



**INSTALLATION MANUAL**

**OF THE**

**LPG/CNG**

**SEQUENTIAL FUEL SYSTEM**

**Tartarini Auto S.p.a**

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## THE 10 RULES

- 1) "MATRIX" injectors unit: the gas injection time when the engine is running at minimum must not be less than 3 ms.  
"TARTARINI" injectors unit type 03: the gas injection time when the engine is running at minimum must not be less than 4 ms.
- 2) SEQUENTIAL: the gas injection time at full load (6000 rpm) must be less than 20 ms, better still if less than 18 ms.  
SEMI-SEQUENTIAL: the gas injection time at full load (6000 rpm) must be less than 10 ms.
- 3) LPG injection pressure = 1 bar
- 4) CNG injection pressure = 1,8 bar
- 5) The emulation cable is marked with letter A. When installing it, match it with letter A of the injectors unit.
- 6) The rubber hose that takes the gas from the rail into the suction manifold must be as short as possible.
- 7) The vacuum compensating hose to the reducer should be as short as possible
- 8) The rubber hose that takes the gas from the regulator to the rail must be as short as possible.
- 9) Install the "map" pressure sensor with the nozzles facing downwards.
- 10) The average reducer temperature in partial load driving condition should be around 60°C.

## SYSTEM DESCRIPTION

### “RAIL MATRIX”

As of the date of the present document, for vehicles with **aspirated engines**, equipped with “**Sequential LPG/CNG**” fuelling system, the homologation covers the displacement range of **900 to 3720 cm<sup>3</sup>**, for vehicles that comply with directives: 2003/76/EC, 2002/80/EC, 2001/100/EC, 2001/1/CE, 1999/102/EC, 98/69/EC (phase A-B), 96/69/EC, 96/44/EC, 94/12/EEC.

Without limits in displacement, it can be fitted on vehicles that comply with directives 93/59/EEC, 91/441/EEC and previous.

### “RAIL MATRIX”

As of the date of the present document, for vehicles with **turbo engines**, equipped with “**Sequential LPG/CNG**” fuelling system, the homologation covers the displacement range of **1500 to 2500 cm<sup>3</sup>** for vehicles that comply with the directives: 2003/76/CE, 2002/80/CE, 2001/100/CE, 2001/1/CE, 1999/102/CE, 98/69/CE (phase A-B), 96/69/CE, 96/44/CE, 94/12/CEE.

Without limits in displacement, it can be fitted on vehicles that comply with directives 93/59/EEC, 91/441/EEC and previous.

### “RAIL TARTARINI AUTO”

As of the date of the present document, for vehicles with **aspirated engines** equipped with “**Sequential LPG/CNG**” fuelling system, the homologation covers the displacement range of **1200 to 3060 cm<sup>3</sup>**, for vehicles that comply with directives 2003/76/EC, 2002/80/CE, 2001/100/CE, 2001/1/CE, 1999/102/CE, 98/69/CE (phase A-B), 96/69/CE, 96/44/EC, 94/12/EEC.

Without limits in displacement, it can be fitted on vehicles that comply with directives 93/59/EEC, 91/441/EEC and previous.

The system is the Multipoint Sequential type. It is controlled by an electronic control unit (also referred to as ECU) that controls the sequence and the injection timing of the Gas. It injects the gas through the rail of injectors directly into the intake manifolds, thus dispensing the gas in a particularly precise manner in order to optimise the combustion process.

The Gas injection timing is obtained by exploiting the petrol injection timing of the original control unit.

The benefits of this system lie in the following:

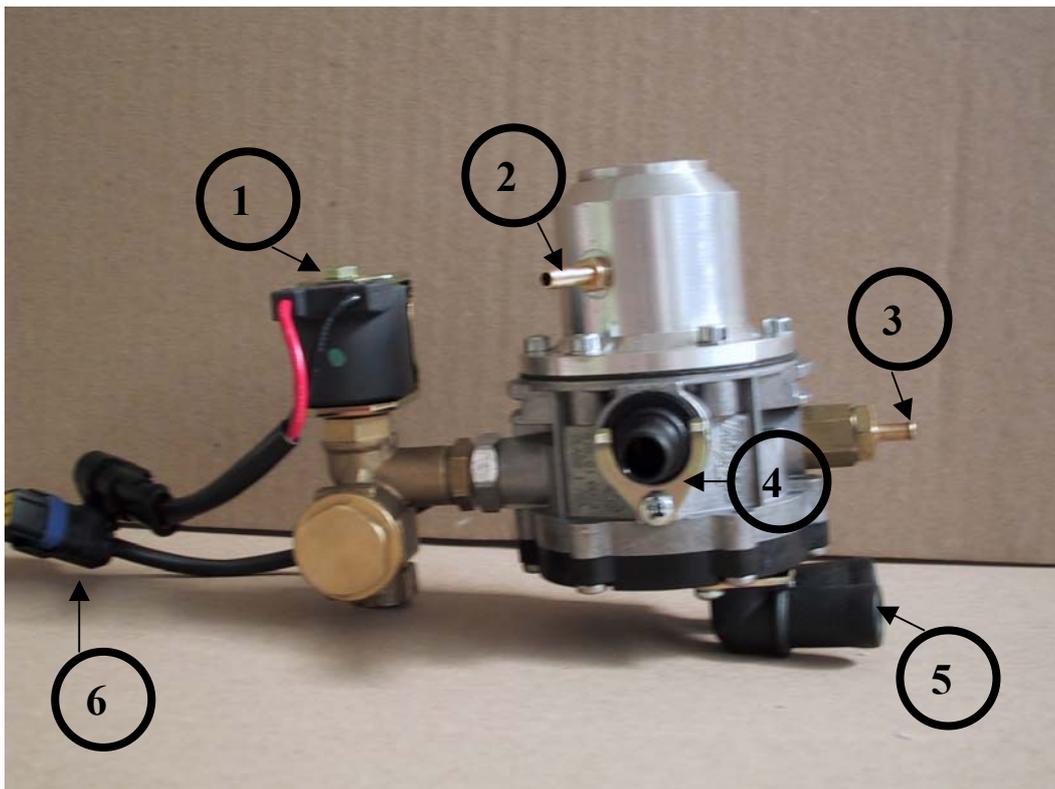
- 1) Compatibility with vehicles having OBD system
- 2) Optimisation of fuel consumption
- 3) Optimisation of vehicle driveability
- 4) Installation simplicity
- 5) Auto-calibration at minimum
- 6) Auto-diagnosis
- 7) Auto-adjustment

## THE LPG REGULATOR

It consists of:

- 1) Interception solenoid valve including filter
- 2) Vacuum fitting
- 3) Safety valve
- 4) Gas outlet fitting
- 5) Heating water inlet and outlet fittings
- 6) Regulator temperature sensor

The regulator sends the gas at a constant pressure of 1 bar to the rail of injectors and converts the LPG from liquid into gas.

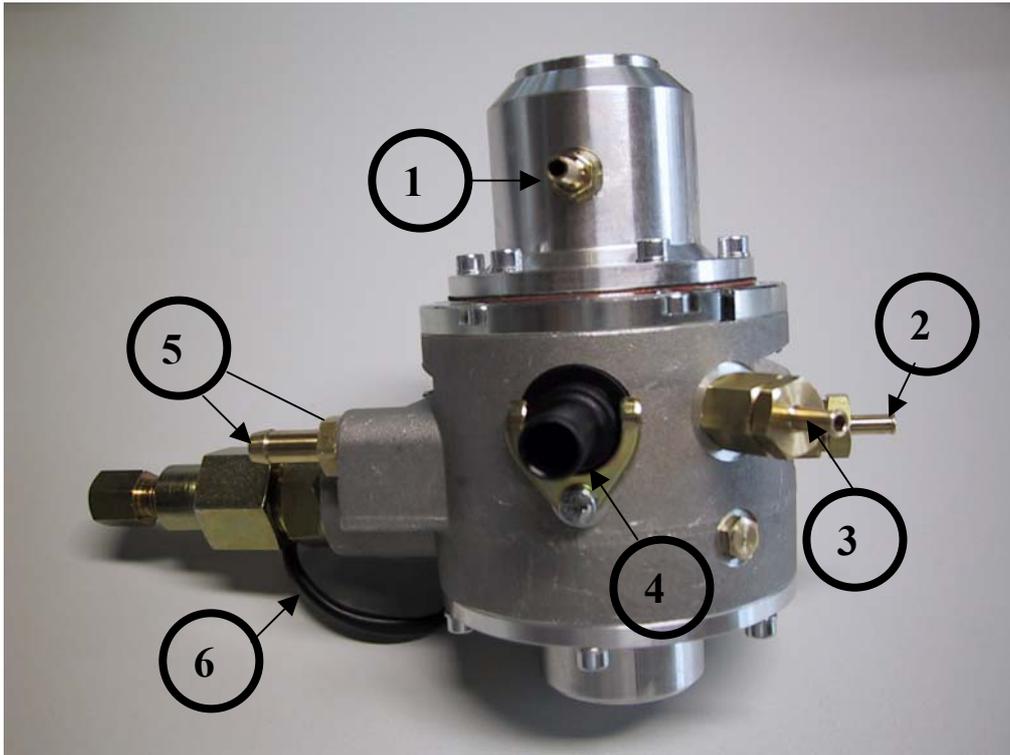


## THE CNG REGULATOR

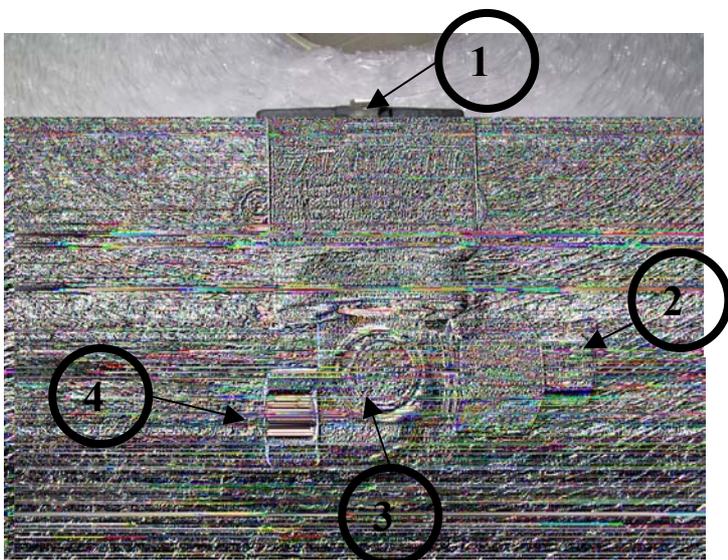
It consists of:

- 1) Vacuum fitting
- 2) 1st stage safety valve
- 3) 2nd stage safety valve
- 4) Gas outlet fitting
- 5) Heating water inlet and outlet fittings
- 6) Regulator temperature sensor connector

This solenoid valve reduces the high pressure from 220 to 1,8 bar and dispenses it constantly to the rail of injectors.



INTERCEPTION SOLENOID VALVE



- 1) Electric command pin
- 2) High pressure gas inlet
- 3) Connector for gauge that indicates the amount of gas in the cylinder.
- 4) High pressure gas outlet.

## THE INJECTORS RAIL

We suggest to install the injector rail as close as possible to the nozzles in order to keep the length of the gas tubes as short as possible, compatibly with the space available in the engine bay.

The nozzles must be screwed into the manifold at t distance between 3 and 15 cm from the petrol injectors.

For engines with 4 or more valves per cylinder we suggest to install the nozzles slightly before the petrol injectors in order to allow a proper flow into the manifold before entering the cylinder.

A filter has been fitted between the regulator and the rail to keep the cavities of the rail of injectors through which the gas flows clean (see fig. n° 1).

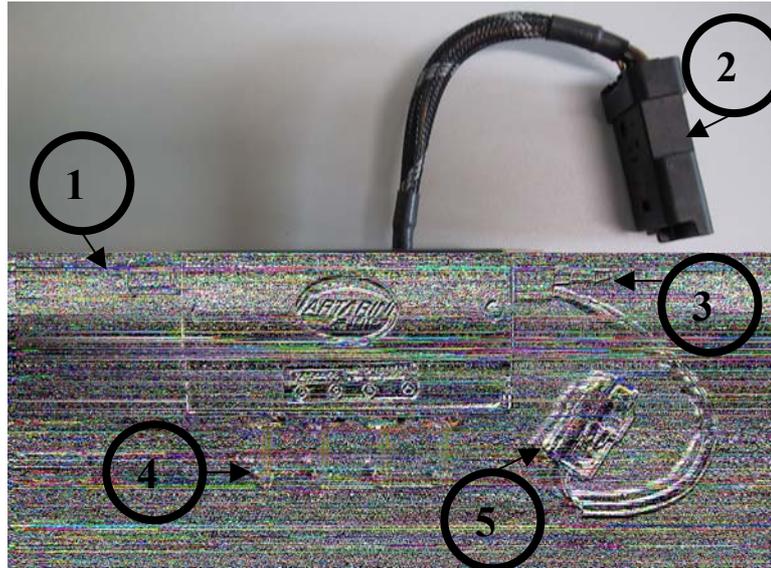


fig. 1

## Rail "matrix"

This device is controlled by the electronic Gas control unit. It distributes the correct amount of fuel to each individual cylinder.

- 1) Gas inlet
- 2) Electric connector
- 3) Connection for pressure meter
- 4) Gauged nozzles for the outlet of Gas towards the manifold
- 5) Gas temperature sensor connector



An adhesive plate has been fitted on each Rail of 4 cylinders, (see fig.3) that bears letters A B C and D. These letters are important as they point out the installation direction of the Rail.

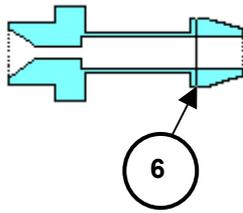
Each letter will be the reference point of each individual cylinder.

**IMPORTANT:** Letter A of the Rail must ALWAYS be by letter A of the injector simulator harness.



fig. 2

## CALIBRATED NOZZLES FOR MATRIX RAIL



The reference marks that identify the type of nozzle to be used can be seen on the outer edge of the nozzle, as illustrated in fig. 6.

## “TARTARINI AUTO” RAIL

This device is controlled by the electronic Gas control unit. It distributes the correct amount of fuel to each individual cylinder.

- 1) Gas inlet
- 2) Electric connector
- 3) Connection for pressure meter
- 4) Gauged nozzles for the outlet of Gas towards the manifold
- 5) Gas temperature sensor connector



On the Tartarini Rail you will not find any indication re. the A/B/C/D injectors, since this is shown on the harness itself and not on the rail.

**IMPORTANT:** Letter A of the harness must always correspond to letter A of the cut-off injectors wiring.

## CALIBRATED NOZZLES FOR TARTARINI RAIL

### Rail Tartarini first version



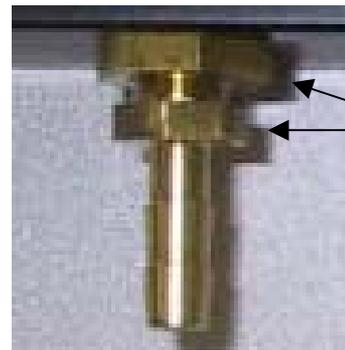
#### ATTENTION:

The nozzles of the Tartarini Rail “first version” cannot be changed or substituted with other nozzles of different measures, because the inner diameter is the same for all types. The calibration of each nozzle is factory set and the suitable requested diameter is shown on the label (see picture, nr 3 and 7). The diameter of this rail is 3,0 mm, the rail of the first version is identifiable by the nozzle with double hexagon, see picture n° 4 and 8.



7

fig. 3



8

fig. 4

### Rail Tartarini second version

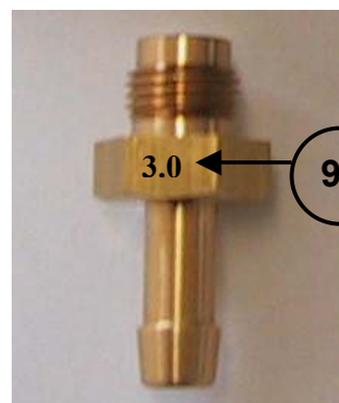
The nozzles of the Tartarini Auto rail “second version” are interchangeable without having to replace the whole rail.

The rail of the second version is identifiable by the nozzle with single hexagon, see picture 5.

You will see the diameter of the nozzle on a face of the hexagon picture n° 6, n° 9, the diameter of this nozzle is 3 mm.



fig. 5



9

fig. 6

## LAMBDA PROBE

### Vehicles with the following Lambda Sensors:

0÷1V 0÷5V 5÷0V 0,8÷1,6V.

Connect the single purple cable to the Lambda probe to view the operating conditions of the system while driving on the road, especially in OpenLoop.

Use the purple/black cable too on vehicles with two Lambda probes upstream from the catalyst, connecting it to the Lambda probe of the 2° cylinder row.

### Vehicles with the following Lambda Sensors:

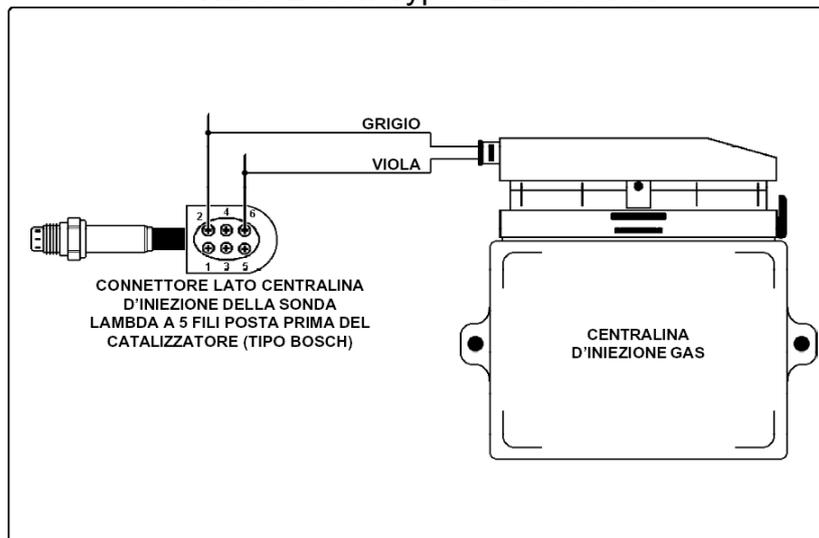
UEGO BOSCH type, or NTK type.

Connect the two purple and grey cables (see diagram) to the Lambda probe to view the operating conditions of the system while driving the vehicle on the road, especially in OpenLoop.

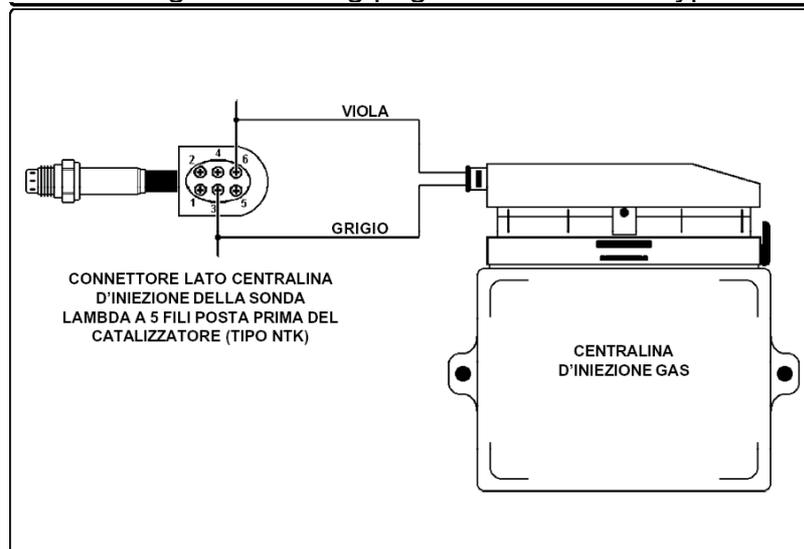
Use the purple/ black cable and the grey/ black cable on vehicles with two Lambda probes upstream from the catalyst, connecting them to the Lambda probe of the 2° cylinder row.

**! ATTENTION:** it is not advisable to connect the cables on this type of Lambda probe unless Tartarini Auto advises you to.

5 Wires Bosch Type UEGO Sensor



see second drawing on following page 5 Wires NTK Type UEGO Sensor



## PRESSURE METERS

The pressure meter (differential or absolute) informs the gas control unit of the difference in pressure between the gas injectors and the suction manifolds.

### Differential meter



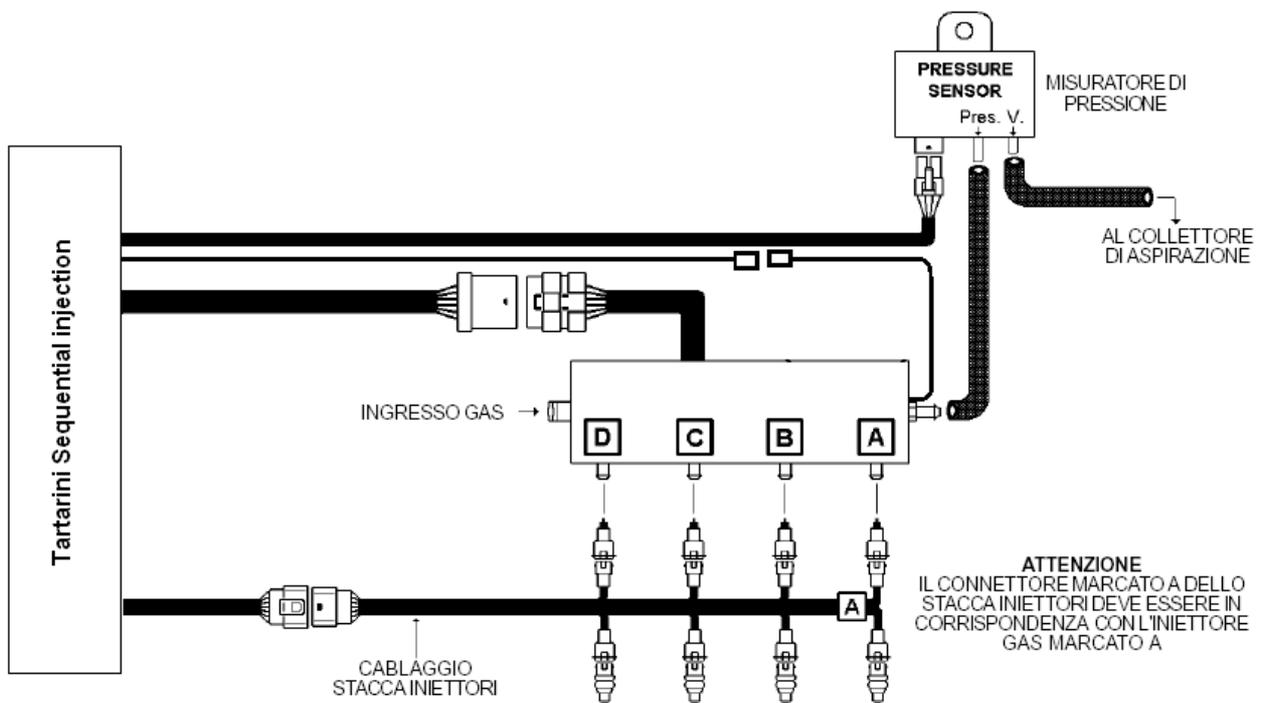
### Absolut meter



There are 2 connectors on the bottom of the pressure meter marked Pres. and V.

-Connect the gas pressure tube leading from the rail of gas injectors to the nozzle marked "Pres".

-Connect the vacuum tube leading from the suction manifolds to the nozzle marked "V".



## THE HARNESS



## THE CONTROL UNIT "Sequential Fuel Injection"



The harness includes:

- 1) DIAGNOSIS CONNECTOR – required to enter and read data in the Gas ECU.
- 2) FOUR-PIN CONNECTOR – this is to be connected to the Pressure Meter.
- 3) TEN-PIN CONNECTOR – this is to be connected to the "injectors simulator" harness.
- 4) The ORANGE and the BLACK cables are to be connected to the temperature sensor of the regulator
- 5) The ORANGE/BLACK cable and the BLACK cable are to be connected to the GAS temperature sensor.
- 6) The WHITE and the GREEN cables are to be connected to the fuel level sensor.
- 7) The RED/BLACK cables are to be connected to the battery POSITIVE pole.
- 8) The BLACK cable is to be connected to earth.
- 9) The BROWN cable is to be connected to the coil negative pole to read RPM
- 10) The PURPLE cable to the Lambda probe of the 1° cylinder row (upstream from the catalyst)
- 11) The GREY cable to the Lambda probe of the 1° cylinder row (upstream from the catalyst)
- 12) The PURPLE/ BLACK cable to the Lambda probe of the 2° cylinder row (upstream from the catalyst)
- 13) The GREY/ BLACK cable to the Lambda probe of the 2° cylinder row (upstream from the catalyst)
- 14) The BLUE cables to the gas position

The remaining cables of the harness are to be individually isolated so that there is no contact between them.

## INJECTORS SIMULATOR HARNESS

How do you know which injectors simulator harness to use?

There are three types of injectors simulator harnesses that can be used with the injection control unit, namely **4822154 (Straight)**, **4822182 (Inverted)** and **4822155 (Universal)**. The two harness types **4822154** and **4822182** have "Bosch" connectors that are to be connected directly to the original petrol injectors.

Harness type **4822155** has free wires so that it can be connected to any type of injector. In the case of injectors with Bosch connectors, check the polarity of the connectors of the petrol injectors to find out whether you should use model **4822154** or **4822182**.

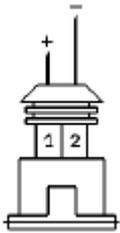
Follow the instructions below to find out which of the two wires is the positive one:

- Disconnect all the connectors of the injectors.
- Get hold of a multi-meter.
- Put the negative tip on earth.
- Put the positive tip in one of the two contacts of the injector connector.
- Turn the dashboard on and immediately check straight away if the reading is +12Volts. If the reading is +12 Volt, it means that this is the positive wire.

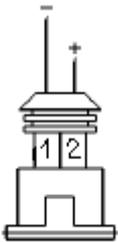


**WARNING**, the +12 volts of the injectors is timed, therefore when the dashboard is switched on it is cut-off again after a few seconds.

We recommend you check the polarity of all the injector connectors to check if any are inverted.



**4822154:** This is used if the positive pole of the injectors is on pin n°1 and the negative pole is on pin n°2. Refer to the drawing if the original connectors are not numbered.

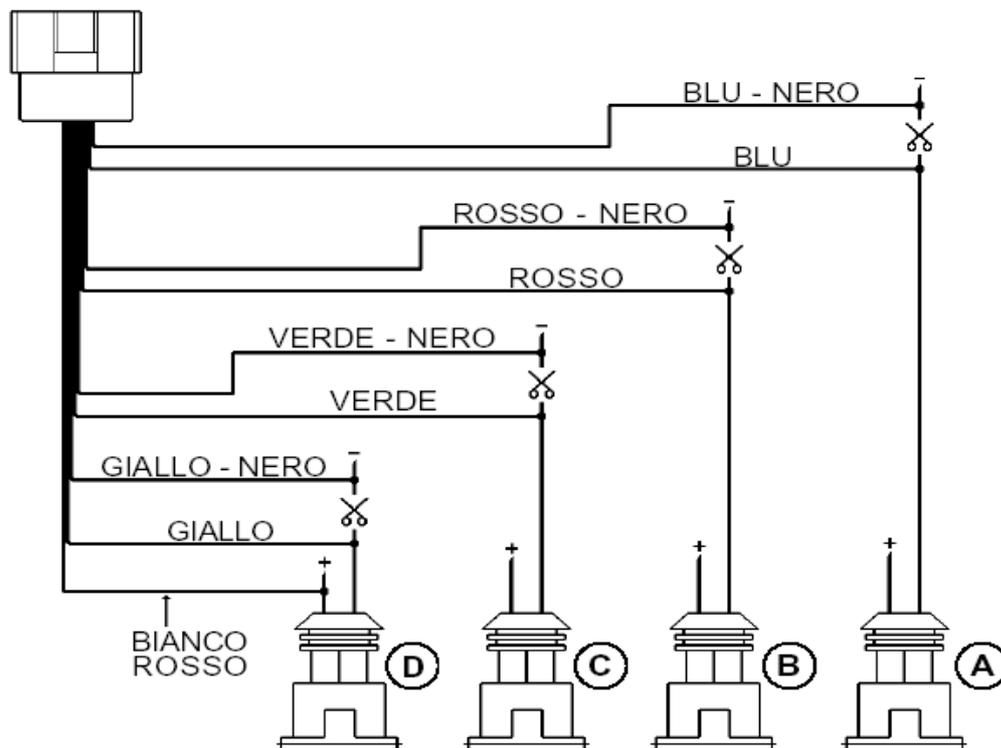


**4822182:** This is used if the positive pole of the injectors is on pin n°2 and the negative pole is on pin n°1. Refer to the drawing if the original connectors are not numbered.

**4822154:** If the connectors of the petrol injectors are not the Bosch type or cables type **4822154** and **4822182** are difficult to install, use harness type **4822155** and cut the original wires of the injectors.

Check which wire is the positive one and which is the negative one following the instructions given earlier.

**The negative wires are the ones to be disconnected.**



### CONNECTORS OF THE PETROL INJECTORS

Follow the diagram above to make the connection.

The connection direction is extremely important. The **BLACK** striped wires are to go towards the control unit and the full black ones towards the injectors.

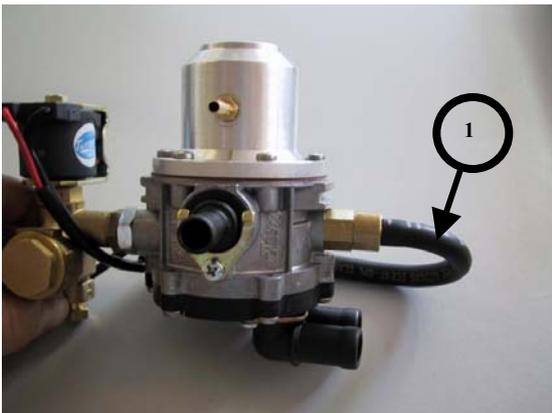
The **WHITE/RED** wire is to be connected to any of the injector positive poles.

It is important that the petrol injector defined as **A** is the one of the cylinder where the gas injector **A** has been fitted. It doesn't matter whether it is on the first or the fourth cylinder. Observe the sequence shown in the diagram for the other injectors.

## RULES FOR A CORRECT INSTALLATION

- Fit the regulator below the height of the expansion tank
- Never secure the Rail of injectors to the chassis
- Place the regulator as close as possible to the rail
- Do not fix the regulator to the dividing panel that separates the engine bay from the vehicle interior
- Connect the rubber hose (4x11), see pict. 3 and 4, to the end of the safety valves of the pressure regulators to convey possible gas leaks outside the engine bay, protecting them from sources of heat or electrical components
- It is not advisable to take the vacuum from pre-existent utilities (petrol pressure regulators, electric canister valve, servo-brake). A new pick-up point is to be created 5 cm away from the throttle body
- Do not install the pressure meter near exhausts, as the high temperatures could cause anomalies.
- Never secure the ECU to the engine, as the strong vibrations involved could compromise its correct operational efficiency.

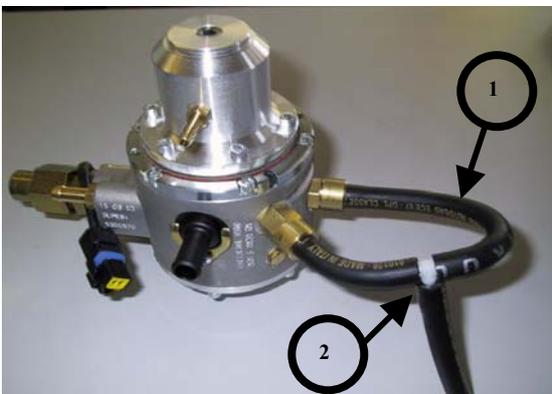
Do not place parts of the harness near alternators, high voltage cables, coils, belts, pulleys, sources of high temperature, such as exhausts for example, as any disturbance could compromise the correct operational efficiency of the system.



### LPG Regulator. Safety Valve Connection

1) Rubber Hose (4x11) Part. #0294620

Fig. 3



### CNG Regulator Safety Valves connection

1) Rubber Hose (4x11) Part#  
0294620

2) T joint Part# 4822211

Fig. 4

## INSTALLATION SAFETY INSTRUCTIONS

- Disconnect the poles of the battery before starting any electric jobs or before disconnecting any of the vehicle's original connectors.
- Once the system has been installed, leave the engine running idle without putting your foot on the accelerator until the solenoid valve energises once, then drive for a few kilometres on petrol before switching over to gas.
- The wires are to be connected by soldering them together.
- The soldered parts are to be isolated with heat-shrink sheathing.
- Put the fuse in an accessible place for the end user.

## THE PROGRAMME

### SOFTWARE INSTALLATION PROCEDURE

The "Sequential" programme has to be installed on a computer to be able to program the ECU.

The minimum configuration of the portable computer to be able to work with this programme is the following:

Operative system: Windows 98 or higher.

Processor: 133 MHz

RAM: 16 Mb

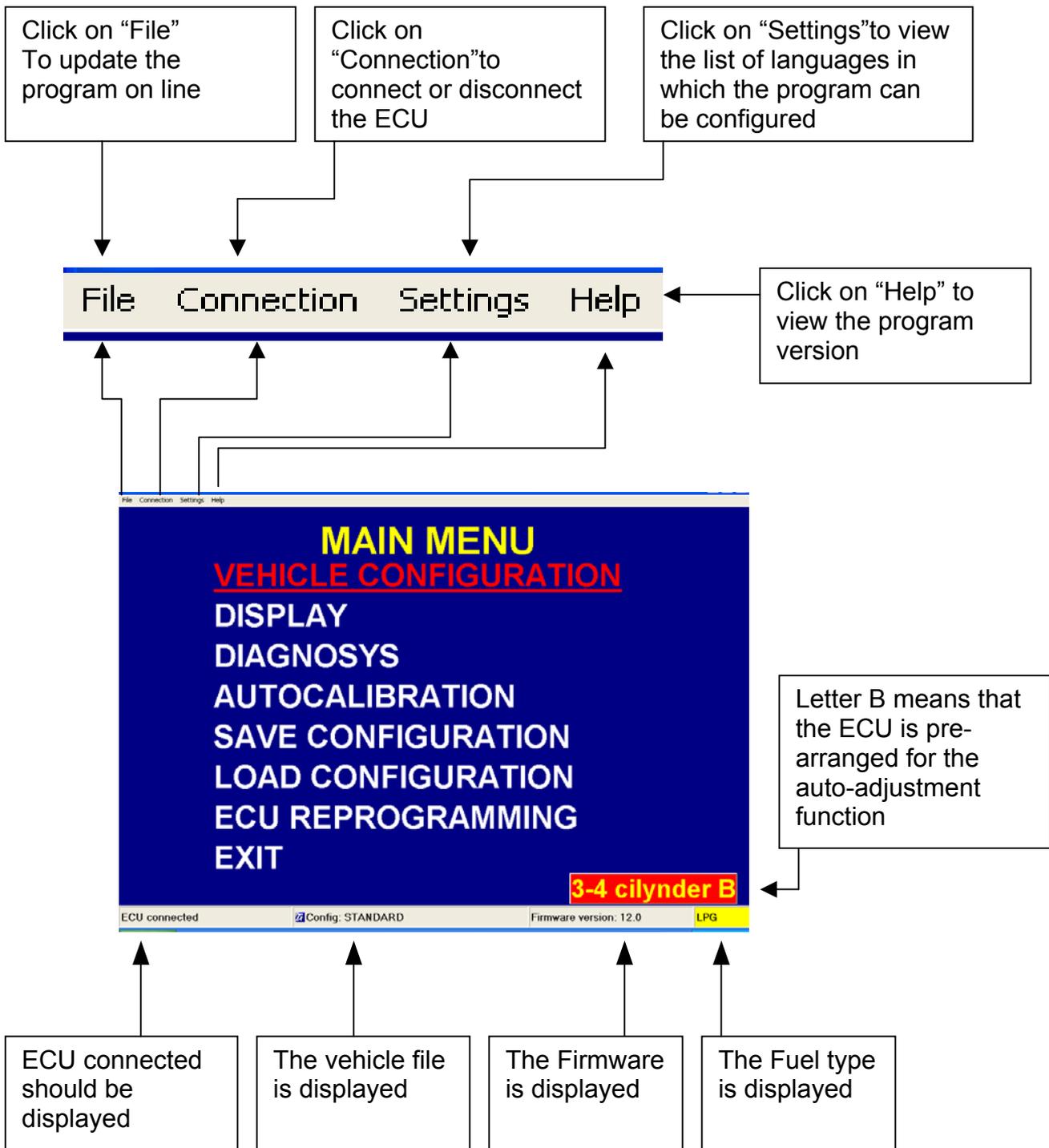
Hard disk: 25 Mb

CD ROM drive

The programme is self-installing, therefore simply put the disc in the CD ROM drive and click on "NEXT" three times with the left button of the mouse.

Once the software installation procedure is complete, the following page is displayed. This page is used to program the ECU of the Sequential system.

To display the page that follows, double click on the "Sequential" icon of the desktop.



The following functions can be accessed from the “MAIN MENU”:

#### VEHICLE CONFIGURATION

This menu is used to display the configuration data of the vehicle, saved in the Sequential control unit.

#### DISPLAY

By selecting this menu you can display the main signals of the vehicle in real time: Engine rpm signal / petrol injection timing / Gas injection timing / Lambda probe signal / regulator temperature / regulator pressure / battery voltage / type of fuel.

#### DIAGNOSIS

Each time an operational anomaly occurs in the Sequential system it can be displayed and reset in this menu.

Service every 350 hours. Each time the system is serviced the installer must reset the meter.

#### AUTO-CALIBRATION

This menu is used to calibrate the system with the vehicle stopped and the engine running in neutral between 2500 and 3100 rpm.

#### MENU Save configuration / Load configuration

This menu is used to manage all the programming maps of the Sequential ECU's.

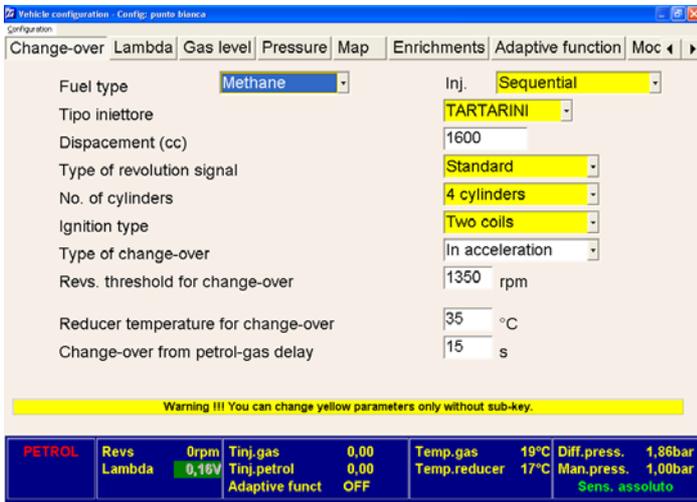
#### ECU RE-PROGRAMMING

This menu is used if the ECU needs to be re-programmed following an up-date of the “Firmware” on behalf of TartariniAuto.

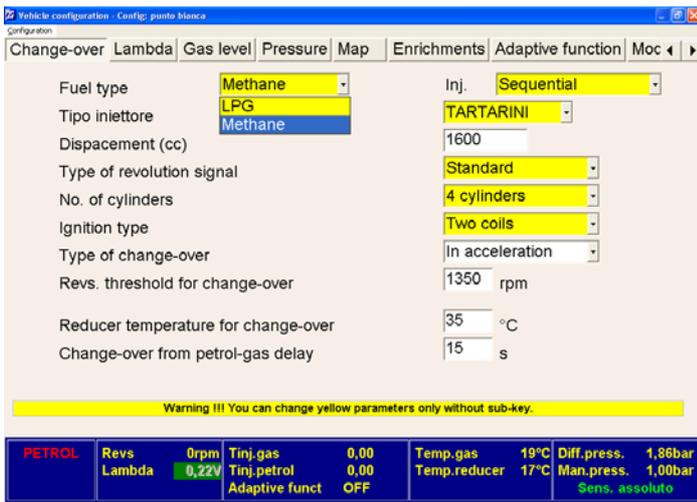
## VEHICLE CONFIGURATION

By selecting the “VEHICLE CONFIGURATION” menu you can display the main functions used to optimise the running conditions of the vehicle on gas.

### CHANGE-OVER

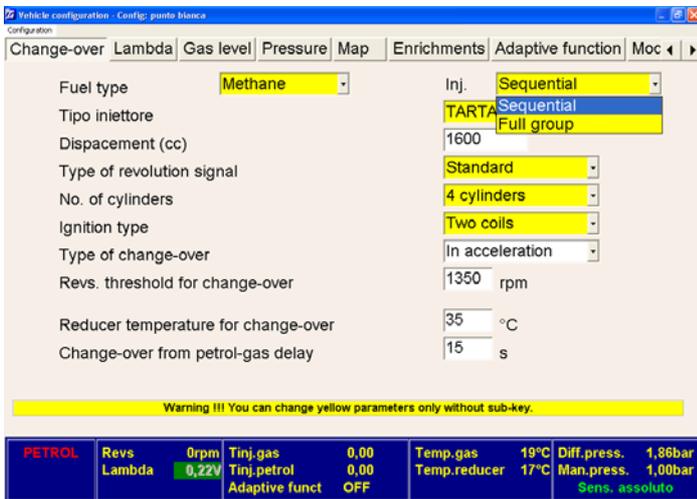


This page shows all the types of settings to be made. The items enhanced in YELLOW are to be modified with KEY OFF



#### Type of fuel.

This selection is to be made to initialise the control unit for the correct operation according to the type of fuel selected, LPG/CNG.

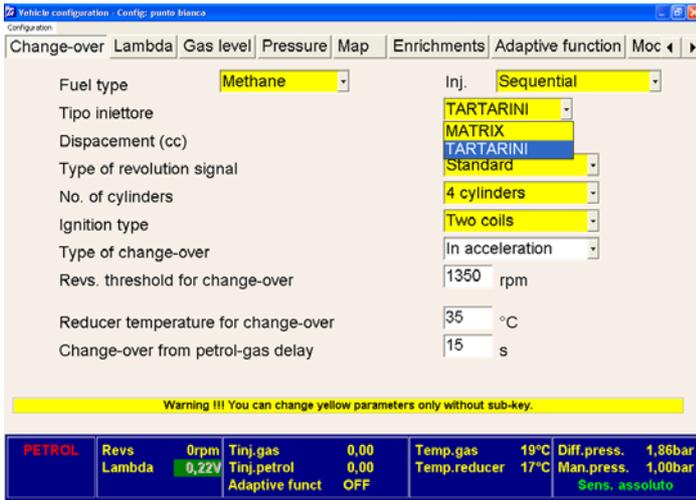


#### Type of injection.

Check the following to establish the correct type of injection system to be selected:

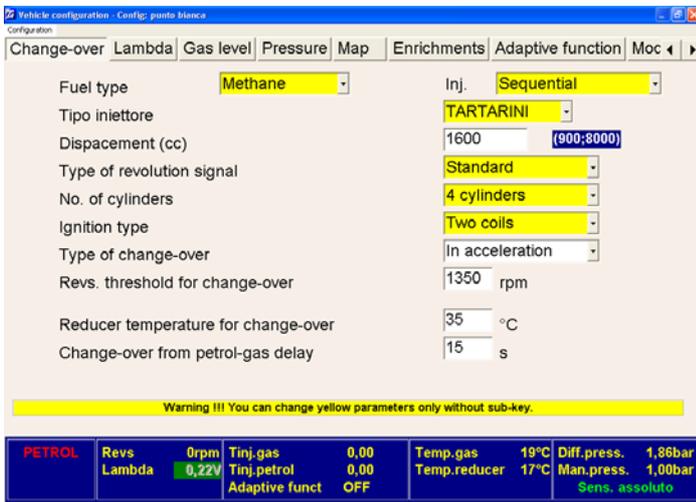
- 1) Petrol injection timing at 6000 rpm = 20 ms, select **Sequential**.

**Petrol injection timing at 6000 rpm = 10 ms, select Full-group**



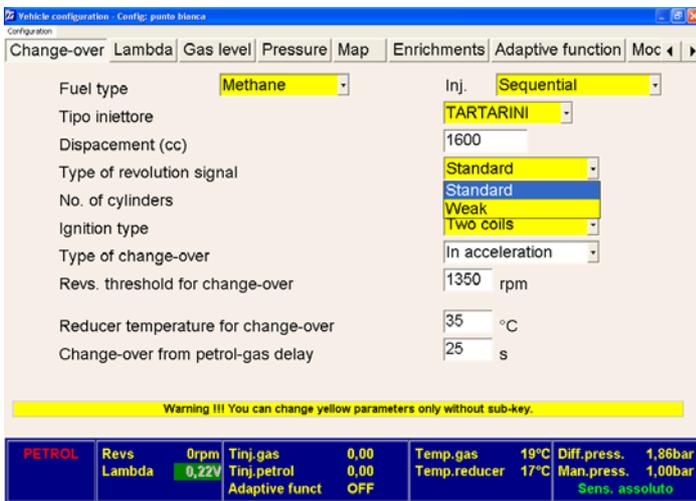
### Type of injector RAIL.

Here you can select the right type of injector RAIL to be used, by choosing between MATRIX or TARTARINI RAIL.



### Displacement (cc).

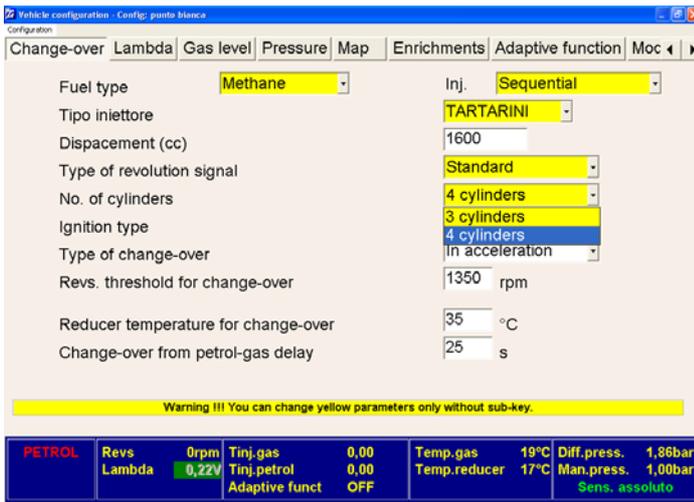
This selection is used to set the vehicle's displacement.



### Type of Revolution signal.

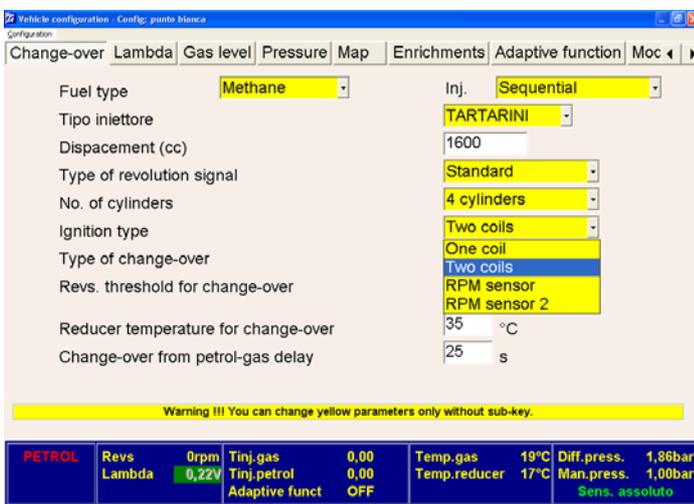
The WEAK signal is selected if the rpm input is given through the pilot signal of the transistor of the ignition coils. The STANDARD option is used in the case of connection to the coil negative pole.

If the connection is made to the rpm meter you can use either one of the items, even if it is preferable to set WEAK SIGNAL.



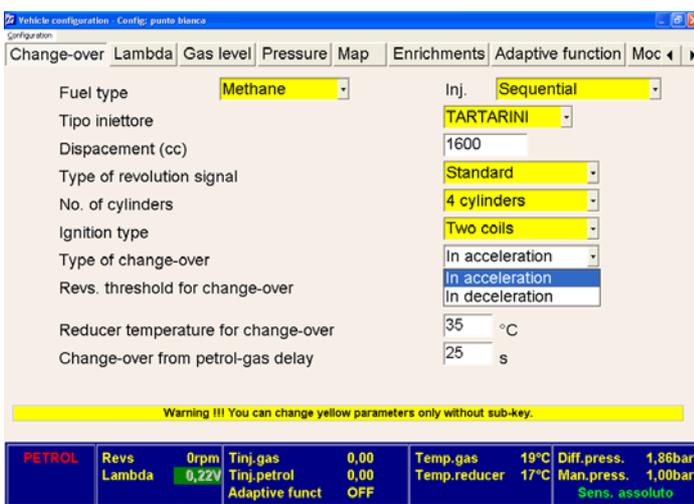
### Number of cylinders.

This option is used merely to inform the control unit of how many cylinders the vehicle has and therefore how many injectors it has to read and pilot.



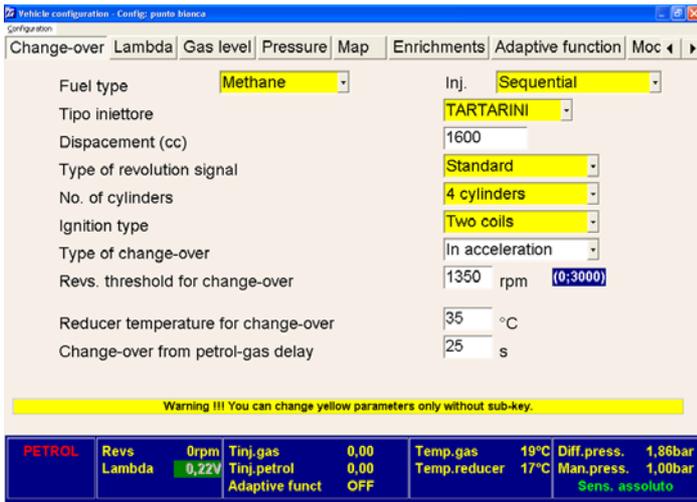
### Type of ignition.

This function is used by the control unit to calculate the engine rpm correctly. Select SINGLE COIL if the vehicle has one coil for each cylinder and the signal is taken from the negative pole of the coil. Select DOUBLE-COIL if the vehicle has one coil that pilots two cylinders and the signal is taken from the negative pole of the coil. Use RPM Sensor in the other cases. With some 5, 6 or 8 cylinder cars could be needed the RPM Sensor 2

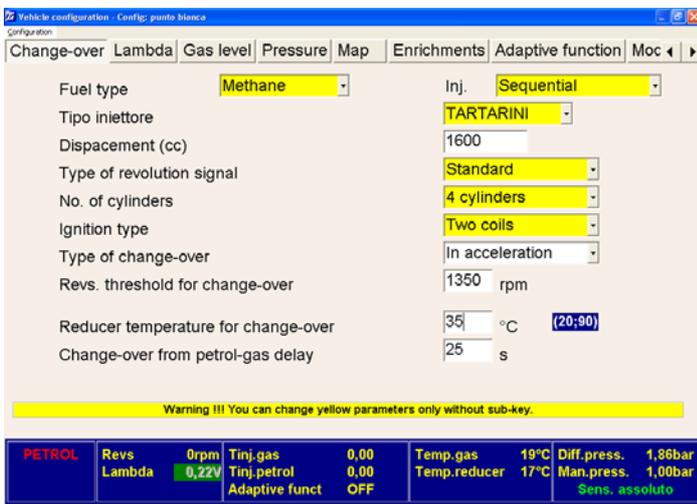


### Type of change-over.

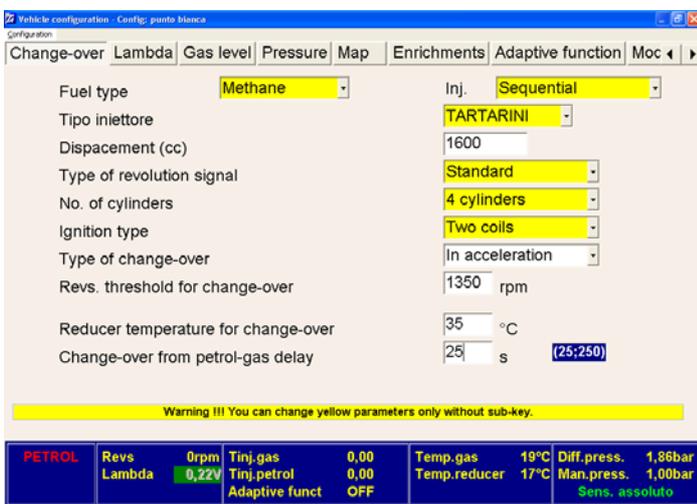
“In acceleration / In deceleration  
This option is used to choose the type of petrol – gas change-over:  
In **acceleration**: the system changes over when the engine exceeds the RPM THRESHOLD set for the change-over at + 100 rpm (hysteresis):  
If set in **deceleration** the system changes over when the RPM falls below this reference value.



**Rpm threshold for change-over.**  
 This points out the minimum rpm threshold at which the system can change over from petrol to Gas (0;3000).

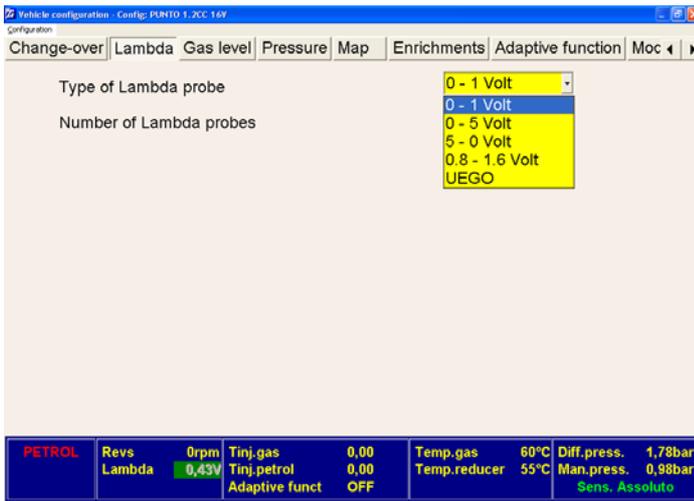


**Regulator temperature for change over.**  
 This points out the minimum temperature threshold at which the system can change over from petrol to Gas. The default and suggested value is 35°C



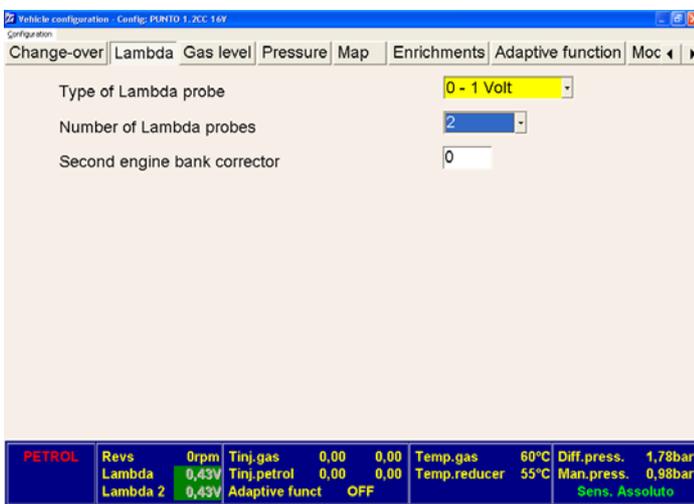
**Petrol gas switching delay**  
 It indicates the number of seconds that you can delay or anticipate the petrol gas switching function. The default and the suggested setting is 30s.

## LAMBDA



### Type of Lambda probe.

This selection enables the control unit to interpret the correct signal sent from the Lambda probe. It is advised to always connect the lambda probe.



### Number of lambda probe.

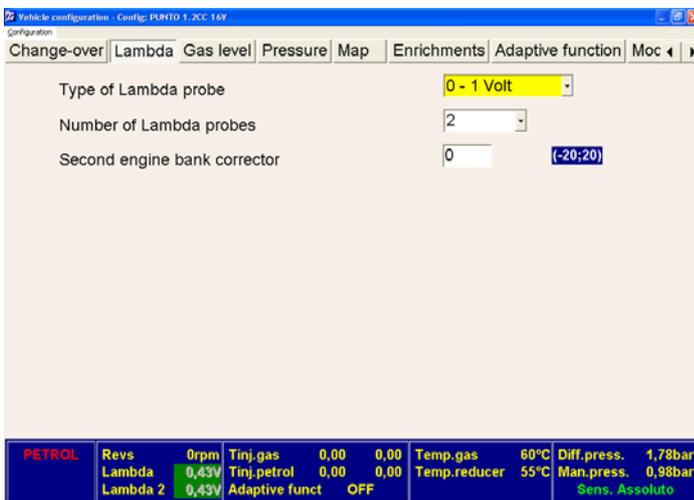
It is referred to probes before the catalyst.

#### Cars with one lambda probe only:

By selecting "1" you can read data about one single probe.

#### Cars with 2 lambda probes:

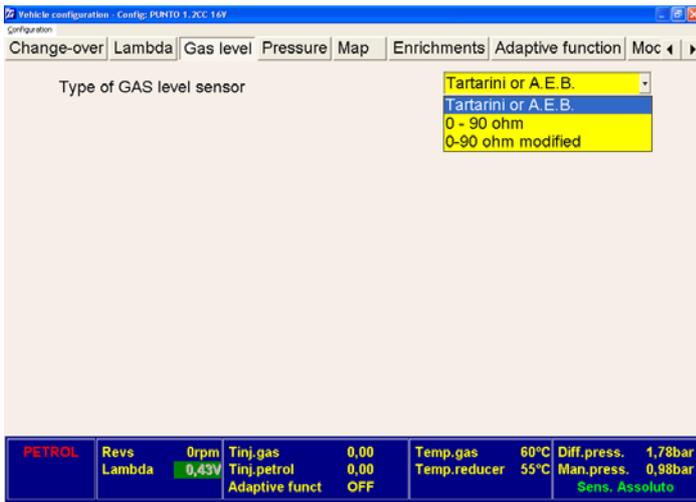
By selecting "2" the system supplies data about both probes (connected via PURPLE and PURPLE/BLACK cables).



### 2ns bank corrector

This function allows you to balance the calibration of two engine banks. Should the value of the 2nd lambda probe be too rich or too poor you can correct the 2nd engine bank by increasing or decreasing the set values.

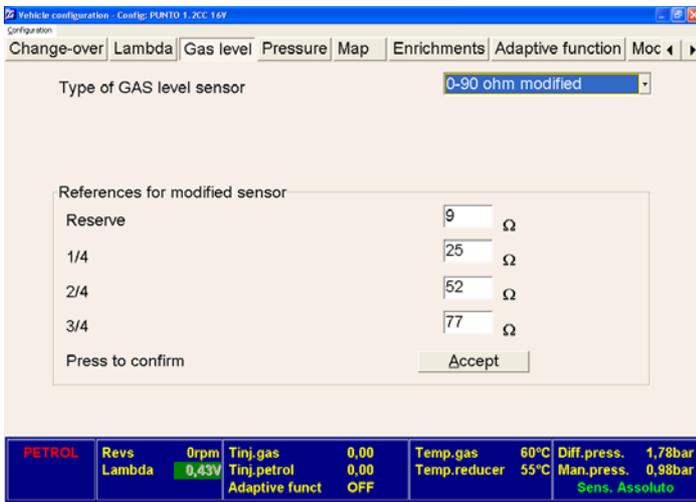
## GAS LEVEL



### Type of GAS level sensor.

This function is used to set the correct level sensor fitted in the vehicle. Setting “A E B” is to be selected for most sensors. Setting “0 – 90 ohm “ is to be set for sensors with 0 – 90 ohm specifications.

“0 – 90 ohm” sensors are adjustable.



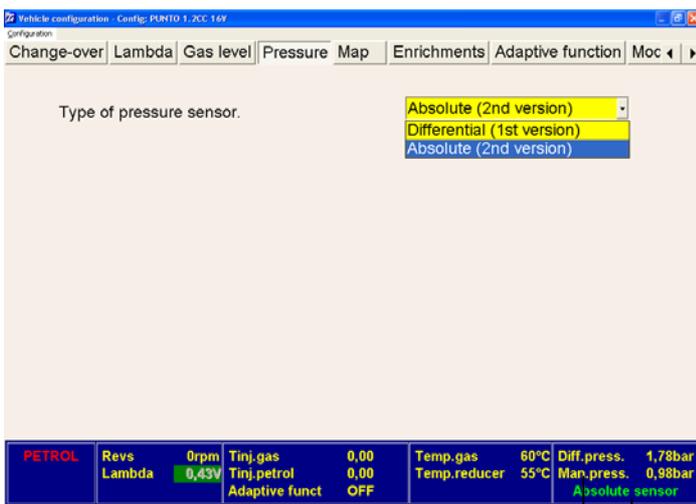
### 0 – 90 ohm modified:

We have the possibility to adjust the resistance relative to the LED of the switch.

We can therefore decide with how much GAS the red reserve LED and the other green LED’s are to light up.

When doing so, you need to adjust by 20 points per attempt.

## PRESSURE



### Type of pressure sensor

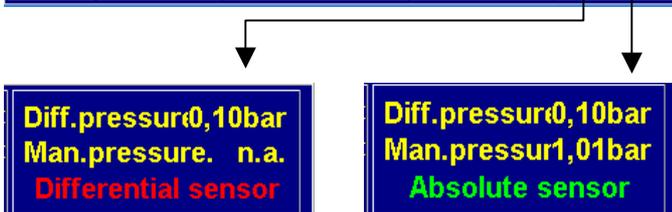
You can choose according to the pressure meter installed on the car:

#### Differential sensor (1<sup>st</sup> version)

You only see the Gas pressure inside regulator

#### Absolut sensor (2<sup>nd</sup> version)

Together with the gas pressure of the regulator you can also see the manifold pressure.



## MAP

Vehicle configuration - Config: PUNTO 1.2CC 16V

Configuration: Change-over | Lambda | Gas level | Pressure | Map | Enrichments | Adaptive function | Moc

t inj/rpm	1000	2000	3000	4000	5000	6000
2,00	114	117	119	126	127	128
2,50	116	119	122	127	128	130
3,00	130	134	135	140	143	145
3,50	143	149	151	158	160	160
4,50	149	156	158	161	162	164
6,00	146	152	155	159	159	162
8,00	139	144	147	153	155	158
10,00	136	140	142	147	148	151
12,00	130	133	136	140	143	145
14,00	126	128	132	136	138	141
16,00	116	118	120	125	127	128
18,00	111	114	118	121	123	126

Modify map refs.      Switch from PC

PETROL    Revs    0rpm    Tinj.gas    0,00    Temp.gas    60°C    Diff.press.    1,78bar  
 Lambda    0,43V    Tinj.petrol    0,00    Temp.reducer    55°C    Man.press.    0,98bar  
 Adaptive funct    OFF    Absolute sensor

### Map.

The map is constructed based on the engine rpm and the petrol injection timing.

This page enables you to optimise the gas-values of the map coefficients acquired during auto-calibration both at minimum and out-of-minimum.

To modify the values, simply enhance one or more cells, press the ENTER key and the following page will appear with the three different ways of making the corrections:

- 1) Absolute
  - 2) Linear
  - 3) Percentage
- DEFAULT: Linear

10	114	114
112	116	116
121	125	125
140	144	144
141	145	145
138	142	
137	141	
126	130	
121	124	
115	118	

Modify value

Mode

Absolute

Linear

Percentage

OK    Cancel

### Absolute mode

The value written will be OVERWRITTEN  
 Example  $110 + 10 \rightarrow 10$

120	114	114
112	116	116
121	125	125
140	144	144
141	145	145
138	142	
137	141	
126	130	
121	124	
115	118	

Modify value

Mode

Absolute

Linear

Percentage

OK    Cancel

### Linear Mode

The value will be ADDED in the cell:  
 Example  $110 + 10 \rightarrow 120$

121	114	114
112	116	116
121	125	125
140	144	144
141	145	145
138	142	
137	141	
126	130	
121	124	
115	118	

### Percentage Mode

The value is applied in PERCENT:  
Example 110 + 10 → 121

Modify value dialog box with input field containing '10', 'OK' and 'Cancel' buttons. The 'Mode' section has radio buttons for 'Absolute', 'Linear', and 'Percentage' (which is selected).

Vehicle configuration software interface showing a table with columns for 't inj/rpm' (1000, 2000, 3000, 4000, 5000, 6000) and rows for various engine speeds (2.00 to 18.00). Below the table are buttons: 'Modify map refs.', 'Stop switch from PC', and 'Switch'. A status bar at the bottom shows 'PETROL' and various engine parameters.

### Click on “Switching from PC”:

You will see another button denominated “Switch” to the right; this will allow you to control the switch directly from the computer.

When testing the calibration settings on the road, simply click on the switch button for the vehicle to switch from petrol to gas or from gas to petrol.

When you have completed the test, click on “End switching from PC”.

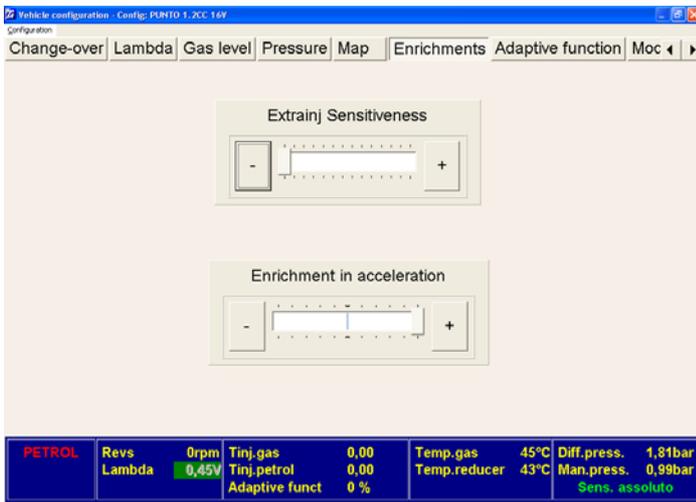
Map cell centres of the k coefficient dialog box. It has two columns: 'REVS. columns (rpm)' with values 1000, 2000, 3000, 4000, 5000, 6000; and 'Time lines (ms)' with values 2, 2,5, 3, 3,5, 4,5, 6, 8, 10, 12, 14, 16, 18. 'OK' and 'Cancel' buttons are at the bottom.

### Click on: “Modify map references”:

You will see the page where you can modify the engine rpm references in the column on the left and modify the injection timing reference in the column on the right.

**Tartarini Auto does not advise you to modify the basic settings.**

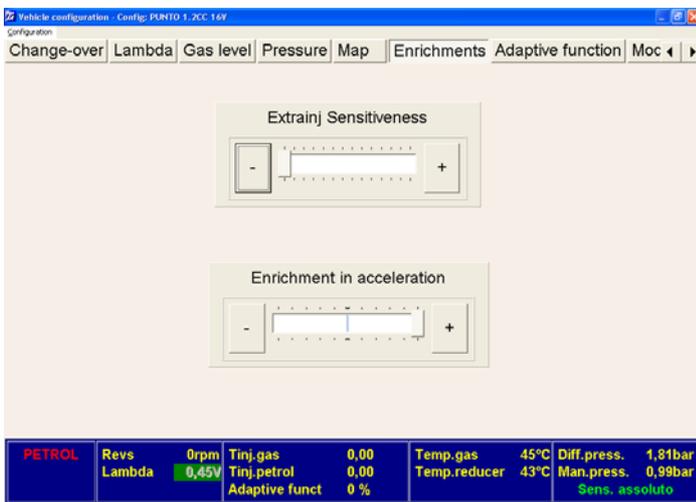
## RICHER MIX



### Extra-injection sensitivity

When driving the vehicle at a constant speed you may feel some jerking every now and again. Check the movement of the “little ball” in the map when the jerking occurs. If it jumps vertically, use the slider, clicking on positive/negative until the defect is eliminated.

**CNG:** very rarely used

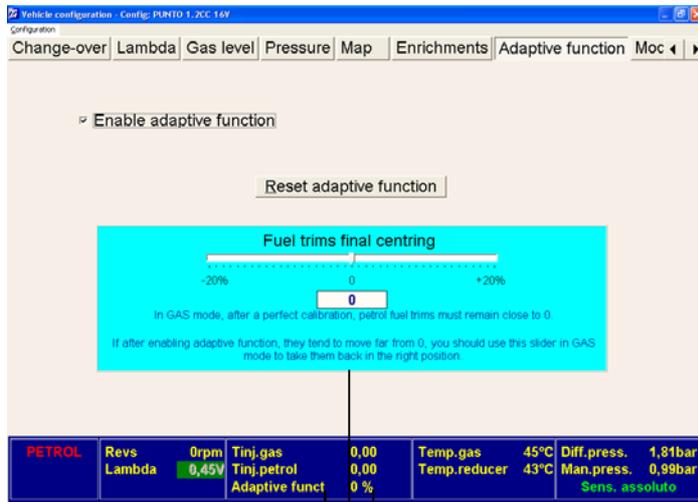


### Mixer rich in acceleration.

When accelerating strongly, if the injection timing should vary with very high injection time, the engine would flood, causing an incorrect input of power. In this case, use the slider, clicking on the negative sign until the defect is eliminated.

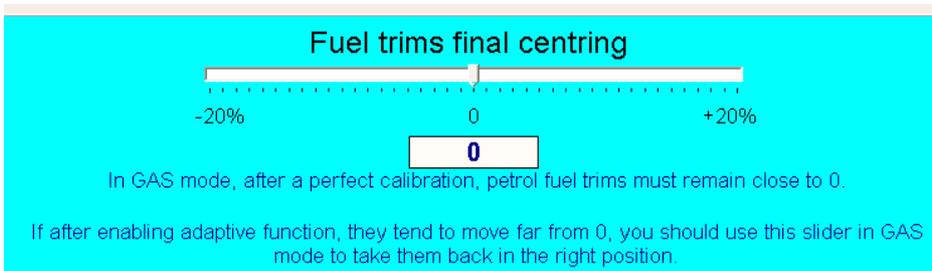
**LPG:** very rarely used

# ADAPTATION



Tinj.gas	3,91	3,80
Tinj.petrol	2,50	2,38
Adaptive funct	0 %	

Tinj.gas	4,30	4,30
Tinj.petrol	2,78	2,78
Adaptive funct	OFF	



## Adaptation:

The purpose of adaptation is:

- 1) to compensate differences in LPG/ CNG mixture according to the various Countries.
- 2) To compensate progressive degradation of components.
- 3) To avoid that “check engine” lamp lights on.

Adaptation can be activated after auto-calibration at minimum.

Adaptation turned on= 0%

Adattatività turned off = OFF

**In order to keep the adaptation performances at the best level and always under control, you can take following actions:**

### Final adjustment of petrol controls

- 1) In case, during the periodical checks gas controls might exceed 10% either positive or negative, move the cursor of the value shown near the adaptive function.
- 2) Reset adaptation.

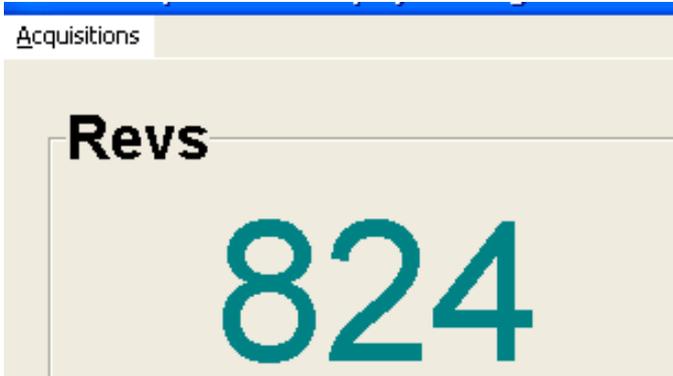
### ATTENTION:

if the adaptation function is active, no autocalibration and no changes in the map carburation values are possible. In order to make any changes, the adaptation function has to be disconnected.

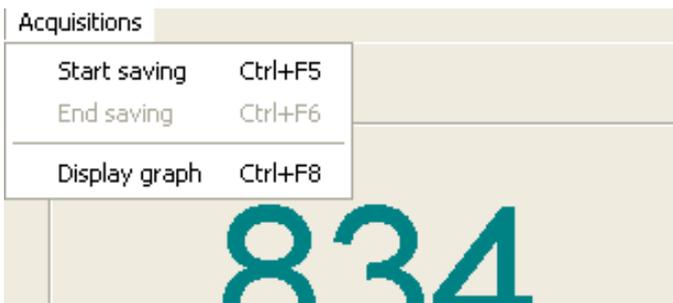




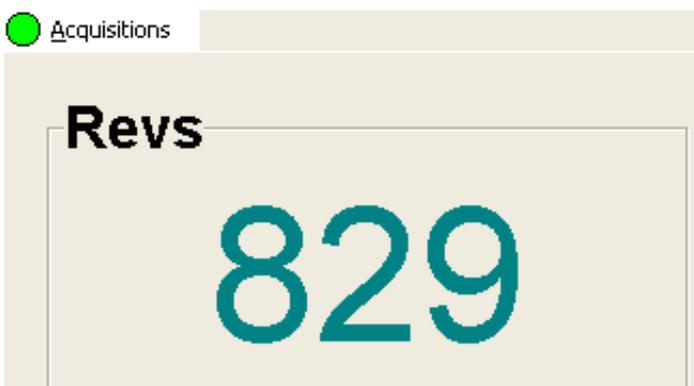
The operating parameters can be adjusted when testing on the road by means of the acquisition function.



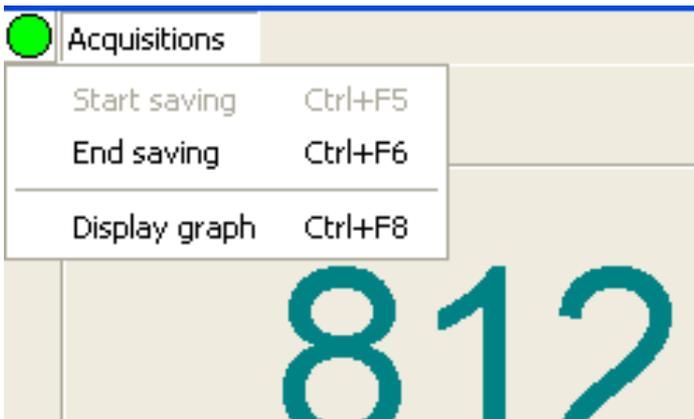
Configuration menu, VIEW.  
Click on ACQUISITIONS.



At this stage you are ready to start acquiring.  
If the driving conditions are not satisfactory, click on **Start saving**.  
You can also press Ctrl+F5 simultaneously, directly from the View menu.



Acquisitions will appear with a green ring to point out that the system is acquiring all the parameters.  
Click on "Acquisitions" when you wish to suspend the procedure.



End "Saving", or press Ctrl+F6 simultaneously, directly from the View menu.



Name the file suitably and click on "Save".

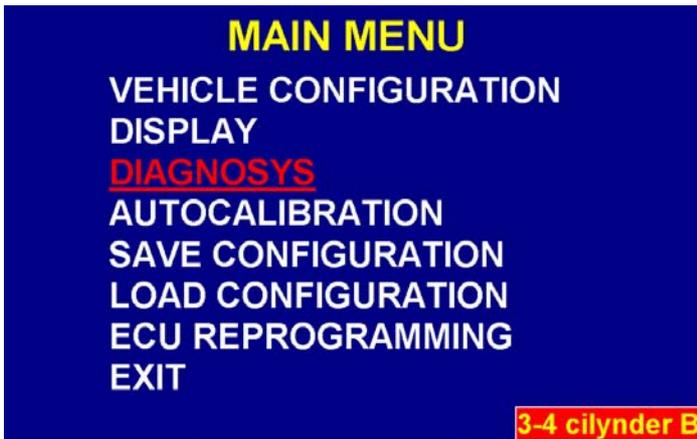
To view the graph, click on "Acquisitions, View Graph, enhance the vehicle, then Open" You can also view the graphs by pressing Ctrl+F8 simultaneously, directly from the View menu.



The graph of the test just carried out will appear.

You can analyse many parameters simultaneously by looking carefully at the graph.

## DIAGNOSIS



Select DIAGNOSIS from the main menu and press ENTER.



If there are no errors in the controller, the page appears as illustrated. If on the other hand an error is detected, the type of error will be indicated with the possibility to cancel it using the **reset errors** button.

### **Service:**

Each time the system is serviced, the installer must reset it using the “**reset service km**” button.

### **Number of starting attempts directly on gas:**

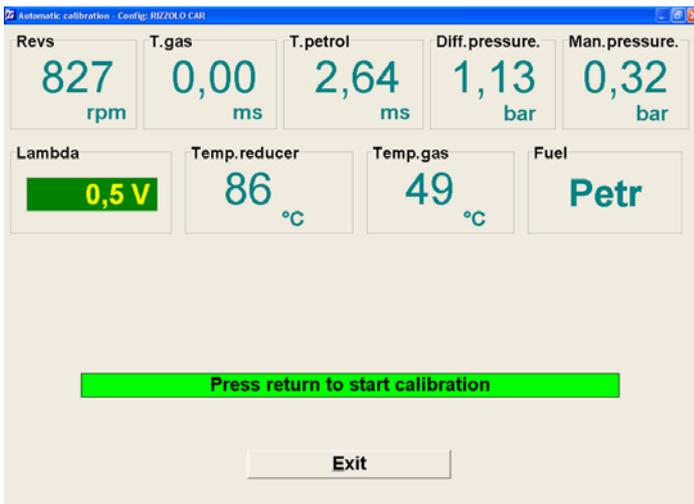
The system allows you to start five times directly on gas, exclusively in the case of emergency.

All the service parameters will be saved in the ecu.

## AUTO-CALIBRATION



Select AUTO-CALIBRATION from the main menu and press enter.



Check all the signals before you press the ENTER key on the PC:

**Rpm/ Gas inj. T/ Diff.Press./ Man.press./ Lambda/ Reg.T/ Gas T,** which must be all legible.

**Important:** the system cannot calibrate until the regulator reaches a temperature of 50°.

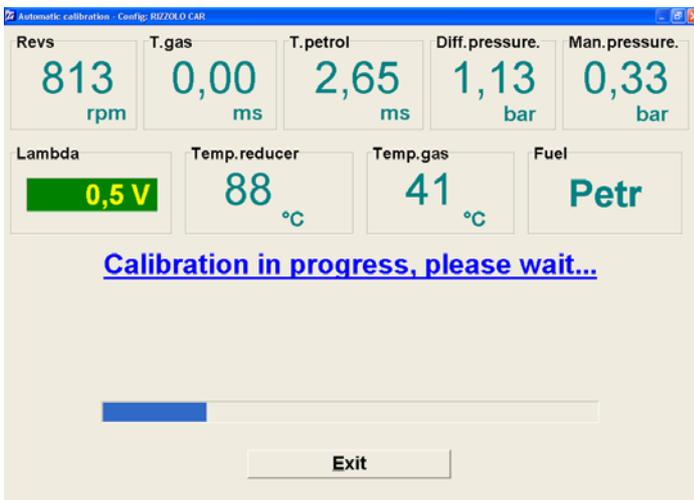
Press the ENTER button with the switch unit turned to petrol and with the engine running at minimum in neutral gear.

It is very important not to accelerate during the auto-calibration procedure or not to do anything that is not requested by the system.

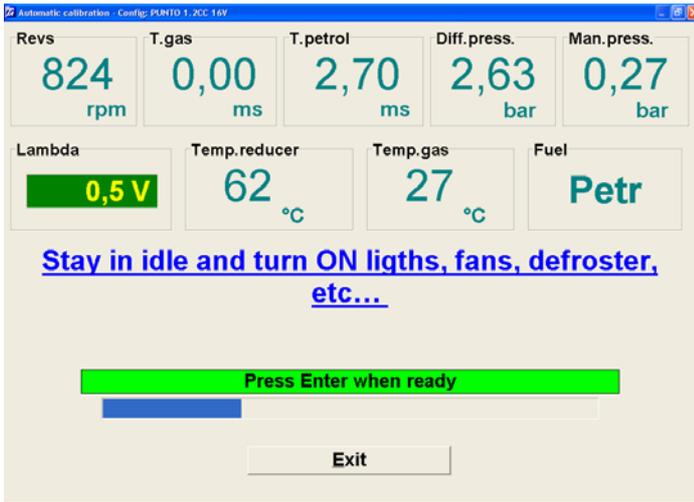


The system will request you to leave the engine running at minimum with all the vehicle's accessories switched off.

As soon as you are ready, press ENTER.



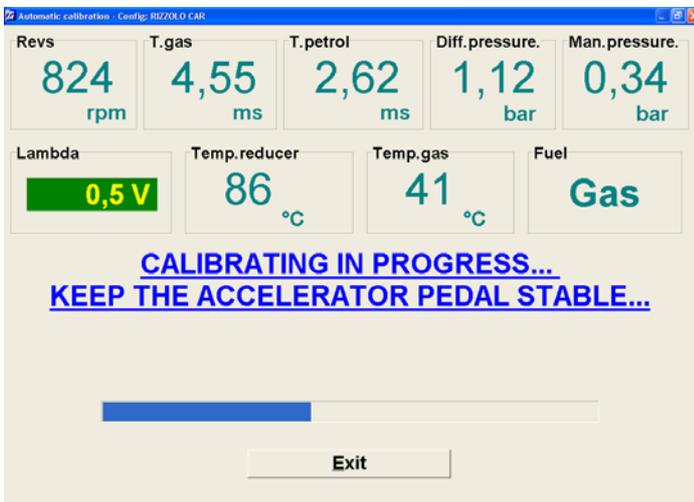
Wait for the system to complete the self-learning phase.



Leave the engine running at minimum without accelerating, turn the lights and the demister on and wait a few seconds before pressing ENTER.

**ATTENTION:**

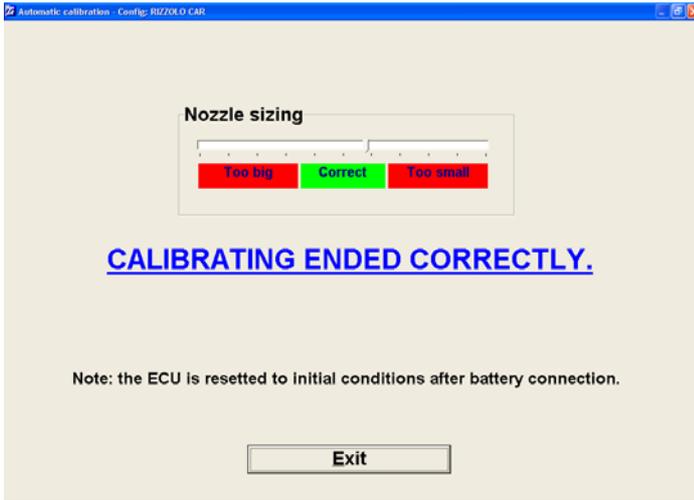
Do not turn the heating/ air conditioning on.



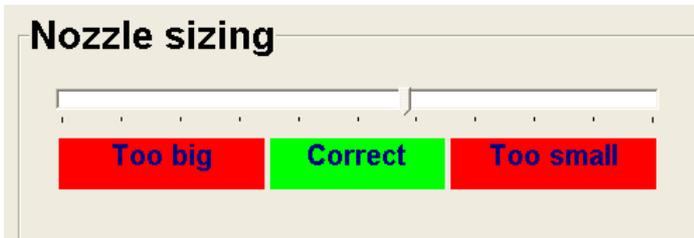
Wait for the system to complete the self-learning phase again.



Leave the engine running at minimum without acceleratine, turn the lights and the demister off and wait a few seconds before pressing ENTER.

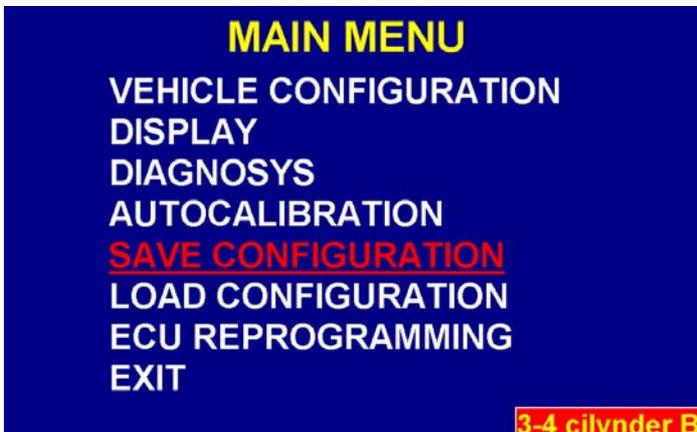


Calibration completed successfully. Check the sizing indicator of the nozzles.

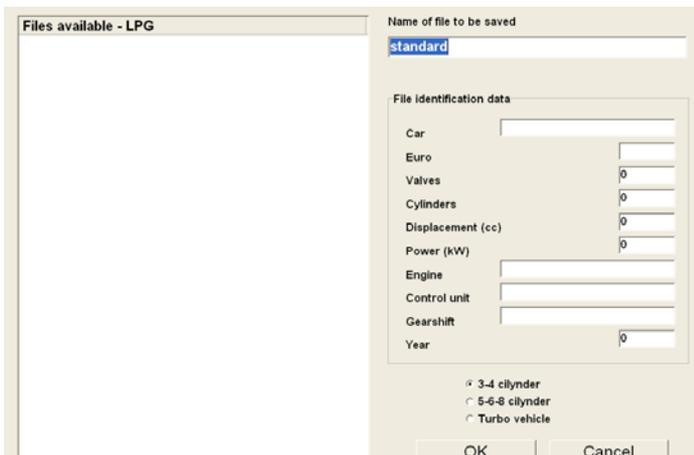


The nozzle sizing is correct when the indicator is within the green bar.

### SAVE CONFIGURATION

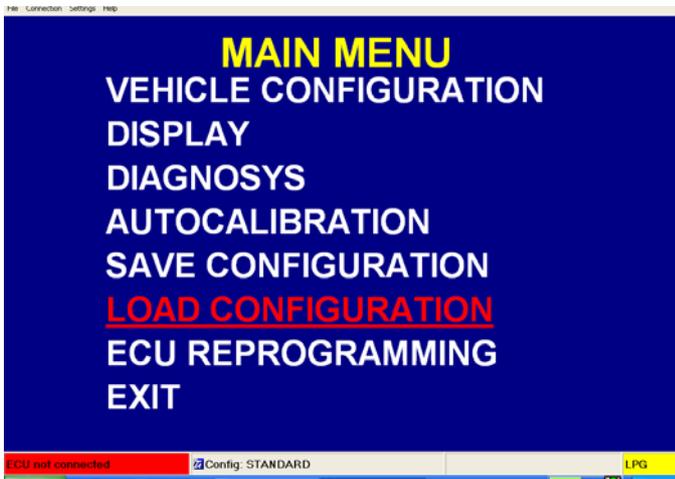


This sub-menu is used to save the configuration parameters of the control unit in a file that can later be used to initialise other control units fitted in vehicles of the same or similar models.

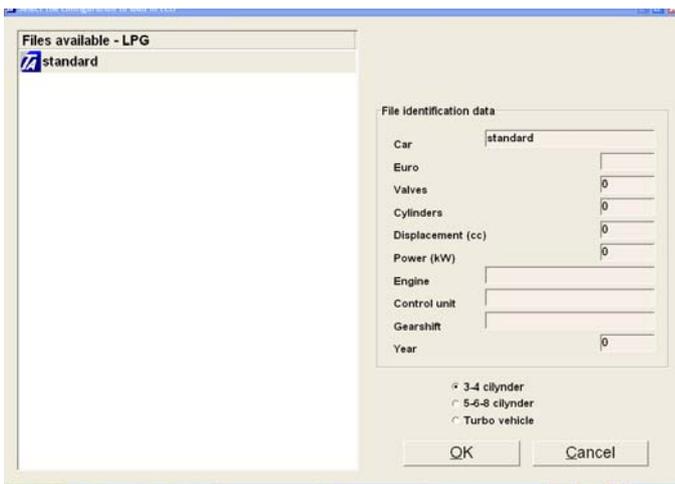


The information entered in the "File identification data" box is used to add useful information for characterising the vehicle on which the system is installed. Before you click on OK, choose the configuration of the vehicle 3-4 cyl./ 5-6-8 cyl. or Turbo. Each option has its own folder with relative files saved.

## LOAD CONFIGURATION



If you wish to load a file saved previously, select “LOAD CONFIGURATION” from the main menu and press Enter.

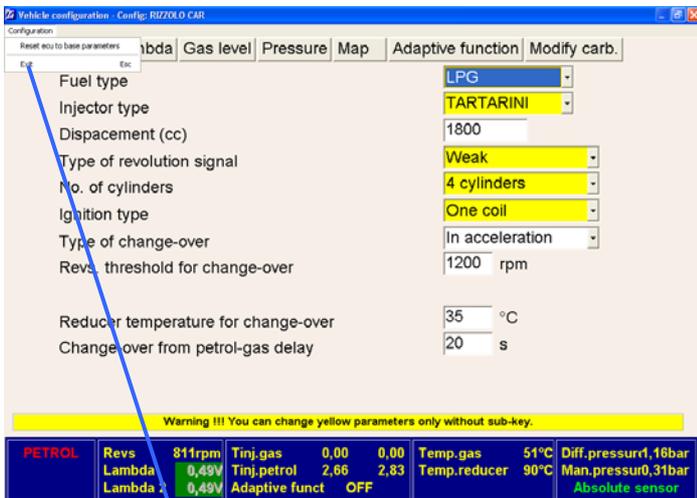


This sub-page is used to load configurations saved previously for vehicles of the same model on which the system is being installed. Choose configuration 3-4 cyl./ 5-6-8 cyl./ or turbo Enhance the name of the vehicle involved and press ENTER. The file selected will be automatically loaded in the GAS ECU.

## RE-PROGRAM THE ECU

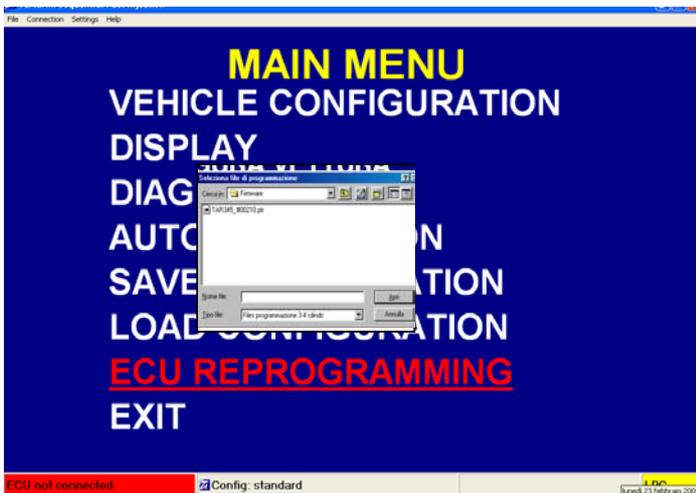
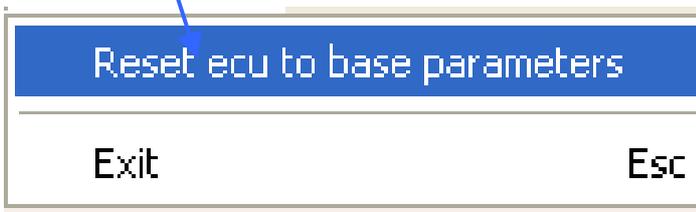


Select RE-PROGRAM ECU from the main menu and press Enter. This menu is used if you should need to re-program the control unit following an up-date of the “Firmware” on behalf of Tartarini Auto, for improvement purposes or to add new program functions.



Please perform the following procedure in order to benefit of all advantages of new Firmwares: Click on “start from ground parameters”: this takes the ECU back to original settings. At the end of this procedures:  
 -reset type of fuel  
 -reset type of ignition  
 -reset type of RPM signal

Now you can re-program the ECU with the new firmware. All this operation always with engine off.



To be able to program, select the file containing the new “Firmware” for the control unit, through a communication window. Once you have selected the file, simply click on the Program tab to start up-dating the control unit.



**WARNING!:**

NEVER re-programme the ECU while the vehicle is running on GAS.

## TROUBLESHOOTING:

➤ **After 10 sec. from engine start the switch lights go off:**

There is no RPM signal.

➤ **The engine runs on “3 cylinder” on gas:**

The petrol injectors wiring harness might have been installed incorrectly. Letter “A” of the injector rail MUST be corresponding to the BLUE and BLUE/BLACK wire of the cut-off injector harness. Once the non-functioning injector has been found out, check as follows:

- 1) make sure the rubber gas hose is not obstructed/ choked or is not leaking.
- 2) make sure the fitting on the suction manifold is not obstructed.
- 3) make sure the gauged fitting on the injector unit has the same diameter as the others
- 4) make sure the gas ECU sends the correct signal to that of the injector
- 5) make sure the commanding wires of the gas injectors are not damaged or disconnected from the connector of the gas ECU or the connector of the injector unit.

➤ **As soon as switched to gas the car switches on petrol automatically and the switch is still in the gas operation position:**

- 1) The gas injection duration is too high
- 2) Check the gas phase filter
- 3) The injection pressure is too low.

➤ **If the “non compatible injector” warning occurs:**

The PC has been disconnected from the serial cable with the program open, therefore exit the program, re-connect the serial cable and connect again.

➤ **The RPM displayed are not correct:**

- 1) Check if the type of ignition is set correctly (monocoil/ bicoil/ speed indicator)
- 2) Check if the type of rpm signal is set correctly (standard/ weak)

➤ **On gas the engine stalls:**

- 1) Check if the level sensor is working properly (is there gas in the tank?).
- 2) If fuel is delivered to the rail.
- 3) If the 12V DC is supplied correctly.

➤ **The check engine light comes on:**

- 1) Record the error in the petrol ECU (code, RPM, load...)
- 2) Check, by means of the OBD connector in “diagnosis”, if the petrol slow/fast trimmers have drifted, in which case:
  - clean the injector unit
  - correct when running on gas until the petrol trimmers settle around zero or similar values to when running on petrol.
- 3) Check if the Lambda probe is working.
- 4) If there is a Timing Advance Processor for the gas, try disconnecting it.

## ERROR CODES

### Communication errors

C01	The ECU is not responding: ckeck the connection, the power supply of the ECU and the efficiency of the communication interface
C02/C03	The ECU is not working properly. Replace it.

### Hardware key errors

H01	The Hardware key is damaged or missed: check the key connection or replace it.
H02	The hardware key does not work: check the key connection or replace it.
H03/H04	Hardware key expired or with expiry date programmed incorrectly: request Tartarini Auto for the hardware key up-date.

### Re Programming errors

P01	The ECU does not dialogue: check the connection, check the ECU power supply
P02	The ECU is not working properly. Replace it.
P03	Problem in reading the programming file: check the access rights to the folder in which such file is stored, check its presence and/ or integrity
P04	Internet Explorer version obsolete: update it to version 6.0 or higher
P05/ P06/ P07/ P08/ P09	Reprogramming error. Disconnect the power supply and try again in less than 4 seconds
P10 / P11	Programming file incoherent/ damaged: request Tartarini Auto for the original programming file.
P12/ P13/ P14	System error. Contact Tartarini Auto explaining what is the hardware configuration (PC, Windows version etc.....)
P15	The re programming file used is not compatible with the actual ECU. For example the file used is for a 4 cylinder ECU while the ECU is for a 6 cylinder. Load the programming file corresponding to the installed ECU type
P1000...	Reprogramming error. Disconnect the power supply and try again in less than 4 seconds

## MAINTENANCE SCHEDULE

Mileage km	Type of Maintenance
20.000	A
40.000	B
60.000	A
80.000	B
100.000	A
120.000	B
140.000	A

### “A” Type Maintenance LPG/CNG

TOPIC	TIME NEEDED
Check injection pressure set and rubber hose	15 Minutes
Check the Map and the general vehicle driveability	30 Minutes
Check the fixing of the tank	15 Minutes
Visual inspection of water pipes, gas pipes	15 Minutes + material if needed
Check and/or do the maintenance procedure of the injector rail.	60 Minutes + material if needed
Replace gas phase filter	15 Minutes + material if needed

### “B” Type Maintenance LPG/CNG

TOPIC	TIME NEEDED
Check injection pressure set and rubber hose	15 Minutes
Check the Map and the general vehicle driveability	30 Minutes
Visual inspection of water pipes, gas pipes	15 Minutes + material if needed
Check and/or do the maintenance procedure of the pressure regulator	60 Minutes + material if needed
Check and/or do the maintenance procedure of the injector rail.	60 Minutes + material if needed
Replace gas phase filter	15 Minutes + material if needed