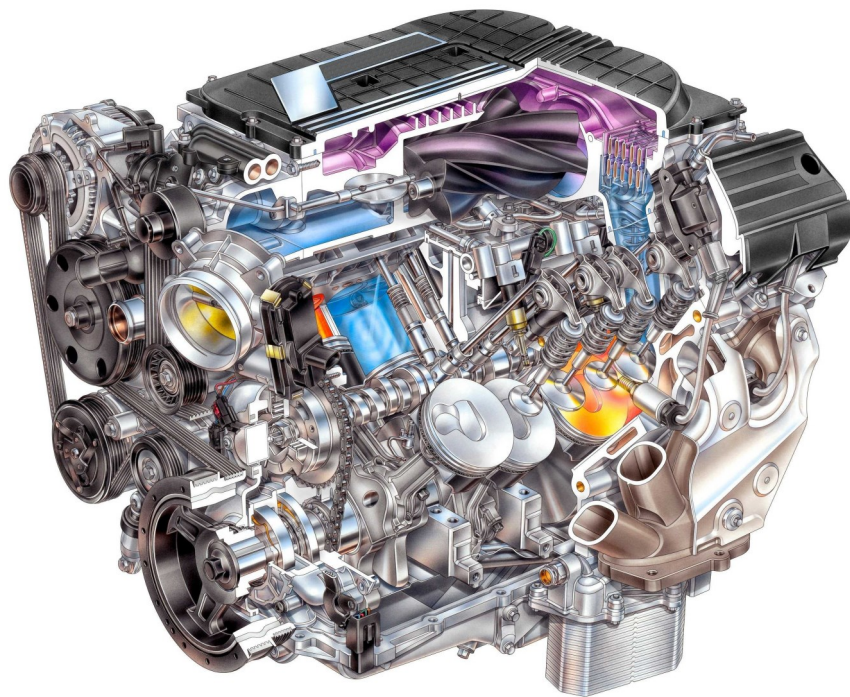# SPARK
sistemi autogas

SOFTWARE MANUAL

ECOCOMFORT DIRECT INJECTION

Welcome:

Dear Customer,
We wish to thank you for the purchase of this product.
This Manual is released to the program you are using or a compatible version.

We strongly recommend that you carefully go through all the pages before
starting any operation or setting of the system: this will allow you to get more
confidence and avoid all possible troubles and delays during your job.

Every Direct Injection Car have a specific installation manual and configuration where,

all the parameters in according to the specific Petrol Ecu strategy, are properly set.
Test the car and check the gas map on the road is mandatory for avoid any troubles.

For any question you may contact our Distributor's After Sales Service.
Have a nice time with your job and our products.

NOTE:
This Manual is referred to the software version 2.00.65
All the functions shown in this manual are referred to the latest version of ECUs firmware
available with the software.

Index:

1 - System requirements:

OS: Windows 7, 8, 8.1, 10
RAM: 2 GB or more
HDD: 20 MB or more
Display resolution: 800x600 (suggested 1024x768)

2 – To launch the Direct Injection Software:

Double-click on the icon "Setup_SPARK_AJ_500_Direct_Injection_v2 . 00.65_20200514" (or right-click it and select open from the pop-up menu).

Select the preferred installer language and press "OK".
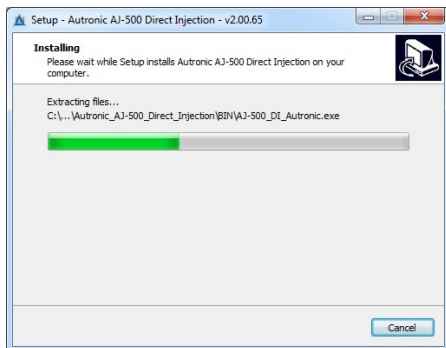
Install the software on your computer. The system before the installation, request the installation directory, we recommend to choose the default directory.

Setup as finished installing software, launcher icon is available on your desktop.

If you are interested to use the Bluetooth interface, double-click the icon "Setup_SPARK_AJ-500_Direct_Injection_v2.00.65_20200514_Patch_BT" (or right-click it and select open from the pop-up menu). This patch does not substitute the software installer and must be install after the Direct Injection Software setup.

3 – Run the Direct Injection Software:

Open the software by double-click the desktop's icon.

The software can work online (connect to the Gas Ecu) or offline (not connect to the gas ecu).

When the software is online if there is the latest firmware all the function are available.

When the software is offline is possible:

- To modify the configuration.
- To analyze external configuration received.
- Load the oscilloscope files.

During the first launch of the application, the software automatically try for 60 seconds to establish the connection with the Gas Ecu; after this time press the button to connect manually.

STOP	Stop: abort the connection try.
	Connection Icon: to start the connection try. This icon can be in three different color in according to the connection status. Yellow: connection in progress. Green: connection establish. Red: connection failed.
COM100 BT	Connection port.

NOTE:

In case of connection failure check:

- PC serial link driver and connection.
- Gas Ecu power supply (+12V battery red/black wire and ground black wire).

4 – Main menu:

This is the main page you can obtain information regarding the configuration loaded when the connection with the gas ecu is established.

Filename: [204PT] LR Range Rover Evoque 2000 177 Kw [ID7190-CNG] #200221
Notes: Hana No Nozzle-1.0 bar-Check the gas map

Status	PETROL	TjPet(ms)	1,09	1,08	TRed(°C)	53	Press(bar)	0,97	Pres.Petr. IN(V)	0,85	42,5 bar
											Fast(%) - Slow(%)
RPM	799	TjGas(ms)	- -	- -	TGas(°C)	44	MAP (bar)	0,41		Petr.Press.	- -

Configuration name loaded in the gas ecu, verify the name match with that one in the direct injection car list.
In this example:

Filename: [204PT] LR Range Rover Evoque 2000 177 Kw [ID7190-LPG] #200221.tsx
Notes: Hana No Nozzle-1.0 bar-Check the gas map

- 204PT: Engine code.
- LR Range Rover Evoque: Brand and model.
- 2000 177 Kw: Engine spec.
- ID7190:   Car ID that match in the DI car list.
- #200221:   Configuration data.
- Notes: Nozzle size and gas pressure suggestion.

⚙	Software level: identify the software level, grey indicate the installer version.
🏠	Home: back to the main menu.
Italiano **English**	Language selection: change the software language.
Tuning (F1)	Automatic process page for acquiring all the system essential signals.
Parameters (F2)	Settings page for tuning and enable strategy.
Monitor (F3)	Monitor page for checking all the signals read by the system and oscilloscope.
Errors (F4)	Gas diagnosis page, freeze frame and service.
Configurations (F5)	Load, save and reset the parameters.
ECU (F6)	Check and update the firmware.
Exit (F7)	Close the software.
Ecu Firmware: 3RD GEN CP[T] 01.08 - 28/11/2019 -------------- Lot: 0, 0, Week: 0/0 ID Code: 0, SL: 0 Cylinders Number: 4 Hardware configuration: 0	Information related to the gas ecu firmware: • Hardware type • Firmware • Batch number • Production week • Internal code • Cylinders number • Hardware configuration

5 – Dashboard:

The dashboard shows the car signals read by the gas ecu, (all the signals are available in the MONITOR page) but this tools it's useful to keep under control the most important information during the tuning. The software's switch is working like the real switch in order to monitor it and use it for switching to the other fuel, Left-click on it and the system switches to the other fuel. It's possible force the commutation for avoid RPM and temperature threshold keep press Shift on the keyboard + Left-click on the icon.
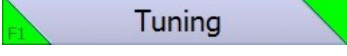
Status	**GAS**	TjPet(ms) 1,70 2,20	TRed(°C) 53	ABS(bar) 1,36 Press(bar) 0,95	Pres.Petr. 0,85 42,5 IN(V) bar	Bank 1 4,7 -3,1 Fast(%) - Slow(%)	
	RPM 999	TjGas(ms) 4,16 0,00	TGas(°C) 44	MAP 0,41 (bar)		Petr.Press. 42.8 bar	

	System is working on petrol.	Status GAS	The system real time status: key-on, key-off, petrol or gas.
	System is working on gas.	RPM 999	Engine rpm.
	System is ready to switch on gas, not reach the switch temperature, the led blinks slowly until reach the temperature threshold and it blinks fast when need only the rpm threshold.	TjPet(ms) 1,70 2,20 / TjGas(ms) 4,16 0,00	The left value indicates the main injection time, the right value indicates the extra-injection time if it's present.
	System is ready to switch on gas the second time after crank the engine.	TRed(°C) 53 / TGas(°C) 44	The gas and water temperature.
	System detects a gas diagnosis error that allow to change back for safety reason and the system is running on petrol, the buzzer beeping and the led blinks fast.	ABS(bar) 1,36 Press(bar) 0,95	Absolute or differential gas pressure.
		MAP 0,41 (bar)	Map sensor.
	System detects a gas diagnosis error that not allow to change back for safety reason and the system is running on gas, the buzzer beeps and the check engine led is light on.	Pres.Petr. 0,85 42,5 IN(V) bar	The rail petrol pressure voltage and bar conversion read by wire.
	System back to petrol for low gas level, the level led light on in sequence and the buzzer beeps.	Bank 1 4,7 -3,1 Fast(%) - Slow(%)	Fuel trim fast and slow. When is red the car is in open loop.
		Petr.Press. 42.8 bar	Petrol pressure read by OBD.

6 – F1 Tuning:

In the tuning page is possible to acquire again all the essential signals for the gas system. In this page there are four automatic tools for acquiring: RPM signal, injection order, petrol pressure and gas pressure. Each one have a led close to the label that show the state of every procedure that effect the color in the tuning button in the main menu. It's mandatory acquire again all of this procedure if the led not display green for everyone.
On the main menu the tuning icon can have three color:

Tuning	The state is red if the leds of the RPM signal, injection order, petrol pressure and gas pressure are all red. It's mandatory to acquire again.
Tuning	It's yellow if one or more of the previous four procedure are red and it's mandatory acquire again the missing procedure.
Tuning	It's green if all of the tuning's procedure have the green led. It's suggested acquire and check again the petrol pressure and gas pressure.
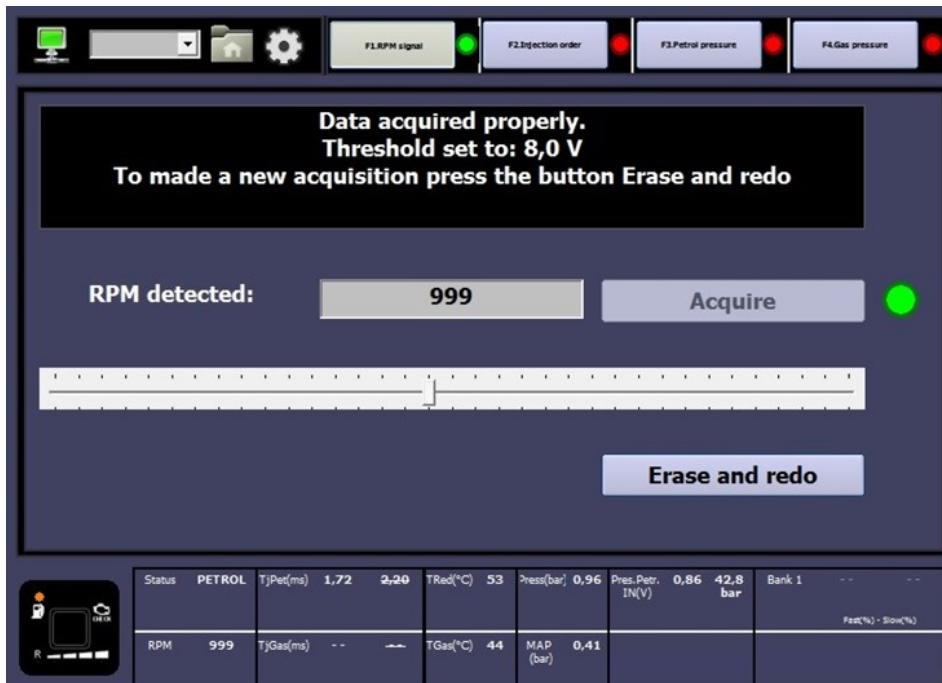
6.1 – F1.RPM signal:

This tool detects the correct voltage threshold for read the RPM signal.

In order to acquire again the signal if there is a problem to read the engine revolution is possible to abort the previous value by the button "Erase and redo" and "Acquire" again.

This procedure works if the RPM wire is connected on the negative signal of the injection coil.
If not working try to check by oscilloscope the connection on the coil and check again the wiring diagram.
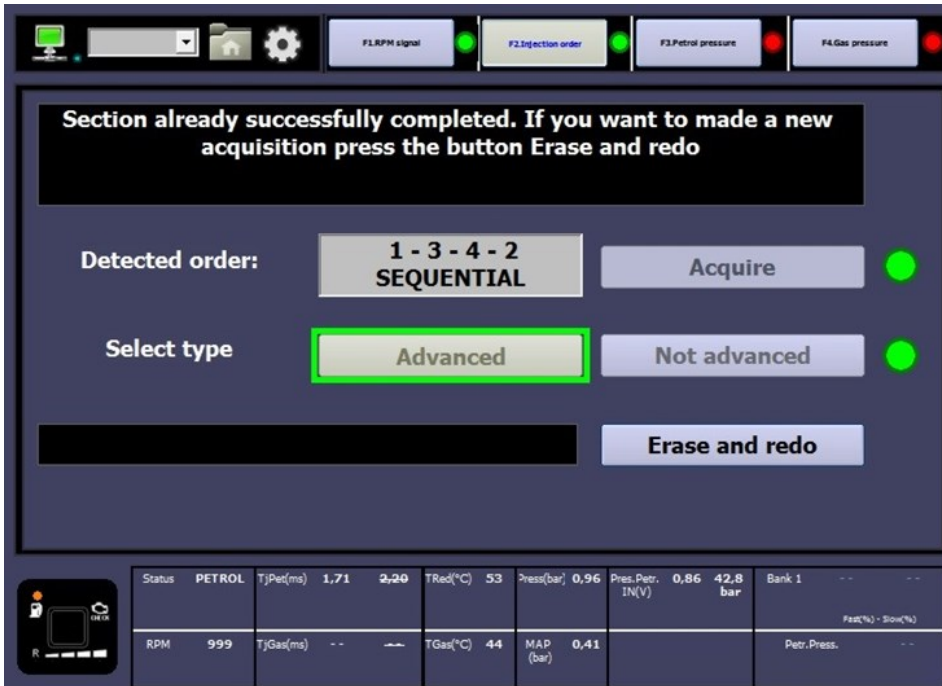
6.2 – F2.Injection order:

This tool allow to detect the correct injection order and select the gas injection.

- Detect order: "Acquire" the petrol sequence in according to the wiring harness connection.
- Select type: "Advance" the system automatically advance by one the gas injection. This strategy is necessary if during the road test without advance there is the feeling to have a delay in acceleration.

In order to acquire again the signal if there is a problem to petrol injectors connection sequence is possible to abort the previous value by the button "Erase and redo" and "Acquire" again.

NOTE:

In order to check the correct gas sequence connection it's important not advance and during gas operation switch on petrol one by one each cylinder (**Page 15**) for testing if the engine jerks.
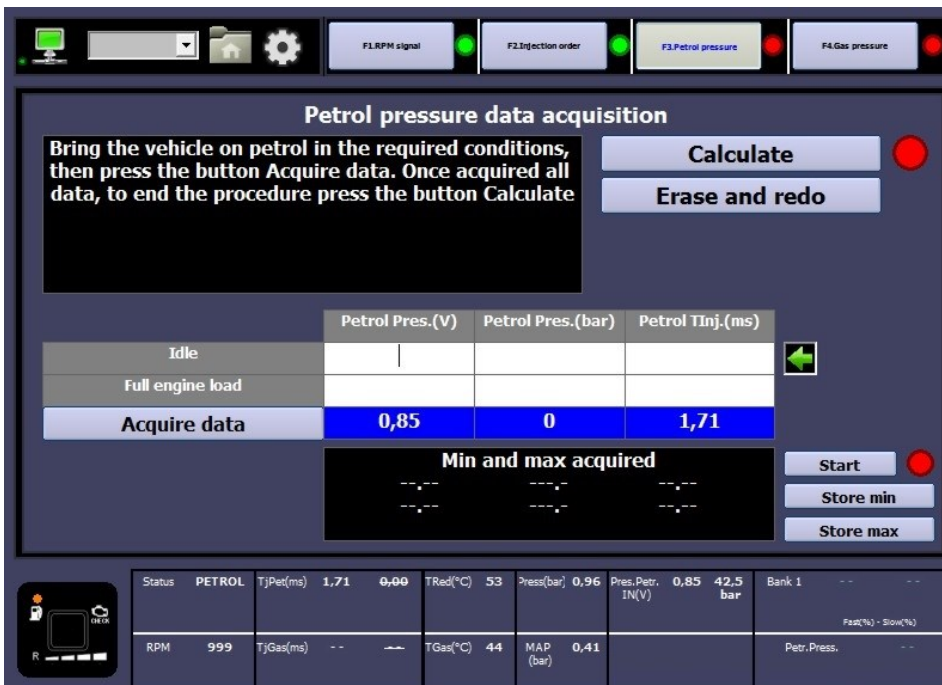
6.3 – F3.Petrol pressure:

The petrol pressure tool is necessary for the system strategies.
It's always better acquire again in every car and it must be done during petrol operation.
The OBD connection and the petrol pressure read by OBD is mandatory for the acquisition.
If the car doesn't switch on gas the first time after crank the OBD connection is disabled.

There is two way to make it:
- Automatic record.
- Push to record.

6.3.1 – Automatic record:

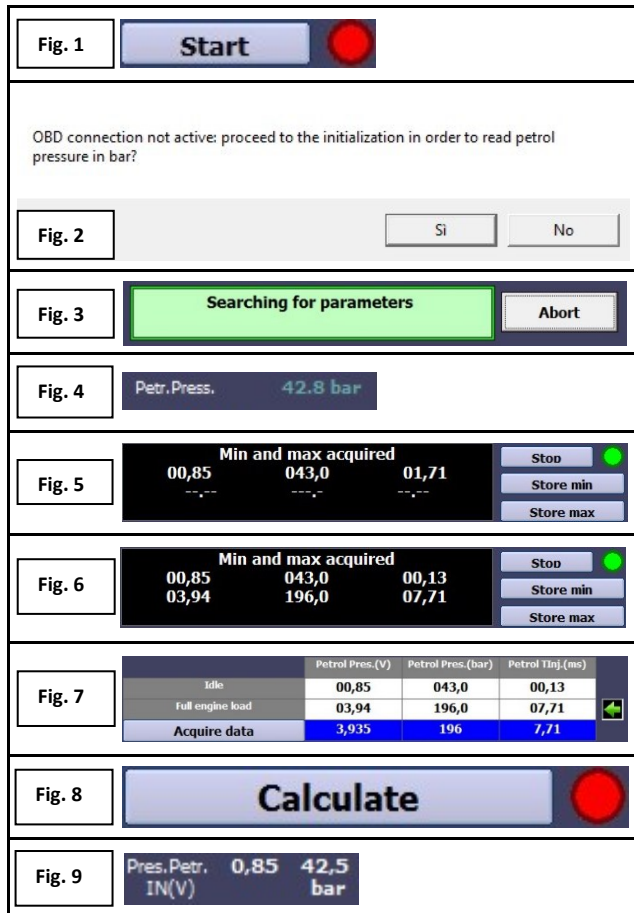|	
Fig. 1	Start 🔴
Fig. 2	OBD connection not active: proceed to the initialization in order to read petrol pressure in bar? — Si / No
Fig. 3	Searching for parameters — Abort
Fig. 4	Petr.Press. 42.8 bar
Fig. 5	Min and max acquired — 00,85 043,0 01,71 — Stop / Store min / Store max
Fig. 6	Min and max acquired — 00,85 043,0 00,13 / 03,94 196,0 07,71 — Stop / Store min / Store max
Fig. 7	(chart)
Fig. 8	Calculate 🔴
Fig. 9	Pres.Petr. 0,85 42,5 / IN(V) bar

Fig. 7 chart:

	Petrol Pres.(V)	Petrol Pres.(bar)	Petrol TInj.(ms)
Idle	00,85	043,0	00,13
Full engine load	03,94	196,0	07,71
Acquire data	3,935	196	7,71

1. Activate the acquisition by pushing the button "Start" (**Fig. 1**) in case the system is already connect on the OBD skip to the **Step n° 6)**. There is a led state that indicate: **Red**: the procedure is not running. **Green**: the automatic strategy is running and the system starts to acquire the petrol pressure information. **Yellow**: the system is not working in the good window for acquiring the petrol pressure information, idle and full load over 3000 rpm.

2. In case the system is not connect with the car OBD the software advice to force the connection (**Fig. 2**), click "Yes" for make it or "No" for abort.

3. OBD connection process (**Fig. 3**)

4. When the gas system is connected to the OBD protocol should be available the petrol pressure on the rail (**Fig. 4**), if not contact the technical assistance for support.

5. Start again the procedure when the OBD connection is available by pushing the button "Start" (**Fig. 1**).

6. The system start to read and store automatically the values (**Fig. 5**) at idle and the full engine load. The values the system store is voltage read on the pressure sensor signal, petrol pressure rail in bar read by OBD and minimum petrol injection time in ms. It's mandatory drive on the road on petrol, use the gear number three and push the accelerator at the maximum for detect the maximum pressure. It's suggested try to stop the car on idle when the engine run in neutral release the accelerator and try to switch off all the load (lights, air conditioning, etc…). When it acquires all the value push the button "Stop", "Store min" and "store max" (**Fig. 6**).

7. The system fill in in the chart (**Fig. 7**) the information stored during the acquisition procedure.

8. Press the button "Calculate" (**Fig. 8**) for saving in the gas ecu the petrol pressure information and create the petrol pressure compensation. The state led of this function will be green.

9. Check on the road on petrol if the value of the petrol pressure read by OBD (**Fig. 4**) match with the petrol pressure IN (**Fig. 9**) calculated by the software. In order to acquire again another value, abort the previous one by pressure on the button "Erase and redo" and go back to the **Step N° 5)**.

6.3.2 – Push to record:

Fig. 10	Petr.Press. 42.8 bar
Fig. 11	⬅
Fig. 12	Idle / Full engine load / **Acquire data** — Petrol Pres.(V): 0,85 / Petrol Pres.(bar): 43 / Petrol TInj.(ms): 1,71
Fig. 13	Idle / Full engine load / **Acquire data** — Petrol Pres.(V): 3,935 / Petrol Pres.(bar): 196 / Petrol TInj.(ms): 7,71
Fig. 14	Idle: 00,85 / 043,0 / 00,13 — Full engine load: 03,94 / 196,0 / 07,71 — Acquire data: 3,935 / 196 / 7,71
Fig. 15	**Calculate** 🔴
Fig. 16	Pres.Petr. IN(V) 0,85 42,5 bar

1. Force the OBD connection on petrol.

2. When the gas system is connected to the OBD is available the petrol pressure **Fig. 10**), if not contact the technical assistance for support.

3. Keep the car on idle and switch off all the load; the green arrow (**Fig. 11**) must indicate the idle line in the chart, press the button "Acquire data" for fill in the chart (**Fig. 12**) the information read by the system on idle. If the green arrow is not on the idle line or in case it's missing check the map value should be close to 0,4 bar.

4. It's mandatory drive on the road on petrol, use the gear number three and push the accelerator at the maximum for detect the maximum pressure; when the car reach the maximum petrol pressure read by OBD press the button "Acquire data" for fill in this information in the chart (**Fig. 13**)

5. When all the chart is complete (**Fig. 14**) press the button "Calculate" (**Fig. 15**) for save in the gas ecu the petrol pressure information and create the petrol pressure compensation. The stat led of this function will be green.

6. Check on the road on petrol if the value of the petrol pressure read by OBD (**Fig. 10**) match with the petrol pressure IN (**Fig. 16**) calculated by the software. In order to acquire again another value, abort the previous one by the button "Erase and redo" and "Acquire" again.

6.4 – F4.Gas pressure:

The gas pressure on idle is an important information for the system in order to create the compensation for automatically adjust the injection time gas when the car is working on gas. The software compensate and stabilize the reducer efficiency in every working condition. It's possible to use two different compensation:

1. Absolute pressure is the real gas pressure out from the reducer.

2. Differential pressure is the difference between the absolute pressure and the map pressure (manifold vacuum). The formula is:
Diff.press. = (ABS) – (MAP).

Select the strategy preferred, switch the car on gas and press the button "Acquire" after a while the led close to it become green and the process end. In order to acquire again another value, abort the previous one by the button "Erase and redo" and "Acquire" again.

In case the system works with the absolute pressure in the software dashboard appears two pressure absolute and differential. It is possible to monitor both during the tuning.

NOTE:

In both the strategy the system is working fine, it's suggested use the ABSOLUTE PRESSURE because the gas map will be more linear and the value is more stable if the car changes frequently on idle the throttle position can change a lot the manifold vacuum, the absolute is always less effected to this problematics.
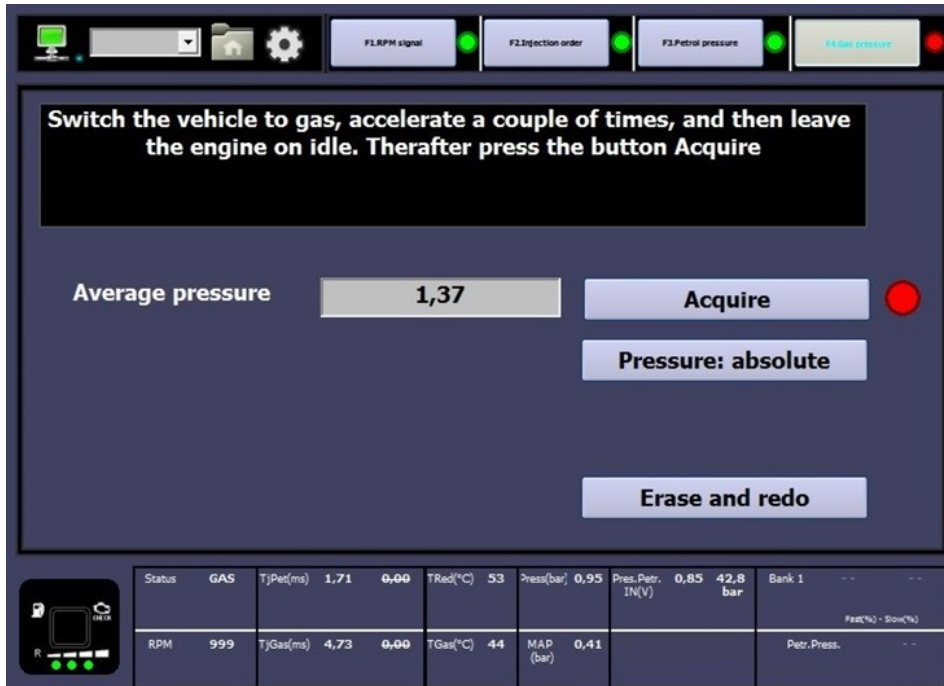
7 – F2 Parameters:

In the parameters page is possible to change all the settings for handle different petrol ecu strategies.

The vehicles can have a different engine code, for every engine code exist a specific configuration and wiring diagram.

In the official configuration all the strategy in the "Parameters pages" are set and properly handle, except the gas map that is mandatory check and adjust.

There are seven submenu: Switchover, Sensors, Carburation, Gas-Petrol, Compensations, OBD and 02 sensor.

In case of problem verify:

- RPM signal wire if it's properly read
- Remove the gas sequence advance and exclude the gas injector one by one during gas operation for check some problem related to a wrong connection (**See page 15**). If something wrong happen can create problem for the switch petrol-gas.
- Car bumps during the switch try to fix it by using the gas map if not set the change in deceleration. (**See page 15**).
- Enable the "Start and Stop" if the car have this petrol strategy in order to start on gas after that condition. (**See page 15**).
- In case high petrol consumption verify if there is some petrol strategy activated. (**See page 19**).
- Check the gas pressure compensation if the system doesn't work on idle on gas in correspondence of the gas compensation zero acquire again the gas pressure (**See page 11-12**) or adjust the pressure manually on the reducer.
- In case the OBD parameters blinks and the system fails the connection try to disable "Petrol pressure PID" (**See page 22-23**).
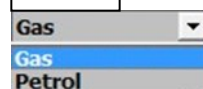
7.1 – F1.Switchover:

In the switch over page is possible to manage all the strategies and thresholds for the petrol-gas switch.

Fig. 17

Inj	Petr	Gas	Fix correction			Mode	
1	1,71	0,00	0		0	Gas	
2	1,71	0,00	0		0	Gas	
3	1,71	0,00	0		0	Gas	
4	1,71	0,00	0		0	Gas	

Fig. 18

Gas
Gas
Petrol

		Description
Fuel Type	LPG	Show the fuel type set in the configuration.
Cylinders	4 / 1 2 3 4	Cylinders: Select number of vehicle cylinders.
Coils	4 / 1 2 3 4 5 6 7 8	Number of ignition times for each cylinder on the rpm signal. (Number of coil).
Threshold for Change-over (Rpm)	1200 / 1200 1400 1600 1800 2000 2200 2400 2600	Threshold for Change-over (Rpm): Switch threshold gas when reach the switch temperature the system switch to gas.
Type of change-over	Acceleration / Deceleration Acceleration	Type of change-over: Set for switch to the other fuel during deceleration or acceleration.
Water temperature (°C)	35 / 35 36 37 38 39 40 41 42	Water temperature (°C): Switch temperature threshold. Over this value if all the other switch variables are true the system changes to gas.
Start&Stop	DISABLED / DISABLED ENABLED	Start & Stop: enable or disable the opportunity to start on gas when this petrol strategy activates. The system starts after this strategy on gas if it's enable.
Injector Type	Hana H2001, 1.9 ohm >>>	Injector type: Select the proper gas injectors. To press ">>>" for activating the compensation and balance of the gas injectors (**Fig. 17**). It's possible to increase or decrease the gas injection time for each gas injectors. When the system works on gas is possible to set one by one the cylinder on petrol for test the gas sequence, it's mandatory remove the advance injection for this test (**Fig. 18**).

7.2 – F2.Sensors:

In this software section is possible to select the different sensors type used for the conversion.

Manage the gas level sensor and the pressure and delay for change back to patrol in case of low gas pressure in the tank (empty tank).

	Gas sensor type: In according to the fuel used there are a selection of sensors that in some case will effect also the wiring harness connection. 1050 (LPG), 0..90 Ohm (LPG) and 806 (CNG) are the standard market sensors. "Personalizzato" and "Personalizzato (invertito)" must be used in case the sensor is different form the other one.
	To press ">>>" close to gas sensor type in order to enable the window for modify all the leds indication threshold. In the lower part of the window there is the real value read by the sensor unfiltered and the value used for the switch led indication.
	Turbo engine: in order to acquire the petrol pressure correctly set it in according to the engine spec, this will effect all the strategy for the detection of the full load related to the map sensor.
	Pressure sensor (bar): selection of different gas pressure sensor. Chose the correct one in according to the sensor in the conversion kit.
	To press ">>>" in order to manage the change back to petrol for low gas pressure, the value in the software is referred to the differential pressure. If you disable the strategy the system not change back to petrol and the engine stalls. If it's enable the system will change back for a pressure lower then the pressure write in the box "Pressure (bar)" for a time bigger than the value write in "Delay (sec)".
	Temperature sensor [gas,water] (Ohm): selection of different sensor on the rail and on the reducer. Select the proper one present in the conversion kit.

7.3 – F3.Carburetion:

Carburation page is the most important for the tuning, in this page is it possible to change the value and create the proper gas map in according to the vehicle. There are two chart: Injection and Extra-injection and in both axis X is the value of RPM x10 and axis Y is the value of injection time petrol (ms). To press with left-click on the axis X or Y select the relative column or line automatically.

Carburation chart selection: To press with left-click on the axis X or Y select the relative column or line automatically or keep it pushed for select the macro area.
Left-click on the zero of the axis in order to select all the gas map. Left-click and keep push for select the zone preferred in the chart. The cursor in the chart show the car working zone in real time, it's red when the car works on petrol and green when the

Once selected the zone on the chart by the pressure of the "Enter" button in the keyboard open the menu for digit the k values correction. It's possible to change "Linear" (± 100), "Percentage" (± 50%) or "Absolute" (0-255). Modify the K values in the selected zone and set the correct value in order to have the same fuel trim than on petrol. In case the fuel trim are not inverted like in the **Fig. 19** the car is lean by +14%=19.5-5.5 so increase the value for compensate the fuel trim. **Fig. 20** the car is rich by -25%=-19.5-5.5 **Fig. 21** the car is in carburation the results of the fuel trim fast and slow are zero.

	Increase or decrease the value in the selected zone by 1 point.
−	
+	
↶	Undo in order to back to the previous values.
	Open the chart for change the reference of the gas map

It's possible to change the reference of the gas map in the axis X or Y. It's possible to set the value manually in the chart or digit in the green line the lower and upper extremes and select "Calculate Tinj or RPM" Select "Default" in case to back to the standard values.

Fig. 19

Fig. 20

Fig. 21

7.3.1 – Injection:

The injection chart is the gas map used for tune when the car have only one injection for each cylinder for every cycle.
There is an example of the signal in current of one negative injector (**Fig. 22**) the car on petrol open the injector only one time for cycle. Increase or decrease the value in the gas map for obtain the same fuel trim than the car has on petrol.

Example: Petrol injector negative of one cycle.

Fig. 22

Injection map (ms / x10 rpm):

	0	77	90	102	115	128	147	166	186	205	224	243	262	275	288	301	314	333	358	390	422	461	499	544
0	**81**	81	81	81	81	81	82	82	82	82	83	83	83	83	83	83	83	83	84	85	85	85	85	85
0,6	81	81	81	81	81	81	82	82	82	82	83	83	83	83	83	83	83	83	84	85	85	85	85	85
0,8	81	81	81	81	81	81	82	82	82	82	83	83	83	83	83	83	83	83	84	85	85	85	85	85
0,9	81	81	81	81	81	81	82	82	82	82	83	83	83	83	83	83	83	83	84	85	85	85	85	85
1	82	82	82	82	82	82	83	83	83	83	84	84	84	84	84	84	84	85	86	86	86	86	86	86
1,2	83	83	83	83	83	83	84	84	84	84	85	85	85	85	85	85	85	86	87	87	87	87	87	87
1,3	84	84	84	84	84	84	85	85	85	85	86	86	86	86	86	86	86	87	88	88	88	88	88	88
1,4	85	85	85	85	85	85	86	86	86	86	87	87	87	87	87	87	87	88	89	89	89	89	89	89
1,5	85	85	85	85	85	85	86	86	86	86	87	87	87	87	87	87	87	88	89	89	89	89	89	89
1,7	86	86	86	86	86	86	87	87	87	87	88	88	88	88	88	88	88	89	90	90	90	90	90	90
1,8	86	86	86	86	86	86	87	87	87	87	88	88	88	88	88	88	88	89	90	90	90	90	90	90
1,9	86	86	86	86	86	86	87	87	87	87	88	88	88	88	88	88	88	89	90	90	90	90	90	90
2	86	86	86	86	86	86	87	87	87	87	88	88	88	88	88	88	88	89	90	90	90	90	90	90
2,2	87	87	87	87	87	87	88	88	88	88	89	89	89	89	89	89	89	90	91	91	91	91	91	91
2,3	86	86	86	86	86	86	87	87	87	87	88	88	88	88	88	88	88	89	90	90	90	90	90	90
2,6	85	85	85	85	85	85	86	86	86	86	87	87	87	87	87	87	87	88	89	89	89	89	89	89
2,9	84	84	84	84	84	84	85	85	85	85	86	86	86	86	86	86	86	87	88	88	88	88	88	88
3,5	84	84	84	84	84	84	85	85	85	85	86	86	86	86	86	86	86	87	88	88	88	88	88	88
4	84	84	84	84	84	84	85	85	85	85	86	86	86	86	86	86	86	87	88	88	88	88	88	88
4,6	84	84	84	84	84	84	85	85	85	85	86	86	86	86	86	86	86	87	88	88	88	88	88	88
5,2	84	84	84	84	84	84	85	85	85	85	86	86	86	86	86	86	86	87	88	88	88	88	88	88
6	84	84	84	84	84	84	85	85	85	85	86	86	86	86	86	86	86	87	88	88	88	88	88	88
7,4	84	84	84	84	84	84	85	85	85	85	86	86	86	86	86	86	86	87	88	88	88	88	88	88

Status: **GAS** | TjPet(ms) 1,70 | 0,00 | TRed(°C) 53 | Press(bar) 0,95 | Pres.Petr. IN(V) 0,85 42,3 bar | Bank 1 4,7 −3,1
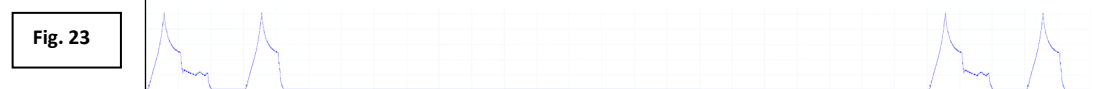RPM 999 | TjGas(ms) 3,83 | 0,00 | TGas(°C) 44 | MAP (bar) 0,41 | Petr.Press. 42.8 bar

7.3.2 – Extra-injection:

The extra-injection chart is the gas map used for the extra when the petrol system open the petrol injector more than one time for every cycle. The car can have only one extra-injection (**Fig. 23**) or more like four in the second example (**Fig. 24**). The gas system highlight with a green square around the main injection map for suggest to use both the gas chart.

Extra-injection map (ms / x10 rpm):

	0	77	90	102	115	128	147	166	186	205	224	243	262	275	288	301	314	333	358	390	422	461	499	544
0	**81**	81	81	81	81	81	82	82	82	82	83	83	83	83	83	83	83	83	84	85	85	85	85	85
0,6	81	81	81	81	81	81	82	82	82	82	83	83	83	83	83	83	83	83	84	85	85	85	85	85
0,8	81	81	81	81	81	81	82	82	82	82	83	83	83	83	83	83	83	83	84	85	85	85	85	85
0,9	81	81	81	81	81	81	82	82	82	82	83	83	83	83	83	83	83	83	84	85	85	85	85	85
1	82	82	82	82	82	82	83	83	83	83	84	84	84	84	84	84	84	85	86	86	86	86	86	86
1,2	83	83	83	83	83	83	84	84	84	84	85	85	85	85	85	85	85	86	87	87	87	87	87	87
1,3	84	84	84	84	84	84	85	85	85	85	86	86	86	86	86	86	86	87	88	88	88	88	88	88
1,4	85	85	85	85	85	85	86	86	86	86	87	87	87	87	87	87	87	88	89	89	89	89	89	89
1,5	85	85	85	85	85	85	86	86	86	86	87	87	87	87	87	87	87	88	89	89	89	89	89	89
1,7	86	86	86	86	86	86	87	87	87	87	88	88	88	88	88	88	88	89	90	90	90	90	90	90
1,8	86	86	86	86	86	86	87	87	87	87	88	88	88	88	88	88	88	89	90	90	90	90	90	90
1,9	86	86	86	86	86	86	87	87	87	87	88	88	88	88	88	88	88	89	90	90	90	90	90	90
2	86	86	86	86	86	86	87	87	87	87	88	88	88	88	88	88	88	89	90	90	90	90	90	90
2,2	87	87	87	87	87	87	88	88	88	88	89	89	89	89	89	89	89	90	91	91	91	91	91	91
2,3	86	86	86	86	86	86	87	87	87	87	88	88	88	88	88	88	88	89	90	90	90	90	90	90
2,6	85	85	85	85	85	85	86	86	86	86	87	87	87	87	87	87	87	88	89	89	89	89	89	89
2,9	84	84	84	84	84	84	85	85	85	85	86	86	86	86	86	86	86	87	88	88	88	88	88	88
3,5	84	84	84	84	84	84	85	85	85	85	86	86	86	86	86	86	86	87	88	88	88	88	88	88
4	84	84	84	84	84	84	85	85	85	85	86	86	86	86	86	86	86	87	88	88	88	88	88	88
4,6	84	84	84	84	84	84	85	85	85	85	86	86	86	86	86	86	86	87	88	88	88	88	88	88
5,2	84	84	84	84	84	84	85	85	85	85	86	86	86	86	86	86	86	87	88	88	88	88	88	88
6	84	84	84	84	84	84	85	85	85	85	86	86	86	86	86	86	86	87	88	88	88	88	88	88
7,4	84	84	84	84	84	84	85	85	85	85	86	86	86	86	86	86	86	87	88	88	88	88	88	88

Status: **GAS** | TjPet(ms) 1,71 | 2,52 | TRed(°C) 53 | Press(bar) 0,94 | Pres.Petr. IN(V) 0,85 42,3 bar | Bank 1 4,7 −3,1
RPM 999 | TjGas(ms) 4,76 | 10,43 | TGas(°C) 44 | MAP (bar) 0,41 | Petr.Press. 42.8 bar

Example: Petrol injector negative of one cycle.

Fig. 23

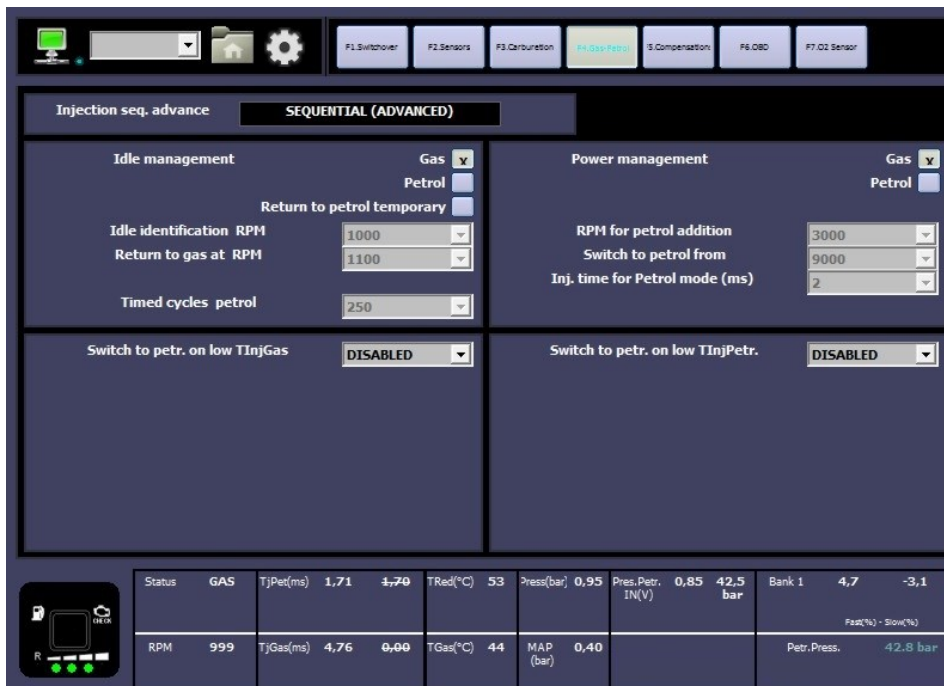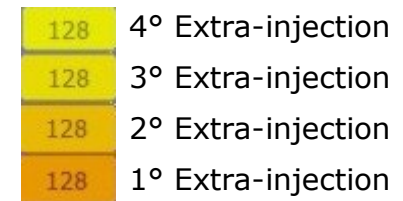Example: Petrol injector negative of one cycle.

Fig. 24

In order to tune the vehicle is suggested drive over 3000 rpm where usually there aren't any extra-injection and to tune the car line by line by changing the line with all the same value (no difference in rpm is compensated by the system) also in the area where the vehicle extra-inject. To drive in the part lower than 3000 rpm and adjust the difference in carburation by changing only the extra-injection map. In this chart can appear up to 4 extra-injection value with they proper cursor as they will move independently in according to the petrol strategy, the value used for each extra-injection will be equivalent to the calculation done by using the point where was the relative cursor.

GAS OPERATION

128	4° Extra-injection
128	3° Extra-injection
128	2° Extra-injection
128	1° Extra-injection

PETROL OPERATION
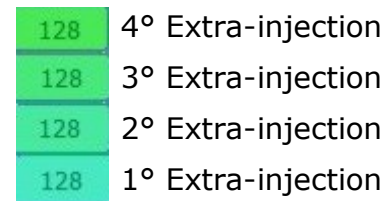
128	4° Extra-injection
128	3° Extra-injection
128	2° Extra-injection
128	1° Extra-injection

7.4 – F4.Gas-Petrol:

The Gas-Petrol page contains all the strategy for change back to petrol completely in according to the selected way.
It's possible to select:

- Switch to petrol always on idle.
- Switch to petrol temporary on idle.
- Switch to petrol on high load.
- Switch to petrol on low injection time gas.
- Switch to petrol on low injection time petrol.

The return to petrol strategies can works together so it's possible to use more of them for cover different zone.

NOTE: The switch on petrol is an option for fix temporary some problem in the meanwhile to fix them definitely, keep it enable means increase the petrol consumption.

7.4.1 – Idle management:

The idle management allows the strategy for work on idle on petrol always or temporary.

Petr.Idle (light-blue) Petr.Idle (empty)	When the square is colored in light-blue the system runs on petrol and the strategy is activated.
Idle management — Gas	The system run on idle on gas.
Petrol — Return to petrol temporary Idle identification RPM 1000 Return to gas at RPM 1100	The system works on petrol for a value lower than "Idle identification RPM" and back to gas again if overpass the threshold "Return on gas at RPM".
Return to petrol temporary Idle identification RPM 1000 Return to gas at RPM 1100 Timed cycles petrol 250	The system works on petrol temporary for a value lower than "Idle identification RPM" and back to gas again if overpass the threshold "Return on gas at RPM". In case remain on idle after the number of cycles set in "Timed cycles petrol" the car switches again on gas.

7.4.2 – Power management:

The power menagement allows the strategy for working on high load on petrol.
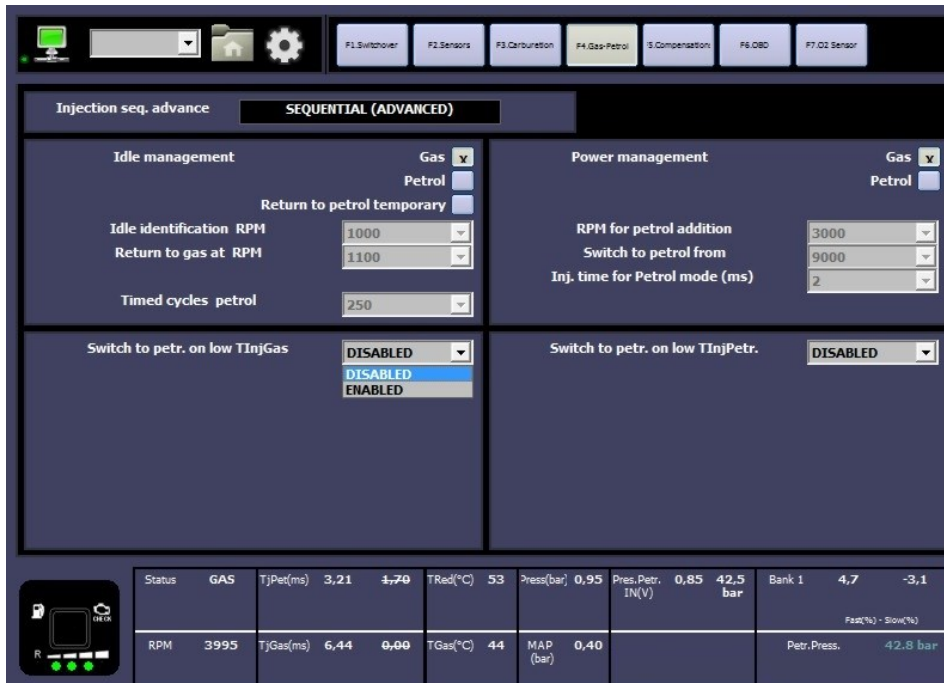
Petr.Power (light-blue) / Petr.Power (empty)	When the square is colored in light-blue the system runs on petrol and the strategy is activated.
Power management — Gas	The system run on high load on gas.
Petr.Power — Petrol / RPM for petrol addition 3000 / Switch to petrol from 9000 / Inj. time for Petrol mode (ms) 2	The system works on petrol in the range of "RPM for petrol addition" and "Switch to petrol from" if the injection time petrol is bigger than "Injection time for petrol mode (ms).

7.4.3 – Switch to petr. on low TinjGas or TinjPetr.:

These strategies enable the opportunity to change back to petrol when the system is running on the minimum opening time of the gas injectors or below to a certain value of the petrol injection time that can be to low for handle it properly. The value are set on the default.

7.5 – F5.Compensations:

Compensation page is studied for compensate automatically the quantity of gas to inject in according to different variables.
The main variables that effect heavily the gas carburation is related to:

- Gas temperature.
- Water temperature.
- Gas pressure.
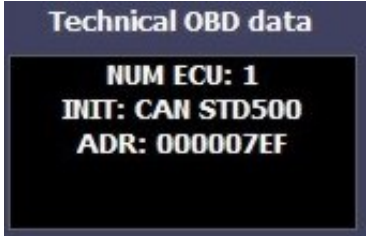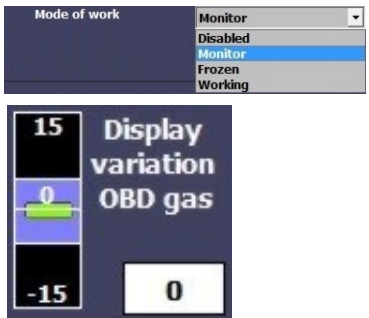
These variables can change in according to the external climate condition or to the gas reducer performance, different load condition and altitude. The gas system compensate and stabilize automatically the injection time gas for obtain the best performance.

Gas Temperature Comp.

°C	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80
%	-13	-11	-10	-8	-6	-5	-3	-2	0	2	3	5	6	8	9

Water Temperature Comp.

°C	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90
%	-9	-8	-7	-6	-5	-3	-2	-1	0	1	2	3	4	6	7

Gas Pressure comp.

Bar	0,99	1,22	1,42	1,63	1,86	2,06	2,29	2,50	2,70	2,93	3,14	3,36	3,57	3,79	4,00
%	16	8	0	-7	-14	-20	-27	-32	-38	-43	-48	-53	-58	-63	-67
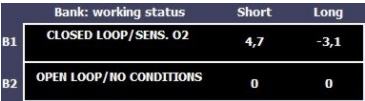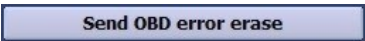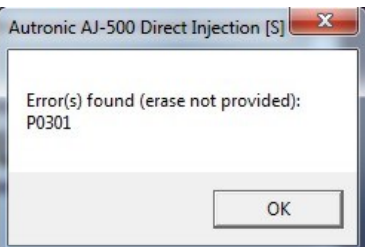
7.6 – F6.OBD:

Obd page is necessary for obtain petrol Ecu information, it's important but not mandatory, this is a good help for the tuning and setting procedure and clear the OBD error.
Our system works without needs to erase any OBD error if the car is properly tuned, erase the error it's important during the calibration in order to see if some problem occurs.

Search Obd / **Stop Obd**	"Search Obd" activate the obd connection, the system automatically detect the car's obd protocol. If the obd connection is enable the system automatically establish the obd connection when the vehicle switches on gas. "Stop Obd" the system disable the obd connection with the vehicle.
Technical OBD data NUM ECU: 1 INIT: CAN STD500 ADR: 000007EF	Once the gas system is connect on the vehicle's obd protocol in the "Technical OBD data" there is the following information: • Number of ecu detected in the OBD line. • OBD protocol used. • Petrol ecu address.
Type OBD connection Can Std500 Iso kl 9141 Iso kl 5Baud Iso kl Fast Can Std50 Can Std250 Can Std500 Can Ext250 Can Ext500	Type OBD connection: select and force manually the selected OBD connection. Select "OBD not connected" and after to press "Search Obd" for start the automatic obd protocol detection.
Mode of work Monitor Disabled Monitor Frozen Working 15 **Display variation OBD gas** 0 -15 0	Mode of work: • Disable: disable the OBD connection. • Monitor: visualize the OBD parameters and fuel trim. • Frozen: disable the connection and use the OBD adaptivity stored for compensate the gas map. • Working: enable the OBD adaptivity, in real time the system check the fuel trim and compensate the gas map for reach the ideal calibration value set in the configuration (Standard is low trim zero). Display variation OBD gas: shows in real time the correction actuated by the OBD adaptivity.
Type Petrol trimmers Standard (+Lean/-Rich) Standard (+Lean/-Rich) Fiat Inv. Inverted (-Lean/+Rich)	Type Petrol trimmers: select the petrol system fuel trim strategy. • Standard: car is lean and it shows positive fuel trim, car is rich and it shows negative fuel trim. • Inverted: car is lean and it shows negative fuel trim, car is rich and it shows positive fuel trim. • Fiat: Marelli fuel trim ±100%.
Petrol pressure PID ADDR. &H23 DISABLED ADDR. &H0A ADDR. &H22 ADDR. &H23 ADDR. &H59 Petr.Press. 42.8 bar	Petrol pressure PID: Select the proper petrol rail pressure PID, in case the selection is wrong there is no petrol pressure information and the fuel trim disappear. When the petrol pressure PID is correct it's possible to se the petrol pressure read by OBD like in the picture.

Bank: working status — Short / Long table: B1 CLOSED LOOP/SENS. O2 4,7 / -3,1; B2 OPEN LOOP/NO CONDITIONS 0 / 0	Bank working status: show the status of the bank one or two in case is present and the concerning fuel trim.
Send OBD error erase	Send OBD error erase: send the request for erase the OBD error.
Erase MIL on kevon	Erase MIL on keyon: select for erase the OBD error automatically when the key is on.
Erase MIL on keyoff	Erase MIL on keyoff: select for erase the OBD error automatically when turn off the car.
Disconnect after Kevon	Select in order to disconnect the gas system after key on.
☑ Selective errors erase	Select for erase the OBD errors selective (Default no error set in the list) and enable the detection of the OBD latent error status: • Grey: OBD connection off. • Red: vehicle run on petrol. • Green: vehicle run on gas and no OBD errors. • Yellow: vehicle run on gas and one or more OBD latent error stored. • Light blue: erase error request send (temporary condition). • Violet: latent error request communication problem.
Autronic AJ-500 Direct Injection [S] Error(s) found (erase not provided): P0301 OK	When the gas ecu has stored a latent error and the software check engine icon is yellow, left-click on the icon with the mouse in order to see the error code stored.
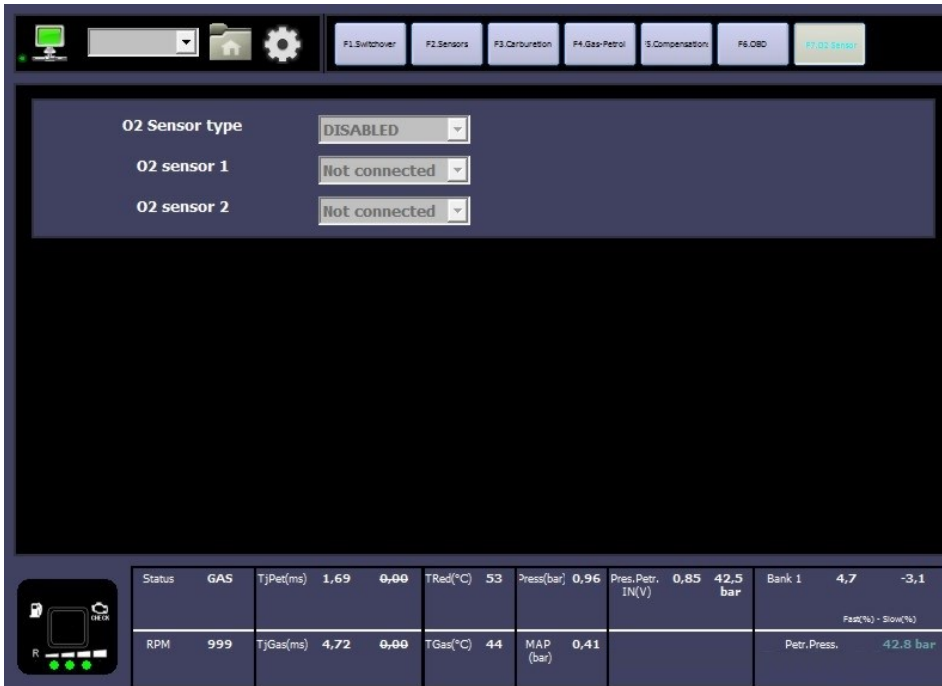
7.7 – F7.O2 Sensor:

The O2 Sensor page is present for the backward compatibility of old hardware direct injection ecu.
This option is not enable on the actual version of firmware/hardware.

8 – F3 Monitor:

"Monitor" is the software page where is shown:

- Each injection time petrol and gas.
- Each electric signals read by the gas ecu.
- Monitor all the software option available in real time see if they are enable and to analyze the state if they are active or not.
- Obd information: all the fuel trim and the bank state.

"Logger" is the software oscilloscope, it's possible to see each signals changing in real time and record it.

8.1 – F1.Monitor:

	Injection time petrol and injection time gas of each injector in order to monitor eventually connection or management problem.	
	Rpm signal visualization.	
	Water and Gas temperature signal visualization.	
Active corrections informations: Light/blue icon: Startegy enable and state active. Grey icon: strategy disabled. Dark/blue icon: strategy enable and state not active.		OBD system state, bank 1 and bank 2 eventually. Fuel trim fast and slow information.
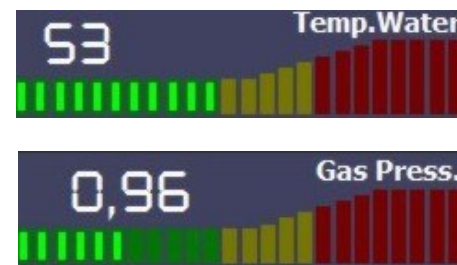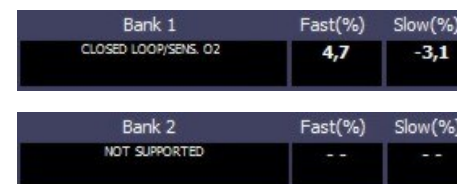
8.2 – F2.Logger:

The software oscilloscope is an important tools for finding some problem and analyze it.
It's possible detect the problem save the acquisition and send to the technical assistance by mail for received support.
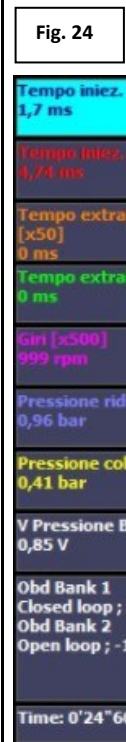
The default folder for save the oscilloscope files is:
C:\Users\Documents\SPARK AJ-500 Direct Injection\Data

It's possible change the destination folder, the file has an extension .vfl

Fig. 26

	Channel selection by left-click on the wish one (**Fig. 24**). Once selected it's possible to shift up and down the trace and zoom in or out. In the logger is possible to monitor concurrently 8 channel but it's possible to change the signal type visualized. Select the channel where you want change the signal visualized by right-click it and select the one you want (**Fig. 26**). It's possible to visualize the interested value by pointing with the mouse on the diagram for visualize the vertical cursor (**Fig. 25**) and close to each channel will appear the value in the cursor point. It's possible disable the selected channel by left-click on the eye icon (**Fig. 27**)
Zoom out and in	Zoom out and in the y axis of the selected channel.
Shift up and down or reset	Shift up and down the selected channel or reset like default.
Open or save	Open recorded trace or save it.
Start or stop	Start the acquisition or stop it
<< >>	Once saved signal and reloaded change the logger page.
Zoom x	Zoom out and in the x axis of the selected channel.

9 – F4.Errors:

The error page manage all the gas system diagnosis, freeze frame and system maintenance.

9.1 – F1.Errors:

In case the system detects some errors the switch beeps slowly and all the led blink. In the page there is a diagnosis for detecting eventually connection problem or mechanical breakages. To Select close to the error the procedure to apply in case of problem:

🔴 The system back to petrol.　　☑ Diagnosis enable.
🔴 The system remain on gas.　　☐ Diagnosis disable.

To press the "Erase errors" for delate the present error. When appear an error in diagnosis and at the next start will be not present anymore the gas ecu allow the car user to switch on gas but save in this page the error code detected and the freeze frame.

9.2 – F2.Freeze Frame:

The freeze frame is the union of all the parameters collected form the gas ecu and petrol ecu (by OBD connection) that allow to create a picture of the problem origin at the time that happened. It's useful for analyze and replicate the problem on the road.

9.3 – Gas diagnosis error list:

GAS INJECTOR 1	"Open load" (Disconnection) or "Current limit" (Short circuit).
GAS INJECTOR 2	"Open load" (Disconnection) or "Current limit" (Short circuit).
GAS INJECTOR 3	"Open load" (Disconnection) or "Current limit" (Short circuit).
GAS INJECTOR 4	"Open load" (Disconnection) or "Current limit" (Short circuit).
REDUCER PRESSURE	"Up limit" or "Down limit"
INTAKE MANIFOLD PRESSURE	"Up limit" or "Down limit"
WATER TEMPERATURE	"Up limit" or "Down limit"
GAS TEMPERATURE	"Up limit" or "Down limit"
SUPPLY VOLTAGE	"Up limit" or "Down limit"
LOCK-OFF REDUCER	"Open load" (Disconnection) or "Current limit" (Short circuit).
LOCK-OFF TANK	"Open load" (Disconnection) or "Current limit" (Short circuit).
PETROL INJECTORS NR.	"Not read"
GAS TRIM	"Up limit" or "Down limit"
GAS INJECTOR CHECK	"Error"
ADC ERROR	"Error"
EMU OUT ERROR	"Error"
TGAS MAX ERROR	"Error"

9.4 – F3.Services:

In the Services page it's possible to manage the maintenance and set a value of hours.

When the hour counter reaches zero the gas switch beeps few times the engine start for remember to the user to contact the installer for the system check.

It's possible visualize gas system working time on gas and petrol.
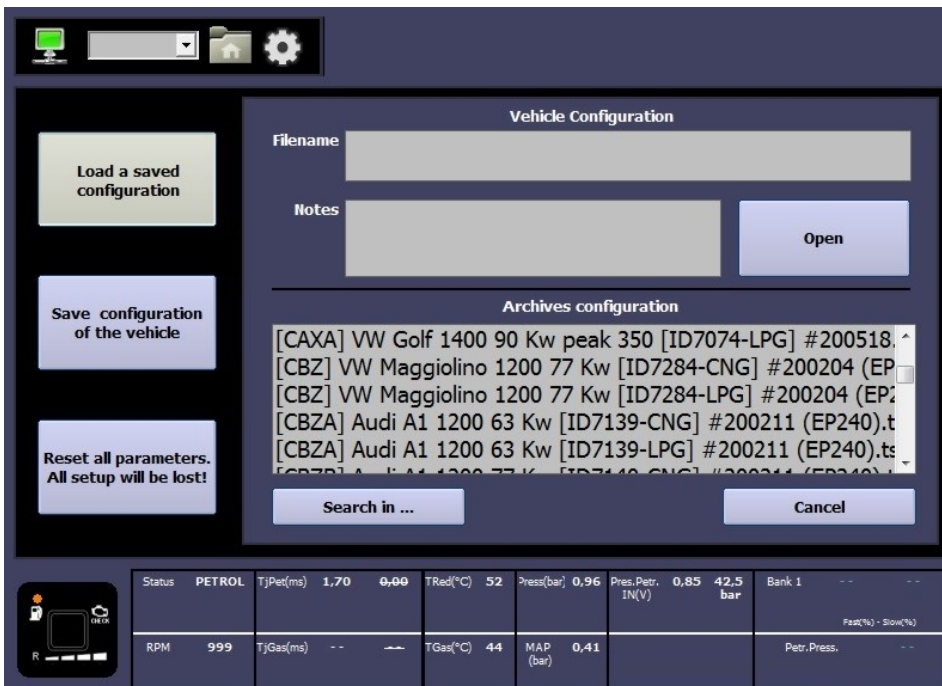
10 – F5.Configurations:

This page allow to load, save the configuration files and reset the parameters like the default.

Every direct injection car have a specific configuration. Request it to the technical support.

[204PT] LR Range Rover Evoque 2000 177 Kw [ID7190-CNG] #200221

Hana No Nozzle-1.0 bar-Check the gas map
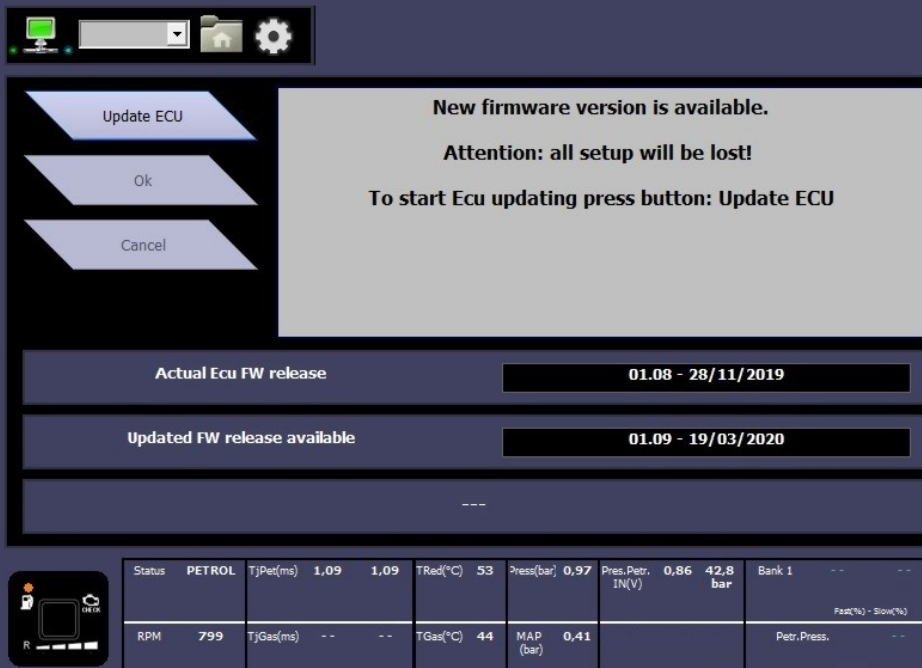
- 204PT: engine code.
- LR Range Rover Evoque: brand and model.
- 2000 177 Kw: engine spec.
- ID7190:   car ID that match in the DI car list.
- CNG: fuel type.
- #200221:   configuration data.
- Notes: nozzle size and gas pressure suggestion.

11 – F6.ECU:

This page allow to check and update the firmware of the Gas Ecu. The icon can be in three different colors in according to the operation required. It's important remember to save the configuration before update the firmware because when the icon is red the system will reset the configuration like default at the end of the process.

ECU (red)	It's red when the firmware update is strictly required in order to use all the software function. After the update the system erase the old configuration because to many changes have occurred.
ECU (yellow)	It's yellow when the firmware is out of date but it's not mandatory update it.
ECU (green)	It's green when the system is updated to the latest version.

It's mandatory for update the firmware do I when the +12V key is off.

12 – Direct injection car conversion step by step:

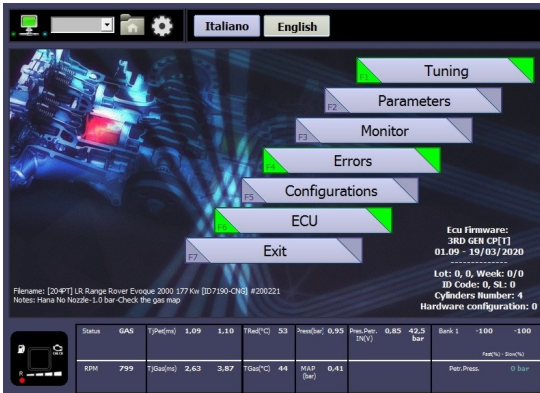|	
Car information: • Car Manufacturer. • Car model. • Engine capacity. • Engine power. • Engine code. • Petrol ecu code. • Model year.	Obtain the vehicle information, in according to the different engine code can change: • Petrol injectors emulation. • Wiring diagrams. • Petrol strategies enabled.
	Check in the direct injection vehicle list the availability of the interested car. Request to the technical assistance the configuration and diagram. Follow the diagram specific for each car for make the installation. Check in the diagram once again: • Engine code. • Petrol ecu code. • Engine capacity and Kw. In case of some difference contact the technical assistance for support.
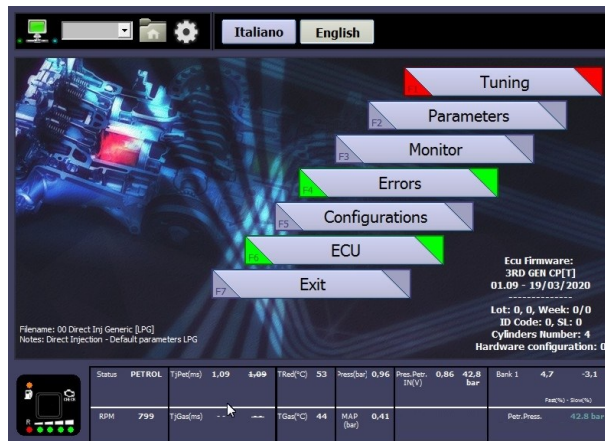
	• Establish the connection with the gas ecu
	• Check if the software is the latest.
	• Check if the gas ecu is updated to the latest firmware available:
	
	   ECU Ok
	
	   ECU Update is required.
	
	   ECU
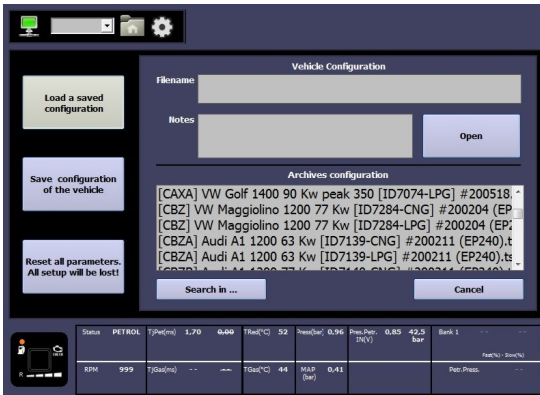
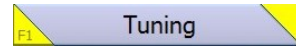|	
	Load the latest configuration received by mail from the technical assistance.
	• Check the state of "Tuning": Ok all the parameters are set correctly. Open "Tuning" and start again the automatic procedure for acquire one again. • Check the petrol pressure read by OBD and the petrol pressure IN match. • Check the gas pressure differential is the same suggested in the configuration note.
	• Switch the car on petrol. • Remove the gas sequence advance. • Set all the injector on petrol. • Switch the car on gas and one by one enable on gas one injector. • If the engine is stable always there is no problem in the gas sequence connection. • Set all the injector on gas and advance the sequence in case it need.