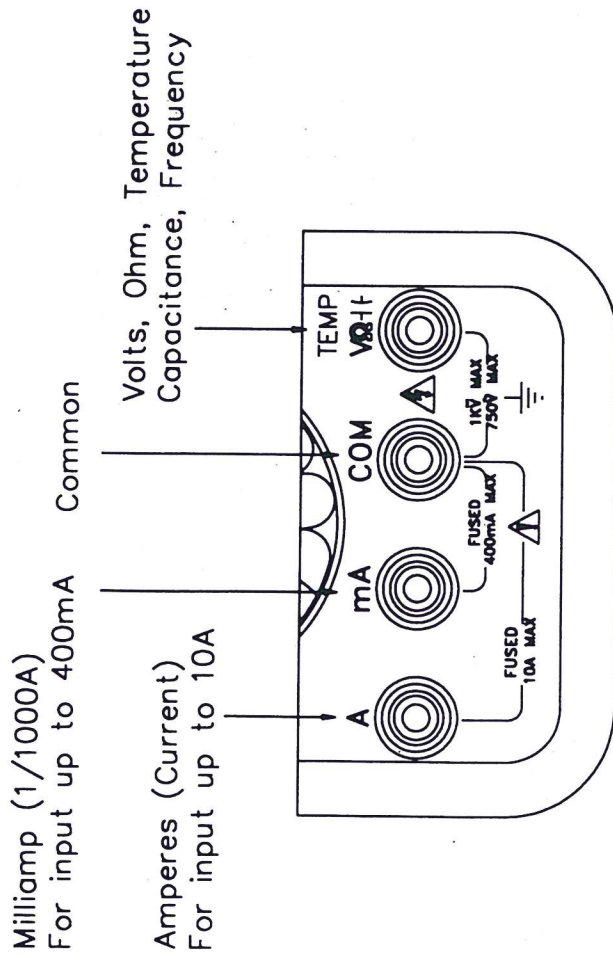
	DANGEROUS VOLTAGE		GROUND
	AC-ALTERNATING CURRENT		SEE EXPLANATION
	DC-DIRECT CURRENT		DOUBLE INSULATION (Protection Class II)
	EITHER DC or AC		FUSE

SAFETY TIP

Exceeding the specified limits of this meter is dangerous and can expose the user to serious and possible fatal injury. To ensure safe and appropriate use, please follow the appropriate guidelines.

- Remember. **THINK SAFETY AND ACT SAFELY**
- Read these operating instructions thoroughly and completely before operating this meter
- Pay particular attention to **WARNINGS** used for conditions and actions that pose a hazard to the user and **CAUTIONS** used for conditions and actions that may damage the meter
- Always inspect this meter, test probes and accessories for any sign of damage or abnormality before every use
- Never ground yourself and keep your body isolated from the ground
- Never touch exposed wiring, connections or any live circuit conductors
- Disconnect the live test probe before disconnecting the common test probe
- Use caution when working above 60V DC or 25V AC RMS. Such voltages pose a shock hazard

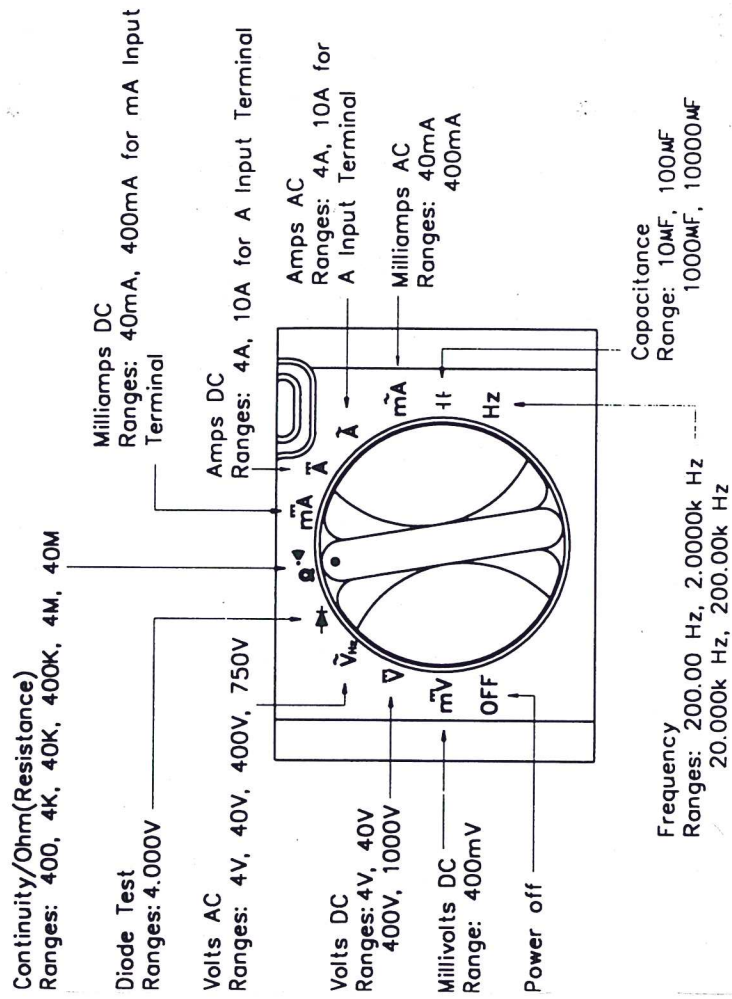
INPUT TERMINALS



WARNING

NEVER ATTEMPT A VOLTAGE MEASUREMENT IF A TEST LEAD IS IN THE AMP(A) OR MILLIAMP (mA) INPUT TERMINAL. YOU MIGHT BE INJURED OR THE METER MAY BE DAMAGED.

ROTARY SWITCH



PUSH BUTTONS

Press to select Compare Function. Press again to exit in edit mode: press to cursor right.

Press to select the Recording Function. Press to step through average and present readings. Press and Hold for two seconds to exit. In edit mode: Press to cursor left.

Press to select the back light On. It turns off automatically in 35 seconds. Press again to turn Off.

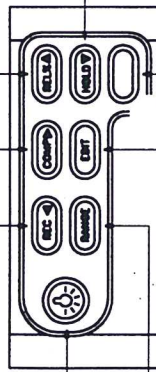
In Autorange (AT displayed): Press to select Manual Range. In Manual Range: Press to step up one Range at a time. Press and hold two seconds to select Autorange.

In COMP, REL % Mode: Press to select Edit Mode

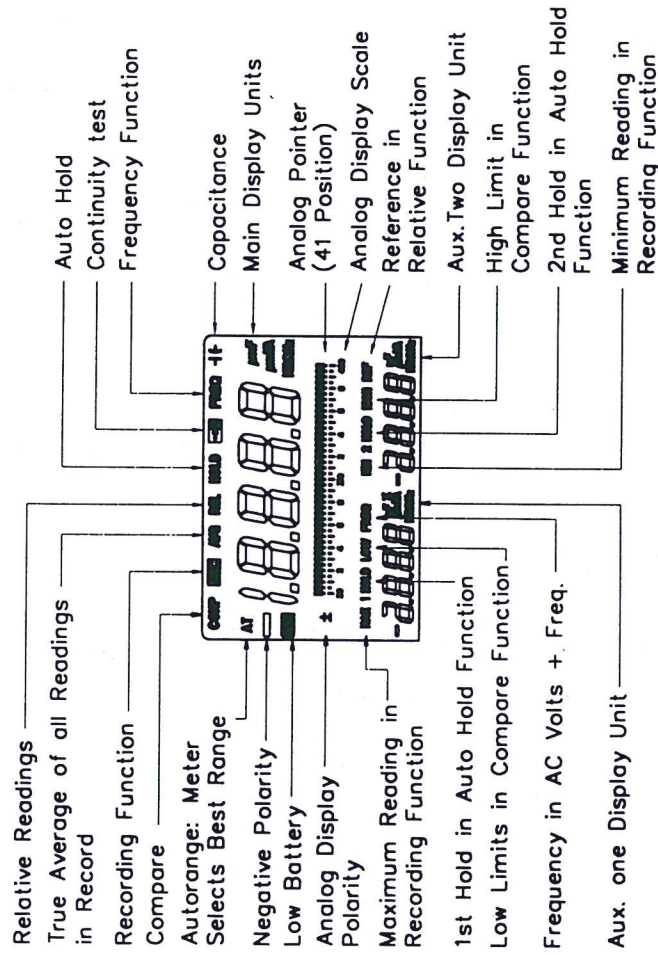
In Continuity/Ohm Function: Press to select the Continuity Function. Press again to Exit in Volts AC Function: Press to select the AC Volts + frequency. Press again to Exit. In DC Amp Function: Press to select the temperature. Press again to select °C or F.

Press to select the Relative Reading Function. Press again to exit. In edit mode: Press to change count up one count at a time.

Press to select Auto Hold Function. Press again to Exit. In edit mode: Press to change one count at a time.



DISPLAY



FEATURES

AC TRUE RMS

The meter measures TRUE RMS value of AC voltage and current. This capability provides accurate RMS values for non-sinusoidal waveforms.

ANALOG BAR GRAPH AND BAR POINTER

The meter has an analog bar graph display to see rapidly changing input signals. The value is indicated by the pointer in the bar graph. The reading resolution is 0.5. If the reading is more than 20, the graph will shift to the 20-40 range for better resolution.

AUTO POWER-OFF

Automatic power-off extends the battery life. The power will go off if either the rotary switch or a push-button is not activated for 30 minutes. The meter turns back on if the back light button is pushed.

LOW BATTERY INDICATION

The meter is powered by a 9V, alkaline battery. The UEI part number is AB10. For the guarantee of specified accuracy and performance, the meter requires certain level of battery power. If the display shows BAT, power is less than required, and the battery should be replaced with a new one.

COMPUTER COMMUNICATIONS AND AUTO POWER OFF OPTIONS

Some options can be selected only when you turn the meter on. To activate the RS-232C communication, turn the rotary switch on while pressing the "COMP" button. To disable the auto power-off function at the same time, also press the "REC" button along with the "COMP" button while you turn the rotary switch on.

BOOTS AND STAND

The meter comes with shock-absorbing boot to protect from rough handling.

PACKING AND ACCESSORIES

This meter comes complete and ready to use. Check the following contents list when unpacking. If any pieces are missing, notify your distributor.

- User operating manual
- Test probe set, red and black
- Temp. probe, temp. connector
- RS-232C communication cable (DM520S only)
- Diskette for RS-232C Communication (DM520S only)

RESOLUTION

Resolution means the smallest value parameter that a meter can measure. For example, DC volts have 400mV, 4.00V, 40.00V, 400.0V, 1000V ranges. When you measure 35.55V, you should use 40.00V range. If you use 400.0V or 1,000V, you will see 035.5V or 0035V respectively and the accuracy is far less than on the 40.00V range. If you use 400.0mV range to measure 35.5V, display will show OUCH. This stands for overload and means the input voltage is beyond the limit of that range.

SELECTING A RANGE

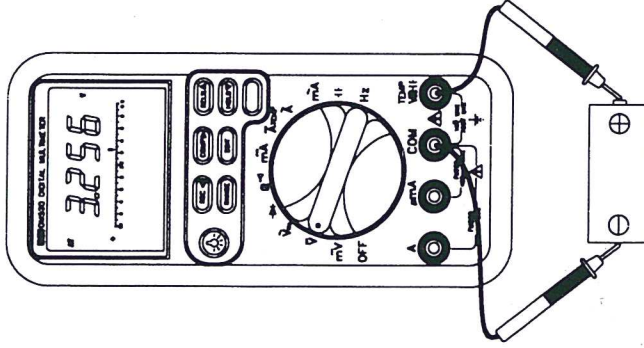
The meter has AUTO RANGE and MANUAL RANGE options. The meter defaults to auto range. When switched on, and you will see AT in the display. Press the RANGE button to change to manual range. To switch back to AUTO RANGE, press and hold RANGE button for two seconds. In AUTO RANGE, the meter is automatically detecting the optimum range for the input signal being measured.

MEASURING VOLTAGE

Voltage is the difference of electrical potential between two points.

WARNING: NEVER ATTEMPT A VOLTAGE MEASUREMENT IF MORE THAN 1,000V DC OR 750V AC OR UNKNOWN HIGH VOLTAGE.

1. Choose the correct voltage selection, (DC mV, DC V and AC V) and set the rotary switch to the proper position.
2. Voltage must always be measured with meter in parallel with the circuit.
3. When measuring AC V, you can simultaneously see frequency of input signal by pushing the RED button.
4. Minus sign (-) indicates negative polarity (DC voltage measurements only)
5. See the following connecting diagram. Meter shows the no-load voltage level of a battery.

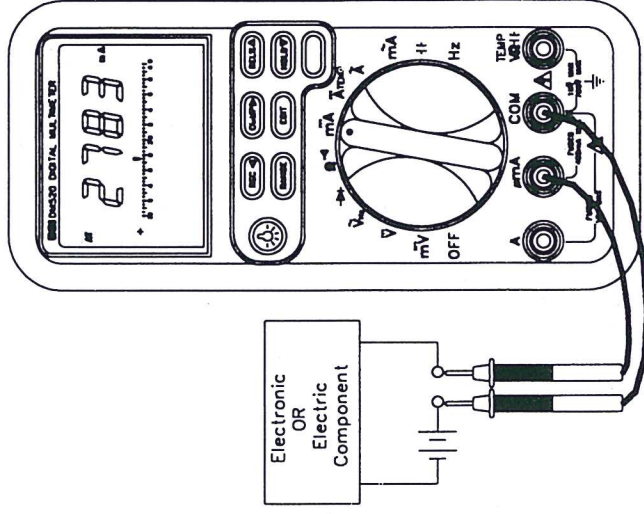


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MEASURING CURRENT

Current is the flow quantity of electrons through a conductor. It is measured in amperes.

WARNING: MAKE SURE THAT THE POWER IS DISCONNECTED BEFORE OPENING THE CIRCUIT. EVEN A SMALL AMOUNT OF CURRENT CAN BE DANGEROUS. DO NOT ATTEMPT A CURRENT MEASUREMENT WHERE VOLTAGE IS ABOVE 600V. IF THE FUSE BLOWS, YOU MIGHT BE INJURED OR THE METER DAMAGED.



1. Verify DC mA, DC A, AC mA and AC A and set the rotary switch to proper position.
 2. Current must always be measured with meter in series with the circuit.
 3. See the following connecting diagram. The meter shows the current flowing through the meter.
- WARNING:** Ensure circuit current does not exceed 10A. Ensure current readings above 400mA use "A" input port.
- NOTE:** CA483 AC Current clamp-on adapter is available as an optional accessory.

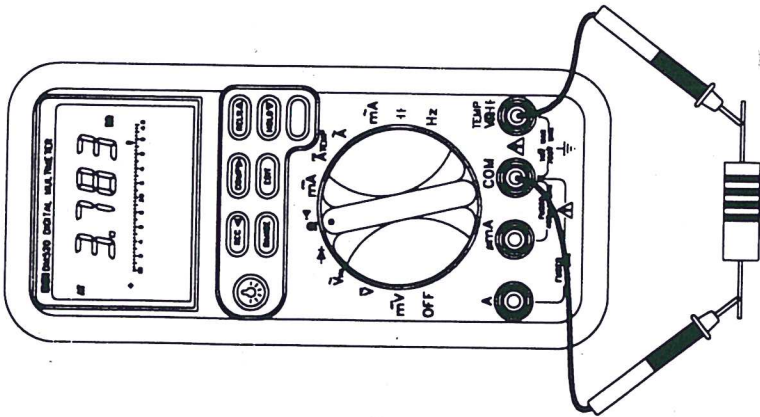
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MEASURING RESISTANCE

Resistance opposes the flow of current flowing through a conductor. Ohm is the unit of this resistance.

WARNING: ALL RESISTANCE MEASUREMENT SHOULD BE TAKEN ON DE-ENERGIZED CIRCUITS ONLY. TURN OFF POWER ON THE TEST CIRCUIT.

1. The resistance displayed on the meter is the total resistance through all possible paths between the red and black probe.
2. Resistance must always be measured with the meter connected in parallel across the component.
3. Resistance in the test leads is about 0.1 - 0.2 ohms. The relative function can be used to compensate for this test lead resistance.
4. Be sure that the contact between the probes and the circuit is clean. Contact resistance coming from dirt, oil, paint, etc. can seriously affect the measurement accuracy.
5. The illustration shows the meter measuring a resistor.

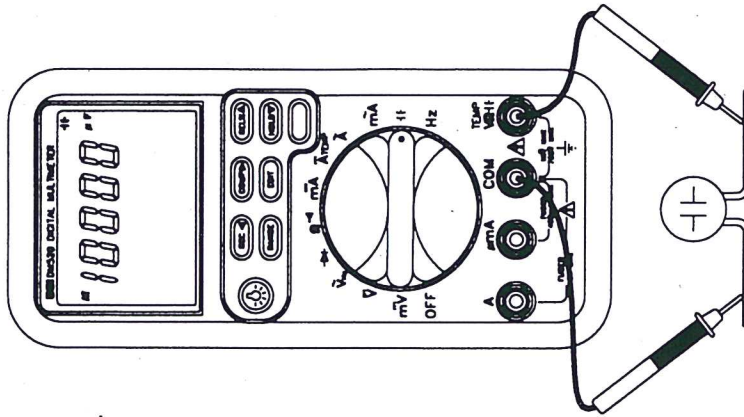


MEASURING CAPACITANCE

WARNING:

ALL CAPACITANCE MEASUREMENTS SHOULD BE MADE ON DE-ENERGIZED CIRCUITS ONLY. DISCHARGE THE CAPACITOR BEFORE MAKING MEASUREMENTS.

1. Capacitance must always be measured with the meter across the capacitor.
2. The illustration shows the meter measuring capacitance.

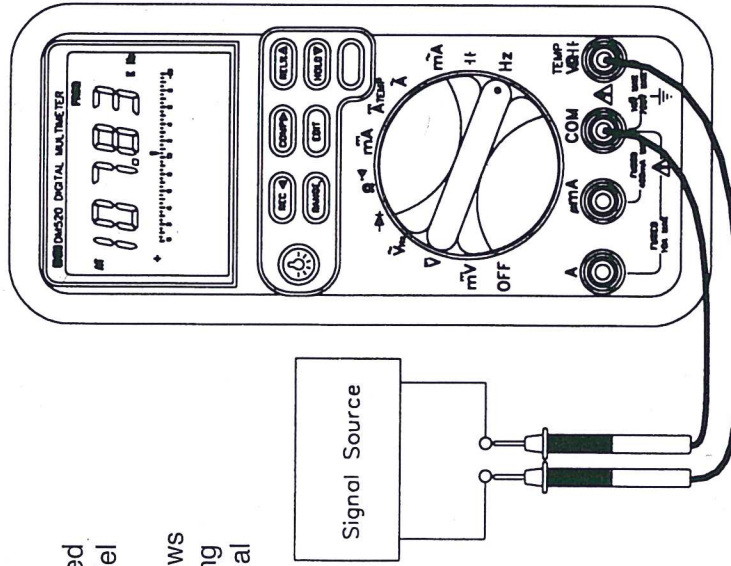


MEASURING FREQUENCY

WARNING:

NEVER ATTEMPT A VOLTAGE MEASUREMENT IF THERE IS MORE THAN 600V OR UNKNOWN HIGH VOLTAGE.

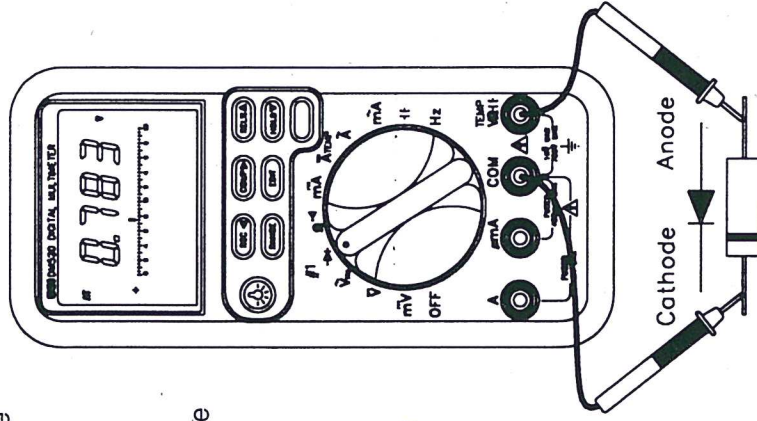
1. Set the rotary switch to proper position.
2. Frequency must always be measured with meter in parallel with the circuit.
3. The illustration shows the meter measuring frequency of a signal source.



DIODE TESTING

A good diode allows current to flow in one direction. To test a single diode, turn the power off and remove the diode from the circuit.

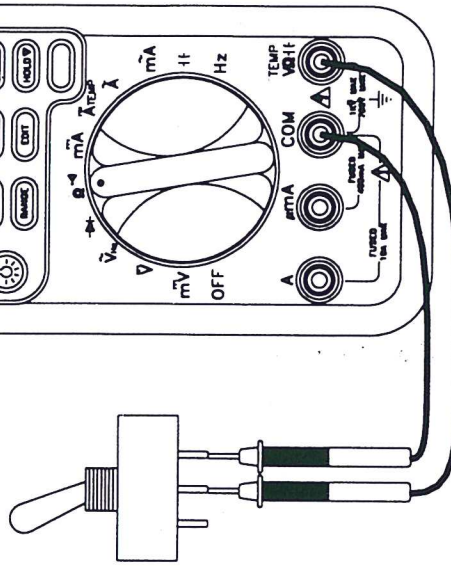
1. Set rotary switch to \rightarrow position. Connect the red probe to the plus (+) side of the diode and the black probe to the minus (-) side.
2. If diode is good, the voltage drop should be 0.5V - 0.8V.
3. Reverse the probes and measure the voltage across the diode again.
 - If diode is good, the display shows 0.
 - If diode is shorted, the display shows 0 in both directions.
 - If display shows OUCH in both directions, the diode is open.
4. See the following connecting illustration.



CONTINUITY TESTING

The continuity test creates a tone, if the circuit is closed. The meter detects, opens and shorts in as little as 100 milliseconds (mS). This can be a powerful aid when looking for intermittent problems associated with cable, connections, switches, relays, etc.

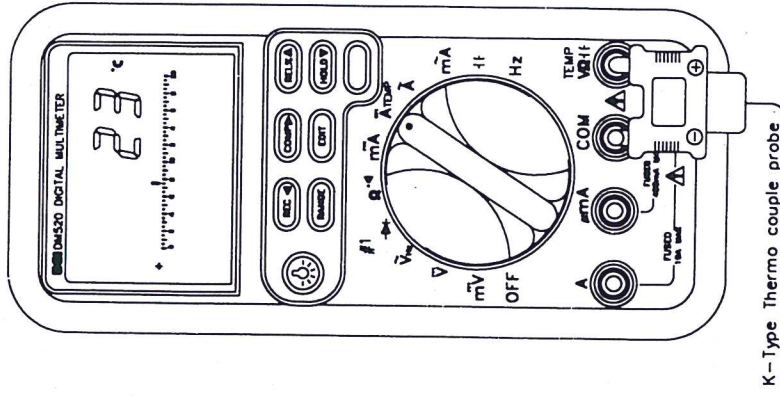
1. Set the rotary switch to the ohm position and push the RED button. This puts the meter in the continuity mode.
2. The LCD shows the continuity symbol.
3. Touch the probes to the circuit and listen for the tone. The tone confirms that the circuit is closed.
4. See the following illustration to test the continuity of a switch.



MEASURING TEMPERATURE

Temperature measurement requires a K-type ThermoCouple Probe and Connection Adapter (UEI part no. ATA1).

1. Set the Rotary switch to TEMP position.
2. Default display is DC Ampere.
3. Input Thermo Couple Probe into COM and Temp socket, observing the polarity marked on the Thermo Couple plug.
4. Press the RED shift button down. The meter is shifted to Celsius (°C) temperature measurement.
5. To change to Fahrenheit (°F) temperature, push the RED shift button again.
6. See the following connecting diagram.



K-Type Thermo couple probe

ADVANCED FUNCTIONS

DM 520 DESCRIPTION

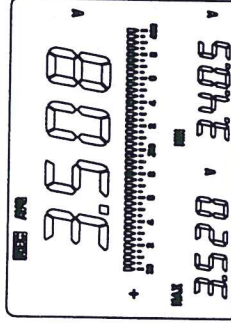
This DMM can compare live signals to pre-defined measurement limits. These limits can be acceptable measurements made from known good components, or they can be entered in precisely by hand.

The comparison can be between an upper and lower limit, or it can be a relative comparison between the live signal and a single pre-defined 'good' value. When the DM520 is comparing a live signal to its two stored (upper and lower) limits, we call this the COMPARE mode. When the meter is comparing the live signal to a single absolute reference value, it is called the RELATIVE measurement mode.

When using the COMPARE function, pressing the EDIT function button allows you to directly enter in upper and lower test limits. Use the REC and COMP function buttons to select which digit you want to modify, then use the REL% and HOLD buttons to enter in the number you want. When you are finished, pressing the EDIT function button again allows you to exit the editing mode - live comparisons will now be made.

RECORD

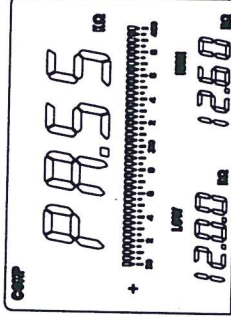
REC button captures and displays maximum(MAX) and minimum(MIN) values simultaneously on the secondary display in the lower part of the LCD. If you push the REC button again, the meter calculates and displays the average (AVG) in the main part of the LCD together with the MAX. and MIN. To escape this REC mode, Press and hold REC button for about two seconds.



COMPARE

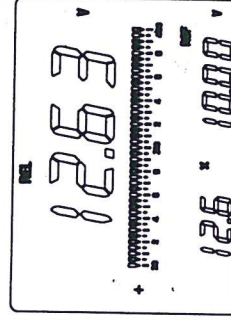
The COMP button verifies whether the input signal is within the specified tolerance limits and is set by the EDIT function. (See EDIT below to set HIGH and LOW limits). The meter displays the following:

- PASS for signals in tolerance
- HI for signals above the high limit
- LO for signals below the low limit
- Default high and low limits are presently displayed values.



RELATIVE %

The REL% button enables you to measure the percentage(%) of difference of the input signal to reference(REF) value. The reference value can be set by the EDIT function. (See EDIT below to set the REF value.) In this mode, the display shows the difference between the reference value set on the right side of the display. The left side display shows the percentage difference. The main display is the actual difference.



MAINTENANCE

BATTERY REPLACEMENT

When meter displays BAT, the battery must be replaced to maintain proper operation.

1. Disconnect and remove all test probes from any live source and meter.
2. Open the bottom case.
3. Remove the old battery and install a new battery into the holder.
4. Assemble the case.
5. Test the battery by turning on the meter.

FUSE REPLACEMENT

1. Disconnect and remove all test probes from any live source and meter.
2. Open the case.
3. Remove circuit board assembly.
4. Locate the defective fuse and remove it by gently prying loose one end of the fuse and sliding the fuse out of the fuse bracket.
5. Install a new fuse of the SAME SIZE AND RATING.
6. Assemble the case.

PART NUMBER

AF135:

AF113:

FUSE RATING

0.5 AMP @ 600V

10 AMP @ 600V

REFERENCE EDITING

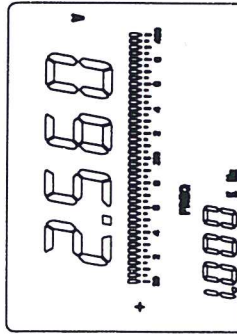
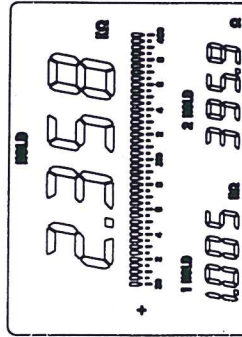
In the COMP and REL% modes you can edit the HIGH/LOW limits and REF values (for REF). First, select the COMP or REL% mode, and press the EDIT button. You will be in the EDIT mode. When you are in this mode, the blinking digit is the one that will be edited by using the UP and DOWN arrows. The arrows pointing LEFT and RIGHT are used to shift to the digit you wish to change. Once you have shifted to the desired digit, use the UP and DOWN arrows to set the desired number. Holding down the UP or DOWN arrow key will result in the number changing at a constant rate. To return to making the measurement, press EDIT again.

TWO HOLD SYSTEM

The HOLD button captures and holds the stable reading on the display under 1 HOLD. When a new stable reading is entered, the beeper sounds and the 1 HOLD display is updated. The previous HOLD reading is moved and still on display under 2 HOLD for your time-lag comparison.

AC WITH HZ

The meter can measure the AC voltage and frequency of the same signal simultaneously. Press the RED button when measuring AC V; the frequency will be displayed on the left secondary display.



ACCURACY DC V

Range	Resolution	Accuracy	Impedance
400 mV	0.1 mV	± (0.3% + 2)	10M Ω
4.000 V	0.001 V		
40.00 V	0.01 V		
400.0 V	0.1 V		
1000 V	1 V		

DC A

Range	Resolution	Accuracy	Overload Protection
40.00 mA	0.01 mA	± (0.5% + 5)	0.5A/250V
400.0 mA	0.1 mA		
4.000 A	0.001 A	± (0.75% + 5)	10A/250V
10.00 A	0.01 A		

DC mA

Range	Resolution	Accuracy	Overload Protection
40.00 mA	0.01 mA	± (0.5% + 5)	0.5A/250V
400.0 mA	0.1 mA		
4.000 A	0.001 A	± (0.75% + 5)	10A/250V
10.00 A	0.01 A		

ACV

Range	Resolution	45Hz-450Hz	0.45kHz-5kHz
4.000 V	0.001 V	± (0.75% + 5)	Unspec'd
40.00 V	0.01 V		
400.0 V	0.1 V		
750 V	1 V		
Range	Resolution	5kHz-20kHz	Impedance
4.000 V	0.001 V	Unspec'd	10M Ω
40.00 V	0.01 V	± (2.5% + 5)	
400.0 V	0.1 V	Unspec'd	
750 V	1 V	Unspec'd	

AC mA

Range	Resolution	Accuracy	Overload Protection
40.00 mA	0.01 mA	± (0.75% + 5)	0.5A/250V
400.0 mA	0.1 mA		
4.000 A	0.001 A	± (1.5% + 5)	10A/250V
10.00 A	0.01 A		

RESISTANCE

Range	Resolution	Accuracy	Overload Protection
400.0 Ω	0.1 Ω	± (0.5% + 5)	600V DC or AC Peak
4.000 kΩ	0.001 kΩ		
40.00 kΩ	0.01 kΩ		
400.0 kΩ	0.1 kΩ		
4.000 MΩ	0.001 MΩ		
40.00 MΩ	0.01 MΩ	± (1% + 10)	

FREQUENCY

Range	Resolution	Accuracy	Overload Protection
200.00 Hz	0.01 Hz	± (0.05% + 2)	600V DC or AC Peak
2.0000 kHz	0.0001 kHz		
20.000 kHz	0.001 kHz		
200.00 kHz	0.01 kHz		

TEMPERATURE

Range	Resolution	Accuracy
-50 °C to -20 °C (-58 °F to -6 °F)	1 °C (1 °F)	± (2.5%+2 °C) ± (2.5%+3.6 °F)
-20 °C to 350 °C (-6 °F to 662 °F)		± (0.5%+2 °C) ± (0.5%+3.6 °F)
350 °C to 1000 °C (663 °F to 1832 °F)		± (2.0%+2 °C) ± (2.0%+3.6 °F)

DIODE TEST

Test Voltage	Max Test Current	Over Load Protection
3V	Approx. 2.5mA	600V DC or AC Peak

CONTINUITY TEST

Test Voltage	Threshold	Over Load Protection
3V	1000 digits	600V DC or AC Peak

CAPACITANCE

Range	Resolution	Accuracy	Overload Protection
10.00 uF	0.01uF	± (3% + 5)	600V DC or AC Peak
100.0 uF	0.1uF		
1000 uF	1 uF		
10000 uF	1 uF		

OPERATING SPECIFICATIONS

Meter Operating Temperature	: -10 to 45 °C (14 to 113 °F)	DISPLAY Digital	: Counts : 4,000 (Frequency range: 20,000) Update Rate : 4/Sec.
Meter Storage Temperature	: -40 to 60 °C (-40 to 140 °F)	Analog	: 2 × 41 Segments Update Rate : 20/Sec.
Relative Humidity	: 0% to 80% (0 to 35 °C, 32 to 95 °F) : 0% to 70% (35 to 55 °C, 95 to 131 °F)		
Temperature Coefficient	: 0.1 × (Specified Accuracy) / °F (for temperatures <18 °F or > 28 °F)		
Replacement Fuses	: UEI part Number: AF135: .5 amp @ 600V AF113: 10 amp @ 600V		
Power Requirements	: Single 9V Battery UEI Part Number: AB10		
Battery Life	: 200 hrs. typical (Alkaline)		
Size (H × W × L)	: 31mm × 89mm × 189mm (1.22 In. × 3.5 In. × 7.44 In.)		
Weight	: 315g (11.1 oz)		
Maximum voltage between any terminal and ground	: 1000V		
Fuse Protection			
mA	: 0.5A/250V		
A	: 10A/250V		