

Dear repairer,

Thank you for choosing our equipment. We feel confident that you will be satisfied of it and that it will be of considerable help. Please read the instructions in this operation manual with great care and keep it close at hand for consultation.

AXONE2000 APRILIA is a portable and self-powered engine diagnostic computer. It is highly effective and compact; it can be used for testing both on the road and in the workshop. The instrument can be updated with any diagnostic function required for modern repairs by adding a special memory card containing the function.

Data, technical specifications and descriptions contained in this manual are supplied as information only and are not binding for the manufacturer.

APRILIA reserves the right to make any change to the instrument, at any time, without prior notice, deemed suitable for improving the product or for manufacturing or commercial reasons.

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## CONTENTS

<b>General safety precautions for operators</b>	1
<b>How to use AXONE2000 APRILIA correctly</b>	4
<b>DESCRIPTION OF AXONE2000 APRILIA</b>	5
Keypad	6
Interface module	8
Read/write unit	9
Input/output connectors	9
How to power the AXONE2000 APRILIA	11
Recharging the battery	12
Replacing the battery	13
<b>NOTES FOR CORRECT USE</b>	14
Recharging precautions	14
Automatic reset internal fuses	15
<b>TECHNICAL SPECIFICATIONS</b>	15
<b>SPARE PARTS</b>	16
<b>GLOSSARY</b>	17
<b>GETTING STARTED</b>	18
Starting programs	20
 <b>HOW TO USE AXONE2000 APRILIA</b>	21
Service menu	21
 <b>UPGRADES</b>	25
PC connection	25
Upgrading with PC	26
Internet connection	32
Internet on-line upgrade	33

	<b>DIAGNOSTICS</b>	39
	Injection devices	40
	Testing	44
	“SIV” test procedures	45
	“SIV” test types and typical use	45
	<b>MEASURES</b>	47
	MULTIMETER	47
	VOLTMETER	48
	AMMETER	49
	OHMMETER	51
	Continuity test	52
	OSCILLOSCOPE	53
	OPTIONS	55
	Input	56
	Cursors	57
	Zoom	59
	Grid	60
	Screen reset	60
	Help line (0)	61
	SCALE SELECTIONS	62
	Scale selection (V)	63
	Scale selection (T)	64
	AC/DC READING SELECTION	66
	AC reading selection	67
	DC reading selection	67
	TYPES OF SYNCHRONISM	69
	Internal synchronism	70
	Manual synchronism	71
	External synchronism	72
	<b>AUTO-DIAGNOSTICS</b>	73
	How to connect AXONE2000 APRILIA to the ECU	74
	How to power the auto-diagnostics interface cable	75
	TESTING	76
	How to select make and model	77

How to connect auto-diagnostic sockets	80
Starting diagnostics	82
Engineering parameters	84
Current and saved errors	85
STO function (automatic storage)	87
Input status	88
Actuators/regulations	89
How to delete actuator active diagnostics codes/errors	90
How to quit the program	91



## **General safety precautions for operators**

Carefully read the instructions on set up, use and maintenance in this operating manual.

Do not allow unskilled personnel to use this machine as this could cause injury to personnel and damage to the equipment.

The working area must be dry, ventilated and with enough light. In particular, all testing with running engine must take place in areas equipped with extraction fans.

Please remember that breathing carbon dioxide (which is odourless) is a health hazard.

### **When operating on engines or other parts of motorcycles:**

- Use proper clothing and act appropriately in order to avoid accidents.
- Before starting make sure that the motorcycle gear-box is neutral and check that the wheels are blocked.
- Protect your face, hands and feet and avoid contact with hot parts such as spark plugs, exhaust pipes, radiators, and connectors of the cooling system.
- Do not smoke and do not use flames while working on the motorcycle.
- Check that all electric connections are isolated and firm.
- Do not look directly into the carburettor inlet while the engine is running.
- Keep hands and hair away from moving parts.
- Do not wear ties, slack clothing, wrist jewellery and watches while working on a motorcycle, especially with running engine.
- Keep away from the fan. The cooling fan is controlled by a temperature switch which operates according to the temperature of the coolant: disconnect the fan cable whenever operating on a warm engine, so that

the fan does not suddenly start up after the engine has been turned off.

- Do not pour fuel directly into the carburettor to start the engine quickly.
- Do not open the radiator cap before both the temperature of the engine and the pressure of the cooling system have decreased.
- Do not touch high voltage cables while the engine is on.
- Handle portable lamps with care and use safety models only.
- Wear safety goggles to protect your eyes from fuel, dust and metal.
- Remember that the catalytic converter can become extremely hot and cause severe injury or fires.

Be very careful that there is no spilt oil, rag, paper or other easily flammable material near the catalytic converter.

### **When operating on car batteries, remember that:**

Motorcycle batteries contain sulphuric acid and produce explosive gases. Therefore, keep the following in mind:

- Always wear safety goggles.
- Do not leave tools on batteries because they could cause short circuits.
- Before testing or charging, cover the battery inlets with a wet rag to choke any explosive gases.
- Avoid sparks when connecting cables to the battery.
- Avoid splashes of electrolyte on your skin, eyes or clothing, because it is corrosive and highly toxic.

**When operating with the device connected to mains, remember to:**

- Check that the instrument has been connected to earth.
- Turn off power before connecting or disconnecting cables.
- Do not touch with wet hands.

**How to use AXONE2000 APRILIA correctly**

Observe the following safety rules in order to use your AXONE2000 APRILIA correctly:

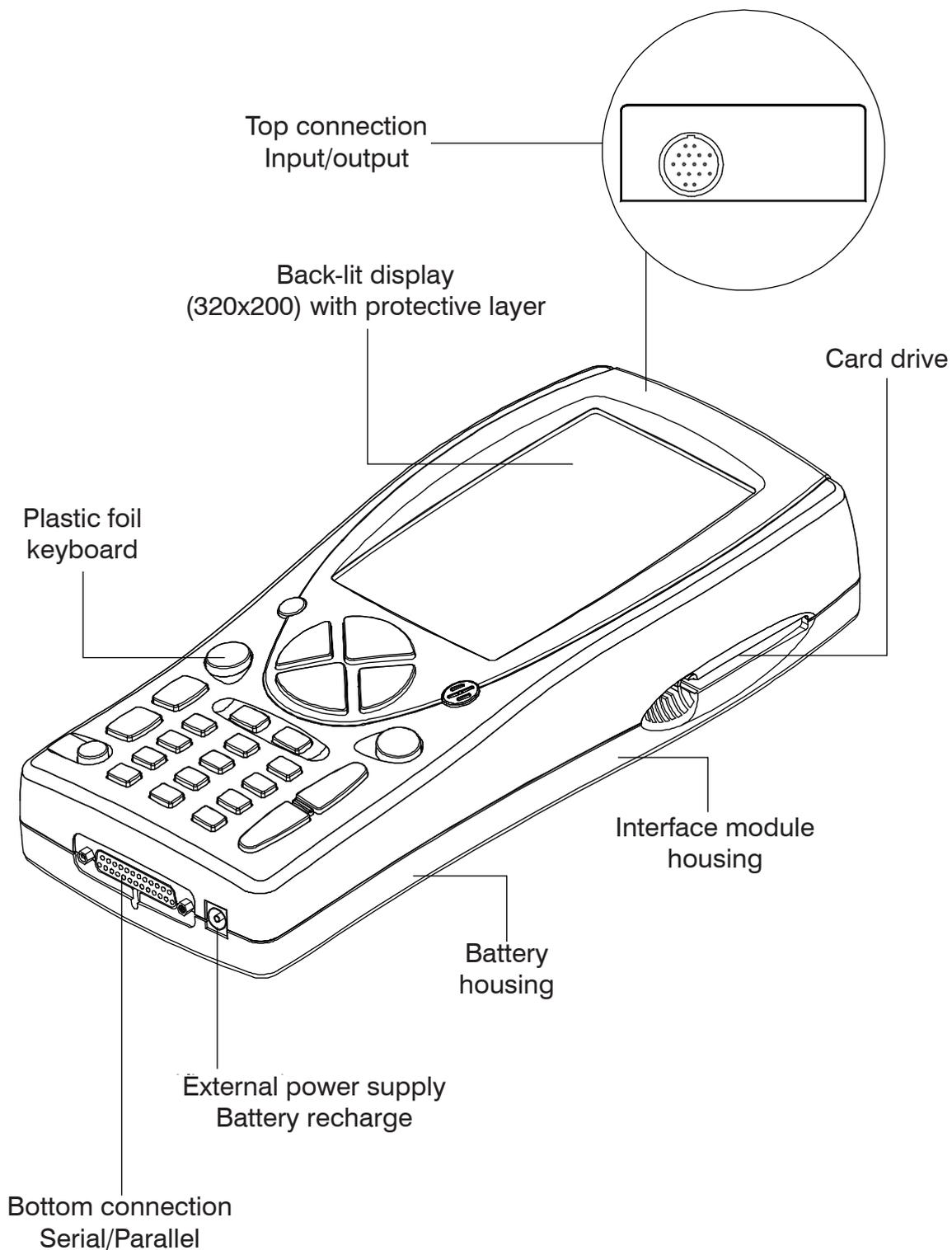
- The equipment must be used in a dry area. Do not expose it or use it near to heat sources.
- Do not subject the AXONE2000 APRILIA CPU to heavy shocks.
- Do not expose the AXONE2000 APRILIA CPU to water or other liquids.
- Do not lay objects on the power cable and do not kink the cable.

## How to use AXONE2000 APRILIA correctly

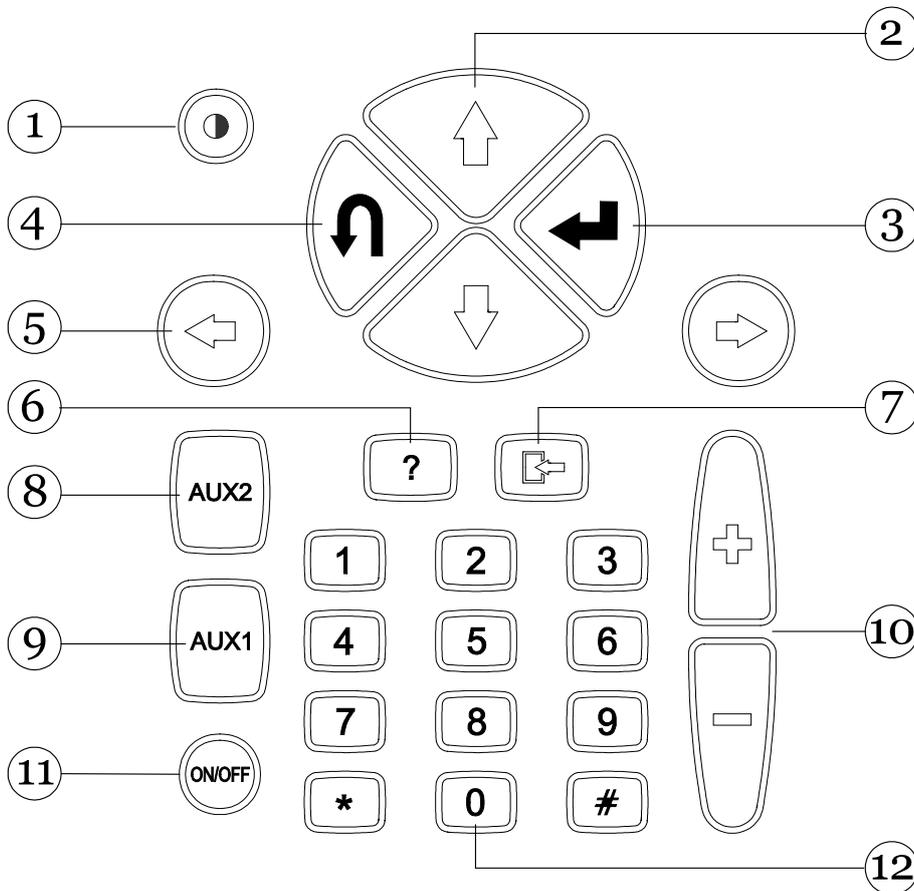
Observe the following safety rules in order to use your AXONE2000 APRILIA correctly:

- The equipment must be used in a dry area. Do not expose it or use it near to heat sources.
- Turn the device on and off using only the ON/OFF switch.
- Do not subject the AXONE2000 APRILIA CPU to heavy shocks.
- Do not expose the AXONE2000 APRILIA CPU to water or other liquids.
- Do not lay objects on the power cable and do not kink the cable.
- For frequent use, store the equipment with the power/charge cable connected.
- Disconnect the power/charge cable if you do not plan to use the equipment for a long period. (longer than one month).
- Do not use AXONE2000 APRILIA with the battery charger inserted.
- Do not replace electronic modules (e.g.: OBD, ACQ, etc.) when the instrument is powered.

# DESCRIPTION OF AXONE2000 APRILIA



## Keypad



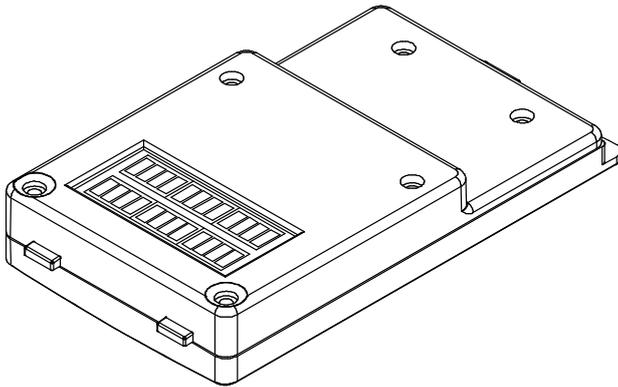
1. Contrast key: to adjust and the screen contrast, push whilst adjusting with the vertical scroll keys (2).
2. Vertical scroll keys: to move the cursor up and down and select the various functions.
3. ENTER key: to confirm selections.
4. CANCEL key: to cancel the most recently selected function and restore the previous function.
5. Horizontal scroll keys: to move the cursor left and right and select the various functions.
6. HELP keys: it is used to display an on-line help guide (when provided by the program).
7. Store/delete key: to store test data or to delete the data from the memory (according to the selected program).
8. AUX 2 key: to access auxiliary functions.
9. AUX 1 key: to access auxiliary functions.
10. Up/down keys.

11. ON/OFF key: to turn the instrument on and off.
12. Number keys: to enter codes, numeric data and select tests (according to the selected program).

The instrument confirms the selection with a beep every time a key is pressed.

## Interface module

This module is used to physically interface the AXONE2000 APRILIA with the cables, the sensors and the probes of the various available kits.

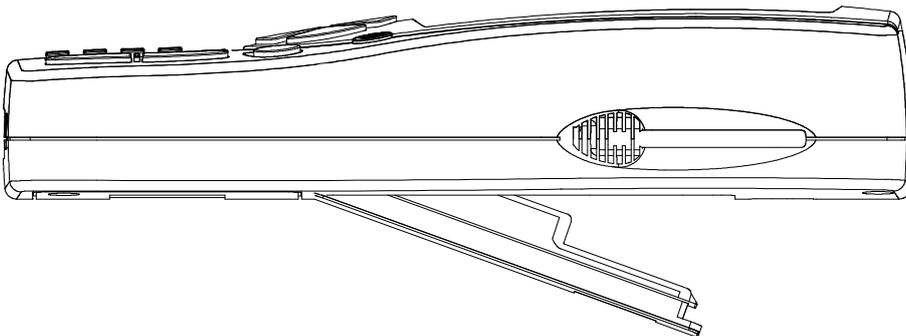


Three different types of interface modules are available.

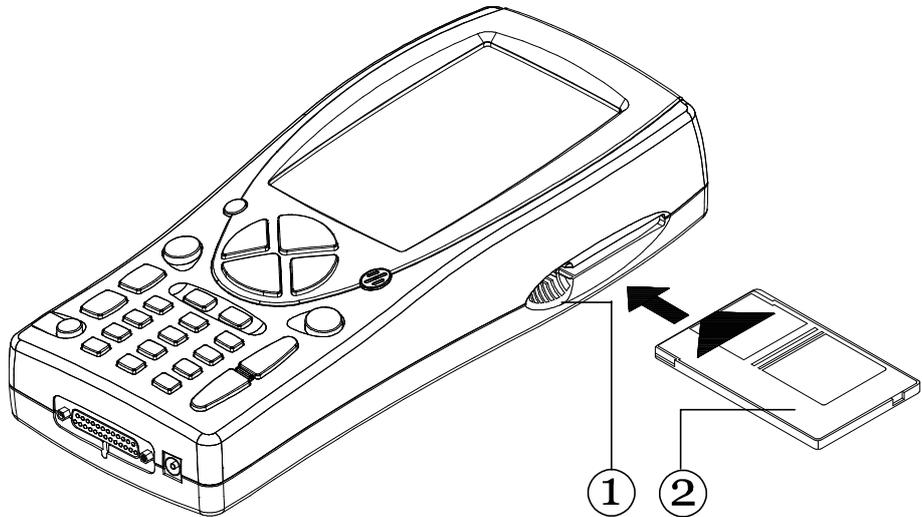
- Self-test OBD-II (OBD module)
- Measurements (ACQ module)
- Modem (for on-line upgrading via the Internet)

Each module is to be used with a specific group of programs.

The module is clipped into the dedicated housing in the base of the AXONE2000 APRILIA. The OBD module can be replaced when AXONE2000 APRILIA is working, but is recommended to replace the module when the AXONE2000 APRILIA is off.



## Read/write unit



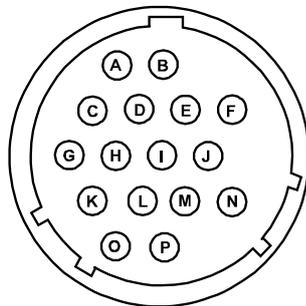
The read/write unit (1) includes a memory card (2), containing various diagnostic programs.

### IMPORTANT NOTE:

Always insert the memory card before switching the AXONE2000 APRILIA on. The screen displays an image prompting you to insert the memory card if it is missing.

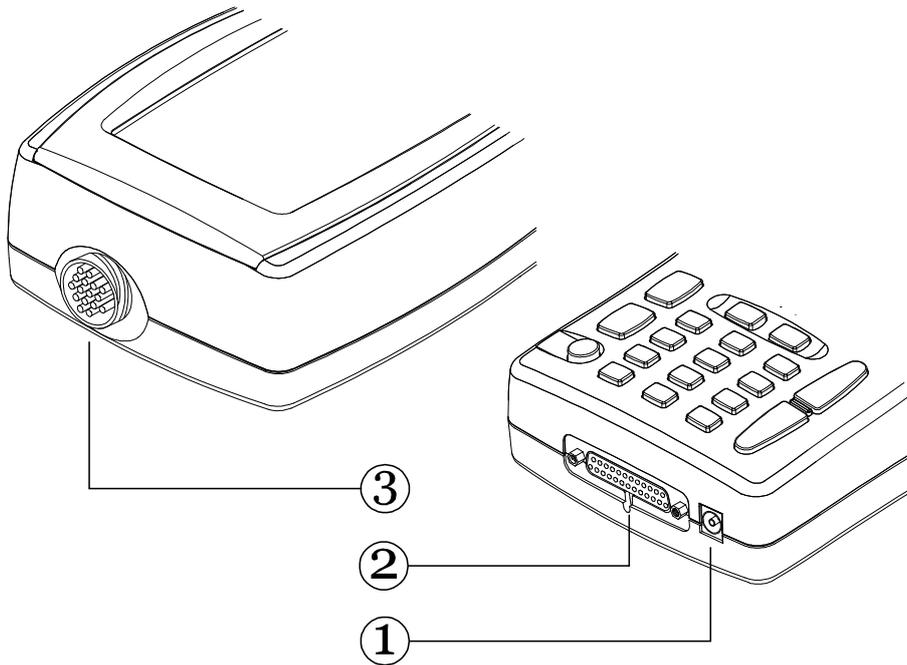
**Insert the memory card when the instrument is off!**

## Input/output connectors



- a. Ground
- b. Power supply IN +12 V
- c. DSR (COM2)
- d. (\*)
- e. Power supply OUT +5
- f. (\*)
- g. (\*)
- h. (\*)
- i. (\*)
- j. (\*)
- k. RX (COM2)
- l. TX (COM2)
- m. (\*)
- n. (\*)
- o. (\*)
- p. (\*)

Note: The pins marked with (\*) have different uses according to the interface fitted in the base of the AXONE2000 APRILIA instrument.

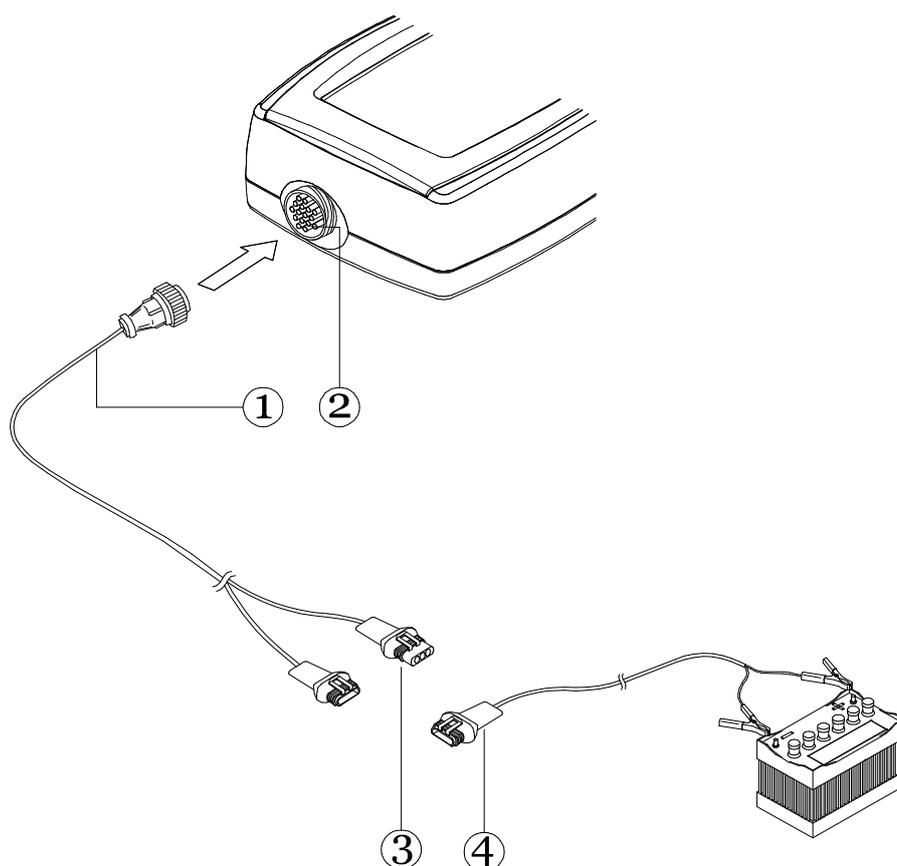


1. **POWER connector:**  
To charge the internal battery, using only the charger supplied.
2. **Lower parallel-serial connection:**  
This connector acts as an interface between the AXONE2000 APRILIA and external units such as: printers, remote terminals, serial devices, etc... This connector is also used to power the AXONE2000 APRILIA.
3. **Upper connector:**  
Depending on the interface module inserted in the AXONE2000 APRILIA, the connector is used to carry out special tests or characteristics for perform AXONE2000 APRILIA diagnostic functions, using the standard cables provided in each kit.

## How to power the AXONE2000 APRILIA

The AXONE2000 APRILIA can be powered automatically by means of an internal battery (self-powered) or externally using the cable provided.

Connect as follows:



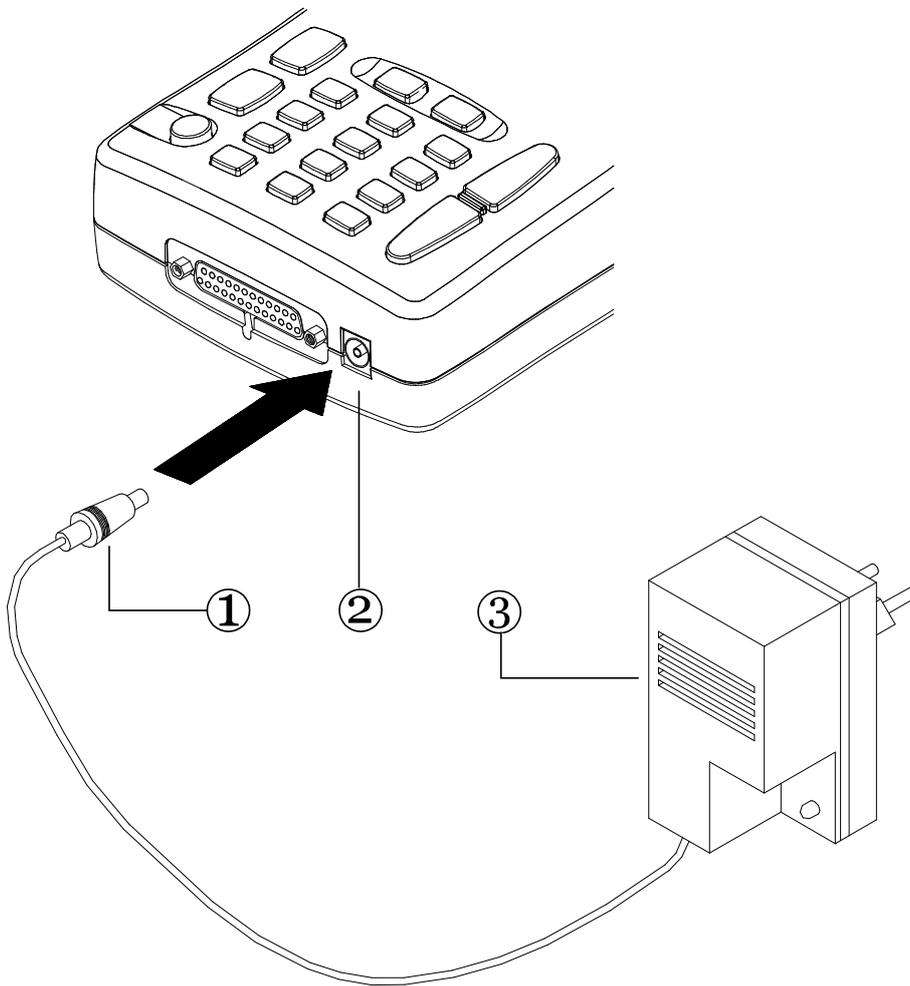
- Connect the cable of the kit in use (1) to the upper connector (2) and connect the battery clamp cable (4) to the connector.

NOTE: The internal battery will be automatically recharged when the AXONE2000 APRILIA is powered externally.

### IMPORTANT:

**The battery charger must only be used for recharging the batteries and never to power the instrument externally.**

## Recharging the battery



To recharge the AXONE2000 APRILIA internal battery:

- Insert the plug (1) in the POWER connector (2).
- Connect the power unit (3) to the 220 V mains.

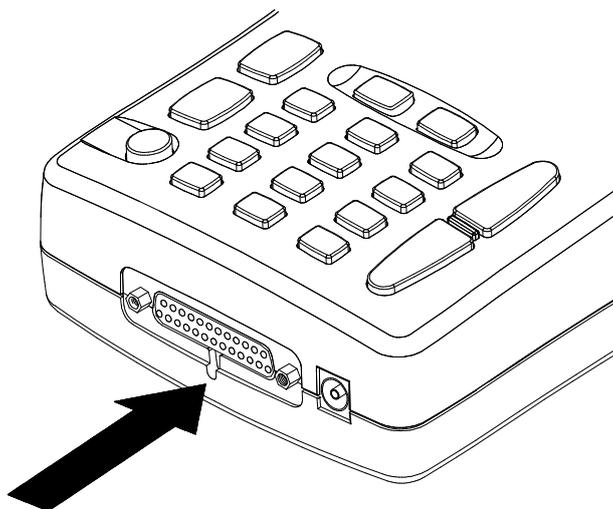
The fully charged instrument battery (efficient battery charged for approximately 12 hours at 20°C) will provide over two hours of operation.

### **IMPORTANT:**

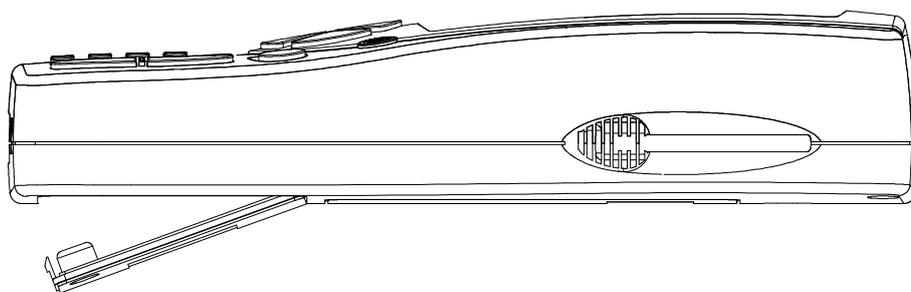
**The battery charger must only be used for recharging the batteries and never to power the instrument externally.**

## Replacing the battery

The battery is contained in a compartment in the base of the AXONE2000 APRILIA. Delicately open the retainer by inserting a pointed object (e.g. a screwdriver) in the slot indicated by the arrow to open the flap and access the battery compartment.



The flap will open.



Access the battery compartment to replace the battery. Make sure the battery is correct connected as shown on the label inside the compartment.

### **IMPORTANT:**

**The battery is charged when supplied. The charge level may present normal decay. For this reason, you are advised to recharge the battery completely for 12-18 hours before normal use.**

## NOTES FOR CORRECT USE

### Recharging precautions

Always use AXONE2000 APRILIA with charged battery. In order to maximise the performance, a slow charge should always be preferred. For the efficient battery operation, just follow the simple rules listed below:

The first two charge cycles must be performed with the instrument under charge for minimum 12 hours (the night charge is recommended). Afterwards, the charging time may be shorter.

However, the battery charge automatically disconnects the supply when the battery has reached the charge complete status.

It is advisable to charge the battery when the charge indicator on the display shows just one mark.

Charge at room temperature; if the tool has been exposed to the sun in summer or in a cold place in winter, wait that the room temperature is reached (approx. 20°C) before beginning to charge.

Programs check battery charge while running and warn you by flashing the battery icon when power is low. After this the control software allows you to use the instrument for about 10 minutes more and then proceeds with auto-shut down.

This function is disabled only when the maximum computing power of the processor is required for instance during fast data acquisition, in such cases the operator is not warned that the battery is almost depleted.

## Automatic reset internal fuses

AXONE2000 APRILIA is equipped with automatic reset protection fuses. Sometimes, the reset is not immediate and it may be necessary to wait for a few minutes.

## TECHNICAL SPECIFICATIONS

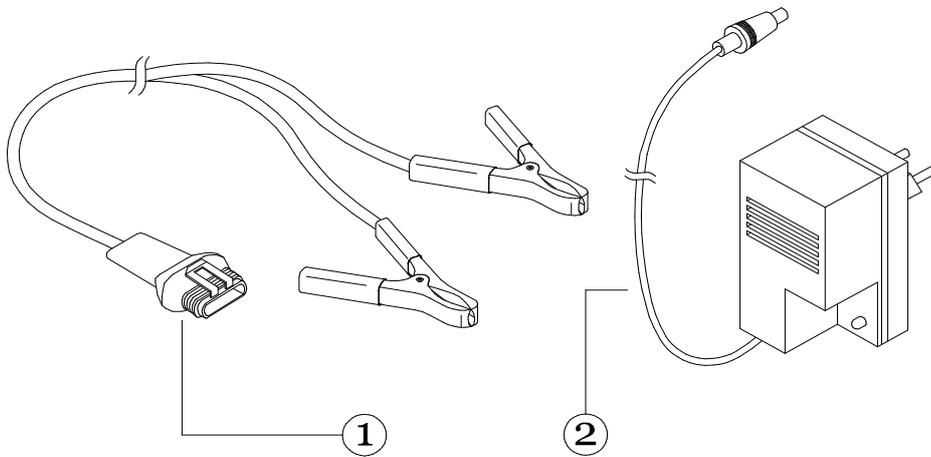
The following technical characteristics refer to the use of the AXONE2000 APRILIA CPU, those relating to the various programs and the associated interface modules are available in the specific section of each kit.

- Self-powered portable computer.
- Graphic display with adjustable brightness and contrast (back-lit), resolution 320x200, brightness can be adjusted by keypad
- Plastic-foil keypad with touch keys
- Internal and external power supply and automatic charge at 12-15 V DC.

Internal power supply with fully charged battery > 2 h

- Three standard RS232 serial communication ports
- Standard parallel communication port
- External software on memory card
- Possible connection to hard disk
- Standard ATA/FLASH PC-CARD drive
- Possible connection to modem or remote terminal
- Size: 310 x 140 x 60 mm
- Weight: 1.5 kg
- Consumption: 10 W
- Working temperature range: -5°C + 40°C

## SPARE PARTS



1. Battery power cable
2. Battery charger

7200052  
51VI150

## GLOSSARY

- **ON-LINE HELP:** Press HELP to get help information. Press CANCEL to quit.
- **DATABASE:** set of data.
- **DISPLAY:** screen where images are shown.
- **DRIVE:** device which accommodates and reads the memory card.
- **HARDWARE:** all material parts of the computer and peripheral devices connected to it.
- **MEMORY:** an electronic component where all information needed to process data, instructions, intermediate and final results are recorded and stored.
- **MEMORY CARD:** data card which can be inserted into AXONE2000 drive; data can be read and written on the card.
- **PARALLEL:** execution of several tasks at the same time (e.g. transmission of several data at the same time).
- **PERIPHERAL:** external device connected to the instrument.
- **SERIAL:** execution of operations one after the other (e.g. transmission of data in sequence).
- **OPERATING SYSTEM:** group of programs which manage resources of AXONE2000 APRILIA and other programs.
- **SOFTWARE:** all programs contained in the computer or everything which is not HARDWARE.
- **CENTRAL UNIT:** in a processing system this is the data control centre (interpretation and execution of instructions).

## GETTING STARTED

AXONE2000 APRILIA is a programmable electronic platform for accessing various fields of motorcycle diagnostics by means of special kits.

The main menu where to select the programs relevant to the required instrument appears when the AXONE2000 APRILIA is switched on.



Use the left/right scroll arrows to scroll the icons of the tool/function to be selected and then press ENTER to confirm.



SELF-DIAGNOSTICS



MEASURES



SERVICE



UPGRADES



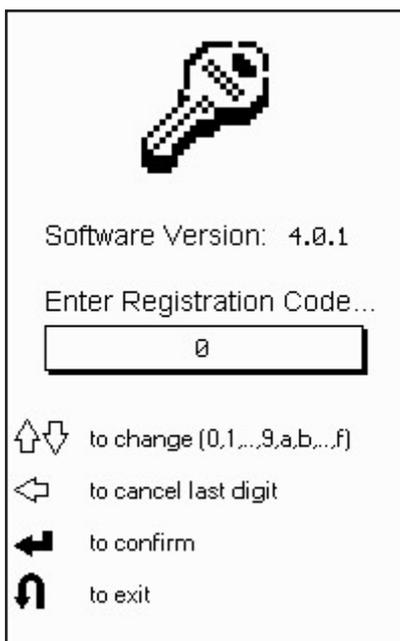
DIAGNOSTICS

AXONE2000 APRILIA offers a special kit for each diagnostic requirement. Each kit includes the instrument control program, an interface module (to be arranged in the base AXONE2000 APRILIA), the sensors, the cables for the connection to the engine, the adapters, the manual and all what is required by the tools and the specific tests.

Contact your area APRILIA dealer for information on available kits.

## Starting programs

An introductory screen where to select the required language will appear when AXONE2000 APRILIA is switched on for the first time. After this, the following screen where enter numbers and letters will appear:



A REGISTRATION CODE is required to start a program. Enter the alphanumeric registration code provided by the retailer, the dealer or others during the first installation or the runoff.

Enter the code and press ENTER to confirm.

AXONE2000 APRILIA is now ready for use. All the production functions can be accessed.

## HOW TO USE AXONE2000 APRILIA

The instructions refer to the AXONE2000 APRILIA CPU; those relating to the various programs are available in the section specific for each kit.

### Service menu

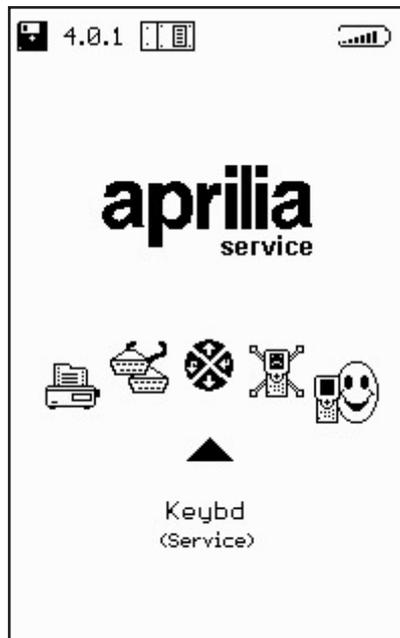
From the introductory page, you can access the diagnosis and service programs using the scroll arrows as described in the previous paragraph.



To select SERVICE, move to the corresponding icon and press ENTER to select. The following functions can be accessed:

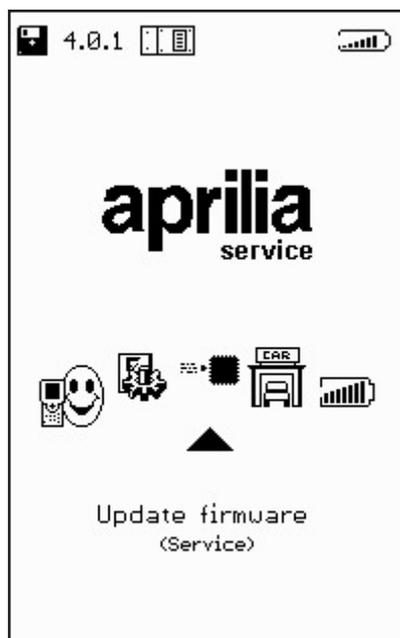
- KEYPAD
- DISABLE INSTRUMENT
- RESET SERIAL INSTRUMENT
- BIOS UPGRADE
- FIRMWARE UPGRADE
- WORKSHOP
- BATTERY
- PARALLEL
- SERIAL

## KEYPAD:



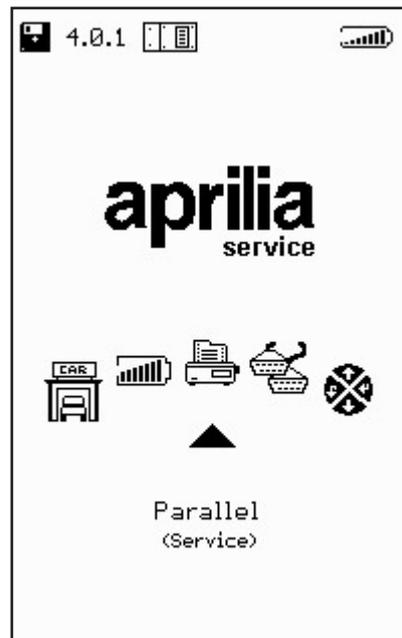
This function is used to test the correct operation of each key.

## FIRMWARE UPGRADE:



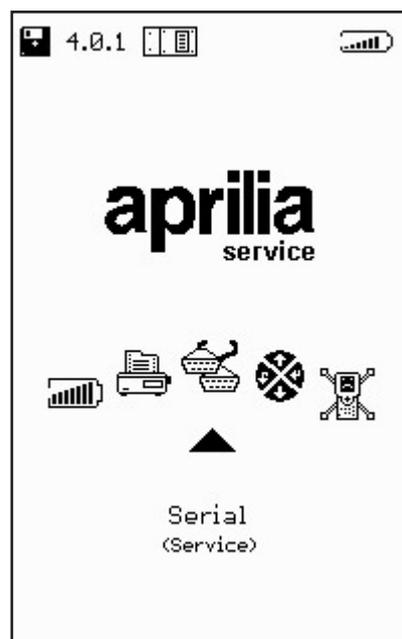
This function is used to upgrade the firmware contained in the various interface modules.

## PARALLEL:



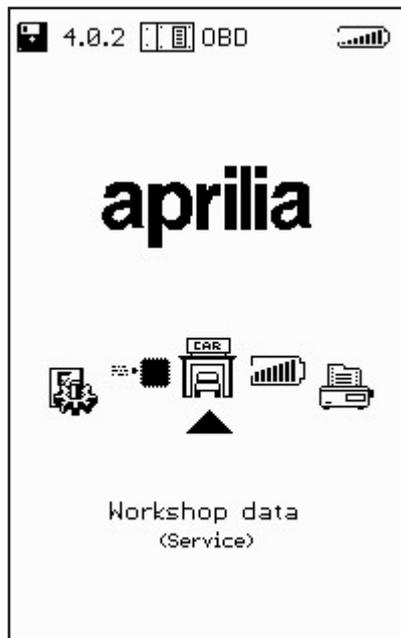
This function is used to test transmission/reception and check correct operation of the parallel port.

## SERIAL:



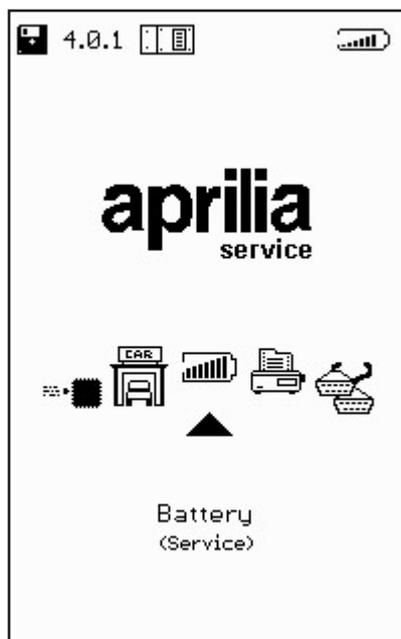
This function is used to test transmission/reception and check correct operation of the serial ports.

## WORKSHOP:



This function is used to enter the name of the workshop which will appear in the main menu when the AXONE2000 APRILIA is switched on.

## BATTERY:



The function is used to discharge the battery. The discharge curve is stored on the memory card to be displayed at a later time.

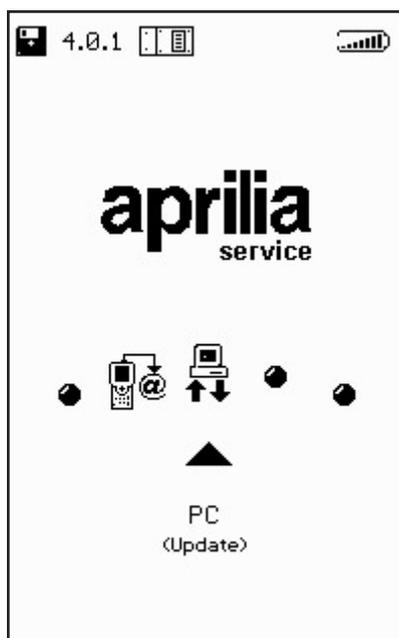
The remaining functions (BIOS UPGRADE, RESET INSTRUMENT and DISABLE INSTRUMENT) are reserved to technical assistance **and must not be used by the end user.**

**UPGRADES:**



This menu can be used to upgrade the programs stored in the memory card in two different ways:

**PC CONNECTION:**



Use a serial connection cable to connect AXONE2000 APRILIA to a PC where the upgrade program is installed. The memory card will be upgraded based on the upgrade file installed in the PC.

The upgrade file can be loaded to the PC in various ways:

By means of a CD-ROM or a diskette provided by the technical assistance service.

Downloading from the Internet or by modem link to by the technical assistance service server.

Receiving it directly on the PC as an e-mail attachment.

APRILIA will inform you on the relevant upgrade method.



## Upgrading with PC

Step 1:

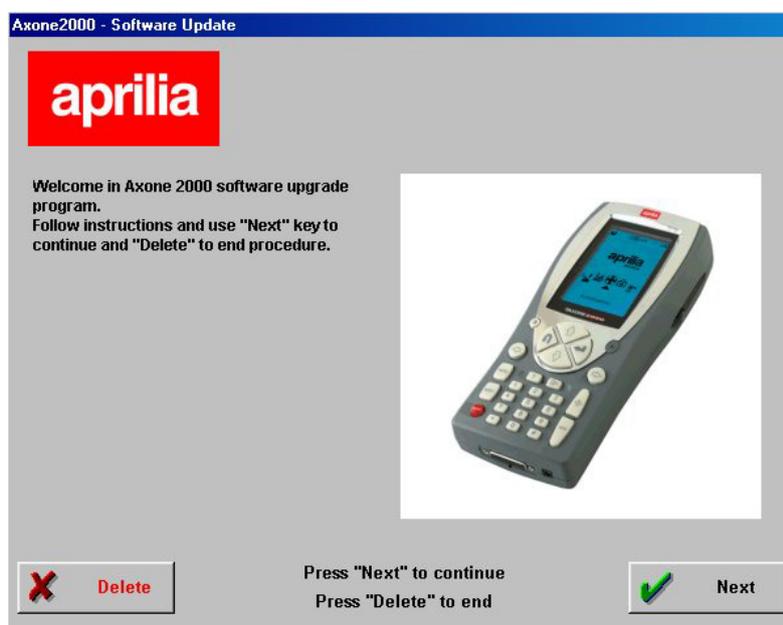
The “AggiornAxo” icon will appear after installing the upgrade program on the PC. This icon is used to start the program. The following screen will appear:



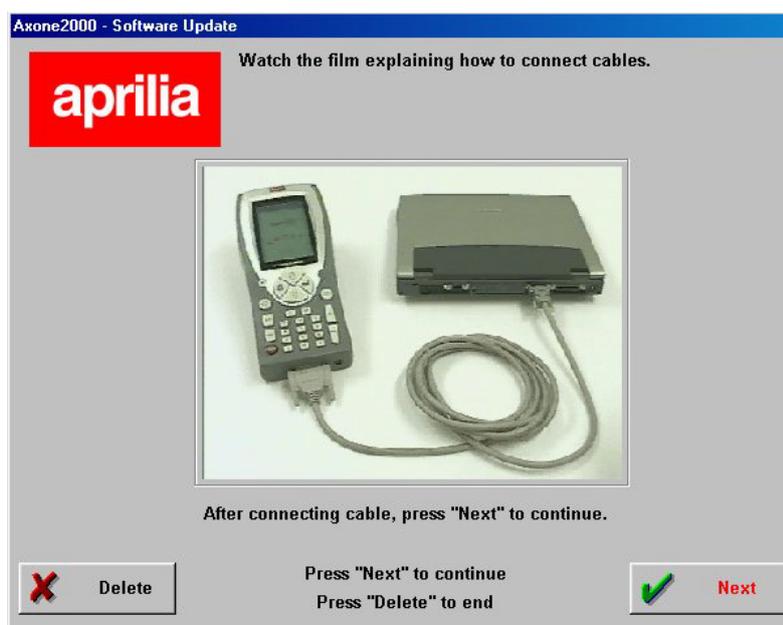
Click on the flag to select the instruction language. Click “Stop” to quit the program.

**Step 2:**

An introductory screen will appear showing instructions in the selected language after clicking the flag.

**Step 3:**

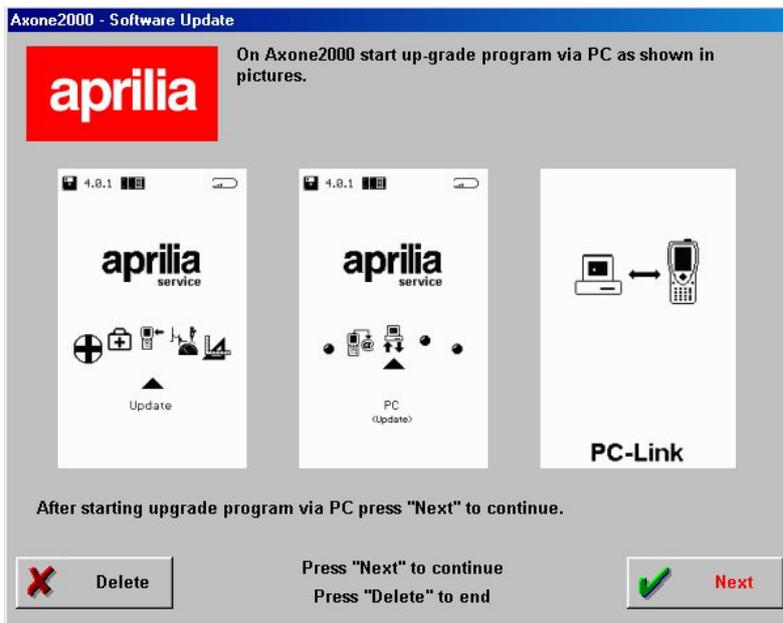
Press "Cancel" in the bottom left of the screen to quit the program. Click "Next" to go to the next page.



You will see a film show you how to connect the PC cable to the AXONE2000. Connect to the PC and click "Next" to continue.

**Step 4:**

Now, switch the AXONE2000 APRILIA on and start the program by selecting as shown in the figures.



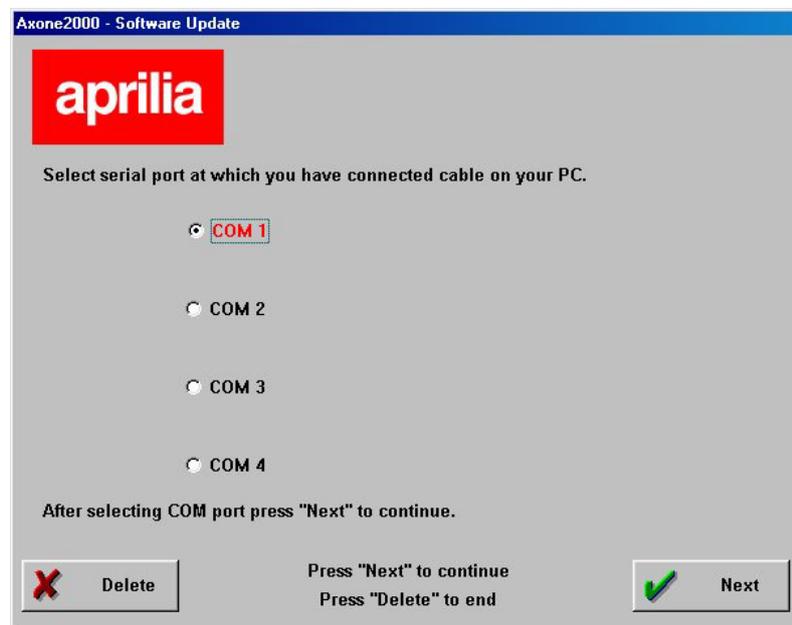
The correct sequence is:

- Accendere AXONE2000 APRILIA
- Selezionare "Aggiornamenti"
- Selezionare "Via PC"

The message "PC-Link" will appear on the last page if the operations were carried out correctly. Press "Next" to proceed.

**Step 5:**

Select the serial port to which the cable is connected with the mouse and click “Next” to continue.



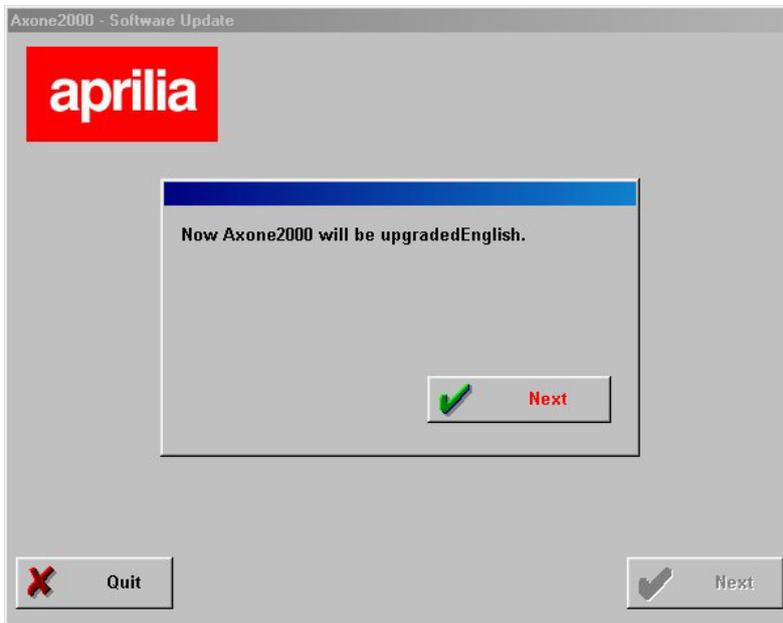
**IMPORTANT:** The following page will appear if either the cable is not connected correctly or the AXONE2000 APRILIA program was not started correctly:



Click “Retry”: the program will attempt to re-establish the connection and go to the next step. Otherwise, click “Cancel” to go back to the previous step.

Step 6:

The following page will appear:



Step 7:

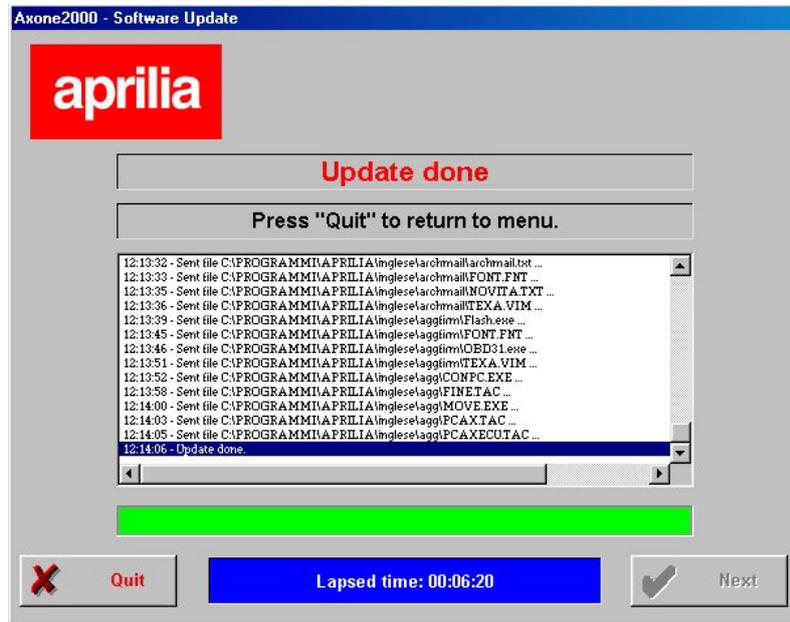
Click "Next" to upgrade AXONE2000:



Click "Stop" to stop the upgrade and quit the program.

**Step 8:**

The following page will appear on the PC at the end of the upgrade:



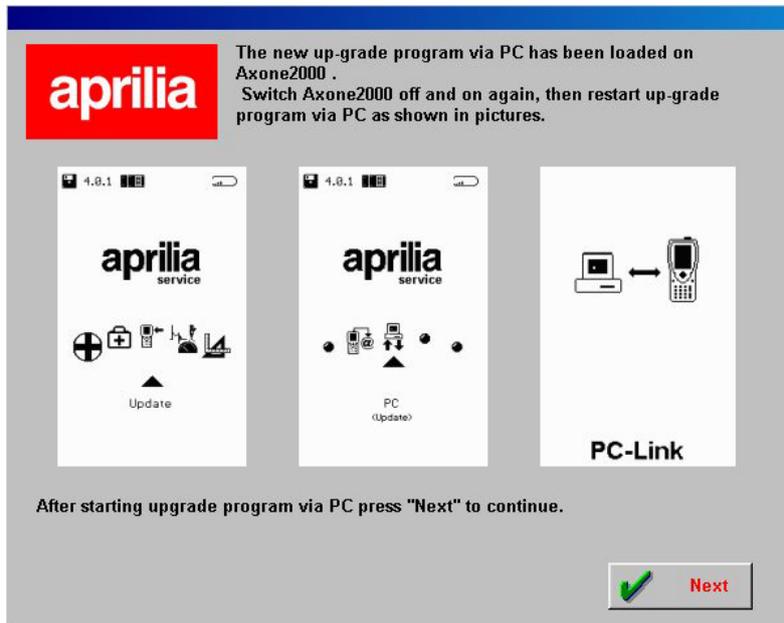
Click "Quit" to quit the program. The message "Upgrade done. Switch the instrument on and off" will appear on AXONE2000 APRILIA.

**IMPORTANT:** The following page appears after step 5:



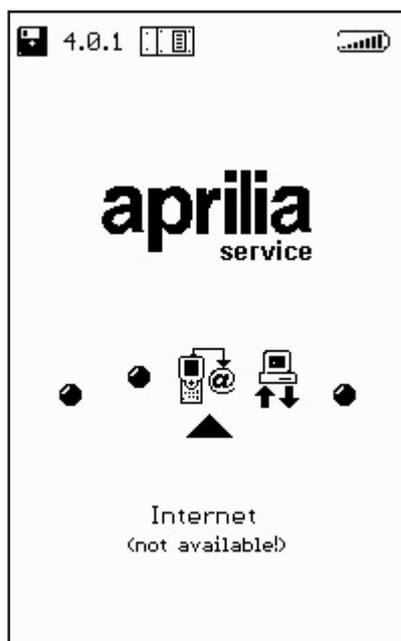
If the program identifies a memory card with unsuitable upgrade program. Click "Next" to install the new upgrade program via PC.

The following page will appear on the PC after upgrading the program:



In this case, go back over the previous steps and continue from step 6 to update the AXONE2000.

#### INTERNET CONNECTION:



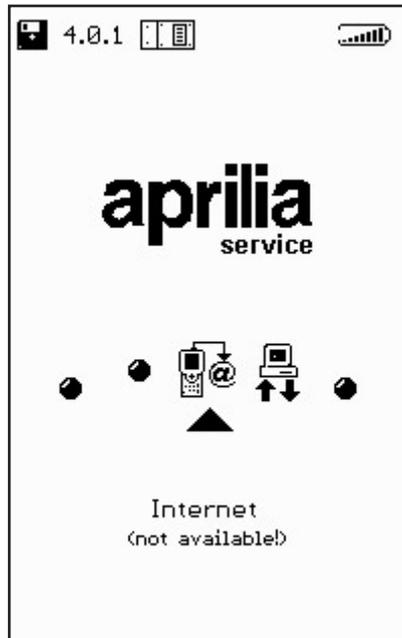
Refer to the manual provided with the optional modem connection kit to use this function (when activated).

## Internet on-line upgrade

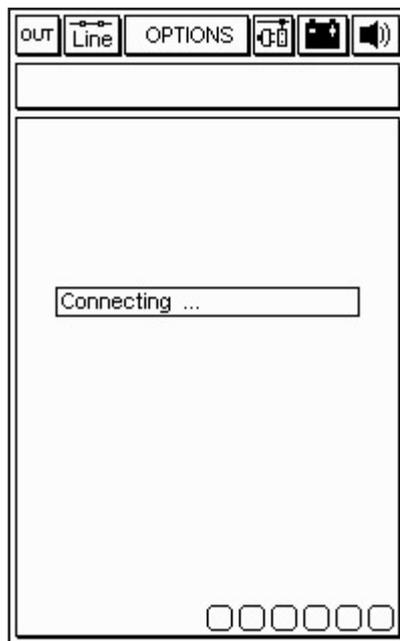
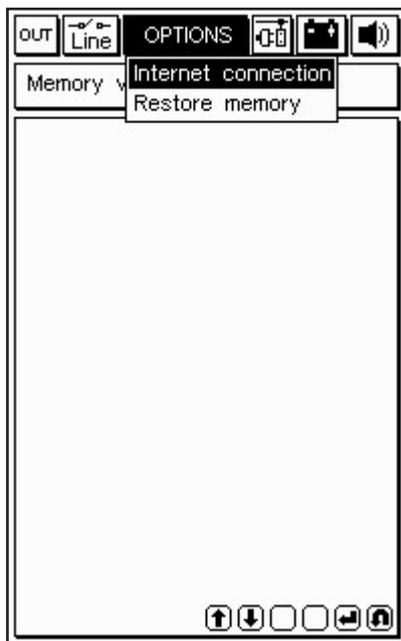
Insert the MDM56 communications module and connect the AXONE2000 APRILIA to a telephone socket using the cable provided for this upgrade procedure. Select “Upgrade” in the main menu to proceed.

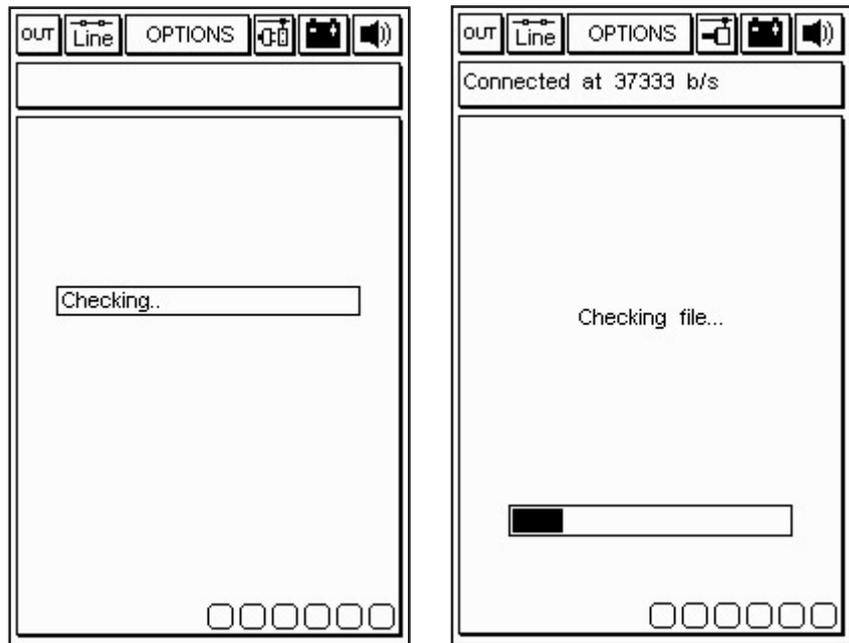


Select "Via Internet" in the following submenu to go to the connection wizard page.



The upgrade wizard will guide you step by step.





Select “Internet connection” in the Options menu to proceed. Icons will appear in the upper line when the connection is up:



Additionally, the message “Connected” will appear in upper window with the connection speed (which depends on the communication line).

The first steps ends once the available programs on the APRILIA server have been detected and after comparing the versions on the APRILIA server with those installed on the AXONE2000.

The next page will show the new available programs which can be selected and downloaded to the AXONE2000 APRILIA memory card.

In this example, the self-diagnostics program is selected. The program automatically connected to the Ftp Server and authenticates the request (verifying that the subscription is valid).



Memory version: 8.0.0

Available Upgrading

<input checked="" type="checkbox"/>	Service	121 Kb
<input type="checkbox"/>	Engine diagnosis	24 Kb
<input type="checkbox"/>	Self-diagnosis	1407 Kb
<input type="checkbox"/>	Lamp reset	77 Kb
<input type="checkbox"/>	Gas	6 Kb
<input type="checkbox"/>	Measurs	12 Kb
<input type="checkbox"/>	OBD	209 Kb
<input type="checkbox"/>	Internet	317 Kb

Select      Exit

↑ ↓ ○ ○ ○ ○ ○ ○

Memory version: 8.0.0

Available Upgrading

<input type="checkbox"/>	Service	121 Kb
<input type="checkbox"/>	Engine diagnosis	24 Kb
<input checked="" type="checkbox"/>	Self-diagnosis	1407 Kb
<input type="checkbox"/>	Lamp reset	77 Kb
<input type="checkbox"/>	Gas	6 Kb
<input type="checkbox"/>	Measurs	12 Kb
<input type="checkbox"/>	OBD	209 Kb
<input type="checkbox"/>	Internet	317 Kb

Select      Exit

↑ ↓ ○ ○ ○ ○ ○ ○

Connected at 42667 b/s

Connecting to file transfer service...

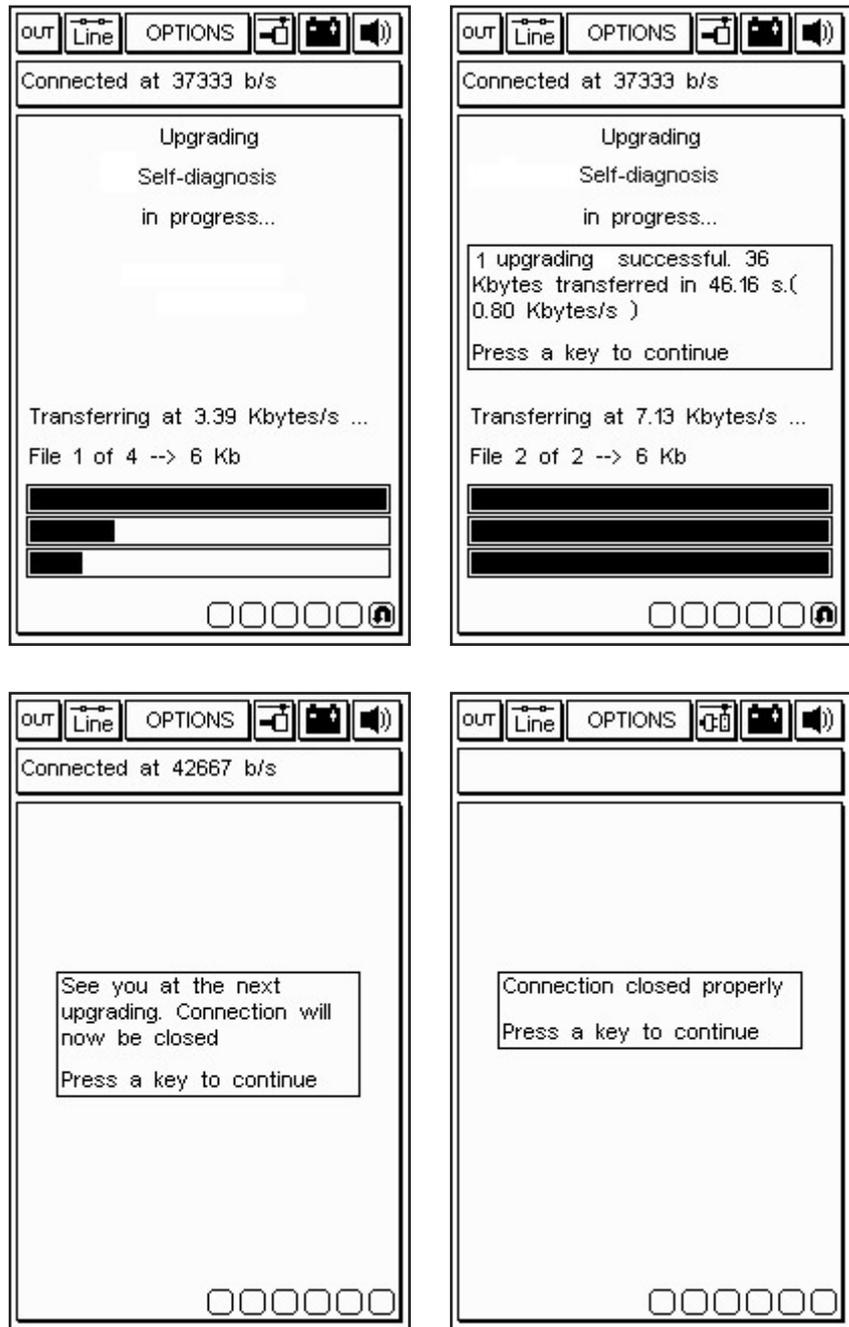
○ ○ ○ ○ ○ ○

Connected at 37333 b/s

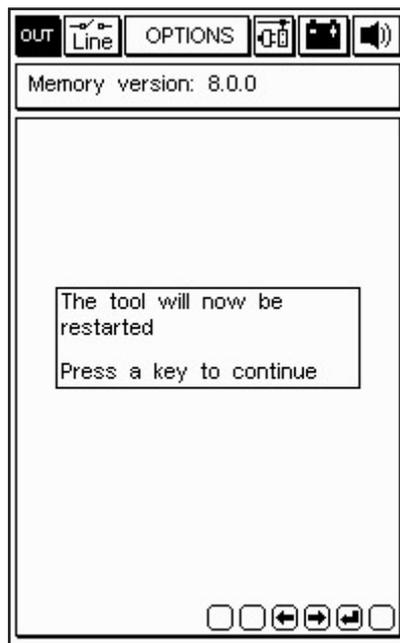
Authenticating...

○ ○ ○ ○ ○ ○

After identifying the product and the user, the program rapidly start downloading the new self-diagnostics program version to the AXONE2000 APRILIA memory card. The lower bars indicate current, partial and total file upgrade advancement.



The program will shut down and AXONE2000 APRILIA will be restarted after upgrading.



The AXONE2000 APRILIA has now been upgraded.

## DIAGNOSTICS

The “Diagnostics” functions is used to carry out traditional diagnostic procedures, i.e. physically analysing signals from various components connected to the ECU, namely sensors (ECU input signals) and actuators (output signals). Step-by-step guidance is offered for the various Aprilia models.

To start the program, insert the ACQ module when the AXONE2000 APRILIA is off, go to the icon corresponding to the program and press ENTER to confirm.

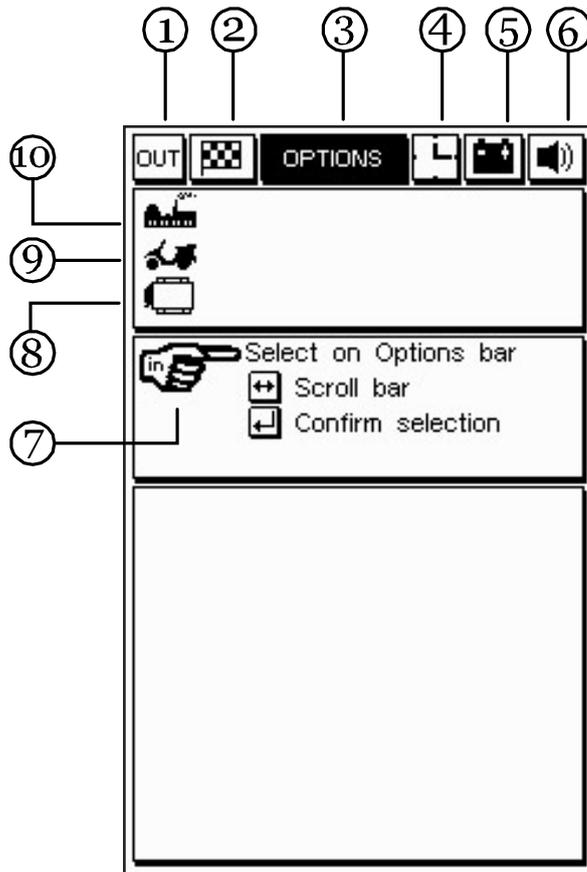


The following page will appear after confirmation. Use the up/down scroll buttons to start the function:

- INJECTION DEVICES

## INJECTION DEVICES

The main menu of the program will appear after the self-calibration phase. Press ENTER to access the following screen:



1. OUT icon: to quit the program.
2. Flag icon: to start and end the test.
3. Options window: to select the various available test types.
4. Animated clock/man icon: to verify when the program is active.
5. Battery icon: the icon will flash when the internal battery is nearly flat. In this case, an external power source is required to continue testing. Use the specific cables or power the AXONE2000 APRILIA with a specific battery charger for a sufficiently long period of time to recharge the internal battery.
6. Bell icon: to enable or disable confirmation and alarm tones. Use the scroll buttons to go to the corresponding icon (which will start blinking)

and press ENTER.

7. Select icon: to display the possible choices.

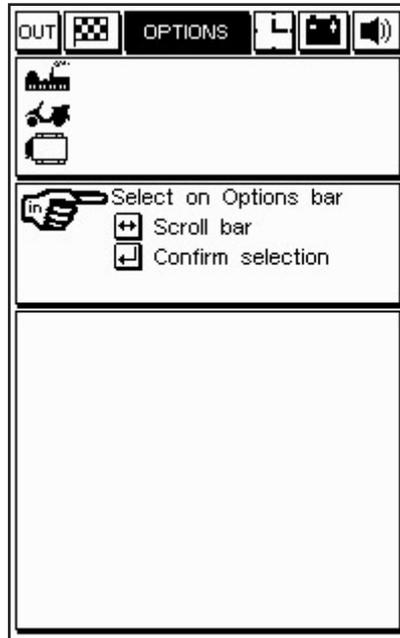
8. ECU icon: to display the selected injection system.

9. Model icon: to display the selected motorcycle.

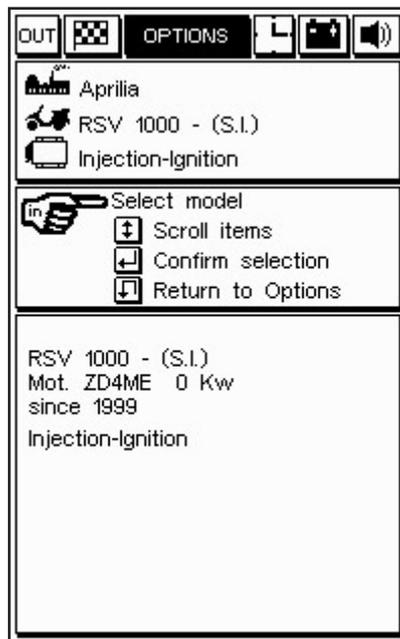
10. Make icon: to display the selected motorcycle make.



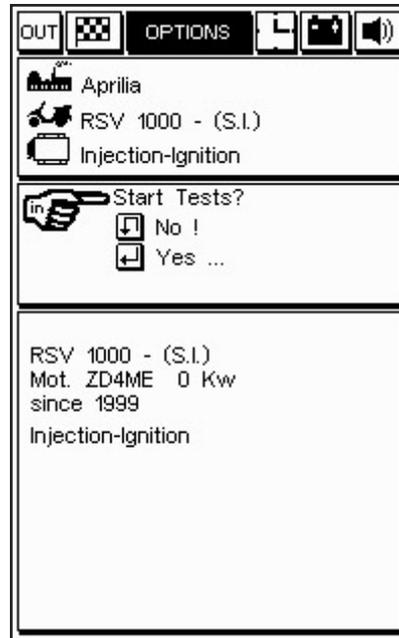
Take the cursor to the options icon to enable an additional window where to select the model to be tested:



To select a different model, scroll the list with the scroll buttons and press ENTER to confirm.



Select and confirm the system to be tested. A window will appear where to confirm start of test or not:

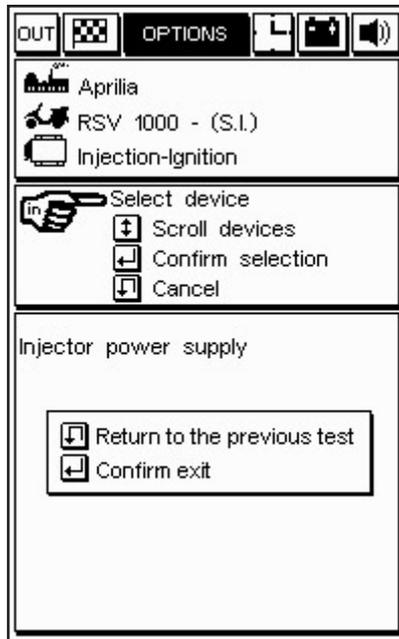


Press ENTER to proceed with the test.

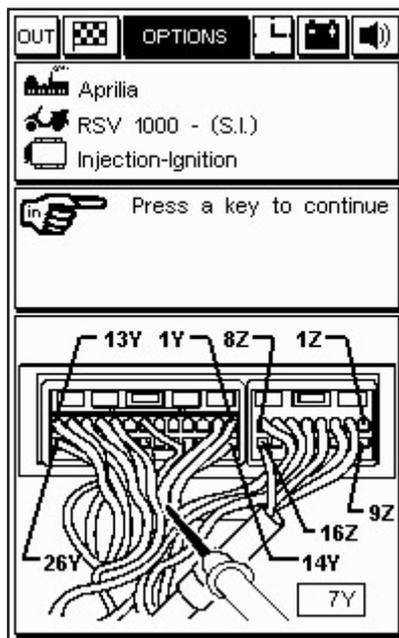


## Testing

The four channel acquisition cable is required.  
Select the type of device to be tested:



A window will appear, indicating the connection to be made directly on the ECU pins:



In this case, connect the black earth clamp to the negative battery terminal and the red probe (channel 1)

on the ECU pin specified by the program and shown in the figure (7Y in this example).

### “SIV” TEST PROCEDURES (Signal Information Viewing)

The various diagnostic tests are “facilitated”, i.e.:  
The various tests are proposed only when the signal of the device to be analysed is compatible with the test type.

The acquired signal is processed by an algorithm which compares the signal with the threshold values stored in AXONE2000 APRILIA for each of the selected models. An error is detected and an acoustic alarm is sounded if the signal is different from expected pattern.

### “SIV” TEST TYPES AND TYPICAL USE

**CRANKING LEVEL:** this parameter displays the signal curve and detects whether the signal value presents anomalies during the critical cranking phase.

**LINEARITY:** this parameter displays the signal curve and monitors linearity of the signal (showing if there is an excessive value difference between two points measured in two very close instances).

**MIN / MED / MAX:** this parameter displays the representative signal curve and stores the minimum, medium and maximum values reached.

**MISSED CRANKING PULSES:** this parameter counts the number of missed pulses according to instantaneous frequency variations (e.g. magnetic or Hall-effect sensor diagnostics, for detecting sensor contact interruption).

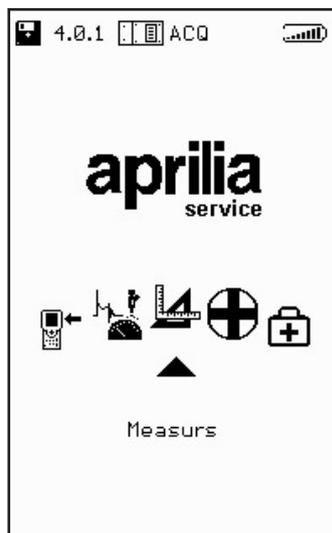


Press ENTER to confirm the possibility of selecting the various available tests which change according to the type of selected device. Select single or continuous test (by means of the up/down scroll arrow ) and press ENTER to start the test:



A single graph will be shown at the end of the test if signal test is selected. In the case of continuous tests, graphic acquisition will be interrupted either if an anomaly is found in the tested devices or by clicking the chequered flag icon. In both cases, the anomaly will be signalled by an acoustic/visual warning. The repairer can decide whether to resume testing or not.

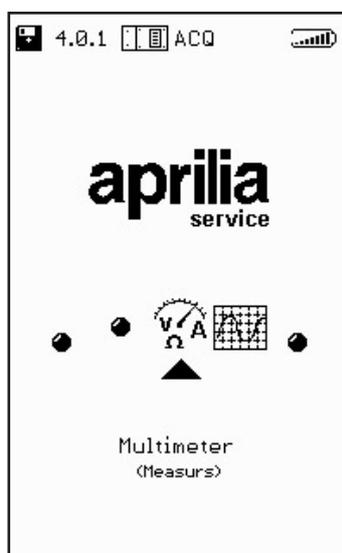
## MEASURES



## MULTIMETER

(VOLTMETER, AMMETER, OHMMETER, CONTINUITY TEST)

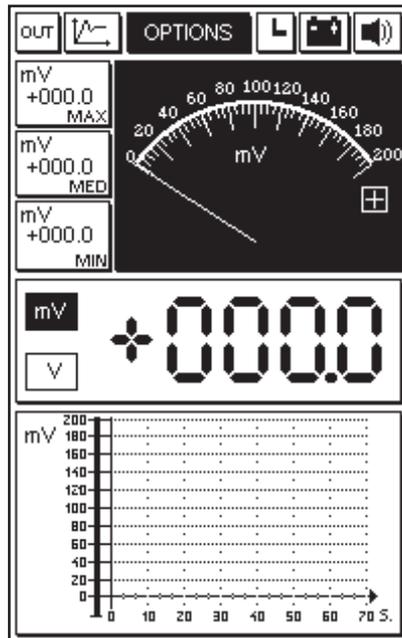
Positive probe: connected to channel 1 (red cable).  
 Negative probe: connect to the negative battery terminal. The function can be accessed from the main menu. Go to the corresponding icon and press ENTER to access the function.



**NOTE:** The multimeter function can be used to measure voltage, current and resistance. Particularly, current can be measured on different scales. The original kit cables can be used to measure capacity up to 2A (full-scale). Capacity from 20A to 600A require the use of an ammeter clamp.



## VOLTMETER



An instrument calibration procedure is started automatically when one of the instruments (voltmeter, ammeter, ohmmeter) is used for the first time. The message CAL will blink and temporarily replace the clock icon). The calibration procedure is used to specifically optimise the AXONE2000 APRILIA. The calibration will be stored only after closing the selected function. The instrument can be used at this point. During this phase, you are advised to short-circuit the red probe and the black probe (i.e. the two input terminals) of the instrument.

The main characteristics of the voltmeter are:

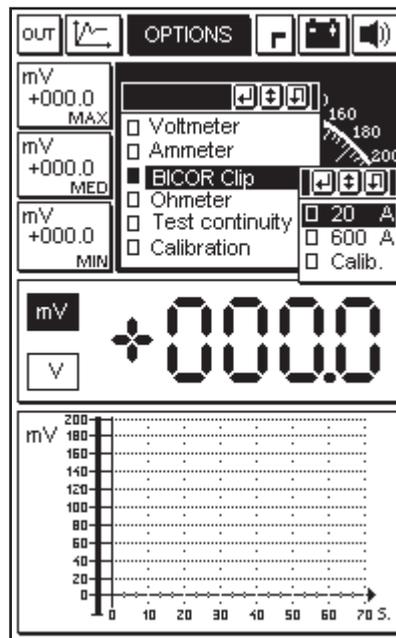
- Automatic scale change
- Stored values: minimum, medium, maximum
- Graphic view of voltage flow in time
- Concurrent analogue and digital display



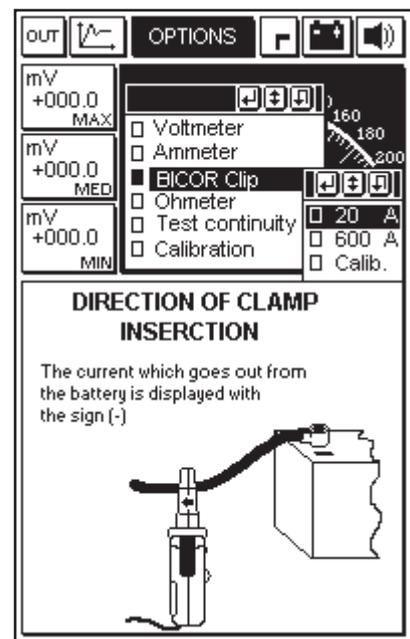
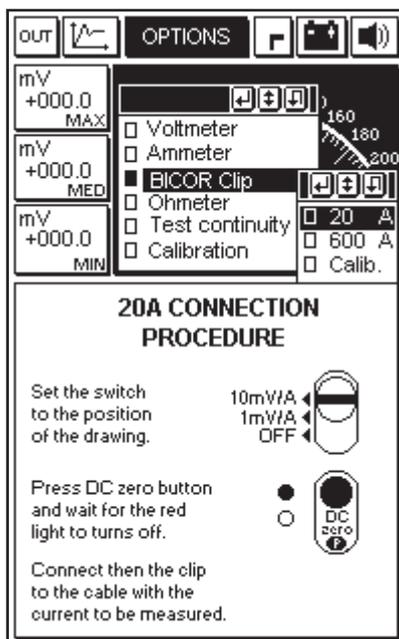
NOTE: Measurements are possible only with DC (direct current) up to 200 Volts.

# AMMETER

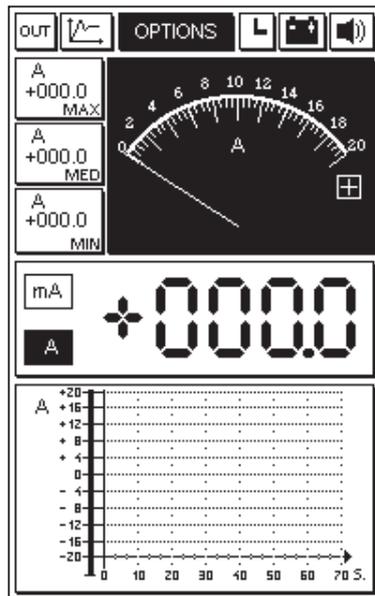
Simply select AMMETER on the OPTIONS menu for tests up to 2A full-scale. A BICOR ammeter clamp (optional) is required for tests from 20A to 600A. Set the required full-scale value manually following the indications in the selection menu:



This menu will provide all the indications required for connecting the BICOR clamp.



This will ensure that the instrument is set correctly (in this example, the full-scale value is set to 20A).



The main characteristics of the ammeter clamp are:

- Stored values: minimum, medium, maximum
- Graphic view of voltage flow in time
- Concurrent analogue and digital display

NOTE: Measurements are possible only with DC (direct current).

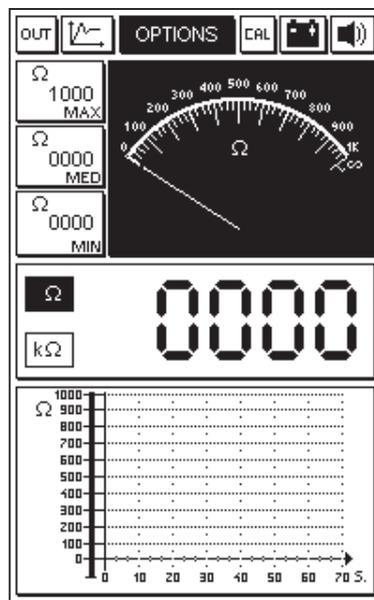


# OHMMETER

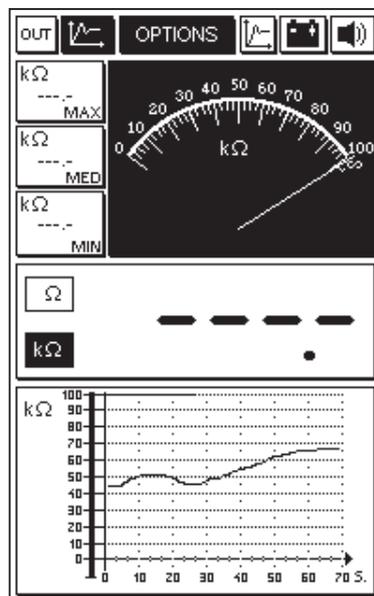
Resistance tests are performed during the red probe and the black earth clamp. Connect the component to be measured between the two terminals.

The main characteristics of the ohmmeter are:

- Automatic scale change
- Stored values: minimum, medium, maximum
- Graphic view of resistance in time

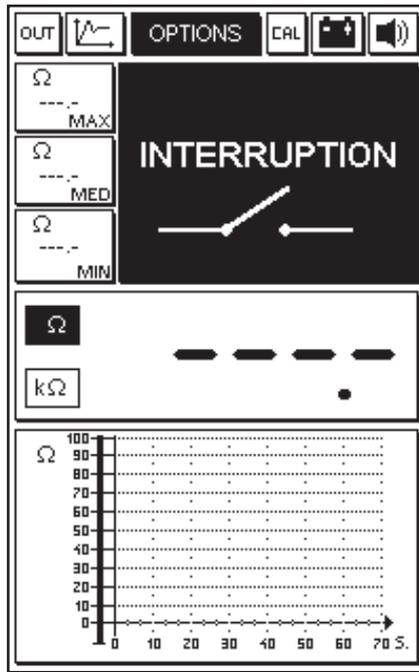


Concurrent analogue and digital display



## Continuity test

This function is used to test continuity in an electrical circuit.



The symbol of an open switch will appear if an interruption in the circuit is found. The symbol of a closed switch and a sound alarm are used to confirm continuity of the circuit.

### QUITTING THE PROGRAM

Select the OUT icon on all pages and press ENTER to confirm.

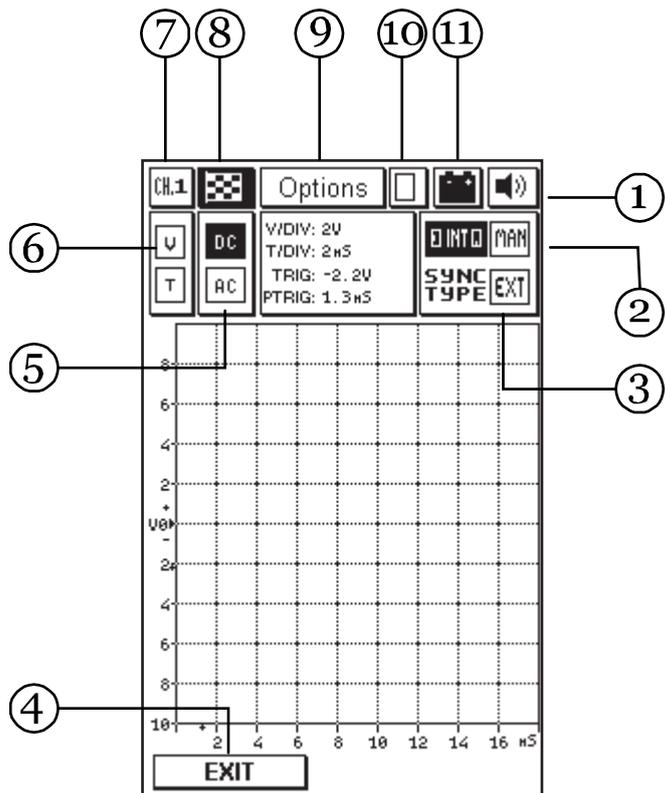


# OSCILLOSCOPE

This function can be accessed from the main menu. Select the corresponding icon and press ENTER



The manual oscilloscope page will be opened. Functional details are described below.

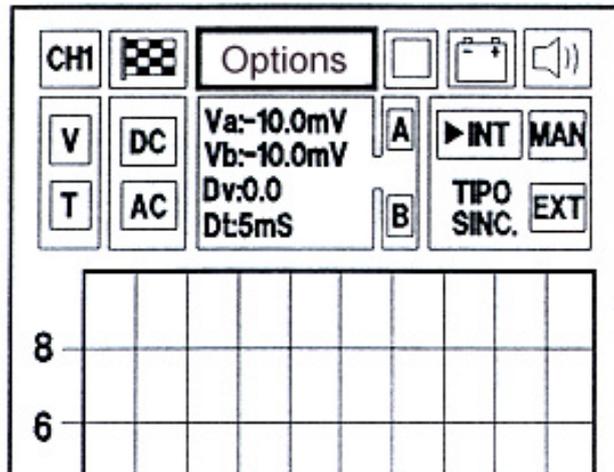


1. Bell icon: to enable or disable confirmation and alarm tones. Use the scroll buttons to go to the corresponding icon (which will start blinking) and press ENTER.
2. Synchronisation window: to select the type of synchronism (i.e. the way used to stabilise the waveform on the display). Three options: manual, external, internal. TRIGGER EXT can only be enabled by the program.
3. Values window: to show the values corresponding to the cursors on the measurement graph. Select Cursor in the Options submenu to activate the reading.
4. Navigation window: to quit the program and go back to main menu.
5. Readings windows: to set two different reading modes: alternate (AC) or direct (DC).
6. Scale window: to set the voltage (V) and time (T) scales according to the signal to be displayed.
7. Channel window: to indicate the selected channel (1, 2, 3 or 4) and the red, yellow, green and blue wires, all referred to the AXONE2000 APRILIA black power clamp (i.e. the common earth terminal).
8. Flag icon: to start and end measurements. The flag icon will blink when the manual function page is accessed. Press ENTER to start measuring. Press again to stop measuring and block the waveform on the display.
9. Options window: to select various modes to simplify reading the signal being measured.
10. Save window: indicating that a signal has been saved.
11. Battery icon: the icon will flash when the internal battery is nearly flat. In this case, an external power source is required to continue testing. Use the specific cables or power the AXONE2000 APRILIA with a specific battery charger for a sufficiently long period of time to recharge the internal battery.



## OPTIONS

Use the scroll arrows to access the Options window and press ENTER.

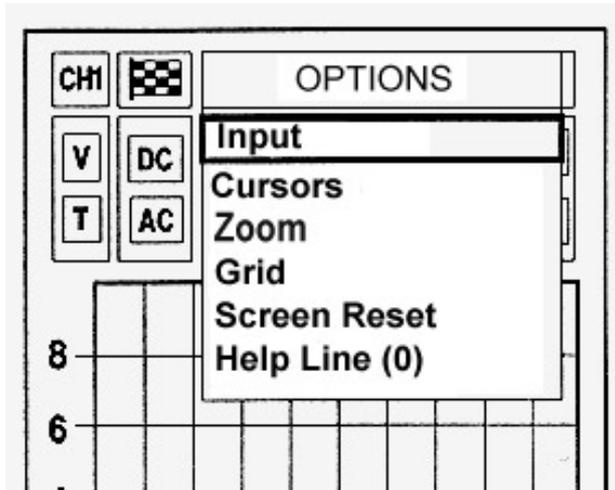


The Options menu containing several functions will be opened:

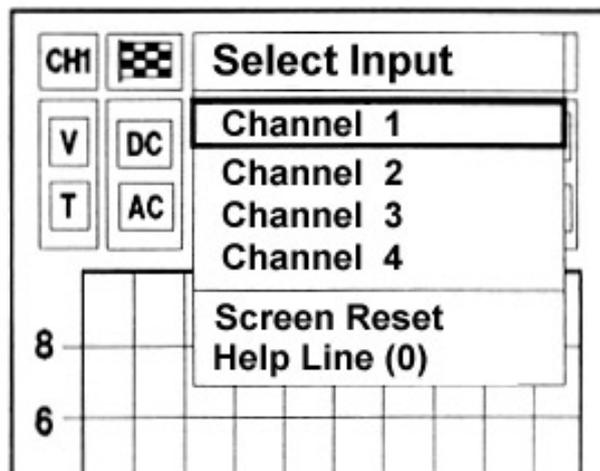
- INPUT
- CURSORS
- ZOOM
- GRID
- SCREEN RESET
- ON-LINE HELP (0)



## Input



Press ENTER in the Options menu to access the Input function. This offers the possibility of displaying the input channel on the display.

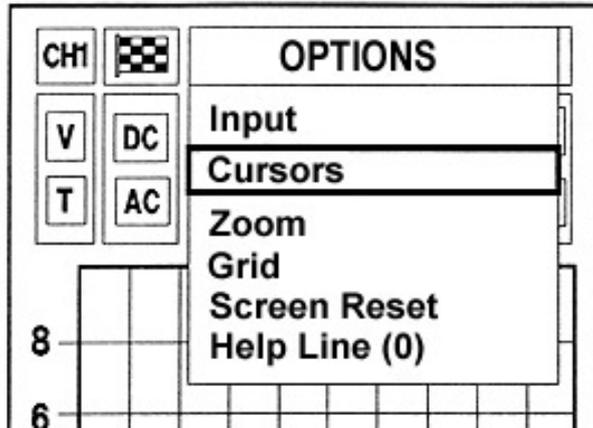


Select the required channel (highlighted in bold print) by means of the scroll arrows and press ENTER

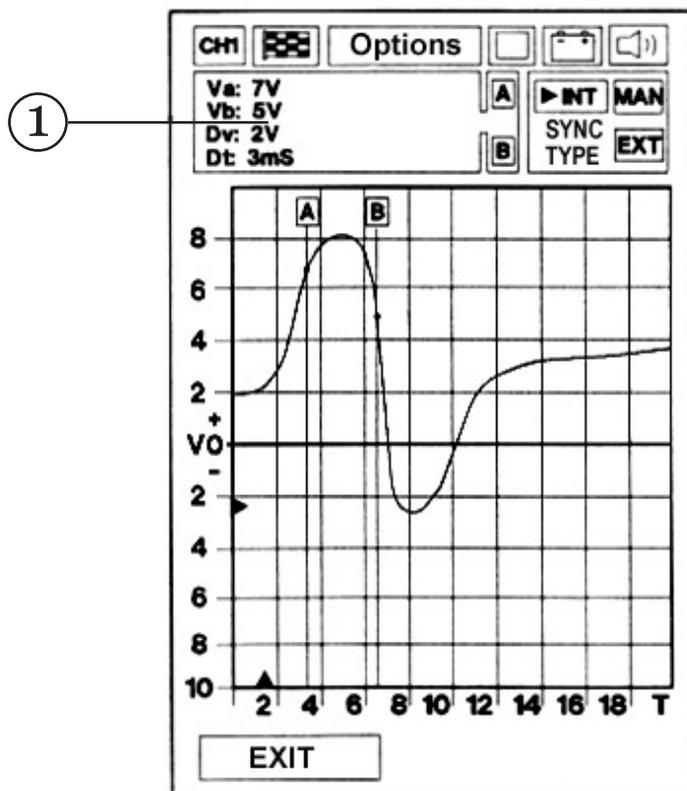
### IMPORTANT:

The function can be selected directly by means of the number keypad by recalling the corresponding channel number.

### Cursors



To select the Cursors function, go to the required option by means of the scroll buttons and press ENTER.



The Cursors function window (1) shows the readings on the curve. Letter A will blink. In this condition, move cursor A to the required point on the displayed curve by means of the left/right scroll arrows.

Select letter B to move cursor B to a point of the curve with the up/down scroll arrows. Move the cursor B to the required point with the left/right scroll arrows.

The voltage and time readings will appear instant by instant during these operations.

Window (1) will show the two voltage values  $V_a$  and  $V_b$ , measured in the two points where the cursors crosses the curve. The difference in voltage ( $Dv$ ) and the time that separates them ( $Dt$ ) will be shown in absolute values.

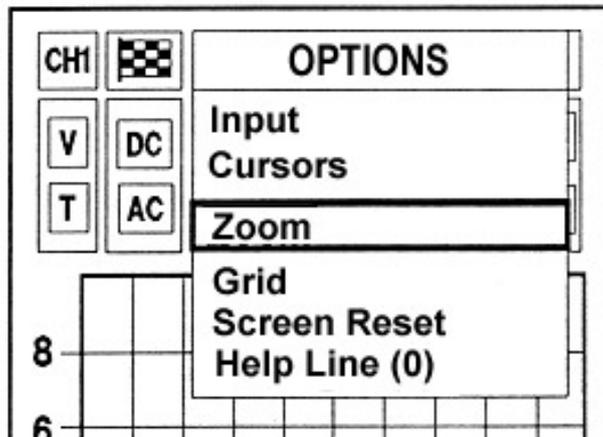
Note that the colour of the intersection point will be inverted by moving the two cursors on the curve at the point corresponding to where the signal was read.

This allows an easier, more accurate reading.

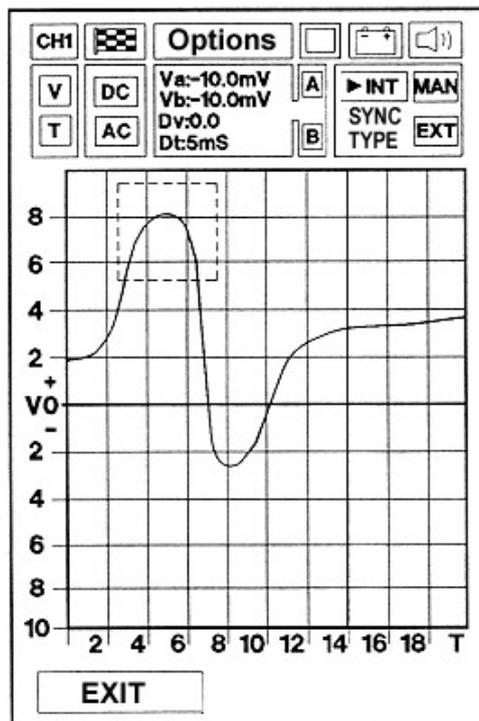
The original line will be cancelled, whereby confirming the right position, when the cursor has been placed exactly on the desired point.



## Zoom



To select the Zoom function, go to the required option by means of the scroll buttons and press ENTER.

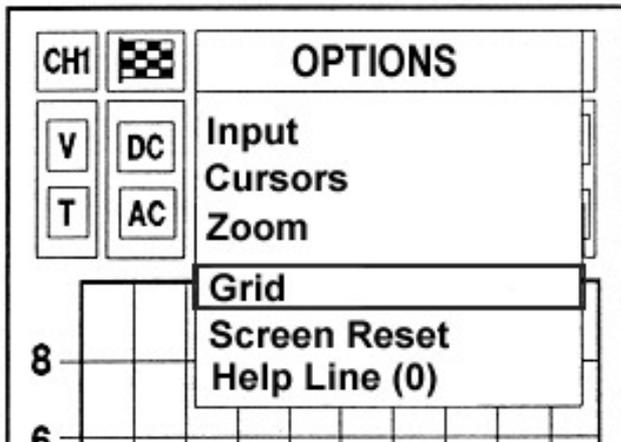


A dotted-border square will appear on the display when the Zoom function is on.

Use the scroll buttons to position the square where you want to zoom in (magnify). The zoom magnifies all the area within the square. Use + and - on the keypad to increase or decrease the zoom area and press ENTER the selected signal will be displayed with the required zoom.

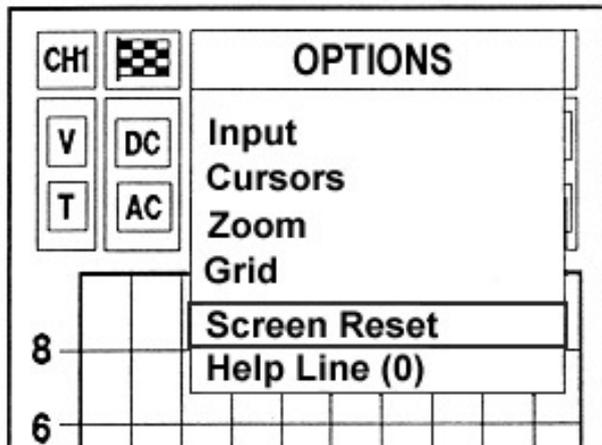


## Grid



The Grid function is used to hide and show grid lines on the display. Go to the corresponding function and press ENTER to select.

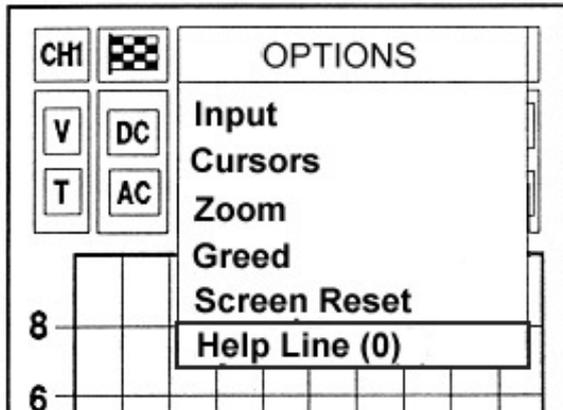
## Screen reset



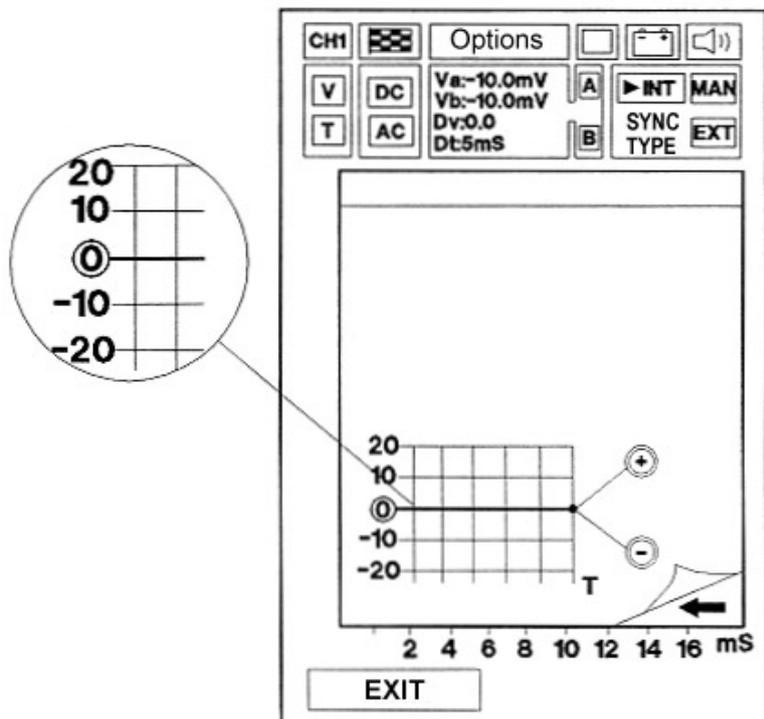
To select the Screen reset function, go to the required option by means of the scroll buttons and press ENTER.

The signal or signals stored on the display will be cancelled and the initial page will appear.

### Help line (0)

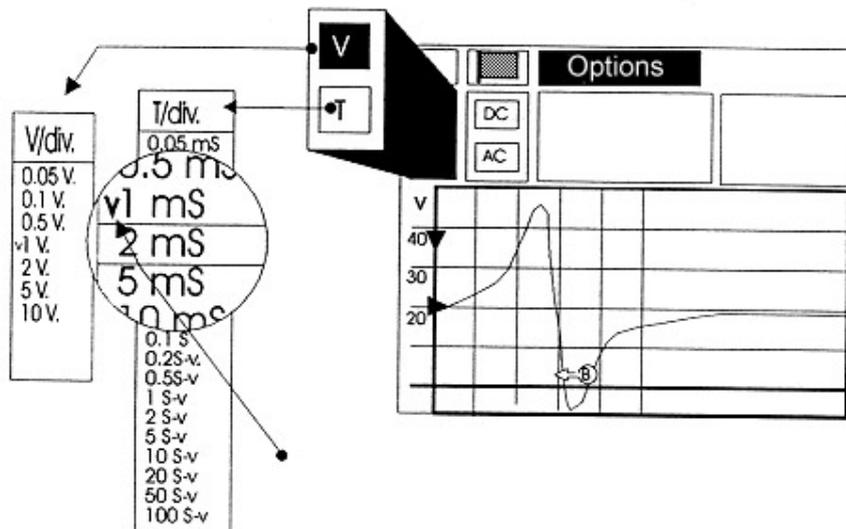


To select the Help line (0) function, go to the corresponding option and press ENTER.  
A page describing the operations required to change the zero potential line will appear. This function can be used to view parts of the signal which would otherwise be left out.



Press the left arrow to go back to the signal view page.  
The zero line can be adjusted while the signal is being read by means of + and - on the keypad.

## SCALE SELECTIONS



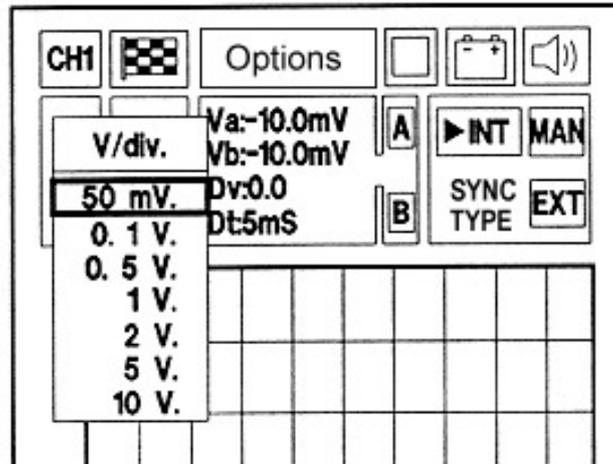
The windows identified by letters V and T are used to select the voltage and time scale.

A grid will appear in the signal display window dividing the display into square. Squares of the same side may indicate different units and values.

These functions must be set according to the signal to be measured in Manual mode so that the best resolution is used for displaying the curve or part of it. In this way, the instrument must be used for more rapid and exact measurements.



## Scale selection (V)



To select V/div scale, select the window with the letter V (bold and blinking) and press ENTER. A drop-down menu will appear containing the values which can be set on the volt scale. Use the scroll arrows to select the required volt/division value and press ENTER. The new scale with the selected scale will be displayed: the voltage value axis will change automatically. A certain voltage value corresponds to each division on the volts axis. For example, the square wave of an optical sensor can be displayed and will fill the entire display with a division of 0.5 V (Fig.1).

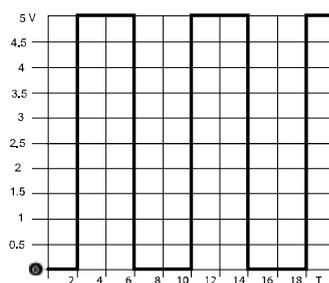


fig.1

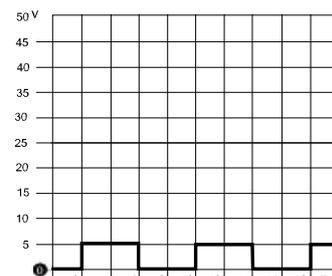


fig.2

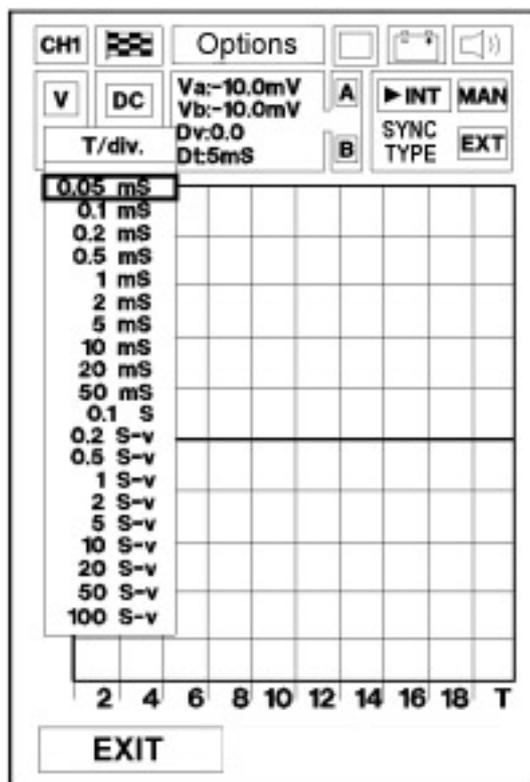
In this case, a part of the signal might stretch beyond the screen and may not be seen. Simply select a greater value per division (e.g.5 V) to see the same signal squeezed down to the height of a single square (Fig.2).



## Scale selection (T)

To select T/div scale, select the window with the letter T (bold and blinking) and press ENTER. A drop-down menu will appear containing the values which can be set on the time scale.

Use the scroll arrows to select the required time/division value and press ENTER. The new scale with the selected scale will be displayed: the time value axis will change automatically.



A certain voltage value corresponds to each division on the time axis. For example, the signal measured on the terminals of the injector can be displayed.



This is because the signal is shorter than expected.

Specially, accurate measurements will not be possible if you want to measure the injection time (Fig.1). Simply change the time division value, lowering to 1 ms for each division (Fig. 2).

In this case the signal will now show the entire form and appear clearly and easily quantifiable.

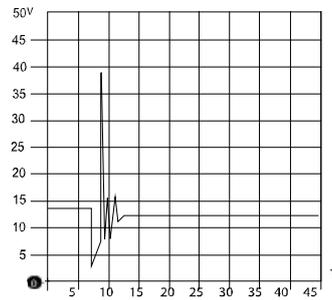


fig.1

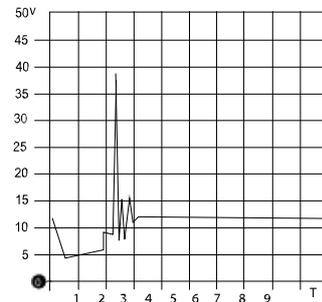
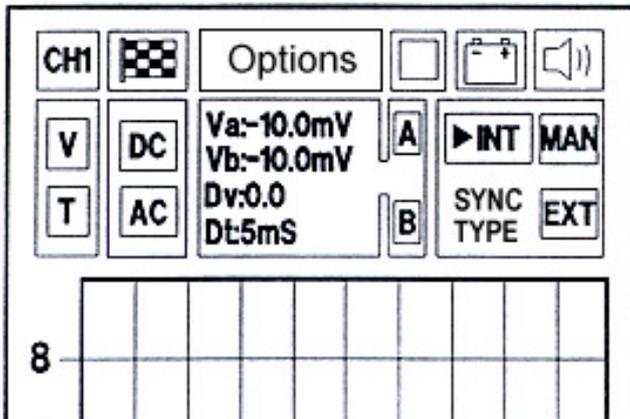


fig.2

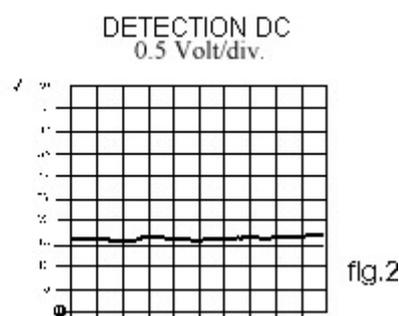
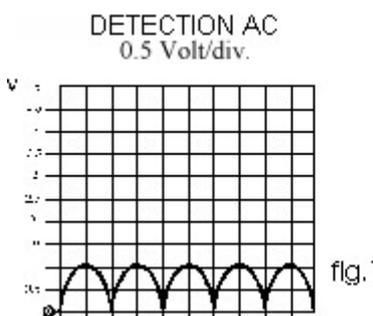
Therefore, when selecting the voltage and time measurement scales, it is advisable to adopt the resolution that provides the best view of the signal to be measured. This will also allow the best positioning of the measurement cursors.



## AC/DC READING SELECTION



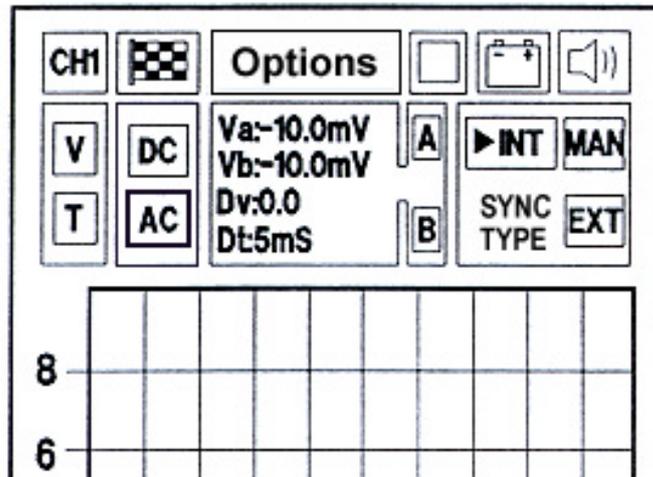
The two windows with the letters AC and DC may be used for enabling two different measurement modes. Select DC to view the direct component of the signal. The direct component will be cancelled and replaced with the alternative component if AC is selected. This option is extremely useful to highlight the disturbance overlaying a direct signal. A typical example is testing the voltage of a battery. If the test is executed in AC, the reading shows the residual signal generated by the rectifier diodes of the alternator. The measurement with the oscilloscope in AC mode (alternate) allows the selection of small voltage resolution (e.g. 1 V/div), while detecting and displaying a high voltage direct signal.



In the above example (battery check), the positive voltage of 12 -14.7 V is tested and controlled with a test sensitivity of 1 V/division. The resulting oscillogram will show a signal on the zero line with a

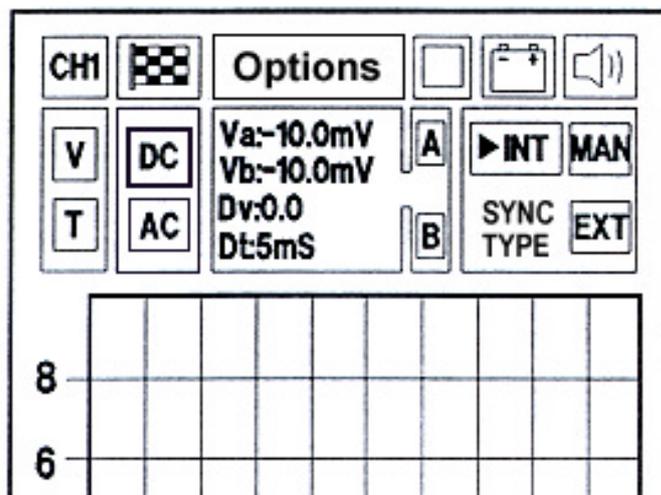
set of arcades in the positive quadrant (Fig. 1). Such arcades confirms that the alternator and the charging system are in working order.

### AC reading selection



To select alternate current measurement, select the window with the letters AC (bold and blinking) and press ENTER. This function is useful for identifying interference signals.

### DC reading selection



To select direct current measurement, select the window with the letters DC (bold and blinking) and press ENTER. This function is useful for identifying interference signals.



### EXAMPLES OF CONTINUOUS SIGNALS:

- Hall-effect magnetic sensor signal (continuous pulse signal)
- NTC/PTC sensor (temperature sensor)
- Piezoelectric sensor (pressure sensor)
- Potentiometer signal (throttle position sensor)

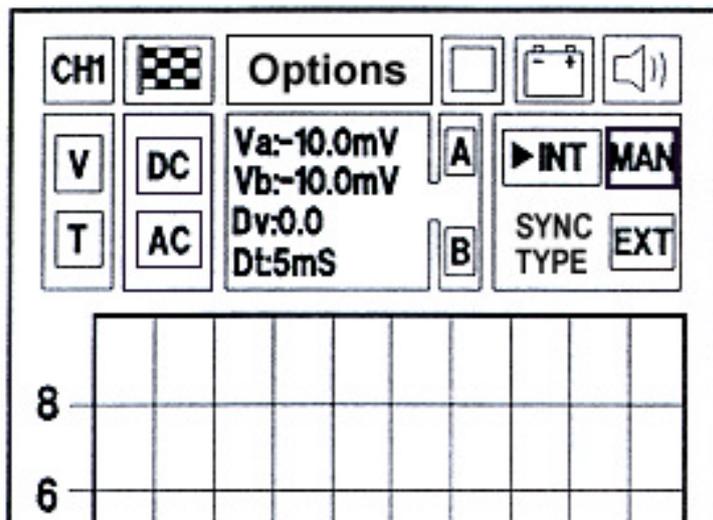
### EXAMPLES OF ALTERNATE SIGNALS:

- Magnetic sensor (pickup sensor)
- Generator signal before the voltage regulator



## TYPES OF SYNCHRONISM

Synchronism means the way of stabilising the display of the wave form (signal )on the screen; an auxiliary signal is used. It may be generated from AXONE2000 itself (INT), it may be input from the outside (EXT), or it may be generated by the operator (MAN).



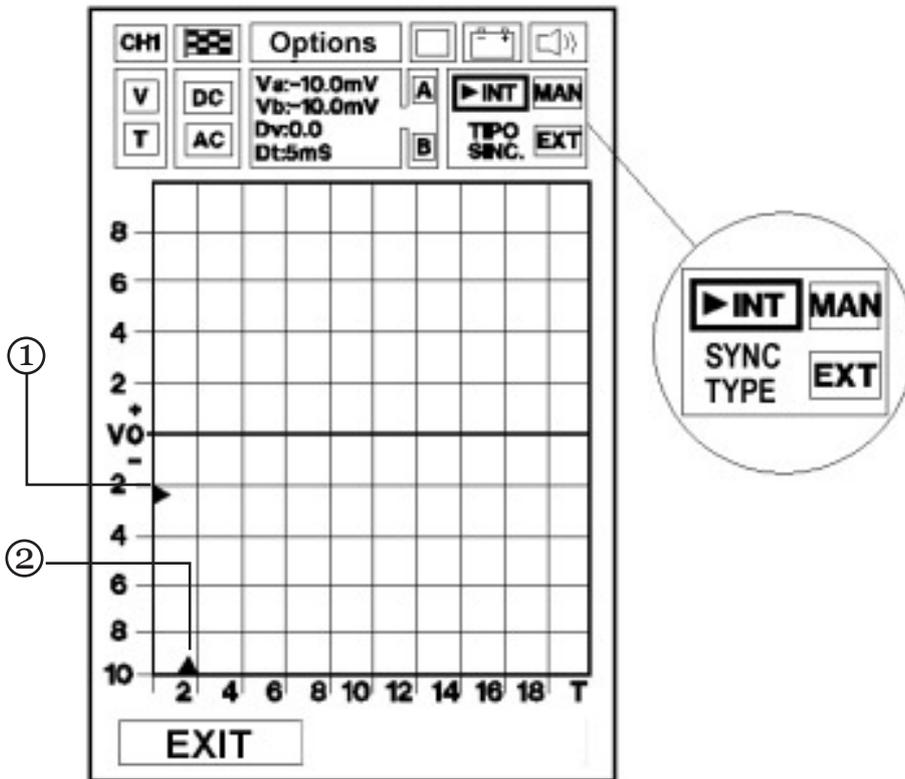
The type of synchronism is shown in the window in the right of the screen. There are three types of synchronism:

INTERNAL  
MANUAL  
EXTERNAL

Simply use the scroll arrows to go to the required synchronism window and press ENTER to confirm.



## Internal synchronism



The waveform on the display is stabilised with a signal generated by the AXONE2000 APRILIA microprocessor.

The synchronism may be adjusted in size and position (TRIGGER). To start such adjustment, move to the window with the letters INT and press ENTER.

The triangles on the V and T axis will blink.

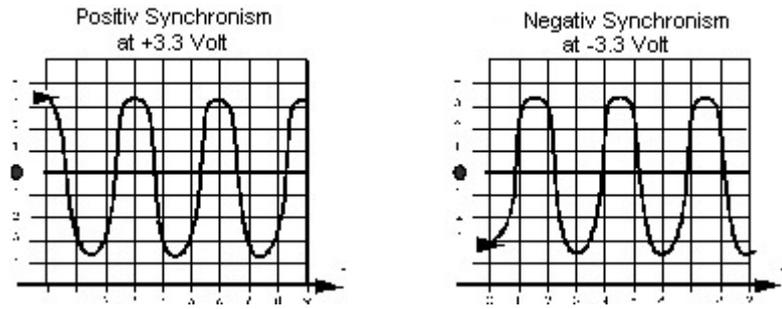
While blinking, triangles (1) and (2) may be positioned on the required points by using the scroll arrows.

In particular, triangle (1) on the V axis represents the level and polarity point in which the connection with the internal synchronism signal will take place.

If the triangle is above the zero line, the signal will be displayed starting from its positive phase.

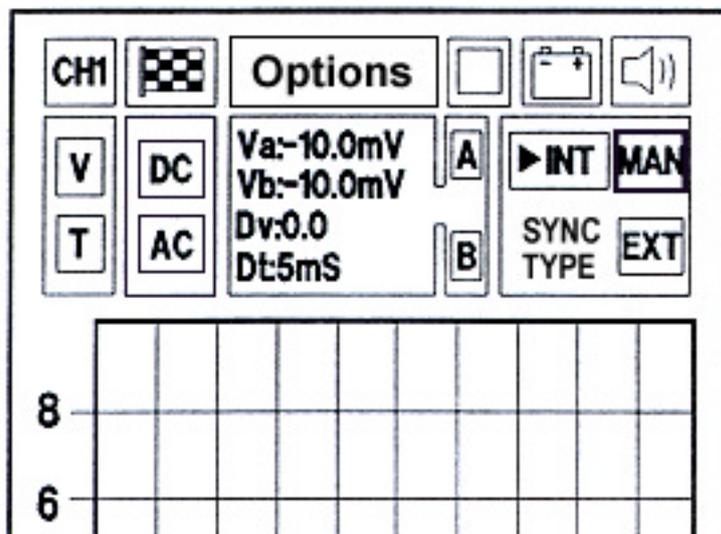
If the triangle is below the zero line, the signal will be displayed starting from its negative phase (see diagram on next page).





The triangle, on the T axis, represents the starting point of the synchronism in the display. Use the arrow keys to move it left or right in order to improve the display of the signal by centring it in the screen.

### Manual synchronism



To select the Manual synchronism, select the window with the MAN letters. Press ENTER to start measuring of the signal.

Manual trigger offers new diagnostic possibilities. While internal or external trigger is as set before, actual signal measurement starts only when the operator presses ENTER.

The acquired image is saved and then shown on the



display.

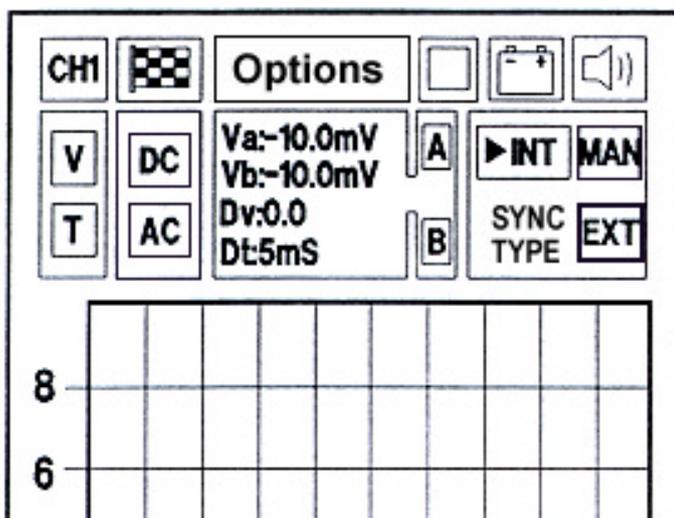
To carry out another measurement, press ENTER again. The second measurement will be placed on top of the previous, this way the operator may compare the two tests.

This function supplies multiple options. For example, it is possible to compare two signals that have been measured at different revs (injection timing test), or to compare the output signal of a spark knock sensor, with and without knocking.

It is possible to carry out this procedure as many times as needed. To avoid confusion and to improve the clearness of the signals, it is advisable to use the hide grid option as shown before.

To exit this function, just press twice any of the scroll arrows.

## External synchronism



Not available.

## AUTO-DIAGNOSTICS



The AUTO-DIAGNOSTICS program is used to connect the AXONE2000 APRILIA to various injection ECUs with different characteristics according to the make and the specific injection system.

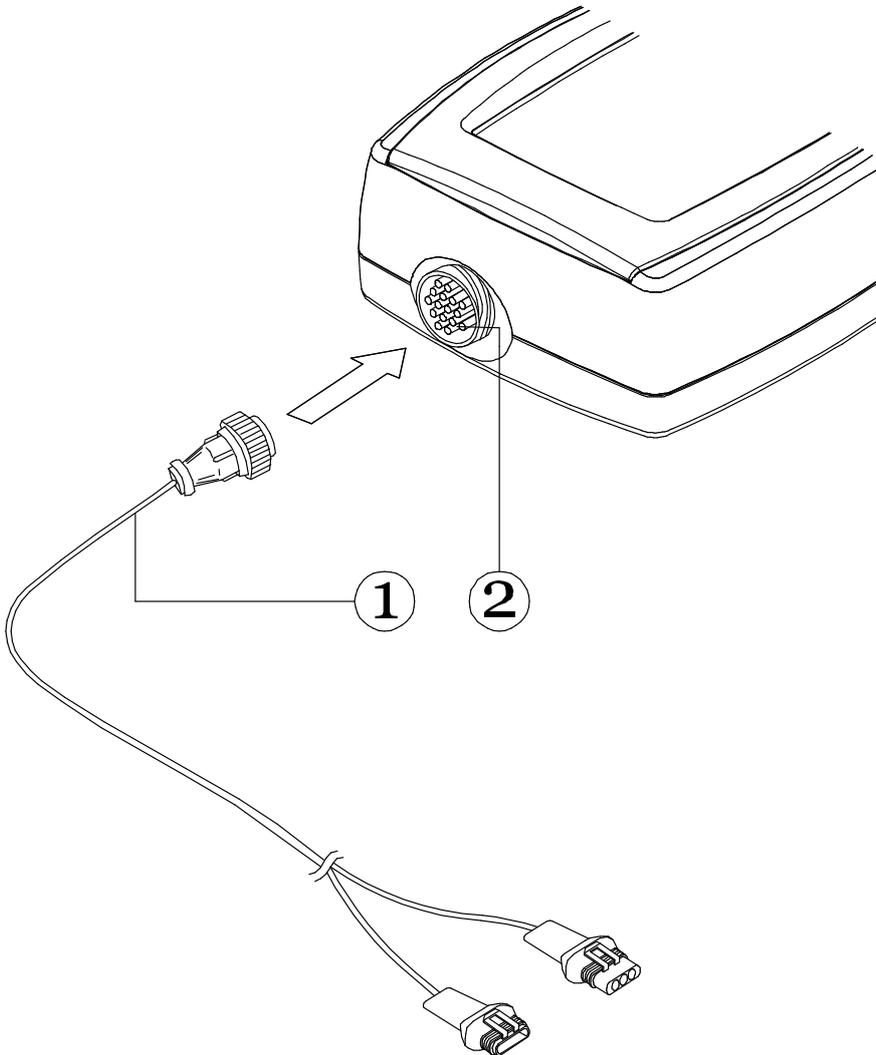
The auto-diagnostics system reads information and interfaces directly with the motorcycle ECU.

Possible procedures:

- Read functional parameters of all systems connected to the ECU.
- Automatically acquire failure codes.
- Edit some engine management parameters.



## How to connect AXONE2000 APRILIA to the ECU



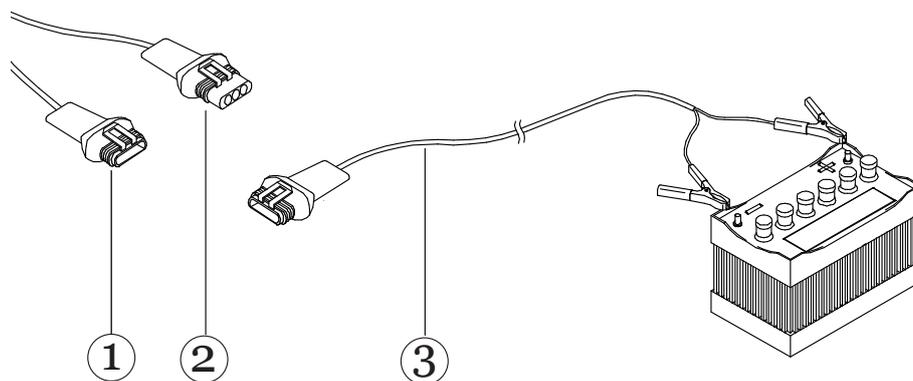
Insert the interface cable connector (1) in the upper connector (2) on the AXONE2000 APRILIA respecting the indications shown on the labels attached to the cable.



## How to power the auto-diagnostics interface cable

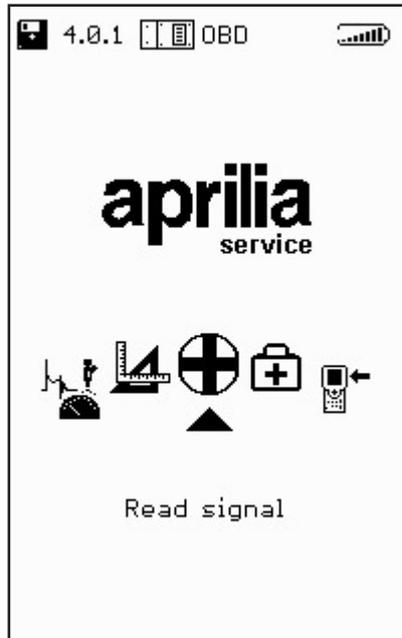
The auto-diagnostics interface cable cannot be powered by the AXONE2000 APRILIA internal battery. An external power source must be used as shown below:

- connector (1) to the motorcycle;
- connector (2) to the motorcycle battery power cable
- (3) (never to an external battery).

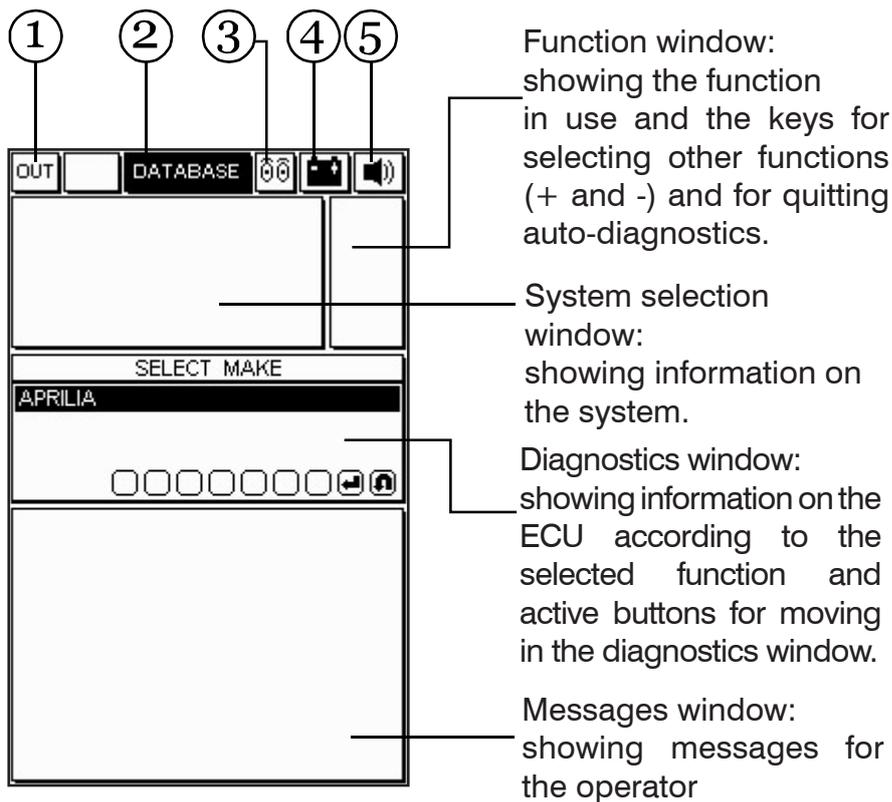


## TESTING

To start a program, insert the OBD module with the instrument off, select AUTO-DIAGNOSTICS and press ENTER to confirm



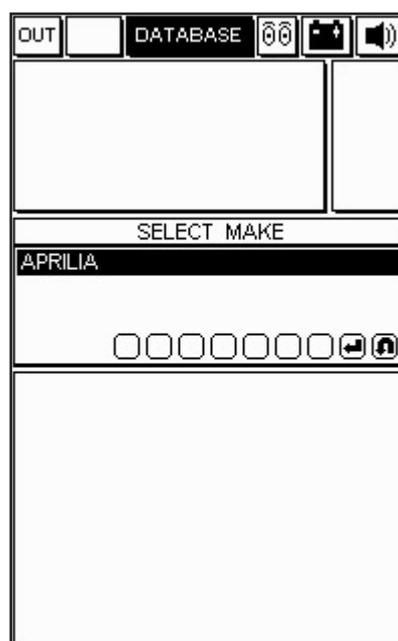
Details on the page which will appear are provided below.



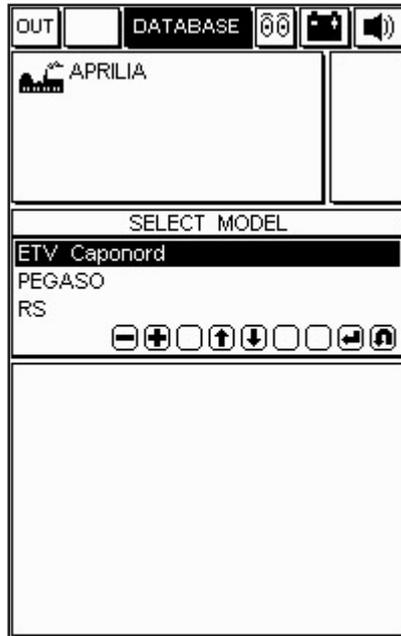
1. OUT box: select to go back to MAIN MENU.
2. DATABASE box: to select the motorcycle type and system to be tested.
3. Activity box: to indicate when the AXONE2000 APRILIA is communicating with the ECU. The icon will become a lamp and blink when the communication is up.
5. Battery box: the symbol will blink slowly when the battery is running low and faster when the battery is flat. The instrument will switched off after 20 seconds.
6. Bell box: to enable or disable tones.

## How to select make and model

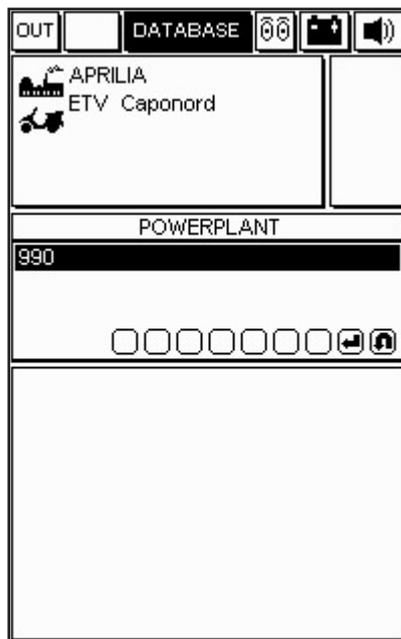
Use the scroll arrows to select the available manufacturers and press ENTER to confirm.



Select the motorcycle model and press ENTER to confirm.



Select the engine type and press ENTER to confirm.



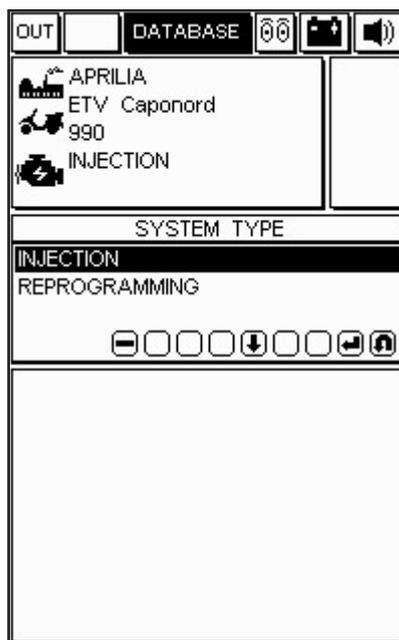
Select the system to be tested from the list of available systems.

Select chassis code and system type.

The following can be selected:

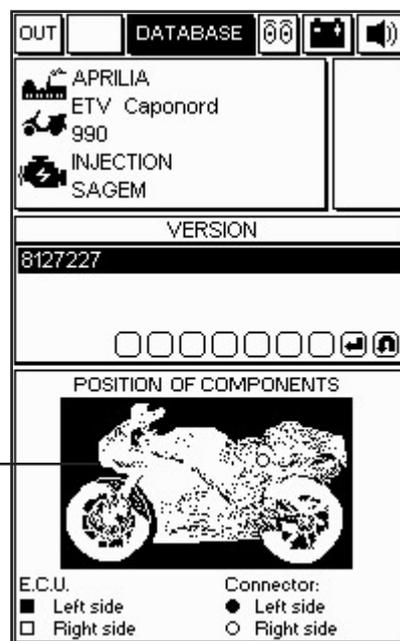
- INJECTION (injection system auto-diagnostics)
- RE-PROGRAM (ECU re-mapping)





In this example, select the injection system and then the ECU type/code. Press ENTER to confirm. The version and location of the diagnostic socket will be provided.

Location of ECU and the diagnostic socket



Confirm selections. A picture of the adapter cable to be used and the interface between auto-diagnostics cable interface and 3151/AP01 main cable with respective code will appear after confirming all selections.





## How to connect auto-diagnostic sockets

Auto-diagnostic sockets vary according to the injection system. A specific page is provided to indicate the adapter cable to be used for the interface between the motorcycle cable interface and the 3151/AP01 main cable.



Connect the adapter cable to the ECU auto-diagnostic socket as shown in the figure using the suggested connection cable.

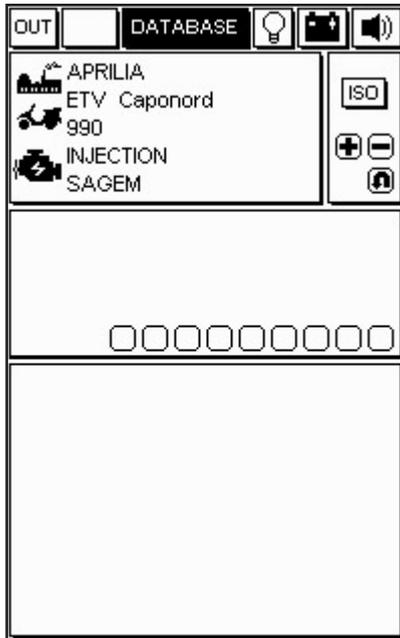
### IMPORTANT:

Examples of operations will be presented to illustrate the diagnostic potentials of the system. These operations may vary according to the type of selected ECU and the data which the ECU is capable of providing.



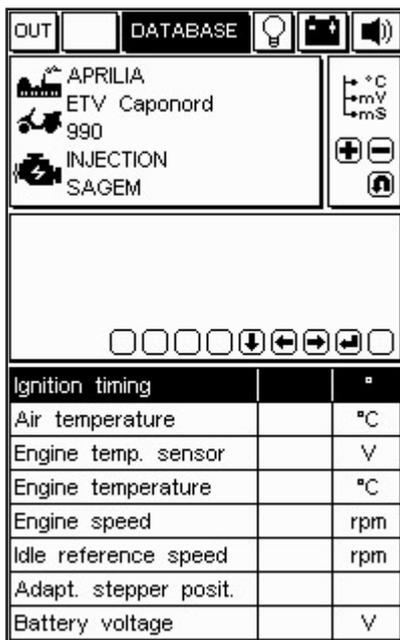
## Starting diagnostics

Select the motorcycle system to be tested and start the test.



**IMPORTANT:**  
Make sure the ignition key is off before starting the test.

- Set up the connection.



The auto-diagnostics program will start if the cable is correctly connected and powered.

A message such as the one shown in the figure will appear. On the other hand, if the connections has not been set up correctly, the message “Communication interrupted, reactivate?” will appear.

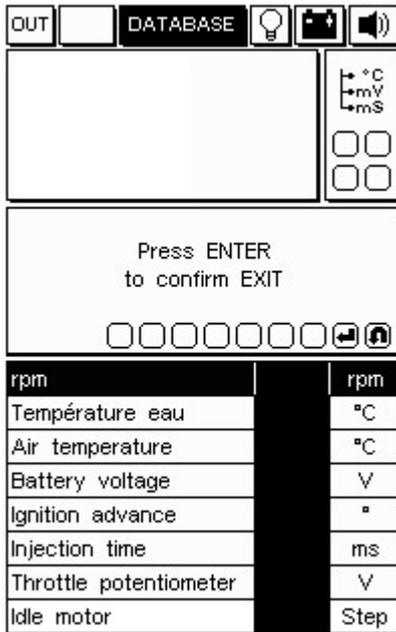
 - Check motorcycle auto-diagnostic socket connection.

- Turn the ignition key on to start communication with the ECU as instructed by the program.
- Wait for a few seconds for the communication between 3151/AP01 main cable and ECU to be established.

The lamp icon in the top right will start blinking when the communication is up. A tone (where relevant) will be heard to indicate the presence of errors in memory. Select the specific page with the keys (+ and -) to view errors.



## Engineering parameters



ENGINEERING  
PARAMETER  
ICON

A list containing a number of parameters referred to the selected motorcycle will appear. The list may not be comprehensive. Use the left/right scroll arrows to select missing items and display them instead of those shown. Press ENTER to confirm.

To view a parameter value:

- Select the required parameter.
- Press ENTER.
- Press ENTER again to display parameter view.

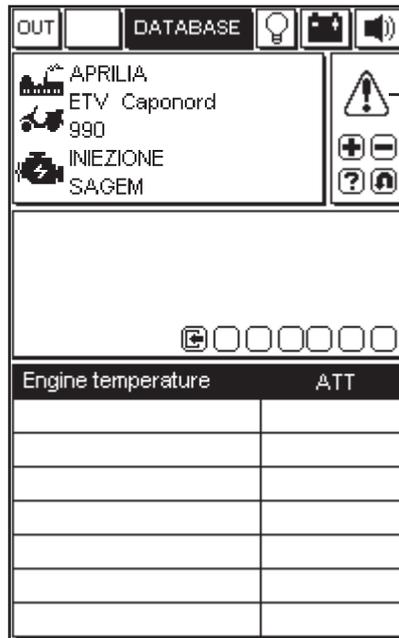
### IMPORTANT NOTE:

The selected data refresher speed and the number of available items depends on the ECU.



## Current and saved errors

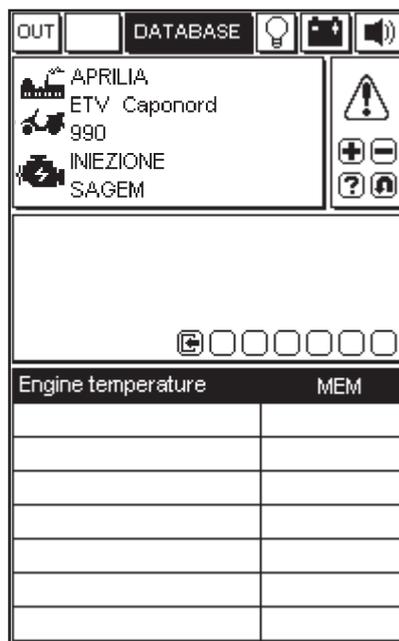
Use the keys (+ and -) on the keypad to view the errors icon in top right to access the ERRORS function. The AXONE2000 APRILIA picture will appear indicating that an engine temperature error has been found.



ERROR  
ICON

The message ATT will appear next to the message to indicate that the error is current (i.e. currently present).

Repair the problem on the motorcycle.



Example of stored error:

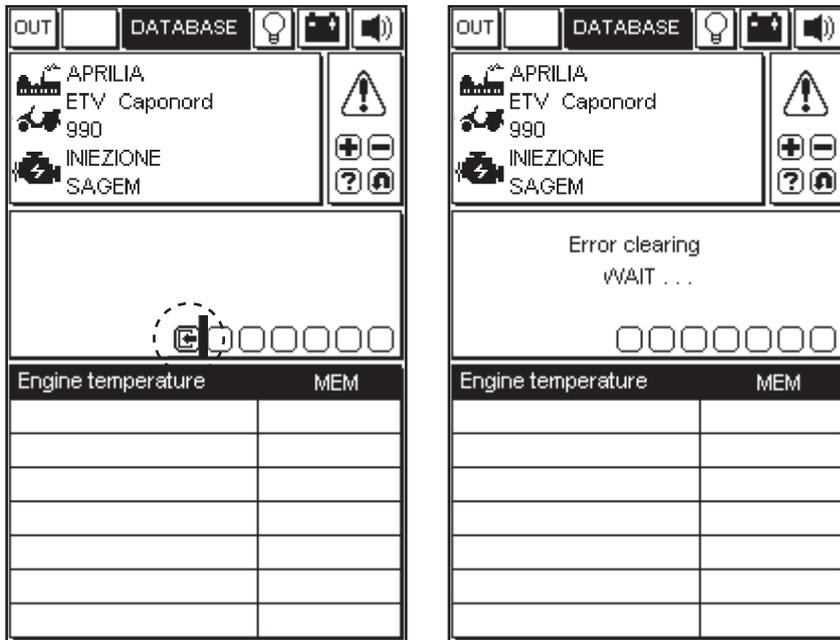
The message MEM will appear next to the error message if the ECU detected a fault in the past which may no longer be present.

NOTE: In some ECUs, the communication protocol may not be capable of discriminating between a current error and a stored error.

The message MEM will appear in any case in this event.



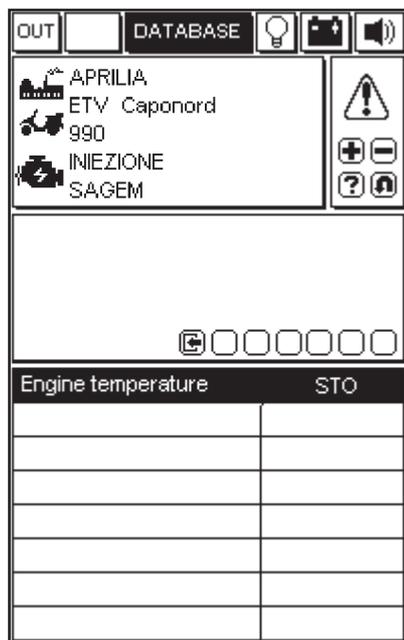
- Press STORE/DELETE to delete detected errors.



- Press either ENTER to confirm deletion or ESC to cancel the operation.  
An error deletion message will appear.



## STO function (automatic storage)



Error deletion will be confirmed by the message STO which will appear next to the error message. The automatic storage function is used to temporary store the errors deleted from the ECU memory in the AXONE2000 APRILIA memory and display them. STOP will appear next to the items on the display. All stored errors will be cleared by deletion.

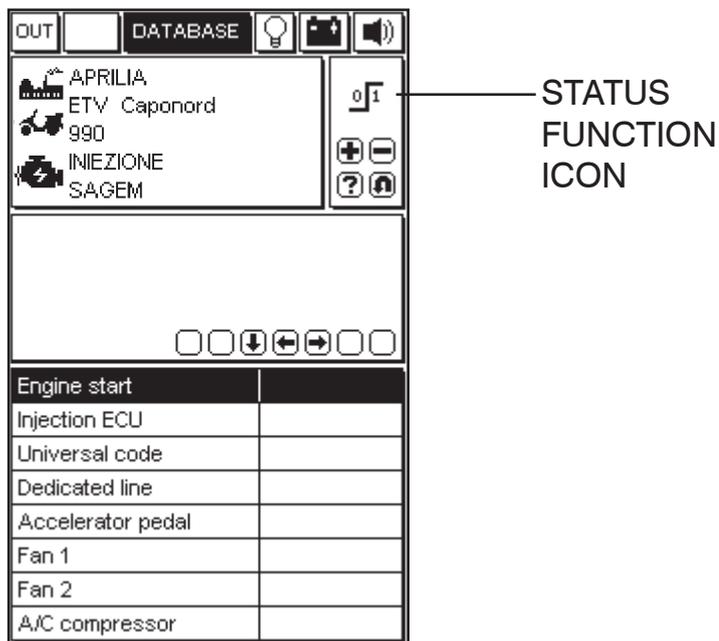
ATT, MEM and STO error status management depends on the selected system and may vary.



## Input status

Status parameters indicate the conditions of some ECU inputs, specifically ON/OFF (engine running/not running, lambda sensor on/off, etc.). Status view is constantly enabled in some systems.

- Repeatedly press keys (+ or -) to view the STATUS function to access INPUT STATUS.



### IMPORTANT NOTE:

The data refresher speed and the number of available items depends on the ECU.



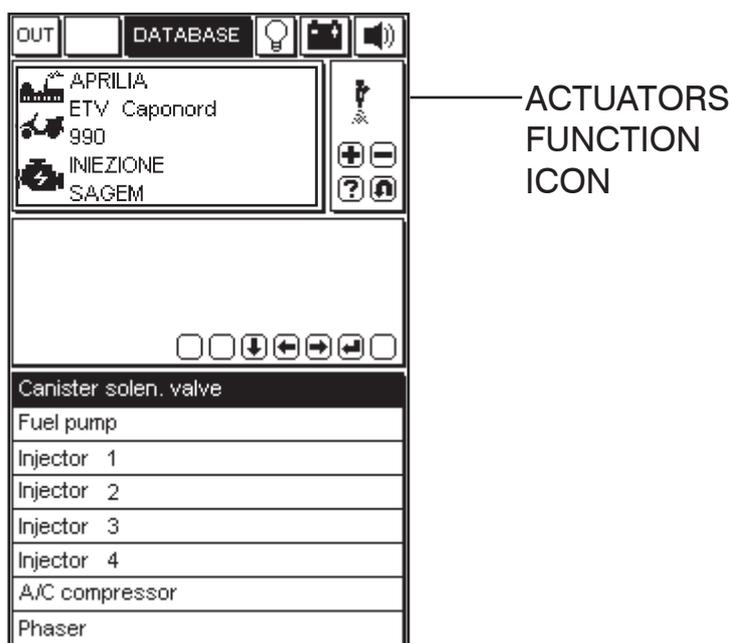
## Actuators/regulations

### Actuators test

**IMPORTANT:**

This function will operate some motorcycle components. This may be dangerous and cause damage in certain conditions. Adopt the necessary precautions.

- Repeatedly press the key to view the ACTUATORS function.



- Go to the required actuator with the scroll arrows.
- Press ENTER to activate the selected component. The list may not be comprehensive. Use the left/right scroll arrows to select missing items and display them instead of those shown. Press ENTER to confirm.

**IMPORTANT NOTE:**

In most cases, the engine must be off before accessing the ACTUATORS functions. Follow the instructions provided by the program for systems requiring different procedures.



The following icon will appear for some models:



**DELETE CODE PAGE**

**ACTUATOR ERROR/ACTIVE DIAGNOSTICS**

Press "ENTER" to confirm deletion of all failures stored in the memory.

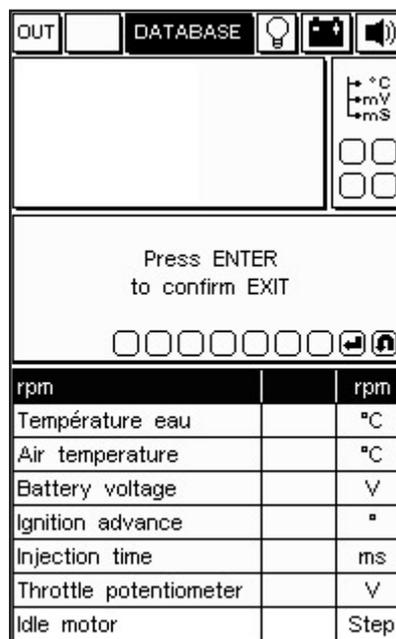


AVAILABLE press ENTER to activate the selected actuator.



## How to quit the program

- Press ESC until the message CONFIRM EXIT appears.



- Press ENTER to confirm.
- Press any key when the message showed the second figure appears
- Press ESC repeatedly until MAIN MENU appears.
- Select another model to resume auto-diagnostics.
- Press the ON/OFF button to switch the device off.

### IMPORTANT:

Always use the ESC key to quit procedures in a safe, correct way.

