



OPTIMA Nano/Expert controller manual

www.optimagas.com www.autogas-alex.com EN

TABLE OF CONTENTS

OP [.]	TIMA NANO CONTROLLER
1.	CONNECTING THE OPTIMA NANO/EXPERT CONTROLLER TO THE VEHICLE'S INSTALLATION
	1.1 OPTIMA Nano connection diagram
	1.1.1. OPTIMA Expert connection diagram
	1.2 Method of installing the OPTIMA Nano/Expert controller
	1.3 Reducerselection 5
	1.4 Selection of injector nozzles
2.	DESCRIPTION OF THE DIAGNOSTIC PROGRAMME OPTIMA 2.05
	2.1 Connecting the controller to a PC
	2.2 Main menu
	2.3 Patrameters window OPTIMA 2 (Nano version)7
	2.3.1 Patrameters window OPTIMA 2 (Expert version)7
	2.4 Engine settings
	2.5 Gas injectors settings
	2.6 Sensors settings
	2.7 Switching to gas
	2.8 Switching to petrol
_	2.9 Uptions
3.	
	3.1 Calibration process
	3.2 Adaptation function
	3.3 CONECTIONS 2D
	3.4 RPM corrections
	3.5 Gus temperature correction (for advanced)
	3.6 Reducer's temperature correction (for advanced)
	2.9 Eucl prossure conjugator (only Optimg Export controllor)
л	
4.	41 Connecting OBD/CAN - vig - the ELM327 interface
	4.1 Connecting ObD/CAN via the LENG2/ Interface
	4.3 From reading with the FLM327 interface
	4.4 Advantages of using FLM327 interface with the controller OPTIMA nano
	4.5 OBD2 adapter
	4.5.1 Built-in OBD (only Optima Expert controller
5.	DIAGNOSIS
	5.1 Possible errors
	5.2 Readings
	5.3 Injection Time [ms]
	5.4 Oscilloscope
6.	SWITCH
7.	TECHNICAL SUPPORT - REMOTE DESKTOP (VIA TEAMVIEWER PROGRAMME)



1.1. OPTIMA Nano connection diagram

Fig. 1 (OPTIMA Nano Connection Diagram)

ന



1.1.1. OPTIMA Expert connection diagram

1.2. Method of installing the OPTIMA Nano/Expert controller

The controller OPTIMA Nano/Expert is being installed with the connector downwords in a way that prevents its direct exposure to water and high temperatures.

Installation should be conducted according to the connection diagram of a particular controller.

1.3. Reducer selection

When installing OPTIMA Nano/Expert sequential injection systems – it is very important to select the reducer in relation to the engine power. Improper selection of the reducer in relation to the engine power will cause that when the LPG delivery is high the – reducer wil not be able to ensure nominal LPG pressure and the pressure in the system will drop. If the LPG pressure drops below the minimum value set in the controller – the system will automatically switch to petrol.

1.4. Selection of injector nozzles

Nozzle diameter [mm] Reducer's pressure 1 [bar)	Engine power per 1 cylinder [HP]
1,8 - 2,0	12 - 17
2,1 - 2,3	18 - 24
2,4 - 2,6	25 - 32
2,7 - 2,9	33 - 40
3	41 - 48

The size of injector nozzles should also be selected according to the engine power. The table below illustrates

the example of nozzle selection- engine power has to be devided by the number of cylinders.

The values presented in the table should be treated as approximate as they may differ depending on the type of gas injector and the type of injection (full group, – semi-sequential, sequential). It is advised to use the calculator built in the diagnostic programme.

2. Description of the diagnostic programme OPTIMA 2.0x

2.1. Connecting the controller to a PC

Having succesfully completed the installation, – connect – the Nano/Expert controller to a PC with OPTIMA diagnostic program, using the RS-232 interface or USB. Before launching – the programme, – turn the key in the ignition switch (power supply "through the ignition") and start the car. Without having power supply the controller goes into sleep mode and the communication is impossible. That situation will be signalized as a connection error when opening diagnostic program OPTIMA. If the interface was connected and installed properly the program serches all the available COM serial ports. The number of port should be chosen with the first connection. Each following connection will be established automatically.

2.2. Main menu



Fig. 1a

DEVICE

- » Device info shows information about the connected controller
- » Service reminds about the installation service
- » Firmware update allows to update the software
- » Read settings from file allows reading settings from the previously saved file
- » Save settings to file saves current settings to file

CONNECTION

- » Connect/Disconnect enables/disables connection with the controller
- » COM(x) x stands for the number of ports available on a PC

ELM

- » Connect/Disconnect enables/disables connection with the additional OBD2 ELM327 interface
- » COM(x) x stands for the number of ports available on a PC

LANGUAGE – selection of the programme language

VIEW - three view options depending on the advancement level

COLOR – colour options depending on a PC screen readability.

DOCUMENTATION – mounting diagram and programme manual. pinout

» Service

CONTACT

» Technical Support – remote desktop (via TeamViewer programme)

2.3. Patrameters window OPTIMA 2 (Nano version)

OPTIMA v2.05 - OPTIMA nano v5	5		And a state of the		and the second					UC.	- 0 - X
Device Connection ELM Langu	iage View Col	or Documentation	on Help								
Settings [F1]	Calibratio	n [F2]	Map [F3]		Diagnostics [F4] Oscillos	scope [F5]	OBD [F6]		V Rea	ldings	>
			Engi	ne pa	arameters			F	Revolutions [[rpm]	2890
RPM signal		1 coil per 1 cy	linder	•	Petrol injection type	Sequenti	ial	<u>ا</u>	√acuum	[bar]	0,60
RPM sensitivity		0,8	[ms] –	+	Engine type	Standard	i j	$\mathbf{\nabla}_{\mathbf{i}}$	Sas pressure	[bar]	1 15
RPM signal		3,00	[V] -	+	Extra-injections switch off time	0,0	[ms] –	$\mathbf{\bullet}$	sus pressure	[Dur]	1,15
RPM wire		RPM		 Image: A start of the start of	Petrol admixture	0	[%]	+ '	Reducer temp	.[°C]	86
Ignition wire		Connected		•	Enable full petrol injection	Yes		V (Gas temp.	[°C]	4
	Inject	ors				Sensors		F F	Power supply	[V]	14.11
Fuel type		LPG		⊻	Gas level sensor	90 Ω gro	wing		Injection	L · J	
Injectors		Barracuda 1.9	Ω	~]	Reducer temp. sensor	4.7 kΩ]				0.00
Turn on injectors warming		No		×	Gas temp. sensor	10 kΩ]		1 0,03	IM	0,00
Corrections for injecto	ors		Calculator						2 5,99	2 🗹	0,00
	Switching	to gas			Switch	hing to petrol			3 6,02	3 🗹	0,00
Switching to LPG when RPM	l rises above	700	[rpm] -	<u>+</u>	Minimum RPM on LPG	300	[rpm] -	+	4 5 08	4 17	0.00
Switching to LPG when tem	p. rises above	31	[°C] –	<u>+</u>	Maximum RPM on LPG	10000	[rpm] -	+	- 3,90	-	0,00
Delay after ignition		6	[sec] -	+	Minimum gas temperature	0	[°C] -	+			
Delay after the solenoid va	lve	2	[sec] -	+	Minimum gas pressure	0,60	[bar] -	<u>+</u>			
Delay for a cold engine		10	[sec] -	+	RPM signal loss time	0,5	[sec] -	+			
Changeover delay per cyl.		1,0	[sec] -	+	Time ignition no signal	2	[ms] -	<u>+</u>			
Enrichment switching		0,0	[ms] -	+	Fast RPM signal fault detection	No		×			
Switching type		In sequence		~	Switch off before full open injector	No]	×			
	_			Opt	ions						
Faster LPG switching (engin	ne hot)	Off		~	Switching signal	Switch-o	ver				- MODE
Leaning on cold		No		×	Reducer temp. signal	No		×		_	U
Petrol addition		No		×	Signaling the work on petrol	No]	×			
							Factory settings		WORK (IN PETR	0L

Fig. 2

PLEASE NOTE

AVAILABLE VIEW OPTION WHICH ALLOWS THE ACCESS TO ADVANCED FUNCTIONS OF THE CONTROLLER.

2.3. Patrameters window OPTIMA 2 (Expert version)

rice Connection ELM Language View Color	Documentation Help									
Settings [F1] Calibratio	n [F2] Map [F3]		Diagnostics [F4] Oscillosco	ppe [F5] OBD [F6]		V 1	Re	adings	>
	Eng	jine p	arameters				Revolu	itions	rpm	590
RPM signal	1 coil per 2 cylinders	•	Petrol injection type	. Sec	uential	•	Vacuur	m	[bar]	0,99
RPM sensitivity	0,2 [ms] -	+	Engine type	Tur	00	•	Gas pr	essure	[bar]	0.94
RPM signal	3,00 [V] -	+	Extra-injections switch off time	0,0	[ms] -	+	D. J.		[00]	40
Probe 1 wire	Not connected	•	Petrol admixture	0	[%] -	+	Reduce	er temp	. [°C]	40
Emulation	Petrol rail pressure	•	Enable full petrol injection	Yes	1	v	Gas te	mp.	[°C]	41
Inject	ors		Sen	sors			Power	supply	[V]	11.84
Fuel type	LPG	•	Gas level sensor	. 90	Ω growing	•	- 1	Injectio	n time [ms	1
Injectors	Barracuda 1.9 Ω	•	Reducer temp. sensor	10	Ω	•	1	5.18	1	0.00
Turn on injectors warming	Yes	v	Gas temp. sensor	10	Ω	•	-	5,10		0,00
Corrections for injectors	Calculator						2	5,18	2 🗹	0,00
Switching	to gas		Switching	to pet	rol		3	5,18	3 🗹	0,00
Switching to LPG when RPM rises above	700 [rpm] -	+	Minimum RPM on LPG	0	[rpm] -	+	4	5,18	4 🗹	0,00
Switching to LPG when temp. rises above	6 [°C] -	+	Maximum RPM on LPG	100	00 [rpm] -	+	F			
Delay after ignition	5 [sec] -	+	Minimum gas temperature	0	[°C] -	$\mathbf{+}$	5			
Delay after the solenoid valve	2 [sec] -	+	Minimum gas pressure	. 0,9) [bar] -	+	6			
Delay for a cold engine	10 [sec] -	+	RPM signal loss time	0,5	[sec] -	+	7			
Changeover delay per cyl.	1,0 [sec] -	+	Time ignition no signal	2	[ms] -	+	8			
Enrichment switching	0,0 [ms] -	+	Fast RPM signal fault detection	Yes	(v				
Switching type	In sequence	•	Switch off before full open injector	No		×				
		Opt	tions							
Faster LPG switching (engine hot)	After ignition button	•	Switching signal	. Swi	tch-over	•			1	MCOE -
Leaning on cold	Yes	~	Reducer temp. signal	Yes			T P	51 21 21 21 21 21	7 8	0
Petrol addition	No	×	Signaling the work on petrol	No		×				R SERVICE
					Factory settings			WORK	ON PETRO	

2.4. Engine settings

		Eng	ine pa	rameters			
RPM signal	1 coil per 1 cylinder		•	Petrol injection type	 Sequential		
RPM sensitivity	0,8	[ms] 🗕	+	Engine type	Standard		
RPM signal	3,00	[V]	+	Extra-injections switch off time	0,0	[ms] -	+
RPM wire	RPM			Petrol admixture	0	[%])+
Ignition wire	Connected			Enable full petrol injection	Yes		

Fig. 3 (engine parameters)

- » **RPM SIGNAL SOURCE** number of cylinders per ignition coil. Selected value should represent the adequacy between the RPM signal in the programme and the vehicle's actual RPM.
- » **RPM SENSITIVITY** in case of a problem with reading the turnovers we can increase the sensitivity of a controller to the particular rotation impulses through decreasing this parameter's sensitivity
- » **RPM SIGNAL DIVIDER** divider available if the selected source of RPM signal is from injectors or from crankshaft.
- » RPM SIGNAL [V] value of power supply with which RPM perform without disturbance (standard value for ignition coil is 12V, for crankshaft sensor 0-5V)
- » **RPM WIRE** with the Nano controller it is possible to use rpm wire to read the signals such us:
- » LAMBDA we are able to read the work of Lambda probe.
- » **MAF** the brown wire is connected to the air flow meter in a vehicle when we need the map for engines without the vacuum in the collector e.g Valvetronic.
- » AFR the brown wire is connected to the analog output of the Air Fuel Ratio set in order to more precise adjustment of λ (lambda) coefficient – especially useful in the case of tuned up vehicles to increase their power.
- IGNITION WIRE when sellecting "off" the controller determines the ignition state basing on the petrol injectors signals. The option available only with 5 pin Mapsenor and could be used after improper connection + after ignition. With option "not connected" the safety valve could be removed from + after ignition and other installation elements will be powered by the gas controller (having problems with starting the engine fro longer period, we choose the option "on" and necessarally connect + after ignition with + of petrol injectors)
- » PETROL INJECTION TYPE type of petrol injection used in the vehicle.Selecting [....] gives the possibility to detect automatically the type of injections and leads to the window with possibilities to sequence configuration – assigning to banks – permanently disabling gas injectors.

- » **ENGINE TYPE** the type of engine:standard(aspirated) or turbo (supercharged)
- » **EXTRA-INJECTIONS SWITCH OFF TIME [MS]** Minimal petrol injection time transferred to gas injectors. It allows to switch off extra-injections in cars e.g Mazda, Opel Antara, Chevrolet Captiva.

1	2,15	1 🗹	0,00
2	0,60	2 🗹	0,00
3	2,13	3 🗹	0,00
4	0,60	4 🗹	0,00

EXAMPLE:

In this situation, the value of extra-injection swich off should be set above the value of extra-injection. In this case 0, 6 or higher e.g. 1, 2 if such injection times occur.

- » PETROL ADMIXTURE Cyclical petrol injection while working on gas for cooling and lubricating the inlet valves.
- » ENABLE FULL PETROL INJECTION should be switched on at the moment of non-impulse injectors opening*
- * NON-IMPULSE INJECTORS OPENING the situation takes place when a singular cycle of an engine work is shorter than estimated time of petrol injection. e.g. If we have 5000 rmp, one cycle of the engine work in a sequential control system is 24ms. When the controller calculates the time above 24 ms e.g 26ms, the injector opens but has no time for closing as it receives another impulse to open. The situation repeats so quickly that there is a continuous pass of pulse from the controller to the injector, thus the time of injection lenght becomes uncountable. Most of the gas contollers recognize 0.00 ms as the time of injection and switch into petrol. With the controller Nano we are able to continue the ride on LPG and the injectors are driven to the maximum allowable injection timing.

Formula for the maximum lenght of the injection time: T_{iniection} in ms=[60/(0, 5 * rmp)]*1000

Fig. 4

2.5. Gas injectors settings

	Injectors	
Fuel type	LPG	
Injectors	Barracuda 1.9 Ω	
Turn on injectors warming	No	×
Corrections for injectors	Calculator	

Fig. 5 (injectors setting)

- » FUEL TYPE type of fuel LPG or CNG
- » **INJECTOR TYPE** type of injector installed in the vehicle.
- » TURN ON INJECTOR WARMING allows warming gas injectors before the switch-over to gas and before reaching the switch-over temperature
- » **CALCULATOR** helps to select the right size of injector nozzles
- » CORRECTIONS FOR INJECTORS After deselecting "Change for all" option it allows to correct injection time variations ina "V" type engine . Such correction (if necessary) should be made in the following way:After callibration, – check what are the petrol injection times on particular cylinders – during work on petrol.
- » Turning on particular gas injectors one at a time, check in which cylinders are differences of petrol injection time after switching to gas.
- » Corrections should be set in such a way that petrol injection time does not change while switching on particular gas injectors.

		ок	
	-		[]
4	0	4.2	[ms]
3	0	4 5	[ms]
2	0	4 >	[ms]
1	0	4 2	[ms]

Fig. 6

DO NOT USE THIS OPTION WHEN SYSTEM IS NOT IN A PERFECT WORKING CONDITION OR WHEN SOME OF ITS ELEMENTS HAVE WORN OUT.

2.6. Sensors settings

	Sense	ors	
Gas level sensor		90 Ω growing)[~
Reducer temp. sensor		4.7 kΩ	
Gas temp. sensor		10 kΩ	~

Fig. 7 (sensors settings)

- » **REDUCER TEMPERATURE** type of sensor used for measuring reducer temperature (included in kit: 10kohm)
- » GAS TEMPERATURE type of sensor used for measuring gas temperature (included in kit: 10kohm)

🚰 optima - lpo	i level sensor					×
				Gas level sens	sor	-
	0,88	• •		Level sensor		
	0,78	• •			[V]	
	0,40	4 >	↓			
	0,16	• •				
					OK	

Fig. 8 (regulation of gas level indication)

» **GAS LEVEL** – selection of the level sensor in a tank. Selecting [...] gives the possibility of more precise adjustment of the switch by changing voltage thresholds for activating particular LEDs

NOTE !!! PROPER SELECTION OF THE SENSOR, - AS WELL AS ITS CALIBRATION, - IS CRUCIAL FOR THE CORRECT SYSTEM PERFORMANCE!

2.7. Switching to gas

Switchin	g to gas			
Switching to LPG when RPM rises above	700	[rpm]	-)	+
Switching to LPG when temp. rises abov	e 31	[°C]	-)	+
Delay after ignition	6	[sec]	-)	+
Delay after the solenoid valve	2	[sec]	-)	+
Delay for a cold engine	10	[sec]	-)	+
Changeover delay per cyl.	1,0	[sec]	-)	+
Enrichment switching	0,0	[ms]	-)	+
Switching type	In sequence			

Fig. 9 (view of parameters when switching to gas)

- » SWITCHING TO LPG WHEN RPM RISES ABOVE minimal RPM required for the engine to switch over to LPG
- » SWITCHING TO LPG WHEN TEMPERATURE RISES ABOVE minimal temperature required for the engine to switch over to LPG
- » **DELAY AFTER IGNITION** time necessary for switching into gas after engine ignition.
- » **SOLENOID VALVE SWITCHING DELAY** regulated solenoid activation time preceding switching into gas.
- » LPG SWITCHING DELAY WITH COLD ENGINE time necessary for switching into gas at first switchover
- » CHANGEOVER DELAY PER CYL [S] time between switching of subsequent cylinders e.g. when this parameter is set at 1.0 [s] for 6 cylinders engine switching from petrol to gas or from gas to petrol will last 6*1.0 [s]
- » **ENRICHMENT SWITCHING** the possibility of momentary overlap when switching fuels useful in the case of " unsatisfactory" change from petrol to gas supply.
- » **SWITCHING TYPE** type of switching between cylinders:
 - In sequence one after another
 - All cylinders at the same time

2.8. Switching to petrol

Switchin	g to petrol			
Minimum RPM on LPG	300	[rpm]	-)	+
Maximum RPM on LPG	10000	[rpm]	-)	+
Minimum gas temperature	0	[°C]	-	+
Minimum gas pressure	0,60	[bar]	-	+
RPM signal loss time	0,5	[sec]	-)	+
Time ignition no signal	2	[ms]	-	+
Fast RPM signal fault detection	No			×
Switch off before full open injector	No			×

Fig.10 (conditions of switching to petrol)

- MINIMUM RPM ON LPG value of RPM below which system will switch over to petrol Minimal RPM on LPG
 value of RPM below which system will switch over to petrol
- » MAXIMUM RPM ON LPG value of RPM above which system will switch over to petrol
- » MINIMUM GAS TEMPERATURE temperature below which system will switch over to petrol
- » MINIMUM GAS PRESSURE [BAR] f gas pressure drops below the selected value, the system will switch over to petrol. Additional options [...]
- » PRESSURE ERROR TIME period of time with gas pressure lower than minimal after which the system switches over to petrol.

Minimum gas pressure [bar]	0.60	
		Test en
Pressure error time [sec]	0,20	4 >
Switch off with the first pressure drop	No	4 >
ſ		

» SWITCH OFF WITH THE FIRST PRESSURE DROP.

- **YES** when the pressure drops below the minimum and the pressure error time is over the system will switch into petrol with a sound signal.
- **NO** when the pressure drops below the minimum and the pressure error time is over the system at first switches only one cylinder into gas to reduce the gas consumption. If the decline remains the controller will swicht the next cylinder up the full petrol work. This mode will be recorded as work on both fuels i.e. "MIX"
- » RPM SIGNAL LOSS TIME adjustment of a closure time of the solenoid valve and injectors following the RPM disappearance. FOR THE CHOSEN OPTION OF RPM READING FROM THE INJECTORS THE TIME SHOULD BE SET TO 5S
- » **TIME IGNITION NO SIGNAL** possibility of adjusting the time at which the gas solenoid valves and injectors will be closed after the ignition disappearance.
- » FAST RPM SIGNAL FAULT DETECTION in vehicles in which power supply "through the ignition switch" is turned on after the engine was switched off
- SWITCH OFF BEFORE FULL OPEN INJECTOR if selected [YES] when there is a full opening of a gas injector (e.g. As a result of too small nozzles or too great pressure drop)the injector will not be able to deliver a larger amount of gas, – the system will automatically switch the cylinder to petrol. If selected [NO], – the car will continue to run on gas even after full gas injector openning.

2.9. Options

Additional abilities of the controller.

» FAST LPG SWITCHING / ENGINE HOT – if sellected the heated engine starts directly on gas. There are two options available:

		optio	115		
Faster LPG switching (engine hot)	 Off	~	Switching signal	 Switch-over	•
Leaning on cold	 No	×	Reducer temp. signal	 No	×
Petrol addition	 No	×	Signaling the work on petrol	No	×

Fig.12

- » AFTER IGNITION BUTTON the controller begins the gas injection directly after receiving the injection signal. It's important to start the enging directly after the ignition and actication of solenoid valves (if there is a problem with starting the option "after RPM" should be chosen.
- » **AFTER RPM** The controller starts the gas injection and opens the solenoid valves after detecting RPM.
- » LEANING ON COLD the option is used when there is flooding on a cold engine, the parametres are chosen in a way that prevents the jerks while acceleration. It mainly applies to the VAG group cars to a temperature up to 40 degrees.
- » PETROL ADDITION The option enables enriching the mixture by additional portion of petrol in an exactly indicated engine work – scope. The option should be used wisely and it should not exceed the petrol addition value above 2ms as well as on low engine rotations.

Leaning on cold	No	v
Maximum injection time [ms]	13,0	4
For reducer temperature [°C]	40	4 +
For RPM [rpm]	3000	4 >



- » **SWITCHING SIGNAL** after sellecting [...] there are 4 sygnal options available:
 - **OFF** Only the moment of running out of gas is being signalled.
 - **SWITCH BUTTON** The moment of pressing the switch button is being signalled quietly.

	-
No	·
2,0	4 >
13,0	• •
3000	• •
OK	
	No 2,0 13,0 3000



• END SWITCH - the switch makes a quiet sound when pressing the switch button and a loud sound

Switching signal	Switch but	ton	-
Brightness		4	4 4
Volume		4	4
		ок	

Fig.12c

after the system has been switched.

- **SWITCH OVER** the switch makes a quiet sound when pressing the switch button and a loud sound after the switching of each cylinder.
- » **BRIGHTNESS** Possibility to regulate the LED brigtness of a switch.
- » **VOLUME** Possibility to regulate the volume of a switch.

- REDUCER TEMPERATURE SIGNAL The option enables to set the alarm for indicated reducer temperature. When the option is on after reaching the switching temperature it switches to gas. Diode on the switch MODE green blinks .Upon reaching the designed temperature the dide stops blinking and the switch signals that the reducer reached the indicated temperature. Example of use: The option is useful when the reducer is not heated enough to use the full engine power without the consequences of a gas system freezing (reducer temp. lower than 25) but enough to enable the car to ride properly at low loads. After reaching the indicated signalling temperature (for example 40 degrees) it is clear that the system is heated enough for the engine to work properly in all load scapes. The reasonable use of the option enables us to reduce the time of working on petrol
- » **SIGNALLING THE WORK ON PETROL** When the option is on it activates the signal 10 seconds after the engine starts to remind that the switch is set to work only on petrol dide MODE: red.



3. Calibration

Fig. 13

Before starting the calibration process, – its method and parameters can be selected:

- » WORKING PRESSURE [BAR] gas pressure during calibration (will be set automatically by the system)
- » GAS TEMPERATURE gas temperature with which system can perform calibration (will be set automatically by the system)
- » PETROL TIME the value of petrol injection time while working on idle run (will be set automatically by the system)
- » IDLE RPM CORRECTION Time corrections for an idle gear(the system sets automatically during calibration)
- » CALIBRATION PER CYLINDER (It is advised to select [NO]) selecting YES, calibration will occur on individual cylinders thus the calibration time will be greatly extended. If deselected, – the calibration will be performed – on all cylinders at the same time.

3.1. Calibration process

During the process of calibration the vehicle must work on idle run. If during the calibration gas injection time is shorter than petrol injection time – it may indicate the necessity of changing the size of injector nozzles (it will be signalized by the programme after calibration).

In most cases – the idle gear correction after the first calibration should be within 0, 8ms - 1, 2ms. If the correction is below 0, 8ms it means that the nozzels are too large whereas the correction above 1, 2ms indicates too small nozzles.

Having finished the calibration process – collect the map – it can be done in two ways: with PC disconnected or connected (connected PC allows to observe which areas on the map have not been collected yet).



Make sure that the vehicle is working on petrol (red MODE diode on the switch). Drive for approximately 5km on one gear with different speed, – tying to speed up rapidly few times. Collecting petrol map will be demonstrated by the red line connecting collected points (opion available when the PC is connected).

Switch to gas (green MODE diode on the switch) and drive for approximately 5 km in a way as close to the previous drive on petrol as possible. Collecting gas map will be illustrated by the green line.





Fig. 15

After map collection, deviations of gas map in relation to petrol map will be visible. In the above example both gas map green line and deviation blue line suggest that the mixture is lean. In such case, – the multiplier should be raised and another ride on gas should be made.

Calibration



Fig. 16

After the multiplier has been raised (lean mixture) and the test ride has beed done, the gas map moved closer to petrol map, though the mixture still remains lean.



Having raised the multiplier correctly the gas map and petrol map moved closer, – the straight – deviation blue line suggests that – the mixture is OPTIMAL.

EVERY CORRECTION ON THE MULTIPLIER LINE WILL BE INCLUDED ON GAS MAP ONLY AFTER NEXT MAP COLLECTION IN GIVEN PERIOD OF INJECTION TIME.

The system is well calibrated if the difference between gas map and petrol map is not bigger than +/-0,5ms Additionally, – the accuracy of collected gas and petrol maps could be checked in the RPM correction file. Map [F3] > RMP correction > Injection time deviation (view changes when pressing the key F8) or the switch Petrol and switch GAS.

In this window, – the range of engine work included for – 2D map drawing is visible. Red bars illustrate the range of petrol map collection wheras the green bars the range of gas map collection. White bars with the values of injection time differences while working on petrol and on gas.



Fig. 18

Collecting both petrol and gas map can be done with disconnected PC. However, – collecting map with diagnostic programme connected allows monitoring and corrections of the map charts.

3.2. Adaptation function

Besides the standard calibration there is an option of adaptation choice and the time when it will be made.

Adaptation

- » TO INJECTION TIME MAP adaptation based on recorded times of petrol and gas injections visible in the RPM correction.
- » TO OBD PETROL MAP adaptation based on the map of short and long term corrections which could be found in OBD> RMP Corrections
- » TO INDICATED OBD VALUE the option allows to set own OBD correction value persued by the gas controller.

Indicated correction value – we should give the resultant of two adjustments STFT and LTFT. Most
often the value is the same as on petrol, for example with the value STFT= -5 and LTFT =5 the
resultant is 0 and such value should be put in. The option should be used for setting the car directly
on gas without the need of driving on petrol.

Callibration without the need of driving on petrol (OBD connection necessary):

If we determine the value that must be reached by the petrol controller adjustments (resultant STFT, LTFT) we are able to set the system through the OBD callibration.

After autocallibration at stand choose: **2D Diagram > Adaptation > For indicated OBD corrections value Adaptation type > constant adaptation**

Indicated correction value: for exapmle 0,0 (value for most cars)

After driving approximately 20km only on gas, – the system automatically sets the multiplier and IDLE RPM corrections so the resultant – of OBD correction for STFT and – LTFT equals the indicated value. The corrections values could be checked on OBD map sellecting RPM corrections (green map)



Fig. 18a

ADAPTATION TYPE:

- » **THROUGH THE IGNITION** adaptation of the parametres is applied at the moment of turning the car on and off .
- » **CONSTANT ADAPTATION** is working while driving the car and currently adjusts the settings of multipier and idle gear.

3.3. Corrections 2D



Fig. 19

In the window MAP/Corrections 2D the charts of controller maps are visible. Charts indicate petrol map of petrol ECU. The ideal situation is when the lines after calibration during driving overlap (in the same road conditions), – however, – in practice it is sufficient when the deviation blue line in nearly horizontal and is overlaping the dotted line 0.

<u>* The same road conditions – petrol map and gas map are collected on the same surface, – with the same air</u> temperature and humidity.





RED LINE – petrol injection time (during work on petrol) GREEN LINE – gas injection time (during work on gas) VIOLET LINE – multiplier correction line BLUE LINE – deviation line Multiplier correction is possible through the blue points, - in the following way:

KEYBOARD:

- ightarrow moving right on the multiplier correction line
- ← Left arrow moving left on the multiplier correction line
- ↑ Up arrow increasing selected point
- ↓ Down arrow decreasing selected point
- Delete deletes selected correction point

MOUSE:

- » left button selecting left correction point
- » right button selecting and adding correction point

RPM CORRECTIONS:

Bars demonstrate state of collected maps in particular injection times:

RED BAR – demonstrates the state of collecting petrol map in given injection time

GREEN BAR – demonstrates the state of collecting gas map in given injection time.

YELLOW BAR – demonstrates the state of overlaping petrol map and gas map. The number gives us the deviation of injection times.



Fig. 21

YELLOW BARS DEVIATION MAPS:

Boxes check multiplier compatibility, – depending on deviation of gas map in relation to petrol map. If there are many bars above -1.0, – it means that the mixture is lean in given scope The petrol time while working on gas is longer than the petrol time while working on petrol – in the same scope of engine work. – Analogously in case when the value is above +1.0

OPTIONS:

- » BLOCKADE if selected, current map chart will be saved in the memory of controller
- » [ERASE PETROL MAP] deletes petrol map chart
- » [ERASE GAS MAP] deletes gas map chart
- » FASTER MAP COLLECTION enables faster collection of chart points
- » [ERASE ADJUSTMENTS] deletes multiplier line to the initial state

Parameters window could be customised.

<u></u>	Readings	1
	Fig. 22	
	- Readings	X
Revolut	ions	
Vacuum		
Gas pre	ssure	
ABS gas	press.	
Reduce	r temp.	
✓ Gas tem	φ.	
RPM		
Level se	insor	
V Power s	upply	
Fuel sys	1	
SHRT F	٢1	
LONG F	Т 1	
Fuel sys	2	
SHRT F	12	
LONG F	T 2	
Lambda	1 OBD	
Lambda	2 OBD	

3.4. RPM corrections

Set	tings [F1]	Calib	ration	[F2]	N	lap [F3	1	Diag	nostic	s [F4]	Oscil	loscop	e [F5]	-	OBD [I	61	V	Re	adings	
С	orrectio	ns 2D		RPM	correct	ions	Redu	cer tem	p. corre	ctions	Gas t	emp. co	rrection	s G	as pre	ss. corre	ections	Revol	lutions	[rpm]	28
				s				Gas in	jection tim	e [ms]								Vacui	um	[bar]	0.
Petrol	bar/rpm 1,00	600	900	1200	1500	1800	2100	2400	2700	3000	3300	3600	4000	4500	5000	5500	6000	C		с J	-
Gas	0,93		9,9	9,4		10,2	10,1	9,8	10,1	10,0	9,8	11,4	10.7	10.0				Gas p	pressure	[bar]	ц,
Deviation	0,87				9,6	8,0	8,8	9,2	9,1 8,6	8,8	10,3	10,3	9,4	10,2	9,0			Redu	cer temp	5.[°C]	
	0,75		7,4		5,6	5,1	6,6	4,9	8,1	7,8	7,8	8,4	9,0	8,4				Cart		[00]	
	0,68			6.3	6,9	5,1	4,7	6,5	5,5	5,0	7,2	7,8	8,0	8,4				Gaste	emp.	[°C]	
	0,56		5,7	-/-	4,3	4,4	4,0	3,9	3,9	5,3	5,7	6,8	6,2	6,4				Powe	r supply	[V]	13.
	0,50		4,6	5,1		3,7	3,7	3,8	3,9	4,0	4,4	5,2	5,2	4,7							/
	0,45		4,5	4,2			3,0	3,5	3,2	2,9	3,5	3,6	4,0	4,4					Injectio	a time [m	sj
	0,31		3,2	3,0	3,4	2,9	2,5	2,8	2,9	2,7	2,9	3,0	3,4					1	0,00	1 🗹	0,
	0,25			2,6	2,6	2,1	0,2	1,9	0,7	1,1	0,9	2,8	2,6	1,2	0,7				0.00		-
	0,18					1,6	0,3	0,9	1,0		1,8	1,4	1,2	1,5	2,0	1,9		2	0,00	2	Ο,
	0,06																	2	0 00	3 🗖	0
																		-	0,00	5 🖭	υ,
								RPM	correction	s [%]								4	0,00	4 🗹	0,
par/rpm	bar/rpm	600	900	1200	1500	1800	2100	2400	2700	3000	3300	3600	4000	4500	5000	5500	6000				
	1,00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
	0,93	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
	0.81	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Ő				
	0,75	0	0	0	0	Ō	0	0	0	0	0	0	0	0	0	0	0				
	0,68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
	0,62	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
	0,56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
	0,50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
	0,43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
	0,37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
	0,31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				-
	0,25	0	0	0	0	0	0	0	00	0	0	0	0	0	0	0	0				
	0,18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-			
	0,12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		1.1.1.1.1.	3.7	-
	0,00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	and the second se	All and the second second		

Fig.24 (RPM correction map)

OPTIMA Nano controller allows very precise mixture adjustments in every scope of engine load. Figure above illustrates the correction map. The purple dot indicates current engine work (scope of RPM and injection time).

Gas injection may be corrected in given RPM scope, – by clicking on the area for which we want to change the gas injection parameter and selecting it with purple – square.

By holding **CTRL + UP ARROW** ↑, – it is possible to enrich given area – and by holding **CTRL + DOWN ARROW** ↓ – to lean it.

When 'change nearest' option is selected – the system will enrich nearest areas. When this option is not selected – change of only one area of RPM correction will be possible.

We can additionally change the values of the current scope by clicking + and – on the keyboard

3.5. Gas temperature corrections (for advanced)

Settings [F1]	Calibratio	n [F2]	Man [E3]	Diagnostics	F41	Oscilloso	one [E5	1	OBD [F6]	R R	eadings	(
Corrections 2D	RPI	M corrections	Reducer te	mp. corrections	Gas te	mp. correct	tions	Gas pre	ss. corrections	Revolutions	[rpm]	256
50 -							,			Vacuum	[bar]	0,6
										Gas pressure	[bar]	0,9
40										Reducer tem	p.[°C]	9
										Gas temp.	[°C]	
30										Power supply	(V]	13,6
20										- Injecti	on time [n	ns]
										1 7,75	1 🗹	8,8
10										2 7,20	2 🗹	8,3
										3 6,23	3 🗹	7,2
• •									Ŷ	4 6,76	4 🗹	7,8
-10												
-20												
-30												
-40											1	MODE
50												• (U)
-30 -20	-10 0	10	20 30	40 5	50	60 3	70	80	90 100			

Fig. 25 (temperature correction map)

OPTIMA controller is equipped with temperature correction algorithm, however the map demonstrated above allows introducing corrections.

Corrections should be conducted in the same way as these of 2D map multiplier – there is a possibility of introducing up to 20 points of temperature corrections.

In most cases changing the parameters of temperature corrections map is not necessary.

3.6. Reducer's temperature correction (for advanced)

OPTIMA v2.05 - OPTIMA nand	o v5									
Sottings [F1]	Calibration [E2]	Man [E3]	Diagnostic	[F4] Oscille	scope [E5			Re	adings	>
Corrections 2D	RPM corrections	Reducer ten	p. corrections	Gas temp. corr	ections	Gas press. correction	ns Revo	lutions	[rpm]	2600
50			·				Vacu	ium	[bar]	0,48
							Gas	pressure	[bar]	1,04
40							Redu	ucer temp	o.[°C]	92
							Gas	temp.	[°C]	7
30							Powe	er supply	[V]	13,77
20							-	Injectio	n time [m	is]
							1	3,80	1 🗹	4,34
10						······	2	3,78	2 🗹	4,30
8							3	3,77	3 🗹	4,29
orrecti							4	3,78	4 🗹	4,32
-10										
-20										
-30										
-40										NODE -
50										U
-30 -20	-10 0 10	20 30 Reducer ter	40 sperature [°C]	60 60	70	80 90	100			R SERVICE
Clear corrections									GAS	

Fig. 26 (reducer's temperature correction)

OPTIMA controller is equipped with temperature correction algorithm, – however, – the map demonstrated above allows introducing corrections.

Corrections should be conducted in the same way as these of 2D map multiplier, – there is a possibility – of introducing up to 20 points of temperature corrections.

IN MOST CASES CHANGING THE PARAMETERS OF TEMPERATURE CORRECTIONS MAP IS NOT NECESSARY.

3.7. Pressure corrections (for advanced)

Settings [F1]	Calibration [F2]	Map [F3]	Diagnostics	[F4]	Oscilloscope []	F51	OBD [F6]	Re Re	adings	(
Corrections 2D	RPM corrections	Reducer tem	p. corrections	Gas ter	np. corrections	Gas p	ress. corrections	Revolutions	[rpm]	278
0			с	Ē				Vacuum	[bar]	0,3
								Gas pressure	[bar]	1,0
0								Reducer tem	o.[°C]	9
								Gas temp.	[°C]	
0								Power supply	[V]	13,7
0								- Injectio	n time (m	is]
								1 2,93	1 🗹	3,6
o								2 2,94	2 🗹	3,6
								3 2,93	3 🗹	3,6
							°	4 2,92	4 🗹	3,6
10										
20										
30										
40									1	MODE
0,60									_	1 (1)
0,5 0,7	5 1	1,25	1,5	1,75	2	2,25	5 2,5			

Fig. 27 (gas pressure correction map)

The same as in case of temperature corrections – OPTIMA controller is equipped with pressure corrections algorithm – with the possibility of introducing corrections on the pressure corrections map. Corrections are introduced in the same way as the ones of multiplier and temperature.

DO NOT USE THIS OPTION IF THE REDUCER IS NOT PROPERLY SELECTED IN RELATION TO ENGINE POWER.

3.8. Fuel pressure emulator (only Optima Expert controller)

Device Cor	nection ELI	M Langua	ge View C	olor Docur	mentation	Help														
Sett	ings [F1]	Calibra	tion [F	2]	Map	[F3]	Di	agnost	ics [F4]	Osc	illosco	pe [F5]		OBD [F	6]	VI	R	adings	>
Cor	ections 2D		RPM co	orrections	Re	ducer tem	o. correcti	ons Ga	as temp. c	orrections	Gas	press. co	rrections	Rail p	ress. rail e	mulator	Reve	olutions	[rpm]	590
																	Vac	um	[bar]	0.99
		i.		1	1		:			1			1				, act	adin	[Dui]	0,55
																	Gas	pressure	[bar]	0,93
															RPM=	590	Red	ucer temp	o. [°C]	40
																	Gas	temp.	[°C]	41
															PWM	=1,57			L - 1	
															Fuel F	-2.64	Pow	er supply		11,85
·····															Emula	tion=2,41	- 1	Injectio	on time [ms	s]
5 [sec/div]														156,3	B [sec]	NL .	1	5,18	1 🗹	0,00
V/rpm	600	900	1200	1500	1800	2100	2400	2700	3000	3300	3600	4000	4500	5000	5500	6000	2	5,18	2 🗹	0,00
12,8																	2	5 1 9	2 🗖	0.00
11.2																	3	5,10	J ™	0,00
10,4																	4	5,18	4 🗹	0,00
9,6						2,28	2,28	2,28	2,28	2,28	2,28	2,28	2,28	2,28	2,28	2,28	5			
8,8						2,28	2,28	2,28	2,28	2,28	2,28	2,28	2,28	2,28	2,28	2,28	5			
7.2						2,28	2,20	2,20	2,20	2,20	2,20	2,20	2,20	2,28	2,20	2,20	6			
6,4	2,36	2,36	2,36	2,36	2,36	2,58	2,28	2,28	2,28	2,28	2,28	2,28	2,28	2,28	2,28	2,28				
5,6	2,36	2,36	2,36	2,36	2,36	2,58	2,28	2,28	2,28	2,28	2,28	2,28	2,28	2,28	2,28	2,28	1			
4,8	2,36	2,36	2,36	2,36	2,36	2,36											9			
4,0	2,36	2,36	2,36	2,36	2,36	2,36											0			
3,2	2,36	2,36	2,36	2,36	2,36	2,36														
2,4	2,36	2,36	2,36	2,36	2,36	2,36														
0,8	2,30	2,30	2,30	2,30	2,30	2,30														
		E	nulation	Petro	l rail press	sure		•			PWM	signal	12 V							MODE (
		Si	gnal sou	rce Probe	2 wire			•			Modu	lation	0,200		1	[V] - +	C		79	
											Perio	bd	0,1		[9	ec] - +	1		16 16	R SERVICE
Erase															Calibrati	ion Start		WORK	ON PETRO	1
															Land Street Street		-			

Fig. 27a

Thanks to built-in emulation system we can emulate some of the electronic components of the engine, such as:

» PROBE BEFORE THE CATALYST:

We can adjust the parametres of a probe with the use of a driver by moving the Lambda coeficient. It is not advisable to use this option without the view of AFR coeficient with the help of the external broadband probe.

» PROBE AFTER THE CATALYST :

in case you want to emulate the lambda probe after catalytic converter ,connect the probe signal before the catalytic converter and the emulation probe cable after the catalytic converter. The controller, based on the first probe signal, will set the right course on a probe wire after the catalyst.

» FUEL RAIL PRESSURE:

Due to the fact that while working on gas the petrol injectors remain closed, with some kind of cars there is the increase of fuel pressure and the voltage of a sensor measuring the pressure. It is being signalled by the shining lamp of engine failure and OBD error.

Thanks to built-in emulator we can collect the voltage map for a fuel pressure sensor and read it while the car is working on gas. By doing so, the car will not see the difference in a fuel pressure when working on gas and on petrol. To make the use of an emulator's abilities, the controller must be installed according to the diagram, switch the car to petrol and press Start Calibration in a Rail Press. Emulator tab.

At this point , the controller will start mapping the fuel pressure sensor while driving on petrol. Standard driving should be performed in the same way as when collecting the injection times on petrol. Try to fill the largest possible range of a table. If we are not able to gather a wider range ,we can switch the car to gas. While driving , check if the violet working point works in the same range as listed in a table. If the violet dot tents to "escape" from the range



Fig. 27b

we can use the Modulation option (the option simulates the voltage changes of a sensor at the determined value) Additionaly, when choosing Period (the option determines the frequency of simulated voltage rise by the value set in the modulation). The signal change is visible on the diagram.

It enables the simulation of indicator's operation and constant voltage change. Thus, the sensor will never achieve a constant value and the petrol controller will not report its damage.

Recommended initial values: Period - 0,200 Modulation - 0,1

4. OBD/CAN

In vehicles fabricated after 2002, – there is a possibility of connecting OPTIMA Nano controller to EOBD.

Connection to CAN or – OBD is possible in two ways.



Fig. 28

4.1. Connecting OBD/CAN – via – the ELM327 interface

ELM327 interface – models



Fig. 29

Fig.30

We are connecting the OPTIMA ECO+ interface to the PC. Then we are also connecting – the ELM327 interface to the car OBD2 socket and to the USB port in the PC.

Having connected to the Nano controller with the software OPTIMA 2.XX and after choosing an option of connecting with ELM327 we are able to collect and compare the injection correction maps of STFT, – LTFT both on petrol and on gas and then we could correct them in a suitable way.

ce Connection	ELM Language Vi	iew Color Documentatio	n Help						
Settings [Connect	ration [F2]	Map [F3]	Diagnostics [F4]	Oscilloscope [F	5]	OBD [F6]	V R	leadings
	COM3	0	BD module	Device		RPM cor	rections	Revolutions	[rpm]
Error	PID							Vacuum	[bar]
x PIDs supported 0	1 - 20					A PORT:		vacuum	[Dai]
x Monitor status sin	ce DTCs cleared.					ELM:		Gas pressure	[bar]
x Freeze DTC						PWR:			[00]
x Fuel system statu	s	Fuel sys				OBD:		Reducer tem	p. [°C]
× Calculated engine	load value	Load				ECU:		Gas temp	[00]
x Engine coolant te	mperature					DTC:		ous comp.	
x Short term fuel Ba	ink 1	SHRT FT1				MIL:		Power supply	/ [V]
× Long term fuel Ba	nk 1							Taiast	ion time [mc]
x Short term fuel Ba	ink 2	SHRT FT2						[-] Inject	ion time [ms]
x Long term fuel Ba	nk 2	LONG FT2						1	1 🗹
x Fuel pressure		Fuel P						2	2 17
x Intake manifold a	osolute pressure	MAP						2	2 💌
x Engine RPM		RPM						3	3 🕅
x Vehicle speed									•
x Timing advance		TA						4	4 🗹
x Intake air temper	sture	IAT						24	
x MAF air flow rate		MAF						5	5 🗹
x Throttle position		TPS						6	6 1
x Commanded seco	ndary air status	Air stat						0	0
x Oxygen sensors ;	present	02						7	7 🕅
× Bank 1 Sensor 1:	Oxygen sensor voltage	O2 B1S1							
x Bank 1 Sensor 2:	Oxygen sensor voltage	028152						8	8 🗹
x Bank 1 Sensor 3:	Oxygen sensor voltage	O2 8 153							
x Bank 1 Sensor 4:	Oxygen sensor voltage	028154							
x Bank 2 Sensor 1:	Oxygen sensor voltage								
x Bank 2 Sensor 2:	Oxygen sensor voltage								
x Bank 2 Sensor 3:	Oxygen sensor voltage	O2 B2S3							

4.2. Maps collecting procedure

Sellect the "OBD" and then the "RPM corrections".

Drive a car on petrol with different speeds on different gears. When noticing that table bars don't change and the new bars don't appear, – switch into gas and fill the table – exactly in the same way during driving on gas.

VIEW OF OBD CORRECTIONS COLLECTED ON PETROL

View of corrections on petrol after the test drive with connected OBD Adapter or with – the ELM327 interface. Red table – view changed with **[F8]** key or – by Petrol, Gas, – Deviation switches.



The controller creates the map by recording each correction value .Red bars represent – scopes collected on petrol. Grey bars mean that the vehicle has not worked in such scope yet or went to the Open Loop (Open Loop – the car do not use – STFT or LTFT)

VIEW OF OBD CORRECTIONS COLLECTED ON GAS

View changed by clicking the gas switch or [F8] on a keyboard.



NOTE:

WHILE MAP COLLECTING IN THE GAS AND PETROL CORRECTIONS VIEW - THE CONTROLLER OFTEN SHOWS - THE CORRECTION WITH NEGATIVE VALUE E.G. -15% - WHICH MEANS THAT THE MIXTURE IS ENRICHED BY 15%. HOWEVER SWITCHING TO THE DEVIATION VIEW - THE SITUATION IS REVISED AND THE CONTROLLER SHOWS THE DIFFERENCE BETWEEN THE CORRECTIONS.

DEVIATION OF OBD CORRECTION ON GAS AND PETROL

GREEN BARS – OBD corrections collected on gas RED BARS – OBD corrections collected on petrol. YELLOW BARS – difference between gas and petrol corrections GREY BARS – no values collected

Petrol	El	600	900		RPN	1 corre		-													-
Petrol bar Gas 0, eviation 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0	r/rpm 1,00 0,93 0,87 0,81 0,75 0,68	600	900				ections		1									Revol	utions	rpm	177
bar bar Gas 0, eviation 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,	r/rpm 1,00 0,93 0,87 0,81 0,75 0,68	600	900					Deviation	OBD petr	ol-gas [%]								Vacuu	um	[har]	07
Gas 1, eviation 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0	1,00 0,93 0,87 0,81 0,75 0,68			1200	1500	1800	2100	2400	2700	3000	3300	3600	4000	4500	5000	5500	6000	vacut		[Dai]	0,1
eviation 0, 0, 0, 0, 0, 0, 0,	0,87 0,81 0,75 0,68						-13.3	-10,9	13.0	±17.2	+7.0							Gas p	pressure	[bar]	1,0
0, 0, 0, 0, 0, 0,	0,81 0,75 0,68				+10,9		-10,9	-11,7	-7,8	+17,2	+7,0		-11,7					-		50.03	
0, 0, 0, 0,	0,75				(+12,5	-10,9		+0,8	-22,7								Redu	cer temp	o.[°C]	9
0,	0,68			+14,1	+36,7	+27,3	+3,9	-10,2	-13,3	+14,8	+18,8							Cart		[00]	
0,	1.67		+30,5	162.5	+41,4	+35,2	+1,6	+3,1	-15,6	+22,7								Gas te	emp.	[°C]	
	0.56		+33,1	+18.8	+20.3	+36.7	+29.7	+6.3	-3.9	+24.2								Powe	r supply	[V]	137
0,	0,50		+21,1	+28,9	-21,9	+53,1	+26,6	+7,8	-7,8	-29,7								TOWC	supply	[v]	13,7
0,	0,43		+83,6	101100000	+26,6	+55,5	+18,0	-8,6	-8,6	+6,3	0,0			+0,8				-	Injection	n time [m	is]
0	0,37		+42,2	+6,3	+52,3	+39,1	+2,3	+4,7	-7,0	-11,7								1	7 70	1 1	77
0,	1.25		+39,1	+20,1	+35,2	+50,0	+33,6	-40,6	-4.7	+21,9				-24.2				1	1,10	I	1,1
0,	0,18						-3,9	+12,5										2	7 65	2 1	78
0,	0,12																	-	1,00		110
0,	0,06																	3	7.71	3 🗸	7.8
har	r.knom	600 L	900	1200	1500	1800	2100	2400	correction	s [%]	3300	3600	4000	4500	5000	5500	6000 I	4	7,67	4 🗹	7,8
ir/rpm 1	1.00	000	0	0	0	0	0	0	2700 0	0	0	0	0000	0	0	0	0000				
<u> </u>	0,93	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
0,	0,87	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
0,	0,81	0	0	0	00	0	0	0	0	0	0	0	0	0	0	0	0				
	1,75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
0,	0,62	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Ō				
0,	0,56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
0,	0,50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
0	1.37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
0,	0,31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			1	
0,	0,25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				MODE
0,	0,18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			_	- da
0	0,12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
0,	1,00	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	1	ज के के क		

Positive value (+ PLUS) - A DEVIATION TABLE indicates that the fuel mixture in given scopes is – rich. Negative value (- MINUS) indicates that the fuel mixture in given scopes is lean. The correction could be done by the deviation table or with the use of multiplier. – In such case the multiplier should be reduced down.

4.3. Error reading with the ELM327 interface

OBD > ELM > ERROR

🔁 ОРПМА v2.05										
Device Connection ELM Lar	nguage View Color Documentation	n Help								
Settings [F1]	ettings [F1] Calibration [F2] Map [F3]		Diagnostics [F4]	Oscilloscope [F5]	OBD [F6]		Readings >			
ELM	Revolutions [rpm]									
Error PID						Vacuum	[bar]			
Throttle Position Sensor/Su Pending Trouble Cod	Cas areas	ura [har]								
P0120	Gas press	ure [bar]								
Czujnik położenia przepusti	Reducer to	emp. [°C]								
Throttle/Petal Position Sen	1220 nrottle/Petal Position Sensor/Switch B Circuit Malfunction ECU: 7E8h 7E9h									
P0105	bwód B przełącznika/czujnika położenia pedału gazu/przepustnicy - usterka 1105									
Manifold Absolute Pressure Obwód ciśnienia bezwzględ	e/Barometric Circuit Malfunction nego kolektora/ciśnienia barome	trycznego - usterka			MIL:	Power supply [V]				
P0300 Random Multiple Cylindor M	licfire Detected					Injection time [ms]				
Wykryto przerwę zapłonu l	andom Multiple Cylinder Mistire Detected /ykryto przerwę zapłonu losową/ na wielu cylindrach									
Intake Air Temperature Cir	cuit Malfunction					2	2 🕅			
Obwód czujnika temperatur P0443	ry powietrza zasysanego - uster	ka								
Evaporative Emission Contr Układ odprowadzania oparo	ol System Purge Control Valve Ci ów paliwa - obwód zaworu sterov	rcuit vania oczyszczniem				3	3 🗹			
Pending Trouble Cod	es / Błędy oczekujące :					4	4 🗹			
Misfire Detected with Low I	Fuel					F	F 57			
P0443	przy niskim pozionne paliwa w zbi	orniku			-	3	5 💌			
Evaporative Emission Contr Układ odprowadzania oparo	ol System Purge Control Valve Ci ów paliwa - obwód zaworu sterov	rcuit vania oczyszczniem				6	6 🗹			
P0105 Manifold Absolute Pressure	/Barometric Circuit Malfunction					7	7 🗹			
Obwód ciśnienia bezwzględ	nego kolektora/ciśnienia barome	trycznego - usterka								
Throttle Position Sensor/Su	witch A Circuit Malfunction	and an				8	8 🗹			
P0220	nicy/obwou przerącznika A - uso	згка		E						
Throttle/Petal Position Sen Obwód B przełacznika/czuj	sor/Switch B Circuit Malfunction nika położenia pedału gazu/prze	pustnicy - usterka								
P0110										
Intake Air Temperature Cir Obwód czujnika temperatur	cuit Malfunction ry powietrza zasysanego - uster	a					MORE			
Pending Trouble Cod	es / Błędy oczekujące :						- (I)			
P1055						모모모모				
Pending Trouble Cod	es / Błędy oczekujące :			-		64.00	de termine service			
Read errors Clear OB) errors				Connec	t NO	CONNECTION			

4.4. Advantages of using ELM327 interface with the controller OPTIMA nano

- » General access of the interface through out the world.
- » Possibility to set every car basing on the corrections of petrol controller and thus avoiding the occurence – of lean mixture errors (the table shows the real state of OBD petrol controller corrections – while – working on gas and petrol).
- » Interface is also used for diagnostics and overview of any parameter in every car with the OPTIMA ECO + contoller with the ability to read and erase OBD errors.
- » Possibility to control the corrections on petrol and gas without the need of using a second OBD scanner (no need for a manual calibration with a scanner)
- » In many cases it eliminates the need of a permanent installation of OBD Adapter.

4.5. OBD2 adapter

Having correctly installed – OBD2 adapter in a car, – there is a possibility to use the same options as with the ELM327. Additionally, – there is a possibility of – constant setting adaptation as regards STFT corrections and LTFT petrol controller.

4.5.1. Built-in OBD (only Optima Expert controller

Device Connection ELM Language View Co	lor Documentation Help							
Settings [F1] Calibrat	ion [F2] Map [F3]		Diagnostics [F4] Os	cilloscope [F5]	OBD [F6]		Readings	>
ELM	Device		RPM corrections			Revolution	s [rpm]	590
				(Vacuum	[bar]	0,99
OBD protocol	ISO 15765-4 CAN 11/500) ~	Clear all OBD error	rs No	×	-		0.00
LTFT corrections inverte	No ×		Clear fuel trim err	ors No	×	Gas pressu	re [bar]	0,93
SIFI corrections inverte	d No	×	Clear selected erro	ors No	X	Reducer te	mp. [°C]	40
Adaptation	OPD to get value		OBD errors	Off		Gas temp	[°C]	41
Adaptation type	Continuous adaptation		OBD errors	Off				
Set correction value			OBD errors	Off		Power supply	oly [V]	11,85
	[])	- 1 Inj	ection time [m	is]
User PID	VSS Vehicle speed	~	DTC reading scope	1	[sec] - +	1 5,1	L8 1 ⊠	0,00
User PID	-	•				2 5,1	19 2 ☑	0,00
						3 5, 1	L <mark>8</mark> 3 ☑	0,00
						4 5,1	L <mark>8</mark> 4 ⊠	0,00
						5		
						6		
						7		
						8		
						00000	1098	
								R SERVICE
Read errors Clear OBD errors						w	ORK ON PETRO	DL.

Imagen. 35a

Optima Expert controller allows a constant communication with the car's OBD. It enables us to programme the petrol controller to adjust the installation automatically during driving

OBD PROTOCOL - choose the type of OBD connection protocol.If it is unknown, we could choos the option Automatically. When we connect to OBD correctly, on the bottom right hand side we will see on which OBD connection pins the protocol has been gathered. The current errors will be displayed together with the name of communication protocol. Based on this, we can choose the permanent OBD protocol's name.

LTFT CORRECTIONS INVERTED - it allows to invert long-term OBD corrections when the car has inverted OBD corrections. In 99% of cars we leave the NO option.

(Usually, if the OBD corrections are positive it indicates too lean mixture whereas if the corrections are heading the negative direction it indicates that the mixture is too rich)

STFT CORRECTIONS INVERTED - it allows to invert short-term OBD corrections when the car has inverted OBD corrections. In 99% of cars we leave the NO option.

(Usually, if the OBD corrections are positive it indicates too lean mixture whereas if the corrections are heading the negative direction it indicates that the mixture is too rich)

ADAPTATION

- » TO INJECTION TIME MAP It is an adaptation based on saved injection times of petrol and gas
- » **TO OBD TO PETROL MAP –** it is an adaptation based on short and long-term correction map on petrol which could be found in a tab OBD> RPM corrections .
- » OBD TO SET VALUE the option allows to enter your own OBD correction value to which the gas cotroller will be aiming to.
 - SET CORRECTION VALUE -here we should give the result of two adjustments of STFT and LTFT. Usually it is the same value as on petrol, for example, for the value STFT= -5 i LTFT= 5 the result is 0 so this value should be entered. The option could be used for setting the car directly on gas without the need of driving on petrol.

OWN PID / USER PID – we can define any PID (OBD parameter) we would like to see in parametres reading and save to the oscilloscope file.Keep in mind that large number of parametres slower down the transmission between the car's OBD controller and the gas driver.

CLEAR ALL OBD ERRORS – it erases all the petrol controller errors. The option is to be used as a last resort, when everything is set properly and the controller still reports the errors

CLEAR FUEL TRIM ERRORS – it erases all the petrol controller errors conected with the fuel trim. The option is to be used as a last resort, when everything is set properly and the controller still reports the errors.

CLEAR SELECTED ERRORS - here we can define an error code to be deleted.

DTC READING SCOPE - the option for setting the period of time when the gas controller is being checked automatically by the petrol controller for the presence of errors.

5. Diagnosis

The controller stores the errors occured during installation work and records their frequency for faster diagnosis. Additionally, – it creates the history of events.

5.1. Possible errors

- » MANIFOLD PRESSURE SENSOR ERROR THE VALUE OF VOLTAGE IS TOO LOW. Improper voltage value in a manifold pressure sensor, – check the wires and connectors
- » MANIFOLD PRESSURE SENSOR ERROR - THE VALUE OF VOLTAGE IS TOO HIGH. Improper voltage value in a manifold pressure sensor, - check the wires and connectors
- » GAS PRESSURE SENSOR ERROR THE VALUE OF VOLTAGE IS TOO LOW. Improper voltage value in a gas pressure sensor, – check the wires and connectors
- » GAS PRESSURE SENSOR ERROR THE VALUE OF VOLTAGE IS TOO HIGH.
 Improper voltage value in a gas pressure sensor, check the wires and connectors
- » REDUCER TEMPERATURE SENSOR ERROR THE VALUE OF VOLTAGE IS TOO HIGH. Improper voltage value in a reducer sensor, – check the sensor wires and the connection. If the switch button was repeatedly held, – the error could be ignored.
- REDUCER TEMPERATURE SENSOR ERROR THE VALUE OF VOLTAGE IS TOO LOW.
 Improper voltage value in a reducer sensor, check the sensor wires and the connection.
- » GAS TEMPERATURE SENSOR ERROR THE VALUE OF VOLTAGE IS TOO HIGH. Improper voltage value in a gas sensor, - check the sensor wires and the connection
- » GAS TEMPERATURE SENSOR ERROR THE VALUE OF VOLTAGE IS TOO LOW.
 Improper voltage value in a gas sensor, check the sensor wires and the connection
- » TOO LOW POWER SUPPLY.

Voltage dropped below 9V, – it may indicate the problem with battery or charging system.

- TOO HIGH POWER SUPPLY.
 Voltage rises above 16V, check the battery charging system
- » NO POWER SUPPLY ON LPG VALVE Absence of a power supply in a solenoid valve.
- » NO POWER SUPPLY ON LPG INJECTORS Absence of a power supply in injectors
- » NO POWER SUPPLY ON PTS Absence of a power supply in PTS
- » TOO LOW GAS PRESSURE BEFORE SOLENOID-VALVES SWITCHING Absence or very low gas pressure pressure before solenoid-valves switching
- » TOO HIGH GAS PRESSURE BEFORE SOLENOID-VALVES SWITCHING Very high gas pressure before solenoid valves switching.
- » MINIMUM RPM ON GAS

Switching to petrol at minimum rotation » LOSS OF RPM WHILE THE IGNITION IS ON Rotations declined while the ignition is on or there is an improper connection of plus after the key. » MINIMUM REDUCER TEMPERATURE ON THE LPG Switching to petrol at the minimum reducer temperature » MAXIMUM GAS PRESSURE Switching to petrol after reaching the gas pressure above 4bar » WORK ON BOTH LPG AND PETROL DUE TO THE MINIMAL GAS TEMPERATURE Partial switching to petrol at the minimum gas temperature. » WORK ON BOTH LPG AND PETROL DUE TO THE MINIMUM GAS PRESSURE Partial switching to petrol at the minimum gas pressure. It may accure at the gas exhaustion or a drastic pressure drop. » WORK ON BOTH LPG AND PETROL AFTER THE PETROL INJECTORS LOOPING. Partial switching to petrol after the full opening of petrol injectors (impulse injection control changes into constant injection control after injection impulses overlaping). » WORK ON BOTH LPG AND PETROL AFTER THE GAS INJECTORS LOOPING. Partial switching to petrol after the full opening of gas injectors (impulse injection control changes into constant injection control after injection impulses Readings V overlaping). Revolutions [rpm] 4610 » FAULT ON GAS INJECTOR NUMBER 0,84 Signalling the lack of injector or damaged – injector wire Vacuum [bar] » SHORT CIRCUIT OF GAS INJECTOR NUMBER 1,14 Gas pressure [bar] Signalling the circuit of a gas injector or damaged injector 88 Reducer temp.[°C] wire. 7 [°C] Gas temp. Power supply [V] 14,13 5.2. Readings -Injection time [ms] 1 **10,48** 1 🗹 0,00 » **REVOLUTIONS** - current engine RPM 2 **10,53** 2 🗹 0,00

- » **PRESSURE** gas pressure in injection rail
- » VACUUM vacuum in the engine's intake manifold
- » REDUCER TEMPERATURE current temperature of the reducer
- » GAS TEMPERATURE current gas temperature outside of the reducer
- » POWER napięcie zasilania sterownika (napięcie instalacji samochodowej)
- » LAMBDA 1 Voltage shown by the first Lambda probe
- » LAMBDA 2 Voltage shown by the second Lambda probe

10,48 3 🗹

10,50 4 🗹

3

4

Fig. 36

0,00

0,00

5.3. Injection Time [ms]

Shows current petrol and gas injection times. The injector that is selected is the currently working one (deselecting given injector results in switching it into petrol).

At the bottom of readings window information about the connection with the controller is visible. Through the switch symbol it is possible to change the type of injection (petrol/gas)

5.4. Oscilloscope

Shows the signals selected on the left side.



Fig. 37 (oscilloscope)

6. Switch



- » DIODES R indicate current gas level in a tank
- » **RED MODE DIODE** engine work on petrol supply
- » GREEN FLICKERING MODE DIODE system is working on automatic mode, waiting for reaching selected temperature and RPM parameters
- » GREEN fast flickering System on automatic mode e.g after gas pressure drop
- » **SERVICE DIODE** signalizes the necessity of the installation service

7. Technical Support remote desktop (via TeamViewer programme)

Through the internet connection. Previously contacted, – the technical support can connect romotely directly with – the OPTIMA user's computer in order to help with the system operating. The only conditions that must be met are the controller connection via interface and the internet access.

www.optimagas.com www.autogas-alex.com



Fig. 39