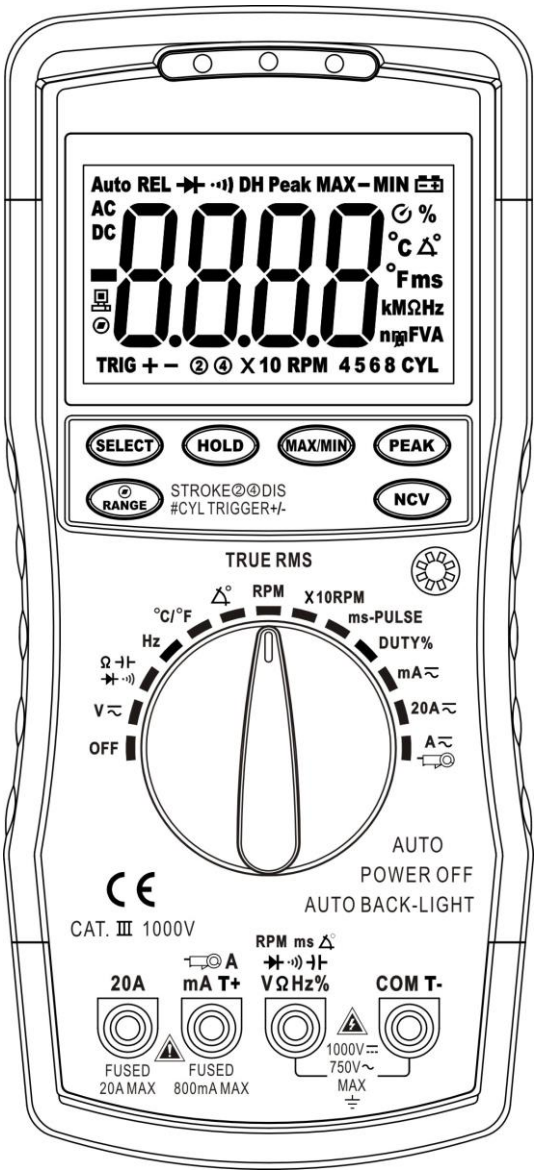
DIGITAL AUTO MOTIVE ANALYSER

770J / 770K



Thank you for purchasing the product. Manufactured to a high standard this product will, if used according to these instructions and properly maintained, give you years of trouble free performance.

***IMPORTANT*: PLEASE READ THESE INSTRUCTIONS CAREFULLY. NOTE THE SAFE OPERATIONAL REQUIREMENTS, WARNINGS & CAUTIONS. USE THE PRODUCT CORRECTLY AND WITH CARE FOR THE PURPOSE FOR WHICH IT IS INTENDED. FAILURE TO DO SO MAY CAUSE DAMAGE AND/OR PERSONAL INJURY AND WILL INVALIDATE THE WARRANTY. PLEASE KEEP THESE INSTRUCTIONS SAFE FOR FUTURE USE.**

1. SAFETY INSTRUCTIONS

1.1 PERSONAL PRECAUTIONS

√ When using this multimeter, please observe all normal safety rules concerning:

Protection against the dangers of electrical current.

Protection of the meter against misuse.

√ Full compliance with safety standards can only be guaranteed if used with the test leads supplied. If necessary, they must be replaced with genuine The test leads supplied with the same electronic ratings.

Failure to do so will invalidate the warranty.

× **DO NOT** use leads if damaged or if the wire is bared in any way.

× **DO NOT** use the meter if it has been damaged.

1.2 GENERAL SAFETY INSTRUCTIONS

❐ **WARNING! USE EXTREME CAUTION** when working with high voltages.

√ Familiarise yourself with the application and limitations of the multimeter as well as the potential hazards.

IF IN ANY DOUBT CONSULT A QUALIFIED ELECTRICIAN.

√ Before commencing testing, follow instructions below and select the correct input sockets, function and range on the multimeter.

√ When the meter is connected to a circuit, do not touch any unused meter terminals.

√ When the magnitude of the value to be measured is unknown beforehand, set the range selector to the highest value available.

√ Before rotating the range selector to change functions, disconnect test probes from the circuit under test.

❒ **WARNING!** ***Never perform resistance, transistor, diode or continuity measurements on live circuits.***

√ Always take care when working with voltages above 35V DC or 25V AC rms. These voltages are considered a shock hazard.

√ Always keep fingers behind the probe barriers whilst measuring and **DO NOT** use when hands are wet.

× **DO NOT** touch the test leads, tips or the circuit being tested.

√ Choose the proper range and function for the required measurement. Do not try voltage or current measurements that may exceed the ratings marked on the Function/Range switch.

√ When testing for the presence of a voltage or current, make sure the meter is functioning correctly. Take a reading of a known voltage or current before accepting a zero reading.

× **DO NOT** test voltages above 1000V DC or 750 AC rms the circuitry of the multimeter will be destroyed.

❒ **WARNING! NEVER** connect the multimeter to a voltage source / live circuit when the rotary switch is set to any other function apart from Voltage testing..

❒ **WARNING!** Voltage checks on electrical outlets can be difficult and misleading because of the uncertainty of connection to the recessed electrical contacts. Other means should be used to ensure that the terminals are not “live”.

√ Avoid damaging the meter when testing voltage. Disconnect the test leads from the test points before changing functions.

× **DO NOT** attempt a voltage measurement with the test leads in the 20A or the mA terminal.

√ **ALWAYS** discharge filter capacitors in power supplies and

disconnect the power when making resistance or diode tests.

× **DO NOT** use the multimeter in a potentially explosive atmosphere or where flammable material is present.

√ **ONLY** operate the multimeter when the back cover is in place and fastened securely.

√ If any abnormal readings are observed, the multimeter must be checked out by an authorised technician.

√ **ALWAYS** turn off the multimeter and disconnect the test leads, before opening the back cover to replace the fuse or battery.

√ When not in use, store the multimeter carefully in a safe, dry, childproof location out of direct sunlight. If storing for a long period of time, remove the battery. Storage temperature range: -15° C to 50° C.

Note: The warnings, cautions and instructions referred to in this manual cannot cover all possible conditions and situations that may occur. It must be understood that common sense and caution are factors which cannot be built into this product, but must be applied by the operator.

❒ **WARNING!** Engines produce carbon monoxide which is odourless and causes slower reaction time which could lead to serious injury. An engine which is operating should be in a well ventilated area, or the vehicle's exhaust should be connected to an adequate fume removal system.

√ When working on a vehicle which is being tested or repaired ensure that the handbrake is on and the front wheels are chocked to avoid the vehicle moving and causing injury.

√ Wear suitable eye protection when testing or repairing a vehicle.

√ When measuring current, connect the meter in series with the load.

√ Disconnect the live test lead before disconnecting the common test lead.

√ The mA and the 20A terminals are protected by fuses. To avoid possible injury or damage, use only in circuits limited to 800mA or 20A for 30 seconds.

√ To maintain the accuracy of the meter, replace the discharged battery immediately when the symbol '  ' appears on the meter display.

√ Avoid measurement errors from outside interference. Keep the meter away from spark plug and coil wires.

√ **Exceeding the electrical limits of this meter is dangerous and will expose you to serious or possibly fatal injury. Carefully read and understand the specification limits of this meter together with the warnings and cautions in this safety section.**

FUNCTION	TERMINAL	INPUT LIMIT
DC/AC Volts, ❶Ohm/Continuity/Diode, CAP., Hz, % Duty, ms Dwell, RPM	VΩHz	CAT III 1000V DC, 750V AC rms
AC/DC Current, Type-K TEMP.	mA T+	600mA DC/AC
AC/DC 20A	20A	*20A DC/AC
* 20 Amp measurement for 30 seconds maximum.		
❶ 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.		

2.INTRODUCTION & SPECIFICATION

INTRODUCTION: Includes new generation, 12-function, auto-ranging automotive diagnostic multimeter. Digital display gives accurate indication of component outputs. Large, easy to read high contrast display with bright, white backlight. Workshop-tough, durable bi-composite case with integral stand and auto power shut-off. High speed processing circuitry reads standard automotive parameters including duty cycle and pulse width making this tool ideal for testing fuel injection systems. Features auto-ranging, and data hold functions with overload protection on all ranges. Includes relative functions including Min/Max and Peak Hold. Supplied with Inductive Coupler, test probes and thermocouple in carry case.

SPECIFICATION.....**Model No: 770J, 770K**

Tach (RPM)...2-10cyl, 4-Stroke 60-9000 (x1)rpm, 600-12000 (x10)rpm

Dwell:.....4/5/6/8cyl

AC Voltage:.....600mV, 6V, 60V, 600V, 750V

DC Voltage:.....600mV, 6V, 60V, 600V, 1000V

AC Current:.....60mA, 600mA, 6A, 20A, 600A

DC Current:.....60mA, 600mA, 6A, 20A, 600A

Capacitance:.....10nF, 100nF, 1000nF , 10μF, 100μF, 10mF, 60mF

Frequency:.....0.001Hz-9.99MHz

Duty Cycle:.....1.0-99.0%

Pulse Width:.....0.1-10ms

Resistance:.....600Ω, 6kΩ, 60kΩ, 600kΩ, 6MΩ, 60MΩ

Continuity:.....<50Ω Continuity Buzzer 2kHz

Temperature:.....-20 to +1000° C, -4 to +1832° F

Diode Check.....Yes

Auto Back-Light.....Yes

Display Hold:.....Yes

Auto Ranging:.....Yes

Inductive Coupler:.....Yes

Digits Height:.....24mm

Auto Power Off.....Yes

NCV detection.....Yes

Low Battery Indicator:.....Yes

Batteries (supplied):.....9V (PP9)

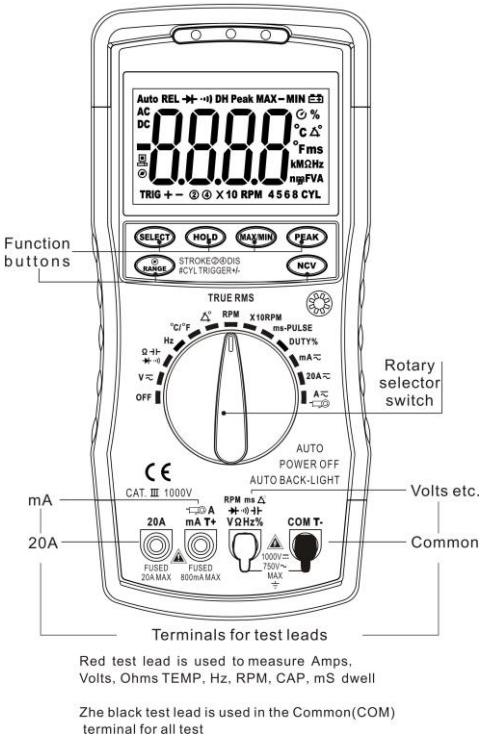
Hi-Impact Case:.....Yes

Size (LxWxD):.....195x88x40mm

Weight(Include9V Battery):..350g

3. MAIN METER FEATURES

Symbols surrounding main display identify functions



Red test lead is used to measure Amps, Volts, Ohms TEMP, Hz, RPM, CAP, mS dwell

Zhe black test lead is used in the Common(COM) terminal for all test

LCD DISPLAY SYMBOLS

MAIN LCD DISPLAY 8888	KILO(OHMS)F k
CONTINUITY	MEGA(OHMS) M
LOW BATTERY	HERTZ(FREQUENCY) Hz
DIODE	PERCENTAGE(DUTY RATIO) %
DATA HOLD	DEGREES FAHRENHEIT °F
AUTO RANGING AUTO	DEGREES CENTIGRADE °C
ALTERNATING CURRENT OR VOLTAGE AC	
DIRECT CURRENT OR VOLTAGE DC	
NANO(CAPACITANCE) n	AMPS A
MICRO(AMPS,CAPS) μ	OHMS Ω
MILLI(VOLTS,AMPS) m	VOLTS V

4. PUSH BUTTON FUNCTIONS

4.1 Manual Range & Stroke 4/2(DIS), DUTY%, ms, CYL Button（Fig 3）

Press to this button to select: STROKE 4, 2 DIS, DUTY%, ms-PULSE, CYL range & V/A/R/CAP/Hz manual Range.

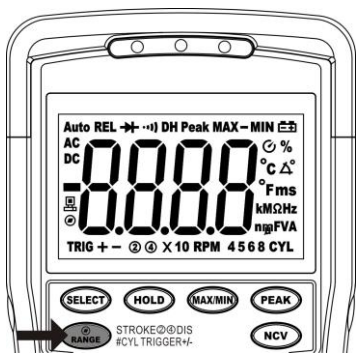


Fig.3

Manual Ranging（Fig 3）

The meter turns on in the auto-ranging mode. Press the Range button to go to manual ranging. The display icon "" will appear. Each press of the range button will step to the next range as indicated by the units and decimal point location. Press and hold the Range button for two seconds to return to auto-ranging.

4.2 Mode Button（Fig 4）

Fig.4

Press the mode push button to select the following functions:

DC/AC Voltage & Current, Ohm/Diode/Continuity/CAP, ℃/℉ TEMP.

4.3 Data Hold（Fig 5a）

The Data Hold function allows the meter to "freeze" a measurement for later reference.

4.3.1 Press the **HOLD** button to “freeze” the reading on the display. The “**DH**” symbol will appear in the display.

4.3.2 Press the **HOLD** button again to return to normal operation.

4.4 Peak Hold (fig. 5b)

Fig.5a Fig.5b

The Peak Hold function captures the peak AC voltage or current. The meter can capture negative or positive peaks as fast as 1.28 millisecond in duration.

4.4.1 Turn the function switch to the ACA or ACV position.

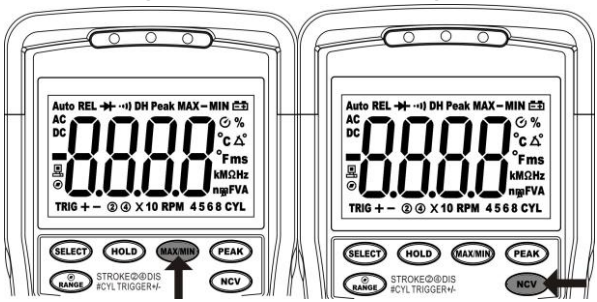
4.4.2 Press the **PEAK** button, **Peak MAX** will display.

4.4.3 The display will update each time a higher positive peak occurs.

4.4.4 Press the **PEAK** button again, **Peak MIN** will display. The display will now update and indicate the lowest negative peak.

4.4.5 To return to normal operation, press and hold the **PEAK** button until the **Peak MAX** or **PEAK MIN** indicator switches off.

Fig.6a Fig.6b



4.5 MAX/MIN button (fig. 6a)

4.5.1 Press the **MAX/MIN** button to activate the MAX/MIN recording mode. The display icon "**MAX**" will appear. Press the **MAX/MIN** button again, The display icon "**MIN**" will appear. The meter will go to manual ranging & display and hold the maximum or minimum reading and will update only when a new “max or min” occurs.

4.5.2. Press the **MAX/MIN** key again and a blinking “**MAX MIN**” will appear. The meter will display the MAX-MIN reading, To exit MAX/MIN mode press and hold the MAX/MIN key for 2 seconds.

4.6 NCV button (fig. 6b)

4.6.1 Press and hold the “**NCV**” button, the meter enters Non Contact AC Voltage (NCV) detection, the NCV green LED light will light up, free it to exit.

4.6.2 Free the “**NCV**” button to exit NCV detection.

5. METER FUNCTIONS

5.1 DC or AC Voltage (DCV or ACV)

5.1.1 Select the Voltage “**V⎓≂**” range with the rotary switch.

5.1.2 Press the "**SELECT**" button to choose **DC** or **AC** voltage measurement.

5.1.3 The meter will automatically select the best voltage range.

5.1.4 Insert Black lead in COM terminal.

5.1.5 Insert Red lead in VΩHz terminal.

5.1.6 Touch the Black probe to ground or to the negative (-) circuit.

5.1.7 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).**

❐ **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.**

5.2 Resistance (Ω)

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.

5.2.1 Select the "Ω ⊣◀ •)) ⊣⊢" range with the rotary switch.

5.2.2 Insert Black lead in COM terminal.

5.2.3 Insert Red lead in VΩHz terminal.

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

5.3 Diode Check (⊣◀)

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

5.3.1 Select the "Ω ⊣◀ •)) ⊣⊢" function with the rotary switch, press the "**SELECT**" button to choose **Diode** measurement.

5.3.2 Insert Black lead in COM terminal.

5.3.3 Insert Red lead in VΩHz terminal

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

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

5.3.6 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 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 3.0 V. In both directions.*

DIODE	(- to +)	Reverse probes (+ to -)
GOOD	0.4 to 0.9V	Over Limit (OL)
	Over Limit (OL)	0.4 to 0.9V
BAD	Over Limit (OL)	1.0 to 3.0V
	1.0 to 3.0V	Over Limit (OL)
	0.4 to 0.9V	0.4 to 0.9V
	Over Limit (OL)	Over Limit (OL)
	0.000V	0.000V

5.4 Audible Continuity (•)))

IMPORTANT: Turn the power OFF on the test circuit

5.4.1 Select "Ω→|•)))⊣⊢" function with the rotary switch, press the "**SELECT**" button to choose **Audible continuity** measurement.

5.4.2 Insert Black lead in COM terminal.

5.4.3 Insert Red lead in VΩHz terminal.

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

5.4.5 If the circuit is complete, the meter will beep continuously.

5.4.6 If the circuit is open, there is no beep and the display shows OL (over limit).

5.5 Capacitance (CAP)

▲IMPORTANT: Turn the power OFF to the test circuit

5.5.1 Select the "Ω→|•)))⊣⊢" function with the rotary switch, press the "**SELECT**" button to choose Capacitance measurement.

5.5.2 Insert Black lead in COM terminal.

5.5.3 Insert Red lead in VΩHz terminal.

CAUTION: When checking in-circuit capacitance, be sure that the circuit has all power removed and all capacitors are fully discharged.

5.5.4 Touch the test lead probes across the capacitance circuit to be tested.

5.5.5 Read the measured value from the LCD Display.

Note:

(a) The measurement time of 10mF and 60mF modes is a little long (MAX Aprox. 7s) .

(b) In order to obtain an accurate reading, a capacitor must be discharged before measurement begins.

(c) Discharging through the chip is quite slow. We recommend the user to discharge the capacitor with some other apparatus.

5.6 DC or AC Current (DCA or ACA)

▲ **IMPORTANT: All current measured flows through the meter.It is important that you do not:**

(A) Measure current greater than 600 Volts AC or DC, with respect to ground.

(B) Do Not Exceed 30 seconds when measuring continuous current between 1A-20A.

5.6.1 Select the "**mA**" or "**20A**" range with the rotary switch.

5.6.2 Press the "**SELECT**" button to select **DC** or **AC** current measurement.

5.6.3 Insert the black lead into the COM Terminal.

5.6.4 Insert the red lead into the **mAT+** or **20A** terminal (select 20A if you are unsure of the current draw).

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

5.6.5 Connect the Red probe to the side of the circuit closest to the power source.

5.6.6 Connect the Black probe to the side of the circuit to ground.

5.6.7 Turn the power ON and test.

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

5-7 DC or AC 600A Current (by clamp adapter)

5.7.1 Select the "A≂ ⊣▭◎" function with the rotary switch, it shows symbol for testing DC current, if you want to test AC current, push "**SELECT**" button switch.

5.7.2 Connect the black banana plug of the AC/DC Current Clamp Adapter to **COM** terminal and the red banana plug to the **mAT+** terminal.

5.7.3 Set the AC/DC Current Clamp Adapter to "**1mV/A**" range.

5.7.4 When perform DC current measurement, always rotate or push the DCA zero adjuster on the Clamp Adapter until the multimeter reads zero.

5.7.5 Clamp the Jaws around the **one** conductor to be measured. Center the conductor within the Jaw using the Centering Marks as guides.

5.7.6 Read the result from the LCD panel. The arrow in the Jaw indicates the DC current direction of positive current flow (positive to negative).

5.8 Temperature (ºC/ºF) **IMPORTANT: To avoid heat damage to the meter, keep it away from sources of very high temperature. The life of the Temperature Probe is also reduced when subjected to very high temperatures. Probe operating range is –58º to 482 ºF.**

5.8.1 Select the "**ºC/ºF**" function with the rotary switch, press the "**SELECT**" button to choose **ºC** or **ºF** measurement.

5.8.2 Insert the temperature probe connector into the K-type thermocouple adapter. Insert the adapter into the front of the meter with the negative pin in the **COM** terminal socket and the positive pin in the mAT+ terminal socket. Touch the end of the temperature sensor to the area or surface of the object to be measured.

5.9 Frequency (Hz)

5.9.1 Select the "**Hz**" Frequency function with the rotary switch.

5.9.2 Insert the black lead into the COM terminal.

5.9.3 Insert the red lead into the VΩHz terminal.

5.9.4 Connect the Black test probe to ground.

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

5.9 Frequency (Hz)

5.9.1 Select the “**Hz**” Frequency function with the rotary switch.

5.9.2 Insert the black lead into the COM terminal.

5.9.3 Insert the red lead into the VΩHz terminal.

5.9.4 Connect the Black test probe to ground.

5.9.5 Connect the Red test probe to the “signal out” wire of the sensor to be Tested.

5.10 Dwell angle ( )

5.10.1 Select the “” function with the rotary switch.

5.10.2 Insert the Black lead into the COM terminal.

5.10.3 Insert the Red lead in VΩHz terminal.

5.10.4 Connect the Black test probe to ground.

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

5.11 Duty Cycle (%)

5.11.1 Select the “**Duty%**” function with the rotary switch.

5.11.2 Insert the black lead into the COM terminal.

5.11.3 Insert the red lead into the VΩHz terminal.

5.11.4 Connect the Black test probe to ground.

5.11.5 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 during one duty cycle.

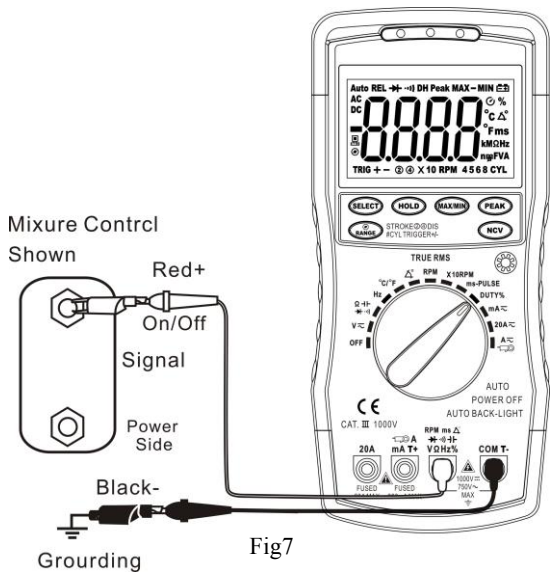


Fig7

5.12 ms-PULSE (Pulse Width) & ms- PERIOD (Period)

5.12.1 Pulse Width is the length of time an actuator is energized. For example, fuel injectors are activated by an electronic pulse from the Engine Control Module (ECM). This pulse generates a magnetic field that pulls the injector nozzle valve open. The pulse ends and the injector nozzle is closed. This open to close time is the Pulse Width and is measured in milliseconds(ms). The most common automotive application for measuring pulse width is on fuel injectors. You can also measure the pulse width of the fuel mixture control solenoid and the idle air control motor.

This exercise shows how to measure Pulse Width (ms) on Port Fuel injectors.

5.12.2 Select the "**ms-PULSE**" function with the rotary switch.

5.12.3 Press the Trigger± button, the negative (-) trigger slope is displayed on the display.

NOTE: The applied time for most fuel injectors is displayed on the negative (-) slope.

5.12.4 Insert the black lead into the COM terminal.

5.12.5 Insert the red lead into the VΩHz terminal.

5.12.6 Connect jumper wires between the fuel injector and the harness connector.

5.12.7 Touch the Black test probe to a good ground at the fuel injector or the negative (-) vehicle battery post.

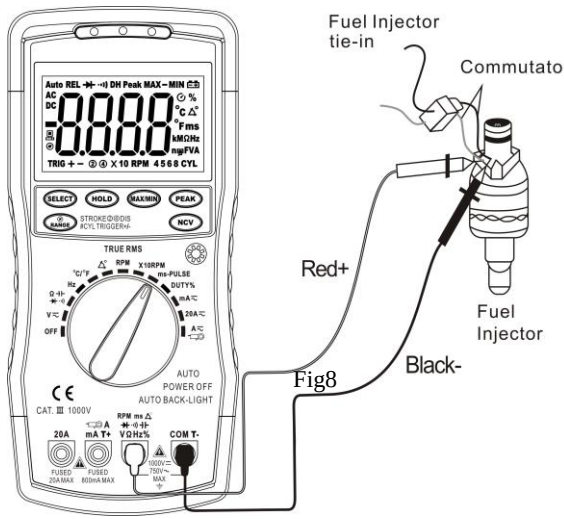


Fig8

5.12.8 Touch the Red test probe to the fuel injector solenoid driver input on the jumper cable.

5.12.9 Start the engine. A pulse width in milliseconds should be read.

Note: Initially, the unit will read “OL”, then readings will descend and stabilize to the actual pulse width. If “OL” remains, re-check your connections.

5.13 RPM and ×10RPM

5.13.1 Using the rotary switch, select either the RPM range or the ×10RPM range (1,000 to 12,000 RPM) and multiply the displayed reading by ten to get actual RPM.

5.13.2 Press STROKE / DIS button to select through RPM for 4-stroke, RPM for 2-stroke and DIS ignitions.

5.13.3 Connect the inductive pickup leads to the meter.

5.13.4 Insert the black lead into the COM terminal.

5.13.5 Insert the red lead into the VΩHz terminal.

5.13.6 Open the inductive pickup and place it onto a spark plug wire. If no reading is received, unhook the clamp, turn it over and connect again.

Notes:

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

5.13.8 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.

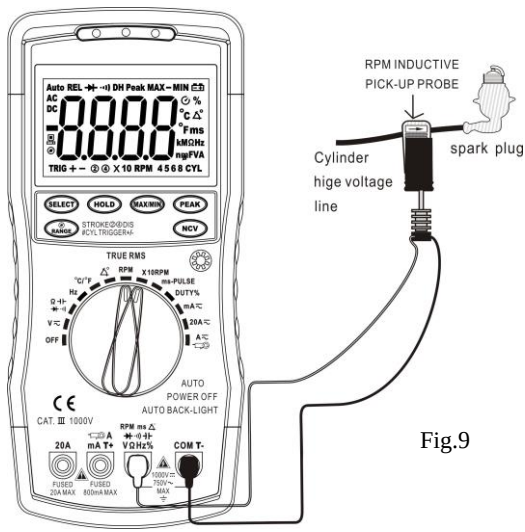


Fig.9

5.13.9 RPM 4 : For RPM of 4-stroke engines which have 1 ignition on every 4 engine Strokes

5.13.10 RPM 2  : For RPM of DIS (Distributor less Ignition System) & 2-stroke engines which Have 1 ignition on every 2 engine strokes

PLEASE NOTE - THE RPM PICK-UP HAS AN ADJUSTABLE SENSITIVITY SWITCH THAT CAN ALSO BE USED TO CORRECT AN UNSTABLE READING.

5-14 Non Contact AC Voltage (NCV) detection

5.14.1 Power on the meter, on any range, press and hold the "NCV" key, the meter enters Non Contact AC Voltage (NCV) detection, the NCV green LED light will light up.

5.14.2 Hold the Meter so that the mater's top is vertically and horizontally centered and contacting the conductor, when the live voltage ≥ 90V AC rms, the NCV red LED light and green LED light will light up alternately together with sound.

NOTE:

1. Even without LED indication, the voltage may still exist. Do not rely on non-contact voltage detector to determine the presence of voltage wire. Detection operation may be subject to socket design, insulation thickness and different type and other factors.
2. When the meter input terminals presence voltage, due to the influence of presence voltage, voltage sensing indicator may also be bright.
3. Keep the meter away from electrical noise sources during the tests, i.e., florescent lights, dimmable lights, motors, etc.. These sources can trigger Non-Contact AC Voltage detection function and invalidate the test.

GENERAL INSTRUMENT SPECIFICATION	
Instrument complies with	IEC 1010-1 EN61010-1
Insulation	Class 2, Double Insulation
Overvoltage category	CATIII1000V/CATIV600V

Display	6000 counts LCD display with function indication
Polarity	Automatic, (-) negative polarity indication.
Overrange	"OL" marks indication
Low battery indication	"⊟" is displayed when the battery voltage drops below the operating level
Measurement rate	3 times per second, nominal
Auto power off	Meter automatically shuts down after approx. 15 minutes of inactivity
Operating environment	0°C to 50°C (32°F to 122°F) at< 70% relative humidity.
Storage temperature	-20°C to 60°C (-4°F to 140°F) at< 80% relative humidity.
For inside use, max height	2000m
Pollution degree	2
Power	One 9V battery (PP9)
Dimensions	195 x 88 x 40 mm
Weight	350g (include battery)

6.ELECTRICAL SPECIFICATIONS

Electrical Specification (ACCURACY).

Accuracy is given as ± ([% of reading] + [number of least significantdigits]) at 18°C to 28°C (65°F to 83°F), with relative humudity up to 70%.

DC VOLTAGE		
Range	Resolution	Accuracy
600.0mV	0.1mV	±1.5% of rdg ± 5dgts
6.000V	1mV	±1.0% of rdg ± 5dgts
60.00V	10mV	
600.0V	100mV	
600V/ 1000V	1V	±1.5% of rdg ± 5dgts
Input Impedance: 10MΩ		

AC VOLTAGE (True RMS)		
Range	Resolution	Accuracy
600.0mV	0.1mV	±2.0% of rdg ± 10dgts
6.000V	1mV	±1.5% of rdg ± 5dgts
60.00V	10mV	±1.5% of rdg ± 8dgts
600.0V	100mV	
600V/ 750V	1V	±2.0% of rdg ± 4dgts
Input Impedance: 10MΩ / Frequency Range 40 to 400Hz		

Overload Protection: 0.8A / 250V and 20A / 250V Fuse Maximum Input: 600mA DC or 600mA AC RMS on mA ranges,20A DC or AC RMS on 20A range.

DC CURRENT		
Range	Resolution	Accuracy
60.00mA	10uA	±1.5% of rdg ± 3dgts
600.0mA	100uA	
20A	10mA	±2.5% of rdg ± 5dgts
600A	100mA	±3.0% of rdg ± 5dgts

AC CURRENT (True RMS)		
Range	Resolution	Accuracy
60.00mA	10uA	±1.8% of rdg ± 5dgts
600.0mA	100uA	
20A	10mA	±3.0% of rdg ± 7dgts
600A	100mA	±3.5% of rdg ± 10dgts

DWELL ANGLE			
Cylinder	Range	0.1°	±2.5% of rdg ± 10dgts
4CYL	0 ~ 90.0°		
5CYL	0 ~ 72.0°		
6CYL	0 ~ 60.0°		
8CYL	0 ~ 45.0°		
Cylinder	Range		

600A range with AC/DC Current Clamp Adapter
Overload Protection: 0.8A / 500V and 20A / 500V Fuse Frequency Range: 40 to 400Hz.
Maximum Input:
600mA DC or 600mA AC RMS on mA ranges,20A DC or AC RMS on 20A range.

RESISTANCE		
Range	Resolution	Accuracy
600.0Ω	0.1Ω	±1.5% of rdg ± 5dgts
6.000kΩ	1Ω	±1.0% of rdg ± 5dgts
60.00kΩ	10Ω	
600.0kΩ	100Ω	
6.000MΩ	1kΩ	
60.00MΩ	10kΩ	±2.5% of rdg ± 10dgts

AUDIBLE CONTINUITY TEST
Audible threshold:< 50Ω
Test Current:< 1mA DC typical

RPM (Tach)			
Range		Resolution	Accuracy
RPM 4	60 ~ 9000 RPM	1 RPM	±2.5% of rdg ± 10dgts
	600 ~ 12000 RPM. (x10 RPM)	10RPM	
RPM 2/DIS	60 ~ 9000 RPM	1 RPM	
	600 ~ 12000 RPM. (x10 RPM)	10RPM	
Effect Reading: >60RPM			

DIODE TEST		
Test Current	Resolution	Accuracy
1.0mA typical	1mV	±5% of rdg ± 15 dgts
Open circuit voltage:3.0V DC typical		

CAPACITANCE		
Range	Resolution	Accuracy
9.999nF	1pF	±2.5% of rdg ± 20dgts
99.99nF	1pF	±2.5% of rdg ± 10dgts
999.9nF	0.1nF	
9.999uF	1nF	
99.99uF	10nF	
999.9uF	0.1uF	
9.999mF	0.001mF	±10% of rdg ± 20dgts
60.00mF	10.00mF	

FREQUENCY			
Range	Resolution	Sensitivity	Accuracy
9.999Hz	0.001Hz	>1V RMS	±0.1% of rdg ± 5dgts
99.99Hz	0.01Hz		
999.9Hz	0.1Hz		
9.999kHz	1Hz		
99.99kHz	10 Hz		
999.9 kHz	100 Hz		
9.999 MHz	1kHz		

DC VOLTAGE		
Range	Resolution	Accuracy
600.0mV	0.1mV	±1.5% of rdg ± 5dgts
6.000V	1mV	±1.0% of rdg ± 5dgts
60.00V	10mV	
600.0V	100mV	
600V/ 1000V	1V	±1.5% of rdg ± 5dgts
Input Impedance: 10MΩ		

PULSE WIDTH		
Range	Resolution	Accuracy
1.0 ~ 10.0ms	0.1ms	± 2% of rdg ± 20dgts

DUTY CYCLE		
Range	Resolution	Accuracy
1.0% ~ 99.0%	0.1%	± 2% of rdg ± 5dgts

Pulse width: >100us, <100ms Frequency width: 5Hz ~ 100kHz
Sensitivity: >5V RMS

7. MAINTENANCE

❒ **WARNING!** Do not attempt to repair or service the analyser unless you are qualified to do so and have the relevant calibration, performance test, and service information. To avoid electrical shock or damage to the meter do not get water inside the case.

7.1 Periodically wipe the case with a damp cloth and mild detergent. Do not use solvents.

7.2 Turn the analyser off when not in use and remove the battery if stored for a long period of time.

7.3 Do not store the analyser in a place of high humidity or high temperature.

7.4 Replacing The Battery

❒ WARNING! To avoid electric shock, disconnect the test leads from the analyser before removing the battery Cover.

7.4.1 When the battery becomes exhausted or drops below the operating voltage, the battery symbol will be appear in the left hand side of the display.

7.4.2 Open the battery cover by loosening the two screws using a small cross head screwdriver.

7.4.3 Remove the old battery and insert the new one, observing the correct polarity.

7.4.4 Replace the battery cover and secure with the two screws.

❒ WARNING! To avoid electric shock, do not operate the analyser until the battery cover is secured in place.

7.5 Replacing the Fuses

WARNING! To avoid electric shock, disconnect the test leads from the analyser before accessing the fuses.

7.5.1 Open the rear cover by loosening the six screws using a small cross head screwdriver. Gently ease the rear cover off.

7.5.2 Remove the old fuse from its holder by gently pulling it out. Take care not to touch any other internal parts of the analyser.

7.5.3 Install the new fuse into its holder by gently pushing it in.
Note: Always use a fuse of the correct size and value.

Fuse Ratings:

20A/500V, 6 x 30mm fast acting ceramic type for the 20A range.

0.8A/500V, 6 x 30mm fast acting ceramic type for the mA range.

7.5.4 Replace the rear cover and secure with the six screws.

WARNING! To avoid electric shock, do not use the analyser until it has been fully re-assembled.

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