

ObdTuner Version 2



Manual

1. Table of contents

1. Table of contents.....	2
2. Introduction.....	5
3. Warnings.....	5
4. Requirements	6
4.1 OBD interface	6
4.2 Computer.....	7
5. Installation and configuration	7
5.1 Installation.....	7
5.2 Configuration.....	7
5.2.1 Select language	7
5.2.2 License key	8
5.2.3 Serial port.....	8
5.2.4 Baud rate	11
5.2.5 Quick mode, only ELM327 v1.3 or higher	13
5.2.6 Interface uses Bluetooth.....	13
6. Storage of data	13
6.1 Temporary memory	14
6.2 Permanent memory	14
7. Menu	15
7.1 Menu File.....	15
7.2 Menu Edit	15
7.3 Menu Learn mode	15
7.4 Menu ECU.....	16
7.5 Menu Power measurement	17
7.6 Menu Logging.....	17

7.7 Menu General.....	17
8. Tabs in ObdTuner	17
8.1 Tab general.....	18
8.2 Tab parameters	19
8.3 Tab Throttle.....	21
8.4 Tab Idling.....	22
8.5 Tab Fuel	23
8.6 Tab Target AFR	24
8.7 Tab Transient Fuel	25
8.8 Tab Ignition.....	26
8.9 Tab Logging.....	27
8.10 Tab Power Measurement.....	31
8.11 Tab Measurement.....	32
9. Executing basic tasks	33
9.1 Reading the ECU (synchronizing)	33
9.2 Saving a calibration file.....	34
9.3 Modifying a calibration by making use of a calibration file	35
9.4 Changing a parameter	35
9.5 Manually adjust the calibration	36
9.6 Make the changes permanent	37
9.7 Creating a log.....	38
9.8 Learning the base fuel table	40
9.9 Ignition and knock measurement.....	43
9.10 Calibrating an engine the easy way.....	44
9.11 Connecting a wideband sensor	44
9.12 Connecting a TMAP sensor.....	45

9.13 Power measurement.....	47
9.14 Finding the optimum ignition timing for full power using the build in power measurement	51
9.15 Finding the optimum full power fueling using a wide band sensor.....	54
9.16 Installing another throttle body.....	56
10. List with compatible parts working with ObdTuner version 2	57
10.1 Injectors.....	57
10.2 Fuel pressure regulators.....	57
10.3 Fuel pumps	57
10.4 Throttle bodies	57
10.5 Manifold Air Pressure sensors.....	57
10.6 Maximum boost	57
10.7 Maximum engine rpm	57
10.8 Inlet Air Temperature sensors.....	58
10.9 Catalytic convertor	58
10.10 Lambda sensors.....	58
11. Suggestions and recommendations	59
12. Troubleshooting	60
13. Word list	61

2. Introduction

With ObdTuner it is possible to calibrate the ECU (Electronic Control Unit) of the VX220, also known as the Opel Speedster. ObdTuner gives you an easy way to modify the calibration and supplies the necessary tools to arrive at an optimum calibration, this way it is possible to make maximum use of the modifications done to your engine.

A properly calibrated ECU will result in more power, better mileage, cleaner exhaust emissions, better throttle response and more reliability.

It is also possible to modify things like fan kick in temperature, throttle speed, rpm limit etcetera. An auto tune option for learning the base fuel table and correcting the ignition table with detonation retard data is built in. A build in power measurement option is also available so you can exactly see how much and where power is gained with a modification or calibration.

If your ECU is upgraded with the ObdTuner software, it can keep up with your engine modifications, from simply replacing the exhaust for a sportier one or an extensive upgrade like adding a supercharger or turbo.

A big advantage over an aftermarket ECU is the originally build in safety systems and the build in diagnostics are preserved and extended. Also the original factory wiring loom can be used, therefore the factory reliability will be guaranteed. So effectively you get the best of both worlds, a standalone ECU with OEM reliability.

To get ObdTuner working with your car it is necessary to upgrade the ECU with a special firmware version. ObdTuner is not free, for more information please contact info@ObdTuner.com

This manual discusses the installation and activation of the client software for ObdTuner, the client software is the PC part of the software package and it is necessary for customizing the calibration in the ECU. An overview is given on the application's structure and how a number of basic tasks can be performed.

Tuning the engine is out of the scope of this manual.

3. Warnings

It is not advised to control a computer while driving a car.

The original ECU contains an error that can occur when the OBD connector is being used to read data. As ObdTuner, just like the Opel Tech2 diagnostic tool, can log information through the OBD connector, it is possible this error is triggered.

When the error occurs, the engine will hold back for a short moment. This can be dangerous while driving on the limit in a curve, please be aware for this error and do not drive on the limit with logging active.

Tuning is only useful when the engine is in good health. Do not tune an engine if there are mechanical or electronic problems. When starting with a tune, ObdTuner checks the ECU for error codes, if there are error codes, ObdTuner will display the codes with their freeze frame data. The error code section must be empty before starting with tuning the engine.

ObdTuner allows for a large number of variables to be changed in the ECU. Some of these variables are quite harmless, but others can seriously damage the engine when they are not properly adjusted.

4. Requirements

To be able to use ObdTuner and the new features of the ECU, the following items are needed.

1. ObdTuner software (free download at www.ObdTuner.com)
2. ECU firmware upgrade
3. License number
4. OBD interface (Not supplied.)
5. Laptop or PC (Not supplied.)

4.1 OBD interface

For connecting a PC or laptop to the car an OBD interface is needed. ObdTuner only works with an ELM327 based interface. The OBD interface must be 100% ELM327 compatible. Sadly this makes most recent Chinese interface useless because they did strip a whole lot of functionality from their interfaces.

So before buying an interface make sure it is a 100% genuine ELM327 based interface. At the moment the safest option is probably to go for a genuine OBDLink one (see picture).



An OBD interface can be bought with different connection options. The most well know are:

- Serial
- USB
- Bluetooth (not recommended for inexperienced computer users)

All of the above mentioned connection options are usable with ObdTuner. ObdTuner works with a large number of Bluetooth interfaces, but there are people having problems with

some Bluetooth devices, drivers and operating system combinations. So the safest options are the Serial or USB interfaces. Do not use Bluetooth if you are a computer rookie.

4.2 Computer

The computer has to be installed with Microsoft Windows. The following versions of Windows have been tested and work with ObdTuner:

- Windows XP
- Windows Vista
- Windows 7
- Windows 8
- Windows 10
- Windows 11

The software will not run on any of the Windows-RT or Windows-365 versions.

It is recommended to use a laptop, notebook or netbook with ObdTuner, so it is easy to get the computer to the car.

Although the ObdTuner application does not require a high-performance computer, it is important to verify the application runs without problems before purchasing a system.

5. Installation and configuration

ObdTuner consists of an ECU firmware update and a PC application, this chapter deals with the installation and configuration of the PC application.

5.1 Installation

The application is best installed in a separate folder. This folder can be created anywhere on the computer. When the folder is created, the application 'ObdTuner.exe' can be copied here. To be able to start the application quickly, make a short cut to the desktop by clicking the application with the right mouse button and choosing the appropriate option from the menu.

5.2 Configuration

Before ObdTuner can be used on the car, ObdTuner must be configured. To configure ObdTuner, open the menu item, *General* and select *Settings*. The below dialog will popup.

5.2.1 Select language

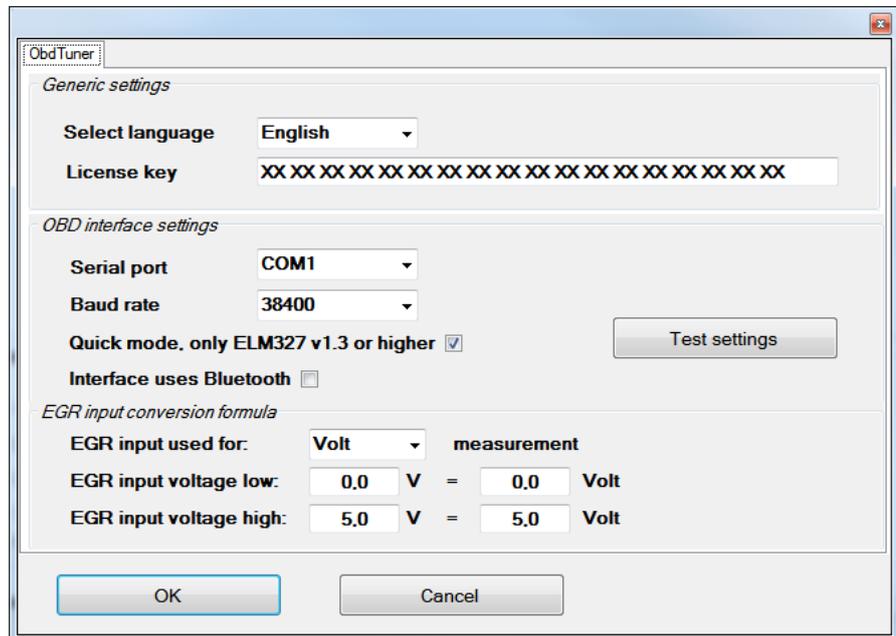
Choose the desired language from the list box.

5.2.2 License key

Type; or even better copy and paste the supplied license key in to the text box.
IMPORTANT: The key is case sensitive and must be copied including spaces etc.

5.2.3 Serial port

Before configuring ObdTuner it is necessary to know which communications port the OBD interface is connected to. Start by connecting the OBD interface to the computer. If required, install the software delivered with the interface. For more information, consult the manual that came with the interface.



When the OBD interface has been installed and connected to the computer, the communications port can be retrieved. It is sometimes necessary to wait a few minutes before the system recognizes the hardware. The examples below are for a Windows 7 system and can be different for other Windows versions.

OBD interface with serial connector (RS232)



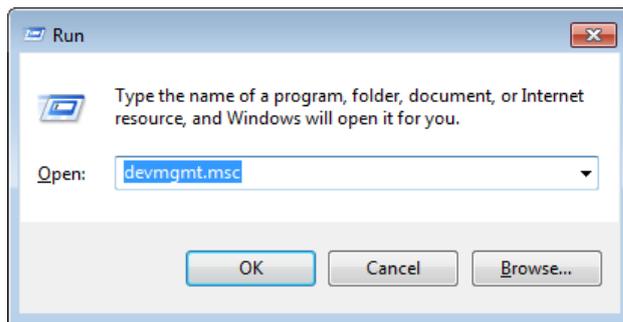
When a normal serial port is used (so not an USB or Bluetooth one) the port number is usually listed on the computer casing itself. For example, if the number on the case is 1, the OBD interface is available on com port 1 and COM1 should be selected as the serial port number. If no port number is listed, the USB procedure below will also work for the serial connector.

OBD interface with USB connector

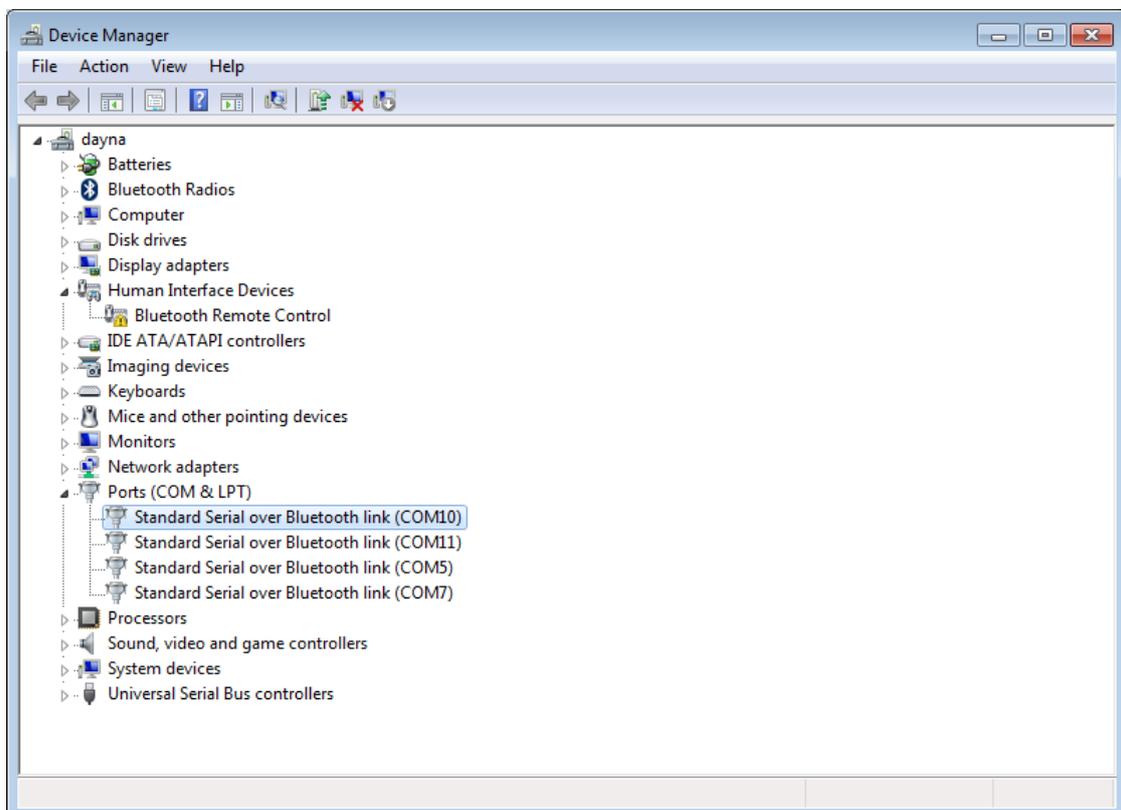
When the OBD interface is connected to an USB port, the communications port can best be retrieved through the device manager. The device manager can be started by pressing the 'Windows-key + R' and then entering the



following in the new screen that will appear: devmgmt.msc



In the device manager, open the 'Ports (COM & LPT)' section and check on which communications port the OBD interface is connected.



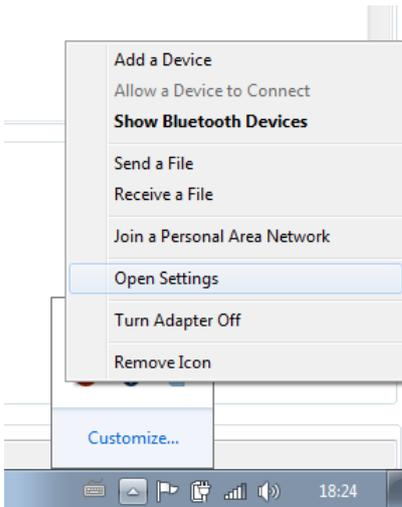
In the example above the OBD interface is connected to COM10.

OBD interface with Bluetooth

When the OBD interface is connected through Bluetooth, it is best to retrieve the communications port through the Bluetooth settings. To open Bluetooth settings, go the Bluetooth icon in the task bar.

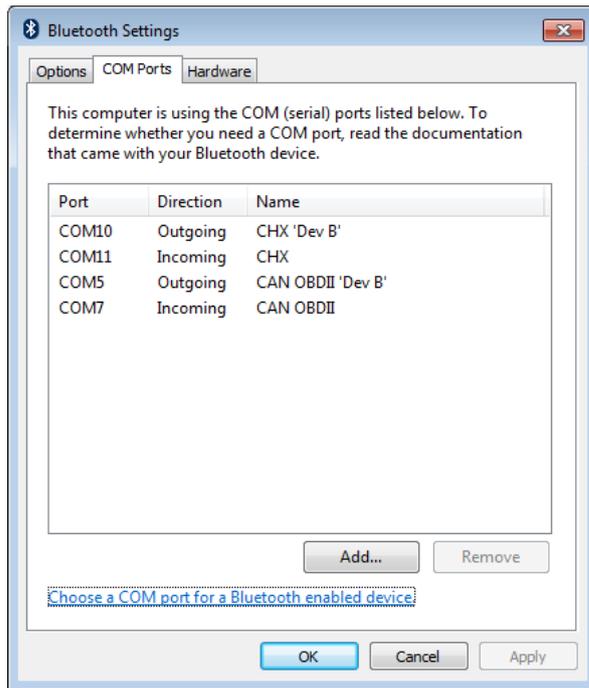


After clicking the Bluetooth icon a menu will appear.



From this menu open the option *Open Settings*.

The next screen that appears will show the communication ports in the second tab (*COM Ports*).



In this example there are two OBD interfaces connected, on communications port COM5 and COM10. Bluetooth OBD interfaces usually show two communication ports. In most cases the 'Dev B' one needs to be used.

From the list of serial ports, choose the one that was found in the previous steps. If the port is not in the list, it is also possible to manually type the port number in the edit field.

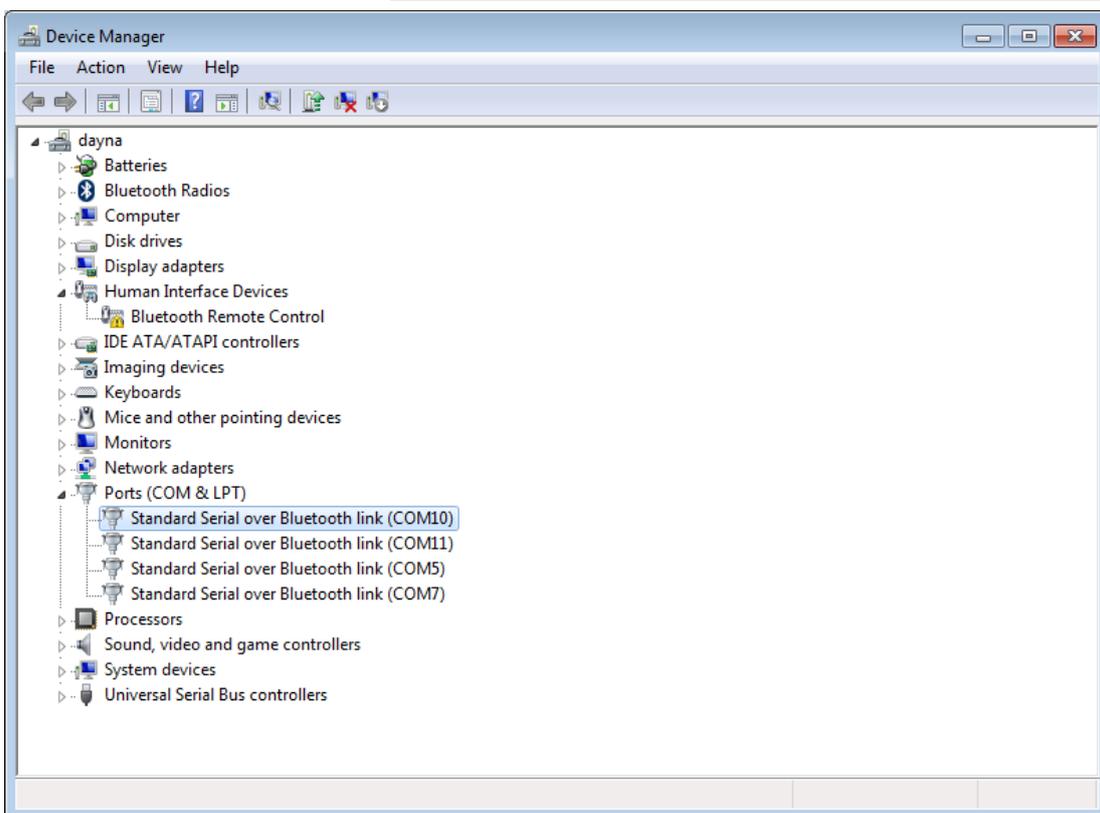
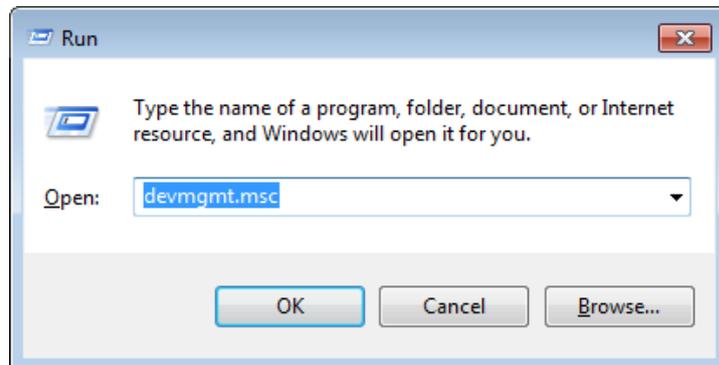
5.2.4 Baud rate

Select the baud rate the OBD interfaces is configured. If it is not clear which baud rate is set, try a number of settings to determine which of the settings the correct setting is. For most ELM based interfaces the baud rate has to be set to 38400. For the OBDLink interfaces a baud rate of 115200 is mostly a good starting point.

For some operating systems it is necessary to also set the baud rate in the driver. The driver baud rate is default set to 9800, and can be modified through the “device manager”. The “device manager” can be started by pressing the ‘Windows-key + R’ and entering

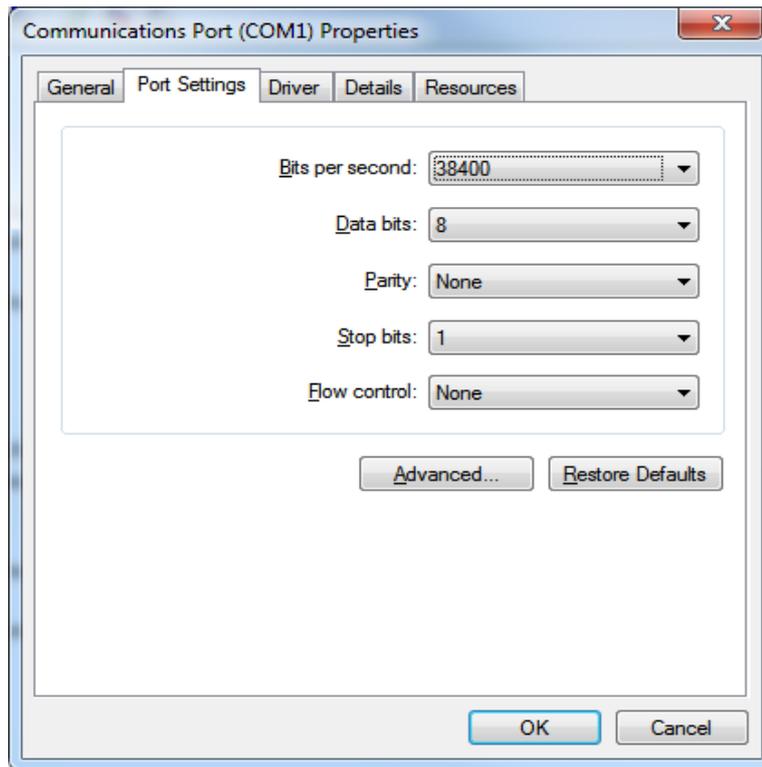


devmgmt.msc in the new screen that will appear. Now the device manager will be



started.

Open the part ‘Ports (COM & LPT)’ and check on which communications port the OBD interface is connected. In the “Ports (COM &LDP)” section, right click on the communications port which the OBD Interface is using and select properties. Then select the tab “Port Settings” and select the number for “Bits per second” the OBD interface is using. For most interfaces this should be set to 38400.



Close all screens with OK and test if the interface is working.

5.2.5 Quick mode, only ELM327 v1.3 or higher

If the OBD interface has an ELM327 chip revision 1.3a or newer, it supports quick mode, this option can be selected to improve the logging speed.

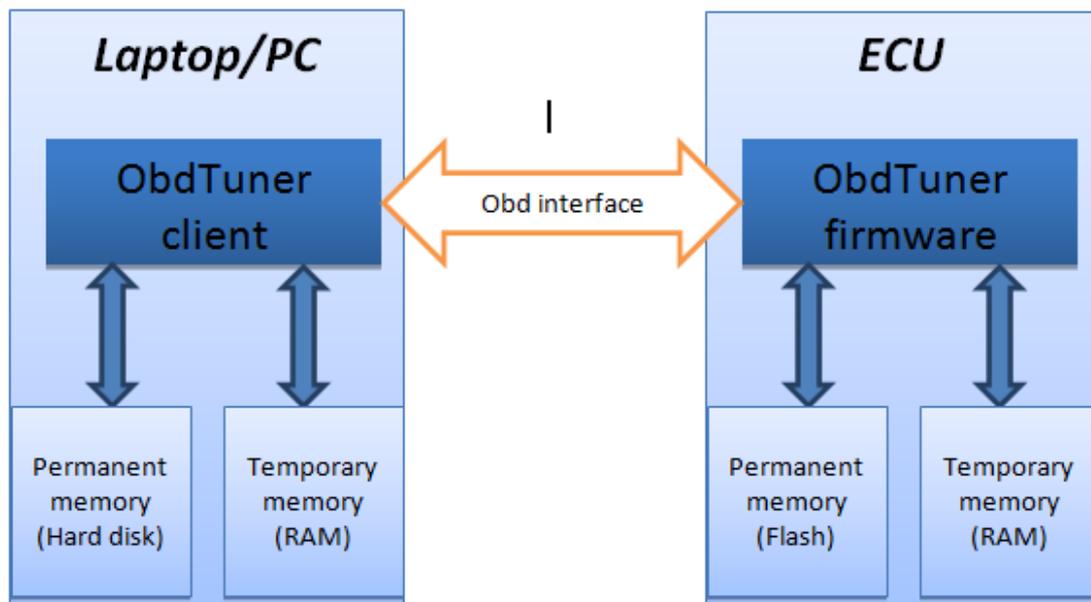
5.2.6 Interface uses Bluetooth

This option can be checked if your Bluetooth interface does not connect or stays connected, it enables hardware handshake and most but not all Bluetooth devices work better with this option checked.

If the OBD interface is connected to the OBD port on the ECU, the button *Test Settings* can be used to check if ObdTuner can communicate with the ECU. If there is a communication problem, check the *Serial Port* and *Baud rate* settings. If the test is completed without problems, the *OK* button can be used to save the settings.

6. Storage of data

Within ObdTuner data is stored in different places. To understand the way the software works, it is important to understand where data is active. The schematic below shows how the different parts of the system are connected.



6.1 Temporary memory

The content of both the temporary memory in the computer and ECU will be lost when the computer or ECU are turned off. For the ECU this happens when the ignition is switched off.

If changes are being made to the table values in the ObdTuner application, the data will be sent directly to the temporary memory in the ECU. As long as the ignition isn't switched off, the ECU will use this data to work with. This can be very useful to do a quick test with new settings. However, if the data needs to be persisted, the data needs to be copied from the temporary to the permanent memory of the ECU. Only then the changed data will be made permanent and will be available when power is removed from the ECU.

6.2 Permanent memory

ObdTuner has an option to store files on the computer as calibration files (with a **smf** extension). These files contain all information to provide the ECU with a full calibration. The following data is stored in a calibration file:

- ECU status
- Notes
- Parameters
- Values in all tables
- Logged data (if applicable)
- Power measurements (if applicable)
- Learned lambda 1 data (if applicable)
- Error codes with freeze frame data

A calibration file contains 1 version of the above mentioned data. When different settings are being tested, each configuration should be saved in a separate calibration file.

7. Menu

This chapter will give a brief explanation of the menu structure in ObdTuner.

7.1 Menu File

The *File* menu has the option to load and save a calibration file (which can be recognized by the **smp** extension). It also contains the option to exit the application.

7.2 Menu Edit

The *Edit* menu has options to modify (selections of) cells in a table. This option is meant to easily change more cells in the tables by lowering or raising the selected cells with a value. It is possible to change the cells by a certain percentage (*Edit Selection %*) or in units (*Edit Selection Absolute*). The menu also contains an option to undo a change.

For more information: [Changing a parameter](#)

The parameter tab contains settings like injector data etcetera. The parameters are the only settings which are not life tunable and are only active after making the changes permanent (programming the ECU).

Quick start, changing a parameter

1. Connect the laptop to the OBD II port of the car.
2. Open ObdTuner.
3. Synchronize ObdTuner with the car.
4. Modify the desired parameter.
5. Press the button 'Send parameter to ECU'



6. Make the changes permanent, see also: [Make the changes permanent](#)

Be aware:

- After changing a parameter like fuel mode or throttle body you have to do a full calibration of the ECU.
- If you change the throttle body, you also must choose a preferred throttle response on the throttle tab.

7.3 Menu Learn mode

Learn base fuel table

Whit this option, the ECU can be placed into learning mode. In this mode the car must be driven and the ECU will check the base fuel table and store the necessary corrections in its

memory. Afterwards the collected data can be used for automatically correcting the base fuel table. For more info see: [Learning the base fuel table](#)

Ignition and knock measurement

When this mode is activated, the ECU will internally store in which cells detonation is measured. Afterwards it is possible to automatically correct the ignition table with the learned data. For more information see: [Ignition and knock measurement](#)

Stop learning/measuring

With this menu option internal learning/measuring can be disabled.

7.4 Menu ECU

The menu ECU contains options for communication with the motor management.

Read (ECU to PC)

This option is used for getting the tables, parameters etc. from the ECU into ObdTuner.

Write (PC to ECU)

This option is used to update the ECU from a calibration file stored on the computer.

Make calibration permanent

This option programs maxes the modifications done in temporary memory persistent by copying the modification into the ECU's permanent memory.

Read error codes

If the check engine light is lit, this option can be used to read the error codes and freeze frame data from the ECU.

Reset Fuel Trims

The long term fuel trims in the ECU can be reset to 0 through this option.

(Re)connect

This option can be used to (re)connect with the ECU.

Clear error codes

This option clears the error codes and reset the ECU. Fuel trims, calibration etc. will not be reset.

Repair table headers

In very rare occasions it can happen the table headers got corrupted. When the ECU is acting strange after flashing new settings it could be the table headers got corrupt. Use this option to repair the table headers.

7.5 Menu Power measurement

This menu contains all the necessary options for generating a power measurement. If all data is filled in correctly, the measurement will be reproducible over the years. For a detailed explanation see [Power measurement](#).

7.6 Menu Logging

This menu contains the option for using the extensive logging possibilities in ObdTuner. For more information see [Creating a log](#)

7.7 Menu General

Settings

The settings option shows a screen where a number of application settings can be changed.

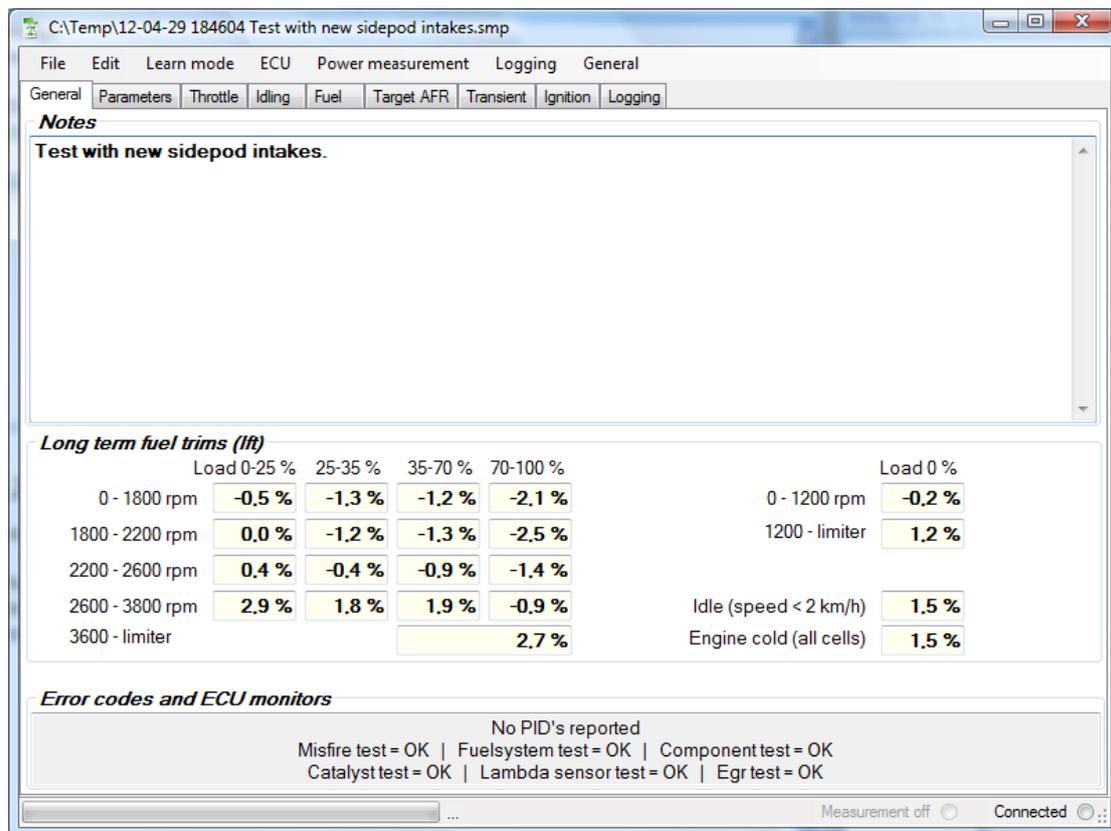
Information

This option will pop up a dialog with the version number of the application.

8. Tabs in ObdTuner

The main structure of ObdTuner is built around tabbed pages. ObdTuner will not always look the same. Depending on the mode the ECU is in, more or less tabs will be displayed after synchronizing with the ECU. For instance; if measuring mode is not active, the tab 'measurement' will not be shown after synchronizing with the ECU.

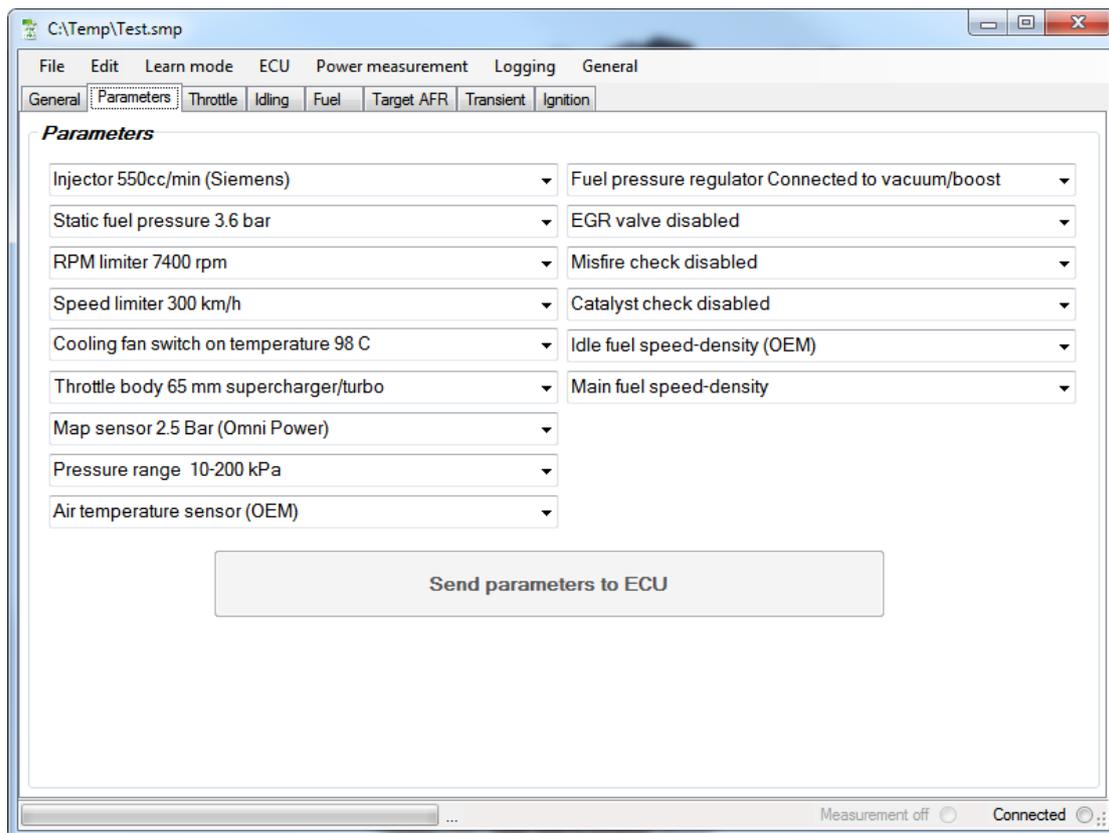
8.1 Tab general



This tab is always available, and can be used to make notes on the current session.

After synchronizing with the ECU or loading a map file this tab will also show the *Long Term Fuel Trims* below the notes. In the bottom of the screen the *Error Codes* and ECU monitors are displayed.

8.2 Tab parameters



The tab *Parameters* contains general settings. This is the only tab with values which cannot be changed live for more info see also [Changing a parameter](#).

Below an explanation of the available parameter:

Injector

Here the injector must be configured, it is very important to configure the correct injector **before** any calibration is done.

Static fuel pressure

The OEM static fuel pressure is 3.8 bar. If a different fuel pressure is used, this must be configured here. It is important to configure this before any calibration is done.

RPM limiter

The maximum amount of revolutions per minute the ECU will allow.

Speed Limiter

The maximum vehicle speed the ECU will allow.

Cooling fan switch temperature

This is the temperature in degrees Celsius at which the radiator fan will start.

Throttle Body

This setting should reflect the throttle body that is mounted. The standard 58mm throttle body, the 65mm throttle body for a 2.4 engine or the 68 mm LSJ throttle body can be used.

Map sensor

This setting should reflect the mounted map sensor. Normally it is only necessary to mount a different map sensor if there is a compressor or turbo added because the OEM sensor cannot measure boost.



Pressure range

Here the boost range can be configured; this setting should be as low as possible but higher than the maximum boost. With this parameter it is possible to make maximum use of the table range in the ECU. This setting has nothing to do with the mounted map sensor.

Intake air temperature sensor

This setting should reflect the used intake air temperature sensor.

Fuel pressure regulator

If the fuel pressure correction input on the fuel pressure regulator is connected with a connection between the engine and throttle valve it is seeing vacuum/boost and the option 'Fuel pressure regulator connected to vacuum/boost' should be selected. The pressure correction will then be done mechanically.



If the option 'Fuel pressure regulator connected to outside' is selected, the ECU will use the map sensor to electronically correct the fuel pressure.

EGR valve

If the EGR valve is removed, choose the option 'EGR valve disabled'. This way the ECU will not try to use the EGR valve and will not correct for it. When the EGR valve is disabled, it is also possible to use the EGR feedback input for other purposes like connecting a wideband lambda sensor or a temperature measuring probe.



Misfire check

The ECU knows how the crankshaft should react on a successful ignition. This is a good way to detect if there are misfires. However if the power output of the engine exceeds 250hp, this algorithm fails, and it can switch the ECU into leap home mode even when there is nothing wrong with the ignition. It is therefore advised to disable misfire detection if an engine produces more than 250hp.

Catalyst check

Using the primary and secondary lambda sensors the ECU tries to verify if the catalytic converter is working correctly. If this is not the case an error code will be raised by the ECU. To prevent the ECU from raising this error, the check can be disabled. This can be useful for

cars with a sports catalyst or with no catalyst. **This does not mean the second lambda sensor can be removed; the ECU still uses the second lambda sensor for safety checks.**

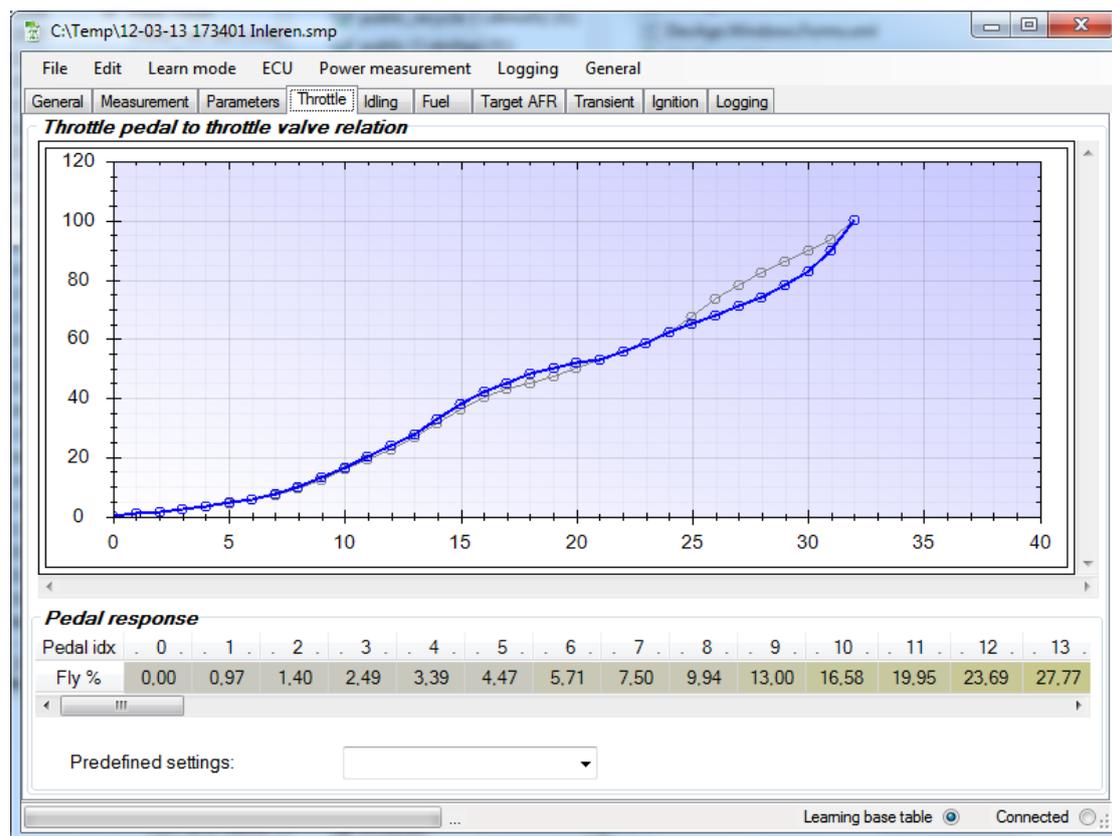
Idle fuel

Normally the ECU uses speed density mode for idling, in most cases it is best to leave this option enabled. However when very extreme camshafts are mounted, setting this parameter to 'Idle fuel alfa-n' can help making the engine run smoother when idling. But it is advised to always begin with 'speed density'.

Base fuel

Depending on the modification on the engine it can be worthwhile to switch to speed density mode. Standard the ECU uses the throttle fly position and the engine rpm for measuring the amount of air that is going into the engine, this mode is called Alfa-n. For normally aspirated engines this works fine, however if a supercharger or turbo is mounted, Alfa-n fails, the better option is to enable speed density. In Speed density mode, the intake manifold pressure and the engine rpm are used as main parameters for calculating the amount of air going into the engine.

8.3 Tab Throttle



In this tab the relation between the throttle pedal and the throttle valve can be adjusted. The table below the graph has 33 cells, which define the relationship. The table is also used

by the ECU during warm up and idling of the engine. It is therefore probably better to not change the first 12 cells of this table.

Below the table is a drop down box, which allows choosing from a number of pre-set profiles.

Changes made to the table are immediately available in the ECU.

8.4 Tab Idling

The screenshot shows the 'Idling' tab in the software interface. It contains three tables:

Engine idle settings
Revolutions [RPM]

Temp [C]	-20	-10	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140
Rpm	1.350	1.300	1.250	1.175	1.150	1.125	1.100	950	850	850	850	850	850	850	850	850	850

Fuel [ms]

Map/Rpm	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600
20 kPa	0.81	0.81	0.85	0.89	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.89	0.90
31 kPa	1.02	1.04	1.09	1.13	1.16	1.15	1.16	1.15	1.14	1.13	1.13	1.13	1.15
42 kPa	1.25	1.28	1.36	1.43	1.44	1.44	1.43	1.41	1.39	1.38	1.38	1.39	1.41
53 kPa	1.46	1.52	1.63	1.71	1.74	1.72	1.72	1.69	1.67	1.65	1.64	1.66	1.69
64 kPa	1.66	1.74	1.89	2.01	2.03	2.02	2.02	1.99	1.97	1.95	1.95	1.96	1.99
75 kPa	1.85	1.97	2.19	2.31	2.35	2.32	2.33	2.28	2.26	2.26	2.25	2.26	2.28
86 kPa	2.07	2.23	2.49	2.64	2.67	2.64	2.63	2.58	2.55	2.55	2.55	2.55	2.56
97 kPa	2.32	2.51	2.82	2.96	2.99	2.95	2.93	2.86	2.83	2.83	2.85	2.85	2.86
108 kPa	2.59	2.80	3.09	3.28	3.29	3.26	3.23	3.17	3.14	3.14	3.15	3.15	3.17

Ignition [degrees]

Map [kPa]	20	30	40	50	60	65	70	75	80	85	90	95	100
Ign	9.6	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4

This tab controls the idling of the engine. Changes made to the tables in this tab are immediately available in the ECU. When *Logging* is active this tab will show cross-hairs indicating which cell the ECU is using at that moment.

Revolutions

Based on the coolant temperature this table determines the target idle RPM. The ECU will try to get as close as possible to this value.

Fuel

This table determines the amount of fuel which needs to be injected when idling. The amount of fuel is depending on the programmed duration, a higher value means more fuel is injected. The table values are programmed in milliseconds [ms].

Ignition

The pressure in the intake manifold determines the moment of ignition. A higher value indicates an earlier ignition. A lower value indicates a later ignition. The table values are programmed in degrees before top dead center.

8.5 Tab Fuel

Smooth	600	800	1000	1200	1400	1600	1800	2000	2200	2400	2600	2800	3000	3200	3400	3600	3800	4000	4200	4400	4600	4800
10 kPa	0.8	0.8	0.7	0.7	0.7	0.8	0.7	0.7	0.7	0.8	0.8	0.7	0.7	0.6	0.6	0.6	0.6	0.7	0.7	0.8	0.8	0.8
20 kPa	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.2	1.2	1.1	1.0	1.0	1.0	1.0	1.0	1.1	1.2	1.2	1.2	1.2
30 kPa	1.5	1.5	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.7	1.7	1.6	1.6	1.5	1.5	1.5	1.6	1.7	1.8	1.8	1.8	1.7
40 kPa	2.0	2.0	2.0	2.0	2.0	2.1	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.1	2.1	2.3	2.4	2.3	2.3
50 kPa	2.5	2.5	2.5	2.4	2.4	2.4	2.4	2.4	2.4	2.5	2.5	2.5	2.4	2.4	2.4	2.4	2.5	2.5	2.7	2.9	2.9	2.9
60 kPa	2.9	2.9	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.9	2.9	2.9	2.9	2.8	2.8	2.9	2.9	2.9	3.0	3.4	3.5	3.5
70 kPa	3.3	3.2	3.1	3.1	3.1	3.2	3.3	3.2	3.2	3.3	3.4	3.4	3.4	3.3	3.3	3.4	3.4	3.3	3.5	3.8	4.0	4.1
80 kPa	3.7	3.6	3.4	3.4	3.4	3.6	3.7	3.7	3.7	3.8	3.9	3.9	3.9	3.9	3.9	3.9	3.8	3.8	3.9	4.3	4.6	4.6
90 kPa	4.2	3.9	3.7	3.6	3.7	3.9	4.1	4.1	4.1	4.2	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.3	4.5	4.8	5.1	5.1
100 kPa	4.9	4.6	4.2	4.0	4.0	4.2	4.4	4.4	4.5	4.7	4.8	4.9	4.9	4.9	5.0	4.9	5.0	5.0	5.1	5.4	5.7	5.7
110 kPa	5.9	5.6	5.3	4.9	4.7	4.6	4.7	4.7	4.8	5.1	5.3	5.5	5.6	5.6	5.6	5.6	5.7	5.8	5.9	6.2	6.5	6.6
120 kPa	7.2	7.1	6.8	6.5	6.1	5.7	5.5	5.4	5.5	5.8	6.1	6.3	6.5	6.5	6.5	6.5	6.8	7.0	7.3	7.3	7.6	7.8
130 kPa	8.8	8.7	8.7	8.4	8.2	7.7	7.5	7.3	7.4	7.5	7.7	7.9	8.0	8.0	7.7	7.6	7.8	8.3	8.6	8.8	8.9	9.2
140 kPa	10.5	10.6	10.5	10.5	10.4	10.2	10.1	10.0	9.9	9.9	9.9	9.9	9.9	9.7	9.1	8.6	8.7	9.2	9.8	10.0	10.2	10.3
150 kPa	12.5	12.5	12.5	12.5	12.6	12.6	12.5	12.5	12.4	12.4	12.3	12.2	12.2	11.8	11.2	10.4	10.2	10.6	11.0	11.3	11.2	11.2
160 kPa	14.6	14.6	14.6	14.7	14.7	14.7	14.7	14.8	14.7	14.7	14.7	14.7	14.6	14.5	14.1	13.5	13.2	13.1	13.1	13.0	12.8	12.7
170 kPa	17.1	17.1	17.1	17.0	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.2	17.2	17.1	16.9	16.7	16.4	16.1	15.8	15.7
180 kPa	19.7	19.8	19.7	19.7	19.7	19.7	19.7	19.7	19.8	19.7	19.8	19.8	19.8	19.8	19.8	19.9	19.9	19.8	19.6	19.4	19.3	19.2
190 kPa	22.2	22.3	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.5	22.5	22.4	22.4	22.3	22.4	22.5
200 kPa	24.1	24.2	24.3	24.4	24.4	24.4	24.4	24.4	24.4	24.4	24.4	24.3	24.3	24.3	24.3	24.4	24.4	24.4	24.4	24.4	24.5	24.6

This tab controls the basic fueling of the engine. The table values are the opening time of the fuel injectors and are programmed in milliseconds [ms]. A higher value in the table indicates a larger amount of fuel.

Changes made to this tab are immediately available in the ECU. When *Logging* is active a cross hair will appear indicating which cell the ECU is using.

8.6 Tab Target AFR

Open loop targeted AFR

Tp/Rpm	0	510	1020	1540	2050	2560	3070	3580	4100	4610	5120	5630	6140	6650	7170	7680	8160
0 kPa	14,7	14,7	14,7	14,7	14,7	14,7	14,7	14,7	14,7	14,7	14,0	14,0	13,5	12,9	12,9	12,9	12,9
20 kPa	14,7	14,7	14,7	14,7	14,7	14,7	14,7	14,7	14,7	14,7	14,0	13,5	12,9	12,9	12,9	12,9	12,9
40 kPa	14,7	14,7	14,7	14,7	14,0	14,0	14,0	14,0	14,0	14,0	13,5	12,9	12,9	12,9	12,9	12,9	12,9
60 kPa	13,5	13,5	13,5	13,5	12,9	12,9	12,9	12,9	12,9	12,9	12,9	12,9	12,9	12,9	12,9	12,9	12,9
80 kPa	12,6	12,6	12,6	12,6	12,6	12,6	12,6	12,6	12,6	12,6	12,6	12,6	12,6	12,6	12,6	12,6	12,6
100 kPa	12,3	12,3	12,3	12,3	12,3	12,3	12,3	12,3	12,3	12,3	12,3	12,3	12,3	12,3	12,3	12,3	12,3
120 kPa	12,3	12,3	12,3	12,3	12,3	12,3	12,3	12,3	12,3	12,3	12,3	12,3	12,3	12,3	12,3	12,3	12,3
140 kPa	12,3	12,3	12,3	12,3	12,3	12,3	12,3	12,3	12,3	12,3	12,3	12,3	12,3	12,3	12,3	12,3	12,3
160 kPa	12,3	12,3	12,3	12,3	12,3	12,3	12,3	12,3	12,3	12,3	12,3	12,3	12,3	12,3	12,3	12,3	12,3
180 kPa	12,3	12,3	12,3	12,3	12,3	12,3	12,3	12,3	12,3	12,3	12,3	12,3	12,3	12,3	12,3	12,3	12,3
200 kPa	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2	12,2

Open loop target AFR correction for coolant temperature

Coolant temp	70 C	74 C	78 C	82 C	86 C	90 C	94 C	98 C	102 C	106 C	110 C	114 C	118 C	122 C	126 C	130 C	134 C
AFR Corr	-1,5	-1,2	-0,7	-0,4	0,0	0,0	0,0	-0,2	-0,4	-1,0	-1,5	-2,0	-3,0	-4,0	-4,0	-4,0	-4,0

Open loop target AFR correction for inlet air temperature

Inlet temperature	28 C	32 C	36 C	40 C	44 C	48 C	52 C	56 C	60 C	64 C	68 C	72 C	76 C	80 C	84 C	88 C	92 C
AFR Corr	0,0	0,0	0,0	-0,1	-0,2	-0,4	-0,6	-0,8	-1,0	-1,2	-1,4	-1,6	-2,0	-2,0	-2,0	-2,0	-2,0

Learning base table Connected

This tab controls the fueling of the engine while operating in open loop. The values in this table are the target Air to Fuel Ratio. The ECU will try to approximate these values as closely as possible. The accuracy will depend on the accuracy of the main fuel table.

The two tables at the bottom of the tab give the possibility to enrich the mixture depending on coolant temperature and intake air temperature. The values in the table will be added to the value selected by the ECU from the main AFR table.

Changes being made to this table are immediately available in the ECU. When *Logging* is active a cross hair will appear indicating which cell is being used by the ECU.

8.7 Tab Transient Fuel

Transient fuel settings

Throttle speed

% Maximum speed	1000 rpm	2000 rpm	3000 rpm	4000 rpm	5000 rpm
Stationary	5,1	29,8	50,2	50,2	50,2
Drive	5,1	29,8	50,2	50,2	50,2

Map delta

Difference	0%	6%	12%	19%	25%	31%	38%	44%	50%	56%	63%	69%	75%	81%	88%	94%	100%
Fuel%	0,0	2,0	2,7	3,5	3,9	4,3	4,7	5,1	5,9	5,9	5,9	5,9	1,6	1,6	1,6	0,0	0,0
Throttle fly pos	0 %	6 %	12 %	19 %	25 %	31 %	38 %	44 %	50 %	56 %	63 %	69 %	75 %	81 %	88 %	94 %	100 %
Corrections	100,0	9,4	21,9	46,9	70,3	82,8	95,3	100,0	100,0								
Status	Acc pushed	Acc pushed < 33 C	Acc Cleared	Acc cleared < 33 C	Coasting	coasting < 33 C											
Time = 1/value	3,9	9,0	3,9	14,9	6,3	14,9											

Throttle valve delta [%]

Diff	0%	6%	12%	19%	25%	31%	38%	44%	50%	56%	63%	69%	75%	81%	88%	94%	100%
Fuel%	0,0	1,6	2,0	3,1	3,5	4,3	5,1	5,9	6,3	7,8	8,2	9,0	9,8	10,6	11,8	12,2	13,3

Learning base table Connected

This tab controls the transient fueling. Changes made to the tables in this tab are immediately available in the ECU. When Logging is active a cross hair will appear indicating which cell is being used by the ECU.

Throttle Speed

This table controls the opening speed of the throttle valve. The speed is dependent on the RPM of the engine and whether the car is stationary or driving. The values in this table are percentages of the maximum possible throttle valve speed.

Map Delta

This is the part of the acceleration enrichment, which is based on the difference in pressure in the intake manifold. Three tables determine the final adjustment by the ECU.

The first table controls the percentage of fuel that needs to be added based on the percentage rise of pressure in the intake manifold.

The second table uses the position of the throttle valve and, based on this value selects a percentage. This percentage is used to correct the fuel adjustment outcome of the first

table. For example, if the first table results in an adjustment of 10% and the second table determines a correction factor of 50% the ECU will use a total fuel correction of 5% (50% of 10%).

The third table uses a status to determine how fast the correction should be reduced to 0. The value in the table is an inverse, so lager values indicate a shorter time. The different statuses are:

- Acc Pushed: The throttle pedal is pressed
- Acc Cleared: The throttle pedal is not pressed
- Coasting: The speed of the car is decreasing

The states are divided between a coolant temperature below or above 33C.

Throttle Valve Delta

This is the part of the acceleration enrichment which is based on the increase in position of the throttle valve. The percentage adjustment in fuel is based on the percentage increase in throttle valve position. This acceleration enrichment will be faster than the map bases enrichment.

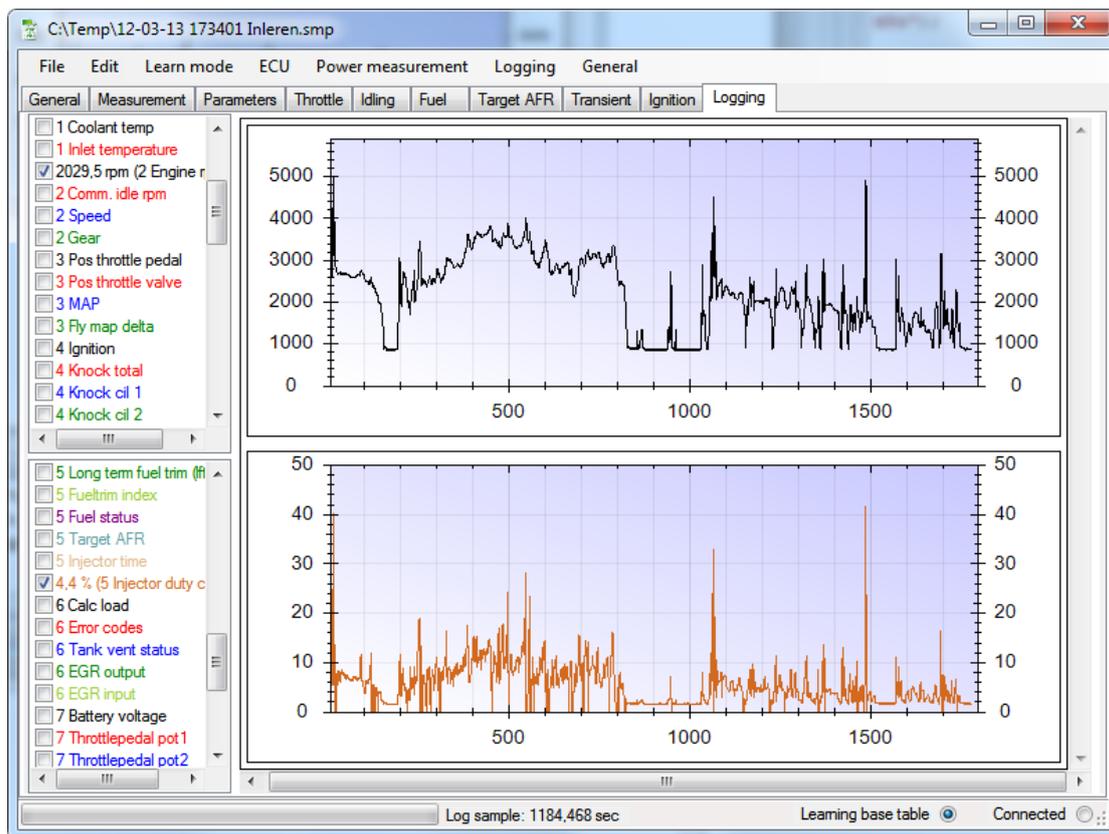
8.8 Tab Ignition

Map/Rpm	600	800	1000	1200	1400	1600	1800	2000	2200	2400	2600	2800	3000	3200	3400	3600	3800	4000	4200	4400	4600	
10 kPa	17,8	20,0	21,3	23,4	24,8	27,0	30,1	32,9	34,6	35,0	36,0	38,2	39,9	39,9	40,6	39,9	40,9	40,9	40,9	40,9	40,9	40,9
20 kPa	20,0	21,0	21,0	21,3	23,1	24,2	28,0	28,4	31,2	32,6	33,6	35,3	37,4	38,5	38,5	38,2	39,6	38,8	39,6	39,9	39,9	39,9
30 kPa	10,8	13,0	15,4	16,4	22,4	23,4	28,4	29,0	31,5	31,5	31,5	31,8	35,0	35,3	36,0	35,3	36,0	37,1	37,1	38,2	38,2	38,2
40 kPa	9,4	12,6	14,0	17,5	24,2	24,5	29,4	29,4	31,5	32,6	32,9	33,6	33,9	33,9	33,6	35,0	35,0	35,0	35,0	35,0	36,0	36,0
50 kPa	8,0	12,6	14,4	21,3	24,2	25,5	26,6	29,4	31,2	31,2	30,4	30,1	30,1	30,4	30,4	30,4	30,4	31,2	31,2	31,2	31,2	31,2
60 kPa	5,9	12,6	17,8	21,0	24,2	24,8	25,5	28,0	28,0	27,6	28,0	28,4	28,4	28,4	29,0	28,4	28,4	29,0	27,6	27,0	27,0	27,0
70 kPa	3,8	10,8	17,8	18,5	21,3	23,4	24,8	25,5	24,8	23,4	24,5	25,5	26,6	27,6	27,6	26,6	27,0	24,8	24,5	24,8	24,8	24,8
80 kPa	2,1	9,1	13,0	17,2	16,4	18,9	20,0	20,0	21,0	21,0	21,0	21,3	23,1	23,1	23,1	24,2	21,3	21,0	20,6	21,0	21,7	21,7
90 kPa	-5,9	-2,1	2,1	5,9	8,4	13,0	14,0	16,4	16,8	17,2	18,5	18,9	20,0	20,0	19,6	19,6	19,2	20,3	18,9	19,2	19,6	19,6
100 kPa	-9,1	-5,9	-3,2	0,0	3,8	8,8	9,1	10,1	13,6	15,4	15,4	15,7	16,4	16,4	16,8	17,5	17,8	18,5	18,5	18,9	20,3	20,6
110 kPa	-9,1	-5,9	-3,2	0,0	3,8	8,8	8,8	13,3	15,0	15,0	15,4	15,7	16,4	16,8	17,2	17,5	17,8	18,2	18,2	19,2	19,6	19,6
120 kPa	-9,1	-5,9	-3,2	0,0	3,5	8,0	8,8	12,2	14,0	14,0	14,0	15,0	15,7	16,1	16,8	16,8	17,5	17,5	17,2	17,2	17,5	17,8
130 kPa	-9,1	-5,9	-3,2	0,0	3,5	7,7	8,4	11,9	13,6	13,6	13,6	14,7	15,4	16,1	16,8	16,8	17,2	16,8	16,4	16,4	16,4	16,4
140 kPa	-9,1	-5,9	-3,2	0,0	3,5	7,7	8,4	11,5	13,3	13,3	13,3	14,4	15,0	15,7	16,4	16,4	16,8	16,8	16,1	16,1	16,1	16,1
150 kPa	-9,1	-5,9	-3,2	0,0	3,5	7,7	8,4	11,5	13,0	13,0	13,0	14,0	14,7	15,4	16,1	16,1	16,4	16,4	15,7	15,7	15,7	15,7
160 kPa	-9,1	-5,9	-3,2	0,0	3,5	7,7	8,4	11,5	12,6	12,6	12,6	13,6	14,4	15,0	15,7	15,7	16,1	16,1	15,4	15,4	15,4	15,4
170 kPa	-9,1	-5,9	-3,2	0,0	3,5	7,7	8,4	11,5	12,2	12,2	12,2	13,3	14,0	14,7	15,4	15,4	15,7	15,7	15,0	15,0	15,0	15,0
180 kPa	-9,1	-5,9	-3,2	0,0	3,5	7,7	8,4	11,5	11,9	11,9	11,9	13,0	13,6	14,4	15,0	15,0	15,4	15,4	14,7	14,7	14,7	14,7
190 kPa	-9,1	-5,9	-3,2	0,0	3,5	7,7	8,4	11,5	11,5	11,5	11,5	12,6	13,3	14,0	14,7	14,7	15,0	15,0	14,4	14,4	14,4	14,4
200 kPa	-9,1	-5,9	-3,2	0,0	3,5	7,7	8,4	11,5	11,5	11,5	11,2	12,2	13,0	13,6	14,4	14,4	14,7	14,7	14,0	14,0	14,0	14,0

This tab determines the ignition of the engine when not idling. The ignition is determined based on the pressure in the intake manifold and the RPM of the engine. Values in the table are degrees before top dead center. A higher value will result in an earlier ignition.

Changes being made to this table are immediately available in the ECU. When *Logging* is active cross hairs will appear indicating which cell the ECU is using.

8.9 Tab Logging



In this tab, the collected sensor data can be viewed which has been stored during logging or while logging data from the ECU. If no log has been made or the loaded calibration file does not contain log data, this tab will not be available. For more information see also [Creating a log](#).

In total two graphs can be displayed. Each graph can contain multiple parameters.

The parameters are grouped by numbers for easy access with numeric keys. The parameters below are available:

Coolant temp:

Temperature of the coolant fluid in degrees Celsius.

Inlet temperature:

Temperature of the intake air in degrees Celsius.

Engine rpm:

Engine RPM in revolutions per minute.

Comm. idle rpm:

The idle rpm the ECU is trying to achieve in revolutions per minute.

Speed:

Vehicle speed in kilometers per hour.

Gear:

Selected gear, the selected gear is calculated by the ECU based on the vehicle speed and engine RPM. Neutral is displayed as 6th gear.

Pos. throttle pedal:

Position of the throttle pedal indicated in a percentage of maximum.

Pos. throttle valve:

Position of the throttle valve indicated in a percentage of maximum.

MAP:

Manifold air pressure in Kilopascal.

Fly map delta:

The difference between the air pressures in the intake manifold calculated by the ECU based on the position of the throttle valve and engine rpm with the actual pressure in the intake manifold. This value is in Kilopascal.

Ignition:

Ignition timing advance in degrees before top dead center.

Knock total:

The amount of knock retard measured over all cylinders. The number indicates how many degrees the ignition was retarded by the ECU. Short peaks will not actually retard the ignition but will show up in the log.

Knock cil 1, Knock cil 2, Knock cil 3, Knock cil4:

The amount of knock retard measured per cylinder. The number indicates how many degrees the ignition was retarded by the ECU. Short peaks will not actually retard the ignition but will show up in the log.

Misfires cyl 1, Misfires cyl 2, Misfires cyl 3, Misfires cyl 4:

The number of times the ECU detected a misfire per cylinder.

Lambda primary:

Primary lambda sensor voltage. (Before the catalyst.)

Lambda secondary:

Secondary lambda sensor voltage. (After the catalyst.)

Short term fuel trim:
Short term fuel correction in percent's.

Long term fuel trim:
Long term fuel correction in percent's.

Fueltrim index:
The long term fuel correction cell the ECU is using from Fuel Trim table.

Fuel status:
The status of the fuel system.
1: Open loop due to insufficient temperature
2: Closed loop
4: Open loop due to engine load or a not pressed accelerator pedal.

Target AFR:
The commanded Air to Fuel Ratio the ECU is trying to reach. This value is the weight of the air in relation to the weight of the fuel.

Injector time:
The total time the injector is opened during an engine cycle.

Injector duty cycle:
The percentage the injector is open according to the maximum opening window determined by the engine rpm.

Calc load:
Calculated load of the engine as a percentage of maximum.

Error codes:
The amount of error codes currently resident in the ECU.

Tank vent status:
Status of the fuel tank ventilation opening. The opening is given in the percentage of maximum opening.

EGR output:
This is the output voltage which the ECU sends to the EGR valve.

EGR input:
This is the voltage which the ECU reads from the input from the EGR valve. This can also be used as an extra input for other purposes if the EGR valve has been removed.

Battery voltage:
Voltage the battery/alternator supplies.

Throttle pedal pot1:
Voltage measured by the ECU on the first throttle pedal potentiometer.

Throttle pedal pot2:

Voltage measured by the ECU on the second throttle pedal potentiometer.

Throttle valve pot1:

Voltage measured by the ECU on the first throttle valve potentiometer.

Throttle valve pot2:

Voltage measured by the ECU on the second throttle valve potentiometer.

Inlet temp V:

Voltage of the intake air temperature sensor.

Map voltage:

Voltage of the manifold air pressure sensor.

Knock sensor V:

Voltage of the knock sensor.

Main relay:

Status of the main relay where 0 indicates off and 1 indicates on.

Fuel pump relay:

Status of the fuel pump relay where 0 indicates off and 1 indicates on.

Ignition on:

Status of the ignition where 0 indicates off and 1 indicates on.

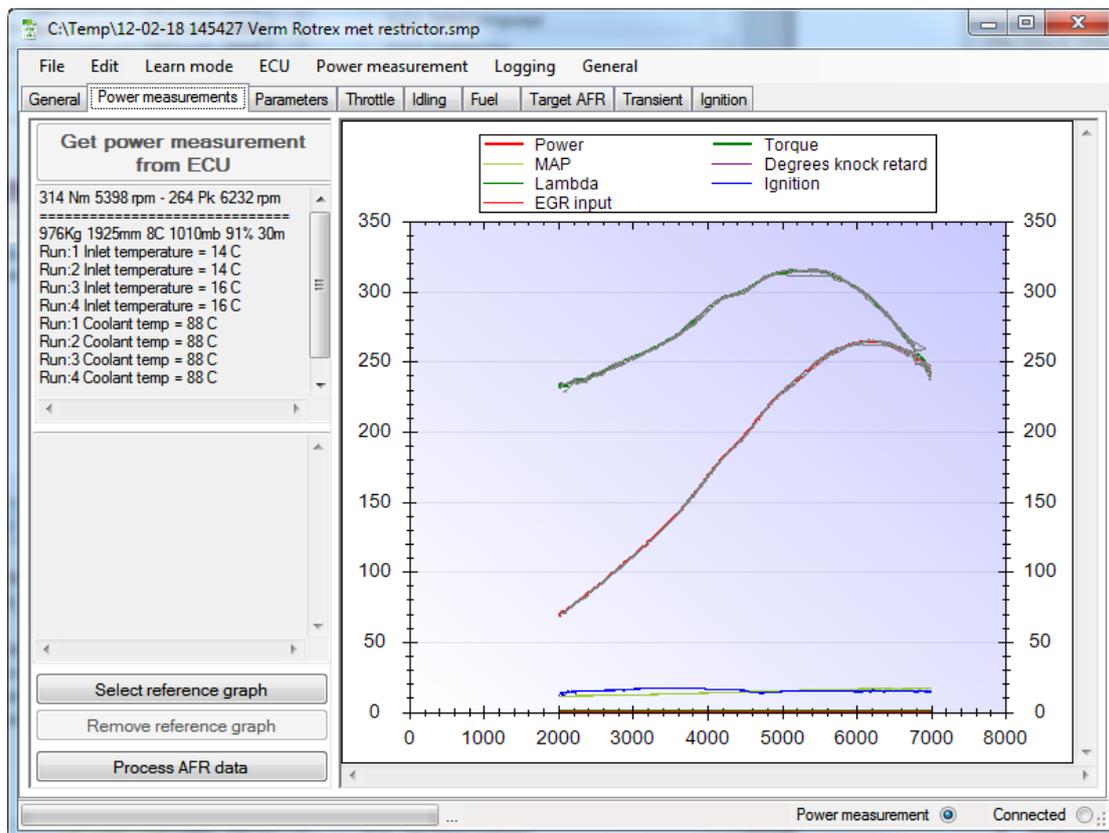
Lambda heater:

Status of the heaters in the lambda sensors where 0 indicates off and 1 indicates on.

Radiator fan:

Status of the fan located on the radiator where 0 indicates off and 1 indicates on.

8.10 Tab Power Measurement



This tab only shows up when a power measurement has been read from the ECU after a power measurement is performed.

This tab shows the power graphs on the right side of the screen and the measured values on the left. The power and torque values have been calculated at the crankshaft. For each power measurement which has been done a graph is drawn (gray). Additionally an average graph is drawn (colored), this way it is easy to spot a faulty run.

The values on the left side of the screen are based on the average graph.

At the bottom of the graph the following data is also drawn for each run:

- MAP (Manifold air pressure in kilopascal)
- Degrees Knock Retard (Number of degrees ignition retard relative to top dead center)
- Lambda (Voltage of the primary lambda sensor)
- Ignition (Number of degrees the ignition has taken place before top dead center, including knock correction)
- EGR Input (Voltage on the input of the EGR sensor)

At the bottom of the tab there is a button *Select Reference Graph*. This button allows opening another map file which contains a power measurement. The average of this power

measurement is also shown in the graph. This allows comparing power measurements between different settings and calibrations.

With the *Remove Reference Graph* button the loaded reference graph can be removed from the computer's temporary memory.

8.11 Tab Measurement

Process measurements	<input checked="" type="checkbox"/> Nr of measurements <input checked="" type="checkbox"/> Fuel correction <input type="checkbox"/> Knock retard											
Tp/Rpm	1600	1800	2000	2200	2400	2600	2800	3000	3200	3400	3600	3800
10 kPa	--	--	--	--	--	--	--	--	--	--	--	--
20 kPa	2362 / -2.3	1672 / -1.6	611 / -4.7	562 / -2.3	556 / -2.3	703 / -3.1	361 / -2.3	331 / -3.1	281 / -3.1	64 / -3.9	94 / -3.1	66 / -
30 kPa	515 / -3.1	2365 / -3.1	1987 / -3.9	1475 / -3.9	1411 / -3.1	1652 / -1.6	1256 / -2.3	1359 / -2.3	547 / -2.3	1013 / -1.6	277 / -0.8	129 /
40 kPa	645 / -3.9	800 / -3.1	3876 / -3.9	2002 / -5.5	2711 / -3.9	3814 / -1.6	2051 / -3.9	1824 / -3.1	987 / -3.9	1205 / -4.7	317 / -4.7	185 /
50 kPa	420 / -5.5	553 / -1.6	1257 / -3.9	1239 / -4.7	2185 / -3.1	3952 / -2.3	2261 / -2.3	2868 / -3.1	2196 / -3.9	1523 / -5.5	1718 / -4.7	45 / -
60 kPa	450 / -3.9	160 / -2.3	662 / -2.3	1578 / -3.9	1826 / -3.1	1613 / -2.3	2695 / -3.1	1598 / -2.3	1605 / -3.9	1704 / -3.9	2751 / -3.1	151 /
70 kPa	330 / -3.1	327 / -2.3	564 / -3.1	694 / -4.7	617 / -3.1	1136 / -2.3	1339 / -1.6	1763 / -2.3	1123 / -3.1	807 / -3.9	2520 / -3.1	389 /
80 kPa	177 / -5.5	129 / -3.1	298 / -1.6	374 / -4.7	248 / -3.1	201 / -3.9	207 / -3.1	189 / -2.3	747 / -3.1	1201 / -4.7	782 / -3.9	272 /
90 kPa	65 / -3.9	107 / -3.9	64 / -3.9	84 / -6.2	131 / -3.1	205 / -2.3	169 / -3.9	261 / -2.3	232 / -3.9	617 / -4.7	275 / -3.9	11 / -
100 kPa	15 / -4.7	47 / -3.1	63 / -3.1	14 / -7.8	9 / -6.2	43 / -4.7	66 / -3.1	236 / -3.1	98 / -2.3	80 / -3.9	284 / -7.0	44 / -
110 kPa	4 / -3.9	4 / -4.7	37 / -3.9	18 / -1.6	21 / 0.8	20 / 2.3	87 / -2.3	37 / -1.6	117 / -0.8	80 / 0.0	90 / -7.0	37 / -
120 kPa	--	--	--	--	--	--	--	--	--	34 / -1.6	73 / -5.5	155 /
130 kPa	--	--	--	--	--	--	--	--	--	--	166 / -3.9	175 /
140 kPa	--	--	--	--	--	--	--	--	--	--	--	35 / -
150 kPa	--	--	--	--	--	--	--	--	--	--	--	--
160 kPa	--	--	--	--	--	--	--	--	--	--	--	--
170 kPa	--	--	--	--	--	--	--	--	--	--	--	--
180 kPa	--	--	--	--	--	--	--	--	--	--	--	--
190 kPa	--	--	--	--	--	--	--	--	--	--	--	--
200 kPa	--	--	--	--	--	--	--	--	--	--	--	--

This tab is only shown when data is learned by the ECU. This can be from a learning base fuel table session or from an ignition and knock measurement session.

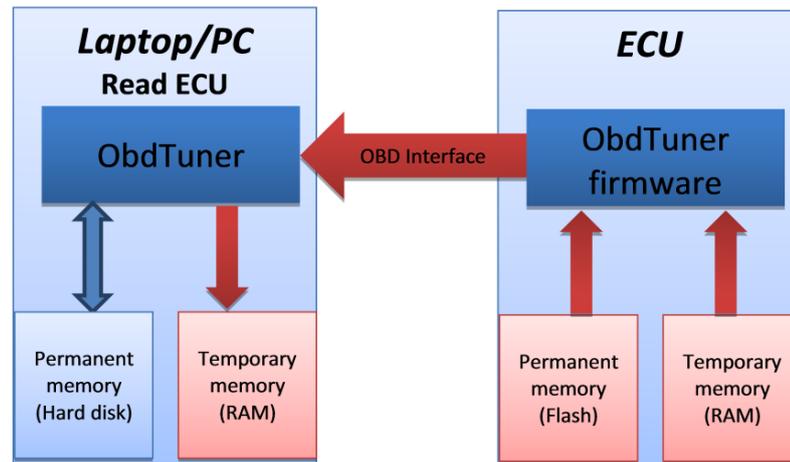
For more information on this see also: [Learning the base fuel table](#)

9. Executing basic tasks

This chapter deals with a number of basic tasks that can be executed with ObdTuner.

9.1 Reading the ECU (synchronizing)

Reading the data from the ECU will be one of the first actions to be done when using ObdTuner. After reading, ObdTuner contains the same data and tables as the ECU does. Also error codes, long term monitors et cetera will be displayed in ObdTuner.

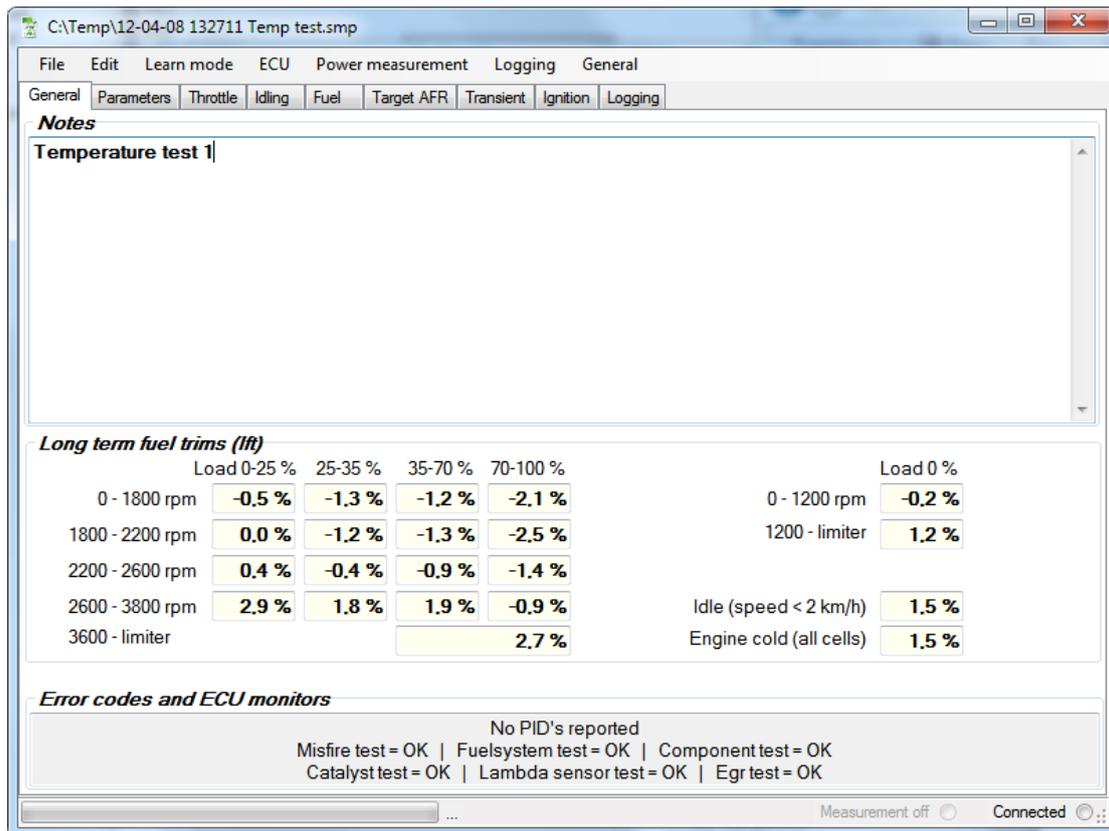


Quick start, reading the ECU (synchronizing)

1. Connect the laptop to the OBD II port of the car. The OBD port is located under the dashboard of the car.
2. Open ObdTuner.
3. Switch the ignition on.
4. Choose *ECU* from the main menu bar and select *Read (ECU to PC)* or press F5
5. ObdTuner will now start reading the calibration from the ECU. The progress can be monitored at the bottom of the screen.



When the reading cycle has finished, a number of extra tabs will appear and the screen should look something like the screenshot below.



Notes can be added in the text field located on the general tab, it is good practice to always add a brief description to your calibration files.

If you want to store the loaded calibration please read: [Saving a calibration file](#)

9.2 Saving a calibration file

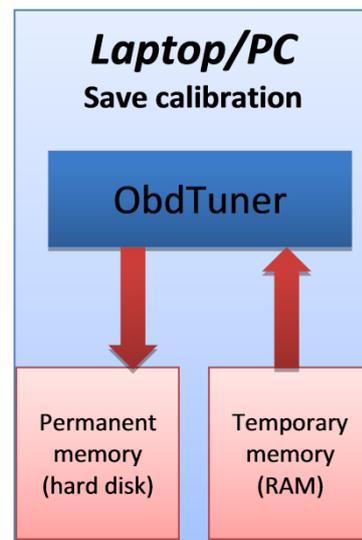
A calibration in ObdTuner can be stored onto your PC or memory stick, to save a loaded calibration:

1. Choose **File** from the main menu bar and select **Save calibration as**. A save dialog with a browser will popup.
2. Browse to the location where you want to save your file and choose **Save**

If this is the first time the ECU has been read it is best to save these settings, this way the original settings can always be restored.

Before saving the calibration, a file name will be prompted.

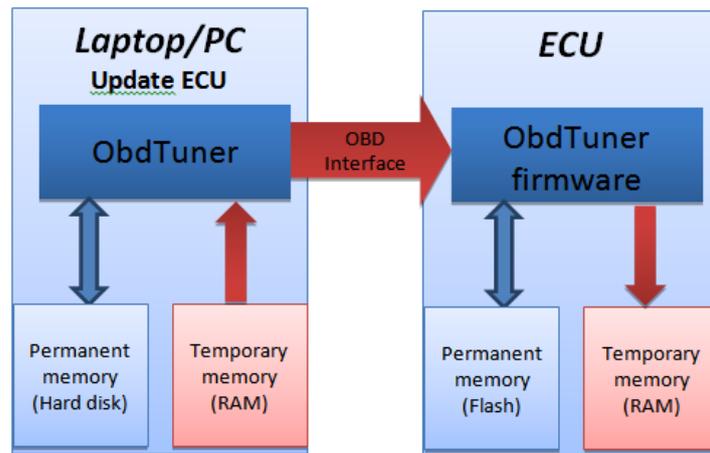
The file name is constructed of the current date, the current time and the first line from the notes text box. If you want another name, simply overwrite the prompted text.



9.3 Modifying a calibration by making use of a calibration file

The ECU calibration can be updated by making use of a calibration file. A calibration file has the file extension **smp** and contains all the necessary data for a complete calibration. Using a calibration file can be very handy as a starting point for your modification. If you have new modification on your engine and you want a good initial calibration for the new setup, contact info@ObdTuner.com When

you supply your license key and engine modifications you will get a new calibration for free.



Quick start, updating the ECU from a calibration file

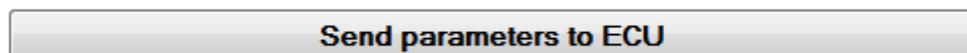
1. Connect the laptop to the OBD II port of the car switch the ignition on.
2. Open ObdTuner.
3. Choose **File** from the main menu bar and select **Open calibration**.
4. Browse to the calibration file and select it.
5. You will be prompted with a question: *Send newly loaded calibration to the ECU?* choose **Yes**
6. ObdTuner will now send the calibration data from your laptop to the ECU. The update process can be monitored by the progress bar and accompanying text at the bottom of the screen.
7. Make the modifications permanent, see also: [Make the changes permanent](#)

9.4 Changing a parameter

The parameter tab contains settings like injector data etcetera. The parameters are the only settings which are not life tunable and are only active after making the changes permanent (programming the ECU).

Quick start, changing a parameter

1. Connect the laptop to the OBD II port of the car.
2. Open ObdTuner.
3. Synchronize ObdTuner with the car.
4. Modify the desired parameter.
5. Press the button 'Send parameter to ECU'



6. **Make the changes permanent**, see also: [Make the changes permanent](#)

Be aware:

- After changing a parameter like fuel mode or throttle body you have to do a full calibration of the ECU.

9.5 Manually adjust the calibration

The calibration can be modified manually by simply typing the new values in.

Quick start, adjusting the calibration manually

1. Connect the laptop to the OBD II port of the car.
2. Open ObdTuner.
3. Synchronize ObdTuner with the car (Press F5).
4. Modify the desired values in the tables.

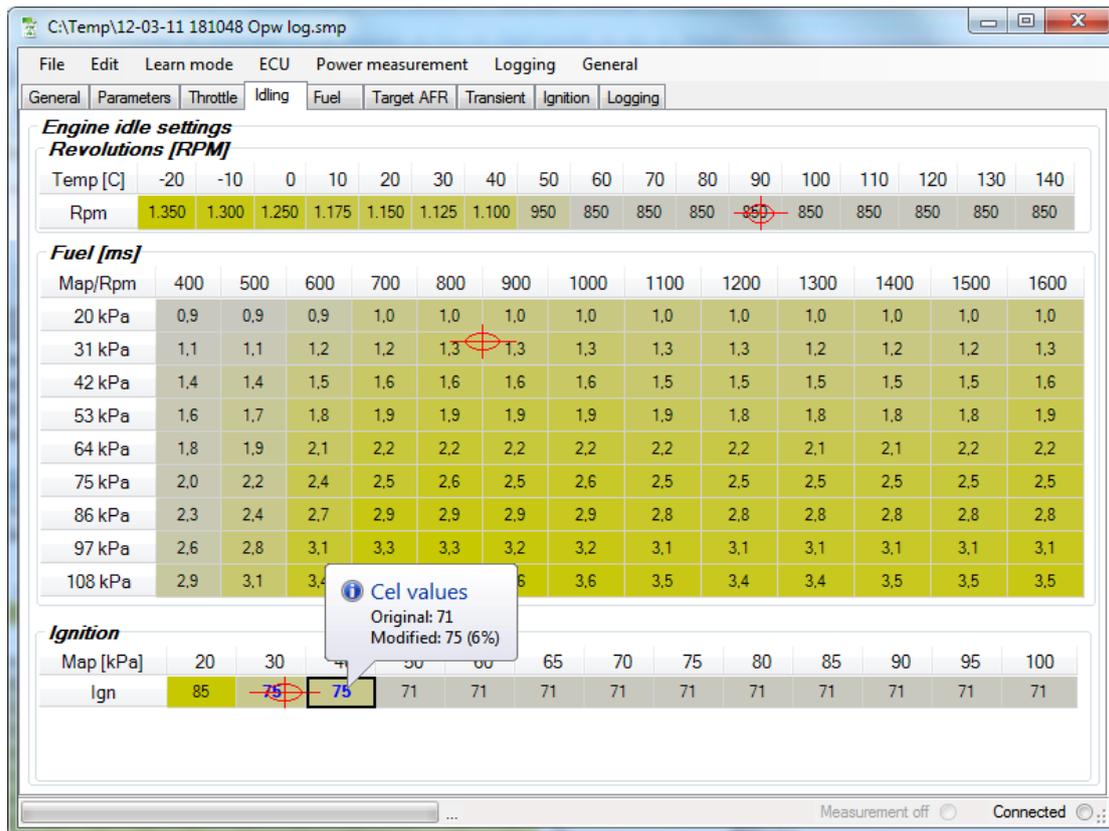
Modifying the calibration this way can be done with the engine running, the changes are affected immediately. This can be very useful when the car is on a rolling road.

It is possible to do your modification offline and later update your ECU by uploading the calibration file to the car, see also: [***Modifying a calibration by making use of a calibration file***](#)

A modified cell can be recognized, by the blue values in the cell. When the mouse pointer is hovered above the cell, an information balloon will appear with adjustment information.

It is also possible to customize multiple cells at once. To do this, select the cells with the left mouse button, and then choose Edit from the main menu bar and select the desired modification method.

If ObdTuner is connected with the car, it is possible to gain insight into the cell of the table that is currently being used. To do this, press F7, after a short period, crosshairs will appear, indicating where the ECU gets its data from; this can be helpful when live adjusting the calibration. Below is an example demonstrating the use of crosshairs during idles.



Please note; the ECU interpolates between the different cells in a table, so if the crosshair hovers between 2 cells, both cells must be changed.

Although the changes will be active immediately, they are not yet made permanent; this means the changes will be lost after switching of the ignition. To make your changes permanent see chapter: [Make the changes permanent](#)

9.6 Make the changes permanent

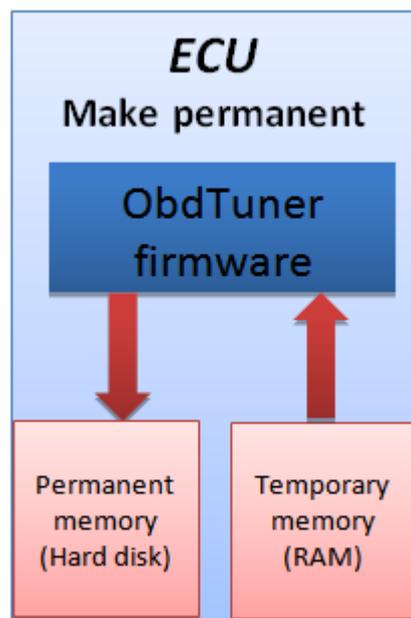
The changes to the calibration can be made permanent. This means they will be there even after the ECU is disconnected from the battery during the winter season or so.

Making the changes permanent is done by moving the changes from RAM to flash memory.

Quick start, making changes permanent

1. Choose **ECU** from the main menu bar and select **Program ECU**.
2. Select **Yes** in the dialog and wait for ObdTuner to synchronize. .

The programming process can be monitored by the



progress bar and accompanying text at the bottom of the screen.

Tip:

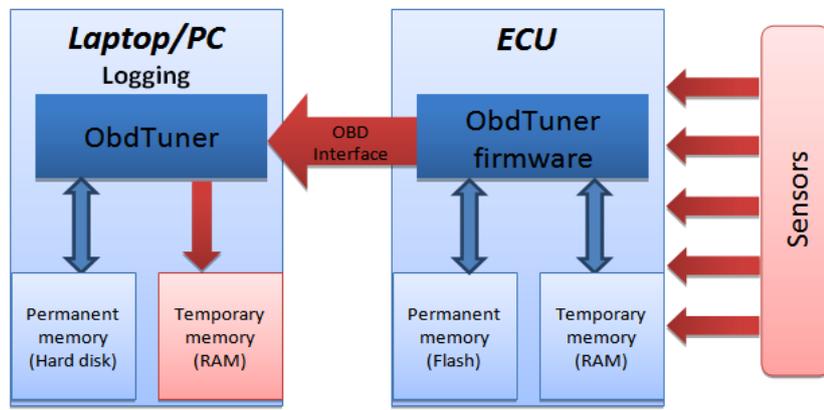
It is no problem to make the changes permanent when the engine is running, but the engine will have a small hiccup for about 1 second and could stall when idling. It is therefore advisable to rev up the engine to about 2000 rpm before making the changes permanent. After the hiccup, the engine may return to idle again.

9.7 Creating a log

With ObdTuner it is possible to collect the sensor data of the ECU and display it in a graph. This is useful for finding malfunctions and verifying if the sensors still work well. It is recommended to create a reference log when there are no problems with the car, this file can then later come in handy as reference data.

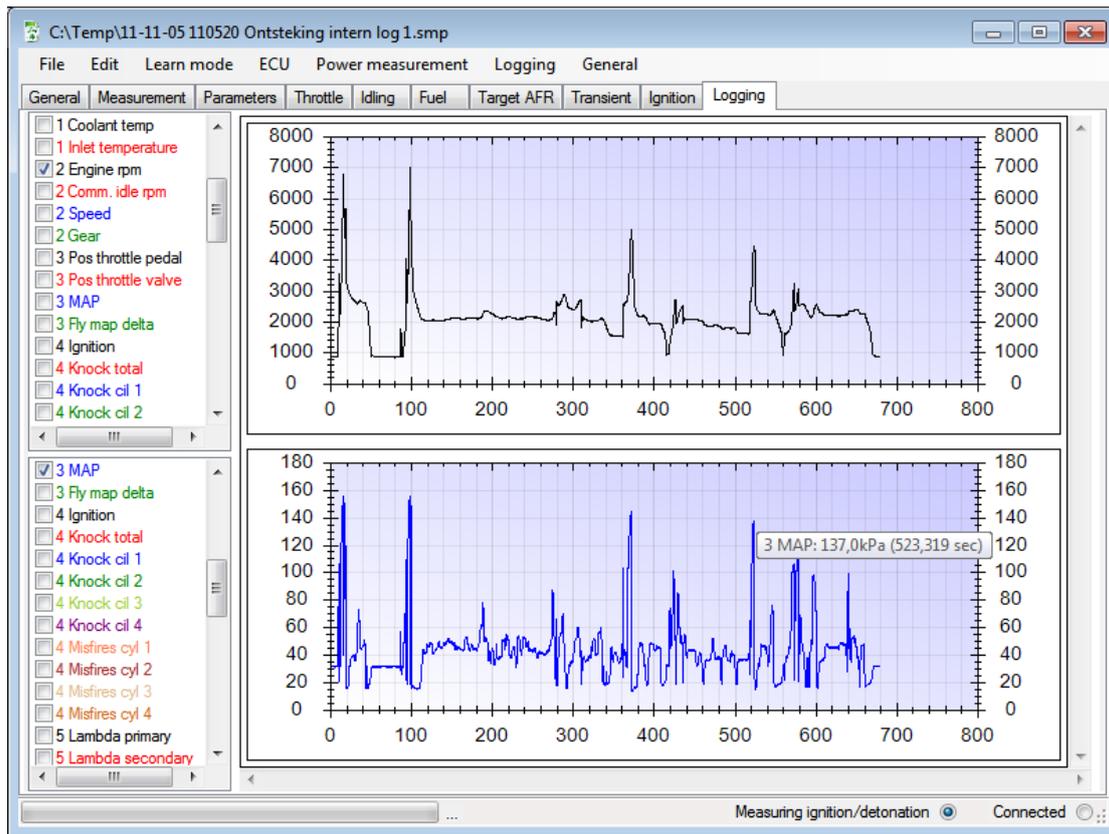
Because all parameters are logged simultaneously, it is not necessary to think about what you want

to view. Afterwards the desired parameters can be made visible by checking the desired parameters and will be displayed in a graph for easy interpretation.



Quick start, creating a log:

1. Connect the laptop to the OBD II port of the car.
2. Open ObdTuner.
3. Switch the ignition on.
4. Choose **Logging** from the main menu bar and select **Start logging**.
5. ObdTuner will first synchronize with the ECU in the car and then start logging. This way the calibration and error data will also be stored together with the logged data,
6. Start the engine and go for a drive, check if the logging is active for instance by selecting the engine RPM or looking at the LED's on the OBD interface.
7. After the drive stop the logging process by choosing **Logging** from the main menu bar and select **Stop logging**.
8. **Do not forget to save the logged data to disk.** See also [Saving a calibration](#) file



It is possible to view the logged data live during logging by selecting the Logging tab and one or more parameters checkboxes. The last 30 seconds of the log file are now live displayed.

The logged data stored in a calibration file can always be viewed by opening the calibration which contains the logged data. After opening the file, select logging tab and select the parameters you want to view.

As visible in the screenshot above, there are 2 graphs available. These graphs are equal in time and it is possible to view parameters with different ranges full screen.

The parameters are divided into numbered groups. The numeric keys can be used for easy selection. Pressing the same button multiple times will select the next parameter; use the spacebar to view the selected parameter.

With the left mouse button it is possible to draw a selection box around an interesting part of the data. After releasing the mouse button ObdTuner will zoom in to the selected region. Un-zooming is possible by clicking with the right mouse button on the chart and select the Un-zoom option.

By clicking on a line on a chart the actual values are displayed in front of the parameter description.

- 90,0 C (1 Coolant temp)
- 22,0 C (1 Inlet tempera
- 4964,8 rpm (2 Engine r
- 2 Comm. idle rpm

With the Ctrl + arrow keys it is possible to walk through the log samples step by step. The current sample is displayed at the bottom next to the progress bar. Also the crosshairs in the tables will be updated by clicking in the chart or by using the

Ctrl + arrows keys.

By hovering with the mouse pointer above a parameter line an info balloon with the current information about the parameter will appear.

For comparing log files, it is possible to start ObdTuner multiple times.

9.8 Learning the base fuel table

By executing a base fuel learning session, the ECU will calculate the necessary corrections for the base fuel table by itself. It will adapt itself to the modifications done to the engine.

When starting a base fuel learning session the ECU's operating mode is changed. In normal operating mode the ECU will change to open loop under higher loads to add more fuel and generate more power, this will lower the combustion temperature and reduce the chance of knock. During the lambda 1 learn session the ECU will be forced to run in closed loop permanently. The ECU will thus always use the feedback from the primary lambda sensor to calculate the necessary corrections. This will lower the power output, increase combustion temperature and increase the chance of knock. Because the ECU uses the primary lambda sensor for calculating the corrections, it is of great importance this sensor functions correctly. Because the ECU does not only use the lambda 1 (0,5V) value of the sensor, it is very important the primary lambda sensor is of the correct type and has the original characteristic.

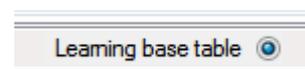
Although no problems have been encountered while using this mode, the user should consider if the particular engine will be able to handle the extra stress of a leaner mixture.

It is advisable to give highly boosted engines some time (30 seconds or more) to recuperate between two full throttle runs and do the full throttle learning in second gear. When in doubt, only use this option for normal driving calibration, and use a wide band sensor to do the full throttle calibration, there is also a method available for calibrating the full power fueling using a wide band sensor, for more info on how to do this, see also: [*Finding the optimum full power fueling using a wide band sensor*](#)

2 Do an ignition learning session with a wideband lambda sensor connected to the EGR input. The output of the wideband sensor (EGR input) is visible the internal knock retard learning measurement tab and can be used for correcting the fuel table.

Quick start, executing a base fuel table learning session:

1. Start the engine and warm-up the engine to its normal operating temperature.
2. Connect the laptop to the OBD II port of the car.
3. Start ObdTuner on the PC.
4. Choose **Learn mode** from the main menu bar and select **Learn base fuel table**.
5. After following the instructions on the screen, learning mode will be enabled.
6. To check if learning mode is enabled, press the throttle pedal, the MIL should now come on, this is an indication the ECU is successfully switched into learning mode. Also



- on the progress bar it will be indicated that 'learning base table' is enabled.
7. Go for a drive until the MIL stays of. While driving the car, it is not necessary to keep your laptop connected to the car, so the laptop can be switched of.
 8. When enough data is gathered, **DO NOT SWITCH OF THE IGNITION**; first read the measurements from the ECU. For more info see also: [Reading the ECU \(synchronizing\)](#)
 9. **Save the learned data to disk**. For more info see also [Saving](#) a calibration file
 10. Click the process measurements button to apply the learned data to the tables.
 11. Make the modifications permanent, see also: [Make the changes permanent](#)

To get a better understanding to what is happening and what you should do during a learning session, please read the section below.

As soon as the ECU enters a situation where not enough data is gathered, the check engine light will be lit. In this case the light doesn't indicate a malfunction; it indicates that the ECU is using a cell from the base fuel table which hasn't had enough measurements to calculate an accurate correction.



The goal of a learning session is to get the MIL to stay off in as many situations as possible.

The inputs for selecting a cell in the fuel table are engine RPM and throttle valve opening (or manifold pressure, if speed density is selected). Therefore it isn't useful to only drive full throttle, the goal is to use as many combinations as possible of throttle and engine RPM. It doesn't matter which gear is being used, so no need for speeding on public roads.

During the measurements the ECU stores all data in the temporary memory. Make sure to **not** turn of the ignition before the measurements are read from the ECU and stored on the PC, otherwise all data will be lost.

As soon as the check engine light doesn't light up any more, or a progress check needs to be done, the laptop/computer can be used to read all measurements from the ECU. See also: [Reading the ECU \(synchronizing\)](#)

After reading the ECU, an extra tab will appear called *Measurements*. This tab contains all the data the ECU has learned up till the moment of synchronization.

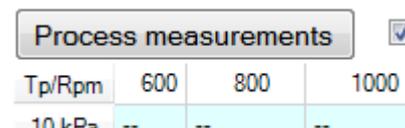
Process measurements	<input checked="" type="checkbox"/> Nr of measurements		<input checked="" type="checkbox"/> Fuel correction		<input type="checkbox"/> Knock retard							
Tp/Rpm	600	800	1000	1200	1400	1600	1800	2000	2200	2400	2600	28
10 kPa	--	--	--	--	--	--	--	--	--	--	--	14 / 7
20 kPa	--	--	15 / 10,9	576 / 10,2	1956 / 9,4	3145 / 9,4	1710 / 10,2	1681 / 10,9	1441 / 11,7	2778 / 9,4	3147 / 12,5	3099
30 kPa	--	905 / 14,1	3082 / 14,1	1401 / 15,6	1937 / 16,4	1714 / 15,6	3175 / 15,6	2657 / 15,6	4196 / 16,4	3924 / 13,3	5854 / 14,8	3319
40 kPa	--	402 / 9,4	1440 / 15,6	1079 / 15,6	1345 / 14,8	1272 / 14,1	1459 / 13,3	2161 / 15,6	2397 / 17,2	2661 / 16,4	6807 / 15,6	2362
50 kPa	--	31 / 10,2	184 / 9,4	327 / 11,7	775 / 13,3	849 / 12,5	912 / 11,7	1365 / 14,1	944 / 16,4	1895 / 15,6	6919 / 14,8	2978
60 kPa	--	2 / 0,0	79 / 14,1	133 / 14,8	339 / 14,8	586 / 12,5	565 / 10,9	638 / 12,5	516 / 14,8	863 / 14,1	1637 / 13,3	998 /
70 kPa	--	--	10 / 10,9	104 / 14,1	196 / 15,6	287 / 12,5	413 / 11,7	278 / 11,7	326 / 11,7	566 / 12,5	727 / 10,9	644 /
80 kPa	--	--	10 / 5,5	9 / 14,8	119 / 10,9	333 / 10,9	176 / 9,4	200 / 9,4	310 / 9,4	381 / 8,6	399 / 8,6	379 /
90 kPa	--	--	33 / 9,4	70 / 12,5	70 / 11,7	67 / 14,8	78 / 13,3	190 / 10,9	274 / 8,6	243 / 10,9	405 / 7,8	469 /
100 kPa	--	--	1 / 1,6	3 / 14,1	24 / 10,2	91 / 14,1	47 / 13,3	76 / 14,8	79 / 9,4	208 / 9,4	347 / 7,8	379 /
110 kPa	--	--	1 / 1,6	4 / 11,7	15 / 9,4	144 / 14,1	265 / 17,2	316 / 17,2	339 / 13,3	285 / 10,9	330 / 8,6	284 /
120 kPa	--	--	--	--	19 / 14,1	80 / 10,9	134 / 14,8	235 / 18,0	155 / 14,1	290 / 9,4	253 / 7,0	283 /
130 kPa	--	--	--	--	--	83 / 16,4	215 / 13,3	212 / 13,3	395 / 9,4	311 / 7,8	263 / 3,9	214 /
140 kPa	--	--	--	--	--	2 / 15,6	85 / 13,3	214 / 11,7	315 / 7,0	540 / 5,5	458 / 6,2	665 /
150 kPa	--	--	--	--	--	--	--	--	91 / -0,8	237 / -0,8	534 / 0,8	742 /
160 kPa	--	--	--	--	--	--	--	--	--	--	--	132 /
170 kPa	--	--	--	--	--	--	--	--	--	--	--	--
180 kPa	--	--	--	--	--	--	--	--	--	--	--	--
190 kPa	--	--	--	--	--	--	--	--	--	--	--	--
200 kPa	--	--	--	--	--	--	--	--	--	--	--	--

Each cell shows the number of measurements the cell has had and behind the slash the calculated fuel correction in %. By checking the checkbox Knock retard also the applied knock retard during the learning session will be shown.

If a cell is green, the cell has enough measurements and the calculated fuel correction is reliable. (For the green cells the MIL will stay of when driving.) The lighter the cell color, the less reliable the calculated correction is.

It is possible to continue learning data as the ECU is still in learning mode. This way it is possible to check progress during learning and see which cells need extra attention.

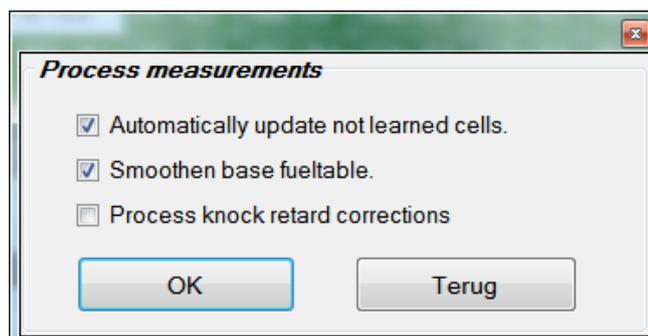
When enough cells are learned (green indicates enough measurements), the learned data can be processed into the tables by clicking the *Process measurements* button.



After clicking the *Process measurements* button, a dialog will appear. Below the options that can be enabled are explained;

Automatically update not learned cells.

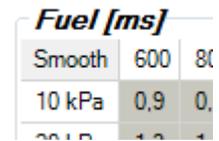
When enabled, ObdTuner will try to calculate the cells which do not have enough measurement by interpolating



and extrapolating the cells that did have enough measurements. It is advisable to leave this option checked.

Smoothen base fuel table.

When enabled, ObdTuner will apply a smoothing algorithm to the base fuel table. This will eliminate spikes in the fuel table. It is advisable to leave this option checked. It is also possible to execute smoothing afterwards by clicking on the smoothening cell in the upper left corner of the base fuel table.



Fuel [ms]		
Smooth	600	800
10 kPa	0.9	0.9

Process knock retard corrections.

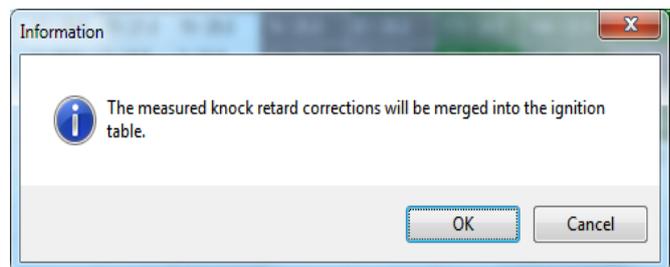
While learning the base fuel table, also the knock retard is monitored and stored. By checking this option, the gathered knock retard data will be merged into the ignition table.

After clicking the OK button, the tables will be updated. When ObdTuner is connected to the car, the tables in the ECU will be updated immediately. The corrections are immediately active, but not stored permanently. To make the changes permanent, see also: [Make the changes permanent](#)

After the learned measurements have been stored, the ECU can be set back to normal mode. Choose **Learn mode** from the main menu bar and select **Stop learning/measuring**. This can also be achieved by simply switching of the ignition; this will also stop the learning session.

9.9 Ignition and knock measurement

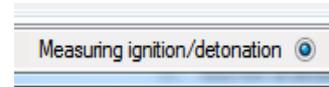
By executing an ignition and knock measurement session, the ECU will measure the total ignition advance, the knock retard and the EGR (for connecting a wideband sensor). In this mode, the ECU will operate completely normal and is not locked into closed loop or anything. The knock retard applied by the ECU is logged and can afterwards be automatically merged into the ignition table. A common misunderstanding is that maximum power is delivered when being as close as possible to the knock retard limit, this is not true. If an engine is not critical for knock, maximum power can be delivered much before the knock retard limit. This method can therefore not be used for auto tuning the ignition for maximum power. Finding the optimum ignition value must be done on a rolling road or by using the build in power measurement function.



Quick start, executing an ignition and knock measurement session:

1. Start the engine and warm-up the engine to its normal operating temperature.
2. Connect the laptop to the OBD II port of the car.
3. Start ObdTuner.

4. Choose **Learn mode** from the main menu bar and select **Ignition and knock measurement**.
5. After following the instructions on the screen, measuring mode will be enabled.
6. To check if measuring mode is enabled, press the throttle pedal. When the engine is running, the MIL should now come on, this is an indication the ECU is successfully switched to measuring mode.
7. Go for a drive until the MIL stays of. While driving the car, the laptop can be switched of.
8. When enough data is gathered, **DO NOT SWITCH OF THE IGNITION**; first read the measurements from the ECU. For more info see also: [Reading the ECU \(synchronizing\)](#)
9. **Save the learned data to disk**. For more info see also: [Saving a calibration file](#)
10. Click the *Process measurements* button, and a dialog will appear. Click OK to apply the learned data to the ignition table.
11. Make the modifications permanent, see also: [Make the changes permanent](#)



For more information please read: [Learning the base fuel table](#) in principle this is the same procedure.

9.10 Calibrating an engine the easy way

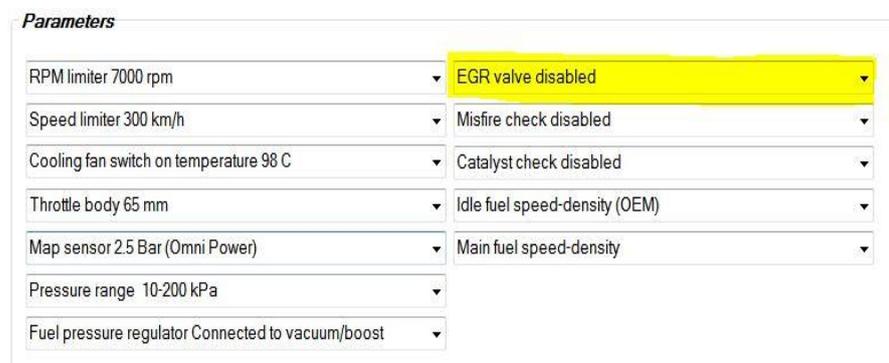
Huge amounts of modification to the engine are possible. These modifications can vary from a simple exhaust change up to mounting a supercharger or a turbo. The easiest way to start is to get a calibration file from someone who has already done the same modifications and is also using this software. The calibration files are not copy protected and can be freely changed between cars. Upload this file into your ECU, and: [Make the changes permanent](#). If you have the exact same engine modifications done to your engine, the mapping will be very close to optimum, providing the copied map was accurate.

9.11 Connecting a wideband sensor

It is possible to use the EGR input for connecting a wideband lambda sensor. Of course this can only be done when the engine not uses the EGR valve. The input of the sensor is not used by the ECU for calculating the fuel mixture. It is only made visible in a number of screens to make

it easy to manually correct the fuel tables.

To use the EGR input as wideband input, first the EGR

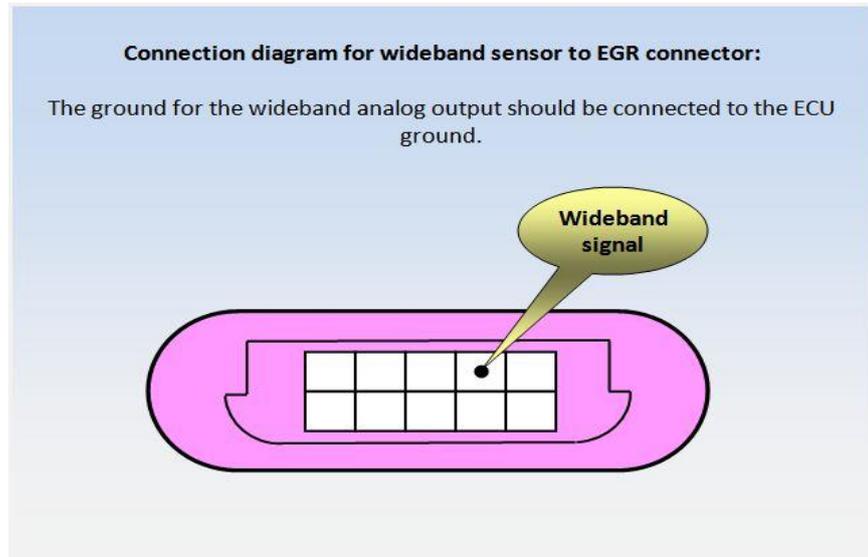


valve has to be disabled. Disabling the EGR valve can be done on the parameters tab.

The input of the EGR valve, in this case the analog output of the wideband sensor must be connected to the EGR connector as shown here. This input can be monitored in the data logging, in the 'ignition and knock learning' measurements when active and also in the power measurement graph.

Default the voltage measured from the EGR input is displayed one on one, but it is possible to display a more human readable value. For this the desired conversion formula can be configured on the settings form.

Choose general from the main menu and select Settings. On the settings screen



go to the 'EGR input conversion formula' section, here you can configure the low and high voltage and the accompanying AFR values coming from the wideband controller. Choose AFR from the combo box so the software knows there is a wideband lambda sensor connected to the EGR input.

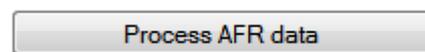
Screenshot with default values for the Innovate LC1 controller

EGR input conversion formula

EGR input used for:	AFR	measurement
EGR input voltage low:	0,00 V	= 7,35 AFR
EGR input voltage high:	5,00 V	= 22,39 AFR
Sensor delay:	90 ms	

When AFR is selected and a power measurement is executed, the button 'Process AFR data' on the power measurement tab will be enabled.

When pushed, the wide open throttle fuel cells will be corrected so the commanded AFR values will be reached.

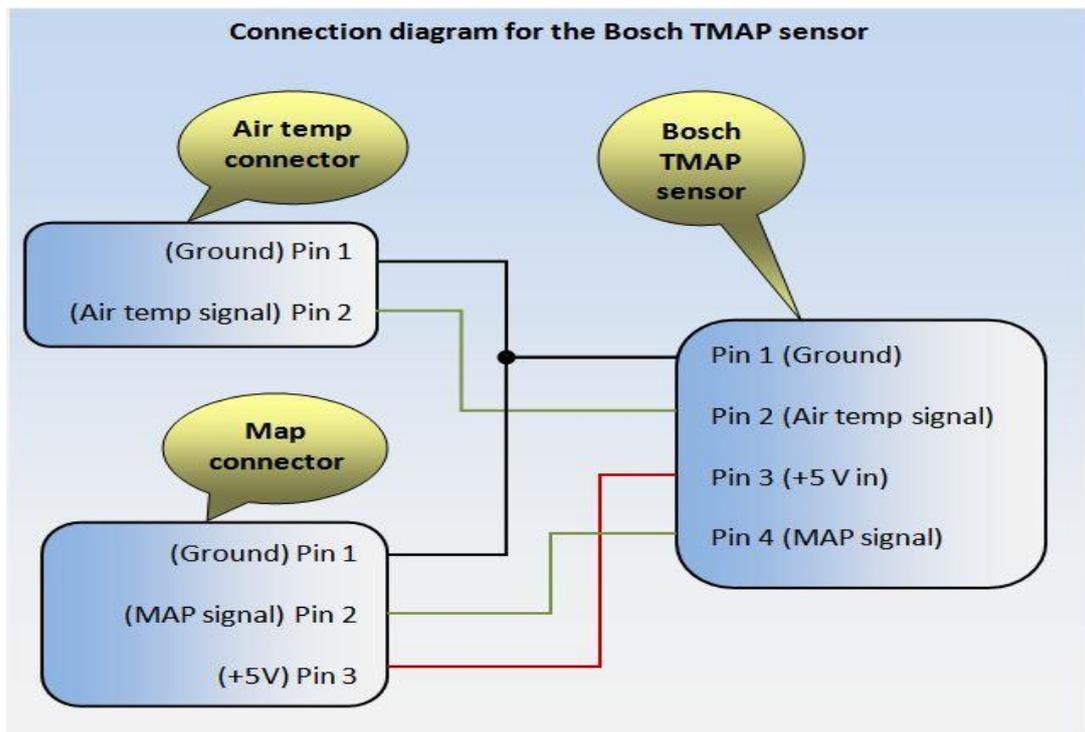


9.12 Connecting a TMAP sensor

This modification is only useful for boosted engines.

Because the MAP sensor delivers highly important information for the ECU, the new connections must be made properly and securely.

Good results have been seen with the standard inlet air temperature sensor (IAT) mounted between the air filter and throttle body, however for true speed density it is necessary for the ECU to measure the temperature of the compressed air going into the engine. This can be achieved by using a combined air-temperature and manifold pressure sensor (TMAP). At the moment there are 2 TMAP sensors configurable in ObdTuner. Both sensors are from Bosch and they should be connected like the diagram below:



Because the wire colors can differ between cars, the best way to find the air temperature signal wire is by measuring the voltages with a multi meter. Switch on the ignition and measure the voltages on the air-temp connector with the sensor disconnected. IAT pin 1 = 0V and IAT pin 2 = 5V

On the parameters tab select the Bosch sensor for intake air temperature. Do not forget to send the parameters to the ECU and program the ECU to make the changes permanent.



After changing from standard air temperature measurement to boost temperature measurement, one has to do a fuel learning session.

You can check if everything is connected correctly by making a log file with the engine not running. In the log file the air temperature should display the ambient temperature, and the MAP value should display the barometric pressure.

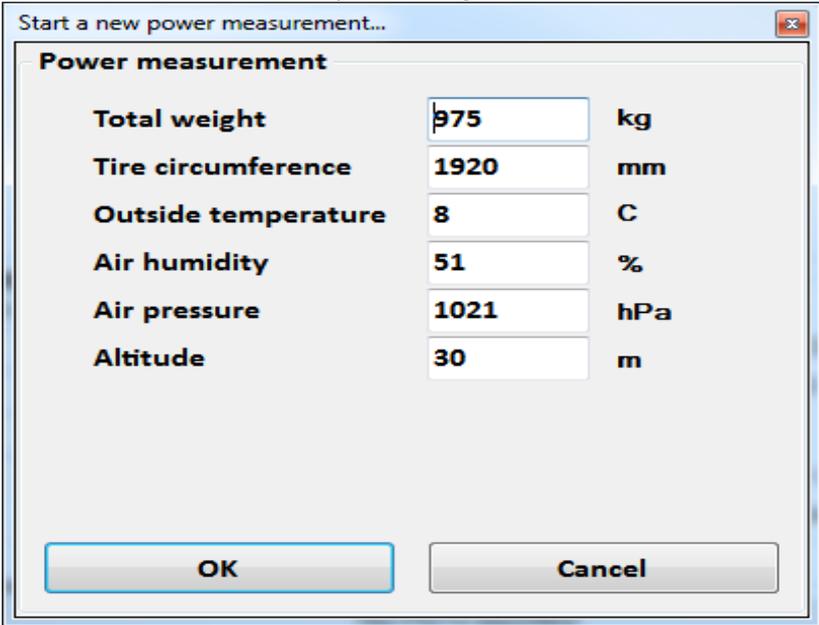
9.13 Power measurement

The purpose of the power measurement option is to measure the difference between modifications or calibrations. For a reliable power measurement, runs in both directions are advised. This way the measurement is corrected for wind and elevation of the road etc. The more runs the better, 2 runs in both directions is advised. It also is important to find a piece of road with an even surface because bumps will have a negative effect on the measurement and will be visible as bumps in the power graph.

It has proven that, if all data is put in correctly, the power measurements are reproducible over a long period of time. However the power measurement is not meant to be used for calculating the exact horsepower of the engine, its intended use is to see where power is gained or lost between modifications or settings.

Quick start, executing a power measurement:

1. Connect the laptop to the OBD II port of the car.
2. Open ObdTuner.
3. Start the engine and warm-up the engine to its normal operating temperature.
4. Choose **Power measurement** from the main menu bar and select **Start a new power measurement**.
5. A dialog will appear, fill in the data and click OK. If you do not have the correct data available, the data can always be changed afterwards.



Power measurement		
Total weight	975	kg
Tire circumference	1920	mm
Outside temperature	8	C
Air humidity	51	%
Air pressure	1021	hPa
Altitude	30	m

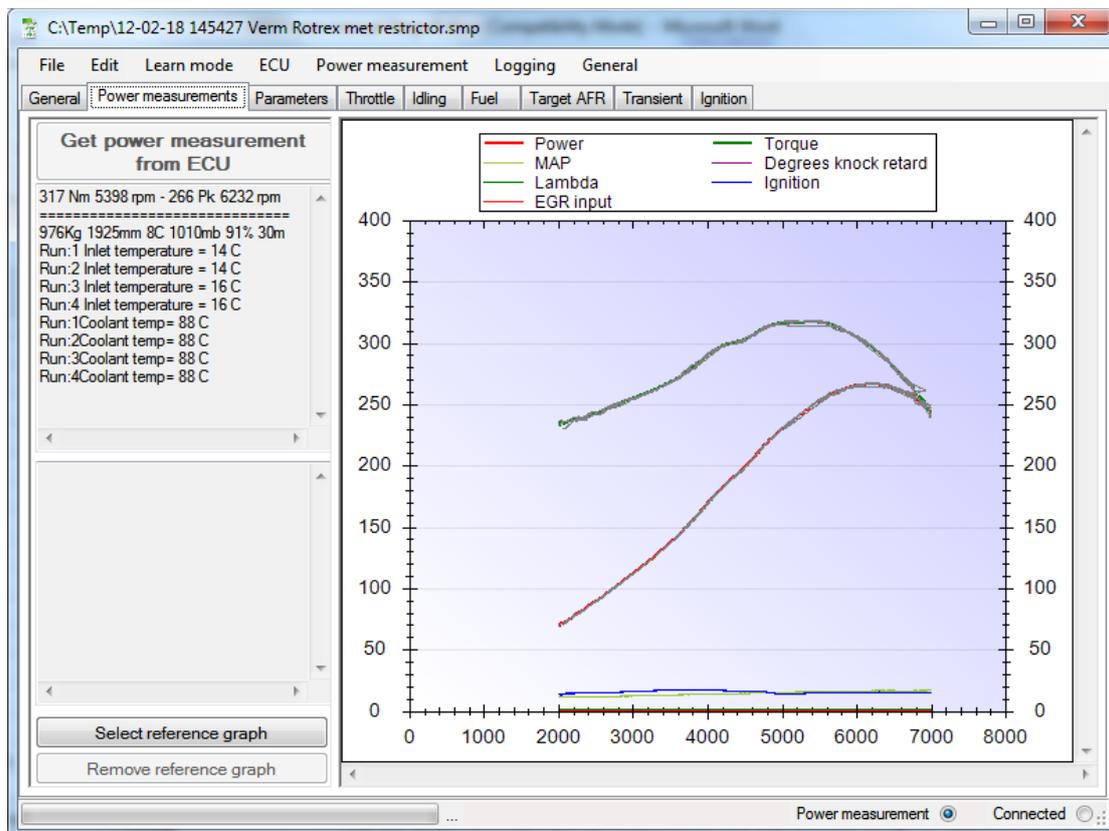
OK Cancel

6. The ECU will be put into power measurement mode and the tab *Power measurement* will be selected.

7. Drive the car in second gear and the engine revving at approximately 1500 rpm.
8. Now squish down the throttle pedal to full throttle, do not smash the throttle down, because this will make the car rock and this will give a bad reading in the early part of the measurement.
9. The measurement will automatically start when full throttle is reached, and will stop as soon as the throttle is released. So when the desired rpm is reached, release the throttle pedal and shift to a higher gear and cruise. Do not shift and give full throttle again; this will ruin your measurement.
10. Now read the power measurement from the ECU by clicking the *Get power measurement from ECU* button. Pressing the space bar will also do the trick.
11. When the power measurement is read from the ECU, a graph will be displayed and the ECU is ready for another measurement.
12. Repeat step 8 through 11 for 2 runs in both directions (4 runs in total) to eliminate wind and elevation of the road.
13. Save the power measurement to the PC, for more info see also: [Saving a calibration file](#)

Tip: All power measurements steps can be confirmed by pressing the space bar, no need to fiddle with the mouse pad.

After the above steps, the power measurement tab should look something like this. If there are strange bumps in the graph, probably the road surface was too bumpy.



Below some extra info on what to fill into the power measurement dialog:

Total weight

The total weight is the weight of the car including everything in it during the power measurement. This includes the driver weight, the passenger weight, the amount of fuel etc. For instance a standard VX220 weighs about 880 Kg with a full tank of gas, so if the measurement is done with a full tank of gas, a driver of 80 Kg and 10 Kg of stuff in the boot, the value to put into the edit field will be $880 + 80 + 10 = 970$ kg.

Measuring the tire circumference

The tire circumference must be measured on the rear wheels, using the values on the tire has been proven to be very inaccurate.

An easy way to measure the tire circumference is by the use of some masking tape and a tape measure. Place a piece of masking tape on the bottom of the tire near to the ground and another piece of tape precisely below the tape on the tire onto the road surface. Now move the car for precisely one revolution of the rear tire and again place a piece of tape onto the road surface below the piece of tape on the tire. Measure the distance between the two pieces of tape on the ground and you will have the value you can fill in the tire circumference field.

Outside temperature, Air humidity and air pressure

These values can be measured yourself or can be found on the internet. A very useful site with the weather information: <http://www.wunderground.com/>

This website gathers weather conditions from all over the world with intervals from 2 to 3 times an hour.

Removing a faulty run

It is possible to remove a faulty run (afterwards), go to the *Power measurement* menu and select *Modify currently loaded power measurement*. A dialog with a *remove run* button will appear. Select the run you want to remove and click the button. You can check which run is faulty by hovering your mouse pointer over the faulty graph; an info balloon will pop up with the run number in it.

Power measurement		
Total weight	975	kg
Tire circumference	1920	mm
Outside temperature	15	C
Air humidity	75	%
Air pressure	1000	hPa

Run 1 Remove run

Use values for power measurements

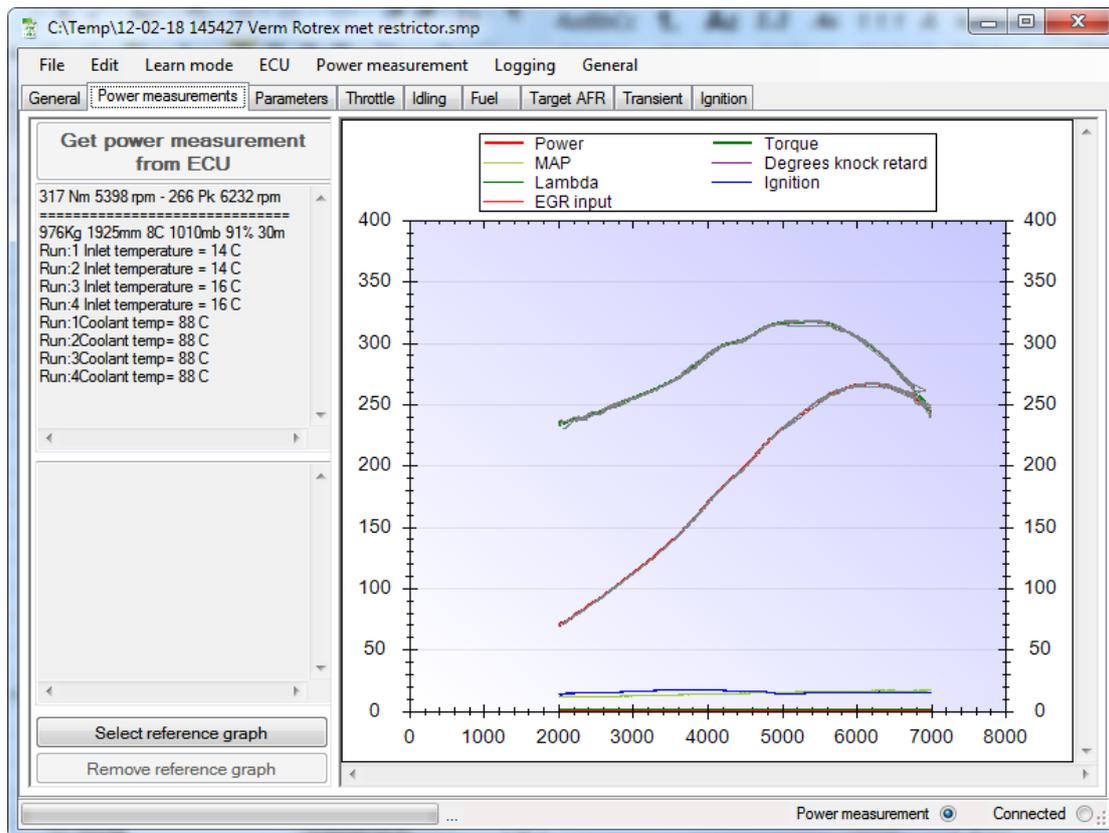
OK Cancel

If the *Use values for power measurements* is checked, the current data is stored and will be used for future measurements.

Using the power measurement results

A power run contains more data than meets the eye, on the left side of the screen the one time measurements like inlet temperature and coolant temperature are displayed. Also a

summary of the data filled into the power measurement dialog is displayed. Also the mean maximum power and mean torque calculated from the data is displayed here.



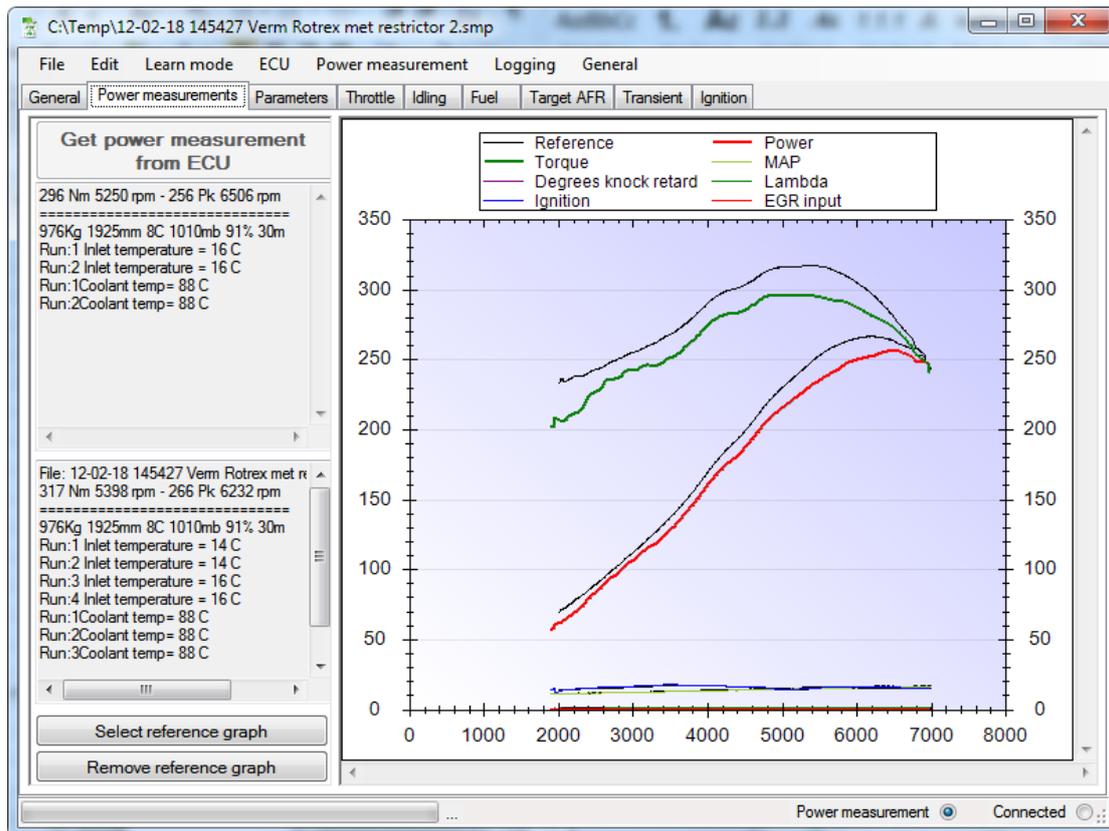
In the power graph itself the gathered run data is displayed. Below is a summary of the gathered data during a power run:

- Power (HP)
- Torque (Nm)
- MAP (manifold air pressure in kilopascal)
- Degrees knock retard
- Lambda Voltage (primary sensor)
- Ignition advance
- EGR input voltage

When more than one run is logged, all the individual runs are displayed in gray, the average data is displayed through a colored line.

By hovering with the mouse pointer over the graph lines, an information balloon will pop up with extra information.

One of the more handy functions of the power measurement function is to compare 2 power runs with each other. It is possible to load a second power measurement by clicking the *Select reference graph* button and browse to the calibration file containing the power measurement. After this, both the graphs are displayed over each other and differences between the runs can be easily spotted.



With the use of the left mouse button a selection can be drawn to zoom in to the lower part of the graph. Here the boost, knock retard etc. can be found.

9.14 Finding the optimum ignition timing for full power using the build in power measurement

It is not very difficult to find the optimum ignition timing; this is where the build in power measurement comes in handy.

Start:

1. Start by making a power measurement with the current calibration, and save the file on your computer. For more information see also: [Power measurement](#)
2. When the power measurement is saved, select the ignition tab and select all the cells from 90 kPa to the maximum map values. Selecting cells must be done with the mouse; point to the starting cell and hold down the left mouse button and drag the mouse over the cells you would like to select. The selected cells will turn blue. If the screen is too small for showing the entire rpm range, the screen can be scrolled and the rest can be selected while holding the **CTRL** key down. Make sure the entire rpm range is selected, after selecting the screen should look something like the screen below.

CaTemp\12-02-18 145427 Verm Rotrex met restrictor.smp

File Edit Learn mode ECU Power measurement Logging General

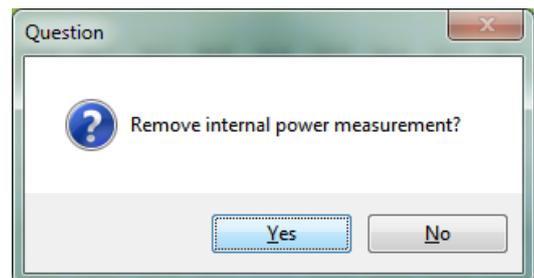
General Power measurements Parameters Throttle Idling Fuel Target AFR Transient Ignition

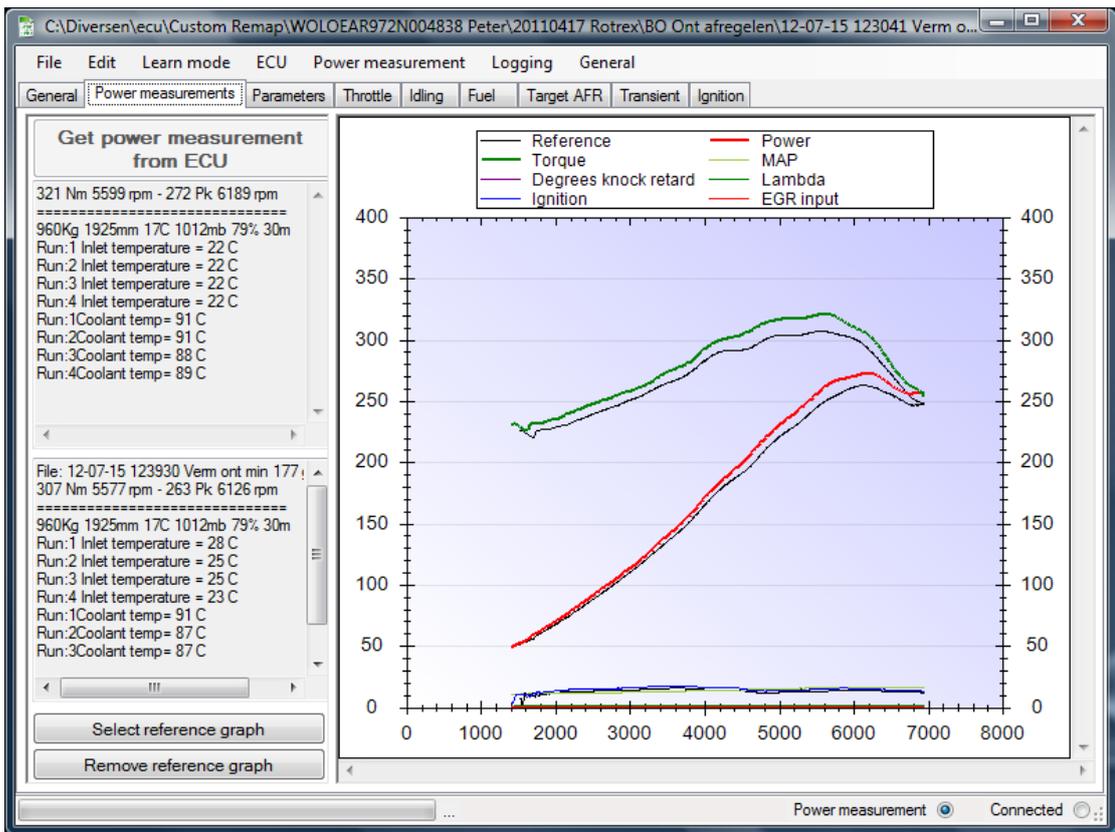
Ignition [degrees]

Map/Rpm	600	800	1000	1200	1400	1600	1800	2000	2200	2400	2600	2800	3000	3200	3400	3600	3800	4000	4200	4400	4600	4800	5000	5200	5400	5600	5800	6000	6200	6400	6600	6800	7000	7200	7400	7600	7800
10 kPa	18.1	19.8	21.6	23.4	25.1	26.9	30.1	32.9	34.3	35.0	36.1	37.9	40.0	40.0	40.4	40.0	41.1	41.1	41.1	41.1	41.1	41.1	41.4	41.8	42.1	42.1	42.1	42.5	42.8	42.8	43.9	44.6	45.0	45.7	46.0	46.4	46.7
20 kPa	19.8	20.9	20.9	21.6	23.0	24.1	28.0	28.7	31.2	32.6	33.6	35.4	37.5	38.6	38.6	37.9	39.6	38.9	39.6	40.0	40.0	40.0	40.4	41.1	41.1	42.5	42.1	42.1	42.1	42.1	42.1	42.8	43.2	43.9	44.2	44.6	45.0
30 kPa	11.0	13.1	15.6	16.6	22.7	23.4	28.7	29.0	31.5	31.5	31.5	31.9	35.0	35.4	36.1	35.4	36.1	37.2	37.2	37.9	37.9	37.9	38.6	38.9	40.0	40.4	41.1	41.4	41.8	41.4	41.8	41.8	42.1	42.8	43.2	43.5	43.9
40 kPa	9.6	12.4	14.2	17.3	24.1	24.4	29.4	29.4	31.5	32.6	32.9	32.9	33.6	34.0	34.0	33.6	35.0	35.0	35.0	35.0	36.1	35.0	35.4	36.1	37.2	37.9	38.6	38.9	39.3	39.6	40.0	40.4	40.7	41.4	41.8	42.1	42.1
50 kPa	8.1	12.4	14.5	21.6	24.1	25.5	26.6	29.4	31.2	31.2	30.4	30.1	30.1	30.4	30.4	30.4	31.2	31.2	31.2	31.2	31.5	31.9	31.9	31.5	32.9	33.6	34.0	34.3	35.0	36.1	36.1	36.5	37.2	37.5	37.9	37.9	
60 kPa	6.0	12.4	18.1	20.9	24.1	25.1	25.5	28.0	28.0	27.6	28.0	28.7	28.7	28.7	29.0	28.7	29.0	27.6	26.9	26.9	28.7	29.0	28.7	28.3	30.1	31.2	31.2	31.9	32.9	33.6	35.0	35.4	36.1	36.5	36.5	36.5	36.5
70 kPa	3.9	11.0	18.1	18.4	21.6	23.4	25.1	25.5	25.1	23.4	24.4	25.5	26.6	27.6	27.6	26.6	26.9	25.1	24.8	25.1	25.1	25.5	25.8	25.5	24.8	26.6	27.6	28.0	28.7	30.4	31.9	32.9	33.6	34.3	34.3	34.3	
80 kPa	3.9	8.8	13.1	17.0	16.6	19.1	19.8	19.8	20.9	20.9	20.9	21.6	23.0	23.0	23.0	24.1	21.6	20.9	20.5	20.9	21.6	21.6	22.7	22.3	22.7	23.0	24.1	24.8	25.5	28.0	29.0	30.1	30.4	30.4	30.4	30.4	
90 kPa	3.9	8.1	8.8	9.9	12.4	13.1	16.6	17.3	18.8	17.3	18.4	19.8	19.8	19.8	19.5	19.8	19.1	20.2	19.8	19.1	19.5	19.5	20.9	20.9	19.8	21.2	21.9	22.7	23.4	25.1	25.1	26.9	26.9	26.9	26.9	26.9	26.9
100 kPa	6.0	6.0	6.0	6.0	8.5	11.0	12.4	14.9	14.9	15.6	16.3	17.0	17.0	17.3	18.1	18.4	18.4	18.1	19.1	20.5	18.8	17.7	18.4	18.1	19.1	19.8	19.8	19.8	21.2	22.3	22.7	23.4	23.4	23.4	23.4	23.4	23.4
110 kPa	6.0	6.0	6.0	6.0	8.5	10.6	12.0	14.5	14.5	15.2	15.9	16.3	17.0	17.3	17.7	18.1	17.7	17.7	18.4	19.5	17.7	17.0	17.3	17.0	18.4	19.1	19.1	19.1	20.5	21.2	20.9	21.2	20.9	20.5	20.2	19.8	19.5
120 kPa	6.0	6.0	6.0	6.0	8.1	9.9	11.0	13.5	13.5	14.2	14.5	15.6	16.3	16.6	17.3	17.3	17.3	17.0	17.3	17.7	15.9	15.6	16.3	16.3	17.3	18.8	19.1	19.1	19.8	19.1	17.7	17.0	16.6	16.3	15.9	15.6	15.2
130 kPa	6.0	6.0	6.0	6.0	8.1	9.6	10.6	13.1	13.1	13.8	14.2	15.2	15.9	16.6	17.3	17.3	17.0	16.3	16.6	16.6	14.5	14.9	16.3	15.9	17.3	18.1	18.4	18.1	18.8	17.3	14.9	14.2	13.8	13.5	13.1	12.7	12.4
140 kPa	6.0	6.0	6.0	6.0	8.1	9.6	10.6	12.7	12.7	13.5	13.8	14.9	15.6	16.3	17.0	17.0	16.6	16.3	16.3	14.2	14.2	15.6	15.9	16.6	17.3	17.3	16.6	17.3	14.5	13.5	13.1	12.7	12.4	12.0	11.7	11.3	11.3
150 kPa	6.0	6.0	6.0	6.0	8.1	9.6	10.6	12.7	12.4	13.1	13.5	14.5	15.2	15.9	16.6	16.6	16.3	15.9	15.9	15.9	13.8	13.5	14.9	14.9	15.9	15.9	16.3	15.6	15.9	14.2	11.3	11.3	11.0	10.6	10.3	9.9	9.6
160 kPa	6.0	6.0	6.0	6.0	8.1	9.6	10.6	12.7	12.0	12.7	13.1	14.2	14.9	15.6	16.3	16.3	15.9	15.6	15.6	15.6	13.5	13.1	14.5	14.5	15.2	15.6	15.6	15.2	15.6	13.1	9.9	9.9	9.9	9.9	9.9	9.6	9.2
170 kPa	6.0	6.0	6.0	6.0	8.1	9.6	10.6	12.7	11.7	12.4	12.7	13.8	14.5	15.2	15.9	15.9	15.6	15.2	15.2	15.2	13.1	12.7	13.8	14.2	14.9	15.2	15.2	14.9	15.2	12.7	9.6	9.6	9.6	9.6	9.6	9.2	8.8
180 kPa	6.0	6.0	6.0	6.0	8.1	9.6	10.6	12.7	11.3	12.0	12.4	13.5	14.2	14.9	15.6	15.6	15.2	14.9	14.9	14.9	12.7	12.4	13.5	13.8	14.5	14.9	14.9	14.5	14.9	12.4	9.2	9.2	9.2	9.2	9.2	8.8	8.5
190 kPa	6.0	6.0	6.0	6.0	8.1	9.6	10.6	12.7	11.0	11.7	12.0	13.1	13.8	14.5	15.2	15.2	14.9	14.5	14.5	14.5	12.4	12.0	13.1	13.5	14.5	14.5	14.5	14.2	14.5	12.0	8.8	8.8	8.8	8.8	8.8	8.5	8.1
200 kPa	6.0	6.0	6.0	6.0	8.1	9.6	10.6	12.7	11.0	11.7	11.7	12.7	13.5	14.2	15.9	14.9	14.5	14.2	14.2	14.2	12.0	11.7	12.7	13.1	14.2	14.2	14.2	13.8	14.2	11.7	8.5	8.5	8.5	8.5	8.5	8.1	7.8

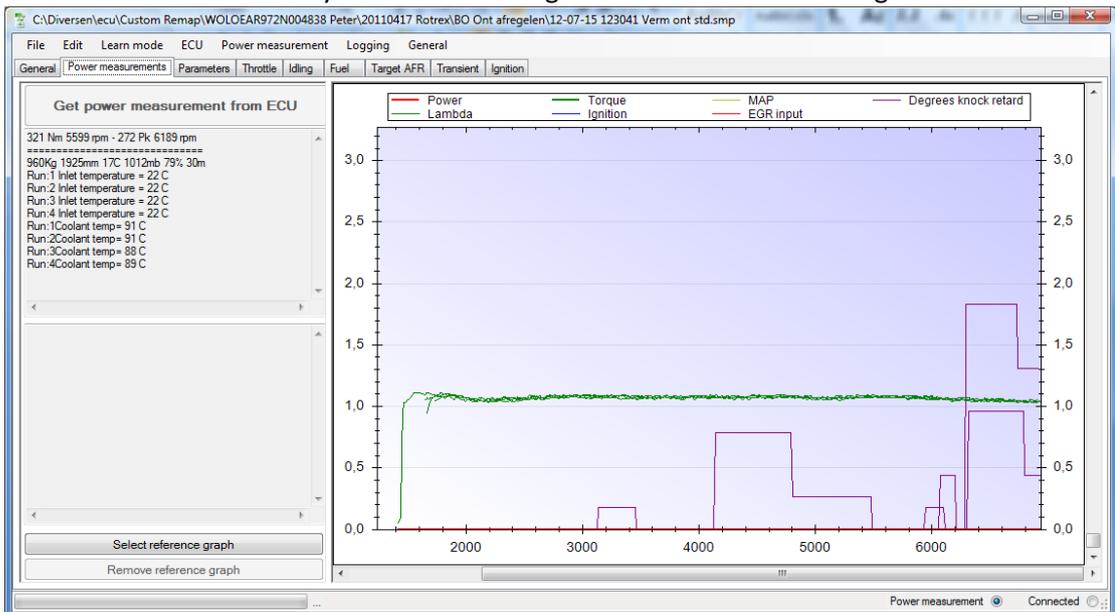
Power measurement Connected

- Choose **Edit** and **Edit selection absolute** from the main menu bar then click **1.77**. This will increase the selected ignition cells with 1.77 degree.
- Wait for changes to be sent completely to the ECU. The progress can be monitored on the bottom of the screen.
- You will be asked if you would like to remove the current internal power measurement, click **Yes**, otherwise the next power measurements will be added to the current power measurements.
- Now again do a power measurement with the new increased ignition setting and save this file also to disk. Tip: Put some comment into the **Notes** text field on the **General** tab, like "Ignition +1.77" this will also be used for in your proposed file name and it makes recognizing what the file is about much easier.
- Now we are going to compare the previous measurement with the new measurement. Click on the **Select reference graph** button, this will open a file browser. Open the previous made base power measurement file.





8. The screen should now look something like the picture above. It is clearly visible; advancing the ignition with 1.77 degrees gives extra power in this case. If you get closer to the optimum ignition value, the power will not increase over the whole rpm range but only for example above 5000 rpm. If this is the case, only increase the ignition for the map/rpm range above 5000 rpm.
9. Double click on the purple line at the bottom of the power measurement graph and check if the ECU has applied knock retard. The purple line is the applied knock retard. In this screen you can see if the ignition is critical and if the ignition should be



- retarded in some regions. Note, the ECU is very sensitive when it comes to knock detection; a knock retard of up to 0.5 degree is no problem.
10. Repeat the steps above until power do not increase anymore or until too much knock retard is visible. At this point you have reached the optimum ignition advance for max power.
 11. It is advisable to build in a margin of about 1 degree ignition advance. So when arrived at optimum ignition, select all the cells above 90 kPa and choose **Edit** from the main menu bar, choose **Edit selection absolute** and select **-1,06**. This will decrease the total full power ignition advance with 1,06 degree.
 12. Save the file and make it permanent: *Make the changes permanent*

9.15 Finding the optimum full power fueling using a wide band sensor

If you think the engine cannot handle the extra stress of a lambda 1 learning session in the wide open throttle area and you have a wide band sensor connected to the EGR input, you can use this method. With this method the engine will not run lean provided your fuel supply system is big enough and you start with a rich enough mixture. Make sure your wideband sensor is connected and configured correctly; for more information see also: *Connecting a wideband sensor*

Make sure your base fueling table is correct, when in doubt; do a fuel learning session, **no need to go into the wide open throttle regions**. The learning session is necessary to get a correct base fuel table so the fuel trims are stable during closed loop driving and will not influence the open loop running. (For more info on how to do a fuel learning session see also: *Learning the base fuel table*)

It is very important to put in the correct EGR input settings. When in doubt, make a log file and look at the AFR values during cruising, these must be around 14.7 AFR.

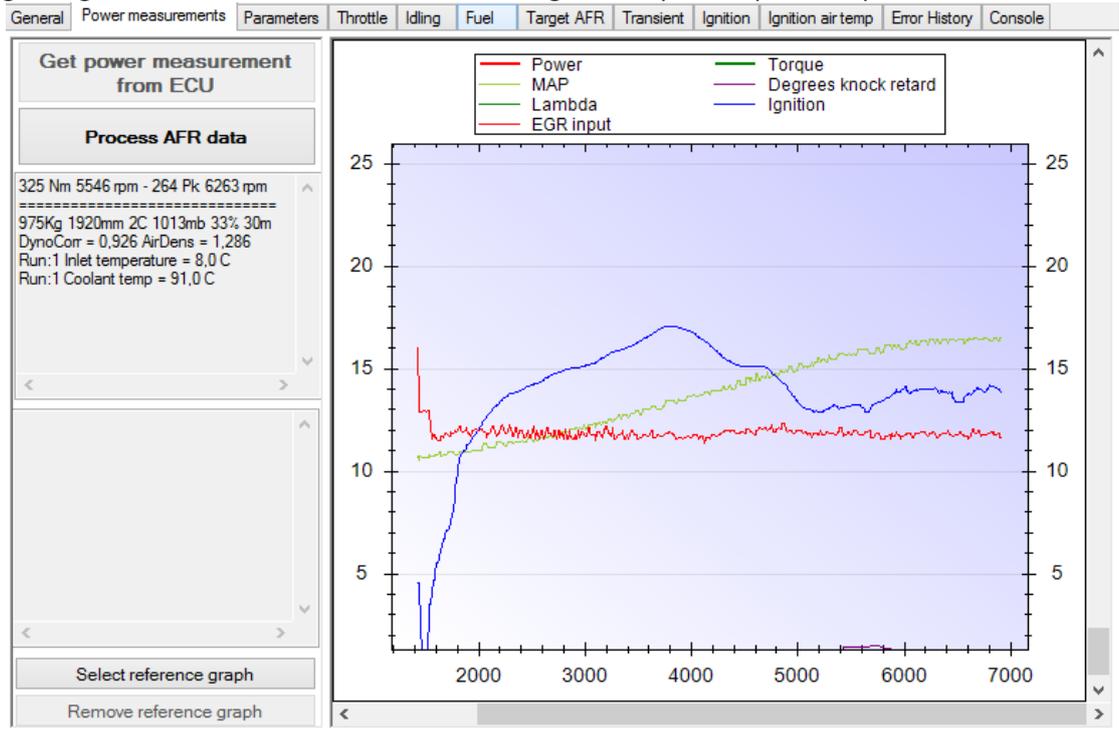
Default settings for an Innovate LC 1 wideband sensor:

<i>EGR input conversion formula</i>					
EGR input used for:	AFR		measurement		
EGR input voltage low:	0,00	V	=	7,35	AFR
EGR input voltage high:	5,00	V	=	22,39	AFR
Sensor delay:	90	ms			

Start:

1. Do a power measurement; for more information see also: *Power measurement*. Tip: because we are only interested in the AFR data, it is not necessary to make runs in both directions, one rpm sweep per AFR correction will be enough.
2. Double click on the EGR input line in the bottom of the power graph, the red line is the voltage coming from the EGR input; in this case it is the output from the Wideband Lambda sensor. The EGR input is logged 64 times every second and will

give a good idea of the actual AFR value during the full power rpm sweep.



3. Save the measurement and push the 'Process AFR data' button.
4. The software will calculate the necessary corrections and will update the fuel table according to the measured AFR and the programmed commanded AFR values.
5. Wait for the changes to be sent completely to the ECU. The progress can be monitored on the bottom of the screen.
6. Depending on how far the fuel values were off, it can be necessary to repeat the above steps a few times.
7. It is advisable to smoothen the table values in the fuel table to get a fluent transition between the closed loop and full power fueling. This can be done manually or by clicking the **smooth** button in the left upper corner of the fuel table.
8. Save the file and make it permanent in the ECU, see also: [Make the changes permanent](#)

Fuel [ms]		
Smooth	600	80
10 kPa	0,9	0,1
AFR	14,7	14,7

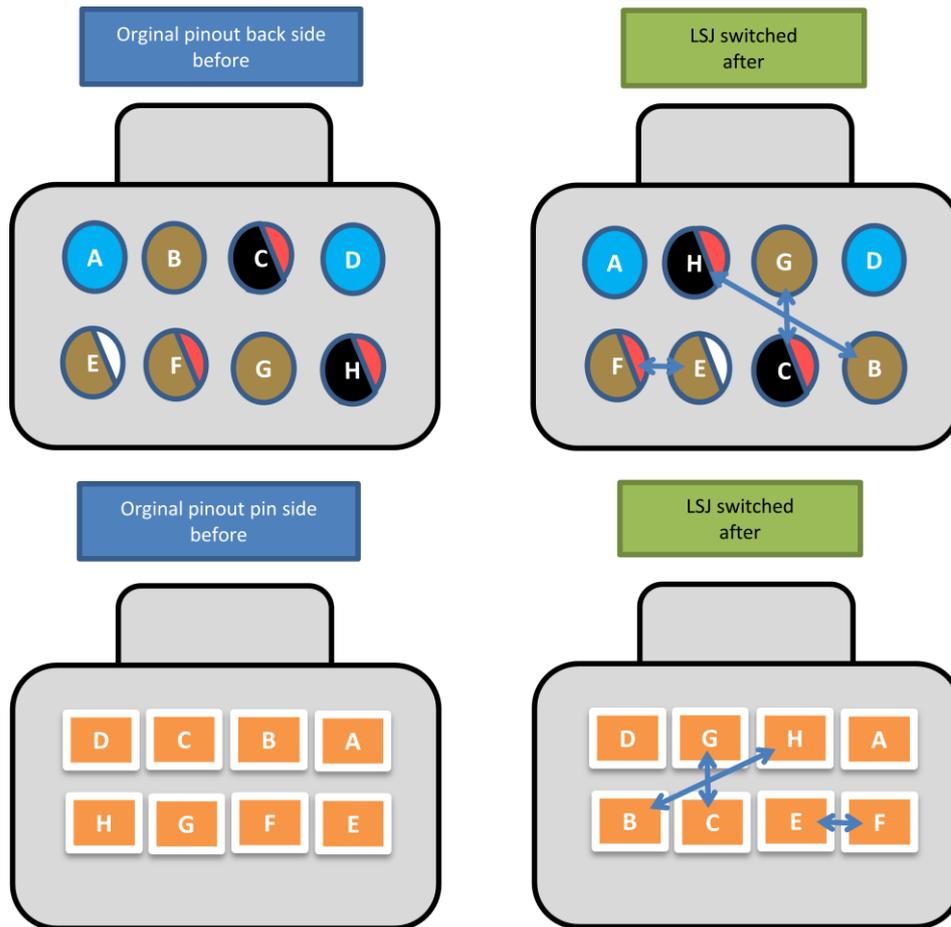
Note: The first part of the AFR graph is not automatically correct because this is highly affected by the transient fueling settings. To get this right, tune the transient settings until the line is also flat at the lower rpm's.

9.16 Installing another throttle body

The software can be used with a number of electronic throttle bodies, for the specific types have a look at chapter 8.

The 2.4 (65mm) throttle body is compatible with the OEM throttle body and can be used without modifying the wiring. For the LSJ throttle bodies it is necessary to switch some pins inside the throttle body connector according to the figure below.

It is not necessary to cut wires and re-solder them, after removing the purple pin cover inside the connector a small barb is visible, use a small screwdriver to pull it back and the pin can be pushed out.



After switching the pins, the TB should work normally, this can be verified by making a log file and checking for error codes and visually check if the throttle body is opening correctly when the throttle pedal is pushed.

10. List with compatible parts working with ObdTuner version 2

10.1 Injectors

- Injector 250cc/min (OEM)
- Injector 365cc/min (Bosch 0 280 156 021)
- Injector 410cc/min (LSJ green GM12790827)
- Injector 470cc/min (Bosch 0 280 156 280)
- Injector 550cc/min (Siemens)
- Injector 650cc/min (Bosch 0 280 158 123) *
- Injector 680cc/min (Siemens 107961)
- Injector 860cc/min (Siemens 110324) **

* The Bosch 0 280 158 123 injectors are fully supported by the software but they need an extension adapter for installing it in the OEM installation position. For this the injector must be extended by 14mm.

** The 860cc/min Siemens 110324 injectors are fully supported by the software but they have a very narrow spray pattern and will therefore give worse exhaust emissions and warm-up behaviour when installed in the OEM installation position. These injectors are better suited for installation further away from the inlet valves.

10.2 Fuel pressure regulators

- Any fuel pressure regulator can be used with the software, the static fuel pressure can be configured, also mechanical or electronic compensation for boost pressure is available.

10.3 Fuel pumps

- Any fuel pump can be used with the software as long as its capacity is large enough to deliver enough fuel for your setup.

10.4 Throttle bodies

- Throttle body 58 mm (OEM)
- Throttle body 65 mm (12580195)
- Throttle body 68 mm (LSJ) supercharger/turbo (12565553)

10.5 Manifold Air Pressure sensors

- MAP sensor 1.0 Bar (Delphi 16212460) OEM
- MAP sensor 2.0 Bar (Delphi 16235939 or 28139776)
- Map sensor 2.5 Bar (GM)
- TMAP sensor 2.5 Bar (Bosch 0 261 230 042)
- TMAP sensor 3.0 Bar (Bosch 0 281 002 437)

10.6 Maximum boost

- The boost is limited to 2.0 bar boost. (3.0 bar including atmospheric pressure)

10.7 Maximum engine rpm

- The software can be used up to 7800rpm. Make sure the engine can handle the selected rpm. A stock Z2.2SE can handle 7000rpm.

10.8 Inlet Air Temperature sensors

- IAT sensor (Bosch 0 261 230 042 / Bosch 0 281 002 437)
- IAT sensor Delphi (OEM)

10.9 Catalytic convertor

- Software works with any type of catalytic convertor and can also work without a catalytic converter. To pass the emission test a cat is required.

10.10 Lambda sensors

- It is required to have the OEM primary lambda sensor and secondary lambda sensor installed and working (or a 100% compatible one) even when using a wideband sensor or when the catalytic convertor is removed.

If a part you want to use is not on the list and you have the necessary data for it, you can contact info@ObdTuner.com

11. Suggestions and recommendations

Special keys in ObdTuner

Most functions in ObdTuner can be operated using the keyboard. Below a list of some special keys for frequently used tasks. Using this keys can make operating ObdTuner easier and faster.

- F4 Read error codes from the ECU.
- F5 Synchronize ObdTuner with the ECU.
- F7 Start logging (press twice to select the logging tab).
- F8 Stop logging.
- F9 Toggle between current and previous tab.
- F10 Connect to the ECU.
- F12 Reset the ECU.
- CTRL+s Save the calibration.
- CTRL+right Select the next sample in log file.
- CTRL+left Select the previous sample in log file.
- Space bar Go to the next step in a power measurement session.

Use of graphs

- It is possible to zoom in on an interesting section in a graph by drawing a rectangle using the mouse and left mouse button around the section.
- Zooming out can be done using the context menu. Right click somewhere in the graph and select the un-zoom function.
- It is also possible to zoom in and out by use of the scroll wheel.
- Printing and saving the image, is also available in the context menu.
- Hovering over a graph line with the mouse pointer will enable an info balloon with extra data about the data sample.

Quick opening of a calibration

It is possible to drag and drop a .smp file from the windows explorer into ObdTuner.

Make backups

Before changing your calibration, it is good practice to first save your calibration immediately after synchronization, this way you can always go back to a working situation, also differences are afterwards easily to spot.

Use clear file names

When saving a calibration, it is handy to use a filename with some information about the calibration. Default ObdTuner composes a name from the data and time the calibration is saved and the first line from the notes field on the general tab.

So when you make it a habit to capture the essence of the calibration in the first line of the note field, ObdTuner will automatically generate a clear filename.

12. Troubleshooting

If the engine is not running correctly, first check if the selected parameters like injector type, Map sensor, throttle body etc. on the 'Parameters' tab are correct. For instance the installed injectors must exactly match the configured injectors. If the installed injectors are not in the list they will not function correctly with the software. The same goes for all the other sensors.

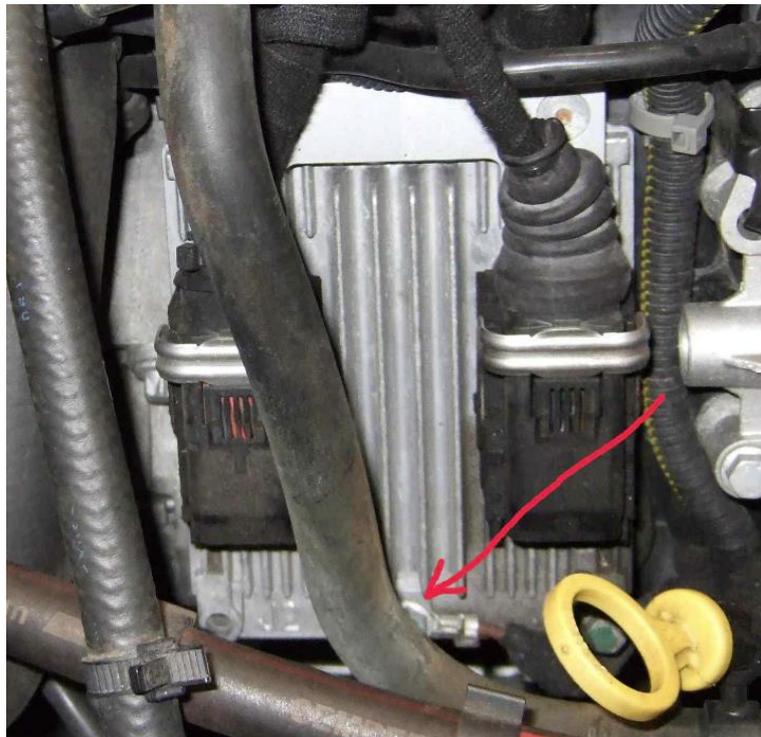
Another common problem is a vacuum leak somewhere in the intake system, check if all hoses etc. are in place. Also check if there are no strange noises around the intake when the engine is running.

Make sure the ECU is correctly grounded, besides the 2 big black connectors, there also should be an extra grounding cable connected to the ECU.

Also make sure all other grounding cables like gearbox to engine etc. are connected and not corroded.

Check if the pins inside the ECU connectors are not bend. It is very easy to bend one of these pins when reconnecting the ECU. So always check if all pins are straight before reconnecting the big

connectors. Also when it does take much force to lock the connector, disconnect the connector and check if all pins are exactly straight and do not force it into place.



In a very rare occasion, after making the calibration permanent, it can happen that the flash sector gets corrupted. Should this happen a message will be displayed, telling the ECU is not successfully flashed and the headers need to be rebuild. If this is the case connect the laptop to the car and select the menu option 'ECU - Repair table headers...'. After this it is recommended to also restore the latest know to be good calibration.

If all the above fails it is best to make a log file and have a look at the signals and check if there are any error codes set. If it is not clear how the signals should look mail the file to info@ObdTuner.com with a description of the problem and I will have a look at it. Please

make a log from some normal driving with a minimum of 15 minutes of driving in it and preferably with the problem occurring somewhere in the log.

13. Word list

AFR

Air - fuel ratio. This is the mass ratio of air to fuel present in the combustion chamber before ignition.

Closed loop

When the ECU enters closed loop, it is using data from the lambda sensors to actively adjust the amount of fuel which is being injected.

ECU

Electronic Control Unit. The system or computer that controls the engine, also known as the engine management.

EGR

Exhaust Gas Recirculation. This is a valve controlled by the ECU which allows inert exhaust gasses to be sent back into the intake of the engine.

Lambda

Lambda is the ratio of actual AFR to stoichiometry for a given mixture. Lambda of 1.0 is at stoichiometry, rich mixtures are less than 1.0, and lean mixtures are greater than 1.0.

Narrowband lambda sensor

A narrowband lambda sensor can indicate if the oxygen level in the exhaust gasses is above or below stoichiometric. This type of sensor cannot indicate how large the deviation from stoichiometric is.

Open loop

When the ECU enters open loop it only uses the data from the tables together with some corrections learned in closed loop to determine the amount of fuel.

Stoichiometric

Stoichiometric or Theoretical Combustion is the ideal combustion process where fuel is burned completely.

Wideband lambda sensor

A wideband lambda sensor measures the amount of oxygen in the exhaust gasses and calculates the actual AFR. This type of sensor gives more information than a narrowband lambda sensor.