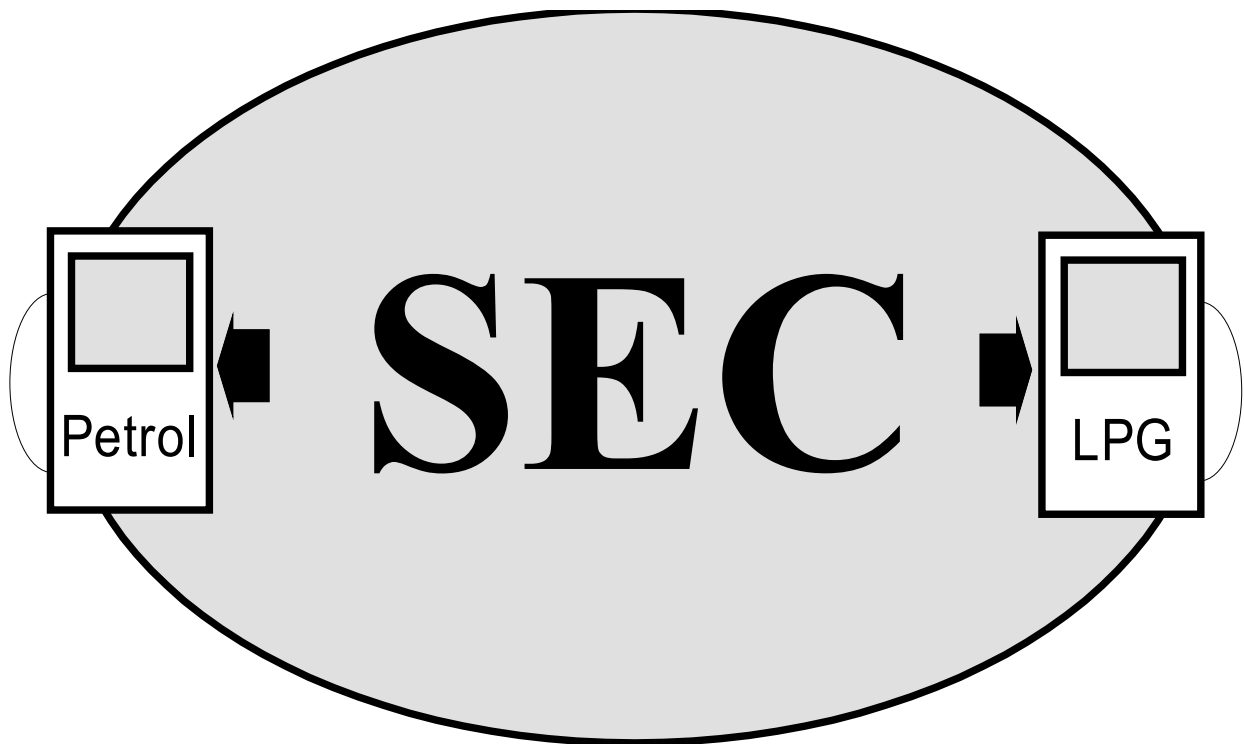


LECHO

Elektronika autogaz



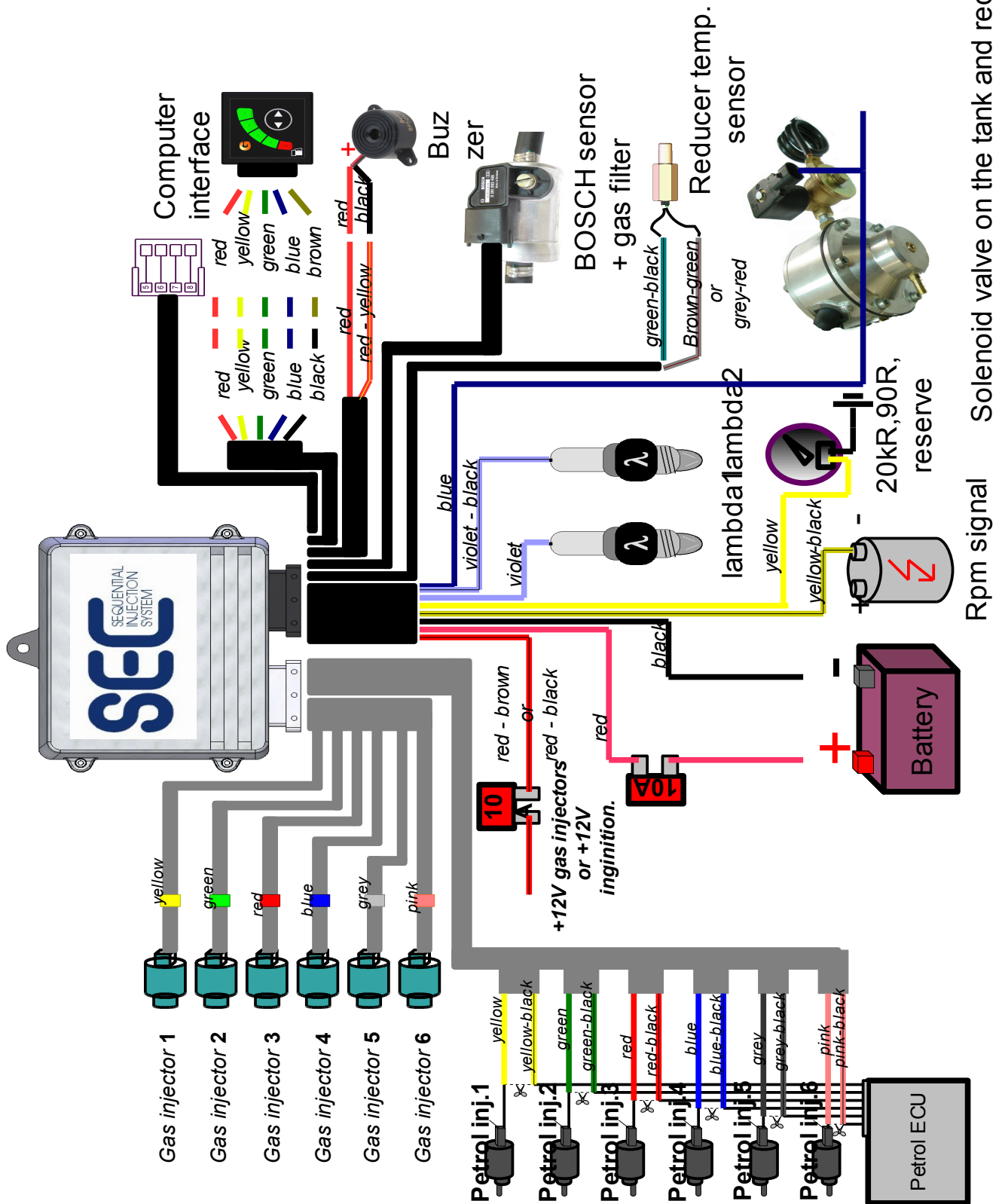
Sequential gas injection system

SEC sequential/synchronous/group gas injection installing and tuning manual

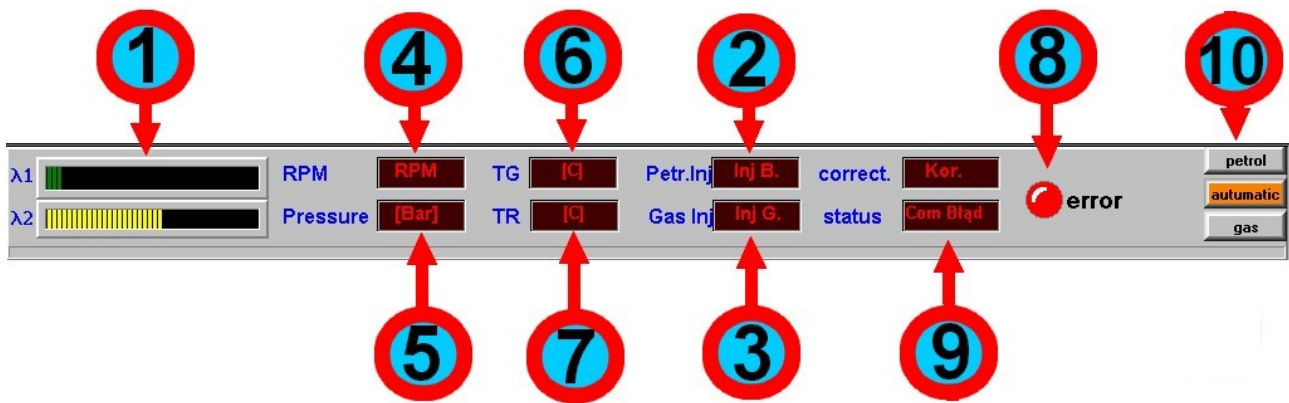
Technical data:

<i>Operating temperature range</i>	<i>-40°C +125°C</i>
<i>Supply voltage range</i>	<i>9 – 20 VDC</i>
<i>Gas injector's minimum resistance</i>	<i>0,6 Ω</i>
<i>Maximum current In</i>	<i>1 to 8A (depending on the injectors used)</i>
<i>Gas pressure readout</i>	<i>BOSCH Sensor – absolute, filtered FIR readout</i>
<i>Gas temperature readout</i>	<i>BOSCH Sensor 0,5 %</i>
<i>Regulator temperature readout</i>	<i>Mitsubishi 0,5 % temp. sensor</i>
<i>Lambda probes voltage readout (2 channels)</i>	<i>0 to +5 V DC</i>
<i>Communication</i>	<i>Diagnostic interface</i>
<i>Computer's processor</i>	<i>DSP – 130 MHz</i>
<i>Analog Channels</i>	<i>12bit 100kHz</i>
<i>Petrol injectors readout</i>	<i>Basic version operates with injectors controlled by „ground”” . A version reading out injectors controlled by „plus” is available.</i>
<i>Inner emulator resistance</i>	<i>100 Ω +/- 10% - It's possible to order a version with different resistance.</i>

Installing blueprint.

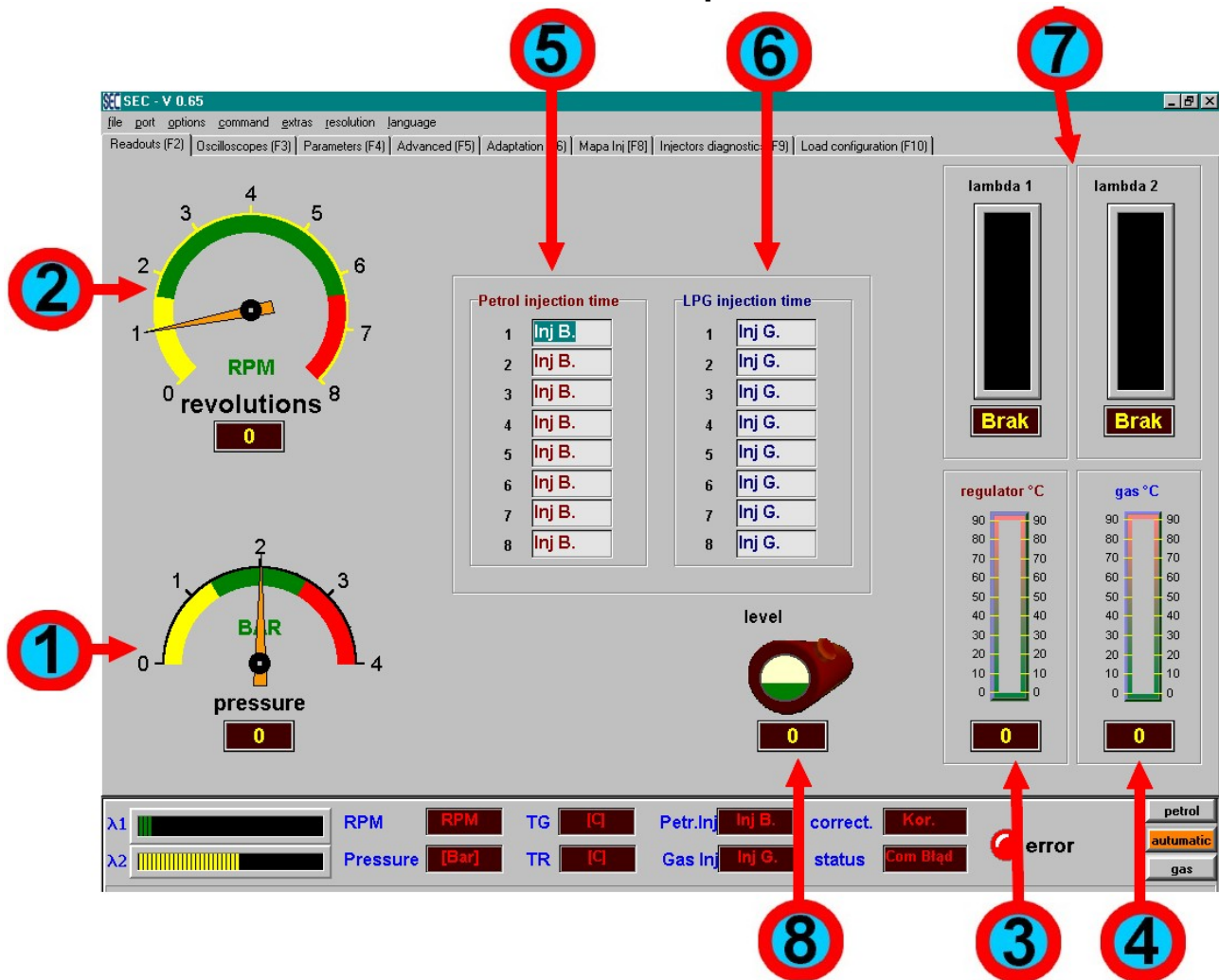


Lower Visualisation Panel description:



1. Lambda probes:
 - after selecting a proper lambda probe type one can observe it's changes in the panel. L1 – first probe, L2 – second probe. Connecting the probes is not necessary.
2. Petrol injection time:
 - petrol injection time displayed in [ms]
3. Gas injection time:
 - Gas injection time displayed in [ms]
4. Engine revolutions:
 - engine revolutions/minute [rpm]
5. Gas pressure on the injectors strip:
 - It is the absolute pressure of expanded gas from BOSCH sensor
 - 1.00 Bar stands for atmospheric pressure
 - Recommended pressure by weight is 1.80 – 2.10 Bar, whereas by idle gear 1.2 – 1.6 Bar.
6. Gas temperature:
 - temperature measured by BOSCH sensor
7. Regulator temperature:
 - regulator current temperature
8. Controller's errors status:
 - if during the system operation an error occurs, it will be indicated by the red dot flashing and an „error” inscription. After clicking the dot the error code will appear. .
 - the error can be deleted in the program menu (it also deletes old errors)
9. System Status:
 - informs whether the controller is connected to a PC computer and indicates the current feed status (Petrol / GAS)
10. Feed change buttons:
 - by means of the buttons the feed can be changed at any moment to petrol, gas or automatic operation
 - feed change works even if switching conditions hadn't been achieved

Readouts Description:

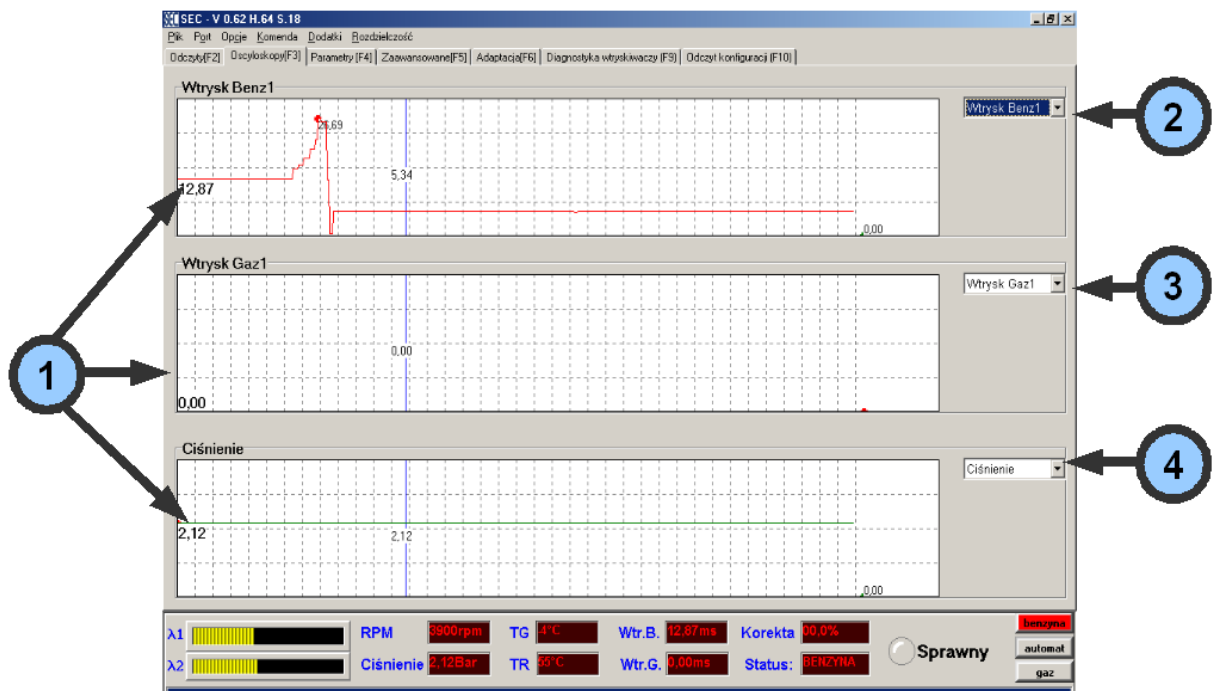


All values are displayed live !!!

1. Gas Pressure:
 - a manometer indicating current gas pressure in the BOSCH sensor
 - 1.00 Bar stands for atmospheric pressure
 - Recommended pressure by weight is 1.80 – 2.10 Bar, whereas by idle gear 1.2 – 1.6 Bar
2. Engine rpm:
 - indicates current engine rpm
3. Regulator temperature:
 - a thermometer indicates the regulator temperature graphically and digitally
4. Gas temperature:
 - a thermometer indicates gas temperature graphically and digitally
5. Petrol Injection Time:
 - petrol injection time in [ms]
6. Gas Injection Time:
 - gas injection time in [ms]

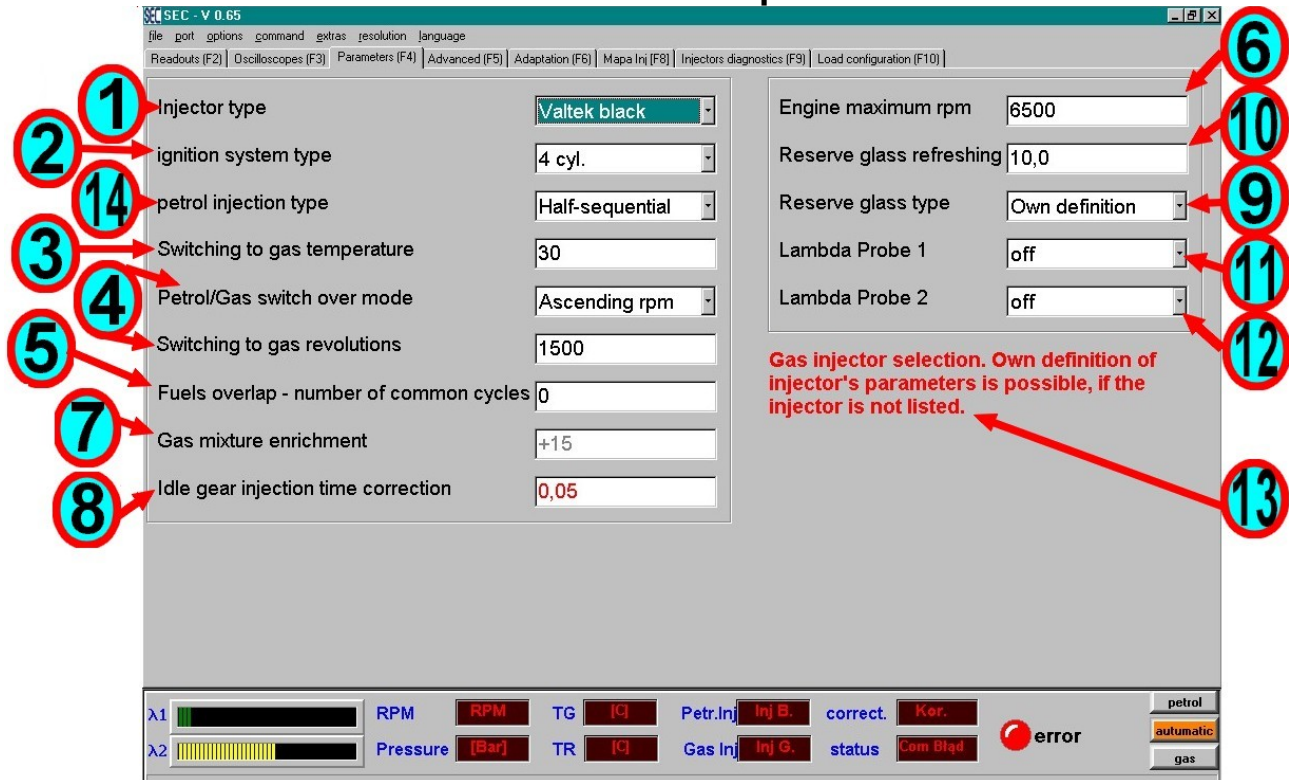
7. Lambda probes readouts:
 - allows to observe graphically and digitally voltage from the probes
8. Tank gas level, according to the sensor indication:
 - indicates the gas level in the gas tank. Level is the unit – a value variable from 0 to 4096

Oscilloscopes Description:



1. Oscilloscopes:
 - very fast, displaying values live.
 - time constant of displaying is 0,015 second
 - **green dot** on the oscilloscope's run indicates the minimum recorded value
 - **red dot** on the oscilloscope's run indicates the maximum recorded value
2. - middle, **blue strip** indicates a value in the middle of the oscilloscope's run
 - **current value** is displayed on the oscilloscope's left side
3. Petrol injector display selection:
 - petrol injectors times from Inj P1 to Inj P8 can be observed on the first oscilloscope. Each injector is displayed separately.
4. Gas injector display selection:
 - gas injectors times from Inj G1 to Inj G8 can be observed on the first oscilloscope. Each injector is displayed separately.
5. Additional parameter display selection:
 - The last oscilloscope can display: gas pressure, lambda probes voltage, gas temperature, regulator temperature, rpm, and corrections

Parameters Description:



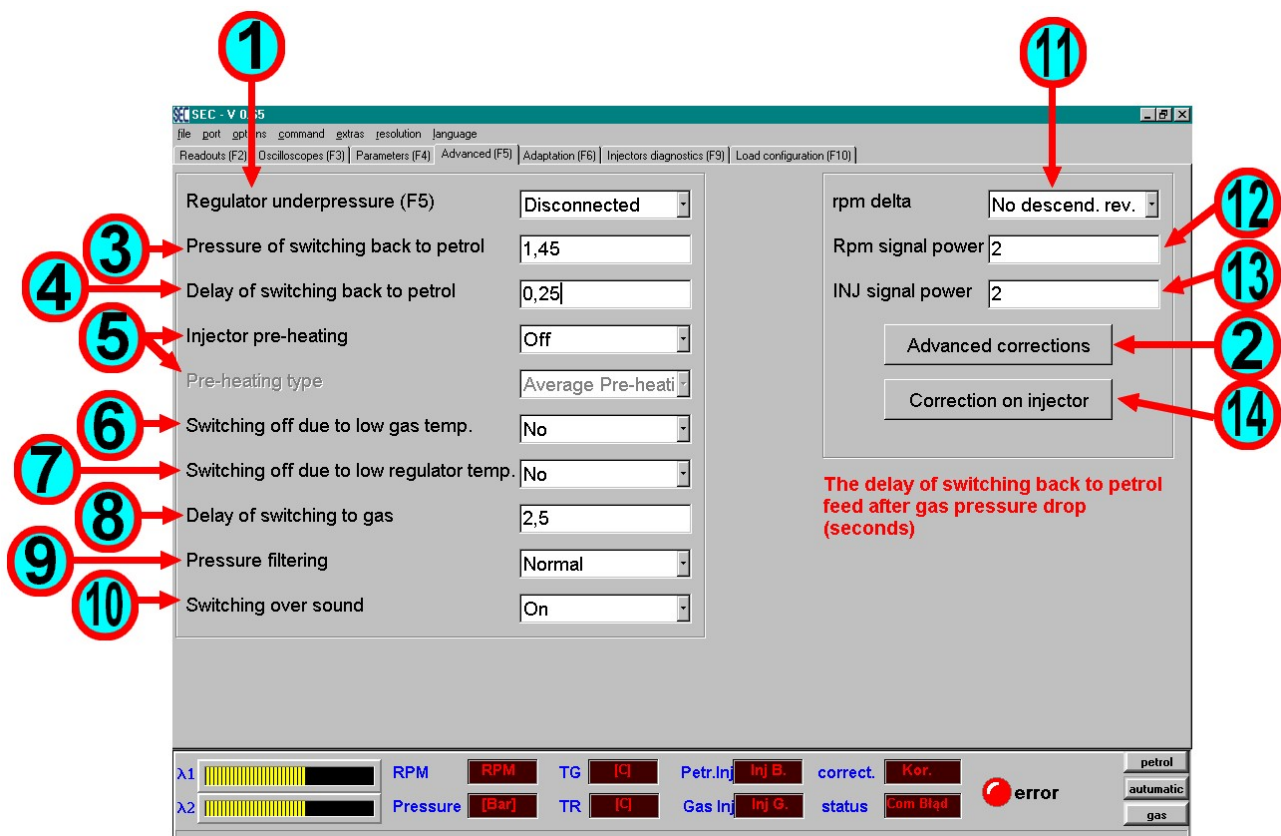
- Manually entered parameters are saved to the controller after exiting the parameter or after pressing the **[Enter]** key.
- Parameters selected with a mouse (e.g. Injector Type) are saved to the controller after selecting the parameter.

1. Injector type:
 - it is the field of selecting the injector type used
 - select the injector used from the list
 - Injector change modifies **Injector Parameters** in **advanced settings**
 - alternatively select an available injector from the list and then select injector's **Own Definition**, what allows to modify **Injector Parameters** in **advanced settings**
 - **Attention !!!! If the injector is available on the list, do not modify it's settings, because it may cause the system's incorrect operation!!!!!!**
2. Ignition System Type:
 - select the ignition system type in such a way, so that the displayed engine rpm are equal to actual ones
3. Switching to gas temperature:
 - regulator temperature, at which switching to gas feed is possible.
 - the temperature should not be set below 30 °C
4. Switching to gas revolutions:
 - rpm, at which switching to gas feed takes place
 - Switching may take place at ascending or descending revolutions

5. Fuels overlap – number of common cycles:
 - it represents fuels overlap in cycles, that is common injections of gas and petrol
 - it's the number of petrol and gas common injections until the injectors emulator switches on, usually it shouldn't exceed 12 common cycles
 - usual settings: 4cyl. – 4 cycles, 6cyl. - 6 cycles
6. Engine Maximum Rpm:
 - a very rarely used option, it allows to switch to petrol feed after reaching maximum rpm
7. **LPG mixture enrichment:**
 - gas mixture enrichment at weight is the main parameter allowing to regulate gas dosage to cylinders
 - enrichment is automatically selected during **autoadaptation**
 - the parameter's value may be negative, however if it is too low, e.g. below **-10 %** it means that **the injectors nozzles have been selected incorrectly**, and they should be changed to **smaller ones**
 - whereas if the parameter exceeds **+40 %**, **the injectors nozzles should be changed to bigger ones**, because the car may have too little **power**.
 - the easiest way, without autoadaptation, is to select the enrichment in the experimental way: check how the car rpm climb up at various settings and choose the best one.
 - if the „**check engine**” lights because of the mixture (e.g. too lean or too rich), adjust it with this particular parameter – if the map is not used
 - after changing **the Enrichment** check if the displacement is set correctly !!!!!!!
8. **Enriching/straitening the mixture on idle gear (displacement):**
 - displacement means **enriching/straitening** the mixture **on idle gear** (without weight)
 - displacement is selected automatically during **autoadaptation**
 - it is the second main controller's parameter. The rule for setting this parameter: make the petrol injection time during gas feed very similar to the petrol injection time during petrol feed . It will prevent the on-board computer from displaying errors on idle gear.
 - before setting the displacement, the previous parameter - **7. - LPG mixture enrichment** must be set correctly first.
 - manual setting:
 - Switch to petrol feed, wait a while, then write down petrol injection time **Tp1**, then switch to gas feed and write down petrol injection time **Tp2**.
 - $Displacement = Tp2 - Tp1$.**
 - This is the equation for calculating the displacement**
 - always try to select **the injectors nozzles** and **pressure on idle gear** in such a way, so that the displacement is a positive value
9. Reserve Glass Type:
 - gas level indicator type selection. Own definition is possible, as well as changing the thresholds values of selected glass
10. Reserve refreshing:
 - this parameter indicates how often (in seconds) the reserve glass level is being refreshed
 - the bigger the inertness of the multivalve is, the higher value this parameter should have

11. Lambda Probe 1:
 - lambda probe selection
 - in case of lack of probe select: **Off**
12. Lambda Probe 2:
 - lambda probe selection
 - in case of lack of probe select: **Off**
13. Handy parameter description
 - displays a short description of each parameter in the program after selecting a specific parameter
14. Petrol injection system type.
 - select a proper one, although it is not necessary

Advanced Parameters Description:



1. Regulator Underpressure:
 - the system may operate either with the underpressure connected or disconnected
 - it is recommended always to connect the underpressure to the regulator !! It allows to achieve lower gas pressure in the injectors' strip on idle gear.
 - this parameter is set during autoadaptation
2. Advanced corrections.
 - switching on a map which allows to enrich the mixture at various engine's run ranges.

3. Pressure of Switching Back to Pertol:
 - pressure, below which the controller will switch back from gas feed to petrol feed
 - this parameter should be kept above the atmospheric pressure, which is 1 Bar
 - do not wxceed 1,5 Bar
 - this parameter is set during autoadaptation
4. Delay of Switching Back to Pertol:
 - time, after which the contoller will switch back from gas feed to petrol feed after detecting too low pressure on the injectors strip
 - this parameter is important by cars with a turbine, where it should be extended
 - 1 second is a standard
5. Injector pre-heating:
 - this option allows to pre-heat gas injectors before switching to gas feed
 - works if the regulator temperature is below 5°C
 - the pre-heating is done by short impulses of gas injectors opening and lasts for several dozen seconds or until the regulator reaches 5°C
 - this option is initially off
6. Switching off due to low gas temperature:
 - if this option is set, car feed will be switched back from gas to petrol when the gas temperature drops below the pre-set one.
 - it prevents gas in the regulator from not vaporizing
7. Switching off due to low regulator temperature
 - if this option is set, car feed will be switched back from gas to petrol feed when the regulator temperature drops below the pre-set one.
 - it prevents the regulator from freezing
8. Delay of switching to gas:
 - time from switchiong on coils on the tank and regulator to switching on gas injectors. It may be used as delay of switching to gas feed
 - it it the time from switching on the tank's multivalve and the regulator's solenoid valve to switching on the injectors emulation and starting the run of gas injectors
9. Pressure filtering:
 - sensitivity of BOSCH sensor filtering
 - initially the filtering is set to Normal
 - if the underpressure is on this parameter may be set to faster filtering
10. Switching the sound signal on/off:
 - the buzzer is active or mute.
11. Rpm Delta.
 - if the rpm descends by the set number, car feed will be switched to gas (with the option descending rpm selected)
12. Rpm Signal Power:
 - if there are interferences on the engine rpm signal, this function allows to eliminate them
 - the higher the parameter value, the stronger the filtering
 - the filtering is internally limited to 500 units, still it is not recommended to exceed 100

- the parameter is initially set on 2

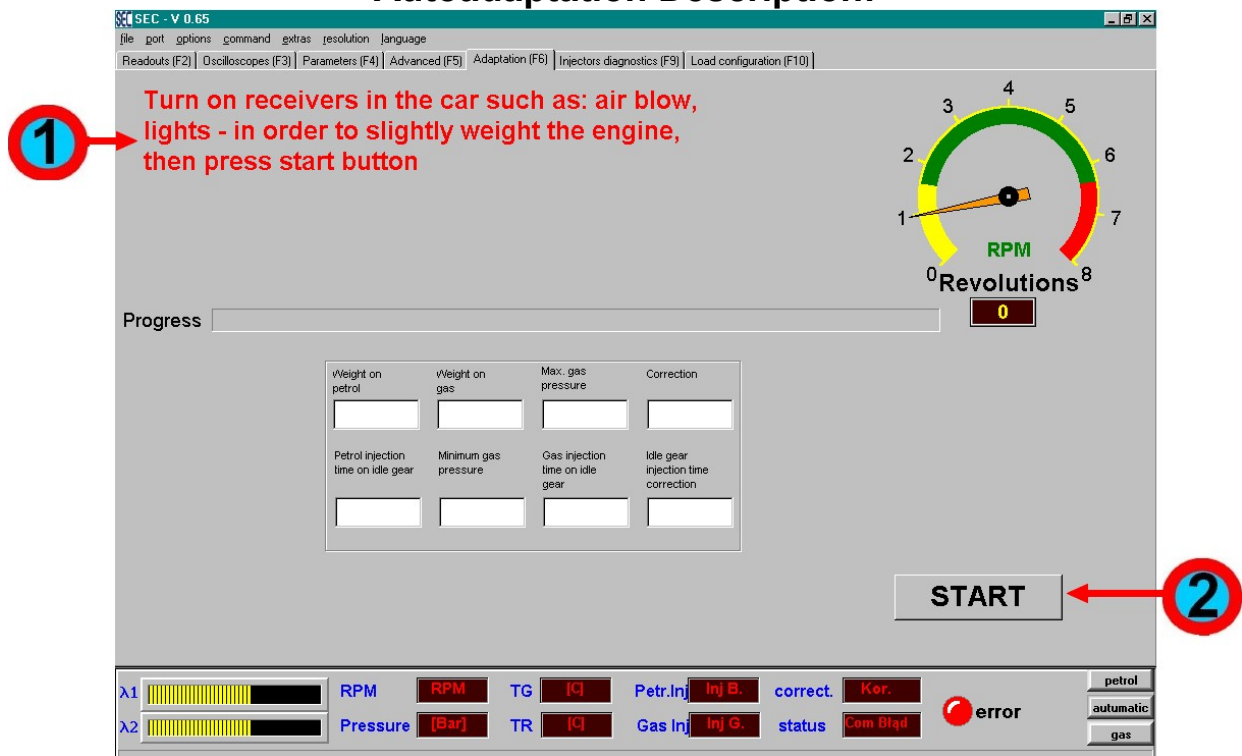
13. INJ Signal Power:

- if there are interferences on the injections time signal, this function allows to eliminate them
- the higher the parameter value, the stronger the filtering
- the filtering is internally limited to 500 units, still it is not recommended to exceed 100
- the parameter is initially set on 50

14. Corrections on the injector:

- this parameter works identically as **Displacement** except that it can be applied to each cylinder separately
- the parameter applies to engine idle gear
- the parameter is useful by V - engines

Autoadaptation Description:



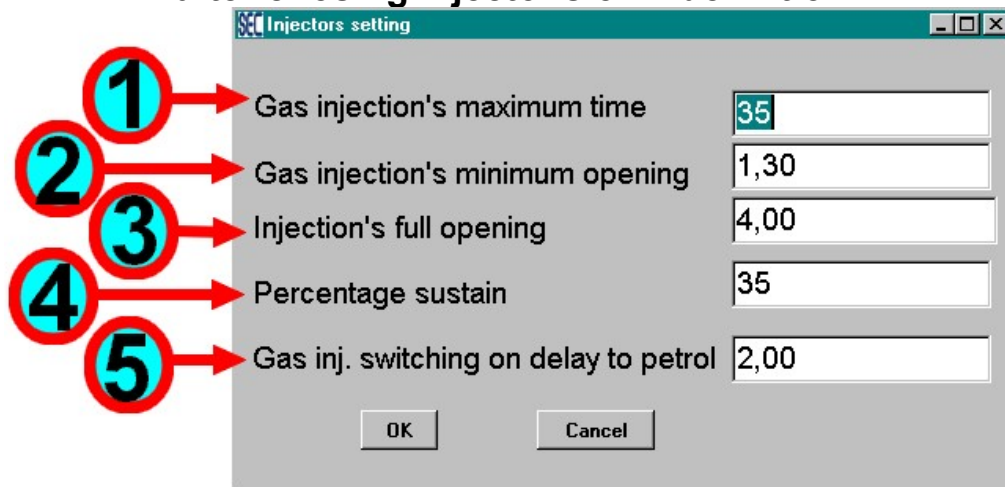
1. Commands field:

- on this field the commands for autoadaptation will be displayed
- follow the commands !!!!

2. Autoadaptation Start Button:

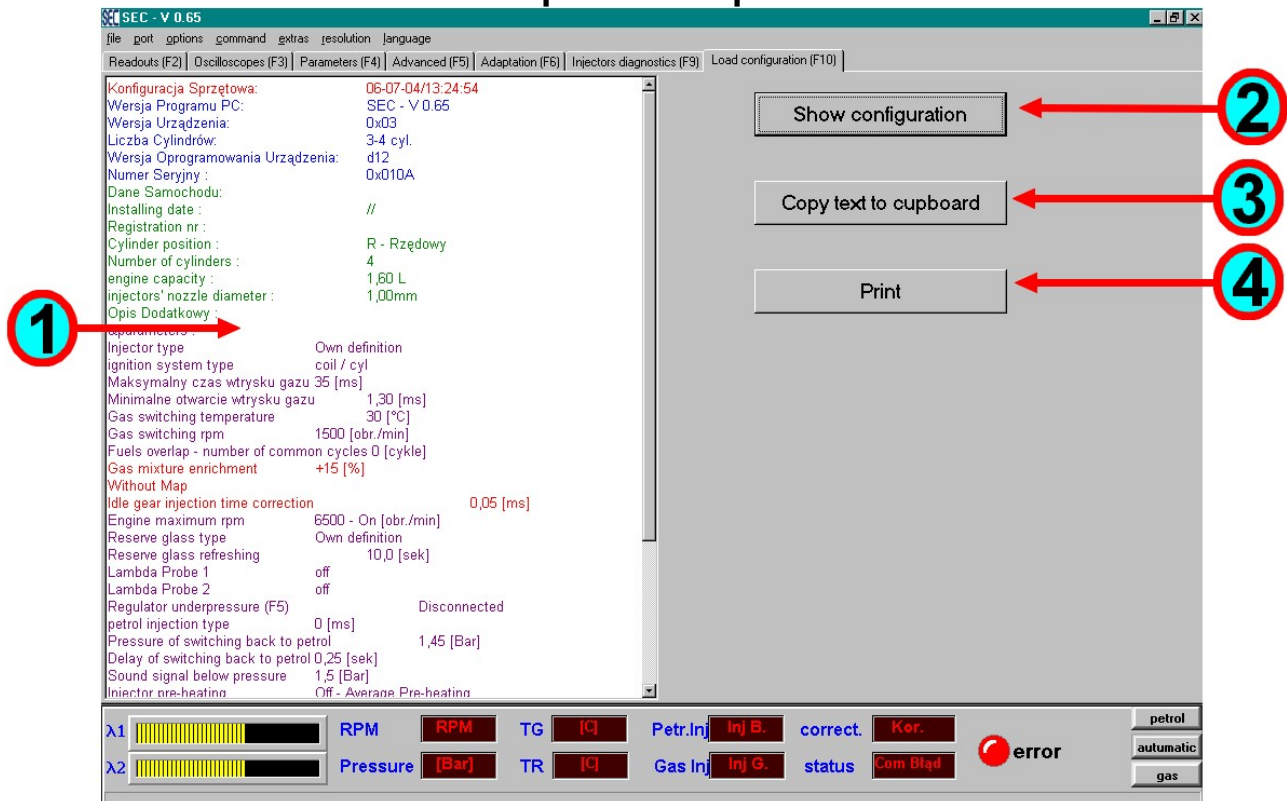
- clicking the button starts the autoadaptation process. Once started, the autoadaptation should not be aborted until it's finished !!!!

Injector's Parameters Description after choosing injector's own definition



1. Gas Injection Maximum Time:
 - Maximum time that a gas injector is able to generate
 - initially set on 30 [ms]
2. Gas Injection Minimum Opening:
 - minimum time, during which a gas injector opens , if a petrol injection opening is detected
 - this parameter depends on the injector's speed and is modified by injector selection field
3. Injection full opening:
 - the time of full current impulse which opens the gas injector.
 - do not exceed the range from 2 to 8 [ms], because it may lead to injectors' coils damage or free injection opening !!!!!!!!!!!!!!!!!!!!!!!
4. Percentage sustain:
 - percentage current of injector's sustain
 - this parameter depends on the injector's resistance and is modified by injector selection field
 - keep this parameter within the range from 30 % with low resistances (e.g. 1.2Ω) to 60 % with high resistances (np. 10Ω)
5. Delay of Switching On LPG injection to Petrol:
 - it is the time in [ms] by which switching on gas injection will be delayed comparing to petrol injection
 - 2 [ms] is a standard value
 - this parameter is modified by injector selection field

Notepad Description:



1. Controller Configuration Display Field:
 - main field, displays the controller's configuration
2. Show Configuration:
 - clicking the button once will display the configuration in the main field
3. Copy Text to Cupboard:
 - clicking the button will copy the configuration in a text form to the system's cupboard, so that it can be pasted to a text editor or another program later
4. PRINT:
 - prints the configuration

Program Menu Description



FILE

1. Load Parameters – loads previously saved parameters from a file.
2. Save Parameters – saves parameters to a file.

PORT

1. Autodetection – automatically detects the computer port, to which the interface has been connected
2. Number of the port, in which the controller's presence has been detected.

OPTIONS

1. Readouts – displaying the readouts tab in the program
2. Oscilloscopes – displaying the oscilloscopes tab in the program
3. Parameters – displaying the parameters tab in the program
4. Advanced – displaying the advanced parameters tab in the program
5. Autoadaptation – displaying the autoadaptation tab in the program
6. Map 1 – map enabling advanced functions of enriching/straitening the mixture.
7. Map Inj – weight map enabling to enrich/straiten the mixture.
8. Injectors diagnosis – tab enabling to switch off gas injectors in order to check their operating
9. Configuration readout – notepad tab.

COMMAND

1. Feed change after choosing petrol/automatic/gas option.
2. Controller errors readout.
3. Controller errors erasure.

EXTRAS

1. Controller's operating time readout.
2. Car's data from the controller readout
3. Saving car's data to the controller (np. w przypadku zmiany dysz).
4. Reset the controller to initial settings

Installing directions:

1. All the connections should be made with fuses taken out.
2. All the connections must be properly soldered and sealed !!
3. Crew members responsible for installing and tuning should be trained for the job.
4. The injectors' nozzles should always be chosen properly, according to the car's power!!
 1. In case of too large nozzles, the car's consumption may be too high, and the mixture may be too rich
 2. In case of too small nozzles, the car's power may be too low and the mixture may be not rich enough
5. Pressure should always be chosen properly on low revolutions, with underpressure connected to the regulator – recommended pressure is 1,4 Bar.