BRC
GAS EQUIPMENT

SEQUENT

manuale per l'installatore - 1/3
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INDICE

INTRODUCTION

WHAT IS THE PROGRAM FOR SEQUENT INSTALLERS

If "SEQUENT" is the most updated timed sequential gaseous injection system and continuously developed by BRC, the PC interface is the most evolved instrument for the gas installation setting up and diagnosis BRC has ever produced and distributed.

We could think about the "FLY SF" electronic control unit as the brain of "SEQUENT" system which has always the full control in defining the carburation, in doing the different calculations on sensors signals and in updating continuously its map, etc. In order to carry out these operations, the ECU needs to be programmed, calibrated, to know what are the maps and the parameters to be used for the vehicle where it has been installed.

The instrument to fully control the ECU and of course SEQUENT system is the PC installers programme. Practically in order to rich, poor, change the change-over parameters, increase or decrease the spark advance ignition, set the gas level sensor inside the tank, verify if there are mistakes in the electrical installation, display the physical (gas pressure and temperature, suction manifold pres-

sure, etc.) and functional parameters (injection times and injectors duty cycle, oxygen sensor, map centering, etc.) you do not need to turn screws, hand-grips, "real" switches but all operations will be carried out in a "virtual" way by using the PC programme as interface.

TO WHOM IS THIS GUIDE ADDRESSED

This guide is useful to those who:

install or adjust gas "SEQUENT" installations

• have already downloaded the "SEQUENT" users programme in the PC

• need a reference guide for the PC programme

• need to understand and deepen the operation principles of "SEQUENT" system

• need a support for the setting and solving of "SEQUENT" system problems.

USEFUL REFERENCES

For further information on "SEQUENT" system please refer to the other guides and informative sheets printed by BRC.

• SEQUENT user's guide.

This is the easiest way to have basic and general information about the SEQUENT system installation.
Inside you can find:

• notions regarding the system operation principle and its structure,

• a detailed description of all the components,

• indications for both mechanical and electrical installation.

• Types of installation.

It contains generic fitting and electrical plans for different types of installation you could face. The listed cases are mainly grouped according to the cylinders number, their position and the vehicle power. It is useful especially when installers do not have specific instructions.

• Specific instructions.

All mechanical instructions and electrical plans of a particular vehicle which has been studied at BRC plant where both electrical connections and mechanical position of the components are precisely indicated. In these

cases BRC will supply a dedicated kit containing all the brackets and possibly the dedicated changeover switch too. This kit has to be paired to a basic one and to a standard one as indicated in the instructions.

Modular Common Rail system for gas
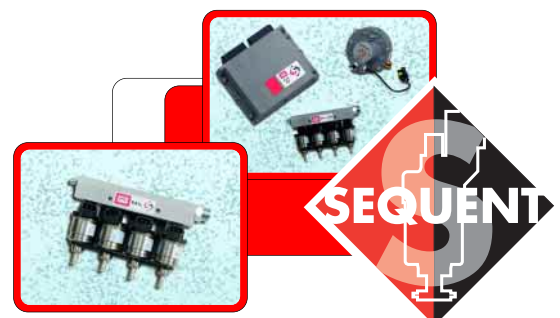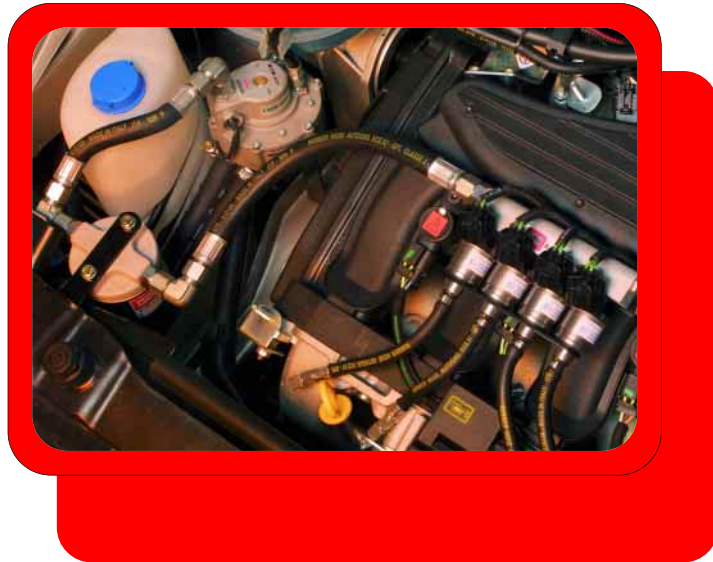
1. WHAT DO YOU NEED TO START?

Pic. 1.1 - SEQUENT interface cable

Briefly all you need to "talk" with the SEQUENT ECU is:

1. Portable PC
2. SEQUENT interface cable (code DE512114)
3. PC SEQUENT Software on CDROM
4. SEQUENT hardware key

Except for the PC which could be ordered to BRC, all the other components are contained inside the kit "Software for SEQUENT" code 90AV99002033.

In the picture 1.1 you will see the SEQUENT interface cable while in pictures 1.2A and 1.2B there is the hardware key suitable for parallel door in the first one and for USB door in the second. The hardware key for SEQUENT is easily recognisable for the word SEQUENT or SF hot pressed on one side; others hardware keys even if suitable for other BRC systems will not work.

In the next paragraphs a short description with all characteristics of what above.

Pic. 1.2.A - Hardware key for parallel door

Pic. 1.2.B - Hardware Key for USB door

1.1 THE PERSONAL COMPUTER

The SEQUENT software can be used on PC with the following operating systems: Windows® 95 (only starting from 4.00950b version), Windows® 98, Windows® 2000, Windows® ME e Windows® XP.

The required Hardware characteristics are the following:

• Minimum Hardware characteristics:

- Microprocessor: Pentium 133
- Memory RAM :16 MB
- Hard Disk: 1 GB
- 800X600 screen
- 1 serial door

• Suggested Hardware characteristics:

- Microprocessor: Pentium II 350
- Memory RAM :64 MB
- Hard Disk: 1 GB
- 800X600 screen
- 1 serial door

For this purpose and on demand BRC could supply portable PC containing the updated software whose functionality has been already tested.

1.2 THE INTERFACE CABLE FOR SEQUENT INSTALLATIONS

This cable contains an electronic circuit able to translate the ECU signals corresponding to the motorcar standard ISO 9141 and ISO 15031 into ones suitable for the PC that is according the standard of RS232 serial communication. **The cable is not compatible with the other ones used for BRC systems,** such as FLYING INJECTION, JUST and JUST HEAVY.

It could be ordered to BRC with the code DE512114.

1.3 SOFTWARE AND HARDWARE KEY

The software is contained in the CDROM supplied in the kit code 90AV99002033 "Software for SEQUENT"

The CDROM also contains all updating for the ECU programming and these are anyway available in the most updating version on internet BRC site at the following address: **http:// www.brc.it.**

2. SOFTWARE INSTALLATION AND HARDWARE KEY USE

The installation could be carried out either through CDROM or diskettes downloaded from internet at http://www.brc.it.

In the same way it is possible to update the PC software and all ECU programming files (software, loader, maps and adjustments) either through CDROM or diskettes downloaded from Internet.

Besides SEQUENT program which allows to control and program the ECU, in order to program an ECU it is necessary to transfer on the ECU itself the following files:

• The program making the ECU operate.

• The loader, to go from an already existing program to a new one.

• The files containing the maps of the developed vehicles (the ones with name type AAP).

• The files containing the setting of the developed vehicles (the ones with name type FSF).

Let's start from the beginning and try to carry out the installation. Let's examine both programming cases: with CDROM and with diskettes.

2.1 "SEQUENT" SOFT-WARE INSTALLATION ON PC WITH CDROM

As well as getting the portable PC and the CDROM for the installation, to load "SEQUENT" software you will have to follow these steps:

1. Switch the computer on and wait for its starting

2. Introduce the CDROM.

3. Wait for the automatic starting of the installation program (if it does not occur please refer to what indicated in the note regarding this procedure).

4. In the screen showed in picture 2.1 click on SEQUENT icon.

5. In the screen showed in picture 2.2 click on SEQUENT icon if you are installing the program for the first time; in case not click on UPDATE SEQUENT icon to update the software.
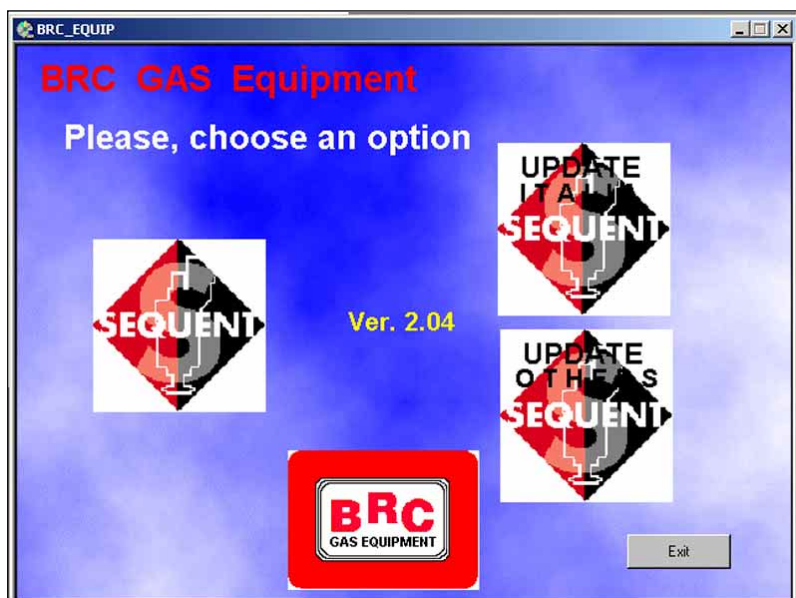
6. This procedure will lead you through all installation steps. At each question answer "Next" or affirmatively.

7. If the installation indicates to choose the destination, keep the original one and click "Next".

8. At this point the program

Pic. 2.1 - First installation screen

Pic. 2.2 - Second installation screen

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installation starts (Picture 2.3); wait till the sliding bar reach 100%.

9. When the screen displays "InstallSchieldWizard Complete" (Picture 2.4) click on Finish.

10. at this point the computer could ask to close and start Windows® again: answer Yes.

NOTE: the automatic starting of SEQUENT program installation depends on the PC setting. In case the installation does not automatically begin, start the "Setup" program contained in the main CDROM file (Click on Start > Execute, write "D:\Setup.exe" and click on OK. "D" represents CDROM; if there is another letter you have to insert the correct one in the computer.

2.2 SEQUENT" SOFTWARE INSTALLATION ON PC WITH DISKETTES

If you prefer to carry out the installation by using diskettes, you will have to follow these steps:

1. Switch the computer on and wait for its starting.

2. Introduce the first diskette for SEQUENT software installation.

3. Start the "Setup" programme (Click on Start > Execute, write "A:\Setup.exe" and click on OK).

4. The installation program will lead the user during the whole procedure.

5. To each question answer "Next" or affirmatively.

6. If the installation indicates to choose the destination, keep the original one and continue clicking on "Next" key.

7. At this point the program installation starts (Picture 2.3); wait

till the sliding bar reach 100%.

8. When the screen displays "InstallSchieldWizard Complete" (Picture 2.4) click on Finish.

9. At this point the computer could ask to close and start Windows® again: answer Yes.

10. Insert the Hardware Key in the printing plug (or in the parallel one) which could be usually placed backwards or, in the new PC versions insert the USB key in its plug.

11. Start the program (click on Start > Programs > Sequent).

The new program is now able to operate but it is necessary to download the available maps and all the files for the ECUs programming. All above is contained in the site www.brc.it or through diskettes and CDROM.
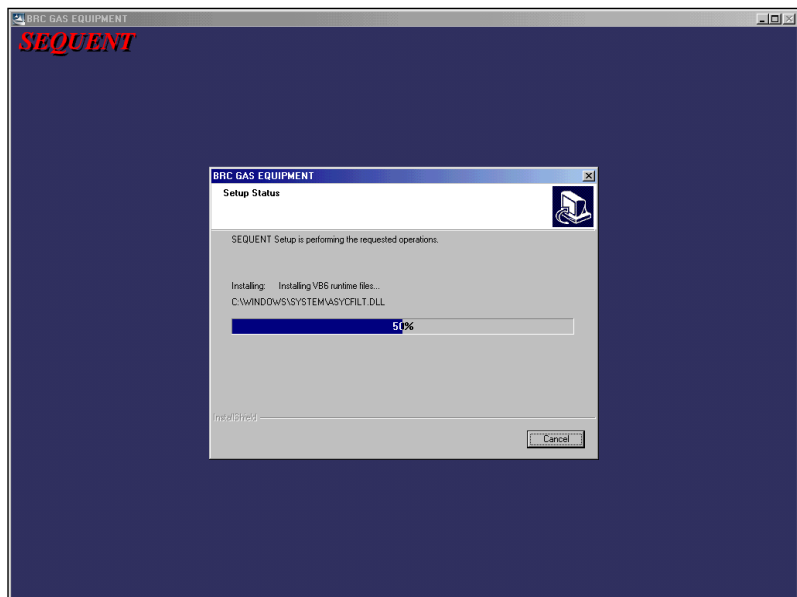
Pic. 2.3 - Installation with sliding bar
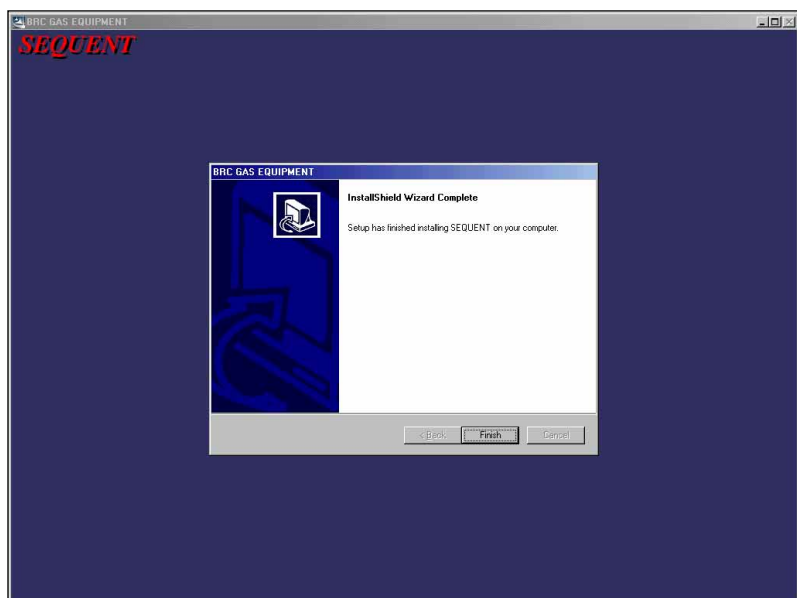
Pic. 2.4 - Installation with Finish key

3. STARTING OF THE PROGRAM AND ITS STRUCTURE

3.1 OPENING PAGE DESCRIPTION

After having correctly carried out the installation and if the Hardware Key has been introduced in the printer door or USB one, it is possible to start and use SEQUENT program. To start click twice SEQUENT icon on the PC screen or point the low left angle of the screen with the mouse choosing "Start" > Programs > SEQUENT.

⚠ BE CAREFUL!: for a correct visualisation of the program pages, hide the Windows® "instruments bar" (see picture 3.1). To do that place the mouse pointer on the bar where there are not icons of opening programs, click on the right key, choose "Properties" and finally select the options "Always foreground" and "Automatically hide" as indicated in picture 3.1.

During the first start (pict. 3.2) SEQUENT program is written in English. To change language click on UTILITY.

In the new menu click on "CHANGE LANGUAGE"; select the language you prefer and click on CHOOSE (pict. 3.3).

A window with the writing "WARNING" will advice the user he is changing the language. Click on OK and go out the program with EXIT.
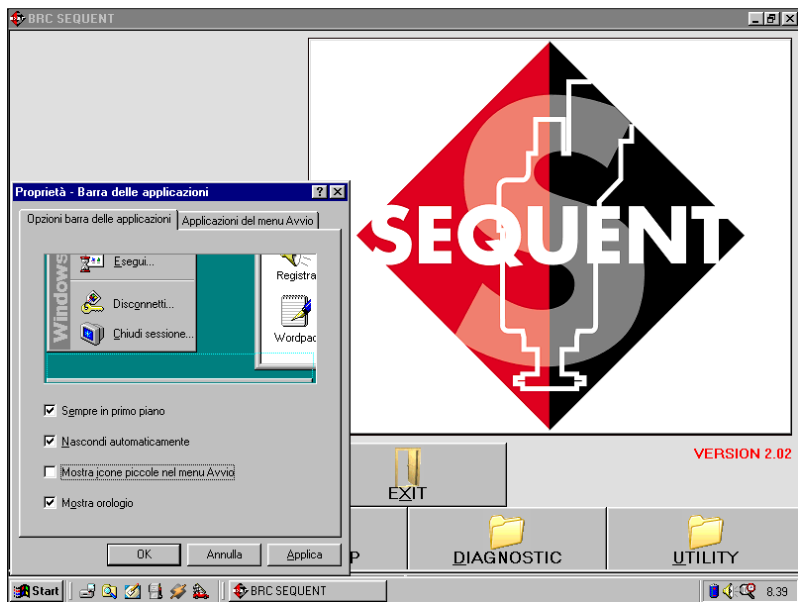
Pic. 3.1 - Hide Windows® instruments bar

Fig. 3.2 - First start – language change

Fig. 3.3 - First start – language selection

Starting the program again it will be displayed in the new selected language.

In describing this guide we obviously choose English one.

When starting again the window of the program will be as shown in picture 3.4.

The big icon with SEQUENT symbol is easily recognisable; when the mouse pointer is on the icon its shape will change into a question mark while clicking on the left key you open a window with some information on the installed software as indicated in picture 3.5.

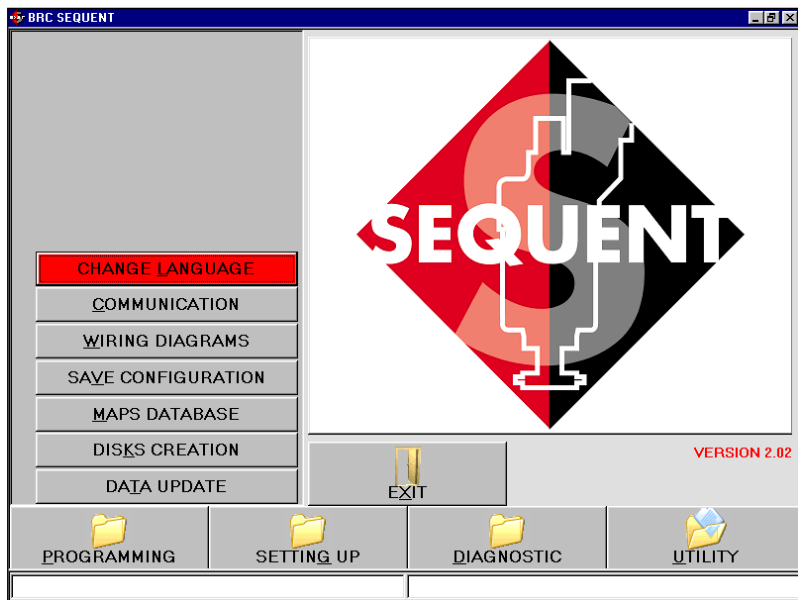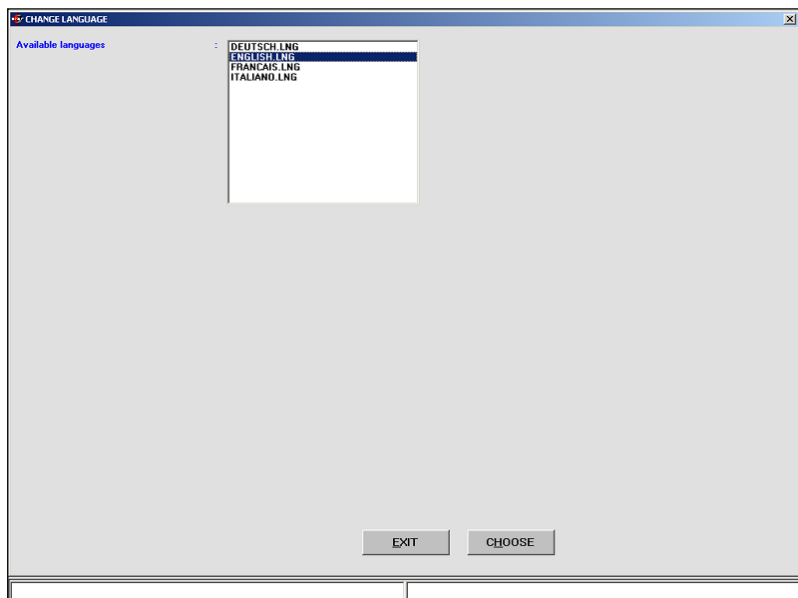The software version contained in the PC can be read down on the right.

At the bottom the screen has 4 keys called "main keys" on which we have 4 files; PROGRAMMING, SETTING UP, DIAGNOSTIC and UTILITY.

Their use will be explained later.

Over these files there is another key with the word "EXIT". By clicking on this one you quit the program; if you do not modify or if you save all changes, the program will immediately close. Otherwise, if changes and operations have not been already saved or memorised on the ECU, the program will ask the user if he wants to save them or not.

⚠ BE CAREFUL!: by answering not, all changes will be lost and it will be not possible to get them back.

At the bottom of the screen there are two narrow and long files covering all the screen width. The
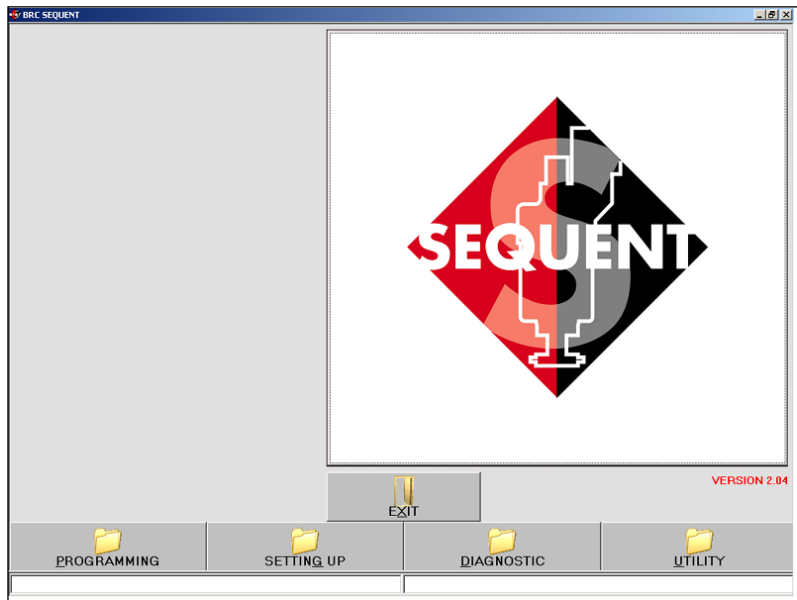
Pic. 3.4: SEQUENT opening page
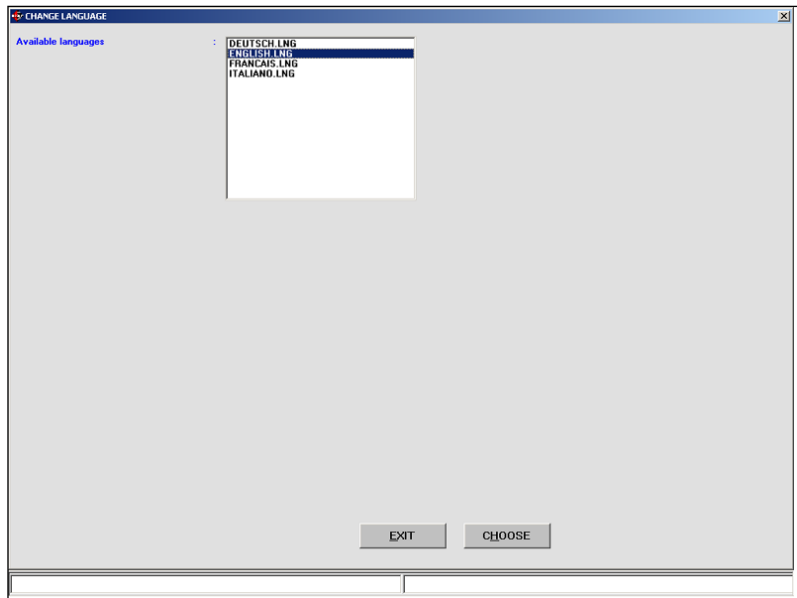
Pic. 3.5: SEQUENT opening page after clicking on the icon

left one displays the current communication condition (Fastening, Communication, OK, etc.) while the right one displays possible communication errors as, for example, when the ECU programming is stopped or other events occur.

3.2 MAIN KEYS

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

All the files are closed (see pic-

ture 3.1). Each key has a writing under the file drawing and from left to right we have:

- PROGRAMMING
- SETTING UP
- DIAGNOSTIC
- UTILITY

Please note the underlined letter.

The basic concept to keep in mind to use this program is that each main key corresponds to a

main function. To better understand this philosophy you can imagine each main key is a big drawer containing all the necessary equipment to develop an operation. When you decide to perform it, open the drawer (or better click on the key), choose the equipment and carry out the desired operation

For the ECU programming refer to "PROGRAMMING" key, for the setting up of an already programmed ECU choose "SETTING UP", to verify possible installation errors or to test the actuators choose "DIAGNOSTIC" and finally to select some program options (i.e. language, communication parameters, etc) open the "UTILITY" drawer.

By clicking on each key, the file will open and you will see the contents of the icon coming out. At the same time on the left side of the screen some keys appear, each one with a specific task: these are the before keys mentioned.

Each main key can be selected by clicking the mouse or keeping the ALT key and contemporarily the underlined letter corresponding to the key pushed (i.e. ALT+P for PROGRAMMING, ALT+G for SETTING UP, etc.).

It is possible to select the key by using the keyboard arrows up and down: the red key is the selected one.

By pushing the enter key on the keyboard, you obtain the same effect of clicking on the red key with the mouse.

In the next paragraph there is a short description of main keys. Please refer to next chapter for the detailed description including com-

plete procedures to use for each single function.

3.2.1 "PROGRAMMING" KEY

This key allows to program the ECU whether if it is virgin or already programmed. It is possible to carry out both of them through recorded files or files supplied by BRC (choosing the key **"FROM RECORDS"**) and the **self-map** (choosing the key **"AIDED PERSONALISED"**). These two keys appear on the left of the screen when selecting the main key "PROGRAMMING".

3.2.2 "SETTING UP" KEY

It contains all the necessary functions to modify maps, adjustments, changeover parameters and everything could effect SEQUENT installation operations. By using the SETTING UP instruments it is possible to revise every phase of the aided procedure separately from the others, to change the parameters of petrol to gas change-over, correct the self adapting maps, etc.

3.2.3 "DIAGNOSTIC" KEY

It allows to see the values in order to understand if there are possible problems or installation mistakes, to verify the type of software, loader and maps unloaded in the ECU, to test the correct operation of actuators, injectors, solenoidvalves, relays, etc.

3.2.4 "UTILITY" KEY

It groups all the general utility instruments not included in the previous categories. These allow to

effect some useful operations to update the program or to modify some aspects: you can change language, communication parameters with the ECU, display electrical plans, extract the map and the settings from the ECU and save them on the PC, manage the files containing already known vehicles maps, create diskettes to transfer the maps to another PC, update all data on the PC.

4. PROGRAMMING

4.1 PROGRAMMING FILES TYPE

The FLY SF ECU programming procedure is based on the download of three different types of files:

1. S19 File
2. FSF File
3. AAP File

4.1.1 S19 FILE

The files with S19 extension contain the algorithms and the strategies used by SEQUENT system. Each time you effect a new programming of the ECU it is advisable to update the S19 software with the last version available in the PC. Obviously the PC has to be updated too. This allows to have all the developed functions and strategies available.

To better clarify the function of S19 files, we could say that it calculates the exact gas flow to supply the engine with and pilot the injectors by analysing the vehicle specific parameters (FSF file), the map (AAP file) and all data coming from the different sensors.

4.1.2 FILE FSF

The FSF file contains the specific data of the converted vehicle. For example the type of installa-

tion (LPG or CNG), the engine type (vacuum or LPG turbo), all calibration parameters of the signals coming from the acquired sensors, the change-over parameters, the possible parameters for tip-in strategies and the advance setting up ones.

4.1.3 AAP FILE

The AAP file contains the vehicle map. In particular the petrol reference map, the gas one and

the map concerning cells condition. Cells condition map is useful to identify the type of vehicle operation in the different operating area, identified by MAP engine revolution couples. These cells could be Open-Loop or Closed-Loop type.

4.2 ECU PROGRAMMING

In case you need to program an ECU, it is necessary to select the Programming key on the main
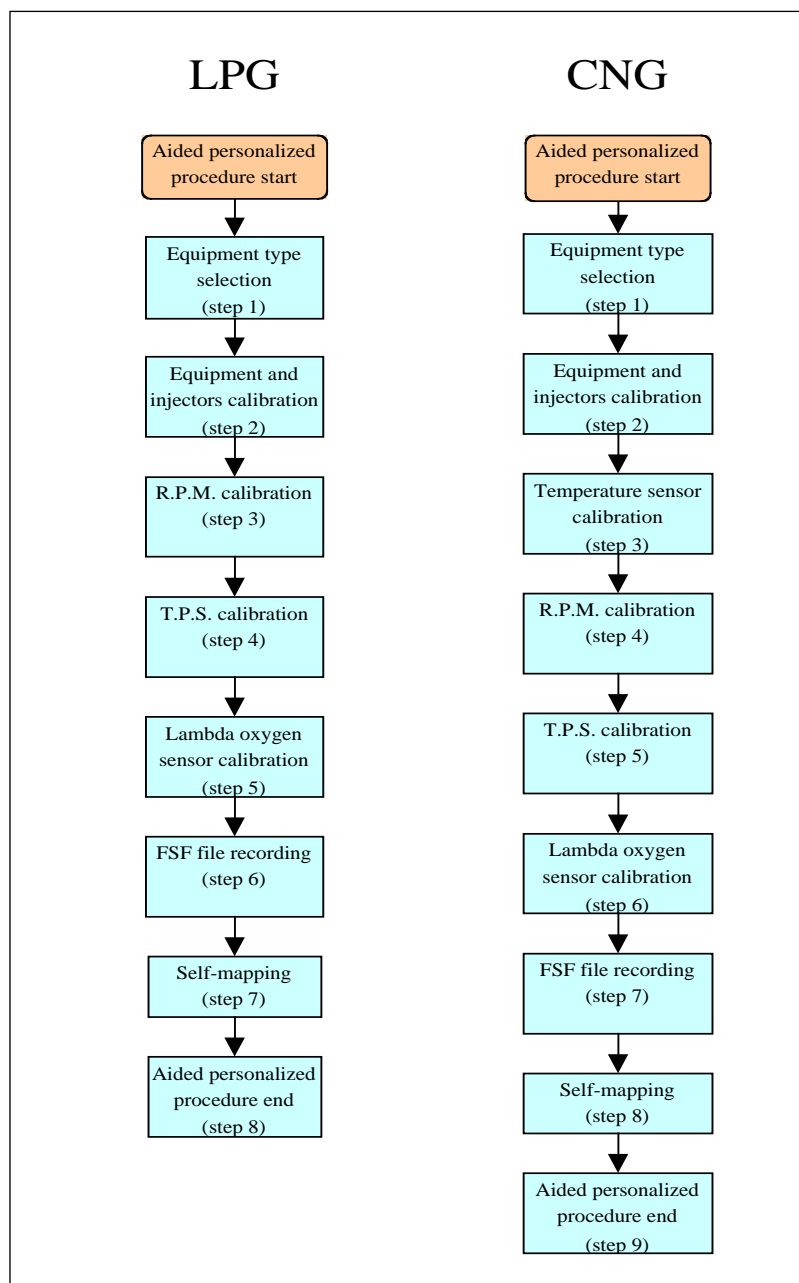
Pic. 4.1: Guided personalised procedure steps

screen. There are two types of programming available:

- Aided Personalised
- From records

4.2.1 AIDED PERSONALISED PROGRAMMING

This type of programming has to be carried out when you wish to convert a new vehicle whose map is not available. In this case start the configuration of the personalised parameters and then the real self-maping. The aided procedure consists of 8 steps for LPG and 9 for CNG as indicated in picture 4.1.

To enter this procedure, select the Programming key at the bottom of the screen and then the Aided Personalised one, on the left. The technician will be guided step by step through all the different phases of the procedure by a red capital writing in the centre of the screen. It is possible to go through this procedure taking one or more steps backwards or FORWARD, by using the PREVIOUS or NEXT keys at the bottom of the screen (see picture 4.4b) or by using PgUp and PgDwn keys on the keyboard.

To correctly effect this procedure, respect the conditions indicated at the top of the screen (see picture 4.2) displaying each step the correct condition of:

- Engine (on or off).
- Ignition key (connected or not).
- The changeover switch (gas or petrol position).
- The vehicle (stopped or running).

Be careful: with the aided calibration procedure all the parameters on the ECU will be lost.

Hereunder the explanation of the Personalised Aided Procedure steps.

4.2.1.1 Type of installation

As shown in picture 4.3 this is the first step and allows to select the type of equipment installed in the vehicle: LPG or CNG.

In case of a usual LPG or CNG installation, after selecting the cell, digit ENTER. Automatically the ECU will receive the software and a standard map to calibrate the vehicle.

After sending the data the program will ask to disconnect and connect the ignition key again. At the end the ECU contents will be read and the program will go directly to the next step without further intervention of the technician.
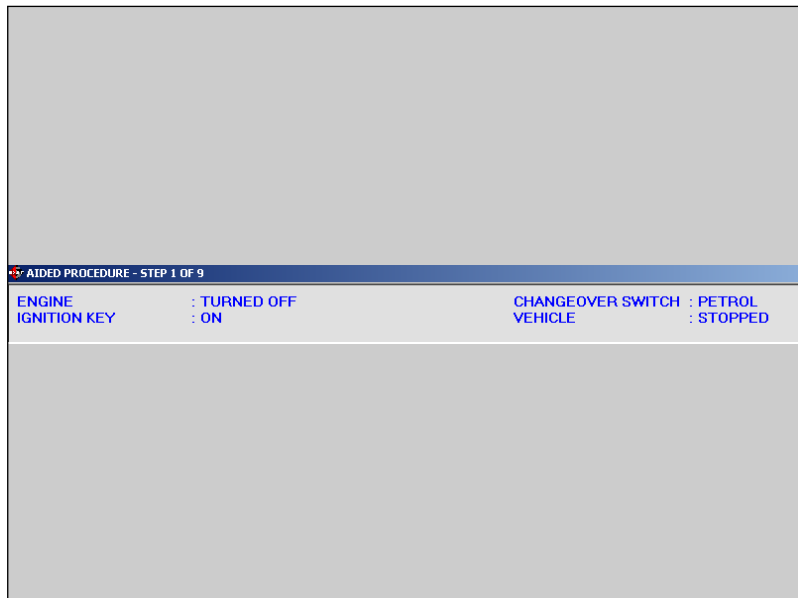
Pic. 4.2 - Conditions at the top of the screen
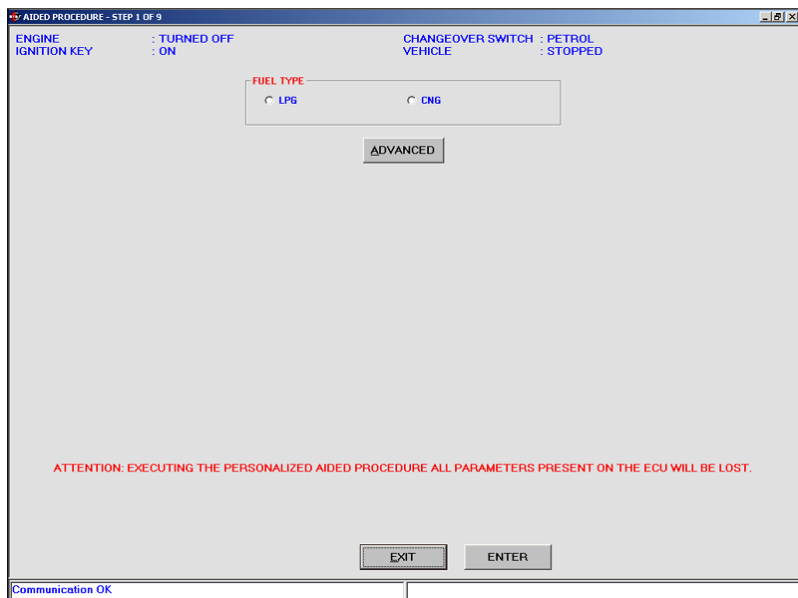
Pic. 4.3 - Aided Procedure – type of installation

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NOTE:

When entering this screen, before doing any operation, the PC program verifies the ECU loader version and compares it with the last downloaded one. If the ECU loader is not updated, a message will ask to do that (see picture 4.3); in this case it is not possible to continue the aided procedure until the ECU contains the updated version (see paragraph 4.2.2 for procedure).

In particular cases indicated by BRC, it could be necessary to download a different software by using "ADVANCED" key. Clicking on it the following possibilities will appear:

• **Default:** it corresponds to the software normally supplied by BRC. Without a special authorisation given by BRC technicians it will be possible to use only standard software.

• **Custom:** it corresponds to particular software used for testing and development. These ones have to be used only if indicate by BRC technicians. After choosing this option, select the software and click OK in the window for the software selection (see picture 4.4).

4.2.1.2 Installation and injectors Calibration

This is the second step both for LPG and CNG. It needs to specify further information about the installed equipment. Particularly it allows to indicate if it is a vacuum or a LPG turbo installation. As indicated in picture 4.4b, in the section where you can choose between
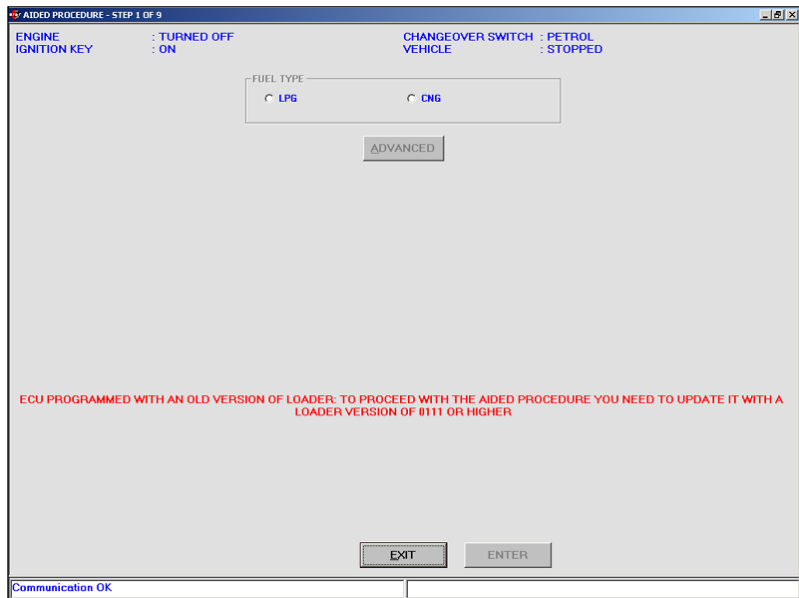
Pic. 4.3a - Aided Procedure – type of installation – not updated loader
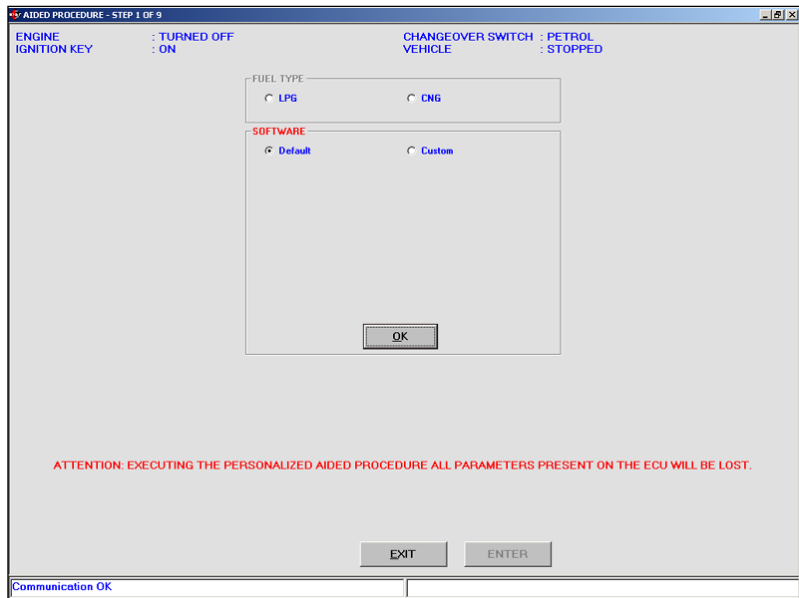
Pic. 4.4 - Aided Procedure – type of installation clicking on "OTHER"

the above options there is the indication of the choice between LPG or CNG confirmed in the previous step (for technician convenience) but no possibility to change it (the writing is grey) To change you have to click on Previous and repeat the procedure explained at step 1. In this screen you can select the installation characteristics too:

• **Injector type:** indicates the installed type of gas injector

choosing among the available ones;

• **N. of Genius:** indicates how many genius reducers have been installed. Mostly it is one so that this is the set value; it is necessary to modify it only if you have two;

• **N. of P1 Sensors:** indicates how many P1 pressure sensors have been installed. The set value is one. Modify it if you

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need to install two (refer to installation plans to know how many sensors are needed).

• **N. of Injectors :** indicates the total number of installed gas injectors. Mainly they are 4 and this is the set value. A message will indicate the technician the number of FLY SF ECU he has to install according to the selected injectors number.

Finish and verify the introduced values, then click on NEXT to continue.

A similar section could be activated from the main screen, outside the aided procedure, by selecting Setting up --> Type of Installation

NOTE: By clicking ADVANCED key in the installation section, it is possible to set operation limits concerning the rpm signal and the MAP manifold pressure (picture 4.4c). Normally this operation has not to be carried out unless indicated by BRC technicians. In detail you could set:

• **Rpm Min:** it is the minimum rpm value in the maps: usually it is suitable to set a value of about 300 rpm under the idling condition value;

• **Rpm Max:** it is the maximum rpm value in the maps: usually it is suitable to set a value of about 500-600giri/min under the vehicle rev up value;

• **MAP Min:** it is the minimum absolute pressure value (mbar)
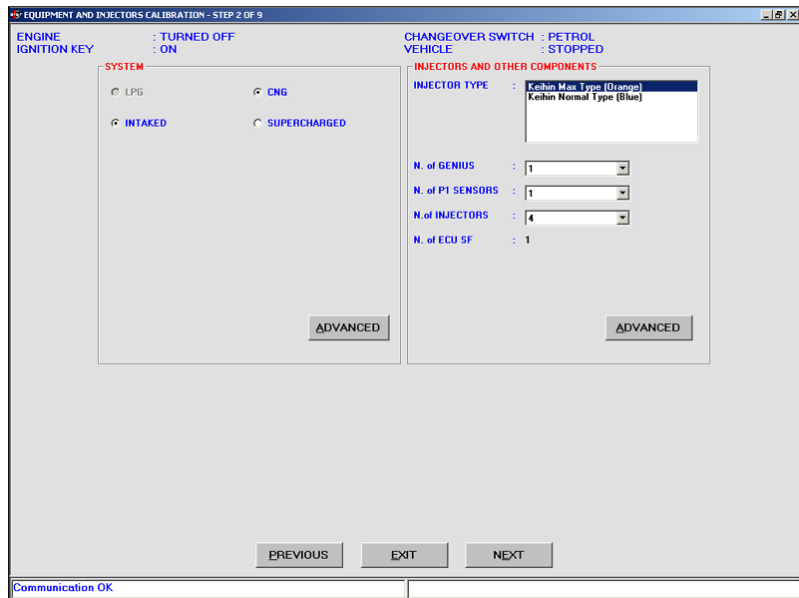
Fig. 4.4b - Aided procedure - installation and iniectiors calibration
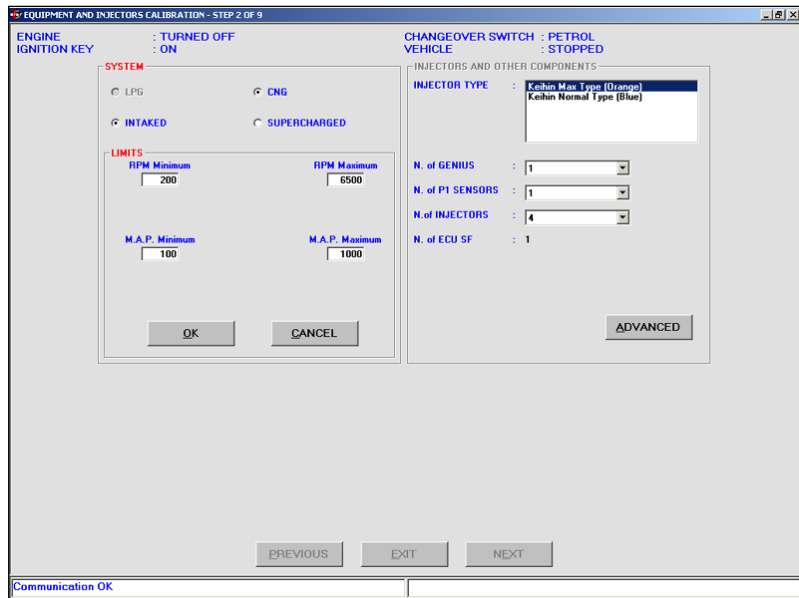
Pic. 4.4c - Aided Procedure – injectors and installation calibration by clicking on ADVANCED key in the installation section

of the suction manifold in the maps: usually it is suitable to set a value of about 200-300mbar under MAP value at idling;

• **MAP Max:** it is the maximum absolute pressure value (mbar) of the suction manifold in the maps: introduce the maximum value of the achievable manifold pressure. In case of vacuum engines set 1000 while for LPG turbo ones set 1700.

By clicking on ADVANCED key in the section concerning injectors and other components, it is possible to display the injector characteristics. It is possible you have to read them to BRC technical Assistance service in case of problems.

💡 A similar section could be activated from the main screen, outside the aided procedure, by selecting Setting up --> Type of Installation.

4.2.1.3 Temperature sensors Calibration (only for CNG)

It is the third step of the aided procedure in case of a CNG equipment; it is not displayed in case of a LPG one (see picture 4.1) and it is useful to calibrate the temperature sensor of the engine cooling water so that it can be read and used by the ECU.

Choose sensor enabled if the original cooling water temperature sensor of the petrol engine has been connected (picture 4.5).

By choosing this second option it is necessary to calibrate the sensor. To do it the vehicle has to be cold.

If not it is possible, choose the option sensor Disabled in this section and calibrate it later, out of the aided procedure, through the suitable option from the Setting up menu.

To calibrate the sensor follow this procedure:

1. Select Sensor Enabled (see picture 4.6).

2. Click on Calibration key.
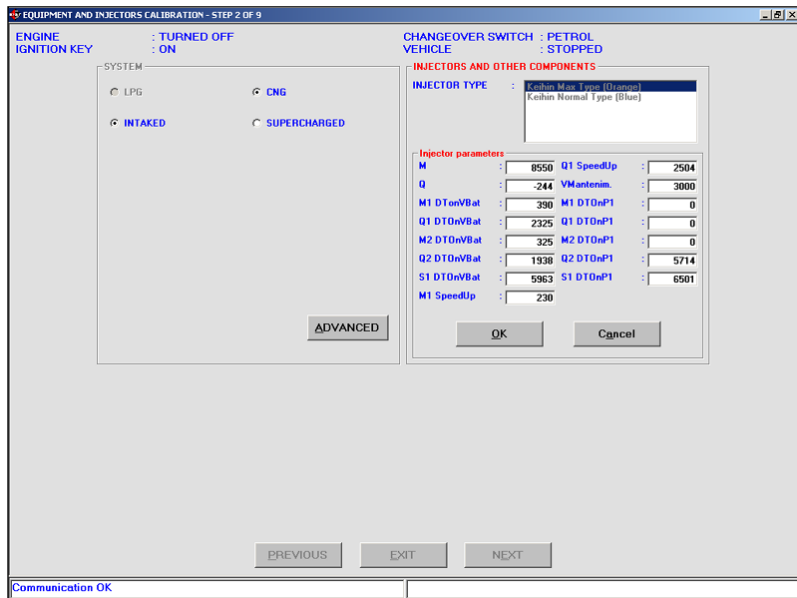
Pic. 4.4d - Aided Procedure – injectors and installation calibration by clicking on ADVANCED key in the injectors section
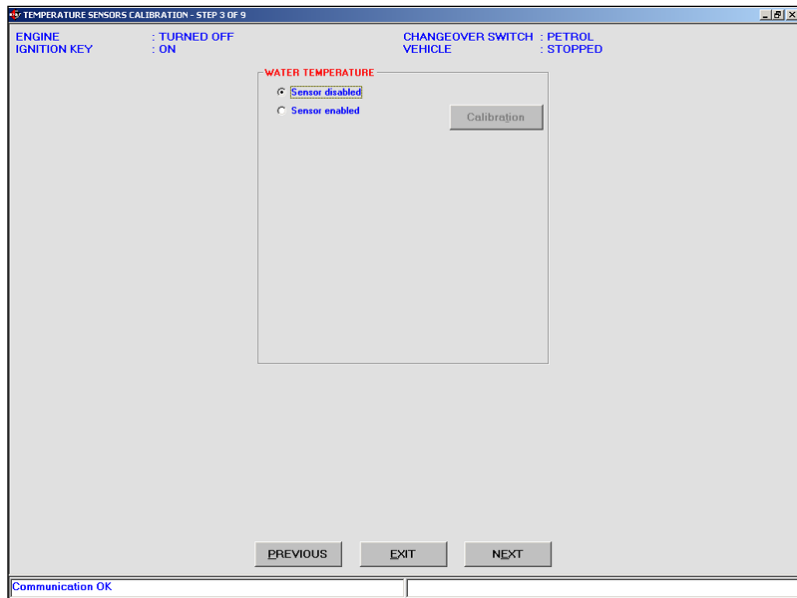
Pic. 4.5 - Aided procedure – Temperature sensors calibration
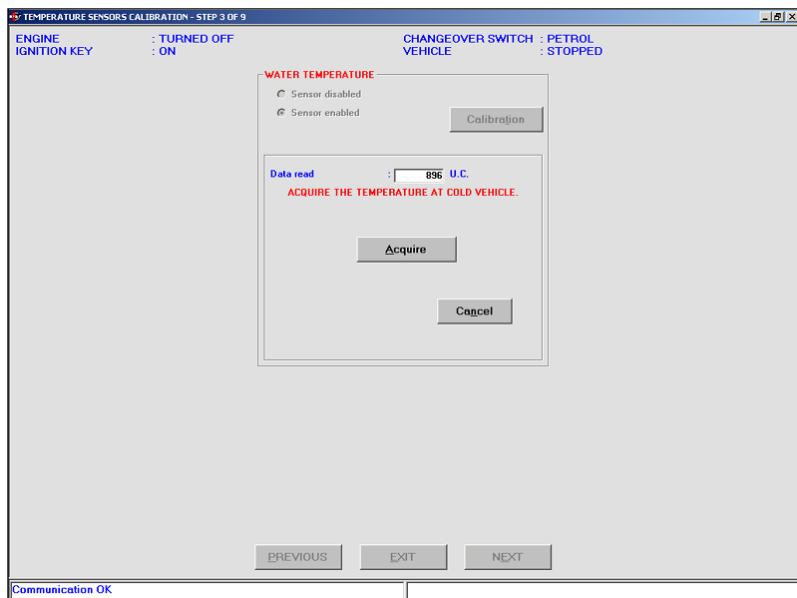
Pic. 4.6 - Aided procedure – Temperature sensors calibration – first value acquisition

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3. Click on the Acquire key to memorise the temperature when the vehicle is cold. This operation will take a few seconds.

⚠️ Note: This acquisition has to be carried out when the temperature of the engine water is enough cold. For example at 40°C.

4. Introduce the Cold Vehicle T value corresponding to the acquired engine water temperature in °C (i.e. 40 °C) as indicated in picture 4.7 and confirm with OK.

5. Switch the engine on and wait till the temperature is enough high and acquire the temperature with warm vehicle clicking on Acquire key (picture 4.8). For example you can wait for the fan operation which occurs around 100 °C.

6. Introduce the warm Vehicle T value corresponding to the acquired engine water temperature in °C as indicated in picture 4.9 (i.e. 100 °C if you wait for the van operation to acquire the temperature with warm vehicle).

After finishing this calibration, go on with Next key; if it has been modified you will be asked to confirm the introduced values. Usually the answer is positive and in this case all data will be memorised (the previous ones will be deleted) and you will approach the next step.

With a negative answer old data will be kept and you will approach the next step. By clicking on Cancel you will stay in the current page and you will not continue the procedure.
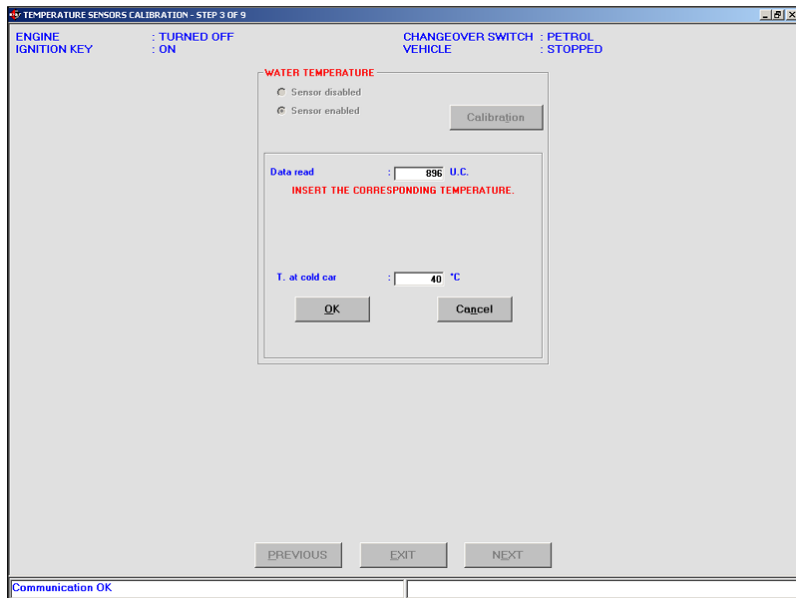
Pic. 4.7 - Aided Procedure – temperature sensors calibration – first value acquisition
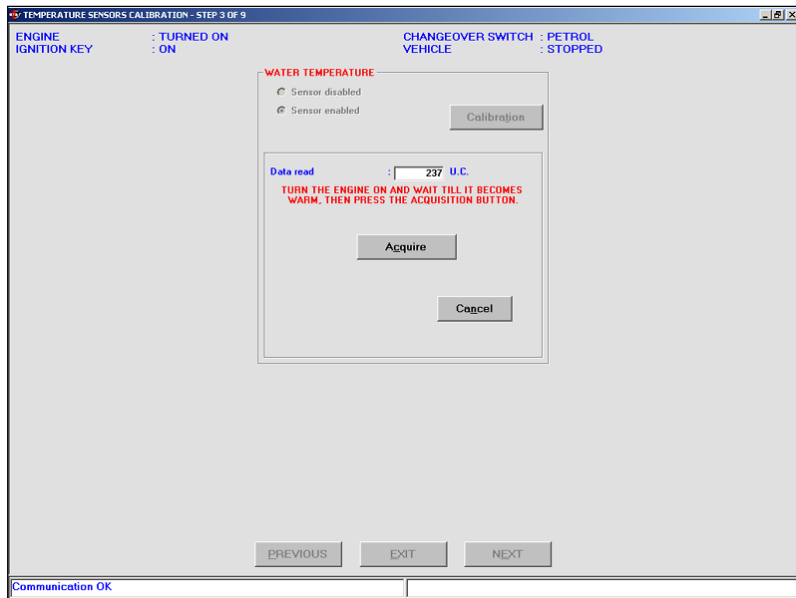
Pic. 4.8 - Aided Procedure – temperature sensors calibration – second value acquisition
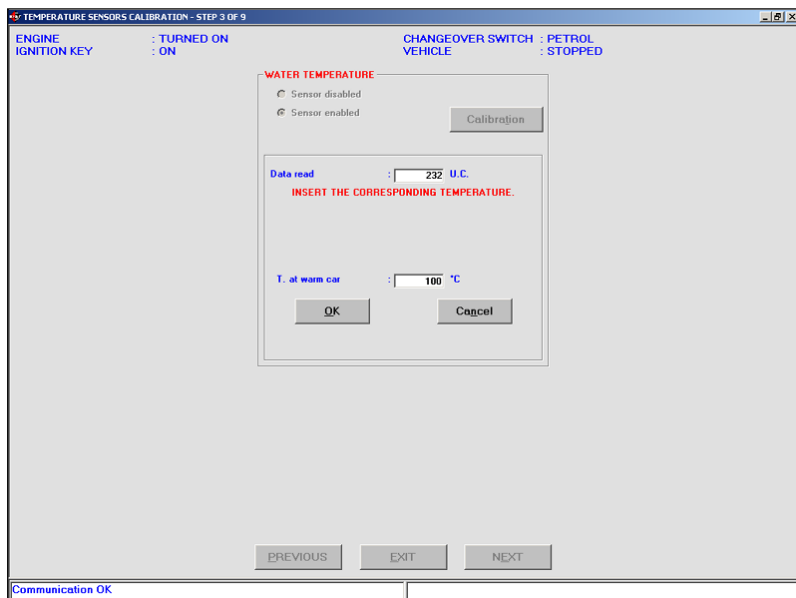
Pic. 4.9 - Aided Procedure – temperature sensors calibration – second value acquisition

4.2.1.4 Rpm calibration

This if the third step in case of LPG installation and the forth one in case of a CNG one (see picture 4.1)

Entering the rpm calibration section, in the Set rpm signal menu, the rpm signal type will be displayed as it is read according to the current ECU definition (see picture 4.10).

If rpm value is not correctly read, it is necessary to carry out the automatic calibration procedure by using Change Calibration key.

The program will ask to keep the engine at idle while running with petrol (see picture 4.11).

You just have to confirm with OK to automatically take the rpm signal type.

At this point, if the rpm is one of the system set ones, its name will be displayed in the rpm signal type taken by the automatic procedure menu. In case the used rpm signal is not in the list, the message "No determined setting" so appears that you will have to manually set the parameters through the indications appearing by clicking on ADVANCED key. (For this operation please contact BRC technicians).
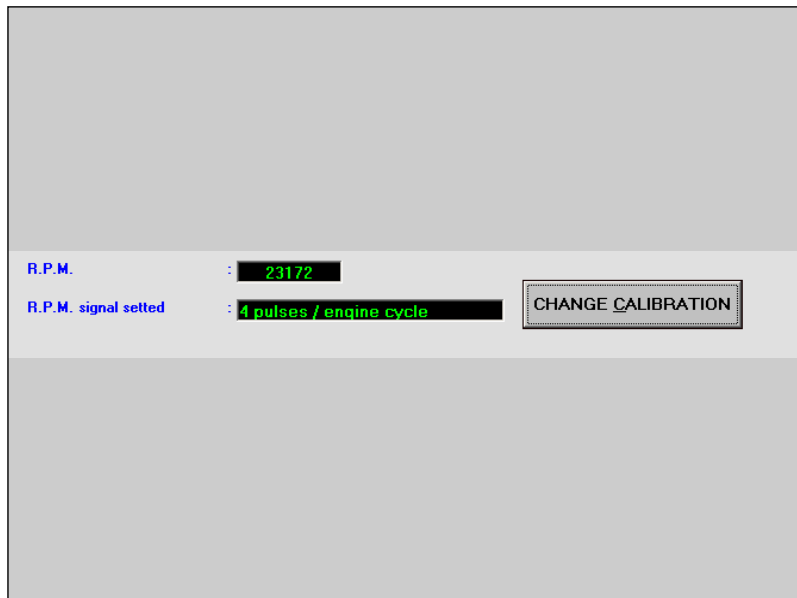
Pic. 4.10 - Aided Procedure – rpm calibration
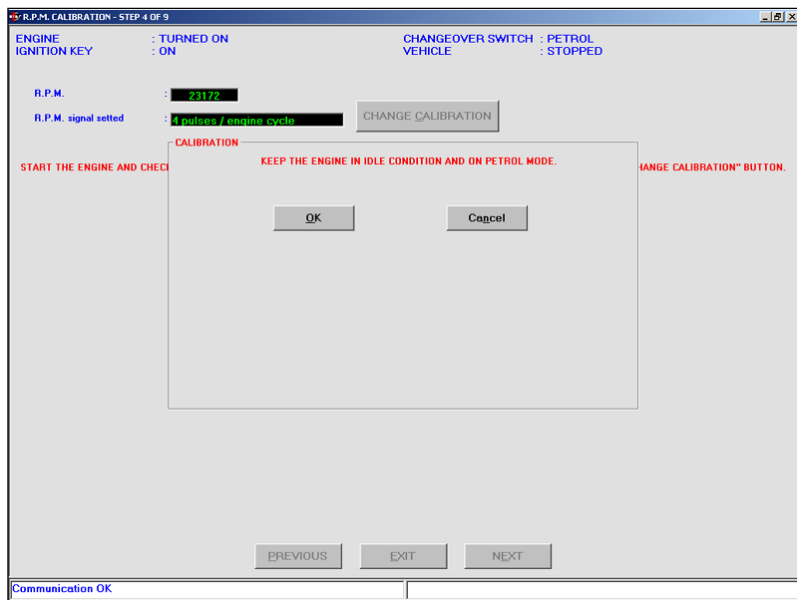
Pic. 4.11 - Aided Procedure – rpm by using Change Calibration key
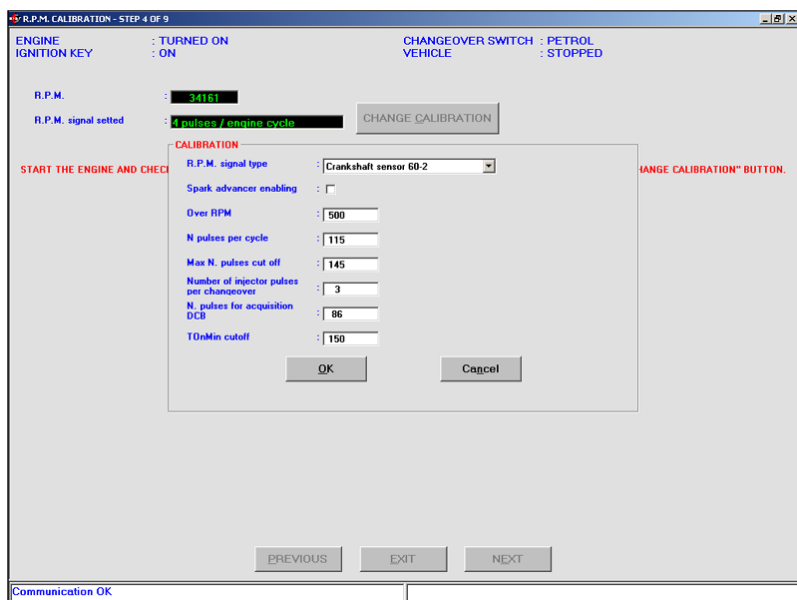
Pic. 4.12 - Aided Procedure – rpm calibration by clicking on ADVANCED key

If the automatic procedure took a known rpm signal (it usually happens) you just need to click on Confirm to continue (picture 4.13).

At this point it is better to verify rpm are correctly read and this control could be made, for example, at idle and at 3000 rpm.

If everything is correct, click on NEXT, and positively answer to the confirmation question; then continue the Aided Procedure.
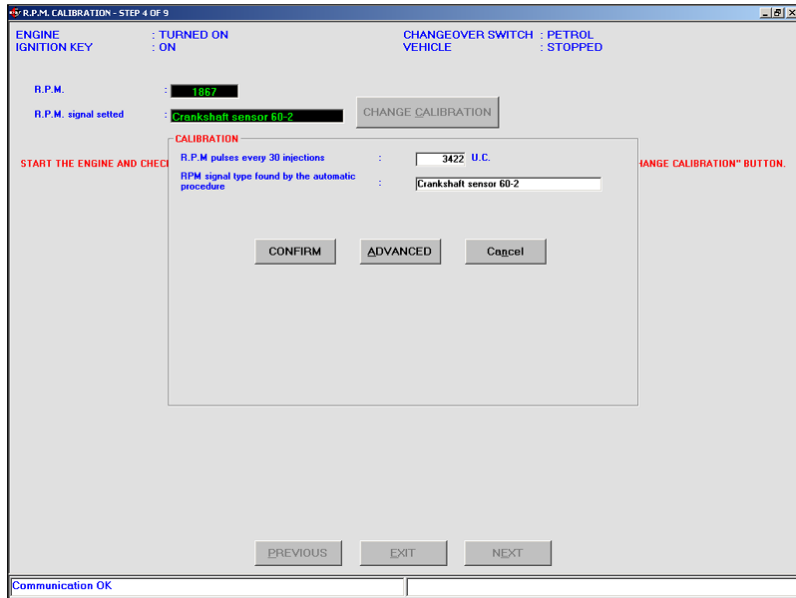
Pic. 4.13 - Aided Procedure Guided Procedure – automatic rpm calibration

4.2.1.5 TPS Calibration

This is the fourth step for LPG installations and the fifth one for CNG (see picture 4.1).

Entering the screen for the TPS calibration, the procedure automatically begins (picture 4.15). First of all it is necessary to verify the operation conditions (the ones written in blue at the top of the screen). The vehicle has to be stopped with the engine running on petrol.
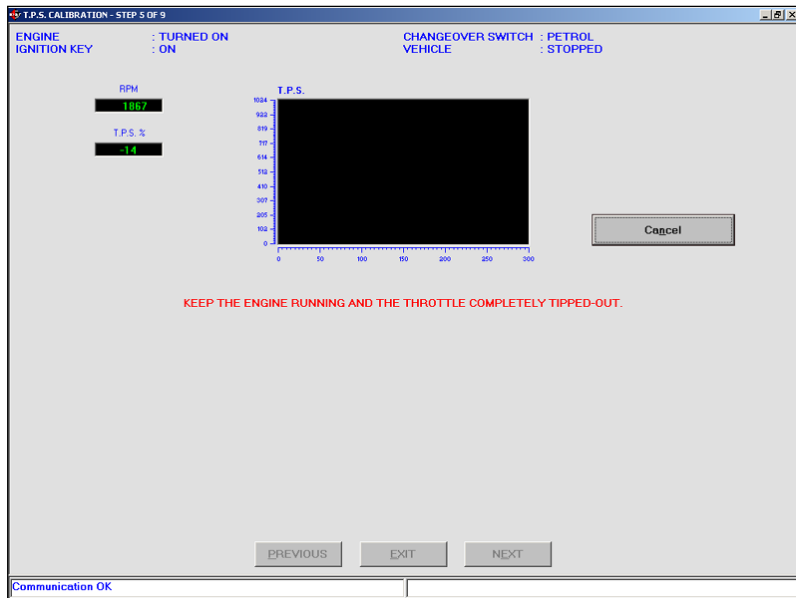
At the beginning the engine has to be on with the accelerator completely released. After the program will indicate to execute three complete and uniform accelerations.

It the TPS calibration has not been correctly executed it is possible to modify it by clicking on Change Calibration key as indicated in picture 4.15.

At the end, click on Next, confirm the acquisitions and continue the Aided Procedure.

Pic. 4.14 - Aided Procedure – TPS calibration
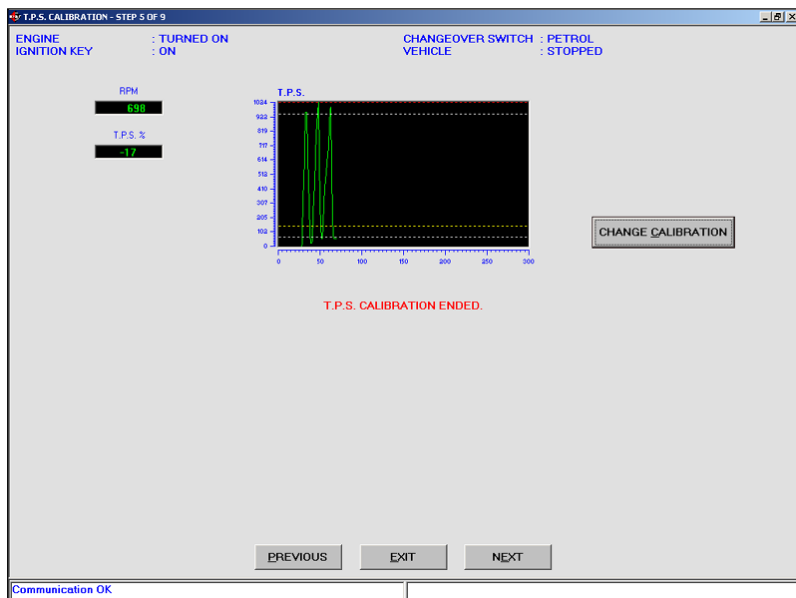
Pic. 4.15 - Aided Procedure – TPS calibration ended

4.2.1.6 Oxygen Sensor Calibration

It is the fifth step for LPG installation and the sixth one for CNG (see picture 4.1).

The Oxygen sensor calibration is very important for this system as this signal is used to speed up and optimize the self-learning strategy.

It is important to know some oxygen sensor characteristics such as if it is a "CURRENT" or a "VOLTAGE" one (ordinary oxygen sensor), if it is "straight" or "reverse".

Let's explain the meaning:

• **Straight Oxygen sensor:** the high tension level corresponds to a "rich" situation of the mixture and, on the contrary, the low tension level to a "lean" situation of the mixture.

• **Reverse Oxygen sensor:** the opposite of Straight one.

Note: usually if the oxygen sensor is a current type, it is a reverse one, too.

Identification method: with a sharp acceleration and standing still, execute a cut- off (released condition where there is no injection); if the oxygen sensor is low it is a Straight one otherwise it is a Reverse one.

The Current oxygen sensor is recognisable for its extremely different behaviour compared to the Voltage oxygen sensor one.

During stationary conditions (at idle) when the vehicle is in control, a voltage oxygen sensor continuously varies between minimum and maximum tension value while a current one will keep practically the same value.
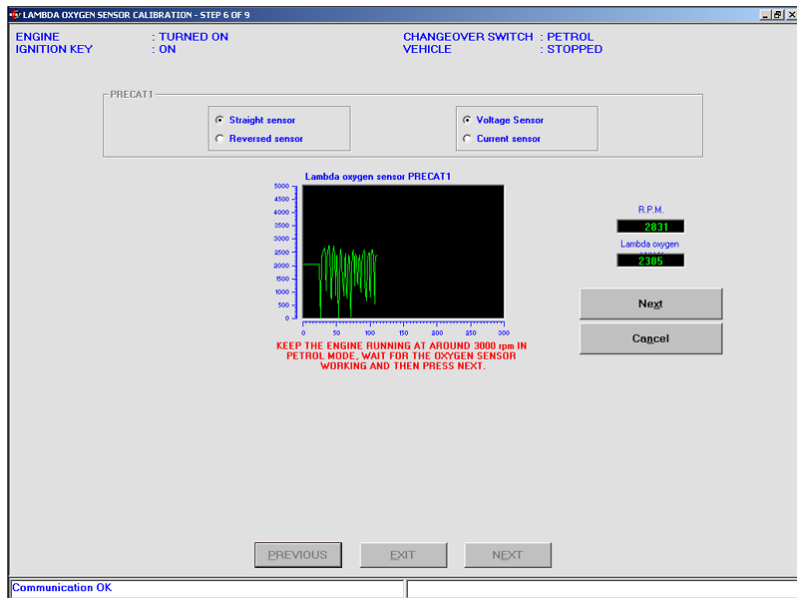
Pic. 4.16 - Aided Procedure – Oxygen sensor calibration
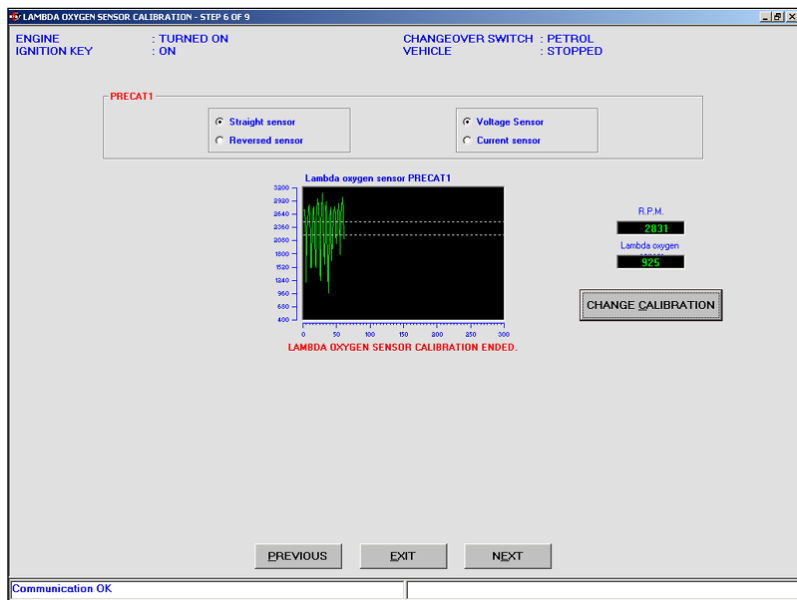
Pic. 4.17 - Aided Procedure – Oxygen sensor calibration clicking on Forward

Only executing sharp tip-in or during an open-loop phase, this value notably changes. Please remember current oxygen sensors are mainly used by some car manufacturers (i.e. Volkswagen) and the mostly have more that 4 cables.

Once these parameters are set and verified, continue the oxygen sensor signal calibration. With the engine at about 3000 rpm wait till oxygen sensor start to check (see picture 4.16) them click on Next (not the one at the bottom of the screen or you will directly go to the next step) and start the automatic calibration procedure. Keep the engine at 3000 rpm and wait till the program acquires the oxygen sensor working range (see picture 4.17).

The calibration could be repeated, in case of mistakes, by clicking Calibration, executing again all the above listed operations.

At the end click on Next again and confirm the acquired data.

4.2.1.7 FSF file Saving

This is the sixth step for LPG installation and the seventh one for CNG (see picture 4.1).

This section requires to select the destination file where the settings dotained up to now have to be saved. Under the main file USER_MAPS select the type of installation (LPG or CNG) and fill the below cells in, indicating Trademark, Model, ECU, File (picture 4.18) in the most detailed way.

For example, in case of a vehicle with the following characteristics:

Installation: CNG
Trademark: Ford
Model: Mondeo 1800i 16v (BWY)
ECU: Visteon LBO-110 Levanta
File: AZ982BP

we will obtain what indicated in picture 4.18:

Note: in choosing the file name you can use whatever you prefer. A good suggestion is to use a name which makes you identify the vehicle where the file has been downloaded (for example the plate number).
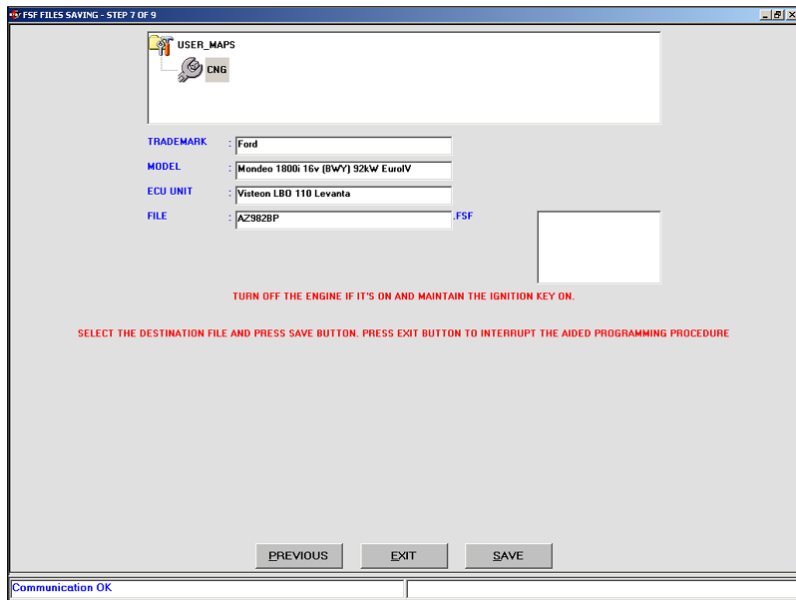
With the engine off and the ignition key on, it is possible to click on Save that means all calibrations will be saved on the PC and downloaded in the ECU.

Clicking Exit, without saving, all executed calibrations will be lost.

Choosing to continue, after the ECU programming, you will have to switch the dashboard off and

Pic. 4.18 -Aided Procedure – FSF file saving

then on and after click on Next: at this point you enter the self-mapping section.

4.2.1.8 Self-mapping

SEQUENT system bases its operation on the maps contained in the ECU which allow to translate the petrol injectors signals into orders for the gas injectors. These are different according to the vehicle. The aim of the self-mapping is to obtain the translation maps through simple acquisitions (on road) of the vehicle operating conditions, immediately after the installation.

There is also a self-learning function able to correct possible map error following the slow variations due to the system ageing, a calibration loss or a slow deterioration of gas and petrol components.

To make the self-mapping and the self-learning possible, it is necessary to acquire and store two maps, one for the petrol operation

and the other for the gas one. The translation from petrol to gas comes from the union and comparison of these two information carried out by the ECU.

The vehicle map procedure follows the phases listed hereunder:

1. Petrol Self-mapping
2. Creation of the gas operation rough map
3. Gas Self-mapping
4. Map and full load check.

4.2.1.8.1 PETROL MAP

In this phase, during petrol operation, the installer has to acquire different operation points, related to rpm and manifold pressure (MAP). The PC program will obtain the complete map during petrol operation by means of suitable extrapolation algorithms.

The map is based on a table with 16 lines and 16 columns. On each line there are 16 points with constant rpm while the MAP (suction manifold pressure) increases

moving to the right. On the contrary, in each column the MAP value does not change while rpm increase moving down.

Please keep in mind the MAP value increases (on the same rpm) according the throttle valve opening to (that is pressing the accelerator more); therefore during the self-mapping we move to the right on the map by accelerating, shifting up and looking for hill trial courses.

To move down the cartography you have to achieve very high rpm, for example, increasing the vehicle speed, shifting down, etc. In this case, the white column on the left of the screen, with values from 300 to 6250, contains rpm values concerning to each line of the table. At the same time, the high white line with values from 125 to 965 contains the MAP value in mbar concerning each column of the map. At the beginning the cells of this table are red and the inside value is zero "O".

The cell where you are corresponding to the current rpm and MAP collected by the system is enlarged during the acquisition (see picture); at the same time rpm and MAP values concerning the centre of the cell are displayed in blue on the border of the table

In the upper cells, indicated as RPM and MAP, the vehicle real values are displayed as shown in picture 4.20. The displayed cell keep to have value "0" till the operation points acquisition does not begin. This acquisition starts as soon as we achieve the optimal conditions (reducer temperature, engine on for enough time,
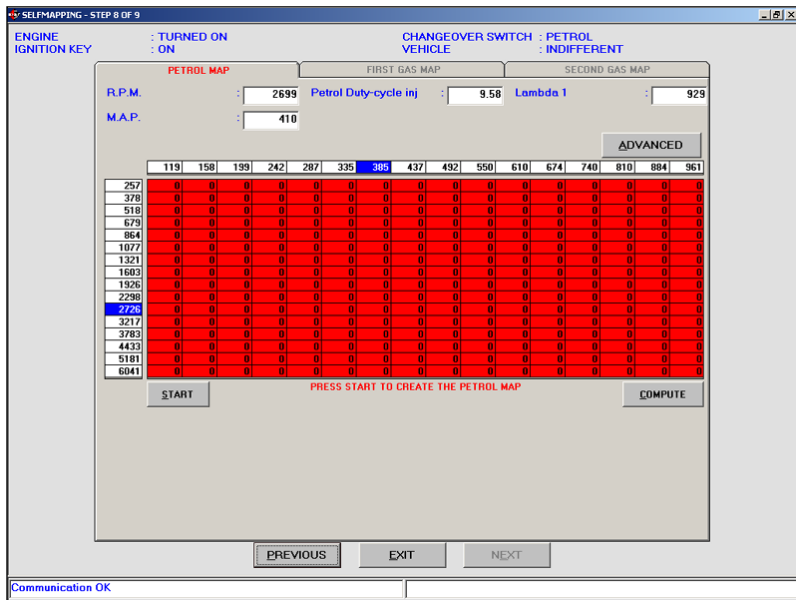
Pic. 4.19 - Aided Procedure – petrol self-mapping beginning
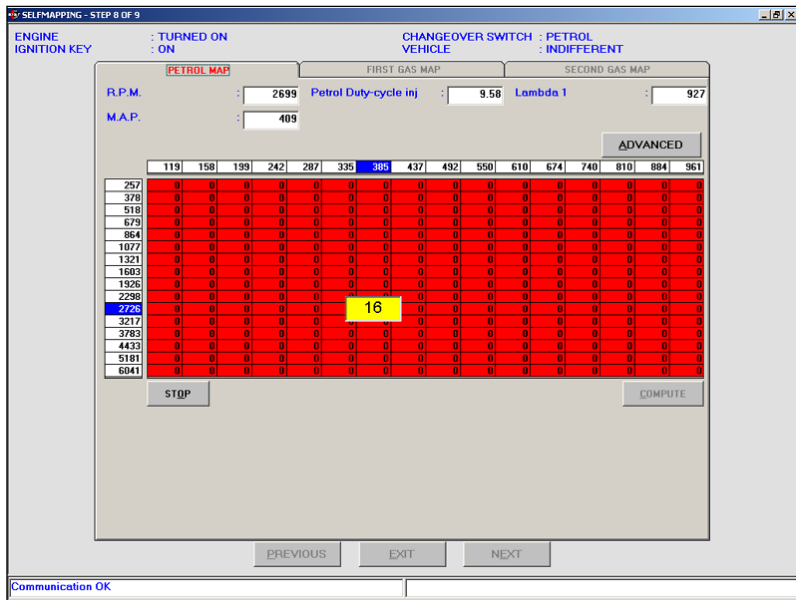
Pic. 4.20 - Aided Procedure – petrol self-mapping

changeover switch in petrol position, constant operation conditions, etc) and the Start key (at the bottom left) has been pushed. The value "0" starts to increase as shown in picture 4.20. The technician is informing again the map phase begins through the message Acquisition in progress (at the bottom of the screen).

Going on with the description of the screen shown in picture 4.20, besides the first two cells at the

top left (RPM and MAP) we have the following information;

• **Petrol duty-cycle inj.:** shows the value picked up by the system in that moment for the petrol injectors Duty Cycle;
• **Lambda 1:** shows the oxygen sensor electric value;

In the upper part of the screen (picture 4.20) we have three files:
1. Petrol Map
2. First gas map

3.Second gas map

Only the first file is selectable and active when you start a new map, while the other two are automatically activated by the program itself. Fit the end of petrol self-mapping begins the gas one. All these files can be selected and activated by the user when he decides to continue a previous stopped self-mapping, where the petrol map processing was carried out. While some operation points are acquired in the same cell, its colour changes from red to yellow. This indicates that operation point has been acquired with few points but it can be used by the extrapolation algorithms which calculate the complete map (see picture 4.21). Going on in acquiring operation points in the same cell, the colour becomes green indicating the acquired points are enough for a good map. When the number contained in the cell achieves the maximum (for example 50), the next acquired point will be not memorised and used to develop the final map; also the number in the cell does not increase anymore.

A good map could be obtained by acquiring more cells as possible, avoiding to leave a big area of the map without acquisition (red), for example full load or high rpm, etc.) The ideal situation is to obtain a map with many green points for all MAP and rpm values (i.e. see picture 4.22).

The points acquisition can be stopped anytime (for example if traffic conditions are averse) click-
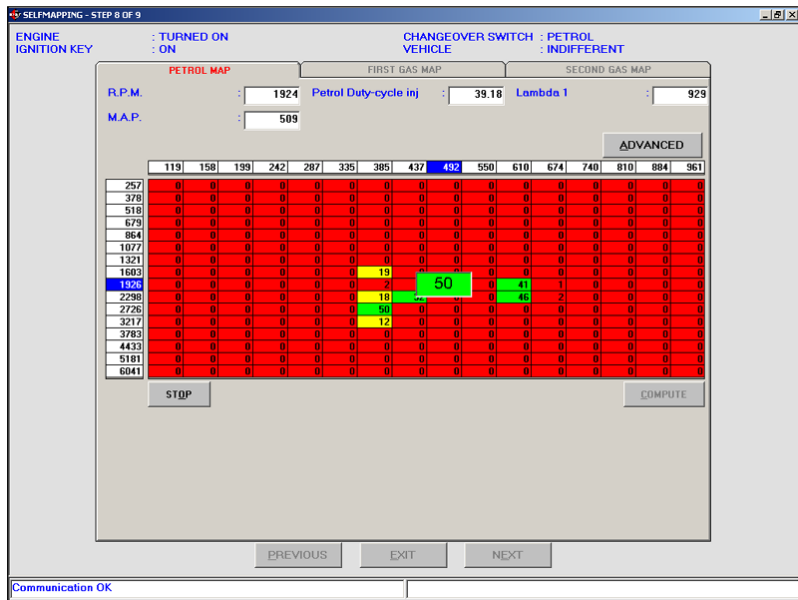
Pic. 4.21 - Aided Procedure – petrol self-mapping with some points
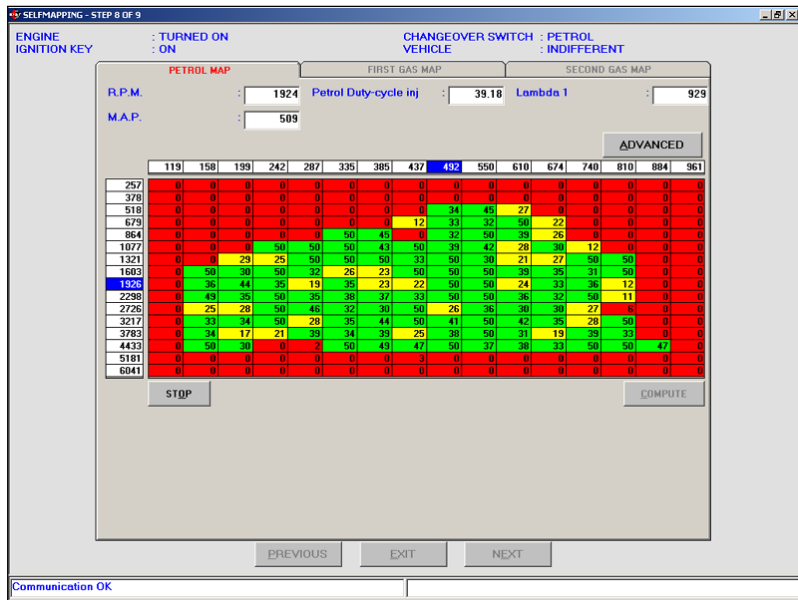
Pic. 4.22 - Aided Procedure – complete petrol map

ing Stop at the bottom left (picture 4.21) and started again clicking the same key (the writing will change into Start – picture 4.22).

When the table contains enough well distributed green and/or yellow cells, it is possible to continue the interpolation of the missed points (red) with the creation of the final petrol map. To do that, stop the points acquisition clicking Stop and then Compute at the right bottom of the screen (picture 4.22). This operation begins, if

possible, the acquired data processing, creats the petrol map, an initial gas one and transfers everything in the ECU. At this point the procedure moves to the screen for the first gas map.

4.2.1.8.2 GAS SELF-MAPPING

At the end of the petrol map phase, you can start the gas one. The gas self-mapping is divided in two steps:
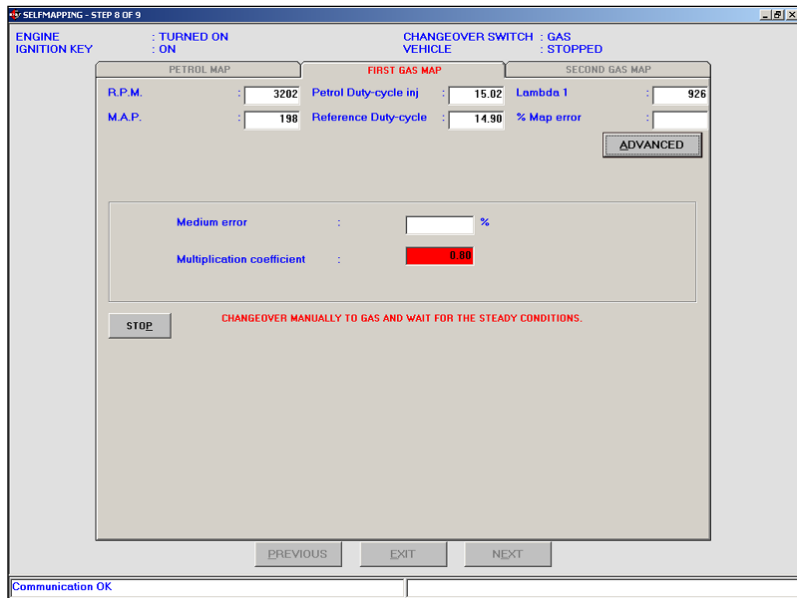
1.First gas map

2.Second gas map

To start the acquisition of the first gas map, click on Start at the bottom left.

At the bottom of the screen there is a red writing as shown in picture 4.23 asking to manually change to gas and wait for stready conditions (condition=3). The program waits for the operator, carrying the map out, changes to gas operation with the Gas/Petrol changeover switch. Only after this change-over the vehicle begins to be fed with gas following the initial map which has been downloaded at the end of the petrol map (see picture 4.24).

This phase is extremely difficult and delicate because the initial gas map, downloaded from the ECU, could be very far from the correct one. The initial map is obtained from the gasoline map through the multiplicative coefficient shown at the top right (picture 4.32). As we do not know the correct value of this coefficient, different for each vehicle, it is possible the engine stops after the change-over. If it happens, there is no data loss and it is possible to start again from the point the self-mapping was left before the accidental stop. As general suggestion in order to avoid this inconvenience, remember that if the change-over is executed keeping the engine rpm not too low (i.e. 2000 or 3000 rpm), lightly accelerating, it is difficult this stop occurs for a carburation defect. When the change-over is carrying out during vehicle movement and in gear, the accidental stop is not possible as
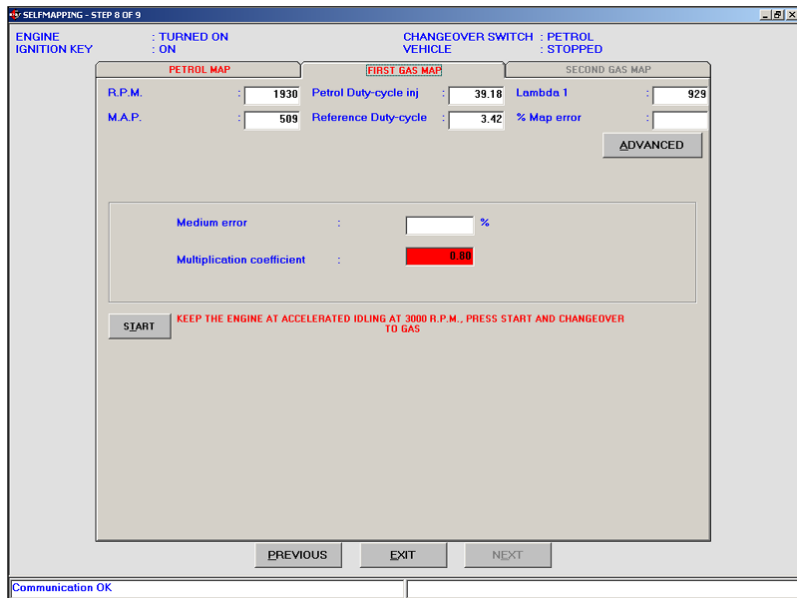
Pic. 4.23 - Aided Procedure – first gas map beginning

Pic. 4.24: Aided Procedure – first gas map

the vehicle motion inertia will keep the engine rotation and in this lapse of time the technician can change to petrol before the stop.

If this stratagem is not sufficient to avoid engine stopping, it will be necessary to start again from the petrol self-mapping (picture 4.32) introducing different values for the multiplicative coefficient and clicking Compute till you find the value which allows the engine to stay on. The value of the multiplicative

coefficient has to be increased if the vehicle stops after the engine flooding or too rich carburation. The reason of the stop can be deduced from the oxygen sensor behaviour immediately after the change-over or before the stop. During the self-mapping phase we strongly suggest the use of instruments able to display fast evolution of the oxygen sensor signal (Jolly or Diagnostic Box). A typical value of the multiplicative coefficient to start from is about 0,80.

Achieving the stationary conditions, the program begins to calculate the best fuel quantity to supply according to the engine operation conditions. During this phase try to keep the operation conditions more constant as possible (stand-still accelerator and constant rpm). The red writing of the screen disappears and in the % Map Error cell we have a numerical value indicating the entity of the correction executed by the program to achieve ideal carburation conditions (see picture 4.25).

While the program achieves a more precise correction, the map error decreases till it is less than the set maximum error (this latter could be set through OTHER). When it occurs, the multiplicative coefficient cell changes from red to green and the initial value changes too (see picture 4.30 whose value decreases from 0,80 to 0,79).

Wait for a few seconds to be sure the new multiplicative coefficient value (0,79 in picture 4.26) is fixed then click on Stop and download the new map obtained from the petrol one and the new multiplicative coefficient.

You will be asked to change to petrol (condition = 2 or 1) so set the changeover switch in the petrol position to make the map download in the ECU possible.

The other cells in this screen have the following meaning:

• **Petrol Duty-cycle inj.:** shows the duty cycle taken from the petrol injectors (cut and emulated).
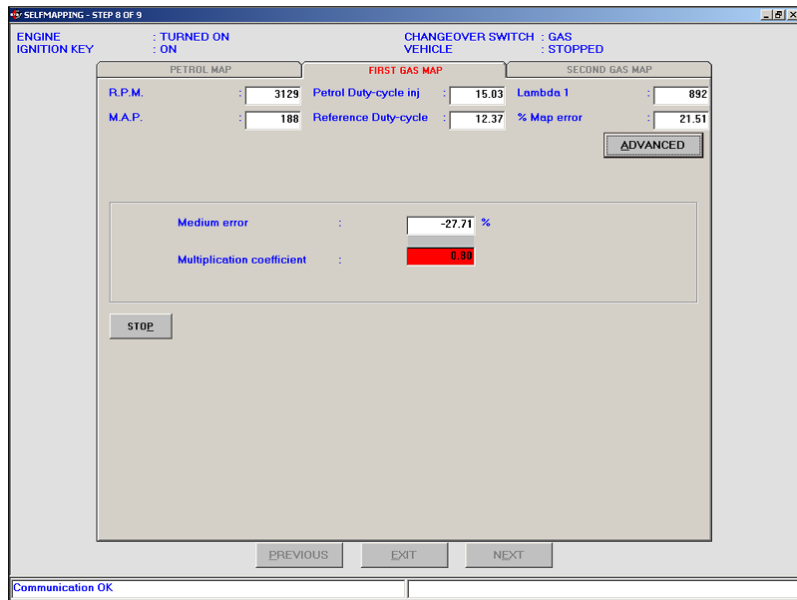
Pic. 4.25 - Aided Procedure – first gas map after change-over
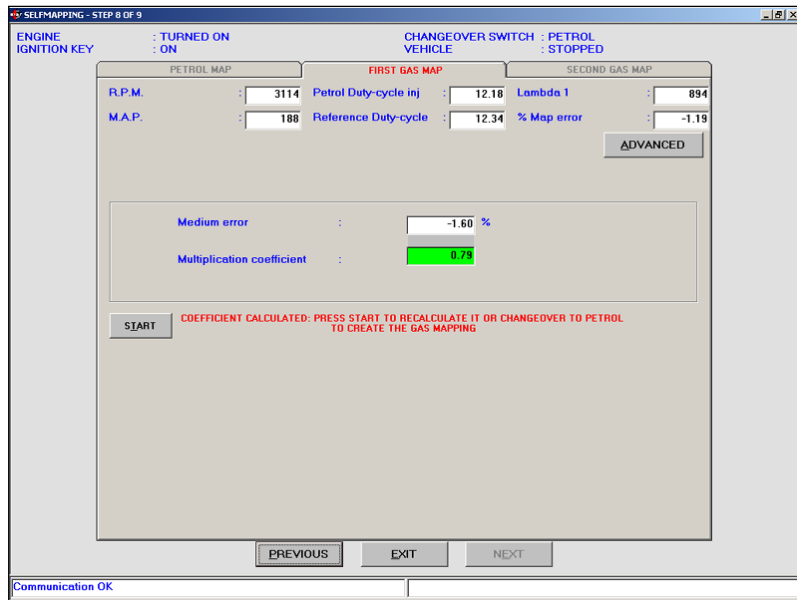
Pic. 4.26 - Aided Procedure – complete first gas map

• **Reference Duty-cycle:** shows the petrol duty cycle value expected by the map in that point.

• **% Map error:** shows the medium shifting between the petrol duty cycle and the reference one; it is positive if the petrol inj. duty cycle is bigger than the reference one that usually means the gas map is lean or the petrol map has too low values.

• **Lambda1:** it has the same meaning of the petrol self-mapping.

Speeding up of the multiplicative coefficient acquisition is possible increasing the maximum error value using ADVANCED key (see picture 4.27) and the sliding bar. Consider that high value for the maximum error lead to obtain imprecise maps so that we suggest not to exceed the value more than 10%.
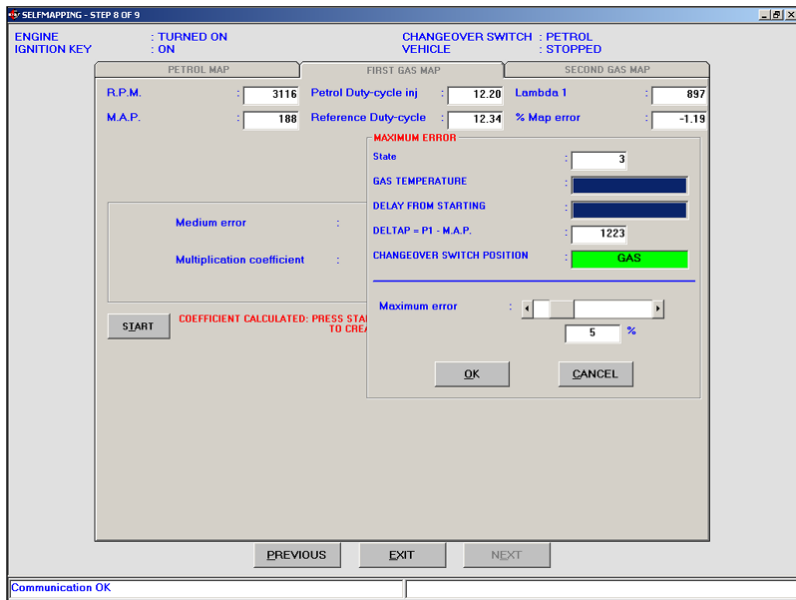
Pic. 4.27 - Aided Procedure – first gas map with ADVANCED key

At the end of the first gas map, the program asks to manually change to gas and to wait stready operation conditions (condition = 13, displayed clicking ADVANCED) as indicated in picture 4.28.
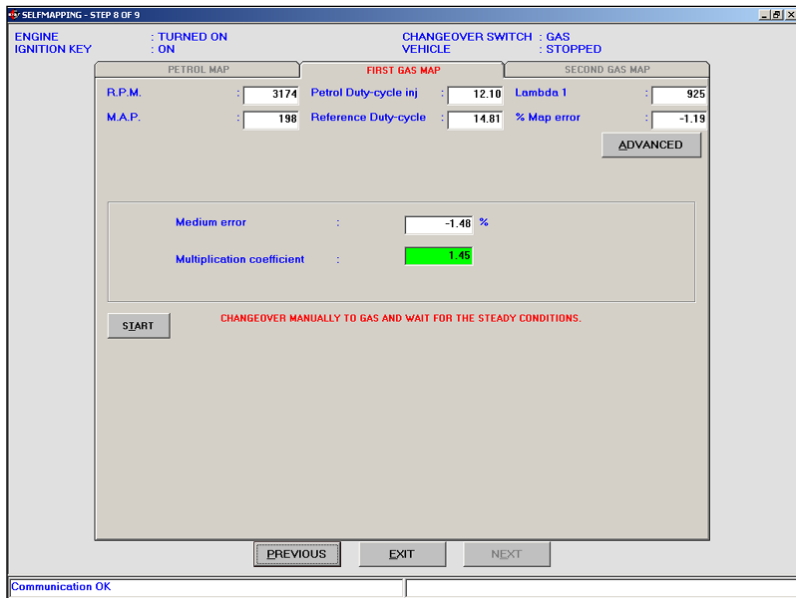
Pic. 4.28 - Aided Procedure – complete first gas map

After the change-over the program automatically goes to the second gas map screen (picture 4.29).

This screen, as the petrol one, has 16 lines and 16 columns. The functionality of the screen is similar to the petrol mapping procedure one. The gas self-mapping one is trained clicking Start. The principle is similar to the petrol mapping; the substantial difference is that, for each cell, the system tries to correct the carburation before starting to acquire the oper-
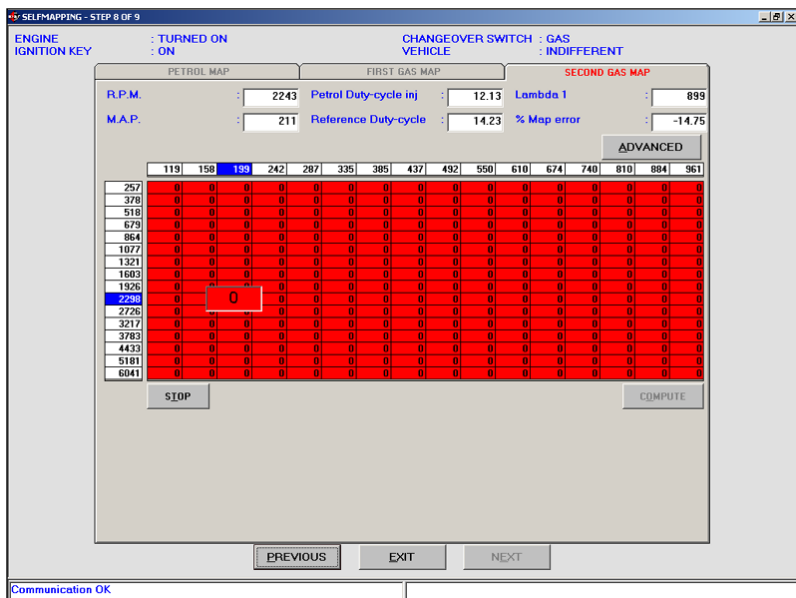
Pic. 4.29 - Aided Procedure – second gas map beginning

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ation points. These latter, represented by the cells, are not acquired till the Map Error is not less then the set Maximum Error value (see picture 4.30).

The carburation centering is made for each cell and stops whenever you go on contiguous cells; moreover it waits maximum error and waiting time limits are respected . For these reasons this procedure is slower than the petrol one and requires the conditions to be constant for a longer time.

At the beginning the map is zero and all cells are red (picture 4.29). While you execute some acquisitions the colour changes from red to yellow and then to green and, at the same time, the inside number increases. The acquisition criteria is the same of the petrol mapping. In the picture 4.31 we show the example of a complete map.

To end the gas map acquisition just click Stop, at the bottom left. Before executing the data processing you have to manually change to petrol operation by turning the petrol/gas changeover switch.

If the change-over does not occur it will be not possible to continue the data processing; this condition will be anyway displayed with an error message. After a correct change-over, click Compute to start the gas missed points interpolation and the download of the final map to the ECU.

Pic. 4.30 - Aided Procedure – second gas map with an acquired point
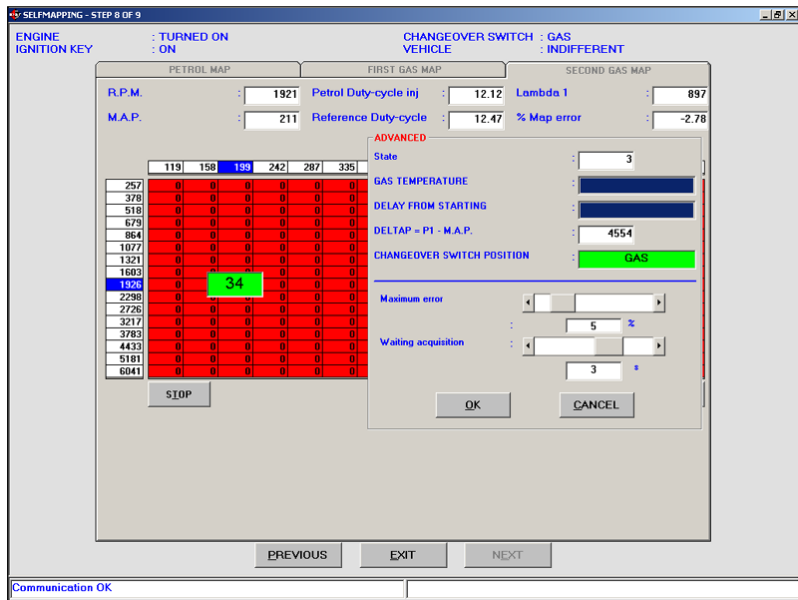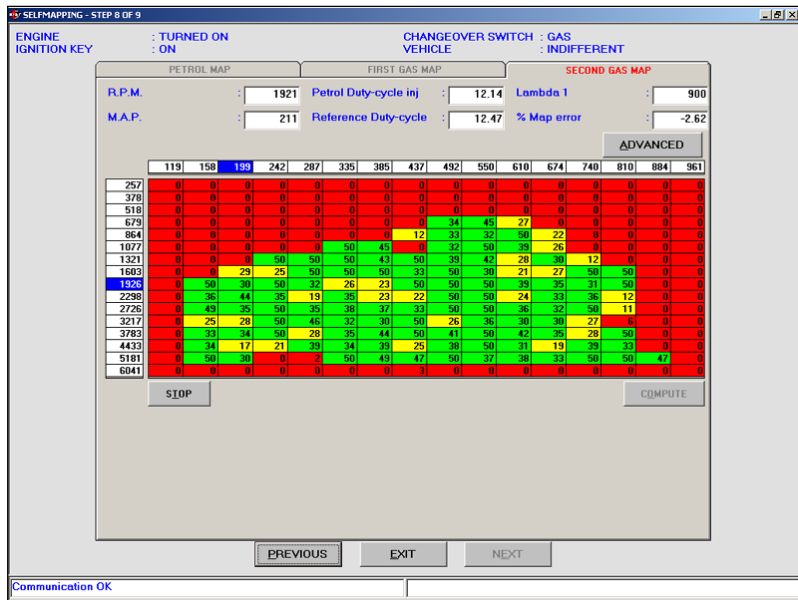

Pic. 4.31 - Aided Procedure – complete second gas map

Note:

• There are some reasons why the petrol or gas self-mapping could create errors and not correctly finish. This could happen is, for example, the acquired points are not enough or if the acquisitions are not plausible. The not operating conditions will be indicated with an error message. if all conditions have been correctly verified, the initial gas map is created from the petrol one.

• The first gas map is created from the petrol one and the multiplicative coefficient displayed clicking ADVANCED (picture 4.32). Usually the coefficient value is 0,80. If you can not continue the gas map, for example because the initial map is too lean and the vehicle stops when changing to gas, it is possible to return to this phase, modify the multiplicative coefficient (for example increasing it to obtain

a richer map) and then click on Compute again.

• When clicking ADVANCED the **Condition** value is displayed; this indicates the changeover switch position and the injected fuel: during normal petrol operation, with the changeover switch in petrol position, with a sufficient reducer temperature, the car running for enough time and in not tip-in conditions, the cell has value 1. In all other cases the value is different and the acquisition is not executed. The gas temperature and the change-over are represented by two sliding bars (picture 4.32): if the bars are completely blue, acquisition conditions have been achieved, on the contrary we have to wait the temperature or the ignition time reaching.

• If you prefer to execute a more precise petrol or gas self-mapping, you can check its reliability before executing the next steps. To check it, leave the self-mapping procedure by entering the Setting Up screen and then the Self-learning one. The value indicating the map centering is contained in % Error cell, at the top left, as shown in picture 4.33. Acceptable error values have to be ±5%. If more than ±10% the map has to be considered not very centred. By staying a long on a not centred point, the ECU self-learning will centre it better so that the percentage error decreases. It is possible to obtain more precise and centred petrol maps running on petrol after the petrol self-mapping and before executing the gas one.
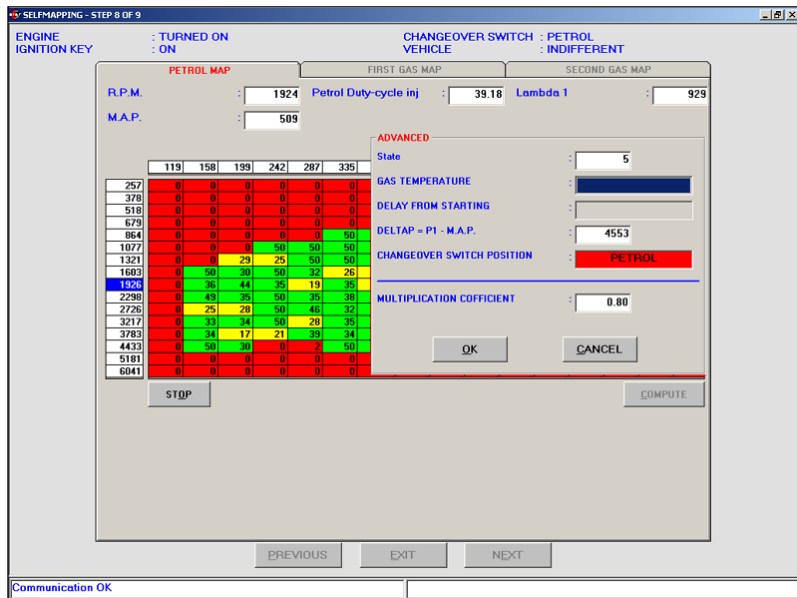
Pic. 4.32 - Aided Procedure – petrol map clicking OTHER
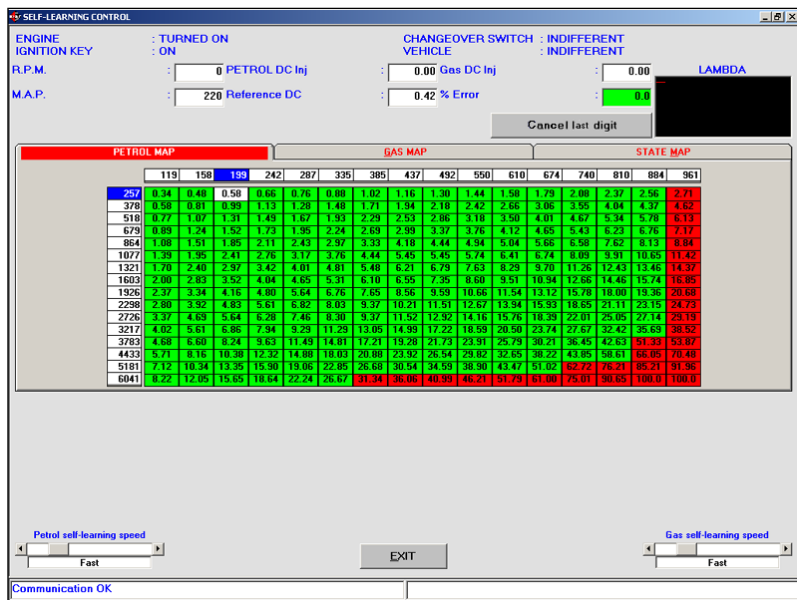
Pic. 4.33 - Self-learning check

• Anytime it is possible to stop an acquisition and start it again in order to verify the centering or for any other reason. For example, after having executed part of the petrol acquisition, that is before downloading the map in the ECU, it is possible to stop, switch the PC off and start the work again later recalling the name chosen at the beginning of the map. The same occurs if the petrol map has been completed and downloaded in the ECU. To start the work again, in the main screen select Setting Up and Self-mapping: you will be asked to select the previously saved vehicle file (picture 4.34).

By selecting the file, the map screen will be opened by selecting the file (picture 4.35).

Pic. 4.34 - To start a partial self-mapping again – file choice

Pic. 4.35 - To start a partial self-mapping again

From this section you can enter and modify petrol and gas maps, following the indications in paragraph 5.7.

4.2.1.9 Parameters transfer to the ECU

With this last section the new vehicle signals and self-mapping calibration procedure ends. You will be asked to turn the ignition key off and then on again (see picture 4.36).

To return to the main screen, click on End.

Pic. 4.36 - Final screen with red message

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4.2.2 PROGRAMMING "FROM RECORDS"

By selecting Programming > From Records you enter the screen for the FLY SF ECU programming from records, that is you will use files available or wich are available supplied by BRC. To correctly program the ECU, verify the operation conditions displayed at the top of the screen. If they will be not respect, it is not possible to execute the programming and this situation will be anyway displayed by the installer program.

To execute the programming, select the file you want to download in the records (according to the type of installation, trademark, model and petrol ECU). If the vehicle has been developed by BRC, the files will be contained in BRC_MAPS, if it has been developed by the technician the files will be in USER_MAPS.

In picture 4.37 we selected :

Map: developed by the user (User_Maps)
Installation: CNG
Trademark: Ford
Model: Mondeo 1800i 16v (BWY) 92kW EuroIV
ECU: Visteon LBO-110 Levanta

Once the vehicle ECU number is chosen, select the files to be downloaded. The example in the picture shows, for the ECU type there is only one FSF file (AB567CA.FSF) and only one AAP file (AB567CA.AAP).

To select the FSF file you have to click twice on the file itself and
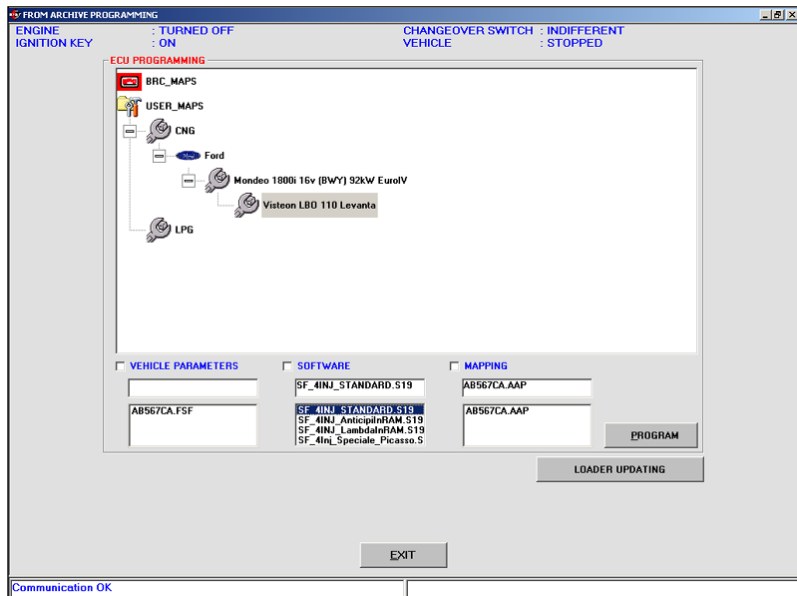
Pic. 4.37 - From records Programming

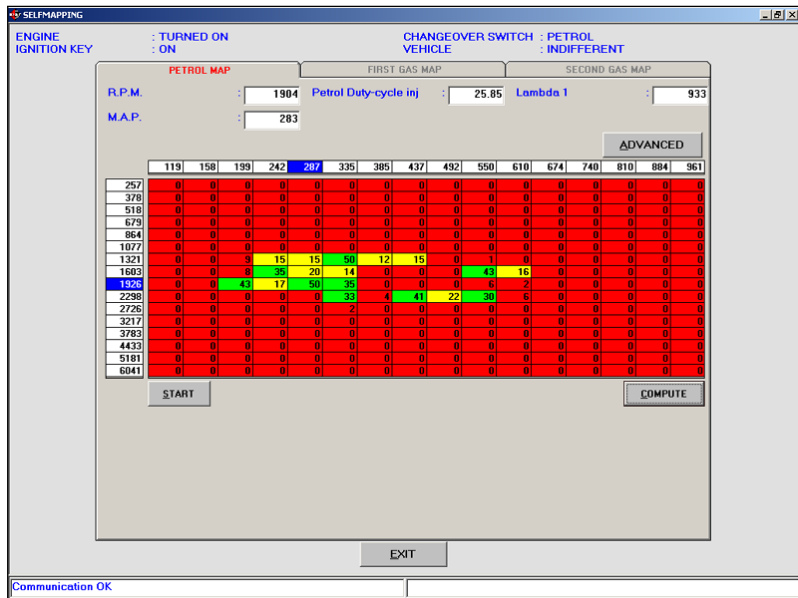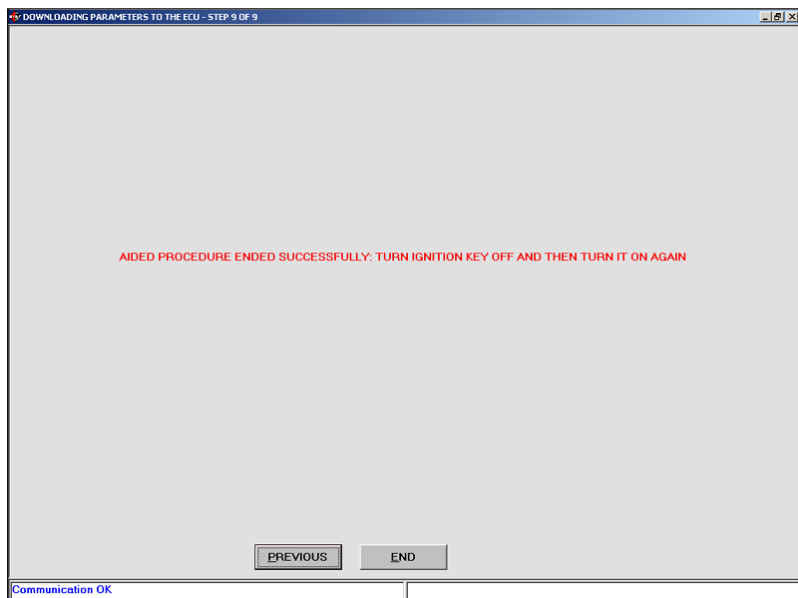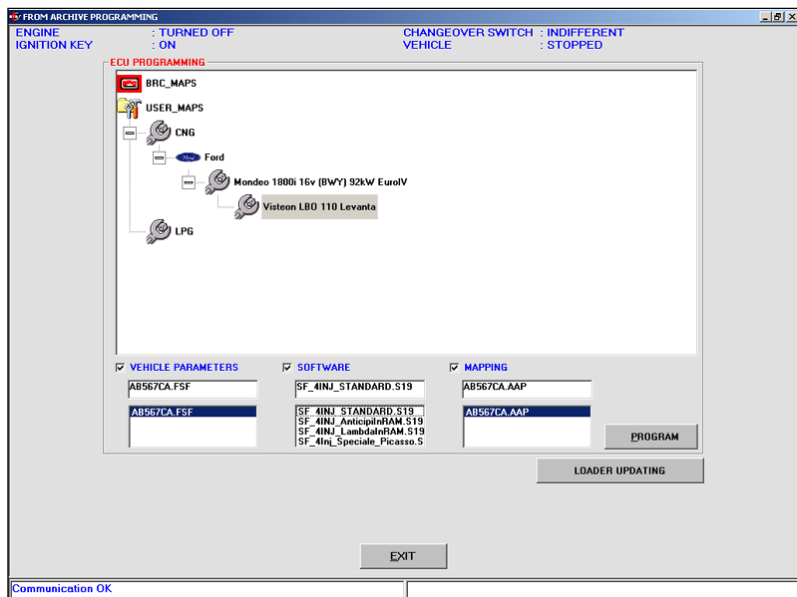Pic. 4.38 - Programming from records – file S19 selection

automatically a tick will be marked near the Vehicle Parameters writing and the name of the selected file will be displayed in the cell below.

The selection of the software to be downloaded (file .S19) is automatically carried out when choosing the Vehicle Parameters file (file .FSF). To transfer it to the ECU it is necessary the cell near Software writing is marked with a tick. You can change the software

through ADVANCED, as indicated in picture 4.38. Clicking it, a cell containing the different available software versions will be displayed. We suggest to carry these operations out only if advised by BRC technicians or qualified personnel.

Click twice to select the .AAP file and a tick will be automatically marked near Mapping writing and the name of the selected file will be displayed in the below cell.

The tick marks the files which will be simultaneously downloaded when continuing the ECU programming clicking Program.

In Picture 4.39 all the three files are simultaneously downloaded (FSF, S19 e AAP).

At one time, it is possible to make the following combinations:
- FSF
- AAP
- FSF + S19
- FSF + S19 + AAP

Sometimes it could be necessary to update the loader on the ECU. In this case the program automatically informs the technician to do that when he chooses to execute a guided personalised programming of the ECU.

To update the loader, click on LOADER UPDATING (see picture 4.39): the program will open a page displaying a red writing with all the indications, according to the situation of the ECU. Clicking PROGRAM at the bottom of the screen, the loader download starts. At the end of this operation a message will inform the operation has been correctly executed and it is necessary to turn the ignition key off and then on (picture 4.40).

NOTE:
While updating the ECU loader you could face the following possibilities:

1. The ECU contains a loader version less than 106. In this case the screen is the one of picture 4.40a and the writing in the centre
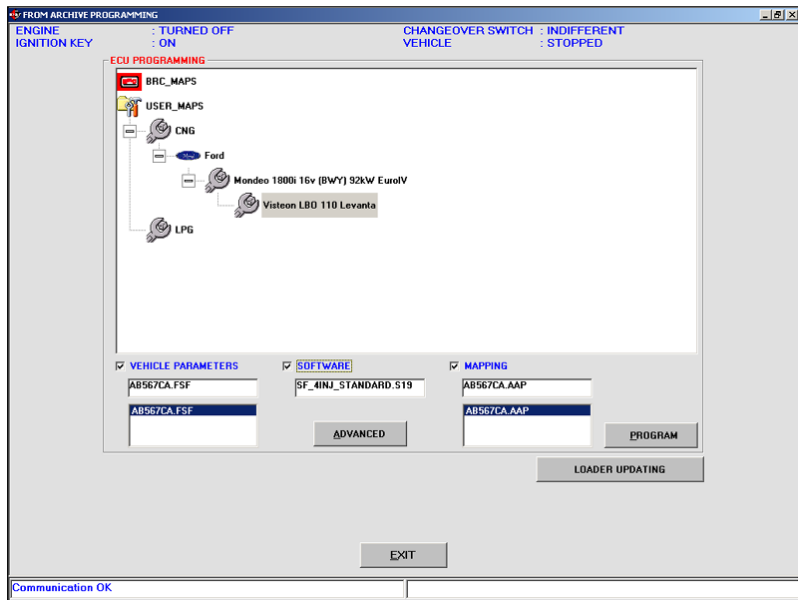
Pic. 4.39 - Programming from records – simultaneous selection of the three files
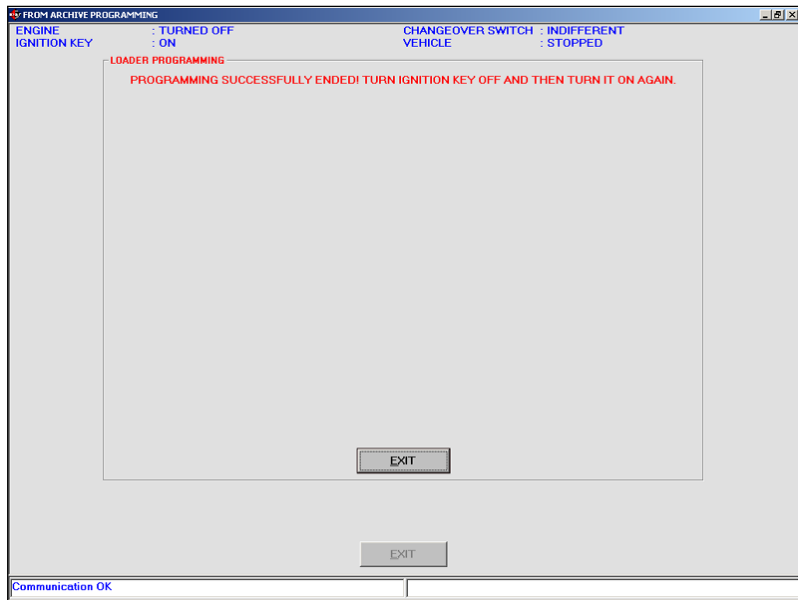
Pic. 4.40 - Correctly ended updating
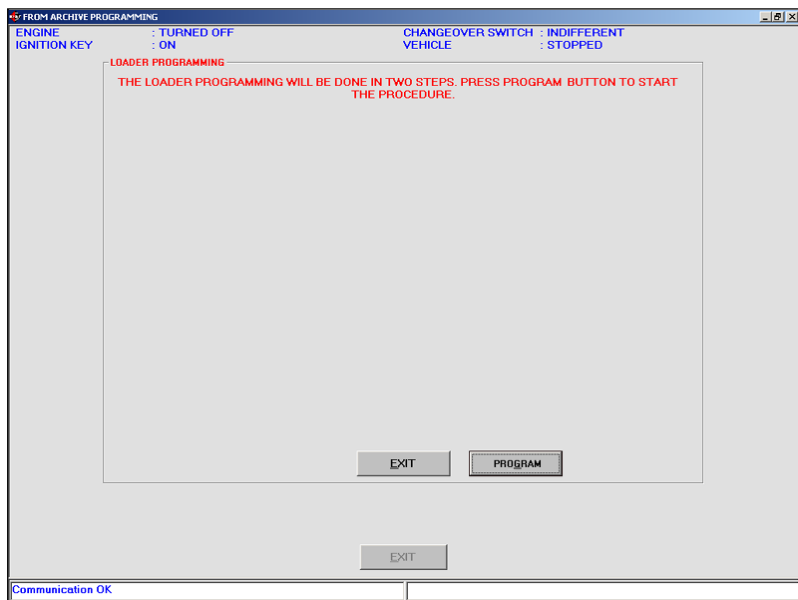
Pic. 4.40a - ECU Loader updating if less than 106

informs the operation will be executed in two steps: the first one executes the loader programming with 106 version (see picture 4.40b) and the second one will download the most updated loader available in the PC. At the end of the first step you will be asked to turn the ignition key off and then on and click on OK (picture 4.40b) At this point the second programming starts and at the end a message displaying it has been correctly executed appears (picture 4.40).

2.The ECU contains a loader version higher or equal to 106, but less than the last version contained in the PC. in this case the screen is the one of picture 4.40c and the writing in the centre informs it is better to update the ECU.

3.The ECU already contains the last version. The screen is the one displayed in picture 4.40d where the writing in the centre informs it is not necessary to update it.

4.The ECU has a loader version more updated than the PC one. This possibility occurs when the PC has not been updated with the last loader versions: in this case we strongly suggest to update the PC.

The screen is the one of picture 4.40e where the writing in the centre of the screen informs it is better not to update the ECU as it will be less updated than it is.

We suggest to carry this operation out only if advised by BRC technicians or qualified personnel.
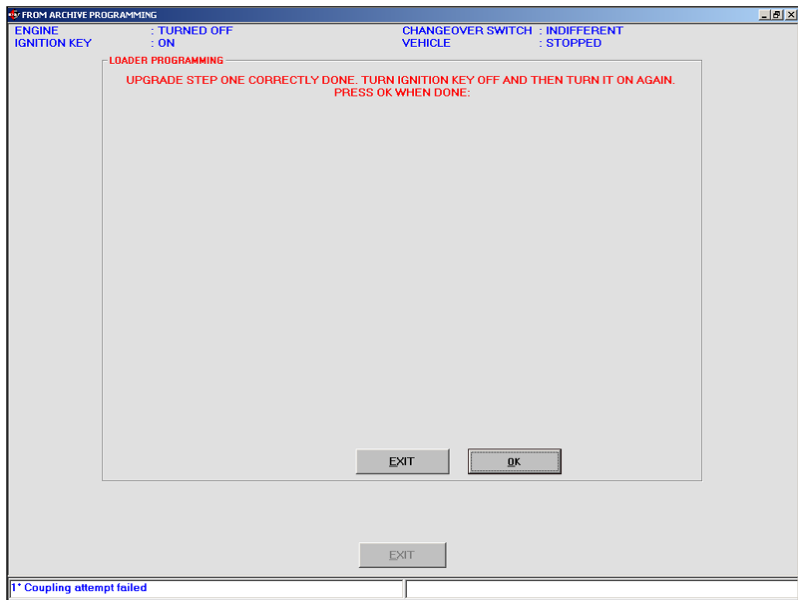
Pic. 4.40b - Loader updating – first step
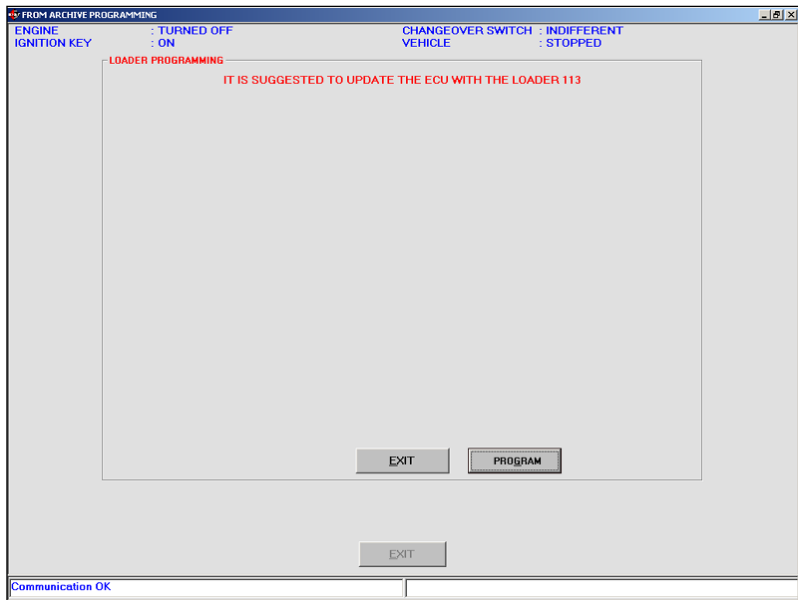
Pic. 4.40c: ECU loader updating if higher than 106
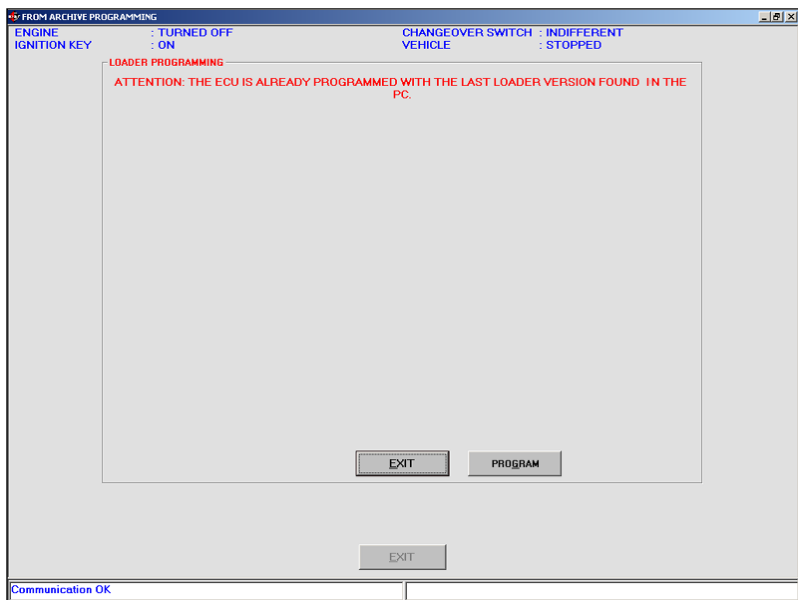
Pic. 4.40d - ECU loader updating if it is the same of the PC one

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BE CAREFUL!:

• If the loader programming stops as soon as it starts you have to turn the ignition key off and then on, and try again.

• Trying to update the loaders starting from versions less or equal to 105, the programming could be not executed in spite of the repeated attempts. In this case follow the listed indications:

1. From the main page select PROGRAMMING > FROM RECORDS

2. Select a start map from BRC_MAPS.

3. In the VEHICLE PARAME-TERS window, select the FSF file in order to mark a tick on the cell.

4. Click on PROGRAM at the bottom right to start the FSF programming.

5. When the sliding bar indicating the programming process appears, stop the communication by turning the ignition key off and then on.

6. Try again to update the loader.
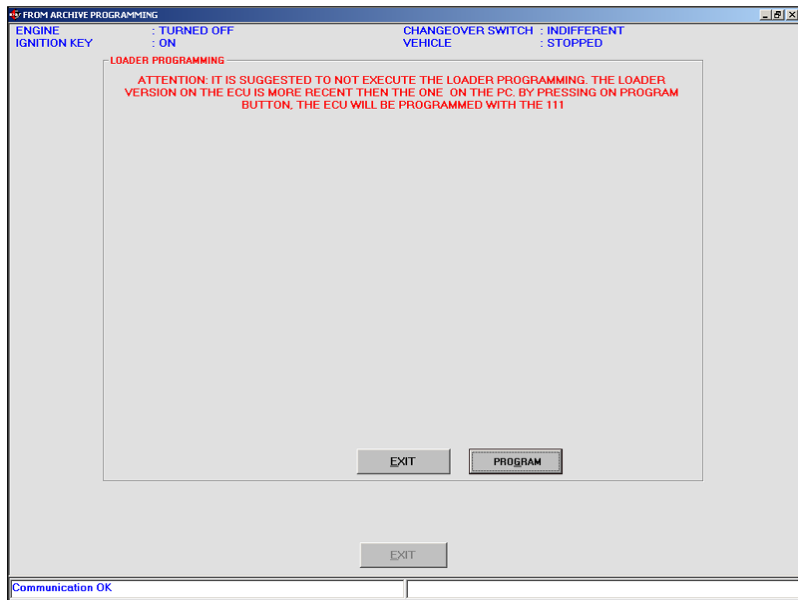
Pig. 4.40e: ECU loader updating if the ECU is less than the PC one

5. SETTING UP

Pic. 5.0a - Setting up

Selecting Setting up from the main screen it is possible to enter some sections dedicated to the control and modification of the vehicle parameters allowing to optimise or correct the calibrations of a previously programmed vehicle (picture 5.0a). Most of the possible operations are equivalent to the aided personalised procedure ones described in the previous chapter so that here you will only find a reference to the concerned paragraph. This chapter describes in detail the different sections.

The changes introduced in the setting up sections are marked with a red "X" near the modified section key (see picture 5.0b).

Leaving the setting up section, you will be required to save the modification on file, specifying the type of installation, trademark, model, ECU and file name (picture 5.0c).

5.1 PREVIOUSLY DESCRIBED FUNCTIONS

Selecting Setting up from the main screen, the previously described functions are the following:
• Temperature sensors calibration.
• RPM Calibration.
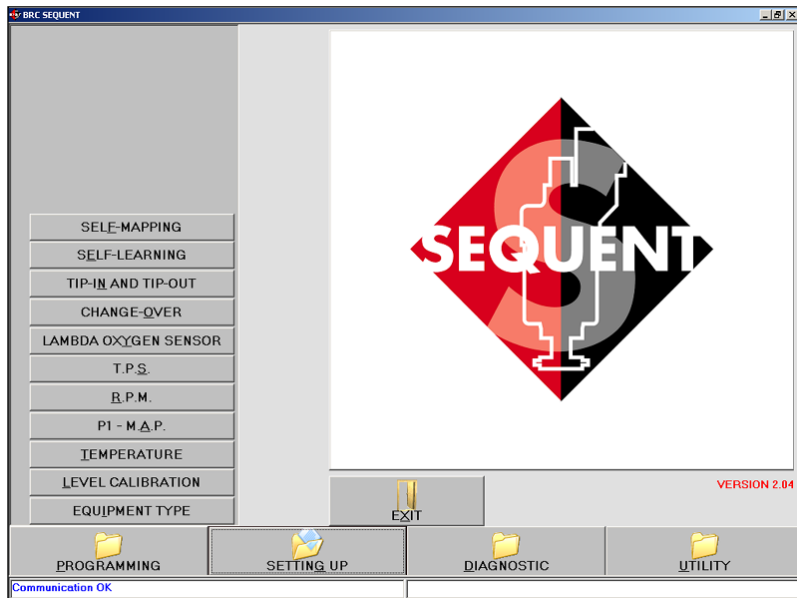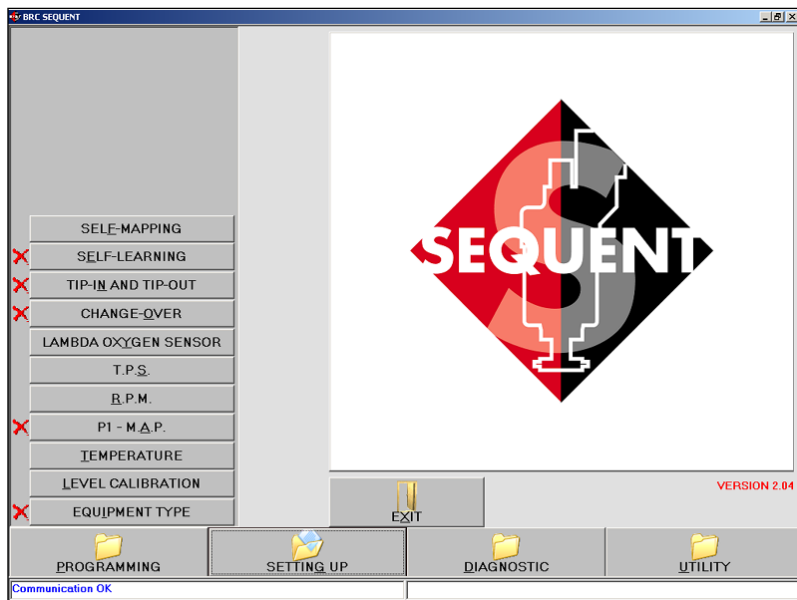
Pic. 5.0b - Setting up with already selected keys
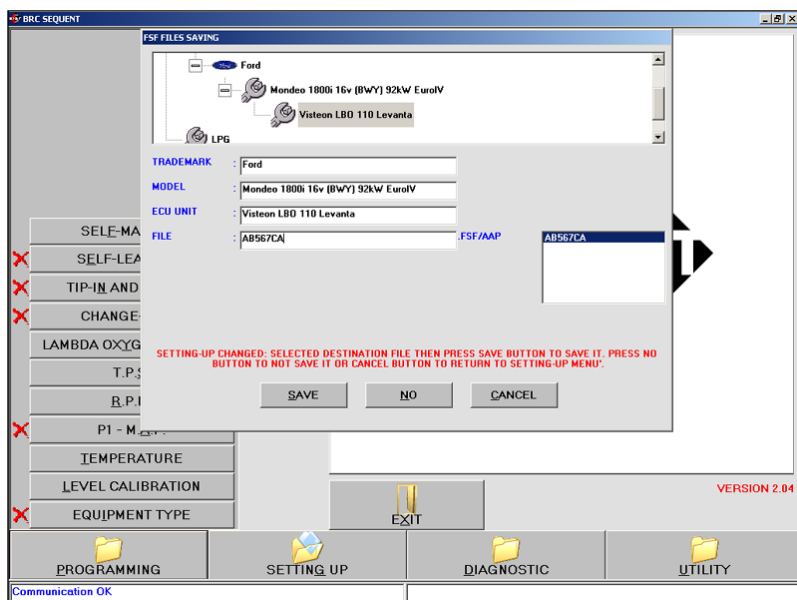
Pic. 5.0c - Setting up – file FSF saving

• TPS Calibration.

• Oxygen sensor Calibration.

• Self-mapping.

Next paragraphs only describe the new functions.

5.2 TYPE OF INSTALLATION

This section allows to point out the basic information of the installation, choosing between LPG or CNG, and the vehicle type between Vacuum or LPG Turbo. The choice is marked with a tick in the circle near the made selection.

In this screen you can also select other installation characteristics (picture 5.1) that are:

• Injector type: indicate the installed type of gas injector choosing among the available ones;

• N. of Genius: indicates how many genius reducers have been installed. Mostly it is one so that this is the set value; it is necessary to modify it only if you have two.

• N. of P1 Sensors: indicates how many P1 pressure sensors have been installed. The set value is one. Modify it if you need to install two (refer to installation plans to know how many sensors are needed).

• N. of Injectors: indicates the total number of installed gas injectors. Mainly they are 4 and this is the set value. A message will indicate the technician the number of FLY SF ECU he has to install according to the selected injectors number.

NOTE:

By clicking ADVANCED key in the installation section, it is possible to set operation limits concerning
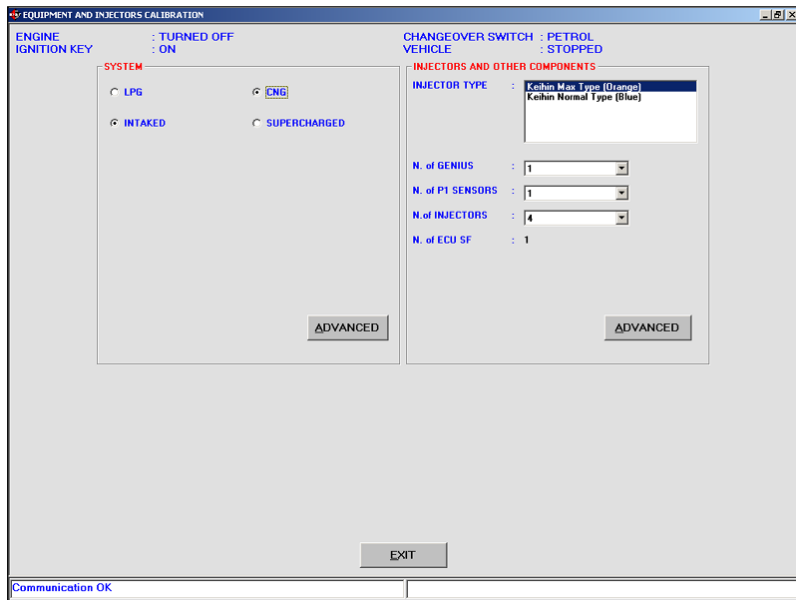
Pic. 5.1 - Setting up – installation and injectors calibration
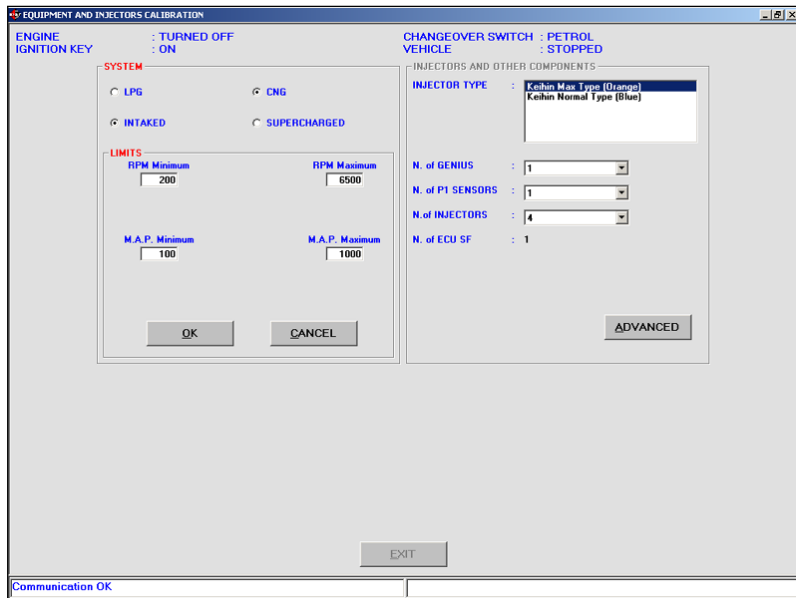
Pic. 5.2a - Setting up – installation and injectors calibration by clicking ADVANCED key in the installation section

the rpm signal and the MAP manifold pressure (picture 5.2). Normally this operation has not to be carried out unless indicated by BRC technicians. In detail you could set:

• Rpm Min: it is the minimum rpm value in the maps: usually it is suitable to set a value of about 300 rpm under the idling condition value.

• Rpm Max: it is the maximum

rpm value in the maps: usually it is suitable to set a value of about 500-600giri/min under the vehicle rev up value.

• MAP Min: it is the minimum absolute pressure value (mbar) of the suction manifold in the maps: usually it is suitable to set a value of about 200-300mbar under MAP value at idling.

• MAP Max: it is the maximum absolute pressure value (mbar) of

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the suction manifold in the maps: introduce the maximum value of the achievable manifold pressure. In case of vacuum engines set 1000 while for LPG turbo ones set 1700.

By clicking ADVANCED key in the injectors and other components section, you can display the injector characteristics (picture 5.2b). In case of problems it is possible you will have to read them to BRC Technical Assistance service.

Finish and verify the introduced values, then click on EXIT to continue. The carried out modifications have to be confirmed by clicking YES when required.

5.3 LEVEL CALIBRATION

This section allows to calibrate the tank level sensor. A correct calibration permits to display on the petrol/gas changeover switch the information concerning the filling up.

At the beginning the values memorised in the ECU are displayed but, if not correct, it is necessary to calibrate the level sensor.

To carry out a correct calibration the tank has to be empty in order to get the level sensor signal clicking empty tank acquisition; the registered value appears in the cell near the key (picture 5.3).

After the gas filling up click on full tank acquisition and the obtained value appears in the cell near the key.

Clicking on LPG (or CNG) set values you can introduce some standard values which normally correspond to a correct calibration
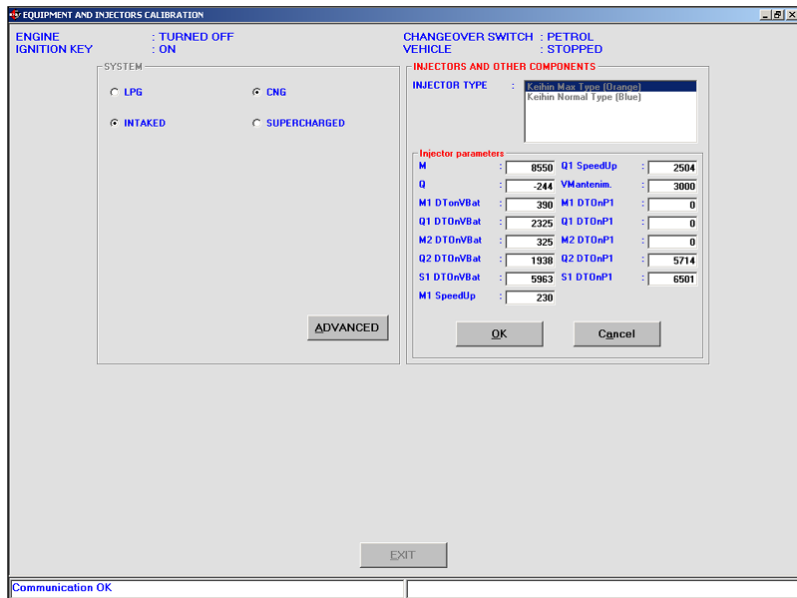
Fig. 5.2b - Setting up – installation and injectors calibration by clicking ADVANCED key in the injectors section
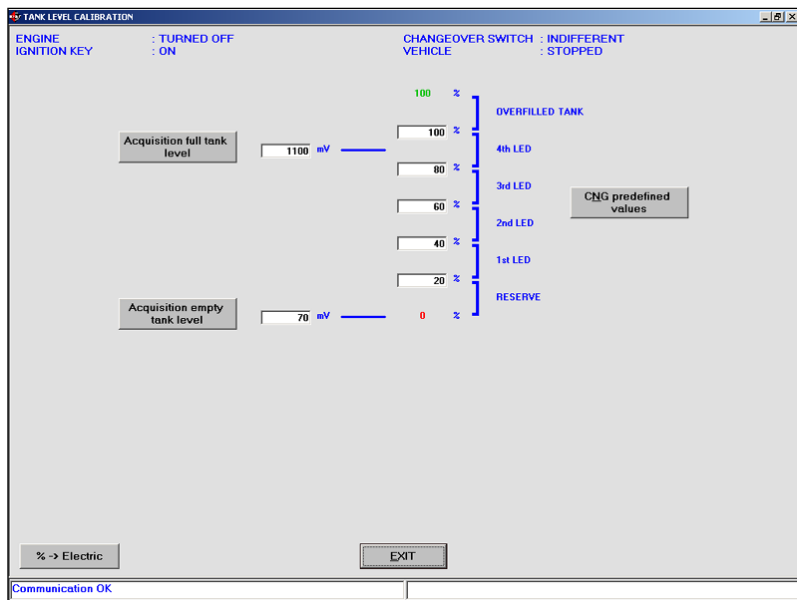
Pic. 5.3 - Setting up – tank level calibration

of BRC resistive level sensor. These values are:

For **LPG**
- Empty tank = 70mV
- Full tank = 1100mV

For **CNG**
- Empty tank = 70mV
- Full tank = 1050mV

You can set percentage discriminating the passage among the different levels and the consequent indication change on the changeover switch. Usually these values are set in order to have a balanced division of the levels. Anyway, if you wish to increase or decrease the persistence of one of the levels, to better set the indication, you need to manually modify the values.

Clicking %->Electric the values of the screen are displayed in mV instead of as a percentage and vice versa (picture 5.4).

Finish and verify the calibration,

then click on EXIT to continue. If the adjustments have been modified, they have to be confirmed by clicking YES when required.
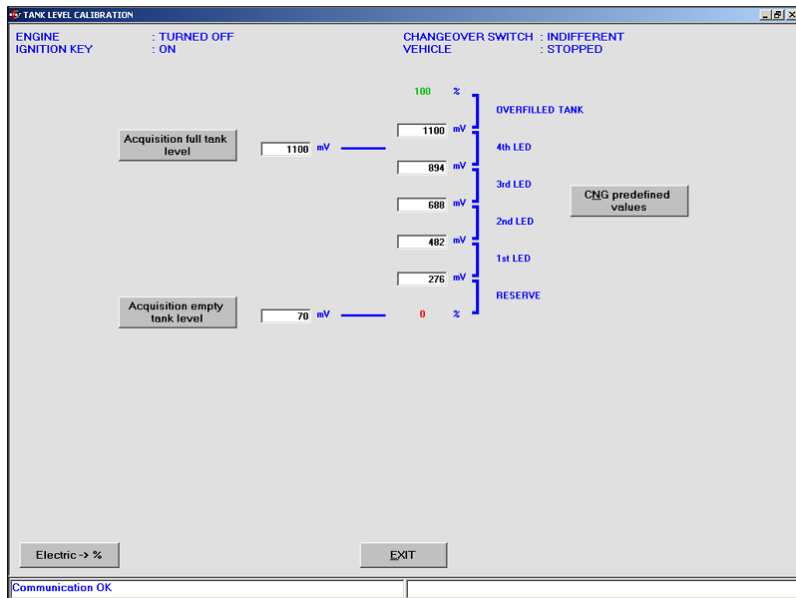
Pic. 5.4 - Setting up – tank level calibration

5.4 P1-MAP

The P1-MAP sensor calibration screen permits to select the installed pressure sensor. It displays the different sensors available for the selected SEQUENT installation.

In case of CNG or LPG turbo vehicle (picture 5.5):
- SEQUENT P1-MAP TURBO/METANO Fujikura pressure sensor:
- SEQUENT P1-MAP TURBO/METANO Motorola pressure sensor:

Pic. 5.5 - Setting up – calibration P1-M.A.P. calibration for CNG or LPG turbo vehicles

In case of LPG installation (picture 5.6):
- SEQUENT P1-MAP LPG Fujikura pressure sensor:
- SEQUENT P1-MAP LPG Motorola pressure sensor:

For some vehicles, mainly the ones studied by BRC, the vehicle original MAP pressure sensor has been used so that in this case it is possible to execute a calibration of this sensor clicking ADVANCED
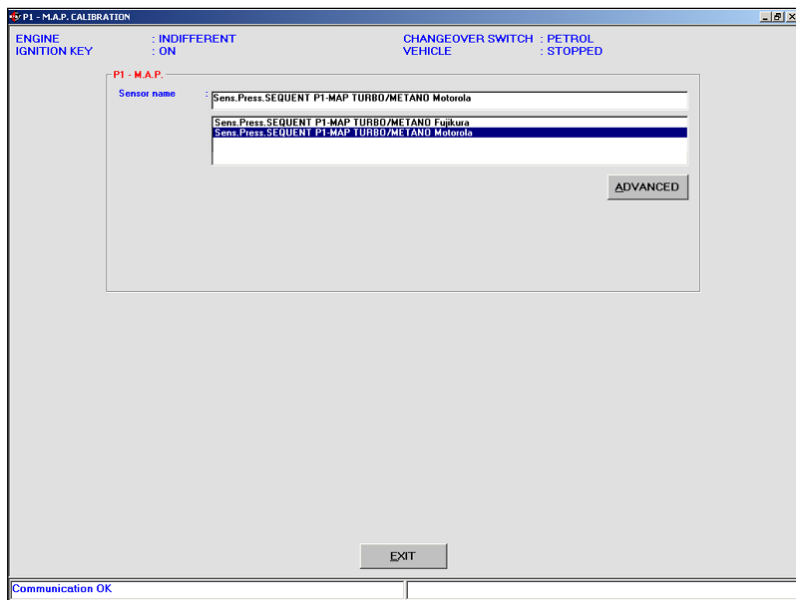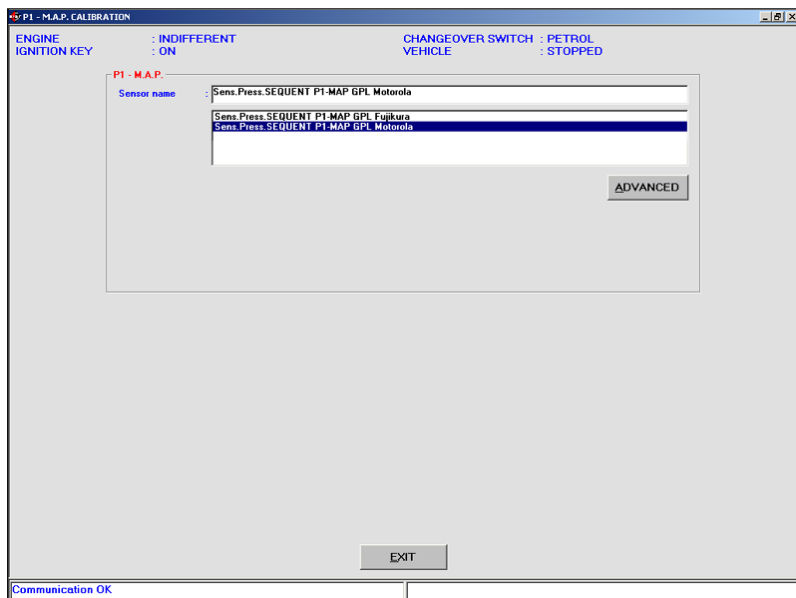
Pic. 5.6 - Setting up –P1-M.A.P. calibration for LPG vehicles

key. The possible selections are, in case of CNG or LPG turbo vehicle (picture 5.7):

- • SEQUENT P1 TURBO/METANO Fuijkura (400kPa) pressure sensor

In case of LPG installation (picture 5.8):
- • SEQUENT P1 LPG Fuijkura (250kPa pressure sensor):
- • SEQUENT P1 LPG Motorola pressure sensor:

The MAP sensor calibration can be executed in two ways, according to the available instruments:
1. Calibration through P1 manometer.
2. Calibration through external manometer.

The suggested operating conditions for the acquisition are:
1. Engine off and ignition key on (pressure 1000 mbar)
2. Engine at idle.

5.4.1 CALIBRATION MAP THROUGH P1

This option is based on the fact the P1 pressure sensor has been already set to execute the MAP calibration, too. The program will ask to disconnect the retroactive pipe for the Genius (hear the itself) and connect it to the P1 pressure sensor inlet (see picture 5.9).

After this operation you just need to keep the changeover switch in petrol position, click on OK and follow the program indications.

The calibration consists of the
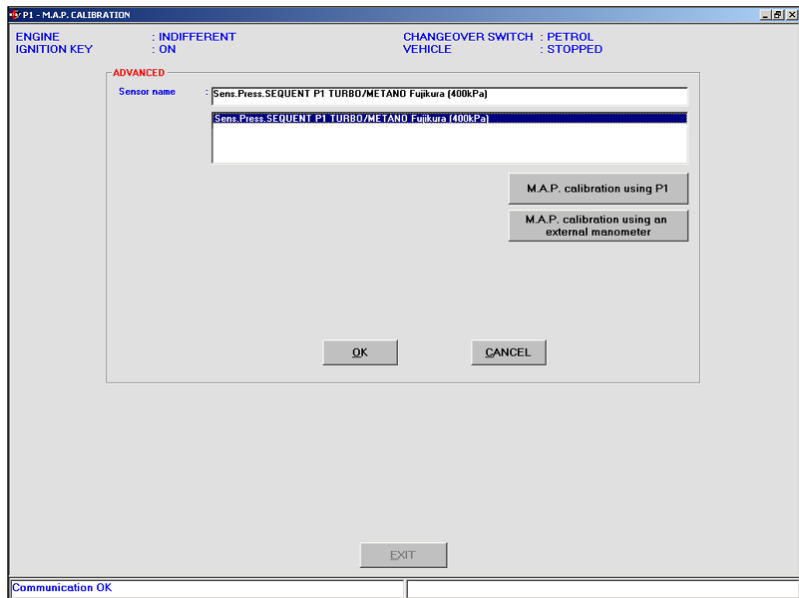
Pic. 5.7 - Setting up – calibration P1-M.A.P. calibration for CNG or LPG turbo vehicles with original MAP
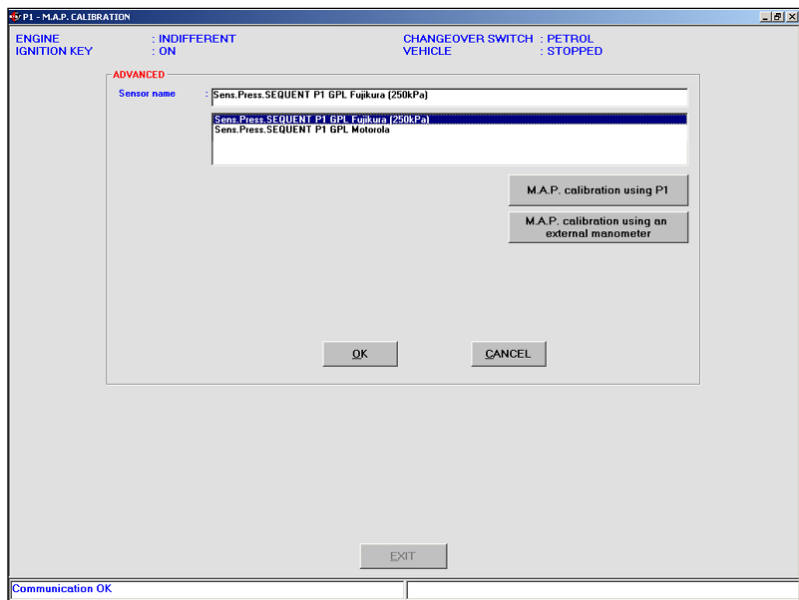
Pic. 5.8 - Setting up – calibration P1-MAP calibration for LPG vehicles with original MAP
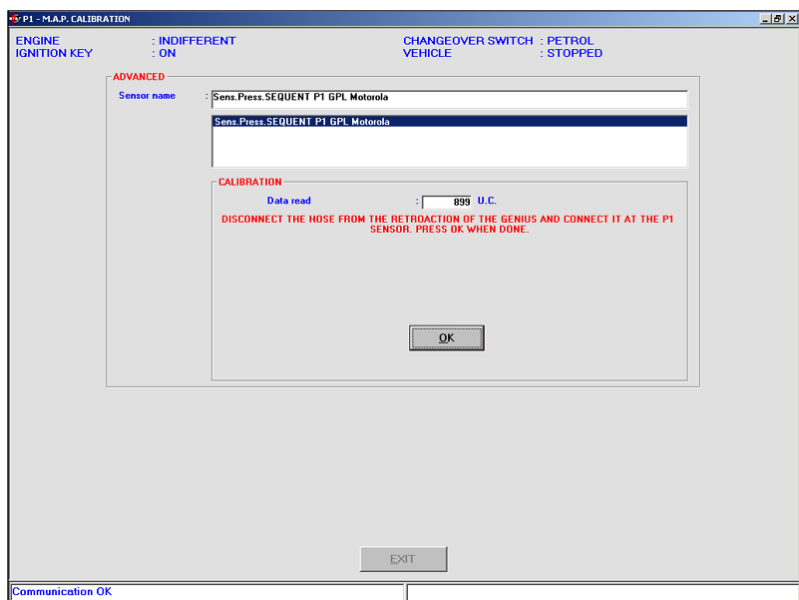
Fig. 5.9 - Setting up – MAP calibration through P1

following steps (picture 5.10):

1.Turn the vehicle ignition key on and leave the engine off.

2.Click on Acquire: this operation will last few seconds.

3.Switch the engine on at idle (see picture 5.11).

4.Click on Acquire: this operation will last few seconds.

At this point you just need to confirm the calibration clicking OK and after Exit, you will be asked to confirm the set adjustments: answer positively.

5.4.2 MAP CALIBRATION THROUGH EXTERNAL PRESSURE GAUGE

It is possible to execute this option only when you have an external pressure gauge or a diagnosis equipment (often the diagnostic handle computer AEB214 is enough); when possible, this method is surely the one allowing a more precise, easier and faster calibration.

The calibration consists in the acquisition of two different vehicle operation conditions and following extrapolation of the characteristic through an easy linearization.

Note: the diagnostic equipment often gives the suction manifold pressure in kPa (Kilo Pascal) instead of mbar (millibar) as required by the program.

The conversion formula to obtain the value in kPa, Knowing the mbar one, is the following:

mbar value = kPa value * 10

For example 42 kPa correspond to 420 mbar.

The calibration procedure consists of the following steps (see pic-
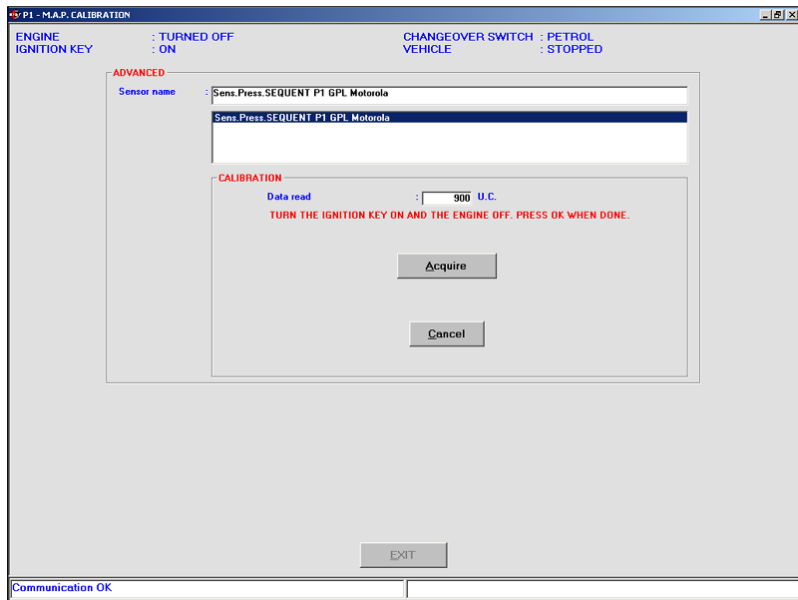
Pic. 5.10 - Setting up – MAP calibration through P1, first value acquisition
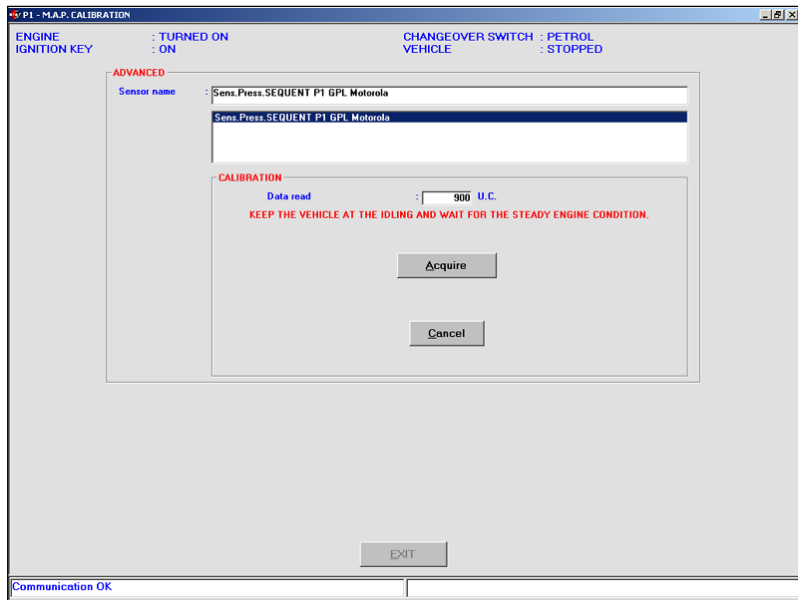
Pic. 5.11 - Setting up – MAP calibration through P1, second value acquisition
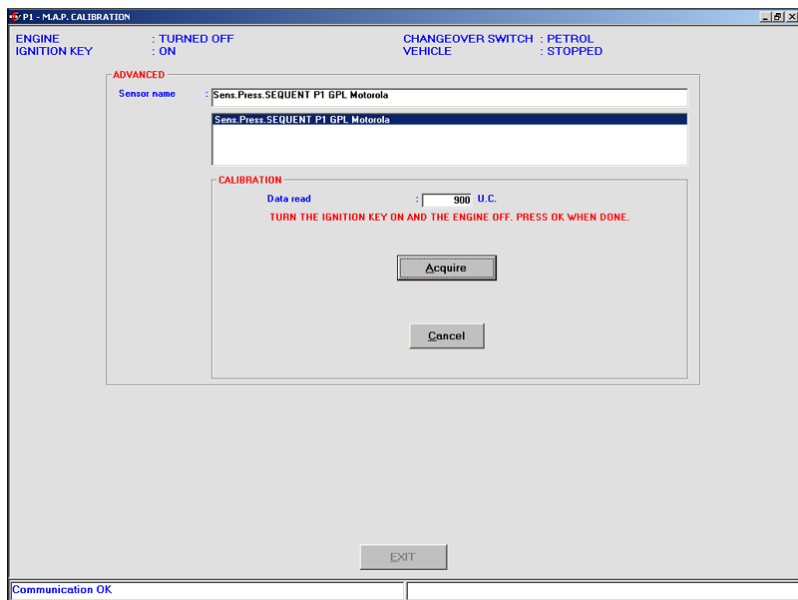
Pic. 5.12 - Setting up – MAP calibration through external pressure gauge

ture 5.12):

1.Turn the vehicle ignition key on and leave the engine off;

2.Click on Acquire: this operation will last few seconds.

3.In Physical 1, introduce the mbar value read by the pressure gauge (or by the diagnostic equipment) and click on OK (see picture 5.13).
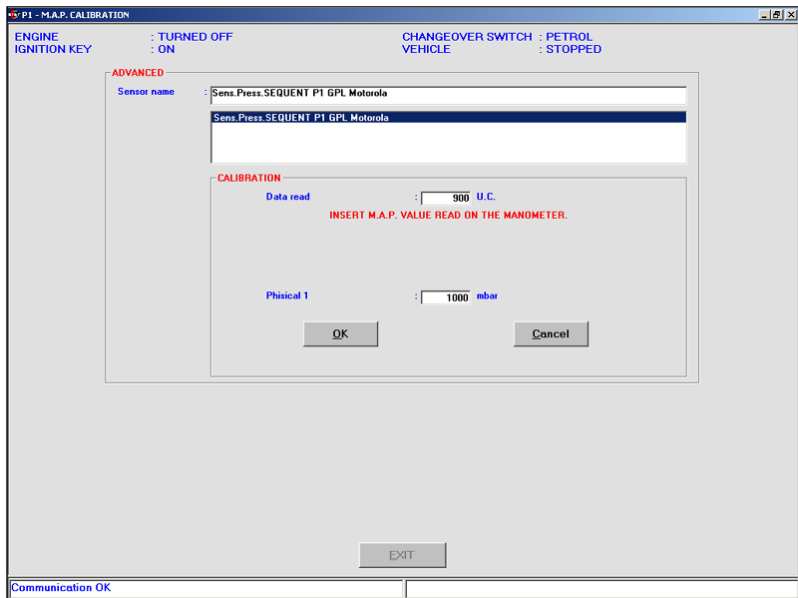
Pic. 5.13 - Setting up – calibration MAP calibration through external pressure gauge, first value acquisition

4.Switch the engine on at idle (see picture 5.14).

5.Click on Acquire: this operation will last few seconds.
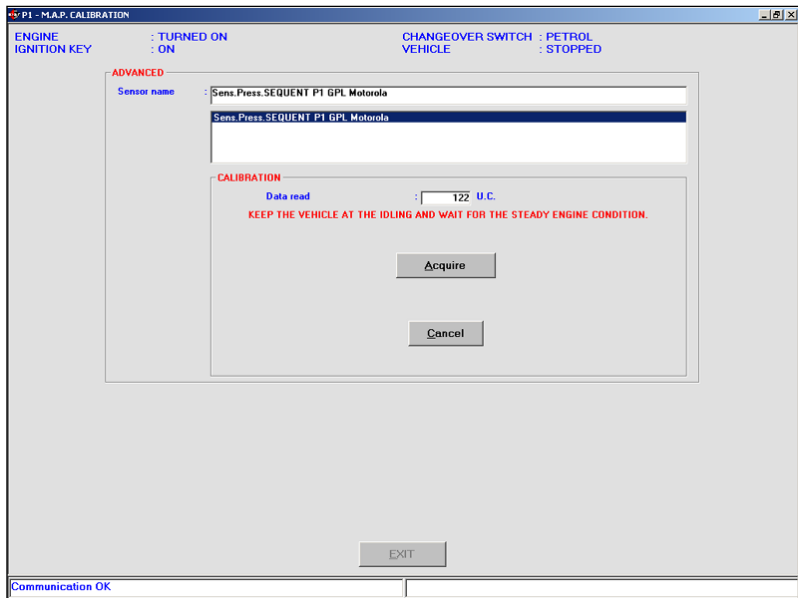
Pic. 5.14 - Setting up – calibration MAP calibration through external pressure gauge, second value acquisition

6.In Physical 2 , introduce the mbar value read by the pressure gauge (or by the diagnostic equipment) and click on OK (see picture 5.15).

At this point you just need to confirm the calibration clicking OK and after Exit. You will be asked to confirm the set adjustments.
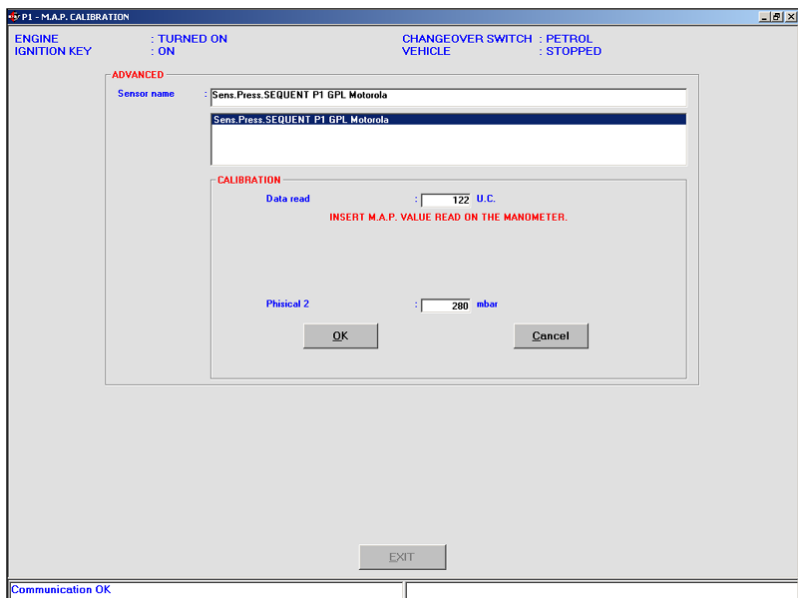
Pic. 5.15: Setting up – calibration MAP calibration through external pressure gauge, second value introduction

5.5 CHANGE-OVER

This screen allows to modify the parameters for the petrol-gas change-over. Two sections have been displayed in red (see picture 5.16):

1.Cold engine
2.Warm engine

The first is necessary to the gas/petrol change-over calibration when the vehicle is cold (for example after a long stop without starting the engine); the second for the change-over calibration when the engine is warm (for example when you start the engine after a short stop) The reference temperature is the genius one or, in case the vehicle original sensor is connected and calibrated, the engine cooling water one.

In the Cold Engine section you can introduce the following data:

• Change-over temperature higher than: it corresponds to the temperature we have to achieve after the set time to execute the change-over.
• Change-over Delay: it corresponds to the waiting time before verifying the change-over temperature.
• Similar paragraphs are included in the Warm Engine section.

Usually, in the Cold Engine section, it is better to set a low change-over temperature and a medium long delay while in the Warm Engine one it is better to set an higher change-over temperature
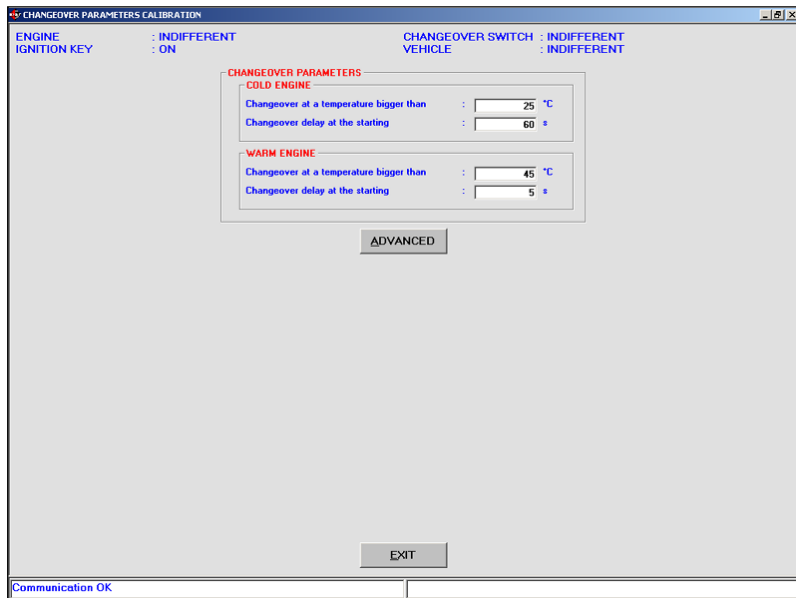
Pic. 5.16 - Setting up – change-over parameters calibration
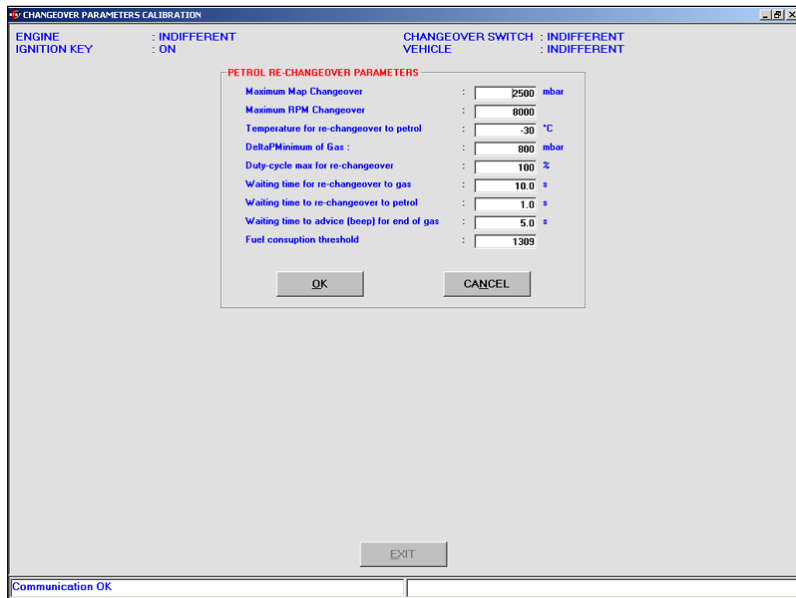
Fig. 5.16a - Setting up - change-over petrol parameters calibration

and a lower delay.

Besides some parameters modification, the ADVANCED key permits to execute the petrol/gas change-over which normally occurs if there is no gas in the tank or if the gas temperature is too low.

This screen parameters have to be modified only with BRC technicians support.

The configurable parameters (fig. 5.16a) are:

• MAP maximum value for the change-over: it corresponds to the manifold pressure value under which it is possible to change from gas to petrol.
• RPM maximum value for the change-over: it corresponds to the rpm value under which it is possible to change from gas to petrol.
• Petrol change-over temperature: it corresponds to the temperature threshold under which the petrol change-over occurs. it

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is possible to deactivate this change-over introducing –41 °C in this table.

• Minimum DeltaP: It corresponds to the DeltaP value (difference between gas P1 pressure and MAP) under which the petrol change-over occurs.

• Maximum Duty cycle for the change-over: It corresponds to the gas injectors duty cycle threshold over which the change-over occurs.

• Waiting time for gas change-over: indicates the time between the conditions recognition allowing to return to gas operation and the real change-over.

• Waiting time for petrol change-over: indicates the time between the recognition of a possible petrol change-over cause and the real change-over.

• Waiting time for end gas warning signal: indicates the time between the conditions recognition of the gas end and the warning signal.

• Fuel consumption threshold: according to the type of installation and the injectors number, this threshold is useful to know when 0,5 petrol litres have been consumed after the petrol change-over.

5.6 TIP IN AND TIP OUT

When necessary, tip in and tip out screens allow to calibrate the setting up parameters to improve the driving.

Let's analyse the tip in screen.

In the upper part the rpm thresholds subdividing the tip in are displayed in red. The below cells can
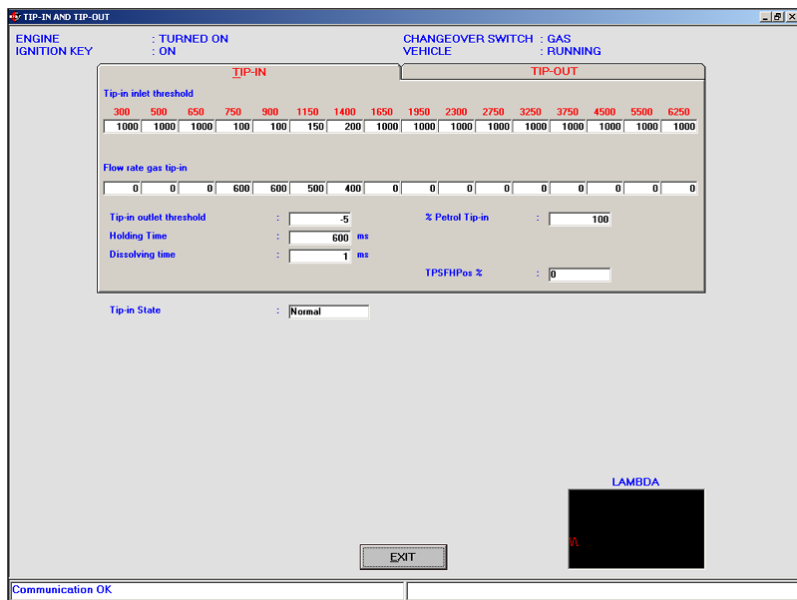
Pic. 5.17 - Setting up – Tip in calibration

be set by the user and indicate the tip in entry threshold based on the TPS and rpm signals. A red arrow indicates what is the condition of the vehicle and consequently what are the cells to be modified to change the transient. The value to introduce is always a positive one and it can be understood from the read one in the TPSFHPos% cell. This latter indicates every second the filtered TPS value; you just have to read the inside value, during a tip in you need to modify and introduce it in the entry threshold cells, where there is the tip in starting condition.

For example, if you wish to modify a tip in at 1000 rpm, it is necessary to modify the fifth and sixth cell, identified by 900 and 1150 rpm even if the tip in exceed this rpm threshold, introducing as entry threshold a value which is the same to the one contained in the TPSFHPos cell.

With an entry threshold value of 1000 in a cell concerning a certain condition, the transients will be

deactivated for that condition.

The Transient Flow cells allow to introduce a flow value to be added to the tip in flow. A positive one will rich the tip in while a negative one will make it lean. To give an idea of the value to be introduced, refer to the flow values displayed in the self-learning screen, near the tip in.

The other parameters in the screen are:

• Tip in exit threshold: indicates the TPS threshold for the tip in exit and usually it is negative: the exit usually occurs with a deceleration.

• Dissolving time: it is the connection time to go from the tip in flow to the one usually required by the vehicle. This time begins at the end of the upkeep one and it is expressed in 1/1000 of second, too.

• Petrol tip in %: indicates how much the immediate petrol correction enter the gas tip in, that is how much influence the petrol ECU tip in has on the gas

behaviour. 1000 corresponds to use all the petrol contribution, decreasing the value the contribution proportionally decreases.
• Tip in condition: indicates the vehicle condition.

Let's analyse tip out in screen (picture 5.18):

In the upper part the rpm thresholds subdividing the tip out are displayed in red. The below cells can be set by the user and indicate the tip out entry threshold based on the TPS and rpm signals. A red arrow indicates what is the condition of the vehicle and consequently what are the cells to be modified to change the tip out. The value to introduce is always a positive one and it can be understood from the read one in the TPSFHNeg% cell. This latter indicates every second the filtered TPS value; you just have to read the inside value, during a tip out you need to modify and introduce it in the entry threshold cells, where there is the tip out starting condition.

For example, if you wish to modify a tip out at 1000 rpm, it is necessary to modify the fifth and sixth cell, identified by 900 and 1150 rpm even if the tip out exceed this rpm threshold, introducing as entry threshold a value which is the same to the one contained in the TPSFHNeg% cell.

With an entry threshold value of 1000 in a cell concerning a certain condition, the tip out will be deactivated for that condition.

The tip out Flow cells allow to introduce a flow value to be added to the tip out flow. A positive one
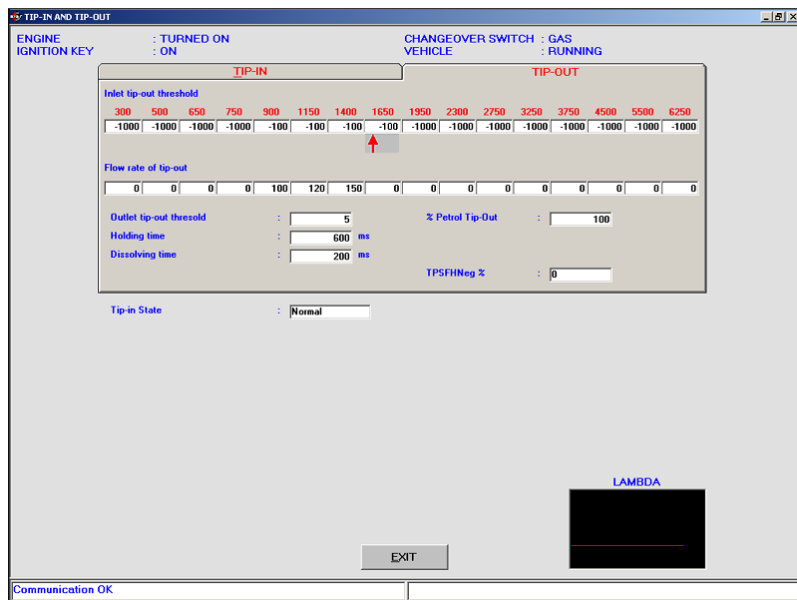
Pic. 5.18 - Setting up – Tip out calibration

will rich the tip out while a negative one will make it lean. To give an idea of the value to be introduced, refer to the flow values displayed in the self-learning screen, near the tip out.

The other parameters in the screen are:
• Tip out exit threshold: indicates the TPS threshold for the tip out exit and usually it is negative: the exit usually occurs with a deceleration.
• Upkeep time: indicates the tip out time. It is indicated in 1/1000 of second that is 1 second 0 1000.
• Dissolving time: it is the connection time to go from the tip out flow to the one usually required by the vehicle. This time begins at the end of the upkeep one and it is expressed in 1/1000 of second, too.
• Petrol tip out %: indicates how much the immediate petrol correction enter the gas tip out, that is how much influence the petrol

ECU tip out has on the gas behaviour. 1000 corresponds to use all the petrol contribution, decreasing the value the contribution proportionally decreases.
• Tip out condition: indicates the vehicle condition.

5.7 SELF-LEARNING

During standard operation conditions, after the mapping, the ECU corrects the light calibration inaccuracies and follows the slow variations due to the system ageing, setting up lost or the slow gas and petrol components deterioration. This is the self-learning function.

It is very important to well understand the difference between self-mapping and self-learning. The self-mapping is executed only one time during the vehicle installation while the self-learning will work for the whole gas installation life, keeping the operation and calibration conditions the best as possible.

The self-learning screen is useful to verify and correct the center-

ing of a map. There are three files:

• Petrol Map

• GAS Map

• Condition Map

To go from a file to another you just have to click on the icon of the file you need to display.

Each file consists of a table with 16 lines and 16 columns. Each cell contains a contains the memorise operating point according to rpm and manifold pressure (MAP). Particularly, the petrol map memorised the petrol injectors duty cycle; the gas map contains the memorised gas flow according to the petrol map and the extrapolation algorithms while the condition map contains the system operation conditions according to the lambda control carried out with petrol. It is possible to set three different operation conditions:

• Closed loop = 4, for the areas regularly checked by the oxygen sensor.

• Open loop = 5, for the areas which are not under the oxygen sensor control.

• Indefinite = 7, for the "border" areas between open loop (full load) and closed loop (controlled oxygen sensor) that are those areas when you can have open loop or closed loop conditions according to the engine load.

According to the selected condition the colour of the cells in the petrol and gas map will be different:

• Green: for closed loop cells.

• Red: for open loop cells

• Yellow: for indefinite cells

The white ones (picture 5.19) indicates the operation area where the system is working. To manually modify a cell value,
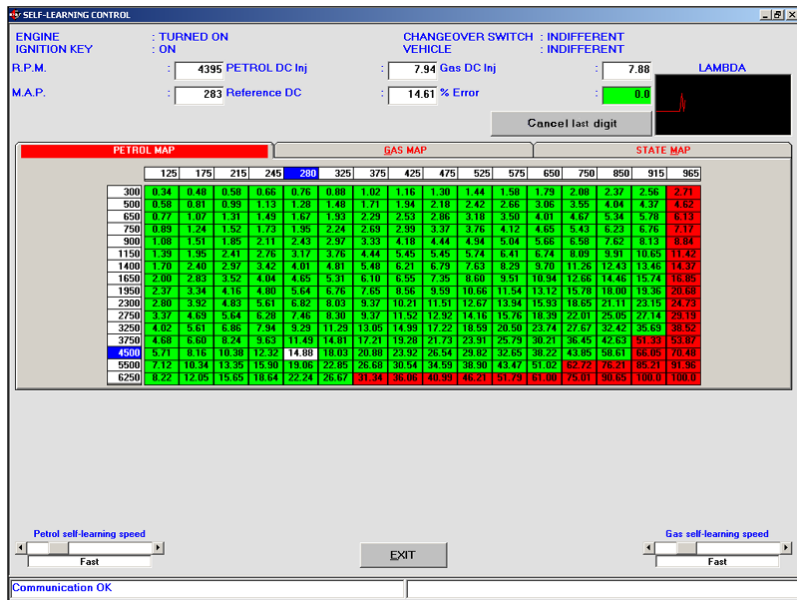
Pic. 5.19 - Setting up – self-learning

click on it, push the space-bar, introduce the new value and click on enter key.

The other parameters represent:

• RPM and MAP: they respectively indicate the engine rotation condition and the suction manifold pressure (MAP)

• Petrol inj. DC: indicates the petrol injection duty cycle instantaneously taken from the petrol injectors.

• Reference DC: indicates the petrol injection duty cycle expected by the map for the specific operation point.

• GAS inj. DC: indicates the gas injectors duty cycle.

• % error: indicates the average difference between the petrol injectors duty cycle and the reference one. It is positive if the petrol injectors duty cycle is higher that the reference one. This has to be interpreted as the signal of a lean gas map or of a petrol map with too low values.

A graphic showing the oxygen sensor behaviour is represented hereunder and it is very useful to identify the open loop and closed loop areas.

The "Cancel last Digit" key allows to settle the previous values again.

At the bottom of the screen there are two sliding bars. On the left we have petrol self-learning speed; on the right the gas self-learning speed . These allow to modify, decelerating and accelerating, the system self-learning algorithms. For each parameter we have 6 different speeds:

• Very fast

• Fast

• Medium

• Slow

• Very Slow

• Stopped

The control of a map centering reliability consists of positioning in different operation points with RPM and MAP constant and check the

%Error value. A map can be considered centred is the error is less than 5%. A not centred map or areas could be brought to a good level with a manual intervention or reviewing the cells keeping the conditions more constant as possible in order to take the %error to a value lower than 5%.

If some changes occur, when leaving this screen you will be asked to confirm them and they will be saved later in the User_Maps file and sent to the ECU.

6. DIAGNOSTIC

6.1 DATA DISPLAY

Clicking on DIAGNOSTIC key at the bottom of the main screen and selecting Data display in the left buttons, we enter the page shown in picture 6.1 where it is possible to display the different ECU operation parameters as numbers or with a graphic.

As indicated in picture 6.1 the numerical values are listed on the left while the graphs are more or less in the centre. These latter can be minimum one or maximum four or even zero (pictures 6.1, 6.2, 6.3, 6.4 and 6.5)

To introduce a new graphic or take one away you just have to click twice the corresponding numerical value. When there are four graphs, to add another it is necessary to take away at least one.
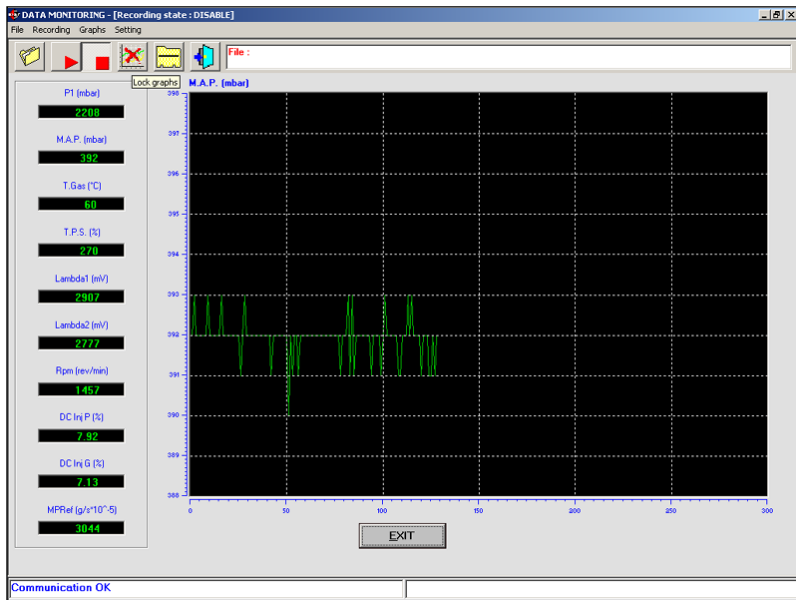
Pic. 6.1 - Data display with a graphic
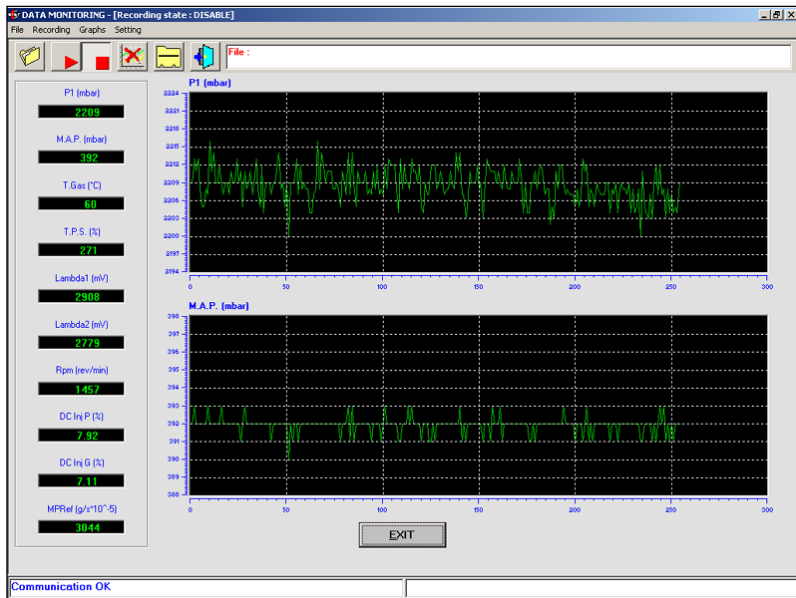
Pic. 6.2 - Data display with two graphics

Pic. 6.3 - Data display with three graphics

At the top of the graphs and the numbers there are 6 square buttons, each with a particular function described later. With the mouse pointer on them, a writing explaining the function will appear for a few seconds. These functions allow to execute file acquisition of data and displayed parameters, to change the numerical data list displayed on the screen choosing the most interesting ones from the list, to modify the list of the values which will be saved in file choosing the most interesting ones.

6.1.1 STORAGE PARAMETERS

The first left key with a file allows to change the storage parameters that is the position where the acquisition file creating in this page will be saved. Clicking on the key, the page in picture 6.6 will be opened.

the same effect is obtained by selecting "File" and then "Record Parameters" from the menu bar (at the top left). In the centre of the screen, at the top, there is a big file with all the previous acquisitions characteristics.

Immediately under there is a table titled "Data Sheet" where there are different files to fill up: you have to compulsorily set trademark, Model and Plate. the others (Year, engine number, ECU type, Power, Type of installation, Note) are optional and will be stored as a reminder in the acquired file.

Let's imagine to fill in trademark with Fiat, Model with "Stilo 1.6i 16V (182B6000) Euro4", and Plate with "AJ280CN" (plate number); in this case the acquisition file will

Pic. 6.4 - Data display with four graphics

Pic. 6.5 - Data display without graphic

Pic. 6.6 - Diagnostic > Data display > Storage Data

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have the following name and address: "
C:\Programs\SEQUENT\ARCHIVI \DIR_DATI\Fiat\Stilo 1.6i 16V (1 8 2 B 6 0 0 0) Euro4\AJ280CN.ACQ" (the position could vary according to the computer characteristics and to the file where SEQUENT program is installed).

Clicking on "Store" key, the file where you will execute the data acquisition will be created. Clicking on "Exit", data will be not stored and the system returns to the previous page.

Please note that the new record is stored in the top cell in order to select it next time without having to digit the complete address. Selecting it all the data will appear in the cells, including the notes you decided to add.

6.1.2 BEGINNING/RESTARTING RECORD

When you push the second key on the left with a red triangle with the point to the right (as the recorder PLAY button), the data acquisition starts (see previous paragraph to know where data will be stored).

When the data acquisition is active, the key changes into two parallel vertical lines (as the recorder PAUSE button). If you click on the key during this condition, the acquisition will be stopped and the key becomes a triangle again. Clicking it again, the acquisition restarts adding new data to the previous ones, without cancelling them.

The same operations can be executed by selecting on the bar
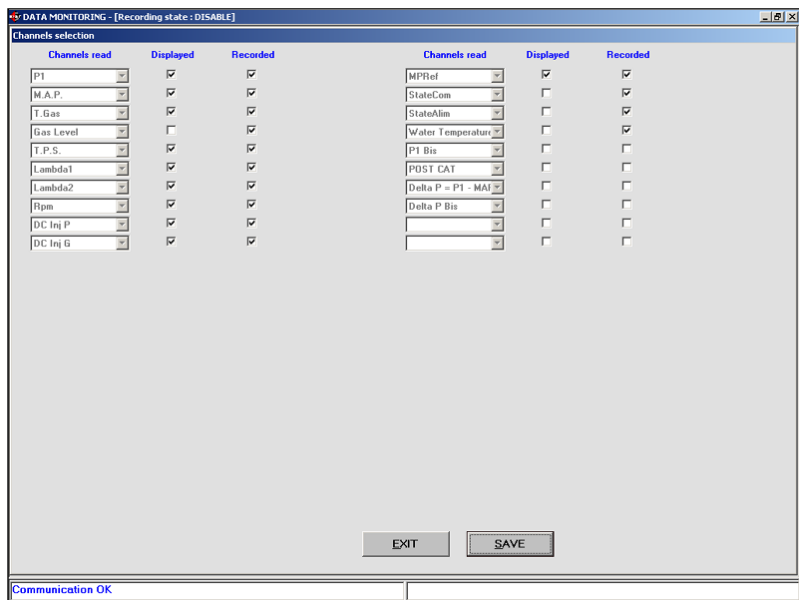
Pic. 6.7 - Diagnostic > Data display > Channel setting

menu (at the top left) "Record" and then "Beginning/Restarting record" or by simply click on SHIFT+F2, SHIFT+F5, SHIFT+F9 on the keyboard.

It is possible to stop the record anytime by clicking on the STOP key (a red square as the recorder STOP button). Clicking again START or PLAY, the acquisition starts again adding new data to the previous ones, without cancelling them.

6.1.3 GRAPHS BLOCKING

The forth left key can block displayed graphs and numerical values. First it contains a graph with a red cross on. Clicking on it the graphs will be blocked and the numerical values do not change; the key will contain a graph without red cross.

By clicking on the key again, the graphs will be deleted and you have to start again from the beginning while the numbers start again to change.

6.1.4 SETTING

The fifth key from the left, at the top of the data display page, is used to choose what are the numerical data to display and what are the ones to be stored during the acquisition.

As shown in picture 6.7, near each value there are two cells where the tick mark has to be added: the first refers to the displayed value. Selecting or deselecting the cell, you add or remove the data from the column. The minimum data number is 1 and the maximum is 10. If you already have 10 values, you will have to remove one to add another.

Under "Recorded" there are some cells to select the data to acquire and store on .ACQ file. you can store the number you prefer, even all, if you wish. Take care that more data you have more the acquisition file becomes long. In the same way, the file enlarges considering the acquisition length.

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6.1.5 PAGE EXIT

Use the sixth key from the left, at the top of the data display page, to leave the page.

The same could be obtained with EXIT key at the bottom centre of the page or by clicking the enter key when framed in a broken line.

6.2 ACTUATORS TEST

When the ECU has been programmed with a basic map it is important to verify the correspondence of the injectors, the signal coming from the petrol injector 1 has to be the same of the gas injector 1, and this for all the injectors.

Possible errors for this connection do not create big problems for the vehicle operation during stabilised running, but are strongly perceptible during tip in and change-over.

The inversion of two injectors is very dangerous during change-over as, for a certain period, one cylinder will be fed with both petrol and gas while the other one will not receive any fuel.

In picture 6.8 we have a correct injectors connection while in picture AM45 gas injector 1 and 2 have been reversed.

In the SEQUENT system the change-over in carried out in order to change-over one injector each time to make the petrol to gas passage milder and vice versa. This means that in a 4 cylinder vehicle the petrol feeds three cylinders and the other with gas, then two cylinders with petrol and two with
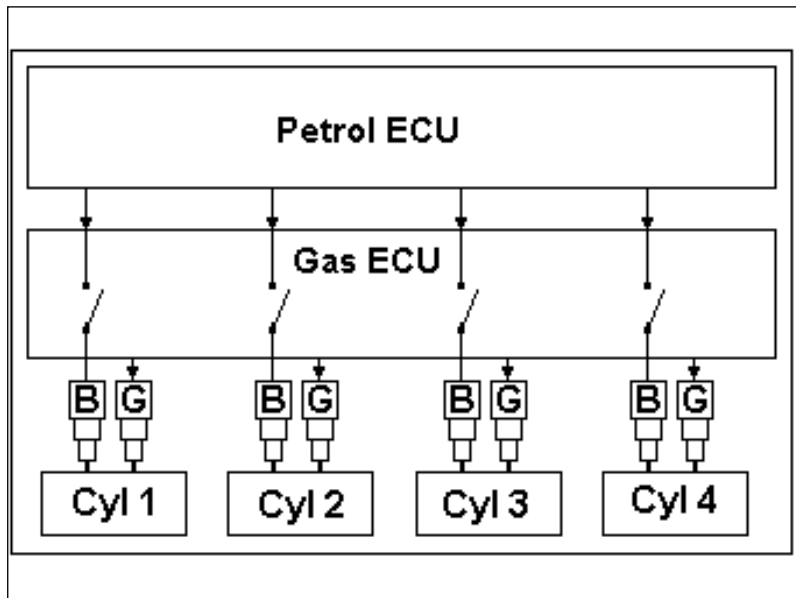
Pic. 6.8 - Correct installation example
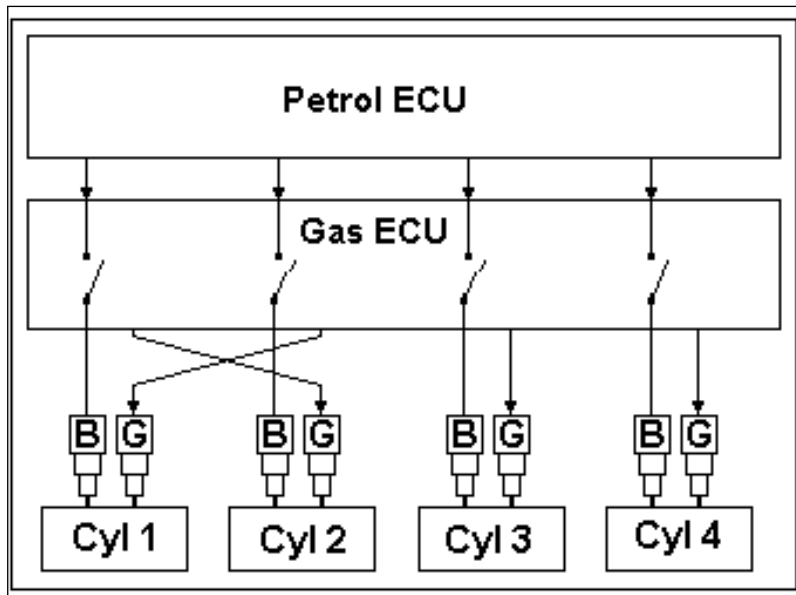
Pic. 6.9 - Wrong installation example

gas, then one with petrol and three with gas till reaching a full gas operation for all cylinders. Some engine cycles which could be set from installers program (normally 3) have to be executed between an injector change-over and another one.

In the picture 6.8 at the change-over happens the following:

• The petrol 1 injector is cut and the gas 1 injector is piloted.

• After 3 injections the petrol 2 injector is cut, too and the gas 2 injector is piloted

• After other 3 injections the petrol 3 injector is cut, too and the gas 3 injector is piloted.

• Again After other 3 injections the petrol 4 injector is cut, too and the gas 4 injector is piloted.

In this case during the change-over all the cylinders are continuously fed with a one and only fuel.

In case of wrong installation (picture 6.8) it happens what indicated hereunder:

• The petrol 1 injector is cut and the gas 2 injector is piloted.

• After 3 injections the petrol 2 injector is cut, too and the gas 1 injector is piloted.

• After other 3 injections the petrol 3 injector is cut, too and the gas 3 injector is piloted.

• Again After other 3 injections the petrol 4 injector is cut, too and the gas 4 injector is piloted.

This means that during the first phase the cylinder 1 is not fed while the cylinder 2 receives both petrol and gas.

To easily find possible error in the injectors electric connection there is a program screen called "Actuators test" (picture 6.10) and you can find it in Diagnostic Actuators Test.

When entering this screen the program reads on the ECU how many injectors are connected to the ECU itself (4 in the example) and what is the delay for the injections number between the changeover in a cylinder and the one in the next one (3 in the example).

By taking the tick marks away from the injectors it is possible to make the cylinders immediately fed with petrol even if the changeover switch is turned to gas position and the led is green: then you can decide (in case of 4 cylinders) to make the engine work with 3 cylinders with gas and 1 with petrol, or 2 with gas and 2 with petrol, or 1 with gas and 3
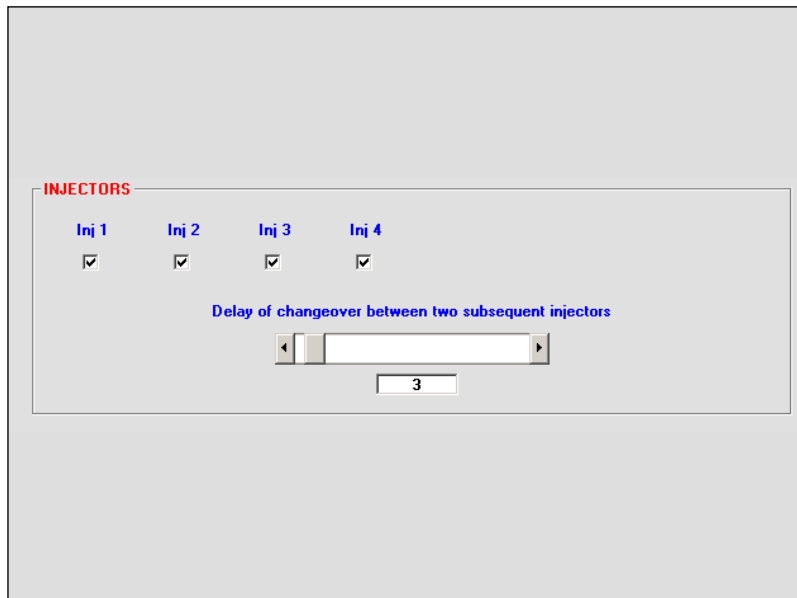
Fig. 6.10

with petrol or, finally, all the 4 with petrol. Note that in this latter case even if the vehicle correctly runs on petrol, the changeover switch led is green, the solenoidvalves open (or they will open at changeover) and this behaviour can create confusion. Moving the sliding bar to the right it is possible to increase the change-over delay between two consecutive injectors.

Procedure for the identification of injectors connection errors:

Let's suppose to have the same situation described in the picture 6.9 and you want to verify if the injectors have been correctly connected.

Increasing the change-over delay the time during which the vehicle has a not fed cylinder (the first) and another one fed with both fuels (the second) increases too and you will easy feel the engine "is working bad" or switch off.

At this point you know there was a change in the connection of the injectors but you do not know

what are the inverted ones. The procedure is the following.

Procedure for the correction of injectors connection errors:

1. Take the tick marks away from each injectors cell. the engine will work with petrol.

2. Add a tick in the injector 1 cell.

3. If the gas injector supply gas in the correct cylinder (that is the petrol 1 injector) the engine will correctly work. In this case repeat the point 1 with the next injector. On the contrary, if there are some problems, go to the point 4.

4. The selected gas injector has to be moved: move the connector on another gas injector till obtaining the engine correct operation.

5. Repeat the point 1 with the next injector till finding the correct connection for all the gas injectors.

6.3 ECU VERSION

With DIAGNOSTIC key at the bottom of the main screen and selecting ECU VERSION among the left keys, you enter the page of picture 6.11 with the parameters identifying the software type, the data and other parameters regarding the ECU programming.

6.3.1 PARAMETERS DESCRIPTION

6.3.1.1 ECU Code

Pic. 6.11 - Diagnostic – ECU Version

It is the code of the component which represents this particular type of ECU. For example the one in the picture is "DE813001-00-00" and identify the first version of the FLY SF ECU for 4 injectors.

This code is divided in a main one (DE813001) for the component (FLY SF ECU for 4 injectors), and two sub-codes divided with a stroke identifying the main and secondary hardware revision.

6.3.1.2 Loader version

Identify the loader version in the ECU memory. It is displayed as a letters and numbers sequence as the following: "KER-FS 0113". The last four numbers represents the version (in this case 113). Higher is this number and more recent and improved will be the loader.

6.3.1.3 Software version

It is the real software contained in the ECU. It is composed by 5 letters + 3 numbers + 3 numbers. The first 5 letters indicates the

software, the other 3 numbers the real software version (higher is this number and more recent and improved will be the program) while the last 3 indicates the hardware version.

6.3.1.4 Map version

It is the ECU map version (file .AAP) (not the calibrations version that is .FSF). For BRC maps it is at least 1: this number is increased each time BRC develop a new version.

For the maps developed by the technician this number is always 0.

6.3.1.5 Vehicle code

This number is paired to each vehicle developed and confirmed by BRC. Its value is 65535 if the map has been developed by the technician with the guided personalised procedure. If the technician creates a new map by modifying a BRC one, without using the guided personalised procedure, the BRC original vehicle code won't be

change.

6.3.1.6 Calibrations Version

It is the ECU calibrations version (file .FSF) (not the mapping version that is .AAP). For BRC maps it is at least 1: this number is increased each time BRC develop a new version.

For the maps developed by the technician this number is always 0.

6.3.1.7 First programming date

It is the date in which the ECU has been programmed for the first time by the technician. After the first one, this date won't change for the ECU all life long.

6.3.1.8 Programming code

It identifies the type of program used in the PC to execute the last ECU programming.

Usually it could be "PROG_INS", to indicate SEQUENT technician program has been used.

7. UTILITY

Pic. 7.1 - Utility

The different available functions in UTILITY allow to carry out different operations to update the program or modify some aspects.

All these functions have not to be connected to an ECU except for the "SAVE CONFIGURATION" option allowing to update maps and calibrations on the PC extracting them from an ECU and adding them to the technician PC record. After selecting "UTILITY" the screen becomes as in picture 7.1 and on the left there are various instruments we will describe in the next paragraphs.

7.1 LANGUAGE CHOICE

It permits to select the language for the program (messages, writings, captions and all the displayed information). The program is studied to change the language introducing a file (a .LNG file) in the installation file (usually "C:\programmi\SEQUENT). the procedure for the selection is the following:

1. Start SEQUENT program.
2. Select "UTILITY" from the main page.
3. Click "LANGUAGE CHOICE" key, on the left of the screen.
4. Select the language file in "AVAILABLE LANGUAGES" (see picture 7.2).
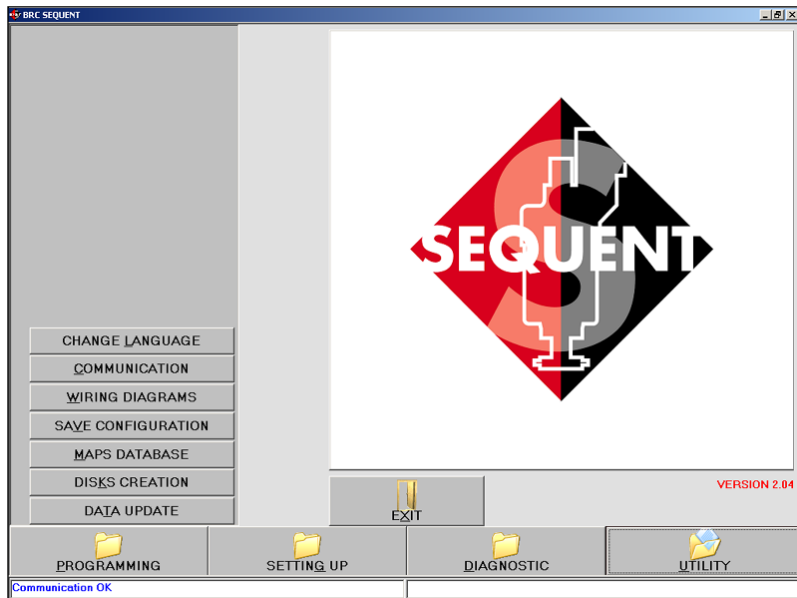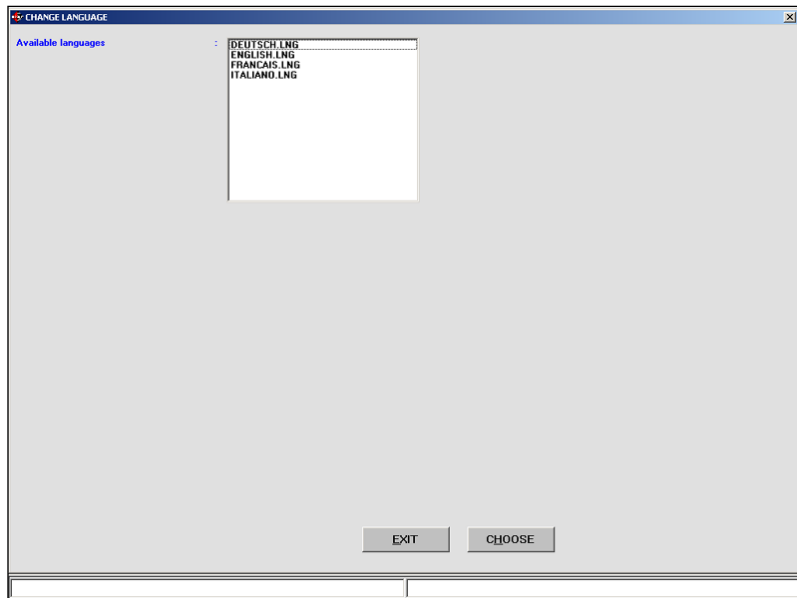
Pic. 7.2 - Utility – Language choice

5. Click "CHOOSE" key at the bottom of the screen,
6. Click "EXIT" key to return to main page.

Clicking on "EXIT" key or escape one on the keyboard (at the top left "Esc") you leave this page without executing changes.

7.2 COMMUNICATION

It allows to modify the parameters of the communication between PC and ECU. It is necessary to modify these options especially when the PC has not a serial plug. In this case use an USB/serial adapter to add a virtual door to the PC. In the "Serial" file (picture 7.3) the "COM 1" value has to be substituted according to the value the operative system set for the adapter (see Windows® control panel, "System" option).

The "Baud rate" file (picture 7.3) allows to modify the transmis-

sion speed. If there are not particular problems, we suggest to leave the maximum speed of 19200 Baud, with whom you have the minimum times of the ECU programming. The other programming speeds are 10400 Baud and 9600 Baud (standard ones).

Another interesting parameter is the "Waiting time between 2 following messages". Decreasing this time you obtain higher speed for the ECU programming but higher possibilities the communication fail, too. The suggested standard value is 150 ms, except in case of problems.

The "Fast init. hooking" key is used to select the initialisation type has to be used to start the communication between PC and ECU. Usually it has to be selected.

The options appearing clicking on "ADVANCED" has to be changed only in case of problems and only with the help of BRC technicians or qualified personnel.

In case these parameters have been modified causing the impossibility to dialogue with the ECU, restore standard values. You can know the value of each cell pl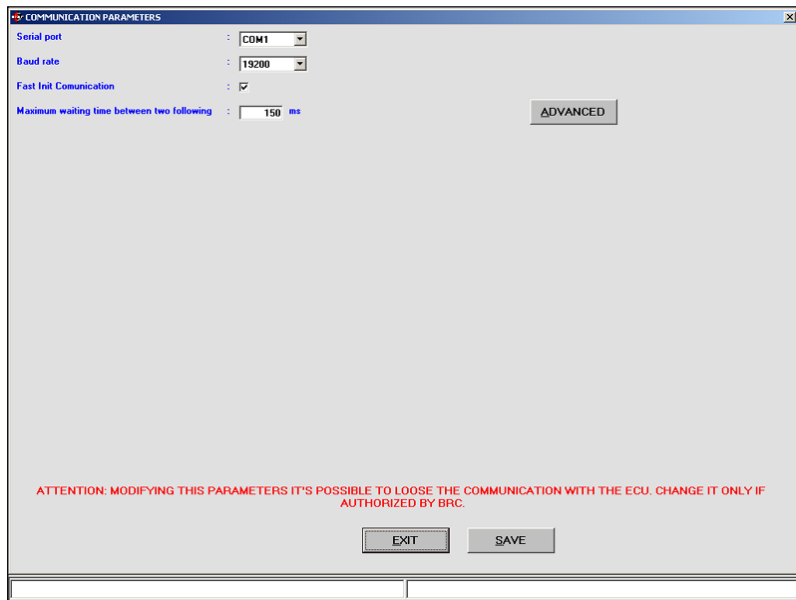acing the mouse pointer on them: a small cell with the standard value will be displayed and will disappear when moving the pointer.

To save the changes and return to the main page, click "SAVE" key at the bottom of the screen. To leave without saving the modifications and return to the main page, click "EXIT" key or the escape one

Pic. 7.3 - Utility – communication

on the keyboard (at the top left "Esc").

7.3 ELECTRICAL PLANS

Clicking on this key you enter the electrical plans file. The plan is available in a PDF format opening with "Adobe Acrobat® ReaderTM " (1) program which has to be installed in the computer (see note (1)). Use the SEQUENT software installation CDROM and follow this procedure:

1. Switch the PC on.
2. Introduce the CDROM.
3. Wait for the automatic start of the installation program (if it does not happen go to note hereunder).
4. Click on "Install Acrobat Reader" key.
5. Follow the installation Guided Procedure.

NOTE: the automatic starting of SEQUENT program installation introducing the CDROM depends

on the PC setting. In case the installation does not begin, start the "Setup" program in the CD ROM main file (Click on Start > Execute, write "D:\Setup.exe" and click on OK. "D" represents the CDROM. If it is different, change it with the correct letter.

Wait for the automatic start of the installation program (if it does not happen go to note hereunder).

The procedure to display an electrical plan is the following:

1. Select "UTILITY" in the main page.
2. Click on "ELECTRICAL PLANS" on the left.
3. Click twice on "BRC_MAPS" file in the file window (at the top left).
4. Select "LPG" o CNG"(see picture 7.4).
5. Using the mouse or the arrows, select the trademark, model and ECU type to get the electrical plan.

6. In the text cell, in the centre of the screen, the list of available electrical plans will be displayed. If the cell is empty it means there are not available plans.

7. If there is at least one plan, select it with the mouse and the name of the selected file will be displayed in the "Electrical Plans" text cell (blue writing).

8. Click on "VIEW" key at the bottom of the screen.

9. Wait for the start of the "Adobe Acrobat® ReaderTM " program, displaying the desired plan.

10. After the plan consultation, close the program.

"Adobe Acrobat® ReaderTM " guide is available starting the program (START key of Windows bar, the PROGRAMS and finally ACROBAT READER) choosing "?" and then "Reader Guide".

To quit the SEQUENT program electrical plans and go to the main page, click on "EXIT" key at the bottom of the screen or the escape one ("Esc" at the top left of the keyboard).
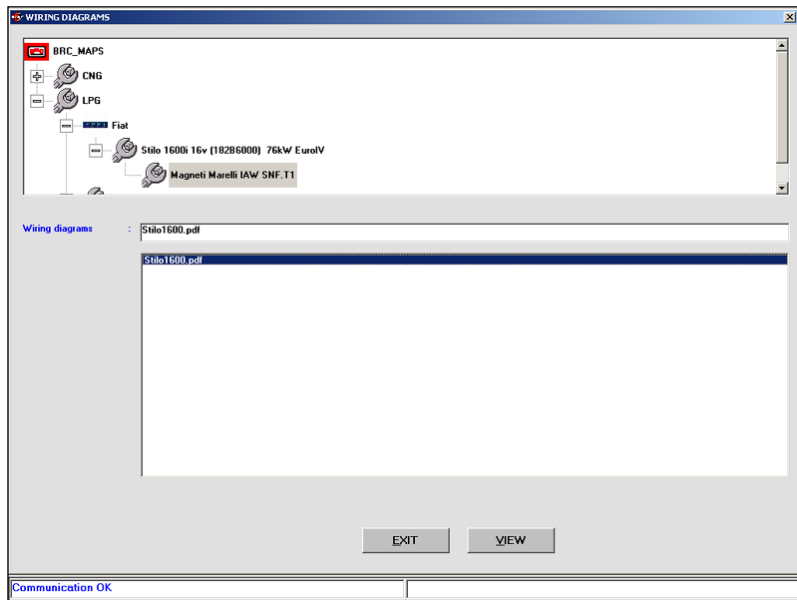
Pic. 7.4 - Utility – ELECTRICAL PLANS

(1) PDF format (Portable Document Format) Adobe® represents the standard for the electronic documents distribution all over the world. PDF Adobe is a universal file format which keep unchanged all characters, the format, colours and images independently of the application and platform used to create them. PDF Adobe files are compact ones and can be shared, displayed, consulted and printed by everybody thanks to the free Adobe Acrobat® Reader™ utility available in the Adobe® site (www.adobe.it in Italian and www.adobe.com in English language).

7.4 CONFIGURATION SAVE

This key allows to extract the data contained in the ECU and to save them on the PC as a new map. By doing this it is possible to increase the list of convertible vehicles without creating updating disks and to operate on every vehicles modifying maps and calibrations even if the specific map is not available on the PC.

The procedure is this one (see picture 7.5):

1. Connect the PC to the SLY SF ECU with the suitable communication harness.

2. Start SEQUENT program.

3. Switch the ignition key on.

4. Select "UTILITY" in the main page.

5. Click on "CONFIGURATION SAVE", on the left of the screen.

6. If the communication is not active (no "Communication OK" writing at the bottom left) wait and try again. If it does not start, verify the connection and

the key contact.

7. Select "LPG" or "CNG" in the "USER_MAPS" file, (the record window at the top left).

8. Select the file concerning trademark, model and ECU type where you wish to save the new map and calibration. If the file does not exist, introduce the above data again in the suitable cells and create a new one.

9. In the text cell identified by the blue "FILE:" writing, introduce a name easy to keep in mind to save the map and calibration files in the computer record.

10. Click on "SAVE" key at the bottom right.

11. Wait for the procedure end confirmed with the red message "CONFIGURATION SAVING CORRECTLY ENDED".

To quit "SAVE CONFIGURATION" and return to the main page, click on "EXIT" key at the bottom of the screen or the escape one ("Esc" at the top left of the keyboard).
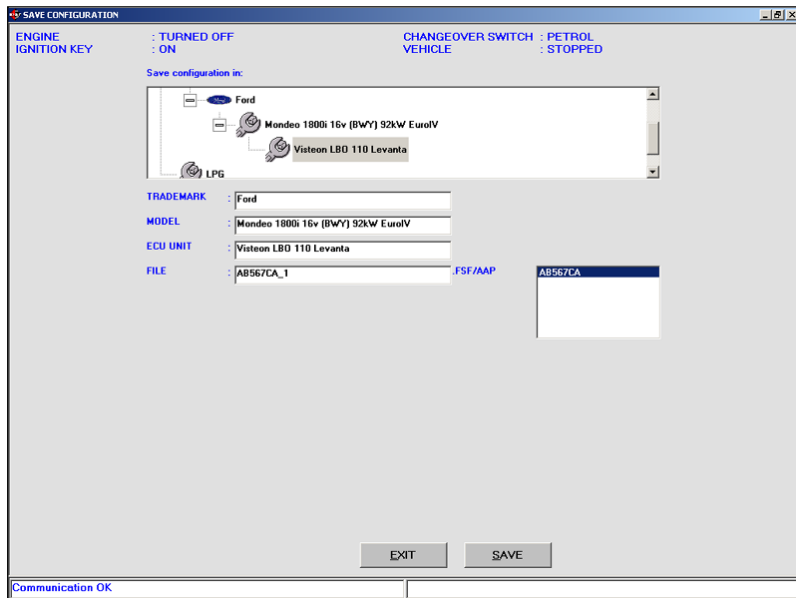
Fig. 7.5 - Utility - Save configuration
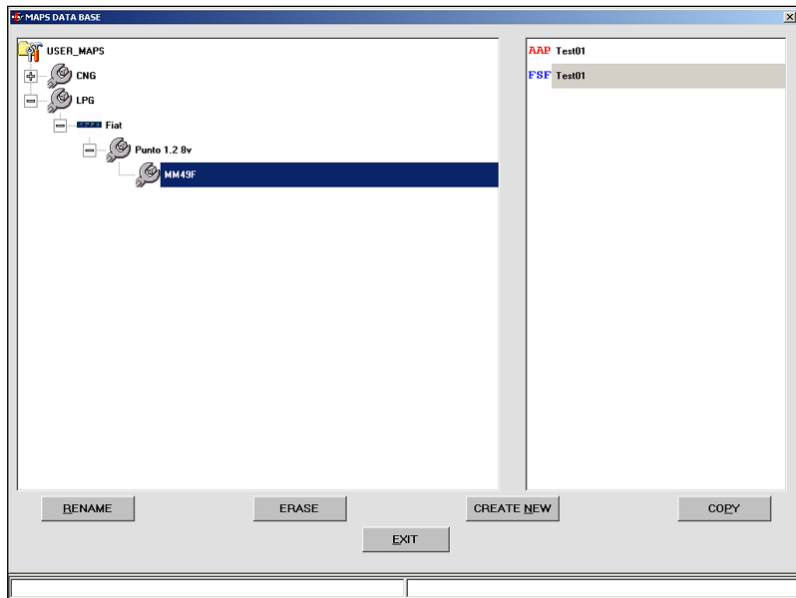
Pic. 7.6 - Utility - MAPS RECORD

7.5 MAPS DATABASE

It allows to modify the user maps record changing the name of the files, moving, deleting and copying them (picture 7.6).

• **To change a record name** (relating to the trademark, the model and the ECU type) follow this procedure:

1. Select "UTILITY" in the main page.

2. Click on "MAPS DATABASE", on the left of the

screen.

3. Click twice on "USER MAPS".

4. Select "LPG" o CNG" in the record window.

5. Choose the file to name and select it using the mouse or the arrows.

6. Click on "RENAME" at the bottom of the screen.

7. Introduce the new name.

8. Click on enter key.

• **To erase a file** (relating to the trademark, the model and the ECU type) follow this procedure:

1. Select "UTILITY" in the main page.

2. Click on "MAPS DATABASE", on the left of the screen.

3. Click twice on "USER MAPS (at the top left).

4. Select "LPG" or CNG".

5. Choose the file to name and select it using the mouse or the arrows.

6. Click on "ERASE" at the bottom of the screen.

7. A message will ask to confirm: a positive answer will erase the file from the record.

8. If a file has been erased, a new message will confirm it. Click on "OK" or enter key to continue.

BE CAREFUL!: The erase operation is very dangerous and can cause the loss of important data contained in the users record. For example if you select a file relating to a trademark (i.e "Fiat") and confirm the erasure, ALL the files of ALL models and ALL ECUs will be removed (that is all "Fiat" vehicles contained in the users record).

• **To create a new file** (relating to the trademark, the model and the ECU type) follow this procedure:

1. Select "UTILITY" in the main page.

2. Click on "MAPS DATA-BASE", on the left of the screen.

3. Click twice on "USER MAPS".

4. Select "LPG" or CNG".

5. If you wish to create a file for a new trademark (i.e. "LEXUS"), go to step 8.

6. If you wish to create a file for a new model (i.e. "Punto 1200 8V" in the "Fiat" file) go to step 9.

7. sIf you wish to create a file for a new type of ECU (i.e. "MagMar49F") go to step 15.

8. Click on "CREATE NEW". A new file relating to the trademark named "New_trademark" will appear.

9. Write the trademark name and click on enter to change it.

10. Go to step 18.

11. Select the file relating to the trademark (i.e. "Fiat").

12. Click on "CREATE NEW". A new file relating to the model named "New_model" will appear.

13. Write the model name and click on enter to change it.

14. Go to step 18.

15. Select the file relating to the trademark (i.e. "Fiat"), and then the model.

16. Click on "CREATE NEW". A new file relating to the type of ECU named "New_ECU" will appear.

17. Write the ECU name and click on enter to change it.

18. The new created file is empty now. To introduce the data, follow the guided personalised programming or setting up procedure.

• **To copy a model or petrol ECU type file in another position:**

1. Select "UTILITY" in the main page.

2. Click on "MAPS DATA-BASE", on the left of the screen.

3. Click twice on "USER MAPS".

4. Select "LPG" or CNG".

5. If you with to move a trademark file (i.e. all "Fiat" maps) from CNG to LPG file, or vice versa, go to step 8.

6. If you with to move a model file (i.e. all the contained ECU types) from a trademark to another one, go to step 13.

7. If you wish to copy a file of ECU type contained in a certain trademark file inside (LPG > FIAT > PUNTO 1.2 8V > MM49F – see picture 7.6) and introduce it in another position (LPG> PEUGEOT > 206 >........), go to step 18.

8. Select the file relating to the trademark by using the mouse or the arrows, (i.e "Fiat").

9. Click on "COPY" key at the bottom right; the key name will change into "PASTE".

10. Choose the new type of installation where you wish to copy the trademark file (i.e. if you are copying "Fiat" , initially contained in "LPG", you have to select "CNG").

11. Click on "PASTE" at the bottom right.

12. Go to step 22.

13. Select the model file you wish to copy (i.e. select, "LPG", then "Fiat", and then "Punto 1200 8V").

14. Click on "COPY" key at the bottom right: the key will change into "PASTE".

15. Choose the trademark file you wish to copy the model in.

16. Click on "PASTE" key at the bottom right.

17. Go to step 22.

18. Select the petrol ECU type file you wish to copy (i.e. select, "LPG", then "Fiat", then "Punto 1200 8V", then "MM59F").

19. Click on "COPY" at the bottom right: the key will change into "PASTE".

20. Choose the model file, under the trademark where you wish to copy it.

21. Click on "PASTE" key at the bottom right.

22. The new file has been cre-

ated with the same name it has when selected to be copied and contains the same file. To change inside data or name it is necessary to follow the specific procedures already described in this guide.

To quit the maps record screen and return to the main page, click on "EXIT" key at the bottom of the screen or the escape one ("Esc" at the top left of the keyboard).

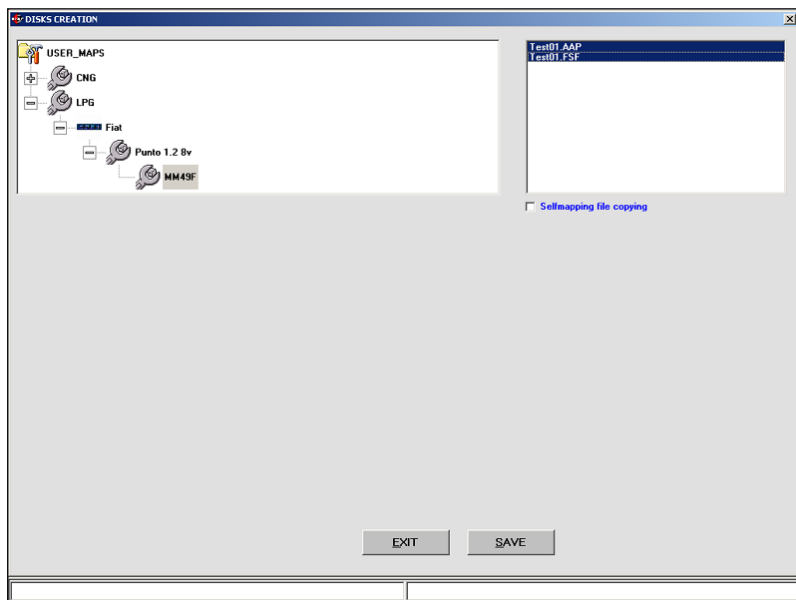## 7.6 DISKS CREATION

This key allows to create disks with the maps taken from the PC user record in order to transfer them in another PC. With this procedure it is not possible to transfer the maps of the BRC record, the software or the loader to another PC. to update the software and loader it is necessary to download the updating one from BRC internet site or from CDROM or disks.

Each disk created by the user can contain various maps till the exhaustion of the available space.

The procedure to be carried out to transfer a map on the diskette is the following (see picture 7.7):

1. Start SEQUENT program in the PC containing the map you wish to transfer.

2. Introduce an empty disk in the PC.

3. Select "UTILITY" key in the main page.

4. Click on "DISKS CREATION" key.

5. In the user record select "LPG" if it is a LPG vehicle map or CNG if it is a CNG one.

6. Select the trademark, model and type of ECU relating to the

Pic. 7.7 - Utility - disks creation

map you wish to transfer.

7. If you want to deepen a self-mapping, adding other points, it is possible by selecting "copy self-mapping file". Keep in mind that even if you are not interested in continuing a self-mapping, the additional files saving is not dangerous (it only fills more space in the disk and in the PC hard Disk).

8. Click on "SAVE" key at the bottom of the screen.

9. When the copy operation is completed, you can repeat it starting from step 4 till there are maps to be transferred or till you have available space. (in this case you have to repeat the not successfully concluded operation after having replaced the disk with a new one).

10. After the last copying operation, click on "EXIT" key to return to the main page.

To transfer a map from the disk to the new PC, follow the data updating procedure from disk,

described in the next chapter.

7.7 DATA UPDATE

Hereunder we described the procedures for the PC data update from CDROM and disks, too. These data can include maps, software and loader for the ECU. The updating CDROM are created by BRC while the disks can be created by users following the procedure described in the previous paragraph or downloading the data from the internet site http://www.brc.it. See picture 7.8.

7.7.1 UPDATE FROM CDROM

1. Start SEQUENT program (at the bottom left corner of the screen) and select "Start" > Programs > SEQUENT).

2. Introduce the CDROM in the PC.

3. Select "UTILITY" key in the main page.

4. Select "UPDATING DATA" key on the left.

5. Select CDROM (usually it is the d: unit) near the writing "Data updating from".

6. Select CDROM file containing the updating file. For example "D:\SEQUENT\updating" (instead of D, select the CDROM name) and continue clicking "UPDATE" key at the bottom of the window.

7. . After the copying operation, click on "QUIT" key to return to the main page.

7.7.2 UPDATING FROM DISKS

In order to create one or more updating disks of the user maps, follow the procedure described in the paragraph 7.6.

In order to create one or more updating disks of maps, Sequent software and Fly SF ECU loader through BRC internet site, follow the procedure described hereunder:
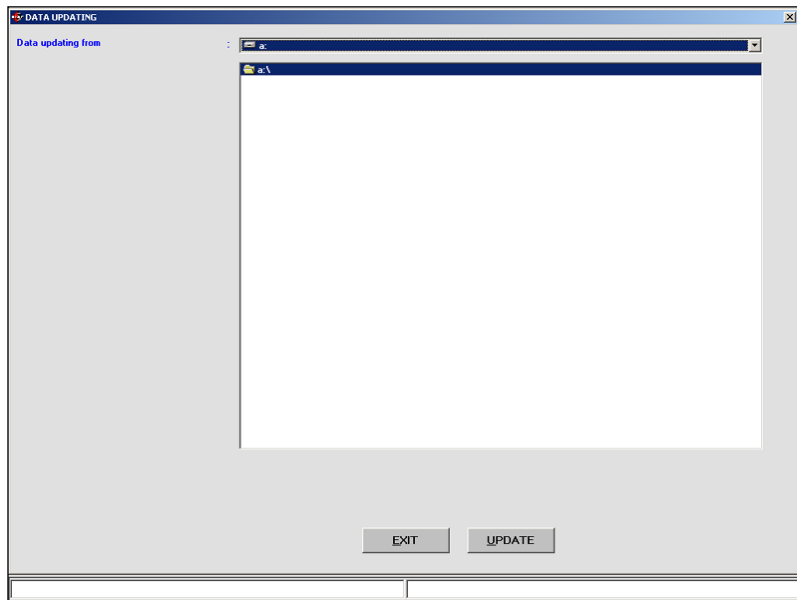
Select Sequent section in www.brc.it.

Digit your ID and PASSWORD to enter.

The section containing the following operations:

1) Download the maps of all the available vehicles.
2) Download Sequent software.
3) Download Sequent software updating.
4) Download Fly SF ECU software updating.
5) Download Fly SF ECU loader updating

The below procedures are by

Pic. 7.8 - Utility – Data updating

way of example only and refer to download carried out with Microsoft Internet Explorer 6.0. They could suffer light differences according to the type and version of the used browser. in this case refer to the browser specific indications.

7.7.2.1 Maps of all the available vehicles

P.S. If you wish to have all the technician maps available, you just need to select the word maps in " Download the maps of all the available vehicles".

Select the desired diskette clicking on DOWNLOAD key.

A window called DOWNLOAD FILE will be opened and you can choose where you prefer to save the file clicking on "SAVE".

If necessary, after the DOWNLOAD, close this window.

Quit Explorer application clicking the X at the top right.

In the chosen file look for the

previously downloaded FIMP#_xx.exe file.

Click twice the file icon to unzip it.

Introduce a formatted disk in the drive A: (write a number on it in order not to mix them up).

Answer OK, UNZIP, OK and CLOSE to the displayed questions.

At this point the disk is ready to be used on the technician program to update the maps record.

7.7.2.2 Software Sequent

P.S. This software operates only if paired to the suitable Hardware Key supplied by BRC.

Select "Sequent software" in "Download Sequent software".

Click on "Continue"

Select the desired software installation disk by clicking DOWNLOAD.

A window called DOWNLOAD FILE will be opened and you can choose where you prefer to save the file clicking on "SAVE".

If necessary, after the DOWNLOAD, close this window.

Quit Explorer application clicking the X at the top right.

In the chosen file look for the previously downloaded SQSWPC#_xx.exe file.

Click twice the file icon to unzip it.

Introduce a formatted diskin the drive A: (write a number on it in order not to mix them up).

Answer OK, UNZIP, OK and CLOSE to the displayed questions.

At this point the diskette is ready to be used to install Sequent software in the PC.

7.7.2.3 Sequent software updating

Select "Sequent software" in "Download Sequent software".
Click on "Continue"
Introduce a formatted disk in the drive A:
Select the desired software updating disk by clicking DOWNLOAD.
A window called DOWNLOAD FILE will be opened and you can choose where you prefer to save the file clicking on "SAVE".
Choose the drive A: and click on "SAVE" key
At this point the disk is ready to be used to update Sequent software in the PC.

7.7.2.4 Fly SF ECU software updating

P.S. If you wish to have the software for the Fly SF ECU updating available, select "Software ECU" in "Download ECU software updating": this is what it

is downloaded in the ECU when executing the ECU software updating.

A window called DOWNLOAD FILE will be opened and you can choose where you prefer to save the file clicking on "SAVE".

If necessary, after the DOWNLOAD, close this window.

Quit Explorer application clicking the X at the top right.

In the chosen file look for the previously downloaded SQSWECU#_xx.exe file.

Click twice the file icon to unzip it.

Introduce a formatted disk in the drive A:

Answer OK, UNZIP, OK and CLOSE to the displayed questions.

At this point the disk is ready to be used on users program to update the ECU software record.

7.7.2.5 Fly SF ECU loader updating

P.S. This software manages the Fly SF ECU re-programming and it can be used only if indicated by BRC technical assistance service.

Select the desired software installation disk by clicking DOWNLOAD.

A window called DOWNLOAD FILE will be opened and you can choose where you prefer to save the file clicking on "SAVE".

If necessary, after the DOWNLOAD, close this window.

Quit Explorer application clicking the X at the top right.

In the chosen file look for the previously downloaded SQKERNELECU#_xx.exe file.

Click twice the file icon to unzip it.

Introduce a formatted disk in the drive A:

Answer OK, UNZIP, OK and CLOSE to the displayed questions.

At this point the disk is ready to be used on users program to update the ECU loader record.

As regards paragraphs 7.7.2.1, 7.7.2.4 and 7.7.2.5, after creating one or more updating disks or taking one from BRC, to update the PC follow these indications:

1. Start SEQUENT program (at the bottom left corner of the screen) and select "Start" > Programs> SEQUENT)

2. Introduce the first disk in the PC

3. Select "UTILITY" key in the main page.

4. Select "UPDATE DATA" key on the left.

5. Select diskette reader (usually it is the a: unit) near the writing "Updating data from"

6. After the transferring operation, if you have other disks continue introducing the next one and repeat the above steps starting from number 4; if not click on "EXIT" key to return to the main page.

As regards paragraph 7.7.2.3, after creating the updating disk or taking one from BRC, to update the PC follow these indications:

1. Introduce the disk in the drive A:\ (3,5 inch floppy)

2. Click twice on "Computer Resources"

3.Select drive A:\ and click twice on its icon.

4.inside the window click twice

on " SQSWPC#_xx.exe" file, represented by the Sequent symbol.

5. Answer OK, UNZIP, OK and CLOSE to the displayed questions.

Now the Sequent Software is updated.

As regards paragraph 7.7.2.2, after creating the updating disk or taking one from BRC, to update the PC follow these indications:

1. Introduce the first disk in the drive A:\ (3,5 inch floppy)

2. Click twice on "Computer Resources"

3 Select drive A:\ and click twice on its icon.

4inside the window click twice on "Setup", represented by the PC icon.

5.Wait for the installation software loading.

6.Answer NEXT, YES, NEXT, NEXT and NEXT to the displayed questions (inside the third window the "Browse" key is necessary to change the installation address. we suggest not to modify it as it could create problems for future updating).

7.Introduce the disks following the indicated sequence clicking on OK for each one.

8. At the end, click on Finish key and switch the PC off and on again if required.