

WARRANTY CARD

Warranty time: 12 months or 30 000 km.

Serial Number

Distributor

Signature

Car brand Number

Drived kilometers since the installing

Owner

Data of the installing

Name & signature of the installer

Warranty terms:

The warranty is only about fabric defects accured during manufacturing whitch have acured in the warranty time. Repairs and installing are made only by AUTHORIZED COMPANY EXPERTS!

The warranty is not about damages from not keeping the safety use instructions, mechanical damages and floods in the module. In these cases the warranty is no longer valid and repairs can be done.

INSTALLING & ADJUSTMENT manual



CAR BSM GAS
Multipoint Sequential LPG Injection System

June 2008

This mini kit contains:

1. ECU
2. Reducer
3. Injector rail - 4 cylinders
4. Cables with connectors
5. Temp/Pressure sensor installed on the rail
6. Vacuum sensor
7. Nozzles - 8
8. LPG valve
9. Filter
10. Hoses - 4 types
11. Accessories
12. Installing and setting manual

Preparations for the system settings

After all parts of the system have been properly installed, detailed check of the mechanical and electrical parts of the system must be done separately. When the mechanical installation is properly done check of the electric connections of the following elements is followed:

- **Powering both electric valves** (particular attention should be granted to their ground witch must be independent from the connection of the measuring sensors with a separate cable to a substantial ground from the body of the car or directly from the terminal of the accumulator)
- **Cut-off of the petrol injectors** (in some cars an inversion of the entering connectors is required – connected to the petrol computer). When connecting the LPG electronic control unit (ECU) with cables without injector connectors (particularly with Japanese, Americans and Korean cars) be careful for the sequence and the equality of the connections for every separate cylinder
- **Supply of the injector rail** – in this case the possibility for a mistake is reduced to the minimum. Attention should be granted to sequence of the cylinders. Much more attention should be granted to the ground connection of the rail. Here should be used cable terminals and screws with nuts. In some places the paint, dirt and anticorrosion plate must be cleaned where is needed.

Exemplary data about the type of nozzles for VALTEK/RAIL injectors with some cars

Year	Make/ Model	Engine Type	Displace- ment ms	Power kW	Number of Cyl.	Power per Cyl.	Nozzle mm
1 1996	MAZDA 626		2.5		6	0.0	1.9
2 1998	MERCEDES	E280	2.8	150	6	25.0	2.0
3 2005	MITSUBISHI LANCER	4G18	1.6	72	4	18.0	1.6
4 1997	MERCEDES C230		2.3	110	4	27.5	2.0
5 2004	OPEL ASTRA		1.6	74	4	18.5	1.5
6 1999	CITROEN XM-2 / RGX	(XU10J2TE)	2.0	110	4	27.5	1.9
7 1998	BMW 318i		1.9	103	4	25.8	1.7
8 2000	SCODA OCTAVIA	ADY	2.0	85	4	21.3	1.9
9 2001	SUZUKI GRAND VITARA	H271	2.7	94	6	15.7	1.7
10 2003	FORD FOCUS	CDDA	1.6	71	4	17.8	1.5
11 1999	TOYOTA PICNIC	3S8	2.0	94	4	23.5	1.7
12 2005	VAZ 2115		1.5	56.4	4	14.1	1.3
13 1999	VW TRANSPORTER	AVT	2.5	85	5	17.0	1.9
14 1995	MITSUBISHI PAJERO	6G74	3.5	153	6	25.5	2.0
15 2000	SUBARU LEGACY	EJ25	2.5	123	4	30.8	2.2
16 2002	VOLVO SC70	B5254T	2.5	155	5	31.0	1.9
17 1998	AUDI A6	ALF	2.4	121	6	20.2	1.8
18 1998	SEAT ALHAMBRA	ADY	2	85	4	21.3	
19 1998	BMW 316i	M43	1.6	75	4	18.8	1.8
20 1999	SAAB 9.5	B235E	2.3	125	4	31.3	2.2

Recomendation data for nozzle choice according to the power of the engine with injectors:

4 cylinders nozzle holes								
engine power (hr)	1,2	1,4	1,6	1,8	2,0	2,2	2,5	2,8
40 - 60								
61 - 79								
80 - 100								
101 - 120								
121 - 137								
138 - 160								
161 - 180								
181 - 200								

6 cylinders nozzle holes									
engine power (hr)	1,4	1,6	1,8	2,0	2,2	2,5	2,8	3,0	3,5
140 - 160									
161 - 180									
181 - 210									
211 - 240									
241 - 270									
271 - 300									
301 - 330									
331 - 360									

Table for calculating the size nozzle (**RAIL**)
(for example 160 hr for 4 cylinders is 40 hr / cyl.)

Calculation table nozzle holes								
power	1,2	1,4	1,6	1,8	2,0	2,2	2,5	2,8
15 hr/cyl.								
20								
25								
30								
35								
40								
45								
50								

ATTENTION: For automobiles with “full group” engines it is necessary to use one or two bigger sizes than those from the table above.

• **Connecting of the sensors** – an independent supply is provided by separate cables, terminals and connectors directly from the ECU. It is important to know that the ground of these sensors should not be used for supplying other elements of the system – injectors, valves, common power of the ECU etc.

• **Level meter with turnover switch and buzzer** – separated cables are provided for them directly from the ECU and from the level meter sensor, mounted on the gas tank.

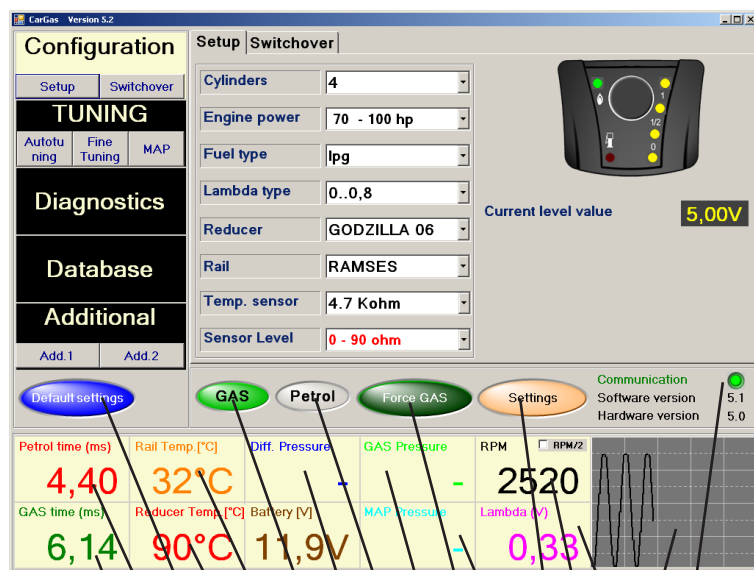
• **Interface connection between the programming computer and the LPG ECU** – special cable and connectors

• **Supplying and information cables** – “+12V”, “+12V engine on”, “+12V from the fuel pump” and “ground cable”. The ground cable should be connected directly and stable to the terminal of the battery and the other 3 are not to be connected together, because they have their own object. The “+12V engine on” cable should not be mistaken with the “ACC” terminal.

When the mechanical and electrical parts are properly installed you can go to starting the engine on petrol, warming it up, and primary checks and settings. To guarantee the automatic tuning some general car data is being required.

Legend

1. GAS injection time in milliseconds (ms)
2. Petrol injection time in milliseconds (ms)
3. Button for factory settings
4. Current temperature on the reducer
5. Current temperature on the GAS rail
6. **Button GAS** - it working when reducer temp is reached or 10 seconds after the engine is on
7. Differential pressure (0-3bar)



Pic. 1

8. Button Petrol

Button GAS is green when the engine is working on GAS, it's blinking when the reducer temp. is not reached or wait 10 seconds after switching from Petrol. Button Petrol is red when the system works on petrol.

9. GAS pressure (0-3bar)

10. Force GAS – you can switch over anyway to GAS.

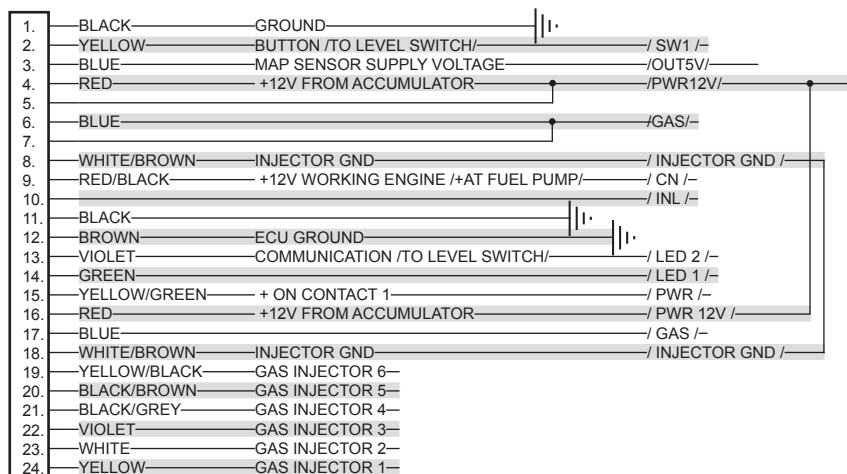
11. Vacuum (-1 – 2bar)

12. Button “SETTINGS” for language and “COM Port”.

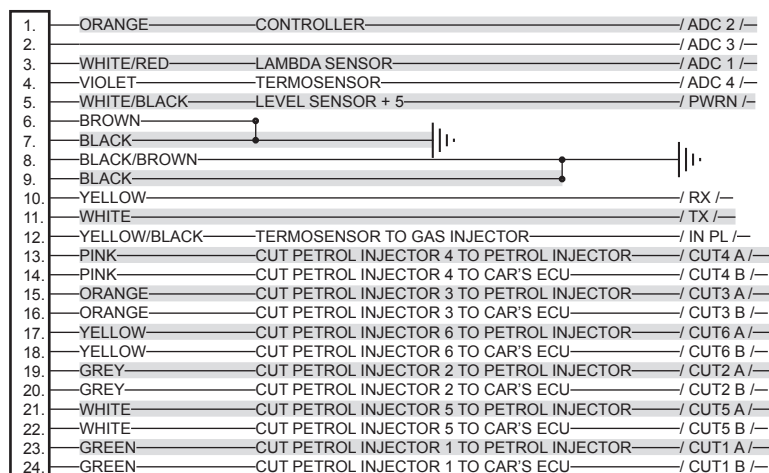
13. RPM meter

The scheme of the cables tuft

BLACK



WHITE



* **GAS let off during Cut Off (sec.)**

* **GAS injector time when let off during Cut Off (ms)**

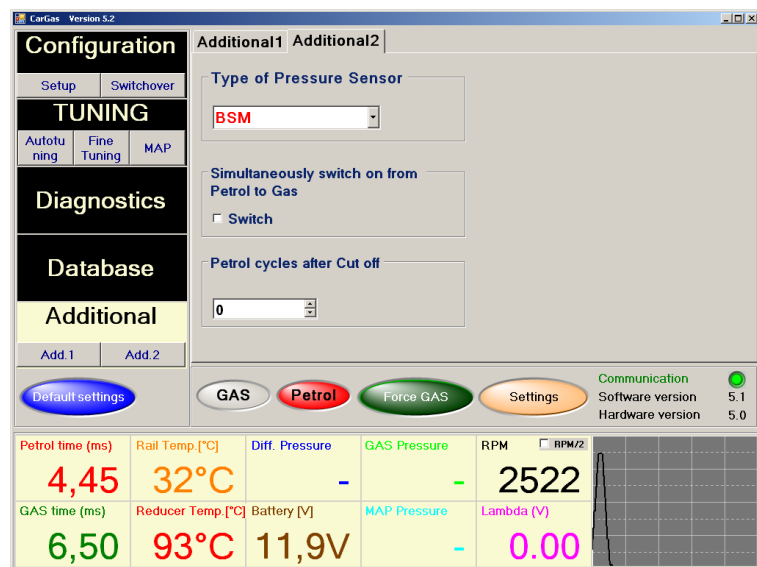
This two sliders, which allow to decrease gas pressure after continuous “CUT OFF” mode for the engine, or for the “turbo” engines, which consume a lot of gas, also for the cars with big power (over 150 PS) with automatic transmissions, which are put often in “kick down” mode. First slider determines how much seconds you have to let the gas off. Sometimes if you choose the times over 5 sec., the petrol ECU could light the “Check engine” lamp, so this function must be used very carefully. The second slider is used to adjust the length of Gas injector time.

Additional 2 (Pic. 10)

* **Type of pressure sensor**

* **Simultaneously turn-over all cylinders from petrol to LPG/CNG.** This function is helpful for some cars with “full group” injector system, because all petrol injectors could not be interrupted separately. (Pic. 10)

* **Petrol cycles after Cut Off**



Pic. 10

14. O2 sensor curve (in upper left corner current value in volts)

15. Communication - lights on green when is normal, lights red when is missing or is incorrect

Menu Configuration (Pic. 1)

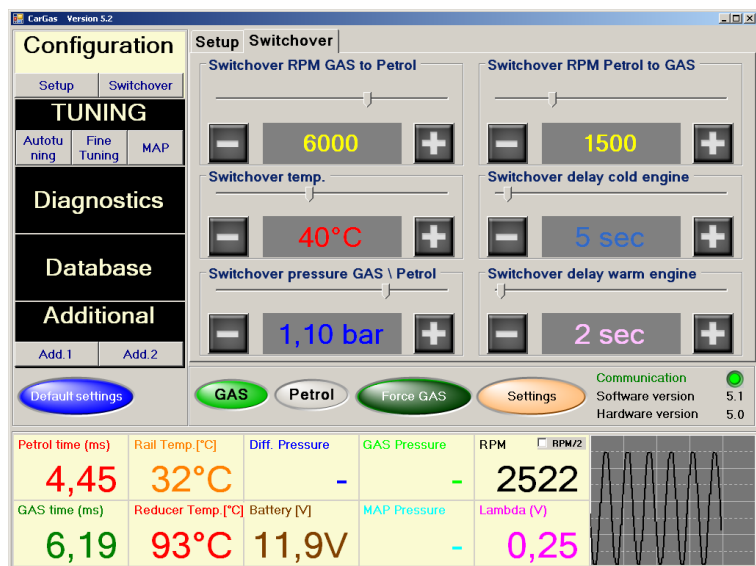
It is necessary to select from the first menu “**Configuration / Setup**” number of the cylinders, app. power in h.p., the type of temperature sensor of the reducer, pressure of the automating switchover “LPG/Petrol”, time for switching over after warming up the engine from “Petrol/LPG” with cold and warm engine, temperature of the automatic switchover from Petrol to LPG.

After completing the initial settings you can select menu 4 – “**DIAGNOSTICS**” (Pic. 7) in order to check to correct cut-off of petrol injectors, their sequence and proper temperatures. If there is a sequential type of control of the petrol injectors you’ll see on the left side of the screen and on the round display the real RPM, also you’ll see sequential movement of the colored squares in the right side of the screen (36) for each cylinder separately. When the control is parallel 2/2 or “full group” you’ll see it clearly on screen – Petrol injector sequence. In this case you’ll have to switch the RPM to real values by using the checkbox in RPM meter. If there is a missing colored square for some cylinder you have to check the electrical connections for petrol injectors, if all the squares are missing – you have to turn over the input connectors to petrol ECU side.

It is realized when all the power consumers are switched off (A/C, window, seat and mirror heaters, lights, cooling fan of the radiator). When reach 3000 +/- 500 RPM without load and keep it permanent, you can push the “Start auto tuning” button (27). After 20-50 seconds in the dark field (38) you’ll see the number between 1-2.5 and message “OK” under it, which means the auto tuning is finished. There is a possibility to choose 3 different ways of driving depending on the driver’s preferences, conditionally called “Economic”, “Normal”, “Sport”. They could be chosen by using the checkboxes in screen.

- Sensor level

Level sensor. (Pic. 1) From this menu you can choose type of sensor and also



Pic. 2

adjust all 4 levels by sliders. Moving non standardtype sensor you could adjust all 4 levels, measured in volts. On the screen are shown the LED-s from the switch - petrol, gas, reserve, 1/4, 1/2, 3/4. When the level from multivalve is increasing and the voltage from the sensor is decreasing, you have to choose "Non standard reverse sensor" The adjustment procedure is the same.

Menu Switch over (Pic. 2)

* **Switchover RPM from GAS to Petrol**

* **Slider for switchover temperature Petrol/GAS**

* **Slider for setting the switchover pressure from GAS to Petrol** (when the GAS tank is empty)

* **Switchover RPM from Petrol to GAS** - The system allows to turnover from Petrol to GAS when the reached RPM is chosen by the slider. If it is in right end position, the function is switched off and the system is turnover independently from RPM.

* **Switchover delay warm engine**

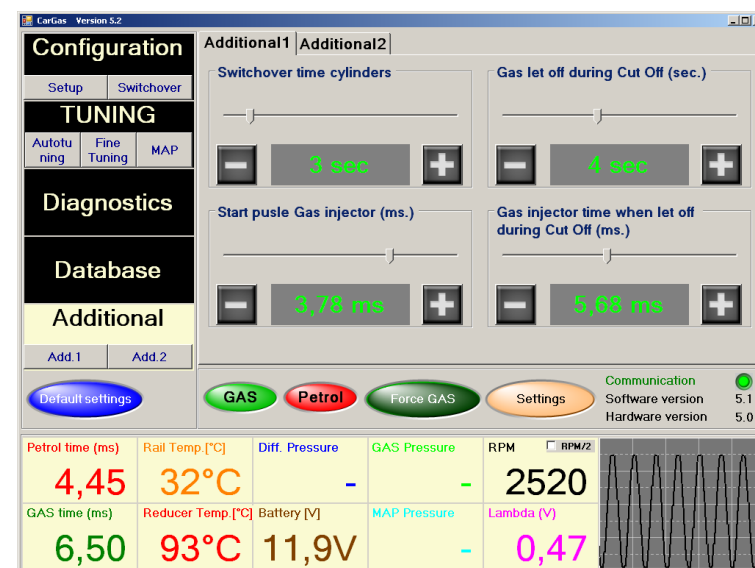
* **Switchover delay cold engine**

the fails by button "CLIENT'S DATA" and to refer the adjustment for the car and the client's data – like "kilometres", "installing data" etc.

Menu Additional 1 (Pic. 9)

* **Switchover time between cylinder**. Sometimes in cold weather (under 10oC) it is necessary to switchover the GAS injectors more slowly to insure easy turnover from Petrol to GAS. This slider is intended to choose the time for switchover between each cylinder. If the time is set for instance 3 sec., the system is working like this (for first time only)! All cylinders are working on Petrol, after that every one is working on GAS sequentially, but only one on GAS / three on Petrol. The function is off if the slider is in right end position.

* **Start pulse GAS injector (ms)**: very special function, which could be adjusted - Gas injector start pulse length (Pic. 6, Left). For the injectors with different coil resistance (1, 1.5, 2, 3ohm) the length of the start impulse must be precisely adjusted, so by this slider you could readjust the necessary time for correspond coil resistance (basically in the system are given 3 ohm coils and factory set time is 3.78ms., you don't need to use this function). For some cars with very short petrol injector times (up to 2.2ms) the coils could be changed with 1.5 or 2ohm coils) in this case the system performance could be better. The times to be choosen are as follow: 1ohm - 2.5ms; 1.5 - 2.8ms; 2ohm - 3.2ms.



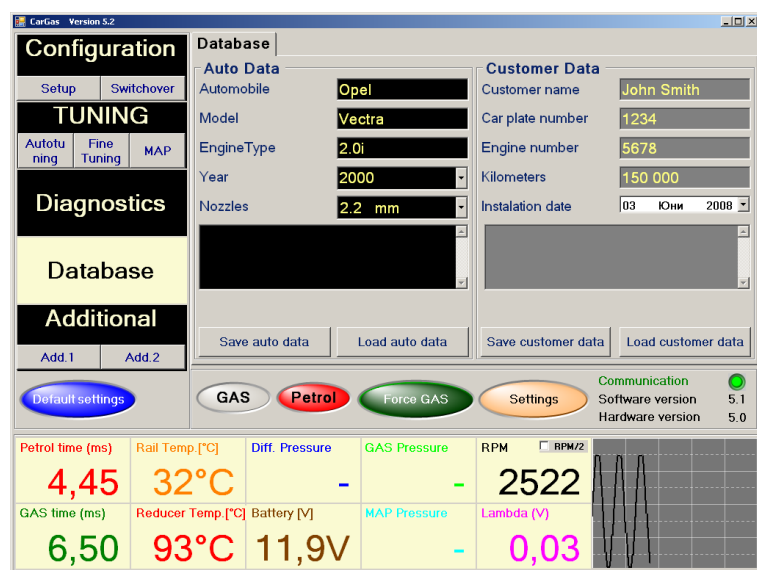
Pic. 9

(Pic. 8)

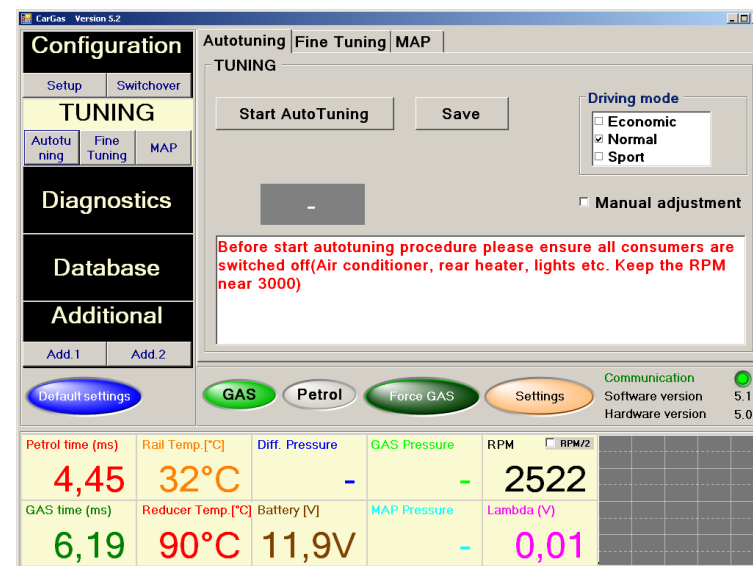
“CAR DATA” – if you want to create new folder with adjustment information for a car, after you fill lines “CAR”, “MODEL”, “ENGINE TYPE” etc., by “SAVE AUTO DATA” button you could save the details for the given car, the software automatically creates the fails with the names of the car (Ford, Opel, Honda etc). The fails are with extension “*.LPG” or “*.CNG” depending on the first menu “SETINGS”. So the created fails you can use to adjust the next car types from previous ones. By button “LOAD AUTO DATA” you choose corresponding fail, on the screen will appear button “LOAD in the ECU” and by pressing it you can load the adjustment parameters into the ECU.

“CLIENT’S DATA”:

After the adjustment of the system is made it is possible to save the information for about the client. You have to fill the lines, by button “SAVE” you save information into a different file, useful for the installer. The names of the files with the data about the client are automatically generated like “CAR NAME_MODEL_PLATE NUMBER (for example OPEL_VECTRA_CA1234XB) which data you can change for your needs. The fails are with extension *.CNT and they are saved in subdirectory “CLIENT’S DATA”. On the time of maintenance of the LPG/CNG systems you can open



Pic. 8



Pic. 3

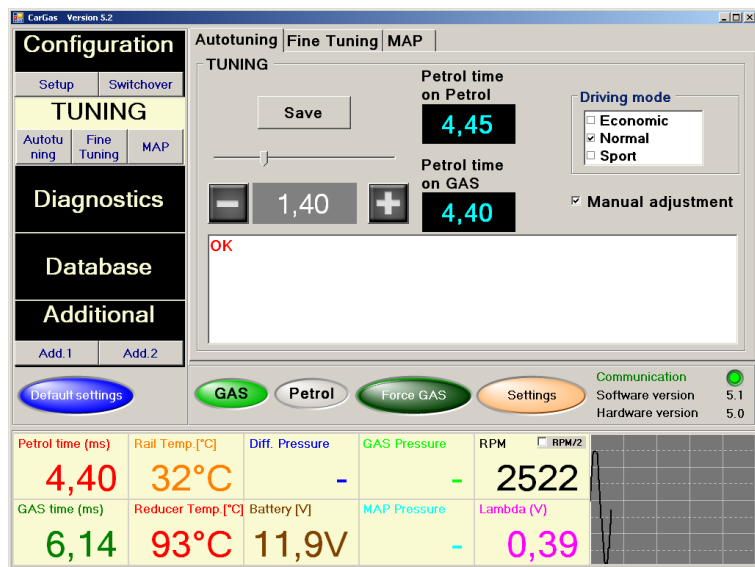
Menu Tuning / Autotuning (Pic. 3)

“AUTOTUNING” (Pic. 3) it is realize when all the consumers are switched off (AC, rear defroster, mirror defroster, cooling fan, lights, fog lights, etc.). At 3000 RPM $\pm$ 500 RPM/min without load (if gear is automatic – in “P” position), pushing the button “Start auto tuning” and keeping upper RPM, after 20 ÷ 50 sec in the dark field under the button will appear the number from 1.0 to 2.5 and the message “OK” in white field – it is mean the automatic tuning is finished. If the auto tuning is not working, the cause will appear in the white field. When you solve the problem (change the nozzles increase the RPM or others) start the automatic tuning again.

Manual adjustment (Pic 4)

Manual adjustment – For many reasons the auto tuning could not be passed, so the system offers tuning by hand, it is makes this way.

Select the checkbox Manual adjustment. Put the engine on idle. In the left dark square you see the petrol injection time on Petrol. When the Petrol ECU really starts to control the time for idle, you have to turnover on GAS. In the right square you see the Petrol time on GAS, so after a few seconds the Petrol ECU starts to control the



Pic. 4

time. If there is difference between two times, by slider you have to adjust the time to be equal with other one.

If the time is bigger, you move the slider right and vice versa. When you equalize the times, button "OK" writes the parameters into the GAS ECU.

Fine tuning (Pic 5)

For a more precise adjustment of the system you can go and execute it by using the "FINE TUNING" (Pic. 5) menu. In this case you have to ensure driving conditions with proper different loads for the engine, adjusting each coefficient to equalize the petrol times on Petrol and GAS modes. It is a hard procedure, but it ensures the right adjustment in any loads of the car engine. You also have to make fine tuning when you notice the change in the way of working of the engine (loosing power or increasing the consumption of GAS fuel).

On the screen you see 16 coefficients; the working in each moment is colored in blue. Ensure permanent load, RPM and throttle position (gas pedal) switchover from Petrol to GAS and if the petrol injector times are changing, correct the colored in blue coefficient simultaneously with switching over. If the petrol time when turn over from Petrol to GAS is increased you have to increase the coefficient and vice versa

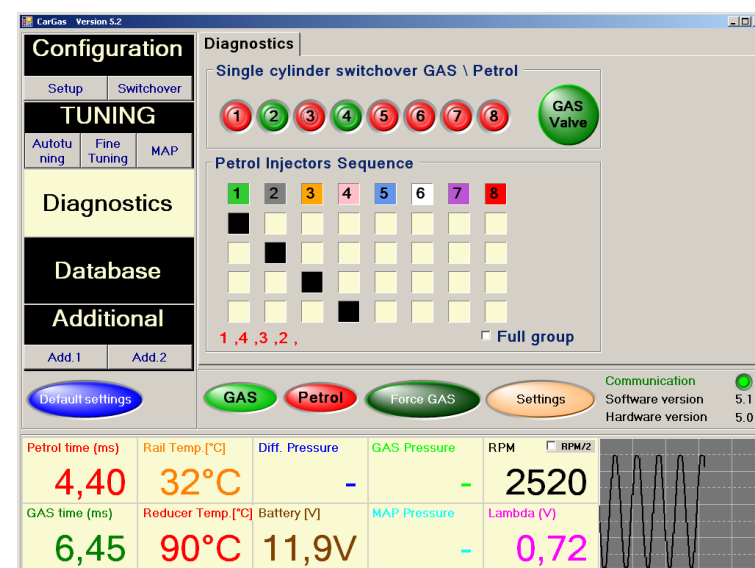
Menu Diagnostic (Pic 7)

From the menu "DIAGNOSTICS" (Pic. 4) the right connection of the Petrol injector wires could be checked, also their sequence. If the control system of Petrol injectors is sequential, you could see on the left upper side of the screen real RPM of the engine, also sequent working of the colored squares for each cylinder separately in the field "Sequence of Petrol injectors". If the system is "Semisequent" or "Full group" from the type of moving of the red squares you could determine the type of the Petrol ECU control. In this case you need to switch check box "RPM/2" under the round RPM meter. If some red square is missing you have to check connection for corresponding cylinder, if it is for all cylinders – you have to reverse both wires from our harness, connected to the Petrol ECU.

If the engine is "Full group" or "semisequential", you can choose this check box. In this case the GAS injectors will inject two times less fuel (missing one cycle). On that reason the nozzles have to be one or two sizes bigger. From the menu the GAS valve or each cylinder could be switched, to localize the problem.

Menu Database (Pic. 8)

"DATA BASE" – this screen is divided on two: "CAR DATA" and "CLIENT'S DATA"



Pic. 7

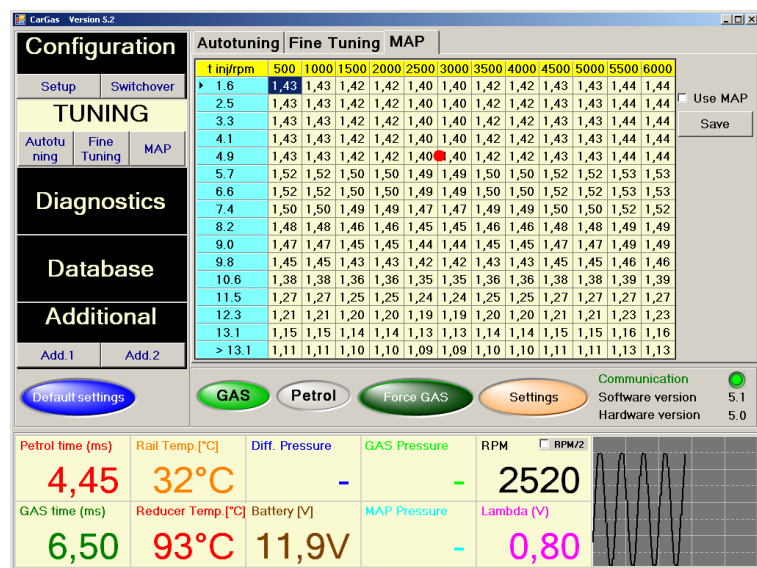
and gas pedal (fixed TPS), you see the blue line on the petrol inj. time. You have to switch from petrol to LPG and move with arrows up or down current coefficient till the valve, when the petrol inj. time is equal on petrol and LPG running. The same procedure for different petrol times will give you more precise adjustment. By arrows of the neighbour coefficients you have to adjust them so, the red curve 32 is slightly falling down to the high P.

Menu Tuning / MAP (Pic. 6)

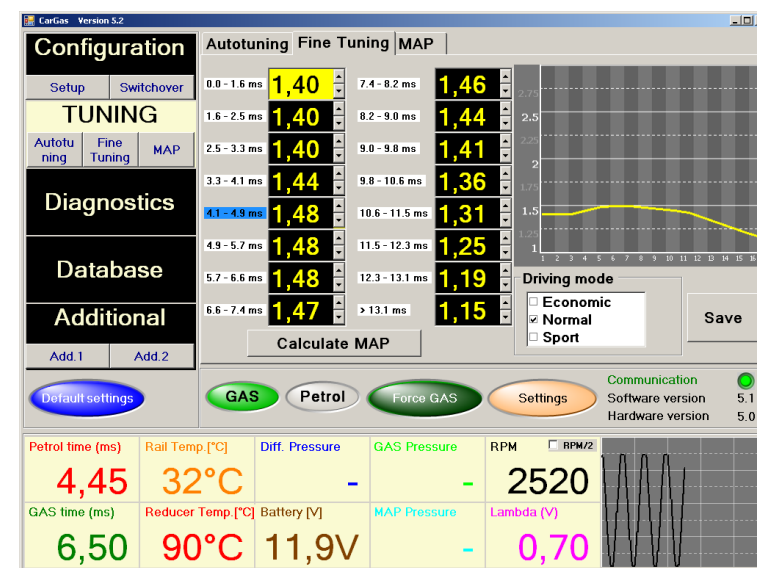
"MAP" – the system has an option to work with the three size "MAP" – it is the function of the coefficients depending from the revolutions and engine load – ms. (Pic. 6)

To work with the map, you have to switch to menu "MAP" and the check box "Use MAP". There is also a red point, which is dynamic, signing the three parameters at the present moment.

The change of the cell of the map or square of cells you can make by mouse marking (with blue colour) and pushing "ENTER". You will see the small menu for type of modification of coefficients – linear, percentage and adding of value. These values in the map could be from 1.00 to 2.50. Each of the time when you change some cells, the system is working with these coefficients, you have to save them by pushing "SAVE". (Pic. 6)



Pic. 6



Pic. 5

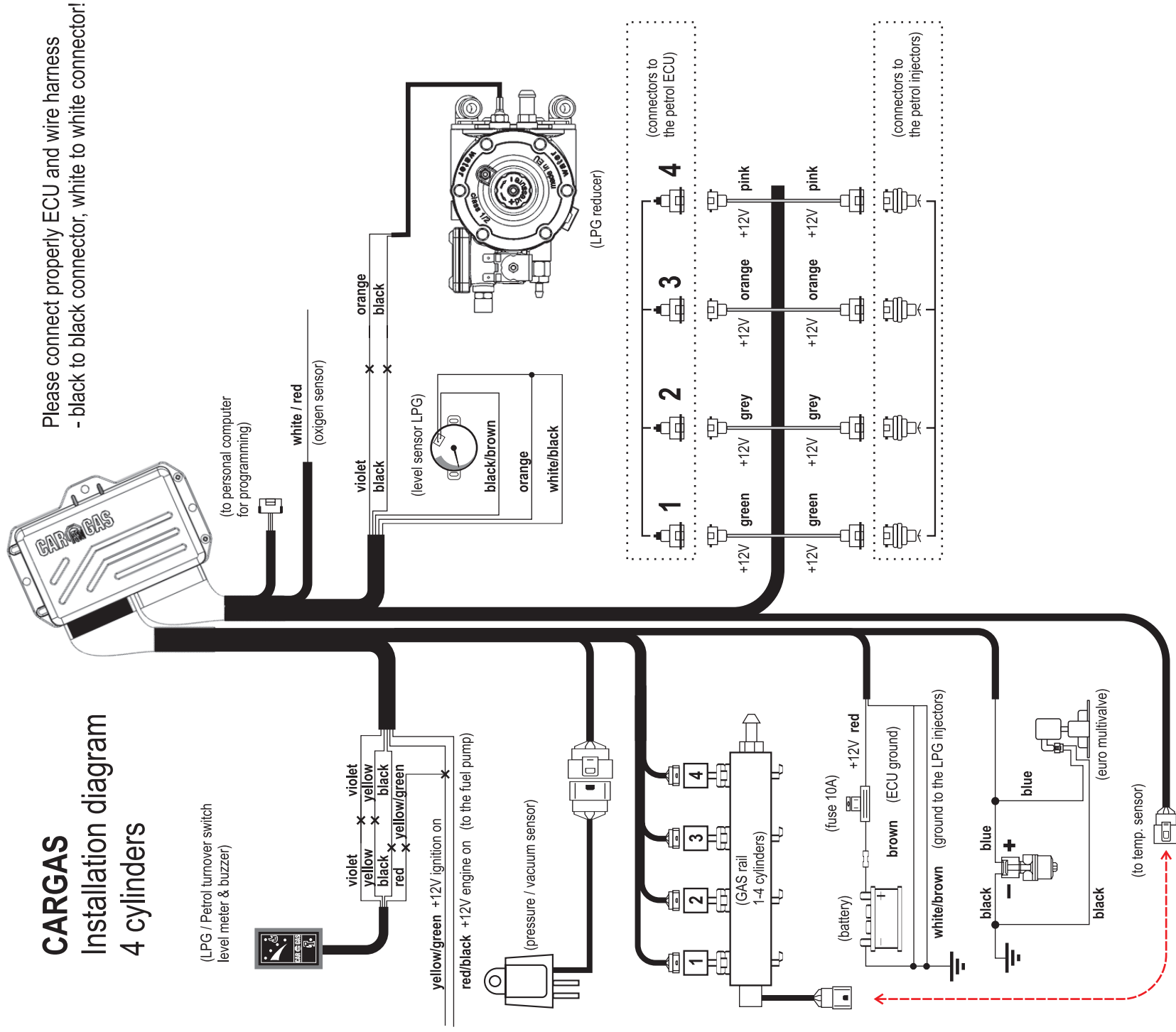
till you reach the equality of these petrol times. It is recommended to use this procedure for more load conditions of the engine (at least 6-10). If you didn't manage to cover all driving modes using the arrows adjust all uncalculated coefficients near to the calculated ones. Looking over the curve, you'll try to make this curve smoother. Sometimes the automatic adjustment does not pass, so you have to adjust the coefficients manually. The steps are the following:

1. The engine runs on idle in petrol. In the upper square you see moment petrol injection time. When the petrol ECU starts vary lambda sensors you can switch on LPG.
2. In the down square the petrol injection time when the engine runs on LPG. You have to reach both values almost equal – it could be done by slider changing the current coefficient, push the "SAVE" button to record into the ECU. Far more precise adjustment you can do it by using the coefficients 30 in the menu "Fine tuning" when the car is moving with different road types, to ensure more loads for the engine and speeds. In the menu you have button "calculate map". this is the connection between the linear adjustment with 16 coefficients and the 3-size map, which is table of coefficients, depending from petrol time and RPM. This button gives you possibility to switch from easy to more detailed adjustment. Driving the car with constant RPM

CARGAS

Installation diagram

4 cylinders



Please connect properly ECU and wire harness
- black to black connector, white to white connector!