

AUTORANGE DIGITAL ENGINE ANALYZER

1. INTRODUCTION

This instrument is a high performance, battery operated, 3 1/2 Auto range & auto power off digital multi-meter for measuring dwell and tach of the engine, DC and AC voltage, DC and AC current, Resistance, Temperature, Diode and Continuity test. polarity selection and over-range indication. Full overload protection is provided. Because of its outstanding features, it is most suitable for use in production line, lab, R & D, maintenance and repair works.

2. SPECIFICATIONS

2.1 GENERAL SPECIFICATIONS

Display : 3 1/2 digit, 17mm high character jumbo of LCD with max. 1999 counts

Polarity : Automatic polarity indication.

Auto power : Working after 15min, instrument is auto off.

Zero adjustment : Automatic.

Sampling rate : 3 times/second

Autorange


Data hold


Max hold

Back light

Spotlight

Over range indication : Only the MSD "OL" or "-OL" displays.

Low battery : The "  " displays.

Safety standards :  EMC/LVD. The meter is up to the standards of IEC1010 Pollution Degree 2, Over voltage category II or double insulation II.

Operating environment : Temperature (0°C to 40°C), Humidity < 80%RH.

Storage environment : Temperature (-10°C to 50°C), Humidity < 80%RH.

Battery : 1.5V(AAA type) × 2

Dimension : 180mm × 87mm × 50mm

Weight : Approx. 357g (including battery)

Accessories : Operation manual, Conform card, Test leads (Red & Black) 1 pair, 'K' type Thermocouple, Shock-proof cover, Gift box, etc.

2.2 ELECTRICAL SPECIFICATIONS

Accuracy is ± (percentage of reading + number of digit) at 23 ± 5°C, < 75%RH.

DC Voltage

Range	Accuracy	Resolution
200mV	± (0.8%+2d)	0.1mV
2V		1 mV
20V		10 mV
200V		100 mV
1000V	± (1.0%+3d)	1V

Input impedance: 200mV range > 100M Ω;
2V-1000V range = 10M Ω

Overload protection: 1000VDC/AC RMS

AC Voltage

Range	Accuracy	Resolution
2V	± (1.0%+3d)	1 mV
20V		10 mV
200V		100 mV
700V	± (1.2%+5d)	1V

Input impedance: 10M Ω

Overload protection: 1000VDC/AC RMS

Frequency response: 2V-200V range: 40-400Hz

700V range: 40-200Hz

Indication: Average (rms of sine wave)

DC Current

Range	Accuracy	Resolution
20mA	± (1.5%+1d)	10μA
200mA		100μA
2A	± (2.0%+5d)	1mA
10A		10mA

Overload protection: 0.5A/250V fuse,

10A/250V fuse (10A up to 15 seconds)

AC Current

Range	Accuracy	Resolution
20mA	± (1.8%+3d)	10μA
200mA		100μA
2A	± (3.0%+7d)	1mA
10A		10mA

Overload protection: 0.2A/250V fuse,

10A/250V fuse (10A up to 15 seconds)

Resistance

Range	Accuracy	Resolution
200 Ω	± (1.0%+3d)	0.1 Ω
2K Ω		1 Ω
20K Ω		10 Ω
200K Ω		100 Ω
2M Ω		1K Ω
20M Ω	± (1.5%+5d)	10K Ω

Open circuit voltage : Less than 3V



Overload protection: 250V DC/AC RMS

Temperature

Range	Accuracy	Resolution
-20°C - 0°C	± (5%+4)	1°C / °F
-4°F - 32°F		
0°C - 400°C	± (1%+3)	
32°F - 752°F		
400°C - 1000°C	± (2%+3)	
752°F - 1832°F		

Using F type thermocouple probes

Diode and Continuity Test

Range	Accuracy	Resolution
	Read & display approx. forward voltage of diode	Forward DC Current approx. 1mA. Reversed DC voltage approx. 1.5V
	Buzzer sounds if resistance between terminals V/Ω and COM is less than about 70 Ω ± 30 Ω	Open circuit voltage is approx. 1.5V

Overload protection: 250VDC/AC RMS

Dwell Test

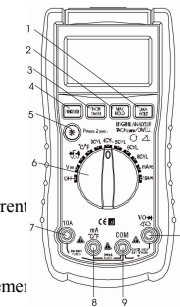
Range	Standard input	Input open Display	Measure ment Value Range	Accuracy
3CYL	10V/50Hz Sine wave	119.4° - 120.6°	66.5° - 69.5°	± (1.2%+2)
4CYL		89.4° - 90.6°	49.5° - 52.5°	
5CYL		71.5° - 72.5°	39.5° - 42.5°	
6CYL		59.6° - 60.4°	32.5° - 35.5°	
8CYL		44.7° - 45.3°	24.0° - 27.0°	

Tach (× 10) Test


Range	Standard input	Input open Display	Measure ment Value Range	Accuracy
3CYL	100Hz/7V Square wave	Open Display is zero	398-402	± (1.2%+2)
4CYL			296-304	
5CYL			237-243	
6CYL			198-202	
8CYL			148-152	

3. PANEL DESCRIPTION



- ① Data hold button
- ② Max hold button
- ③ Tach/Dwell button
- ④ Function button
- ⑤ Backlight and spotlight button
- ⑥ Function switch
- ⑦ Input terminal for AC and DC current Measurements to 10A.
- ⑧ Input terminal for AC and DC microamp and milliamp measurement: to 400mA and Temperature(+) measurement.
- ⑨ Common (return) terminal for all measurements.
- ⑩ Input terminal for voltage, resistance, continuity, diode and engine analyzer measurements.




4. OPERATION

- ① Check the battery by setting the POWER switch to NO. If the battery is weak, a "  " sign will appear on the display. If this does not appear on the display, proceed as below. See MAINTENANCE if the battery has no be replaced.
- ② The mark or sign next to the lead jacks, is for warning that the input voltage or current should not exceed the indicated values. This is to prevent from damaging the internal circuits.
- ③ The function switch should be set to the range that you want to test before operation.

4.1 DC and AC Voltage measurement

- ① Connect the black test lead to "COM" jack and red test lead the "V Ω  " jack.
- ② Move the function switch to V  position.
- ④ Press "FUNC" button to choose "DC" or "AC" measurement model.
- ⑤ Connect the probes across the source or load under measurement.
- ⑥ Read the voltage result from the LCD panel.

Note:

- a.  Do not apply more than DC 1000V or AC 700Vrms to the input. Indications possible at higher voltages but there is danger of damaging the internal circuitry. To



covert function and range switch, test leads must leave test dot.

b. Be careful when measuring high voltage.

4.2 DC and AC Current Measurement

- ①. Connect the black test lead to the "COM" jack and the red test lead to "mA" jack for a maximum of 200mA, for a maximum of 10A, move the red test lead to "10A" jack.
- ②. Press the "FUNC" key select DC or AC measurement model.
- ③. Set the Function rotary switch to "mA" position for a maximum of 200mA, for a maximum of 10A, rotate the Function rotary switch to "10A" position.
- ④. Will the test leads in series with the load, and the measurement value appear on display.




4.3 Resistance measurement

- ①. Connect the black test lead to "COM" jack and red test lead the "V Ω " jack.
- ②. Move the function Switch to "" position.
- ③. Press "FUNC" button to choose "Ω" measurement model.
- ④. Connect the probes across circuit to be tested.
- ⑤. Caution: Ensure that the circuit to be tested is "dead".

Note:

- a. When the input is not connected, i.e. at open circuit, the figure "OL" will be display for the over range condition.
- b. When checking in-circuit resistance, be sure the circuit under test has all power removed and that all capacitor are fully discharged.
- c. Don't input voltage. This is to prevent from damaging the internal circuit.




4.4 Diode test

- ①. Connect the black test lead to "COM" jack and red test lead the "V Ω " jack.
- ②. Move the function Switch to "" position.
- ③. Press "FUNC" button to choose "" measurement model.
- ④. Connect the probes across the diode under Measurement, display shows the approx. forward voltage of this diode.
- ⑤. Note: The polarity of the red test probe is +.
- ⑥. Caution: Ensure that the circuit to be tested is "dead".

Note:

- a. When the input is not connected, i.e. at open circuit, the figure "OL" will be display for the over range condition.
- b. When checking in-circuit diode, be sure the circuit under test has all power removed and that all capacitor are fully discharged.
- c. Don't input voltage. This is to prevent from damaging the internal circuit.

4.4 Continuity test

- ①. Connect the black test lead to "COM" jack and red test lead the "V Ω " jack.
- ②. Move the function Switch to "" position.
- ③. Press "Function" button to choose "" measurement model. When the resistance value in the measured circuit is approximately below $70 \Omega \pm 30 \Omega$, the buzzer will sound, and this is for the continuity test.
- ④. Connect the probes across circuit to be tested.
- ⑤. Caution: Ensure that the circuit to be tested is "dead".

Note:




- a. When the input is not connected, i.e. at open circuit, the figure "OL" will be display for the over range condition.
- b. When checking in-circuit resistance, be sure the circuit under test has all power removed and that all capacitor are fully discharged.
- c. Don't input voltage. This is to prevent from damaging the internal circuit.

4.5 Temperature measurement

- ①. Move function switch to "C/F" of range position.
- ②. Insert the cold end (black plug) of thermocouple into "COM" jack and red plug into "C/F" jack. And put work end into measurement place. Display reading is the temperature of measurement place in °C or °F.

Note: The instrument has special thermocouple probes.




4.6 MEASURING ENGINE DWELL

- ①. Connect the black test lead to the COM jack and the red test lead to the  jack.
- ②. Set the transform switch at the desired DWELL range position according to the measured cylinder of the engine.
- ③. Press "" button to choose "" measurement model.
- ④. Connect the black test lead to the iron or the negative pole of the storage cell, and the red one to the low voltage connection pole of the divider or the negative pole of the



ignition winding for measurement.

- ⑤. You can get reading from LCD after the engine is started.

4.7 MEASURING REV

- ①. Connect the black test lead to the COM jack and the red test lead to the  jack.
- ②. Set the transform switch at the desired TACH range position according to the measured cylinder of the engine.
- ③. Press "" button to choose "" measurement model.
- ④. Connect the black test lead to the iron or the negative pole of the storage cell, and the red one to the low voltage connection pole of the divider or the negative pole of the ignition winding for measurement.
- ⑤. You can get reading from LCD after the engine is started.

4.8 The buttons

- ①. Data hold: Press the "data hold" key to lock display value, and the "DATA-H" sign will appear on the display, press it again to exit.
- ②. MAX. hold: Press the "MAX. hold" key to lock maximum value, and the "MAX-H" sign will appear on the display, press it again to exit.
- ③. TACH/DWELL: Press the "TACH/DWELL" key to select "TACH" or "DWELL" measurement model.
- ④. Function: Press the "FUNC" key to select AC Voltage, DC Voltage, ohm, diode, continuity, Fahrenheit, °F or °C.
- ⑤. : Press the "" key over 2 seconds to open the backlight and the spotlight, press it again for more than 2 seconds to wink the lights.

4.9 Auto off and sleep mode

- ①. Working after 15min, instrument is auto off.
- ②. Press "FUNC" key, the instrument was opened again.

4.10 ARNING

- ①. When measuring more than 36VDC/25VCA voltage ensure that instrument is not connected or switched to a current or resistance range, or to the diode check. Always ensure that the correct terminals are used for the type of measurement to be made.
- ②. Pay attention when measuring voltage above 36V, especially from sources where high energy is existed.
- ③. Avoid making connections to live circuits whenever possible.
- ④. Before making resistance measurements or diode test, ensure that the circuit under test is de-energized.

- ⑤. Always ensure that the correct function is selected.
- ⑥. Extreme care should be taken when using the instrument to conjunction with a current transformer connected to the terminals if an open circuit occurs.
- ⑦. Ensure that the test leads and probes are good condition with no damage to the insulation.
- ⑧. Take care not to exceed the over-load limits as given in the specification.
- ⑨. Before opening the case of the instrument to replace battery, disconnect the test leads from any external circuit, set the function switch to OFF position.

5 CARE AND MAINTENANCE

5.1 Care for your multi-meter

Your Digital Multi-meter is an example of superior design and craftsmanship. The following suggestions will help you to care for the multi-meter so you can enjoy it for years.

- ①. Keep the multimeter dry. If it gets wet, wipe it dry immediately. Liquids can contain minerals that can corrode electronic circuits.
- ②. Use and store the multi-meter only in normal temperature environments. Temperature extremes can shorten the life of electronic devices, damage batteries, and distort or melt plastic part.
- ③. Handle the multimeter gently and carefully. Dropping it can damage the circuit boards and case and cause the multi-meter to work improperly although the holster can provide enough protection.
- ④. Keep the multi-meter away from dust and dirt, which can cause premature wear of parts.
- ⑤. Wipe the multi-meter with a damp cloth occasionally to keep it looking new. Do not use harsh chemicals, cleaning solvents, or strong detergents to clean the multi-meter.
- ⑥. Use only fresh battery of the required size and type. Always remove old or weak batteries.
- ⑦. They can Leak chemicals that destroy electronic circuits.

5.2 Maintenance

- ①. 1.5- Volt batteries replacement
 - a. Ensure the instrument is not connected to any external circuit. Set the selector switch to OFF position and remove the test leads from terminals.
 - b. Remove the screw on the bottom case and lift the bottom case.
 - c. Remove the spent battery and replace it with a battery of the same type.