



ATD-5540

AUTOMOTIVE MULTIMETER

## Safety

### DANGER

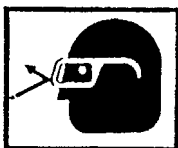
- Engines produce carbon monoxide which is odorless, causes slower reaction time, and can lead to serious injury. When the engine is operating, keep service areas WELL VENTILATED or attach the vehicle exhaust system to the shop exhaust removal system.



- Set the parking brake and block the wheels before testing or repairing the vehicle. It is especially important to block the wheels on front-wheel drive vehicles; the parking brake does not hold the drive wheels.



- Wear an eye shield when testing or repairing vehicles.



Exceeding the limits of this meter is dangerous. It will expose you to serious or possibly fatal injury. Carefully read and understand the cautions and the specification limits of this meter.

- Voltage between any terminal and ground must not exceed 600V DC or 600V AC.
- Use caution when measuring voltage above 25V DC or 25V AC.
- Circuit tested must be protected by a 10A fuse or circuit breaker.
- Do not use the meter if it has been damaged.
- Do not use the test leads if the insulation is damaged or if metal is exposed.



## Safety Cont 'd...

### Danger

- Avoid electrical shock: do not touch the test leads, tips or the circuit being tested.



- Do not try a voltage measurement with the test leads in the 10A or the mA terminal.
- When testing for the presence of voltage or current, make sure the meter is functioning correctly. Take a reading of a known voltage or current before accepting a zero reading.
- Choose the proper range and function for the measurement. Do not try voltage or current measurements that may exceed the ratings marked on the Function/Range switch or terminal.
- When measuring current, connect the meter in series with the load.
- Never connect more than one set of test leads to the meter.
- Disconnect the live test lead before disconnecting the common test lead.
- The mA and the 10A terminals are protected by fuses. To avoid possible injury or damage, use only in circuits limited to DC 10A for 60 seconds.


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





### See also...

- Fuse Replacement

## Safety Cont'd...

### IMPORTANT

- To maintain accuracy of the meter, replace the discharged battery immediately when the battery symbol  appears on the meter display.
- Avoid measuring error from outside interference: keep the meter away from spark plug or coil wires.
- Avoid damaging the meter when testing voltage: disconnect the test leads from the test points before changing functions.
- Do not exceed the limits shown in the table below:

FUNCTION	Terminal	Input limit
DC Volts	 VHz 	600 Volts DC
Frequency	 VHz 	500 Volts AC/DC
Ohm(resistance)		250 Volts AC/DC
Diode		
DC 10A	10A	*10A AC/DC
RPM	 VHz 	500 Volts AC/DC
Duty Cycle(%)		
Dwell angle		

- ★ 10 Amp measurement for 60 seconds maximum.
- ① Ohms can not be measured if voltage is present, ohms can be measured only in a non-powered circuit. However, the meter is protected to 250 volts

## Meter Basics

### 1. Display:

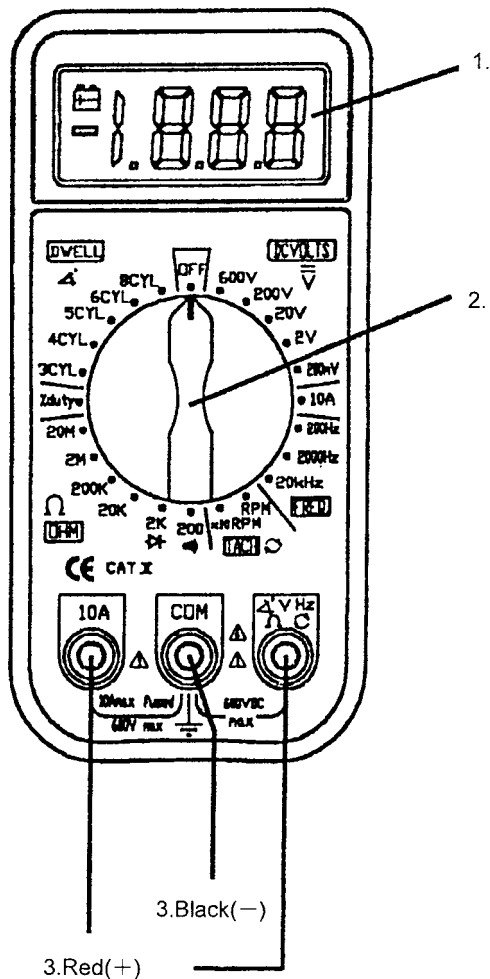
Large 3 1/2 digit (1999 counts) LCD display with low battery indication.

### 2. Rotary Selector Switch:

Turn this switch to Select a function or turn the meter OFF.

### 3. Test Lead Terminals:

The Black test is used in the common(COM) terminal for all rests. The Red test Lead is used to measure Amp or Volts.



## Meter Functions-Voltage (DCV)

⇒ The meter will automatically select the best voltage (V) range.

Insert:

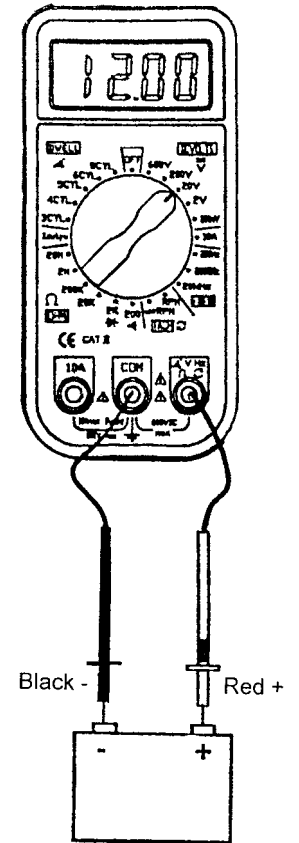
- Black lead in **COM** terminal.
- Red lead in **V-Ω-RPM** terminal Touch the Black probe to ground or to the negative (-) circuit.

Touch the Red probe to the circuit coming from the power source

**IMPORTANT: voltage must be measured in parallel (Red probe measuring circuit from power source).**

⇒ **Accuracy**

Selection of a lower range will move the decimal point one place and increase the accuracy. An “1” display means the range is too low,select the next higher range.



## **!** WARNING

When measuring voltage,be sure the Red test lead is in the terminal marked “V”.If the test lead is in an Amp (A)or Milliampere (mA) terminal, you may be injured or the meter damaged.

## Meter Functions – Resistance ( $\Omega$ )

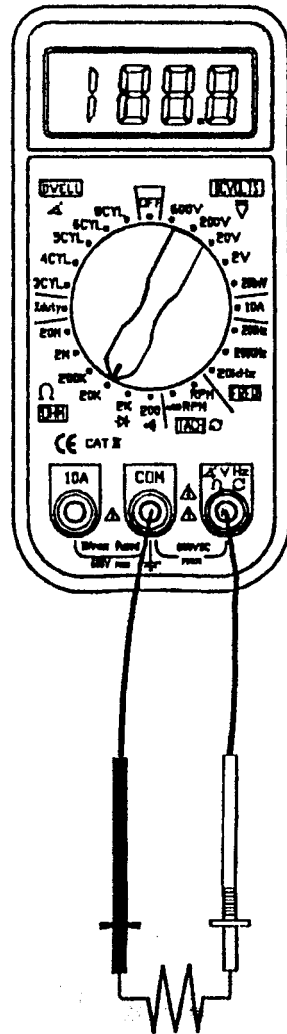
**IMPORTANT:** If you are testing an application that has capacitors in the circuit, be sure to turn the power OFF on the test circuit and discharge all capacitors. Accurate measurement is not possible if external or residual voltage is present.

⇒ Select the **resistance** (  $\Omega$  ) range with the rotary switch.

Insert:

- Black lead in **COM** terminal.
- Red lead in **V-  $\Omega$  -RPM** terminal.

Touch the test lead probes across the resistor to be tested.



## Meter Functions – Diode Check ( $\rightarrow|$ )

**IMPORTANT:** Turn the power OFF to the test circuit

⇒ Select the **Diode Check** (  $\rightarrow|$  ) setting with the rotary switch.

Insert:

- Black lead in **COM** terminal.
- Red lead in **V-  $\Omega$  -RPM** terminal.

Touch the Black test probe to the negative (-) side of the diode.

Touch the Red test probe to the positive (+) side of the diode.

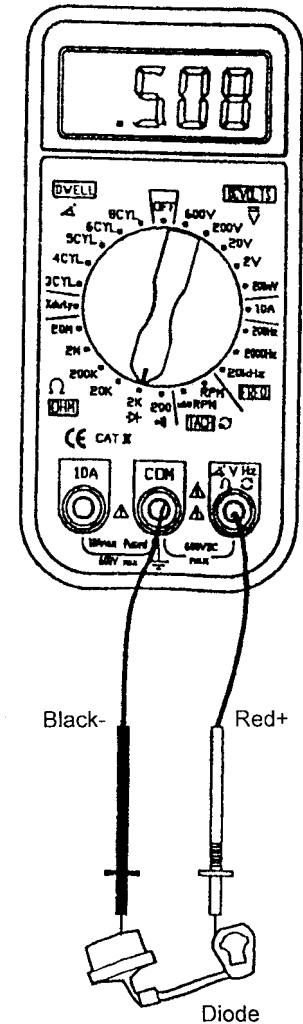
Reverse the probes : Black to the positive (+) side and Red to the negative (-) side.

*Note:*

A "good" diode will read low in one direction and high in the other direction when the probes are reversed (or vice versa).

A defective diode will have the same reading in both directions or read between 1.0 to 3.0V. in both directions

Diode	- to +	Reverse Probes + to -
Good	.4 to .9V	OL
	OL	.4 to .9V
Bad	OL	1.0 to 3.0V
	1.0 to	OL
	.4 to .9V	.4 to .9V
	OL	OL
	.000V	.000V



## Meter Functions – Audible Continuity ( ••••• )

**IMPORTANT:** Turn the power OFF on the test circuit

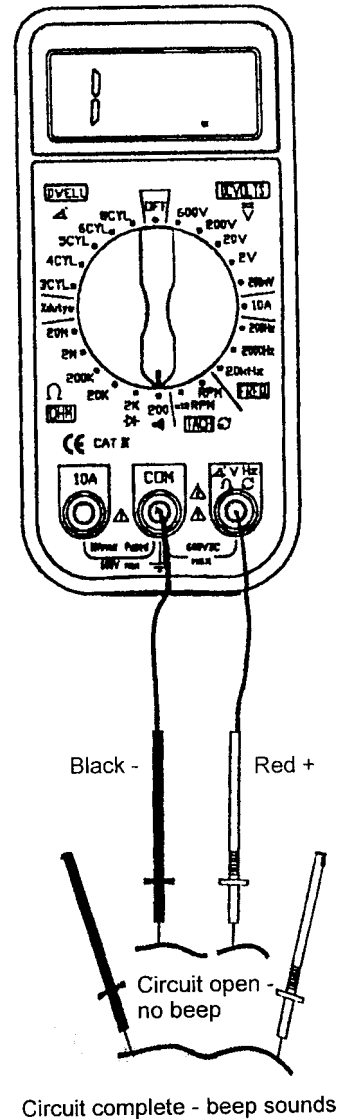
⇒ Select the **Audible Continuity** ( ••••• ) range with the rotary switch.

Insert:

- Black lead in **COM** terminal.
- Red lead in **V – Ω – RPM** terminal.

Connect one test probe to each end of the circuit to be tested.

- Circuit complete, the meter will beep continuously.
- Circuit open, there is no beep and the display shows to “1” (over limit)



## Meter Functions DC Current (A)

**IMPORTANT :** All current measured flows through the meter.

It is important that you do not:

- Measure current greater than 600 Volts AC or DC, with respect to ground.
- Exceed 60 seconds when measuring continuous current between 1A-10A. Allow five minutes for cool down before continuing.

⇒ Select the **10A** range with the rotary switch.

Insert:

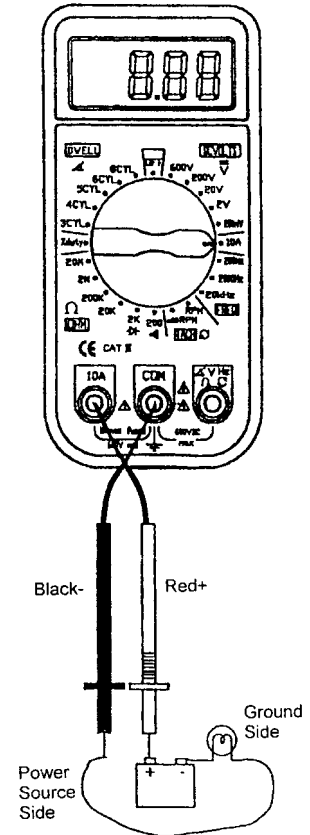
- Black lead in **COM** terminal.
- Red lead in the **10A** terminal

**IMPORTANT:**

**Turn OFF all power to the circuit or disconnect the circuit from the power source.**

Connect:

- The Red probe to the side of the circuit closest to the power source.
- The Black probe to the side of the circuit to ground.
- Turn the power ON and test.



*Note:*  
Current must always be measured with the meter test probes connected in series, as described.

## Meter Functions-RPM/x10RPM

⇒ Select the **RPM** range with the rotary switch.

or

⇒ Select the **x 10RPM** range with the rotary switch (1,000 to 12,000 RPM). Multiply the displayed reading times by ten to get actual RPM.

Insert the inductive pickup connecting terminal into the meter.

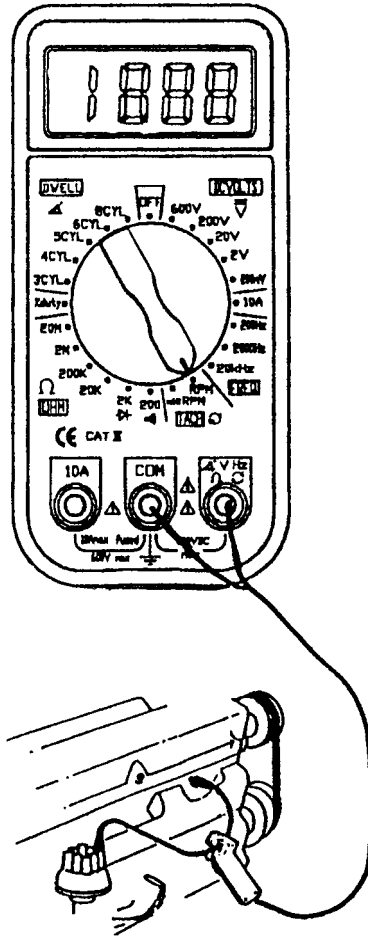
- Ground lead in **COM** terminal.
- Output lead in **V - Ω - RPM** terminal.

Connect the inductive pickup to a spark plug wire. If no reading is received, unhook the clamp, turn it over and connect again.

### Note:

• Position the inductive pick-up as far away from the distributor and the exhaust manifold as possible.

• Position the inductive pick-up to within six inches of the spark plug or move it to another plug wire if no reading or an erratic reading is received.



## Meter Functions-Frequency(Hz)

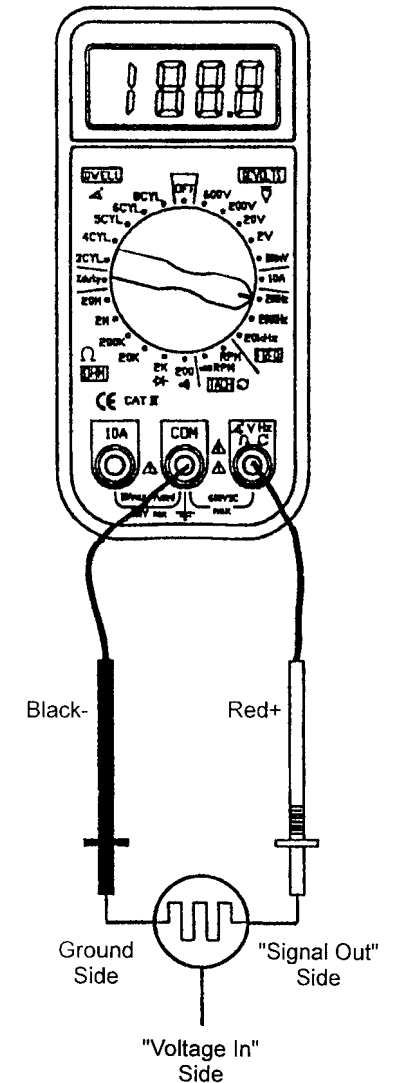
⇒ Select the **Frequency(Freq)** setting with the rotary switch.

⇒ Set the rotary switch to the Frequency range that gives the most accurate measurement reading.

Insert:

- Black lead in **COM** terminal.
- Red lead in **V - Ω - RPM** terminal. Connect the Black test probe to ground.

Connect the Red test probe to the "signal out" wire of the sensor to be tested.



## Meter Functions-Dwell

⇒ Select the proper **Dwell** range with the rotary switch.

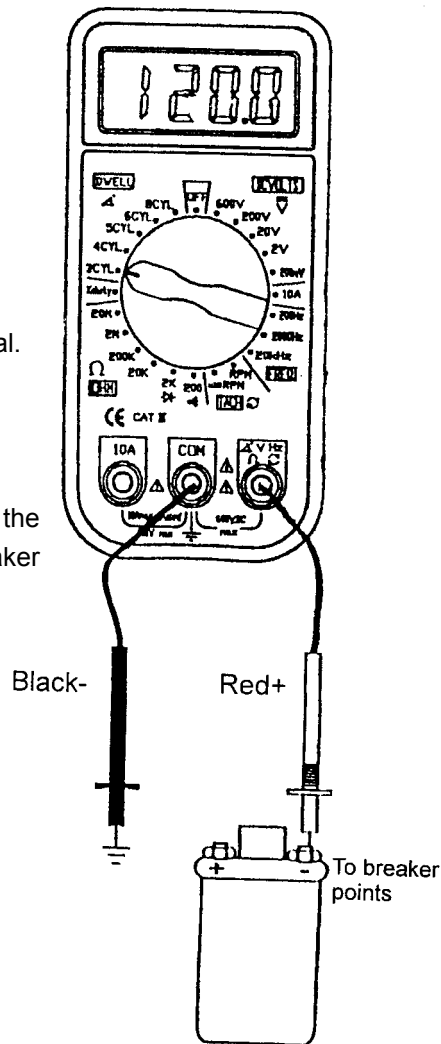
Insert:

· Black lead in **COM** terminal.

· Red lead in **V-Ω-RPM** terminal.

Connect the Black test probe to ground.

Connect the Red test probe to the wire that connects to the breaker points (see illustration).



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## Meter Functions-Duty Cycle (%)

⇒ Select the % **Duty Cycle** range with the rotary switch.

Insert:

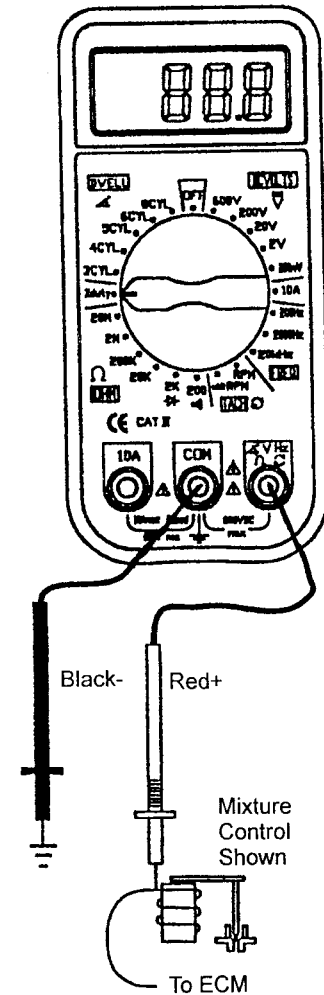
· Black lead in **COM** terminal.

· Red lead in **V-Ω-RPM** terminal.

Connect the Black test probe to ground.

Connect the Red test probe to the signal wire circuit.

The illustration for a mixture control solenoid is shown with the metering rod in the closed position. The meter will display the percentage of time the plunger is in the closed position (low duty cycle) during one duty cycle.



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## Maintenance

### Fuse and Battery Replacement

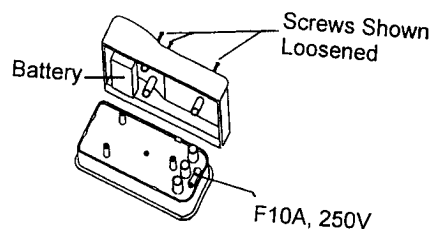


#### WARNING:

- **Avoid electrical shock: remove test leads before opening case.**
  - **Do not operate the meter or rotate the meter switch when the case is open.**
1. To replace a battery or fuse, loosen the three screws in the case back and remove the case by lifting up and forward .
  2. Replace the battery with an 9 Volt alkaline battery.

#### Important:

- **To prevent contamination of the circuits, your hands must be clean and the printed circuit board must be held by the edges.**
  - **Replace the fuses with the same type of fuse.**
  - **10 A is a F 10 A ,250V high energy, fast acting fuse.**
  - **Make sure the replacement fuse is centered in the fuse holder.**
- 3.Re-assemble the case. Fasten the three screws.



## Trouble Shooting

### 1. Meter will not turn ON.

- Check the battery contacts for a tight fit.
- Check for a minimum battery voltage of 8.0 volts.

### 2. Ampere reading is erratic or there is no reading at all.


- Disassemble the meter back cover and test the fuses for continuity.

### 3. Meter reading is erratic.

- Printed circuit board contaminated from handling with hands.
- Low battery.
- Open circuit in a test lead (frayed or broken wire).
- Wrong range selected.
- “Blown” fuse.

## General Specifications

### GENERAL SPECIFICATIONS

- **Display** : 3 1/2digit(1999 counts)liquid crystal display(LCD)
- **Polarity** : Automatic,(-)negative polarity indication.
- **Overrange Indication** :“1” mark indication.
- **Low Battery Indication**: The  is displayed when the battery voltage drops below the operating level.
- **Measurement Rate** :2 times per second ,nominal.
- **Operating Environment** : 0°Cto 50°C (320 °F to 122 °F)

at<70% R.H.

- **Storage Environment** : -20°C to 60°C (-4 °F to 140 °F )  
at<80%R.H
- **Temperature Coefficient** :  $0.2 \times (\text{specified accuracy}) / ^\circ\text{C}$   
( < 18 °C or > 28°C ).
- **Power** : Single standard 9 Volt battery (NEDA 1604 or IEC6F22).
- **Battery Life** : 200 hours typical with alkaline battery.
- **Fuse** : 10A/600V,6.3×25mm fast acting ceramic type.
- **Dimensions** : 147mm(H)×70mm(W)×39mm(D).
- **Weight** : Approx.222g(Meter Only),355g(With Holster).

## Electrical Specifications

### ELECTRICAL SPECIFICATIONS\*

Accuracy is given as  $\pm([\% \text{ of reading}] + [\text{number of least significant digits}])$  at 18°C to 28°C (65°F to 83°F), with relative humidity up to 70%.

#### RPM(Tach)

Ranges:600-2000, 6000-12000(x10RPM)

Resolution:1 RPM

Effect Reading:>600RPM

Accuracy: $\pm(2\% \text{ rdg} + 4 \text{ dgts})$

Overload protection:500VDC or RMS AC

### %DUTY CYCLE

Ranges:1.0%-90.0%

Resolution:0.1%

Pulse width:>100us,<100ms

Accuracy: $\pm(2.0\% \text{ rdg} + 5 \text{ dgts})$

Overload protection: 500VDC or RMS AC

### DWELL ANGLE

No.of cylinders:3,4,5,6,8

Ranges:0-120.0°(3CYL),0-90.0°(4CYL),0-72.0°(5CYL),  
0-60.0°(6CYL),0-45.0°(8CYL)

Resolution:0.1

Accuracy: $\pm(2.0\% \text{ rdg} + 5 \text{ dgts})$

Overload protection: 500VDC or RMS AC

### DC VOLTAGE

Ranges : 200mV, 2V, 20V, 200V, 600V

Resolution :100  $\mu$  V

Accuracy : $\pm(0.5\% \text{ rdg} + 1 \text{ dgt})$  on 200mV

$\pm(0.8\% \text{ rdg} + 1 \text{ dgt})$  2V to 600V ranges

Input impedance :10M  $\Omega$

Overload protection:600VDC or AC rms.

### DC CURRENT

Ranges:10A

Resolution:10mA

Accuracy: $\pm(3.0\% \text{ rdg} + 3 \text{ dgts})$

Input protection:10A/250V fast acting ceramic fuse on 10A input

### **RESISTANCE**

Ranges : 200  $\Omega$  , 2K  $\Omega$  , 20K  $\Omega$  , 2M  $\Omega$  , 20M  $\Omega$

Resolution : 100m

Accuracy : $\pm(0.8\%rdg+3dgts)$  on 200  $\Omega$

$\pm(0.8\%rdg+2dgts)$  on 2K  $\Omega$  to 2M  $\Omega$  ranges

$\pm(1.5\%rdg+5dgts)$  on 20M  $\Omega$  ranges

Overload protection:250VDC or RMS AC

### **FREQUENCY**

Ranges : 200Hz, 2000Hz, 20KHz

Resolution : 0.1Hz

Accuracy : $\pm(1.0\%rdg+4dgts)$  on all ranges

Sensitivity : 3.5V RMS min. at>20% and <80% duty cycle

Effect Reading : More than 100 digits at pulse width>2 $\mu$  Sec

Overload protection : 500 VDC or RMS AC

### **DIODE TEST**

Test current : 0.6mA typical( $V_f=0.6V$ )

Resolution :1mV

Accuracy : $\pm(10\%rdg+3dgts)$

Open circuit voltage : 3.0Vdc typical

Overload protection : 250VDC or RMS AC

### **AUDIBLE CONTINUITY**

Audible threshold : Less than 50  $\Omega$

Resolution:100m  $\Omega$

Overload protection:250VDC or RMS AC

### **Warranty Information**

This product is warranted to be free from defects for one year. If this product fails during the first 12 months due to faulty materials or workmanship, it will be replaced free of charge, at the discretion of the manufacturer.

NOTE: This one year warranty does not cover dead batteries and blown fuses.

Defective units being returned to your dealer or to the factory should include proof of purchase date.

Any testers that do not function due to misuse or abuse will be subject to "out of warranty service charges."