



Installation manual

EASY FAST

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1.0 General recommendations

- Before installing the gas system, disconnect the battery earth cable (unless specified to the contrary by the car maker).
Attention: this may delete the car radio and telephone memories and jam the centralised door locking and anti-theft systems. In this case, you may connect the battery temporarily.
- Always smooth holes after drilling and apply anti-rust to the edges.
- Apply silicon to each cable through-hole to prevent water from entering the interior.
- Install the control unit as far away as possible from areas where water could infiltrate, far away from heat sources (e.g.: exhaust manifolds), far away from high-voltage cables and, wherever possible, with the connector pointing downwards.
- If the fuse blows, do not replace it with one of a higher current rating.
- Do not attempt to open the control unit as this could cause irreparable damage. LOVATO declines all liability for injury to people or damage to property should its equipment be tampered with. In this event the warranty shall also be invalidated.
- Always make electrical connections using the relative joints or soft solder them to prevent the formation of false contacts.
- Always observe the current laws and/or regulations in the State where the LPG system is mounted.
- Remember that, as per the relative standards, all the assembly instructions refer to the driving position.
- Before mounting the electronic control unit, make sure the relative fuses are disconnected.
- Do not wash the engine after installation.

WARNING

FAILURE TO OBSERVE THE INSTRUCTIONS CONTAINED IN THIS MANUAL MAY CAUSE THE SYSTEM TO WORK INCORRECTLY OR NOT WORK AT ALL. THIS MAY CAUSE DAMAGE TO LOVATO COMPONENTS AND INVALIDATE THE WARRANTY.

2.0 CONNECTION OF THE INJECTORS CUT-OFF WIRING.

There are different types of wiring for the connection of the petrol injectors to the gas control unit.

Code	Description	Remarks
1080011	WIRING EMU EASY FAST 4 UNIVERSAL	Injectors cut-off wiring for 4 cylinder cars without connectors
1080012	WIRING EMU EASY FAST 4 INJ. BOSCH	Injectors cut-off wiring for 4-cylinder cars with connectors type "BOSCH" and injector control on the right.
1080013	WIRING EMU EASY FAST 4 INJ. JAPAN	Injectors cut-off wiring for 4-cylinder cars with connectors type "JAPAN" and injector control on the right.
1080014	WIRING EMU EASY FAST 3 INJ. BOSCH	Injectors cut-off wiring for 3-cylinder cars with connectors type "BOSCH" and injector control on the right.
1080015	WIRING EMU EASY FAST	Injectors cut-off wiring for 4-cylinder cars with single connector to be used on Fiat Stilo and Doblò 1.6, Peugeot 1.4 and Citroen C3 1.6.
1080016	WIRING EMU EASY FAST 3 INJ. BOSCH INV.	Injectors cut-off wiring for 3-cylinder cars with connectors type "BOSCH" and injector control on the left.
1080017	WIRING EMU EASY FAST 4 INJ. BOSCH INV.	Injectors cut-off wiring for 4-cylinder cars with connectors type "BOSCH" and injector control on the left.
1080018	WIRING EMU EASY FAST 4 INJ. JAPAN INV.	Injectors cut-off wiring for 4-cylinder cars with connectors type "JAPAN" and injector control on the left.

To establish which wiring should be used, it is necessary to verify the type of connector installed on the car, as well as its polarity. To verify the polarity of the injectors do the following:

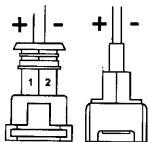
- 1 Disconnect all connectors of the original injectors,
- 2 Prepare a multimeter to measure the direct voltage with full range equal to 20V and connect the negative lead to the ground,
- 3 Place the positive lead on one of the contacts of the connector injector,
- 4 Insert the panel and check on the multimeter the measured voltage value. If the reading is about 12V, that is the positive cable.

WARNING

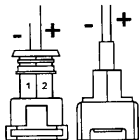
FEEDING OF THE INJECTORS IS TIMED; THEREFORE, AFTER SOME SECONDS FROM SWITCHING ON OF THE PANEL, IT IS DISABLED.

IT IS SUGGESTED TO VERIFY THE POLARITY OF ALL INJECTORS, SINCE SOME CARS HAVE AN INVERTED INJECTOR WITH REFERENCE TO THE OTHERS.

After having verified the physical form and the polarity of the injectors, it is possible to select the suitable wiring.



Use the wiring 1080012, 1080013, and 1080014 when the positive lead of the injectors is on pin 1 and the negative lead on the pin 2 of the original connectors. If the original connectors are not numbered refer to the drawing.



Use the wiring 1080016, 1080017, and 1080018 when the positive lead of the injectors is on pin 1 and the negative lead on the pin 2 of the original connectors. If the original connectors are not numbered refer to the drawing.

If the original connectors are not compatible with the connectors of the wiring or the installation of the wiring with connectors results is, use the wiring 1080011. Verify in any case the polarity of the injectors. The wires to be cut-off are the negative ones.

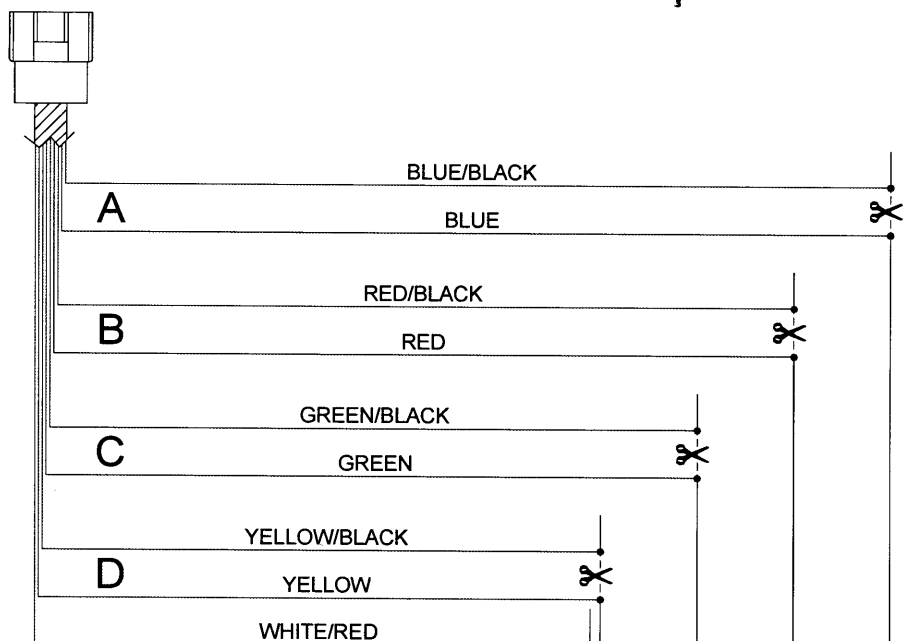
2.1 Connection of the Injectors cut-off wiring on the original wiring of the car

Cut the connectors of connection to the electro-injectors. The wires of a single color have to be connected to the injectors; while the corresponding ones with a black stripe have to be connected to the petrol injection control unit.

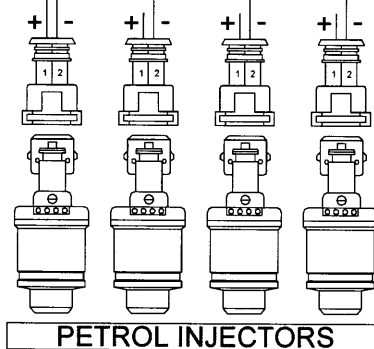
Respect the matching between the sheath of the injector emulator wiring and the gas injector.

On the injector control, where the gas injector "A" has been connected pneumatically, it is necessary to connect the wires of the sheath "A" of the injector emulator wiring. The same is valid for the other injectors.

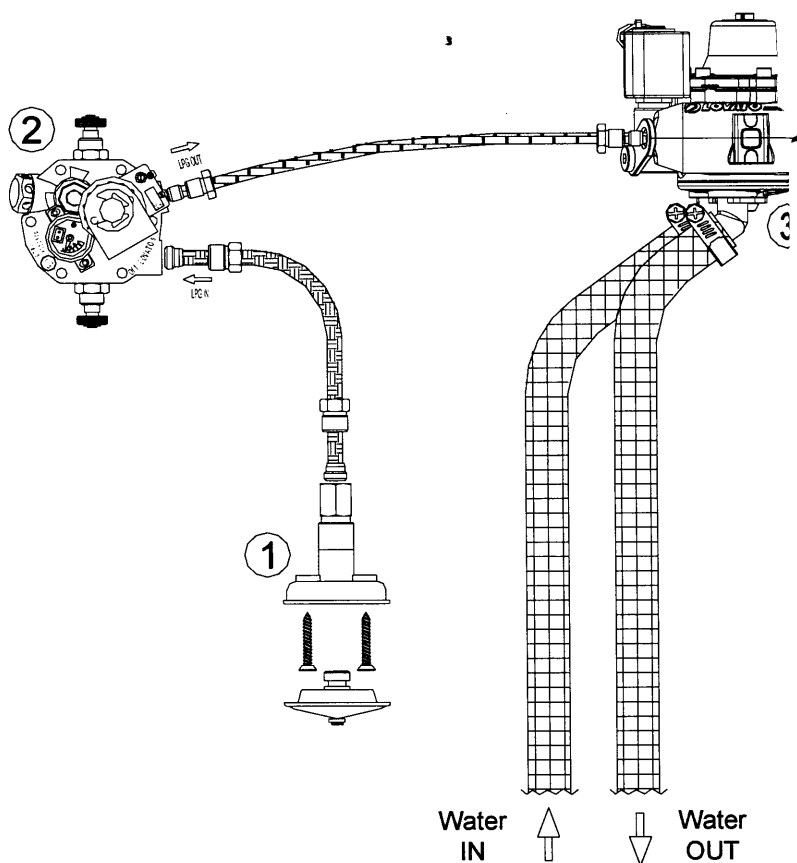
In case of connection on a 3-cylinder car, the YELLOW AND YELLOW/BLACK wires have to be left disconnected.



Wiring connection description								
Type of car	Injector							
	A	B	C	D	E	F	G	H
3 Cylinder	X	X	X					
4 Cylinder	X	X	X	X				
5 Cylinder	X	X	X		X	X		
6 Cylinder	X	X	X		X	X	X	
8 Cylinder	X	X	X	X	X	X	X	X

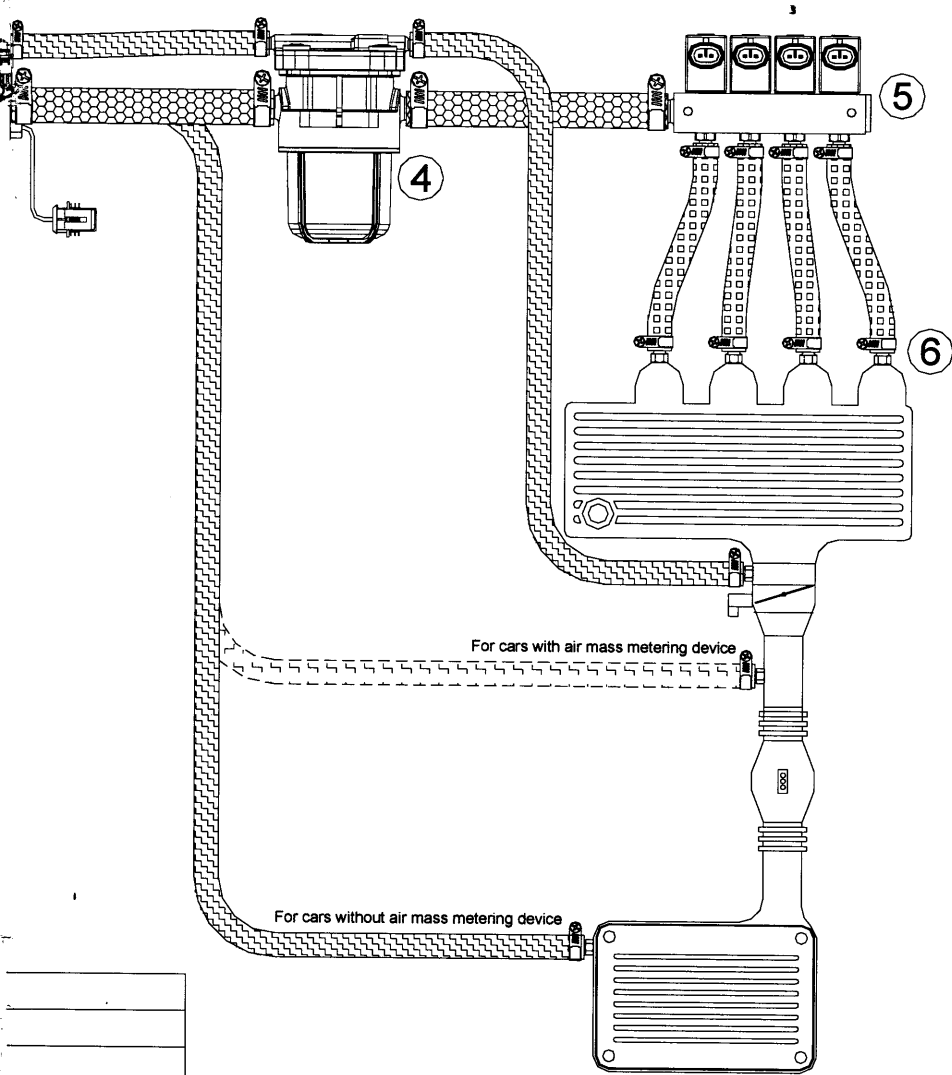


3.0 EASY FAST GPL 3 - 4 CYLINDER PNEUMATIC DIAGRAM



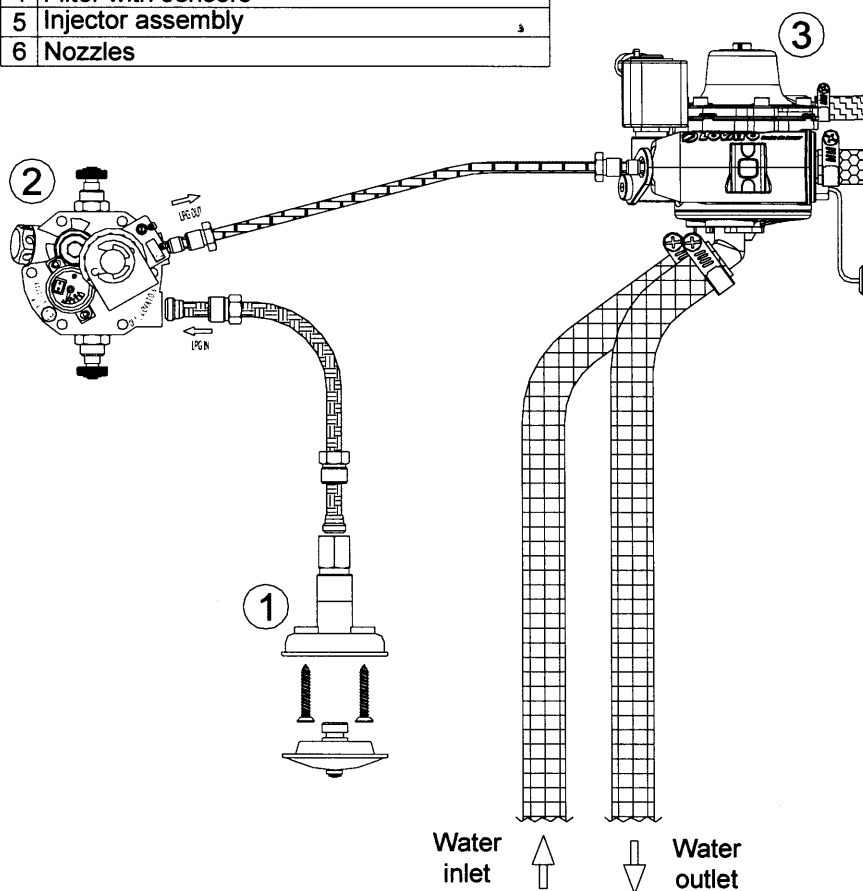
	6x1 copper pipe
	8x1 copper pipe
	15x23 rubber water hose
	6x13 rubber hose
	6x13 gas rubber hose
	12x19 gas rubber hose

1	Fill-in plug
2	Multivalve
3	Reducer with lock-off valve
4	Filter with sensors
5	Injector assembly
6	Nozzles

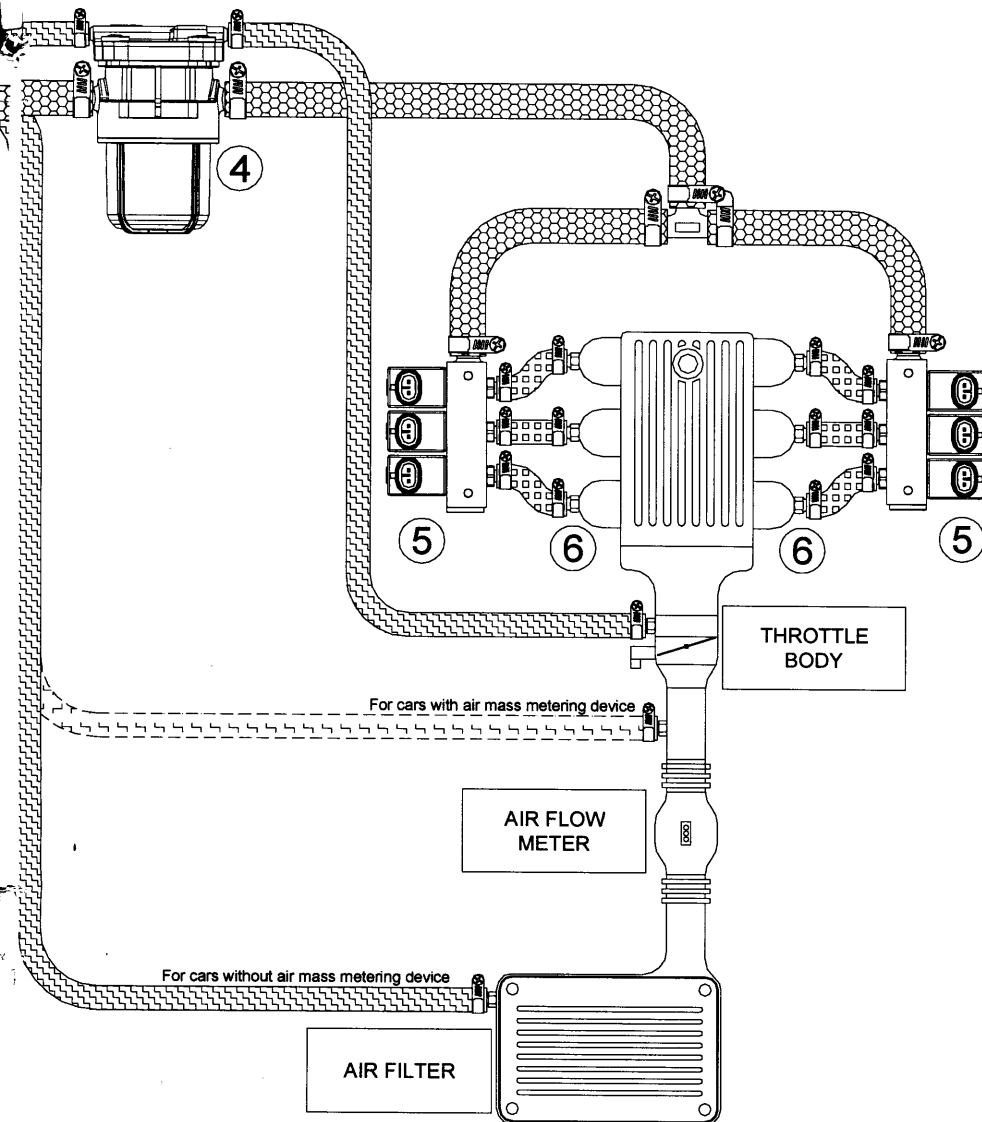


4.0 EASY FAST GPL 5 - 6 CYLINDER PNEUMATIC DIAGRAM

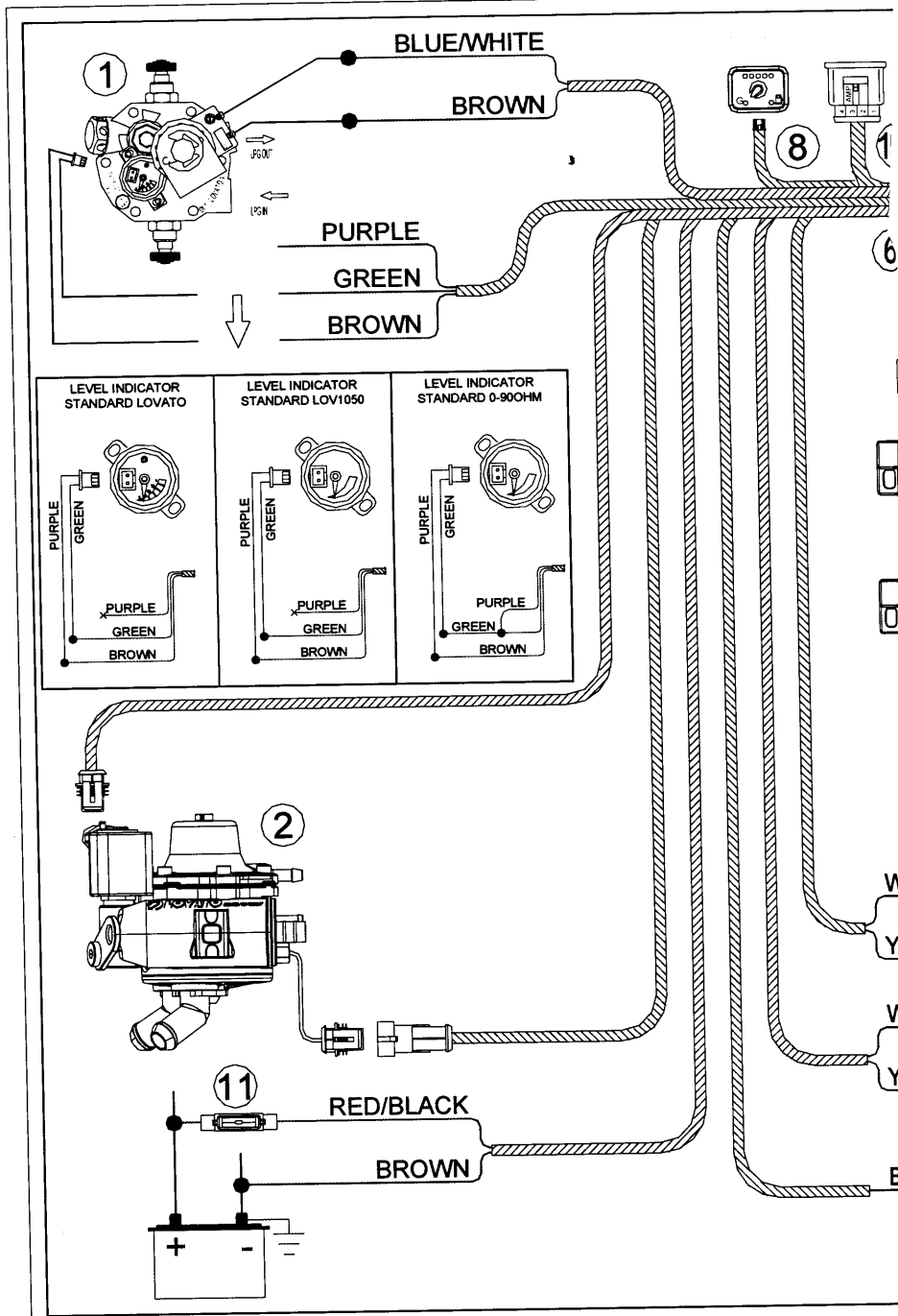
1	Fill-in plug
2	Multivalve
3	Reducer with lock-off valve
4	Filter with sensors
5	Injector assembly
6	Nozzles

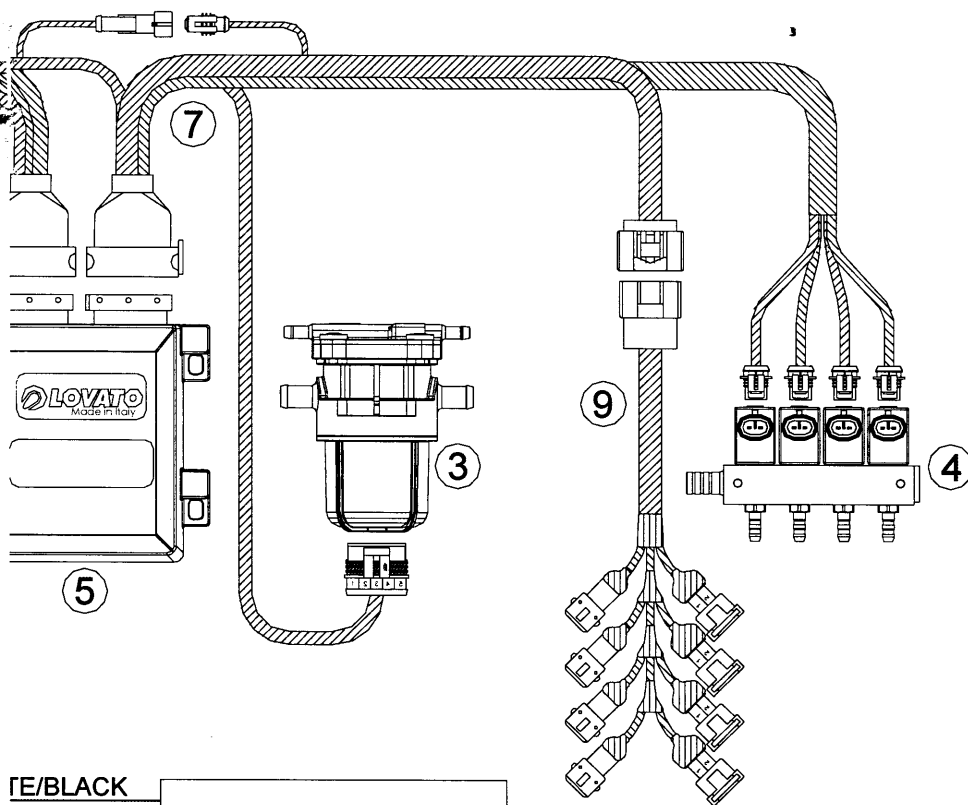


	6x1 copper pipe
	8x1 copper pipe
	15x23 rubber water hose
	6x13 rubber hose
	6x13 gas rubber hose
	12x19 gas rubber hose



5.0 EASY FAST LPG 3 - 4 CYLINDER WIRING DIAGRAM

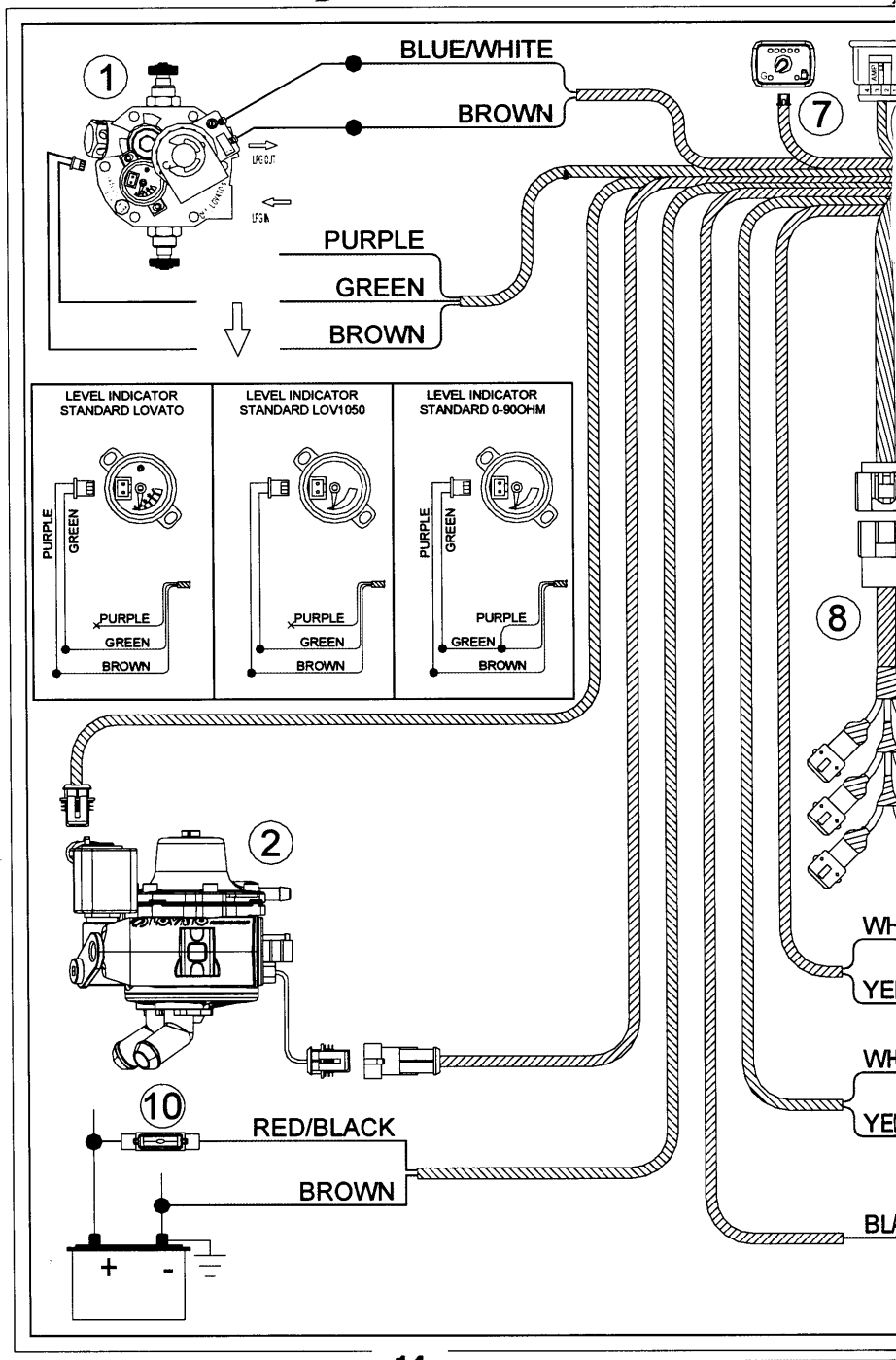


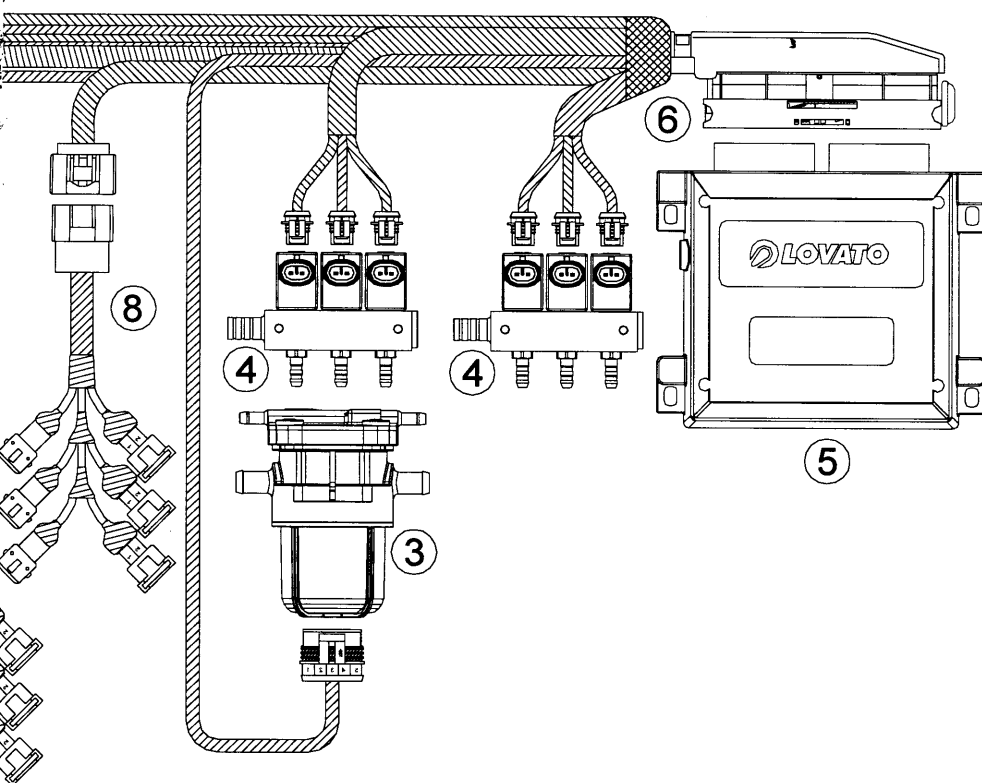


TE/BLACK	
OW/BLACK	Oxygen Sensor 2
TE	
OW	Oxygen Sensor 1
CK	RPM signal

1	Multivalve with level sensor
2	Reducer with LPG lock-off valve
3	Filter with sensor
4	Injector assembly
5	EASY FAST control unit
6	Black harness
7	Grey harness
8	Switch
9	Injector harness
10	Self-diagnosis plug
11	Fuse 7,5 A

6.0 EASY FAST LPG 5 - 6 CYLINDER WIRING DIAGRAM





W/BLACK

W/BLACK

W

K

Oxygen Sensor 2

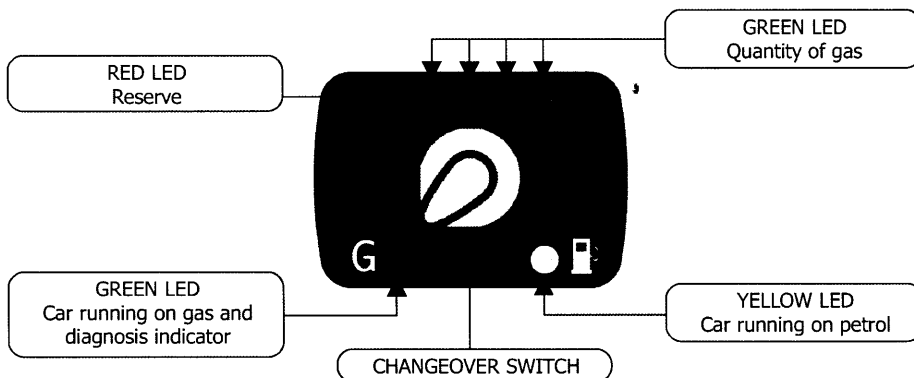
Oxygen Sensor 1

RPM signal

1	Multivalve with level sensor
2	Reducer with LPG lock-off valve
3	Filter with sensor
4	Injector assembly
5	EASY FAST control unit
6	Black harness
7	Switch
8	Injector harness
9	Self-diagnosis plug
10	Fuse 7,5 A

7.0 OPERATION OF THE SWITCH

The switch supplied with the kit is equipped with a push-button, 7 luminous LEDs, and an internal buzzer.



CHANGEOVER SWITCH

Used to select the type of fuel (petrol or gas). By pressing it, it is possible to switch from one type of fuel to the other.

YELLOW LED	GREEN LED	BUZZER	DESCRIPTION
ON fixed	OFF	OFF	Petrol operation.
ON fixed	Blanking	OFF	Petrol operation. Control unit prepared to switch automatically to gas.
OFF	ON fixed	OFF	Petrol operation. <i>LPG</i>
ON fixed	Blanking	Blanking	Petrol operation. Diagnostics have been operated.
ON fixed	OFF	Blanking	Petrol operation. The control unit has performed the automatic switching to gasoline because gas is finished.
OFF	OFF	OFF	Petrol operation. The vehicle is working with petrol and does not switch to gas because it does not detect the motor revolutions signal.

FUNCTIONS OF THE STATUS LED

SWITCHING TO PETROL DUE TO GAS LOW PRESSURE

When the switch reaches the reserve and the gas pressure falls under a pre-set value, the control unit switches automatically to run on petrol. This occurs to avoid the engine operating with a too weak mixture damaging in this way the catalytic converter. Before switching again to gas, perform a fuel filling. The switching to petrol due to GAS LOW PRESSURE is signaled by the switch with the switching-on of the YELLOW LED (petrol operation), the alternated switching-on of the RED LED indicator and of the 4 GREEN LEDs and by the acoustic warning given by the internal buzzer. To restore the switch to the normal operation, it is necessary to press the PUSH-BUTTON once; the YELLOW LED remains switched-on to indicate that the car is running on petrol, and the buzzer stops buzzing.

EMERGENCY

Should the car not be able to start on petrol (e.g. due to problems on the petrol pump, etc.), it is possible to start it directly on GAS. To do this, just start the car keeping the switch push-button pressed.

WARNING

DIRECT GAS STARTING IS TO BE CONSIDERED AN EMERGENCY OPERATION. ITS REPEATED USE CAN LEAD TO DAMAGES TO THE CATALYTIC CONVERTER OR THE SWITCHING-ON OF THE CHECK ENGINE WARNING LAMP.

DIAGNOSIS

Should a diagnosis error be detected and the car be switched to petrol as a consequence, the YELLOW LED is fixed ON (petrol feeding), the GREEN LED blinks and the buzzer buzzes intermittently (the LEDs of the level indicator are OFF). To interrupt the acoustic signaling it is necessary to press the push-button of the switch.

8.0 EASY FAST INTERFACE SOFTWARE

8.1 MINIMUM REQUIREMENTS OF THE COMPUTER TO INSTALL THE SOFTWARE

Operating system - Windows 98 2nd edition or following versions
Memory (RAM) - At least 16 MB
Hard disk - At least free 20 MB upon installation
Screen resolution - 800 x 600 or higher
Moreover, it is necessary to have installed Internet **Explorer 5.5** or later versions.

8.2 SOFTWARE INSTALLATION

To install the calibration software insert the CD-Rom in the reader of the computer and wait until the guided installation window appears.

Should the installation program not start, select "Start" from the "Application Bar". Select "Execute" and enter: "D:\setup.exe" (where "D" indicates the CD-Rom reader).

During the installation you will be asked to select the folder in which the program shall be installed. We suggest not changing the pre-set folder.

After the installation, the program icon is created automatically on the desktop.

8.3 INTRODUCTION

The calibration software works by hardware key code 7155002 and can be opened without being necessarily connected to the control unit.

To connect to the control unit, it is instead necessary that the PC and the control unit are correctly connected by a serial cable (Code 0570001 Installation kit) and a serial USB adapter, if the PC is not equipped with a Serial port (Code 4685001 Serial USB adapter).

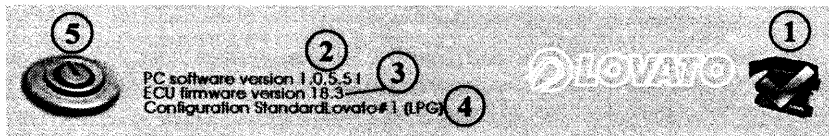
Moreover, the control unit has to be connected to the +12 volt battery (RED - BLACK wire) and to the ground (BROWN wire).

8.4 MAIN MENU

From this menu, it is possible to access all sub-menus of the calibration software that are given and individually described here below:



On the lower part of the page there is the following information:

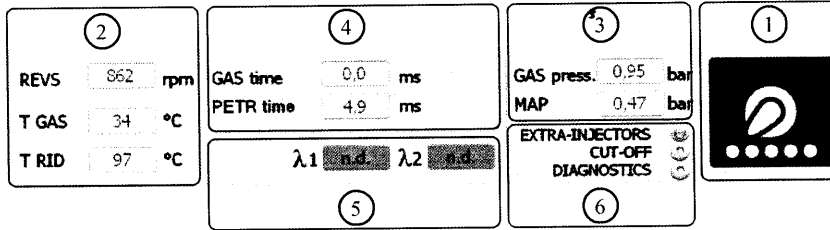


- 1) This indicates if the control unit is connected or not to the calibration software. It is important to remember that all settings and regulations being performed with the disconnected control unit will be lost upon connection, unless they are previously stored in a configuration file. When the program is opened, it automatically tries to connect to the control unit. If the program does not connect, an error window appears. At this point, verify:
 - the connection of the serial interface;
 - that the control unit is connected to the battery and to the ground;
 - if the under-key has been disabled for more than an hour, to connect, it is necessary to enable the panel for some seconds of to star the car.
 By clicking on the icon 1, it is possible to enable (Ctrl+C) or disable (Ctrl+D) the communication.
- 2) This indicates the software version.
- 3) This indicates the firmware version. To update it access the sub-menu "NEW FIRMWARE" and select the wished firmware among the suggested ones.
NB: This operation is possible only if INTERNET EXPLORER 5.5 or later version is installed.
- 4) This is the name of the car configuration. If a previously saved configuration is loaded on the control unit, the name of such configuration will appear. If the control unit is new, appears the message "StandardLovato#1" followed by "LPG" or "METHANE".
- 5) Click on this icon to exit the program.

8.5 CAR CONFIGURATION



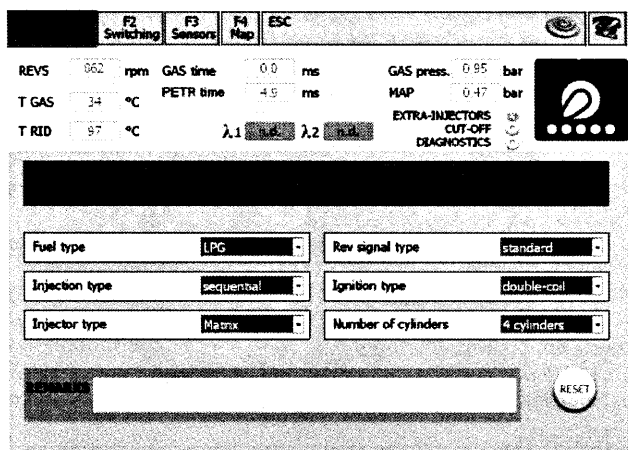
This menu consists of 4 screen pages in which it is possible to set the parameters managing the behavior of the gas control unit. On the upper part of all pages, there is a summarizing display of the current values of the general operation signals of the system.



- 1) This box shows whether the car is running on petrol or gas, as well as the gas level indicator; moreover, there is the push-button allowing the switching via software.
- 2) This box shows:
 - REV. These are the engine revolutions measured in real time by the gas control unit.
 - T GAS This is the gas temperature detected by the temperature sensor positioned on the filter.
 - T RID. This is the temperature of the gas reducer, detected by the temperature sensor positioned on the gas reducer.
- 3) This box shows the gas (GAS time) and petrol (PETR time) injection times. For each variable, it is possible to have one or two values according to the number of main bearings set in the drop menu "Number of main bearings" of the window "Sensors".
- 4) This box shows:
 - PRESS GAS This is the pressure difference between the gas present in the gas injectors, and that present in the suction manifolds, detected by the pressure sensor inserted in the filter.
 - MAP This identifies the suction pressure present in the manifolds detected by the sensor existing in the filter.
- 5) This box shows the values of the voltages of the lambda probes read through the connection of the WHITE and WHITE/BLACK wires. If these latter are not connected, no value (n.a.) is displayed.
- 6) Within this box there are three warning lamps, which light when the car is in the conditions of EXTRA-INJECTION, CUT-OFF and DIAGNOSIS.
 - EXTRA-INJECTION If the program detects any extra-injection, the corresponding warning lamp lights with YELLOW color and becomes GREEN for 2/300 ms, so that it is visible for the operator when the extra-injection occurs.
 - CUT-OFF The warning lamp lights in RED color, when the car is in CUT-OFF status.
 - DIAGNOSI The warning lamp lights in RED color, when an error is detected by the diagnosis system of the plant. By clicking on "Diagnosis", the diagnosis window is opened to monitor the type of error.

8.5.1 CONFIGURATION.

In this window it is possible to set the parameters that characterize the car.



The screenshot shows a configuration window with the following elements:

- Top Bar:** F2 Switching, F3 Sensors, F4 Map, ESC, and a Lovato logo.
- Parameters:**
 - REVS: 062 rpm
 - GAS time: 0.0 ms
 - GAS press.: 0.95 bar
 - T GAS: 34 °C
 - PETR time: 4.9 ms
 - MAP: 0.47 bar
 - T RID: 97 °C
 - λ.1: 14.4
 - λ.2: 14.4
 - EXTRA-INJECTORS CUT-OFF DIAGNOSTICS: 0.0
- Configuration Section:**
 - Fuel type: **LPG** (highlighted in blue)
 - Rev signal type: standard
 - Injection type: **sequential** (highlighted in blue)
 - Ignition type: double-coil
 - Injector type: **Matrix** (highlighted in blue)
 - Number of cylinders: 4 cylinders
- Buttons:** A large black button and a circular RESET button.

WARNING

ALL PARAMETERS HIGHLIGHTED IN BLUE HAVE TO BE MODIFIED WITH DISABLED PANEL AND OFF SWITCH.

- **TYPE OF FUEL**

This selection is used to initialize the control unit with the characteristic parameters previously set for the correct operation with the type of fuel used. Select:

LPG: for cars which run on LPG.

CNG: for cars which run on METHANE.

By selecting LPG or CNG, moreover, it changes also the folder where the configuration files are saved (see Load configuration).

- **TYPE OF INJECTION**

This function allows selecting the enabling strategy of the gas injectors with reference to the type of system:

SEQUENZIALE (SUGGESTED OPTION): The GAS injector is enabled at each PETROL injection.

FULL GROUP: The GAS injector is enabled every 2 PETROL injections.

- **TYPE OF INJECTOR**

This window allows selecting the type of GAS injectors supplied with the Installation kit.

Should a previously saved configuration be loaded, this window shows the type of gas injectors foreseen in the configuration file.

If the type of gas injectors previously saved in control unit does not correspond to the ones shown in this window, a warning message is displayed. To solve the problem, it is necessary to load a configuration file, which foresees the installed injectors, or to change the type of gas injectors set in the control unit. Should the injectors installed on the car not match the selected ones, the injectors are piloted by wrong parameters causing gas malfunctions or the damaging of the same injectors. It is possible to select between MATRIX injectors and LOVATO injectors.

- **TYPE OF REVOLUTION SIGNAL**

It pre-arranges the control unit for the detection of the revolution signal by means of the BLACK wire:

STANDARD: Select this option when the BLACK wire is connected to one of these signals:

- revolution counter wire with square wave signal 0 + 12 V;

- coil negative.

WEAK SIGNAL: Select this option when the BLACK wire is connected to one of these signals:

- revolution counter wire with square wave signal $0 \div 5$ V;
- static switching-on signal with square wave signal $0 \div 5$ V.

These signals can be identified only using an oscilloscope.

- TYPE OF ~~START~~ IGNITION

This parameter is used by the control unit to calculate correctly the engine standard operation, which varies according to the type of ~~start~~ on which the BLACK wire is connected. Set:

SINGLE COIL: for cars with a coil every cylinder, if the BLACK wire is connected to the negative pole of one of the coils;

DOUBLE COIL: for cars with a coil every 2 spark plugs, if the BLACK wire is connected to the negative pole of one of the coils;

REVOLUTION COUNTER: for cars with a coil and mechanical distributor, if the BLACK wire is connected to the negative pole of this coil, or on all the cars where the BLACK wire is connected to the wire signal revolution counter.

REVOLUTION COUNTER 2: set this option when on one car with 6 or 8 cylinders with BLACK wire connected to the revolution counter, the engine revolutions are not measured correctly.

- NUMBER OF CYLINDERS

This parameter is used to indicate to the control unit how many cylinders has the car and, therefore, how many gas injectors it should control; set 3 CYLINDERS or 4 CYLINDERS in function of the number of cylinders of the car.

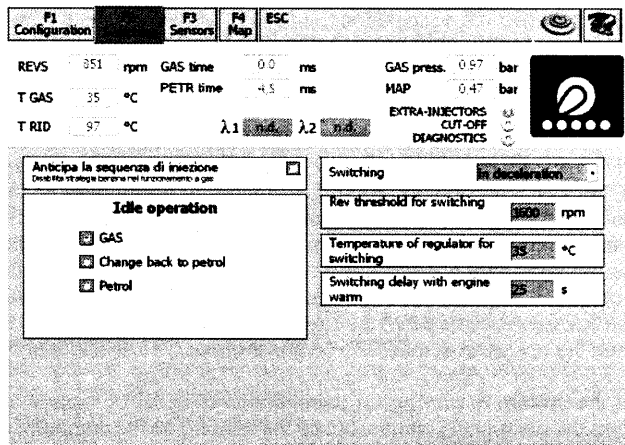
Should one use a control unit for 5-6-8 cylinders, in the selection window also these options are displayed: select 5 CYLINDERS, 6 CYLINDERS or 8 CYLINDERS according to the number of cylinders of the car.

- RESET

By clicking on the push-button of program reset cancel all settings of the control unit and loads the default configuration.

8.5.2 SWITCHING.

This window allows selecting the switching mode from petrol to gas and vice versa.



• SWITCHING

During acceleration

The switching from PETROL to GAS occurs during acceleration when the car exceeds the number of revolutions set under "REVOLUTION THRESHOLD FOR THE SWITCHING".

During deceleration

The switching from PETROL to GAS in this case can occur following any of these two conditions:

- When the number of engine revolutions exceeds the reference set under "REVOLUTION THRESHOLD FOR THE SWITCHING" and then falls under such reference.
- When a Cut-Off condition occurs with the number of engine revolutions higher than the reference set under "REVOLUTION THRESHOLD FOR THE SWITCHING"

• REVOLUTION THRESHOLD FOR SWITCHING.

This identifies the engine revolutions at which one wishes to perform the PETROL-GAS SWITCHING.

• TEMPERATURE OF THE REDUCER FOR SWITCHING.

This indicates the temperature that the pressure reducer has to reach in order to allow the switching to gas. Below this temperature, the control unit DOES NOT SWITCH TO GAS. If during the gas operation the temperature falls under the set reference, the control unit remains in any case operating by GAS.

We suggest setting a temperature ranging from 20° and 45°, because:

- by setting a too low temperature the PETROL-GAS switching would occur when the reducer is not hot enough for a correct flow of gas;
- By setting a high temperature too long time would pass before the switching to GAS.

• SWITCHING DELAY WITH HOT ENGINE.

This indicates the minimum time from the start of the engine for the switching from PETROL to GAS.

We suggest setting a time not shorter than 25 seconds to assure the correct operation of the system.

• ANTICIPATE INJECTION SEQUENCE.

This is a guided procedure allowing the automatic acquisition of the injection sequence, as well as

the enabling of an advance phase shift of the gas injection; the entity of the phase shift depends also on the command "Number of main bearings" of the page F3 Sensors.

This advance can increase the car operation above all in case of gas injectors far from the suction manifold.

This function is to be used only if really necessary, since it disables the characteristic of GRADUAL PETROL-GAS switching performing such switching instantaneously.

- **OPERATION AT MINIMUM.**

GAS - By enabling this function, the car at minimum always works on GAS (default and suggested option).

RETURN TO PETROL - During the return to minimum the car switches for some seconds to petrol and then returns to gas feeding, avoiding in some cases the shut-off during this phase. It is suggested to use this function only if necessary. The value "Revolutions for identifications of the minimum determines the number of revolutions under which this procedure is enabled.

PETROL - The operation at minimum, under the set value of revolutions, is always on petrol. The restoration of gas operation occurs when the revolutions exceed the set value. This function has to be used only when the operation at minimum on gas is impossible, instable and results in frequent shut-offs.

The indication that the system is working on petrol does not occur by means of indication on the switch that still shows the car running on gas, but by the reading on the computer of the gas injection time that becomes null.

In fact, in this phase the switch keeps signaling the gas operation and the gas solenoid valves remain enabled.

In case of presence of the advance converter, which remains fed in this phase, it is necessary to pay attention that introduced advance does not disturb the operation of the system.

8.5.3 SENSORS

In this window, it is possible to configure the level sensor and the Lambda probe.

The screenshot shows a software window with a menu bar at the top containing 'F1 Configuration', 'F2 Switching', 'F3 Map', and 'ESC'. Below the menu bar, there are several data fields: 'REVS' (036 rpm), 'GAS time' (0.0 ms), 'GAS press.' (1.00 bar), 'T GAS' (35 °C), 'PETR time' (4.9 ms), 'MAP' (0.45 bar), and 'T RID' (93 °C). There are also two lambda probes indicated as 'λ.1' and 'λ.2'. On the right side, there are icons for 'EXTRA-INJECTORS', 'CUT-OFF', and 'DIAGNOSTICS'. The main area of the window contains several configuration options: 'Number of banks' (a dropdown menu), 'GAS level indicator type' (a dropdown menu), 'Front Lambda probe types' (a dropdown menu), 'Lambda probe 1 (WHITE wire)' (a dropdown menu), 'Lambda probe 2 (BLACK/WHITE wire)' (a dropdown menu), and a checkbox labeled 'Increase GAS pipe filling time'.

- **NUMBER OF MAIN BEARINGS (BANKS OF CYLINDERS).**

This selection is necessary to set the number of banks of cylinders in which the engine is subdivided.

- **CORRECTION DEVICE OF THE SECOND BANKS OF CYLINDER.**

By setting the number of banks of cylinders in two, this item appears. On cars equipped with two front lambda probes, this allows modifying (strengthening or weakening) in percentage the GAS

carburetion concerning the second bank when the two bank of cylinders work slightly unbalanced. In detail, by acting on this parameter, in case 4-cylinder cars the carburetion of the gas injectors B and C is unbalanced with reference to that of the gas injectors A and D.

In case of cars with 6 or 8 cylinders it is instead unbalanced the carburetion of the gas injectors connected by the wiring identified by the RED STRAP with reference to that of the other gas injectors.

• **TYPE OF FRONT LAMBDA PROBE.**

By setting correctly this parameter, the control unit is able to detect the operation of the Lambda probe. Before selecting the type of Lambda probe, it is necessary to check their operation with a digital multimeter.

With probes with a 0-1 Volt, 0-5 Volt, 5-0 Volt, 0.8-1.6 Volt voltage, in case one wishes to read only their value, proceed as follows:

Connect to the Lambda probe the WHITE wire without interrupting the original connection (then leave the YELLOW wire disconnected).

Should one use lambda probes of the type UEGO, it is not possible to perform the reading of the probe voltage value. (In this case, use an OBD palmtop).

0÷1 V - Select this option if, on the signal wire, the voltage oscillates between these voltage values:

- about $0 \div 0.2$ V with weak mixture;
- about $0.8 \div 1$ V with rich mixture.

0÷5 V - Select this option if, on the signal wire, the voltage oscillates between these voltage values:

- about $0 \div 0.2$ V with weak mixture;
- about $4.8 \div 5$ V with rich mixture.

5÷0 V - Select this option if, on the signal wire, the voltage oscillates between these voltage values:

- about $4.8 \div 5$ V with weak mixture;
- about $0 \div 0.2$ V with rich mixture.

0,8÷1,6 V - Select this option if, on the signal wire, the voltage oscillates between these voltage values:

- about $0.7 \div 0.8$ V with weak mixture;
- about $1.4 \div 1.6$ V with rich mixture.

• **TYPE OF GAS LEVEL SENSOR.**

This indicates to the gas control unit what type of level sensor has been used:

Type LOVATO1050 - set AEB if to the gas control unit it is connected a sensor with standard output signal LOVATO1050. For the connection refer to the assembling diagram of the gas control unit.

0 - 90 ohm - set 0-90 ohm if to the gas control unit it is connected a sensor with output signal ranging from 0 to 90 ohm. For the connection refer to the assembling diagram of the gas control unit.

Not standard - Set this option if it is connected a LPG or METHANE resistive sensor with a variable STRAIGHT signal (lower value (Ohm) with empty level and higher value (Ohm) with full level).

Not standard inverted (Non standard invertito) - Set this option if it is connected a LPG or METHANE resistive sensor with a variable INVERTED signal (higher value (Ohm) with empty level and lower value (Ohm) with full level).

References for the not standard indicator (Riferimenti per indicatore non standard) - This option appears only if, in the box "TYPE OF GAS LEVEL SENSOR" it is set NOT STANDARD or NOT STANDARD INVERTED.

Set the reference values necessary for the setting of the level sensor as follows:

- manually shift the indicator of the sensor starting from the full value and write down the indicated value for each reference (RESERVE, 1/4, 2/4, 3/4).
- enter the noted values in the corresponding boxes.
- press the push-button ACCEPT.

On the switch, it is therefore possible to see the following changes:

Reserve = LEVEL value when the LED of 1/4 switches off and the reserve one switches on.

Reference 1/4 = LEVEL value when the LED of 2/4 switches off.

Reference 2/4= LEVEL value when the LED of 3/4 switches off.
Reference 3/4= LEVEL value when the LED of 4/4 switches off.

• **INCREASE OF THE TIME TO FILL THE GAS PIPES.**

Usually, the gas control unit, to prevent the possible shut-off of the car during the switching from one type of fuel to the other, enables the gas solenoid valves 5 seconds before performing the switching: this allows a greater filling of the piping.

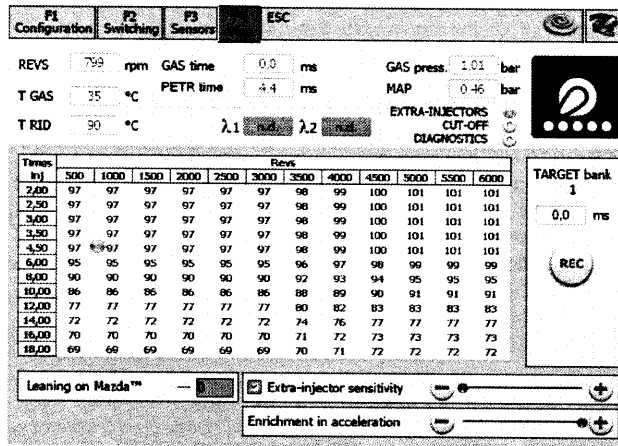
It is possible to disable this function. In this case, the gas solenoid valves are enabled only for about 1 second.

WARNING

IT IS SUGGESTED NEVER TO DISCONNECT THE PETROL PUMP

8.5.4 MAP

This menu allows performing a numerical display of the multiplication coefficients called K used by the control unit in the calculation of the gas injection time.



The table shows on the vertical axis the petrol injection times, while on the horizontal axis there is the number of engine revolutions. The red point shown on the map identifies the revolutions references and the petrol injection times with which the engine is working (with gas feeding the point is green). By increasing the value of K, at same PETROL injection time, the gas injection time is increased, while reducing the value of K, the contrary operation is performed obtaining a weaker mixture in the system.

To modify the values of K, select one or more boxes of the map and press the key enter. A window appears with the following modification modes:

ABSOLUTE - it allows bringing the map exactly back to the value corresponding to the one entered.

LINEAR - It adds or deduces (in case a number with negative sign is entered) the entered value to/from the one already present in the selected box(s).

PERCENTAGE - It adds or deduces in percentage the entered value to/from the one already present in the selected box(s).

• **EXTRA-INJECTION SENSITIVITY.**

The EXTRA-INJECTION are very short injections performed additionally to the normal injection and are carried out when the car runs on petrol, usually during acceleration, to enrich slightly the carburetion increasing the engine yield.

The extra-injections can be recognized by observing the signaling LED or the movement of the

point.

During the gas operation, if we manage the extra-injections as a normal injection we could enrich too much the carburetion risking to increase the engine revolutions jaggging (this occurs above all in the methane plant; in the LPG ones this problem is usually less relevant).

By enabling the tick next to "EXTRA-INJECTIONS SENSITIVITY" it is possible to modify the parameters concerning the gas extra-injections increasing or decreasing the opening time of the gas injectors during the extra-injection. By shifting the slider towards the negative sign (-), the extra-injected gas time decreases and the mixture becomes weaker. By shifting the slider towards the positive sing (+), the gas extra-injections time increases and the mixture becomes richer.

By not enabling the tick, the extra-injection is not considered as such and the gas control unit manages the impulse as a normal fuel injection.

- **ENRICHMENT DURING ACCELERATION.**

In some car models, by accelerating suddenly, the PETROL injection time shifts quite simultaneously from a medium-low value to a high value (e.g. 15-16 ms). This, during the use by GAS, can cause malfunctions since the carburetion would be greatly enriched.

To avoid this problem, use the slider "Enrichment during acceleration" as follows:

- By shifting it towards the positive sing (+) the control unit will follow the changes in the PETROL injection time always quicker.
- By shifting it towards the negative sing (-) this change will be more and more limited and filtered.

- **WEAKENING ON MAZDA.**

On some MAZDA models, during the petrol feeding during acceleration, a switching occurs from a SEQUENTIAL type injection mode to a HALF-GROUP injection mode with opening by pairs of the petrol injectors.

This condition can be easily recognized observing during the acceleration the movement of the RED point on the map or the PETROL injection time.

During the switching from one injection mode to the other, it is possible to observe that the injection time usually displayed acquires a value equal to about the half of the one previously carried out (for example from about 8 ms it shifts to about 4 ms) and a continuous variation of the RED point is displayed between these two values or, in some cars, such point remains fixed on a given number of revolutions to return consequently to the initial PETROL injection time.

During the gas operation this work condition can cause malfunctions since when the injection switches from a SEQUENTIAL mode to a HALF-GROUP mode (low injection time), the GAS carburetion tends to enrich very much causing rips.

Therefore, to avoid this problem, just enter under "Weakening on MAZDA" a proper value to contrast this trend.

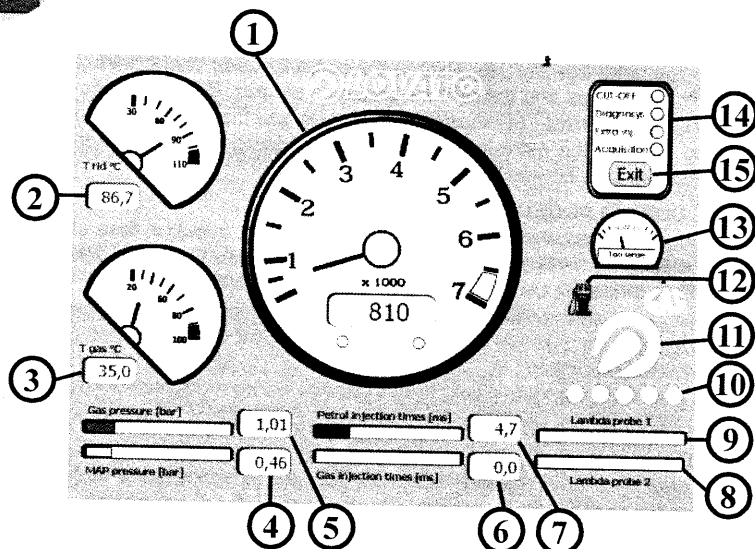
- **TARGET**

By pressing the push-button REC, it is possible to store on screen the petrol time (PETROL time) (with petrol feeding) on a given area of the map to ease the comparison with the petrol time (PETROL Time) (with gas feeding) in the same condition.

8.6 DISPLAY.



This page shows all signals managed by the control unit

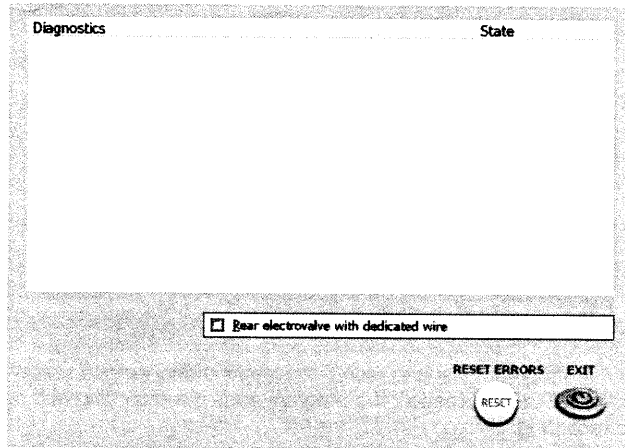


- 1) This shows the number of engine revolutions in real time (rpm);
- 2) This shows the temperature of the gas reducer (°C);
- 3) This shows the gas temperature (°C);
- 4) This shows the MAP pressure present in the suction manifold (bar);
- 5) This shows the gas pressure present in the filter (bar);
- 6) This shows the gas injection time in real time (ms);
- 7) This shows the petrol injection time in real time (ms);
- 8) This shows the work position of the Lambda probe 2 (if connected);
- 9) This shows the work position of the Lambda probe 1 (if connected);
- 10) This shows the level of gas present in the tank;
- 11) This allows the switching from petrol to gas by computer;
- 12) This indicates whether the car is working in gas or petrol mode;
- 13) This supplies useful hints on the correct dimensioning of the nozzles installed on the gas injectors;
- 14) This supplies a visual indication on some operation statuses of the car and of the plant with gas CUT-OFF, extra-injections, diagnosis (see chap. 5.0) or to enable the acquisition function (paragraph 8.8).
- 15) This allows returning to the main menu.

8.7 DIAGNOSIS



This page shows all parameters that the control unit controls through the diagnosis. When the gas control unit detects a diagnosis error on the read parameter, it performs the action corresponding to the detected error.



Diagnosis	Action
Gas injectors	Switching to Petrol
Connection of petrol injectors	Switching to Petrol
Tank solenoid valve	Switching to Petrol
Reducer solenoid valve	Switching to Petrol
Gas pressure sensor	Switching to Petrol
Map sensor	Switching to Petrol
Gas temperature sensor	Switching to Petrol
Water temperature sensor	Switching to Petrol
Switch presence	None

The detected diagnostic errors can be deleted from the memory of the control unit simply by pressing the key on the bottom right "Errors resetting".

By enabling or disabling the flag "Rear solenoid valve with dedicated wire" it is enabled or disabled the diagnostic on the solenoid valve of the multi-valve.

The detected error will be signaled to the driver by the switching-on with fixed light of the YELLOW LED and the slow blinking of the green LED on the switch. Moreover, to ease the identification of the alarm status, it is enabled the buzzer present within the switch itself.

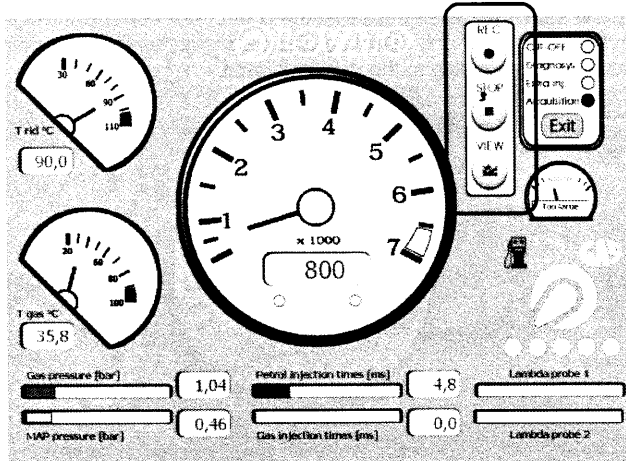
To disable the acoustic alarm, press the push-button of the switch switching the car feeding from gas to petrol.

To return to GAS operation, it is necessary to shut-off and re-start the vehicle.

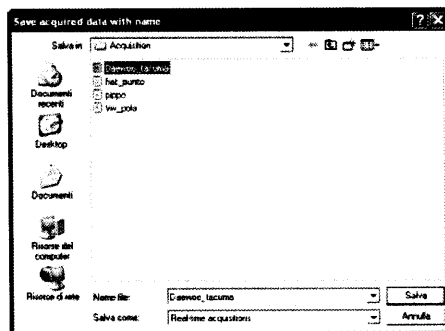
8.8 ACQUIRE



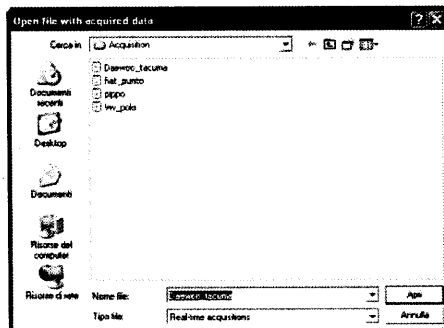
By clicking on acquire, the window "displays" opens the following window.



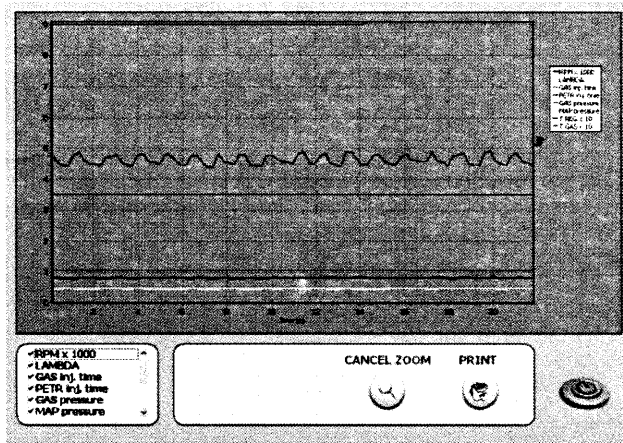
By clicking on "REC" the program starts to record the tracks of the various set variables. When the push-button "STOP" is pressed, the program ends the recording and opens the following window to save the recording.



By pressing the push-button "VIEW", the program opens the following window.



Select the file that you wish to see and click on "OPEN".



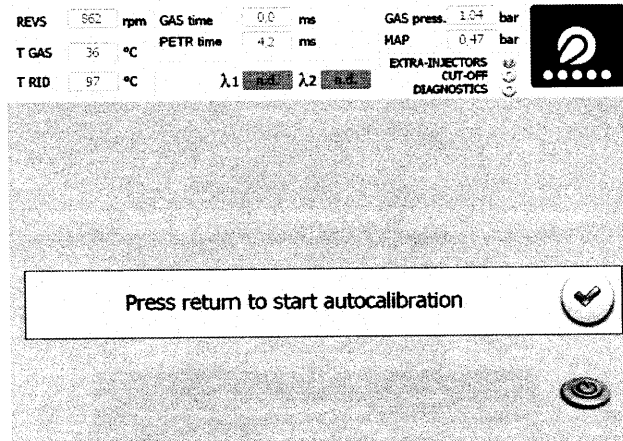
The program offers the possibility to select the variables to be displayed, to enlarge part of the graph and/or to print it.

8.9 SELF-CALIBRATION.



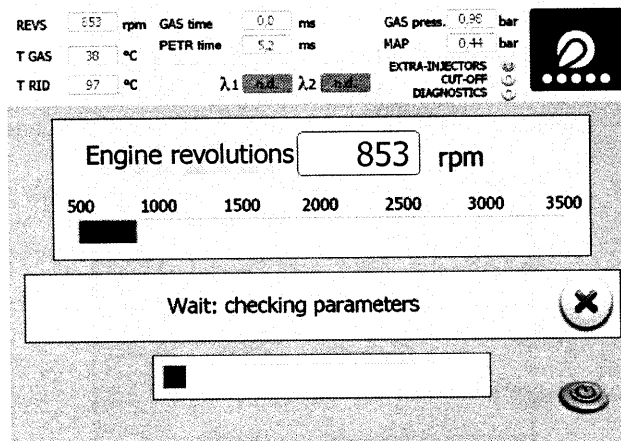
In this section, it is possible to perform the automatic calibration of the gas control unit in order to obtain an averaged correct carburetion of the car during the gas operation.

Before starting the self-calibration procedure it is necessary to verify that the car ignition and injection petrol systems are in good conditions, since the gas feeding system bases on the petrol one. By pressing the push-button "Self-calibration" the following window opens.



To perform the self-calibration follow these instructions:

- 1) Start the car with petrol feeding and wait until the engine reaches the operation temperature (T RED. >60° C).
- 2) Start the self-calibration procedure by pressing the key ENTER and follow the instructions given on screen.



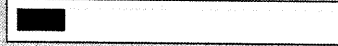
REVS	862	rpm	GAS time	0.0	ms	GAS press.	1.06	bar	
T GAS	36	°C	PETR time	4.4	ms	MAP	0.47	bar	
T RID	87	°C	λ1	0.4		λ2	0.4		

EXTRA-INJECTORS
CUT-OFF
DIAGNOSTICS

Engine revolutions **862** rpm

500 1000 1500 2000 2500 3000 3500

Allow the engine on idle



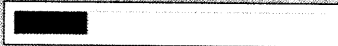
REVS	862	rpm	GAS time	4.2	ms	GAS press.	0.92	bar	
T GAS	37	°C	PETR time	3.6	ms	MAP	0.28	bar	
T RID	91	°C	λ1	0.4		λ2	0.4		

EXTRA-INJECTORS
CUT-OFF
DIAGNOSTICS

Engine revolutions **862** rpm

500 1000 1500 2000 2500 3000 3500

Calibration in progress



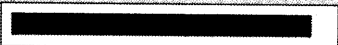
REVS	862	rpm	GAS time	0.0	ms	GAS press.	0.92	bar	
T GAS	38	°C	PETR time	3.2	ms	MAP	0.28	bar	
T RID	93	°C	λ1	0.4		λ2	0.4		

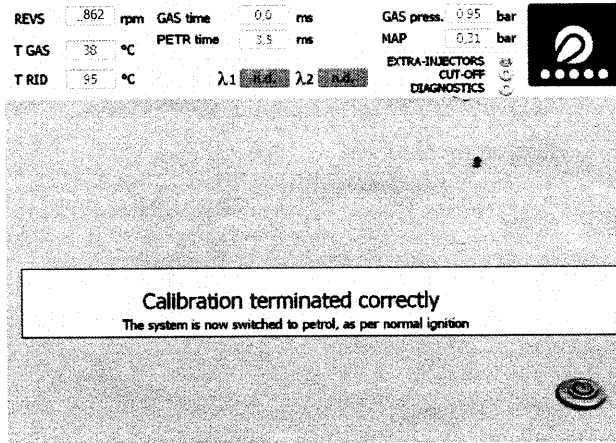
EXTRA-INJECTORS
CUT-OFF
DIAGNOSTICS

Engine revolutions **862** rpm

500 1000 1500 2000 2500 3000 3500

Calibration complete, data transfer in progress





After having concluded the SELF-CALIBRATION test the car with gas feeding verifying that it works correctly and correct if necessary the carburetion acting on the map as previously described. During the self-calibration, the car is brought to gas feeding automatically and the slider gives an indication of the self-calibration progress status. The slider moves forward rapidly during the first calibration and then slowly during the final calibration.

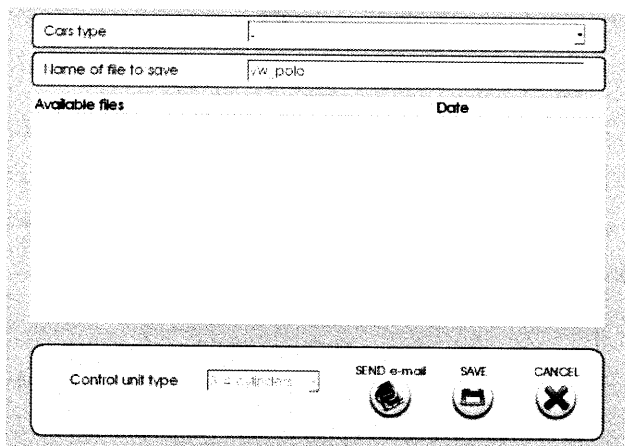
8.10 SAVE CONFIGURATION



In this submenu it is possible to save in a file all calibration parameters set in the menu "car configuration".

This file can then be used to configure other control units installed on cars of the same model and with the same type of fuel, METHANE or LPG.

Remark: the selection of the number of cylinders (on the bottom of the window)



appears only if the control unit is not connected to the computer.

If the control unit is connected to the computer, this information is automatically stored.

To save select the brand of the car from the drop menu, if you wish to file the configuration on the specific folder of the brand; specify the "Name of the file to be saved" and click on "SAVE".

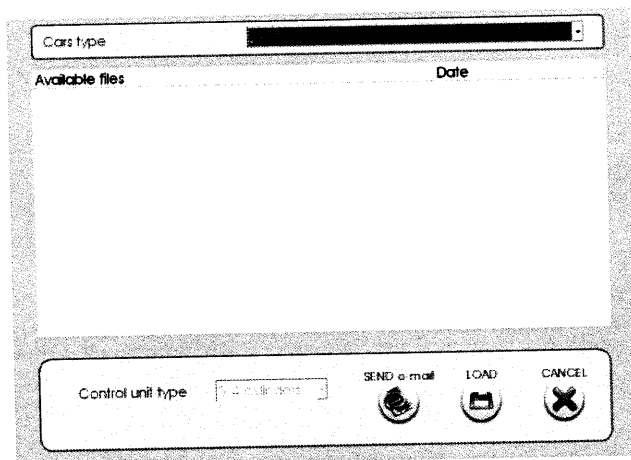
By selecting a configuration from the list of the available ones, it is possible to send by e-mail the file that will be automatically attached to the message.

8.11 Load configuration



From this submenu, it is possible to load onto the control unit an already existing configuration.

The configuration files are contained in two separate folders: one for LPG configurations and the other for the methane configurations.



Before loading a configuration, it is necessary to access "VEHICLE CONFIGURATION" and select under "Fuel type" methane or LPG according to the configuration that one wishes to load.

The selection of the number of cylinders (on the bottom of the window) appears only if the control unit is not connected to the computer.

If the control unit is connected to the computer, the lists suggests only the configurations available for the model of control unit automatically recognized.

Select the file that you wish to load and click on "LOAD".