AUTOMOTIVE METER

(including Signal Pick Up)

OWNER'S MANUAL

Read this owner's manual thoroughly before use

WARRANTY

This instrument is warranted to be free from defects in material and workmanship for a period of one year. Any instrument found defective within one year from the delivery date and returned to the factory with transportation charges prepaid, will be repaired, adjusted, or replaced at no charge to the original purchaser. This warranty does not cover expandable items such as batteries or fuses. If the defect has been caused by a misuse or abnormal operating conditions, the repair will be billed at a nominal cost.

SAFETY INFORMATION

The digital multimeter has been designed according to IEC-1010 concerning electronic measuring instruments with an overvoltage category (CATII 600V) and pollution degree 2.

ELECTRICAL SYMBOLS

~ AC (Alternating Current)

⎓ DC (Direct Current)

⚠ Important safety information. Refer to the manual.

⚠ Dangerous voltage may be present.

⏚ Earth ground

⊟ Fuse

CE Conforms to European Union directives

⧈ Double insulated

⚠ WARNING

To avoid possible electric shock or personal injury, follow these guidelines:

- Do not use the meter if it is damaged. Before you use the meter, inspect the case. Pay particular attention to the insulation surrounding the connectors.
- Inspect the test leads for damaged insulation or exposed metal. Check the test leads for continuity. Replace damaged test leads before you use the meter.
- Do not use the meter if it operates abnormally. Protection may be impaired. When in doubt, have the meter serviced.
- Do not operate the meter around explosive gas, vapor, or dust.
- Do not apply more than the rated voltage, as marked on the meter, between terminals or between any terminal and earth ground.
- Before use, verify the meter's operation by measuring a known voltage.
- When servicing the meter, use only specified replacement parts.
- Use with caution when working above 30V AC RMS, 42V peak, or 60V DC. Such voltages pose a shock hazard.
- When using the probes, keep your fingers behind the finger guards on the probes.
- Connect the common test lead before you connect the live test lead. When you disconnect test leads, disconnect the live test lead first.
- Remove the test leads from the meter before you open the battery door.
- Do not operate the meter with the battery door or portions of the cover removed or loosened.

- To avoid false readings, which could lead to possible electric shock or personal injury, replace the batteries as soon as the low battery indicator ("⊟+") appears.
- Remaining endangerment:

When an input terminal is connected to dangerous live potential it is to be noted that this potential at all other terminals can occur!

- CAT II-Measurement Category II is for measurements performed on circuits directly connected to low voltage installation.(Examples are measurements on household appliances, portable tools and similar equipments.) Dot not use the meter for measurements within Measurement Categories II and III.

CAUTION

To avoid possible damage to the meter or to the equipment under test, follow these guidelines:

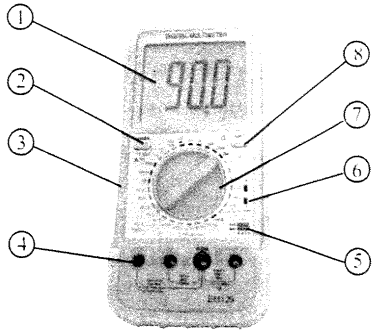
- Disconnect circuit power and discharge all high-voltage capacitors before testing resistance, continuity, diodes, or temperature.
- Use the proper terminals, function, and range for your measurements.
- Before measuring current, check the meter's fuses and turn power OFF to the circuit before connecting the meter to the circuit.
- Before rotating the Function / Range switch to change functions, disconnect test leads from the circuit under test.
- Before attempting to insert transistors for testing, always be sure that the test leads have been disconnected from any measurement circuits.
- Remove test leads from the meter before opening the meter case.

MAINTENANCE

- Before opening the case, always disconnect the test leads from all live circuits.
- To continue protection against fire, replace fuse only with the specified voltage and current ratings:

  F 250mA/250V (Fast Blown)ø5×20mm
- Periodically wipe the case with a damp cloth and mild detergent. Do not use abrasives or solvents.

FRONT PANEL



1. **LCD**
2. **Power Switch**
3. **Holster**
4. **Input Jacks**
5. **Transistor hFE Testing Socket**
6. **Temperature Testing Socket**
7. **Function / Range Switch**
8. **Hold Button**

GENERAL SPECIFICATIONS

Maximum Display: 1999 counts (3 1/2 digits) with automatic polarity indication

Indication Method: LCD display

Measuring Method: Dual-slope integration A/D converter system

Overrange Indication: Only figure "1" dispalyed on the LCD

Reading Rate: 2-3 times/second (approximate)

Operating Temperature: 0°C ~ 40°C (32°F~104°F) , <75% R.H.

Storage Temperature: -10°C ~ 50°C (14°F~122°F) , <75% R.H.

Power Supply: One 9-volt battery (NEDA1604, 6F22)

Low Battery Indication: " " displayed on the LCD

Dimensions: 200×97×48(mm)

Weight: 495g (including battery and holster)

TECHNICAL SPECIFICATIONS

Accuracy is specified for a period of one year after calibration and at 18°C~28°C (64°F~82°F) with relative humidity up to 75%. Accuracy specifications take the form of:

± ([% of Reading]+[Number of Least Significant Digits])

DC VOLTAGE

RANGE	RESOLUTION	ACCURACY
200mV	100μV	±(0.5% + 2)
2V	1mV	
20V	10mV	
200V	100mV	
1000V	1V	±(0.8% + 2)

Input impedance: 1MΩ for all ranges.

AC VOLTAGE

RANGE	RESOLUTION	ACCURACY
200V	100mV	±(0.8% + 3)
750V	1V	±(1.2% + 3)

Input impedance: about 450kΩ for all ranges

Frequency: 40Hz ~ 400Hz

Indication: Average (RMS of sine wave)

DC CURRENT

RANGE	RESOLUTION	ACCURACY
20mA	10μA	±(1.2% + 2)
200mA	100μA	
10A	10mA	±(2.5% + 5)

Overload Protection: 250mA/250V fused (Range 10A unfused)

Maximum input current: 10A (can not last for more than 15 seconds)

Max. voltage drop: 200mV

RESISTANCE

RANGE	RESOLUTION	ACCURACY
200Ω	0.1Ω	±(1.0% + 3)
2kΩ	1Ω	±(0.8% + 2)
20kΩ	10Ω	
200kΩ	100Ω	
2MΩ	1kΩ	
20MΩ	10kΩ	±(2.0% + 5)

Open circuit voltage: less than 2.8V

FREQUENCY

RANGE	RESOLUTION	ACCURACY
20kHz	10Hz	±(1.5% + 5)

TEMPERATURE

RANGE	RESOLUTION	ACCURACY
-20°C~750°C	1°C	-20~0°C ± (1.5%+4)
		0~400°C ± (1%+3)
		> 400°C ± (2%+3)
-4°F~1382°F	1°F	-4~32°F ± (1.5%+7)
		32~752°F ± (1%+5)
		> 752°F ± (2%+5)

Note: Use type K thermocouple while measuring temperature.

DIODE AND AUDIBLE CONTINUITY TEST

RANGE	DESCRIPTION	TEST CONDITION
→|+	LCD displays the equivalent impedance under the test condition.	The forward DC current is approx. 1mA, the reversed DC voltage is approx. 3V.
•))	If the resistance of the circuit under test is less than 30Ω, the built-in buzzer will sound.	Open circuit voltage is approx. 3V.

TRANSISTOR hFE TEST

RANGE	hFE	TEST CURRENT	TEST VOLTAGE
PNP & NPN	0 ~ 1000	Ib≈10μA	Vce ≈ 3V

DWELL ANGLE

CYLINDER	RANGE(°)	RESOLUTION	ACCURACY
3 CYL	0~120.0	0.1°	±(1.5% + 2)
4 CYL	0~90.0		
5 CYL	0~72.0		
6 CYL	0~60.0		
8 CYL	0~45.0		

TACHO

CYLINDER	RANGE(RPM)	RESOLUTION	ACCURACY
3 CYL	180~10000	1×10RPM	±(1.0% + 2)
4 CYL			
5 CYL			
6 CYL			
8 CYL			

OPERATING INSTRUCTIONS

DC VOLTAGE MEASUREMENT

1. Connect the red test lead to the"VΩHz→+|-" jack and the black test lead to the "COM" jack.
2. Set the Function / Range switch to the desired V⎓ range. If the voltage to be measured is not known beforehand, set the range switch to the highest range and then turn it down range by range until satisfactory resolution is obtained.
3. Connect the test leads to the source or load to be measured.
4. Read the voltage value displayed on the LCD along with the polarity of the red test lead.

AC VOLTAGE MEASUREMENT

1. Connect the red test lead to the"VΩHz→+|-" jack and the black test lead to the "COM" jack.
2. Set the Function / Range switch to the desired V~ range. If the voltage to be measured is not known beforehand, set the switch to the highest range and then turn it down range by range until satisfactory resolution is obtained.
3. Connect the test leads to the source or load to be measured.
4. Read the voltage value displayed on the LCD.

DC CURRENT MEASUREMENT

1. Connect the black test lead to the "COM" jack and the red test lead to the "mA" jack. (While the current to be measured is between 200mA and 10A, remove the red test lead to the "10A" jack.)
2. Set the Function / Range switch to the desired A⎓ range. If the current to be measured is not known beforehand, set the switch to the highest range and then turn it down range by range until satisfactory resolution is obtained.
3. Open the circuit in which the current is to be measured, and connect the test leads in series with the circuit.
4. Read the current value displayed on the LCD along with the polarity of the red test lead.

RESISTANCE MEASUREMENT

1. Connect the red test lead to the "VΩHz" jack and the black test lead to the"COM" jack.
2. Set the Function / Range switch to the desired Ω range.
3. Connect the test leads to the resistor to be measured and read the value displayed on the LCD.

DIODE TEST

1. Connect the red test lead to the "VΩHz" jack and the black test lead to the "COM" jack. (The polarity of the red test lead is positive "+").
2. Set the Function / Range switch to " 2k/ " range.
3. Connect the red test lead to the anode of the diode to be tested and the black test lead to the cathode of the diode. The approximate forward voltage drop of the diode will be displayed on the LCD. If the connection is reversed, only figure "1" will be shown.

AUDIBLE CONTINUITY TEST

1. Connect the red test lead to the"VΩHz" jack and the black test lead to the "COM" jack.
2. Set the Function / Range switch to " 200/ " range.
3. Connect the test leads to the two terminals of the circuit to be tested. If the resistance is less than about 30Ω, the built-in buzzer will sound.

TRANSISTOR TEST

1. Set the Function / Range switch to "hFE" range.
2. Determine whether the transistor to be tested is NPN or PNP, and locate the E, B, C leads. Insert the leads into the proper holes of the hFE socket on the front panel.
3. Read the approximate hFE value at the test condition of base current 10μA and Vce 3V.

FREQUENCY MEASUREMENT

1. Set the Function / Range switch to the "Hz" range.
2. Connect the black test lead to the "COM" jack and the red test lead to the "VΩHz" jack.
3. Connect the test leads to the source or load to be measured.
4. Read the frequency value displayed on the LCD.

TEMPERATURE MEASUREMENT

1. Insert the type K thermocouple to the temperature testing socket.
2. Set the Function / Range switch to the "°C" or "°F" range.
3. Connect the type K thermocouple to the object to be measured.
4. Read the temperature value displayed on the LCD.

MEASURING DWELL ANGLE

1. Connect the black test lead to the "COM" jack and the red test lead to the "VΩHz" jack.
2. Set the rotary switch to the desired "DWELL" range according to the cylinders of the motor to be measured.
3. Connect the black test lead to the iron bars or the negative pole of the battery, and the red test lead to the connecting pole for the low voltage of the distributor or the terminal "-" of the firing coil.
4. Start up the motor, and read the value of the dwell angle on the LCD.

MEASURING TACHO

1. Connect the black test lead to the "COM" jack and red test lead to the "VΩHz" jack.
2. Set the rotary switch to the desired " TACH " range according to the cylinders of the motor to be measured.
3. Connect the black test lead to the iron bars or the negative pole of the battery, and the red test lead to the connecting pole for the low voltage of the distributor or the terminal "-" of the firing coil.
4. Start up the motor, and read the TACHO value on the LCD.

AUTO POWER-OFF

The function of auto power-off extends the life of the battery by turning the meter off if the range switch has not been operated for about 15 minutes. To turn the meter on again, just rotate the range switch or press the power switch.

BATTERY & FUSE REPLACEMENT

If "⊟" appears on the LCD, it indicates that the battery should be replaced. To replace the battery, open the case, and replace the exhausted battery with the ratings specified: 9V, NEDA 1604 or 6F22, and then close the case, install the screws.

The fuse rarely needs to be replaced and is blown generally as a result of the operator's error. To replace the fuse, open the case, and replace the blown fuse with the ratings specified: F 250mA/250V, and then close the case, install the screws.

ACCESSORIES

Users Manual : 1 copy
Test Leads: 1 pair
9V Battery (NEDA 1604 or 6F22) : 1 piece
Type K thermocouple: 1 piece

Signal Pick Up

INTRODUCTION

This unit is designed to be used with automotive meter or oscillograph. It can be used in the adjustment and diagnosis of automotive engine.

FEATURE

Using this instrument and an automotive meter, you can accurately measure dwell angle and engine's turning speed (RPM).
Using this instrument and an oscillograph, you can observe the engine's ignition-pulse wave shape.
Samples every kind of signal with Inductive pickup.
Easy to use.

SPECIFICATION

Operating temperature: -10℃ to 60℃ (14℉~140℉)
at <80%, relative humidity
Dimensions: 32 X 70 X 146mm
Weight: 200g

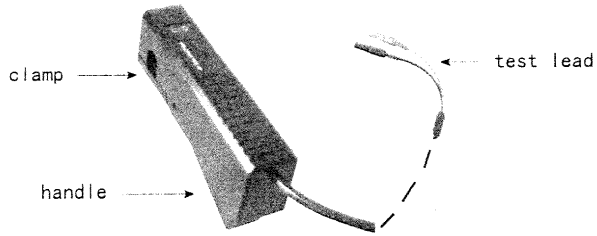
OPERATING INSTRUCTION

1. Connect the clamp to a spark plug wire with the mark " → " on the instrument pointing to the spark plug.
2. Connect the red and black test leads of the unit to the input terminals of the automotive meter.
   Set the automotive meter in corresponding measuring range. Then you can read the value on the display. If no reading is received, unhook the clamp, turn it over and connect again.

NOTE

Position the Signal Pick Up as far away from the distributor and the exhaust manifold as possible.

The black test lead of this unit should be connected to "COM" jack when you connect the test leads to automotive meter.



Signal Pick Up

DISPOSAL OF THE ARTICLES

Dear Customer,

Please help avoiding refuse.

If you at some point intend to dispose of the articles, then please keep in mind that many of their components consist of valuable materials, which can be recycled.

Please do not discharge them in the garbage bin, but check with your local council for recycling facilities in your area.