

Injection System

**Description of the injection system
calibration software
COMPLETE VERSION**



Table of Contents

English

● Introduction	3
● Main Menu	4
● Vehicle Configuration.....	5
<i>F1 Change-Over</i>	6-7
<i>F2 Lambda</i>	8-9
<i>F3 Sensors</i>	10
<i>F4 Map</i>	11-12
<i>F5 Gas/Petrol</i>	13-14
<i>F6 Modify carb</i>	15
<i>Display chart</i>	16
● Display.....	17
● Diagnosis	18
● Autocalibration	19
● Save Configuration	20
● Load Configuration.....	20
● ECU Reprogramming	21

Minimum computer requirements for software installation

Operating system	-	Windows 98 2 nd edition or later versions
Memory (RAM)	-	At least 16 Mbyte
Hard drive	-	At least 20 Mbyte free at time of installation
Display resolution	-	800 x 600 or greater

Internet Explorer 5.5 or higher must also be installed.

Software installation

To install the calibration software, put the CD-ROM in the computer drive and wait for the guided installation window to open.

If the installation program does not start, select "Start" in the "Taskbar". Choose "Run" and enter: "D:\setup.exe" (where D stands for the CD-ROM drive).

During installation you will be asked in which directory you want to install the program. We recommend you do not change the pre-set directory and remember it since the configuration, acquisition and firmware files will be saved in it.

The program icon will be created on the desktop when installation is complete.

Note: To view the complete installer's version (IC), you will need to connect the relevant parallel port or USB port hardware key to the PC.

Introduction

The calibration software can be opened without having to be connected directly to the control unit. To connect to the control unit, on the other hand, the PC and control unit must be properly connected by an interface cable (to order separately as it does not come in the kit) and a USB serial adapter (if the PC does not have a serial port), which can be purchased from any IT material retailer.

The control unit must also be connected to the +12 volt battery (red – black wire) and to the ground (black wire).

Main Menu

All calibration software submenus listed below with their separate descriptions can be accessed from this menu:

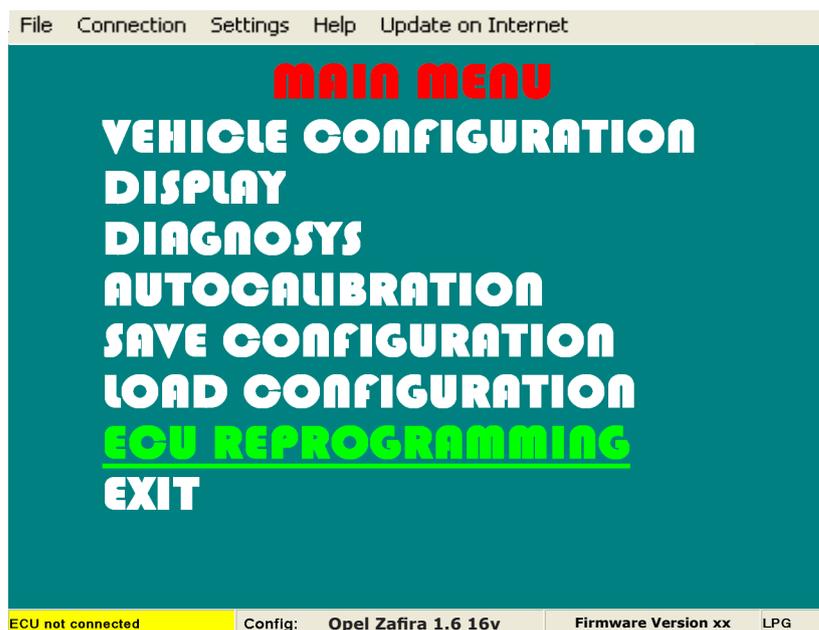
File Menu: For exiting the calibration software.

Connection Menu: For connecting/disconnecting the gas control unit from the calibration software.

Settings Menu: For selecting the calibration software language based on the country where used.

Help Menu: Provides information about the software version installed and the expiration date of the hardware key used.

Update on the Internet: Here you can update the software to the latest version available using a guided procedure on the Internet. If updated versions should become available, a message saying an update is missing will be displayed.



The following information is shown at the bottom of the page:



1) indicates whether the control unit is connected or disconnected to the calibration software. It is important to remember that all the settings made on the disconnected control unit will be lost when it is connected, unless they are previously saved in a configuration file.

When the program is opened automatically, it will try to connect to the control unit.

If the program does not connect, an error window will open. At this point check:

- the serial interface connection,
- that the control unit is connected to the battery and ground,
- if the sub key has been disconnected for more than an hour, to connect it will be necessary to connect the panel for a few seconds and check that the switch turns on at the same time, or start the vehicle.

To attempt connection again, open the "Connection" window and select "Connect".

2) is the name of the configuration in the control unit (max. 28 characters displayed). To upload a pre-existing configuration in the control unit, it must be connected to the configuration software (see chapter "**Load configuration**").

3) is the firmware version of the control unit connected; to update it, go to the submenu "REPROGRAM CONTROL UNIT" and select the desired firmware from those proposed.

Note: This operation is possible only if INTERNET EXPLORER 5.5 or higher is installed.

4) indicates whether the configuration currently loaded in the control unit uses the operation parameters for natural gas or for LPG; to select the fuel type, go to the submenu "VEHICLE CONFIGURATION".

This menu consists of 6 pages in which it is possible to set the parameters that manage the behaviour of the gas control unit and 2 pull-down menus situated in the upper left-hand corner:

- **Configuration:** For exiting the vehicle configuration menu.

F1 Change-over	Fuel type	LPG	Inj.	Sequential				
F2 Lambda	Injectors							
F3 Sensors	Type of revolution signal	Standard						
F4 Map	No. of cylinders	4 cylinders						
F5 Gas/petrol	Ignition type	Two coils						
F6 Modify carb.	Type of change-over	In acceleration						
	Revs. threshold for change-over	1600 rpm						
	Reducer temperature for change-over	35 °C						
	Change-over from petrol-gas delay	35 s						
	Overlapping time	0 s						
	Note:	Attention! Do not disconnect the pump and do not run low on petrol!						
	Reset ecu and go to base parameters	Warning ! You can change yellow parameters only without sub-key.						
PETROL	Revs	Orpm	Tinj.gas	0,00	Press.gas	n.a.	Lambda	n.a.
	T.gas	n.a.	Tinj.petrol	0,00	MAP	n.a.	Lambda 2	n.a.
	T.reducer	n.a.			Sensor AEB025		Level	0

In the part underneath all of the pages, a display summarising the current values of the general system operation signals is provided.

PETROL	Revs	Orpm	Tinj.gas	0,00	Press.gas	n.a.	Lambda	n.a.
	T.gas	n.a.	Tinj.petrol	0,00	MAP	n.a.	Lambda 2	n.a.
	T.reducer	n.a.			Sensor AEB025		Level	0

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1) Whether the vehicle is petrol or gas-powered is displayed in this box; CUT-OFF also might appear when the system is in the cut-off condition.

2) The following are displayed in this box:

REVOLUTIONS: the engine revolutions read in real time by the gas control unit.

T.GAS: gas temperature detected by the temperature sensor positioned on the gas injection rail.

T.RED: gas reduction gear temperature detected by the temperature sensor positioned on the gas reduction gear

3) The gas (Tinj.gas) and petrol (Tinj.benz) times are displayed in this box. If 2 banks are selected (see paragraph "F2 Lambda"), the gas and petrol times regarding the second bank will also be displayed.

4) The following are displayed in this box:

GAS PRESS: this is the pressure difference between the gas in the gas injectors and that in the intake manifolds read by the pressure gauge supplied in the kit.

MAP: If an AEB025 pressure sensor has been installed, it identifies the intake pressure in the manifolds.

AEB025 SENSOR: indicates the type of pressure gauge the software selects (see paragraph "F3 sensors").

5) The following are displayed in this box:

- the voltage of the **lambda** probe read by the purple wire (if connected); it is also necessary to set the type of probe connected (front/back) in "F2 Lambda". If the latter is not set, no value will be displayed (n.d.).

- the voltage of the **lambda** probe read by the purple/black wire (if connected); it is also necessary to set the type of probe connected (front/back) in "F2 Lambda". If the latter is not set, no value will be displayed (n.d.).

- the value the GAS injection control unit reads through the level sensor connected to it (absolute value).

F1 CHANGE-OVER

Note: all parameters highlighted in YELLOW are changed with the panel disconnected and the switch off. Moreover, to keep system operation in good condition, do not leave the petrol tank completely empty and do not disconnect the petrol pump.

FUEL TYPE

This selection serves to initialise the control unit with the typical parameters set ahead of time for correct operation with the type of fuel used.

Select:

LPG: for LPG-powered vehicles.

NATURAL GAS: for NATURAL GAS-powered vehicles.

When LPG or NATURAL GAS is selected, also the directory where the configuration files are saved changes (see "**Load configuration**").

F1 Change-over	Fuel type	LPG	Inj.	Sequential
F2 Lambda	Injectors			
F3 Sensors	Type of revolution signal			Standard
F4 Map	No. of cylinders			4 cylinders
F5 Gas/petrol	Ignition type			Two coils
F6 Modify carb.	Type of change-over			In acceleration
	Revs. threshold for change-over			1600 rpm
	Reducer temperature for change-over			35 °C
	Change-over from petrol-gas delay			35 s
	Overlapping time			0 s
	Note:			Attention! Do not disconnect the pump and do not run low on petrol!
	Reset ecu and go to base parameters			
	Warning ! You can change yellow parameters only without sub-key.			
PETROL	Revs	0rpm	Tinj.gas	0,00
	T.gas	n.a.	Tinj.petrol	0,00
	T.reducer	n.a.	Press.gas	n.a.
			MAP	n.a.
			Sensor AEB025	
			Lambda	n.a.
			Lambda 2	n.a.
			Level	0

INJ.

This function lets you select the GAS injection activation strategy with reference to the type of system:

SEQUENTIAL (RECOMMENDED OPTION): the GAS injector is activated next to every PETROL injection.

FULL GROUP: the GAS injector is activated next to every 2 PETROL injections.

INJECTORS

This window is used to select the type of GAS injectors that are supplied with the conversion kit. When a previously saved configuration is loaded, this window indicates the type of injectors that are used in the configuration.

If the GAS injectors installed on the vehicle do not correspond to the type shown in the window, then you will need to load a configuration that uses the correct type of injector. If the installed injectors do not correspond to the type that have been selected on the software, then the injectors will be piloted with incorrect parameters and may cause malfunctions during gas operation.

TYPE OF REVOLUTION SIGNAL

It sets up the control unit for reading the rev signal through the BROWN² wire:

STANDARD: select this option when the BROWN wire is connected to one of these signals:
 - rev counter wire **with 0 ÷ 12 V square wave signal**;
 - negative coil.

WEAK SIGNAL: select this option when the BROWN² wire is connected to one of these signals:
 - rev counter wire **with 0 ÷ 5 V square wave signal**;
 - static ignition control **with 0 ÷ 5 V square wave signal**;

These signals can be identified only by using an oscilloscope

NUMBER OF CYLINDERS

This parameter serves to tell the control unit how many cylinders the vehicle has and therefore how many gas injectors it has to control:

set **3 CYLINDERS** or **4 CYLINDERS**, depending on the number of cylinders the vehicle has.

If a control unit for 5-6-8 cylinders is used, these options will also be displayed in the selection window: select **5 CYLINDERS**, **6 CYLINDERS** or **8 CYLINDERS**, depending on the number of cylinders the vehicle has.

NOTE²: Meaning the Brown wire of the gas control unit wiring harness.

IGNITION TYPE

The control unit uses this parameter for correctly calculating the engine speed, which varies based on the type of ignition on which the BROWN² wire is connected. Set:

MONO COIL: for vehicles with one coil per cylinder if the BROWN² wire is connected to the negative terminal of one of the coils;

DOUBLE COIL: for vehicles with one coil every 2 cylinders if the BROWN² wire is connected to the negative terminal of one of the coils;

REV COUNTER: for vehicles with one coil and mechanical distributor if the BROWN² wire is connected to the negative terminal of this coil, or in all vehicles where the BROWN² wire is connected to the rev counter signal wire.

REV COUNTER 2: set this option when the engine's speed is not read correctly on a **6 or 8-cylinder** vehicle with the BROWN² wire connected to the rev counter.

TYPE OF CHANGE OVER

The mode of switching over from PETROL to GAS can be selected.

ACCELERATION

PETROL switches over to GAS during acceleration when the vehicle exceeds the number of revolutions set in "REV THRESHOLD FOR SWITCH OVER".

DECELERATION

In this case PETROL may switch over to GAS following either one of these two conditions:

- when the rpm exceeds the reference set in "REV THRESHOLD FOR SWITCH OVER" and then drops below this reference.
- when a Cut-Off condition occurs with the rpm higher than the reference set in "REV THRESHOLD FOR SWITCH OVER"

REVS. THRESHOLD FOR CHANGE OVER

Identifies the rpm at which you want the petrol-gas switch over to take place.

REDUCER TEMPERATURE FOR CHANGE OVER

It indicates the temperature the reduction gear has to reach so that switching to gas is allowed. The control unit WILL NOT SWITCH TO GAS beneath this temperature.

If during gas operation the temperature drops below the set reference, the control unit in any case continues to operate with GAS.

To get an idea of what temperature value should be set, contact the manufacturer of the system.

CHANGE OVER FROM PETROL-GAS DELAY

It indicates the minimum time from engine ignition for switching over from PETROL to GAS.

We recommend you set a time no less than 20 seconds in order to ensure correct system operation.

OVERLAPPING TIME

It indicates the time during which there is an overlap between PETROL and GAS in order to prevent possible carburetion gaps when switching over from one type of fuel to the other.

NOTE: It is recommended to leave the pre-set value (ZERO).

RESET ECU AND GO TO BASE PARAMETERS

All control unit configuration parameters are reset and put back in the original configuration when this button is pressed. We recommend that this button be pressed if you are unsure you have correctly set all control unit parameters and you want to start with the original configuration of the parameters.

NOTE²: Meaning the Brown wire of the gas control unit wiring harness.

F2 LAMBDA

NUMBER OF BANKS

This selection serves to set the number of banks in which the engine is divided into.

FUEL TRIM BANK 2

When the number of banks is set at two, this item appears. Its purpose is to be able to modify (enrich or weaken) the GAS carburetion concerning the second bank in vehicles equipped with two front lambda probes if the two banks are working slightly off-balance.

In particular, in the case of 4-cylinder vehicles, carburetion of the GAS B and C injectors is unbalanced with respect to carburetion of the GAS A and D injectors when this parameter is changed.

In the case of 6 or 8-cylinder vehicles, carburetion of the GAS injectors connected by the wiring harness identified by the **RED STRAP** is instead unbalanced with respect to that of the other GAS injectors.

F1 Change-over	Number of banks	2
	Fuel trim bank 2	0
F2 Lambda	Type of pre-catalytic oxygen sensor	0 - 1 Volt
	Oxygen Sensor 1 (purple wire)	Not connected
	Oxygen Sensor 2 (purple/black wire)	Not connected
F3 Sensors		
F4 Map		
F5 Gas/petrol		
Warning ! You can change yellow parameters only without sub-key.		
F6 Modify carb.		
PETROL	Revs	0rpm
	T.gas	n.a.
	T.reducer	n.a.
	Tinj.gas	0,00
	Tinj.petrol	0,00
	Press.gas	n.a.
	MAP	n.a.
	Sensor AEB025	
	Lambda	n.a.
	Lambda 2	n.a.
	Level	0

TYPE OF PRE CATALYTIC OXYGEN SENSOR

When this parameter is set correctly, the control unit is able to detect operation of the lambda probe. Before you select the type of Lambda Probe, check its operation with a digital multimeter.

With probes having 0-1 Volt, 0-5 Volt, 5-0 Volt, 0.8-1.6 Volt voltage, follow these instructions if you want to read only its value:

Connect the purple wire to the lambda probe without interrupting the original connection (therefore leave the grey wire disconnected).

If you want to instead emulate the rear lambda probe(s), follow these instructions:

Interrupt the original connection of the rear lambda probe and connect the PURPLE wire to the sensor and the GREY wire to the PETROL control unit.

0 ÷ 1 V - Select this option is the voltage fluctuates between these voltage values on the signal wire:

- about 0 ÷ 0.2 V with lean mixture;
- about 0.8 ÷ 1 V with rich mixture.

0 ÷ 5 V - Select this option is the voltage fluctuates between these voltage values on the signal wire:

- about 0 ÷ 0.2 V with lean mixture;
- about 4.8 ÷ 5 V with rich mixture.

5 ÷ 0 V - Select this option is the voltage fluctuates between these voltage values on the signal wire:

- about 4.8 ÷ 5 V with lean mixture;
- about 0 ÷ 0.2 V with rich mixture.

0.8 ÷ 1.6 V - Select this option is the voltage fluctuates between these voltage values on the signal wire:

- about 0.7 ÷ 0.8 V with lean mixture;
- about 1.4 ÷ 1.6 V with rich mixture.

2.5 ÷ 3.5 V - Select this option is the voltage fluctuates between these voltage values on the signal wire:

- about 2.4 ÷ 2.5 V with lean mixture;
- about 3.4 ÷ 3.5 V with rich mixture.

OXYGEN SENSOR 1 (PURPLE WIRE)

This reads the front lambda probe and, if necessary, emulates a rear lambda probe (if there are diagnostic errors such as "Catalyser inefficiency").

NOT CONNECTED: the lambda probe value is not displayed (n.d.) and no type of emulation is activated.

FRONT: During GAS operation, the value of the front lambda probe is displayed in the lower right-hand corner (**if this option is selected, connect only the PURPLE wire**).

REAR: During GAS operation, the value of the rear lambda probe is displayed in the lower right-hand corner and the control unit actuates an emulation.

This action is particularly advisable for solving catalyser inefficiency problems with the warning light being consequently turned on by the PETROL control unit.

ATTENTION: If you select this option, connect the GREY wire to the PETROL control unit and the PURPLE wire to the lambda probe.

OXYGEN SENSOR 2 (PURPLE/BLACK WIRE)

This reads the front lambda probe and, if necessary, emulates a rear lambda probe (if there are diagnostic errors such as "Catalyser inefficiency").

NOT CONNECTED: the lambda probe value is not displayed (n.d.) and no type of emulation is activated.

FRONT: During GAS operation, the value of the front lambda probe is displayed in the lower right-hand corner (**if this option is selected, connect only the PURPLE/BLACK wire**).

REAR: During GAS operation, the value of the rear lambda probe is displayed in the lower right-hand corner and the control unit actuates an emulation.

This action is particularly advisable for solving catalyser inefficiency problems with the warning light being consequently turned on by the PETROL control unit.

ATTENTION: If you select this option, connect the GREY/BLACK wire to the PETROL control unit and the PURPLE/BLACK wire to the lambda probe.

F3 SENSORS

TYPE OF MAP SENSOR

It tells the GAS control unit what type of MAP sensor is being used (AEB 025 – AEB 013).

TYPE OF GAS LEVEL SENSOR

It tells the gas control unit what type of level sensor was used:

AEB – set AEB if a sensor with an AEB standard output signal sensor (e.g. AEB1050) is connected. Refer to the assembly drawing of the gas control unit for connection.

0 – 90 ohm – set 0 – 90 ohm if a sensor with output signal sensor ranging between 0 and 90 ohm (e.g. AEB1090) is connected. Refer to the assembly drawing of the gas control unit for connection.

NON STANDARD – Set this option if an LPG or NATURAL GAS resistive sensor with a variable STRAIGHT signal (lower (Ohm) value with higher vacuum level and value (Ohm) with full level) is connected.

LEVEL REFS. NOT AS STANDARD – Set this option if an LPG or NATURAL GAS resistive sensor with a variable REVERSED signal (higher (Ohm) value with lower vacuum level and value (Ohm) with full level) is connected.

NON STANDARD LEVEL REFERENCE – This option appears only if NON STANDARD or REVERSED NON STANDARD is set in the "TYPE OF GAS LEVEL SENSOR" box.

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

- manually move the sensor indicator starting from the full level and note the value indicated in "Level" for each reference (RESERVE, 1/4, 2/4, 3/4).
- enter the values noted in the corresponding boxes.
- press the **ACCEPT** button.

We can then see the following changes on the switch:

RESERVE = LEVEL value when the red reserve LED turns on and the 1/4 LED turns off.

1/4 REFERENCE = LEVEL value when the 2/4 LED turns off.

2/4 REFERENCE = LEVEL value when the 3/4 LED turns off.

3/4 REFERENCE = LEVEL value when the 4/4 LED turns off.

TANK SOLENOID VALVE WITH DEDICATED WIRE

Enables diagnosis of the GAS solenoid valve of the tank.

If there is no sheath with BLUE-WHITE and BLACK wires on the GAS control unit cable (wires expressly dedicated to powering the rear multivalve) or they are not connected, do not enable this control; otherwise, the GAS control unit might save errors.

GAS ELECTROVALVES OPENED IN ADVANCE

The GAS control unit usually enables the GAS solenoid valves for about 1 second before switching from PETROL to GAS in order to allow the pipes to fill up.

If there is not enough time to prevent the vehicle from shutting down while switching from one type of fuel to the other, you can enable this function so that the GAS solenoid valves are opened at least 5 seconds before switching over to GAS. This will allow the GAS pipes to fill more. If this function is enabled, a warning signal will appear to remind you to not interrupt the PETROL pump.

ATTENTION: If this function is enabled, a warning message reminds you to not interrupt the PETROL pump because it would cause the vehicle to shut down.

ATTENTION: If you use a timing advance processor, this will start to advance when the vehicle is still running on petrol, causing it to malfunction during the "fill gas pipes more" phase. For this reason we recommend setting the processor with 9° advance at the most.

PETROL	Revs	0rpm	Tinj.gas	0,00	0,00	Press.gas	n.a.	Lambda	n.a.
	T.gas	n.a.	Tinj.petrol	0,00	0,00	MAP	n.a.	Lambda 2	n.a.
	T.reducer	n.a.				Sensor AEB025		Level	0

F4 MAP

This menu provides a numerical display of the multiplication coefficients called **K** the control unit uses in calculating the GAS injection time.

The table displays the petrol injection times on the Y axis, while we find the engine rpm on the X axis. The red dot displayed on the map identifies the rpm references and petrol injection time in which the engine is running.

t inj/rpm	1000	2000	3000	4000	5000	6000
2,00	132	132	132	134	134	134
2,50	134	134	134	136	136	136
3,00	146	146	146	148	148	148
3,50	155	155	155	157	157	157
4,50	159	160	160	160	160	160
6,00	156	158	158	159	159	159
8,00	151	153	153	155	155	155
10,00	139	139	139	142	142	142
12,00	130	130	130	132	132	132
14,00	126	126	126	128	128	128
16,00	126	126	126	128	128	128
18,00	124	124	124	126	126	126

Switch from PC

PETROL	Revs	0rpm	Tinj.gas	0,00	0,00	Press.gas	n.a.	Lambda	n.a.
	T.gas	n.a.	Tinj.petrol	0,00	0,00	MAP	n.a.	Lambda 2	n.a.
	T.reducer	n.a.				Sensor AEB025		Level	0

To change the K values, select one or more map boxes and press enter; a window with the following modification modes will appear:

ABSOLUTE – the value corresponding to the one entered can be exactly placed in the map.

LINEAR – adds or subtracts (if a number with negative sign is entered) the entered value to or from the one already in the box or boxes selected.

PERCENTAGE – adds or subtracts the entered value to or from the one in the box or boxes selected in percentage.

Modify value

132

Mode

Absolute

Linear

Percentage

OK Cancel

SWITCH FROM PC

When this function is enabled, the "SWITCH" button is displayed on the right to allow switching from GAS to PETROL directly from the PC.

Operation of the switch in the passenger compartment is temporarily disabled with this function enabled.

CARBURETION TESTING PROCEDURE:

Once the self-calibration procedure is completed, it is recommended to test the carburetion and make the necessary changes as described below.

NOTE: Before making any changes, check that the vehicle is running correctly on petrol as the Gas delivery system is based on the Petrol delivery system.

- Start the petrol-powered vehicle and wait for the engine to reach the operating temperature;
- Move into the area of the map where you want to test carburetion and keep the accelerator position steady;
- Check the value of the integrators/calibrators using an OBDII PDA if the vehicle is equipped with the OBDII diagnostic system, whereas if the vehicle does not have this diagnostic system you have to check the petrol injection time **(in vehicles equipped with OBDII, it is recommended to always check the carburetion using the integrators/calibrators as reference parameters, and not the petrol injection time)**.
- Enable the "Switch from PC" function and switch to GAS using the "Switch" button while being careful to keep the accelerator constantly steady;
- Check the value of the integrators/calibrators or of the PETROL injection time;

TEST USING THE INTEGRATORS/CALIBRATORS:

If the value of the calibrators/integrators shifts more than 3-4 units compared to normal PETROL operation during GAS operation (e.g. the calibrator moves from 8% to 11-12%), correct the value in the map while bearing in mind that:

- If the integrators/calibrators shift toward positive values, this usually means that the petrol control unit detects a weak carburetion, so in the box you are checking the K value should be increased until the integrators/calibrators return to the values detected with PETROL.
- If the integrators/calibrators shift toward negative values, this usually means that the petrol control unit detects a rich carburetion, so in the box you are checking the K value should be decreased until the integrators/calibrators return to the values detected with PETROL.

To check that the K values entered are correct, perform a few PETROL/GAS changes at a constant speed while checking that the calibrators/integrators are operating in a similar manner with both PETROL and GAS.

To perform a correct mapping, you have to road-test the vehicle while bearing in mind that it will not be possible to perform the procedure described above in some map areas because the engine will not abide staying in the same map area during the PETROL/GAS changes as it is in a transient state (acceleration or deceleration).

TEST USING THE PETROL INJECTION TIME:

If the value of the PETROL injection time during GAS operation shifts compared to normal PETROL operation (e.g. 0.5/1 ms longer or shorter), correct the carburetion remembering that:

- If the PETROL injection time increases, this means that the petrol control unit is detecting a weak carburetion, so in the box you are checking the K value should be increased until the PETROL injection time returns to the values detected with PETROL.
- If the PETROL injection time decreases, this means that the petrol control unit is detecting a rich carburetion, so in the box you are checking the K value should be decreased until the PETROL injection time returns to the values detected with PETROL.

To check that the K values entered are correct, perform a few PETROL/GAS changes at constant speed while checking that the PETROL injection time is working during GAS operation as it works during PETROL operation.

To perform a correct mapping, you have to road-test the vehicle while bearing in mind that it will not be possible to perform the procedure described above in some map areas because the engine will not abide staying in the same map area during the PETROL/GAS changes as it is in a transient state (acceleration or deceleration).

F5 GAS - PETROL

SEQUENTIAL FUEL CHANGE OVER

GAS is switched over to gradually one cylinder at a time when this function is enabled (recommended default option).

The switch over is usually smoother when this function is used.

If this function is not enabled, the PETROL injectors are all disconnected at the same time and switching over to GAS is immediate.

This option is automatically disabled when started in emergency mode with the switch.

ANTICIPATE THE INJECTION SEQUENCE

This is a guided procedure which allows automatic acquisition of the original injection sequence and enables a phase shift in advance of the gas injection. The entity of the phase shift also depends on the **“Number of cylinder banks”** control on page **F2 Lambda**.

This advance can improve vehicle function especially if the gas injectors are distant from the intake manifold.

This function is to be used only if it is really necessary since it disables the GRADUAL PETROL-GAS switch over feature, with the switch over occurring instantaneously.

OPERATION AT MINIMUM

GAS – the vehicle always runs with GAS when at idle speed when this function is enabled (recommended default option).

RETURN TO PETROL - while returning to idle speed, for a few seconds the vehicle switches to petrol and then returns to gas, in some cases preventing the vehicle from switching off during this phase.

Only use this function if absolutely necessary.

The value **“Revolutions to identify idle speed”** determines the number of revolutions below which this strategy is enabled.

PETROL - when running at idle speed, below the value of set revolutions, the vehicle always runs on petrol.

Gas function is restored when the number of revolutions exceeds the set value.

This function can only be used if running on gas at idle speed is practically impossible, unstable and causes the vehicle to switch off frequently.

The fact that the system is running on petrol is not indicated on the switch (which stays on gas), but by reading the gas injection time on the computer (which becomes nil).

In this phase, the switch continues to signal gas function and the gas solenoid valves stay enabled.

If there is an advance variable valve timing mechanism, if the supply remains active during this phase, ensure the idle speed advance does not disturb the system.

The screenshot shows a configuration window for 'Sequential fuel changeover'. It includes several sections: 'Operation at minimum' with radio buttons for Gas, Return to petrol, and Petrol, and a text input for 'RPM for identifying minimum' set to 1100; 'Operation at high RPM' with radio buttons for Gas, Petrol addition, and Petrol, and text inputs for 'RPM for petrol addition' (4500 - 9000), 'Petrol inj. time for petrol addition' (15 ms), and 'Amount of petrol addition' (2 ms). A table at the bottom displays various engine parameters.

PETROL	Revs	0rpm	Tinj.gas	0,00	0,00	Press.gas	n.a.	Lambda	n.a.
	T.gas	n.a.	Tinj.petrol	0,00	0,00	MAP	n.a.	Lambda 2	n.a.
	T.reducer	n.a.				Sensor AEB025		Level	0

OPERATION AT HIGH RPM

GAS – the vehicle normally runs on GAS when this function is enabled, even at high engine speed and load (recommended default option).

PETROL ADDITION – by enabling this function, there is the possibility to deliver an additional contribution of PETROL to the normal GAS injection. You can therefore set:

- RPM window inside of which petrol contribution goes into effect
- The PETROL contribution injection time, i.e. the read PETROL injection time reference, over which the PETROL contribution is delivered.

ATTENTION: The petrol contribution will be enabled only if both conditions are met.

- The petrol contribution value, i.e. the injector opening time of the PETROL delivered as a contribution.



The graphic status indicator on the far right side of the "Running at high engine speed" box will be **YELLOW** to signal temporary operation with PETROL contribution.

PETROL – temporary high engine speed and load operation with PETROL will commence when this function is enabled, and will last until the accelerator is released. Both the number of revolutions and the injection time after which the GAS control unit will switch over to PETROL can be set.

ATTENTION: Switching over from one type of fuel to the other will occur only if both conditions are met.

This function will be particularly recommended for all vehicles equipped with a very delicate catalyser subject to overheating while running on GAS.

Another application where this system proves to be extremely useful regards highly powerful engines (usually turbo), where in order to be able to power the high-load engine we are forced to use large GAS injectors with consequent instability at low loads.

The fact that the system is running on petrol is not indicated on the switch (which stays on gas), but by reading the gas injection time on the computer (which becomes nil).

In this phase, the switch continues to signal gas function and the gas solenoid valves stay enabled.

If there is an advance variable valve timing mechanism, if the supply remains active during this phase, ensure the idle speed advance does not disturb the system.



The graphic status indicator on the far right side of the "Running at high engine speed" box will be **RED** to signal temporary operation of the vehicle with PETROL.

F6 CHANGE CARB.

You can change carburetion to gas in manual mode in this menu, refining the GAS system self-calibration procedure. With this software version, it is however recommended to use the "Map" (see paragraph "F4 Map") and leave the default values (all zero) of the menu unaltered.

There are 2 columns in the MANUALLY MODIFY CARBURETION section:

IDLE: for engine speeds lower than 1000 rpm;
OUT OF IDLE: for engine speeds higher than 1000 rpm.

Both columns are divided into 4 cells characterised by the engine load.

When the box is marked red, this indicates the current engine operating condition.

The arrow buttons placed inside the two columns can be used to increase or decrease the values of all the boxes by 5 points.

PETROL	Revs	0rpm	Tinj.gas	0,00	0,00	Press.gas	n.a.	Lambda	n.a.
	T.gas	n.a.	Tinj.petrol	0,00	0,00	MAP	n.a.	Lambda 2	n.a.
	T.reducer	n.a.				Sensor AEB025		Level	0

EXTRA INJECTION SENSITIVENESS

EXTRA INJECTIONS are very short injections made in addition to the normal injection, and are given during petrol operation, usually during accelerations, to slightly enrich the carburetion, thus improving engine performance.

The extra injections can be recognised by looking at the progress of the RED dot in the map, or the petrol injection time that will switch from normal injection time (e.g. 8ms) to a much shorter time (e.g. 0.8ms), to then immediately go back to the previous one.

If we control the extra injections like a normal injection during gas operation, we may enrich the carburetion too much, with the risk that the engine runs too fast serrating (this happens above all in natural gas systems, whereas the problem is usually less noticeable in LPG systems).

By enabling the "EXTRA INJECTION SENSITIVITY" check at the side, the parameters of the GAS extra injections can be changed, increasing or decreasing the GAS injectors opening time during the extra injection.

By moving the slider towards the plus sign, we increase the gas extra injection time, whereas we decrease it by moving the slider towards the minus sign.

If the check is not enabled, the extra injection will not be considered as such, and the GAS control unit will control the impulse like a normal fuel injection.

ENRICHMENT IN ACCELERATION

In some models of vehicles, the PETROL injection time almost instantaneously changes from a MEDIUM-LOW level to a high value (e.g. 15-16 ms) when accelerating suddenly. This can cause malfunctioning when GAS is used since the carburetion would be greatly enriched.

To get round this problem, use the "Enrichment in acceleration" slider in the following way:

- By moving towards the plus sign, the control unit will follow the PETROL injection time changes faster and faster.

- By moving towards the minus sign, this change will be increasingly narrower and filtered.

The background of the slider lights up BLUE when the "Enrichment in acceleration" strategy goes into operation.

WEAKENING ON MAZDAS

On some MAZDA models we see a change from a sequential injection strategy to a half-group with opening of the PETROL injectors in pairs during PETROL operation in acceleration.

This condition is easily to recognise by watching the course of the RED dot in the map or the PETROL injection time in acceleration.

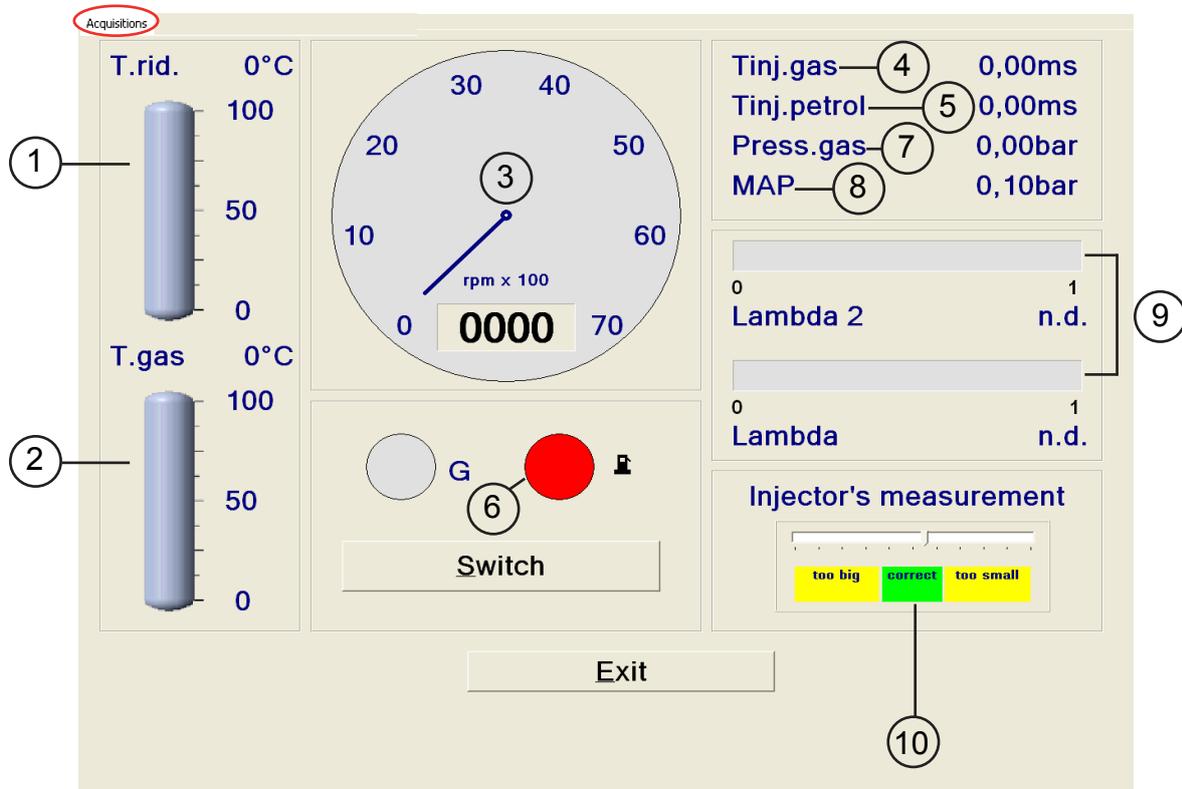
When switching from one injection strategy to the other, you will notice that the injection time normally displayed will take on a value of about half that previously implemented (e.g. from about 8ms to about 4ms), and you will see a continuous variation of the RED dot between these two values or, in some vehicles, the RED dot will remain stationary up to a certain number of revolutions to then return to the initial PETROL injection time.

This working condition may cause malfunctioning during GAS operation since when injection changes from a sequential type of strategy to a half-group (low injection time), GAS carburetion tends to become highly enriched, causing erratic behaviour.

Therefore, in order to get round this problem all you have to do is enter a value adequate for resisting this tendency in "Leaning on MAZDAS".

Display

All the signals managed by the control unit are displayed on this page.

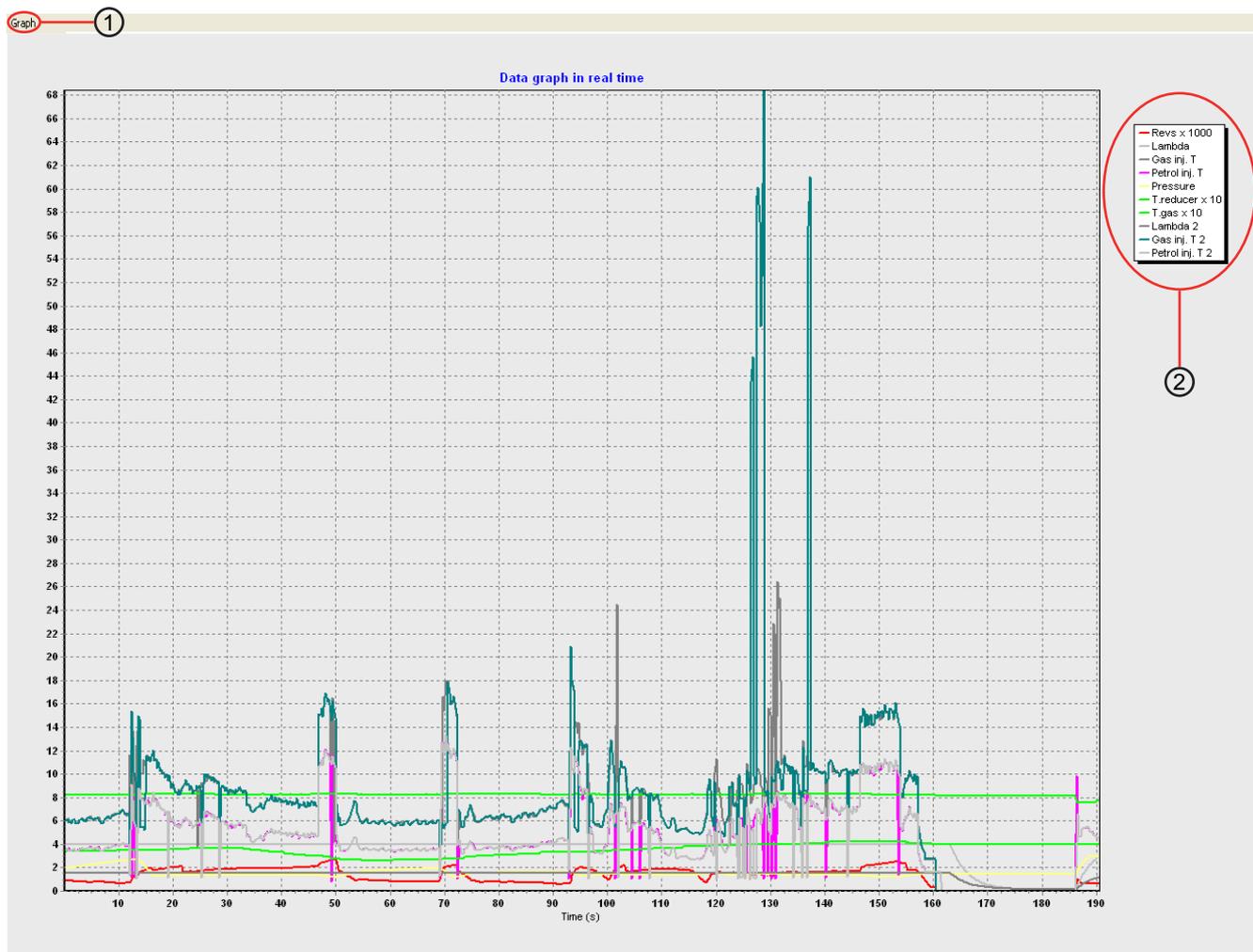


Acquisitions: For storing the GAS control unit operation parameters in a file that can be displayed via a chart.

- Start/Stop saving: For starting/stopping the data saving operation.
- Display chart: For viewing the trend of the saved data in a chart (see chapter "Display chart").
- Send by e-mail: For sending the file in which the data are save by e-mail.

Note: This option is available only for Outlook.

- 1) It displays the temperature of the GAS reduction gear (expressed in °C);
- 2) It displays the gas temperature (expressed in °C);
- 3) It displays the number of engine revolutions in real time (rpm);
- 4) It displays the Gas injection time in real time (ms);
- 5) It displays the petrol injection time in real time (ms);
- 6) It indicates whether the vehicle is running on Gas or Petrol;
- 7) It is the pressure difference between the gas in the gas injectors and that in the intake manifolds read by the pressure gauge supplied in the kit (expressed in Bar);
- 8) It displays the pressure in the intake manifolds (expressed in Bar);
- 9) It is the voltage of the lambda probe(s).
If the wires of the lambda probe(s) are not connected, there will be no display;
- 10) It provides information useful for correctly sizing the nozzles installed on the GAS injectors.



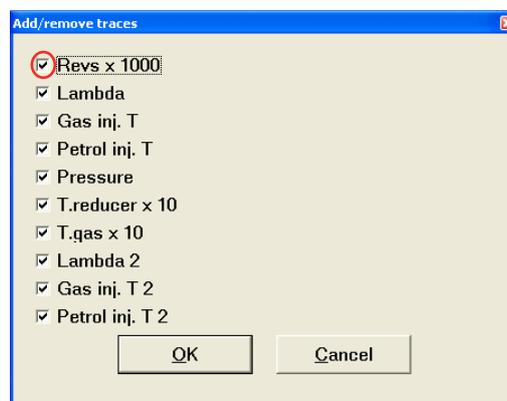
One of the acquisitions previously made and saved can be graphically displayed (see figure) by selecting "Display chart" (see chapter "Vehicle configuration").

By moving from left to right with the left mouse button pressed, you can enlarge the selected area; similarly, by moving from right to left you will cancel this operation and return to the original display.

You can move within the chart by keeping the right mouse button pressed.

1) You can select the following items in the "Chart" menu:

- Trace management: It lets you choose all the parameters (traces) you plan to display on the chart.
- Print: It lets you print the displayed chart.
- Cancel zoom: It lets you bring the chart back to default display (100%).
- Exit: It lets you exit the "Chart" menu.



2) Chart key: Indicates the colours assigned to the various signals displayed. Only the traces selected in "Trace management" in the "Chart" menu are displayed (see point 1).

NOTE: The "T inj.gas 2" and "T inj.benz.2" traces refer to "GAS injection Time" and "PETROL injection Time" of the second bank, respectively.

Diagnosis

If present, one or more errors detected by the GAS control unit are displayed on this page. There is an example of a display of some of these errors in the figure below.

Diagnosis	State
Gas injectors	Error
Petrol injector connection	Error
Tank solenoid valve	Error
Reduction gear solenoid valve	Error

Petrol injectors signal diagnosis

A	B	C	D	A	B	C	D
OK							

OK - Injector signal properly read X - Injector signal not read

Gas injectors cut out

A	B	C	D	A	B	C	D
Off							
On							

Enable diagnosis

Operating times (hh:mm)

Gas	0:00	Petrol	0:00
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When the GAS control unit detects a diagnosis error on the parameter read, it will perform the action corresponding to the error detected. The possible diagnoses of the PETROL control unit are:

Diagnosis	Action
Gas injectors	Change to Petrol
Tank solenoid valve	Change to Petrol
Reduction gear solenoid valve	Change to Petrol
Gas pressure sensor	Change to Petrol
Map sensor	Change to Petrol
Gas temperature sensor	Change to Petrol
Water temperature sensor	Change to Petrol
Switch present	None

The diagnostics performed on the reading of the petrol injection time is graphically represented in the box "Petrol injector signal diagnosis".

That the signal has been correctly read is indicated with "OK", and the presence of a reading error corresponding to injector A, B, C or D is indicated with the symbol "X", respectively.

NOTE: In the case of 5/6/8-cylinder vehicles, the PETROL injectors and corresponding GAS injectors marked in red refer to the second bank.

One or more GAS injectors can be cut out electrically in the "Gas injectors cut-out" box by pressing the "Off" button, in this way enabling the corresponding PETROL injector.

This operation is particularly useful, for example, for diagnosing the malfunctioning of one or more GAS injectors.

The diagnostic errors detected can be deleted from the control unit memory simply by pressing the lower right-hand button "Zero-set diagnosis errors".

By enabling or disabling the check in the "Enable diagnosis" box, display of the diagnostic errors will be activated or deactivated.

The error detected will be signalled to the driver by the yellow LED coming on and remaining steady, and by the slow blinking of the green LED on the switch. Moreover, the buzzer inside the switch will be enabled to simplify identification of the alarm status.

To deactivate the audible alarm, just press the switch button to change the car from Gas set-up to the Petrol position.

NOTE: Switching over to petrol is envisaged for some errors. In this case, the GAS control unit will automatically switch over when the error is detected.

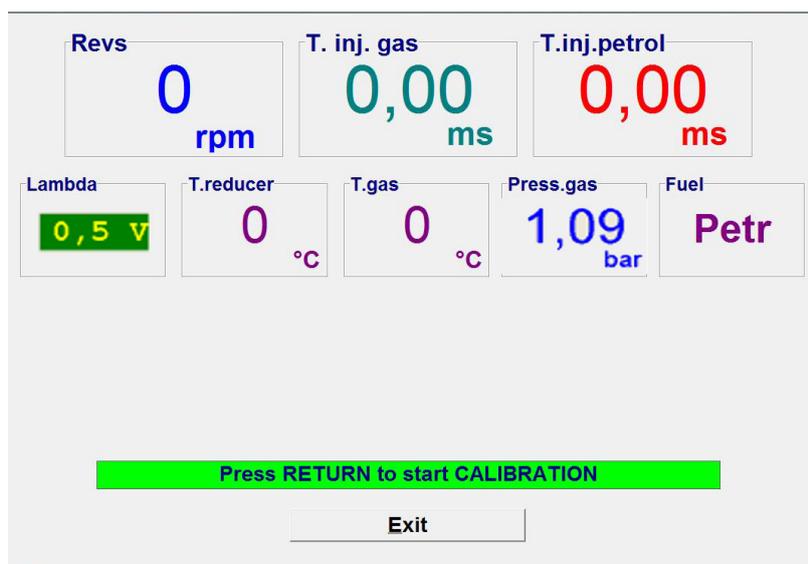
To return to GAS operation, it is necessary to shut down and re-start the vehicle.

Counters (hh:mm) register the vehicle's time of operation (shown in hours and minutes) during GAS and PETROL operation, is found in the "Function Time" option.

AUTO CALIBRATION

After the GAS control unit has been correctly set according to the vehicle on which it is installed (see "Vehicle configuration"), in this section it is possible to automatically calibrate the GAS control unit so as to get car carburetion that on the average is correct during GAS operation.

Before you start the self-calibration procedure, you have to check that the vehicle is in good operating condition with petrol as the Gas fuel delivery system is based on the petrol system.



Follow these instructions for self-calibration:

- 1) Start the vehicle running on Petrol and check that the following parameters are correct:
 - **PETROL injection time**
 - **Number of rpm**
 - **GAS temperature**
 - **Reduction gear temperature**
- 2) Wait for the engine to reach the operating temperature.
- 3) Start the self-calibration procedure by pressing the SEND key and follow the instructions displayed on the monitor.

Once the number of engine rpm specified on the monitor is reached, the control unit will perform several switch overs from petrol to gas. It is important that the accelerator be kept steady in this situation, even if the revolutions shift, without trying to bring the number of rpm back to the value taken on during PETROL operation.

After SELF-CALIBRATION is completed, try the vehicle running on gas to verify it operates correctly, and if necessary, correct the calibration using the map (see paragraph "**F4 Map**") as previously illustrated.

SAVE CONFIGURATION

It is possible to save all calibration parameters set in the **"Vehicle configuration"** menu in a file in this submenu.

This file can later be used for configuring other control units installed on vehicles of the same model and with the same type of fuel, NATURAL GAS or LPG.

Note: The "Control unit type" and "Fuel type" menus (in the lower part of the window) appear **only if the control unit is not connected to the PC.**

The "Fuel type" parameter cannot be modified because it depends on what is set in the "Vehicle configuration" menu (see paragraph **"F1 Change-Over"**). If the control unit **is connected** to the computer, this information is saved automatically.

To save, specify the "Name of the file to save" and click on OK.

By selecting a configuration in the list of those available, you can also sent the file by e-mail. It will be automatically attached to the message.

LOAD CONFIGURATION

It is possible to upload a pre-existing configuration into the control unit from this submenu.

The configuration files are in two separate directories: one for LPG configurations and the other for NATURAL GAS configurations.

Before uploading a configuration it is necessary to go to **"VEHICLE CONFIGURATION"** (see paragraph **"F1 Change-Over"**) and select natural gas or LPG in "Fuel type", based on the configuration you want to upload.

The "Control unit type" and "Fuel type" menus (in the lower part of the window) appear **only if the control unit is not connected to the PC.**

If the control unit **is connected** to the computer, only the configurations available for automatically recognised control unit are proposed in the list.

Select the file you want to upload and click on OK.

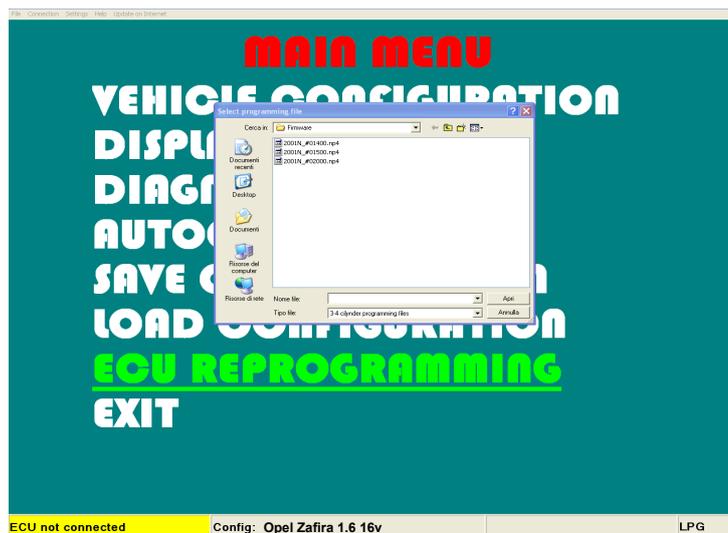
NOTE: It is possible to save or upload the configurations only from the **CONFIGNG** and **CONFIGLPG** subdirectories contained in the main directory created during software installation.

ECU REPROGRAMMING

From this submenu it is possible to update the FIRMWARE (the management program in the control unit) of the gas control unit after updates.

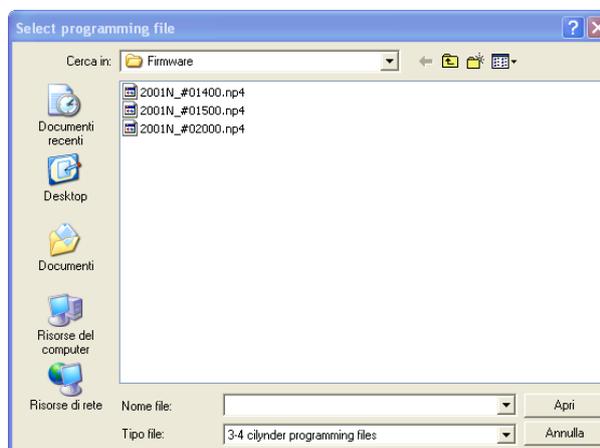
The latest firmware version available when the CD-ROM is created is always included in the calibration software installation CD-ROM, whereas any subsequent versions can be sent by e-mail or on any other removable support.

To update the FIRMWARE, select "REPROGRAM CONTROL UNIT". The window "Select program file" will be displayed. Select the update file and click on open. If there is more than one file, select the one with the highest number (most recent version).



NOTE: To avoid losing the configuration of the control unit, make sure that the control unit is connected to the computer before updating.

Whether or not the control unit is connected is indicated on the bottom left-hand side of the main menu screen.



IMPORTANT: to run the reprogramming, it is necessary that Internet Explorer 5.5 or higher be installed on the PC.



EMER s.p.a. *Via Roma n° 104/A*
25060 Collebeato (Brescia)
Tel. +39.030.2510391 - fax +39.030.2510392
E-Mail: commercial@emer.it