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Sequent plug&drive

installer's handbook - 1/3
installation types - 2/3
software handbook 3/3

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INTRODUCTION

SEQUENT PLUG & DRIVE
SOFTWARE

Sequent Plug&Drive is the new calibration software for LPG and natural gas supply systems developed by BRC.
It was developed for the new **Sequent Plug & Drive** system, but it is suitable also for **Sequent 24 Model Year 07** and **Sequent Direct Injection (SDI)** systems.
The new software is characterized by a **completely innovative approach** and is strongly addressed to manage gas as fuel for the most advanced engines with controlled starting.
The main innovation is in the engine control software inside the ECUs, which, thanks to new manage algorithms, allows to optimise the gaseous fuel dosing in a simple and intuitive way, so that the installer can obtain easily the best results.
In order to assure a higher integration with the petrol engine control satisfying OBD requirements, Sequent Plug & Drive software has an update diagnostic on the gas system and allows communicating with vehicle original OBD system (just for Sequent Plug & Drive e SDI systems).

SEQUENT PLUG & DRIVE installer's program

The calibration software has changed both for the aspect and for its functionality, but we tried to help the installers, already expert with the Sequent systems, even more, maintaining the philosophy at the basis of the previous software.
Some of the most advanced functions have been integrated and others have been added in order to simplify the setting procedure.
The calibration software is available (on www.brc.it), where new updates and latest improvements will be always available.

To whom this handbook is addressed

This handbook is useful for:
- Those who install or set up gas system using "SEQUENT PLUG & DRIVE", "SEQUENT 24 M.Y. 07", "SEQUENT DIRECT INJECTION" systems
- Those who installed "SEQUENT PLUG & DRIVE" installer's program on PC
- Those who need a reference guide about the PC program
- Those who wish understand or deepen the operation principles of "SEQUENT PLUG & DRIVE", "SEQUENT 24 M.Y. 07", "SEQUENT DIRECT INJECTION" systems
- Those who need a help for the setting up and the problems solution of "SEQUENT PLUG & DRIVE", "SEQUENT 24 M.Y. 07", "SEQUENT DIRECT INJECTION" systems

USEFUL REFERENCES

- For further information about "SEQUENT PLUG & DRIVE", "SEQUENT 24 M.Y. 07", "SEQUENT DIRECT INJECTION" systems, please refer to the other handbooks and information leaflets published by BRC.
- Sequent Installer's Handbook 1/3. This is the easiest way to obtain basic and general information about the installation of SEQUENT PLUG & DRIVE system.

Inside the guide you will also find:
- Information about the system working principles and its structure.
- A detailed description of its components.
- Indications for the mechanical and electrical installation.

- Types of installation 2/3. It contains generic electrical and assembly diagrams for all the different kinds of installation. The listed cases are mainly different in accordance to the cylinders numbers and position and to the vehicle power. This is useful above all when installer works without specific instructions.
- Specific instructions. These are the mechanical instructions and wiring diagrams of a specific vehicle studied at BRC, of which electrical connections and components disposition are indicated with high precision.

1. WHAT DO I NEED TO START?

In summary, here's what you need to communicate with the BRC system ECU and set up the system:

1. Portable Personal Computer
2. SEQUENT Communication wire (code DE512114)
3. PLUG & DRIVE Software for PC on CDROM

NOTE: for more comfort, you don't need the SEQUENT hardware key anymore.

Excluding the PC, all other things are contained in the kit 90AV99002054 *"SOFTWARE BRC WITHOUT HW KEY (CD ROM)"*, which contains all the necessary for installing the others BRC software too, save for the HW key.

Picture 1-1 shows a communication wire for SEQUENT. Remember that hardware key is not required by the Sequent Plug & Drive software, but it is necessary for others software presents in the CDROM.

Let's start to describe the characteristics of the above listed instruments.

1.1. THE PERSONAL COMPUTER

SEQUENT PLUG & DRIVE software has been written in order to be used on PC with Windows 2000 / XP / Vista operating programs.

The required hardware characteristics are:

Minimum hardware characteristics:

- Microprocessor: Pentium II 350
- Memory RAM: 128 MB
- Hard Disk: 1 GB available
- Display 1024x768
- 1 serial port or USB port with "full duplex" serial-USB adapter.

1.2. THE COMMUNICATION WIRE FOR SEQUENT SYSTEMS

This wire contains an electronic loop able to translate the signals coming from the ECU (complying with ISO 9141 and ISO 15031 automotive standard) into signals suitable for PC, that is according to RS232 serial



Pic. 1-1
SEQUENT
communication wire

communication standard. The wire is not compatible with BRC previous ones (i.e. FLYING INJECTION, JUST e JUST HEAVY).

It can be ordered to BRC indicating the code DE512114.

1.3. SOFTWARE

The software is contained in the CDROM supplied with the kit 90AV99002054 *"SOFTWARE BRC WITHOUT HW KEY (CD ROM)"*.The CDROM also includes the updates for the ECU programming, that can be anyway update on the BRC website http://www.brc.it.

2. SOFTWARE INSTALLATION

The installation can be made by means of the CDROM, or downloading files from the website http://www.brc.it.
In the same way you can update the PC software and the ECU programming files (software, kernel loader, mappings and setting up) both from CDROM and from internet.
But let's start from zero and suppose to do the installation. Let's analyse in details both kinds of programming possible with the CDROM.

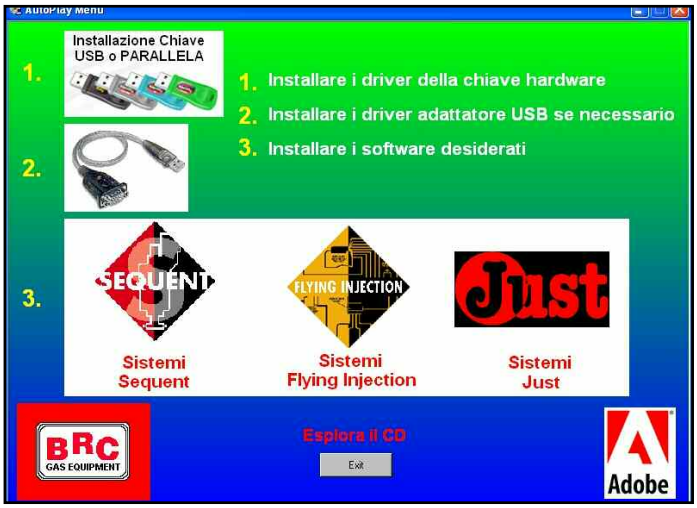
2.1. "SEQUENT PLUG & DRIVE" SOFTWARE INSTALLATION ON PC FROM CDROM

With the portable PC and the installation CDROM, follow next steps to install "SEQUENT PLUG & DRIVE" software:

1. Start the PC and wait it is operative.
2. Insert CD-ROM
3. Wait till the installation program automatically starts (if this doesn't happen, follow the note at the end of this paragraph).
4. In the window shown in picture 2-1 click on the wished language icon.
5. In the window shown in picture 2-2, click on *SEQUENT* icon.
6. In the window shown in picture 2-3, click on *SEQUENT PLUG & DRIVE* icon.
7. In the window shown in picture 2-4, click on *SEQUENT PLUG & DRIVE* icon under the writing "FULL INSTALLATION". Whereas, if the software has been already installed and you want only update it, click on the icon under the writing *"UPDATE"*.
8. The aided procedure will guide you along all the installation steps: answer *"Next"* or *"Yes"* to every question.
9. If installation asks for choosing the destination path, leave the original one and then click *"Next"*.



Pic. 2-1
First installation window



Pic. 2-2
Second installation window



Pic. 2-3
Third installation window



Pic. 2-4
Fourth installation window

10. At this point the program installation starts: wait until the bar indication reaches the 100%.
11. At the end of installation, the PC might ask for closing and restarting Windows: answer YES.

NOTE: the automatic start of SEQUENT PLUG & DRIVE installation when introducing the CDROM depends on the PC set up you're using. If it doesn't automatically start, you have to start the *"Setup"* program in the CDROM main folder (Press *Start* > *Execute*, write *"D:\Setup.exe"* and press OK. "D" is the letter identifying the CDROM: if the PC indicates another one, you have to insert the right letter).

3. PROGRAM START AND ITS STRUCTURE



Pic. 3-1
SEQUENT PLUG & DRIVE main page

3.1. GENERALITIES

The program is suitable, as we said, for the following systems:

- Sequent Plug & Drive
- Sequent 24 M.Y. 07
- Sequent Direct Injection

In the handbook we make reference above all to the Sequent Plug & Drive system, which is the most complete. For the others system, we'll tell you what you can't apply if necessary.

3.2. STARTING PAGE DESCRIPTION

After the correct installation you can start and use the SEQUENT PLUG & DRIVE system. To start the program double-click on SEQUENT PLUG & DRIVE icon on the PC desktop, or click on "Start" in the screen bottom left and select "Start" > Programs > BRC Gas Equipment > SEQUENT PLUG & DRIVE.

You can also read the software version under the icon, without any particular user action.

In the lower side of the screen there are 4 keys (called "main keys") on which appear the writings: *PROGRAMMING*, *SETTING UP*, *DIAGNOSTIC* e *UTILITY*.

We will see their use soon.

Above these 4 keys there's a further "EXIT" key that allows exit from program; if you didn't make changes and/or you already saved all, the program will immediately close. Whereas, if you made changes or if there are operations not yet saved, the PC will notice this situation and will ask for the saving before the exit.

WARNING!: by answering NOT, all changes will be completely lost.

At the bottom of the screen there are three narrow and long panels all along the screen width. The left one displays the current communication condition (Coupling, Communication OK, etc…). The middle one shows the equipment type (i.e. P&D means Plug & Drive), ECU code (i.e. DE815010 is the 4 cylinders P&D ECU) and software version (i.e. SPDAA008010).

The right one always displays the diagnostic state, which controls system actuators sensors. If diagnostic is enabled, the eventual errors found are displayed; on the contrary, the message *"DIAGNOSTIC ENABLED"* is displayed.

3.3. MAIN KEYS

As already said, main keys are 4 and are located at the bottom of the screen.

You can see that all keys are blue and not pressed (see picture 3-1). Each key has a writing inside; from left to right we have:

- PROGRAMMING
- SETTING UP
- DIAGNOSTIC
- UTILITY

The basic concept to keep in mind to use this program is that each main key corresponds to a main function. In order to better understand this philosophy, you can consider that, by means of each key, you can reach all the tools you need to develop a specific operation.

So that, for all concerning the ECU programming you'll refer to the *"PROGRAMMING"* key, for the setting up of an already programmed ECU you'll choose the *"SETTING UP"* key, to verify possible installation errors or run the actuators test you'll press *"DIAGNOSTIC"* and, finally, to set up some program options (i.e. language, communications parameters, etc.) you'll have to press the *"UTILITY"* keys.

When you move the mouse pointer on a key, its colour changes from blue to light blue.

By clicking on a key, it changes its colour into red and it will appear as pressed. At the same time, some keys will appear, everyone with has a specific task; these are the keys we mentioned above.

In the next paragraph there is a short description of main keys; for the detailed one, including the complete procedures to use for each function, please refer to the next chapters.

3.3.1. "PROGRAMMING" KEY

This is the main key that allows to program the ECU whether if it is virgin or already programmed. You can both make the programming by using previously recorded files or files supplied by BRC (choosing "**FROM DATABASE**" key), and make a new setting up (choosing "**AIDED PROCEDURE**" key).

3.3.2. "SETTING UP" KEY

It contains all the necessary functions in order to modify maps, settings, changeover parameters, and everything could influence the SEQUENT PLUG & DRIVE program. By using the SETTING UP instrument you can, for instance, revise any aided procedure phase separately from the others, change parameters of changeover from petrol to gas, correct maps, etc.

3.3.3. "DIAGNOSTIC" KEY

It allows to see data values in order to understand if there are problems or installation errors, to verify what kind of software,

kernel loader or maps are installed on the ECU, to check the actuators right working (injectors, solenoid valves, relay, etc.).

3.3.4. "UTILITY" KEY

It groups all the general utility instruments not included in the previous categories, and that allows making different operation useful for updating the program on PC or changing some of its aspects: you can change language, communication parameters with ECU, display wiring diagrams, extract mapping and settings from the ECU and save them on the PC, manage databases containing the already known vehicles mappings, crate discs to transfer mapping to another PC, update all data on the PC.

4. PROGRAMMING

4.1. PROGRAMMING FILES TYPE

The SEQUENT PLUG & DRIVE programming procedure is based on two different kind of file:

1. File .S19
2. File .FPD, .F7D or .FDD.

4.1.1. File S19

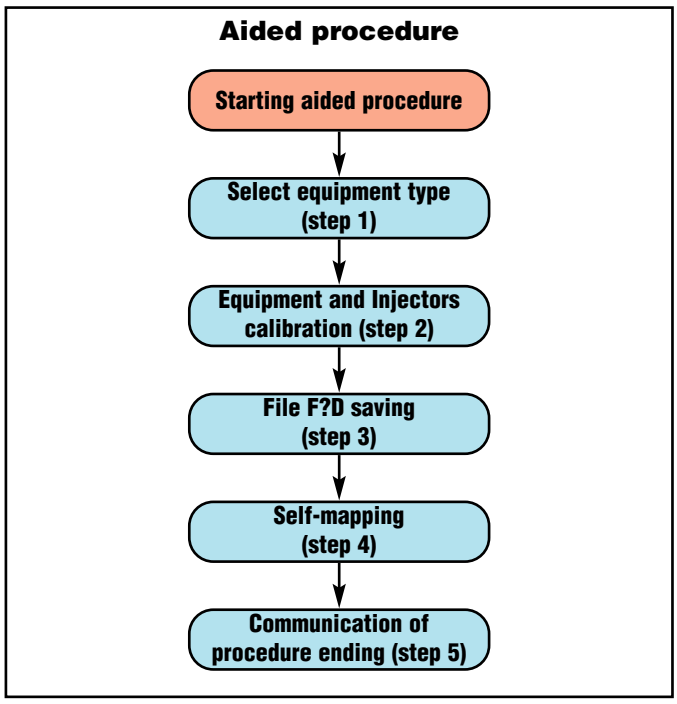
Files with S19 extension contain the algorithms and the strategies used by systems with SEQUENT PLUG & DRIVE software. Every time you make a new ECU programming, it is advisable to update the S19 software with the last version available on PC (obviously you have to update the PC too). This allows to have all the developed functions and strategies available.

4.1.2. File FPD, F7D, FDD

This files contain the specific data of the vehicle and its mapping.
It contains for instance the equipment type, the engine type (intaked or supercharged), mapping parameters, calibration parameters of all signals coming form the sensors, changeover parameters, eventual parameters for tip-in strategies, etc.

- • Il file **FPD** refers to a vehicle installed with **Sequent Plug & Drive**.
- Il file **F7D** refers to a vehicle installed with **Sequent 24 MY07**.
- Il file **FDD** refers to a vehicle installed with **Sequent Direct Injection**.

Along the handbook we will call the generic mapping file **F?D**, where "?" could be "P", "7" or "D".
Once the communication with the ECU is enabled, the software can select by itself the files of the system you're using, without any other installer's operation, as afterwards explicated.



Pic. 4-1
Aided procedure steps



Pic. 4-2
Aided procedure selection

4.2. ECU PROGRAMMING

If you want to effect an ECU programming you have to select from the main window the *Programming* key. Two different kinds of programming are available:

- Aided Procedure
- From Database

4.2.1. Aided Procedure Programming

This kind of programming is available just for Sequent Plug & Drive and Sequent 24 MY07 systems. On Sequent Direct Injection systems it will be necessary to proceed with the "From Database" programming, eventually followed by a map refinement.
We'll make a detailed description of Sequent Plug & Drive procedure.

The Sequent 24 MY07 procedure differing in some messages that help the installer to insert at the begin and remove at the end the setting kit with MAP sensor.
The aided procedure is carried out when you wish to convert a new vehicle whose mapping is not available. In this case start the configuration of the personalised parameters and then the real self-mapping. The aided procedure consists of variable steps depending on the selections made. In Picture 4-1 the main steps are indicated.
To enter this procedure, select *Programming* key at the bottom of the screen, and then the *Aided Procedure* one, on the right (see Picture 4-2).
The installer has guided step by step through all the different procedure phases by a capital writing in the centre of the screen. You can go through this procedure taking one or more steps backwards or for-

ward, by using *NEXT* and *PREVIOUS* keys at the bottom of the screen, or using PgUp and PgDwn on the keyboard.

WARNING: by effecting the aided setting procedure all parameters in the ECU will be lost.

Aided procedure steps are explained afterwards.

4.2.1.1. Equipment type

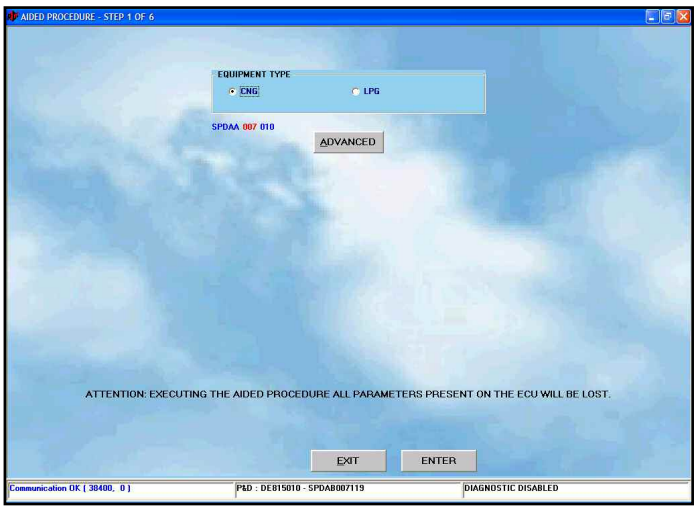
It is the first step of the procedure, as you can see in Picture 4-3. In case of standard installation, after selecting the equipment type (LPG or CNG), just click on *ENTER* key. Automatically the ECU will receive the software and a standard mapping in order to effect the vehicle calibration. At the end of the programming you'll go to the next step, without any further installer's intervention.

At the left of "OTHER" key there are some letters and numbers, which show you information about the kind of software to be downloaded on the aided procedure ECU.

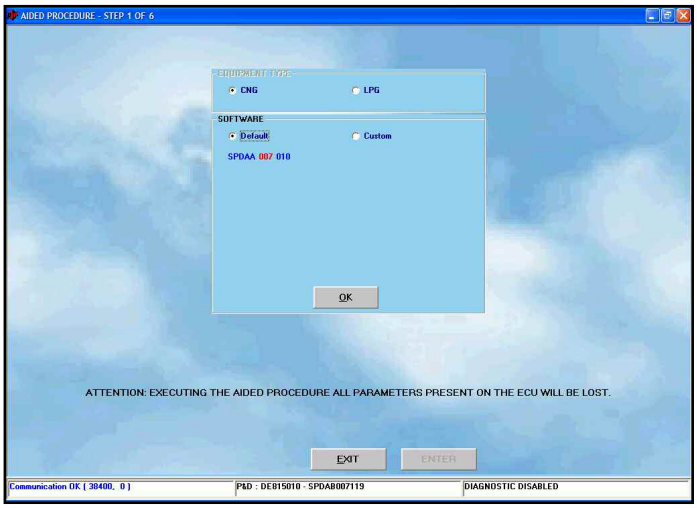
- The first 5 characters show the software name ("SPDAA" in Picture 4-3).
- The three numbers in the middle show the software version to be downloaded ("007" in Picture 4-3).
- The last three numbers show the software type, depending on the kind of ECU you wish to program ("010" in Picture 4-3 indicate that the ECU type is DE815010-4 injectors Sequent Plug & Drive).

NOTE:

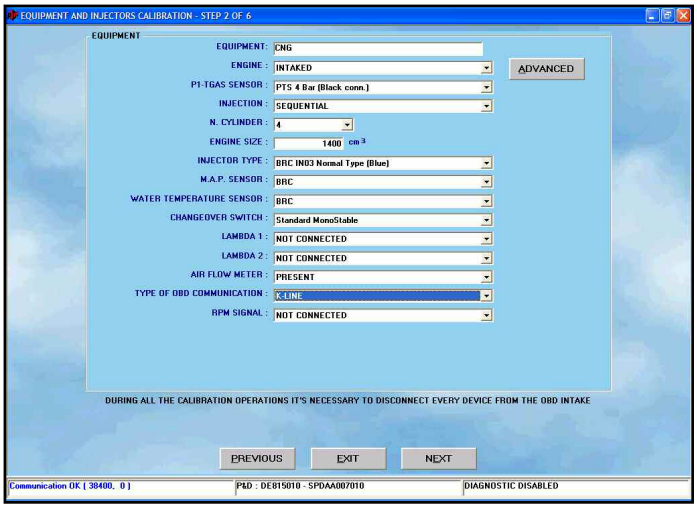
1. When entering this window, before doing any operation, the PC program verifies the ECU kernel loader version, and compares it with the last version on PC. If the ECU kernel loader is not updated, a message will notice that you need to update it; in this case, you can't proceed with the following steps until the update won't be made (see paragraph 4.2.2 for procedure).
2. In particular cases indicated by BRC, it could be necessary to download on the ECU a software different from the usual; you can do this by press the *"OTHER"* key (see Picture 4-4). By clicking on it the following possibilities will appear:
   - **Default**: corresponds to the software normally supplied by BRC. Without special authorization given by the BRC technicians you have to use just standard software.
   - **Custom**: corresponds to particular software used for test and development. These ones have to be used only under indication of BRC technicians. After choosing this option, select the software you wish to transfer, then click *OK* in the window for software selection.



Pic. 4-3
Aided procedure - Equipment type



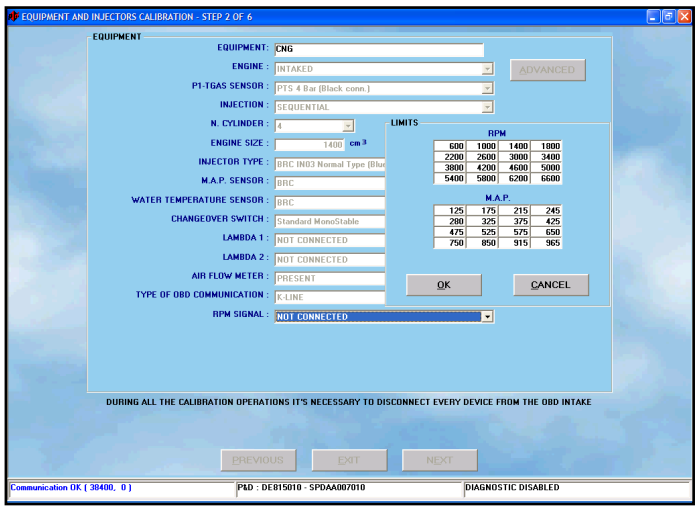
Pic. 4-4
Aided procedure - equipment type clicking on "OTHER" key



Pic. 4-5
Aided procedure - equipment calibration

4.2.1.2. Equipment calibration

This is the second step of the procedure; it specifies further information about the installed equipment and the vehicle (see Picture 4-5). Particularly it indicates if it is an *Intaked* or *Supercharged* (turbo) equipment. Most of the parameters are previously set up and usually you don't need to modify them, others change according to the vehicle and have to be changed by the installer. From this window you can also select the following installation characteristics:



Pic. 4-6
Aided procedure - equipment calibration by clicking OTHER in the equipment section

- **Equipment**: it indicates if it is a LPG or CNG equipment.
- **Engine**: you have to indicate if it is an intaked or turbo engine.
- **P1-T gas sensor**: you have to indicate the sensor type used for gas pressure and temperature. The program suggests automatically the usual sensor for application you've chosen, but the installer can change it if necessary.
- **Injection**: you have to choose between sequential or semi-sequential injection.
- **N. Cylinders**: you have to indicate the engine cylinders number, which is also the number of the installed gas injectors and of the petrol ones. If this number is lower than the maximum injectors number that the ECU can pilot, pay attention not to connect the injectors with higher number. For instance, using a 6 injectors ECU on a 5 cylinders vehicle, you have to avoid to connect the injector n°6 wire, both petrol and gas, connecting all the others.
- **Engine size**: indicate the engine size in cc (i.e. 1400 for 1,4 litres).
- **Injector type**: you have to indicate the installed gas injector type, by choosing among the available ones. Remember that the injector selection **depends on the vehicle power: see "2-3 Sequent Installation type..." handbook.**
- **MAP sensor**: it displays the sensor type to be used. At the moment is the only one and cannot be modified.
- **Water temperature sensor**: visualizza il tipo di sensore da usare. Per ora è unico e non può essere modificato.
- **Changeover switch**: it displays the changeover switch type to be used. The value previously set is the correct one, save for particular cases.
- **Lambda 1 and 2**: it allows to choose if you connected the lambda oxygen sensors wire or not. The program will display and take care, in some specific strategies, only the lambda oxygen sensors indicated as connected.
- **Air flow meter**: to having a more precise system setting, it is necessary indicates if in the original petrol equipment there's an air flow meter (also called MAF); usually you can see it on the intake duct. If yes, choose "PRESENT" option, otherwise choose "NOT PRESENT" option or, if you have any doubt, choose "UNDEFINED". If possible, it is better to avoid the last option, and check the air flow meter presence or absence.
- **Type of OBD communication**: it specifies if system is connected to the vehicle diagnostic intake and if has been used the K-line (1 connected wire) or the CAN BUS (two connected wires).
  You can define the communication and connections type by connecting an OBD tester, sold by BRC with code DE805500, to the vehicle intake.
  As soon as the tester will effect communication, it will supply a number from 1 to 9, which indicates the communication itself.
  Connections and selection must follow these indications:

Communication type on OBD tester	Communication to set up on S P&D interface	Wires to connect
From type 1 to type 3	K-LINE	White on pin 7 OBD intake
Type 4 or type 5	Not available	-
From type 6 to type 9	CAN BUS	Yellow on pin 6 and yellow/black on pin 14 OBD intake (plait)

- **RPM signal**: It specifies if vehicle RPM has been connected to the system, or if RPM are read by petrol injectors or by the coil. Normally it isn't necessary to connect this signal, so that the software suggests automatically the "not connected" option.

Once finished and checked the settings click *Next* to continue the aided procedure.

A similar section could be activated, outside the aided procedure, from the main window by selecting Setting up --> Equipment type.

NOTE: by clicking *OTHER*, at the top of the screen, you can set working limits for RPM signal and for MAP manifold pressure, as you can see in Picture 4-6. This operation couldn't be made normally, save different indications given by BRC technicians.

4.2.1.3. Save files FPD, F7D o FDD

It is the third step of the aided procedure. This section asks you to select the destination file where all set configuration have to be saved. You have to fill in the below boxes, indicating *Trademark*, *Model*, *ECU*, *File* in the most detailed way (Picture 4-7).

Note: when choosing the file name, you can use whatever name you like. An always valid suggestion is to use one that can help you to identify the vehicle where you downloaded it (i.e. the name could be the vehicle plate number).

After leaving the vehicle with the engine off and the ignition key on you can press *"Save"* to save the calibrations on the PC and download them on the ECU.

Clicking *Exit*, without save, all calibrations will be lost.

4.2.1.4. Self-mapping

Systems based on SEQUENT PLUG & DRIVE software, ground their working on suitable maps contained in the ECU, allowing to translate the petrol injectors signals in controls for gas injectors; they change according to the vehicle. **Self-mapping** aim is to obtain translation maps through simple

acquisitions (to effect in stop condition) of working conditions of the vehicle to “map”, immediately after the installation phase.

The self-mapping procedure consists in acquiring the values of the different parameters during three consecutive accelerations in petrol mode, and in their processing, carried out according to the data supplied (engine size, cylinders number, injection type, etc.). Then, without any installer’s intervention, a setting for end of idle condition will be made.

As soon as the self-mapping starts, the window represented in Picture 4-8 appears requiring to press OK when petrol steady idle condition are reached.

Look at the two graphics in Picture 4-8. In the first you can see the trend of the lambda oxygen sensor and of the MAP, instead in the second one you can see at the same time the injection times of both petrol and gas injectors.

It is now required to maintain the engine at idle condition (Picture 4-9) and then to make three deep tip-in until 5000 RPM (see Picture 4-10).

You have to press the accelerator quickly all the way, loosening it so that the engine doesn’t reach condition of RPM over 5000 rpm/min and avoiding however the RPM containment decided by the car builder.

After every tip-in, note that inside the yellow circle, in the middle low part of the screen, you can see the number of tip-in already made (see Picture 4-11).

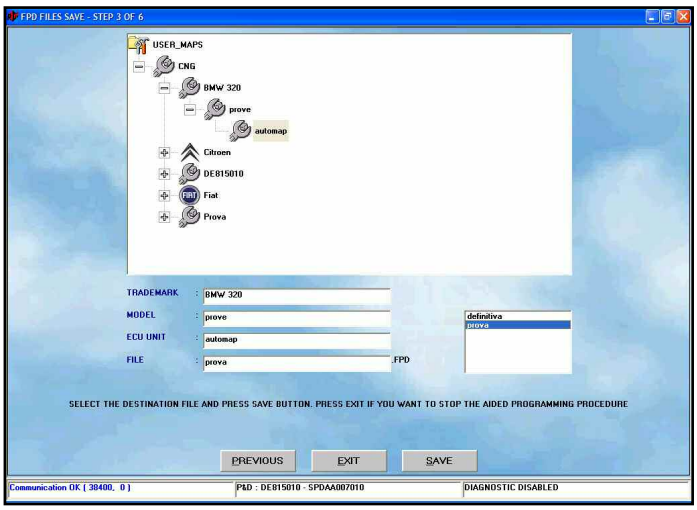
After the third tip-in, the installer’s task is substantially over. All the next self-mapping and aided procedure calibrations are automatic and doesn’t need any other intervention, just press OK at the end, as confirmation of the end of procedure.

Also if these phases are automatic, as we said, we describe them however in the following, so that you can understand what happens.

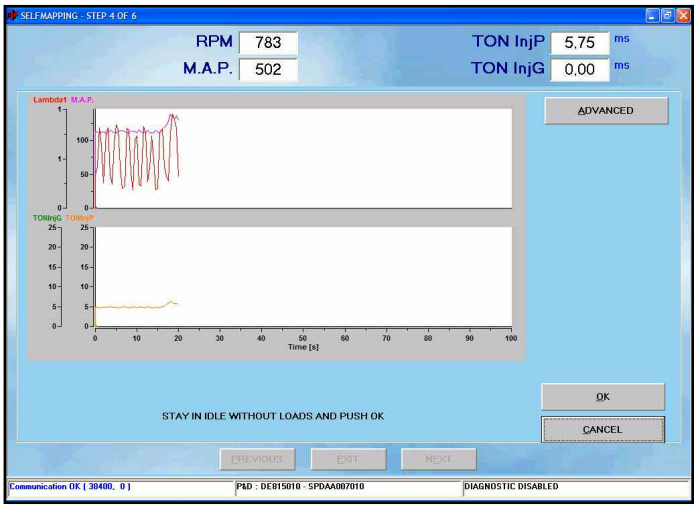
The aim of the automatic calibration (see Picture 4-12) following the three tip-in, is to center automatically in the best way the idle condition.

During this phase, notes in the picture the appearance at the bottom of 4 little red or green squares and of a text box with the error percentage still to correct.

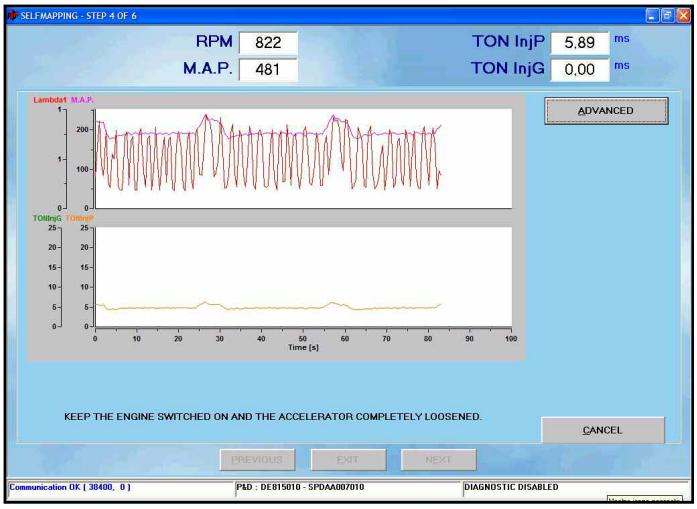
At the beginning, the boxes (one for each



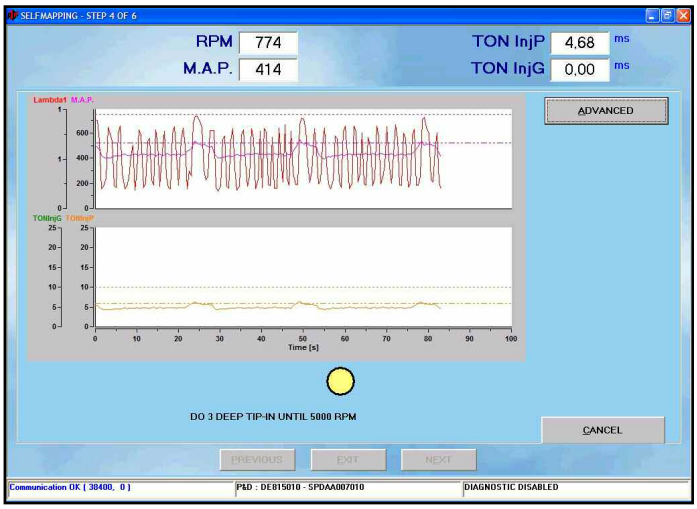
Pic. 4-7
Aided procedure - file F?D saving



Pic. 4-8
Aided procedure - Self-mapping, press OK



Pic. 4-9
Aided procedure - Self-mapping, waiting



Pic. 4-10
Aided procedure - Self-mapping, three tip-in

cylinder) are red, and this means that all cylinders are supplied with petrol.

Then, we'll have the partial changeover to gas of some cylinder, with following re-changeovers between gas and petrol, until the complete gas mode is reached at the end of procedure.

During all the procedure, the error box shows how is far away the optimal situation. When the error percentage is lower (in a positive or negative way) than 5%, the little box is green, showing an acceptable situation to proceed, whereas it becomes red, and in this case you'll need to wait before the changeover of other cylinders.

At the end of procedure, a message will tell you that all has ended successfully (see Picture 4-13).

Clicking NEXT you can end the aided procedure, saving changes made an adding the mapping in the database.

NOTE 1: if during the mapping, vehicle switch off before changing over all the gas cylinders, you can repeat the self-mapping, so that the PC at the beginning enriches or leans of a percentage at will, operating on the cursor "Initial correction", after pressing "OTHER/ADVNCED" key (see Picture 4-14). The initial correction has its effect just in the first moments after the first cylinder changeover to gas. Then the corrections made automatically will become operative.

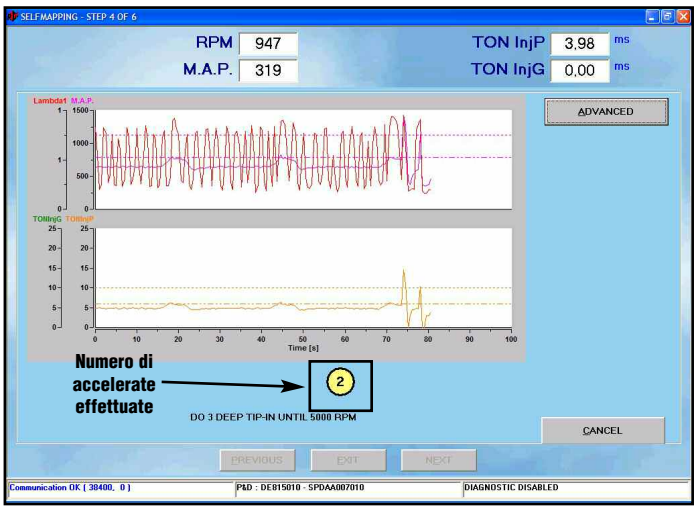
NOTE 2: the PC verifies the plausibility of the data acquired during the procedure. If some not-reasonable data result, an error message will be shown and you will have to repeat the mapping.

4.2.1.5. Sending parameters to the ECU

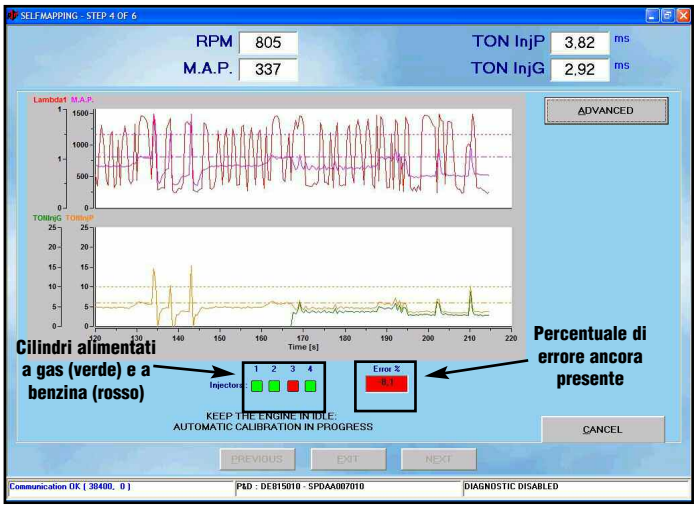
With this last section the signals calibration and self-mapping of a new vehicle procedure ended. It will require the data saving. If you want you can choose a new position, or the PC will save them automatically into the already chosen position (see Picture 4-15).

4.2.1.6. End procedure

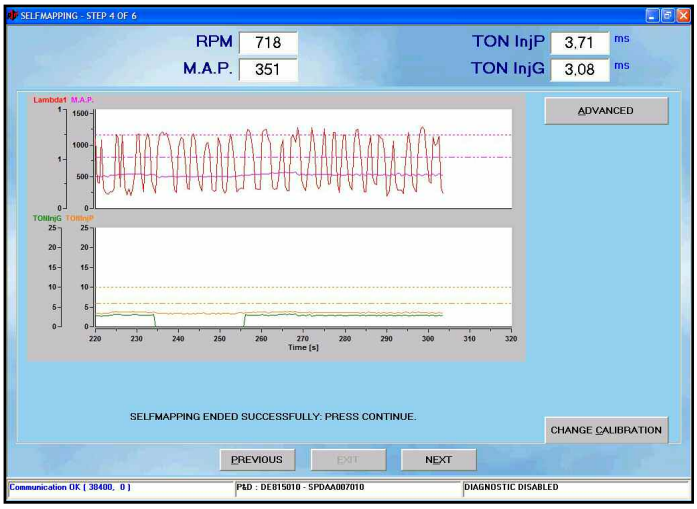
The last step of the aided procedure has the only aim to notice the good end operation (see Picture 4-16). By clicking on *"Exit"* the aided procedure ends and you come back



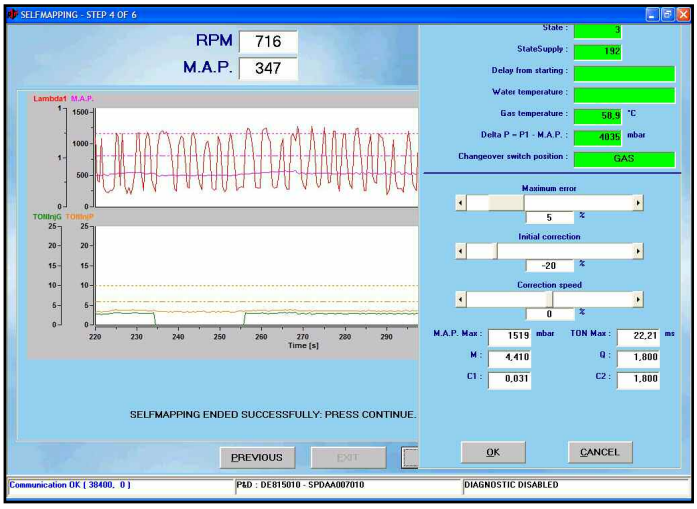
Pic. 4-11
Aided procedure - Self-mapping, tip-in n°2



Pic. 4-12
Aided procedure - Self-mapping, automatic calibration



Pic. 4-13
Aided procedure - Self-mapping ended successfully



Pic. 4-14
Aided procedure - Self-mapping, OTHER/ADVANCED key

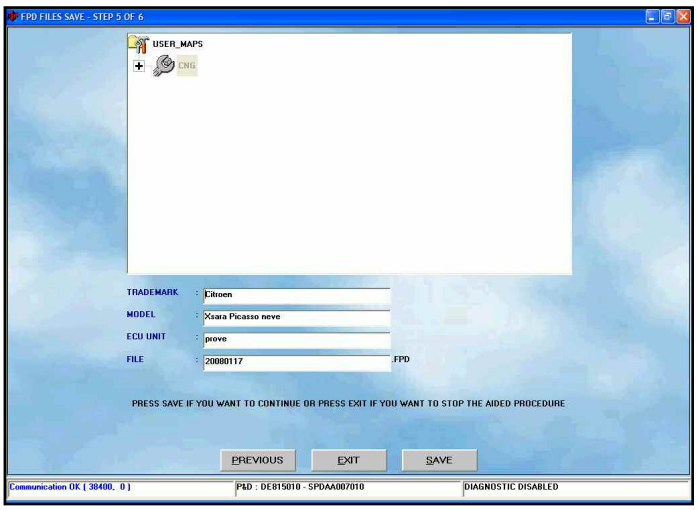
to the first program window.
Vehicle automatically changes over to gas.

4.2.2. "FROM DATABASE" PROGRAMMING

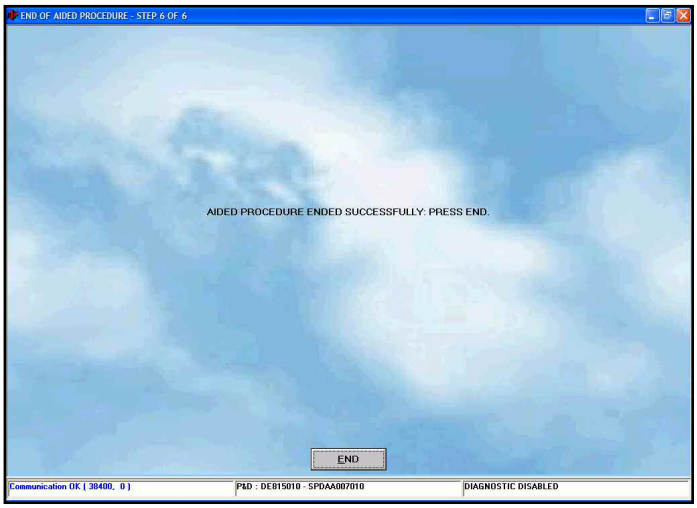
Selecting the *Programming > From Database* key, you will enter the window for the BRC ECU programming from database, that's to say by using files already available (i.e. the ones of vehicle already developed in the past). The programming will be made if the ignition key is turned on, with stopped engine or during the petrol working mode. If vehicle is working in gas mode, system will automatically change over to petrol before starting the programming.
In order to make the programming, select in the database the file to download according to the equipment type, trademark, model and petrol ECU of the vehicle. If vehicle is supplied by BRC files are in the folder BRC_MAPS, whereas if vehicle has been developed by the installer, files are in the folder USER_MAPS.
In the example of Picture 4-17 we selected:
Map: made by the user (User_Maps)
CNG: CNG equipment
Trademark:BMW 320
Model: tests
ECU: self-map
File: definitive.FPD (Plug & Drive system)
Once you selected the ECU of the vehicle you want to program, you have to select files to download.
In the example of the picture for the selected ECU are available two kind of FPD file ("definitive.FPD" and "test.FPD").
To select the file.F?D to download, you have to double-click the one you've chosen. Automatically a sign has put near the writing *Vehicle Parameters* and the selected file appears in the box under the writing.
The selection of the software (file .S19) to download has made automatically when choosing the vehicle parameters file (file .F?D). To transfer this file on the ECU you need that the box near the writing *Software* be selected with a flag sign. You can change the software with the *OTHER* key. Clicking on it, a box appears containing all the available software versions. You can select the software to download, by double-clicking on one of the listed. We suggest doing this operation just if told by BRC technicians or specialists.
The flag sign indicates the files that will be downloaded at the same time, when you'll make the ECU programming, that's to say when you'll press the *Programming* key.
In the example of Picture 4-17 we download just the FPD file, but not the S19 software.
You can run the following kind of programming, in once time:

- F?D
- F?D + S19

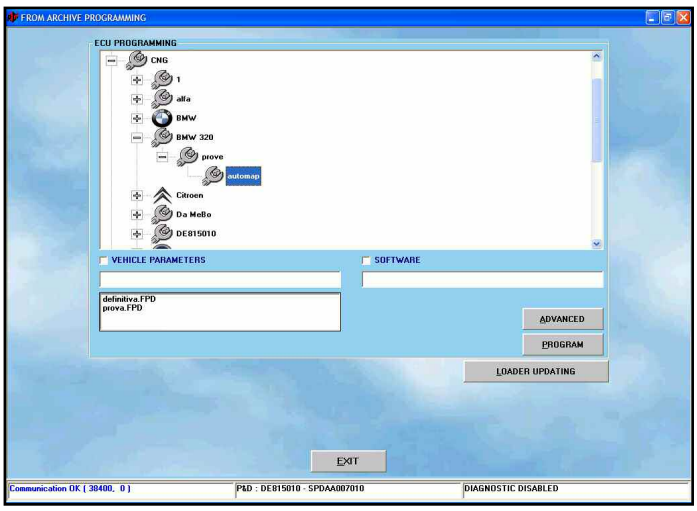
You can't download only S19, without F?D.
Sometimes you could need to update the kernel loader on the ECU. The program can recognize this need, and notice automatically the installer during the aided procedure. To update the loader, press the *UPDATING LOADER* key (see Picture 4-17); a page will be open that, according to the ECU situation, will show a writing telling you what to do. Clicking on the *PROGRAM* key at the bottom of the page, the loader transfer on the ECU starts. At the end of this operation will be shown a window telling



Pic. 4-15
Aided procedure - final programming



Pic. 4-16
final window with end procedure message



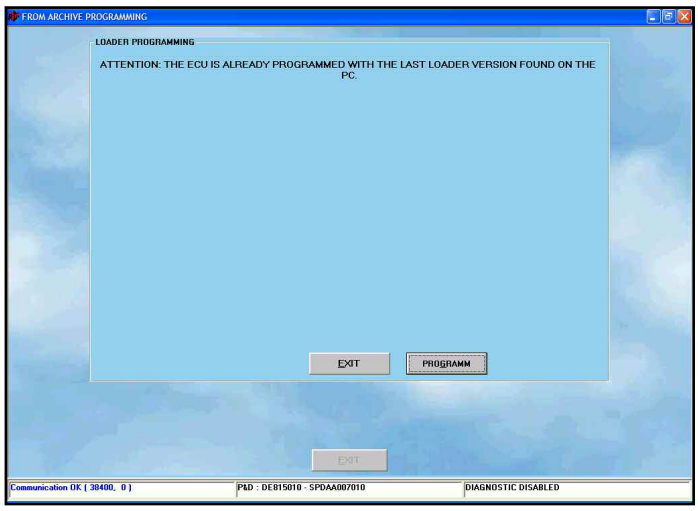
Pic. 4-17
From database programming

that all ended successfully.

If ECU doesn't need the loader update, a writing will show that the version on the ECU has been already updated. (see Picture 4-18). In this case the loader programming is still possible, but it's useless and not suggested.

ATTENTION!:

- The loader updating is a delicate and potentially dangerous operation. Be careful that the PC batteries are loaded and the electric supply be connected before starting.
- If loader programming is interrupted at its beginning you have to disconnect and connect again the ignition key and retry.
- If you can't make the loader updating also in this way, you can cancel completely the ECU by selecting UTILITY > ERASE ECU and then retry.



Pic. 4-18
Loader updating not necessary

5. SETTING UP



Pic. 5-1
Setting up

By selecting from the main page Setting up you can enter in different sections dedicated to verification and modification of the vehicle parameters, which allows to refine or correct calibrations of a pre-programmed vehicle (see Picture 5-1). Operations of equipment type and self-mapping selection are the same that the ones in the aided procedure, and, being already described in the previous chapter, we won't talk again about them here; it'll be sufficient a little recall to the relative previous paragraph. In this chapter, instead, we'll describe in detail the sections that change most.

Changes made in the setting up sections are put in evidence with a red X near the relative section button. For instance a red X near the *"RPM"* key indicates that the RPM setting has been changed, a red X near the *"DRIVEABILITY"* key indicates that the driveability setting has been changed and so on.

At the program exit, or sometimes when you select other functions, if you've made some changes it will be required a file saving, specifying equipment type, trademark, model, ECU and file name, as described for the aided procedure.

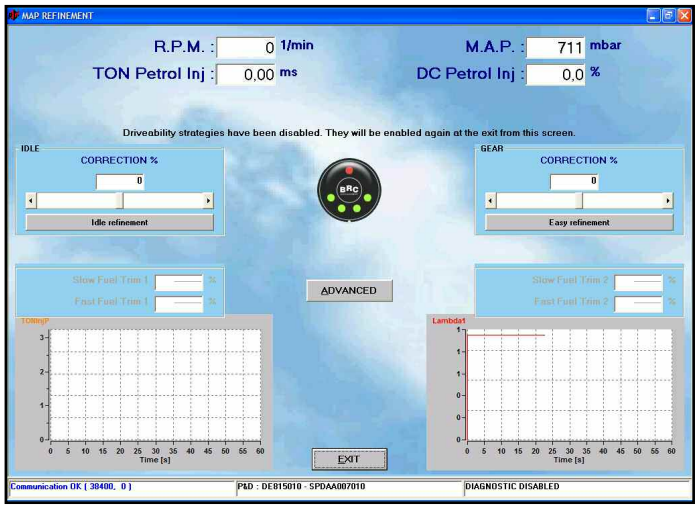
5.1. PREVIOUSLY DESCRIBED FUNCTIONS

Functions in the Setting up main window, already described in the previous chapter are the followings:

- Equipment type (see paragraph 4.2.1.2)
- Self-mapping (see paragraph 4.2.1.4)

Now we'll describe functions not yet considered before, that are (see Picture 5-1):

- Map refinement
- Driveability
- Changeover
- RPM
- MAP
- OBD Configuration
- Level calibration



Pic. 5-2
Setting up - map refinement

5.2. MAP REFINEMENT

In this window, you can revise any map present on an ECU and, particularly, it is very useful to revise the result of a self-mapping just done.

5.2.1. MANUAL REFINEMENT

The map refinement can be made in "manual" way, as many BRC installer already know, operating on the two "pointers", as you can see in picture 5-2.

The first is called *IDLE* and the second *GEAR*.

Theirs function can be consider similar to the reducer and trimmer calibration on the traditional system:

- **IDLE**: this pointer is roughly equal to the calibrations of idle and sensibility of a traditional reducer, its effect is to enrich or lean in the idle zone working. By moving the pointer to the right you increase the gas flow at the minimum percentage indicated (numbers higher than 0). By moving the pointer to the left you decrease the gas flow at the minimum percentage indicated (numbers lower than 0).
  Operate on this calibration in order to center the map at the idle in the better way.
- **GEAR**: this pointer is roughly equal to the trimmer calibrations on a traditional equipment, its effect is to enrich or lean points with medium and high engine loads. By moving the pointer to the right you increase the gas flow of the percentage indicated (numbers higher than 0). By moving the pointer to the left you decrease the gas flow of the percentage indicated (numbers lower than 0).
  Operate on this calibration in order to correct the carburetion with medium and high engine loads.

No one of the two calibrations practically influence on the other condition working.

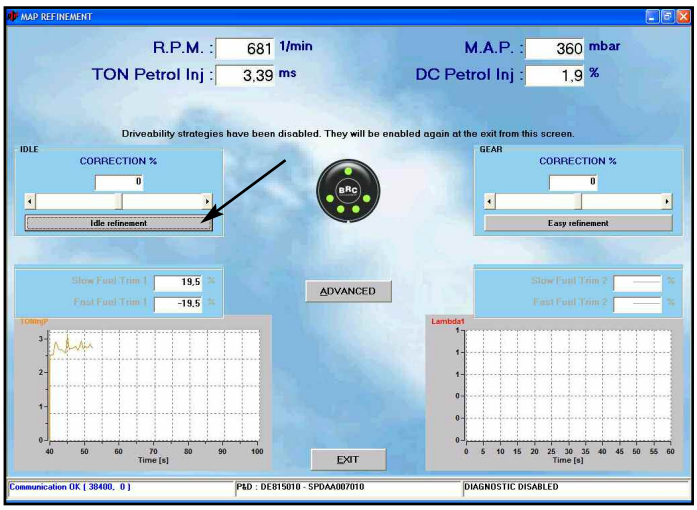
After a self-mapping it's better to control the right vehicle working on the road in high and medium power conditions, **in closed loop conditions**, on the basis of the petrol ECU self-adjustable parameters, that you can see in this page if the connection with the

vehicle diagnostic intake has been made, and if OBD data are available, or on the basis of the sensor working (use eventually the diagnostic box or other suitable instrument). Possible carburetion anomalies in these conditions can be resolved by acting on *"GEAR"*.

Look at the left too, under the idle and gear correction pointer in Picture 5-3, and note the presence of the slow and fast fuel trim values read by the OBD communication.

These values won't be shown, as in the picture, if communication is not enable or if OBD hasn't be connected to the system.

At the bottom there are two little graph windows where you can see injection times and the lambda oxygen sensor trend.



Pic. 5-3 Idle automatic refinement

5.2.2. IDLE AUTOMATIC REFINEMENT

You can refine the mapping concerning the idle mode in a completely automatic way.

It's enough to press the IDLE REFINEMENT key, shown by the arrow in Picture 5-3.

It will appear a little window in the middle as shown by the Picture 5-4.

Clicking on START, the procedure will begin.

Before, it will wait the petrol steady conditions, as you can see in Picture 5-5.

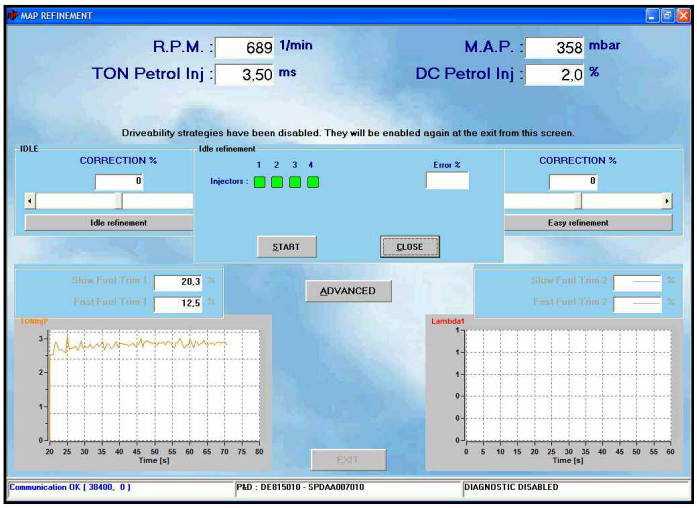
Then it will change over automatically to gas, and will center the idle (see Picture 5-6).

Note that in Picture 5-6 the idle correction pointer has automatically moved, reaching a correction of -7%.

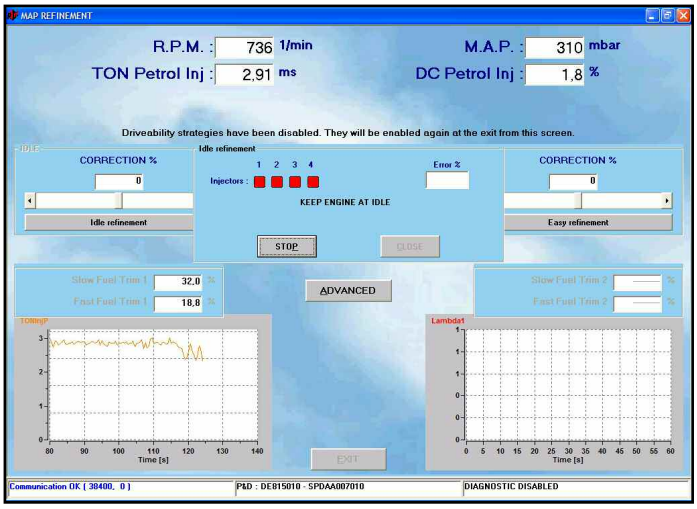
The pointer movement will continue along all the automatic procedure, which will end as shown in Picture 5-7.

Note that the final correction is just a -2%, and this confirms that the idle was already centred before.

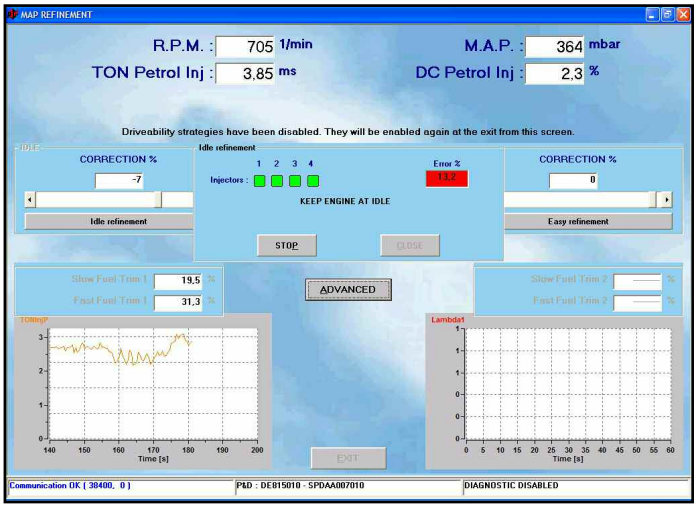
The procedure, beyond a simple and useful setting instrument, is also a diagnostic instrument which allows to check if a vehicle calibrated in the past is still centred or not.



Pic. 5-4 Idle refinemen little window



Pic. 5-5 Idle refinement starting



Pic. 5-6 Idle automatic centering

5.2.3. EASY REFINEMENT IN RUNNING CONDITIONS

In running conditions has been studied a new way of easy refinement and semi-automatic, which allows:

- Extreme use easiness for the installer
- Shorter setting times and routes
- There's no need to read data on the PC or check values or graphs while driving
- Setting up at stopped vehicle, after acquisition, with no need to drive
- Extreme precision in the results, for not specialist too

Clicking the button shown by the arrow in Picture 5-8 a graph will open, as you can see in Picture 5-9.

In the low part of Picture 5-9, you can see three buttons: ERASE, START and CLOSE. Clicking on START, the program start to acquire the Ton (injection time) of petrol injectors, and put them in the graph in correspondence to the MAP value at the acquisition moment.

During the petrol working in the graph will appear orange points, whereas during the gas working points will become blue.

After driving a route both in petrol mode and in gas mode, the graph will become as the one in Picture 5-10.

Remember that you can changeover from petrol to gas and vice-versa both acting on the changeover switch and clicking the changeover switch picture in the program, or also by using the F5 key on the PC keyboard.

We suggest proceeding first at the petrol point acquisition, trying to explore all the MAPs.

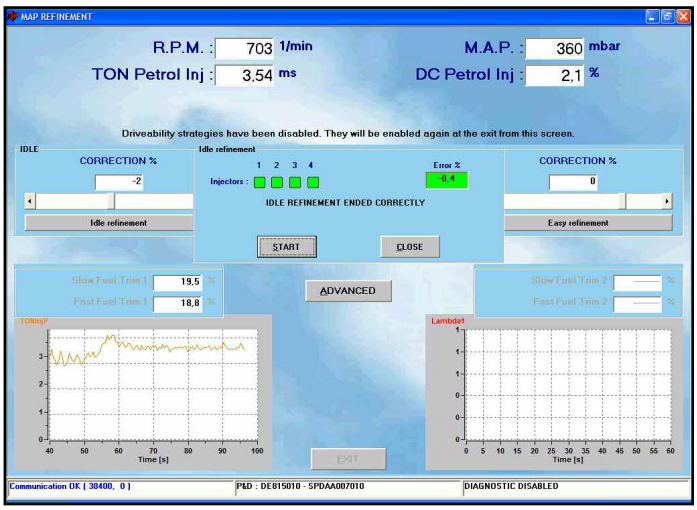
It is not necessary that points be acquired with a lonely acceleration progression: they can be acquired in different times, eventually also interrupting the acquisition by means of the middle key, which from START will be become STOP.

Just be careful to avoid the acquisition of RPM too high or too low in the same graph: it is better, for instance, tray to maintain them between 2500 and 3500 rpm/min, eventually loosening the foot or increasing the gear when the engine loose rpm.

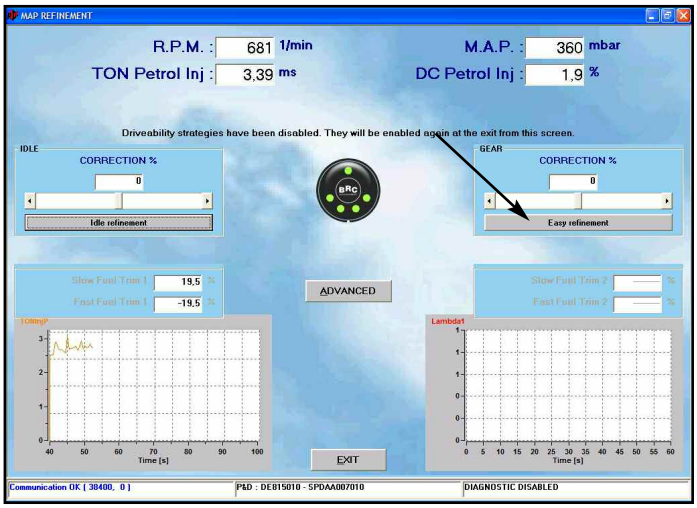
The Open Loop conditions, which usually you can obtain with the accelerator completely pressed, are not important for this kind of setting and they don't have to be considered.

Their possible acquisition, however, is not a problem because they will be recognizable in the graph.

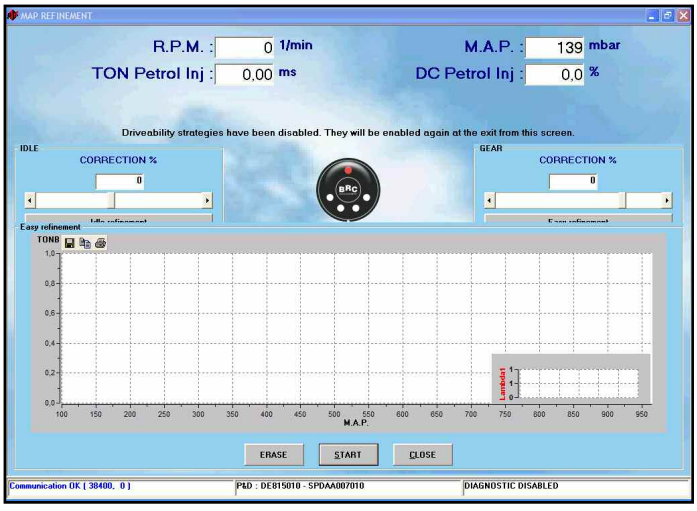
Making then the changeover to gas and



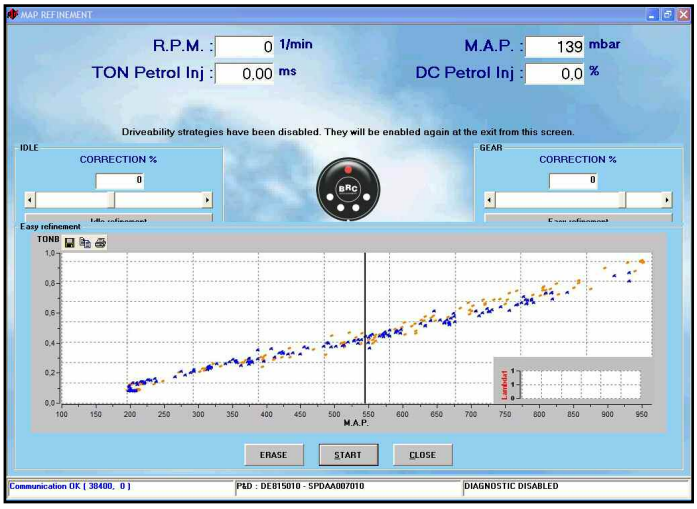
Pic. 5-7
Idle refinement ended successfully



Pic. 5-8
Easy refinement while running



Pic. 5-9
Easy refinement graph



Pic. 5-10
Acquisition petrol and gas points

acquiring points in the same way, you obtain a graph similar to the one of Picture 5-10.

Now you can press STOP and try a safe place where stop the vehicle.

Since now, the map correction will be made, with stopped vehicle and without needing other people operating on the PC, safe for the driver.

Note that the petrol and gas points in Picture 5-10 are substantially superimposed to the left, and they pull apart in the right side of the graph.

This means that the mapping is not centred in the right way in the higher power zone and therefore you have to correct by acting on the GEAR button.

Let's try to act on the GEAR button, taking the correction to +10%.

The result will be the one shown in Picture 5-11, where the gas points are moved more and more to the low. We'll make the situation worse, obtaining points even more far away one from another, always in the same side.

Therefore, it is completely intuitive that in order to approach the gas points to the petrol ones, you'll have to correct in the opposite sense, that's to say with a negative value.

Trying with -10%, we obtain the result in Picture 5-12.

The point superimposition has improved, petrol and gas points are well superimposed and the refinement procedure is practically ended.

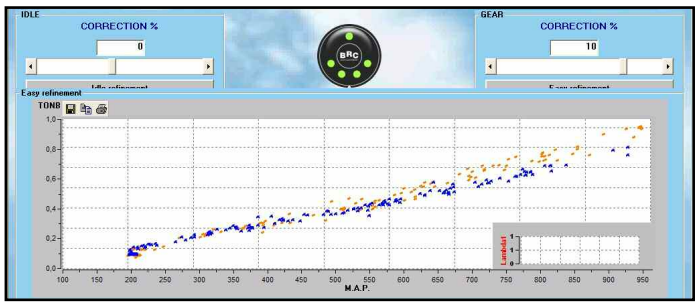
In order to save the correct mapping in the ECU, it will be enough exit from the map refinement page and press EXIT or PROGRAMMING key.

Also the IDLE button produces a movement of gas points.

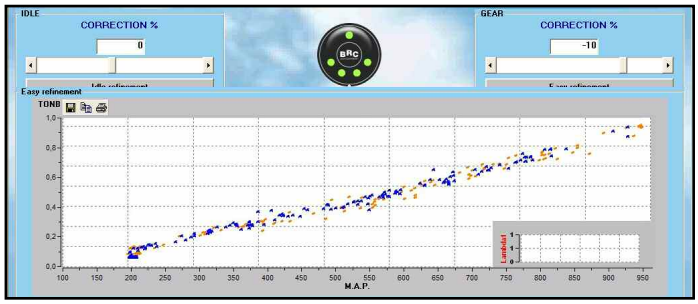
But while the GEAR pointer changes the gas point inclination, leaving all the bottom left points steady, the IDLE pointer moves points up and down, all at the same way, maintaining the inclination unchanged.

In some cases, to have a perfect superimposition, it could be necessary acting on both the buttons.

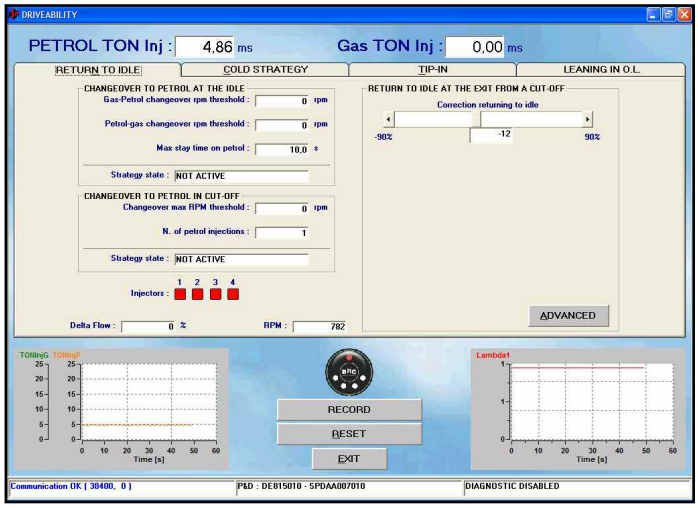
The gas point movement in real time when the pointers change, will make very intuitive understand what to do, without needing too many explications.



Pic. 5-11
Gear correction +10%



Pic. 5-12
Gear correction -10%



Pic. 5-13
Setting up - Driveability - Leaning in O.L.

5.3. DRIVEABILITY

These windows allow to calibrate some setting parameters in order to improved the driveability during the rich Open Loop working (usually with foot deeply pressed), quick tip-in, sudden tip-out or during the return to idle.

Let's analyse the leaning in Open Loop window, starting from the top to the bottom and starting from the elements always present in each strategy, and then let's analyse the specific parts.

First of all, you can see at the top the **injection times** values and the gas and petrol injectors.

Just below you can see that you can select, by clicking on it, four different folders, relatives to the return to the idle, to the cold leaning strategies, to the tip-in and to the Open Loop leaning strategies.

Just below the middle of the screen, at the left you can see a little box "**Delta Flow**".

In this box appears, in percentage, the total modification introduced by all driveability strategies to the gas quantity supplied to the engine. It's not, therefore, the single contribution of a specific strategy, but of the global effect of driveability strategies.

In the middle you can see a **changeover** drawing, with the writing "BRC" in the middle.

The little circle at the top shows the actual working, in gas mode (green) or in petrol mode (red).

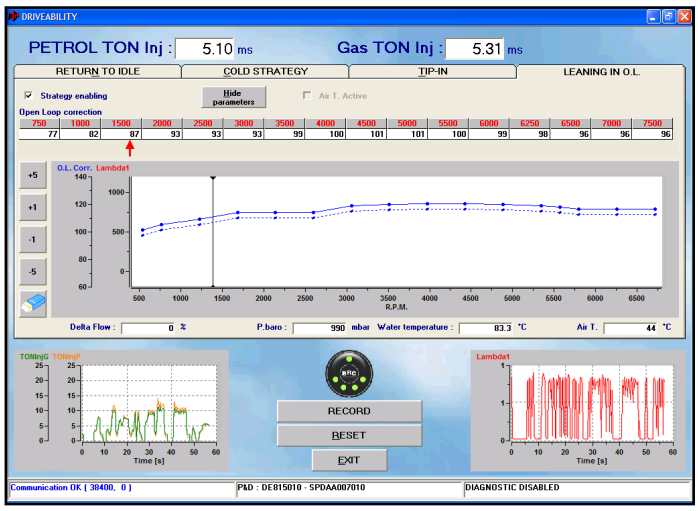
The four little circles at the bottom indicate the driver's selection, in gas mode (on) or in petrol mode (off).

There are also two buttons bottom left with the writings *"RECORD"* e *"RESET"*.

- **Record**: it records the changes just made, so that you can recall them anytime, coming back to the recorded situation.
- **Reset**: it comes back to the last recorded parameters configuration.

Both buttons make reference only to the changes made in each folder, therefore the

reset will make reference just to the folder parameters.
There are always two squares with some graphs inside, one bottom left, one bottom right.
The bottom left graph shows the petrol injection times (in orange) and the gas injection times (in green).
The bottom right graph shows the lambda oxygen sensor trend.
You can click on “BRC” writing of the changeover switch drawing, or press F5 key on the keyboard, in order to changeover from gas to petrol and vice-versa.



Pic. 5-14
Setting up - Driveability - OL enabled +5%

5.3.1. Leaning in Open Loop (O.L.)

The leaning in Open Loop is maybe the most powerful, innovative and interesting strategy of the driveability setting up to analyse.
This strategy is not suitable for systems installed with Sequent Direct Injection.

What does it mean Open Loop?
As many people knows, during the normal engine working in petrol mode, in load and conditions not too high and not during the tip-in, the petrol quantity with which the engine is supplied has to be measured with a high precision so that it don’t be neither to rich nor too lean, compared to an optimal value, called “**stoichiometric**”.
During the stoichiometric working, the petrol ECU **always correct the petrol quantity, according to the lambda oxygen sensor signal** and always revise the title according to the indication that it obtain. This continuous correction is called “**CLOSED LOOP**”.
When the working conditions are instead of high request of couple/power by the driver (i.e. pressing deeply the accelerator pedal), the petrol injection electronic management usually provides the stoichiometric conditions abandonment, in favour of a mixture richer in petrol, in high percentage too (i.e. the 30%).
In this case the lambda oxygen sensor, often indicates that the air/petrol mixture is rich, but **it can’t supply to the ECU information about HOW is rich**. So the ECU can’t consider this signal in order to correct continuously the injection times, and it **doesn’t work anymore in CLOSED LOOP, but in OPEN LOOP (O.L. since now).**
The aim of leaning in O.L. strategy is to **limit the enrichment** with which the petrol setting up is calibrated for the working in O.L.
In fact if an enrichment of 30% can be an optimal value for the petrol working, can be on the contrary completely intolerable for the gas, above all in case of CNG.
CNG in fact doesn’t burn well in case of rich mixture, causing engine bad working and tugs during the driving.

Working of leaning in O.L. strategy
The leaning in O.L. strategy re-calculates in an independent way, the petrol quantity needed to have a stoichiometric dosage and allows a maximum enrichment that the installer can set up.
If the petrol ECU requires a enrichment higher than the calibrated one, during the gas mode, a limited gas quantity (the calibrated one) will be given.
Instead if the petrol ECU will require a petrol quantity lower than the maximum one allowed by the strategy, no limits will be applied and that gas quantity will be injected.

Calibration of leaning in O.L. strategy
The following steps make reference to a vehicle with equipment correctly installed, the lambda oxygen sensor 0/1V standard connected and with calibration correctly done with the aided procedure and map refinement.
The first step for the strategy calibration consists in select the little box top left called “**Strategy enabling**”. In these conditions, strategy limits the gas quantity to supply according to its calculations and pre-defined values, so that you could already see its effect in full load working conditions (accelerator completely pressed).
ATTENTION: after enabling strategy, it’s better to verify that, during the normal idle gas mode, the gas quantity don’t be too much limited. Check for instance that the lambda oxygen sensor do not stop at low values, or that the OBD adapting stay centred. On the contrary, the engine bad working indicator could turn on in a few seconds.
If this happens, changeover to petrol and repeat the aided procedure be careful to insert the right engine size, the right gas injector type and the other parameters.
Now, the window becomes the same in Picture 5-14, where the OTHER key top left was pressed too.
The ***OTHER*** key visualizes two lines of 16 red and black numbers that you can see at the top, under the writing “Open Loop correction”. A red arrow under these numbers shows the engine condition, pointing to the relative box.
Note that after enabling the strategy, some little square buttons have become available on the left, with the numbers +5, +1, -1 and -5, and a rubber drawing on them.
In the graph in the middle, that you can see in Picture 5-14, there’s the enrichment containment trend in accordance with the rpm, with a blue bend (graph O.L. corr.) which join 16 blue points.
Pressing, for instance, **the +5 key**, the graph lifts up, leaving a dotted line on its original place (see Picture 5-14).
At the same time, the 16 black numbers above the graph increase of 5 units.

The effect will be an increase of 5% of the allowed enrichment limit, with all engine working conditions.

The next thing to do is to **verify on the road** this effect.

1. During the working in gas mode take the vehicle on the road, put, i.e., the second or third gear and reach a low speed, corresponding for instance to 800 or 900 rpm/min, by maintaining the accelerator not too pressed.
2. Press now the rubber button, to star the acquisition.
3. Then make a deep tip-in, until reaching a high engine condition and near the “out of rpm” condition (i.e.: 6500 rpm/min.).
4. Loosen the accelerator and approach as soon as possible, trying to not press it too much.
5. You can see the result in Picture 5-15, where big red points and little green points appear in the central graph.

- **Red points** represent the lambda oxygen sensor value acquired during the rpm increase.

  As you can see, in all conditions, sensor remained high, showing that the enrichment containment has produced a richer mixture than the stoichiometric one.

  So, strategy is not calibrated to limit too much the fuel quantity.

  But we have still to decide if it needs a leaning or not.

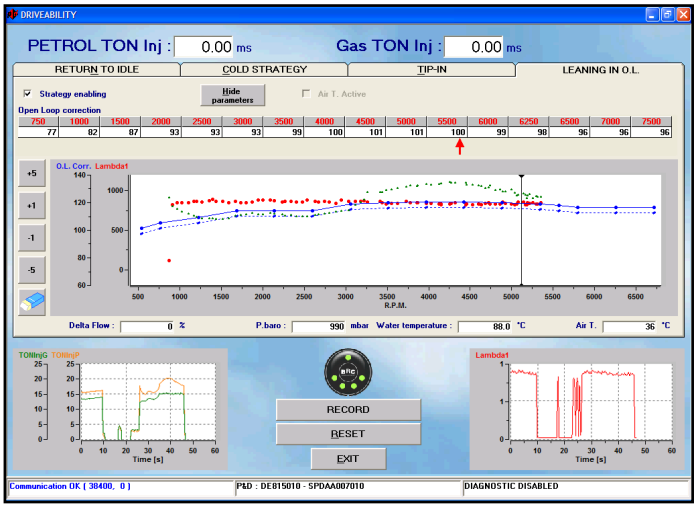
- **Green points** represent the fuel quantity required by the petrol ECU.
  - If green points are above the graph blue unbroken line (as in Picture 5-15, over 3500 rpm/min), strategy leans, bringing the fuel quantity to the blue points level, instead that to the green points one.
  - When green points are under the graph blue unbroken line (Picture 5-15, under 3000 rpm/min), instead, there’s no leaning and the gas quantity is the one wanted by the petrol ECU.

In the previous picture you can see better the strategy effect. The -7% value in the “Delta Flow” box, under the graph in the middle, shows that strategy was leaning in that moment of a 7%. As the sensor stay high, it means that the enrichment required by the petrol ECU is higher than 7% compared to the stoichiometric.

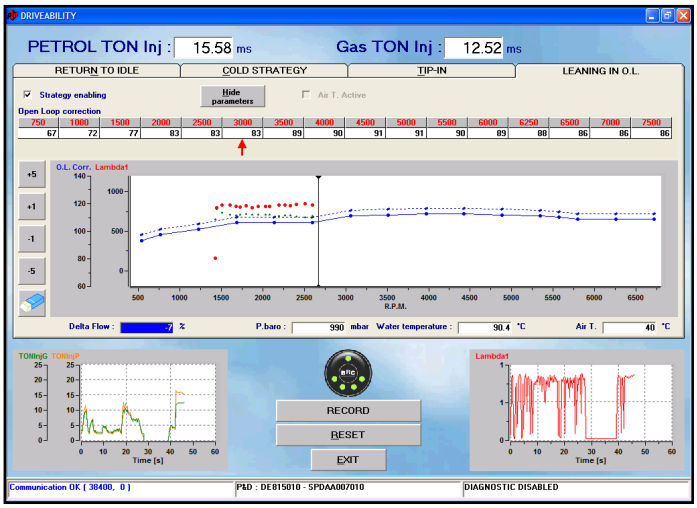
Note, in the middle graph, a black upright pointer between 3000 and 3500 rpm/min, which shows the current engine rotation condition.

Now you can try to lean of a 5% more in all conditions, clicking the “-5” button, then press the rubber button and repeat the acquisition, and so on until the sensor (red points) don’t start to lean.

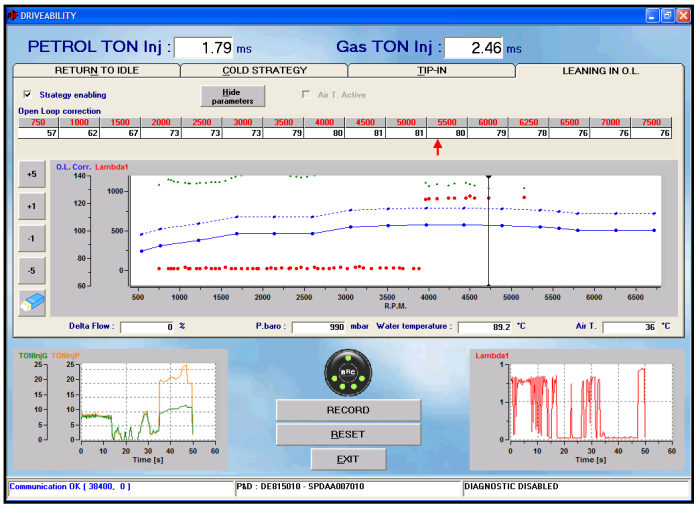
After a couple of trials the result will be the one in Picture 5-17.



Pic. 5-15
Setting up - Driveability - OL road test 1



Pic. 5-16
Setting up - Driveability - Delta flow -7%



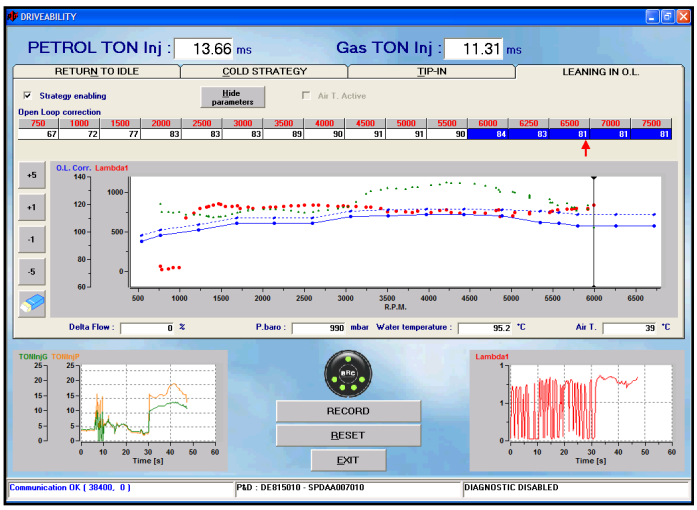
Pic. 5-17
Setting up - Driveability - OL, lean sensor

Note that sensor results lean until roughly 4500 rpm/min, and return rich with higher conditions.

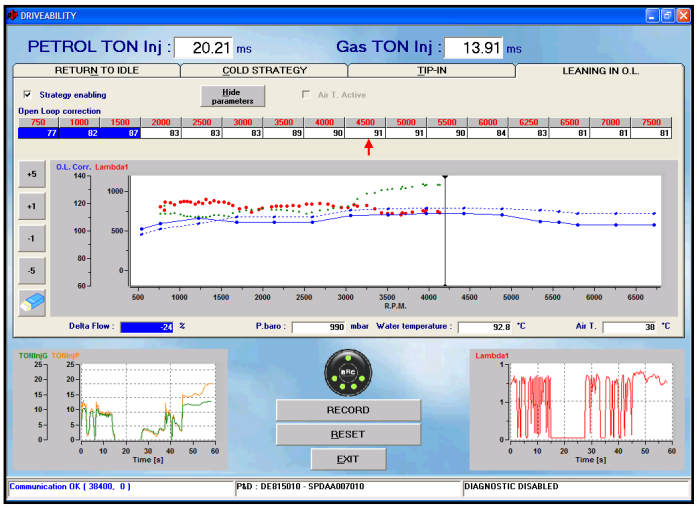
This means that we have leaned too much. We could come back to the previous condition, obtaining an acceptable leaning result, but with some margin, useful to avoid bad strategy intervention during the different working conditions.

You can also, if you want a perfect calibration, precisely set up working in the different conditions, in order to obtain the most uniform working possible.

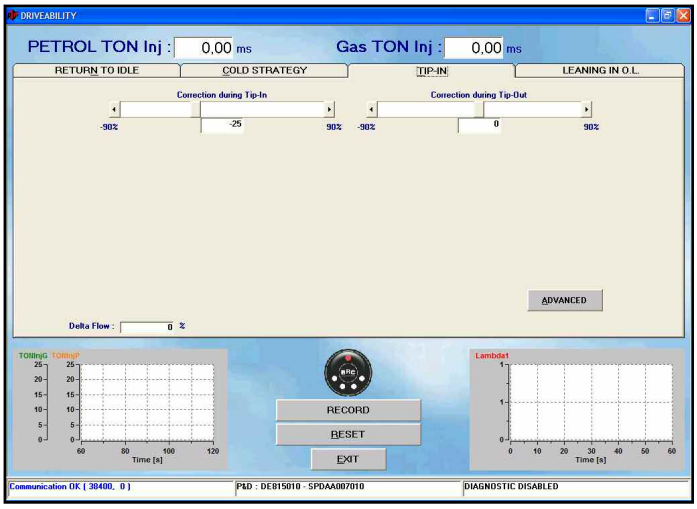
For instance, after having made again a 5% enrichment, it is possible to select the top boxes, relatives to rpm bigger or equal to 4000 rpm/min, and to lean only them.
You have just to click on them, and then press -5, or -1.
The result is the one in Picture 5-18.
You still needed to make a little revision under 1500 rpm/min, where the sensor is lean. The Picture 5-19 shows the final result.
Compare it with the initial trend, represented by the blue dotted line.
NOTE: the leaning in O.L. strategy has always to be calibrated so that remains an enrichment margin enough (at least the 10% over the stoichiometric). Calibrations too near the lean sensor limit risk to intervene too much when working and environmental conditions changing, causing the engine breakdown indicator turning on and the catalysts excessive heating.
It is important to remember that the OBD communication supplies fundamental data for this strategy, for instance the air temperature. Under the right graph you can see, in this case, a little box showing an Air t. 38°C; in absence of OBD communication little box becomes red.



Pic. 5-18
Setting up - Driveability - OL, partial leaning



Pic. 5-19
Setting up - Driveability - OL, final result



Pic. 5-20
Setting up - Driveability - tip-in

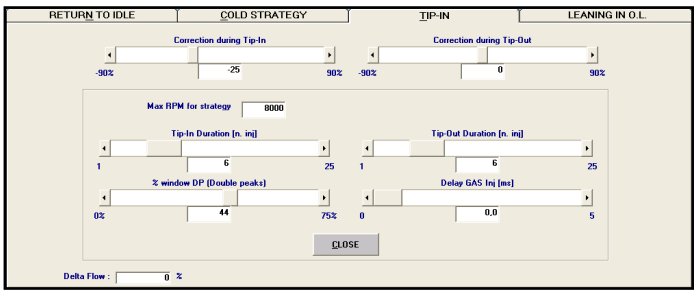
5.3.2. TIP-IN

The tip-in strategy allows to improve the vehicle driveability by the enrichment or the leaning of the mixture in the tip-in, that's to say when there are quick changes of engine working parameters, as MAP and rpm, usually due to quick tip-in or tip-out made by the driver. Strategy is not necessary if map centering and leaning in O.L. calibration already reach good driveability results.
A bad driveability work, in fact, depends on the petrol calibrations, that use strategies that increase very much the injection times after abrupt tip-in and usually decrease them after abrupt tip-out.
Petrol strategy are not always suitable for the gas mode working, above all for the CNG, because the gas doesn't support well excessive enrichments, and because the diffusion and mix of the gaseous fuel injected near the intake valves, happens in a different way from the liquid one.
Tip-in strategy allows compensating easily the changes made by the petrol injection, setting up by means of a pointer the leaning or enrichment wished.
Tests and experience made by the BRC research department allowed obtaining a strategy that don't need the entering of different values for different engine working conditions, but that grants to obtain good results by changing just a parameter 'till the achievement of the best driveability performances for every vehicle.
Obviously you can also correct tip-in and tip-out in a different way, as you can see in Picture 5-20, in order to obtain the wished driveability effect during the two tricks.
Pointer positive values always indicate enrichments, and the negative ones indicate leanings.
Strategy, at the end of aided procedure, will be already enabled and pre-configured automatically with initial standard values that give a good driveability in most cases.
By bringing the corrections during tip-in and tip-out towards zero you obtain the strategy deactivation.

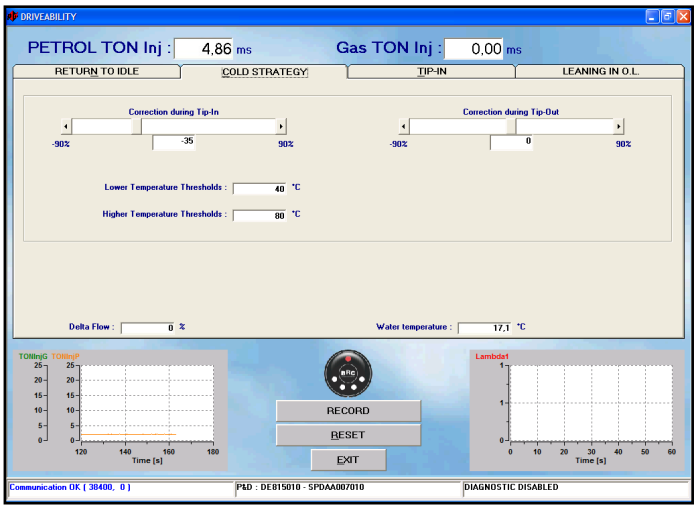
Clicking on *OTHER* key you can change other parameters, but usually it is not necessary (see Picture 5-21).

Let's see them in detail:

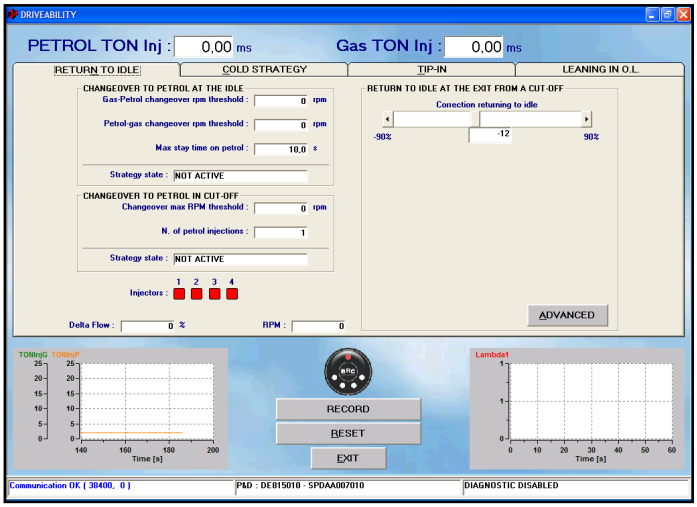
- **Max RPM for strategy**: strategy stops to lean or enrich if rpm surpass the indicated ones.
- **Tip-in duration [n. inj.]**: allows having a more or less extended strategy effect after an abrupt tip-in.
- **Tip-out duration [n. inj.]**: allows having a more or less extended strategy effect after an abrupt tip-out.
- **% window double peaks**: allows to calibrate sensibility with which extra-injections are distinguished by the normal injections. Increasing the value, it's likely that system recognize injections as extra- injections and that strategy operate consequently.
- **Delay Gas Inj**: allows delaying the gas injection beginning in respect to the petrol one. You have to increase it above all when the injection times of gas injectors is often lower than the petrol injectors one.



Pic. 5-21 Setting up - Driveability - tip-in, other



Pic. 5-22 Setting up - Driveability - cold strategies



Pic. 5-23 Setting up - Driveability - Return to idle

5.3.3. Cold Strategies

Cold strategies allow setting up specific values of tip-in leaning or enrichment in case of low temperatures.

Usually in cold condition it is necessary leaning more the tip-in.

So the calibration software will introduce pre-defined values with leaning higher than the ones of tip-in in warm condition. If installer will change the warm pre-defined values (page *"TIP-IN"*), without change the cold ones, also the cold ones will be changed consequently, so that a constant difference can be maintained.

If installer gives a cold correction value different from the pre-defined one, value won't be automatically changed anymore, staying the same of the manually defined one.

Page is very similar to the tip-in one (see Picture 5-22), with the same pointer previously seen.

Moreover there are these two numerical boxes that you can set:

- **Lower temperature threshold**: under this coolant liquid temperature, the tip-in and tip-out corrections are the ones defined in this page instead of the ones defined in the tip-in page.
- **Higher temperature threshold**: over this coolant liquid temperature the tip-in and tip-out corrections configured in this page are completely ignored, in favour of the ones configured in the tip-in page.

Remember that with temperature between these two thresholds, the system use for the correction halfway values between the ones defined in this page and the ones of the tip-in one. This value will be nearer the first ones if temperature is nearer the lower threshold, or nearer the second ones if temperature is nearer the higher threshold.

Bottom right there's also the current value of coolant liquid temperature.

5.3.4. Return to Idle

In Picture 5-23 you can see the window appearing after selecting the ***Return to idle*** folder.

As you can see, in this folder there are three different strategies:

- **Changeover to petrol at idle**
- **Changeover to petrol in cut-off**
- **Return to idle at exit cut-off**

Afterward we'll describe better these three strategies.

Note at the bottom the little squares sequence, that in Picture 5-23 are red and numbered from 1 to 4.

They represent the supply state of every cylinder: when the box is red, the relative cylinder is supplied with petrol in that moment, and when it's green, it's supplied

with gas. This visualization allows keeping under control the working of the strategies that we'll describe afterward.

5.3.4.1. Changeover to petrol at idle

This strategy resolves possible problems in the return to idle, on vehicle where you can't solve this problem in a different way.
Strategy allows making a petrol changeover for few moments during the return to idle, with an unimportant petrol consumption, but permitting to avoid the engine switching off or the excessive RPM decrease.
Parameters on which it can act are:

- ***Gas-Petrol changeover rpm threshold***: when rpm are lower than the value in this box, strategy is enabled and vehicle changes over to petrol. In Picture 5-23 there's the 0 pre-defined value: it disables in fact the strategy.
- ***Petrol-gas changeover rpm threshold***: when rpm are higher than the value in this box strategy is immediately disabled and vehicle re-changes over to gas, not depending on the elapsed time. In Picture 5-23 there's the 0 pre-defined value: it disables in fact the strategy.
- ***Max stay time on petrol***: with this time elapsed strategy ends its effect, and vehicle re-changes over to gas, not depending on the rpm. In Picture 5-23 there's the pre-defined value of 10 seconds.

NOTE: besides that on the injectors state representation at bottom page, you can also check the strategy current state in the *"Strategy state"* box.

5.3.4.2. Changeover to petrol in cut-off

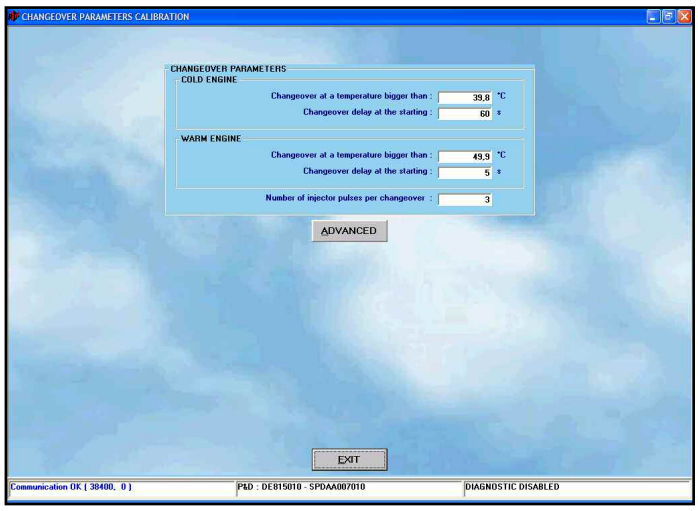
This strategy resolves possible problems during the rpm decrease due to a cut-off (momentary injectors switching off during deceleration) on vehicle where you can't solve this problem in a different way. It can be necessary use this strategy for instance in order to prevent engine switching off due to a sudden transmission clutch pressure with consequent quick rpm decrease.
Strategy allows making a petrol changeover for few moments after a cut-off, with an unimportant petrol consumption, but permitting to avoid the engine switching off or the excessive RPM decrease.
Parameters on which it can act are:

- ***Changeover max RPM threshold***: when rpm are lower than the value in this box, strategy is enabled and vehicle changes over to petrol. In Picture 5-23 there's the 0 pre-defined value: it disables in fact the strategy.
  If RPM signal is not connected and you want to enable the strategy, you need to introduce a very high value (i.e. 8000 rpm/min) so that you don't have errors in the rpm value read in cut-off.
- ***N. of petrol injections***: determines the strategy maximum duration. After the injections number indicated in this box (counted on the first injector), system re-changes over to gas. In Picture-5 23 there's the pre-defined value of 1 injection.

NOTE: besides that on the injectors state representation at bottom page, you can also check the strategy current state in the *"Strategy state"* box.

5.3.4.3. Return to idle with cut-off

This strategy allows to set up a leaning or an enrichment that will be applied immediately at the exit from cut-off.
Usually, a not too hard leaning can help to improve the rpm decrease after a off, permitting to prevent switching off and to avoid an excessive rpm decrease.
Strategy works as in case of tip-in, but normally leanings needed are less.
After the aided procedure a pre-calibrated value is automatically applied.



Pic. 5-24
Setting up - changeover parameters calibration

5.4. CHANGEOVER

This window allows to modify parameters for the changeover from petrol to gas. There are two sections with capital writings (see Picture 5-24):

1. COLD ENGINE
2. WARM ENGINE

The first calibrates the petrol/gas changeover happening when vehicle starts from cold condition, i.e. after a long stop without starting the engine.
The second calibrates the changeover happening when vehicle is already warm, i.e. when you start it after a not too long stop.
Reference temperature is the engine coolant liquid one, read by the sensor in the pressure reducer.
In the ***Cold engine*** section you can introduce the followings data:

- *Changeover at a temperature bigger than*
- *Changeover delay*

When the coolant liquid reach the set temperature, changeover happens, provided that a time equal or bigger than the *"Changeover delay"* one, is passed since the engine starting.
You can find similar parameters in ***Warm engine*** section. If the coolant liquid temperature is higher than the one set up in the *Warm engine* section, the parameters contained in *Cold engine* will be ignored and just the warm engine ones will be considered.
Vice-versa, with temperature lower than the *Warm engine* one, just the parameters relating to the cold engine will be considered.
For instance, considering the parameters that you can see in Picture 5-24, we'll have

the changeover when at least one of the two followings situations will happen (the first that happens, it wins):

1. The coolant liquid has a temperature bigger than 39,8°C and more than 60 seconds are passed since the engine starting.
2. The coolant liquid has a temperature bigger than 49,9°C and more than 5 seconds are passed since the engine starting.

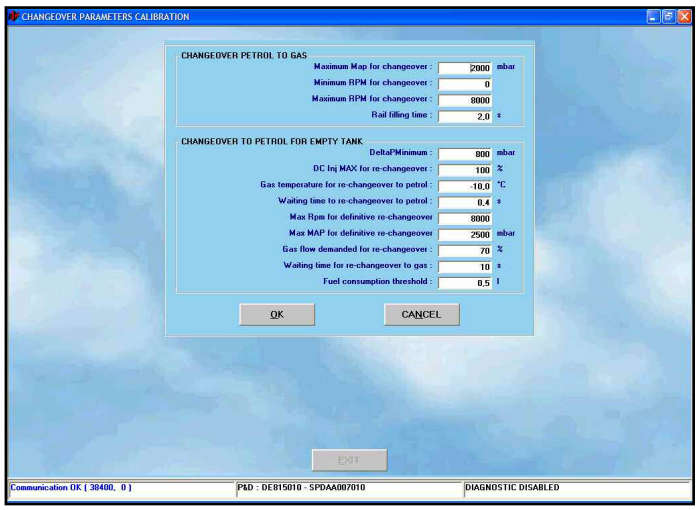
So it's clear that with warm engine changeover will happen within 5 seconds or little more, instead with cold engine you'll have to wait at least one minute.

The ***"Number of injector pulses per changeover"*** parameter allows to set up the speed with which the sequential changeover from petrol to gas happens, and vice-versa (BRC patent). Practically, you can define how many injections each gas injector has to do before the next one starts to change over. With a value of 3 injections as in Picture 5-24, doing the example of a 4 cylinders vehicle, after the first injector changeover there will be 3 injections where 3 cylinders will be still supplied with petrol and just one with gas, then for 3 injections there will be 2 cylinders in gas mode and 2 in petrol mode, after other 3 injections there will be 3 cylinders in gas mode and 1 in petrol mode, and finally after 3 further injections also the last gas injector will be enabled.

The ***OTHER*** key allows to set up other parameters for the petrol/gas changeover and to manage the re-changeover gas/petrol, usually due to gas lack in the tank, or to a too low gas temperature (see Picture 5-25). We suggest to modify parameters in this window only with the BRC technician aid.

Parameters that you can set in ***"Changeover Petrol to Gas"*** section allow managing the normal changeover from gas to petrol. They are:

- ***Maximum Map for Changeover:*** it corresponds to the absolute pressure value in the intake manifold, over which the gas changeover is blocked. Introducing here a value of "2000", as in Picture 5-25, changeover is possible just with MAP values lower than 2000 mbar (practically always).



Pic. 5-25 Setting up - Changeover - OTHER key

- ***Minimum RPM for changeover:*** it corresponds to the rpm value under which the gas changeover is blocked. Introducing here a value of "0", as in Picture 5-25, changeover is possible with any rpm value.
- ***Maximum RPM for changeover:*** it corresponds to the rpm value under which the gas changeover is blocked. Introducing here a value of "8000", as in Picture 5-25, changeover is possible just with rpm values much lower than 8000 rpm/min (practically always).
- ***Rail filling time:*** it is the time that passes, during the changeover, from the solenoid valves opening to the beginning of the first injector changeover. This time attends to bring in pressure the system before the changeover. Introducing here a value of "2", as in Picture 5-25, changeover starts 2 seconds after the solenoid valves opening.

Parameters that you can set in ***"Re-changeover to petrol for empty tank"*** section allow managing the changeover from gas to petrol, due to gas pressure lack, to impossibility for the gas injectors to supply enough fuel (excessive duty cycle), or to gas temperature too low.

Parameters are:

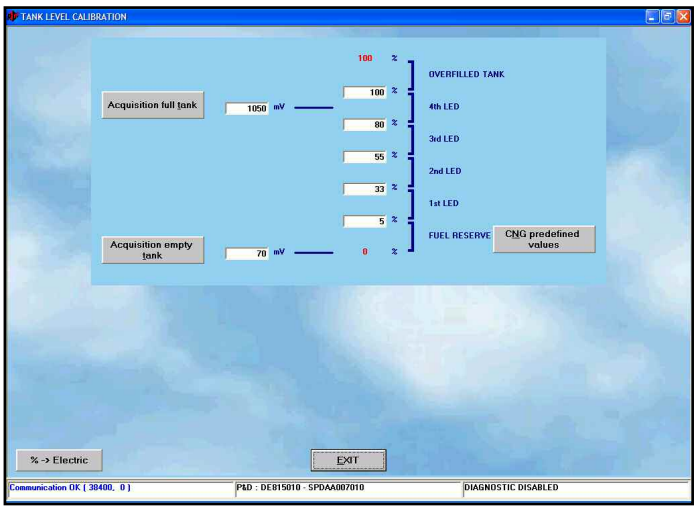
- ***DeltaP Minimum:*** it corresponds to the DeltaP value (difference between the gas pressure in the rail and the MAP) under which happens the re-changeover to petrol. In the example of Picture 5-25 a DeltaP lower than 800 mbar causes the re-changeover to petrol for empty tank.
- ***DC Inj MAX for re-changeover:*** it corresponds to the gas injectors duty cycle threshold over which happens the re-changeover for reaching the maximum gas injectors duty cycle.
- ***Gas temperature for re-changeover to petrol:*** if gas temperature become lower than the defined value (-10°C in the example of Picture 5-25), system re-changeover to petrol, in order to prevent bad working due to too low temperatures.
- ***Waiting time for re-changeover to petrol:*** it shows the time elapsing between recognizing a possible cause of re-changeover to petrol and the real re-changeover. Also if there are the conditions to turn into petrol mode, therefore, the change won't be instantaneous if this parameter is not zero.
- ***Max Rpm for definitive re-changeover:*** if re-changeover to petrol happens with rpm condition lower than this threshold, it is considered as definitive and the system don't retry the gas supply and notice immediately the user by means of a buzzer (or acoustic indicator).
- ***Max MAP for definitive re-changeover:*** if re-changeover to petrol happens with a MAP lower than this threshold, it is considered as definitive and the system don't retry the gas supply and notice immediately the user by means of a buzzer (or acoustic indicator).
- ***Gas flow demanded for re-changeover:*** system will retry to changeover to gas, after a re-changeover to petrol not definitive, just when the gas flow will decrease under the percentage set in this parameter, in respect to the conditions in which the re-changeover to petrol was happened.
- ***Waiting time for re-changeover to***

gas: when conditions allowing the coming back to normal gas mode are recognized, also if it was necessary turn into petrol mode for a moment, system still waits this time before re-changeover.

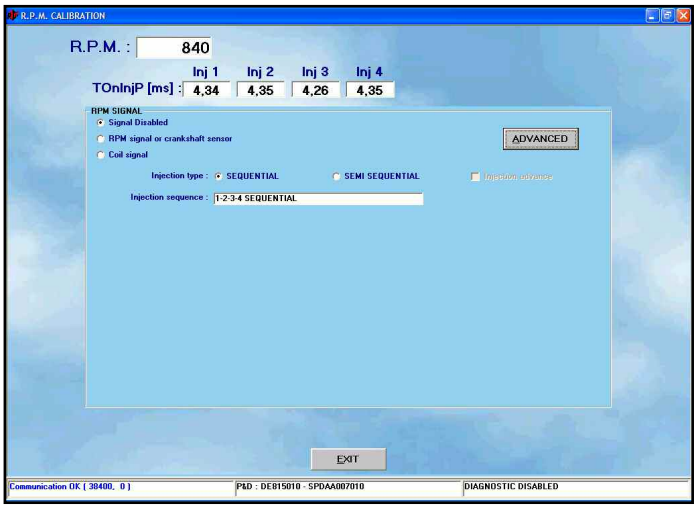
- ***Fuel consumption threshold:*** this threshold detects, on the basis of setting parameters, when you consumed roughly 0,5 litre of petrol after a re-changeover not definitive to petrol for empty tank. When this will happen, the acoustic indicator will emit a short sound, in order to notice to the driver that he's consuming petrol also if on the changeover switch is selected the gas mode.

5.5. LEVEL CALIBRATION

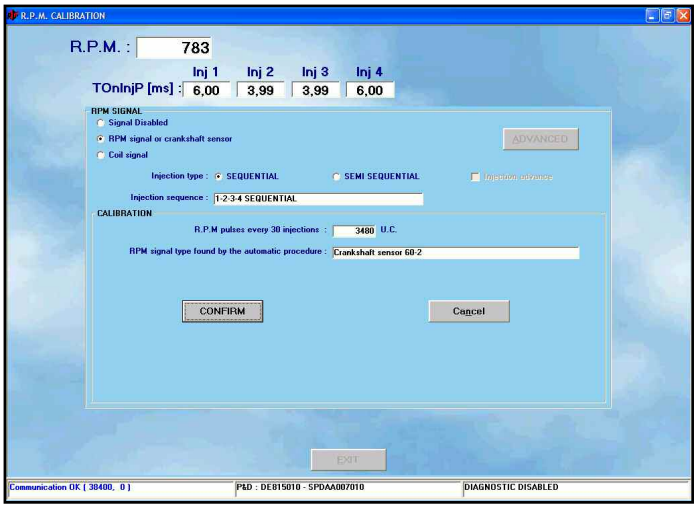
This section allows doing the calibration of the signal coming from the tank level sensor, so that you could correctly visualize the level on the changeover switch LEDs.
As always, values displayed on the screen are the ones present in the ECU.
In order to have a correct calibration you have to park the vehicle with empty tank and acquire the level sensor signal in these conditions, by clicking on *Acquisition empty tank* key; the recorded value appears in the box near the button (see picture 5- 26). After doing a gas refuelling it is sufficient click on *Acquisition full tank* key, and the recorded value appears in the box near the button.
Clicking on *CNG predefined values*, standard values are automatically set up, and in most cases they agree with the correct calibration of BRC resistive pressure gauge. In this way you can reset very quickly a calibration approximately working.
As you can see in picture 5- 26 you can set some percentages that discriminate the passage among the different levels and the consequent change in the number of changeover switch LEDs turned on. Normally these values are already defined so that you can have a level balanced subdivision. However, if you want to increase or decrease the staying in one of the levels, in order to better set up the indication, you have just to modify manually these values.
Clicking on *%->Electric* the window values are expressed in milliVolt instead that in percentage. Clicking again on this button you reset the visualization in percentage.



Pic. 5-26
Setting up - tank level calibration



Pic. 5-27
Setting up - RPM



Pic. 5-28
Aided procedure - rpm calibration - confirm

When ended and verified the calibration, you can continue clicking on the *Exit* key. If settings have been modified, you have to confirm them by clicking then on *YES*, when required.

5.6. RPM

You can select *"Signal disabled"*, *"RPM signal or crankshaft sensor"* e *"Coil signal"*. The aided procedure will calibrate automatically RPM so that the signal is disabled and, therefore, you don't need to connect the grey wire of the wiring.
In case of disabled signal or coil, it won't be necessary to calibrate the rpm signal and it will be enough to select the injection type between *SEQUENTIAL* and *SEMI SEQUENTIAL*, be careful in verifying that the read rpm are correct in the top left box.
Selecting *"RPM signal or crankshaft sensor"*, after opportunely connecting the grey wire of the wiring, the program will require to maintain the engine in idle condition and in petrol mode and it will proceed automatically to recognizing the correct signal type (pic-

ture 5-28).

Therefore, it will be required the confirm that the rpm number is correct and, in this case, it will be enough to confirm and continue.

If the system won't be able to recognize a rpm signal among the pre-defined ones, the message "None pre-defined configuration" will be shown and system will try to calibrate itself automatically, according to the frequency of the pulses received on the rpm signal wire in a determined number of engine cycles.

In this case check that rpm are correctly read and eventually check the electric connection.

NOTE: for this automatic recognition is very important that the SEQUENTIAL or SEMI SEQUENTIAL setting be the correct one.

Ended and verified the settings, you can exit from the page and eventually save changes made by clicking on *PROGRAMMING* key.

Note the text box *"Injection sequence"* in the middle of the screen.

If rpm signal is correctly connected, system arrives, in most cases, to automatically determine both the injection sequence and the injection type, sequential or semi-sequential, on the basis of the rpm signal and petrol injectors.

If data in the box don't agree with the ones known by the installer, it is necessary to check the installation, especially the petrol injectors and rpm signal connection or the setting introduced in the software.

5.7. MAP

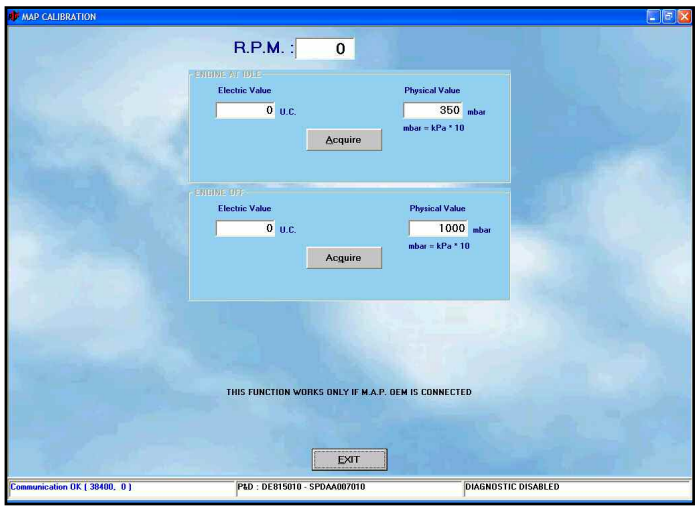
If into "equipment type" is selected an OEM MAP sensor (that's to say present in the vehicle original equipment), it is necessary to make the sensor calibration, by using this page (see picture 5-29).

Procedure is simple and intuitive:

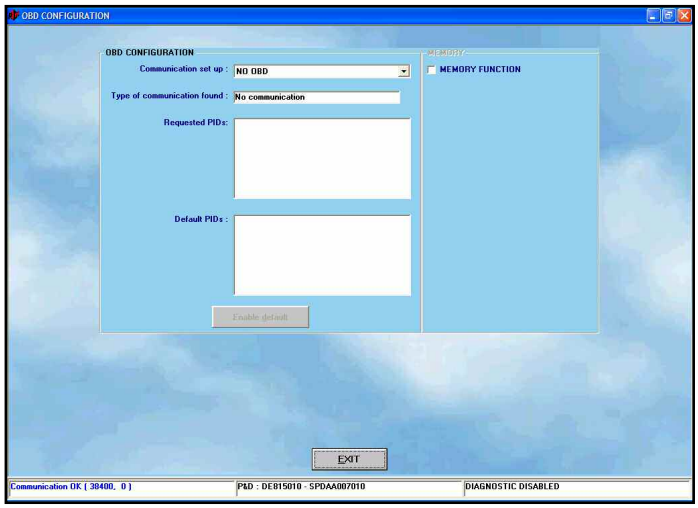
1. Place yourself with engine switched off and the control board turned on and click on *ACQUIRE* in the Engine Off section (the lowest).
2. Switch the engine on, put in petrol mode and wait for engine steady condition, then click on *ACQUIRE* in the Engine at Idle section (the highest).

During the second step you can introduce a MAP physical value different from the 350 mbar automatically suggested, in order to be nearer to the real MAP value in idle conditions. This value can be for instance obtained from an OBD tester or from the data visualization page, if OBD communication is enabled.

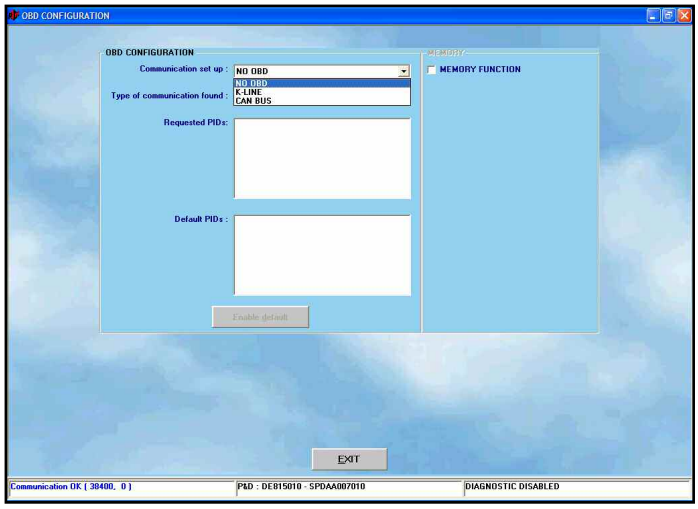
If atmospheric pressure is too different from 1000 mbar (i.e. in high mountain), you can in the same way introduce a MAP physical value different from the 1000 mbar automatically suggested in the first panel.



Pic. 5-29
Setting up - MAP



Pic. 5-30
Setting up -
OBD configuration



Pic. 5-31
Setting up -
OBD configuration,
communication set up

5.8. OBD CONFIGURATION

When vehicle is equipped with communication in accordance with the norms about the On Board Diagnostic, called "OBD", you can acquire data supplied from the petrol ECU and use them both as an aid for the installer during the setting up, and by the strategies contained in the ECU in order to have a more accurate working that could be repeat.

After choosing the relative button, the page will become as the one in picture 5-30.

Note at the top the possibility to choose the communication type, as you can see in picture 5-31.

You have to introduce the right kind of communication and connect the equipment wires in the correct position of the vehicle OBD intake.

You can define the communication type, and thereby the kind of connections to make, by connecting an OBD tester, that you can buy from BRC with the code DE805500, at the vehicle intake.

As soon as the tester will make the communication, it will supply the kind of it with a number form 1 to 9.

Connections and selection will have to follow the indications shown in this table.

Communication type on OBD tester	Communication to set up on S P&D interface	Wires to connect
From type 1 to type 3	K-LINE	White on pin 7 OBD intake
Type 4 or type 5	Not available	-
From type 6 to type 9	CAN BUS	Yellow on pin 6 and yellow/black on pin 14 OBD intake (plait)

Now communication should activate itself and show something similar to picture 5-32.

Inside the box *"Type of communication found"* you can read the kind of communication with which the petrol ECU is communicating with the gas system.

The *"Default PIDs"* box indicate parameters that you can read from the OBD communication, that are very important for our system.

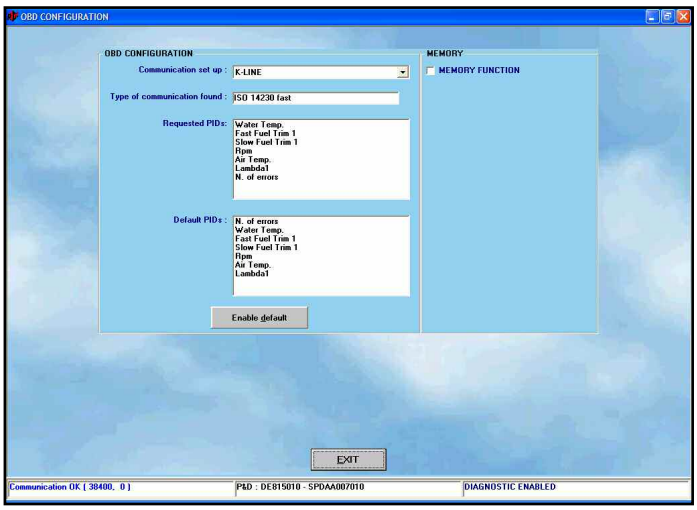
The *"Requested PIDs"* box indicate parameters that the petrol ECU is really transmitting to the gas system.

The *"Enable default"* key allows introducing the parameters contained in the default PIDs box, if not yet present.

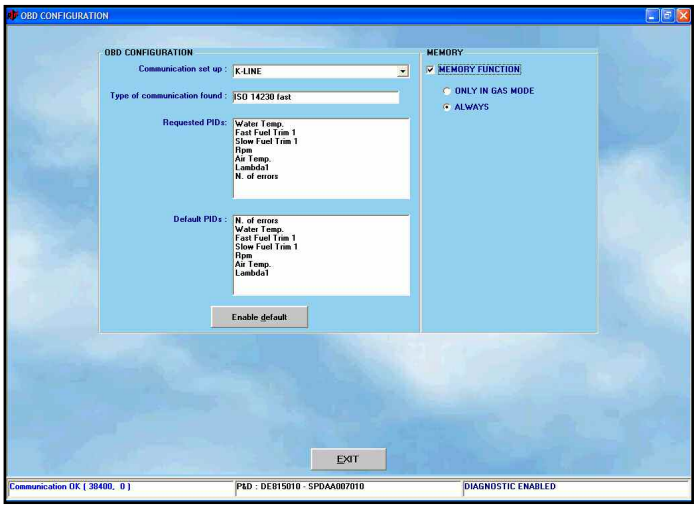
In fact, if there are not PIDs requested, the only presence of the communication doesn't guarantee that the gas system really read the data.

Selecting the "Memory function" box, you enable the erasing of diagnostic errors recorded by the petrol ECU.

You can make the erasing in each condition, or only during the gas working mode, as you can see in picture 5-33.



Pic. 5-32
Setting up - OBD configuration, communication enabled



Pic. 5-33
Setting up - OBD configuration, Memory function

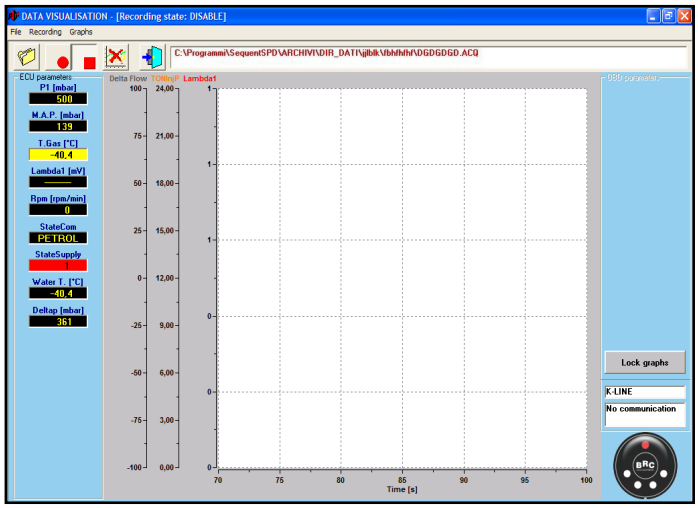
6. DIAGNOSTIC

6.1. DATA VISUALIZATION

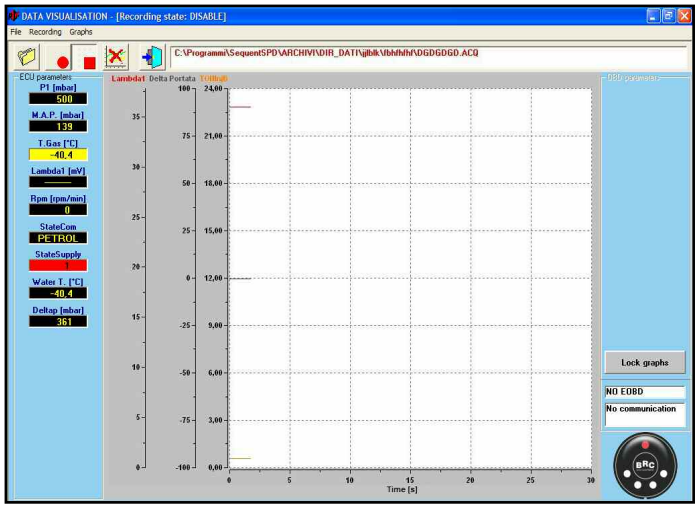
Clicking on *DIAGNOSTIC* button bottom in the main window and selecting *Data Visualization* in the right side of the screen, as you can see in picture 6-1, you enter the page shown in picture 6-2, where you can visualize the different ECU working parameters, both in numeric way and as a graphic.
As you can see in picture 6-2, numerical values are in column at the left of the screen, in a zone called *"ECU parameters"*.
At the right of the screen there is a zone *"OBD parameters"* where appears numerical values of the data acquired by means of the OBD **communication** with the petrol ECU.
In picture 6-2 there are some values, but in absence of OBD communication the zone will be empty and in the little box down right this absence will be noticed, as you can see in picture 6-3.
In the middle you can see the **graphics**, that can be divided into one, two, or three windows, as you can see in picture 6-3, picture 6-4 e picture 6-5.
In order to add or remove a graph window, select "Graphs" from the menu, as shown by the arrow in picture 6-5.
In order to add new parameter in each graph, you have just to right-click and select the parameter, as you can see in picture 6-6: data visualization, add graphs parameters. You can introduce at most 10 parameters displayable at the same time, distributed as you prefer on the 3 graphs. At the left of each window are shown the different vertical axis and the parameters name displayed.
You can't display the same parameter in more than a window at the same time.
Always clicking on "Graphs" and selecting "Lock graphs", or by clicking on the button shown in picture 6-7, you can suspend the new data layout, blocking the graphs in the condition of the moment and analyse the already acquired data.



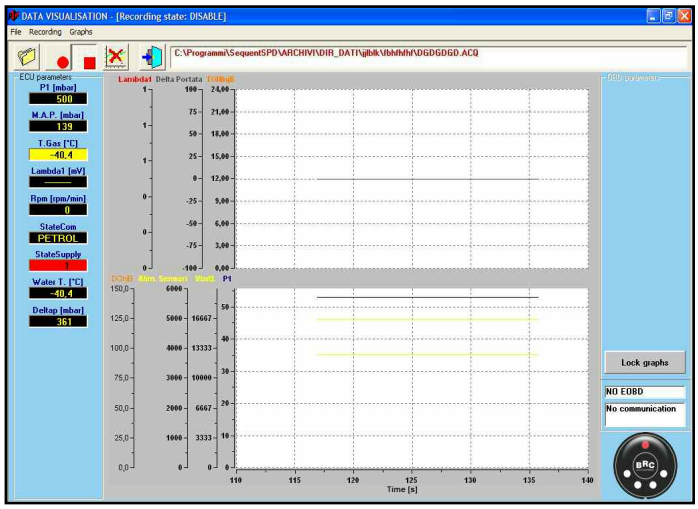
Pic. 6-1
data visualization selection



Pic. 6-2
data visualization with OBD



Pic. 6-3
data visualization without OBD



Pic. 6-4
data visualization, 2 graphs

After blocking the graphs, the page will become the on shown in picture 6-8, where some analysis instruments appears, as shown by the arrow in the picture.

Moving the mouse pointer on each one, you can see for few seconds a writing describing its function.

- Selecting **the cross**, on the left, a red upright pointer appears in the graphs (see picture 6-9).
  You can move the pointer to the right and left to display at the right side of the graphs the parameters value in that point.
- Selecting **the hand lens with symbols + and -** you can zoom on a graph parts to have a more detailed analysis.
- Selecting **the crossed lens** you can make the reverse and display all the acquired data.
- Selecting **the diskette** you can save a file with the data image (snapshot).
- Selecting **the data sheets** you can save an acquisition of displayed data, which you can manage with Excel or other electronic spreadsheet.
- Selecting **the printer** you can print graphs.

You can unlock again the graphs by clicking on “Graphs” and selecting “Unlock graphs”, or by clicking on the button shown in picture 6-7.

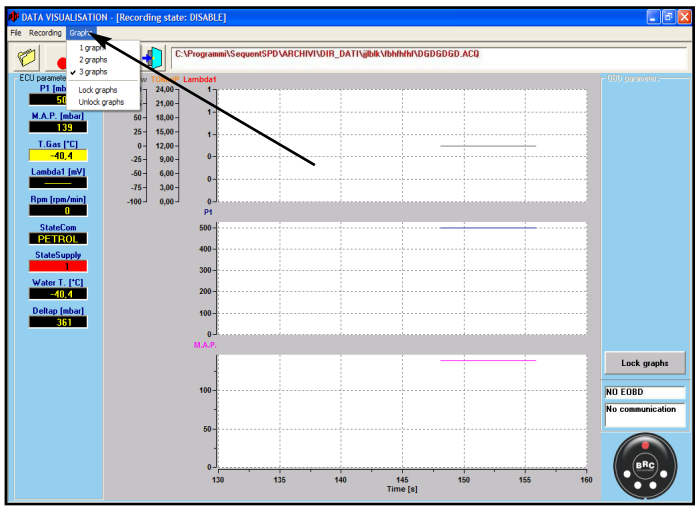
6.1.1. Recording parameters

The first button on the left, which you can see in the icon list in picture 6-10, allows changing the recording parameters, that’s to say the file name and other information with which the trend of the different parameters acquired by the PC will be recorded. Clicking on the button, a page as the one in picture 6-11 will open.

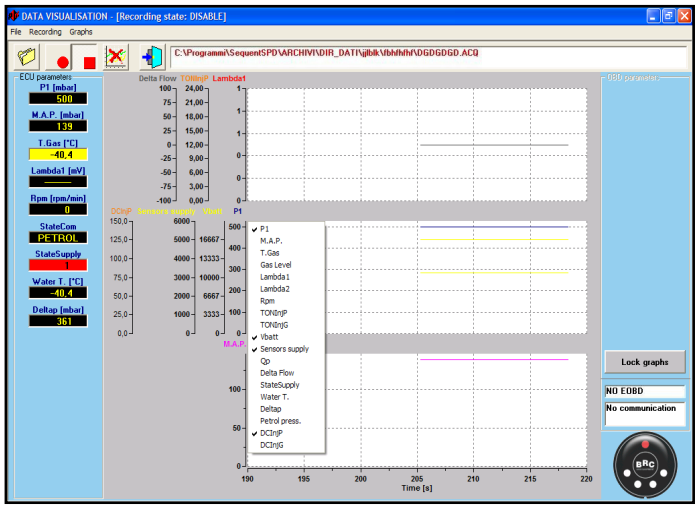
You can obtain the same effect selecting *”File”* from the menu (top left) and then *“Recording parameters”*.

In the middle top of the screen there’s a big box where previous acquisition characteristics are shown.

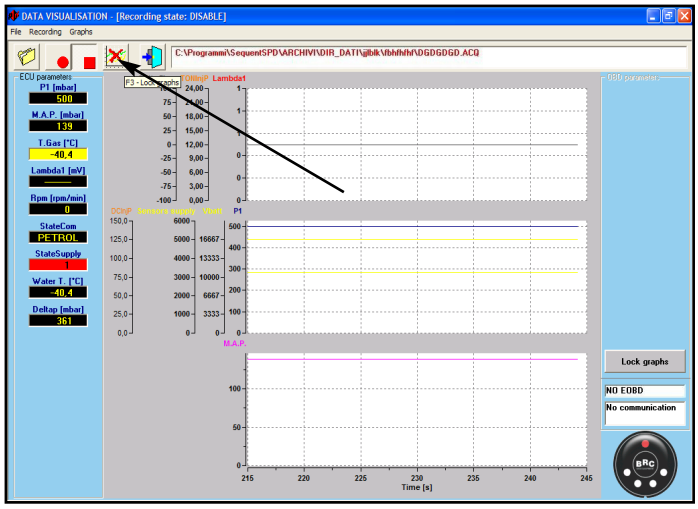
Just below there’s a table called *“Data Sheet”*, where there are different boxes to fill in: it is necessary to introduce *Trademark*, *Model*, and *Plate/Identificative*. Other data (*Year*, *Engine code*, *ECU type*,



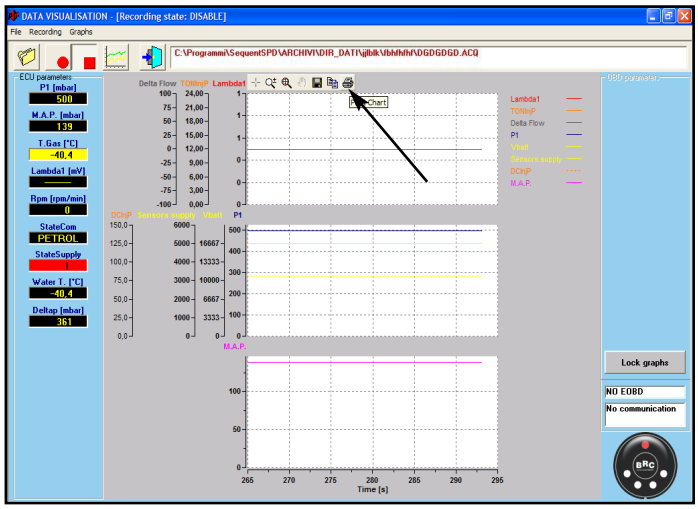
Pic. 6-5
data visualization, 3 graphs



Pic. 6-6
data visualization, add graphs parameters



Pic. 6-7
data visualization, lock graphs key



Pic. 6-8
data visualization, lock graphs

Power, *Fuel Equipment type*, *Notes*) are optional and will be recorded as a memo in the file that will be acquired.

Supposing give to *Trademark* the value "Fiat", to *Model* the value "Stilo", and to *Plate/Identificative* the value "PROVA 1", then the acquisition file will have, for instance, the following name and path:"**C:\BRC Gas Equipment\Sequent Plug & Drive\DATABASE\FOL_DATA\Fiat\PROVA 1.ACQ**" (its position could change according to the used PC setting ad to the folder in which the program SEQUENT PLUG & DRIVE has installed). Clicking on *Record*, you create the file in which you will make the data acquisition. Instead if you click on *Exit*, data won't be recorded and you'll come back to the previous page.

Note that in the top box the new record is recorded, so that the next time you could choose it easily, without need to rewrite it. By choosing it, in the boxes below all data introduced will appear, the notes added too.

6.1.2. START/RESTART RECORDING

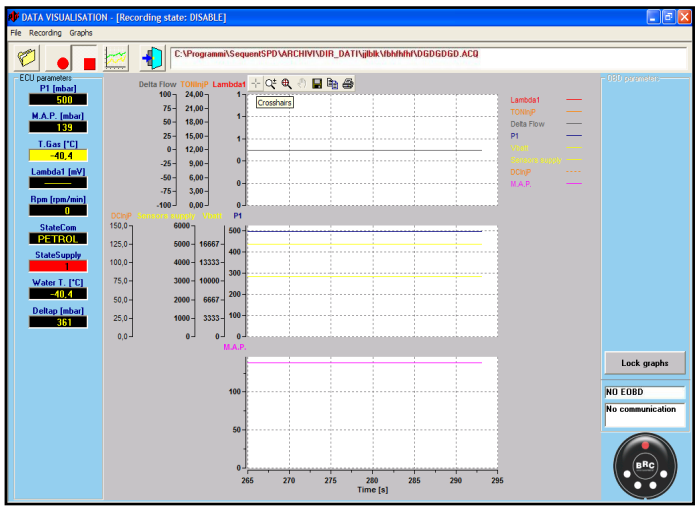
If you press the second button from the left, with a red circle inside (as the REC button of a recorder: see picture 6-12), it starts the data acquisition.

When data acquisition is enabled, button changes, showing two upright parallel lines (as the PAUSE button of a recorder). If you press it in these conditions, you suspend the acquisition and the button turn again into the red circle. Still pressing it in these conditions, acquisition will restart, adding the new data to the previous ones, without erase them. Also some data present in the PC previously to the recording restart will be recorded.

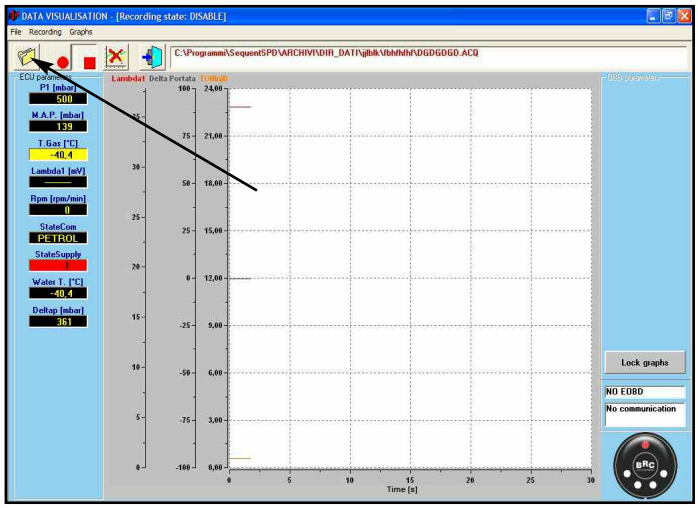
You can make the same operations by selecting *"Recording"* from the menu (top left), and then *"Start/Restart recording"*, or by clicking MAIUSC+F2, MAIUSC+F5, MAIUSC+F9, form the keyboard too.

You can also suspend the recording in every moment pressing the STOP next little button, where there's a little red square (as the STOP button of a recorder).

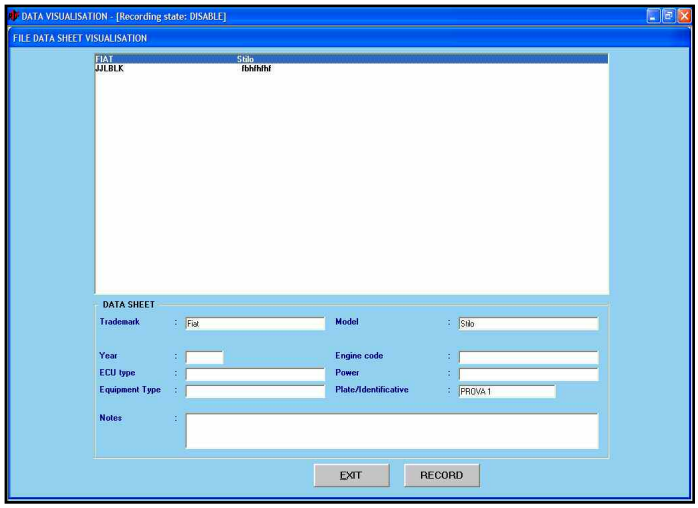
Clicking again on the recording key, the acquisition will restart, adding the new data to the previous ones, without erase them. In that case, differing from the suspension with



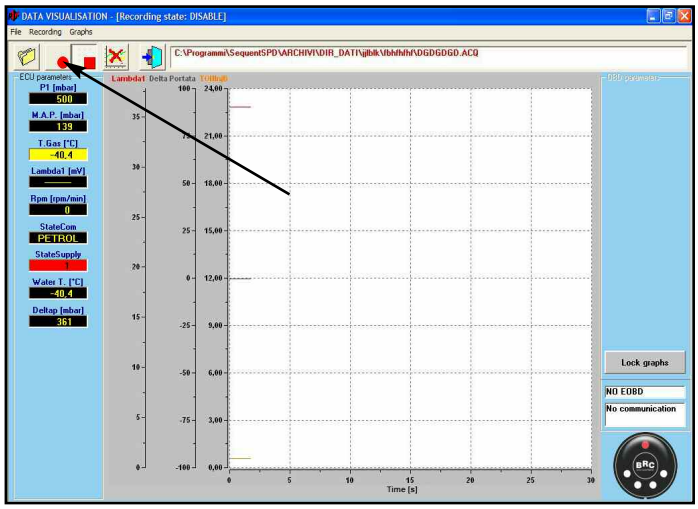
Pic. 6-9
data visualization, pointer



Pic. 6-10
recording parameters



Pic. 6-11
Diagnostic -
Data visualization -
Data recording



Pic. 6-12
Start and restart recording

the STOP button, data present in the PC previously to the recording restart won't be recorded.

6.1.3. Lock graphs

The fourth button from the left locks the graphs and the numerical values in display. At the beginning it contains a graph drawing with a red cross on it. By clicking it, graphs are frozen in the current condition, and numerical values stop to change; on the button there won't be anymore the red cross, but just the graphic drawing.
Clicking again on the button, graphs are erased and restart their layout from zero, and numbers restart to change.

6.1.4. Page exit

The fifth button from the left, top of the data visualization page produces the exit from the page.
You can make the same thing by clicking on "ESC" on the keyboard.

6.2. ACTUATORS TEST

Clicking on "*ACTUATORS TEST*", that you can see in picture 6-1 bottom left, you enter the page dedicated to the system actuators working verification (see picture 6-14), where you can test:

- The right sequence of injectors connection
- The working of each gas injector
- The working of the system main relay
- The working of the two solenoid valves
- The working of petrol injectors cut function
- The working of each LED of gas level visualization
- The working of the changeover switch buzzer
- The working of changeover switch button

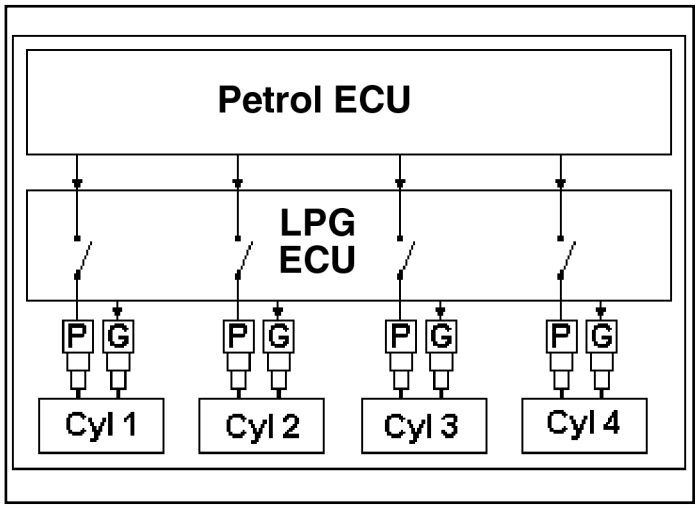
Let's see how to use the *"Injectors"* panel in picture 6-14 to verify the injectors right connection sequence.

6.2.1. Injectors sequence

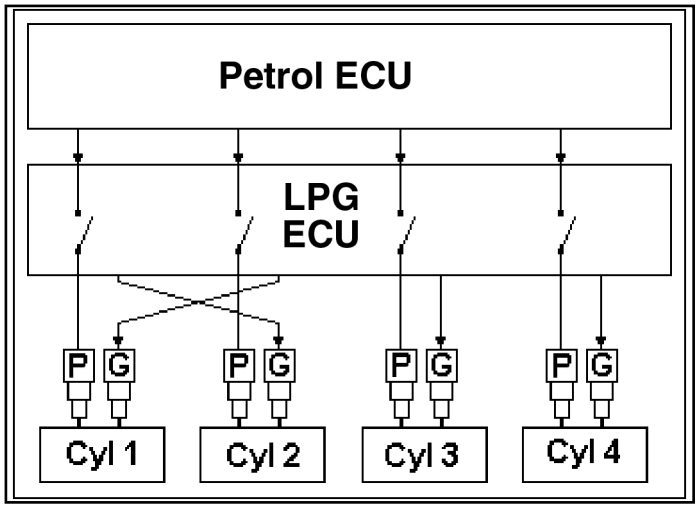
Once you made the ECU mapping it's important to verify the right correspondence among the injectors that's to say that the signal coming from the petrol injector 1 be the one that guide the gas injector 1 and so on for the other injectors.
From some tests we've seen that probable errors in this kind of connection don't cause, normally, big problem during the vehicle working in steady condition, but they are stronger in all the tip-in conditions and during the changeover.
During the changeover, particularly, the reverse of two injectors can produce strong damages because for some time you'll have a cylinder not supplied, and another one supplied with petrol and gas at the same time.
In picture 6-14, you can see an example of injectors right connection; on the contrary, in picture 6-15, you can see a reverse error of gas injectors 1 a 2.
In SEQUENT PLUG & DRIVE system changeover is managed so that just one injectors at a time will be change over; in this way the passage from petrol to gas and vice-versa will be less sensitive. Practically, in a four cylinders engine, we pass from petrol working to a working with three cylinders in



Pic. 6-13
Diagnostic - Actuators test



Pic. 6-14
Example of right installation



Pic. 6-15
Example of wrong installation

petrol mode and one in gas mode, then with two cylinders in petrol mode and two in gas mode, therefore with only one cylinder in petrol mode and three in gas mode, and finally all cylinders are supplied in gas mode. Between an injector changeover and the next one, will have to pass a defined number of engine cycle (normally 3) that you can set from the installer's program.

In case of right installation, as in picture 6-14, during the changeover it happens the following:

- In a defined moment the petrol injector 1 is cut and the gas injector 1 is piloted: ok.
- After 3 injections the petrol injector 2 is cut and the gas injector 2 is piloted: ok.
- After other 3 injections the petrol injector 3 is cut and the gas injector 3 is piloted: ok.
- After other 3 injections the petrol injector 4 is cut and the gas injector 4 is piloted: ok.

In this case it results that during the changeover all cylinders are supplied in continuity and with only a kind of fuel at a time.

In case of wrong installation, as in picture 6-15, during the changeover it happens the following:

- In a defined moment the petrol injector 1 is cut and the gas injector 2 is piloted: cylinder 1 remains without fuel and the 2 is supplied with gas petrol together.
- After 3 injections the petrol injector 2 is cut and the gas injector 1 is piloted: now the engine turn again regularly because the cylinders 1 and 2 are supplied with gas.
- After other 3 injections the petrol injector 3 is cut and the gas injector 3 is piloted: ok.
- After other 3 injections the petrol injector 4 is cut and the gas injector 4 is piloted: ok.

Practically, during all the first phase the cylinder 1 don't appear as supplied whereas the cylinder 2 works at the same time in petrol and gas mode.

In order to find easily eventual errors in the injectors electric connection you can use the actuators test page, in the injectors section, that you can see top in picture 6-14 (that you can reach in *Diagnostic > Actuators Test*).

Entering this page, the program reads from the ECU how many injectors are connected to it (4 in the example) and what is the delay in terms of injections number between the changeover on a cylinder and the changeover on the next one (3 in the example).

Removing the flag signs corresponding to each injectors (little boxes under the little red in picture 6-13) you can obtain that cylinders pass immediately to the petrol supply, also if the changeover stay on the gas mode and the LED stay green; therefore you can decide (in case of a four cylinders) to make work the engine with just one cylinder in gas mode and three in petrol mode, or with two and two, or with three injectors in petrol mode and one in gas mode, or all the injectors in petrol mode. Note that in this last case, also if the vehicle works correctly in petrol mode, the changeover LED will be green and the solenoid valves will be open (or they'll open at the changeover): this can create confusion. Moving to the right the bar indication you can instead increase the changeover delay between two consecutive injectors. In this case a wrong connection will give a engine bad working longer and more sensitive, allowing a simple and quick problem diagnostic.

Procedure to identify injectors wiring errors

Suppose to be in a case as the one in picture 6-15 and want to verify if injectors are correctly connected.

Increasing the changeover delay, will increase also the time during which vehicle has a cylinder not supplied (the first) and another one which works at the same time with two kind of fuels (the second) so that you can feel easily if engine works bad or, in worst case, it switch off.

Now we know that a reverse in the injectors connection has passed, but we still don't know which injectors. In order to discover it, you have to follow this procedure.

Procedure to correct injectors wiring errors

1. Remove all the flag signs from each injector box. Now engine will work totally in petrol mode.
2. Put a flag sign in the injector n°1 box.
3. If gas injector n°1 inject in the right cylinder (that's to say the one corresponding to the petrol injector called n°1), engine will work correctly. In this case repeat the procedure from step 1 with the next injector. If instead you detect working problems, follow with step 4.
4. The selected gas injector has to be moved: it'll be enough to move the connector on another gas injector, until the right engine working.
5. Repeat the procedure from step 1, with the next injector until the right position of all gas injectors connectors.

6.2.2. LEDs and Buzzer

You can check the changeover switch LEDs and buzzer (acoustic indicator) working, selecting one of the LEDs boxes, for instance *LED 1/4* or *red LED*, or the buzzer box and pressing *START* at the bottom of the panel (see picture 6-13). A consecutive sequence of flashes or beeps of the indicator will notice their right working.

6.2.3. GAS Injectors

Selecting a gas injector box (see picture 6-13) and pressing *START* at the bottom of the screen, the relative injector will open and close for many times. The sound that it produces will confirm the injector working.

6.2.4. Actuators relay

Selecting the actuators relay box (see picture 6-13) and pressing *START* at the bottom of the screen, the relay will open and close for many times. The sound that it produces will confirm the injector working.

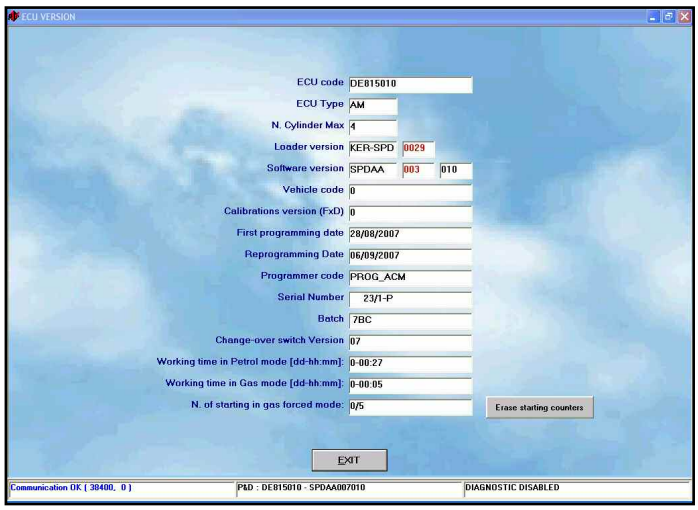
6.2.5. Front and back solenoid valves

Selecting a solenoid valve box (see picture 6-13) and pressing *START* at the bottom of the screen, the solenoid valve will open and close for many times. The sound that it produces will confirm the injector working.

6.3. ECU VERSION

Clicking on *DIAGNOSTIC* at the bottom of

the main page an selecting *ECU VERSION* button on the left, you enter the page shown in picture 6-16, where are displayed parameters identifying software type, data and other parameters relating to the ECU programming. Let's see it one by one.



Pic. 6-16
Diagnostica - Versione centralina

6.3.1. Parameters description

6.3.1.1. ECU code

Represent the product code, identifying that specific kind of ECU. For instance the one in the picture is "DE815010" and identify the SEQUENT PLUG & DRIVE ECU version for four cylinders. Afterward the code could become as DE815010-2, where the main code (DE815010) identify the product (Sequent Plug & Drive ECU for 4 cylinders), whereas the number after the dash identify the ECU hardware revision. In absence of number after the dash, you have to consider a "0" revision, that's to say the first version not yet modified.

6.3.1.2. Loader version

It indicates the kernel loader version currently present in the ECU memory (loader is that part of software that allows changing the ECU program. You need it just at the starting and for the programming). It is a sequence of letters and numbers as this one: ***"KER-SPD 0029"***. The last four numbers represent the version (in this case 29). The more the version number is high, the more the loader will be modern and improved.

6.3.1.3. Software version

It really indicates the ECU software. It consists of 5 characters + 3 numbers + 3 numbers. The first 5 characters indicate the particular kind of software, the next 3 numbers indicate the software real version (the more the number is high, the more the program will be modern and improved), whereas the last 3 numbers indicate the hardware version to which is dedicated (010 means that it is for the DE815010 ECU, that it's the Sequent Plug & Drive for 4 cylinders).

6.3.1.4. Vehicle code

It I a number linked by BRC to each vehicle developed and validated into the seat. It takes value 0 if mapping was made with the aided procedure by the installer. If the installer produces a new mapping changing another one already made by BRC, without the aided procedure, the original BRC vehicle code will remain the same.

6.3.1.5. Calibrations version

It indicates the calibrations version (file .F?D) present on the ECU. For BRC mapping is at least 1; this number increase each time BRC make a new calibration version. For maps made by the installer, this number is always 0.

6.3.1.6. First programming date

It indicates the date when the ECU was programmed for the first time by the installer. After the first programming, this date won't change along all the ECU life, showing its first use.

6.3.1.7. Reprogramming date

It indicates the date when the ECU was programmed the last time by the installer. Practically it's the date of final and effective programming of that vehicle.

6.3.1.8. Programmer code

It identifies the kind of program used on the PC to make the last ECU programming. Normally it should be ***"PROG_INS"***, indicating that the installer's program SEQUENT PLUG & DRIVE was used (the one object of this handbook). If it is ***"PROG_ACM"***, it means that an experimental or dedicated and not distributed was used.

6.3.1.9. Serial number

It identify the serial number (consecutive) of each single SEQUENT PLUG & DRIVE ECU coming out from the BRC productive line, passing all the hard tests made. After the serial number, divided by a "/" it's indicate the test machine number that made the test, whereas divided by a "-" there's the kind of test made.

6.3.1.10. Batch

It identifies the ECU production batch, that is a code from which you can obtain the production year and week. For instance "7BC" means that it's been produced in 2007 (first number), week 23 (B=2 e C=3).

6.3.1.11. Changeover switch version

It indicates the changeover switch version connected to the system in that moment. The changeover switch is in fact equipped with a microprocessor and it's able to communicate with the ECU. Replacing the changeover switch, this data could change. You can't reprogram the changeover switch in order to increase the version.

6.3.1.12. Working time in petrol mode [dd:hh:mm]

It shows the total time of system working in

petrol mode, recorded in the ECU memory, in days, hours and minutes. You can't reset the counter by PC.

6.3.1.13. Working time in gas mode [dd:hh:mm]

It shows the total time of system working in gas mode, recorded in the ECU memory, in days, hours and minutes. You can't reset the counter by the interface on the PC.

6.3.1.14. Numbers of starting in gas forced mode and Erase starting counters

The Sequent Plug & Drive system allows a limited number of engine starting directly in gas mode. This function has to be considered as an emergency trick which allows the ignition in case of petrol ending or if some parts of the petrol original system work bad (pump, injectors, petrol loop).

To start the engine in gas mode, introduce the ignition key, keep pressed the changeover switch button, wait for the double-beep acoustic indication (roughly 4 seconds) and start the engine within 4 seconds. Just 5 gas starting are allowed to the user, then, to make others, you'll have to reset the counter using the "Erase starting counter" key.

The ECU reprogramming or any setting parameter change (except for the gas level setting) automatically reset the counter, so that the installer, at the end of its own work, give always to the customer the system with 5 enabled starting.

6.4. ERRORS DIAGNOSTIC

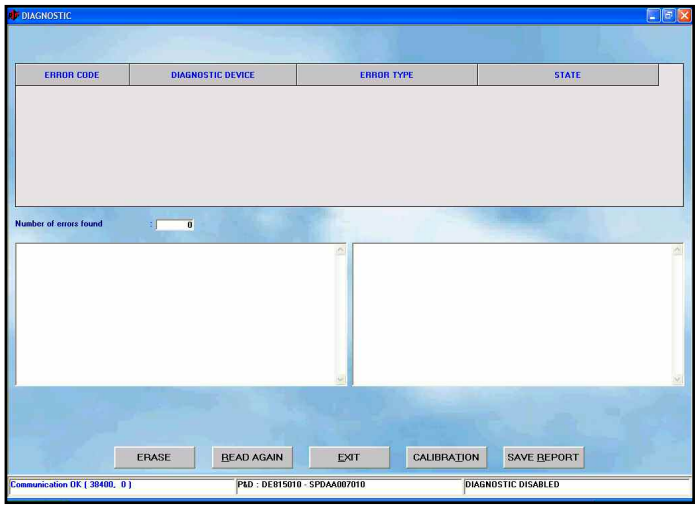
An important innovation in the new BRC gas system is the diagnostic "ON BOARD", that's to say integrated inside the ECU.

Besides the normal system management functions, the ECU has now also the task of maintain always under control all the electric and electronic devices of the gas system, as also the signals coming from the original petrol system.

It isn't necessary that a PC be connected so that this constant system control happens: the ECU operates in a way completely independent and it is able to keep in memory



pic. 6-17
Errors diagnostic selection



Pic. 6-18
Errors diagnostic - no errors found

any anomaly, occasional too, and to communicate it to the installer by means of the PC also after a long time.

The errors recording happens in the ECU NOT EPHEMERAL memory, that it's able to keep information, in case of electrical supply lack too.

In case of anomaly, the BRC ECU can notice it to the user by means of a petrol/gas LED flash and with three double-beeps repeated.

If a serious failure has detected, potentially dangerous for the driver or for the vehicle, the on board diagnostic will make RECOVERY correction operation, as for instance the exclusion of faulty sensor and the working according to the remaining sensors, or SAFETY operations, as for instance the automatic passage to the working in petrol mode.

6.4.1. ENABLE AND DISABLE THE ON BOARD DIAGNOSTIC

Now we'll describe the simple operations to know in order to immediately use the on board diagnostic.

First step, naturally only after the correct calibration of the vehicle, is enter the suitable program page.

It will be enough to click on the DIAGNOSTIC button highlighted at the bottom of picture 6-18 and then the ERRORS DIAGNOSTIC button on the right.

Note that at the bottom of the screen in picture 6-17, on the left appear the writing "DIAGNOSTIC DISABLED", indicating that at this moment the On Board diagnostic hasn't been enabled yet.

On the future software version, enabling could be automatic and the following step could be useless.

The page that we'll see now is the one in picture 6-18, which at the beginning will appear totally empty.

To continue, press the bottom CALIBRATION button.

As soon as you arrive in the page of picture 6-20, where you can see the errors detectable by the system but not yet selected, it will be enough to press the ENABLE DEFAULT key to enable the function.

The situation you obtain is the ones shown in picture 6-20. Note that some errors are enabled and others not, according to the particular software and calibration type that there are on the ECU.

Clicking the bottom OK and confirming the changes made when the PC asks you for it, you'll reach the page of picture 6-21, where is notified that you have to exit from the errors diagnostic (EXIT key), in order to program the ECU, if you don't want to make other modifications.

Clicking on EXIT you'll have to introduce trademark, model and other information needed to save in the database the new calibration with errors diagnostic.

Introducing these data, you'll obtain a new initial page showing bottom right that the diagnostic is enabled and there are not errors (see picture 6-21).

If there are errors, instead the result will be the one in picture 6-23, where 5 errors have been detected.

6.4.2. Errors reading and erasing

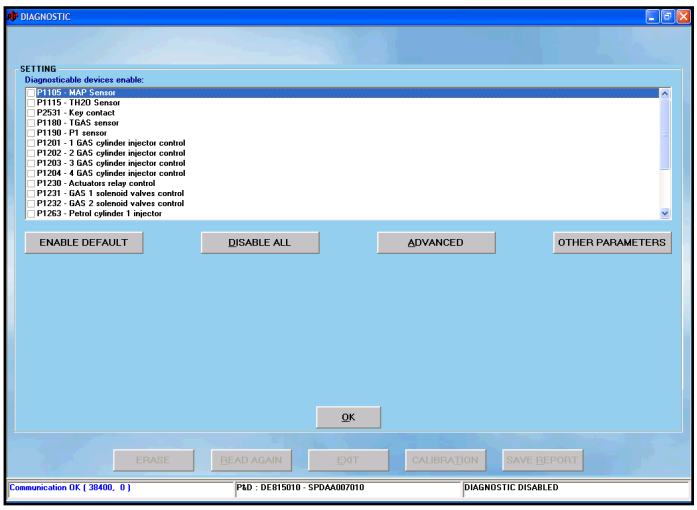
If system detected errors, we'll have to know which are the faulty components or the installation errors, and how to correct the situation.

It will be sufficient enter again the ERRORS DIAGNOSTIC section in order to have a complete idea of the situation, as shown in picture 6-24.

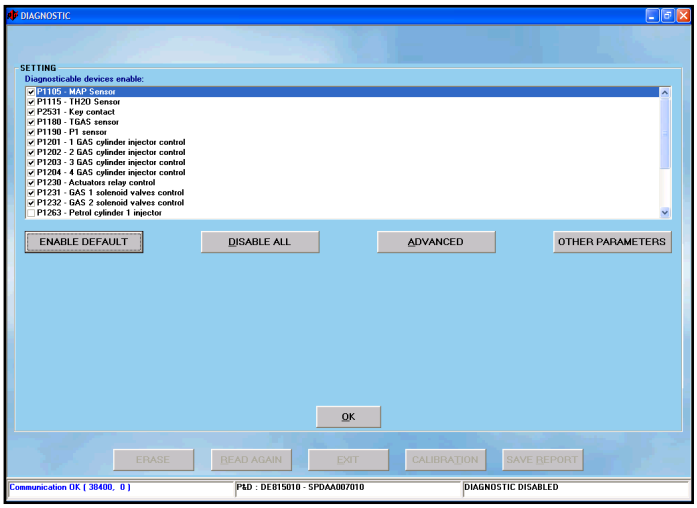
In a summary table you can see the 5 errors; for each one, it specifies the code, the relative device, the errors type (that's to say if signal is too low, too high, if a short-circuit or an open loop has detected, and so on) and finally if error is present; or if the device created an error, but for now it works correctly, as you can see for the petrol/gas changeover switch in the last line.

By selecting the error wanted with mouse, the two middle panels show you the system signals value at the failure moment (on the right) and operations suggested to find the error cause (on the left).

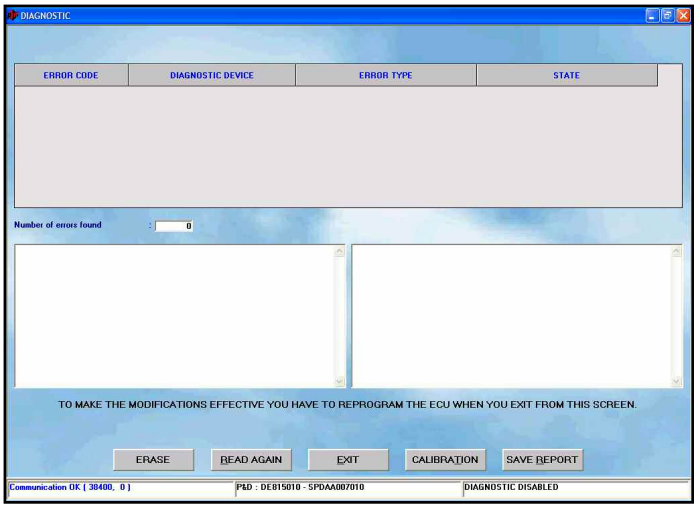
In case of picture 6-24, for instance, we selected the water temperature error. The indication "Signal value under the minimum threshold" means that the temperature is too low and exit from the reasonable range. As you can see, the error is present when



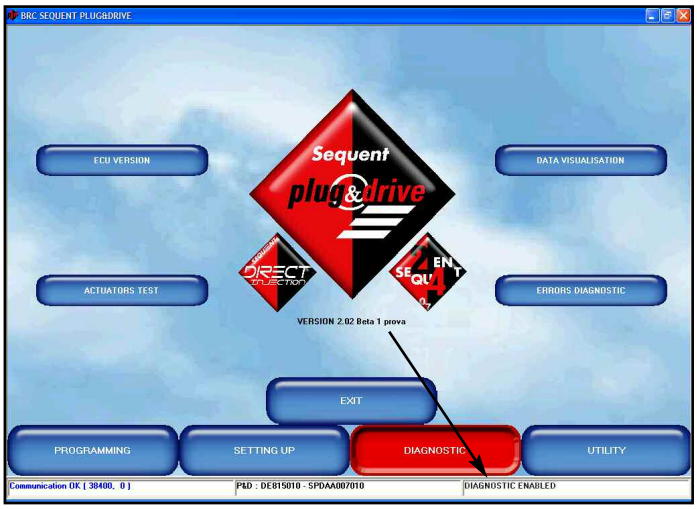
Pic. 6-19
Errors calibration



Pic. 6-20
Enable Default



Pic. 6-21
Changes programming

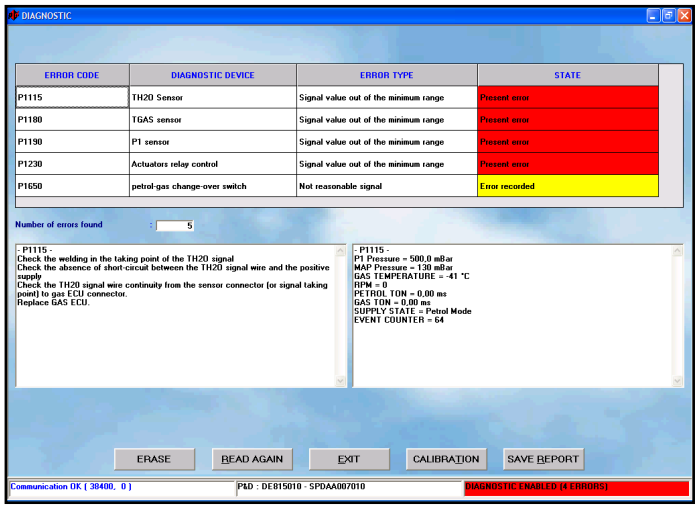


Pic. 6-22
Diagnostic Enabled, no errors found

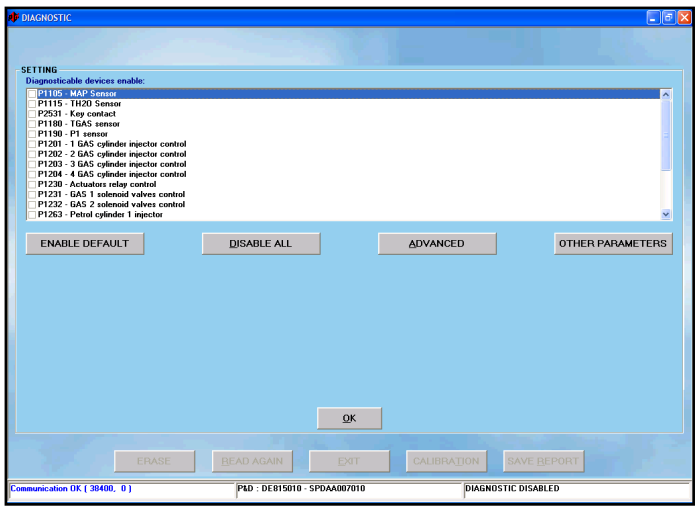
you make the errors request with the PC.
In the values of the right panel, note the "**EVENT COUNTER**". It has a value of 64 when error is detected, and decrease of 1 point for every ECU switching on, if error is not detected. So that an error recorded (yellow) with the counter at 60 is more recent than an error with counter at 35. When the counter will reach the zero value, error will be completely removed from the ECU memory.
Operations suggested are, in this case, the verification of the water temperature electric connections (in particular we suspect a short-circuit at the positive supply or an open loop), a connector not connected or a ECU failure.
To have a new updated situation of the errors state, for instance because you corrected the possible cause of one of them and you want to check the result, it is necessary to press the bottom READ AGAIN key.
If an error cause was removed, the error state will become RECORDED, colouring in yellow the STATE box.
No RECOVERY or SAFETY operation has made by the system for only recorded errors.
If you want to cancel completely the errors memory of the ECU, eliminating both recorded errors and present errors, you have just to press ERASE, bottom in picture 6-24.
Naturally if really there are still errors really in the system, the on board diagnostic will detect them again.
The error detection time could take a lapse of time included between a second fraction and one or more complete cycle of ignition key, starting, petrol/gas changeover and heat steady condition.



Pic. 6-23
Diagnostic Enabled, 5 errors



Pic. 6-24
Errors Diagnostic, 5 errors found



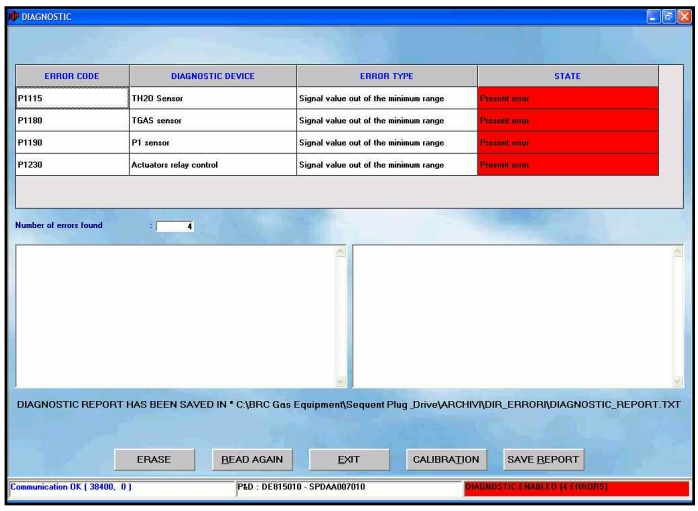
Pic. 6-25
Errors calibration

6.4.3. Disable the On Board Diagnostic

In case of On Board Diagnostic bad working, it can be useful to completely or partially disable it.
In order to completely disable it, from the main page press:
DIAGNOSTIC > ERRORS DIAGNOSTIC > CALIBRATION.
Reaching the errors diagnostic page of picture 6-25, press DISABLE ALL.
The result will be the one in the picture, where no error has selected.
In order to disable someone only, it is sufficient de-select them by clicking on the relative box on the left (see picture 6-25).
To save changes made, exit completely from errors diagnostic by clicking the EXIT key time after time, until you arrive at the main page.
If software asks for keep the changes made, answer yes.

6.4.4. Automatic report

Clicking on SAVE REPORT, the software automatically creates a file with complete information about errors and system.
A writing in the bottom screen informs you about the report creation and its position on the PC.
Afterward we show a report example with two errors recorded.



Pic. 6-26
Diagnostic report

21/02/2008

ECU code: DE815010
ECU Type: P&D
N. Cylinder Max: 4
Loader version: KER-SPD0029
Software version SPDAA007010 Beta20
Vehicle code: 0
Calibrations version (FxD): 0
First programming date: 20/02/2008
Reprogramming Date: 21/02/2008
Programmer code: STD 2.02 Beta 1 prova
Serial Number:2270/2-P
Batch: 7DE
Working time in Petrol mode [dd-hh:mm]: 0-00:00
Working time in Gas mode [dd-hh:mm]: 0-00:00

Number of errors found = 4

P1115 - TH2O SENSOR
ERROR TYPE = Signal value out of the minimum range
STATE = Present error

- Suggested operation
Check the welding in the taking point of the TH2O signal
Check the absence of short-circuit between the TH2O signal wire and the positive supply
Check the TH20 signal wire continuity from the sensor connector (or signal taking point) to gas ECU connector.
Replace GAS ECU.

- Associated context
P1 Pressure = 500,0 mBar
MAP Pressure = 130 mBar
GAS TEMPERATURE = -41 ?C
RPM = 0
PETROL TON = 0,00 ms
GAS TON = 0,00 ms
SUPPLY STATE = Petrol Mode
EVENT COUNTER = 64

P1180 - TGAS SENSOR
ERROR TYPE = Signal value out of the minimum range
STATE = Present error

- Suggested operation
Check TGAS sensor connector
Check the absence of short-circuit between TGAS signal wire and positive supply
Check TGAS signal wire continuity from the sensor to the gas ECU connector.
Replace TGAS sensor
Replace GAS ECU.

- Associated context
P1 Pressure = 500,0 mBar
MAP Pressure = 130 mBar
GAS TEMPERATURE = -41 ?C
RPM = 0
PETROL TON = 0,00 ms
GAS TON = 0,00 ms
SUPPLY STATE = Petrol Mode
EVENT COUNTER = 64

P1190 - P1 SENSOR
ERROR TYPE = Signal value out of the minimum range
STATE = Present error

- Suggested operation
Check P1 sensor connector
Check the absence of short-circuit between P1 signal wire and negative supply
Check P1 signal wire continuity from the sensor to the gas ECU connector.
Replace P1 pressure sensor.
Replace GAS ECU.

- Associated context
P1 Pressure = 500,0 mBar
MAP Pressure = 130 mBar
GAS TEMPERATURE = -41 ?C
RPM = 0
PETROL TON = 0,00 ms
GAS TON = 0,00 ms
SUPPLY STATE = Petrol Mode
EVENT COUNTER = 64

P1230 - ACTUATORS RELAY CONTROL
ERROR TYPE = Signal value out of the minimum range
STATE = Present error

- Suggested operation
Check actuators relay wiring.
Check the absence of short-circuit between actuators relay wiring and negative supply
Check actuators relay wiring continuity from its connector to the gas ECU one.
Replace actuators relay
Replace GAS ECU.

- Associated context
P1 Pressure = 500,0 mBar
MAP Pressure = 130 mBar
GAS TEMPERATURE = -41 ?C
RPM = 0
PETROL TON = 0,00 ms
GAS TON = 0,00 ms
SUPPLY STATE = Petrol Mode
EVENT COUNTER = 64

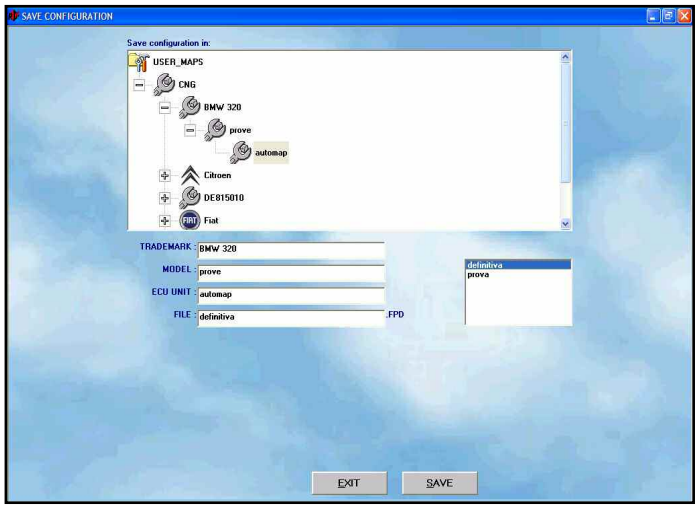
6.4.5. OTHER/OTHER PARAMETERS KEY

The OTHER and OTHER PARAMETERS keys that you can see in picture 6-25 show different OBD setting parameters.
This parameters setting depends on many factors, for example the actuators and sensors characteristics used by the system.
The software on the PC is able to make the diagnostic setting up in a totally automatic way, on the basis of the calibration in the ECU.
Values shown by these keys don't have to be changed by the installer, therefore, but they should be required by the BRC technical assistance in case of diagnostic bad working.

7. UTILITY



Pic. 7-1
Utility



Pic. 7-2
Utility -
save configuration

Different functions available with the *UTILITY* main key allow making different operations useful to update the program on the PC or to change some aspects. Utility function don't need the connection with an ECU, save for the *"ERASE ECU"* option, that serves to eliminate all the ECU data, and for *"SAVE CONFIGURATION"* option, that allows updating maps and calibrations presents on the PC taking them from an ECU and adding them to the database on the PC. After selecting the *"UTILITY"* main key, screen appears as shown in Picture 7 1 where you can see the various instrument in the screen sides. Let's see now their functions.

7.1. SAVE CONFIGURATION

It is the button that allows taking data from an ECU previously programmed and save them on your PC database as a new map. In this way, you can enlarge your repertoire of vehicles you can install also without create update diskettes, and you can intervene on any vehicle doing changes to maps or calibrations, also if you don't have the specific mapping available on the PC.

Procedure is the following (see Picture 7-2):

1. Connect the PC with the SEQUENT PLUG & DRIVE ECU, by using the suitable communication cable.
2. Start the SEQUENT PLUG & DRIVE program
3. Switch on the vehicle control board.
4. From the main page select the *"UTILITY"* main key
5. Press the *"SAVE CONFIGURATION"* key, on the left of the screen.
6. If the communication isn't enabled (writing "Communication OK" doesn't appear bottom left) wait and retry. If it doesn't start, verify its connection and the ignition key.
7. Select the CNG equipment type in the folder *"USER_MAPS"*, in the top left database window.
8. Select the folder relative to trademark, model and ECU type where you want to save new mapping and calibration. If folder doesn't exist, introduce the name of trademark, model or ECU type in the relative text boxes below, to create a new one.
9. In the text box called *"FILE:"* introduce a meaningful and easy to remember name, with which mapping and calibration files taking from the ECU will be saved in the PC database.
10. Press the *"SAVE"* button bottom right.
11. Wait for the end of procedure, noticed by the writing *"CONFIGURATION SAVE ENDED SUCCESSFULLY"*.

To exit from the page *"SAVE CONFIGURATION"*, coming back to the main page, it is sufficient press the bottom *"EXIT"* key, or press "ESC" on your keyboard (normally top left).

7.2. ECU ERASURE

The ECU erasure is an emergency procedure to use in case you don't arrive anymore to program the ECU.

It brings again the ECU in the original production conditions, eliminating the calibrations and software with which it has previously been programmed.

ATTENTION: making this operation on data in the ECU will be lost.

If you have some doubts, you can save ECU data on the PC before proceeding, by means of *UTILITY > SAVE CONFIGURATION*.

After choosing *UTILITY > ECU ERASURE*, the page displayed in Picture 7-3 will appear.

Erasure will happen after pressing the *"ERASE"* key in the middle of the screen.

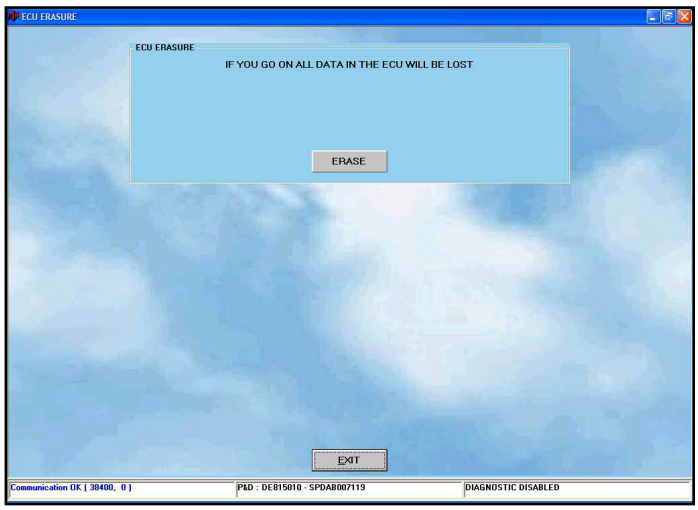
7.3. DATA UPDATING

Afterward there are the procedures to follow in order to update data of a PC, both from CDROM and from any removable or shared unit. Updated data can comprehend mappings, software and the ECU kernel loader. The updating CDROM are created by BRC, whereas mappings on removable units can

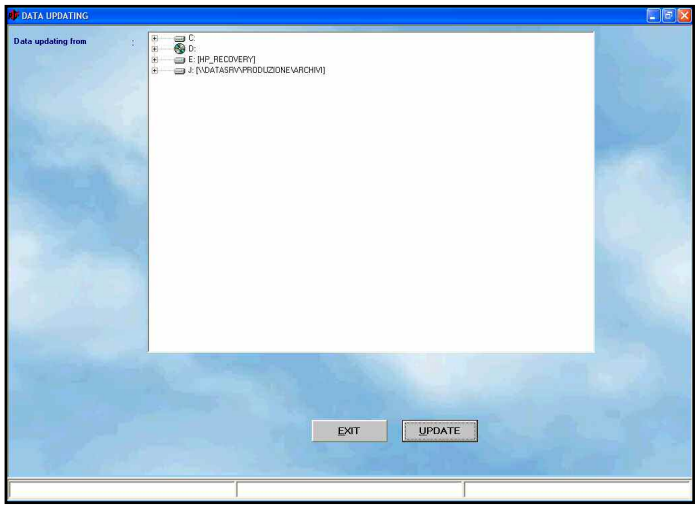
be created by the users, both using the procedure described in the previous paragraph, and downloading data from the website http://www.brc.it. The data updating window is the one in Picture 7-4.

The procedure to follow is the following:

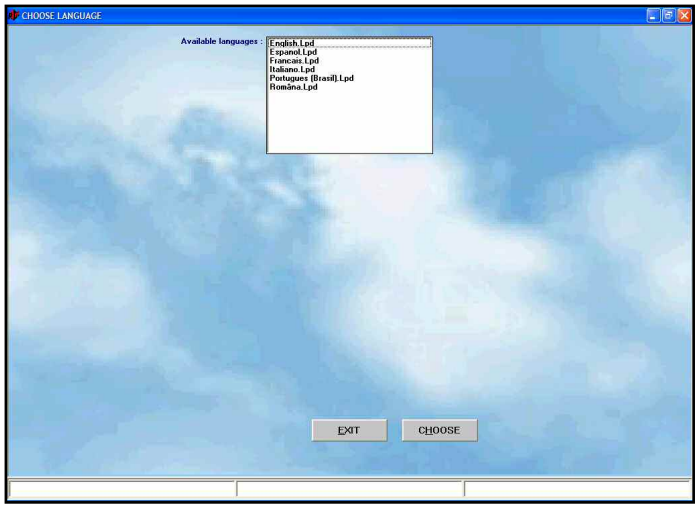
1. Start the SEQUENT PLUG & DRIVE program on the PC to be updated.
2. Introduce eventually the CDROM or removable unit which contains the updating.
3. Select from the main page the *"UTILITY"* main key.
4. Select the *"DATA UPDATING"* key on the left.
5. Select the unit containing the mappings to be updated in the top box, near the writing *"Data updating from:"*.
6. Select the folder of the unit containing the updating files. For instance, from CDROM it should be "D:\SEQUENTP&D\update" and proceed with the updating by pressing on *"UPDATE",* at the bottom of program window.
7. When the copy operation is ended, press *"EXIT"* to come back to the main page.



Pic. 7-3
Utility -
ECU erasure



Pic. 7-4
Utility -
Data updating



Pic. 7-5
Utility -
choose languages

7.4. CHOOSE LANGUAGES

It allows choosing the languages with which the program will show messages, writings, captions and all text information. The program allows the passage to different languages just introducing the suitable language file (files .LPD) in the installation folder (usually "C:\BRC Gas Equipment\Sequent Plug & Drive"). The procedure to choose the wished languages is the following:

1. Start the SEQUENT PLUG & DRIVE program,
2. From the main page select the *"UTILITY"* main key
3. Press the *"CHOOSE LANGUAGES"* key, at the left of the screen,
4. Select the language file in the panel *"AVAILABLE LANGUAGES"* (see Picture 7 5),
5. Press the *"CHOOSE"* key in the bottom of the screen,
6. Press the *"EXIT"* key to come back to the main page.

Press on *"EXIT"* or press ESC on your keyboard (normally top left) you leave the "choose languages" page without make changes.

7.5. COMMUNICATION

It allows to modify the parameters of the communication between PC and ECU. You have to modify these options above all when you use a PC not equipped with a serial port. In this case you have to use an USB/Serial adapter or a USB cable, which add a virtual port to the PC. In the folder *"Serial port"* that you can see in Picture 7 6 the normal value *"COM 1"* has to be replaced according to the value that the operating system set for the adapter (that you can see in the Windows control panel, under the option *"System"*).

The *"Baud rate"* box that you can see in picture 7-6 allows modifying the transmitting speed. If there aren't particular problems we suggest to introduce the maximum speed (38400 baud), automatically set by the program, with which you have short ECU programming times.

The *"Fast Init coupling"* box allows modifying the communication reset. We suggest to let it selected.

Another important parameter is *"Maximum waiting time between two following messages"*. Decreasing this time you obtain higher speed in ECU programming, but higher probability of communication failure too. We suggest to set the minimum value (0 ms), except for problems.

Il *"Data acquisition time"* changes the acquisition data speed when you start the recording in the data visualization page (*DIAGNOSTIC > DATA VISUALIZATION*).

Decreasing this value, acquisition obtains more data in a 1 second, creating bigger acquisition files. It happens the contrary if you increase this value.

You have to change the options contained in the *"OTHER"* key just in case of problems, with help of BRC technical assistance or of some specialist.

If you can't communicate with the ECU because of the parameters change, you can reset standard values. You can see the standard value of each box moving the mouse pointer on it, without press any key: a little box with the standard value inside will appear. Little box disappears as soon as you move the pointer out of if.

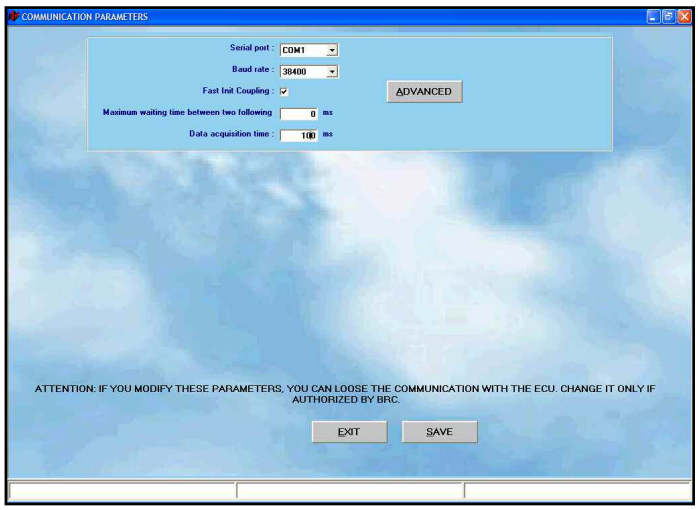
To save changes and come back to the main page press *"SAVE"* at the bottom of the screen. To come back to the main page without save changes, it's enough press *"EXIT"*, or press ESC on your keyboard.

7.6. INFORMATION

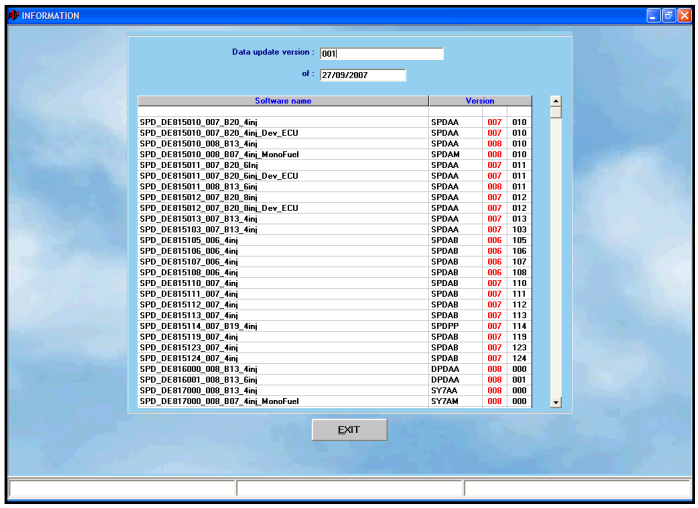
With this function you can see every software version available on the PC. You can see the software name and the version too (see picture 7-7).

The version is made up of 5 characters + 3 numbers + 3 numbers. The first 5 characters indicate the software particular type, the next 3 numbers indicate the real software version (the more the number is high, the more the program will be modern and improved), and the last 3 numbers indicate the hardware version to which it's dedicated (001, for instance, means that it's for the DE815010 ECU, which is the Sequent Plug & Drive for 4 cylinders).

This utility is particularly useful to see if you have already the last updating or if you need to update the PC program.



Pic. 7-6 Utility - communication



Pic. 7-7 Utility - information

7.7. EXPORT MAPS

This key allows saving mappings taken from the user database on the PC to a diskette or a removable unit, so that you can easily move them to another PC. Procedure allows moving the mapping to any PC hard disk place or to any logic unit that you can see from the operating system.

Procedure to follow in order to move a mapping to a PC unit is this one (see Picture 7 8):

1. Start the SEQUENT PLUG & DRIVE program from the PC containing the mapping to transfer.
2. Eventually introduce a diskette or a removable unit in the PC.
3. From the main page select the *"UTILITY"* main key.
4. Click on *"EXPORT MAPS"*
5. In the customer database select equipment type, trademark, model, and the ECU type relative to the map you want to transfer.
6. Press *"SAVE"*, at the bottom of the screen.
7. When the copy operation ended, you can repeat from the step 4, until you have mapping to transfer or until you have available place on the diskette or on the removable unit (in this case you have to repeat the last operation failed, after replacing the diskette or the removable unit or after making free some space).
8. When the last wished copy on diskette ended, press *"EXIT"* to come back to the main page.

To move a mapping from the removable unit to another PC you have to follow the data updating procedure from diskette described in the next paragraph.

7.8. MAPS DATABASE

It allows modifying user mapping database, by changing name, moving, erasing and copying folders (see picture 7-9).

- **To rename a folder** (trademark, model

or ECU type folder) it is sufficient follow this procedure:

1. From the main page select the *"UTILITY"* main key.
2. Press *"MAPS DATABASE"*, on the left of the screen.
3. Double-click on *"USER MAPS"* folder.
4. Select equipment type in the database window.
5. Always in the database choose the folder to be renamed, selecting it with mouse or with arrow keys.
6. Click *"NAME AGAIN"* at the bottom of the screen.
7. Type the new name.
8. Press enter.

- **To erase a folder** (trademark, model or ECU type folder) the procedure to follow is this one:

1. From the main page select the *"UTILITY"* main key.
2. Press *"MAPS DATABASE"*, on the right of the screen.
3. Double-click on *"USER MAPS"* folder in the database window (top left).
4. Select the equipment type.
5. Always in the database choose the folder to be erased, selecting it with mouse or with arrow keys.
6. Click *"ERASE"* at the bottom of the screen.
7. Now a window will appear asking you for confirmation: if you say yes, the folder will be erased from the database, and if you say no, nothing will happen.
8. If you removed a folder, a window will appear informing you about the erasing. Press "OK" in the box or enter on the keyboard to continue.

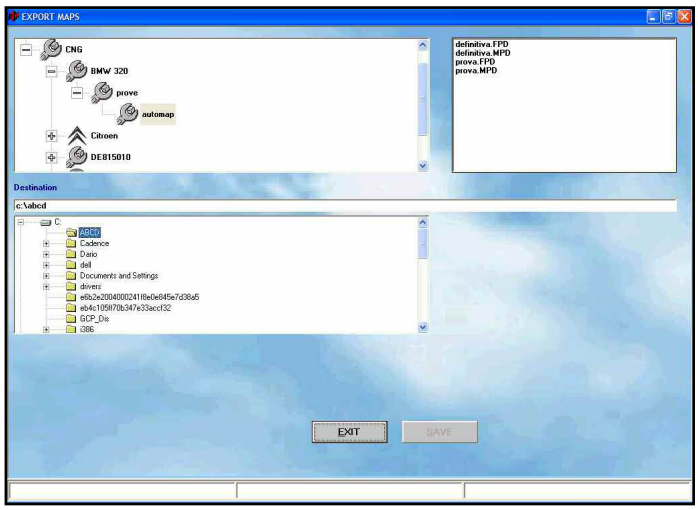
ATTENTION!: The database folder erasing is very dangerous and can cause the loss of important data of the user database. Consider that if you select a trademark folder (*"Citroen"* for instance) and give the Erasing control, all the model and ECU type folders inside it will be removed, that's to say all the *"Citroen"* vehicles in the users database.

- **To create a new folder** (trademark, model or ECU type folder) the procedure to follow is this one:

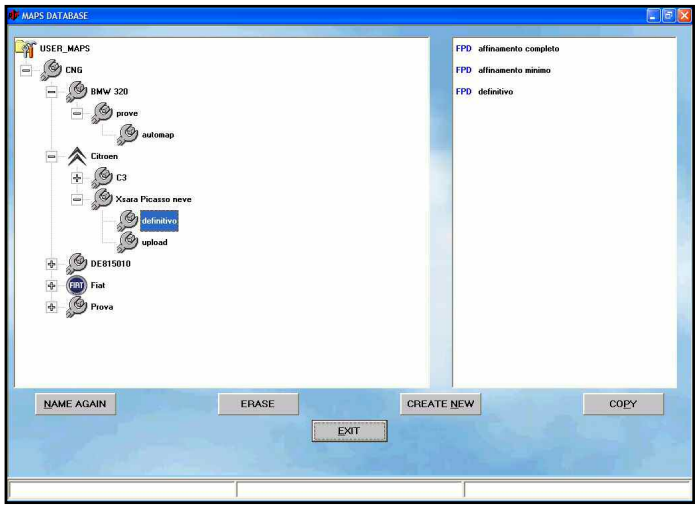
1. From the main page select the *"UTILITY"* main key.
2. Press *"MAPS DATABASE"*, on the right of the screen.
3. Double-click on *"USER MAPS"* folder in the database window (top left).
4. Select the equipment type.
5. If you want to create a new trademark folder (that's to say a new car builder's folder, i.e. "LEXUS"), go on with step 8.
6. If you want to create a new model folder (i.e. you already have *"Citroen"* and you want to introduce inside it the model "C3 1100") go to step 9.
7. If you want to create a new ECU type folder (i.e. "MagnetiMarelli") go step 15.
8. Press *"CREATE NEW"*. A new trademark folder called *"New_trade_mark"* will be created.
9. Type the trademark name and then press enter to turn the name into the one wished.
10. Go to step 18.
11. Select the trademark folder (in our case "Fiat").
12. Press *"CREATE NEW"*. A new model folder called *"New_model"* will be created.
13. Type the model name and then press enter to turn the name into the one wished.
14. Go to step 18.
15. Select the trademark folder (in our case "Citroen"), then the model.
16. Press *"CREATE NEW"*. A new ECU type folder called *"New_ECU"* will be created.
17. Type the ECU type name and then press enter to turn the name into the one wished.
18. New folder was created, but it will be empty. To introduce data in it you have to follow the aided procedure or the setting one.

- **To copy a model or petrol ECU type folder in another position:**

1. From the main page select the *"UTILITY"* main key.
2. Press *"MAPS DATABASE"*, on the right of the screen.
3. Double-click on *"USER MAPS"* folder in the database window (top left).
4. Select the equipment type.



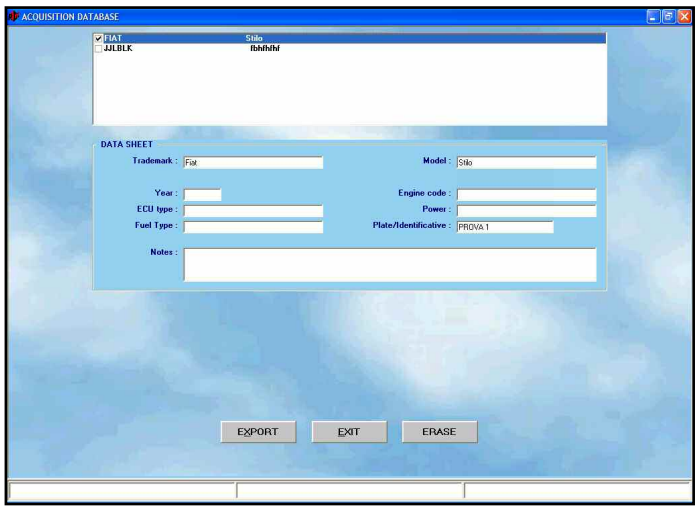
Pic. 7-8
Utility -
Export maps



Pic. 7-9
Utility -
Maps database

5. If you want to move a whole trademark folder (i.e. all “Fiat” categories), from a folder to another one, follow with step 8.
6. If you want to move a model folder (with all its ECU folder inside) from a trademark to another one, follow with step 13.
7. If you want to copy a ECU type folder, contained in a model folder of a specific trademark, in a model folder of the same trademark or of another one, proceed with step 18.
8. Select with mouse or with arrow keys the trademark folder (i.e.: *“Citroen”*).
9. Click *“COPY”* bottom right: it turns its name into *“PASTE”*.
10. Choose the new equipment type where you want to copy the trademark folder.
11. Click *“PASTE”* bottom right.
12. Follow with step 22.
13. Select the model folder to be copied (i.e. select “CNG”, then *“Citroen”*, then “C1 1100”),
14. Click *“COPY”* bottom right: it turns its name into *“PASTE”*.
15. Choose the trademark folder where you want to copy the model.
16. Click *“PASTE”* bottom right.
17. Follow with step 22.
18. Select the ECU type folder to be copied (i.e. select, “CNG”, then *“Citroen”*, then “C1 1100” then “4cyl”),
19. Click *“COPY”* bottom right: it turns its name into *“PASTE”*.
20. Choose the model folder, under the trademark where you want to copy it.
21. Click *“PASTE”* bottom right,
22. New folder was created, with the same name and the same file inside of the original one. To change its name or its data you have to follow the procedures already described in this manual.

To exit the maps database page and come back to the main page, it’s enough press *“EXIT”*, at the bottom of the screen, or press ESC on your keyboard (normally top left).



Pic. 7-10
Utility -
Acquisitions database

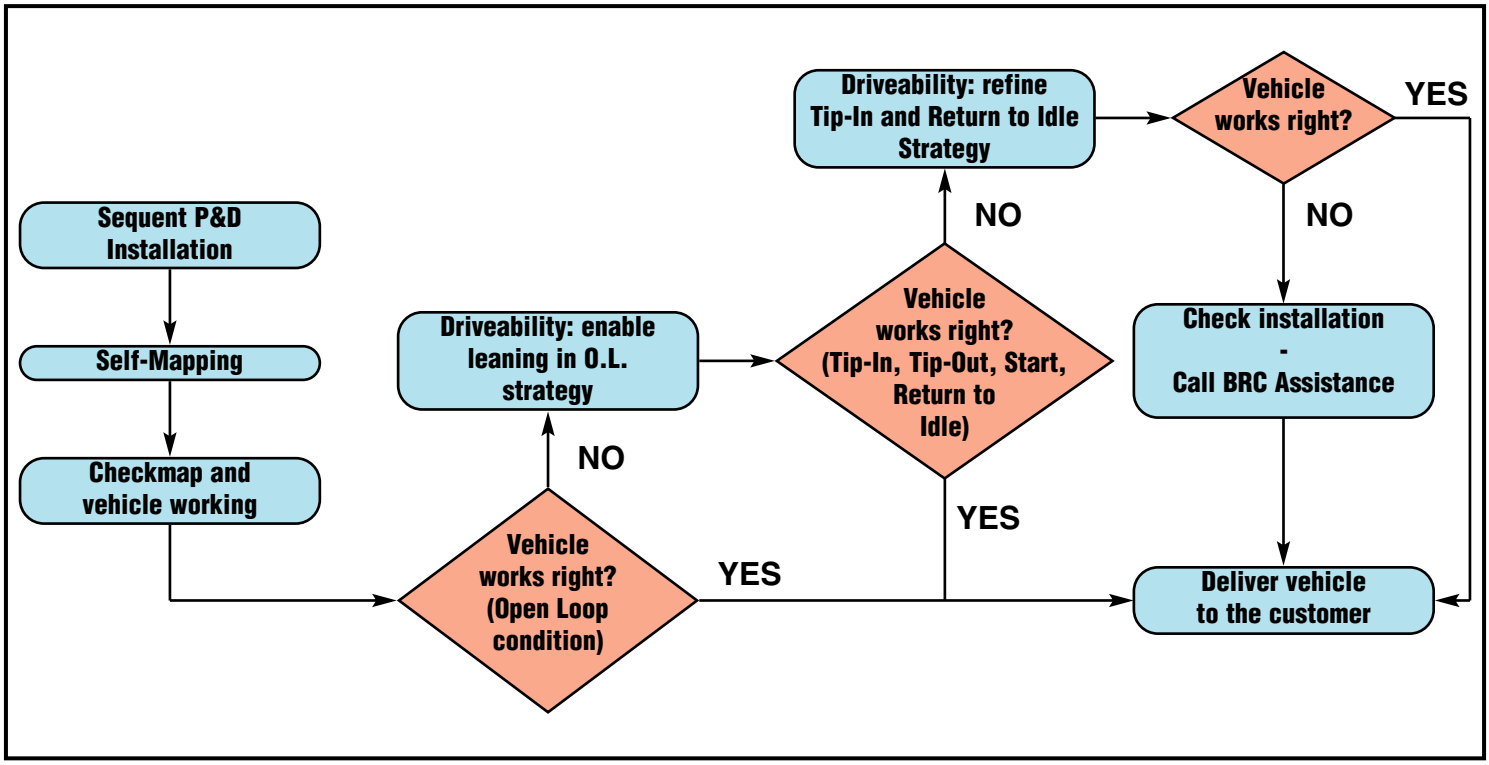
7.9. ACQUISITIONS DATABASE

It manages the acquisitions made in the data visualization page (*DIAGNOSTIC > DATA VISUALIZATION*).

Selecting the wished acquisition, you can move it to a removable unit (USB key, disk, etc.) or on the PC hard disk by clicking *EXPORT*, at the bottom of the screen, and selecting its destination.

You can also remove acquisitions you don’t need anymore, by selecting them and clicking on *ERASE*, at the bottom of the screen.

SEQUENT PLUG&DRIVE INSTALLATION AND SETTING



SELF-MAPPING

