Digital Multimeter

500 Auto

Operating manual

Fig 1. Voltage measurement DC and AC

Fig 2. Current measurement DC

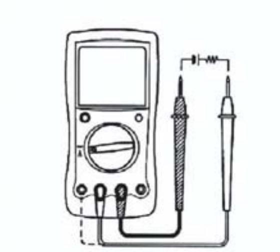


Fig 3. Resistance measurement Diode test Continuity test

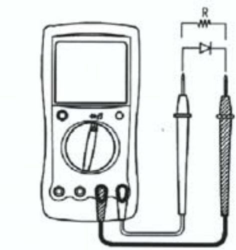


Fig 4. Dwell test Engine tach/Rotation speed

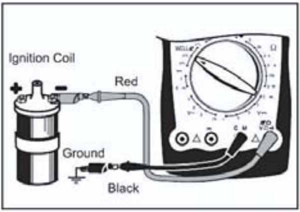


Fig 5. Ignition coil test

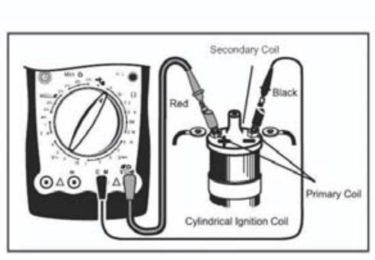


Fig 6. Replaceing the Battery

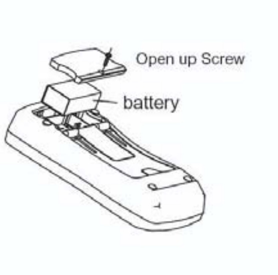
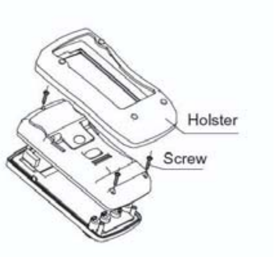


Fig 7. Replace the fuse



DC Voltage

Range	Resolution	Accuracy	Overload Protection
200mV	0.1mV	±(0,5%+1)	230V AC
2V	1mV		1000V DC or 750 V AC continuous
20V	10mV		
200V	100mV		
1000V	1V	±(0,8%+5)	

AC Voltage

Range	Resolution	Accuracy	Overload Protection
2V	1mV	±(0.8%+5)	1000V DC or 750 V AC continuous
20V	10mV		
200V	100mV		
750V	1V	±(1.0%+4)	

DC Current

Range	Resolution	Accuracy	Overload Protection
200mA	0.1mA	±(0.8%+5)	CE: Fuse 315mA, 250V, fast type, 5x20 mm
10mA	10mA	±(1.2%+5)	CE: Fuse 10A, 250V, fast type, 5x20 mm

Diodes Test

Range	Resolution	Overload Protection
⊣⊢	1mV	600Vp

Resistance

Range	Resolution	Accuracy	Overload Protection
200Ω	0.1Ω	±(0.8%+5)	600Vp
2kΩ	1Ω		
20kΩ	10Ω		
200kΩ	100kΩ		
2MΩ	1kΩ		
20MΩ	10MΩ	±(1.5%+5)	

Continuity test

Range	Resolution	Accuracy
	1Ω	600Vp

Dwell test

Range	Resolution	Accuracy	Overload Protection
4CYL	0.1°	± (3%+5)	600Vp
6CYL			
8CYL			

Tach (Rotation Speed) test

Range	Resolution	Accuracy	Overload Protection
4CYL	10 RPM	± (3%+5)	600Vp
6CYL			
8CYL			

Language Contents

Contents

Overview
This Operating Manual covers information on safety and cautions. Please read the relevant information carefully and observe all the Warnings and Notes strictly.

Limit 500 Auto are 3 1/2 digits multimeter, especially designed for automotive troubleshooting but also for all kind of electrical measuring. The display have large digits and also shows correct test leads terminals and rotary switch position, makes this instrument easy to handle for the user.

General Specifications
Measuring range and accuracy see page 2-3.
- Fused µmA Input terminal: 0,5A, 250V fast type, 5x20 mm
- Fused 10 A Input terminal: 10 A, 250V fast type, 5x20 mm
- Range: Manual ranging
- Maximum Display: Display: 1999 or 3 1/2 digits.
- Measurement Speed: Updates 2-3 times /second.
- Temperature: Operating: 0°C~40°C (32°F~104°F).
  Storage: -10°C~50°C (14°F~122°F).
- Battery Type: One piece of 9V Battery NEDA 1604 or 6F22 or 006P.
- Safety/Compliances: IEC61010 CAT II 1000V, CAT III 600 V over voltage and double insulation standard.
- Certification: CE

Safety Information
This Meter complies with the standards IEC61010: in pollution degree 2, over voltage category (CAT II 1000V, CAT III 600V) and double insulation.

Warning

To avoid possible electric shock or personal injury, and to avoid possible damage to the Meter or to the equipment under

test, adhere to the following rules.

- Before using the Meter inspect the case. Do not use the Meter if it is damaged or the case (or part of the case) is removed. Look for cracks or missing plastics. Pay attention to the insulation around the connectors.
- Inspect the test leads for damages insulation or exposed metal. Check the test leads for continuity.
- Do not apply more than the rated voltage, as marked on the Meter, between the terminals or between any terminal and the grounding.
- The rotary switch should be placed in the right position and no any changeover of range shall be made during measurement is conducted to prevent damage of the Meter.
- When the Meter working at an effective voltage over 60V in DC or 42V rms in AC, special care should be taken for there is danger of electric shock.
- Do not use or store the Meter in an environment of high temperature; humidity, explosive, inflammable and strong magnetic fields. The performance of the Meter may deteriorate after dampened.
- When using the test leads, keep your fingers behind the finger guards.
- Disconnect circuit power and discharge all high-voltage capacitors before testing resistance, continuity, diodes and current.
- Before measuring current, check the Meter fuses and turn off power to circuit before connecting the Meter to the circuit.
- Replace the battery as soon as the battery indicator appears. Whit to low battery, the Meter might produce false readings that can lead to electric shock and personal injury.

Functional buttons

Yellow	• **ON/OFF** switch.
Hold	• **ON/OFF** for hold function. • H shows on the display when value is hold.

Voltage measurement DC and AC (see fig 1)

1. Insert the red test lead into the VΩ terminal and the black test lead into the COM terminal.
2. Set the rotary switch to an appropriate measurement position in V--range for DC or V~ for AC. When the value is unknown always start from the max range 1000 V.
3. Connect the test leads across with the object being measured. The measured value shows on the display.

Note

- Displays 1 selected range is overload; it is required to select a higher range in order to obtain a correct reading.
- In each range, the Meter has an input impedance of approx.10 MΩ. This loading effect can cause measurement errors in high impedance circuits. If the circuit impedance is less than or equal to 10kΩ, the error is negligible (0.1% or less).

Current measurement DC (see fig 2)

Warning

Never attempt an in-circuit current measurement where the voltage between terminals and ground is greater than 250 V.
If the fuse burns out during measurement, the Meter may be damaged or the operator himself may be hurt. Use proper terminals, function, and range for the measurement.
When the testing leads are connect-ed to the current terminals, do not parallel them across any circuit.
Measuring time for current should be less than 10 sec and interval between measurement should be at least 15 minutes.

To measure current, connect as follows:

1. Turn off power to the circuit. Discharge all high-voltage capacitors.
2. Insert the red test lead into the A or mA terminal and the black test lead into the COM terminal.

3. Set the rotary switch to an appropriate measurement position A ⎓ range for DC or A~ for AC. When the value is unknown always start from the max range 10 A.
4. Break the current path to be tested. Connect the red test lead to the more positive side of the break and the black test lead to the more negative side of the break.
5. Turn on power to the circuit. The measured value shows on the display.

Note

- Displays 1 selected range is overload, it is required to select a higher range in order to obtain a correct reading.

Resistance measurement (see fig 3)

1. Insert the red test lead into the VΩ terminal and the black test lead into the COM terminal.
2. Set the rotary switch to an appropriate measurement position in Ω range.
3. Connect the test leads across with the object being measured. The measured value shows on the display.

Note

- Displays 1 selected range is overload, or the circuit is open.
- The test leads can add 0.1Ω to 0.3Ω of error to resistance measurement. To obtain precision readings in low-resistance measurement, that is the range of 200Ω, short-circuit the input terminals beforehand and record the reading obtained. This is the additional resistance from the test lead.

Diode test (see fig 3)

Use the diode test to check diodes, transistors, and other semiconductor devices. The diode test sends a current through the semiconductor junction, and then measures the voltage drop across the junction.

A good silicon junction drops between 0.5V and 0.8V.

To test a diode out of a circuit, connect as follows:

1. Insert the red test lead into the VΩ terminal and the black test lead into the COM terminal.
2. Set the rotary switch to diode position.
3. For forward voltage drop readings on any semiconductor component, place the red test lead on the component's anode and place the black test lead on the component's cathode.

The measured value shows on the display.

Continuity test (see fig 3)

To test for continuity Testing voltage is 2,7 V.

1. Insert the red test lead into the VΩ terminal and the black test lead into the COM terminal.
2. Set the rotary switch to continuity position.
3. Connect the test leads across with the object being measured. The buzzer sounds if the resistance of a circuit under test is less than 30Ω.

Dwell test (See fig 4)

For older cars it was important to test the dwell of the cut-off switch of an ignition system. Dwell testing means the duration when the cut-off switch remains off when the cam is turning.

1. Set the rotary switch to Dwell position and correct numbers of cylinders.
2. Insert the red test lead into the V_Dwell terminal and the black test lead into the COM terminal.
3. Connect the red test lead to the ignition coil and the black test lead to ground as fig 4.
4. Read the ignition dwell on the display.

Engine tach / Rotation speed (See fig 4)

1. Set the rotary switch to RPMx10 position and correct numbers of cylinders.
2. SInsert the red test lead into the V_RPM terminal and the black test lead into the COM terminal.
3. Connect the red test lead to the ignition coil and the black test lead to ground as fig 4.
4. Start the engine and read the rotation speed on the display. The reading must be multiplied by 10.

For example, actual rotation speed is 2350 RPM, the display shows 235.

Test of switches, fuses, solenoid, relay etc.

1. Set the rotary switch to 200 Ω.
2. Insert the red test lead into the Ω terminal and the black test lead into the COM terminal.
3. Short circuit the red and black test leads. The display should show 0,2 to 0,5 Ω.
4. Connect the test leads parallel to the component which would be tested.

The impedance of most solenoids and relays is less than 200 Ω. Fuses and switches have impedance around 10 Ω or less. Displays 1, the component is cut off or the rotary switch is in incorrect position.

Ignition coil test (see fig 5)

Before testing the engine must be cold and cut off the ignition coil.

1. Set the rotary switch to 200 Ω.
2. Insert the red test lead into the Ω terminal and the black test lead into the COM terminal.
3. Short circuit the red and black test leads. The display should show 0,2 to 0,5 Ω.
4. Connect the red test lead to the ignition coils primary + pole and the black test leads to the primary - pole as fig 5. The resistance should be less than 0,5 Ω.

5. Set the rotary switch to 200 kΩ.

6. Connect the red test lead to the secondary outlet and the black test leads to the primary - pole as fig 5.

The secondary outlet is generally in range 6 kΩ to 30 kΩ. Refer to various kind of automotives manuals.

Battery condition test

Test if battery is fully charged.

1. Set the rotary switch to 20 VDC position.

2. Insert the red test lead into the V terminal and the black test lead into the COM terminal.

3. Turn off the ignition switch.

4. Turn on the driving lights for 10 sec. to release charges from the battery.

5. Connect the black test lead to the battery negative pole and the red to the positive pole.

The testing result are shown in contrast as follows. 12,6V-100%. 12,45V-75%. 12,3V-50%. 12,15V-25%.

Battery consumption test when the engine is off

The test is useful for determination of the additional consumption of the battery.

1. Turn off ignition key and make sure lights etc are closed.

2. Set the rotary switch to 10A position.

3. Insert the red test lead into the A terminal and the black test lead into the COM terminal.

4. Cut off the cable to the battery positive pole and connect the red test lead to the battery positive pole and the black test lead to the cable. The measured value shows on the display.

Power consumption to a frequent-modulated radio or clock needs a current supply of 100 mA. If there emerges any additional current do necessary service.

Note

- Do not start the engine during test, or the instrument will be damaged.

Battery charging test

For testing if the charging system operates normally.

1. Set the rotary switch to 20 VDC position.

2. Insert the red test lead into the V terminal and the black test lead into the COM terminal.

3. Connect the black test lead to the battery negative pole and the red to the positive pole.

4. Run the engine idle and close or turn off accessories as light, fan, radio etc. Voltage would be 13,2 V to 15,2 V.

5. Open the throttle to 1800 RPM to 2800 RPM. The voltage would increase max 0,5 V.

6. Turn on driving lights, fan, windscreen wipers etc. and increase the loads of the electric system. The voltage would not be less than 13,0 V if the charging system works properly.

Replacing the Battery (see fig 6)

1. Disconnect the connection between the testing leads and the circuit under test when battery indicator appears on the display.

2. Turn the Meter to OFF position.

3. Remove the screw, and separate the case bottom from the case top.

4. Replace the battery with a new 9V battery (NEDA 1604 or 6F22 or 006P).

5. Rejoin the case bottom and case top, and reinstall the screw.

Replace the fuse (see fig 7)

1. Disconnect the connection between the testing leads and the circuit under test.

2. Turn the Meter to OFF position.

3. Remove the screw and separate the case bottom from the case top.
4. Replace only fuses with the identical type and specification as follows. 315 mA, 250V, fast type, 5x20mm or 10 A, 250 V, fast type 5x20 mm.
5. Rejoin the case bottom and case top, and reinstall the screw. Replacement of the fuses is seldom required. Burning of a fuse always results from improper operation.