

MANUAL ON SEQUENT FAST

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Introduction

What's SEQUENT FAST

SEQUENT FAST is the new calibration/configuration method for SEQUENT systems that is faster and easier to use. It enables the installer to make a new configuration with the stationary vehicle¹, in a few minutes. The installation is simpler too, being generally unnecessary to connect the rpm, TPS and lambda oxygen sensor signal. The components used by SEQUENT FAST are the same already used for the standard SEQUENT.

The SEQUENT FAST programme on PC is new, easier to use and completely separate from the standard SEQUENT, even as regards the database. The guided personalised process is shorter and easier.

Main differences between SEQUENT FAST and standard SEQUENT.

The following table contains the main differences between the standard SEQUENT and the SEQUENT FAST.

Topics	FAST	Standard
Lambda oxygen sensor connection	Not necessary	Optional: it improves the self-learning function
Rpm connection	Not necessary	Necessary
TPS connection	Optional: it is used for tip-ins	Optional: it is used for tip-ins
Self-learning	Coming from the petrol one	System's own self-learning
Self-mapping	With the stationary vehicle by acquiring 3+3 points (+ possible verification and refinement)	Road test (or roller bench test)
Map refinement	Simple and fast	-
Tip-ins & tip-outs	It needs connection to the TPS.	It needs connection to the TPS and rpm.
Working principles	Configuration contained in the FSF file	Configuration based on 2 maps with 256 points contained in the AAP file
Database	Separate from the standard SEQUENT database. One FSF file contains parameters and configuration	An FSF file for parameters and an AAP one for configuration
Data	Some data are different, others are not present (see par.3,1)	-

The topics listed in the table are subject to close examination in the next chapters of this manual.

¹ A short road test of the vehicle being just equipped and configured is a good practice.

1 Programming

1.1 Types of programming files

The programming process of the FLY SF ECU is based on the downloading of two different types of files:

- File .S19
- File .FSF

The AAP file is not present anymore. It contained the standard SEQUENT configuration; full information necessary to the vehicle working is contained in the FSF file.

1.2 Personalised aided programming

Let's go through the new personalised aided programming. It should be noted that there is a reduced number of screens, being unnecessary to calibrate the rpm, TPS and lambda oxygen sensor signals².

For a vehicle powered by LPG it is sufficient to select the fuel type (LPG), the injectors type, the position to save the map in the databases (carmaker, model, etc.) and finally make the self-mapping.

For a vehicle powered by CNG the water temperature sensor calibration page will be added. The described pages are identical to the corresponding pages of the standard SEQUENT aided configuration: therefore make reference to the standard SEQUENT software manual for a more detailed description.

² It is possible to calibrate these signals through the "Setting up" button of the main screen.

Personalised aided process

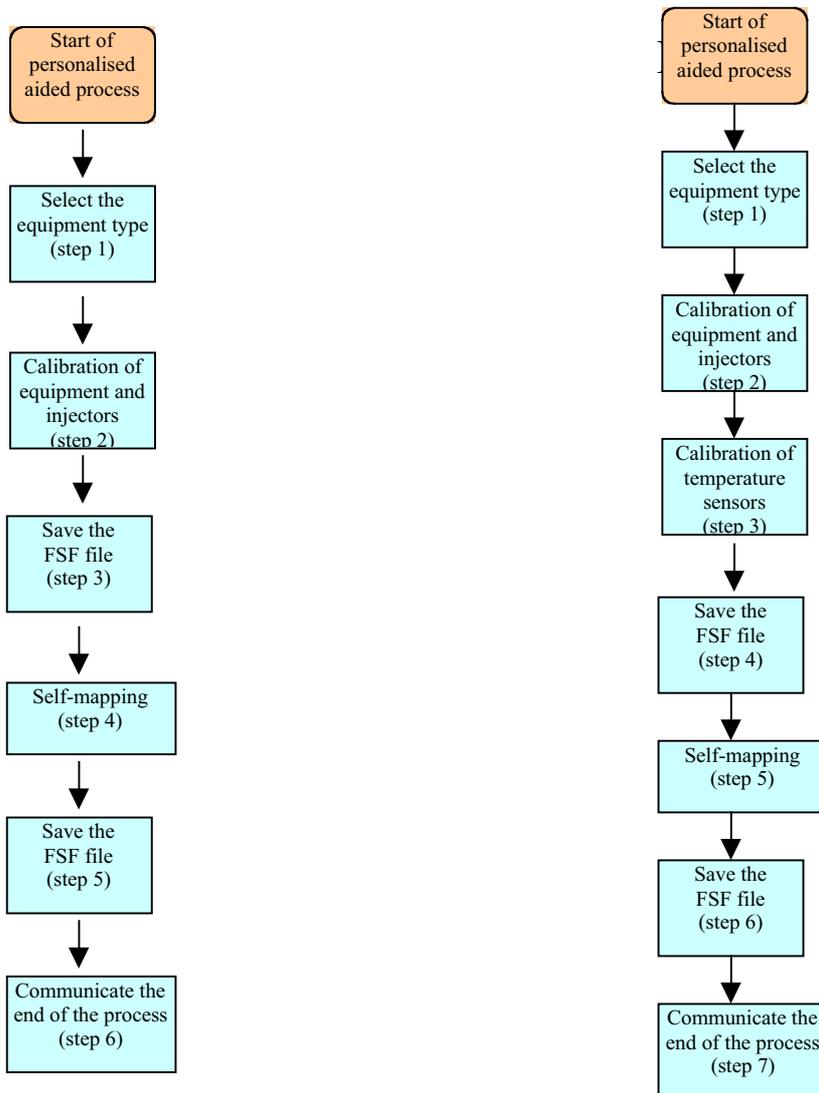


Figure 1.2.1: The steps of the personalised aided process

1.2.1 Self-mapping

The self-mapping is the process necessary to obtain the maps for running a given vehicle on gas. Such maps translate the petrol injectors signals into corresponding controls for the gas injectors. Whereas in the standard SEQUENT there were two distinct maps: petrol and gas, in the SEQUENT FAST the petrol and gas behaviour acquisitions are synthesised in one translation map contained in the .FSF file.

The self-mapping process consists in acquiring the following three points of the vehicle operation, first on petrol and then on gas (see figure 1.2.1.1):

1. Idle speed
2. Idle speed with loads
3. Acceleration in neutral

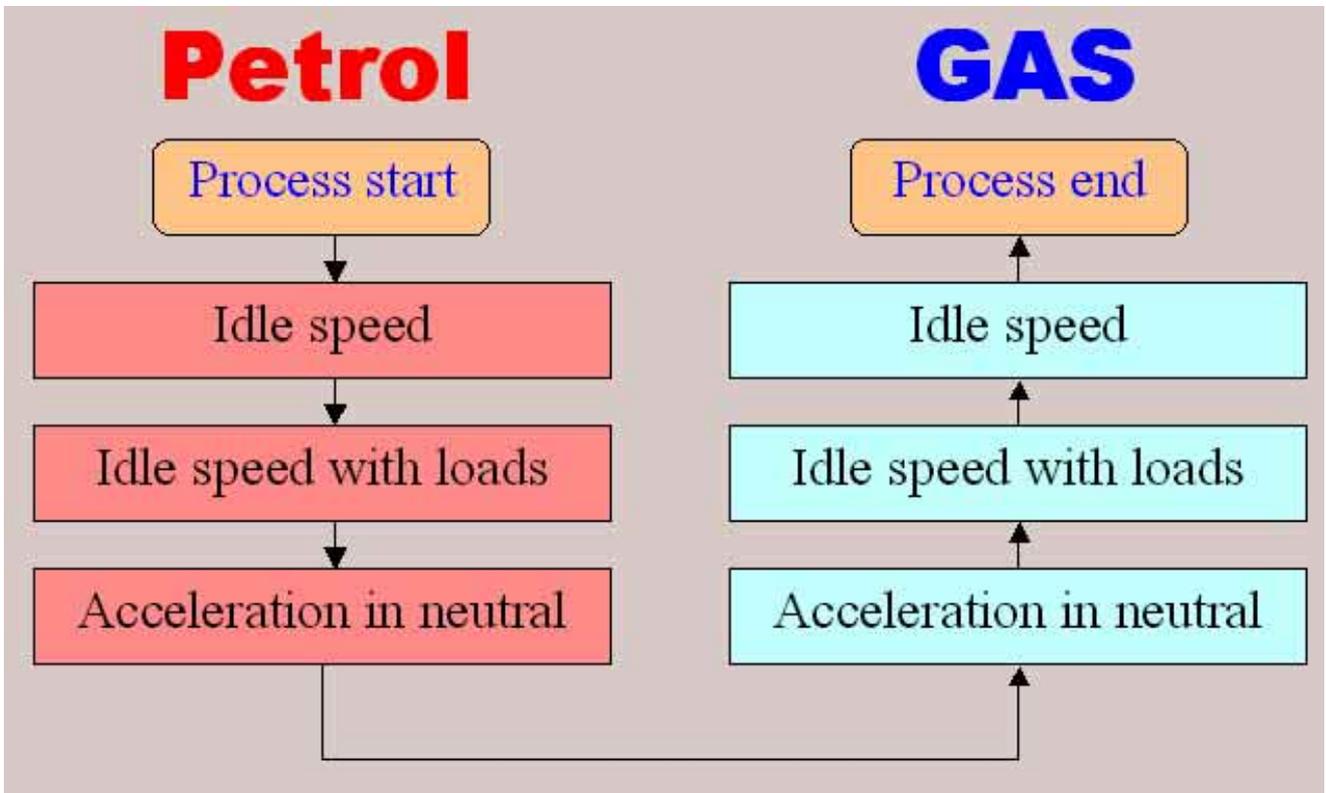


Figure 1.2.1.1: self-mapping, block diagram.

Running on petrol the order will be the above one, whereas running on gas the order will be reverse, from point 3 to point 1. To avoid any misunderstanding, it is necessary to be more precise about:

- the meaning of “idle speed”: running the vehicle at idle speed, with the engine warmed up in steady operating conditions, without any load (air conditioner, headlights, etc.);
- the meaning of “idle speed with loads”: idle speed after connecting all the available loads and
- the meaning of “acceleration in neutral”: about 3000 rpm, with the stationary vehicle, in neutral and without any load.

The screen depicted in figure 1.2.1.2 appears as soon as the self-mapping is started.

It is proper to give an explanation on the meaning of some digital parameters:

- **TON Inj petrol** it is the current opening time of the petrol injectors (ms).
- **Correction** it is a percentage value that indicates the correction the programme is making on the map contained in the ECU that moment. It has only sense in the gas operation. The value “0” means no correction, 10% means an enrichment of the 10% and -10% means a corresponding leaning.
- **Error** while running on gas it is a distance rating between the petrol operation and the gas operation, based on the petrol acquisitions of the injection time. The correction value is constantly and automatically changed by the programme, in order to minimise the error.

Please note that the lambda oxygen sensor value is replaced by a hyphen in figure 1.2.1.2 because the oxygen sensor signal hasn't been calibrated.

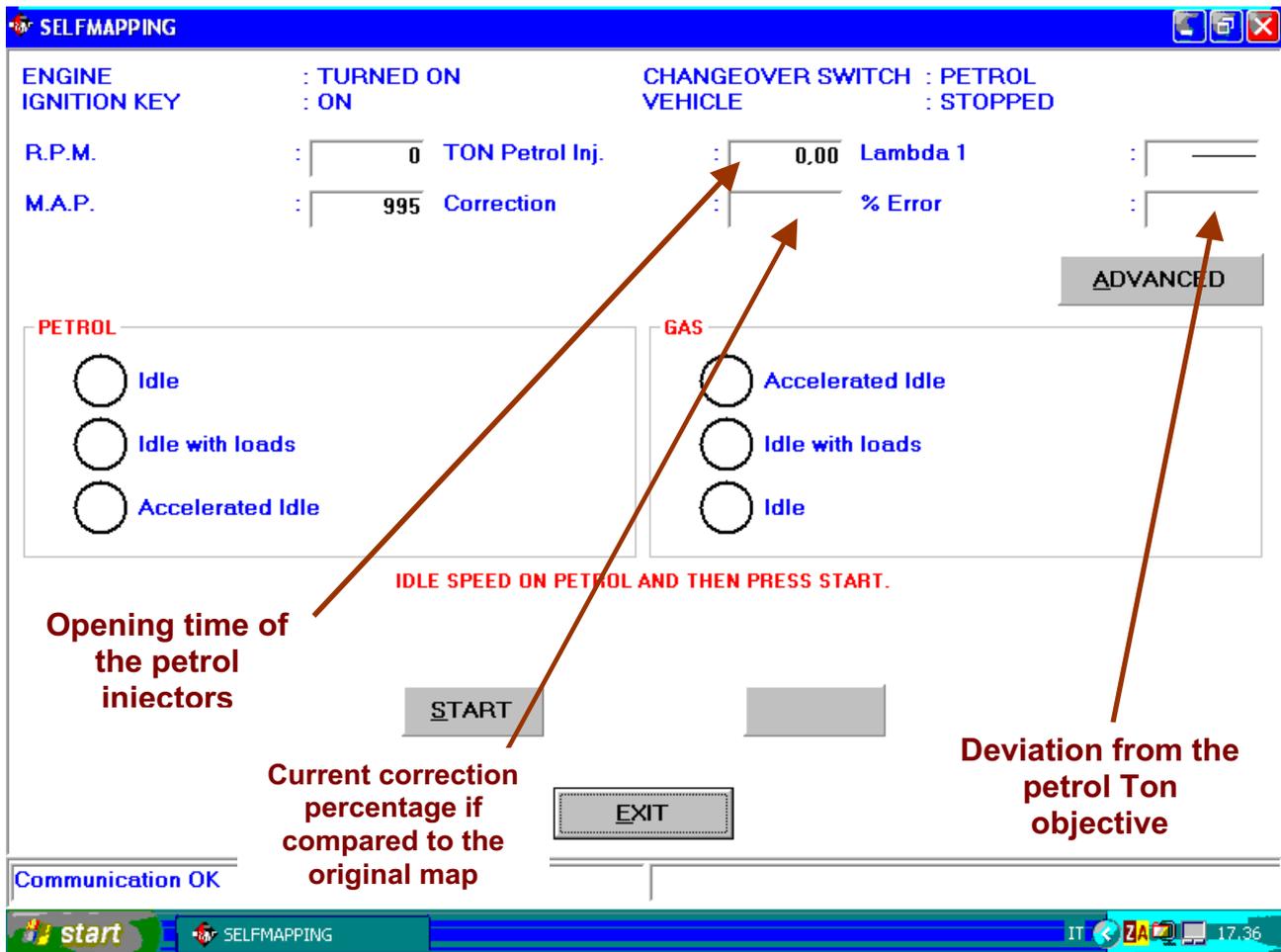


Figure 1.2.1.2: self-mapping, start.

As can be seen from the red indications on the screen depicted in figure 1.2.1.2, the configuration starts with the engine idling, after pressing “START”. If there aren’t the conditions necessary to acquire the first point, a red warning advises to verify such conditions. They are:

- Engine warmed up, operating for 1 minute at least.
- Required rpm and load conditions (see appendix A1 at the bottom of this manual).
- Steady operating conditions.

Such conditions can be verified by pressing “ADVANCED”, as who made configurations with the standard SEQUENT already knows (see figure 1.2.1.5).

With the conditions verified, in the spot corresponding to the idle speed on petrol a number ranging from 0 to 50 will appear, on a background that initially is white, then yellow and finally green. With the first point acquired, attain the conditions required by the following point and then press “START” again (see figure 1.2.1.3), and do the same for the third one too. The conditions necessary to acquire every point are shown by the red indications visible in the figure.

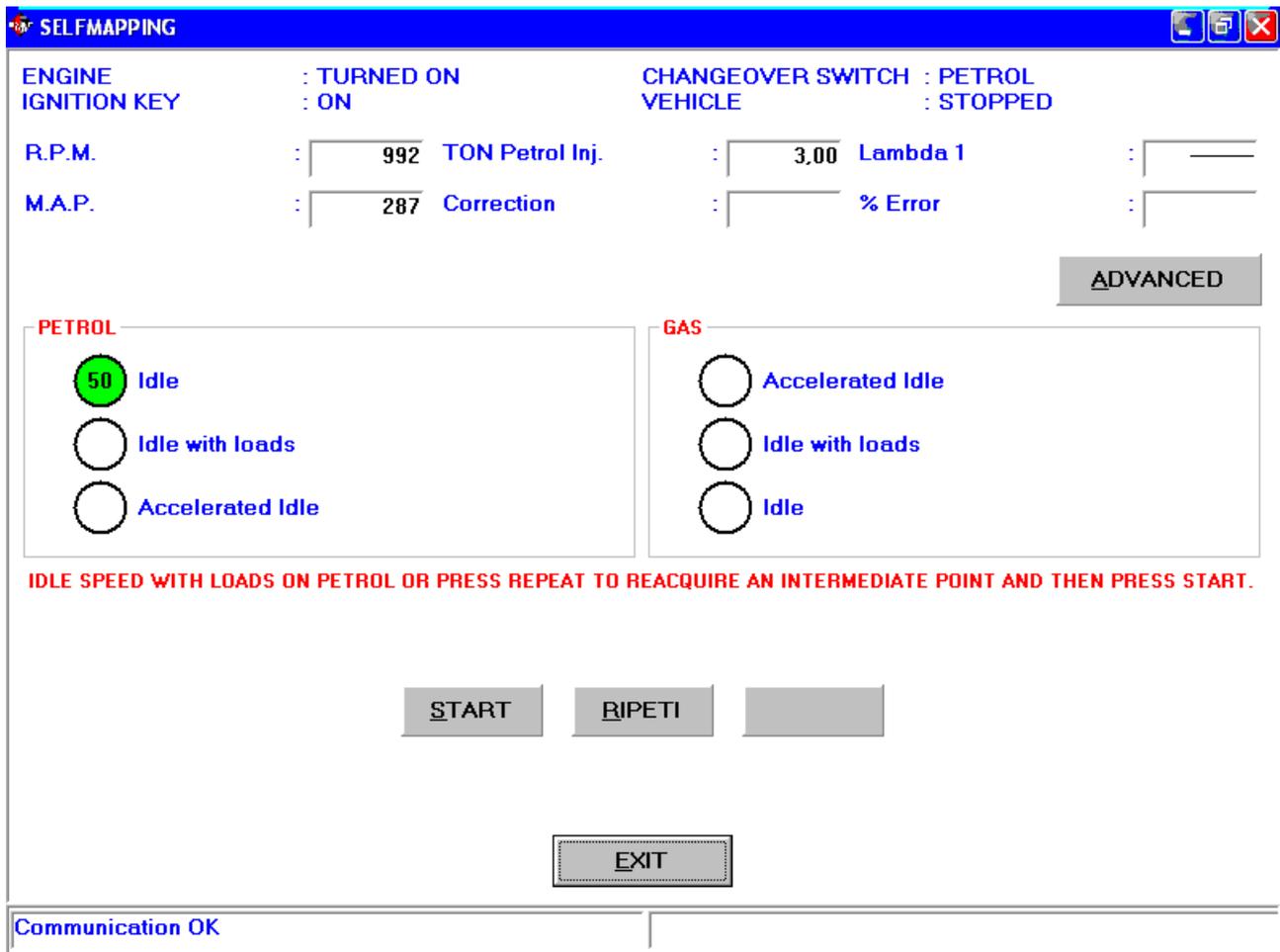


Figure 1.2.1.3: self-mapping, second point.

With the three points acquired on petrol, it is necessary to changeover manually to gas, by keeping the acceleration in neutral, and then press “START” (see figure 1.2.1.4)

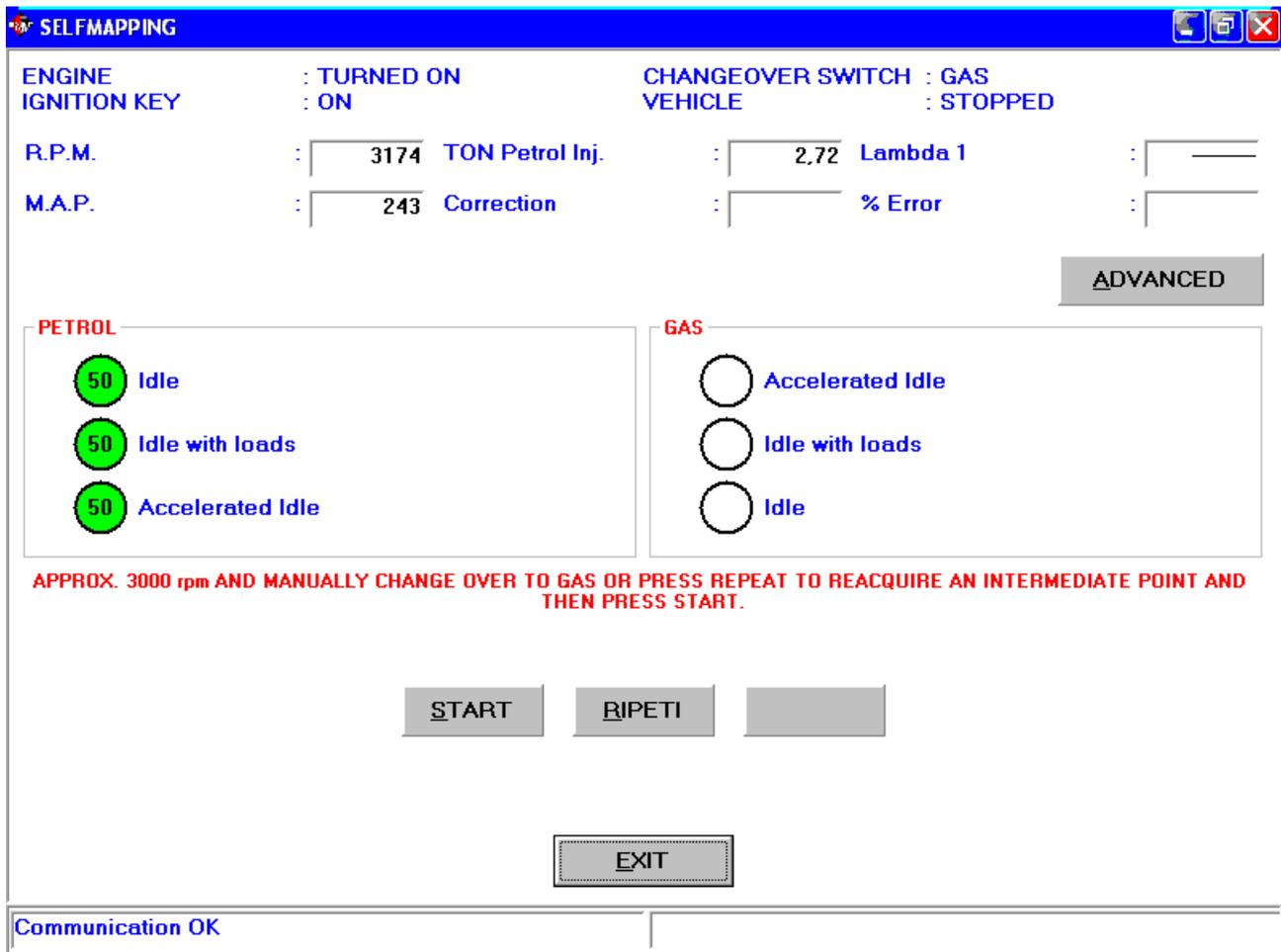


Figure 1.2.1.4: self-mapping, start of gas map.

The number in the spot of the first gas point will not start immediately ranging from 0 to 50, but it will be necessary to wait a certain time, variable from case to case, in which the PC will make the necessary correction to include the error within the top value. Such a top value is normally 5%, but it is possible to modify it after pressing “ADVANCED” (see figure 1.2.1.5). By configuring a superior error the acquisition of the gas points is quickened, but a coarser result is obtained, whereas with a low error the self-mapping is precise, but you run the risk of waiting an excessive time or even of not acquiring the gas points.

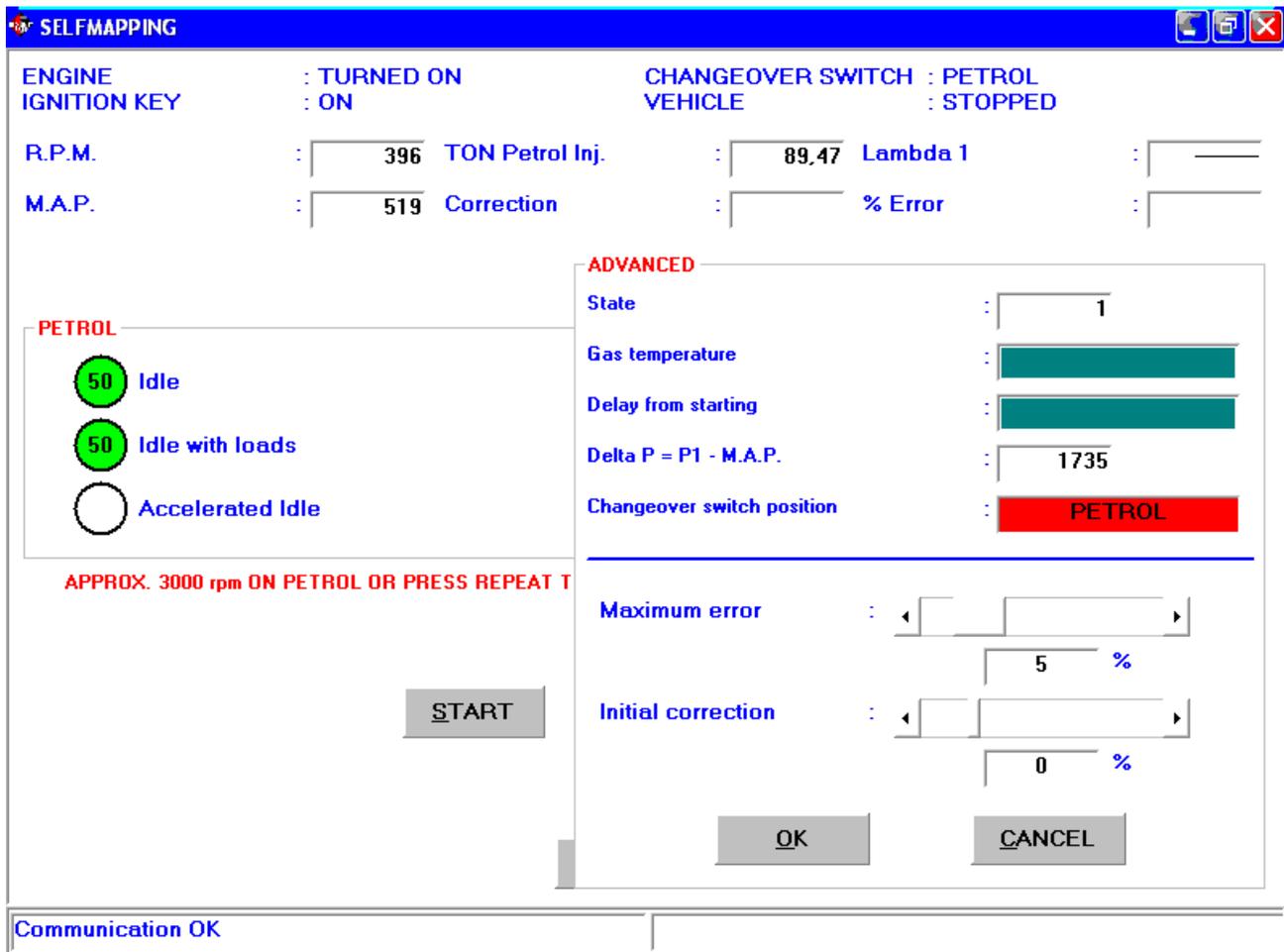


Figure 1.2.1.5: self-mapping, “ADVANCED” button

After acquiring the six points, the configuration is over and can be stored in the database and definitively sent to the ECU, in the same way as the standard SEQUENT.

NOTE 1 If, after changing over to gas, the vehicle switches off before acquiring the first gas point because it is too lean or too rich, it is possible to repeat the self-mapping so that, after changing over to gas, the PC gets rich or lean by whichever percentage, by acting on the “Initial correction” cursor and pressing “ADVANCED” (see figure 1.2.1.5). The initial correction has no effect in the acquisition of the points following the first one.

NOTA 2: After acquiring each point of the configuration, it is possible to go back to acquire the previous points or the last one acquired, pressing “REPEAT” (see figure 1.2.1.6). A selection button will be displayed beside each point acquired, as can be seen in figure 1.2.1.5. Selecting a point and pressing “START”, the configuration will restart from the selected point, by deleting the previous acquisition of that point and the following ones that had been already acquired (if any).

NOTE 3: While acquiring any point, it is possible to interrupt the operation by pressing “STOP”.

NOTE 4: The PC verifies the reasonableness of the data acquired after the third petrol point and after every gas point. In the event of the unreasonableness of the data collected, a message like the one in figure 1.2.1.7 will be displayed and it will be necessary to repeat the configuration from the beginning.

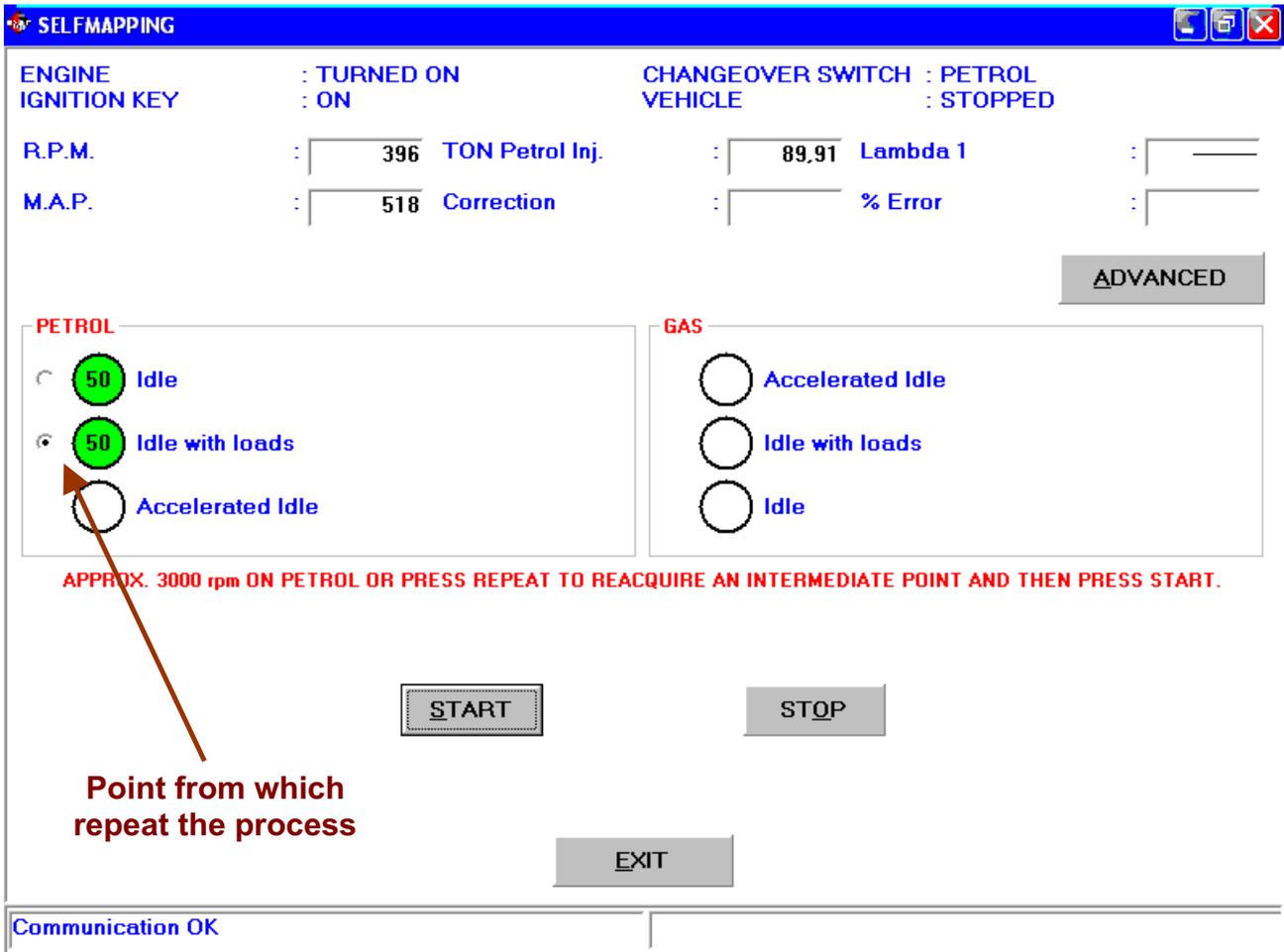


Figure 1.2.1.6: self-mapping: Selection after “REPEAT” button.

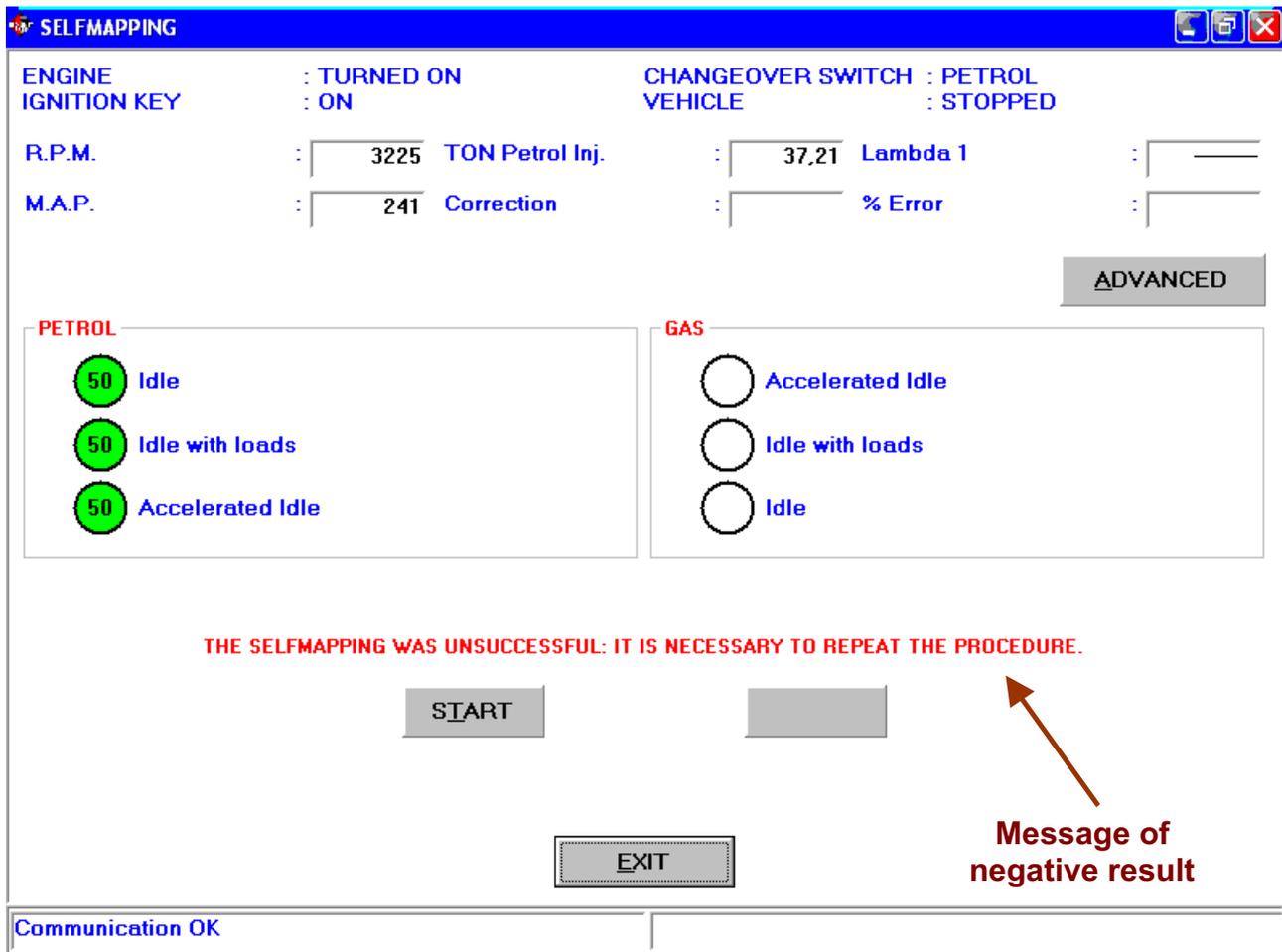


Figure 1.2.1.7: self-mapping: negative result.

2 Setting-up

This chapter expounds the differences between the SEQUENT FAST and the standard SEQUENT, contained in the Tune-up section.

2.1 Map refinement

In this screen, not present in the standard SEQUENT, it is possible to revise any FAST map present on an ECU. It is very useful, in particular, to revise the result of a self-mapping that has been just made.

The map refinement can be done by acting on two "cursors", as can be seen in figure 2.1.1.

The first one is indicated as IDLE SPEED and the second one as GEAR.

The function of these two cursors can be considered similar to the tune-ups of the reducer and of the adjusting screw on the traditional systems.

IDLE: this cursor is nearly equal to the tune-ups of the idle speed and sensitivity of a traditional reducer; the effect is to enrich or lean in the idle speed conditions. With the cursor to the right, the gas flow at the idle speed increases by the percentage indicated (numbers > 0). With the cursor to the left the gas flow at the idle speed decreases by the percentage indicated (numbers < 0).

Act on this tune-up to centre the map at the idle speed better.

GEAR: this cursor is nearly equal to the tune-up of the adjusting screw on a traditional system; the effect is to enrich or lean the points at mean and high engine loads. With the cursor to the right, the gas flow increases by the percentage indicated (numbers > 0). With the cursor to the left the gas flow decreases by the percentage indicated (numbers < 0).

Act on this tune-up to correct the carburetion at mean and high engine loads.
 Each one of the two tune-ups does not affect the behaviour in the other condition.
 After a self-mapping it is advisable to check the correct running of the vehicle in mean or high power conditions, also considering the oxygen sensor behaviour (if case, use the diagnostic box or another proper instrument). Any carburetion anomaly in such conditions are solved by acting on the cursor "GEAR".

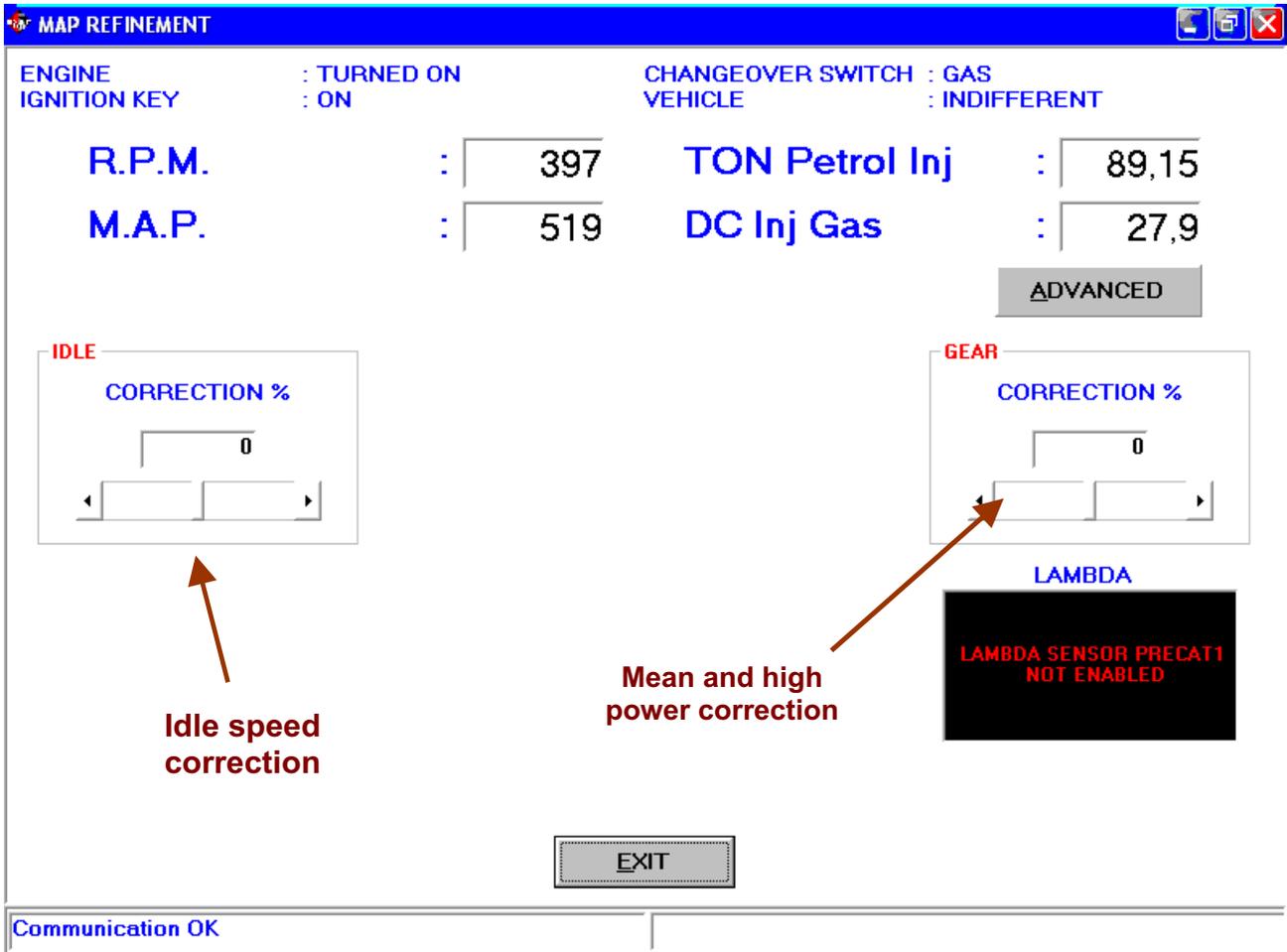


Figure 2.1.1 Map refinement.

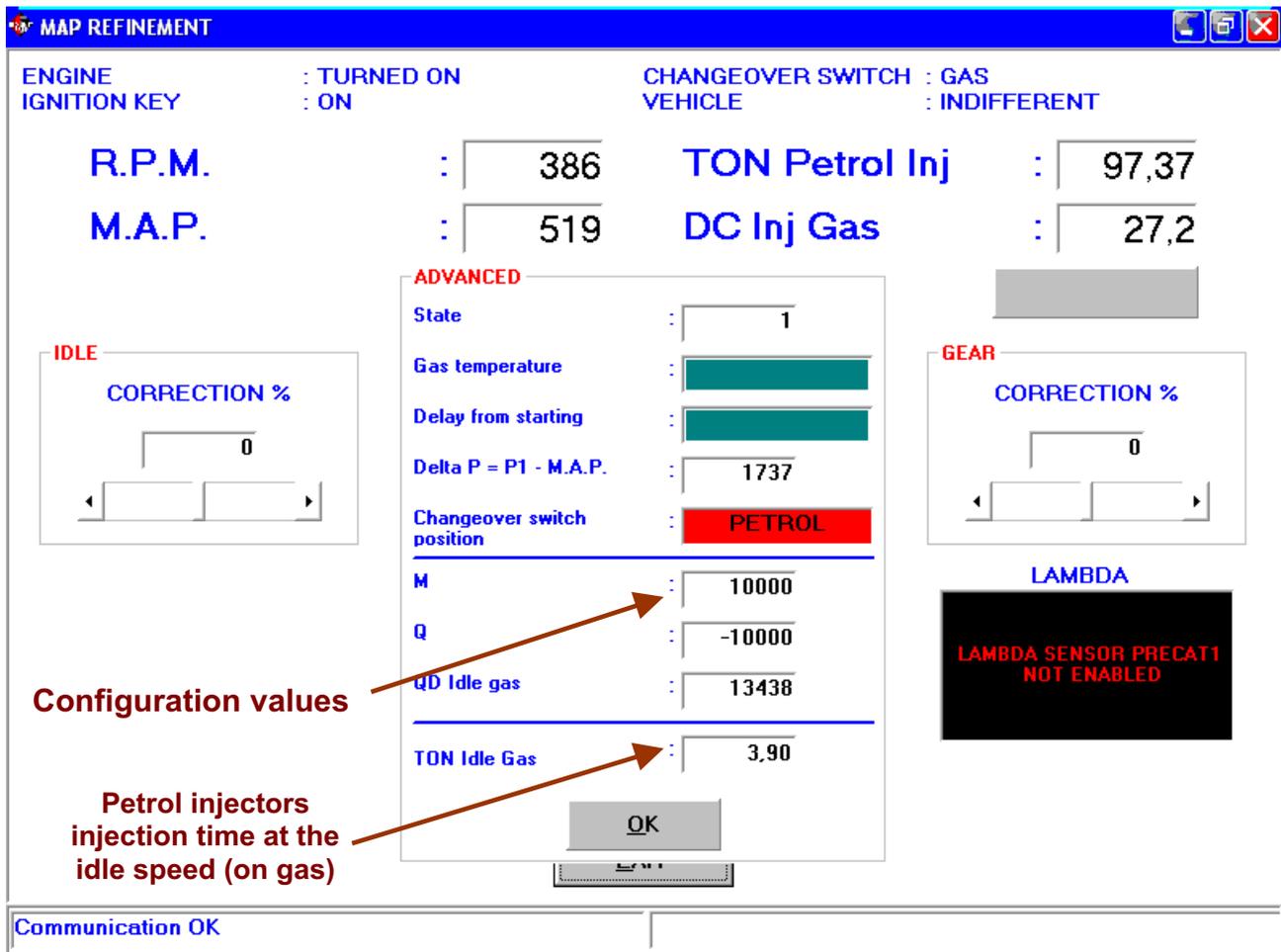


Figure 2.1.2 Map refinement, “ADVANCED” button.

2.2 Other differences if compared with the standard SEQUENT

Let’s see now the other screens regarding the tune-up that differ from the standard SEQUENT.

2.2.1 Rpm, TPS and lambda oxygen sensor

In SEQUENT FAST it is possible to enable or to leave disabled the rpm, TPS and lambda oxygen sensor signals, selecting the corresponding button in the “TUNE-UP” section. Figure 2.2.1 depicts, by way of example, the screen regarding the rpm and visualises the selection mode; the screens related to the other signals are quite similar. The guided process automatically configures the three signals as disabled so that it is inevitably necessary to select this option after the process itself if you want to enable them. With a signal enabled, its calibration page appears as in the Standard SEQUENT.

The ECU ignores the disabled signals in its calculi; it is therefore useless (but not harmful) to connect the rpm, TPS or lambda oxygen sensor harness wires to the corresponding vehicle signals³. If the rpm signal is not enabled, the ECU will try to estimate the revolutions depending on the injectors signal. In view of the imprecision of the estimated value (that can also be rather wrong,

³ It is necessary to cut and insulate separately the wires that are not used in the harness, reducing their length as much as possible.

specially in some particular cases, as transients, tip-outs, etc.) it won't be used in any particular strategy, as transients, etc. but only during the self-mapping.
The following paragraphs explain in detail what a connection or a non-connection to the several signals involves in every tune-up screen.

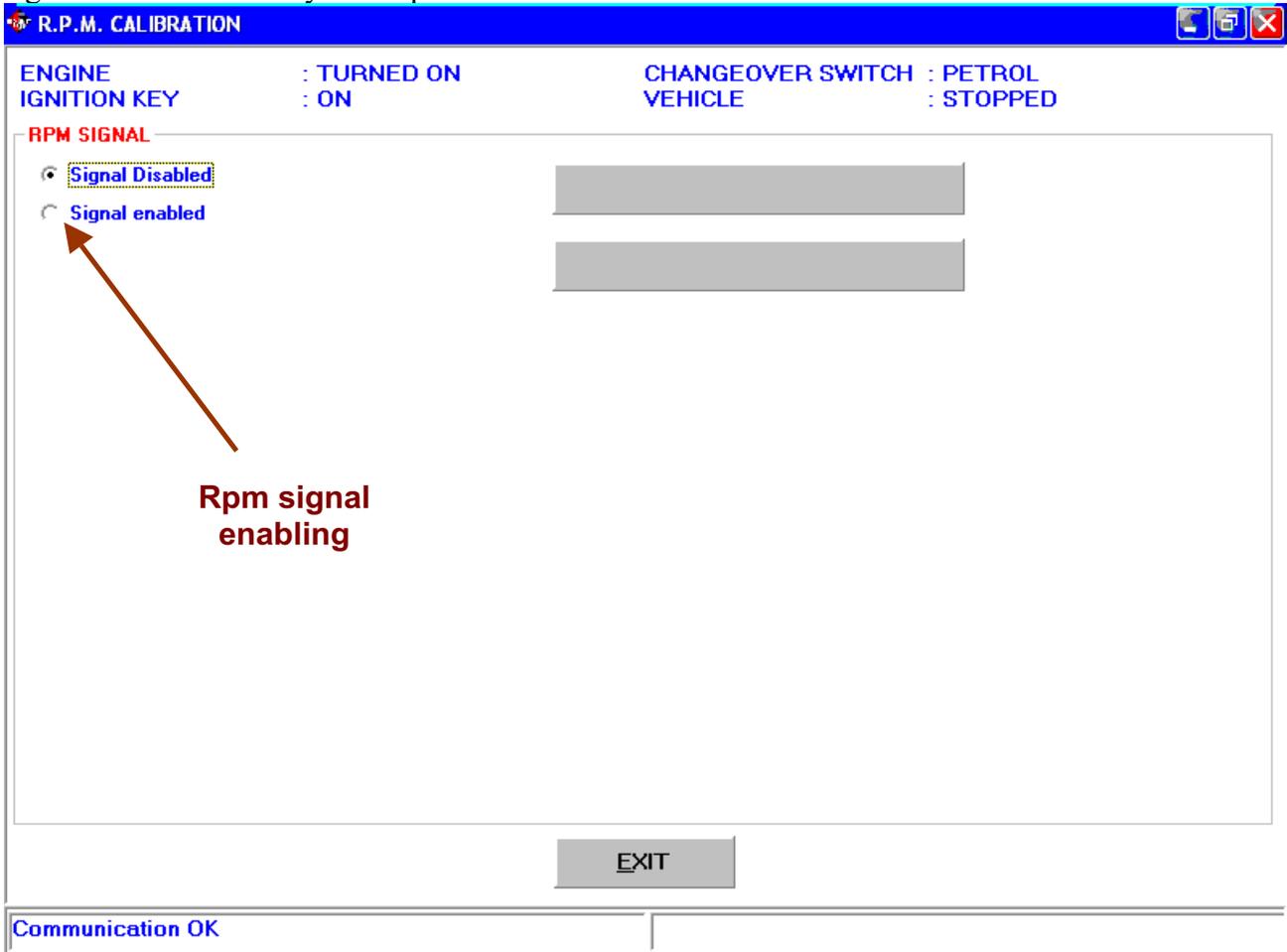


Figure 2.2.1 Disabled rpm signal.

2.2.2 Tip-ins and tip-outs

The tip-ins and the tip-outs, in the standard SEQUENT, depend both on the rpm and on the TPS. The SEQUENT FAST comes within the cases listed in the following table, according to whether the two signals are enabled or not:

TPS	rpm	Tip-ins and tip-outs
Disabled	Disabled	Not active
Disabled	Enabled	Not active
Enabled	Disabled	Simplified
Enabled	Enabled	Complete

Table 2.2.1.1

In case the tip-ins are not active, the relevant tune-up screen appears (see figure 2.2.1.1).

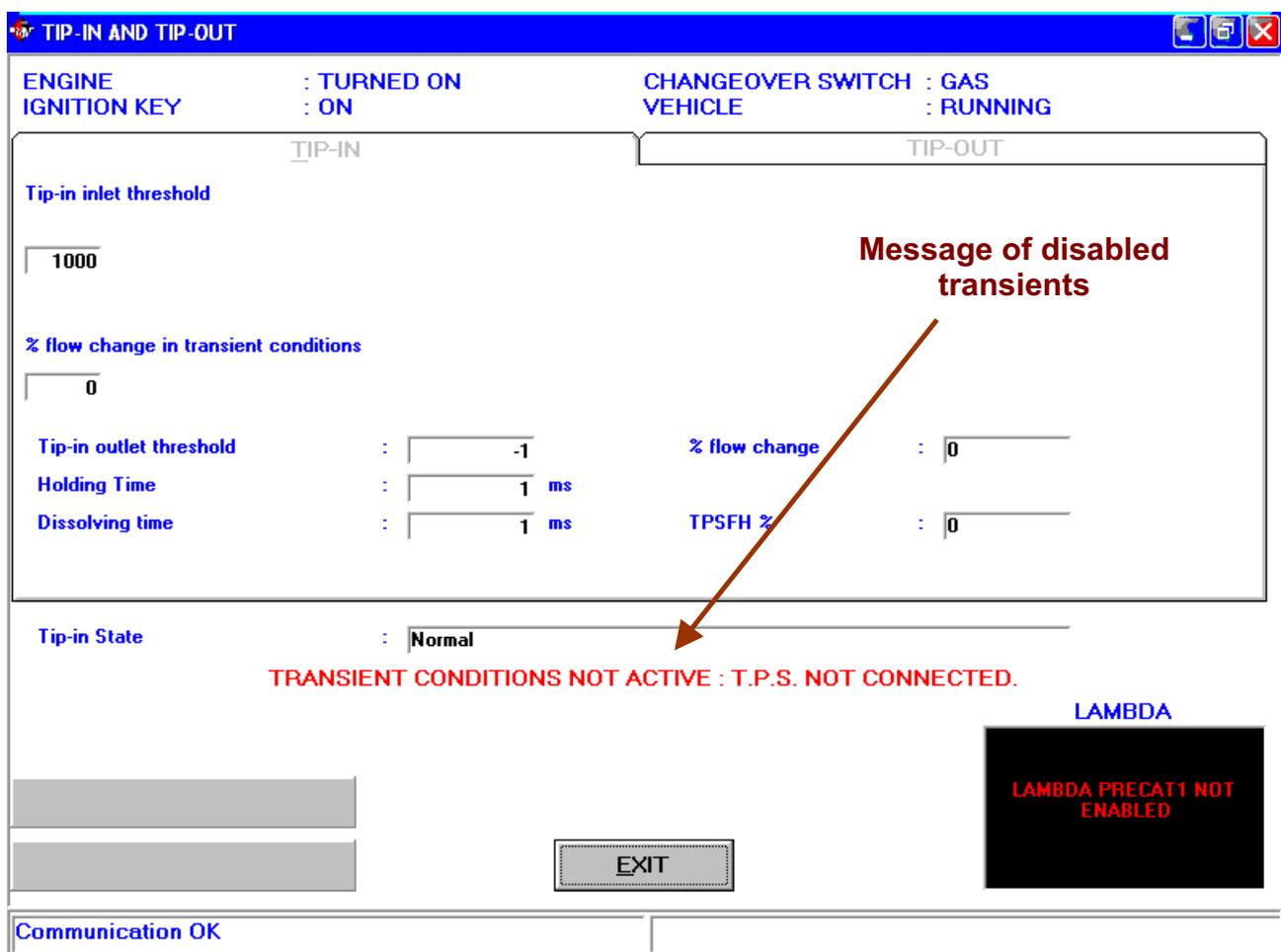


Figure 2.2.1.1 Disabled tip-ins

The tip-ins called “Simplified” in the Table 2.2.1.1 only depend on the TPS, but not on the rpm and act in the same way at all rpm. The corresponding screen is in figure 2.2.1.2. The values of the several parameters correspond to the standard SEQUENT ones, except for the “*flow % variation in transient condition*”, that indicates the flow per cent increase during the transient condition: 0% indicates no variation, 10% indicates 10% more and –10% the 10% less.

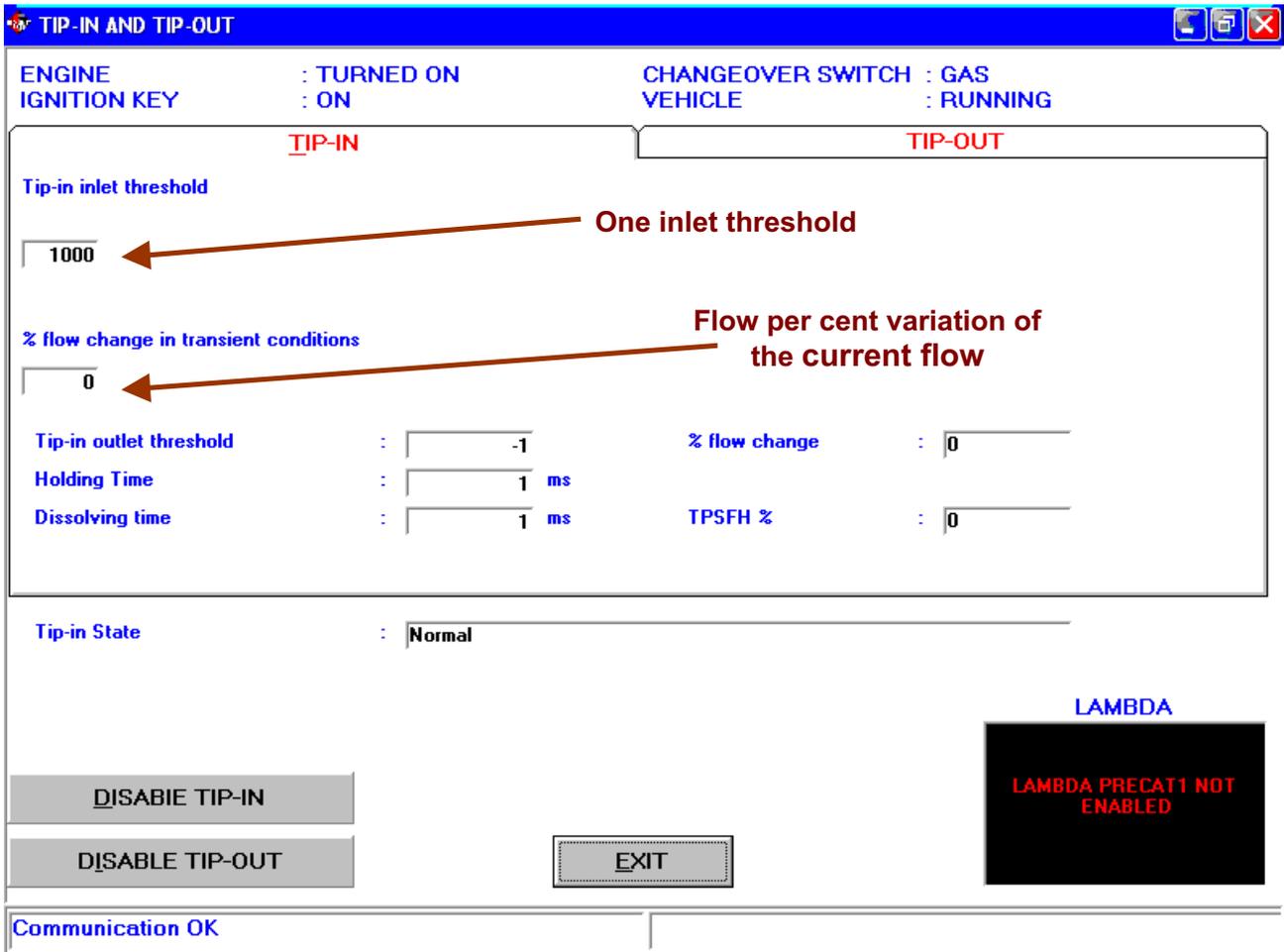


Figure 2.2.1.2 Simplified tip-ins.

The “complete” tip-ins appear like in figure 2.2.1.3. For every rpm the flow % variation in tip-ins condition is configured instead of the value of the flow itself, as in the standard SEQUENT. Another difference lies in the fact that it is not possible anymore to configure the “*Petrol transients %*”, that will be therefore always completely present.

NOTE: The screen depicts a graph at the bottom on the right that will indicate the course of the lambda oxygen sensor if the corresponding signal is enabled by the software; if not, a message will appear inside it as can be seen from the previous figures.

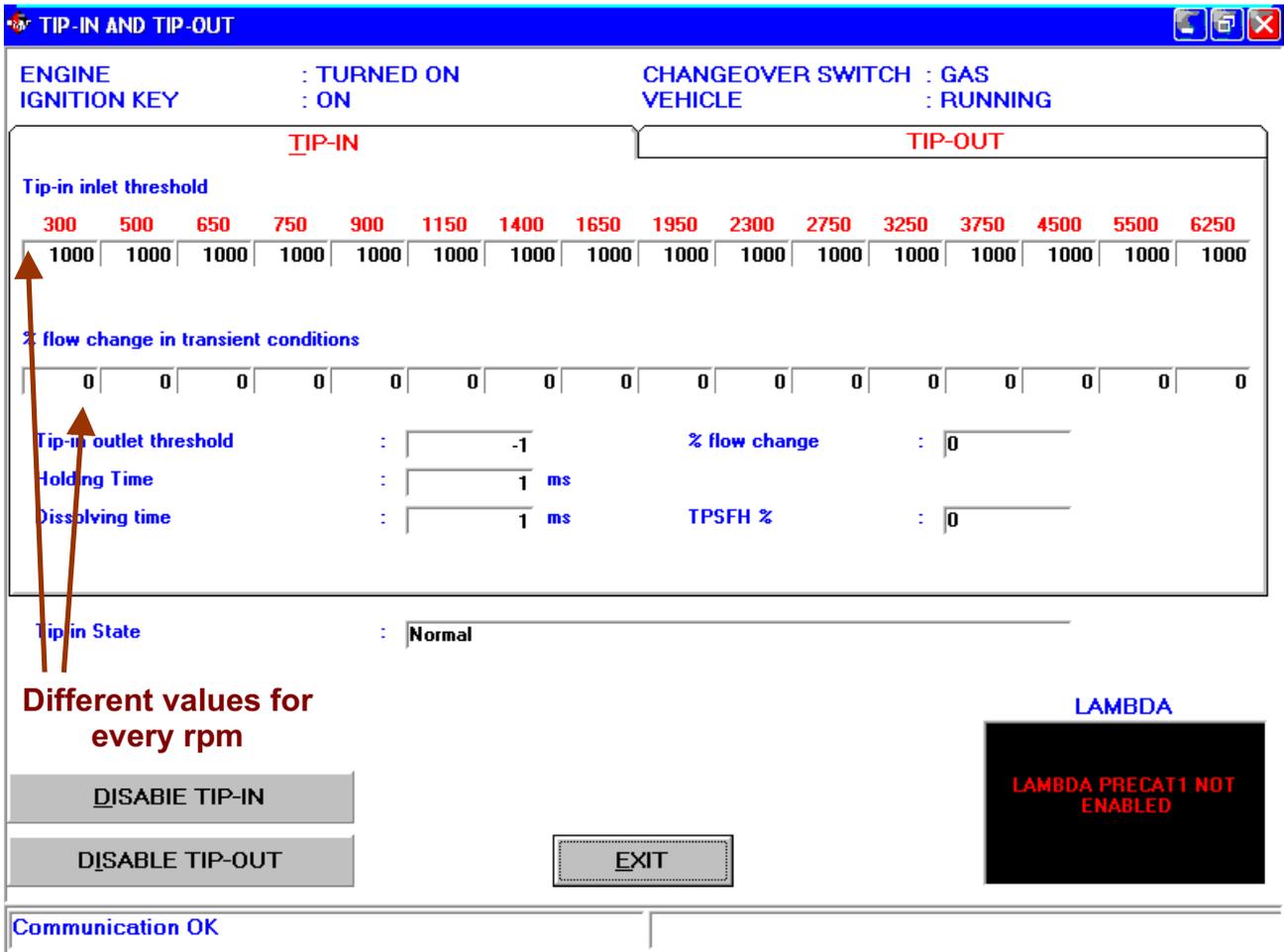


Figure 2.2.1.3 Complete transients.

2.2.3 Spark advances

They are obviously available only when the harness wires have been connected correctly to the vehicle crankshaft position sensor signals and the rpm signal has been enabled. In this case there are no differences with the standard SEQUENT. If the rpm signal is not enabled, the PC programme will advise the installer as can be seen from figure 2.2.3.1.

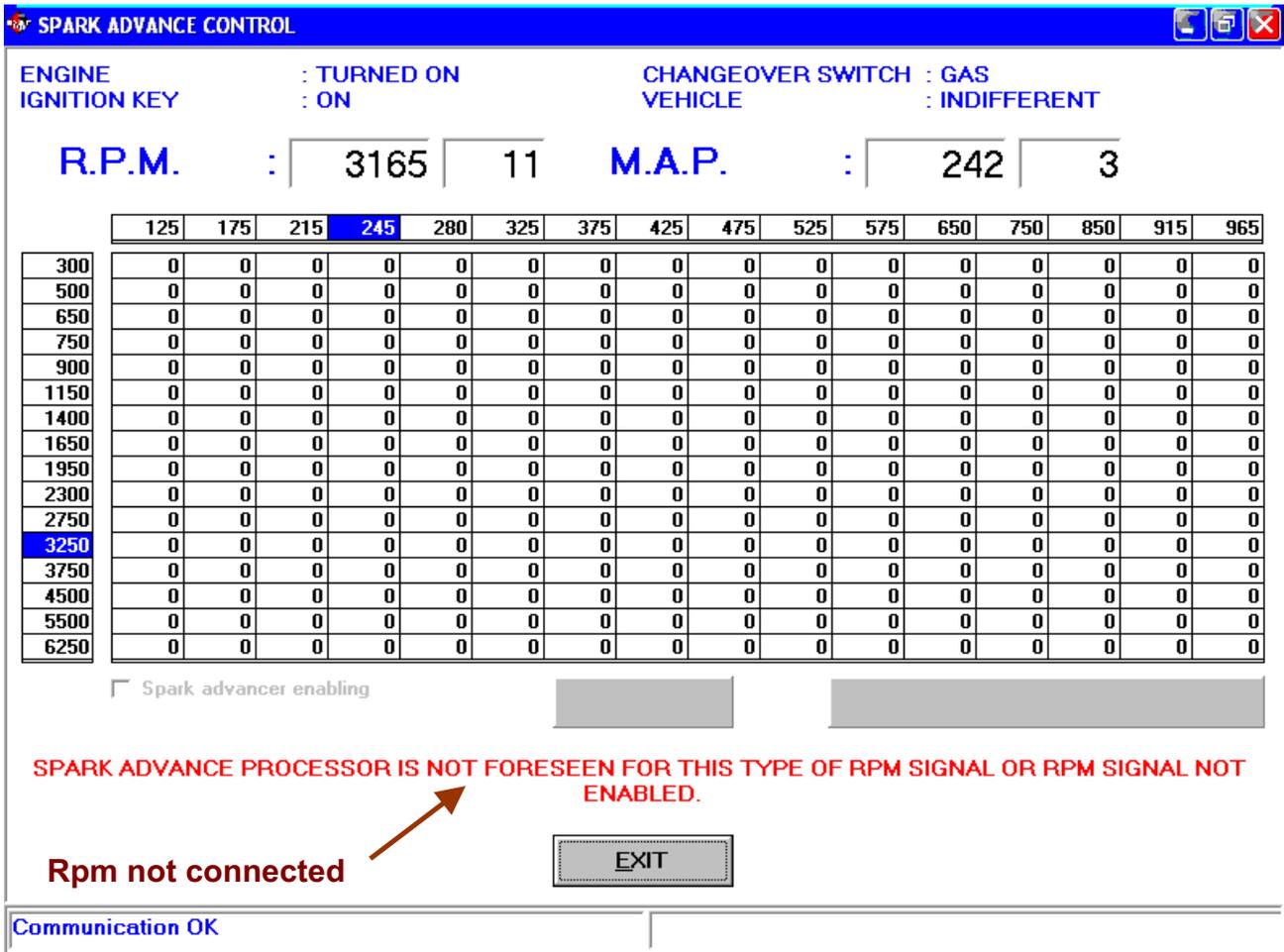


Figure 2.2.3.1 Spark advances: rpm disabled.

3 Diagnostics

3.1 Data monitoring

This screen does not visualise anymore some data existing in the standard SEQUENT that, in case, are replaced by new ones. This situation is schematised in the following table

Standard SEQUENT	SEQUENT FAST
Petrol Duty Cycle	T_on petrol
Gas Duty Cycle	T_on gas
DC_Ref	(not present)
MP_Ref	(not present)
Error	(not present)

Table 3.1.1 Data visualisation.

The rpm, the TPS and the lambda oxygen sensor are visualised only if they have been enabled. If not, a hyphen appears in the corresponding digital squares, whereas the graphs visualise nothing.

A1. Acquisition conditions of the points

To make sure the conditions are as requested, verify whether there is the correct temperature, the state is 1, the necessary time from starting has passed. For every point it is also verified as follows:

- At the idle speed on petrol: $0 < \text{RPM} < 1500$
- At the idle speed with petrol loads: $0 < \text{RPM} < 1500$, $\text{MAP} > 1.1 * \text{MAP_idle}$
- At the acceleration in neutral on petrol: $2500 < \text{RPM} < 4000$
- At the acceleration in neutral on gas: $(\text{RPM_acc_pet} - 1000) < \text{RPM} < (\text{RPM_acc_pet} + 1000)$,
 $(\text{MAP_pet} * 0,85) < \text{MAP} < (\text{MAP_pet} * 1,25)$
- At the idle speed with gas loads: $0 < \text{RPM} < 1500$, $(\text{MAP_pet} * 0,85) < \text{MAP} <$
 $(\text{MAP_pet} * 1,25)$
- At the idle speed on gas: $0 < \text{RPM} < 1500$, $\text{MAP} < 0,9 * \text{MAP_idle_load_gas}$