

Owner's Manual & Safety Instructions

Save This Manual Keep this manual for the safety warnings and precautions, assembly, operating, inspection, maintenance and cleaning procedures. Write the product's serial number in the back of the manual near the assembly diagram (or month and year of purchase if product has no number). Keep this manual and the receipt in a safe and dry place for future reference.

ET0751

Multisystem Ignition Analyzer



When unpacking, make sure that the product is intact and undamaged.

Due to continuing improvements, actual product may differ slightly from the product described herein. Tools required for assembly and service may not be included.

WARNING

Read this material before using this product. Failure to do so can result in serious injury.
SAVE THIS MANUAL.

Table of Contents

1. Important Safety Information	2
2. Technical Specifications	2
2.1 General specifications	2
2.2 Electrical specifications	2
3. Operating Instruction	3
3.1 Instrument description	3
3.2 LCD Display	4
3.3 Buttons description and operation	5
3.4 Measurement procedures	7
3.5 Additional functions	11
4. Application information	12
4.1 Taking measurements	12
4.2 Diagnostic using spark burn time and spark KVolt readings	12
4.3 Common causes of long burn time readings	12
4.4 Common causes of short burn time readings	13
4.5 Common causes of low spark KVolt readings	13
4.6 Common causes of high spark KVolt readings	13
5. Maintenance	14
5.1 Battery replacement	14
5.2 Cleaning	14
6. Warranty	15

1. IMPORTANT SAFETY INFORMATION

- ◆ This instrument can be used indoor, the temperature should between 32°F and 104°F (0°C and 40°C), altitudes up to 6500 ft (2,000 meters).
- ◆ In order to use the instrument safely, please follow all the safety and operating instructions of this manual to operate. The security feature of this instrument will be impaired if not following the manual to operate.
- ◆ If this instrument, the capacitive pick-up or the flexible probe looks damaged, or you suspect that the instrument is operating abnormally, please do not use it under the circumstances.
- ◆ In order to avoid personal injury and damage to the instrument, capacitive pick-up or flexible probe, please keep away from the moving parts (fan, transmission belts etc.) and hot objects (exhaust pipe, muffler, catalytic converter, etc) when using the instrument.
- ◆ Please do not connect or apply more than 42 VDC or any AC current to the capacitive pick-up or the flexible probe.
- ◆ When operate the circuit above 60 V DC or 25 V AC, to avoid electrical shock, please be careful at any time. Because such voltage may cause shock hazard.
- ◆ Please do not operate the instrument when the battery cover is off.
- ◆ In order to avoid electrical shock or damage to the instrument, please do not exceed the specified input limits.

When using this instrument, if exceeding the above limitation or not paying attention to the precautions, it may cause personal injury or permanently damage to the instrument or the vehicle under test.

2. TECHNICAL SPECIFICATIONS

2.1 General Specifications

Display:	LCD 128 x 64 digits screen.
Update rate:	3 per second (for LCD).
Ignition system comp.:	Coil on plug, coil near plug, DIS, conventional and magneto.
Engine cycles:	2 and 4 cycles and DIS (distributorless ignition system).
Power:	9 Volt battery.
Auto power off:	Automatically powers off after 3 min. of no operation.
Battery life:	Approximately 20 hours (w/alkaline battery).
Probe length:	35 cm, Including capacitive pick-up.
Dimensions:	165x100x32 mm without antenna.
Weight:	Approximately 0.363 kg (Including battery).
Included accessories:	Padded hard carrying case, user's manual, rubber holster and 1x9 Volt alkaline battery.

2.2 Electrical Specifications

- ◆ The specifications below are in the standard 23°C environment, there will be slight difference between different equipments and temperatures. To avoid personal injury or damage to the instrument, the input voltage should not exceed the specified

maximum value.

Function	Measurement Range	Accuracy/ Repetitivity	Input Characteristics
RPM	200 to 19999 RPM 2 and 4 cycles 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: ±0.1ms	

3. OPERATING INSTRUCTION

3.1 Instrument Description

- 1) Capacitive pick-up
- 2) Flexible probe
- 3) Protective rubber holster
- 4) LCD Display
- 5) Power /Reset button
- 6) F2 button
- 7) Ignition System button
- 8) F1 / Calibrate button
- 9) Engine Cycles button



Fig. 1- Instrument description

3.2 LCD Display

3.2.1 LCD Display description

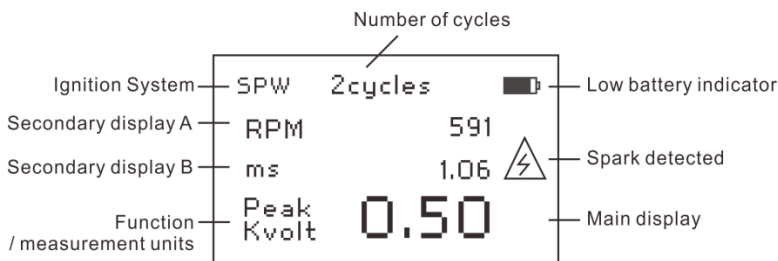


Fig.2-LCD Display

3.2.2 ' ' Low battery indicator

The low battery indicator reminds that the battery voltage is below the recommended minimum value, it need to be replaced a new battery.

Notes:

- ◆ If the battery voltage is low but still allows the instrument operating, the low battery indicator will appear and maintain until replace a new battery.
- ◆ If the instrument turns off immediately after turning on, it means that the battery voltage is below the absolute minimum value, it should be replaced a new battery in case of malfunction.

3.2.3 Number of Cycles

Displays the number of cycles (strokes) selected: 2,4 or DIS.

3.2.4 Ignition System

Displays the selected ignition system measurement: "SPW" for Spark Plug Wire, "COP" for Coil on Plug and Coil near Plug.

3.2.5 Spark Detected

A flashing high voltage symbol  indicates that the spark is detected in the ignition system.

3.2.6 Secondary display A

Press the "F2" button, according to the selected setting, it will display the maximum reading, RPM or the spark KVolt with the selected measurement units and/or functions.

3.2.7 Secondary display B

Press the "F2" button, according to the selected setting, it will display the minimum

reading, RPM or the spark burn time with the selected measurement units and/ or functions.

3.2.8 Main display

Press the “F1/Calibrate” button, the main display can be set to show the engine RPM, spark KVolt or spark burn time.

3.2.9 Functions and measurement units

Displays the measurement units and / or the functions of the main display. The selected functions with measurement units will show as below.

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

3.3 Buttons description and operation

3.3.1 Power ON/OFF and Reset button



- ◆ When the instrument is off, press the “Power / Reset” button until the instrument turns on (about 1 second).
- ◆ When the instrument is on, press the “Power / Reset” button until the instrument turns off (about 3 seconds).
- ◆ When the instrument is on, press the “Power / Reset” button momentarily to reset the maximum and minimum and capture values.

Note: In order to prolong the battery life, the instrument will automatically turn off after 3 minutes of being idle (i.e. No button pressed and no input signal). When not in use, turn off the instrument manually will prolong the battery life.

3.3.2 Ignition System button



- ◆ Press the “Ignition system” button to select the ignition system measurement mode that matches the ignition system of the engine under diagnosing, explain as below. The selected setting will be shown on the

display.

- ◆ SPW (Spark Plug Wire): This setting apply to all the ignition systems equipped with high voltage spark plug wire (i.e.:Conventional distributor, magneto, distributorless or waste spark ignition systems).
- ◆ COP (Coil On Plug): This setting apply to the ignition systems which the ignition coil is mounted near the spark plug or on top of the spark plug.

3.3.3 Engine Cycles button

Engine
Cycles

- ◆ Press the “Engine Cycles” button to select the number of cycles for the engine under testing. The number of cycles will change between 2 cycles, 4 cycles and DIS setting each time the button is pressed. The selected setting will be shown on the display.
- ◆ In SPW (Spark Plug Wire) measurement mode, it can be set to: 2 or 4 cycles or DIS (Distributorless or waste spark ignition system).
- ◆ In COP (Coil on Plug) measurement mode, it can be set to: 2 or 4 cycles.

3.3.4 F1 / Calibrate button

F1
Calibrate

- ◆ Press this button will change the measurement which shown on the main display. There are three measurements to select: RPM, spark burn time, and spark peak voltage. The measurement functions will be changed each time the button is pressed momentarily.
- ◆ Press this button for 3 seconds to start the automatically calibration of the unit, enter the COP module type under testing. While calibrating, the screen will display “Calibrating please wait” , it will turn back to the normal after accomplishing the procedure (about 3 seconds). The calibration function is disable when in SPW mode.

3.3.5 F2 button

F2

- ◆ Press the button momentarily will change the display of the two secondary displays. There are two possible selections: the two measurements not shown in the main display or the Maximum and Minimum readings of the main display. Press the button for three seconds to turn on/ off the display backlight.

3.3.6 Main and Secondary Functions display combinations

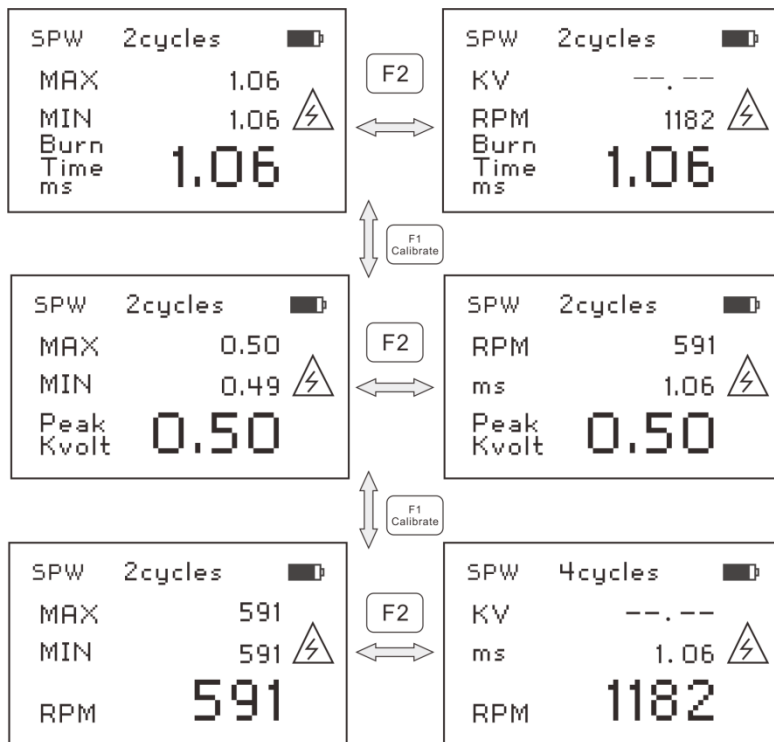


Fig.3- Examples of Main and Secondary Functions combinations

3.4 Measurement Procedures

CAUTION

To avoid personal injury or damage to the instrument, please check the spark plug wire, distributor cap, ignition coil, ignition module and other ignition system components carefully for damage or leaks. If there is any damage or leaks, please do not use the instrument. Please do not touch the capacitive pick-up or the flexible probe during the testing period. Please wear insulating gloves when working around the high voltage and hot parts, and keep away from moving objects (fans, transmission belts etc.) and hot parts (exhaust manifold and pipes, muffler, catalytic converter, etc.).

3.4.1 Instrument measuring functions

There is the special dedicated mode for the ignition technology of diagnosing and troubleshooting the Coil on Plug and Coil near Plug, and using the spark plug wire system. These dedicated modes compensate the difference in signal strength and waveform patterns between ignition systems.

The instrument can measure the below function:

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

3.4.1.1 Engine RPM

Measure the engine RPM in 2, 4 cycles and DIS engines, in order to evaluate the ignition system performance in different engine speeds, it can combine the spark burn time and spark KVolt to use.

3.4.1.2 Spark burn (firing) time

The spark burn time, also called “firing time”, it’s the time period measurement of a spark from ignition to extinguishing, it’s the best measurement to indicate the ignition system performance. The abnormal long or short burn time is likely to indicate that there are some problems with the ignition module, spark plug, fuel mixture or cylinder compression, etc.

3.4.1.3 Spark KVolt

The spark KVolt value is a relative measurement, it’s used to compare the ignition system performance in each cylinder. It can diagnostic the common problems by comparing the spark KVolt between different cylinders, such as misfire, broken spark plug wire, etc. But the spark KVolt values vary widely, they are inconsistent, and not always indicate a properly working ignition system.

3.4.2 Measuring Coil on Plug and Coil near Plug ignition systems

- 1- Turn on the instrument.
- 2- Press the “Ignition System” to select if the instrument is not already in the COP mode.
- 3- Press the “ Engine Cycles” button repeatedly to select the number of cycles for the engine under testing, until the display shows the correct setting.
- 4- Select the measurement to show on the display: RPM, spark burn time and spark KVolt.
- 5- Select the mode for the secondary display: the Minimum and Maximum value of the main display or the complementary measurements.
- 6- Place the capacitive pick-up over one of the ignition modules, as show in Fig. 4, search the position that produce the stable RPM or the spark burn time reading.
- 7- Calibrate the spark KVolt measurement first if this is the first measurement for the engine, since this calibration value will be used as the reference value to compare the spark KVolt reading between the coil on plug or coil near plug modules.

8- Place the capacitive pick-up over the ignition module, read the measurements.



Fig. 4-Capacitive pickup on coil on plug module

Important:

- ◆ In some engines, the ignition modules are close to each other, this may cause the capacitive pick-up of the instrument receive signals from nearby modules, it may cause false readings.
- ◆ In order to reduce interference from other ignition modules, the nearby ignition modules should be completely covered with pieces of aluminum foil, make sure that the aluminum foil is connected to the electrical grounding system of the engine.

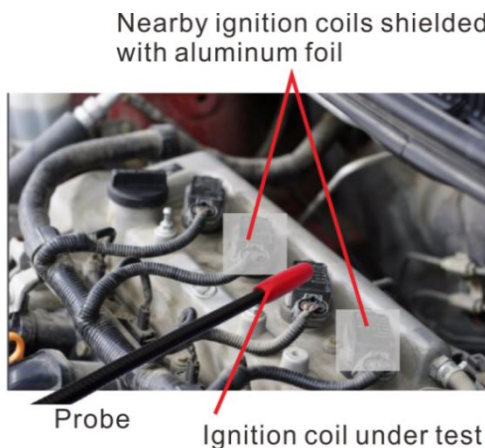


Fig. 5 – Avoiding interference by shielding nearby ignition coils

3.4.3 Spark plug wire ignition systems

- 1- Turn on the instrument.
- 2- Please press the "Ignition System" button to select if the instrument is not already in the SPW (Spark Plug Wire) mode.

- 3- Press the “ Engine Cycles” button repeatedly to select the number of cycles for the engine under testing, until the display shows the correct setting.
- 4- Select the measurement to show on the display: RPM, spark burn time or spark KVolt.
- 5- Select the mode for the secondary display: the Minimum and Maximum value of the main display or the complementary measurements.
- 6- Place the capacitive pick-up over one of the spark wires, read the measurements.

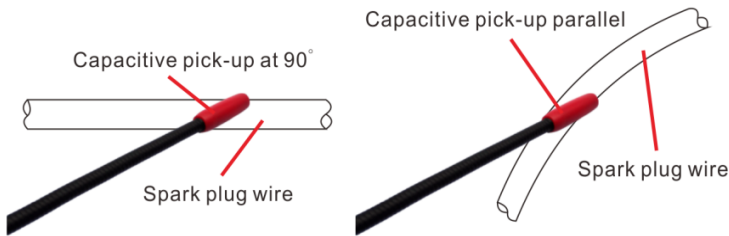


Fig. 6 – Capacitive pick-up on spark plug wire

Important:

- ◆ The relative position from the capacitive pick-up to the spark plug wire should be the same for every measurement, so as to obtain the consistent result when measuring the spark KVolt on spark plug wires.
- ◆ There is an easy way to obtain the consistent result of the measurement: place the capacitive pick-up at 90° or parallel to the spark plug wire, and then repeat the same positioning for every spark plug wire.
- ◆ The 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 can detect the signal.
- ◆ The capacitive pick-up may receive signals from several wires at the same time if several spark plug wires are bounded close together, this may cause false measurement. In order to reduce interference and obtain the correct measurement, the wires under test should be separated in this situation.

3.4.4 KV Adjust function

In the SPW (Spark Plug Wire) mode, the instrument allows the user to adjust the scale used for spark plug wire peak voltage measurements in order to match readings with other instruments (i.e. Ignition Scope).

To use the KV Adjust function:

- 1- Turn the instrument on.
- 2- To perform adjustments of the KV scale while performing actual measurements, select the Peak KVolt function as described in “3.4.1.3 Spark KVolt”.
- 3- Press and hold the “ Engine Cycles” button until the minimum reading in the display is replaced by “KV Scale” and a number followed by a “%” sign.
- 4- While holding the “Engine Cycles” button pressed, use the “F2” (Cylinder Increase)

or “F1 /Calibrate” (Cylinders Decrease) button to adjust the scale value.

3.5 Additional functions

3.5.1 Minimum and Maximum functions (For COP and SPW modes)

This instrument remains the record of the minimum and maximum readings of the function currently selected.

- 1- In order to display the minimum and maximum readings of the main display, press the “F2” button if not already selected.
- 2- In order to reset the minimum and maximum readings, press the “Power /Reset” button momentarily. These values will be reset after turning on the instrument.

3.5.2 Spark KVolt calibration function (For COP mode only)

In order to measure the spark KVolt in Coil on Plug and Coil near Plug ignition systems, this instrument requires the user to calibrate the instrument. This calibration uses the measurement values obtained during the procedure to find the optimal measurement parameters or a particular type of the ignition module, and compensates for the difference in waveform and signal strength.

◆ Once the instrument calibrated one of ignition modules of the engine under test, the spark KVolt measurement will relative to the calibration value.

◆ Follow the procedure as described in “3.4.2 Measuring in Coil on Plug and Coil near Plug ignition systems” to calibrate the instrument.

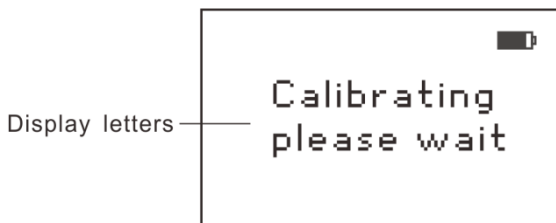


Fig. 7 – Display during calibration

Notes:

◆ The instrument will display the default baseline value of “10.0 spark KVolt” immediately after calibration. All the spark KVolt measurements obtained thereafter will relative to the calibration value module.

◆ The calibration does not have any influence on the spark burn time or the PRM measurement. (These are absolute).

◆ The Spark KVolt values obtained before and after calibration may not be comparable if calibrate the instrument again.

◆ The instrument will display a false “0.0 Spark KVolt” reading when measuring the spark KVolt on Coil on Plug and Coil near Plug systems if not calibrated.

3.5.3 Auto power off

In order to prolong the battery life, the instrument will automatically power off after

about 3 minutes of inactivity.

Inactivity means:

- ◆ No buttons are pressed
- ◆ No measurements are taken

4. APPLICATION INFORMATION

4.1 Taking measurements

- 1- According to the instructions in “3.4 Measurement Procedures”, select the ignition system to measure.
- 2- Observe the spark burn time and spark KVolt reading of the display. It's normal that there are some changes of the readings, it reflects the actual changes in the spark voltage and burn time of the ignition system.
- 3- Record or memorize the maximum, minimum and average reading. Test every spark plug wire or ignition module of the engine repeatedly, pay attention to the reading which is obviously higher or lower than the average.
- 4- The ignition problems may sometimes appear at the high engine RPM, but not at low or idle speed. We recommend to measure at idle speed and the normal engine operating temperature, and then increase the RPM, until the high speed, generally about 2000 to 2500 RPM. Please do not exceed the limited maximum value of the engine speed (“red-line”). All the measurements should be taken at about the same engine speed, check the RPM by using the tachometer function of the instrument.

4.2 Diagnostic using spark burn time and spark KVolt readings

Some changes of the spark burn time and spark KVolt readings between different cylinders are normal, these do not indicate any problem.

Pay attention to the significant difference readings caused by the engine or the ignition system problems for the diagnostic purpose.

Important:

- ◆ The RPM and the spark burn time shown on the display are the absolute measurements.
- ◆ The spark KVolt is the relative measurement, it should be used to compare the ignition module or the spark plug wire only in the same engine.
- ◆ In the COP mode, before measuring and comparing the results between cylinders, please calibrate spark KVolt in one of the ignition modules as described in “3.4.2 Measuring Coil on Plug and Coil near Plug ignition systems” .
- ◆ The placement of the capacitive pick-up along the spark plug wire will also cause some variation when measuring on spark plug wires (SPW mode), due to the internal resistance 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, the voltage reading will be higher than if placed near the spark plug.

4.3 Common causes of long burn time readings

- ◆ Short circuit, dirty or the gap of the spark plug is too small.

- ◆ Dirty or the damaged spark plug insulator or boot allows the spark “tracking” across the insulator.
- ◆ Rich mixture. Most likely due to the leaking fuel injector, or the faulty oxygen sensor.
- ◆ Low cylinder compression pressure. It may be caused by the leaking valves, worn piston ring, blown cylinder head gasket, etc.

4.4 Common causes of short burn time readings

- ◆ Spark plug is worn or the gap is too wide.
- ◆ Spark plug connector is damaged, loose or disconnected.
- ◆ The resistance of the ignition coil primary circuit is excessive.
- ◆ Lean mixture.

4.5 Common causes of low spark KVolt readings

- ◆ Short circuit, dirty or the gap of the spark plug is too small.
- ◆ Dirty or the damaged spark plug insulator or boot allows the spark “tracking” across the insulator.
- ◆ The core of the spark plug wire is broken. The break is located between the distributor (or DIS coil) and the test point.
- ◆ Short circuit, disconnection or partial disconnection between the distributor (or DIS coil) and the spark plug.
- ◆ Rich mixture. Most likely due to the leaking fuel injector, or the faulty oxygen sensor.
- ◆ Low cylinder compression pressure. It may be caused by the leaking valves, worn piston ring, blown cylinder head gasket, etc.

4.6 Common causes of high spark KVolt readings

- ◆ Spark plug is worn or the gap is too wide.
- ◆ Spark plug connector is damaged, loose or disconnected.
- ◆ The core of the spark plug wire is broken. The break is located between the spark plug and the test point.
- ◆ Lean mixture.

5. MAINTENANCE

5.1 Battery replacement



Fig. 8 - Battery replacement

To replace the internal battery:

1- As show in Fig.8, find out the battery compartment at the back of the instrument.

2- Open the battery cover.

3- Pay attention to the polarity of the battery connectors, connect the new battery.

4- Close the battery cover.

5- Press the “ Power / Reset” button until the display turns on. Please check the polarity of the battery if the display does not turn on, reinstall the battery if necessary. To turn off the instrument, press the “Power / Reset” button again until the display turns off.

5.2 Cleaning

When not in use, please keep the instrument in the carrying case, do not subject it to dampness or severe heat or cold. Do not use the instrument in rain, use a clean paper towel to dry it off before storing it if it should accidentally get wet.

Prevent the instrument contacting with any solvents. Please do not clean it with a solvent or petroleum based medium such as gasoline, as these chemical may attack the plastic parts and cause permanent damage. Do not use an abrasive cleaner. Use the clean damp paper towel to wipe and a small amount of soap if necessary. Dry the instrument thoroughly after cleaning.

This unit is a sealed instrument, except the battery, it contains no user serviceable parts. Open other parts of the instrument will void the warranty.