Sequential GIS N

Sequential
Gas Injection System

bigas INTERNATIONAL S.R.L. AUTOGAS SYSTEMS

INSTRUCTION MANUAL
PROGRAMMING SOFTWARE

FOR THE "BIGAS 2001n" ECU

Ver. 4.6.7
ISGI036

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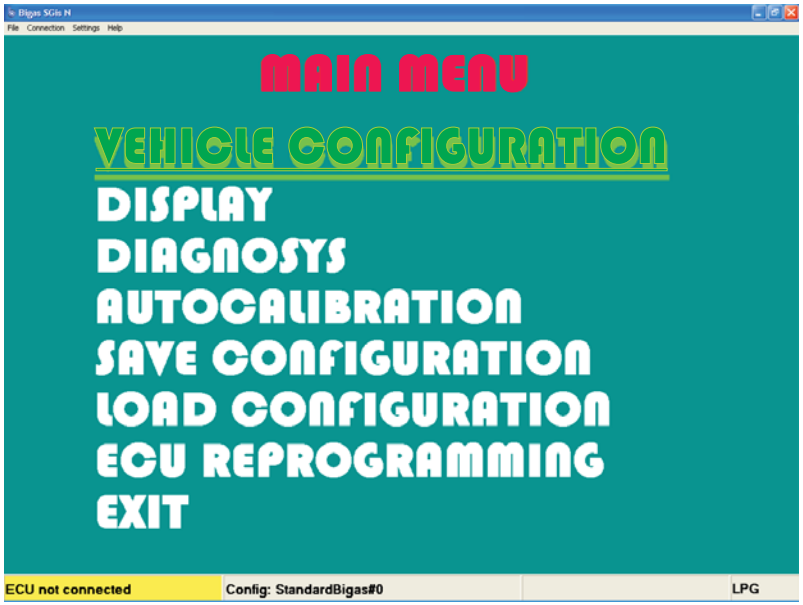
Contents

Check that the programming software has been installed correctly.

- Connect the SGIS ECU to the computer through the serial or usb interface.
- Before beginning configuration, check that the system has been installed correctly.
- To test connection with the ECU:
  - Start the vehicle engine.
  - Set the fuel changeover switch to "petrol" (red LED lighted).
  - Double-click the "Bigas 2001" icon on the desktop to launch the program.

  If the program opens correctly (without displaying connection errors) and the changeover switch remains lighted, connection with the ECU has been successfully and correctly established.
- Troubleshooting possible preliminary-phase problems.
  - If the software is unable to establish a connection with the SGIS ECU, check connection of the positive key wire and the positive and negative battery connections. Also check connection of the serial or usb interface.
  - If the changeover switch goes out a few seconds after engine start, there may be problems with the "RPM" signal or the negatives (signal line) of the fuel injectors may not have been connected.
  - If the changeover switch lights and goes out alternately, the probable cause is that an unsuitable vehicle configuration has been loaded. Load a more suitable or standard configuration to eliminate the problem.

Phase 1



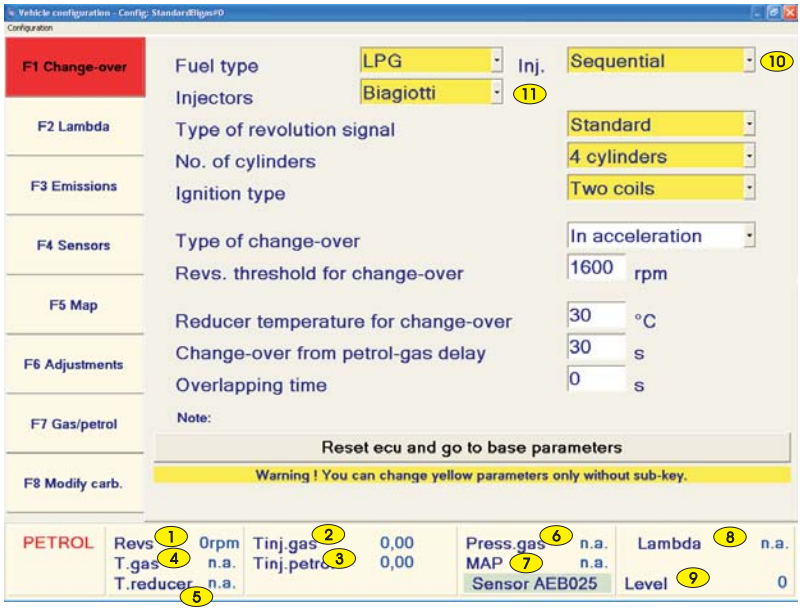
Once the Bigas 2001 (SGIS Plus) program has been launched and correct connection with the ECU has been established, select the type of fuel (methane or LPG) used by the installed system:

- on the main menu, click "VEHICLE CONFIGURATION"
- select "Methane" or "LPG" in the "fuel type" field.
- press "Esc" to return to the main menu.

A configuration may be loaded into memory after the correct fuel type has been selected:

- on the main menu, click "LOAD CONFIGURATION"
- select a file for an identical vehicle or for an engine of the same type; otherwise, select a standard file. Click "OK."
- press "Esc" to return to the main menu.

Phase 1 - "F1 Change-over"



To set the vehicle parameters (modification of the parameters must be made with the ignition key in the "off" position), click "VEHICLE CONFIGURATION" on the main menu. The various signals displayed along the lower edge of this screen are:

1 Engine "Revs". This is the engine RPM value. It is important that the value displayed on the screen correspond to that shown on the vehicle tachometer. Should this not be the case, change the value in the "Ignition type" field in the "F1Change-over" menu. If, instead, no value is displayed, change the setting in the "Type of revolution signal" field of the "F1Change-over" menu or check connection of the brown wire.

2 "Tinj.gas". Indicates the gas injection time.

3 "Tinj.Petrol". Indicates the petrol injection time.

4 "T.gas". Measured temperature of the gas in the injector rails.

5 "T.reducer". Measured temperature in the reducer.

6 "Press.". Pressure relative to gas injection.

7 "Map". Negative pressure value at the suction manifold, in bar.

8 "Lambda". Lambda probe signal, in Volt.

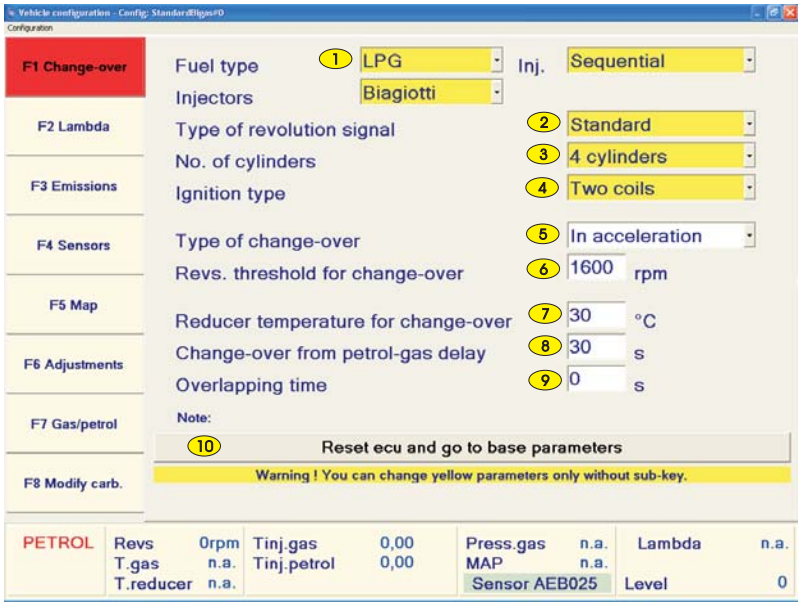
9 "Level". Gas level in tank.

All these values must be correctly display before proceeding with self-calibration.

10 The petrol injection time (Tinj.benz) will vary greatly depending on whether the SGIS-N system is installed on a half-group or full-group sequential injection engine. It therefore may be necessary to adjust software function.
With either a half-group or a full-group system we can set as for full-group if the gas injector measurements are maintained as shown in the table for sequential systems.
If the software is left set for sequential operation, the diameter of the gas injectors must be reduced as shown in the table.

11 The "Biagiotti" injector setting is suitable for injectors with 6 Ohms resistance.
The "Biagiotti Fast" injector setting is suitable for injectors with 3 Ohms resistance.
"Fast" configurations may not be loaded with "Biagiotti" injector settings, and vice-versa.

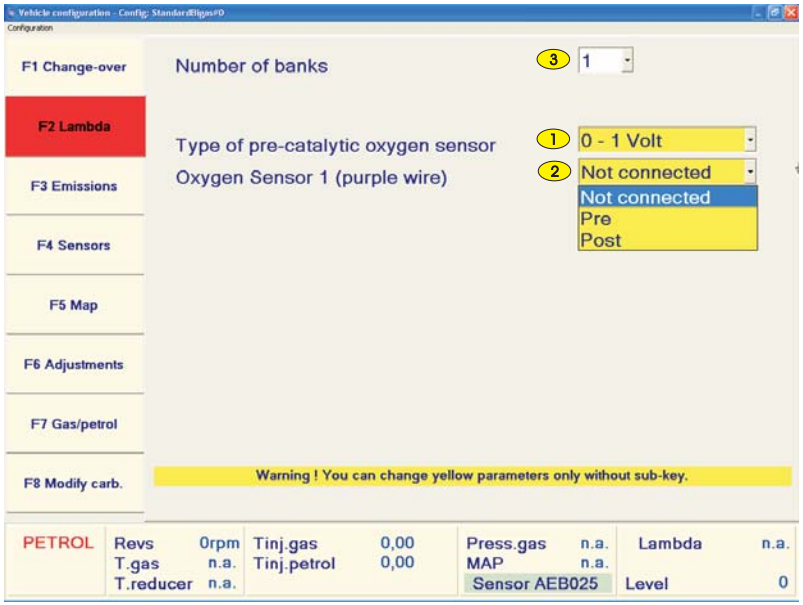
Phase 1 - “F1Change-over”



The “F1Change-over” menu permits setting:

1. “Fuel type”. Select LPG or methane.
2. “Type of revolution signal”. Select standard 0-12Volt or “low” 0-5Volt RPM signal.
3. “No. of cylinders» Set the number of cylinders for the vehicle engine.
4. “Ignition type”. Set the type of ignition. Select “two coils”, “one coil”, “RPM sensor” or “RPM sensor 2”. (Select RPM sensor 2 for 6-8 cylinder engine that has RPM signals like 4 cylinder engine, ex. Chevrolet, Range Rover)
5. Changes switchover in acceleration or deceleration.
6. “Revs. threshold for change-over”. This is the threshold, expressed in RPM, beyond which the system switches from petrol to gas fueling. We recommend setting a value of 1000 RPM.
7. “Reducer temperature for change-over”. This value indicates the temperature that must be reached by the reducer before switching over to gas fueling. For small engines, we recommend setting values between 20 °C and 30°C; for more powerful engines, values between 30°C and 50°C.
8. Compulsory delay time for switchover.
9. Not use, the valve is to be set always to zero
10. This button permits loading the standard preset parameters, zeroing the current settings.

Phase 1 - "F2-Lambda"



For the self-calibrating system to operate it is not necessary that the lambda sensor be connected. Connection is required only in order to display its operation and has no influence whatsoever on carburetion. If the 4-wire lambda sensor is connected, this menu permits setting the type. Select among: (1) 0-1 Volt; 0-5 Volt; 5-0 Volt, 0.8-1.6 Volt.

(2) If the engine has two lambda probes, enter "Pre" or "Post" according to the position of lambda probe 1.
(3) Set "2" to enable the corrector for the second cylinder bank for carburation control, which permits enriching or leaning out the second bank (gas injectors B and C in a 4-cylinder engine; red-sheathed gas injectors in 6- and 8-cylinder engines).

With this function enabled, the petrol and gas fuel times for the second cylinder bank may be displayed.

The "Bank Number" command interacts with the "Injection Sequence Advance" command on the "F7 Gas/Petrol" page. With the "Injection Sequence Advance" function enabled, changing the "Bank Number" command setting annuls the advance for the sequence run previously.

SWITCH PLUG

PIN	COLOR	SIGNAL
1	RED	5 V
2	BROWN	5 V
3	BLACK	0 V
4	BLUE	4,2

NOTE:_____
_____
_____
_____

Example: adjust carburation with the Bank 1 correctors to near "0"; if Bank 2 has correctors with values of -20%, enter this value in the window.

It is very important that only the purple wire be connected.

It is not possible to directly connect 5-wire sensors. This type of sensor must be connected to the 4-wire sensor below the catalyzer in order to obtain an indicative value for carburetion. Normal values are from 0.200 to 0.600 Volt.

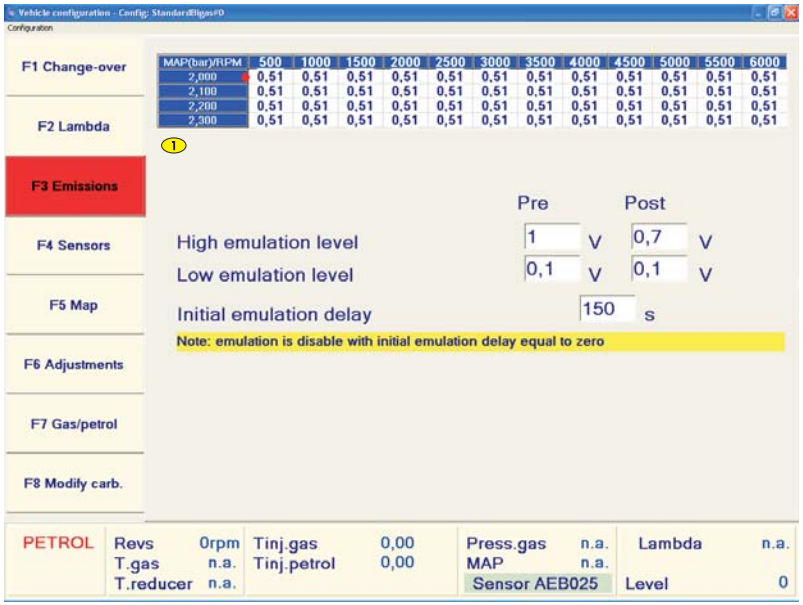
A single lambda probe in the 5-6-8 cylinder control box may be read and if desired emulated. Reading and emulation can be performed whether the probe is anterior or posterior.

With "Not Connected" selected, the lambda value is not displayed (n.d.) and no type of emulation is activated.

With "Anterior" selected, the value of the anterior lambda probe is displayed and emulation is activated after 150 seconds (default) from engine start in the gas fuel mode..
The settings defined on the "F3 Emissions" page determine the emulation values.
The emissions map and the high and low emulation levels can be modified. These values can be modified in the "Anterior" column.

With "Posterior" selected, the posterior lambda probe value is displayed and emulation on the posterior lambda probe is activated, with the settings defined on the "F3 Emissions" page, after 150 seconds (default) from engine start in the gas fuel mode..
With "Posterior" selected, the map is of no importance. Only the emulation values in the "Posterior" column have significance.
This function can resolve the problem posed by lighting of the diagnostics alarm indicating catalytic converter inefficiency.

Phase 1 - "F3-Emissions"



1 This table permits varying the default point for the lambda probe at various engine speeds and pressures on the accelerator pedal.

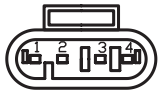
All the parameters for the anterior and posterior probes may be displayed independently of whether "Anterior" or "Posterior" is selected in the lambda probe field on page "F2 Lambda." This permits setting the default values for both probes, whose use or exclusion will be determined by the settings made.

In the case of 5-6-8 cylinder control boxes, up to two anterior and posterior lambda probes (violet/gray and violet-black/gray-black wires) maybe read and emulated, each with the pre-selected function. .

In the case of 3-4 cylinders, either the anterior or the posterior probe is emulated.

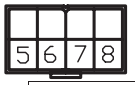
In the case of 5 cylinders, both the anterior and the posterior probe may be emulated, even though in practice this has never been necessary.

In the case of 6-8 cylinders, either the anterior or the posterior probes may be emulated (there is no utility in emulating a single anterior probe and a single posterior probe).



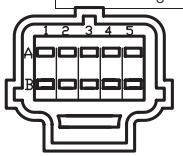
PLUG PRESSURE SENSOR

PIN	COLOR	SIGNALS
1	BLACK	12 V
2	ORANGE\BLACK	2,4 V
3	YELLOW\RED	0,45 V
4	RED\BLACK	5 V



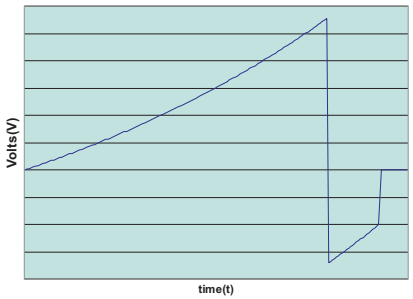
DIAGNOSIS PLUG

PIN	COLOR	SIGNAL
5	PINK\BLACK	5 V
6	BLACK	0 V
7	RED\BLACK	12 V
8	PINK	5 V



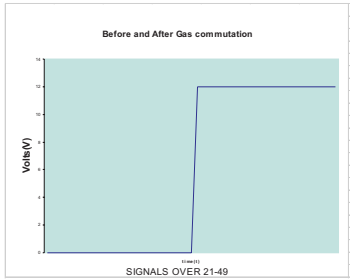
PLUG INJECTION OF FLUEL

PIN	COLOR	SIGNALS
A1	BLACK\BLUE	IMPULSE
A2	BLACK\ RED	IMPULSE
A3	BLACK\GREEN	IMPULSE
A4	BLACK\YELLOW	IMPULSE
A5	NOT UTILIZZATED	
B1	BLUE	12 V (GAS WORKING)
B2	RED	12 V (GAS WORKING)
B3	GREEN	12 V (GAS WORKING)
B4	YELLOW	12 V (GAS WORKING)
B5 (FIRST BANK ONLY)	WHITE\RED	12 V

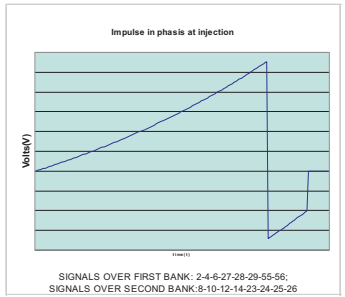


SIGNAL OVER: A1-A2-A3-A4

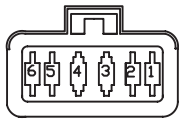
NOTE:_____



SIGNALS OVER 21-49

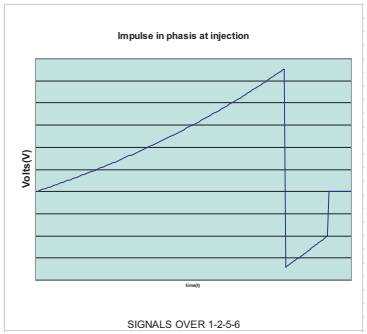


SIGNALS OVER FIRST BANK: 2-4-6-27-28-29-55-56;
SIGNALS OVER SECOND BANK:8-10-12-14-23-24-25-26

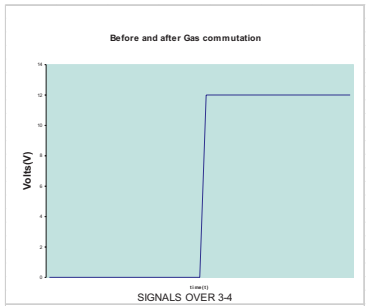


PLUG GAS INJECTION

PIN	COLOR	SIGNAL
1	YELLOW	IMPULSE
2	ORANGE	IMPULSE
3	BLACK	12 V (GAS WORKING)
4	BLACK	12 V (GAS WORKING)
5	RED	IMPULSE
6	BROWN	IMPULSE



SIGNALS OVER 1-2-5-6



SIGNALS OVER 3-4

NOTE:_____
_____
_____
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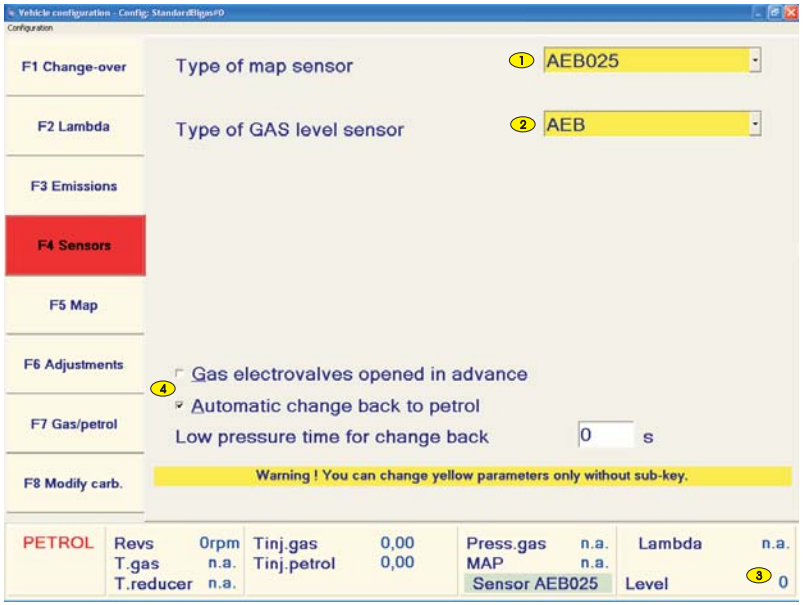
Note: whatever type of probe is selected, in the AEB2001NB and AEB25568B/C **control boxes emulation of the lambda probe** uses the **gray** wires for one cylinder bank and **gray/black** for the other.

The UEGO "current pump" lambda probes (Volkswagen, etc.) cannot be read but only emulated. None of the lambda probe wires must be interrupted; the gray or gray/black wire must be connected to the signal wire.

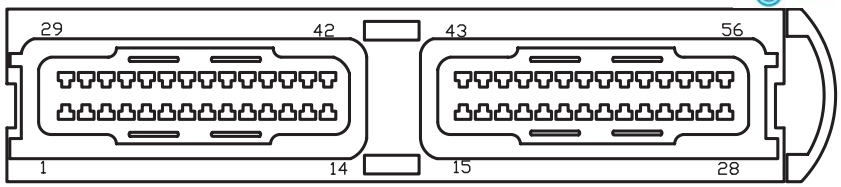
Example: a 0-1 Volt probe at a value lower than 0.51 is considered by the petrol control box as lean and values above 0.51 as rich.
If we enter a value of 0.3 in the table, the petrol control box considers values below 0.3 as lean and values above 0.3 as rich.. In this manner we will see a lambda ratio, measured on the exhaust gas analyzer, of greater than 1.00 (lean).
If we enter a value of 0.7 in the table, the control box considers values lower than 0.7 as lean and values above 0.7 as rich. We will see a lambda ratio of less than 1.00.
This function is used primarily for emissions testing during inspection.

Phase 1 - “F4-Sensors”



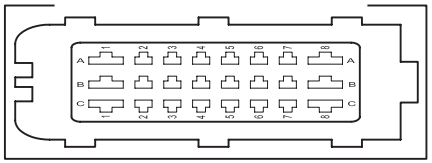
This menu permits entering the type of gas level sensor used. Select between: A.E.B; 0-90 Ohm, not standard and not standard inverted.
To select correct value, not standard, see the value displayed on point moving manually the sensor on the tank.
Further you can choose between: first series sensor AEB 013 or the newer AEB 025, available after 28/07/2004.
For 025 type you have to upload the firmware 0500 or higher for 4 cylinders or firmware 01000 or higher for 5-6-8 cylinders.

4 This function permits activating the gas solenoid valves at least 5 seconds prior to changing over to gas.
It is thus possible to fully fill even very long or large inner diameter gas pipes controlled by gas solenoid valves with piloted opening
With the function enabled, a warning message is displayed to remind the user not to shut off the petrol pump.
A normally-closed relay connected to the gas line is usually used to shut off the petrol pump. Powering this conductor 5 seconds before effective changeover to gas fueling would cause the automobile to stall for lack of petrol.

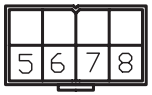


PIN	COLOR	SIGNAL
1	BLUE	12 V (GAS WORKING 1° BANK)
2	RED\BLACK	IMPULSE
3	RED	12 V (GAS WORKING 1° BANK)
4	GREEN\BLACK	IMPULSE
5	GREEN	12 V (GAS WORKING 1° BANK)
6	YELLOW\BLACK	IMPULSE
7	YELLOW	12 V (GAS WORKING 1° BANK)
8	BLACK\BLUE	IMPULSE
9	BLUE	12 V (GAS WORKING 2° BANK)
10	RED\BLACK	IMPULSE
11	RED	12 V (GAS WORKING 2° BANK)
12	GREEN\BLACK	IMPULSE
13	GREEN	12 V (GAS WORKING 2° BANK)
14	YELLOW\BLACK	IMPULSE
15	RED\BLACK	12 V (BATTERY)
16	NOT UTILIZZATED	
17	NOT UTILIZZATED	
18	BLUE	12 V (ELECTROVALVES GAS)
19	NOT UTILIZZATED	
20	NOT UTILIZZATED	
21	BLACK	12 V (GAS WORKING)
22	BLACK	0 V
23	BROWN	IMPULSE
24	RED	IMPULSE
25	ORANGE	IMPULSE
26	YELLOW	IMPULSE
27	BROWN	IMPULSE
28	RED	IMPULSE
29	BLUE\BLACK	IMPULSE
30	PURPLE\BLACK	OXINGEN SENSOR 2
31	GREY\BLACK	OXINGEN SENSOR 2
32	PURPLE	OXINGEN SENSOR 1
33	GREY	OXINGEN SENSOR 1
34	GREEN	A.E.B. LEVEL SENSOR
35	WHITE	A.E.B. LEVEL SENSOR
36	ORANGE\BLACK	FROM 300 AT 80° TO 3000 AT 20° WHIT
37	ORANGE	PLUG DISCONNECT
38	RED\YELLOW	0,45 V
39	ORANGE\BLACK	2,4 V
40	BROWN	TACHOMETER
41	WHITE\RED	12 V
42	YELLOW	12 V (GAS WORKING 2° BANK)
43	RED	12 V
44	PINK	5 V
45	PINK\BLACK	5 V
46	RED	5 V
47	BROWN	5 V
48	BLUE	4,2
49	BLACK	0 V
50	BLACK	12 V (GAS WORKING)
51	NOT UTILIZZATED	
52	NOT UTILIZZATED	
53	NOT UTILIZZATED	
54	NOT UTILIZZATED	
55	ORANGE	IMPULSE
56	YELLOW	IMPULSE

BLACK PLUG



PIN	COLOR	SIGNAL
A1	RED\BLACK	12 V (BATTERY)
A2	RED\BLACK	12 V (SWITCHED IGNITION)
A3	PINK	5 V
A4	WHITE	GAS
A5	BLUE	4,2
A6	BROWN	5 V
A7	BROWN	TACHOMETER
A8	NOT UTILIZZATED	
B1	BLACK	0 V
B2	BLACK	0 V
B3	PINK\BLACK	5 V
B4	GREEN	GAS LEVEL SENSOR
B5	BLACK	0 V
B6	RED	5 V
B7	NOT UTILIZZATED	
B8	NOT UTILIZZATED	
C1	BLUE	12 V (GAS WORKING)
C2	BLACK	0 V
C3	BLACK	0 V
C4	ORANGE	FROM 300 AT 80° TO 3000 AT 20° WHIT PLUG DISCONNECT
C5	ORANGE\BLACK	
C6	NOT UTILIZZATED	
C7	GREY	DON'T CONNECT
C8	PURPLE	DON'T CONNECT



DIAGNOSIS PLUG

PIN	COLOR	SIGNAL
5	PINK\BLACK	5 V
6	BLACK	0 V
7	RED\BLACK	12 V
8	PINK	5 V

SWITCH PLUG

PIN	COLOR	SIGNAL
1	RED	5 V
2	BROWN	5 V
3	BLACK	0 V
4	BLUE	4,2

NOTE:_____

Phase 1 - "F5-Map"

In this menu you can modify correction values in function of time and petrol injection (Tinj.benz).
To modify values:

- select one or more cells clicking on cell with the left mouse button. For multiple selection click on the first left cell with left mouse button and, taking the button pressed, drag to the bottom right cell you want select, release then the button.

- After cell selection, press "return" on the keyboard.

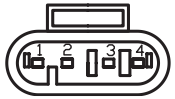
- In the new window fill a correction value, choose a modify mode and press "OK". Absolute Mode changes the old value with the new one. Linear Mode adds or subtracts the value in the field to the old value. Percentage Mode adds or subtracts the percentage value in the field to the old value.

The growing od decreasing trend of values in the map has to be similar to the one showed on the above figure. Before to modify map values read with attention pages 12-13-14.

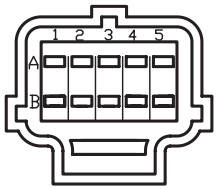
① Clicking "Start Calibration" displays a switch for gas-petrol changeover without using the vehicle switch and therefore with constant accelerator pedal pressure.

N.B. On the first page, "Configuration," the window displayed under the delay time for switchover permits overlapping the two fuels slightly during changeover, so avoiding knocks.

PLUG PRESSURE SENSOR



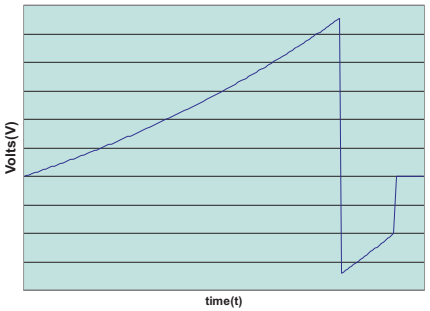
PIN	COLOR	SIGNALS
1	BLACK	12 V
2	ORANGE\BLACK	2,4 V
3	YELLOW\RED	0,45 V
4	RED\BLACK	5 V



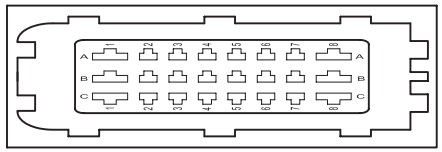
PLUG INJECTION OF FLUEL

PIN	COLOR	SIGNALS
A1	BLACK\BLUE	IMPULSE
A2	BLACK\ RED	IMPULSE
A3	BLACK\GREEN	IMPULSE
A4	BLACK\YELLOW	IMPULSE
A5	NOT UTILIZZATED	
B1	BLUE	12 V (GAS WORKING)
B2	RED	12 V (GAS WORKING)
B3	GREEN	12 V (GAS WORKING)
B4	YELLOW	12 V (GAS WORKING)
B5	WHITE\RED	12 V

Impulse in phasis at injection

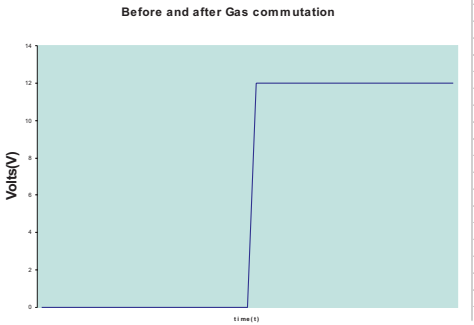


SIGNAL OVER: A1-A2-A3-A4

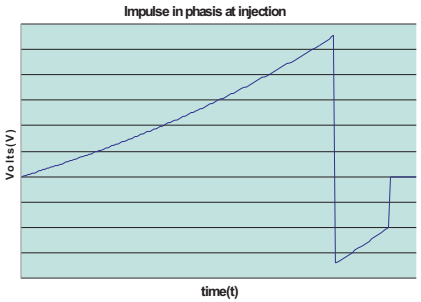


GREY PLUG

PIN	COLOR	SIGNALS
A1	RED	12 V (GAS WORKING)
A2	WHITE\BLACK	IMPULSE
A3	WHITE\RED	IMPULSE
A4	BLUE	12 V (GAS WORKING)
A5	YELLOW	12 V (GAS WORKING)
A6	YELLOW\BLACK	IMPULSE
A7	WHITE\RED	12 V
A8	NOT UTLIZZATED	
B1	RED	12 V (GAS WORKING)
B2	WHITE\BROWN	IMPULSE
B3	WHITE\BLUE	IMPULSE
B4	BLACK\BLUE	IMPULSE
B5	BLACK\GREEN	IMPULSE
B6	YELLOW\RED	0,45 V
B7	ORANGE\BLACK	2,4 V
B8	BLACK	0 V
C1	RED	12 V (GAS WORKING)
C2	RED	12 V (GAS WORKING)
C3	BLACK\RED	IMPULSE
C4	RED	12 V (GAS WORKING)
C5	GREEN	12 V (GAS WORKING)
C6	RED\BLACK	5 V
C7	BLACK	0 V
C8	NOT UTLIZZATED	



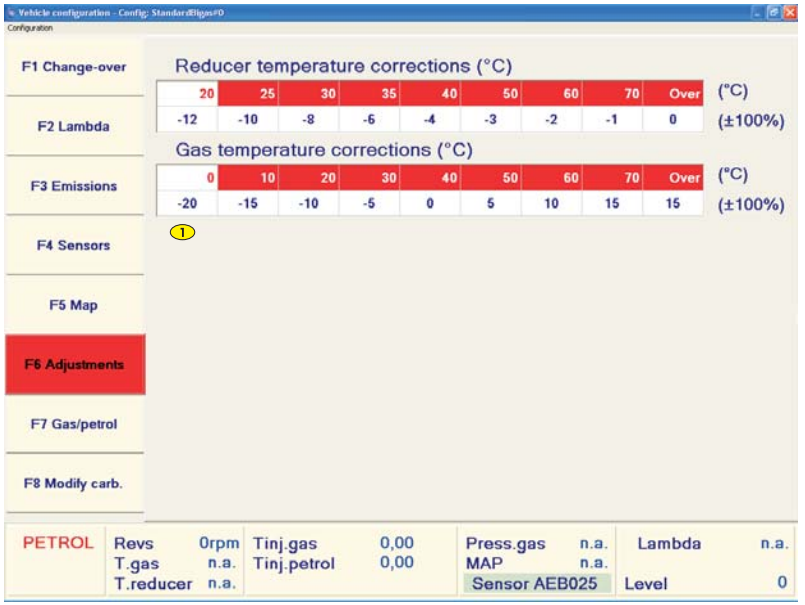
SIGNALS OVER A1-B1-C1-C2



SIGNALS OVER A2-A3-B2-B3-B5-C3-A6

NOTE:_____
_____
_____
_____

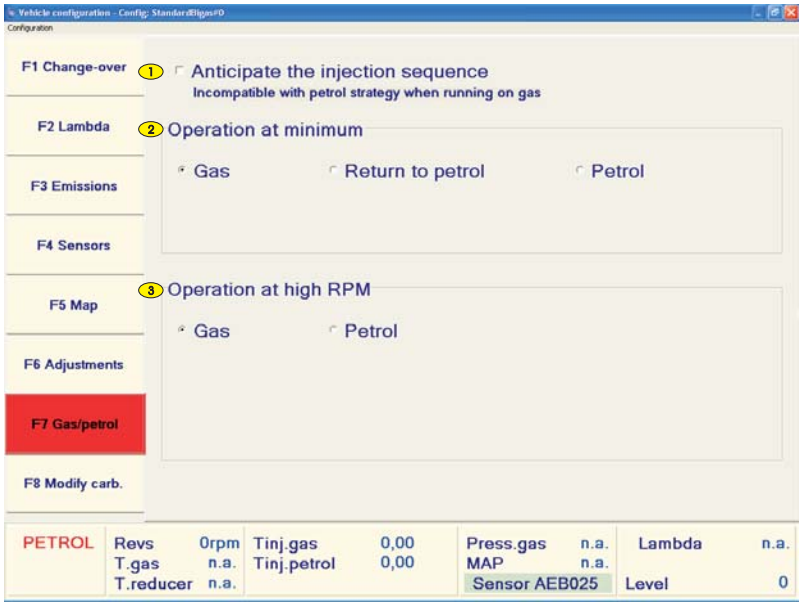
Phase 1 - “F6-Adjustments”



1 This function is used to modify carburation when there are temperature variations in the gas reducer and at the same time in the gas itself during the different phases of operation.
Example: both the temperature and corresponding correction scales may be modified after switchover to gas with the engine cold, after city driving with a very hot engine, and during full-power driving.

N.B. If the reducer temperature drops below 40°C, water circulation is inadequate or the engine power is greater than that allowed by the installed kit.
If gas temperature drops below 10°C, the engine may misfire during acceleration.

Phase 1 - "F7-Gas/petrol"



Important note: with the AEB2001NB and AEB2568B control boxes, the correspondences between injector pairs (petrol injector A with gas injector A, petrol injector B with gas injector B, etc.) must be respected during installation.
Changeover from petrol to gas fueling is gradual: petrol injector A shuts off first, then B, and so on. Were petrol injector A to be erroneously associated with gas injector D, for example, we would be shutting off petrol flow to cylinder A and letting in gas to cylinder D; cylinder A would thus not be fueled, while D would be fueled with both petrol and gas, and would consequently malfunction.
If changeover from petrol to gas is jerky and irregular, this is the cause.

1. When "Injection Sequence Advance" is enabled, we have a guided procedure for automatically acquiring the injection sequence and enabling gas injection advance. The advance value is also dependent on the "Bank Number " command on the "F2 Lambda" page.
This advance can improve vehicle performance, especially when the gas injectors are distant from the intake manifold.
Thus function should be used only when actually necessary, since it disenables gradual petrol-gas changeover.

To recognize the injection signal wire from 12V signal wire, we have to start the engine on petrol and with a digital voltmetre tester we have to measure each wire of the petrol rail.
For all the wires of each rail we have to measure the voltage, for example: a wire is 13,8V and the other one is 13,6V, the wire of the injection signal will be always the one which has the lower voltage.

Here below you find a table for the correct choice of the nozzle diameter of the gas rail.

Ø nozzle	unitary cylindrate	injection type
2.0	fino a 300cc	Sequential
2.0	fino a 400cc	Half-group
2.0	fino a 500cc	Full-group
2.4	da 300cc a 400cc	Sequential
2.4	da 400cc a 500cc	Half-group
2.4	oltre 500cc	Full-group
2.8	da 400cc a 450cc	Sequential
2.8	oltre 500cc	Half-group
2.8	da non utilizzare	Full-group
3.0	oltre 450cc	Sequential
3.0	da non utilizzare	Half-group
3.0	da non utilizzare	Full-group

Correct selection of the rail

This sheet has been created to select the right nozzle diameter of injector rail which depends form the engine cylindrate and from the petrol injection type on which we are working on.

For unitary cylindrate, we refer to the volume in cm^3 of each engine cylinder. (Ex. An engine of 4 cylinders 1600cc is the same of a unitary cylindrate of 1600/4=400cc.)

We devide the injection type in sequential, half-group, full-group.

The injection is sequential when each rail of each cylinder works independently from the other rails.
In many cases we can recognize this type of injection from the colour of the injection signal wire wich is placed on each rail and each one has a different colour from the other.
There are some exceptions, such as: Mercedes, Renault, Ford etc. where the colour of the injection signal wire is the same for all of them, so to be sure that it is a sequential system, we have to check the elettric diagram of the petrol injection of the vehicle or to use a know engine code.

The injection is half-group when the petrol rails operate in pair of two (in an engine of 4 cylinders these pairs are composed by the 1° and the 4° cylinder and from the 2° and 3° cylinder) in this case the injection signal is on two wires of different colour. Also in this case are valid the above indicated exceptions.

The injection is full-group when all the petrol rails operate at the same time by a unique injection signal so the colour of the injection signal ware will be the same for each rail and all the signals are united in a unique wire places on the petrol injection ecu.

Setting Vehicle Configuration Parameters

2 Operation at idle speed:

"Gas" mode: recommended and default option. At idle speed, the automobile always runs on gas.

"Return to Petrol" mode: when slowing down to idle, the vehicle changes over to petrol for a few seconds and then returns to gas fueling, which in some cases can avoid stalling during this phase.
We recommend using this mode only when necessary.

"Petrol" mode: operation at idle speeds slower than the preset RPM value will always be petrol fueled. Gas fueling is restored when the RPMs exceed the preset value.
This mode is used only when the vehicle stalls frequently during gas idling.
Note that tests have shown that petrol consumption in this phase is insignificant, much lower than during the warm-up phase.

Indication of temporary or constant petrol-fueled engine operation is not given by the switch position (which remains set to gas) but rather by the computer reading of the gas injection time, which drops to zero.
In these two phases, the switch continues to indicate gas fueling and the gas solenoid valves remain activated.
The idle advance must be excluded when an advance variator is installed, since the variator is supplied during this phase.

3 Operation at high engine speeds:

"Gas" mode: recommended and default option. With this setting, the automobile runs on gas fuel even at high engine speeds and high loads (normal operation).

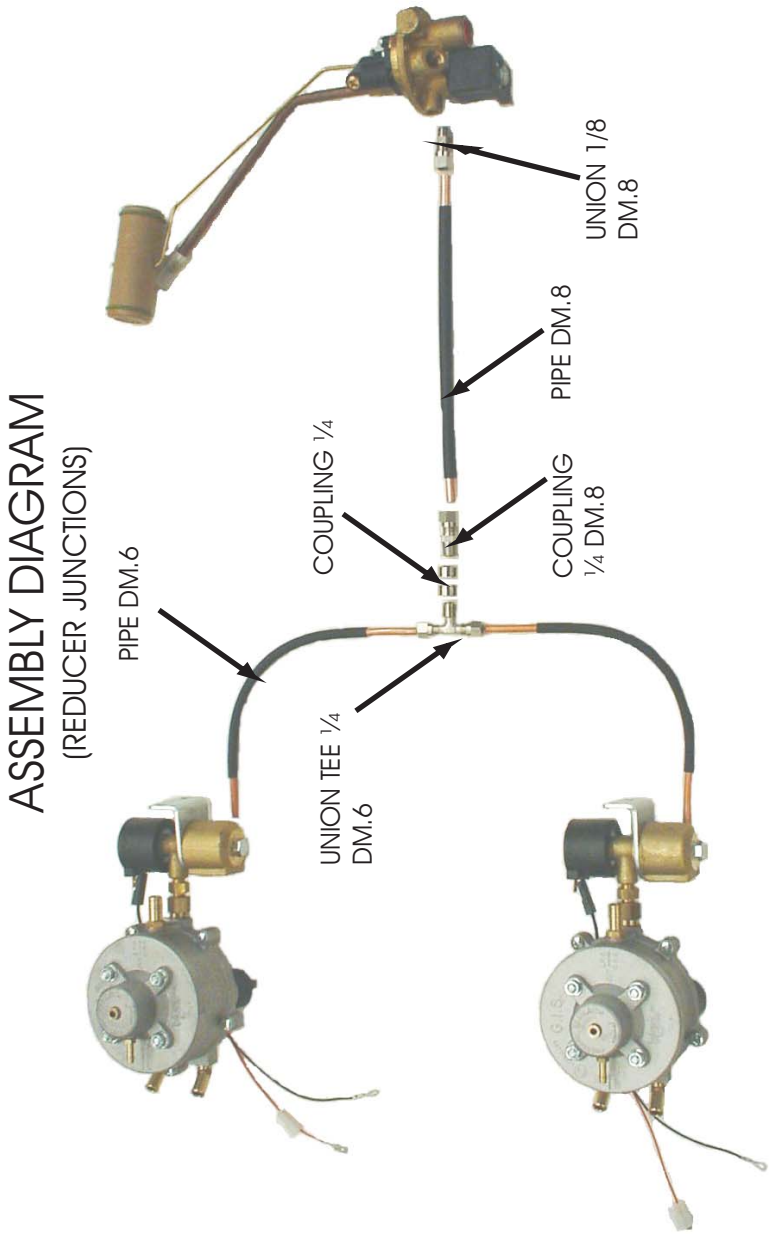
"Petrol" mode: with this setting, the vehicle is temporarily petrol-fueled at high engine speeds and loads until the accelerator is released.
It is possible to set the engine RPMs and petrol injection times defining the cut-in thresholds for this strategy.
This strategy is activated only if both the RPMs and the petrol injection times simultaneously exceed the relative preset thresholds.

This function can be useful in the case of vehicles equipped with particularly delicate catalytic converters that are subject to overheating during gas-fueled operation.

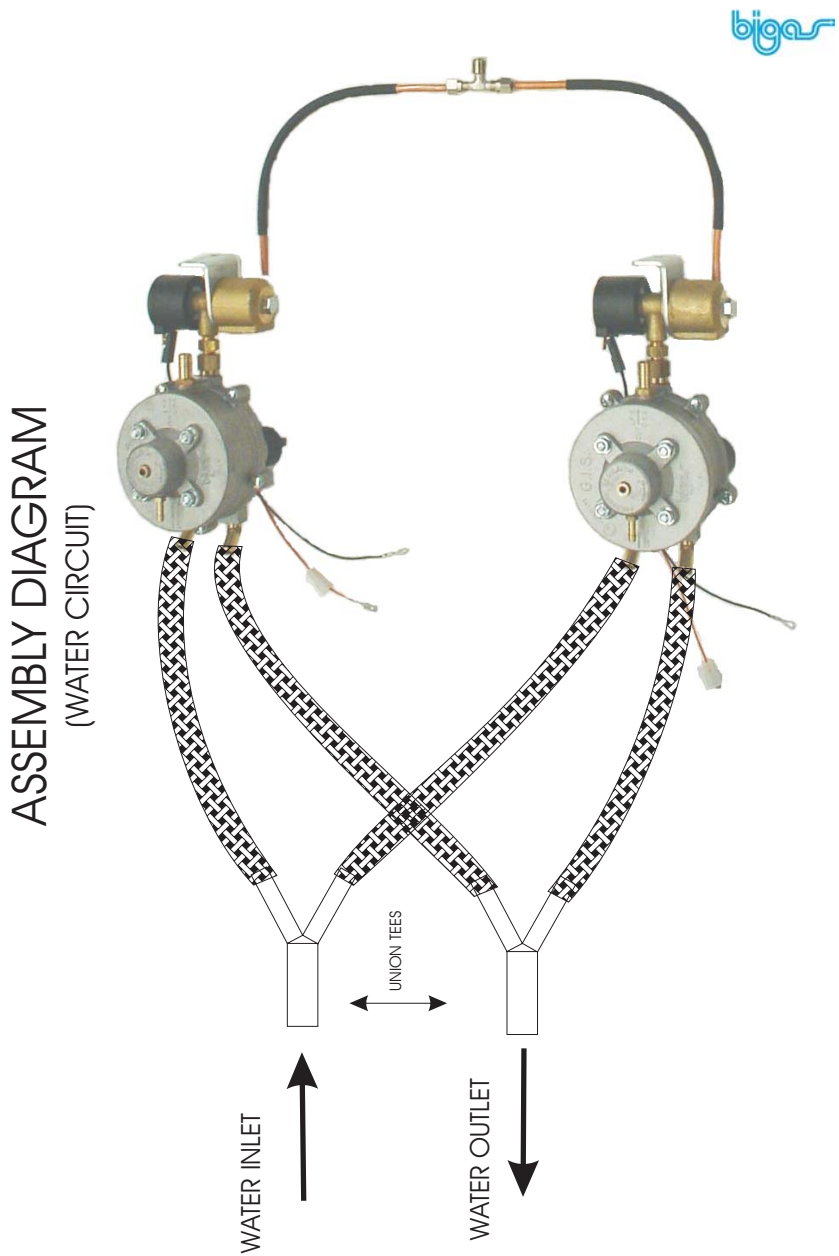
It also finds application in especially powerful engines (turbo), where in order to fuel the engine in maximum load conditions very large gas injectors must be used, with consequent risk of instability at light loads. In this case, the function ensures automatic petrol-fueled operation in those rare cases when full engine power is required, without prejudice to gas-fueled operation in normal operating conditions.

In this case as well, petrol consumption is insignificant during the infrequent times this mode is used.

Indication of petrol-fueled engine operation is not given by the switch (which remains set to gas) but rather by the computer reading of the gas injection time, which drops to zero.
In this phase, in fact, the switch remains set to gas fueling and the gas solenoid valves remain activated.
If an advance variator is installed, in this fueling phase it is important to ensure that the advance thus introduced does not disturb system operation.

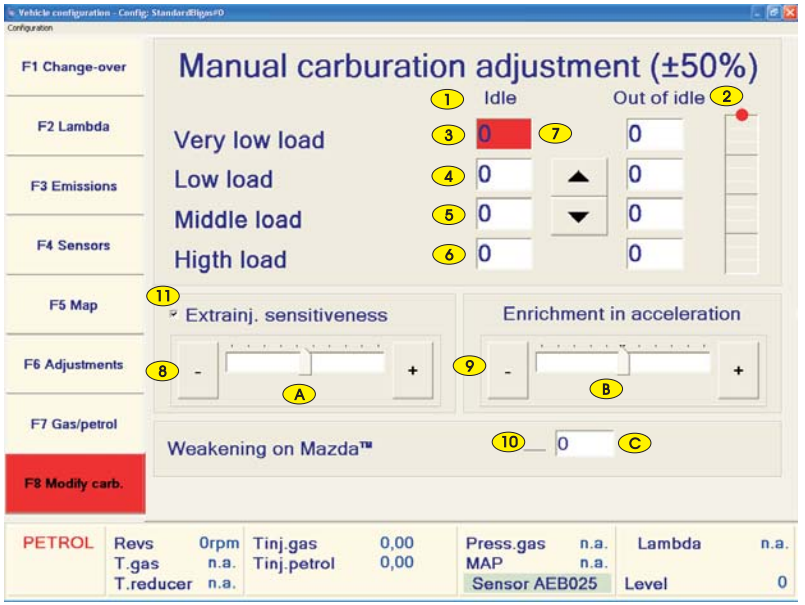


Water sector diagram for 2 reducer



Setting Vehicle Configuration Parameters

"F8-Modify carb."



After the self-calibration procedure has been run, it is possible to further improve carburetion, in the following manner. Click "VEHICLE CONFIGURATION" on the main menu, and then click "F4-MODIFY CARB". The menu displays the carburetion correction cells, divided by injection ranges at idling speed and higher speeds.
The "Idle" column (1) indicates an engine speed of up to 1400 RPM; the "Out of idle" column (2) indicates an engine speed of more than 1400 RPM. The "Very low load" line (3) indicates injection times of up to 3 milliseconds; "Low load" (4) indicates injection times greater than 3 milliseconds up to 6 milliseconds; "Middle load" (5) indicates injection times greater than 6 milliseconds up to 12 milliseconds, "Higth load" (6) indicates injection times greater than 12 milliseconds up to 18 milliseconds.
The red cell (7) indicates the range of times and RPMs that the system is detecting at any moment.
The red indicator on the right sale of the figure indicates whether we are working at the limits or at the center of the range.
For each cell, correction may have values of ±50% with respect to the configuration loaded or created with the self-calibration procedure.
(8) The "Extra Injection Sensitivity" function is an electronic filter that permits selecting a certain type of petrol injection signals suitable for use for the gas injection time.
Moving the cursor to position "x" eliminates longer multiple injections (extra injections).

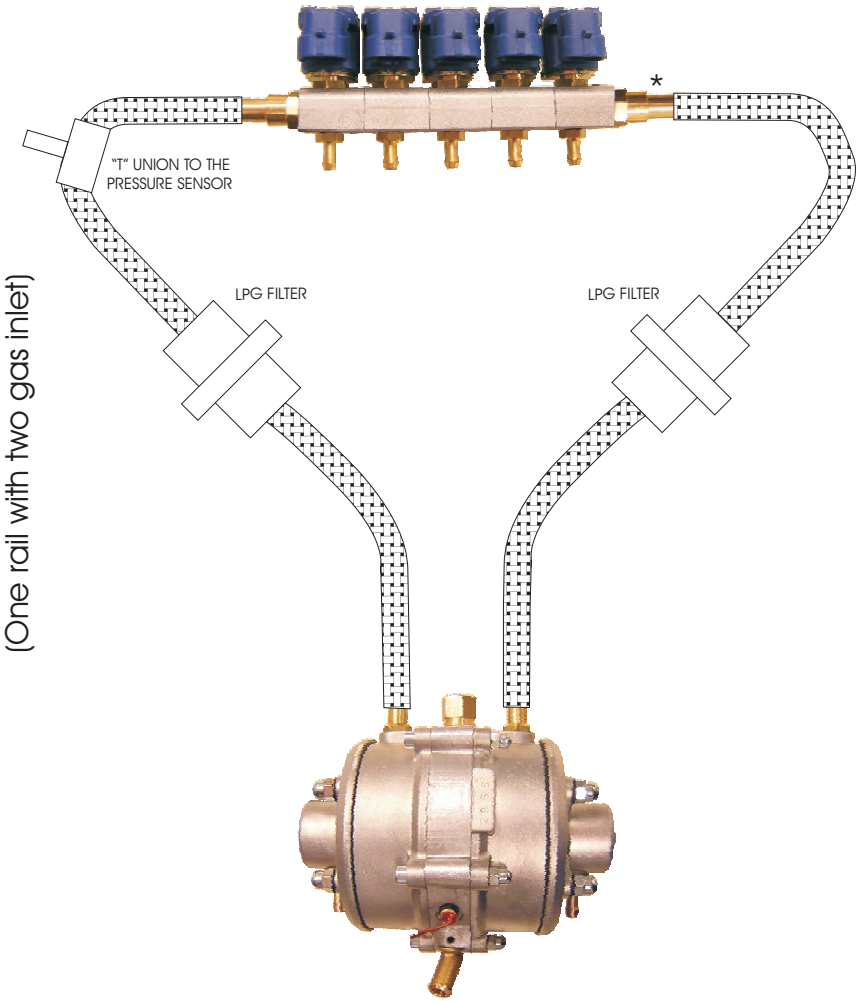
We cannot exceed the halfway point of the adjustment range toward positive (+), because doing so would begin to eliminate the normal injections as well.
The position may vary from full left (-) to the halfway point on the bar.
This function is used when hesitations or misfires are felt during acceleration. If adjusting the cursor position does not eliminate the problem, it is not dependent on extra injections.

9 The "Enrich in Acceleration" function is used to enrich carburation during acceleration. To make this modification, move the cursor B to the "+" half of the bar (click the "+" button); to lean out carburation, move the cursor B to the "-" side (click the "-" button).
This function may also be activated at idle speed to aid in stabilizing engine RPMs.
In some cases it may not work. This can be seen from Tinj.gas: when the cursor B is moved during acceleration with the vehicle stopped the maximum values obtained do not vary.
During steady running, the values entered in the map in "F5" are determinant for carburation.
This function can be useful for obtaining better fuel economy or greater acceleration, but also for avoiding that Tinj.gas exceeds the value of 24 ms during acceleration, which would cause the system to switch back to petrol.

10 The "Mazda Leaning" function is for use only on Mazda vehicles.
It can also be used in the case that the dot indicating carburation on the "F5" map moves suddenly upward and then back down after a short delay, causing the engine to jolt.
The values to be entered in the window C are about 1/3 of the center value of the "F5" map. The value is correct when engine running is smooth.

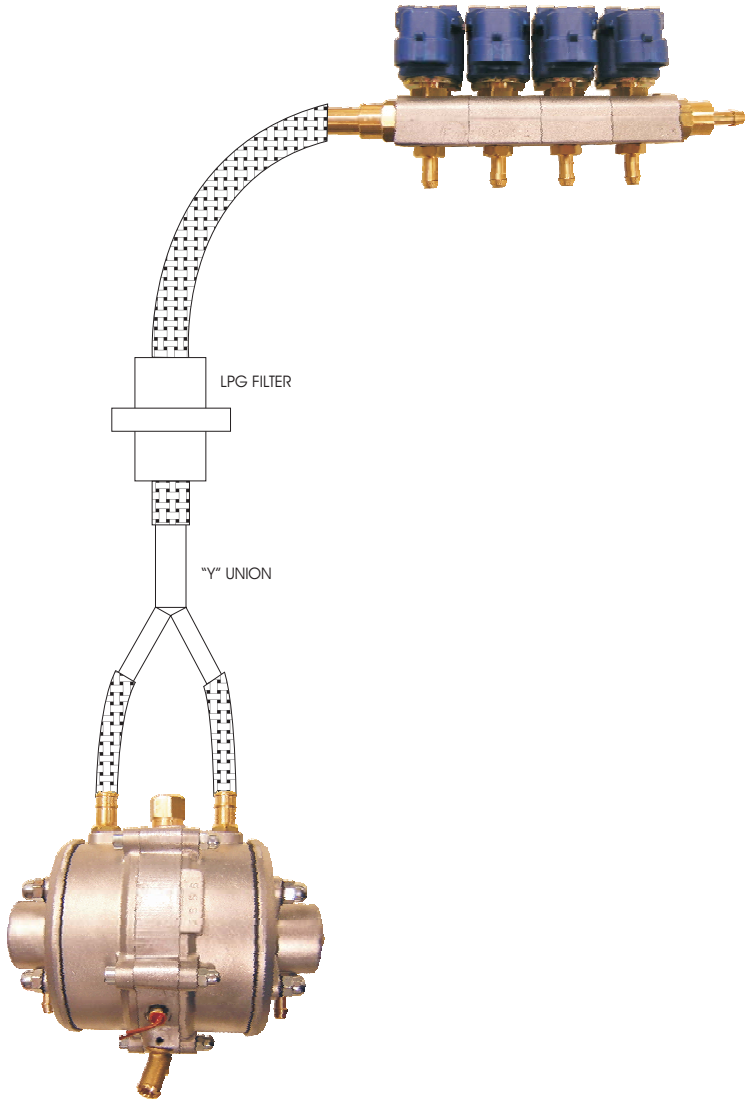
11 The "extra injection sensitivity" function is active by default ("Check On") and permits considering very brief petrol injection times as extra or as normal injections
When this function is enabled ("Check On"), petrol injection times shorter than the "Maximum Petrol Extra Injection Time" are suitable managed with the slider under the "Extra Injection Sensitivity" label on page F9.
When this function is disenabled ("Check Off"), short petrol injections are considered normal injections. The slider under the "Extra Injection Sensitivity" label is disenabled and any petrol injection is replicated in the gas mode according to the map values.
Warning: at this point, no gas injection may be less than the value set in the "Minimum Injector Opening Time" field, irregardless of the relative petrol injection..
Being able to disenable this function is useful in cases in which older-version control box firmware inexplicably operates better than newer versions; in fact, this is the only factor that could determine a difference, since the older firmware did not manage extra injections.

DOUBLE REDUCER ASSEMBLY DIAGRAM
(One rail with two gas inlet)



* N.B. The second inlet gas is an optional

DOUBLE REDUCER ASSEMBLY DIAGRAM
(One Rail)



In order to ascertain whether the map acquired automatically, using one of the available configurations, is suitable for the vehicle being tuned, the vehicle must be run on the road or on a roller test bench. At constant speed and with constant accelerator position, switch back and forth from gas to petrol one every 4-5 seconds, and at the same time check that the petrol injection time value " Tinj.Petrol" remains almost constant, with a maximum variation of ±20%. Repeat the carburetion check with the accelerator in a number of different positions.

To better explain, let us consider **Tinj.PetrolGas** as the **petrol** injection time when the vehicle is gas fueled, and **Tinj.PetrolPetrol** as the **petrol** injection time when the vehicle is **petrol**-fueled. We may thus say that the values are correct when:

(Tinj.PetrolPetrol-20%) <= Tinj.PetrolGas <= (Tinj.PetrolPetrol+20%)

Thus, if Tinj.PetrolGas < (Tinj.PetrolPetrol-20%) in a given cell (range/RPM), we will have to decrease the correction value in that cell (max -25) so as to bring the injection times back within the 20% admissible variation.

Contrariwise, if Tinj.PetrolGas > (Tinj.PetrolPetrol+20%) in a given cell (range/RPM), we will have to increase the correction value in that cell (max +25) so as to bring the injection times back within the 20% admissible variation.

In the "Higth load" range it is, however, preferable modifying the equation as shown below.

(Tinj.PetrolPetrol- 10%) <= Tinj.PetrolGas <= (Tinj.PetrolPetrol+10%).

Example 1:
Let us suppose that during petrol-fueled operation the petrol injection time (Tinj.PetrolPetrol) = 7 milliseconds. Switch the vehicle to gas fueling and read the petrol injection time (Tinj.PetrolGas).
Remember that carburetion is correct if the Tinj.PetrolGas value remains in the interval

5.6 (7-20%) <= Tinj.PetrolGas <= 8.4 (7+20%)

Thus, if the Tinj.PetrolGas value is less than 5.6 in a given cell (range/RPM), it will be necessary to decrease the correction value in that cell (max -25) so as to bring the values to Tinj.PetrolGas >= 5.6;
If Tinj.PetrolGas is greater than 8.4 in a given cell (range/RPM), it will instead be necessary to increase the correction value in that cell (max 25) so as to bring the values to Tinj.PetrolGas <= 8.4;

Example 2: "Higth load" range
Let us suppose that during petrol-fueled operation in the "Higth load" range, the petrol injection time (Tinj.PetrolPetrol) = 15 milliseconds. Switch the vehicle to gas fueling and read 13 milliseconds as the petrol injection time (Tinj.PetrolGas). Remember that carburetion is correct if the Tinj.PetrolGas value remains in the interval

13.5 (15-10%) <= Tinj.PetrolGas <= 16.5 (15+10%)

We may thus say that Tinj.PetrolGas =13 milliseconds is an excessively short injection time and that the mixture is too rich.

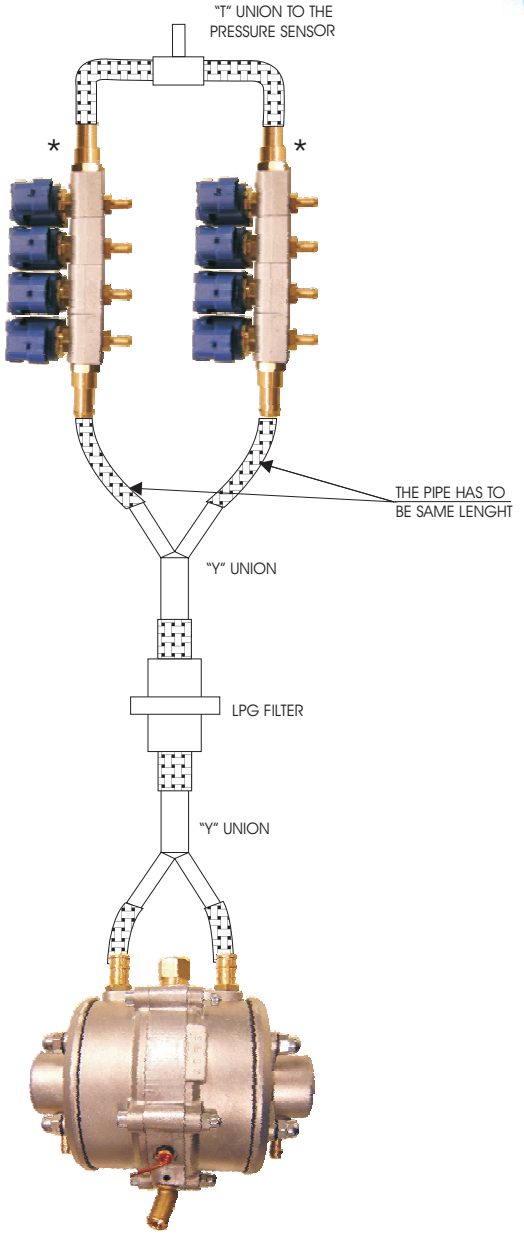
Often correction will be necessary only in the "Middle load" range in order to reduce fuel consumption, or in the "Higth load" range at higher than idling speeds in order to increase engine response. If 25% adjustments are not sufficient, it will be necessary to load a new standard configuration (richer or leaner according to need), run the self-calibration procedure again, and then go on to manual regulation.

The "Tinj.Gas" value is used to verify whether the diameter of the gas injector nozzles (or the reducer outlet pressure) is adequate to meet engine demands. For example, if the "Tinj-Gas" value is less than 4 milliseconds, it is probable that the injectors being used have an excessively large outlet. Contrariwise, if at " Higth load" the "Tinj-Gas" value is greater than 24 milliseconds, the injector diameter is probably too small or the reducer pressure is too low. It may also be that the feed from the tank to the reducer is insufficient.

The exact pressures for reducer are:
- RI-21 (LPG) reducer for engines with power up to 100 KW, right pressure is 1 Bar;
- RI-21 (LPG) reducer for turbo or with power over 100 KW engines, right pressure is 1,6 Bar;
- RI-23 (CNG) reducer for engines with power up to 100 KW, right pressure is 1,6 Bar;
- RI-23 (CNG) reducer for turbo or with power over 100 KW engines, right pressure is2-2,5 Bar.

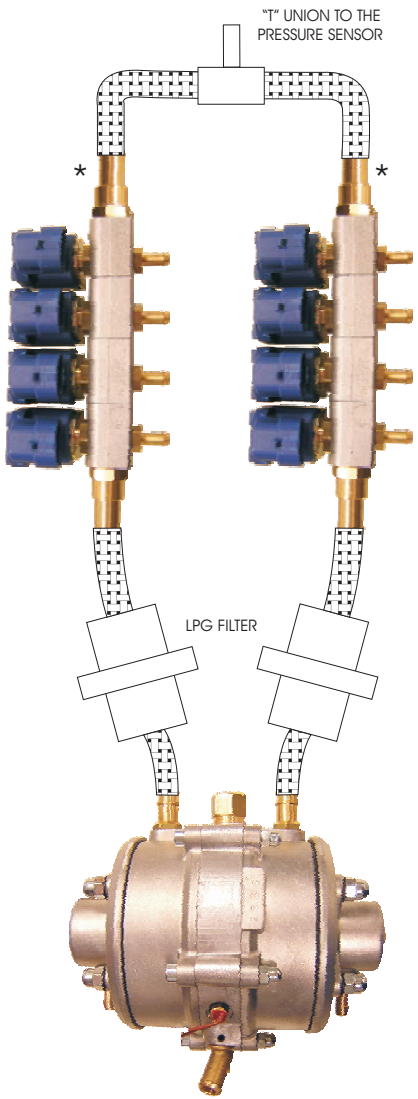
If in this condition the system automatically changeover on petrol, it means that the Tinj.gas value is too high. To solve the problem is necessary open a configuration file more suitable for the vehicle.

DOUBLE REDUCER ASSEMBLY DIAGRAM
(Two rails with double gas inlet)



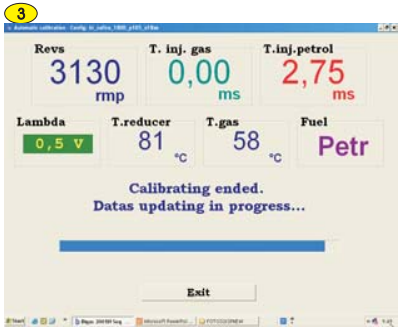
* N.B. The second inlet gas is an optional

DOUBLE REDUCER ASSEMBLY DIAGRAM
(Two rails with double gas inlet)



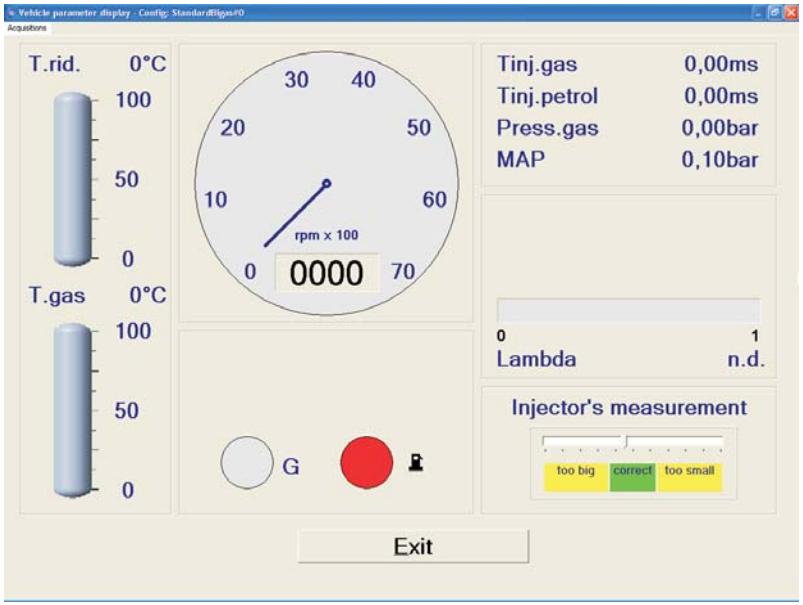
* N.B. The second inlet gas is an optional

Phase 2

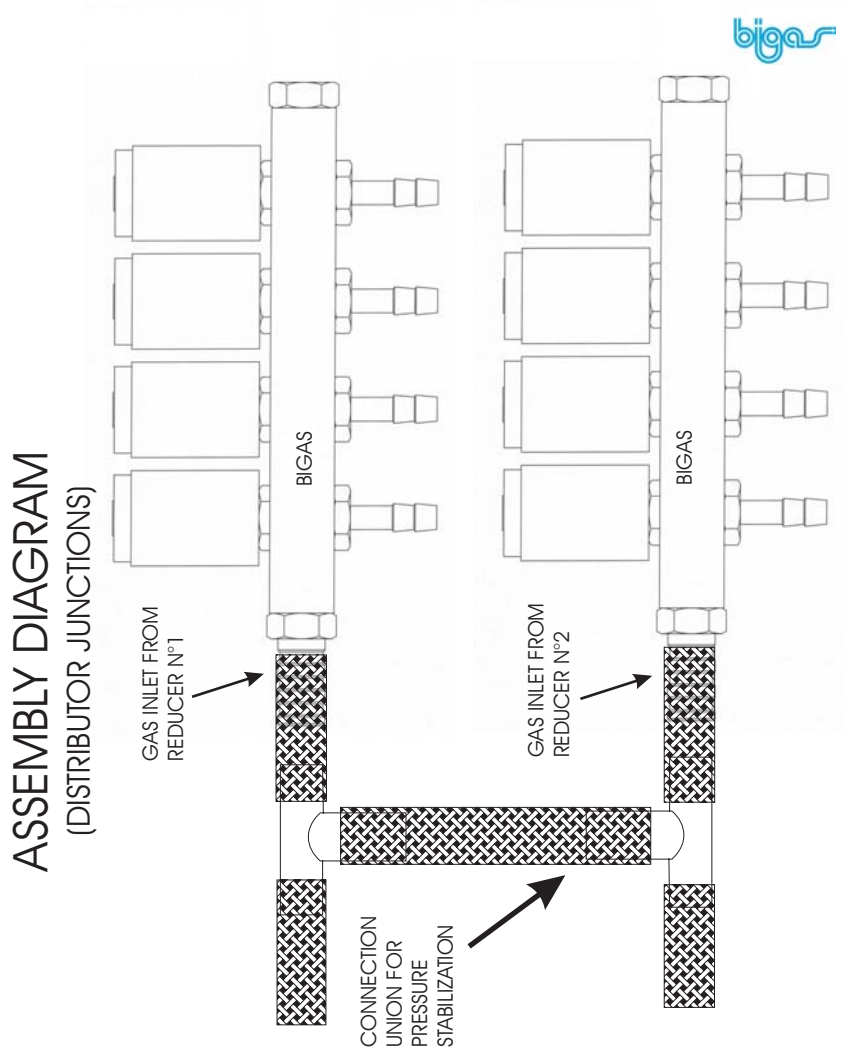


Once the correct vehicle parameters have been set, wait until the reducer reaches a temperature of at least 60C° and the distributor at least 30C°; then press the "ESC" key to return to the main menu.
Click "SELF-CALIBRATION" to access the guided self-calibration procedure.
Press "Enter" to begin.
On the first screen (1) the software will request that you accelerate the vehicle to about 2800 RPM in neutral gear. Once this speed is reached, a second screen (2) will request that you neither accelerate nor decelerate. A few seconds later a third screen (3) will confirm that calibration has been completed. The last screen (4) will confirm that calibration is ended correctly.
Click on "Exit" to return to the main menu.
If the program stops during self-calibration, it is probable that an unsuitable configuration has been loaded or that incorrect parameters have been set. To resolve the problem, load a different configuration and restart the self-calibration procedure.

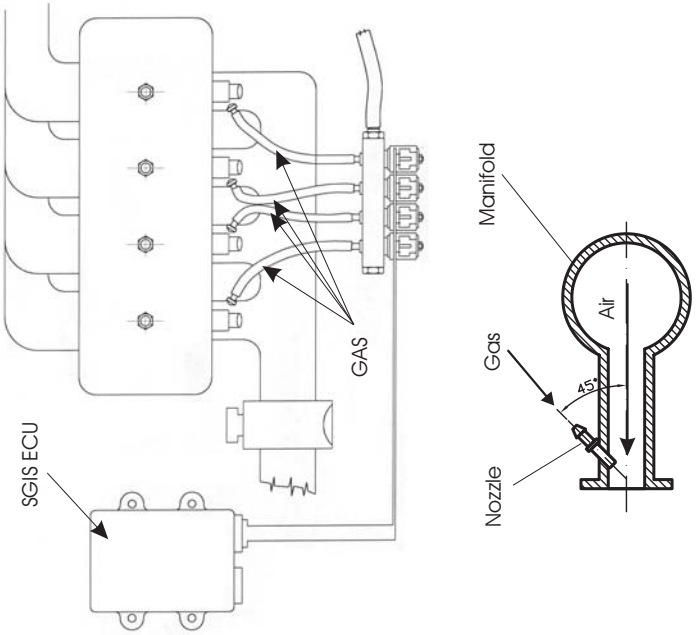
NB: (5) means that the GIS ECU cannot switch to gas before 20-30 seconds from the end of calibration, as though the vehicle had been restarted at that moment.



To access the display menu, click "DISPLAY" on the main menu.
This menu offers graphics displays of the following signals: RPM, lambda, temperature, pressure, and petrol and gas injection times. Press "Esc" to return to the main menu.
(A) Click on the word "Capture" and then on "Start Save" to memorize all the values displayed on this page on a histogram graph.
Recommended save time must not exceed 20 seconds in order to not excessively reduce graph resolution.
Click "Display Graph" for help in the case of defects in engine operation that could derive from a momentary lack of signal. .
The various graphs may be named, saved, and printed for checking.
You may select a saved capture and automatically launch Microsoft Outlook to send a selected file as an attachment.
This function aids the operator in sending files and captures by e-mail in the simplest manner possible, avoiding time-consuming, complicated operations that require extensive computer skills.
(B) This function is indicative, operating in the case of Tinj.benz of around 3 ms. In other conditions, do not heed the indications given.

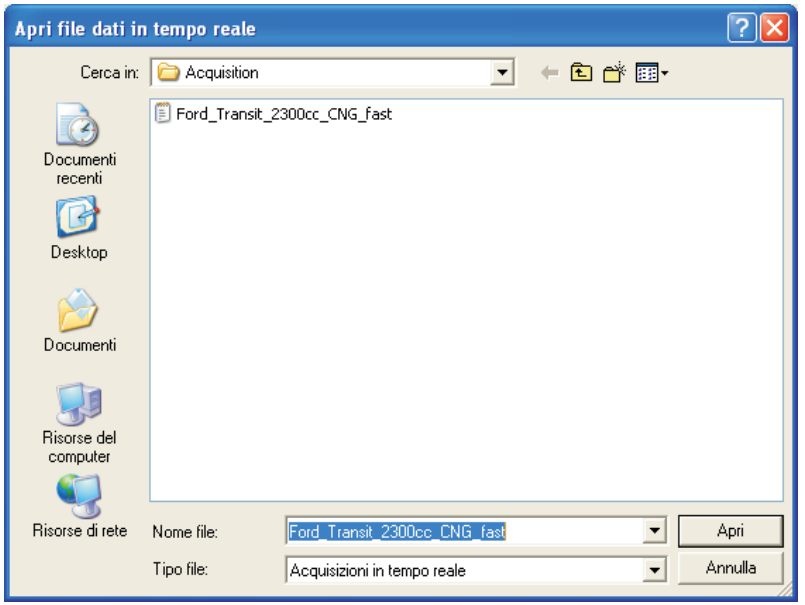


ASSEMBLY DIAGRAM



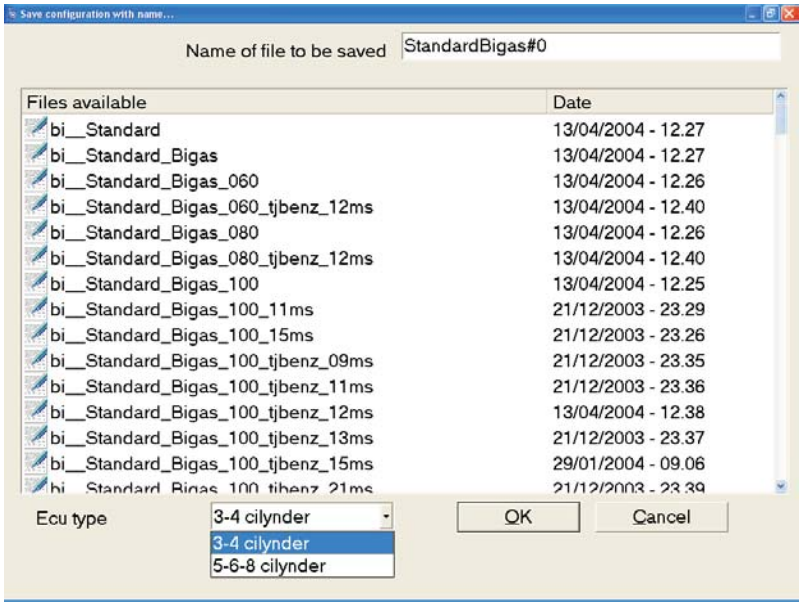
DESCRIPTION

THE GAS PIPES BETWEEN THE RAIL AND THE COLLECTOR MAY BE OF DIFFERENT LENGTHS.



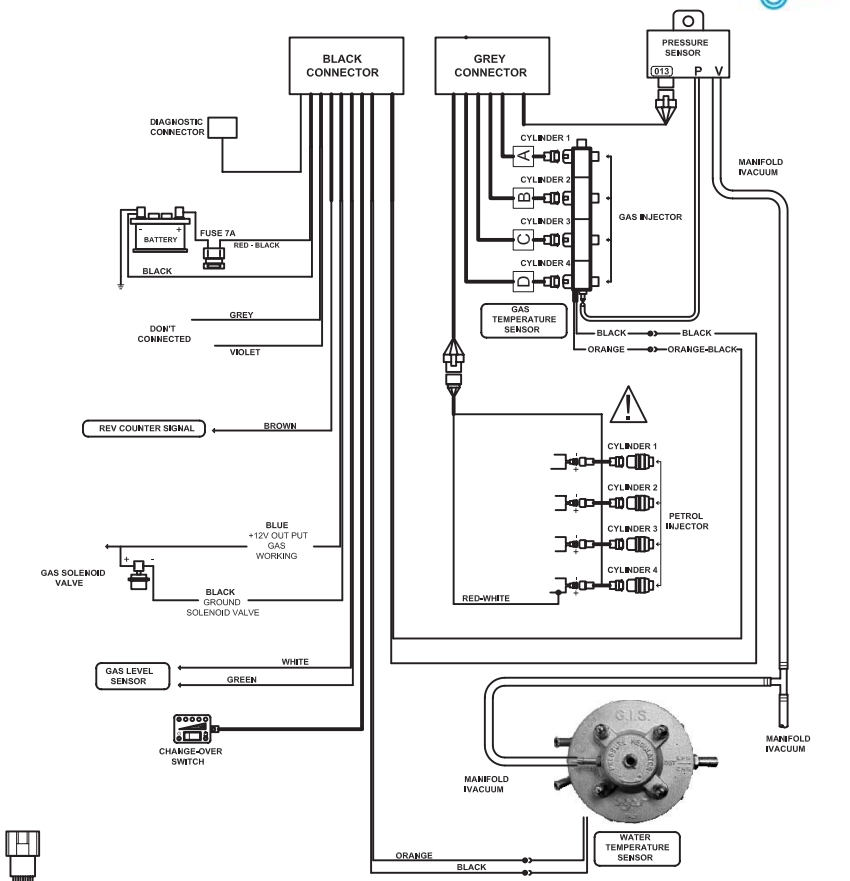
N.B. Assign a different name to each capture to store in memory for comparison.

"Save configuration" Menu



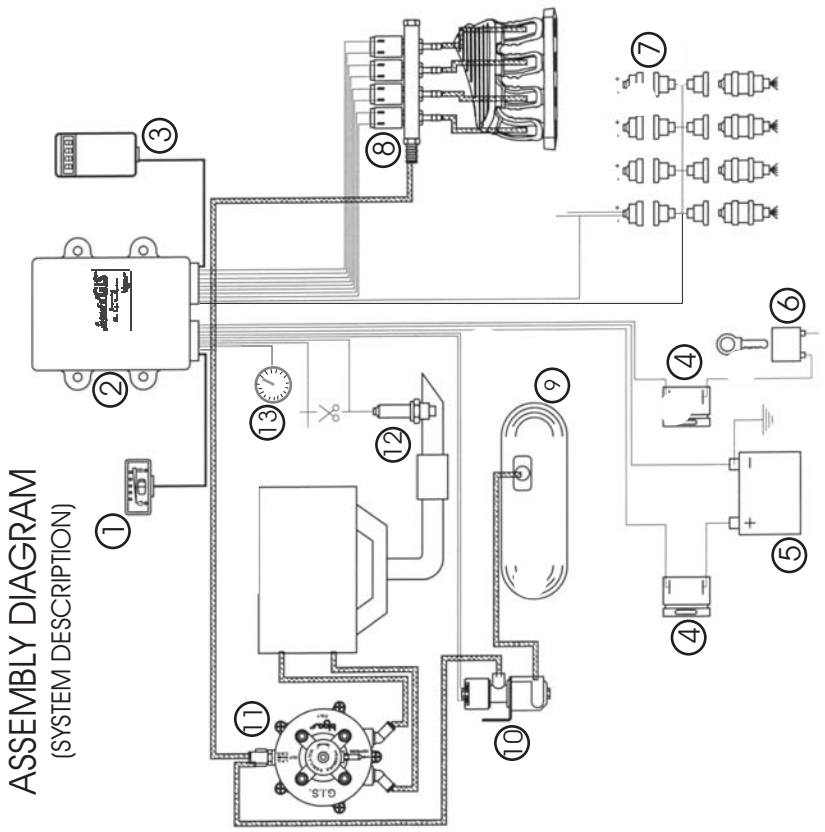
Once a satisfactory calibration has been achieved, it must be saved.
Click "SAVE CONFIGURATION" on the main menu.
In the "Name of file to be saved" field, type in a name for the working file to be saved and click "OK". We recommend establishing a filename list ahead of time, and in any case never using the prefix "bi_", which is used by the system as an abbreviation for Bigas, since our configuration update procedures will overwrite all files with this prefix. For example, if you save a file as "bi_mycar" and then launch the configuration update procedure, your file will be deleted.
We also recommend the system outlined below for naming your files:
"your abbreviation"_"brand"_"model"_"displacement"_"pressure"_"engine type"_"injection type."
For example: xx_seat_ibiza_1400_P090_66y144482_iaw4mvah is a correct filename.
Never use such characters as spaces, any punctuation marks, or special characters; use only the letters of the alphabet, numbers, and the underscore ("_") as a space marker.
WARNING. If the filename is the same as that of a previously existing file and you answer "yes" when asked to overwrite, the earlier file will immediately be deleted.
You may select a saved capture and automatically launch Microsoft Outlook to send a selected file as an attachment.
This function aids the operator in sending files and captures by e-mail in the simplest manner possible, avoiding time-consuming, complicated operations that require extensive computer skills.

General diagram for 4 cylinder engine



⚠ Perform this type of cabling, cutting the original wires of the injectors, in the case the connectors of the gasoline injectors are not Bosch brand or the cables are difficult to install.

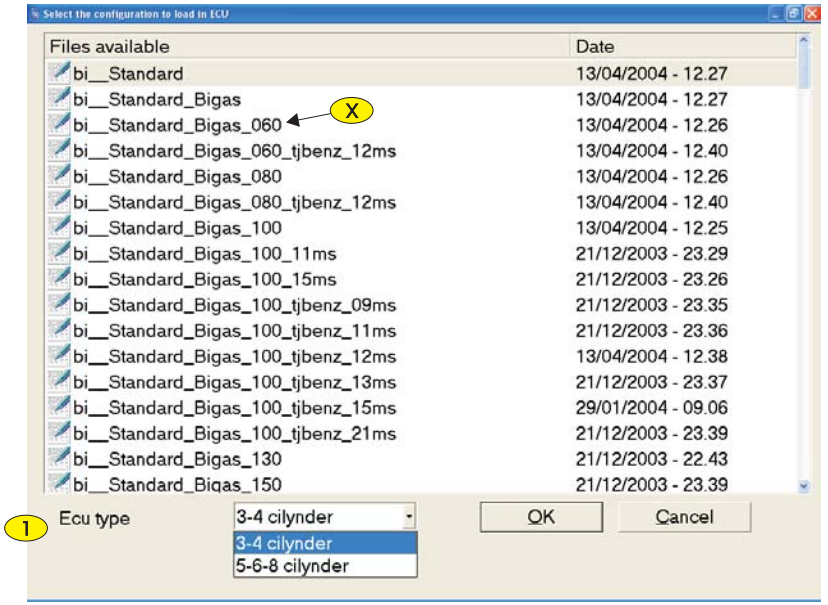
SGIS General diagram



DESCRIPTION

1) Indicator-ready switch
2) AEB ECU E13-67R-010157 BIGAS trade name
3) Connection for computer or tester
4) System protection fuses
5) Battery
6) Ignition coil
7) Petrol (petrol) injectors
8) Gas injectors, E20-67R-010494
9) LPG tank
10) On-off solenoid valve, E20-67R-010389
11) Class 1/2A reducer-vaporizer "E20-67R-010493"
12) Lambda probe
13) Connection for engine speed indicator

"Load configuration" Menu

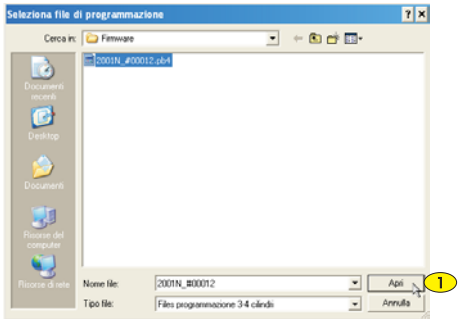


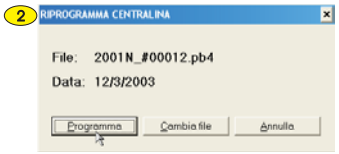
To access this menu, click on "LOAD CONFIGURATION."
Use the arrow keys to move to the desired file; press "ENTER" or left-click with the mouse to select. One you have selected a filename, click "OK" to confirm or "CANCEL" to return to selection.

1 For car 5-6-8 cylinders, click here.

Configurations with "X" valve under 128 have a map more lean than the standard one for valves over 128 the map is more rich than the standard one.
The filename provides certain data for correct installation and calibration of the vehicle; for example, the filename
BI_Fiat_Stilo_1600_i24_PO95_182a5000_FW300_S013 stands for:
- BI, map created by Bigas
- Fiat, brand of the automobile
- Stilo, model of the automobile
- 1600, engine volume
- i24, diameter of the gas injectors used (Diam. 2.4 mm)
- P095, gas pressure used, in bars (0.95 Bar);
- 182A5000, automobile engine code
- Fw300, firmware utilized
- S013, pressure sensor utilized.

You may select a saved capture and automatically launch Microsoft Outlook to send a selected file as an attachment.
This function aids the operator in sending files and captures by e-mail in the simplest manner possible, avoiding time-consuming, complicated operations that require extensive computer skills.





This important function permits updating the EPROM (firmware) of the ECU in order to ensure its continuing compatibility even after a programming software update.
WARNING: It is extremely important that the vehicle be switched off before reprogramming the ECU.
To access the menu, click "ECU REPROGRAMMING" on the main menu.
Use the arrow keys to select the programming file; then press "ENTER" or left-click with the mouse. The filename will appear alongside the "file name" tag.
Click "Open". (1)

A window will then open. (2)
Click on "Program" to program the EPROM, on "Change file" to look for another programming file, or on "Cancel" to terminate the operation.

For reprogramming the control box, Internet Explorer 5.5 or newer version must be installed on the computer; otherwise reprogramming cannot be performed.

APPENDIX

8. Gas injectors:

The electrical continuity of the installed gas injectors is diagnosed for each cylinder during operation in the gas fueling mode only.

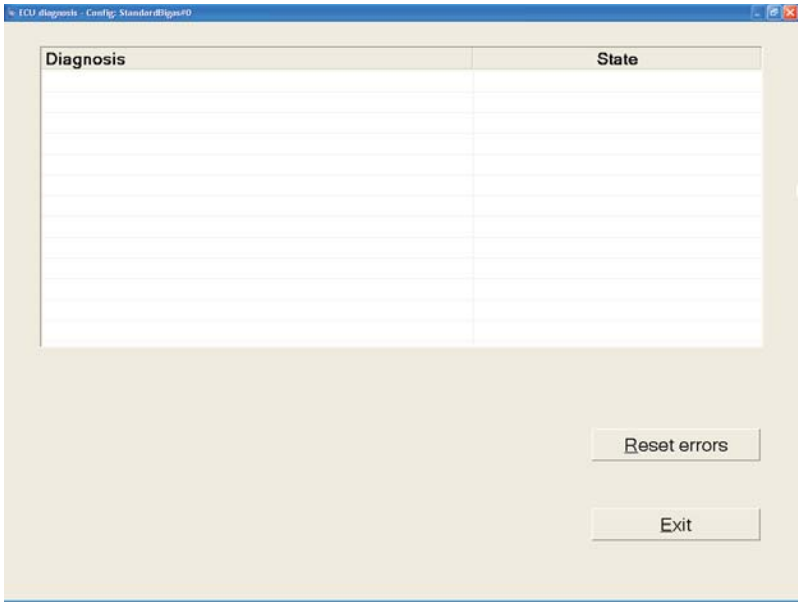
An error is diagnosed whenever no injector (coil) is sensed on the channel signal for a given number of consecutive commanded injections.

If the gas injection time is less than 3 ms (for example, following extra injections), this diagnostic check is momentarily inhibited.

9. Switch:

This check is run whenever the control box is powered up and an error is diagnosed whenever no switch conforming to system requirements is detected.

The error is automatically canceled as soon as a correctly-operating compliant switch is installed.



Description of diagnostic checks on the sequential injection system

Checks on the electronic components making up the gas system include diagnosis of the following components:

1. Reducer solenoid valve
2. Gas bottle (tank) solenoid valve
3. Petrol injectors connection
4. Map sensor
5. Gas pressure sensor
6. Gas temperature sensor
7. Water temperature sensor
8. Gas injectors
9. Switch

In today's kits, a single command pilots the solenoid valves of both the reducer and the gas supply tank. But each solenoid valve must be piloted with a separate signal if we are to correctly diagnose anomalies in valve operation and correctly identify single damaged valves,

We must therefore add a wire to pin no. 8 of the gray connector of the 4-cylinder control box to command the tank solenoid valve, and in this case the blue wire normally used for common piloting of all the solenoid valves pilots only the reducer valve.

An analogous operation must be performed on the 5/6/8 cylinder control boxes. Connect a wire to pin no. 19 to command the reducer solenoid valve; in these cases the blue wire from pin no. 18 will be reserved for piloting the tank valve.

The calibration Tool permits disabling tank solenoid valve diagnostic control when installation of that component is not required (refer to page: "Sensors" "Rear solenoid valve with dedicated wire").

1. Reducer solenoid valve:

The level of the current absorbed by the reducer solenoid valve is constantly monitored both in no-load conditions (petrol fueling) and when piloted.

A trouble condition is signaled when the measured current absorption is anomalous, suggesting a short circuit or electrical disconnection.

2. Tank solenoid valve:

The level of the current absorbed by the tank solenoid valve is constantly monitored both in no-load conditions (petrol fueling) and when piloted.

A trouble condition is signaled when the measured current absorption is anomalous, suggesting a short circuit or electrical disconnection.

3. Petrol injectors connection:

The electrical continuity of the petrol injectors cutout is diagnosed separately for each cylinder during operation in both the gas and petrol fueling modes.

An error is diagnosed whenever petrol injection is not detected on a single channel for a time in excess of 5 seconds.

This check is momentarily inhibited by cutoff or high RPM conditions (in excess of 4500).

4. Map sensor:

The electrical continuity of the map sensor (AEB025) connection is diagnosed during operation in both the gas and petrol fueling modes.

An error is diagnosed whenever a very low voltage, suggesting electrical disconnection, is measured on the relative wire for a time in excess of 3 seconds.

Cutoff conditions will momentarily inhibit this check.

5. Gas pressure sensor:

The electrical continuity of the gas pressure sensor (AEB025) connection is diagnosed during operation in both the gas and petrol fueling modes

An error is diagnosed whenever a very low voltage, suggesting electrical disconnection, is measured on the relative wire for a time in excess of 3 seconds.

Cutoff conditions or gas fuel in reserve will momentarily inhibit this check.

6. Gas temperature sensor:

This check is enabled only when the engine is gas fueled.

An error is diagnosed whenever a very low or excessively high voltage, corresponding to temperatures of +150°C and 40°C, is measured on the relative wire for a time in excess of 10 seconds.

7. Water temperature sensor:

This check is enabled only when the engine is gas fueled.

An error is diagnosed whenever a very low or excessively high voltage, corresponding to temperatures of +150°C and 40°C, is measured on the relative wire for a time in excess of 10 seconds.