



Dream XXI-P Diagnostic

User's Manual

Version 2.2

REG® Dream XXI-P Diagnostic User's Manual
Version 2.2.03

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Chapter 1: Introduction

This manual is for the Diagnostic software of the REG Dream XXI-P automotive gas injection electronic control unit (ECU).



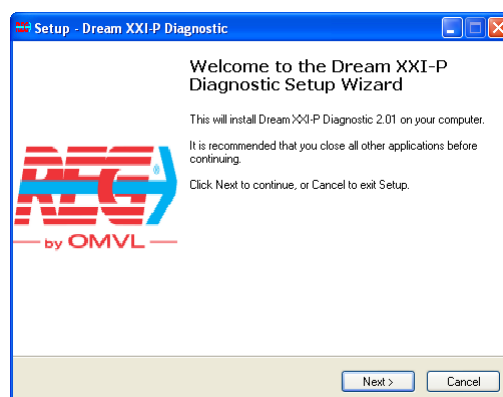
REG Dream XXI-P injection ECU

1.1 Software installation

Please insert the software installation CD-ROM: your PC should detect it and start the automatic installation procedure. If the installation procedure doesn't show up, you can start it manually: browse the CD-ROM contents and double clicking on the `Setup.exe` icon.

The software is compatible with Windows Vista, XP, 2000, ME and 98.

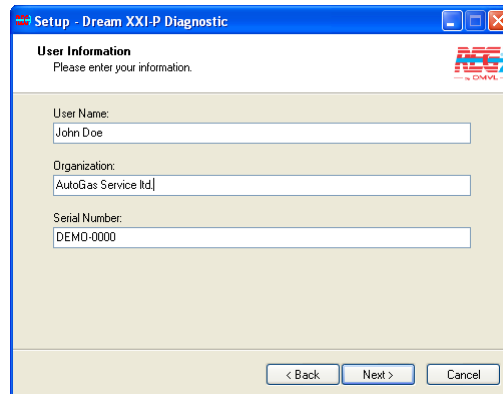
Once the automatic procedure starts, a welcome window shows up: please click on the Next button. The software version is reported here for your convenience.



Welcome window

1.1.1 Serial number

The next window requires you to enter your full name and company.



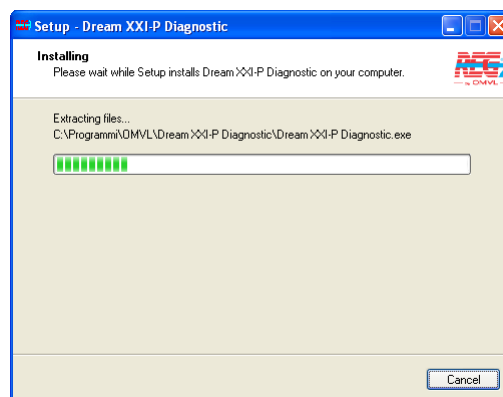
Type-in user information

IMPORTANT: please take a moment to type-in the 8-digits serial number of the software. If your dealer supplied you a serial number, this is the time to enter it; if you don't have a serial number, please type **BASE-LVL1**.

The serial number enables your password for higher access level, so please type it carefully.

1.1.2 Completing installation

The installation is completed in the next window, showing a progress bar while it copies the files to your hard-drive; it should complete in few seconds. The software will be installed into the C:\Program Files\OMVL\Dream XXI-P Diagnostic folder.



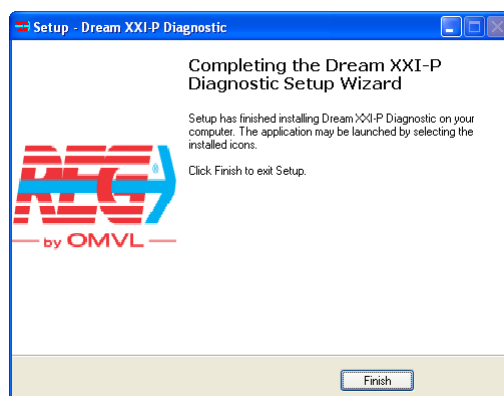
Installation in progress

A Dream XXI-P Diagnostic folder is created in the **Start** menu of your PC, with the short-cuts for the software; an icon short-cut is placed on your desktop, too.

Windows 2000, XP, Vista: the procedure automatically installs the drivers for the REG USB interface, at the end of software installation.

Windows 98 or ME: you need to install the REG USB interface drivers manually.

When the installation is complete, click on the Finish button.



Installation complete

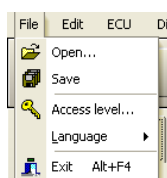
You can now start the software double-clicking on its icon on your desktop, or selecting its short-cut in the Start menu.



1.1.3 Higher access level

The software has got two access levels: *Base access level* and *Higher access level*. The first has a simplified user interface, while the latter lets you access more parameters; the parameters not available in Base level are set to default values, so they need no change.

After installation, you are logged into base level: if your dealer gave you a password for higher level (along with the serial number) now it's the time to activate it.



File menu

Start the program and select the File menu of the menu-bar at the top-left of the main window: there's no need to connect an ECU at this time. Select now the Access level item in the File menu: it pops-up a dialog where you can type the password.

The password is made up of 16 digits, grouped 4 by 4; once typed completely, press the `ENTER` key on your keyboard or click on the **Ok** button.



Higher access level dialog

If the password is correct, you are immediately logged into higher access level: you can see it in the at the bottom of the dialog, where now you should read **Access level: 2**. You can close the dialog.

The password is stored automatically, so you don't need to type it again: from now on, you will be logged into higher access level. If you need to take a look at the Base level, you can click on the arrow on the bottom of the dialog: you will temporarily get into lower level. Close the software and open it up again, to get back to higher level.

Trouble shooting: if you mistyped the password, the dialog warns you of the wrong password and you can type it again.

If you typed the correct password but the program still rejects it, you have a wrong serial number: open the Help menu and select the About item. A window will show your serial number (S/N): check it against the one supplied by your dealer.

If the serial number is wrong, you need to install the software again, typing the right one in.

1.2 PC connection interface

The ECU wiring harness has got a yellow 4 pin socket for PC connection: you need a REG USB interface, p/n 410665. Remove the black rubber cap from the socket and plug in the interface.



REG USB interface

Locate a free USB socket on your PC and plug in the USB interface: with Windows 2000, XP or Vista, its drivers are automatically installed during software installation, so you can use the software immediately.

With Windows 98 or ME, you need to install the USB drivers, before you can use the software.

1.2.1 Windows 98: USB drivers installation

If you are using Windows 2000, XP or Vista, you can ignore this paragraph.

Please be sure that the CD-ROM of the software installation is in your CD drive. Connect the device to a spare USB port on your PC: this will launch the *Windows Add New Hardware Wizard*. Click Next to proceed with the installation.

Note: on some Win98 releases the Wizard doesn't come up. Shut down and restart your PC with the USB interface connected: the new hardware Wizard should come up during system start.



Add New Hardware Wizard

Select `Search for the best driver for your device. (Recommended)`, as shown below and then click Next.



Search for the best driver

Select `Specify a location` and uncheck all others boxes. Click Browse and locate the driver files: the USB drivers are inside the CD-ROM, in the Win98 USB Interface Drivers folder. Click Next to proceed with the installation.



Specify a location

Once Windows has found the required files, click Next to install the device.



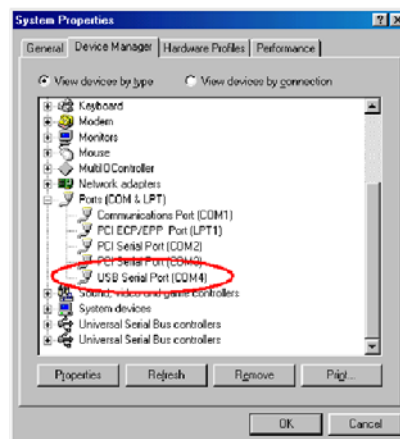
Ready to install

Windows then displays a message indicating that the installation of the USB serial converter was successful. Click Finish.



USB drivers installation complete

If you want to check the installation and the COM port number of the REG USB interface, open the *Device Manager* (located in Control Panel\System, then select the Device Manager tab). The device appears as an additional COM port labeled *USB Serial Port*.



Windows 98 Device Manager

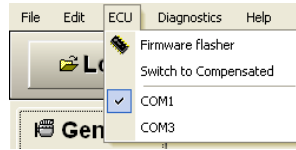
1.2.2 Windows 98: COM port setting

If you are using Windows 2000, XP or Vista, you can ignore this paragraph.

With Windows 98 and ME, the software is not able to find the USB interface automatically: it accesses the USB interface thru a COM port, so you have to manually select the right COM port number.

Disconnect the USB interface (if connected), wait few seconds and open the ECU menu: this menu lists all the COM ports installed on your PC (including modems). Please take note of all the COM

ports listed here.



COM port selection in ECU menu

Close now the ECU menu and connect the USB interface; wait few seconds and open the menu again. This time there will be one more COM port, so check the old COM port listing and select the new COM port. The setting is automatically stored, so the next time you'll run the program it will be recalled.

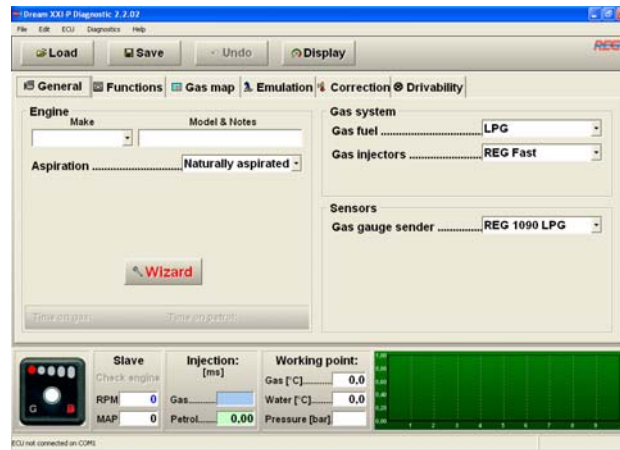
1.2.3 Establishing a communication

In order to start the communication with the ECU, you need:

- The software running
- The key of the car must be in the On position (no need to run the engine)
- USB interface must be connected
- **Windows 2000, XP or Vista:** the communication starts automatically
- **Windows 98 and ME:** USB drivers must be properly installed and COM port setting correctly set. Then the communication will start.

Chapter 2: Main window

When you start the program, a splash window welcomes you and then the main window shows up.



Main window

Once running, the program tries to start the communication with the ECU; when it finds it, the configuration stored in it is automatically uploaded in few seconds and displayed on screen. A big green box pops-up at the bottom of the window, showing the upload progress.

Watching at the main window from top to bottom, you find:

- Title bar: it shows the program version and the current configuration file
- Menu bar: with File, Edit, ECU, Diagnostics and Help menus
- Tool bar: with the **Load**, **Save**, **Undo** and **Display** buttons. When working with 2 banks, a **Bank** button will be visible, too.
- Parameter pages: with **General**, **Functions**, **Gas map**, **Corrections** (only for level 2), **Emulation** (level 2) and **Drivability** pages. To view a page, click on the label on the top of it; you can see only one page at a time.
- Status panel: showing the working point of the engine and the lambda signal diagram
- Status bar: it shows the ECU firmware version. If the program doesn't find an ECU, it displays 'ECU not connected'.

2.1 Menus

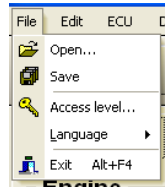
There are 5 menus for the main operations of the program: File, Edit, ECU, Diagnostics and Help.

2.1.1 File menu

Open: pops-up a file-open dialog that lets you load a configuration file (.cfg). It's equivalent to the

Open button on the tool-bar. The file name of the opened configuration is shown on the title bar.

Note: each time you open a configuration, it's automatically downloaded it into the ECU. If the previous configuration is not saved, the program asks you to save it before opening the new one.



File menu

Save: pops-up a file-save dialog that lets you store on your hard-drive the current configuration. It's equivalent to the **Save** button on the tool-bar. The program will suggest a default name for the file.

Note: whenever the ECU is connected, any parameter change is immediately downloaded to the ECU, so the current configuration is always stored inside the ECU.

Language: shows the supported languages. The software will immediately translate into the chosen language.

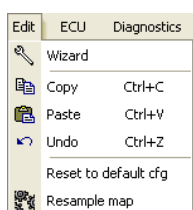
Access level: this item is discussed in the Higher access level Paragraph of the first Chapter, and lets you type-in the password for Higher access level.

Exit: closes the program. If the current configuration is unsaved, it asks you to save it.

2.1.2 Edit menu

Wizard: it starts a guided procedure that helps you tuning up the ECU to run on gas. It's the same as the **Wizard** button on the first page. Refer to the Wizard chapter for details.

Note: whenever the program finds a brand new ECU, it starts the Wizard automatically.



Edit menu

Copy: copies data from a map to a clipboard. Used with Paste command, lets you move data from one map to another. Please refer to the Maps and Tables chapter for details.

Paste: copies data from the clipboard to a map. Refer to the Maps and Tables chapter.

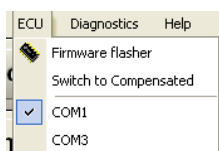
Undo: cancels the last operation you have done. It's exactly the same as the **Undo** button in the tool bar. Please note that there is only one level of undo: only the last operation can be cancelled.

Reset to default cfg (only on Level 2): reset to default values all the parameters, except gas fuel selection. It's handy when you want to start from scratch again.

Resample map (only on Level 2): lets you change the references of a map. Please refer to the Maps and Tables chapter.

2.1.3 ECU menu

Firmware flasher: this feature is used to update the firmware of an ECU. Refer to the Firmware flasher chapter for details.



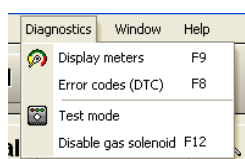
ECU menu

Switch to Compensated (only on Level 2): lets you toggle the ECU's between Slave and Stand-alone (Compensated) modes. When running in Stand-alone, the menu shows the Switch to Slave command. A dialog will ask you to confirm the operation; please refer to Slave and Stand-alone modes chapter.

At the bottom of this menu you find a list of COM ports: any COM port found on your system is listed here. You need to select one only with Windows 98 or ME; on Win 2000, XP or Vista, the selection is automatic.

2.1.4 Diagnostics menu

Display meters: pops-up the Display window. It's the same as the **Display** button in the tool bar. Details about the Display are in the last chapter.



Diagnostics menu

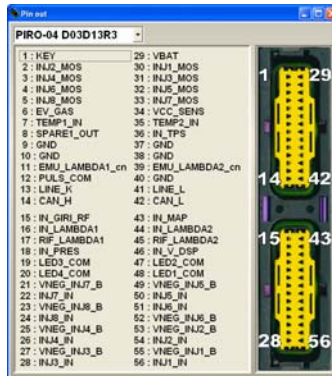
Error codes: shows a list of the Diagnostic Trouble Codes (DTC) generated by the gas ECU. You can access the list also clicking on **Check engine**, on the Status panel. Please refer to the Diagnostics chapter.

Test mode (only for Level 2): it opens a window where you can check the injectors, solenoids and all the actuators of the gas system, while monitoring the sensor's inputs. Please refer to the Diagnostics chapter.

Disable gas solenoid (only for Level 2): disables temporarily the gas solenoids while running on gas, letting you test the petrol back-up features. Please refer to the Diagnostics chapter.

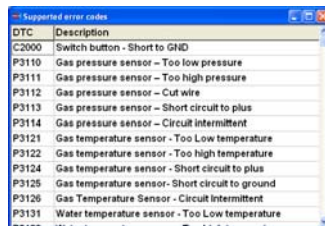
2.1.5 Help menu

Pin out: pops up a window showing the ECU connector's pin out, with pin descriptions and a picture of the ECU connector itself; when you select a pin on the list, a marker will blink on the picture, showing its position.



ECU's pin out

Supported DTCs: shows a list of the supported Diagnostic Trouble Codes of the gas ECU. You can browse the list and read the descriptions of all the implemented codes, that are reported in the Error codes list of the Diagnostics menu, whenever a fault is detected.



List of supported DTCs

About: recalls the splash window that is displayed when the program is launched. It is useful to read the software version and its serial number (S/N).

2.2 Tool bar



Tool bar of the main window

Load: lets you select a configuration file (.cfg) from your hard-drive and download it into the ECU. It pops-up a file-open dialog where you can search for your configuration.

Save: saves the current configuration to a file. A file-save dialog will pop-up, where you can type the name of the file to save (or accept the default one), or even replace an old file.

Undo: cancels the last operation. if you modify a parameter and you want to get back, Undo takes you back the last configuration before you changed that parameter.

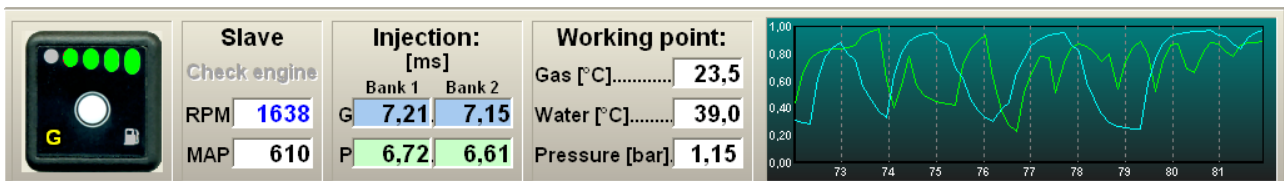
Display: it pops-up the Display window, displaying the acquired data in a graphical format. See

the last chapter to read more about it.

Bank: every time you select the Gas map page on a 2 banked engine, this button appears at the right of the tool bar, letting you toggle between the first and the second bank.

2.3 Status panel

This panel at the bottom of the window shows the main data acquired from the ECU. It's updated automatically every 100ms.



Status panel

The left-most box shows a fully working software change-over switch, identical to the one installed in the car. You can click its button to toggle between gas and petrol, or keep it pressed for 2 seconds to force an instant the transition to gas. The led level gauge on the top of it shows the currently measured level of gas inside the tank.

Power:

- **Slave:** the top-most label shows the mode of the ECU. If the ECU is set to Stand-alone, it will show **Comp**.
- **Check engine:** it will blink in red every time the gas ECU finds a fault and generate a Diagnostic Trouble Code (DTC).
- **RPM** (Revs Per Minute): shows the current revs of the engine.
- **MAP** (Manifold Air Pressure): shows the currently measured MAP in mbar.

Injection:

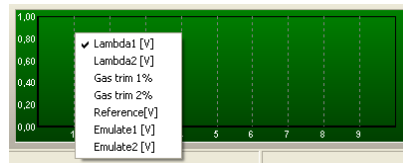
- **Gas:** shows the gas injection time computed by the ECU, in milliseconds. When working with 2 banks, you will see two boxes showing gas timings of cylinders 1 and 5.
- **Petrol:** shows the petrol injection time measured from the petrol ECU, in milliseconds. There will be two boxes for two banks systems.

Working point:

- **Gas:** shows the temperature (in Celsius degrees) of the gas in the injection rail.
- **Water:** shows the temperature of the water (in Celsius degrees) inside the pressure reducer.
- **Pressure:** shows the gas pressure (in bar). Note that if the gas pressure is too low, this control blinks in red.

2.3.1 Lambda trace

At the right hand side of the Status panel there is a chart showing the trace of the lambda signal: it plots the signals taken from the Lambda oxygen sensors, in real time.



Lambda trace graph

If you click the right-mouse button on it, a pop-up menu lets you choose which trace to plot:

- **Lambda 1** and **Lambda 2:** show the currently acquired signals from Lambda oxygen sensor 1 and 2 (in Volts), if connected. The trace for lambda 1 is painted in solid green, while lambda 2 is painted in solid light-blue. The Y axis of the graph is automatically scaled to the range of the selected lambda probe; please note that the trace for 5-0V reverse lambda probes is inverted, so when the trace stays up the lambda is rich, and when the trace gets down the lambda is lean.
- **Gas trim 1%** and **Gas trim 2%:** while in Stand-alone mode, these show the percentage of the internal gas fuel trims. 0% is plotted in the middle of the chart, so these traces can show positive or negative values (from -50% up to 50%). The trace for bank 1 is painted in solid red, while the fuel trim for bank 2 is yellow.
- **Reference:** shows the Lambda emulation reference voltage (in Volts), in dotted gray.
- **Emulate 1** and **Emulate 2:** show the emulated Lambda signals for bank 1 and 2, in Volts. The trace for bank 1 is painted in solid white, while the Emulated lambda 2 is painted in solid gray.

Chapter 3: Wizard

Each time you connect a brand new ECU, the Wizard comes up: this procedure guides you thru the steps of properly setting-up the ECU and create its maps for running on gas.

You can also start the Wizard anytime you want, on any ECU, clicking the **Wizard** button on the General page, or selecting the Wizard item from the Edit menu.

3.1 Starting the Wizard

Once the Wizard is started, you will see its Welcome page and two buttons on the tool bar:

- **Next:** allows you to go to the next step;
- **Abort:** you can stop the Wizard anytime you want with this button.

Initially the Next button might be disabled: before you can go on, the engine must be running and the **water temperature higher than 50°C**.

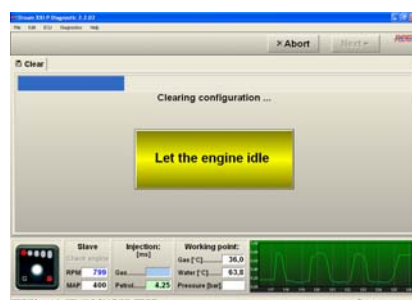


Wizard welcome page

The menus of the main window are available also in the Wizard: if you need to switch to Stand-alone mode (only Level 2), please do so before going on.

3.1.1 Auto-detection

In the first step of the Wizard, the ECU is cleared and set to default parameters; anyway, the previous configuration is kept and restored whenever you abort the Wizard.

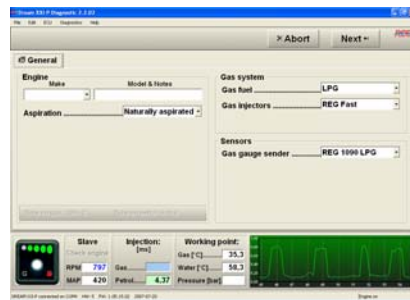


Auto-detection in progress

The Wizard then goes into an auto-detection process: during this step it's very important that you **keep the engine on idle**. It will automatically set a lot of parameters.

3.1.2 Manual parameters

The next step will show you the General page of the main window and instruct you to adjust the settings in it.



Manual parameters in General page

- Type in the **Make** and **Model & Notes** of the car;
- Select the **Aspiration** (**Naturally aspirated** or **Turbo**) of the engine;
- The ECU is preset to **LPG**; if you are using **CNG**, you need to change the **Gas fuel**.
- **Gas injectors** are set by default to **REG Fast**; on Level 2, you can choose different ones, if you want.
- You need then to select the **Level gauge sender** you have installed;
- If the auto-detection was not able to adjust the RPM reading, the page will also show the **Source of RPM signal** and **Pulses per rev** parameters: you need to manually set those parameters to get the right RPM reading.

3.1.3 Timings

The next screen instructs you to **rev up past 2500RPM** and then release for three times: while you do that, the Wizard analyzes the signals from the engine and sets some more parameters.



Timings page

Once the progress bar is completed, you can click the **Next** button and go on.

3.2 Gas map tuning

You are then ready to tune the gas map: the Tuning window appears over the gas map.



Tuning high speed

Before you can go on with the tuning, the **water temperature must be higher than 70°C**; on the top of the window, you get instructions in red.

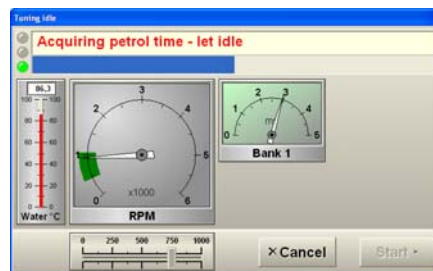
- Initially the Wizard computes a target speed and asks you to rev up to that speed. For a 4 cylinders cars, the target is 3000RPM.
- The accepted speed range is shown as a green portion around the target speed, on the RPM meter: while in neutral or parking gear and all loads off (no A/C, no lights, etc), accelerate and try to move the needle into the green portion.
- Click the **Start** button, when you're ready; the procedure starts acquiring petrol timings and
- When the lambdas start strobing (if connected), the "traffic light" on the left will turn from red light to yellow and then green; a blue progress bar will start moving. If there is no lambda connected, the progress bars starts immediately.
- If RPM or injection timings are unstable, the progress bar may bounce back; keep the throttle pedal as much stable as possible. If it's too difficult, you can click the **Cancel** button, change the target speed with the slider on the bottom of the window, and then start again.
- Once the progress bar is complete, the system will switch to gas. It's very important that you **don't move the throttle pedal**, even if the engine revs up or down.
- After some quick modifications to the gas map, the system will turn back to petrol and loop again. You can re-adjust the throttle pedal now, if needed.
- After the procedure has acquired again the petrol timings, it will switch to gas again, to double-check the gas map; this time it will stay on gas longer.
- The green portions on the petrol meters show the target timings: when the needles get close to the green portions, the gas map is almost ok. At the end, a big green box will inform you that the procedure ended successfully.

Note: the sensors are checked before and during the auto-tune. You might get these error messages:

- wrong MAP reading: maybe the sensor is broken. You should check it.
- Low gas pressure: the auto-tune will stop and warn you to check the shut-off valves.

3.2.1 Tuning idle

The tuning procedure will appear once more, this time for tuning the idle. The Wizard instructs you to **let the engine idle** and press the Start button.



Tuning idle

It's exactly the same as the high speed tuning, but now you don't need to touch the throttle pedal.

Idle tuning is optional: the Next button on the tool bar will turn into **Skip**. If you click it and confirm, you will jump over this step and go on without completing it.

Note: air conditioning, lights and all electric loads should be switched off, while tuning idle.

3.3 Final report

After tuning the idle, the wizard has finished and reports you the auto-detected parameters:



Report window

On the bottom, a green box with a progress bar will appear, while the new configuration is stored in the ECU. You can then click Ok; the ECU will be ready to run on gas.

Chapter 4: Parameters

A configuration is the set of parameters of the ECU and defines completely its behavior. They are organized in pages and the most important are in the first ones (General, Functions and Gas maps), while the last pages (Corrections and Drivability) are used only for fine-tuning.

The pages themselves are divided into boxes, showing only a group of parameters; when you select a parameter (just click over it), its box glows in yellow, reminding you where you are.

When you select a numeric parameter, after a second a blue label will pop-up below it, showing the range of accepted values.

Blue range label, below selected parameter

Note: remember to press **ENTER** on your keyboard, each time you change a parameter. It will be then downloaded to the ECU.

4.1 General

4.1.1 Engine

Engine box of the General page

Make: you can choose the car's manufacturer from a list of common ones. Eventually you can type it manually.

Model & notes: you can type here the car's model and some notes about the gas system, like nozzles size, or engine displacement, etc.

Aspiration: lets you choose between Natural aspiration or Turbo. It recalls specific settings for N/A or turbo engines. A confirmation dialog will warn you that the gas map will be cleared, each time you change it.

Lambda probe: this parameter is visible only if the Wizard is not able to set it.

- **None:** no lambda probe connected.
- **0 – 1 Volt:** the probe's voltage ranges from 0 to 1 Volt. This is the most common type.
- **0 – 5 Volt:** ranges from 0 to 5 Volts.
- **5 – 0 Volt:** ranges from 0 to 5 Volts, but the signal is inverted. Common on Range Rovers.
- **0.8 – 1.6 Volt:** ranges from 0.8 to 1.6 Volts. Very un-common.

Source of RPM signal: this parameter is visible only if the Wizard is not able to set it.

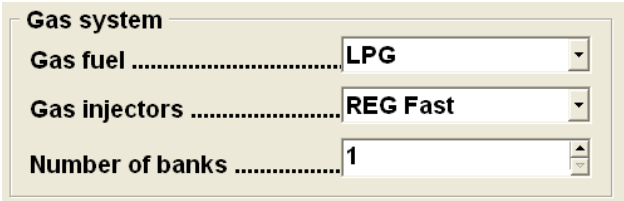
- **Wasted spark coil:** the brown wire for reading the RPM is connected to a coil pack that's feeding multiple spark plugs, like in old electronic ignitions and mechanical distributors.
- **Direct coil:** brown wire connected to a coil pack and there's a coil on the top of each spark plug. Recent electronic ignitions are like this.
- **Crank / Cam shaft:** brown wire connected to the position sensor of the crank shaft (top dead center sensor), or to the phase sensor of a cam shaft, or to the tachometer.

Pulses per rev: this parameter is visible only if the Wizard is not able to set it . Sets the number of pulses the ECU should get from the brown wire, per each rev. Can range from 1 to 255.

Wizard: click this button to start the Wizard procedure and tune-up the ECU. Refer to the Wizard chapter for details.

At the bottom of the box the **Time on gas** and **Time on petrol** counters show the hours and minutes the car has run on gas and on petrol. The counters are updated automatically as the car runs and it is not possible to clear them.

4.1.2 Gas system



Gas system	
Gas fuel	LPG
Gas injectors	REG Fast
Number of banks	1

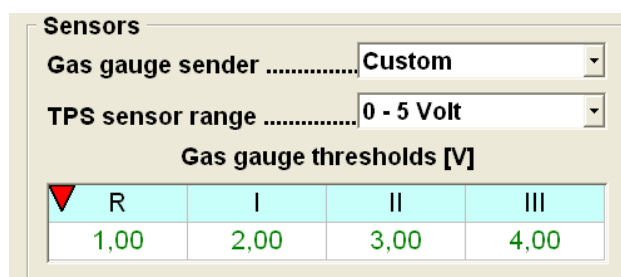
Gas system box of the General page

Gas fuel: lets you choose between **CNG** (Compressed Natural Gas) or **LPG** (Liquid Petroleum Gas) fuel. A confirmation dialog will appear if you change it, warning that the gas map is cleared each time you change gas type.

Gas injectors (only on Level 2): choose the type of the gas injectors installed in the system. The default is **REG Fast**. Other injectors type are supported, too.

Number of banks (only in Stand-alone): set accordingly to the number of banks of the engine.

4.1.3 Sensors



Sensors

Gas gauge sender Custom

TPS sensor range 0 - 5 Volt

Gas gauge thresholds [V]

R	I	II	III
1,00	2,00	3,00	4,00

Sensors box of the General page

Gas gauge sender: sets the type of sender unit used to monitor the gas level in the tank.

- **REG 1090 LPG:** resistive sensor for LPG multi-valves; it ranges from 0 to 90 Ohm.
- **REG 1050 LPG:** reverse resistive sensor for LPG multi-valves; ranges from 5 to 0 Volts.
- **REG 820 LPG:** bigger resistive sensor for LPG multi-valves; ranges from 0 to 100 Ohm.
- **REG 806 CNG:** manometer for CNG; it's reverse and ranges from 5 to 0 Volts.
- **REG linear CNG:** resistive sensor for CNG; ranges from 0 to 24 KOhm.
- **Custom:** this enables the **Custom gas levels** table, where you can set the threshold voltages as you like.
- **Reverse custom:** this is just like the **Custom** setting, but the voltages are reverse.

TPS sensor range (only in Stand-alone): sets the type of TPS sensor, if connected. This parameter is automatically set by the Wizard; remember that TPS connection is not necessary in Slave.

- **NONE:** no TPS connected.
- **0-5 Volt:** standard type of TPS sensor. Also switch type are supported.
- **5-0 Volt:** reverse TPS sensor.

Gas gauge threshold (only with **Custom** or **Reverse custom** gas gauge sender): this table lets you adjust the four thresholds that drive the gauge level display on the change-over switch.

4.2 Functions

The ECU has the facility to automatically switch to gas for you after the engine has warmed-up running on petrol; the Gas yellow led on the change-over switch blinks when the auto-switch is enabled and the ECU is waiting for the engine to warm up. Once the warm-up conditions are met, the ECU switches to gas.

The ECU supports also Start on gas and Mono-fuel features, where the auto-switch to gas is disabled and the engine starts on gas immediately.

4.2.1 Gas power

The screenshot shows a configuration window titled "Gas power". At the top, there is a label "Switch condition" followed by a dropdown menu currently set to "Acceleration". Below this are three input fields: "Delay [s]" with the value "25", "Temperature [°C]" with the value "30", and "Revs [RPM]" with the value "1800". At the bottom of the window, there are two horizontal sliders. The first slider is labeled "Fill-up delay [s]" and has a scale from 0 to 5 with major ticks every 1 unit. The second slider is labeled "Overlap time [ms]" and has a scale from 0 to 250 with major ticks every 50 units.

Gas power box of the Functions page

Switch condition: lets you choose the condition for automatic switch to gas.

- **Acceleration:** the ECU switches to gas when the revs of the engine are above a threshold (see below), thus when the car is accelerating.
- **Deceleration:** the ECU switches to gas when the revs get under the threshold, thus when decelerating.
- **Cut-off:** the ECU switches to gas when it detects a cut-off in the petrol injection, that usually happens when decelerating or shifting gears.
- **Start on gas:** the auto-switch to gas feature is disabled and the engine starts-up on gas (if the water temperature condition is met), thus petrol power is never used. The back-up to petrol features are available and also the gas priming time, at the bottom of this page.
- **Mono-fuel:** the auto-switch to gas feature is disabled and the engine starts-up on gas. The back-up to petrol features are defeated, thus petrol can not be used anymore. The gas priming time table at the bottom of this page is available.

Delay: this is the initial, warm-up delay. When the engine starts, the ECU waits this time before evaluating the other conditions. Accepted values go from 0 to 765 sec, but it's not available for Start on gas and Mono-fuel.

Temperature: this condition inhibits the automatic switch, till the water is warm enough. Accepted values go from 0 to 100 °C. The parameter is not available for the Mono-fuel setting, but it's active in Start on gas.

Revs: sets the revs at which the ECU should switch to gas. Accepted values range from 500 to


4000 RPM, but it's not available for Start on gas or Mono-fuel settings.

Fill-up delay: when the warm-up conditions are met, the ECU powers the gas solenoid immediately, but waits some seconds before injecting gas. This let the gas fill up the rail and the pipes; after this delay, the gas injection starts. Use this delay to cure power loss during the switch; it can range from 0 to 5sec.

Overlap time: after the gas injection has started, the petrol injection can be kept alive for few milliseconds, to achieve a smoother transition. You can set it up to 250ms.

4.2.2 Start on gas prime time

This table is visible only with **Start on gas** or **Mono-fuel** settings. It shows the injection timings that are applied when you start the engine: gas is injected before the engine starts cranking.

Start on gas prime time					
	10	20	30	40	50
0,0	0,0	0,0	0,0	0,0	0,0
Injection time [ms] vs water's temperature [°C]					

Gas level box of the Functions page

You can define up to six priming times for different temperatures: a red needle over the table shows the current water's temperature. Both temperatures and injection times can be edited, copied and pasted: refer to the next Chapter about Maps and Tables to learn how to edit a table.

The accepted injection timings range from 0 to 25.5 milliseconds; if you set it to 0, there will be no priming time.

4.2.3 Back-up to petrol

Back-up to petrol		
<input checked="" type="checkbox"/> At idle	Revs [RPM] 1500	Duration [s] 3
<input checked="" type="checkbox"/> At full throttle	Revs [RPM] 4000	Time [ms] 12,0

Back-up to petrol box of the Functions page

At idle: activate this feature if you want to switch automatically to petrol anytime the engine gets back to idle. This can fix some idling issues while on gas.

- **Revs:** the ECU switches back to petrol when you rev down below this speed. Can range from 0 to 4000RPM.
- **Duration:** sets how long you want to stay on petrol, while on idle. By default it's 3 sec; after that, it will switch to gas automatically. Accepted values range from 0 to 60sec.

Zero duration has a special meaning: the ECU won't switch to gas and it will stay on petrol, till the usual automatic switch conditions are met.

At full-throttle: this feature switches automatically to petrol when the engine reaches full throttle. This could cure power losses while on gas at extremely high engine loads.

- **Revs:** when the engine revs up above this limit and the **Time** condition is met too, the ECU switches back to petrol. Can range from 0 to 8000RPM.
- **Time:** when the injection timings are greater than this value and the **Revs** condition is met too, the ECU switches to petrol. The ECU returns to gas as soon as one condition is no longer satisfied.

Note: by default both these features are disabled. If enabled, the leds on the change-over switch will not show that you're on petrol.

Chapter 5: Maps and tables

5.1 Gas map

Slave: the gas map shows the ratios between the gas injection times and the petrol injection times. The top-most row shows engine revs, while the left-most column shows the petrol injection time. The ratios can span from 0.00 to 1.99. Each bank has got its own gas map, in a two-banks engine.

The ECU computes the gas injection times multiplying the petrol injection times (acquired from the petrol ECU) by those ratios, then adjusting the gas times with the corrections of the Corrections page.

The cells are painted in blue (the higher the value, the lighter the color) and a red moving ball shows the engine's working point.

Bank 1	500	1000	1500	2000	2500	3000	4000	5000	6000
1.5	0.80	0.80	0.88	0.88	0.91	0.92	1.01	1.03	1.03
2.0	0.83	0.85	0.94	0.94	0.96	0.97	1.08	1.09	1.09
2.5	0.97	1.00	1.01	0.99	1.02	1.02	1.16	1.17	1.17
3.5	1.03	1.05	1.07	1.09	1.09	1.09	1.23	1.25	1.25
4.5	0.98	1.02	1.09	1.11	1.17	1.18	1.28	1.30	1.30
6.0	0.97	1.00	1.07	1.09	1.15	1.19	1.29	1.32	1.32
8.0	0.94	0.97	1.04	1.05	1.15	1.18	1.26	1.28	1.28
10.0	0.88	0.90	0.97	0.98	1.03	1.05	1.13	1.14	1.14
12.0	0.85	0.88	0.93	0.97	0.99	1.00	1.09	1.11	1.11
14.0	0.84	0.87	0.92	0.96	0.99	0.99	1.09	1.10	1.10
16.0	0.84	0.87	0.92	0.96	0.99	0.99	1.09	1.10	1.10
18.0	0.82	0.84	0.89	0.91	0.94	0.95	1.07	1.09	1.09

Gas map

Stand-alone (Compensated): the gas map shows directly the gas injection times (in milliseconds), that can range from 0.00 to 25.50 ms. The top-most row shows engine revs, while the left-most column shows the Manifold Air Pressure (MAP). Each bank has its own map.

The ECU uses the times of the gas map directly as gas injection times; those times are then adjusted with the gas fuel trims and the corrections of the Corrections page.

Note: if you press the `SPACE` bar on the gas map, you switch the fuel immediately. This is good to compare the injection timings between petrol and gas.

5.1.1 Modify

You can select a cell of a map clicking the left mouse button over it; you can also select a group of cells, dragging the mouse with the left button pressed. Selected cells are painted in dark blue.

0.82	0.82	0.82	0.85	0.86
0.94	0.94	0.94	0.98	0.98
1.00	1.00	1.00	1.04	1.05
1.12	1.13	1.13	1.18	1.19
1.11	1.11	1.12	1.16	1.17
0.98	0.98	0.98	1.02	1.03
0.90	0.90	0.90	0.94	0.95
0.84	0.84	0.84	0.87	0.88

Selected cells in a map

To open the Modify dialog for the selected cells, you can:

- Click the right mouse button
- Press RETURN key
- Type a number



Modify dialog

Set (CTRL+S) : the value entered is put in all selected cell.

Example: selected cells have 0.50, 0.75 and 1.00 values. If you type 1.20, all the cells will change to 1.20.

Add (CTRL+A) : the value entered (positive or negative) is summed to selected cell.

Example: selected cells have 0.50, 0.75 and 1.00 values. If you type 0.20, the first value will change to 0.70, the second to 0.95 and the third to 1.20.

Add % (CTRL+D) : the selected cells are increased by the percentage you type; negative values decrease the selected cells.

Example: lets take a cell with a 0.90 value. Adding a 10% would change its value to 0.99 (+10%).

Bank (CTRL+B) : lets you choose which bank to modify, in a 2 banks system.

- The first time it shows the current bank number: the modification is applied only to the current bank.
- If you click it once, it shows **Bank 1+2**: the modification is applied to both banks.
- Click it once more and it switches the selected bank: the modification is applied to the new bank.

To confirm the modification, press the RETURN key or click the **Ok** button; all selected cells are modified at once. To cancel the modification (and preserve the original values), press the ESC key or click the **Cancel** button.

Please remember that all the changes are immediately downloaded into the ECU, so any modification to the maps is stored immediately in the ECU.

5.1.2 Copy & Paste

The Copy and Paste items of the Edit menu work with any map and table: simply select the cells you want to copy and choose the Copy menu item, or press CTRL+C on the keyboard. The selected cells are copied to the clipboard. Select then the cells you would like to replace and click on the Paste menu item (or press CTRL+V).

The selected cells are copied to the Windows system clipboard, too, so you can copy data from the

program to another application (for example, a spread-sheet), but not vice-versa.

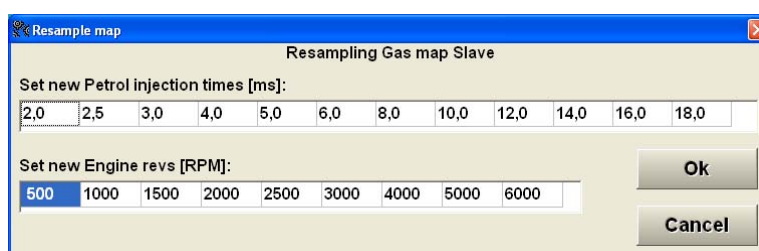


Copying some selected cells into another map

Note: when working with two banks, if you copy and paste some cells of the gas map of one bank, the other bank is left unchanged: usually this is misleading, thus the program warns you that the other bank has not been changed.

5.1.3 Resample

The Resample map command of the Edit menu is available only in Level 2 and it's enabled whenever you are on a map.



Resample map window

The resample feature lets you set different references for the map you are working on: for example, you can set new petrol injection timings and engine revs for the Slave gas maps.

When you select the **Resample map** command in the Edit menu, the Resample map window pops up and lets you type in all the references for the rows and columns of the active map. Once you are finished, click on the **Ok** button and the map will be changed.

This feature works differently than simply changing the references of the map, as you would do with the Modify dialog: resampling also changes the values inside the map.

5.2 Emulation

The Emulation page is available only on Level 2 and it's useful only to control the emissions of pollutants. There's no benefit in drivability, using Emulation, so please use it only for emission tests.

Lambda references											
Engine revs [RPM]											
500	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000
0,45	0,45	0,45	0,45	0,45	0,45	0,45	0,45	0,45	0,45	0,45	0,45

Lambda reference voltage [V]

Emulation ☒ Enabled

Lean level [V] 0,1 Rich level [V] 0,8

Emulation page

The lambda reference table allow you adjust the gas mixture, thus reducing specific pollutants. Of course, the different pollutants are strongly linked together, so, for example, reducing NOx will also lead to an increase of CO and HC.

When you work with a standard lambda probe (like 0-1V):

- If you need to enrich the mixture, increase the reference voltage;
- If you need to lean-out the mixture, reduce the reference voltage.

Reverse lambda probes (like 5-0V) of course need opposite modifications.

You can enable the emulation checking its check-box; the Lean and Rich levels are computed automatically during the Wizard and should not need any change.

Note: lambda emulation feature needs that the **original wire of the lambda probe is cut** and both purple and gray wires of the gas harness are properly connected. If the wiring is not correct, the emulation won't work.

5.3 Corrections

The Corrections page is available only at Level 2 and shows the water temperature correction table. The gas injection times are adjusted by correction percentages varying over water temperature: this allows to adjust the mixture also when the engine is cold.

The top row shows the reference water temperatures, while the bottom row shows the correction percentages.

Reset	Water's temperature [°C]							
▼0	10	20	30	40	50	60	80	100
-17	-14	-10	-7	-5	-4	-3	0	0
Correction %								

Water's temperature table in Corrections page

Accepted temperatures go from -20 to 235 °C, accepted percentages go from -100% to +100%.

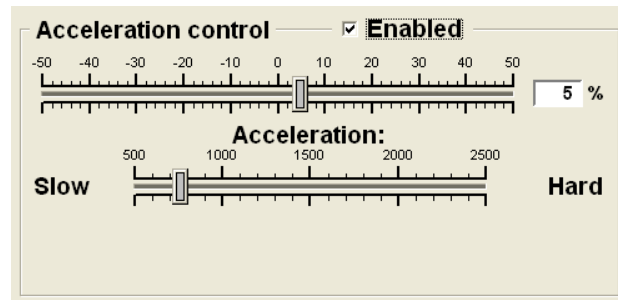
The **Reset** button clears the correction table to its default values; a dialog will ask confirmation.

We do not recommend that installers modify these settings.

Chapter 6: Drivability page

6.1 Acceleration control

Use this feature to cure engine's jerking during accelerations.



Acceleration control box in Drivability page

It works by temporarily enriching or leaning the mixture, whenever it detects an acceleration. You can set the percentage of correction with the slide-bar on the top: it ranges from -50% to 50 %. Negative values lean out the injection, while positive ones enrich it. A percentage of 0% won't affect the injection and simply disables this feature.

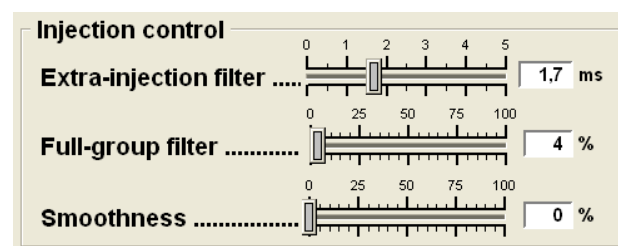
The bottom **Acceleration** slide-bar is available only on Level 2 and lets you adjust the sensitivity of the acceleration detection:

- **Slow:** moving the slider to the left increases the sensitivity of the feature, so even lighter acceleration will fire the feature.
- **Hard:** moving the slider to the right decreases the sensitivity, so only harder, stronger accelerations will fire the feature. Lighter accelerations are not affected.

Please note that whenever this feature is fired, the box will glow in red. The feature needs a valid MAP reading to work.

6.2 Injection control

The features of this box help you curing jerking due to extra-injections, full-group injection strategy or transients.



Injection control box in Drivability page

6.2.1 Extra-injection filter

Petrol ECUs can generate spurious injection times while the engine is working at constant load, or even when pulling out of idle. Those extra-injections usually are shorter than 2 ms and are not in-phase with the aspiration stroke; they can cause jerking while on gas.

The Extra-injection filter is set automatically by the Wizard; anyway, it's adjustable.

- if you experience jerking when cruising at constant speed, chances are that you need to increase a little bit the filter setting;
- if you experience strong shaking when pulling out of idle, maybe you need to increase the filter;
- if instead the gas injection suddenly cuts-off, especially at very low loads, it's time to decrease the filter.

Note: extra-injection pulses can be easily detected by a sudden rising and falling of the ball on the Slave gas map.

6.2.2 Full-group filter

This setting is available only on Level 2.

Petrol ECU's injection strategy can be sequential, meaning that the fuel is injected in 1-3-4-2 sequence (for a 4 cylinders engine), or it can be *full-group*: it means that the ECU injects fuel in all the cylinders at the same time. Other strategies are known, too, like the semi-sequential. You can check the injection strategy and sequence in the Injection sequence box.

Usually the Dream XXI-P ECU can cope with petrol injection strategy; anyway, on smaller engines (especially older Peugeot) the gas injectors can be annoyed by the very short petrol timings this injection strategy generates, most of all at idle. The filter is set automatically by the Wizard:

- fully sequential engines: the filter is set to 5%;
- semi-sequential or full-group engines: it's set to 50%.

Should you experience unstable idling with full-group engines, you can try to set the filter manually; usually, full-group injection is more problematic on lower loads and on idle.

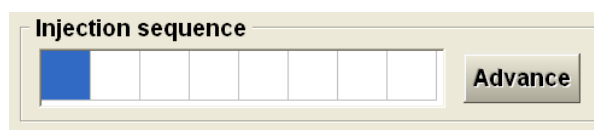
6.2.3 Smoothness

This setting is available only on Level 2. This filter smooths out gas injection transients, making them slower: this some times helps curing jerking and generally improves drivability.

If you are experiencing jerking during transients (most of all, accelerations) and the Acceleration control doesn't fix them, try increasing the Smoothness slider; please note that setting higher than 50-60% could affect idling.

6.3 Injection sequence

This box shows the injection strategy and sequence.



Injection sequence box in Drivability page

It's updated each time you open the Drivability page and its appearance depends on the petrol injection sequence detected:

- *Sequential*: the box reports the gas injection sequence. Usually, on 4 cyl engine you will get ACDB sequence. If you see a gas injection sequence that's not correct, it means that the petrol injectors cut-loom have been wired incorrectly.
The **Advance** button lets you advance the gas injection sequence.
- *Semi-sequential*: the box shows the groups of injectors that are fired together. Usually, on 4 cyl semi-sequential engines you will see A-C, B-D groups. It tells you also how many times per rev the petrol injectors are fired. The Advance is not available.
- *Full-group*: the box shows you only if the injectors are fired once or twice per engine rev. The Advance is not available.

Please note that the injection sequence is influenced by the Extra-injection and Full-group filters.

Chapter 7: Stand-alone mode

The Dream XXI-P ECU can work in two completely different modes: the ECU comes set-up in Slave mode from the factory, but Level 2 users can activate the Stand-alone (Compensated) mode.

While the Slave mode requires a Petrol ECU to get petrol injection times, in Stand-alone mode petrol fueling is completely ignored and the gas injection is determined by the gas ECU by its own.

Note: Stand-alone is available only in Level 2.

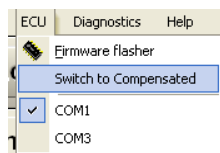
7.1 Requirements

The Stand-alone mode has some more requirements than Slave mode:

- Special wiring schemes for petrol-cut loom are required in case of single-point injection (Like Bosch Mono-Jetronic), mechanical injection (like Bosch Ke-Jetronic) or carburetor engines.
- **RPM:** the brown wire of the gas harness must be connected (usually to an ignition coil), unless you are working on a fully sequential Electronic Fuel Injection engine.
- **MAP:** the engine load is computed with the MAP reading.
- **TPS:** when working with single-point injection, mechanical injection or carburetor engines, gas injection cut-off can be achieved only connecting to the TPS sensor (blue/yellow wire of the harness).
- **Lambda:** the ECU uses its own gas fuel trims, so reading the lambda probe is mandatory.
- Lambda emulation is needed only by Electronic Fuel Injection systems working in closed-loop. Please note that emulation requires cutting the original wires of the lambda probes.

7.1.1 Settings

To switch to Stand-alone mode, open the ECU menu and select the Switch to Compensated item; a dialog will ask confirmation. Default settings will be loaded.



ECU menu

Basically you have the same parameters of the Slave mode and the Wizard works exactly the same, setting them up for you. Two more parameters are available in General page:

Gas system	
Gas fuel	LPG
Gas injectors	REG Fast
Number of banks	1
Sensors	
Gas gauge sender	REG 1090 LPG
TPS sensor range	0 - 5 Volt

Parameters of General page in Stand-alone mode

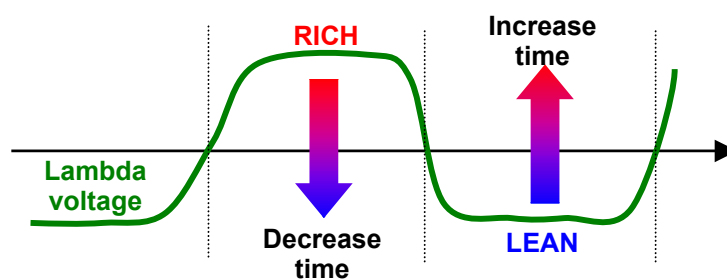
Number of banks: lets you set up the number of banks. The Wizard detects automatically the number of banks, but you can override its setting.

TPS sensor range: choose which type of TPS system you have. The Wizard detects automatically this parameter, but you can override its setting.

7.2 Closed-loop control

In Stand-alone mode, the ECU implements a close-loop control of the gas injection by means of the gas fuel trims, one per each bank. The fuel trims are correction percentages applied to the gas injection times.

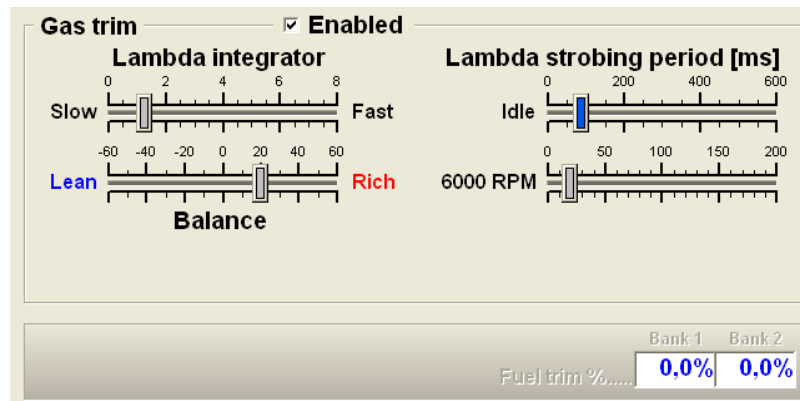
Whenever a lambda probes is rich, its fuel trim gets lower and lower, reducing the injection times and thus leaning out the mixture, till the lambda goes lean. If instead the lambda is lean, the fuel trim gets higher and higher till the lambda goes rich.



Closed-loop injection control

7.2.1 Gas trim

The settings for the gas fuel trim are in the Fuel trim page of the main window.



Gas trim box of Fuel trim page

The Gas trim it's enabled by default, when in Stand-alone; do not disable it, otherwise you will have open-loop gas injection all the time.

Lambda integrator: sets the strength of the fuel trims. The stronger the fuel trims, the bigger the corrections applied to the gas injection times, the quicker those times will change; so, when you move the fader to the **Fast** side, the fuel trims will be stronger and the gas times will change quicker. Move it to the **Slow** side, and the gas injection times will change more slowly.

Balance: sets the mixture balance you want to achieve. When it's zero, the fuel trims try to get stoichiometric mixture. If instead you move it to the **Rich** side, the lambdas will stay a little bit longer in the rich part of the oscillation, thus leading to a slightly richer mixture; for older engines, it's better to stay a little bit richer.

Lambda strobing period: the two faders let you set the period of oscillation of the lambdas at Idle and at 6000RPM; in-between, the period will be interpolated.

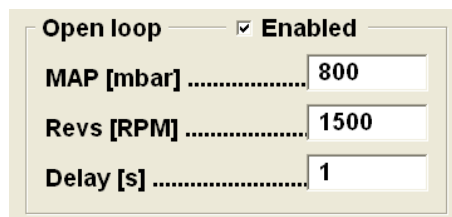
For example, if idling is unstable with oscillating engine speed, you should increase the idle lambda period, till the speed oscillation disappears.

On the bottom of the page you can see the fuel trim percentages for each bank: the parameters for the two fuel trims are the same, but they are using two separate lambda probes, so their values can be different.

These gas trims are *short-term* fuel trims that affect the gas injection times only temporarily. A *long-term* fuel trim is implemented, too, by means of the **gas map adaptivity**: the gas maps will be modified according to the average values of the fuel trims, so the maps will be automatically adjusted to have the fuel trims as close to zero as possible.

7.2.2 Open loop

This feature defeats the fuel trims at high load conditions. It helps getting more power during accelerations: the fuel trims are temporarily disabled and the gas injection goes in open-loop, taking the timings directly from the gas maps.



Open loop <input checked="" type="checkbox"/> Enabled	
MAP [mbar]	800
Revs [RPM]	1500
Delay [s]	1

Open loop box of Fuel trim page

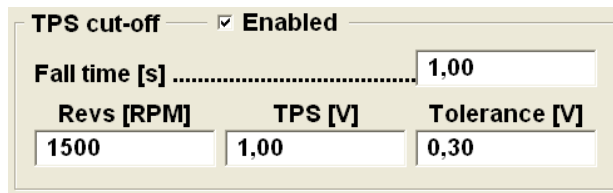
MAP and **Revs**: when the MAP is higher than this pressure and the engine revs above this speed, the fuel trims are defeated. Whenever one of the two condition ceases, the fuel-trims start working again.

Delay: once the MAP and Revs conditions are met, the ECU waits this time, before defeating the fuel trims. This avoid switching the fuel trims off during short transients.

Note: the mixture during open-loop is determined only by the values in the gas maps. Check that it's rich enough, otherwise you could damage the engine or the cat.

7.3 TPS cut-off

In Drivability page there is one more feature, while in Stand-alone:



TPS cut-off <input checked="" type="checkbox"/> Enabled			
Fall time [s]		1.00	
Revs [RPM]	TPS [V]	Tolerance [V]	
1500	1.00	0.30	

TPS cut-off box in Drivability page

When working with a petrol ECU, whenever the petrol injection cuts-off, also the gas injection is cut. If instead you are not working with an EFI system, you can achieve cut off when the TPS voltage goes below a threshold:

Fall time: set the time it takes to go from injection to cut-off

Revs: below this speed, there will be no cut-off. By default, as soon as the engine revs below 1500RPM, the gas injection starts again; this is how the system gets back to idle.

TPS: it's the threshold below which you want cut-off. As soon as the TPS goes above the threshold, injection starts again.

With 5-0V TPS systems, the cut-off feature is engaged when their voltage rises above the threshold.

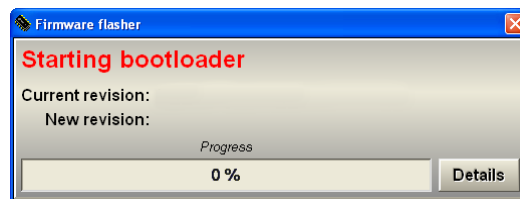
Tolerance: lets you set a voltage range to cope with noise in the TPS line. The 0.30V default setting should be fine for most engines.

Chapter 8: Firmware flasher

The firmware is the core software that's inside the ECU and handles all its tasks; with the Firmware flasher, you can upgrade an old ECU writing a new firmware into its memory.

8.1 Upgrade the firmware

Anytime you need to upgrade an ECU, select the Firmware flasher item of the ECU menu; it will guide you through an automatic procedure.



Firmware flasher window

8.1.1 Requirements

- The ECU must be powered, that is the engine's key must be in the On position (it's a good idea to leave the engine running).
- Connections of the USB interface: the ECU should be communicating with the software.

The procedure automatically goes thru a sequence of steps and the instructions are clearly printed in red on the top of the page.

Emergency: if for some reason the ECU does not respond to the flasher, an 'emergency' procedure will start asking you to manually switch the ECU off and then power it up again: the flashing process then goes on normally.

8.1.2 File selection

When the initial steps are completed, the procedure asks you to choose a file from the `Firmwares` folder: it will be written to the ECU's memory.

The procedure checks the file's content and warns you if the file is not valid; in that case the ECU won't be upgraded and you should pick another file. Please use only the approved firmware files you find in the `Firmwares` folder: they were copied during the software installation procedure.

You can select the firmware using a standard file-open dialog; the file names report the firmware's tag and release date. Once you've selected a valid file, the program asks you confirmation to start flashing the ECU's memory.

8.1.3 Flashing new firmware

While the flashing procedure is writing the ECU's memory, a progress bar shows you the percentage of completion. It should take a couple of minutes to completely write a new firmware on the ECU.



Firmware flasher in progress

IMPORTANT: the procedure should never be stopped while flashing the ECU. If the PC is accidentally powered off during firmware flashing, the firmware may not be flashed completely, so the ECU maybe will not work. In that case, simply re-flash the firmware again: this time, the emergency procedure will ask you turn the ECU off and then on again.

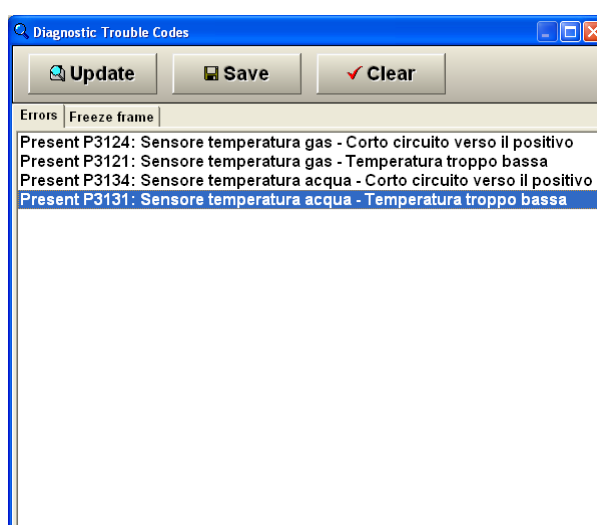
Once finished, an 'Upgrade successful' message will appear. The previous configuration is automatically restored and the flasher window is closed: now your ECU is successfully upgraded and ready to use.

Chapter 9: Diagnostics

The Dream XXI-P ECU is eOBD-compliant and implements complete diagnostic features; it complies to the KWP-2000 protocol (*ISO 14230*) and performs diagnostic checks on all the inputs and actuators. These features are controlled by the commands in the Diagnostics menu.

9.1 DTC error codes

The ECU performs diagnostic checks whenever it is powered; if an error condition is detected, a Diagnostic Trouble Code (DTC) is generated. You can reach the list of generated DTCs selecting the Error codes (DTC) item in the Diagnostics menu.



Diagnostic Trouble Codes

Click the **Update** button to refresh the error codes. If you wish to save the codes, you can click the **Save** button and choose a name for the plain text file that's going to be saved.

The **Clear** button clears the codes: a dialog will ask confirmation. Once cleared, the old codes are lost, but if an error condition is still present, a new DTC will be generated immediately.

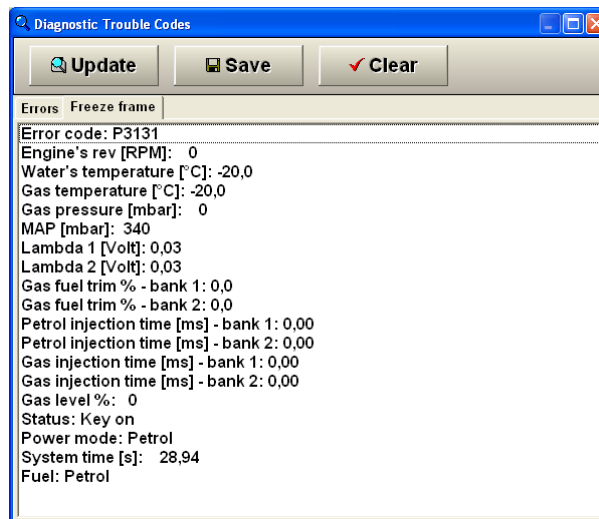
Each line in the list has got its own code (like P3124) and description; please refer to Appendix A for a list of supported error codes.

At the left of each code you can read the status of that specific error:

- **Present:** the error condition is still present. You can clear the code, but the error condition will generate the same DTC again immediately.
- **Stored:** any error condition detected in previous driving cycles but no more present in current driving cycle, becomes **Stored**.
- **Not ready:** any stored error code which the ECU is not ready to check again, is declared as **Not ready**. As soon as the working conditions become appropriate (switching to gas, for example), the DTC changes into **Stored** or **Present**.

9.1.1 Freeze-frame data

When a DTC is generated, the system's working point is saved into a 'freeze-frame': it is a sort of snap-shot of the conditions that generated the last error. You can have a look at those data selecting the Freeze-frame page of the Diagnostic Trouble Codes window.



Freeze-frame data

The freeze-frame is made of:

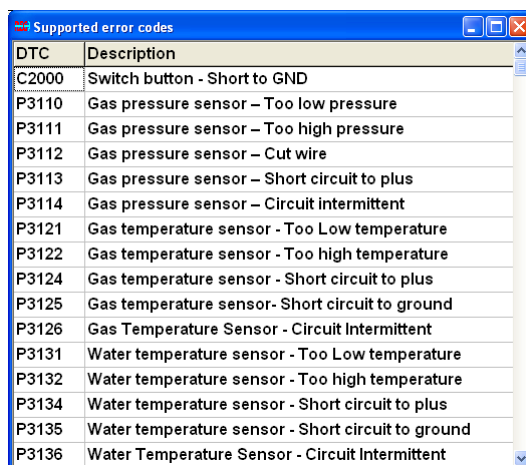
- Error code: the DTC that the freeze-frame refers to. Only the code is reported.
- Engine's rev, water temperature, gas temperature, gas pressure, MAP, lambda 1 and 2 voltages, gas fuel trims 1 and 2 (only for Stand-alone mode), petrol injection timings for bank 1 and 2, gas injection timings for bank 1 and 2 and gas level in the tank: all this data shows the working point of the engine.
- Status: this shows the status of the engine when the error was detected. It can be: key-voltage on, waiting, engine on, engine off or stall.
- Power mode: working status of the ECU. It can be: running on petrol, on gas, waiting to switch to gas, running on petrol because of a back-up condition, etc.
- System time: this shows the system internal time (in seconds) when the DTC was generated. Note: the system time is not cleared at the engine start.
- Fuel: it can be petrol or gas.

You can click the **Update** or the **Clear** buttons to refresh the freeze-frame. You can also save the freeze-frame into a plain text-file just clicking the **Save** button.

Please note that the freeze-frame refers only to the last DTC.

9.1.2 Supported DTCs

The Supported DTCs item of the Help menu shows you the list of all supported error codes with their descriptions. Please refer to Appendix A for the list of supported DTCs.



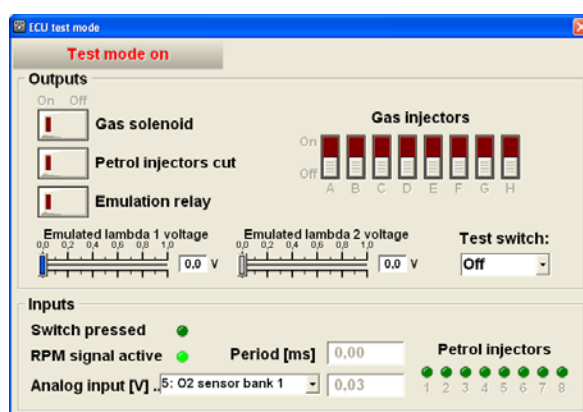
DTC	Description
C2000	Switch button - Short to GND
P3110	Gas pressure sensor - Too low pressure
P3111	Gas pressure sensor - Too high pressure
P3112	Gas pressure sensor - Cut wire
P3113	Gas pressure sensor - Short circuit to plus
P3114	Gas pressure sensor - Circuit intermittent
P3121	Gas temperature sensor - Too Low temperature
P3122	Gas temperature sensor - Too high temperature
P3124	Gas temperature sensor - Short circuit to plus
P3125	Gas temperature sensor - Short circuit to ground
P3126	Gas Temperature Sensor - Circuit Intermittent
P3131	Water temperature sensor - Too Low temperature
P3132	Water temperature sensor - Too high temperature
P3134	Water temperature sensor - Short circuit to plus
P3135	Water temperature sensor - Short circuit to ground
P3136	Water Temperature Sensor - Circuit Intermittent

List of supported error codes

9.2 Test mode

The test mode checks the actuators and inputs of the gas ECU; it's available only at Level 2. To start it, select the Test mode command in the Diagnostics menu; a message will warn that **the tests should be performed only in controlled conditions**. It's not advisable to do them on the road.

The ECU is on petrol for all the time the test mode is on; the normal operations are interrupted, so you can't switch to gas nor edit the configuration, till you exit the test mode.



Test mode

You can stop the test mode at any time closing its window: a dialog will ask confirmation, then the ECU resets and few seconds later it returns to normal operation.

9.2.1 Outputs

While the test mode is on, you can test the actuators of the gas system:

- **Gas solenoid:** click the switch to power the gas solenoid. To power it down, turn off the switch. When the solenoid is powered, the gas fills the injection rail. This test is harmless.
- **Gas injectors:** you can activate the injectors one by one, toggling their switches. If there is gas in the rail, a small amount will flow into engine, thus disturbing the petrol injection. If the gas solenoid is powered when you power an injector, a steady flow of gas will be fed into the engine, disturbing even more.
The software doesn't allow to switch on more than two injectors at a time and no more than 2 seconds.
- **Petrol injectors cut:** you can test the petrol injectors cut circuit. When you activate it, the petrol injectors will be disabled and the fuel injection will cut-off. The engine will certainly stall.
- **Emulation relay:** activate this switch to check the emulated lambda voltages. Do not activate this relay when the engine is running and the gray or gray/black wires of the gas harness are connected to the OEM ECU.
- **Emulated lambda 1 and 2 voltage:** use these faders to change the voltages applied to the gray and gray/black wires of the harness. You have to enable the emulation relay, before you can measure any voltage in the wires.
It's not advisable to perform these tests with the engine on.
- **Test switch:** you can select the desired setting for the change-over switch and check its leds and buzzer. This test is harmless.

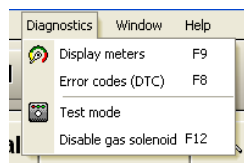
9.2.2 Inputs

- **Switch pressed:** whenever the button of the change-over switch is pressed, the green light turns on.
- **RPM signal active** and **Period:** the green light will flash any time the ECU detects a pulse on the brown wire. The **Period** box shows the time between two pulses, in seconds.
- **Petrol injectors:** the leds will blink each time the ECU detects a petrol injection. The refresh frequency is low, so it's perfectly normal if some led stays on or off for few seconds.
- **Analog input:** lets you check the voltages of the analog inputs of the ECU. The values are measured at the inputs of the ECU and may not be the actual voltages. You can measure:
 - Voltages of the lambda oxygen sensors, bank 1 or 2
 - Battery voltage
 - 5V sensors power
 - Voltages of MAP and rail pressure sensor
 - Voltage of the gas level sender
 - Voltage of rail temperature sensor

- Voltage of water temperature sensor
- TPS voltage
- Voltages of the shunt resistors inside the ECU that measure the current of each gas injector.

9.3 **Disable gas solenoid**

The last command of the Diagnostics menu lets you disable temporarily the gas solenoid; this command is available only at Level 2. Differently from the solenoid switch in Test mode, you can use this command during normal operations; it's also tied to the F12 key on the keyboard.



Diagnostics menu

You can use this command while on gas to test the low level or the low pressure back-up features: simply rev up the engine, select the command from the Diagnostics menu (or press the F12 key) and confirm the operation.

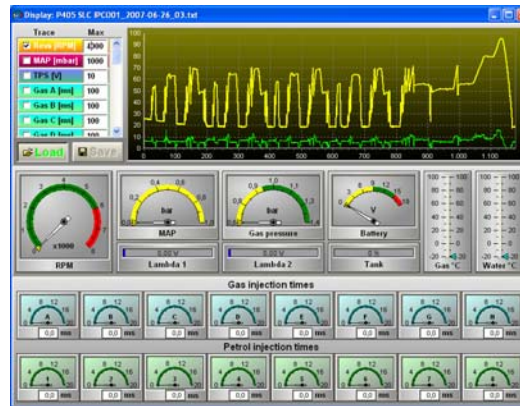
A green label will confirm you that the gas solenoid is disabled:

- The gas flow is now inhibited and thus the gas pressure start dropping down;
- Because of the lack of fuel, the engine will rev down and eventually stall;
- When the pressure reaches the low-pressure threshold, the ECU should fire the low pressure back-up and switch to petrol before the engine stalls.

You can re-enable the gas solenoid un-checking the command in the Diagnostics menu, or pressing the F12 key again.

Chapter 10: Display window

The Display window is shown when you click the **Display** button in the tool bar of the main window or select the Display meters menu-item of the Diagnostics menu.



Display window

While the ECU is connected and powered-up, all the graphical meters show the currently acquired data from the ECU as they change in real-time.

10.1 Chart

The Chart can show a window of 100 seconds of measured signals. It automatically scrolls to the left while the acquisitions go on.

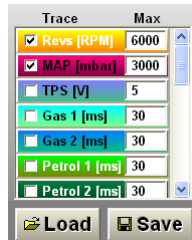
You can have a full screen look at the Chart if you double-click the left-mouse button: the Chart will enlarge and hide completely the Engine box, leaving only the Injectors visible. To reset the Chart to its original size simply double-click on it once more.



Chart in full screen

10.1.1 Traces

You can choose what you want see with the legend at the left: it lists all available traces. To see a trace on the Chart, check-mark its box; un-check to hide it. The color of a box is the same used to plot the trace on the Chart.



Legend of the Chart

The traces are drawn in the Chart as percentages of their maximum value: the Y-axis of the Chart shows percentages from 0 to 100%. You can scale the traces modifying their max value in the legend. The available traces are:

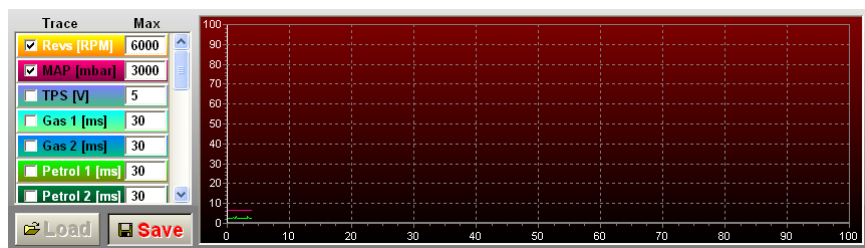
- **RPM**: this is the engine's speed in RPM.
- **MAP**: the MAP signal, in bar.
- **TPS**: the TPS voltage in Volt.
- **Gas A, B, C, D, E, F, G, H** : the gas injection time for each cylinder, in ms.
- **Petrol 1, 2, 3, 4, 5, 6, 7, 8**: the petrol injection time for each cylinder, in ms.
- **Lambda 1, 2**: the lambda probes voltages in Volt, if any.
- **Reference**: the lambda reference in Volt, as reported in the reference tables of the Emulation page in the main window.
- **Gas trim 1, 2**: the percentage of gas fuel trims for Stand-alone mode.
- **Emulated 1, 2**: the emulated lambdas voltages in Volt.
- **Gas °C**: the temperature of the gas in the injection rail.
- **Water °C**: the temperature of the water inside the pressure reducer.
- **Press**: the differential gas pressure in mbar.
- **Gas level**: the voltage of the gas level sender, in Volt.
- **Battery**: the voltage of the battery of the car.
- **Vcc**: the 5V power line of the ECU, that feeds the sensors.

10.1.2 Save

The **Save** button on the bottom of the legend lets you save the data acquired to your hard-drive: click it once and it will open a file-save dialog, to choose the file where you want to save the data.

The program then writes all the data into the chosen file: every signal acquired from the ECU is

saved, not only the traces you've selected on the chart. When you open the saved file back, you can see all the available data.



Saving data

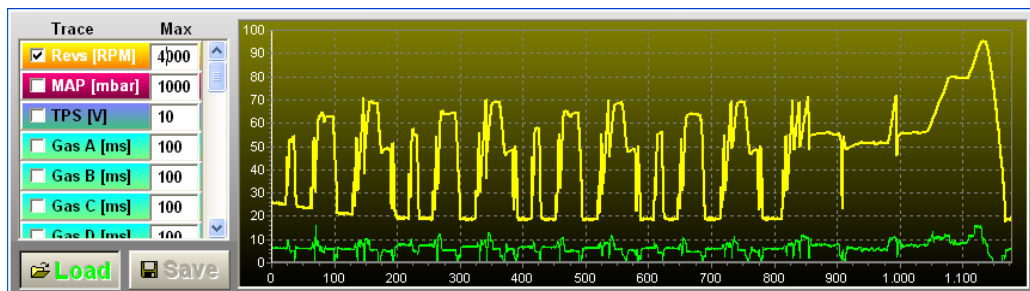
While saving data, the background of the Chart is painted in red, to remind you that you are saving to disk.

To stop saving, click again the **Save** button or close the Display window: a dialog will pop-up asking confirmation.

Note: data is stored in text files (.txt files) and the fields within are separated with TAB characters; you can import those files in any spread-sheet software.

10.1.3 Load

You can look at the data saved in a file just clicking the **Load** button: a file-open dialog will pop-up asking you to choose a file.



Data loaded from an acquisition file

The chart's background will be painted in green, reminding that you are watching to saved data and not the real-time acquisitions as usual: of course, while watching at a file, the live signals acquired from the ECU are not traced.

Once the file is opened, the chart expands to show all the acquired data.

- You can **select** whatever trace you want from the Legend (remember that every trace is saved).
- You can **scale** the traces modifying their max value in the Legend.
- You can even **zoom-in**, simply drawing a rectangle from left to right, top to bottom with the

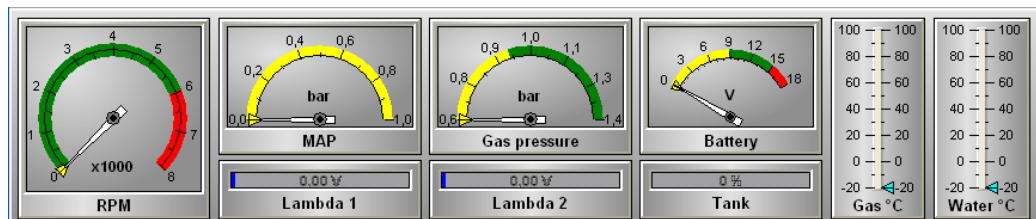
left-mouse button.

- You can also **scroll** the chart, dragging the right-mouse button over it. Only scrolling left or right is allowed.
- To **zoom-out** and reset the Chart, simply draw a right-to-left or bottom-to-top rectangle with the left-mouse button.

When you're finished, click again the **Load** button and the chart returns to work in the usual way; the background is painted in blue and the real-time data appear on it.

10.2 Needle meters

This box is in the center of the Display window and shows the current engine's working point.



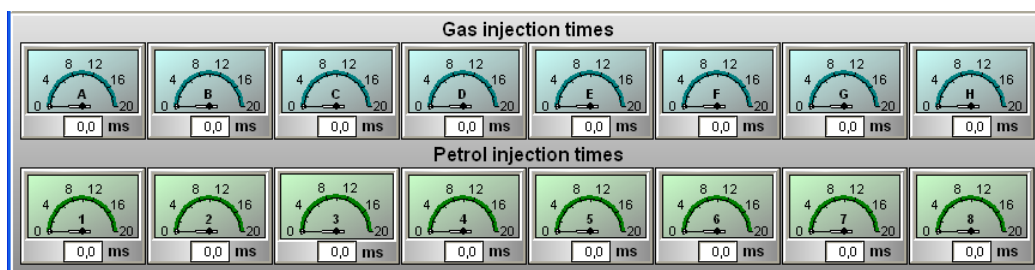
Needle meters

From left to right, you can see:

- Engine speed, in RPM, up to 8000 RPM;
- MAP pressure in mbar;
- Gas differential pressure, in mbar. The yellow portion shows lower pressures.
- Battery voltage, in Volt;
- Gas temperature in °C;
- Water temperature in °C;
- Lambda 1 voltage, on the bottom;
- Lambda 2 voltage, on the bottom;
- Gas level percentage in tank, on the bottom.

10.3 Injectors

At the bottom of the Display window there is the Injectors box: it shows the gas and petrol injection times for all the supported cylinders.

*Injectors box*

The top-most meters show the gas injection times for each cylinder, while the bottom ones show petrol. Only the injectors that are detected are lighted: the un-connected injectors are grayed out. This is helpful when checking the wirings.

Please note that for two banked systems the injectors are split in two groups: 1, 2, 3 and 4 belong to bank 1 (along with gas injectors A, B, C and D), while 5, 6, 7 and 8 belong to bank 2 (with gas injectors E, F, G, H).

Chapter 11: Appendix A

11.1 List of supported Diagnostic Trouble Codes (DTC)

- P3391: Sensor power circuit range/performance
- P3394: Sensor power intermittent
- P3121: Gas temperature sensor - Too Low temperature
- P3122: Gas temperature sensor - Too high temperature
- P3124: Gas temperature sensor - Short circuit to plus
- P3125: Gas temperature sensor- Short circuit to ground
- P3126: Gas Temperature Sensor - Circuit Intermittent
- P3131: Water temperature sensor - Too Low temperature
- P3132: Water temperature sensor - Too high temperature
- P3134: Water temperature sensor - Short circuit to plus
- P3135: Water temperature sensor - Short circuit to ground
- P3136: Water Temperature Sensor - Circuit Intermittent
- P3110: Gas pressure sensor – Too low pressure
- P3111: Gas pressure sensor – Too high pressure
- P3112: Gas pressure sensor – Cut wire
- P3113: Gas pressure sensor – Short circuit to plus
- P3114: Gas pressure sensor – Circuit intermittent
- P3220: No injector 1 command detected from petrol ECU
- P3221: No injector 2 command detected from petrol ECU
- P3222: No injector 3 command detected from petrol ECU
- P3223: No injector 4 command detected from petrol ECU
- P3224: No injector 5 command detected from petrol ECU
- P3225: No injector 6 command detected from petrol ECU
- P3226: No injector 7 command detected from petrol ECU
- P3227: No injector 8 command detected from petrol ECU
- U3000: Link wire between injector 1 and gas ECU – Short circuit to GND or cut wire
- U3002: Link wire between injector 2 and gas ECU – Short circuit to GND or cut wire
- U3004: Link wire between injector 3 and gas ECU – Short circuit to GND or cut wire
- U3006: Link wire between injector 4 and gas ECU – Short circuit to GND or cut wire
- U3008: Link wire between injector 5 and gas ECU – Short circuit to GND or cut wire
- U300A: Link wire between injector 6 and gas ECU – Short circuit to GND or cut wire

- U300C: Link wire between injector 7 and gas ECU – Short circuit to GND or cut wire
- U300E: Link wire between injector 8 and gas ECU – Short circuit to GND or cut wire
- P3200: Gas injector A cut wire
- P3202: Gas injector B cut wire
- P3204: Gas injector C cut wire
- P3206: Gas injector D cut wire
- P3208: Gas injector E cut wire
- P320A: Gas injector F cut wire
- P320C: Gas injector G cut wire
- P320E: Gas injector H cut wire
- P3230: Oxygen sensor 1 – Short circuit to GND
- P3231: Oxygen sensor 1 – Short circuit to plus
- P3233: Oxygen sensor 2 – Short circuit to GND
- P3234: Oxygen sensor 2 – Short circuit to plus
- C2000: Switch button - Short to GND
- P3160: Absolute gas pressure sensor - Short circuit to GND or cut wire
- P3161: Absolute gas pressure sensor - Short circuit to plus
- P3170: Absolute MAP sensor - Short circuit to ground or cut wire
- P3171: Absolute MAP sensor - Short circuit to plus or cut wire
- P3140: Gas level sensor - Short circuit to plus or cut wire