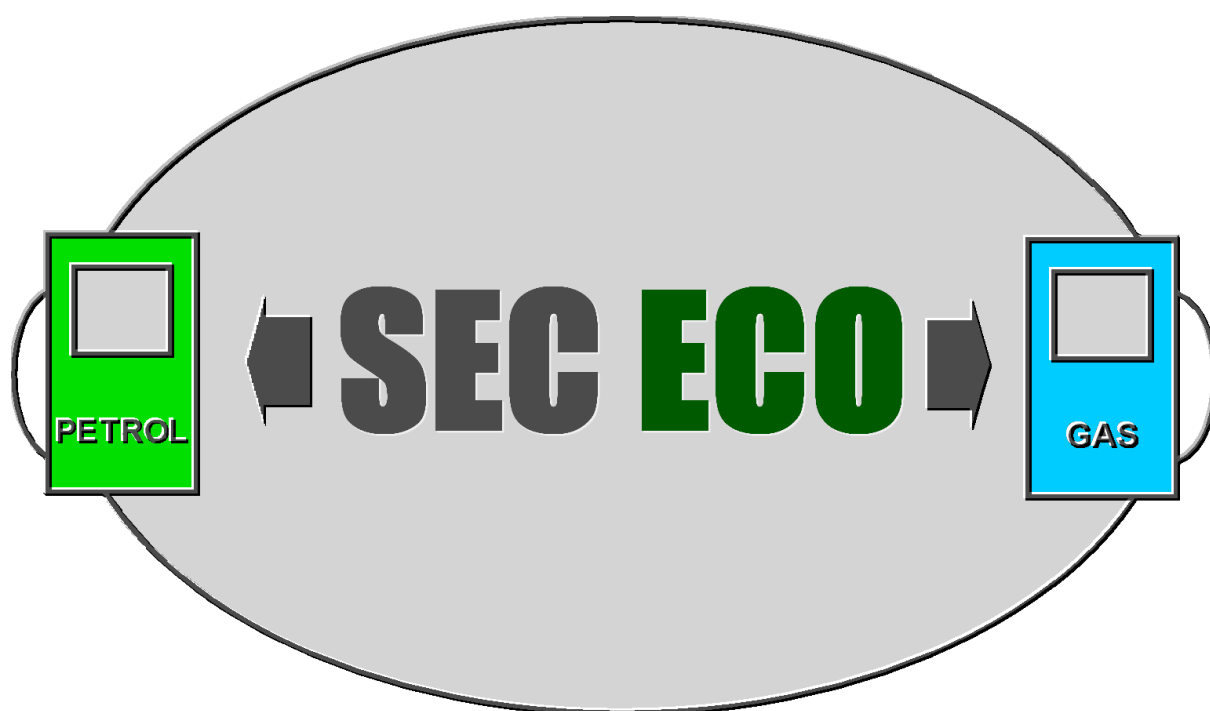# Installation and adjustment instruction for sequential/ synchronous/ sectional gas injection driver SEC ECO

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TABLE OF CONTENTS

1. GENERAL INFORMATION

Equipment necessary to the correct installation of SEC ECO system:

- computer

- SEC ECO software

- OBD or RS232C interface

- workshop tools

System properties:

The operation basis of sequential driver in power supply installation is gas decompressed to a suitable pressure. The sequential operation of installation means that injection of gas into the engine combustion chambers follows in order which it is assigned for petrol engine power.

Sequential injection means also that gas as engine fuel is injected in the amount and during time regulated by the sequential system. These values can be regulated by appropriate system settings.

SEC ECO system is fully automated and using it as an alternative power by the owner of the vehicle doesn't need any special knowledge about the system. The owner as the system user not only doesn't need, but cannot make any adjustments of the system.

The adjustment can be made only by authorized workshop.

ATTENTION!

The manufacturer is not liable for damages arisen as a result of improper set installation and use of improper materials, parts, components and assemblies.

The opening of driver cover or seal damage may void the warranty.
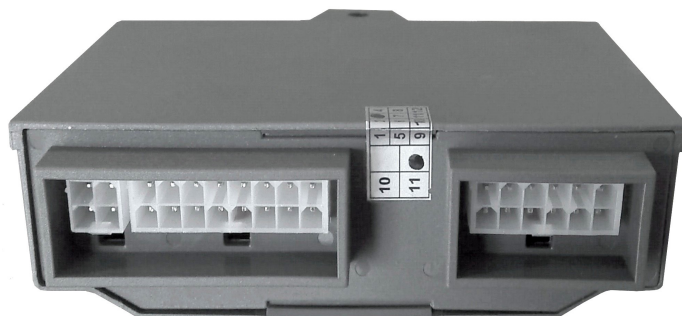
Warranty seal

2. RECOMMENDATION CONCERNING THE ASSEMBLY

1. Method of connecting the components according to picture 1.
2. All connections should be made by removed fuses.
3. All connections have to be properly soldered and insulated!
4. The staff making assembly and adjustment should be trained for this purpose.
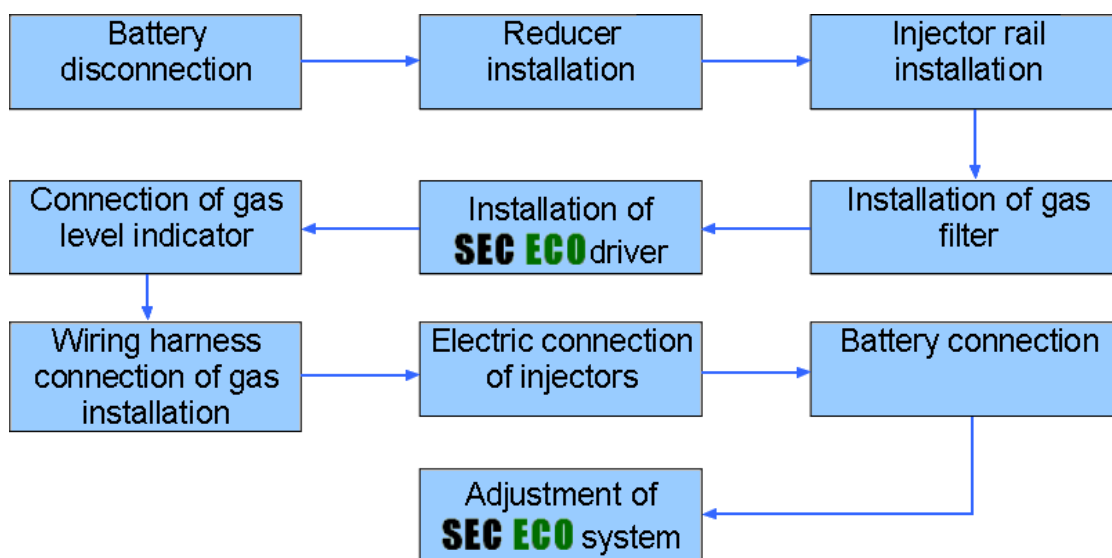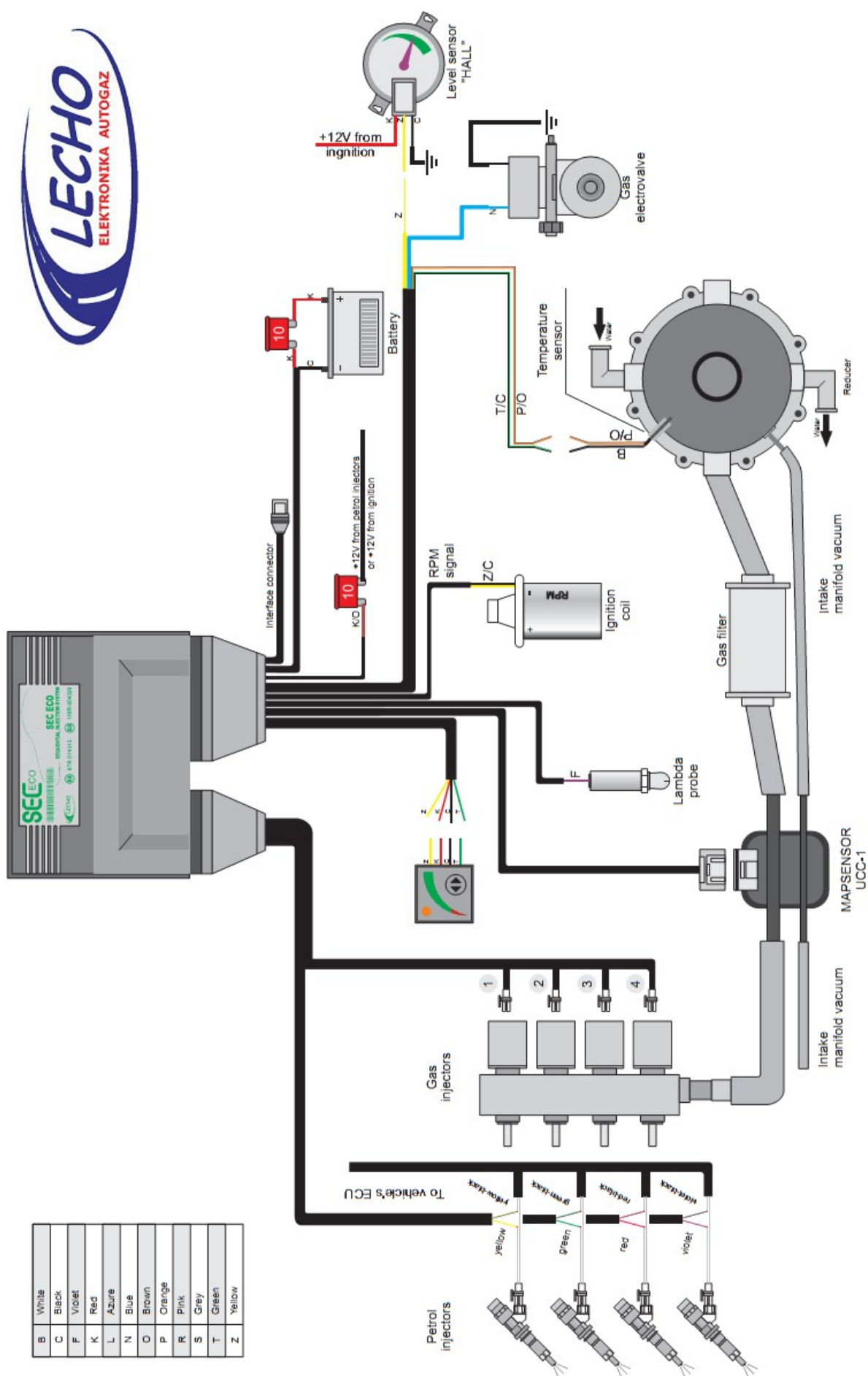5. The injection nozzles should be always appropriately chosen for horsepower of the car (Table1).

5.1. In case of too big nozzles the car can have too large combustion and too rich mixture.

5.2. In case of too small nozzles the car can have too little power and too lean mixture.

Attention: The program will inform by appropriate message, if the nozzles are beyond the adjustment range.

6. The pressure should be always set appropriately at idle with vacuum connected to a regulator- **recommended pressure is: 1,4bar for LPG and 2.0- 2.2 for CNG.**

2.2 SHORTENED INSTALLATION OF GAS INJECTION CONTROL SYSTEM SEC ECO

```
Battery          →    Reducer          →    Injector rail
disconnection         installation          installation
                                                  │
                                                  ↓
Connection of gas ←   Installation of  ←    Installation of gas
level indicator       SEC ECO driver        filter
   │
   ↓
Wiring harness    →   Electric connection →  Battery connection
connection of gas     of injectors                 │
installation                                        ↓
                      Adjustment of
                      SEC ECO system
```

LECHO
ELEKTRONIKA AUTOGAZ

CONNECTION DIAGRAM

LECHO
ELEKTRONIKA AUTOGAZ

Level sensor "HALL"

+12V from ingnition

Gas electrovalve

Temperature sensor

T/C
P/O
P/O
B
Water
Water
Reducer

Battery

10

Interface connector

+12V from petrol injectors
or +12V from ignition

10
K/O

RPM signal

Z/C

RPM

Ignition coil

SEC ECO
SEQUENTIAL INJECTION SYSTEM
E8 014/013 E8 105-2045B

Gas filter

Intake manifold vacuum

Lambda probe
F

MAPSENSOR
UCC-1

Gas injectors

1 2 3 4

Intake manifold vacuum

To vehicle's ECU

yellow-black
green-black
red-black
violet-black

yellow
green
red
violet

Petrol injectors

B	White
C	Black
F	Violet
K	Red
L	Azure
N	Blue
O	Brown
P	Orange
R	Pink
S	Grey
T	Green
Z	Yellow

Power/ 1 cylinder [KM]	Type of injection		
	Sequential	Half- sequential	Fullgrup
	LPG nozzle diameter [mm]		
1-12	1,6	1,5	1,3
12-15	1,8	1,7	1,5
15-18	2	1,9	1,7
18-22	2,2	2,1	1,9
22-25	2,4	2,3	2,1
25-29	2,6	2,5	2,3
29-32	2,8	2,7	2,5
32-36	3	2,9	2,7
36-40	3,2	3,1	2,9

Table 1

ATTENTION:
The above sizes of nozzles are appropriate values dependent on the type of engine, gas injectors and other factors.

2.3 INSTALLATION OF CONTROL SYSTEM WITH SEC ECO GAS INJECTION

STEP ONE: BATTERY DISCONNECTION

ATTENTION: Before starting the assembly of gas installation the battery should be absolutely disconnected from the electrical installation of a vehicle.

STEP TWO: REDUCER INSTALLATION

Picture 2 Reducer

The reducer should be installed, according to the instruction, in the place where it could be easily checked, repaired, replaced.

The reducer should be fixed only by special designed openings on its rear part and only with special screws attached to the set.

The gas electrovalve can be mounted on the reducer as its integral part or separately.

All hoses have to be minimum 10cm from the elements of the exhaust system.

The signal of gas temperature sensor in the reducer is used to determine the moment of changing over from petrol to gasoline supply. The temperature sensor mounted in the reducer should be connected to the wiring harness of gas installation.

STEP THREE: INSTALLATION OF INJECTORS

Picture 3 Injector rail

The injector rail should be mounted near the inlet collector and possibly far from the high-voltage wires. Make the openings on the ends of collector wires near the suction valve, then thread them and screw into them brassy nipples.

These nipples should be connected with pressure rubber hoses to the nipples of injector rail.

The connections should be protected with metal clamps. Attention should be given at the length of rubber hoses, which should be equal. To the injector rail should be connected the harness of feeding and control wires from the gas driver.

ATTENTION:

1. **Rubber hoses connecting gas injectors with collector should have equal length.**
2. **The injection rail shouldn't be mounted with outlet holes directed upwards.**

STEP FOUR: GAS FILTER INSTALLATION

Picture 4 Gas filter + pressure and temperature sensor

The volatile gas phase filter should be mounted between the reducer and gas injectors rail, with the use of pressure rubber hoses. The connections should be protected with metal clamps. To the BOSCH sensor should be connected a wiring harness with four cable outlets (see the scheme).

The gas filter should be mounted in the place accessible for replacement, according to the rules described in the warranty certificate.

STEP FIVE: INSTALLATION OF SEC ECO DRIVER

Picture 5 Driver

SEC ECO driver is available in 4-cylinder version. But it is able to operate the vehicles with less number of cylinders, i.e. 3. The driver should be mounted in accessible place of engine chamber. The driver should be mounted away from sources of electromagnetic interference (for example ignition coil), away from the sources of high temperature (for example engine exhaust manifold) and at a safe distance from the fluid tanks, away from the contact with water.

Required installation: joint downwards, to reduce the consequences of eventual flooding and damage to the driver.

STEP SIX: CONNECTION OF GAS LEVEL INDICATOR

Picture 6 Switch

The switch should be mounted inside the car, in the place, which is easily accessible and visible from the seat of driver. During the installation the switch should be carefully pressed into prepared opening fi=8mm.

The system makes possible the cooperation with gas level sensor 0-20kΩ, 0-50kΩ, 0-90Ω and the other after the adjustment own thresholds in the program.

STEP SEVEN: WIRING HARNESS CONNECTION OF GAS INSTALLATION

1. The assembly of fuse cover should be made according to the assembly diagram **without inserted fuses**.

2. The connection of gas installation wires with battery system: the **red** wire (+) of gas installation connect directly with plus on the battery. The **black** wire (-) of gas installation connect directly with minus on the battery. The **red and brown** wire connect into the electric installation of a vehicle in the place making possible to start the car- i.e. into the system, in which occurs voltage after turning on the ignition-ignition switch.

3. The connection of rotational speed signal: **yellow and black**; to determine the rotational speed of engine crankshaft the driver uses the rotational speed signal RPM transmitted by ignition module to the petrol driver. The identification of signal is necessary for switch to gas power, which follows by rotational speed adjusted by the use of computer program (typically 2000r.p.m.). The electric wire, which sends the signal, can be found with the use of voltage tester or oscilloscope. The impulse frequency sent to the petrol driver increases with engine rotational speed so that also increases the frequency of signal maximum on the oscilloscope screen. The value of signal voltage amplitude RPM is within 12V and this should be adjusted in the program, if we get the signal from Hall sensor or another one, we should choose the option of 5V in the program.

4. The connection of gas level sensor in the tank: the **yellow** sensor wire should be soldered to the **yellow** wire of gas driver, and the **black** sensor wire to the mass of vehicle. In the case of Hall sensor the power supply should be additionally connected from the blue supply wire of gas electrovalve.

5. The connection of gas electrovalves: the gas electrovalves installed near the gas tank (multivalve) and near the reducer should be connected to the **blue** wire of gas driver.

6. The connection of reducer temperature sensor: the cables from **orange-brown** and **white-black** wiring harness connect with wires of reducer temperature sensor.

ATTENTION: The temperature sensor is not polarized. The change of colours doesn't cause wrong working of the sensor.

7. Switch connection: connect the cables of wiring harness suitably with the switch wires keeping the compatibility of colours

8. Connection of Lambda Probe: the driver makes possible to connect one Lambda probe. The connection of probe is a purple wire. The Lambda probe signal does not affect the functioning of the driver, it only gives the information about the state of mixture.

STEP EIGHT: ELECTRIC CONNECTION OF INJECTORS

Connect suitable cable ends with the wires of petrol injector rail, cutting and switching the gas installation wires into electric circuit in appropriate order - according to the assembly diagram (picture 1).

STEP NINE: BATTERY POWER CONNECTION

After all checking activities and making sure that all connections are correct with regard to quality of wire connections and compatibility of connections with the assembly diagram, the battery can be connected to the vehicle electric system.

STEP TEN: ADJUSTMENT OF SEC ECO SYSTEM

After checking all connections, battery connection, but before inserting the fuses, the vehicle can be started on petrol. Then fill the gas tank with appropriate gas- LPG or CNG.

Then insert the fuse, start the engine, wait for switch-over to gas supply and check with suitable tester the thickness of gas installation.

After that it is possible to make adjustment of the system according to SEC ECO programming instruction.

3. Adjustment instruction for SEC ECO system

SEC ECO system can be regulated using the interfaces:

1. **RS232 (COM)**- enables full calibration/rating, AUTO-ADAPTATION, viewing all parameters, except these, which are read from OBD.

2. **OBD2**- enables exactly the same as interface RS232 and in addition it is possible with its help to observe and use the parameters from OBD system. This interface has also the mapping function from the vacuum.

Particular adjustment stages:

Stage 1. CENTRAL CONNECTION

1. Connect interface RS232 or OBD2 to the PC computer, then connect to the interface connection in the wiring harness, and in case of interface OBD2 additionally connect the OBD plug into the socket in the car.

2. Start the engine.

3. Start on computer the actual version of software appropriate for the driver. Then takes place the automatic detection and communication with the driver. It will be indicated in the left lower corner of the program.

Stage 2. SETTINGS CONFIGURATION IN THE PROGRAM

In the tab menu on the left program window choose the tab **PARAMATERS**. Set the parameters of the vehicle and other configuration options for gas switch-over.

Stage 3. AUTO-ADAPTATION

After performing all above activities it is necessary to start automatic regulation, so click the tab **AUTO-ADAPTATION**, the driver will collect basic parameters. This should be made at idle and means pushing the button **START** and following the instructions on the screen.

During the auto-adaptation process is also performed the test of proper nozzle choice. The program informs, if used nozzles are appropriate or recommends their replacement, if they are improper. After the replacement of nozzles repeat the process of auto-adaptation.

This is the end of automatic driver regulation.

Stage 4. PRECISE DRIVER ADJUSTMENT WITH THE HELP OF OBD/VACUUM INTERFACE

The adjustment is made during the drive with laptop connected to the central with the help of OBD interface. There are two possibilities of precise driver adjustment.

4.1. Adjustment from OBD

In case when the car is equipped with OBD diagnostic socket, connect the OBD plug into the socket in the car and the white plug to the driver. The kind of report signalized with message confirming the connection with vehicle OBD system will be detected automatically. In case of incompatibility of kind of report used in the car, the program will inform about it with the appropriate massage.

Order of operations:

Go to the tab **ADJUSTMENT/ MAP** and choose adjustment mode **OBD CORRECTION**. Start the drive. On the chart, while adjustments are made, the pink line will change its colour into black. The process will be finished when the line will become black in the whole range of engine work. All made adjustments will be saved automatically in driver's memory.

Disconnect the interface from the driver and OBD socket- finishing the process of adjustment.

4.2 Adjustment from the vacuum

ATTENTION: This adjustment is possible only with interface OBD2.

In case of this option connect the interface to the vehicle vacuum system sticking the pressure sensor to the system with the help of: cable set and tee attached to the interface.

Order of operations:

Go to the tab **ADJUSTMENT/ MAP** and choose adjustment mode from underpressure. Switch over the car to petrol and collect the petrol map, which is visible in the form of red dots. Then switch over to gas and collect similarly the gas map pictured in the form of green dots. The more dots we collect on the map the more precisely the driver will be programmed.

After finishing this activity click button **APPLY ADJUSTMENTS**. The adjustments will be automatically applied and saved in driver's memory. In order to increase the accuracy it is necessary to make the mapping several times on gas and observe, if after adjustments the gas curve agrees with the curve for petrol, if yes- the adjustment is finished successfully. Disconnect the interface from the driver and stick out from the vacuum system- finishing the adjustment.

4. DESCRIPTION OF SEC ECO PROGRAM

4.1 Description of lower Visualization Panel:
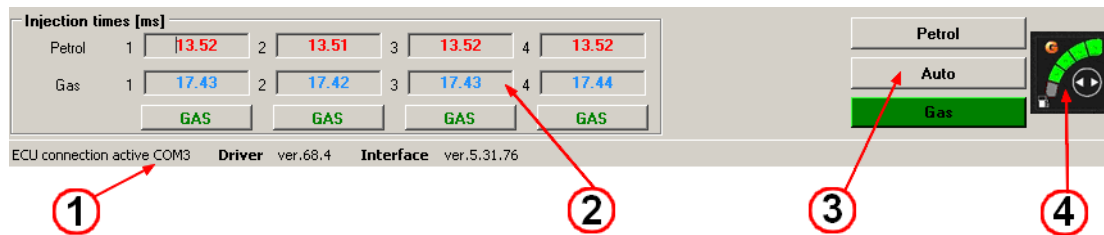
1. Driver Error Status:

- If during the system work appears error, it will be indicated by flashing the red box and information "Error". After clicking the box it is possible to read the error code.

- The error can be deleted from the program menu (reset removes also old errors).

2. Gas and petrol injection time:

- petrol injection times displayed on the screen in [ms]

- gas injection times displayed on the screen in [ms]

3. Fuel change buttons :

- thanks to these buttons the system supply between: petrol, gas or automatic work can be changed at any time.

- the switch over works also when the conditions of switching over weren't reached.

4. Fuel change button (petrol/automat/gas)

- clicking causes cyclical change of state: petrol/automat/gas).

4.2 Description of readings:
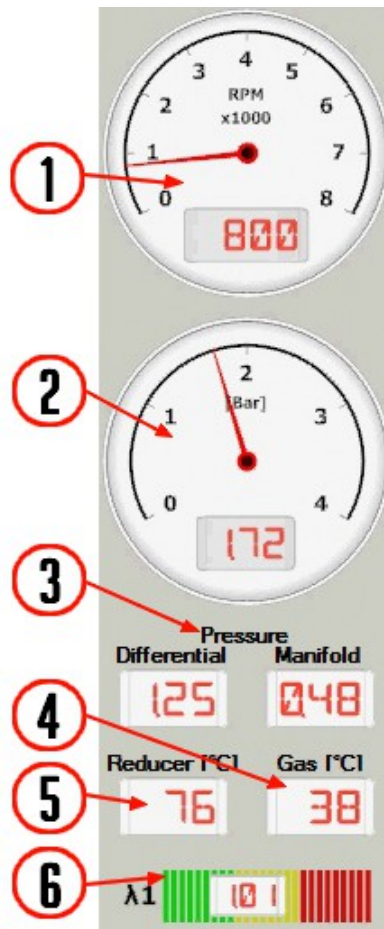
All values are displayed during the real time.

1. Engine rpm:

- the tachometer shows actual engine rpm during the real time.

2. Gas pressure (differential and manifold):

- manometer showing the actual gas pressure in UCC-1 sensor, this is a sum of differential and manifold pressures. Separately they are being shown on windows. (3)

4. Gas temperature:

- the thermometer shows graphically and numerically the value of gas temperature.

5. Reducer temperature:

- the thermometer shows graphically and numerically the value of reducer temperature.

6. Lambda probe:

- the lambda oxygen sensor shows graphically and numerically the value of lambda

4.3 Description of the tab PARAMETERS:

The parameters written manually are saved to the driver after exit from the tab "PARAMETERS" or after clicking the button **[Enter].**

The parameters chosen by the mouse (for example kind of injector) are saved to the driver after the choice of given parameter.

Vehicle parameters:

1. Kind of ignition system:

- the ignition system should be so adjusted that it could display rpm of the engine consistent with the actual rpm.

2. Engine rpm signal:

- choose 12V or 5V so that rpm would be shown correctly on the tachometer in the program.

3. Turbo

- this option is used to set the car with turbine. After its switching off the range of enrichment on the maps changes from 50% to 90%.

4. Revolution signal level:

- placing the level of switching for accessing reading revolutions

Setting up of gas installation:

1. Choice of fuel:

- The engine works on gas: CNG or LPG, depending on the mounted installation.

2. Kind of injector:

- it is the choice box of used injector

- choose the used injector from the list

- the change of injector modifies **Injector Parameters** in *Advanced Settings*

- eventually choose the injector from available on the list, then in order

to modify its settings choose own definition, which allows to change injector parameters in advanced settings.

- **ATTENTION:** If the injector is available on the list, its settings shouldn't be modified, because it can result in improper system operation.
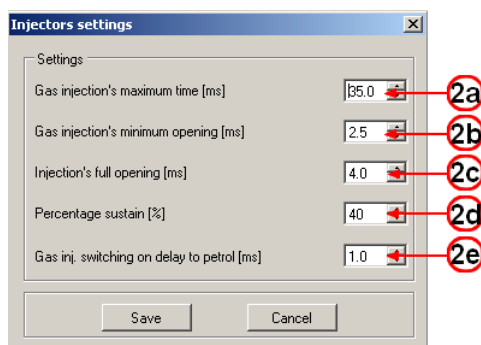
Injectors settings

2a. Maximal time of gas injection:

- maximal time which the gas injector is able to generate

- standard setting- 30ms.

2b. Minimal opening of gas injector:

- minimal injection time for opening of gas injector, if the opening of petrol injector will be detected

- this parameter depends on the injector speed and is modified by the box of injector choice.

2c. Full opening of injector:

- time of full current impulse opening the gas injector

- the range of 2ms- 8ms shouldn't be exceeded, because it threatens with damage of injection coils or free opening of injection.

2d. Proportional upholding:

- the proportional upholding current of injector after switching off the constant voltage injector coil in relation to entire current range switching. This parameter depends on the injector coil resistance and is modified by the box of injector choice;

- by small resistances it is necessary to keep the range of 25% (below 1.5Ω), to 45% by large resistances (above 8Ω).

2e. Delay of gas injection in relation to petrol:

- it is the time, counted in milliseconds, of delayed gas injection in relation to petrol injection
- standard is 2ms
- this parameter is modified by the choice of injector.

3. Kind of reserve slide

Select from the following types of reserve sensors:

- sensor 90Ohm
- sensor 20kOhm
- sensor 50kOhm
- increasing and decreasing
- sensor for CNG (manometer)

Additionally you can choose own definition and then will be displayed the following setting window:
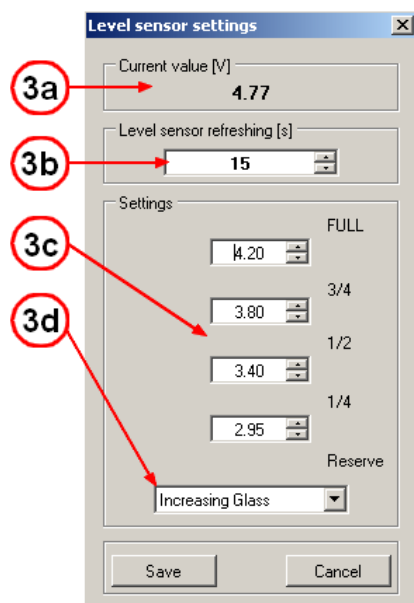
Own definition window parameters of reserve sensor

- **3a** voltage value actually measured by the central
- **3b** time in seconds periodically refreshed measurement result
- **3c** threshold scale- switching of level indicator on the switch
- **3d** kind of sensor- increasing or decreasing

4. Switch audio signal

- allows to switch on/off the audio signalization of driver operation

5. Regulator's temperature sensor

- select from two sensors "S" and "K/M"
- sensor K/M has the resistance 5kΩ
- sensor S has the resistance 2kΩ

6. Reducers vacuum:

- the system can work when vacuum is connected or disconnected
- it is always recommended to connect vacuum to the reducer. Thanks to it it's possible to obtain lower gas pressure during idling on the injector rail
- the parameter is set by auto-adaptation

7. Lambda probe

- show or hide lambda probe

Switching to gas

1. **Temperature of switching to gas**
- reducer temperature, which enables switching to gas
- the temperature shouldn't be set below 30°C

2. **Engine rpm by switching to gas:**
- rpm/minute, by which follows the switching to gas

3. **Delay in switching to gas:**
- time between connection of coil on the reducer and starting the gas injectors necessary for filling the installation with gas

4. **Injectors heating:**
- the switching of this option results in connection of gas injectors before the switching to gas. Thanks to it is avoided the unequal start of injectors in winter conditions. The values are set from small to very high, but are modified manually.

5. **Time between the cylinders:**
- we choose the kind of switch from petrol to gas as a sequential switch or simultaneous switch of all injectors. The sequential switch eliminates the jerks during the change of power from petrol to gas.

6. **Starting on gas**
- the option enables starting the car directly on gas without petrol.

This should be used only when it's necessary, because when we often start the car on gas we can cause a permanent damage of gas installation.

Switching to petrol

1, 2. Minimal engine rpm on gas:

- the option used very seldom, allows to switch to petrol power below minimal rpm/minute. The diode G (orange) on the switch is off.

3, 4. Maximal rpm of the engine on gas:

- the option used very seldom, allows to switch to petrol power by maximal rpm/minute. The function isn't signalized on the switch.

5. Auto-adaptation pressure:

- pressure value at which the last auto-adaptation was carried out, the parameter is set automatically after auto-adaptation.

6. Pressure for return to petrol:

- the pressure below which the driver will return from gas power to petrol power

- during the pressure drop, to the determined threshold, will follow double short sound signal

- it is necessary to keep up the above atmospheric pressure limits, which is 1Bar

- the value of 1.5Bar shouldn't be exceeded

- the parameter is set by auto-adaptation

7. Delayed return [ms]:

- time after which follows the return of driver from gas to petrol power, after detection of too low pressure on injection rail

- important by cars with turbine, where this time should be extended

- standard is 1 second (1000ms).

8. Minimal gas temperature:

- if this option is chosen, it will follow the switching from gas to petrol power by temperature drop of gas below the set temperature.

3.4. Description of the tab AUTO-ADAPTATION (automatic adjustment of gas installation)
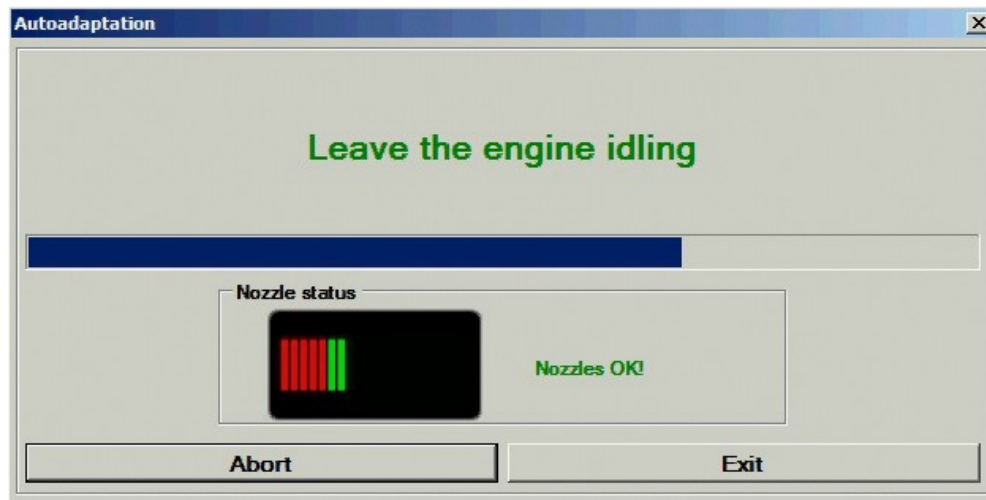
Auto-adaptation tab view

1. **Command display box:**
- information command box necessary for appropriate auto-adaptation
- follow the instructions

2. **Start/Abort:**
- the button starts the process of automatic driver adjustment, after it is pressed the adjustment shouldn't be interrupted. The interruption at any time will cause the necessity of new auto-adaptation.

3. **Status of the nozzles:**
- The information concerning the nozzles, if they aren't placed in the adjustment range- the appropriate information will be displayed.
- If the nozzles are chosen properly, it is signalized with information: "Appropriate nozzles size", and the cursor is in the dark green box.
- If the nozzles are too small, it is signalized with information: "TOO SMALL NOZZLES", and the cursor is in the red box.
- If the nozzles are too big, it is signalized with information: "TOO BIG NOZZLES", and the cursor is in the red box.
- The beginning of auto-adaptation is possible only in case of proper nozzles.

4.5 Description of the tab ADJUSTMENT/ MAP

Adjustment mode
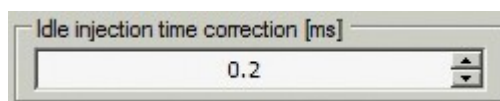
4.5.1. Easy mode- there are only two parameters to choose- percent enrichment of mixture and correction of idle injection time [ms]

1a. Percent enrichment of gas mixture:
- Percent enrichment of gas mixture by the load is a main parameter, which allows to adjust the transmission of gas quantity to the cylinders.
- The enrichment is automatically adjusted during the **auto-adaptation.**
- The parameter can have a negative value, but when it is too high, for example below **-10%** it means **wrong chosen injector nozzles**, it is necessary to replace them to smaller.
- If the parameter is bigger than **+40%, it is necessary to replace the injector nozzles** to bigger, because the car can have to little **power**
- If in the car appears from the mixture **"check engine"** (it's too lean or too rich), it's necessary to adjust with the use of this parameter- if we don't use the map
- After the change of **enrichment** check if the shift is well adjusted.

1b. Correction of the idling injection time
- The shift is the **enrichment / leaning** of mixture **at idle** (without the load)
- The shift is automatically adjusted during the **auto-adaptation**
- It's the second main driver parameter. It should be so adjusted that petrol injection time during the work on gas as well as during the work on petrol is equal. Then the petrol computer won't change the time of petrol injections at idle.
- The shifting always sets itself as the second after well adjusted parameter described in the instruction as- **LPG mixture enrichment**
- Principle of manual setting:

Switch over the power to petrol, wait a minute, and then save the injection time of petrol **Tb1**, then switch to gas power and once more save the injection time of petrol **Tb2**.

Shifting= Tb2-Tb1
- It is necessary to adjust *injector nozzles* and *pressure at idle* so that shifting is *positive*.

4.5.2. Standard map

- switching on the map enabling enrichment of mixture in different ranges of flat mode of engine operation, in the form of diagram.

– in the map window remains the correction of idle injection, described in foregoing item. In addition, it is visible the map window with the range of corrections -20 to +50% and to +90% in the turbo mode.
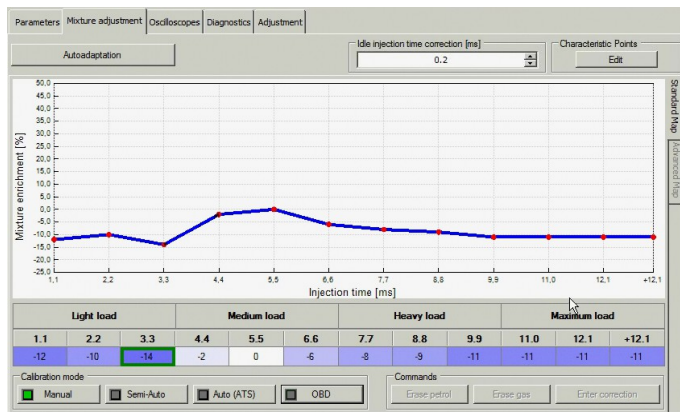
- the change of values on the map is possible after click in the diagram box or selection lower edition windows with entered values.
ATTENTION: Several values can be selected at the same time.

1. The buttons: **-5%, -1%, +1%, +5%** are for quick change of value for given percentage up or down.
2. The button "Edit characteristic points" is for scale change of injection opening range on the horizontal axis. It is possible to choose in it the settings named respectively:
the button "Enter" the changes will be saved.

4.5.3. Advanced map

- switching on the map, which enables the enrichment of mixture in different ranges of engine work in the form of table
- the value changes follow after click the chart with value or selection of several charts and click ENTER.
ATTENTION, it is possible at the same time to select several values with the whole map field.

0	1000	2000	3000	4000	5000	6000	+6000
1,5	+16	+16	+16	+16	+16	+16	+16
2,0	+16	+16	+16	+16	+16	+16	+16
3,0	+16	+16	+16	+16	+16	+16	+16
4,5	+16	+16	+16	+16	+16	+16	+16
6,0	+16	+16	+16	+16	+16	+16	+16
8,0	+16	+16	+16	+16	+16	+16	+16
10,0	+16	+16	+16	+16	+16	+16	+16
12,0	+16	+16	+16	+16	+16	+16	+16
14,0	+16	+16	+16	+16	+16	+16	+16
16,0	+16	+16	+16	+16	+16	+16	+16
18,0	+16	+16	+16	+16	+16	+16	+16
+18,0	+16	+16	+16	+16	+16	+16	+16

The function of advanced map is identical as by standard map, the difference is the greater number of adjustment points. In addition, there are speed ranges after click **"Edit characteristic points"**- described in item 4.5.2.2.
Additional buttons for the standard map

4.5.4. Corrections from OBD

Switching on the regulation enabling enrichment of mixture in different ranges of engine operation in the diagram mode depending on the OBD system correction readings. The use of OBD corrections is possible after cables connection according to the mounting diagram or through the interface to OBD2 socket. The adjustments are made automatically on the basis of OBD corrections. The shape of characteristics can be observed on the diagram.
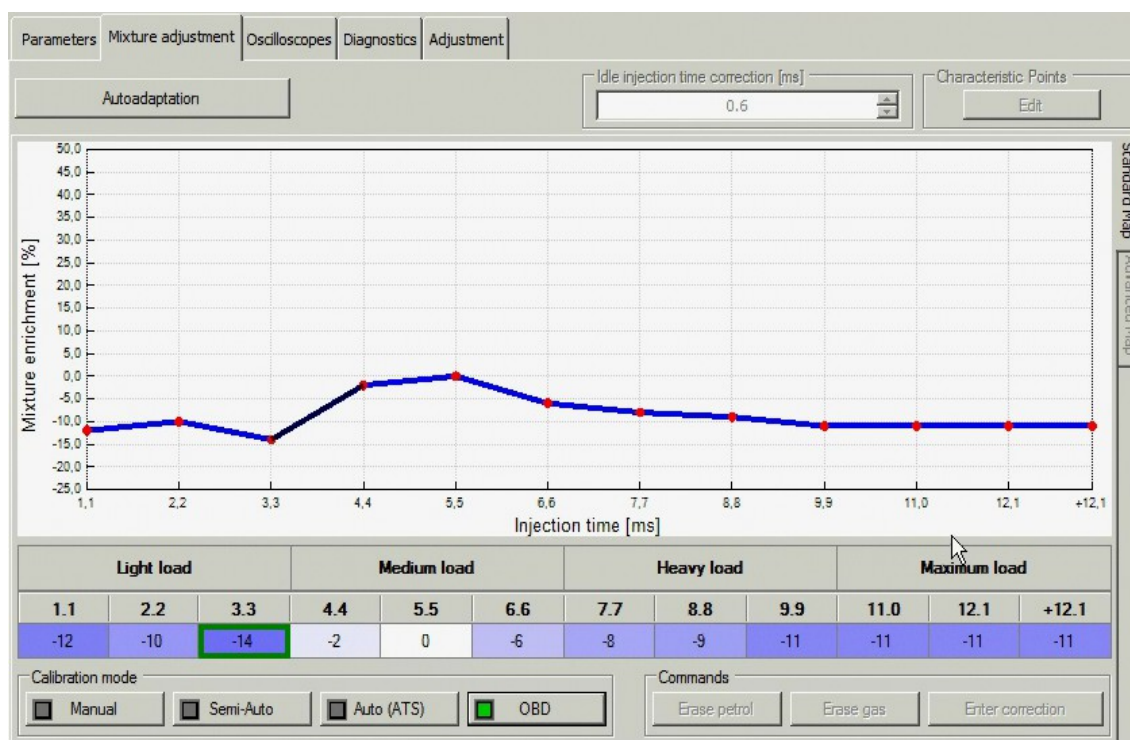

On the diagram with red colour are marked the intervals for which the corrections were saved, and with vertical lines is marked the interval during which follows the given correction. It enables the exact map adjustment in the whole load range.

4.5.5. Vacuum (mapping) – semi-auto mode.

The switching on of gas injection time mapping mode during the drive. It is created the curve of drive on petrol, then curve of drive on gas and the correction is calculated from the difference. The approval of correction "Approve correction" causes the shift of gas to petrol curve. The mapping should be made repeatedly in order to obtain better exactness.

Start from mapping on petrol. We make it to the moment, when the curve stops to change the shape. To obtain this the car should be driven in the full speed range. After petrol mapping (red colour) switch over to gas and repeat mapping to obtain green gas curve. Then click the button **"Approve correction"** to adjust the gas curve to the petrol curve.
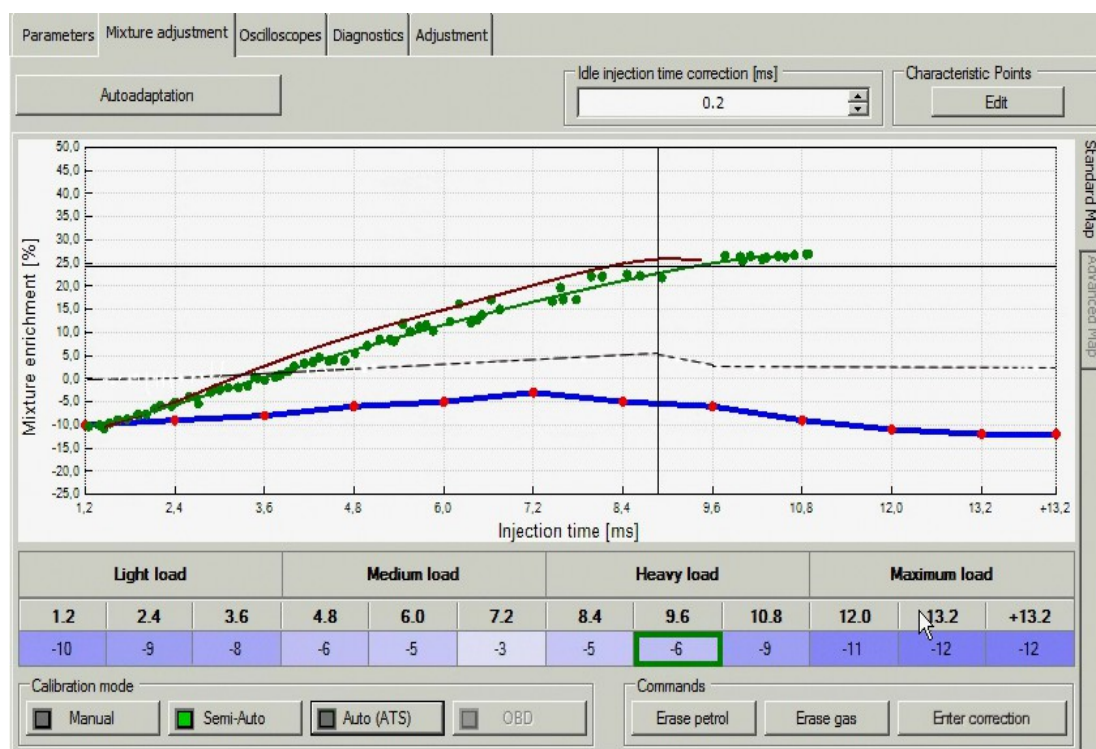
During mapping gas and petrol curves can be cancelled with the use of buttons under the diagram.

4.5.6 ATS (Adaptive Tuning System)

After the end of the autoadaptation on idle RPM please start the ATS mode and ECU will switch to petrol. From this moment fully automatic mode is started.
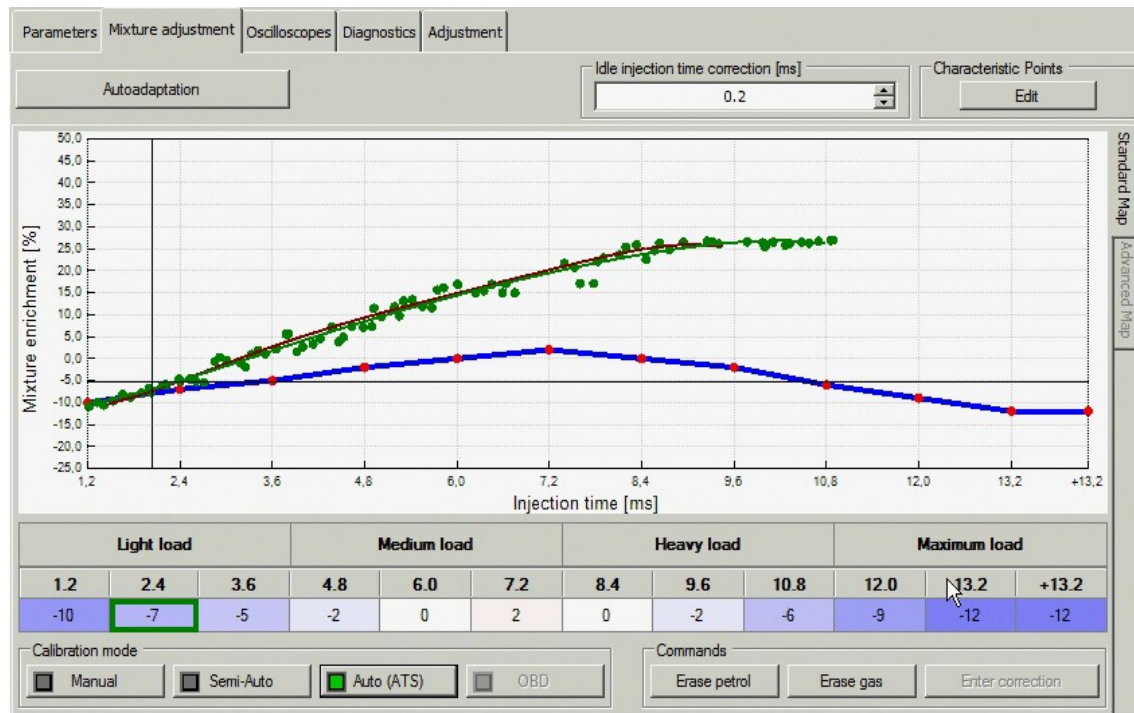
Car is going few kilometers on petrol, during it is collecting points of characteristics and is creating the petrol map. After collecting all necessary data, ECU is automatically switching to gas. ECU is starting collecting points to the map of gas and automatically entering necessary corrections. This mode is a constant mode and is active all the time. It's taking care of perfect selection of fuel mixture parameters.

4.6 Description of the tab OSCILOSCOPES:
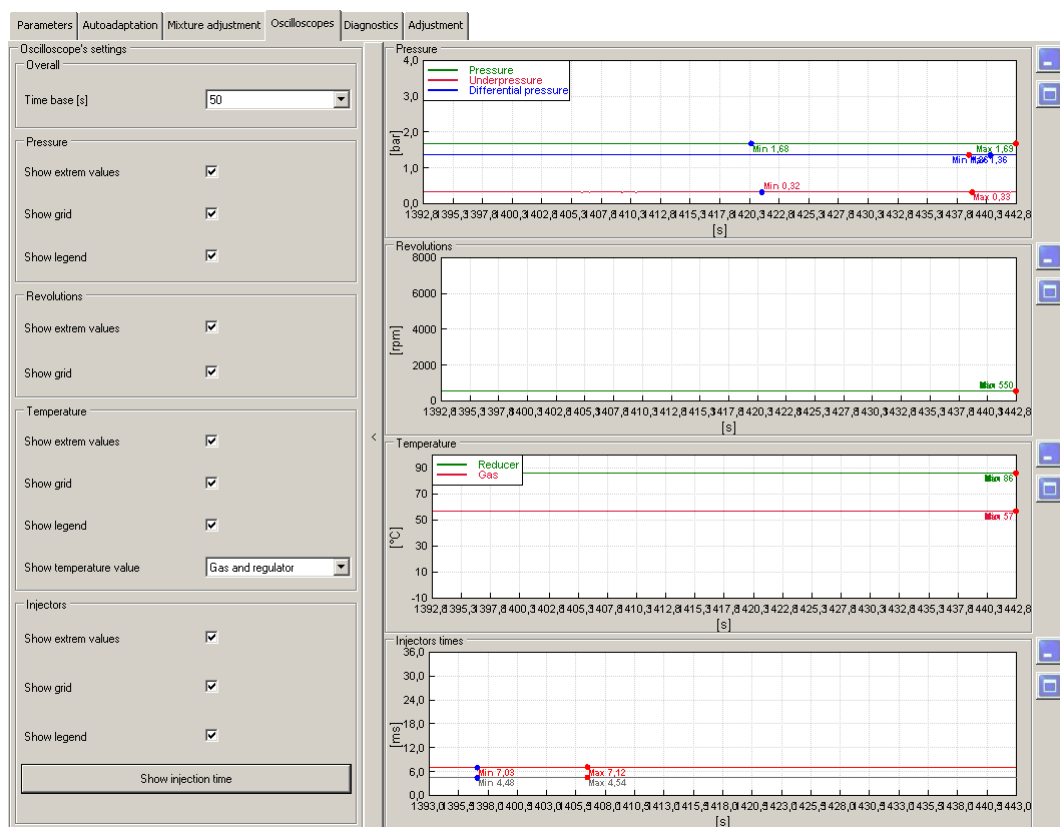
4.6.1 Overall

- time base in seconds. Other parameters depend of selected oscillograms and facilitate their observations.

4.7 Description of the tab DIAGNOSTIC

The program tab enables the diagnosing of arisen problems with installation. We can choose diagnosing from OBD system (with the use of additional interface) and diagnosing of the driver, injectors and the installation. The diagnosing from OBD allows to delete the lit indicator **"Check Engine"**, i.e. delete the OBD errors on the car computer.

4.7.1 OBD diagnostics

After connection SEC ECO to OBD (through the interface) appear additional options:

4.7.1.1 Protocol and correction indicator

4.7.1.2 OBD error check

Available buttons: "Refresh error history", "Erase errors" and the tab **"READ OBD"**, which activates additional window with display all information OBD. After click the button "Read errors" we obtain in the window the information about errors reported by OBD system.
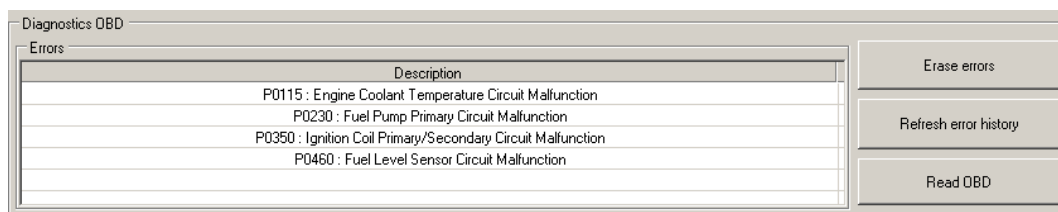
The OBD system saves car parameters at the moment, when the error apears. The data from this event are called freeze frames. To see them click twice given error and additional window will be displayed:

- OBD readings

OBD readings show much more parameters, showing also corrections, which SEC ECO reads from OBD main line. To see them select the box of given parameter.

Attention, if given reading can't be selected, it means that the car doesn't handle the parameter.

4.7.2 OBD driver error check:

It allows to determine and delete errors, which arise in the driver.

Possibilities of the tab:

- showing errors from SEC ECO system
- cancellation of errors, if they occur
- viewing of gas computer error description

4.7.3 Diagnostic of injectors
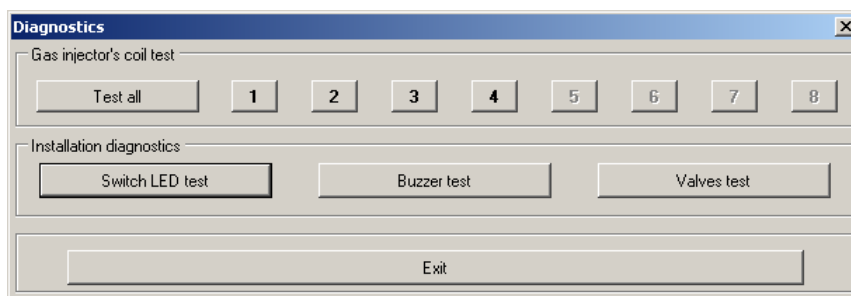
The window allows to make the test of gas injector coils by measuring their current.
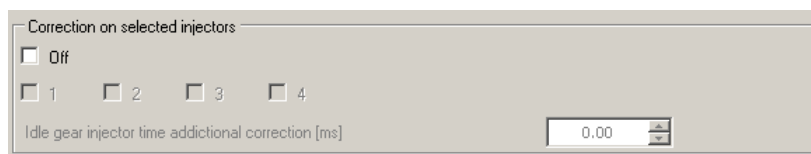
4.7.4 Installation diagnostics

The window allows to make some tests:
-   **Switch LED test**- checking of state of PBX switch and gas level indicators. After starting the test the switch diodes are off to the reserve state (red diode), and then in the program appears the switch view and from this moment the diodes switch on one after another. After switching the last green diode the switch in the program disappears- the test is finished. The test consists in observation, if all switch diodes switch synchronously with the switch in the program.
-   **Buzzer test**- checking of buzzer. After starting the test the lettering changes its colour to red and the buzzer sounds short, long and short. The test consists in listening, if the buzzer squeaks.
-   **Valves test**- checking of gas valves. After starting the test on the switch appears an orange diode marked with G and simultaneously to the electrovalves is transmitted the voltage +12V. The test consists in listening, if the electrovalves are opened- it sounds as metallic clatter of electrovalve anchor.
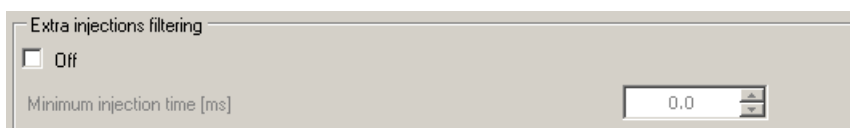
4.8 Description of the tab Adjustment

The tab contains additional parameters, which enable the system adjustment. The parameters were divided topically and each topic can be separately switched on/ off.
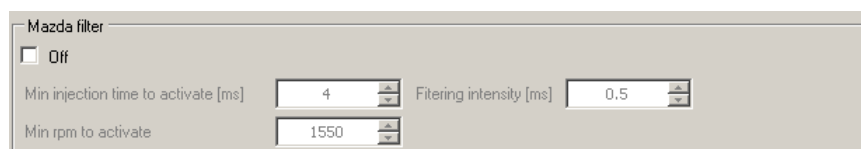
4.8.1 Correction for chosen injectors

The tab no 3 allows to make an adjustment on chosen injector or the group of injectors. The time should be given in milliseconds. The correction allows to adjust equal time on each injector.

4.8.2 Filtration of extra injections

The filtration of additional fuel injections. The slider allows to adjust the time of extra injections, which will be omitted by the calculation of correction for gas injectors. The omission of additional injections eliminates jerking during the drive. The optimum value should be adjusted experimentally during the drive.

4.8.3 Mazda filter

This filter eliminates jerking in mazda cars (1999-2001). It is necessary to adjust minimal time for filter activation, minimal rpm to activate- if jerking is from 1700RPM adjust lower rpm of about 200, and a filtration constant- je larger the constant the greater filtration- this parameter should be adjusted during the drive and checking the effects.
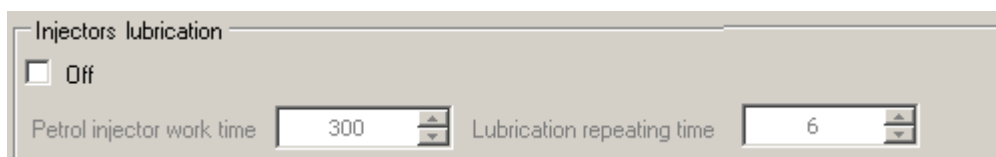
4.8.4 Correction from the gas temperature

The tab enabling making own percentage correction of gas mixture enrichment depending on the actual gas temperature.

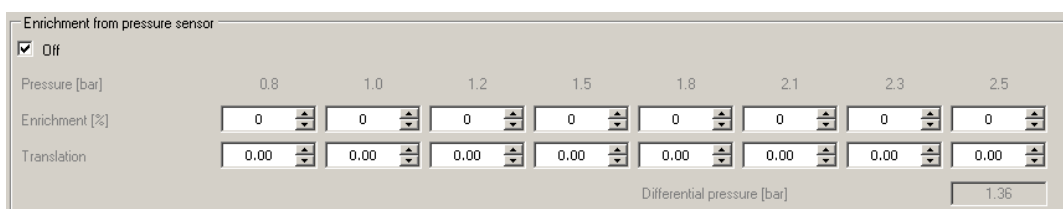### 4.8.5 Correction from the reducer temperature

The tab enabling own percentage correction of gas mixture enrichment depending on the actual reducer temperature (water temperature).

4.8.6 Injectors lubrication

After switching this function, gas injector turn off and petrol injectors turn on after specified period of time (Lubrication repeating time).
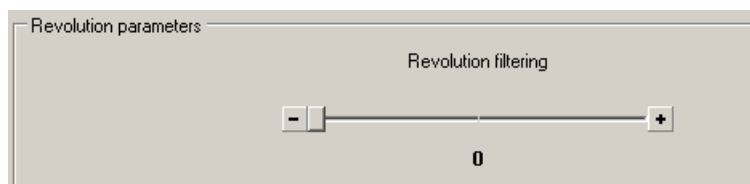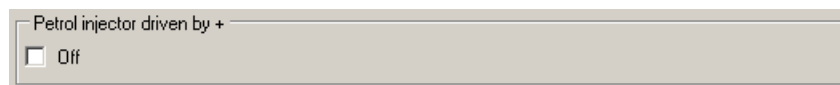
4.8.7 Enrichment from pressure sensor

Additional map of making rich from the differencing pressure.

4.8.9 Revolution parameters

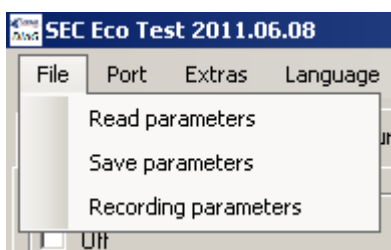Filtrations of revolutions. We should set so as to revolutions. Where shaved stable on the revolution counter.

4.8.10 Petrol injection driven by +

Choice between injectors controlled by plus or minus.

4.9 Description of program menu

File

1. **Read parameters**- saved parameters reading from the prior driver settings file or copying from the other drivers, files, which were earlier saved.
2. **Save parameters**- saving parameters to the file in order to use them later with given car or to copy to the other driver.
3. **Recording parameters**- recording of configuration parameters to archive parameters of adjusted cars.

Port
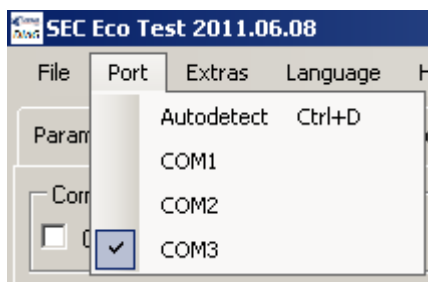
1. **Autodetect-** automatic port detection on computer, to which was connected the interface connecting the driver with computer.
2. **COM1 to COM3 –** the ports, on which the driver was detected.

Extras
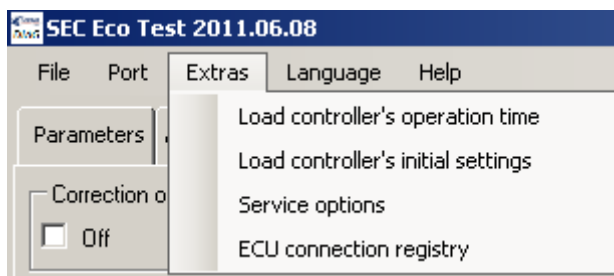
5. Technical specifications

Operating temperature range	**-40°C +125°C**
Voltage input range	**10 – 16 VDC**
Minimal resistance of gas injector	**2 Ω**
Maximal rated current In	**1 to 6A** **(depending on used injectors)**
Standby curent	**Below 1mA**
Measuring of gas pressure	**Diff Sensor – absolute, relative measurement, filtered FIR**
Measuring of gas temperature	**Diff Sensor 0,5 %**
Measuring of reducer temperature	**Mitsubishi 0,5 % temp. sensor**
Communication	**Diagnostic interface**
Computer processor	**DSP – 130 MHz**
Analog channels (lambda probe, pressure, temperature)	**Voltage range: 0-16V, sampling: 12bits 100kHz**
Reading of petrol injectors	**Petrol injectors controlled with „ground" and "+" .**
Resistance of internal emulator	**100Ω +/–10%** **-It's possible to order version with a different resistance.**

* ATTENTION, the manufacturer reserves himself the possibility of changes in the program not contained in this instruction.

WARRANTY

1.1 The basis to use the warranty powers is to have a properly completed warranty book and the original excerpt from the certificate of installation approval.

1.2 The warranty is given by the plant mounting the installation for the period of:

- 24 months from the date of installation- for electronic parts;

- 12 months from the date of installation- for mechanical parts (reducer, injectors etc.) bought from LECHO Elektronika Autogaz.

1.3 The manufacturer is not liable for defects or damages resulting from faulty installation.

1.4 The repair of faulty installation of parts should be done within 14 days from the date of written notification of failure at the plant, which has mounted it.

1.5 The warranty does not cover materials that have been damaged as a result of normal operation (filters etc.)

1.6 The manufacturer is not liable for damages of installation caused by contaminated gas fuel.

1.7 The loss of warranty cause:

- failure to comply with recommendations and information on the proper operation of the gas installation contained in the User Manual and Warranty Book;

- violation of seals and regulatory elements of installation;

- failure to follow the recommended maintenance procedures and the lack of their confirmation on the guarantee;

- making individual repairs or adjustment of gas installation.

The manufacturer is not liable for damages caused by the poor technical condition of the engine or its components affecting the proper operation of the gas installation.

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