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## 1. 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.

**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.**

### 3. OPERATION

#### 3.1 Instrument Description

- 1) Capacitive pick-up
- 2) Flexible probe
- 3) Protective rubber holster
- 4) LCD Display
- 5) Power ON/OFF / Reset button
- 6) Secondary Function / Capture button
- 7) Ignition System button
- 8) Main Function / Calibrate button
- 9) Engine Cycles button

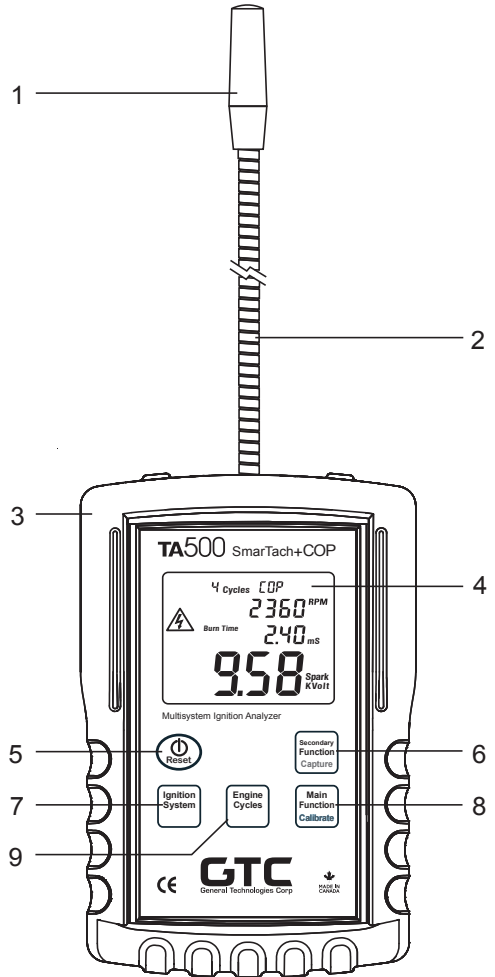


Fig. 1 - Instrument description

#### 3.2 LCD Display

##### 3.2.1 LCD Display description

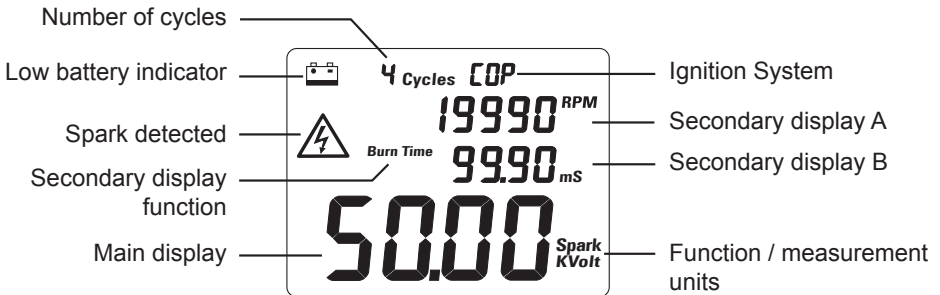


Fig. 2 - LCD Display

## 3.3 Buttons description and operation

### 3.3.1 Power ON/OFF and Reset button



- When the instrument is OFF, to turn it ON press and hold the '*Power ON/OFF / Reset*' button until the unit turns on (in approximately 1 second).
- When the instrument is ON, to turn it OFF press and hold the '*Power ON/OFF / Reset*' button until the display turns OFF (in approximately 3 seconds).
- When the instrument is ON, press momentarily the '*Power ON/OFF / Reset*' button to reset the Maximum and Minimum and capture values.

Note: To extend battery life, the TA500 will automatically turn OFF after 3 minutes of being idle (i.e. no button pressed and no input signal). Turning the unit off manually, when not in use will prolong battery life.

### 3.3.2 Ignition System button



- Press the '*Ignition System*' 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.

### 3.3.3 Engine Cycles button



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

### 3.3.4 Main Function / Calibrate button



- Press this button to change which measurement is shown in the main (large) 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 flash "CAL" and will return to normal after the procedure is completed (in about 3 seconds). Calibration is disable when in **SPW** mode.

## 3.4 Measurement Procedures

### 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.)

### 3.4.1 TA500 measuring functions

The TA500 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. These special modes compensates for differences in signal strength and waveform patterns between ignition systems.

The TA500 can measure the following:

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

#### 3.4.1.1 Engine RPM

Measures engine RPM in 2, 4 cycles 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.

#### 3.4.1.2 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.

#### 3.4.1.2 Spark KVolt

Spark KVolt values are relative measurements, useful to compare the performance of the ignition system in each cylinder. 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.

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

- 1-Turn the instrument on.
- 2- If not already in **COP** mode, select it by pressing the '*Ignition System*' button.
- 3- Select the number of cycles for the engine under measurement by pressing the '*Engine Cycles*' button repeatedly until the display shows the correct setting.

### 3.4.2 Spark plug wire ignition systems

- 1-Turn the instrument on.
- 2- If not already in **SPW** (Spark Plug Wire) mode, select it by pressing the '*Ignition System*' button.
- 3- Select the number of cycles for the engine under measurement by pressing the '*Engine Cycles*' button repeatedly until the display shows the correct setting.
- 4- Select the measurement to show in the main display: RPM, spark burn time or spark KVolt.
- 5- Select the mode for the secondary display: Minimum and Maximum of the main display or the complementary measurements.
- 6- Place the capacitive pickup over one of the spark plug wires, and proceed to read the measurement on the display.

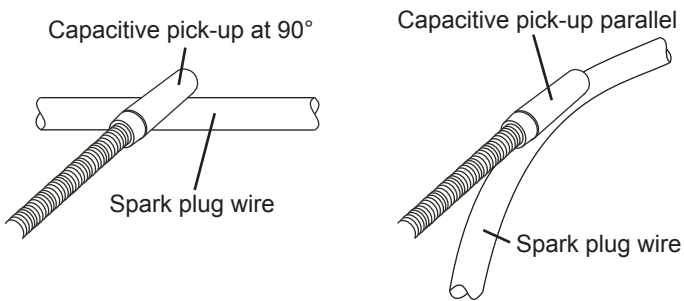


Fig. 6 - Capacitive pick-up on spark plug wire

#### **Important:**

- In order to obtain consistent results when measuring Spark KVolt on spark plug wires, the position of the capacitive pick-up relative to the spark plug wire should be the same for every measurement.
- An easy way to obtain consistent measurements, is to position the capacitive pick-up either at 90° or parallel to the spark plug wire (Fig 5), and then repeat the same positioning for every spark plug wire
- 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.

### 3.5.2 Capture function (For COP and SPW modes)

The capture function is used to measure and hold maximum spark KVolt and spark burn time readings. This function is most useful when performing a no-start test or when measuring ignition modules in places in which it is difficult to position the capacitive pick-up over the module and read the display at the same time.

To use the capture mode:

- 1-Follow the directions in '3.4 Measurement Procedures', to setup the TA500.
- 2-Press and hold the 'Secondary Function / Capture' button (for approximately 3 seconds) until a flashing "CAP" appears in the secondary display A.
- 3-To exit the capture mode, press the 'Secondary Function / Capture' button momentarily again.

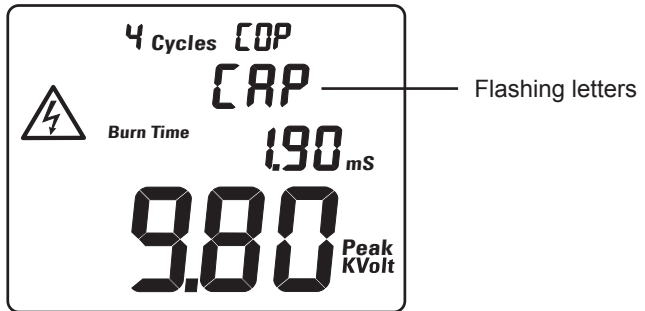


Fig. 8 - Typical display in capture mode

#### Notes:

- The capture function holds the maximum spark KVolt and spark burn time displayed (measured) values.
- The values held while in capture mode can be reset by pressing the 'Power ON/OFF / Reset' button momentarily.
- When in capture mode, only the 'Power ON/OFF / Reset' and 'Secondary Function / Capture' buttons will remain operative, in order to prevent accidental changes in the setup of the TA500.
- Upon exiting the capture mode, the held values are reset.

### 3.5.3 Auto power off

To help prolong battery life, the TA500 will automatically turn off after a period of approximately 3 minutes of inactivity.

A period of inactivity means:

- No buttons are pressed
- No measurements are taken

#### **4.4 Common causes of short burn time readings**

- Spark plug worn or gap too wide.
- Spark plug connector damaged, loose or disconnected.
- Excessive resistance in the ignition coil primary circuit.
- Lean mixture.

#### **4.5 Common causes of low spark KVolt readings**

- Shorted, dirty or too small spark plug gap.
- Dirty or damaged spark plug insulator boot allowing spark “tracking” across insulator.
- Broken core in spark plug wire. 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 spark plug wire.
- Rich mixture. Most likely due to leaking fuel injector, or faulty oxygen sensor.
- Low cylinder compression pressure. Could be caused by leaking valves, worn piston rings, blown cylinder head gasket, etc.

#### **4.6 Common causes of high spark KVolt readings**

- Spark plug worn or gap too wide.
- Spark plug connector damaged, loose or disconnected.
- Broken core in spark plug wire. Break is located between the spark plug and the test point.
- Lean mixture.