

# User's Handbook

---

## ENGINE IGNITION ANALYZER



# Table of Contents

<b>1. Technical Specification</b>	<b>Page 1</b>
1.1 General specifications	Page 1
1.2 Electrical specifications	Page 1
<b>2. General description</b>	<b>Page 2</b>
3.1 Instrument description	Page 2
3.2 Display description	Page 2
<b>3. Buttons description and operation</b>	<b>Page 3</b>
3.1 Clear button and operation	Page 3
3.2 Strokes 2/4 button and operation	Page 3
3.3 Mode button and operation	Page 3
3.4 View button and operation	Page 3
3.5 Select button and operation	Page 4
3.6 Examples of View and Select Functions combination	Page 4
<b>4. Measurement functions</b>	<b>Page 5</b>
4.1 Engine RPM	Page 5
4.2 Spark burn (firing time)	Page 5
4.3 Spark plug voltage	Page 5
<b>5. Measurement Procedures</b>	<b>Page 6</b>
5.1 Measuring Coil on Plug and Coil near Plug ignition systems	Page 6
5.2 Spark plug wire ignition systems	Page 7
<b>6. Safety Rules</b>	<b>Page 8</b>
<b>7. Maintenance</b>	<b>Page 8</b>
<b>8. Warranty</b>	<b>Page 8</b>

# 1. TECHNICAL SPECIFICATIONS

## 1.1 General Specifications

Display:	View display ,select display,indicators for low battery, number of strokes ,ignition system, functions and measurement units.
Update rate:	3 per second (for LCD).
Ignition system comp.:	Coil on plug, coil near plug, DIS, conventional and magneto.
Engine strokes:	2 and 4 strokes and DIS.
Power:	9 Volt battery, type MN1604
Auto power off:	Automatically powers off after 3 min. of no operation.
Battery life:	Approximately 15 hours (w/alkaline battery).
Probe length:	25 cm Including capacitive pick-up.
Dimensions:	135 x 70 x 35 mm without antenna.
Weight:	Approximately 350 g. (Including battery).
Included accessories:	the capacitive pick-up Padded hard carrying case, user's manual and 1 x 9 Volt alkaline battery.

## 1.2 Electrical Specifications

- The specifications below are typical at 23° C, and will vary slightly from device to device and with temperature. The input voltage should not exceed the indicated maximum values, to prevent personal injury or damage to the instrument.

Function	Measurement Range	Accuracy/Repetitivity	Input Characteristics
RPM	200 to 20000 RPM 2 and 4 strokes and DIS	Accuracy: 0.5% ± 1 LSD	Input Impedance: 100KΩ + 1.5 nF (Minimum).  Input Protection: ± 42 VDC Max.
Spark KV	0 to 50 Kv	Repeatability: 3% ± 1 LSD	
Spark burn time	0 to 10 ms	Accuracy: ± 0.1 ms	

## 2. GENERAL DESCRIPTION

### 2.1 Instrument Description

- 1) Capacitive pick-up
- 2) Flexible probe
- 3) LCD Display
- 4) View button
- 5) Strokes 2/4 button
- 6) Mode button
- 7) Select button
- 8) Clear button

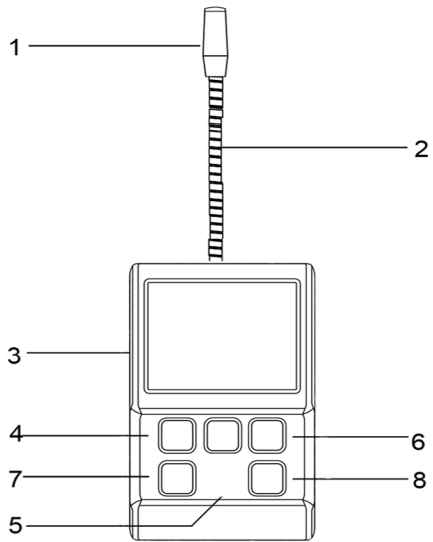


Fig. 1 - Instrument description

### 2.2 Display Description

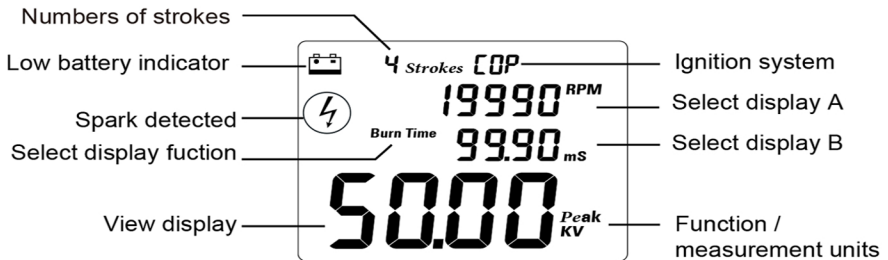


Fig. 2 - LCD Display

#### Functions and measurement units

Display	Function	Measurement units
<b>RPM</b>	Tachometer	RPM (Revolutions per minute)
<b>Burn Time mS</b>	Spark plug burn time	mS (Milliseconds)
<b>Spark KVolt</b>	Spark plug peak voltage	KV ( 1000 x Volt)

## 3. BUTTONS DESCRIPTION AND OPERATION

### 3.1 Clear button



- When the instrument is OFF, to turn it ON press and hold the 'Clear' button until the unit turns on (in approximately 1 second).
- When the instrument is ON, to turn it OFF press and hold the "Clear' button until the display turns OFF (in approximately 3 seconds).
- When the instrument is ON, press momentarily the 'Clear' button to reset the Maximum and Minimum and capture values.
- The 'Auto Power Off' feature will automatically turn the instrument off after 3 minutes of no button being pressed or 15 seconds after the last spark signal was detected. Turning the unit off manually when not in use will prolong battery life.

### 3.2 Strokes 2/4 button



- Press the 'Strokes 2/4' button to select the number of strokes for the engine under measurement. Each time the button is pressed the number of strokes will change between 2 strokes, 4 strokes, and DIS settings. The selected setting will show on the display.
- For **SPW** (Spark Plug Wire) measurement mode, it can be set to : 2 or 4 strokes or DIS (Distributorless or waste spark ignition system).
- For **COP** (Coil on Plug) measurement mode, it can be set to: 2 or 4 strokes.

### 3.3 Mode button



- Press the 'Mode' button to select the ignition system measuring mode that matches the ignition system used in the engine being diagnosed, as explained below. The selected setting will be shown on the display.
- **SPW** (Spark Plug Wire): Use this setting for all ignition systems equipped with high voltage spark plug wires (e.g.: Conventional distributor, magneto, distributorless or waste spark ignition systems).
- **COP** (Coil On Plug): Use this setting for ignition systems in which the ignition coil is mounted near or directly on top of the spark plug.

### 3.4 View button



- Press this button to change which measurement is shown in the view display. There are three measurements to choose from: RPM, spark burn time, and spark KVolt. Every time this button is pressed momentarily the measurement changes from one function to the next.
- Press and hold this button for three seconds to start the automatic calibration of the unit to the COP module type being measured. While calibrating, the display will flas "CAL" and will return to normal after the procedure is completed (in about 3 seconds). Calibration is disable when in SPW mode.

**Important:**

- Immediately after calibration, the Engine Ignition Analyzer will display a baseline value of “10.0 Spark KVolt” by default. All the spark KVolt measurements obtained thereafter would be relatives to the (value) module used for calibration.
- If the Engine Ignition Analyzer is calibrated again, the Spark KVolt values obtained before and after calibration may not be comparable.
- If not calibrated, the Engine Ignition Analyzer may show a false ‘0.0 Spark KVolt’ reading when measuring spark KVolt on Coil on Plug and Coil near Plug systems.

**' ) 'GYWVi Itcb**



Ú;^••Ác@Áà`ç [ Á [ { ^ } çã Áç Á&@ \*^Á, @Áã Áãã ] æ^áÁã Ác@Áç [ Á selectÁã ] |æ•ÉV@Áã^Áç [ Á ] [ ••ã|^Á&@ã•^Ác@Áç [ Á ( ^æ`!^ { ^ } ) not shown in the main display or the Maximum and Minimum readings of theÁmain display.

Þ[ çK | Á c@Á ç&@ { ^ç!Á~ } &ç ] Á ÇÛT D Á çÁ T çã ~ { Á çã Á T çã } readings on the select displays are shown with the last digit rounded to “0”.Á

Ú;^••ã \* Áã áÁç |ãã \* Ác@Áà`ç [ Á ] :Ác@^Á•^Áç [ á•Á~ } çÁã' æ @ \* Áç@É+ appears in the select display A enables ‘Capture mode’,which measures and holds the maximum readings of spark KVolt and spark burn time.The values held while in capture mode can be reset by pressing the ‘Clear’ button momentarily.When in capture mode, only the ‘Clear’ and ‘Select’ buttons will remain operative.To exit this mode press the ‘Select’ button momentarily again.Á

**3.6 Examples of View and Select Functions combination**

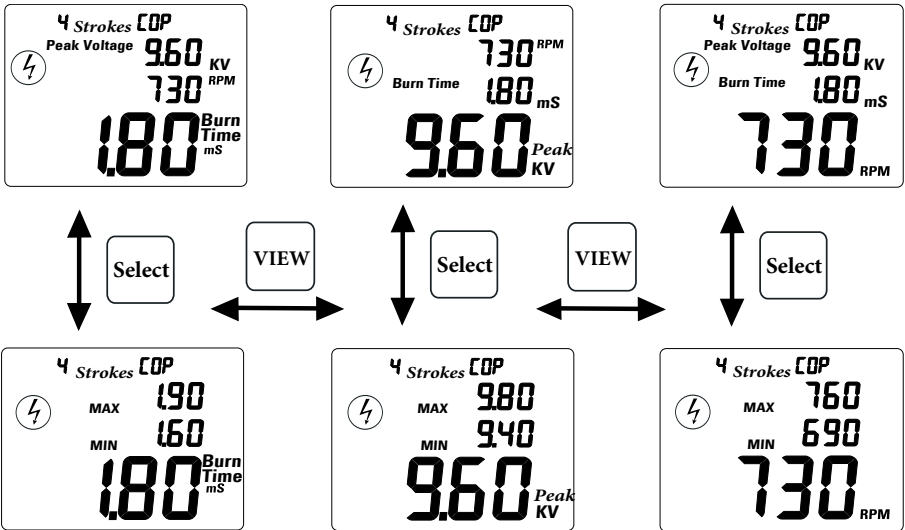


Fig. 3 - LCD Display

## 4. MEASURING FUNCTIONS

The Engine Ignition Analyzer has specially dedicated modes for use in the diagnostics and troubleshooting of Coil on Plug and Coil near Plug ignition technology, and for systems using spark plug wires. The Engine Ignition Analyzer can measure the following:

- Engine RPM,
- Spark burn time, and
- Spark KVolt (relative measurement).

### 4.1 Engine RPM

Measures engine RPM in 2, 4 strokes and DIS engines, and it can be used in combination with spark burn time and spark KVolt measurements, to evaluate the ignition system performance at different engine speeds. The RPM displayed by the Engine Ignition Analyzer is absolute measurement.

### 4.2 Spark burn (firing) time

The spark burn time, also called “firing time”, is the measurement of the time period from the moment that a spark is initiated up to the point when it is extinguished, and is the most indicative measurement of performance of the ignition system. Abnormally long or short burn times may indicate some problem in the ignition module, spark plug, fuel mixture, cylinder compression, etc. The spark burn time displayed by the Engine Ignition Analyzer is absolute measurement.

### 4.3 Spark KVolt

Spark KVolt values are relative measurements, only useful to compare the performance of the ignition system in each cylinder of the same engine. Comparing spark KVolt between cylinders may be used to diagnose common problems like misfires, broken spark plug wires, etc. However spark KVolt values may vary widely, are less consistent and not always indicative of a properly working ignition system.

#### **Important:**

- Small variations in spark burn time and spark KVolt readings from cylinder to cylinder are normal, and do not indicate any problem. For diagnostic purposes, the attention should be focused on SIGNIFICANT DIFFERENCES in readings, most likely caused by problems in the engine or the ignition system itself.
- Ignition problems may sometimes appear at higher engine RPM, but not at low or idle speed. We recommend that measurements be made at idle speed and normal engine operating temperature, and then at increasing RPM, and up to equivalent of highway speeds, typically about 2000 to 2500 RPM. Do not exceed maximum permissible (“red-line”) engine speeds. Make all measurements at about the same engine speeds, using the Engine Ignition Analyzer tachometer function to check the RPM.

# 5 MEASURING PROCEDURES

## 5.1 Measuring Coil on Plug and Coil near Plug ignition systems

- 1-Turn the instrument on.
- 2-Select the mode COP by pressing the 'Mode' button.
- 3-Select the appropriate strokes for the engine under measurement by pressing the 'Strokes 2/4' button.
- 4-Select the measurement to show in the main display( RPM, spark burn time or spark KVolt )by pressing the "View" button
- 5-Select the mode for the select display (Minimum and Maximum of the main display or the complementary measurements )by pressing "Select" button.
- 6- Place the capacitive pick-up on the top and center of the ignition module (as shown in Fig 4 below), searching for the position that produces a stable RPM or spark burn time reading.
- 7- If this is the first measurement taken in the engine, then proceed to calibrate the spark KVolt measurement first (following the procedure in '3.4 View' button'), as this calibration value will be used as a reference value to compare the spark KVolt reading between all the coil on plug or coil near plug modules.
- 8- If the instrument is unable to detect the ignition system signal, it may be necessary to reposition the pick-up so that a consistent signal is detected and displayed.

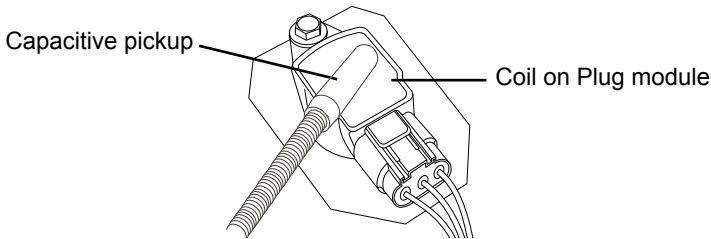


Fig. 4 - Capacitive pickup on coil on plug module

### Important:

- In some engines, the ignition modules are located very close together, and in rare occasions this could cause the instrument's pick-up to detect signals from nearby modules, leading to inconsistent measurements. This can usually be solved by changing the placement or orientation of the pick-up on the ignition module.
- Spark KVolt is a relative measurement and should be used only to compare between ignition modules or spark plug wires in the same engine. In COP mode, always perform a calibration of the spark KVolt in one of the ignition modules before proceeding to measure and compare results between cylinders.



## 5.2 Spark plug wire ignition systems

- 1-Turn the instrument on.
- 2- Select the mode SPW by pressing the 'Mode' button.
- 3- Select the appropriate strokes for the engine under measurement by pressing the 'Strokes 2/4' button.
- 4- Select the measurement to show in the main display(RPM, spark burn time or spark KVolt ) by pressing the "View" button
- 5- Select the mode for the select display( Minimum and Maximum of the main display or the complementary measurements) by pressing "Select" button.
- 6- Place the capacitive pickup over one of the spark plug wires, and proceed to read the measurement on the display.To obtain consistent measurements, maintain a right angle (90°) or parallel between the pick-up and the wire(as shown in Fig 5 below).
- 7- If the instrument is unable to detect the ignition system signal, it may be necessary to reposition the pick-up so that a consistent signal is detected and displayed.

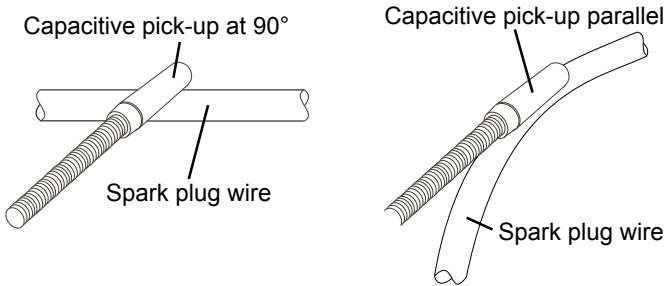


Fig. 5 - Capacitive pick-up on spark plug wire

### Important:

- The Spark KVolt reading is sensitive to exact position of the capacitive pick-up relative to the spark plug wire. Therefore the placement of the pick-up relative to the wire should be kept as consistent as possible for all the measurements in order to compare voltage readings between several cylinders' spark plug wires.
- Spark burn time and RPM measurements are not sensitive to the exact position of the capacitive pick-up relative to the spark plug wire, but it has to be placed so the instrument is capable of detecting the signal.
- When several spark plug wires are routed or bunched close together, the capacitive pick-up may receive signals from several wires at the same time, which could cause erroneous measurements. In these situations it may be necessary to separate the wire under measurement from the others, in order to reduce interference and obtain an accurate measurement.
- When measuring on spark plug wires, the placement of the capacitive pick-up along the spark plug wire will also cause some variation, due to the internal resistance (or impedance) of the spark plug wire. For example, if the capacitive pick-up is placed on the spark wire near the distributor or the DIS coil, voltage reading will be higher than if placed near the spark plug.

## 6. SAFETY RULES

- This instrument is designed for indoor use at temperatures between 32° and 104° F (0°C and 40°C) and altitudes up to 6500 ft (2,000 meters).
- To ensure that the instrument is used safely, follow all safety and operating instructions in this operation manual. If the instrument is not used as described in this operation manual, the safety features of this instrument may be impaired.
- Do not use the instrument if the instrument, the capacitive pick-up or the flexible probe looks damaged, or if you suspect that the instrument is not operating properly.
- When using the instrument, keep away from moving parts (fan, drive belts, etc) and hot objects (exhaust pipes, muffler , catalytic converter, etc), to avoid personal injuries and damage to the instrument, the capacitive pick-up or the flexible probe.
- Do not connect or apply more than 42 VDC or any AC current directly to the capacitive pick-up or the flexible probe.
- At all times, to avoid electrical shock, use CAUTION when working with electrical circuits above 60V DC or 25V AC rms. Such voltages pose a shock hazard.
- Do not operate this instrument with the battery cover off.
- To avoid electrical shock or damage to the instrument, do not exceed the specified input limits.

**CAUTION:**To avoid personal injuries and damage to the instrument carefully inspect the spark plug wires, distributor cap, ignition coil , ignition module, and all other ignition system parts for damage or leaks, and avoid using this instrument in case any damage or leaks are found. Never touch the capacitive pick-up or flexible probe during a test. Wear insulating gloves when working around high voltage, and hot parts, and keep away from moving parts (fan, drive belts, etc) and hot objects (exhaust manifold and pipes, muffler, catalytic converter, etc.)

**Exceeding the limits listed above when using this apparatus, or not observing the precautions listed above can expose you to physical injury and permanently damage your instrument and/or parts and components of the vehicle under test.**

## 7. MAINTENANCE

Keep the instrument in its carrying case when not in use and do not subject it to dampness or severe heat or cold. Do not use the instrument in the rain, if it should accidentally get wet, dry it off with a clean paper towel before storing it away.

Cleaning should be limited to wiping with a clean damp paper towel and a small amount of soap if required. Dry the unit thoroughly after any cleaning.

The unit is a sealed instrument and contains no user serviceable parts other than the battery, which can be replaced by opening the drawer on the back of the unit. Opening other parts of the unit will void the warranty.

## 8. WARRANTY

With the exception of the battery, this instrument is warranted against defects of material or workmanship which develop within a period of one (1) year following the date of purchase by the original owner.