DTAFast S Series ECUs

USER MANUAL

DTAFast Limited

Introduction

1 Introduction

Welcome to the S Series ECU Manual.
This manual covers all the features and functions available in the S Series ECUS. These are the S40Pro, S60Pro, S80Pro and S100Pro.

1.1 What's New

DTASwin is a major new release of our control software to match the new S series ECU’s. It can only be used with the S series.

This release is ground up rewrite of the DTASwin software, to take advantage of the software technologies now available.

Full copy/paste/manipulate functionality is built in.

Much improved log manipulation and graphing facility is built in to the S series.
Any map changes which require a system reset are now handled automatically.

Full two stroke capability is built in.

Full sensor calibration charts are included with default buttons for ease of setting.

Real time mapping now uses real copies of the advance and fuel maps so you can make changes manually whilst mapping.

File names are now 30 characters with a 250 character comment field.

Diagnostic display has many more items added including current switch positions to aid set up.

ECU Firmware flash upgradeable from the PC.

RPM Limit 20,000 rpm.

There are thousands of other improvements which you will find in use. People already familiar with the old DTASwin software will have no difficulty in adapting to the new product.

1.2 Software Installation

Download the latest version of the software from the Downloads section of the website here:
http://www.dtafast.co.uk/downloads/
Simply run the dtaswinsetup.exe file, and follow the instructions.

The software is installed in the Program Files structure, while maps are stored in the users Documents folder, in the DTASwin sub-folder, along with other user files.
If you are upgrading from an old version of the software, all the saved maps in the old location will be copied across to the new location.

Set the Com Port to the COM port you are going to plug into.
If your machine does not have a COM port contact us about an approved USB -> COM port adapter.

1.3 Quick Start Guide

All units are supplied with a map installed. This is a real map with conservative advance timing and fuel figures for correctly sized injectors. These values will start most engines. The following steps will get the engine running quickly.

1. Determine how you are going to run the engine, that is, sequential or non sequential, wasted spark or individual coils. This determines whether you will need a cam sensor.
2. Install the ECU and wiring loom as per the wiring diagram (at the end of this manual, pay attention also to the wiring notes pages) or just attach a loom from us. Although the S series is strong and waterproof it is best to install the unit in the cab of the vehicle.
3. Install the software on the PC and if you are using a CAN adapter install the software for that also. If using RS232, make sure you set the DTASwin software to the correct number of the port you are using. See menu option *File/Options*.
4. Turn on the ECU and connect the comms lead before launching the software. If the ECU is turned on and the port settings are correct, the PC will automatically connect to the ECU.
5. Unlock the map using the *Padlock* icon on the tool bar or using menu item *File/Map Locking* or click on the red “Map Locked” rectangle on the status line at the bottom of the screen.
6. Go to *Essential Map Settings.* The following menu items must be set before the engine can be started.

General Engine Settings
RPM Range
Main Map Columns
Coil Per Plug Settings
Sequential Injection
Throttle Stops

If you do not understand any of the numbers required in these maps then consult the relevant sections of the manual.

These are the very minimum of steps required to attempt to start your engine. In the directory Documents\DTASwin\maps you will find a selection of maps. This selection will be increased over time and there may be one there for your engine although the specification is unlikely to be the same. If so use the menu option *File/Open* (or the folder icon on the tool bar) to send this to the ECU.

If the above is done correctly the engine should start or at least attempt to. Use your ears and knowledge of engines to determine if the engine has too much or too little fuel. If using a Dyno Control box then turn on the knobs and set them coarse (you can do this by clicking on *Knobs On* and *Knobs Fine* on the status bar at the bottom of your screen. You can then keep the engine running by swinging the fuel knob. When running use a timing light to check that the advance the PC is showing is the same as the engine is seeing. Use *Real Time Mapping/Main Display* to see the current advance. Run the engine at about 2000 rpm to do this. If the two disagree alter the Sensor Position in *Essential Map Settings/General Engine Settings* until they do.

If the engine will not start

Make sure all connections are correct. **Pay particular attention to the crank sensor wiring as it is critical that a magnetic sensor is wired the correct way round**.
Use the Crankshaft Oscilloscope to check the crank sensor (and cam sensor if connected) are reading correctly.

Check all your sensors are reading sensible values in *Real Time Mapping/Main Display.* If not and they are known not to be faulty, check the settings in Engine Configuration*/Sensor Scaling* are correct.

Go to *Display and Test Functions/Test Injectors and Coils* and make sure they are all working. Also ensure that you have a minimum of 3 bar fuel pressure.

Turn off sequential injection, coil per plug and cam control, as this will eliminate the cam sensor. If you are running individual coils, also tick Twin Spark in General Engine Settings.

Go to *Display and Test Functions/Diagnostic Display* and make sure that all connected sensors are showing as OK.

Whilst in *Display and Test Functions/Diagnostic Display* crank the engine and make sure that you see an RPM with no crank errors. If you do not then you either have a mechanical or electrical problem with the crank wheel or sensor or you have made errors in *General Engine Settings.*

When all the above have been correctly identified and corrected, try again.

1.4 Definition of Terms

CALIBRATION UNITS USED

Temperature	degrees Centigrade	(C)
Time (fuel flow)	pulse length in milli-seconds	(ms)
Engine speed	revs. per minute	(rpm)
Engine turns	rotations from starter engagement	(plain number)
Ignition	degrees before top dead center	(degs. BTD)
Throttle opening	percentage of throttle opening	(%)
Dwell	percentage of time coil turned on	(%)
Exhaust	rich/weak indication	Lambda number
Pressure	kPa of inlet pressure	(kPa) 100kPa = 1 atm

1.5 Map Editing Keys

F1 Help
F4 Exit and store changes to engine
F5 Manipulate highlighted cells
Ctrl + Tab Switch between the open windows

IN 20 x 14 Main Maps

Alt + Up Arrow Nudge Cell to Higher Value
Alt + Down Arrow Nudge Cell to Lower Value
Alt + Page Up Coarser Nudge Cell to Higher Value
Alt + Page Down Coarser Nudge Cell to Lower Value

OTHER KEYS

CURSOR KEYS Move about maps

IN REAL TIME MAPPING

Shift F7 Ignition+
Ctrl F7 Ignition-
Shift F8 Fuel +
Ctrl F8 Fuel-
Ctrl P Knobs on/off
Ctrl C Knobs coarse/fine
Ctrl K Stop Engine
Ctrl I Interp on/off
Ctrl L Closed Loop Lambda on/off
F6 Send Traced Cells to ECU
F7 Cam 1 target on left Dyno Box Knob
F8 Cam 2 target on right Dyno Box Knob

From v88, the following keys have been added:
Space Select the current load site highlighted by the cross hairs
a Advance up. Amount will depend whether coarse or fine is currently active.
s Advance down. Amount will depend whether coarse or fine is currently active.
d Fuel up. Amount will depend whether coarse or fine is currently active.
f Fuel down. Amount will depend whether coarse or fine is currently active.
Enter Same as pressing the Enter button on the dyno control box, but only if the Real Time Mapping form is the focused form.
These all function in the same way as using the dyno control box

To update a range of cells, highlight the cells (either with the arrow keys and Shift, or with the mouse), then use the Alt + Page Up/Page Down/Up Arrow/Down Arrow as above.
This requires F4 to be pressed to write these changes to the ECU.

1.6 USB-Serial Adapter Settings

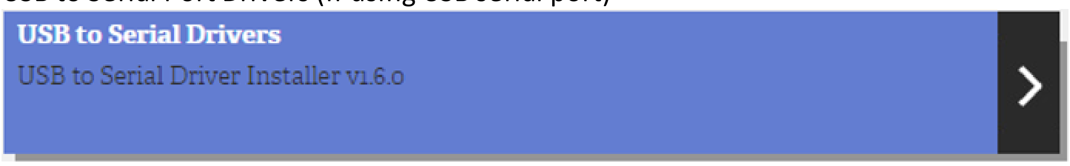
Serial Port Settings Guide

To connect to a DTA ECU you will need the following items/software;

- Serial Cable (9 to 15 pin)

- Serial Port (USB or PCI)

- USB to Serial Port Drivers (if using USB serial port)



- DTA Swin Software

Important Note – Install Drivers First!

Be sure to install the USB serial port drivers before pluging the device into the PC. This is because Windows may choose the incorrect driver for our use.

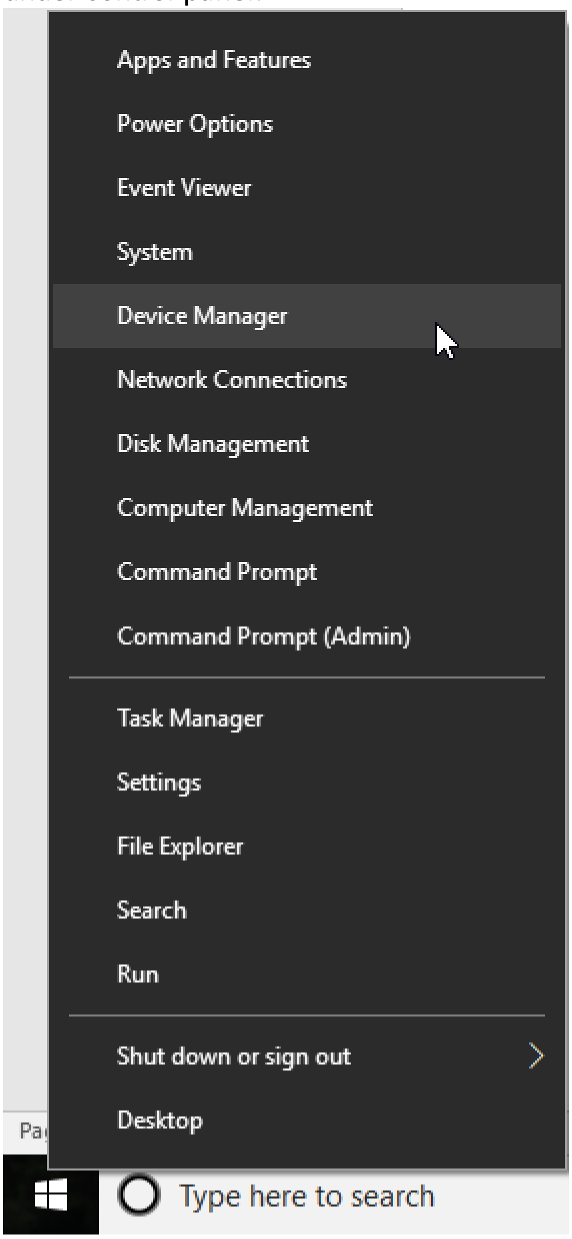
To do this download the USB Serial drivers listed above, or use the CD provided with the adapter.
Follow the on screen instructions and once the install is complete, restart your PC.
Once restarted you can plug in the USB adapter

This install may take some time, so please be patient.

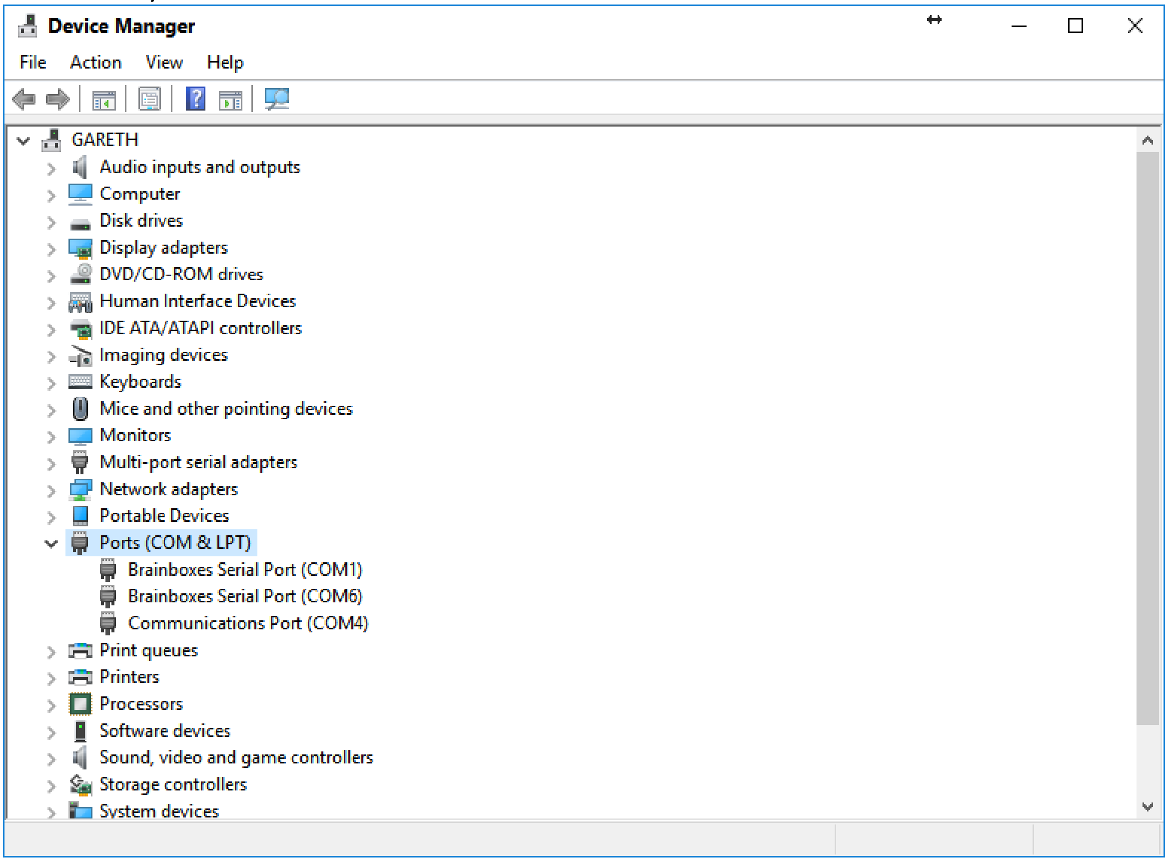
If you are using a PCI Serial port, refer to the manufacture for instructions and drivers.

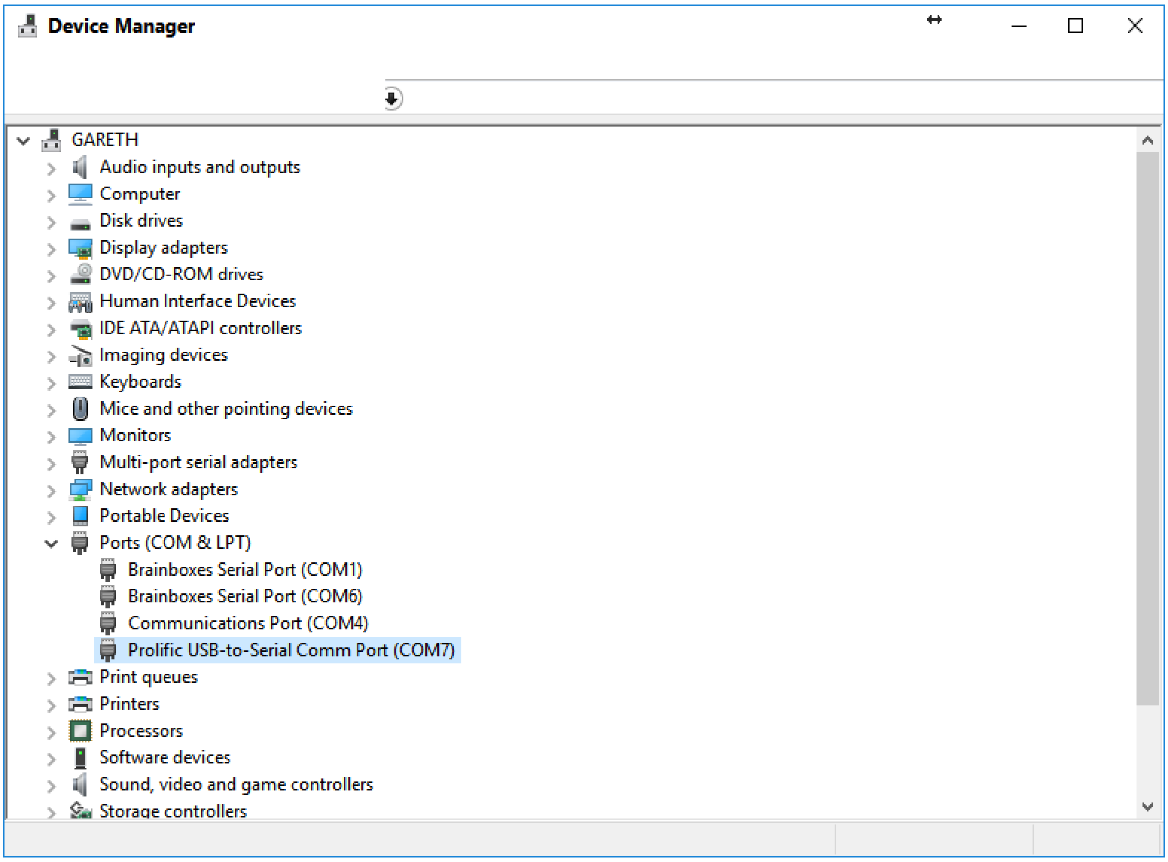
Finding Your Serial Port Number

Begin by opening the windows 'Device Manager'. In windows 10 this can be done by right clicking on the start button. Older versions of windows 'Device manager' can be found under control panel.



When the list has opened, select 'Ports'. If there is a problem with the installation you may find an 'unrecognized device'. In this situation re-attempt the installation of the drivers and confirm they are correct.

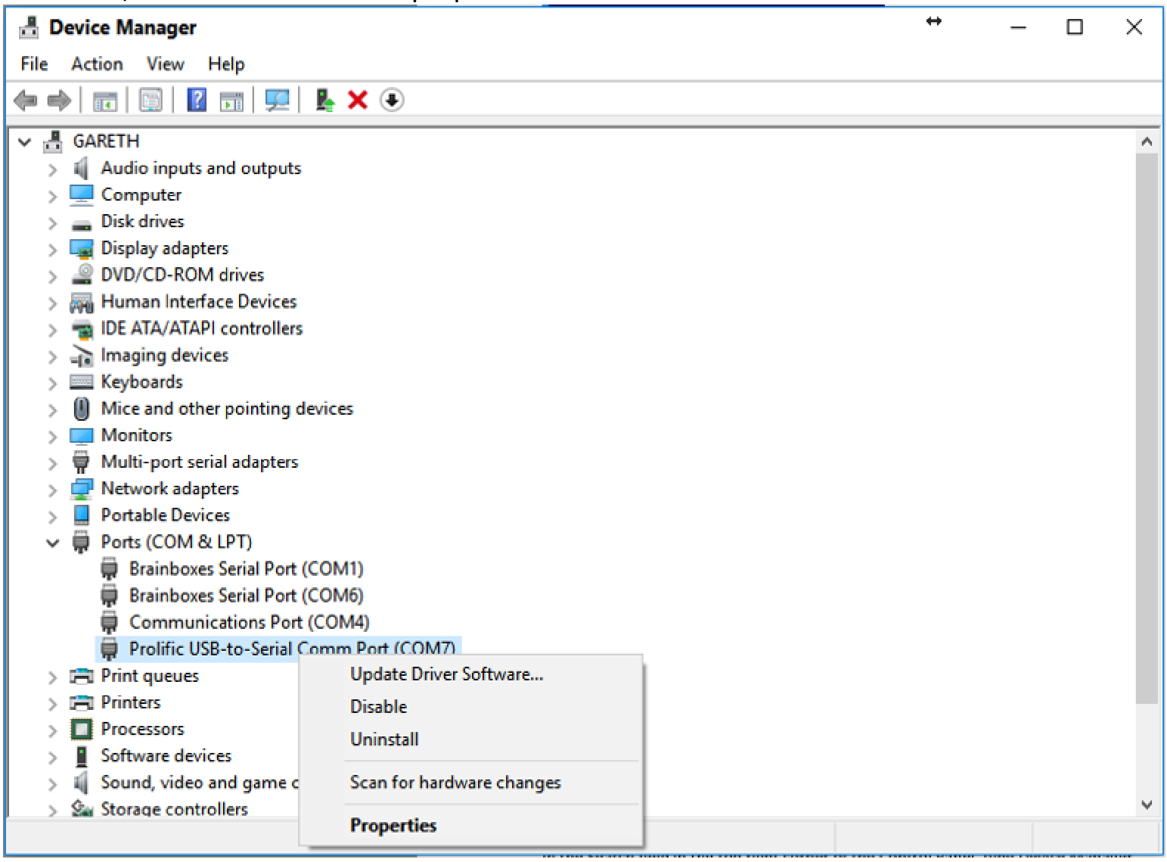




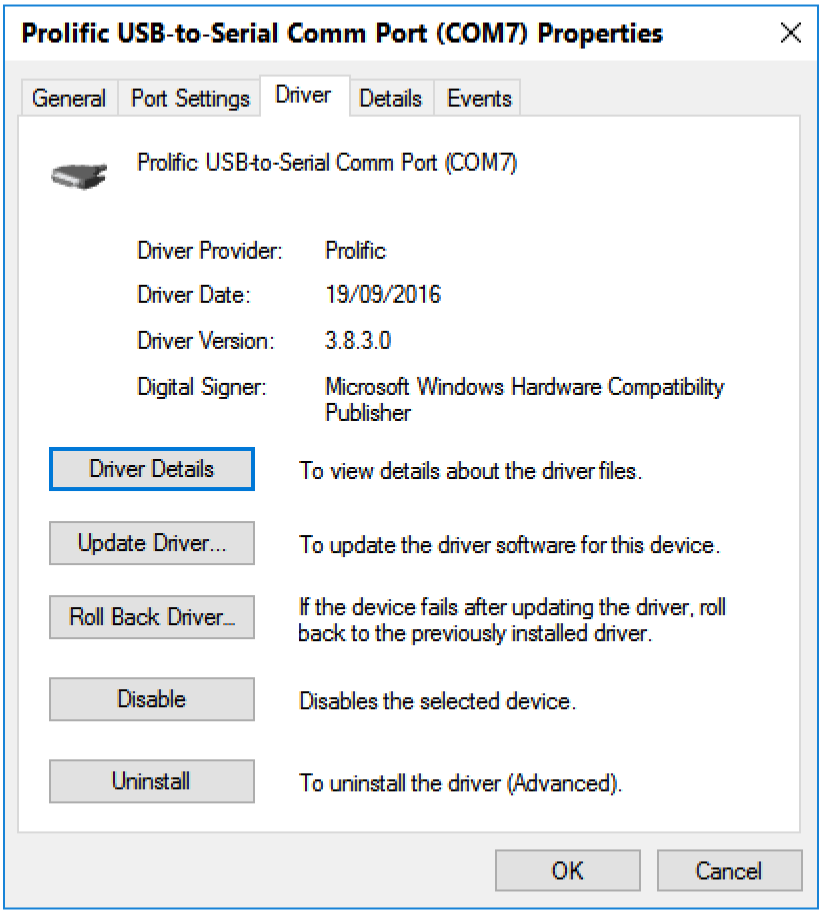
When connecting the USB to Serial adapter, if the drivers have been installed correctly, it appears as 'Prolific USB-to-Serial Comm Port' and in this example, it is com port 7.

Checking Drivers

To ensure the settings of the serial port are set correctly, right click on the port you wish to review, as shown and select properties



To review the drivers select the 'Driver' tab and review the details shown. For a USB Serial adapter, ensure the Driver provider is 'Prolific'. Other manufactures are known to cause connection issues.

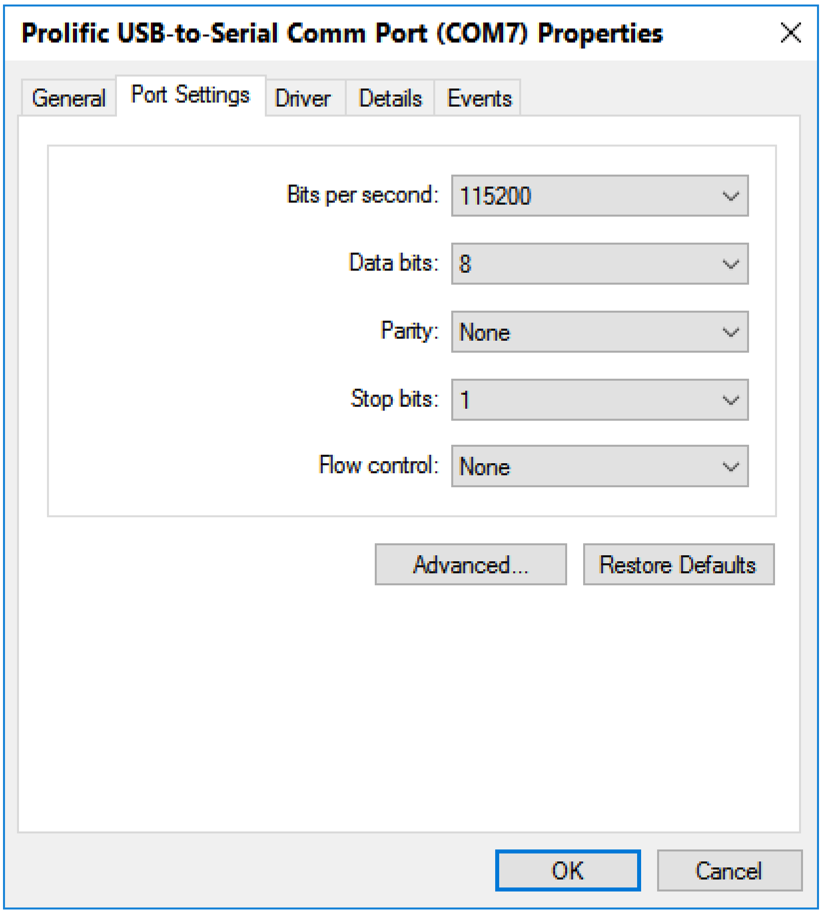


Known Good Driver Numbers	Known Bad Driver Numbers
• 3.4.62.293 • 3.4.36.247 • 3.4.42.258 • 2.1.30.193 (Installer Version V1.6.1) • 3.4.31.231 (Installer Version V1.6.0)	• 3.4.48.472 • 3.3.5.122 • 3.4.48.272

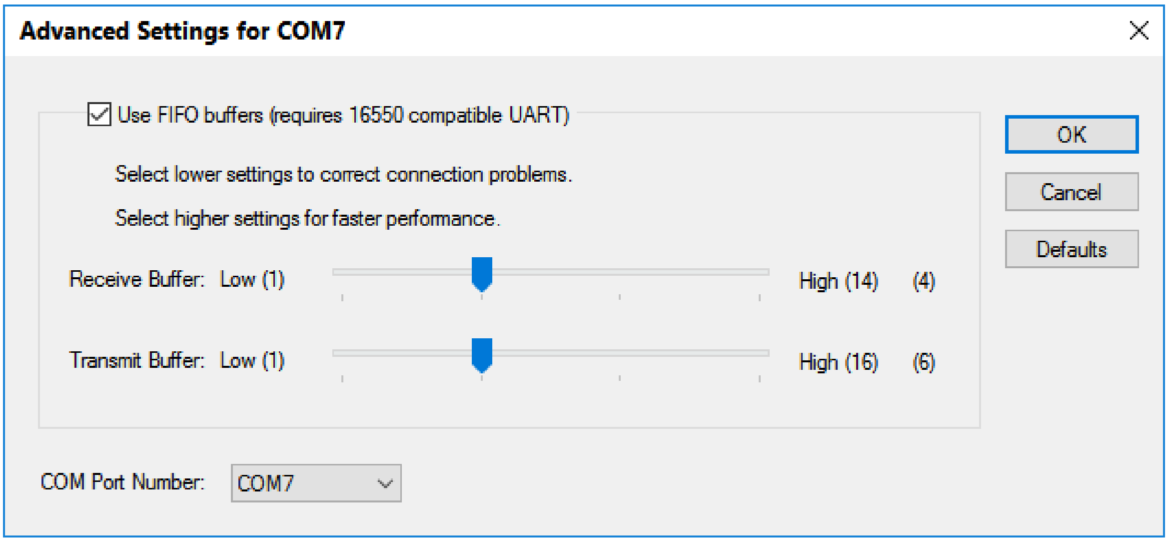
If you have a bad driver number, please refer to the guide on how to update your drivers.

Checking Serial Port Setting

Access the serial port properties as shown in the previous section and select 'port settings'. The Bits per second should be 115200 and can be selected from the pull down list.



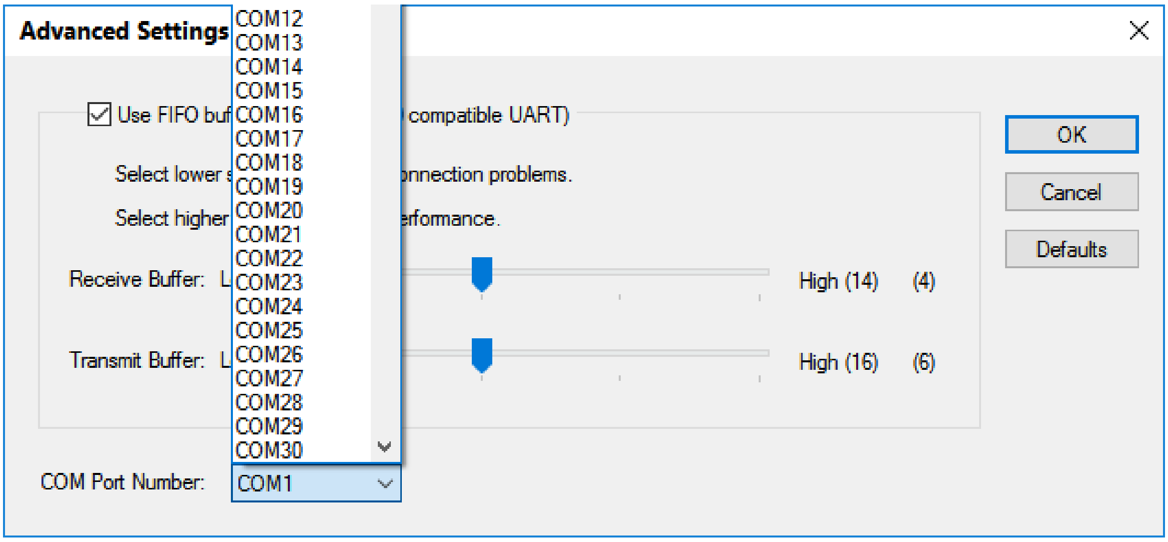
From the 'Port Driver Settings' click 'Advanced…' towards the bottom of the window and the advanced settings window will appear. Ensure the sliders match the example shown and that FILO is checked.



Changing the Serial Port Number

If you ever need to change a Com Port number, you can do this from the advanced settings window. (see previous sections on how to access this menu)

Simply click the Com Port Number and choose from the list provided. Be sure not to select a Com Port that is already in use as this will cause connection problems.



Now the USB adapter settings refer to the File->Options section of this manual to update the serial port number to match the number chosen.

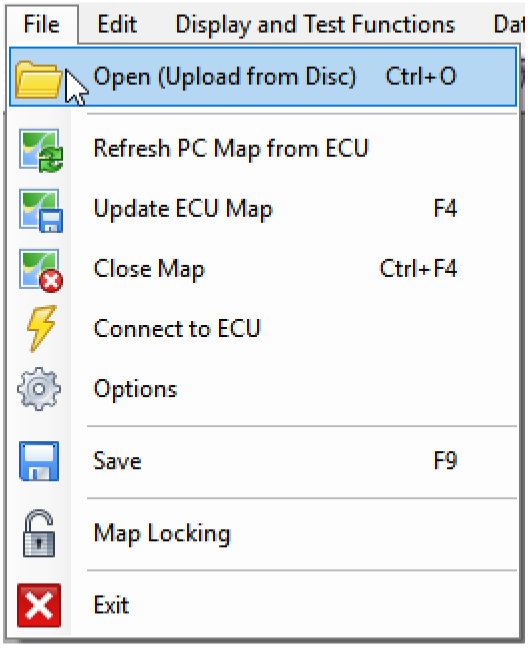
File Menu

2 File Menu

This section covers all the items found in the File Menu section.

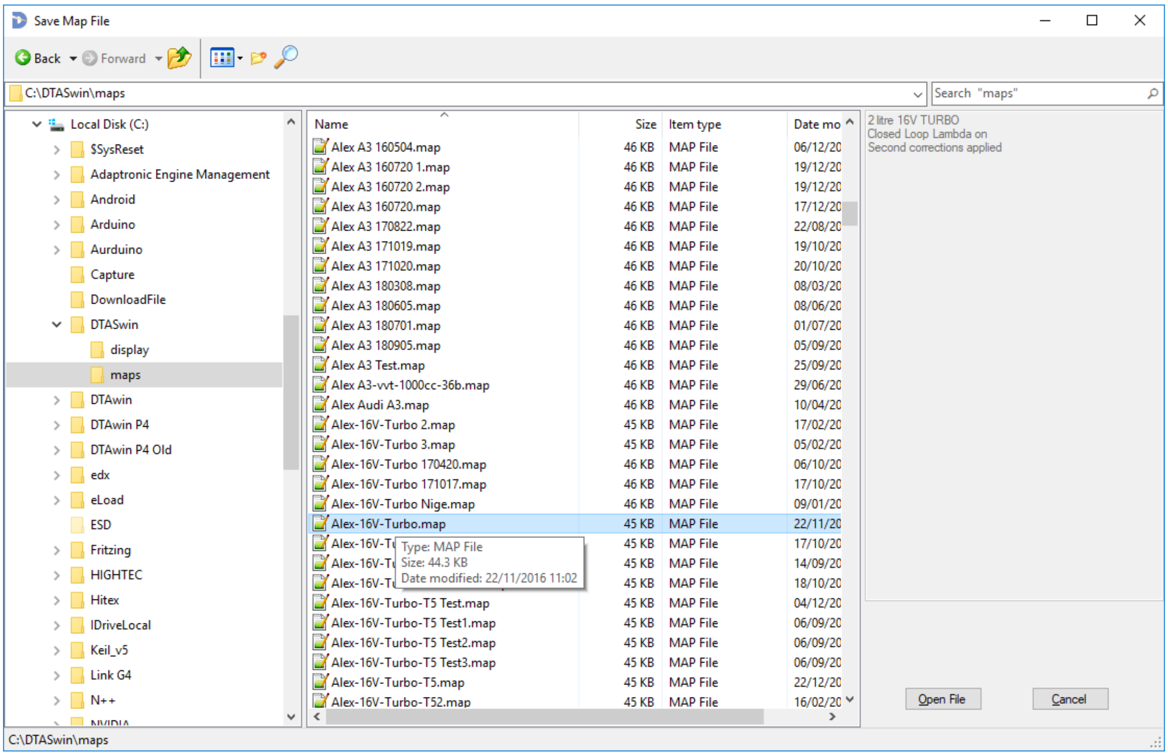
2.1 Open (Upload From Disc)

NOTE: opening a map file when connected to an ECU will automatically upload the map to the ECU.
Ensure you have taken a backup of the map on the ECU first by using the save option first.



Windows:- Normally maps are stored in Documents/DTASwin/Maps.
If you load a map from a different location you may need to look for the above folder name.

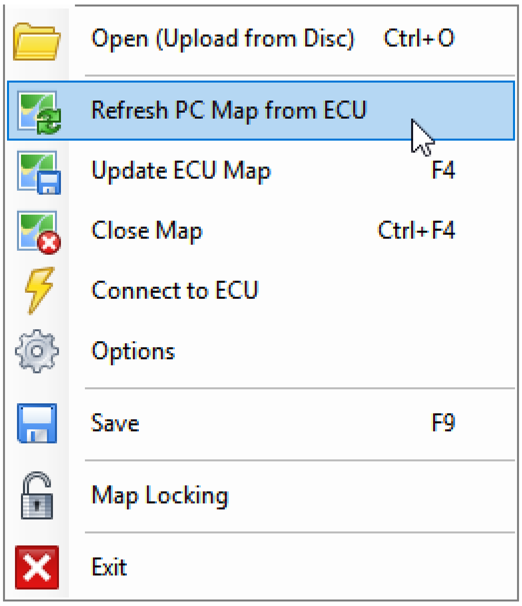
The list of available engine maps will then be displayed on the screen. The current chosen map is highlighted.



The comment for that map is displayed in the right hand panel. Clicking on any map in the available list will display its comment.

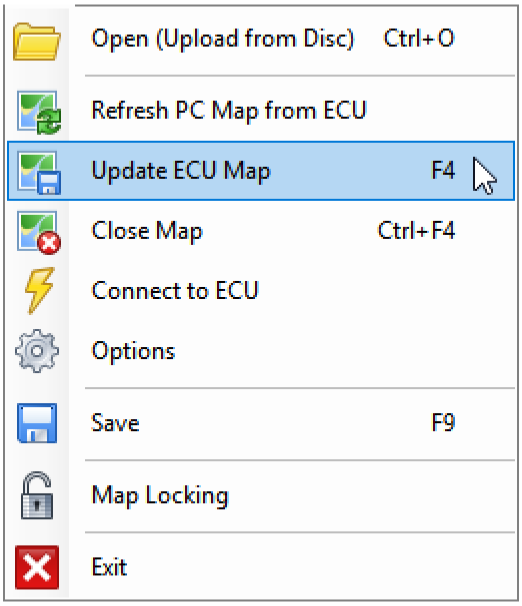
Once the correct file has been found and selected click Load.
In offline mode the map will be loaded into the software, but if in online mode the map will be loaded directly to the ECU.

2.2 Refresh PC Map From ECU



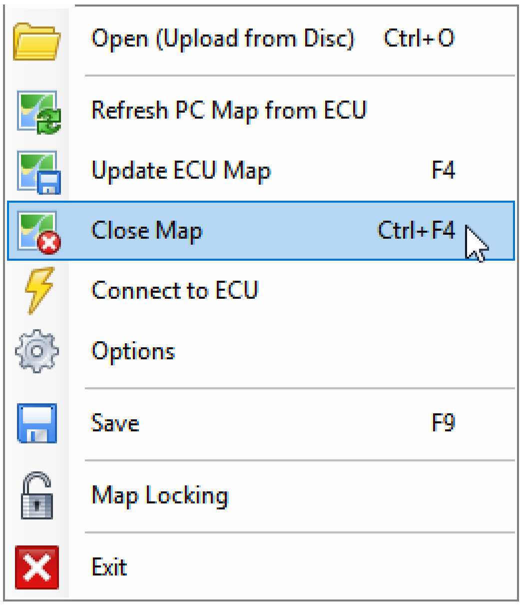
This will download the map currently stored on the ECU, overwriting the map stored in the PC memory.

2.3 Update ECU Map



'Update ECU Map' will upload the changes you have made to the map to the ECU of the current form. This is the same as pressing F4.

2.4 Close Map

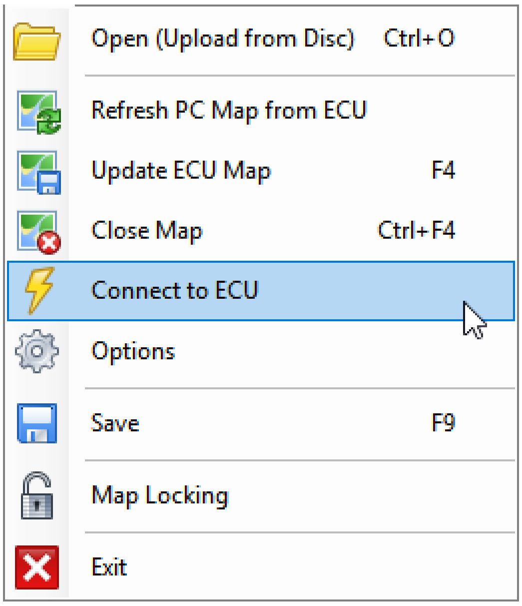


Close map will close the active window.
This might be a mapping window or a parameters window.

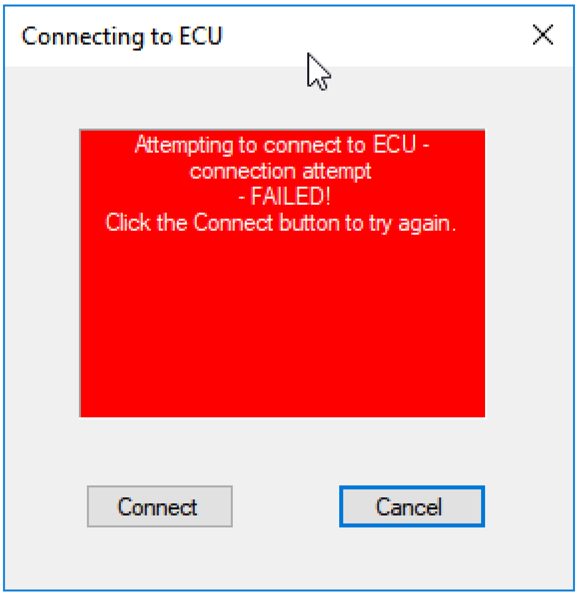
If you have not ether uploaded your changes to the ECU or saved a copy to the PC you will be asked if you wish to upload or save your changes.

2.5 Connect To ECU

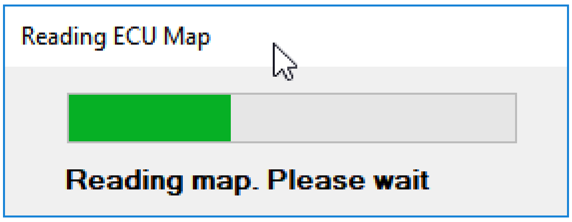
If you are working on a map in offline mode, be sure to save your work before connecting to the ECU



Click file then 'Connect to ECU'

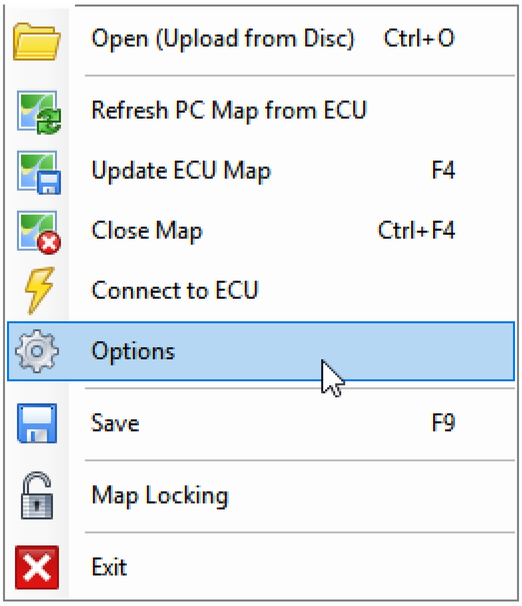


If the ECU is not connected, turned off or the COM settings are incorrect the above error will be shown.
Check the above and refer to the relevant sections of the manual if required.



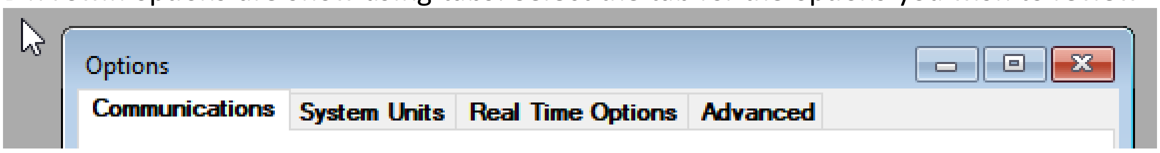
If the ECU is powered on and connected to the PC correctly, the map on the ECU will be loaded into the DTASwin software.

2.6 Options

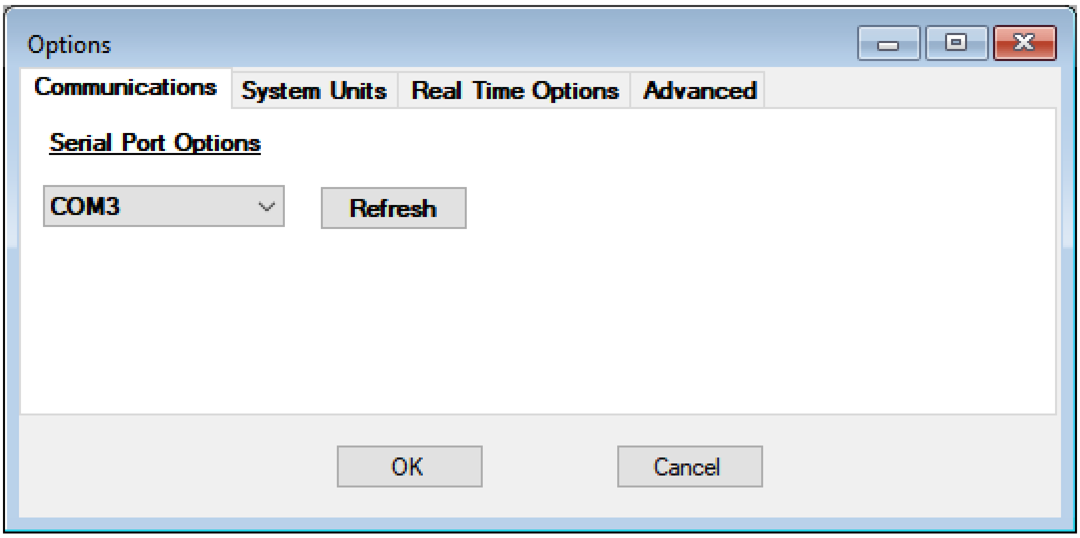


Access the options menu by selecting file then options.

DTA Swin options are show using tabs. Select the tab for the options you wish to review

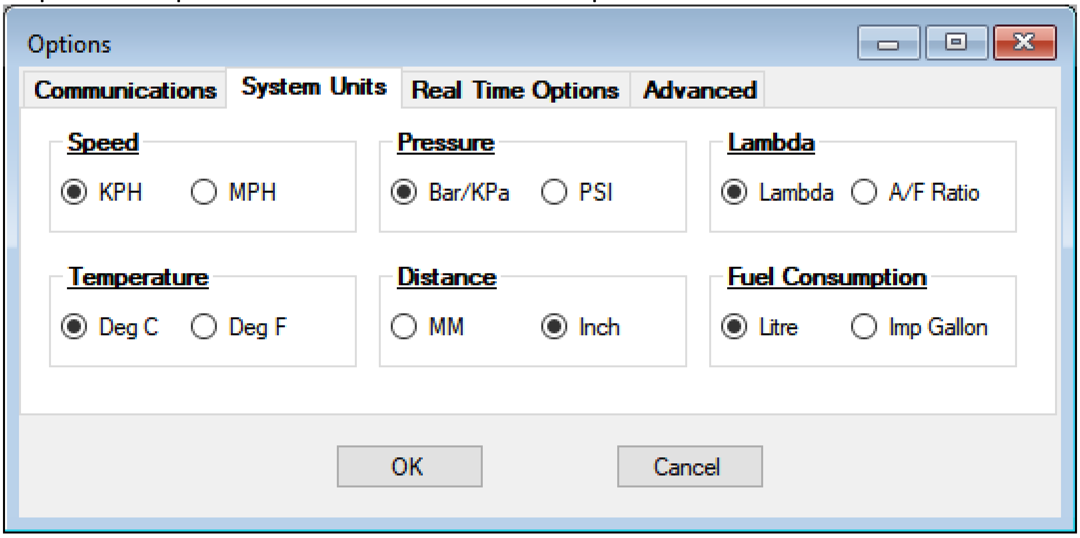


The Commuinications tab allows changing of the serial COM port number.
The COM port number can be chosen using the pull down arrow.
If the options window is opened before the USB-serial adapter is plugged in, click refresh.
This will update the list of available com ports.
for further advice on serial port settings reefer to the USB-Serial Adapter settings 15 part of the manual.

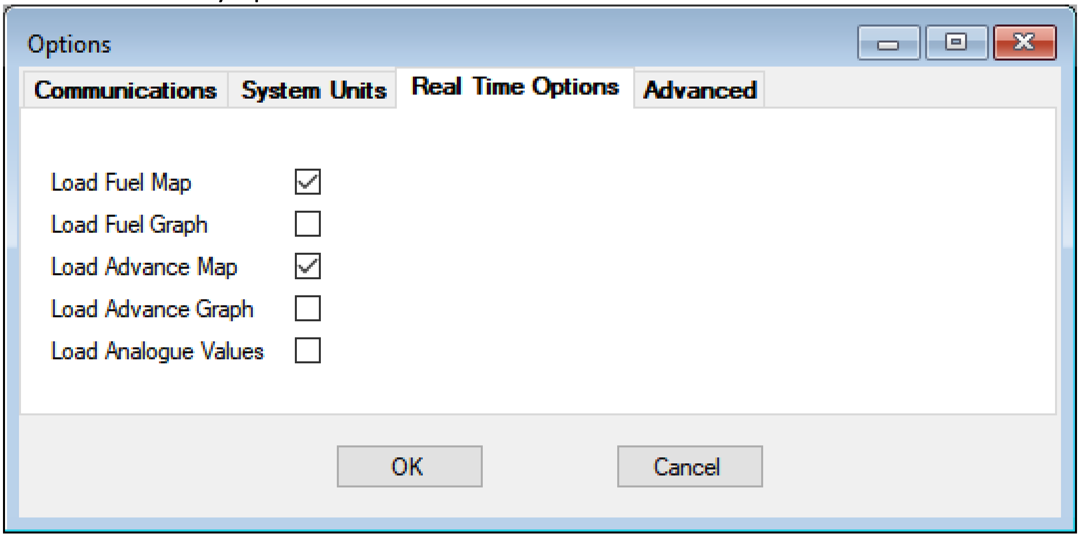


The System Units tab allows individual units to be changed. EG MPH/KPH

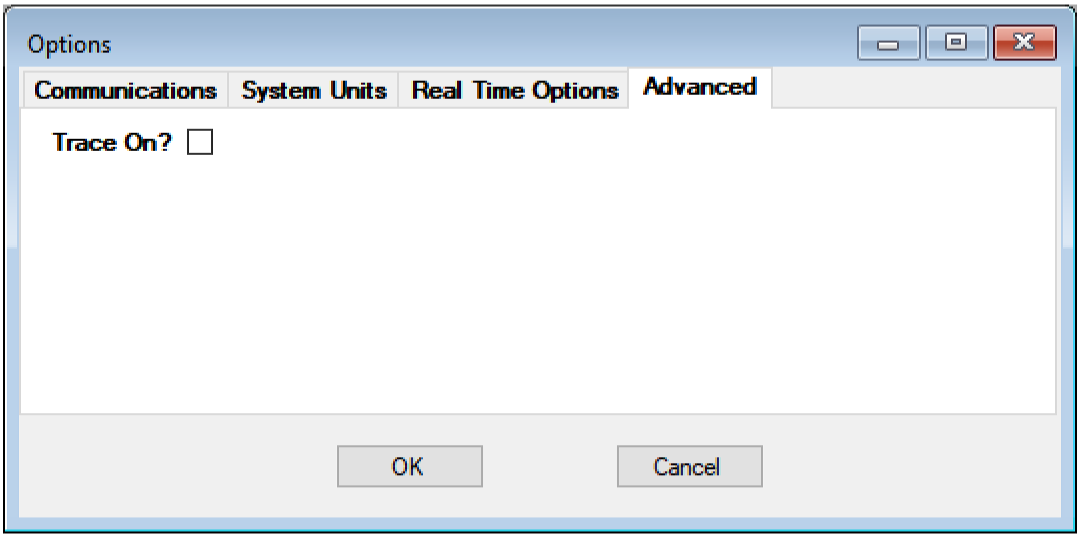
Using the toggle buttons it is possible to choose the desired measurement types. If required it is possible to have a mixture of imperial and metric measurements



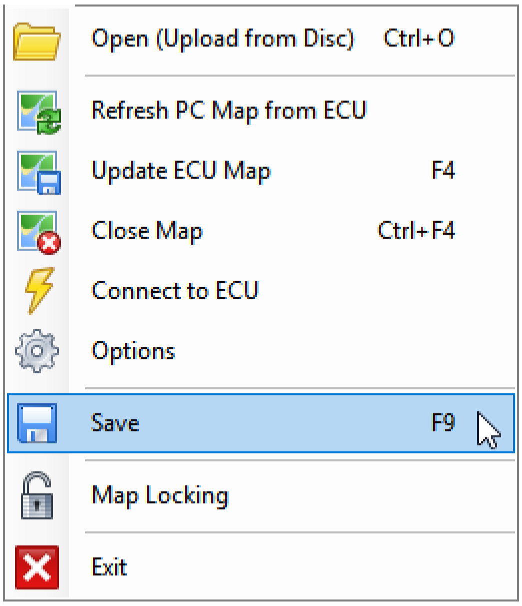
The Real Time Options Tab allows you to specify what opens when running real time mapping.
to select items you wish to load click the check box.
a tick shows the window will load and an empty square shows the windows which will not automatically open.



The Advanced tab contains additional settings.
Trace On should only ever be used when requested by DTA.
In ALL other instances this should be disabled.

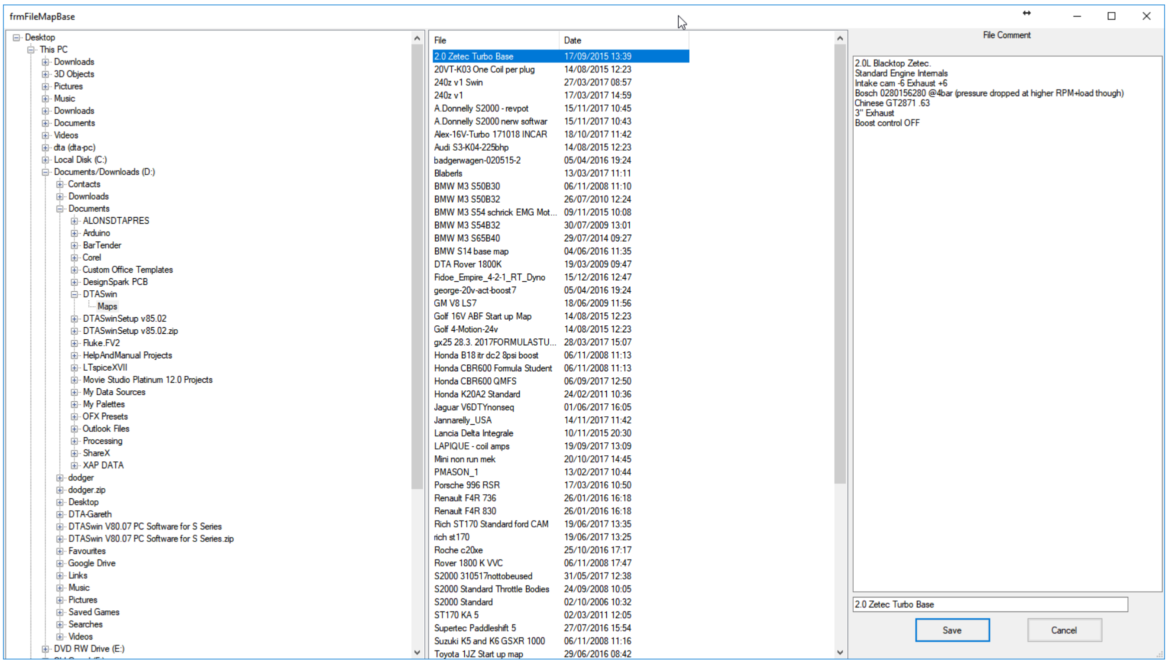

Options
Communications
System Units
Real Time Options
Advanced
Trace On?
OK
Cancel

2.7 Save (Download to PC)

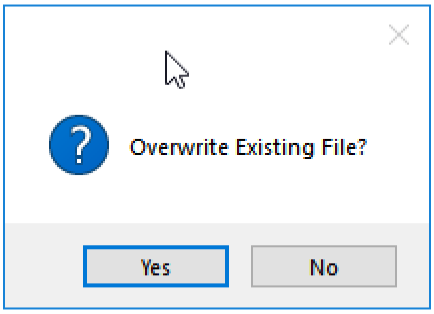


Store map on disc (saving a map and giving it a file name).
This enables you to keep an engine map on your pc's hard disc. The default directory for maps is:- Documents\DTASwin

The file name can be any Windows legal file name up to 30 characters in length.
An extension .map will automatically be added.
On saving the file up to 200 characters of useful comment information can be added.



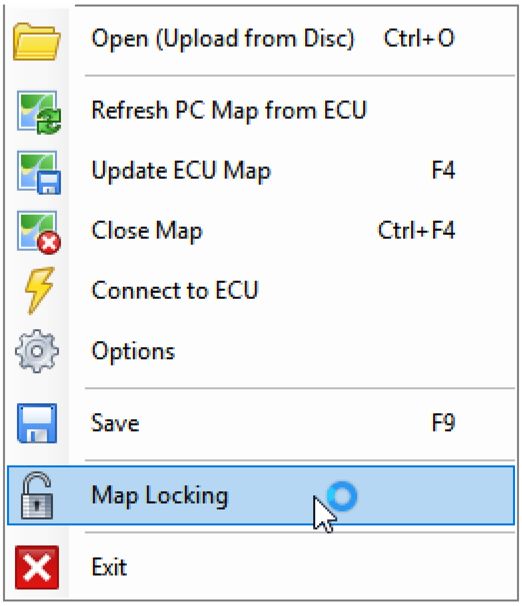
The file name is written in the bottom right hand corner of the save window and comments can be added on the right hand side.



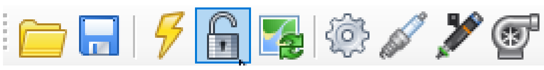
If you try to overwrite a file you will be asked if you wish to continue.
In most instances we would recommend saving using a date to ensure you can return to an earlier map if required.

2.8 Map Locking

Map Locking is a way to ensure that no unintentional changes are applied to the map. You can lock and unlock the map at will by two different methods.

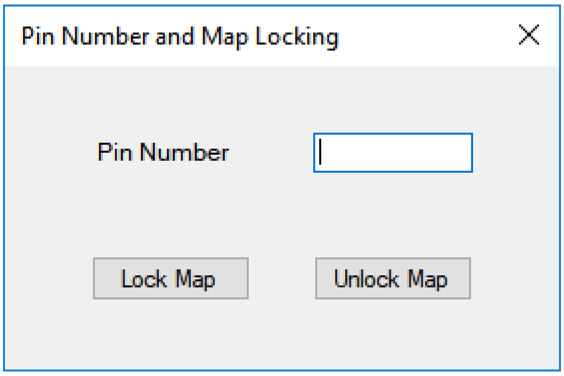


The first option is through the file menu and then Map Locking.



Alternatively there is a short cut padlock

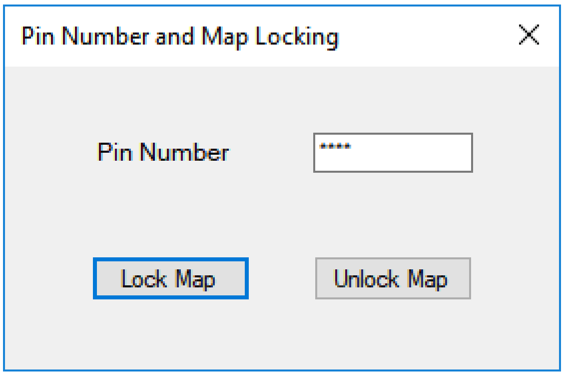
Or finally clicking the box at the bottom left of the screen.



If the ECU is locked, you will be asked to provide the pin number.

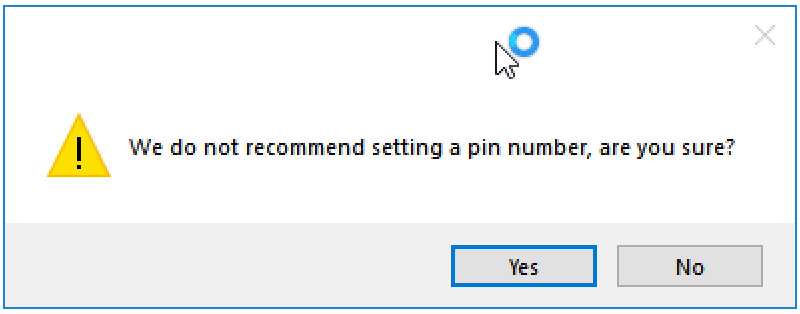
The ECU map can be locked without entering a pin number.
If you do not require a pin number, clock 'lock map'.

When locked the bar at the bottom left of the screen will turn red.

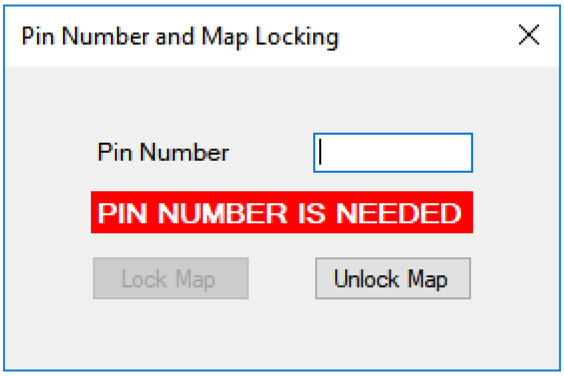


If you should wish to use a pin number, for example if mapping a unit for a locked race series to ensure all vehicles are mapped the same, then when prompted enter the desired pin number and click 'lock map'

BE SURE TO MAKE A NOTE OF THE PIN NUMBER

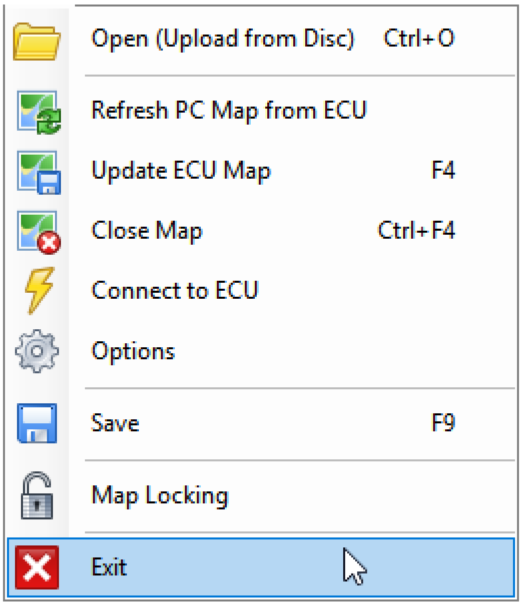


Due to the frequency of people forgetting pin codes, we do not recommend using them unless absolutely necessary.



When unlocking the map when a pin number has been used you will be prompted for this number

2.9 Exit



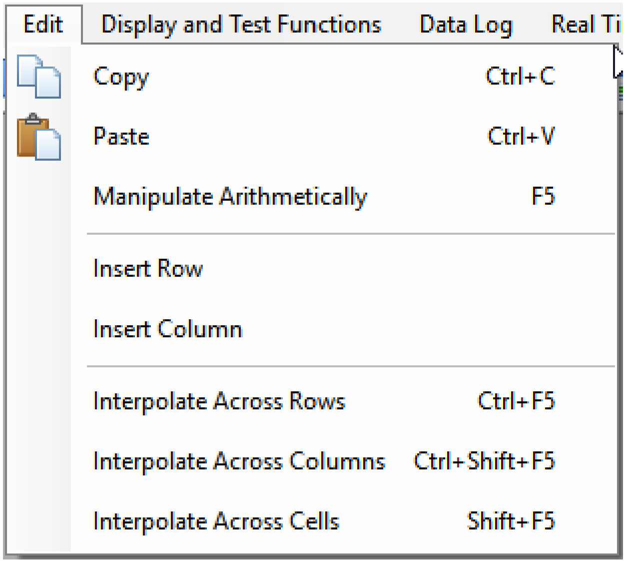
The exit button will close the DTASwin software.
If there are unsaved changes, you will be asked if you wish to save you work before exiting.

Edit Menu

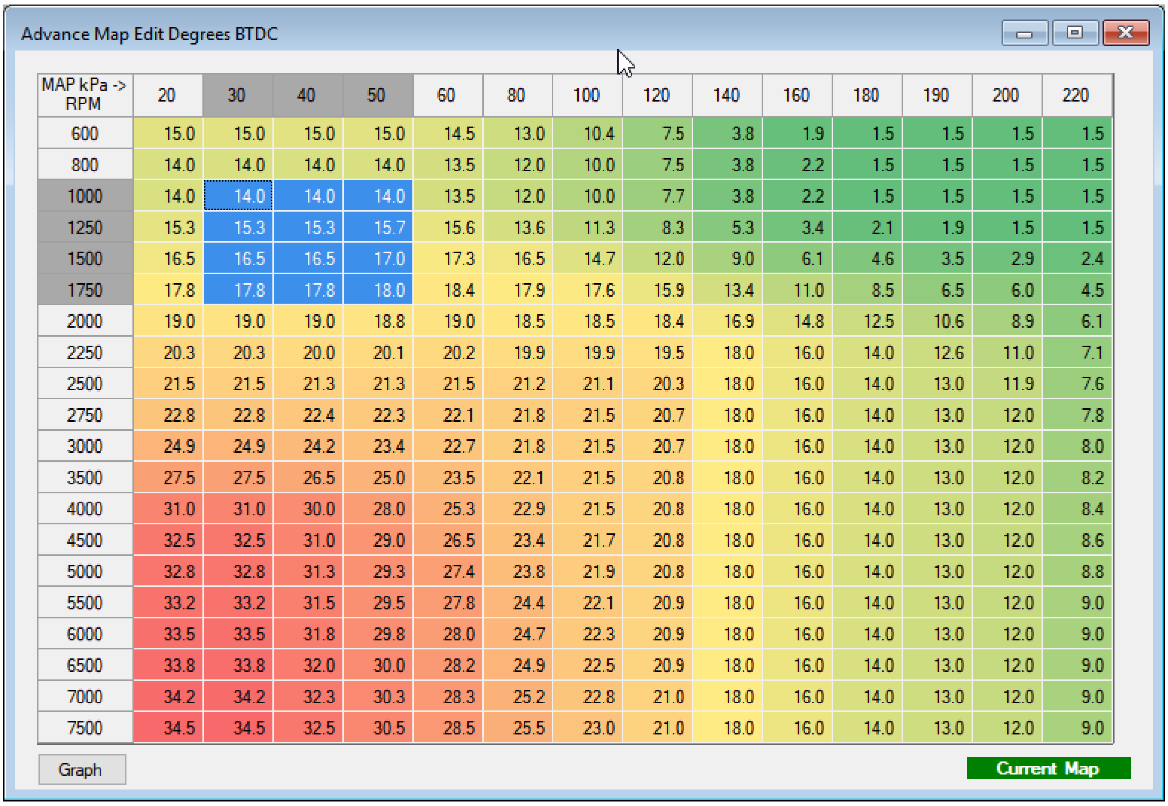
3 Edit Menu

This section covers all the items found in the Edit Menu section.

3.1 Copy



The copy function can be found under Edit. Control and C can also be used.



MAP kPa -> RPM	20	30	40	50	60	80	100	120	140	160	180	190	200	220
600	15.0	15.0	15.0	15.0	14.5	13.0	10.4	7.5	3.8	1.9	1.5	1.5	1.5	1.5
800	14.0	14.0	14.0	14.0	13.5	12.0	10.0	7.5	3.8	2.2	1.5	1.5	1.5	1.5
1000	14.0	14.0	14.0	14.0	13.5	12.0	10.0	7.7	3.8	2.2	1.5	1.5	1.5	1.5
1250	15.3	15.3	15.3	15.7	15.6	13.6	11.3	8.3	5.3	3.4	2.1	1.9	1.5	1.5
1500	16.5	16.5	16.5	17.0	17.3	16.5	14.7	12.0	9.0	6.1	4.6	3.5	2.9	2.4
1750	17.8	17.8	17.8	18.0	18.4	17.9	17.6	15.9	13.4	11.0	8.5	6.5	6.0	4.5
2000	19.0	19.0	19.0	18.8	19.0	18.5	18.5	18.4	16.9	14.8	12.5	10.6	8.9	6.1
2250	20.3	20.3	20.0	20.1	20.2	19.9	19.9	19.5	18.0	16.0	14.0	12.6	11.0	7.1
2500	21.5	21.5	21.3	21.3	21.5	21.2	21.1	20.3	18.0	16.0	14.0	13.0	11.9	7.6
2750	22.8	22.8	22.4	22.3	22.1	21.8	21.5	20.7	18.0	16.0	14.0	13.0	12.0	7.8
3000	24.9	24.9	24.2	23.4	22.7	21.8	21.5	20.7	18.0	16.0	14.0	13.0	12.0	8.0
3500	27.5	27.5	26.5	25.0	23.5	22.1	21.5	20.8	18.0	16.0	14.0	13.0	12.0	8.2
4000	31.0	31.0	30.0	28.0	25.3	22.9	21.5	20.8	18.0	16.0	14.0	13.0	12.0	8.4
4500	32.5	32.5	31.0	29.0	26.5	23.4	21.7	20.8	18.0	16.0	14.0	13.0	12.0	8.6
5000	32.8	32.8	31.3	29.3	27.4	23.8	21.9	20.8	18.0	16.0	14.0	13.0	12.0	8.8
5500	33.2	33.2	31.5	29.5	27.8	24.4	22.1	20.9	18.0	16.0	14.0	13.0	12.0	9.0
6000	33.5	33.5	31.8	29.8	28.0	24.7	22.3	20.9	18.0	16.0	14.0	13.0	12.0	9.0
6500	33.8	33.8	32.0	30.0	28.2	24.9	22.5	20.9	18.0	16.0	14.0	13.0	12.0	9.0
7000	34.2	34.2	32.3	30.3	28.3	25.2	22.8	21.0	18.0	16.0	14.0	13.0	12.0	9.0
7500	34.5	34.5	32.5	30.5	28.5	25.5	23.0	21.0	18.0	16.0	14.0	13.0	12.0	9.0

to use the copy function, select the area you wish to copy. Then select copy or use the keyboard shortcut.

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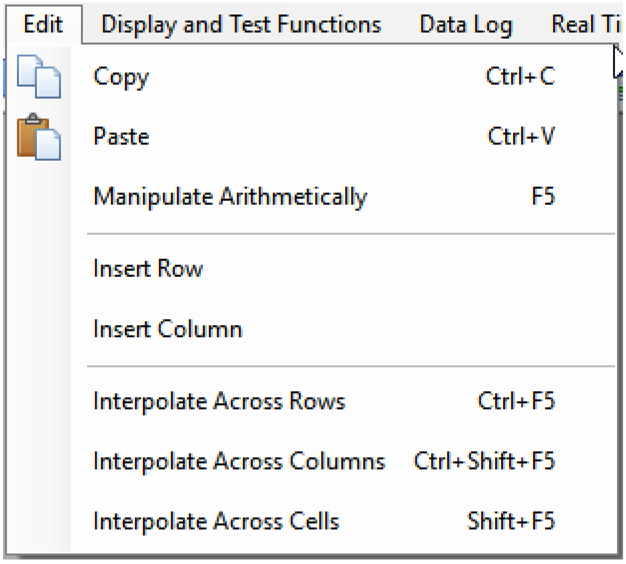
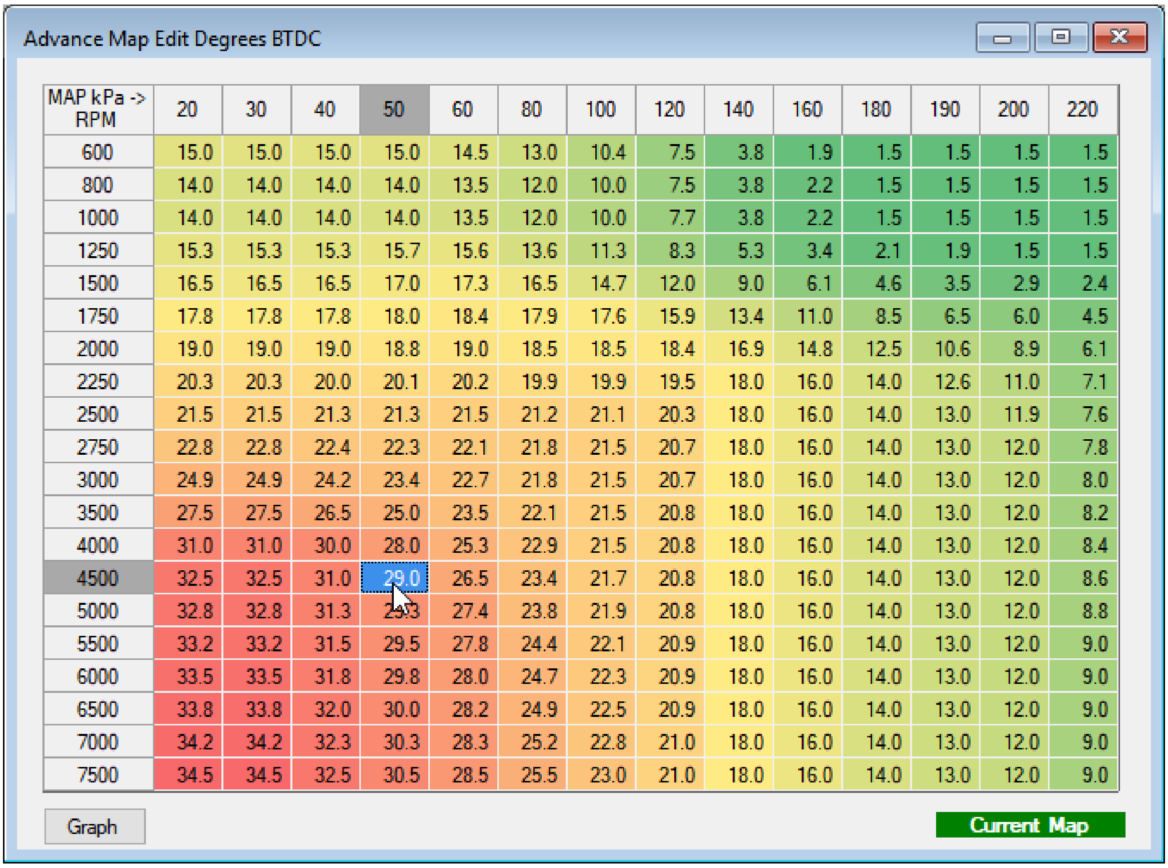
3.2 Paste



The Paste function can be found under Edit or alternatively Control and P can be used.



MAP kPa -> RPM	20	30	40	50	60	80	100	120	140	160	180	190	200	220
600	15.0	15.0	15.0	15.0	14.5	13.0	10.4	7.5	3.8	1.9	1.5	1.5	1.5	1.5
800	14.0	14.0	14.0	14.0	13.5	12.0	10.0	7.5	3.8	2.2	1.5	1.5	1.5	1.5
1000	14.0	14.0	14.0	14.0	13.5	12.0	10.0	7.7	3.8	2.2	1.5	1.5	1.5	1.5
1250	15.3	15.3	15.3	15.7	15.6	13.6	11.3	8.3	5.3	3.4	2.1	1.9	1.5	1.5
1500	16.5	16.5	16.5	17.0	17.3	16.5	14.7	12.0	9.0	6.1	4.6	3.5	2.9	2.4
1750	17.8	17.8	17.8	18.0	18.4	17.9	17.6	15.9	13.4	11.0	8.5	6.5	6.0	4.5
2000	19.0	19.0	19.0	18.8	19.0	18.5	18.5	18.4	16.9	14.8	12.5	10.6	8.9	6.1
2250	20.3	20.3	20.0	20.1	20.2	19.9	19.9	19.5	18.0	16.0	14.0	12.6	11.0	7.1
2500	21.5	21.5	21.3	21.3	21.5	21.2	21.1	20.3	18.0	16.0	14.0	13.0	11.9	7.6
2750	22.8	22.8	22.4	22.3	22.1	21.8	21.5	20.7	18.0	16.0	14.0	13.0	12.0	7.8
3000	24.9	24.9	24.2	23.4	22.7	21.8	21.5	20.7	18.0	16.0	14.0	13.0	12.0	8.0
3500	27.5	27.5	26.5	25.0	23.5	22.1	21.5	20.8	18.0	16.0	14.0	13.0	12.0	8.2
4000	31.0	31.0	30.0	28.0	25.3	22.9	21.5	20.8	18.0	16.0	14.0	13.0	12.0	8.4
4500	32.5	32.5	31.0	29.0	26.5	23.4	21.7	20.8	18.0	16.0	14.0	13.0	12.0	8.6
5000	32.8	32.8	31.3	[illegible]	27.4	23.8	21.9	20.8	18.0	16.0	14.0	13.0	12.0	8.8
5500	33.2	33.2	31.5	29.5	27.8	24.4	22.1	20.9	18.0	16.0	14.0	13.0	12.0	9.0
6000	33.5	33.5	31.8	29.8	28.0	24.7	22.3	20.9	18.0	16.0	14.0	13.0	12.0	9.0
6500	33.8	33.8	32.0	30.0	28.2	24.9	22.5	20.9	18.0	16.0	14.0	13.0	12.0	9.0
7000	34.2	34.2	32.3	30.3	28.3	25.2	22.8	21.0	18.0	16.0	14.0	13.0	12.0	9.0
7500	34.5	34.5	32.5	30.5	28.5	25.5	23.0	21.0	18.0	16.0	14.0	13.0	12.0	9.0

when you wish to place the items you have copied, click the top left cell you wish to paste into,
Select Paste or use the keyboard shortcut.

Advance Map Edit Degrees BTDC*

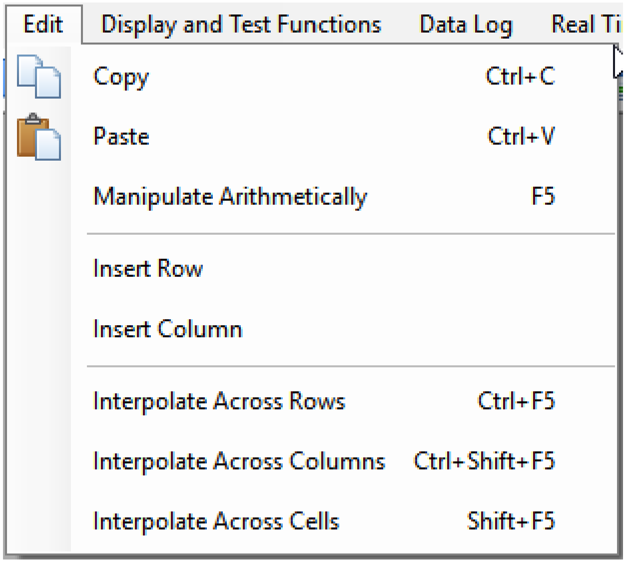
MAP kPa -> RPM	20	30	40	50	60	80	100	120	140	160	180	190	200	220
600	15.0	15.0	15.0	15.0	14.5	13.0	10.4	7.5	3.8	1.9	1.5	1.5	1.5	1.5
800	14.0	14.0	14.0	14.0	13.5	12.0	10.0	7.5	3.8	2.2	1.5	1.5	1.5	1.5
1000	14.0	14.0	14.0	14.0	13.5	12.0	10.0	7.7	3.8	2.2	1.5	1.5	1.5	1.5
1250	15.3	15.3	15.3	15.7	15.6	13.6	11.3	8.2	5.3	3.4	2.1	1.9	1.5	1.5
1500	16.5	16.5	16.5	17.0	17.3	16.5	14.7	12.0	9.0	6.1	4.6	3.5	2.9	2.4
1750	17.8	17.8	17.8	18.0	18.4	17.9	17.6	15.9	13.4	11.0	8.5	6.5	6.0	4.5
2000	19.0	19.0	19.0	18.8	19.0	18.5	18.5	18.4	16.9	14.8	12.5	10.6	8.9	6.1
2250	20.3	20.3	20.0	20.1	20.2	19.9	19.9	19.5	18.0	16.0	14.0	12.6	11.0	7.1
2500	21.5	21.5	21.3	21.3	21.5	21.2	21.1	20.3	18.0	16.0	14.0	13.0	11.9	7.6
2750	22.8	22.8	22.4	22.3	22.1	21.8	21.5	20.7	18.0	16.0	14.0	13.0	12.0	7.8
3000	24.9	24.9	24.2	23.4	22.7	21.8	21.5	20.7	18.0	16.0	14.0	13.0	12.0	8.0
3500	27.5	27.5	26.5	25.0	23.5	22.1	21.5	20.8	18.0	16.0	14.0	13.0	12.0	8.2
4000	31.0	31.0	30.0	28.0	25.3	22.9	21.5	20.8	18.0	16.0	14.0	13.0	12.0	8.4
4500	32.5	32.5	31.0	14.0	14.0	14.0	21.7	20.8	18.0	16.0	14.0	13.0	12.0	8.6
5000	32.8	32.8	31.3	14.0	14.0	14.0	21.9	20.8	18.0	16.0	14.0	13.0	12.0	8.8
5500	33.2	33.2	31.5	15.3	15.3	15.7	22.1	20.9	18.0	16.0	14.0	13.0	12.0	9.0
6000	33.5	33.5	31.8	16.5	16.5	17.0	22.3	20.9	18.0	16.0	14.0	13.0	12.0	9.0
6500	33.8	33.8	32.0	17.8	17.8	18.0	22.5	20.9	18.0	16.0	14.0	13.0	12.0	9.0
7000	34.2	34.2	32.3	30.3	28.3	25.2	22.8	21.0	18.0	16.0	14.0	13.0	12.0	9.0
7500	34.5	34.5	32.5	30.5	28.5	25.5	23.0	21.0	18.0	16.0	14.0	13.0	12.0	9.0

Graph

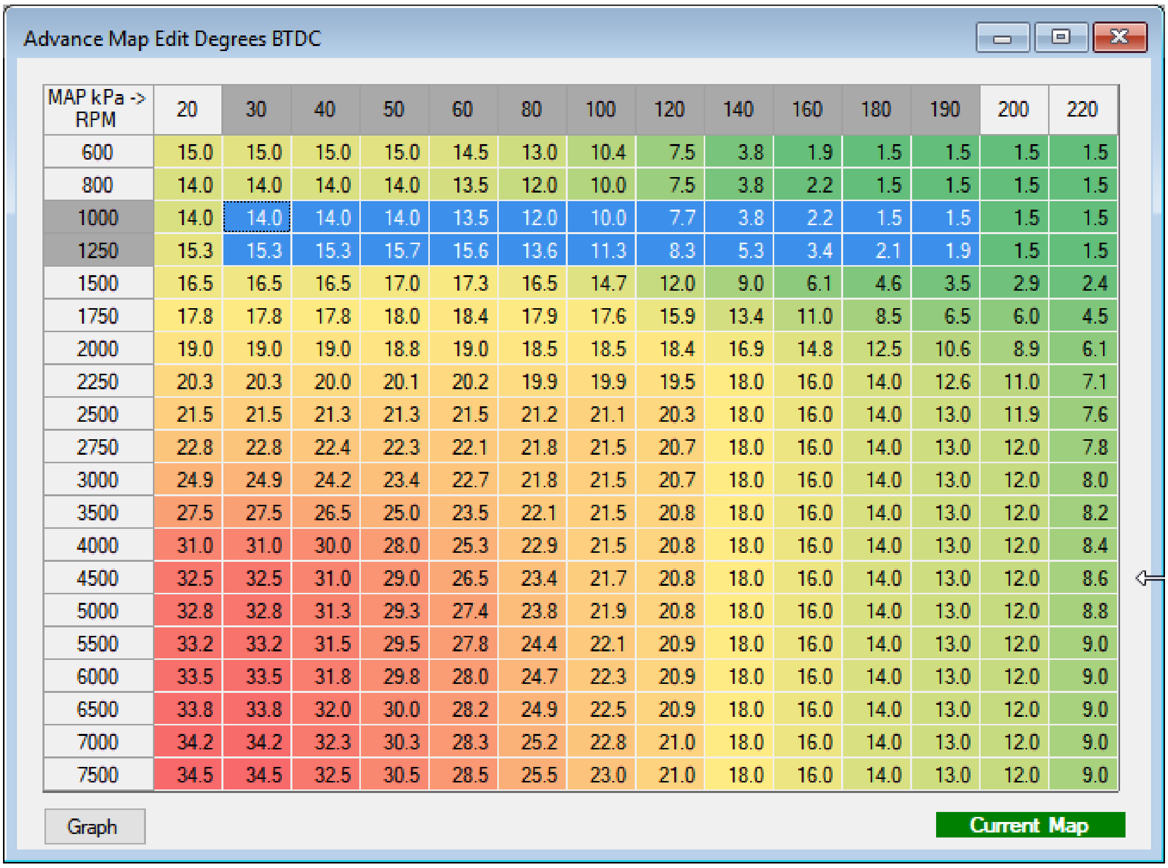
Map Not Current

The rest of the table will then paste below and to the right of the selected value as shown.

3.3 Manipulate Arithmetically



Manipulate Arithmetically can be found under Edit, or when an area is selected the F5 shortcut key can be used.



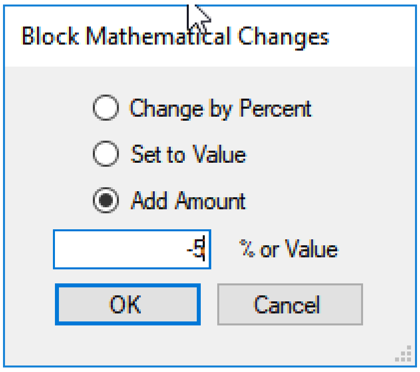
Advance Map Edit Degrees BTDC

MAP kPa -> RPM	20	30	40	50	60	80	100	120	140	160	180	190	200	220
600	15.0	15.0	15.0	15.0	14.5	13.0	10.4	7.5	3.8	1.9	1.5	1.5	1.5	1.5
800	14.0	14.0	14.0	14.0	13.5	12.0	10.0	7.5	3.8	2.2	1.5	1.5	1.5	1.5
1000	14.0	14.0	14.0	14.0	13.5	12.0	10.0	7.7	3.8	2.2	1.5	1.5	1.5	1.5
1250	15.3	15.3	15.3	15.7	15.6	13.6	11.3	8.3	5.3	3.4	2.1	1.9	1.5	1.5
1500	16.5	16.5	16.5	17.0	17.3	16.5	14.7	12.0	9.0	6.1	4.6	3.5	2.9	2.4
1750	17.8	17.8	17.8	18.0	18.4	17.9	17.6	15.9	13.4	11.0	8.5	6.5	6.0	4.5
2000	19.0	19.0	19.0	18.8	19.0	18.5	18.5	18.4	16.9	14.8	12.5	10.6	8.9	6.1
2250	20.3	20.3	20.0	20.1	20.2	19.9	19.9	19.5	18.0	16.0	14.0	12.6	11.0	7.1
2500	21.5	21.5	21.3	21.3	21.5	21.2	21.1	20.3	18.0	16.0	14.0	13.0	11.9	7.6
2750	22.8	22.8	22.4	22.3	22.1	21.8	21.5	20.7	18.0	16.0	14.0	13.0	12.0	7.8
3000	24.9	24.9	24.2	23.4	22.7	21.8	21.5	20.7	18.0	16.0	14.0	13.0	12.0	8.0
3500	27.5	27.5	26.5	25.0	23.5	22.1	21.5	20.8	18.0	16.0	14.0	13.0	12.0	8.2
4000	31.0	31.0	30.0	28.0	25.3	22.9	21.5	20.8	18.0	16.0	14.0	13.0	12.0	8.4
4500	32.5	32.5	31.0	29.0	26.5	23.4	21.7	20.8	18.0	16.0	14.0	13.0	12.0	8.6
5000	32.8	32.8	31.3	29.3	27.4	23.8	21.9	20.8	18.0	16.0	14.0	13.0	12.0	8.8
5500	33.2	33.2	31.5	29.5	27.8	24.4	22.1	20.9	18.0	16.0	14.0	13.0	12.0	9.0
6000	33.5	33.5	31.8	29.8	28.0	24.7	22.3	20.9	18.0	16.0	14.0	13.0	12.0	9.0
6500	33.8	33.8	32.0	30.0	28.2	24.9	22.5	20.9	18.0	16.0	14.0	13.0	12.0	9.0
7000	34.2	34.2	32.3	30.3	28.3	25.2	22.8	21.0	18.0	16.0	14.0	13.0	12.0	9.0
7500	34.5	34.5	32.5	30.5	28.5	25.5	23.0	21.0	18.0	16.0	14.0	13.0	12.0	9.0

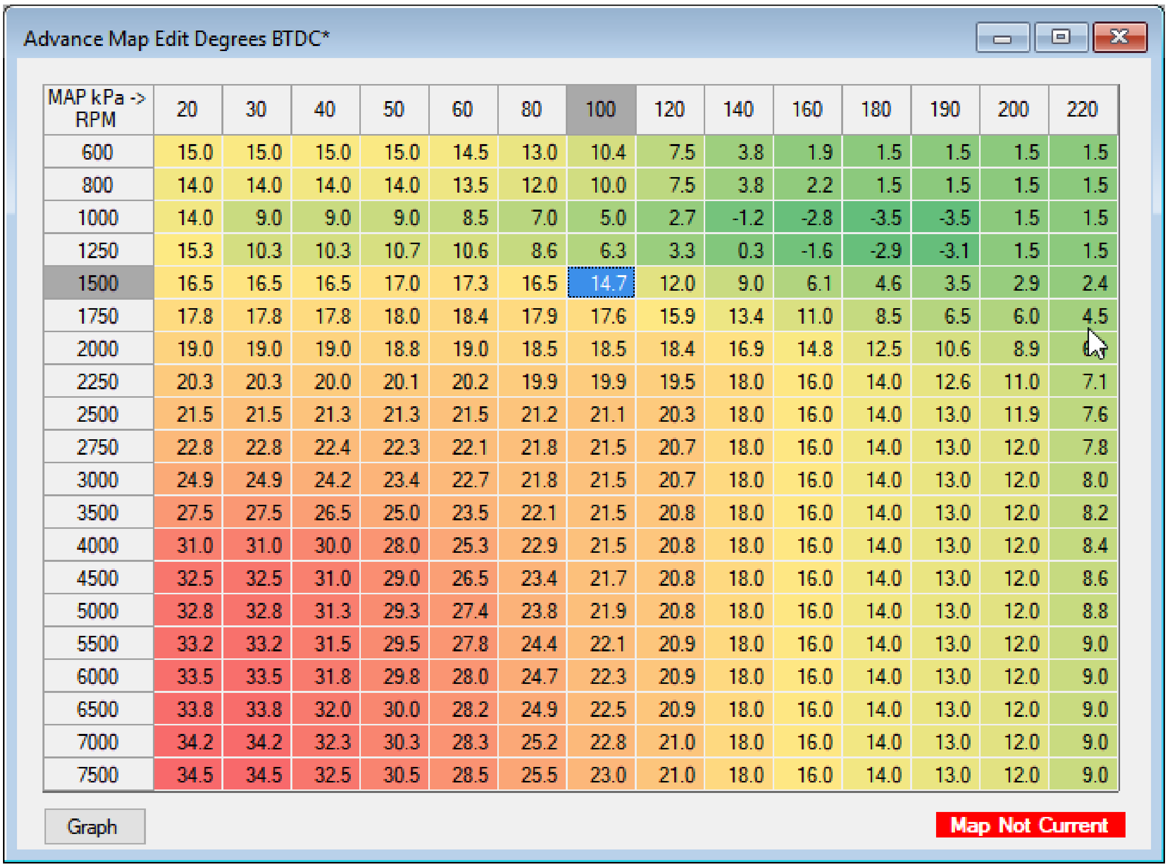
Graph

Current Map

Select the area you wish to apply the alteration to then press F5 or select 'Manipulate Arithmetically' under the edit menu.



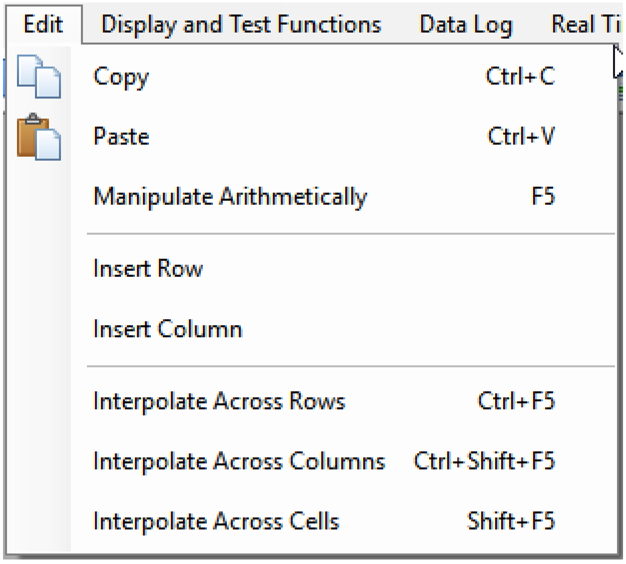
It is possible to change by a percentage, set all to a single value or add/remove an amount.
By adding a negative number as shown it is possible to take away. it is also possible to do the same with percentage.



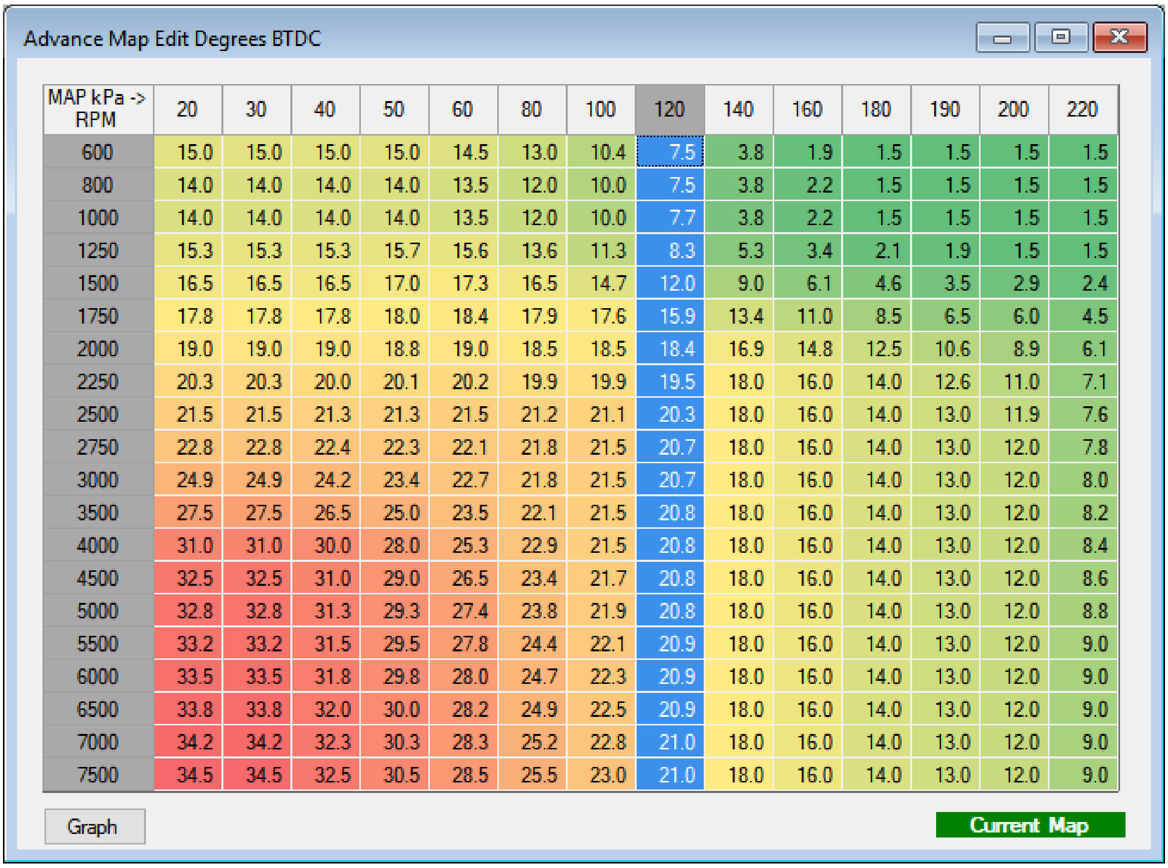
MAP kPa -> RPM	20	30	40	50	60	80	100	120	140	160	180	190	200	220
600	15.0	15.0	15.0	15.0	14.5	13.0	10.4	7.5	3.8	1.9	1.5	1.5	1.5	1.5
800	14.0	14.0	14.0	14.0	13.5	12.0	10.0	7.5	3.8	2.2	1.5	1.5	1.5	1.5
1000	14.0	9.0	9.0	9.0	8.5	7.0	5.0	2.7	-1.2	-2.8	-3.5	-3.5	1.5	1.5
1250	15.3	10.3	10.3	10.7	10.6	8.6	6.3	3.3	0.3	-1.6	-2.9	-3.1	1.5	1.5
1500	16.5	16.5	16.5	17.0	17.3	16.5	14.7	12.0	9.0	6.1	4.6	3.5	2.9	2.4
1750	17.8	17.8	17.8	18.0	18.4	17.9	17.6	15.9	13.4	11.0	8.5	6.5	6.0	4.5
2000	19.0	19.0	19.0	18.8	19.0	18.5	18.5	18.4	16.9	14.8	12.5	10.6	8.9	[illegible]
2250	20.3	20.3	20.0	20.1	20.2	19.9	19.9	19.5	18.0	16.0	14.0	12.6	11.0	7.1
2500	21.5	21.5	21.3	21.3	21.5	21.2	21.1	20.3	18.0	16.0	14.0	13.0	11.9	7.6
2750	22.8	22.8	22.4	22.3	22.1	21.8	21.5	20.7	18.0	16.0	14.0	13.0	12.0	7.8
3000	24.9	24.9	24.2	23.4	22.7	21.8	21.5	20.7	18.0	16.0	14.0	13.0	12.0	8.0
3500	27.5	27.5	26.5	25.0	23.5	22.1	21.5	20.8	18.0	16.0	14.0	13.0	12.0	8.2
4000	31.0	31.0	30.0	28.0	25.3	22.9	21.5	20.8	18.0	16.0	14.0	13.0	12.0	8.4
4500	32.5	32.5	31.0	29.0	26.5	23.4	21.7	20.8	18.0	16.0	14.0	13.0	12.0	8.6
5000	32.8	32.8	31.3	29.3	27.4	23.8	21.9	20.8	18.0	16.0	14.0	13.0	12.0	8.8
5500	33.2	33.2	31.5	29.5	27.8	24.4	22.1	20.9	18.0	16.0	14.0	13.0	12.0	9.0
6000	33.5	33.5	31.8	29.8	28.0	24.7	22.3	20.9	18.0	16.0	14.0	13.0	12.0	9.0
6500	33.8	33.8	32.0	30.0	28.2	24.9	22.5	20.9	18.0	16.0	14.0	13.0	12.0	9.0
7000	34.2	34.2	32.3	30.3	28.3	25.2	22.8	21.0	18.0	16.0	14.0	13.0	12.0	9.0
7500	34.5	34.5	32.5	30.5	28.5	25.5	23.0	21.0	18.0	16.0	14.0	13.0	12.0	9.0

The values in the selected area have now been changed.

3.4 Insert Row

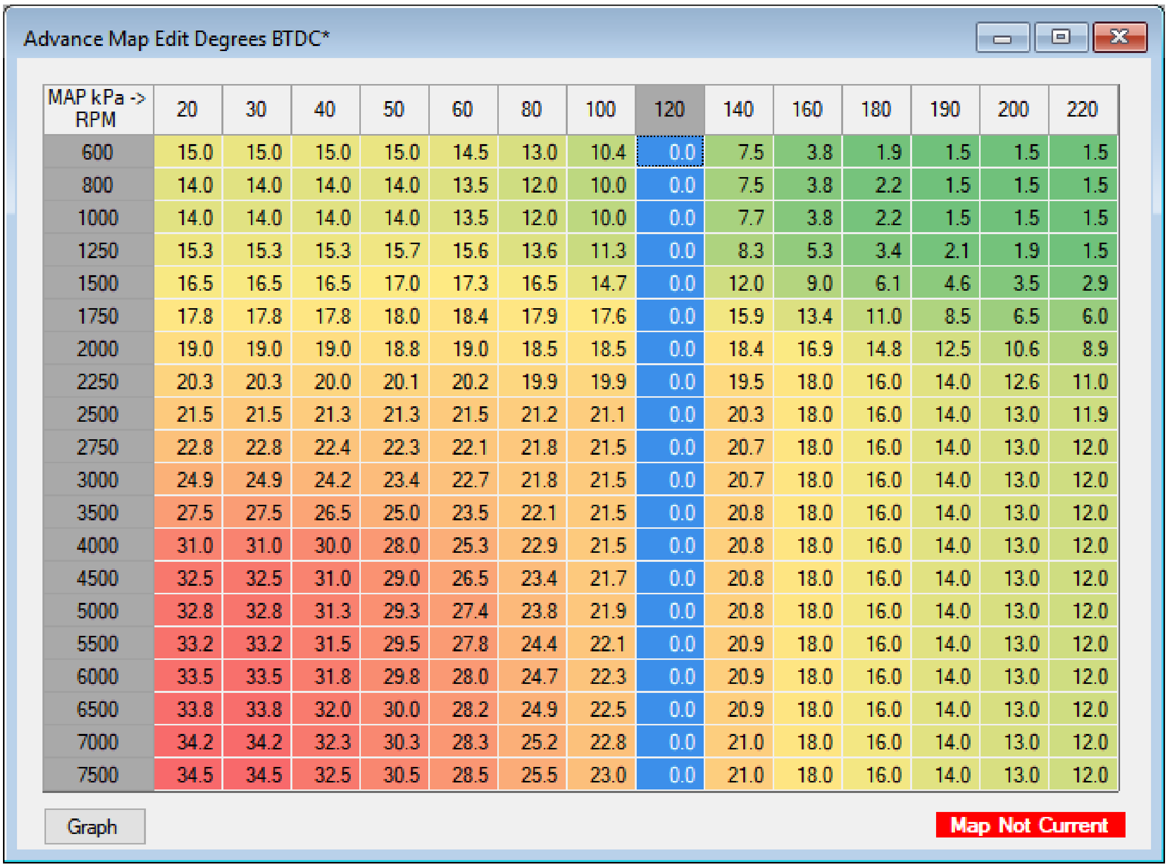


This function can be found under Edit.



MAP kPa -> RPM	20	30	40	50	60	80	100	120	140	160	180	190	200	220
600	15.0	15.0	15.0	15.0	14.5	13.0	10.4	7.5	3.8	1.9	1.5	1.5	1.5	1.5
800	14.0	14.0	14.0	14.0	13.5	12.0	10.0	7.5	3.8	2.2	1.5	1.5	1.5	1.5
1000	14.0	14.0	14.0	14.0	13.5	12.0	10.0	7.7	3.8	2.2	1.5	1.5	1.5	1.5
1250	15.3	15.3	15.3	15.7	15.6	13.6	11.3	8.3	5.3	3.4	2.1	1.9	1.5	1.5
1500	16.5	16.5	16.5	17.0	17.3	16.5	14.7	12.0	9.0	6.1	4.6	3.5	2.9	2.4
1750	17.8	17.8	17.8	18.0	18.4	17.9	17.6	15.9	13.4	11.0	8.5	6.5	6.0	4.5
2000	19.0	19.0	19.0	18.8	19.0	18.5	18.5	18.4	16.9	14.8	12.5	10.6	8.9	6.1
2250	20.3	20.3	20.0	20.1	20.2	19.9	19.9	19.5	18.0	16.0	14.0	12.6	11.0	7.1
2500	21.5	21.5	21.3	21.3	21.5	21.2	21.1	20.3	18.0	16.0	14.0	13.0	11.9	7.6
2750	22.8	22.8	22.4	22.3	22.1	21.8	21.5	20.7	18.0	16.0	14.0	13.0	12.0	7.8
3000	24.9	24.9	24.2	23.4	22.7	21.8	21.5	20.7	18.0	16.0	14.0	13.0	12.0	8.0
3500	27.5	27.5	26.5	25.0	23.5	22.1	21.5	20.8	18.0	16.0	14.0	13.0	12.0	8.2
4000	31.0	31.0	30.0	28.0	25.3	22.9	21.5	20.8	18.0	16.0	14.0	13.0	12.0	8.4
4500	32.5	32.5	31.0	29.0	26.5	23.4	21.7	20.8	18.0	16.0	14.0	13.0	12.0	8.6
5000	32.8	32.8	31.3	29.3	27.4	23.8	21.9	20.8	18.0	16.0	14.0	13.0	12.0	8.8
5500	33.2	33.2	31.5	29.5	27.8	24.4	22.1	20.9	18.0	16.0	14.0	13.0	12.0	9.0
6000	33.5	33.5	31.8	29.8	28.0	24.7	22.3	20.9	18.0	16.0	14.0	13.0	12.0	9.0
6500	33.8	33.8	32.0	30.0	28.2	24.9	22.5	20.9	18.0	16.0	14.0	13.0	12.0	9.0
7000	34.2	34.2	32.3	30.3	28.3	25.2	22.8	21.0	18.0	16.0	14.0	13.0	12.0	9.0
7500	34.5	34.5	32.5	30.5	28.5	25.5	23.0	21.0	18.0	16.0	14.0	13.0	12.0	9.0

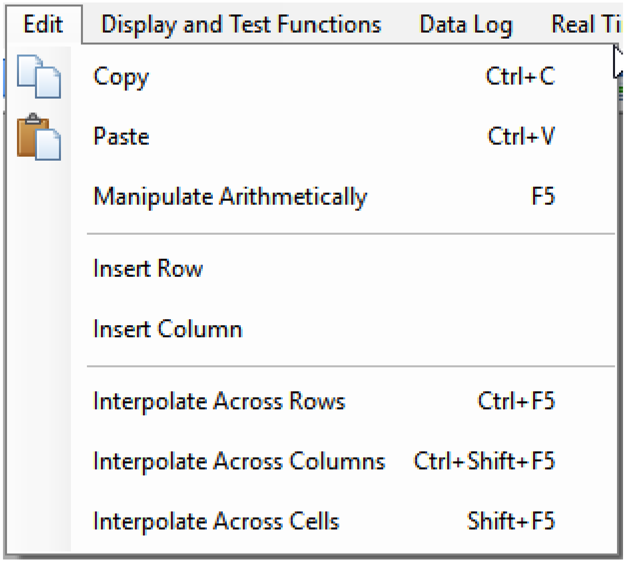
Select the Row you wish to inset a blank row in and select the insert row function.



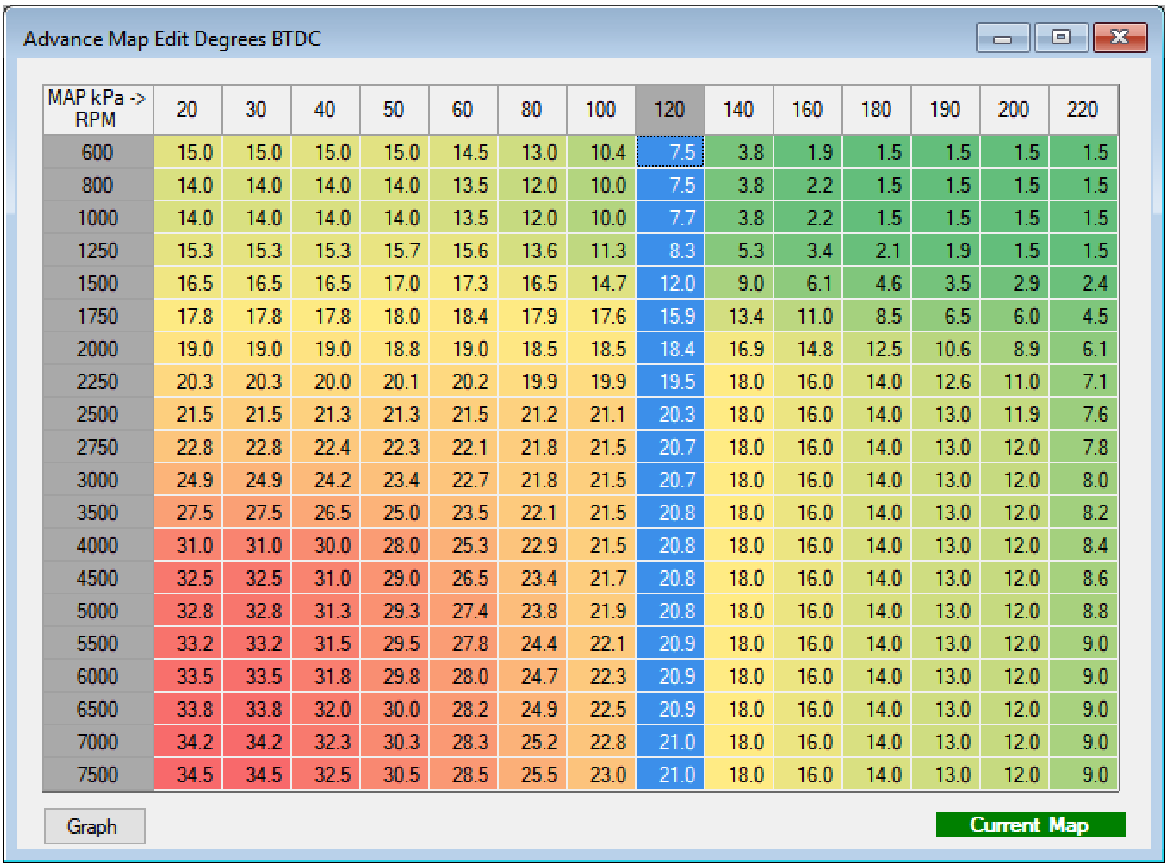
MAP kPa -> RPM	20	30	40	50	60	80	100	120	140	160	180	190	200	220
600	15.0	15.0	15.0	15.0	14.5	13.0	10.4	0.0	7.5	3.8	1.9	1.5	1.5	1.5
800	14.0	14.0	14.0	14.0	13.5	12.0	10.0	0.0	7.5	3.8	2.2	1.5	1.5	1.5
1000	14.0	14.0	14.0	14.0	13.5	12.0	10.0	0.0	7.7	3.8	2.2	1.5	1.5	1.5
1250	15.3	15.3	15.3	15.7	15.6	13.6	11.3	0.0	8.3	5.3	3.4	2.1	1.9	1.5
1500	16.5	16.5	16.5	17.0	17.3	16.5	14.7	0.0	12.0	9.0	6.1	4.6	3.5	2.9
1750	17.8	17.8	17.8	18.0	18.4	17.9	17.6	0.0	15.9	13.4	11.0	8.5	6.5	6.0
2000	19.0	19.0	19.0	18.8	19.0	18.5	18.5	0.0	18.4	16.9	14.8	12.5	10.6	8.9
2250	20.3	20.3	20.0	20.1	20.2	19.9	19.9	0.0	19.5	18.0	16.0	14.0	12.6	11.0
2500	21.5	21.5	21.3	21.3	21.5	21.2	21.1	0.0	20.3	18.0	16.0	14.0	13.0	11.9
2750	22.8	22.8	22.4	22.3	22.1	21.8	21.5	0.0	20.7	18.0	16.0	14.0	13.0	12.0
3000	24.9	24.9	24.2	23.4	22.7	21.8	21.5	0.0	20.7	18.0	16.0	14.0	13.0	12.0
3500	27.5	27.5	26.5	25.0	23.5	22.1	21.5	0.0	20.8	18.0	16.0	14.0	13.0	12.0
4000	31.0	31.0	30.0	28.0	25.3	22.9	21.5	0.0	20.8	18.0	16.0	14.0	13.0	12.0
4500	32.5	32.5	31.0	29.0	26.5	23.4	21.7	0.0	20.8	18.0	16.0	14.0	13.0	12.0
5000	32.8	32.8	31.3	29.3	27.4	23.8	21.9	0.0	20.8	18.0	16.0	14.0	13.0	12.0
5500	33.2	33.2	31.5	29.5	27.8	24.4	22.1	0.0	20.9	18.0	16.0	14.0	13.0	12.0
6000	33.5	33.5	31.8	29.8	28.0	24.7	22.3	0.0	20.9	18.0	16.0	14.0	13.0	12.0
6500	33.8	33.8	32.0	30.0	28.2	24.9	22.5	0.0	20.9	18.0	16.0	14.0	13.0	12.0
7000	34.2	34.2	32.3	30.3	28.3	25.2	22.8	0.0	21.0	18.0	16.0	14.0	13.0	12.0
7500	34.5	34.5	32.5	30.5	28.5	25.5	23.0	0.0	21.0	18.0	16.0	14.0	13.0	12.0

The row will then be entered all with the value 0.
all rows below this will be pushed down and the last row will be lost.

3.5 Insert Column

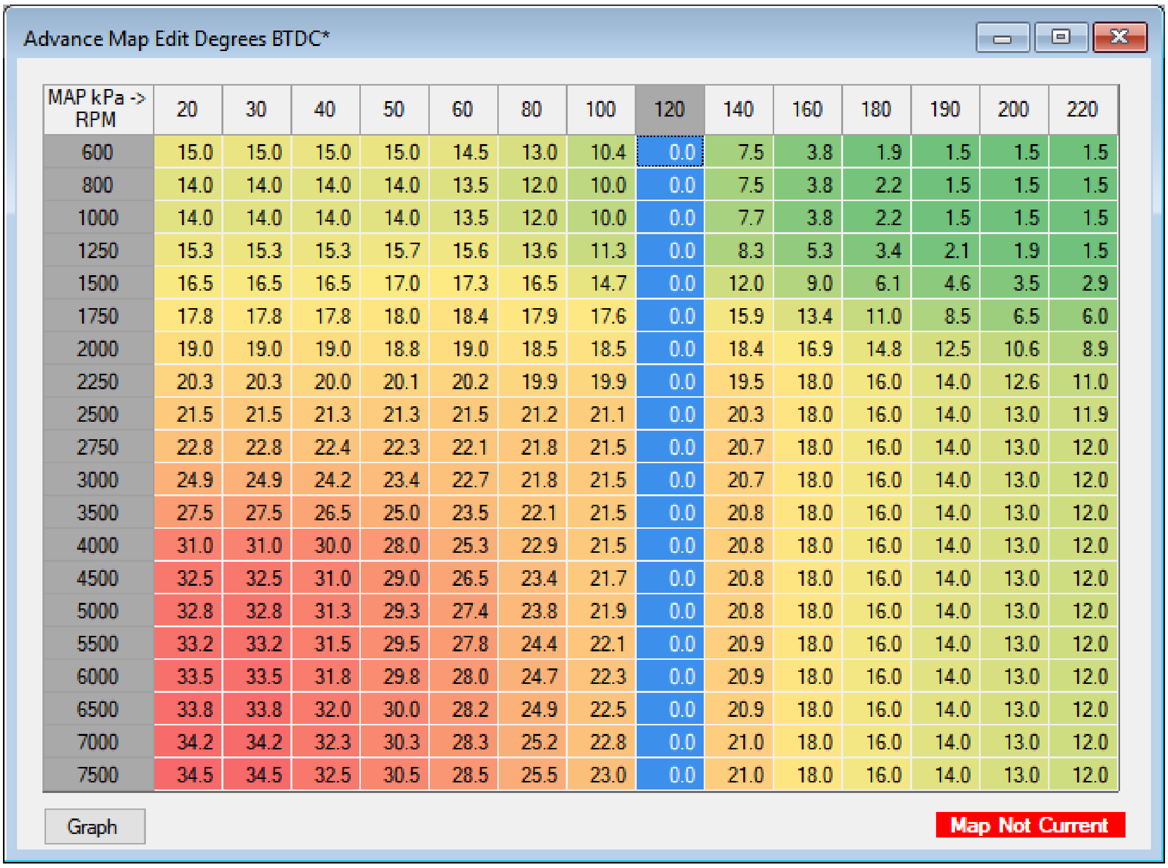


This function can be found under Edit.



MAP kPa -> RPM	20	30	40	50	60	80	100	120	140	160	180	190	200	220
600	15.0	15.0	15.0	15.0	14.5	13.0	10.4	7.5	3.8	1.9	1.5	1.5	1.5	1.5
800	14.0	14.0	14.0	14.0	13.5	12.0	10.0	7.5	3.8	2.2	1.5	1.5	1.5	1.5
1000	14.0	14.0	14.0	14.0	13.5	12.0	10.0	7.7	3.8	2.2	1.5	1.5	1.5	1.5
1250	15.3	15.3	15.3	15.7	15.6	13.6	11.3	8.3	5.3	3.4	2.1	1.9	1.5	1.5
1500	16.5	16.5	16.5	17.0	17.3	16.5	14.7	12.0	9.0	6.1	4.6	3.5	2.9	2.4
1750	17.8	17.8	17.8	18.0	18.4	17.9	17.6	15.9	13.4	11.0	8.5	6.5	6.0	4.5
2000	19.0	19.0	19.0	18.8	19.0	18.5	18.5	18.4	16.9	14.8	12.5	10.6	8.9	6.1
2250	20.3	20.3	20.0	20.1	20.2	19.9	19.9	19.5	18.0	16.0	14.0	12.6	11.0	7.1
2500	21.5	21.5	21.3	21.3	21.5	21.2	21.1	20.3	18.0	16.0	14.0	13.0	11.9	7.6
2750	22.8	22.8	22.4	22.3	22.1	21.8	21.5	20.7	18.0	16.0	14.0	13.0	12.0	7.8
3000	24.9	24.9	24.2	23.4	22.7	21.8	21.5	20.7	18.0	16.0	14.0	13.0	12.0	8.0
3500	27.5	27.5	26.5	25.0	23.5	22.1	21.5	20.8	18.0	16.0	14.0	13.0	12.0	8.2
4000	31.0	31.0	30.0	28.0	25.3	22.9	21.5	20.8	18.0	16.0	14.0	13.0	12.0	8.4
4500	32.5	32.5	31.0	29.0	26.5	23.4	21.7	20.8	18.0	16.0	14.0	13.0	12.0	8.6
5000	32.8	32.8	31.3	29.3	27.4	23.8	21.9	20.8	18.0	16.0	14.0	13.0	12.0	8.8
5500	33.2	33.2	31.5	29.5	27.8	24.4	22.1	20.9	18.0	16.0	14.0	13.0	12.0	9.0
6000	33.5	33.5	31.8	29.8	28.0	24.7	22.3	20.9	18.0	16.0	14.0	13.0	12.0	9.0
6500	33.8	33.8	32.0	30.0	28.2	24.9	22.5	20.9	18.0	16.0	14.0	13.0	12.0	9.0
7000	34.2	34.2	32.3	30.3	28.3	25.2	22.8	21.0	18.0	16.0	14.0	13.0	12.0	9.0
7500	34.5	34.5	32.5	30.5	28.5	25.5	23.0	21.0	18.0	16.0	14.0	13.0	12.0	9.0

Select the Column you wish to inset a blank row in and select the insert row function.



Advance Map Edit Degrees BTDC*

MAP kPa -> RPM	20	30	40	50	60	80	100	120	140	160	180	190	200	220
600	15.0	15.0	15.0	15.0	14.5	13.0	10.4	0.0	7.5	3.8	1.9	1.5	1.5	1.5
800	14.0	14.0	14.0	14.0	13.5	12.0	10.0	0.0	7.5	3.8	2.2	1.5	1.5	1.5
1000	14.0	14.0	14.0	14.0	13.5	12.0	10.0	0.0	7.7	3.8	2.2	1.5	1.5	1.5
1250	15.3	15.3	15.3	15.7	15.6	13.6	11.3	0.0	8.3	5.3	3.4	2.1	1.9	1.5
1500	16.5	16.5	16.5	17.0	17.3	16.5	14.7	0.0	12.0	9.0	6.1	4.6	3.5	2.9
1750	17.8	17.8	17.8	18.0	18.4	17.9	17.6	0.0	15.9	13.4	11.0	8.5	6.5	6.0
2000	19.0	19.0	19.0	18.8	19.0	18.5	18.5	0.0	18.4	16.9	14.8	12.5	10.6	8.9
2250	20.3	20.3	20.0	20.1	20.2	19.9	19.9	0.0	19.5	18.0	16.0	14.0	12.6	11.0
2500	21.5	21.5	21.3	21.3	21.5	21.2	21.1	0.0	20.3	18.0	16.0	14.0	13.0	11.9
2750	22.8	22.8	22.4	22.3	22.1	21.8	21.5	0.0	20.7	18.0	16.0	14.0	13.0	12.0
3000	24.9	24.9	24.2	23.4	22.7	21.8	21.5	0.0	20.7	18.0	16.0	14.0	13.0	12.0
3500	27.5	27.5	26.5	25.0	23.5	22.1	21.5	0.0	20.8	18.0	16.0	14.0	13.0	12.0
4000	31.0	31.0	30.0	28.0	25.3	22.9	21.5	0.0	20.8	18.0	16.0	14.0	13.0	12.0
4500	32.5	32.5	31.0	29.0	26.5	23.4	21.7	0.0	20.8	18.0	16.0	14.0	13.0	12.0
5000	32.8	32.8	31.3	29.3	27.4	23.8	21.9	0.0	20.8	18.0	16.0	14.0	13.0	12.0
5500	33.2	33.2	31.5	29.5	27.8	24.4	22.1	0.0	20.9	18.0	16.0	14.0	13.0	12.0
6000	33.5	33.5	31.8	29.8	28.0	24.7	22.3	0.0	20.9	18.0	16.0	14.0	13.0	12.0
6500	33.8	33.8	32.0	30.0	28.2	24.9	22.5	0.0	20.9	18.0	16.0	14.0	13.0	12.0
7000	34.2	34.2	32.3	30.3	28.3	25.2	22.8	0.0	21.0	18.0	16.0	14.0	13.0	12.0
7500	34.5	34.5	32.5	30.5	28.5	25.5	23.0	0.0	21.0	18.0	16.0	14.0	13.0	12.0

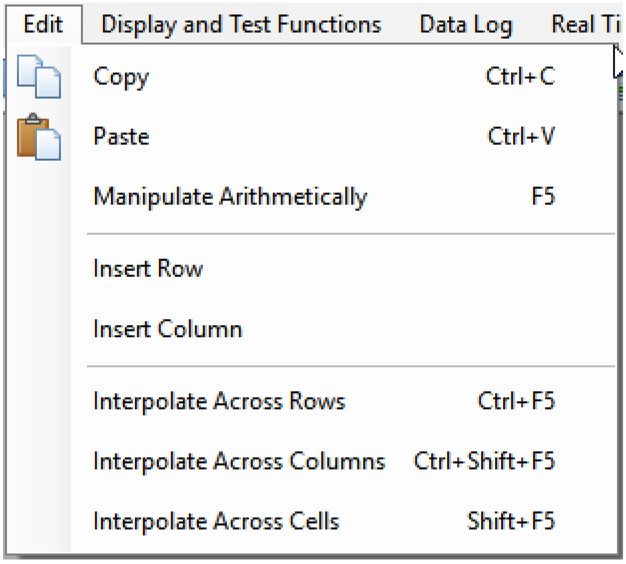
Graph

Map Not Current

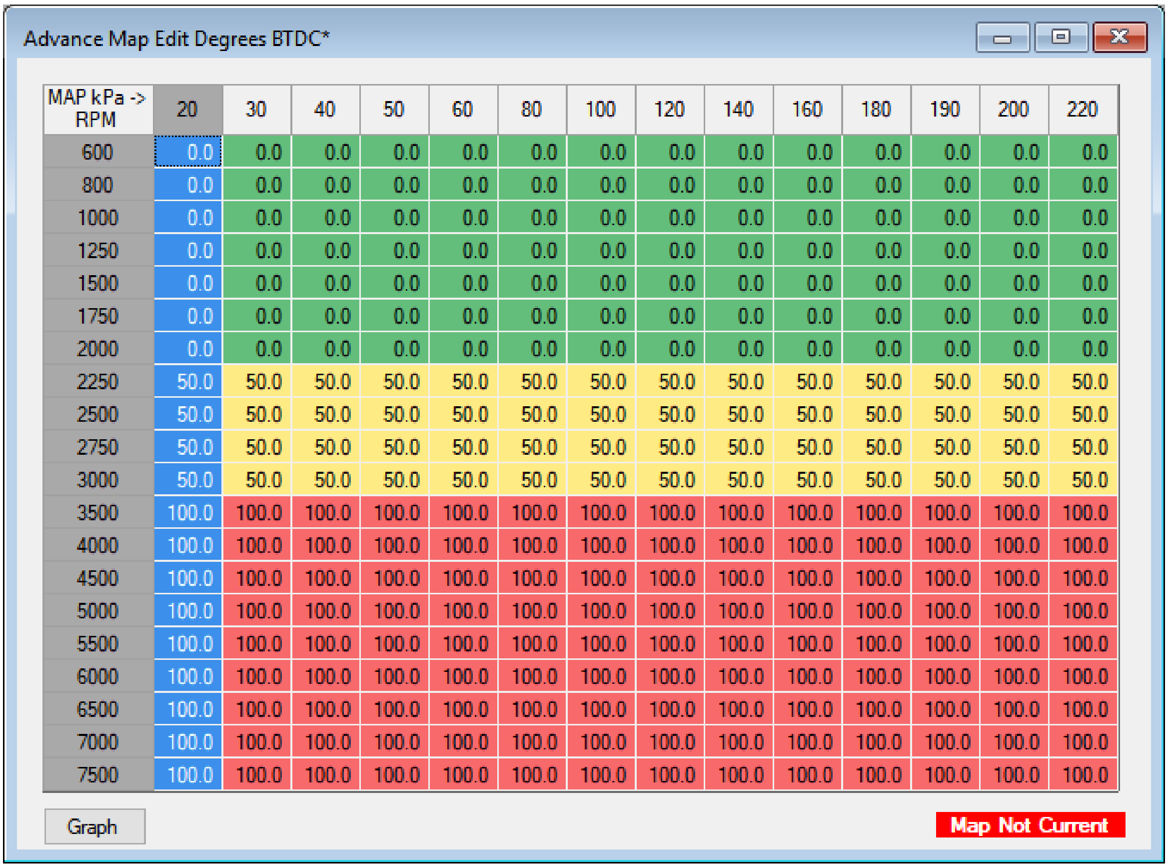
The Column will then be entered all with the value 0.

All Columns to the right will be moved to the right and the last Column will be lost.

3.6 Interpolate Across Rows

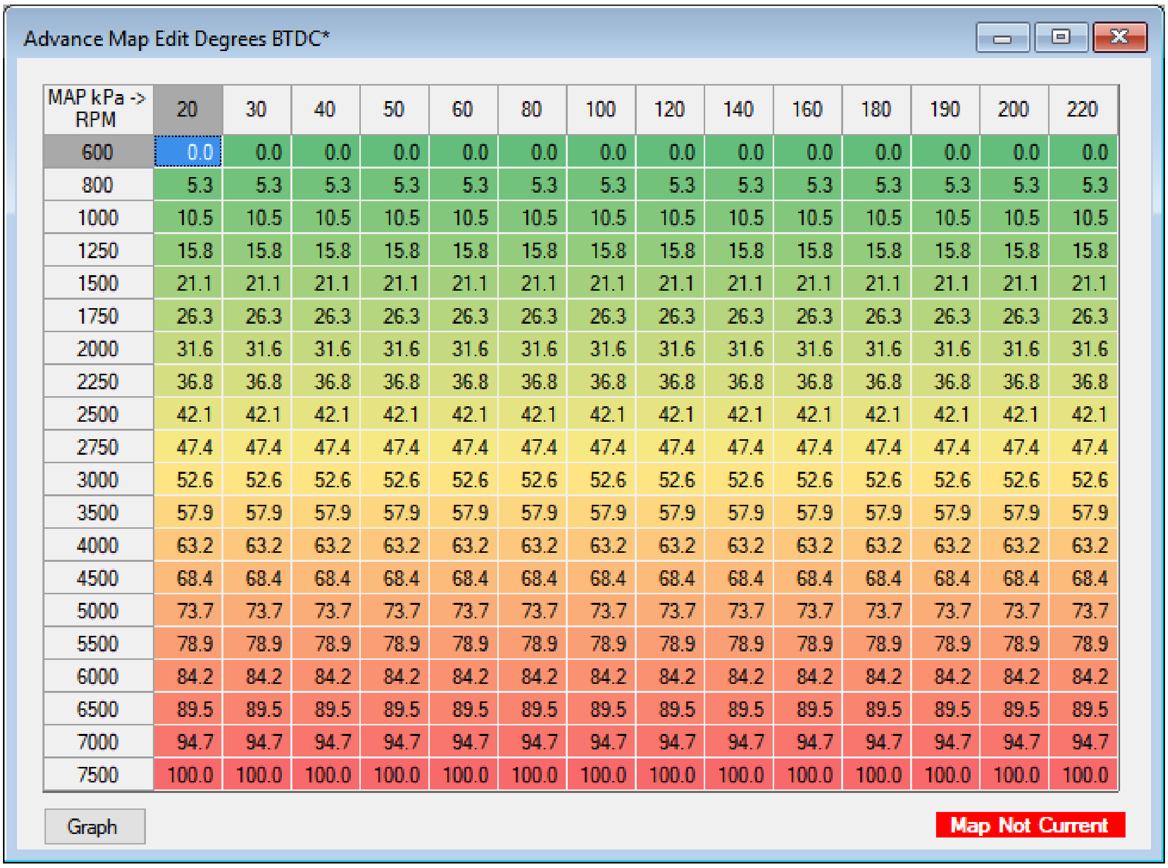


Interpolate across Rows can be found under the edit menu. The Keyboard shortcut Ctrl and F5 can also be used



MAP kPa -> RPM	20	30	40	50	60	80	100	120	140	160	180	190	200	220
600	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
800	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1250	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1750	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2250	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
2500	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
2750	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
3000	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
3500	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
4000	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
4500	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
5000	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
5500	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
6000	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
6500	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
7000	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
7500	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

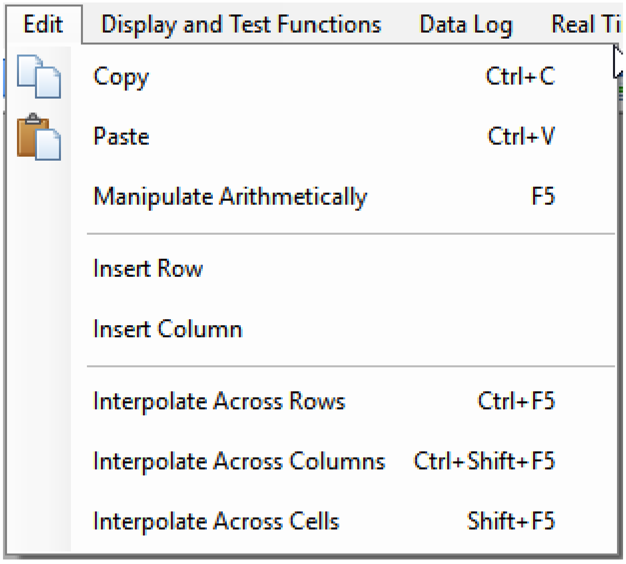
Select the Rows you wish to interpolate across. This can be all cells or a select few. Then click 'interpolate across Rows' or use the keyboard shortcut.



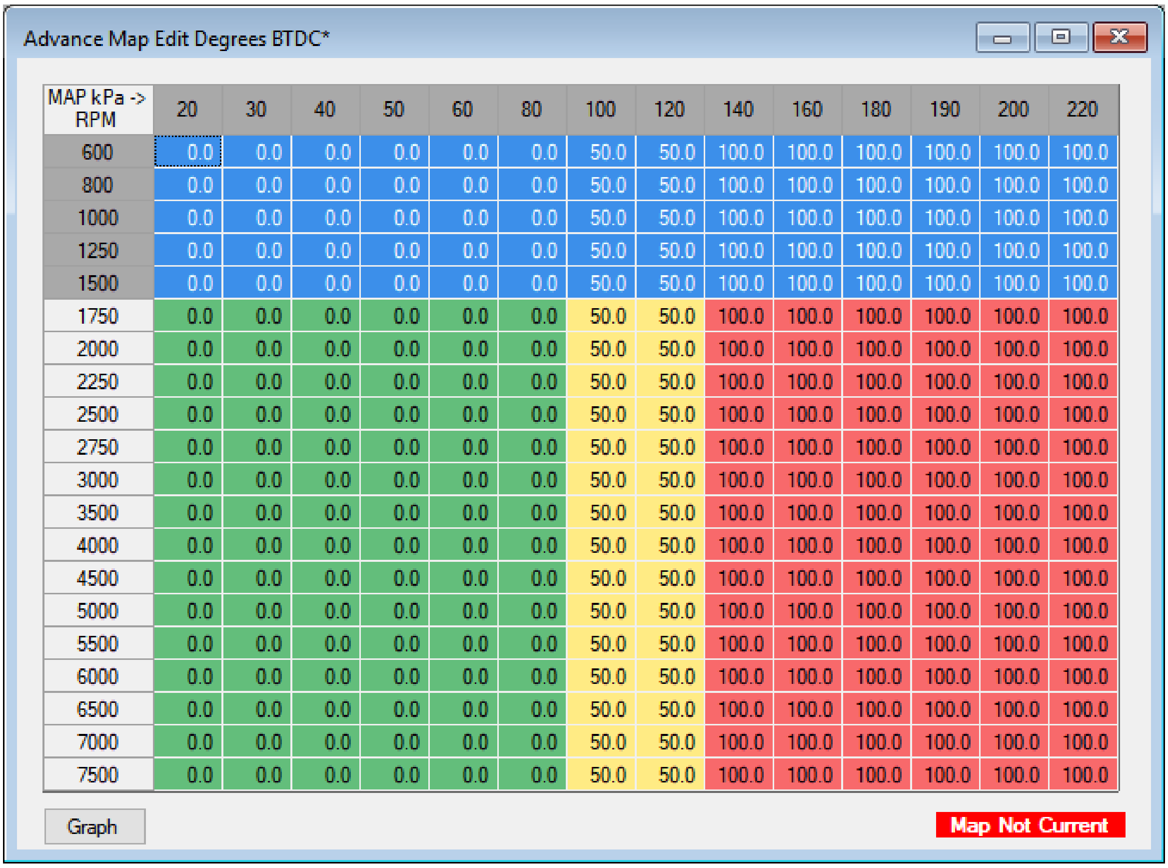
MAP kPa -> RPM	20	30	40	50	60	80	100	120	140	160	180	190	200	220
600	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
800	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3
1000	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5
1250	15.8	15.8	15.8	15.8	15.8	15.8	15.8	15.8	15.8	15.8	15.8	15.8	15.8	15.8
1500	21.1	21.1	21.1	21.1	21.1	21.1	21.1	21.1	21.1	21.1	21.1	21.1	21.1	21.1
1750	26.3	26.3	26.3	26.3	26.3	26.3	26.3	26.3	26.3	26.3	26.3	26.3	26.3	26.3
2000	31.6	31.6	31.6	31.6	31.6	31.6	31.6	31.6	31.6	31.6	31.6	31.6	31.6	31.6
2250	36.8	36.8	36.8	36.8	36.8	36.8	36.8	36.8	36.8	36.8	36.8	36.8	36.8	36.8
2500	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1
2750	47.4	47.4	47.4	47.4	47.4	47.4	47.4	47.4	47.4	47.4	47.4	47.4	47.4	47.4
3000	52.6	52.6	52.6	52.6	52.6	52.6	52.6	52.6	52.6	52.6	52.6	52.6	52.6	52.6
3500	57.9	57.9	57.9	57.9	57.9	57.9	57.9	57.9	57.9	57.9	57.9	57.9	57.9	57.9
4000	63.2	63.2	63.2	63.2	63.2	63.2	63.2	63.2	63.2	63.2	63.2	63.2	63.2	63.2
4500	68.4	68.4	68.4	68.4	68.4	68.4	68.4	68.4	68.4	68.4	68.4	68.4	68.4	68.4
5000	73.7	73.7	73.7	73.7	73.7	73.7	73.7	73.7	73.7	73.7	73.7	73.7	73.7	73.7
5500	78.9	78.9	78.9	78.9	78.9	78.9	78.9	78.9	78.9	78.9	78.9	78.9	78.9	78.9
6000	84.2	84.2	84.2	84.2	84.2	84.2	84.2	84.2	84.2	84.2	84.2	84.2	84.2	84.2
6500	89.5	89.5	89.5	89.5	89.5	89.5	89.5	89.5	89.5	89.5	89.5	89.5	89.5	89.5
7000	94.7	94.7	94.7	94.7	94.7	94.7	94.7	94.7	94.7	94.7	94.7	94.7	94.7	94.7
7500	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

The software will then take the number from the top row and the bottom row and evenly split the values in between as shown.
If the change is to be kept press F4 or if not, close the window and Abandon any changes

3.7 Interpolate Across Columns



Interpolate across Columns can be found under the edit menu. The Keyboard shortcut Ctrl, Shift and F5 can also be used



MAP kPa -> RPM	20	30	40	50	60	80	100	120	140	160	180	190	200	220
600	0.0	0.0	0.0	0.0	0.0	0.0	50.0	50.0	100.0	100.0	100.0	100.0	100.0	100.0
800	0.0	0.0	0.0	0.0	0.0	0.0	50.0	50.0	100.0	100.0	100.0	100.0	100.0	100.0
1000	0.0	0.0	0.0	0.0	0.0	0.0	50.0	50.0	100.0	100.0	100.0	100.0	100.0	100.0
1250	0.0	0.0	0.0	0.0	0.0	0.0	50.0	50.0	100.0	100.0	100.0	100.0	100.0	100.0
1500	0.0	0.0	0.0	0.0	0.0	0.0	50.0	50.0	100.0	100.0	100.0	100.0	100.0	100.0
1750	0.0	0.0	0.0	0.0	0.0	0.0	50.0	50.0	100.0	100.0	100.0	100.0	100.0	100.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	50.0	50.0	100.0	100.0	100.0	100.0	100.0	100.0
2250	0.0	0.0	0.0	0.0	0.0	0.0	50.0	50.0	100.0	100.0	100.0	100.0	100.0	100.0
2500	0.0	0.0	0.0	0.0	0.0	0.0	50.0	50.0	100.0	100.0	100.0	100.0	100.0	100.0
2750	0.0	0.0	0.0	0.0	0.0	0.0	50.0	50.0	100.0	100.0	100.0	100.0	100.0	100.0
3000	0.0	0.0	0.0	0.0	0.0	0.0	50.0	50.0	100.0	100.0	100.0	100.0	100.0	100.0
3500	0.0	0.0	0.0	0.0	0.0	0.0	50.0	50.0	100.0	100.0	100.0	100.0	100.0	100.0
4000	0.0	0.0	0.0	0.0	0.0	0.0	50.0	50.0	100.0	100.0	100.0	100.0	100.0	100.0
4500	0.0	0.0	0.0	0.0	0.0	0.0	50.0	50.0	100.0	100.0	100.0	100.0	100.0	100.0
5000	0.0	0.0	0.0	0.0	0.0	0.0	50.0	50.0	100.0	100.0	100.0	100.0	100.0	100.0
5500	0.0	0.0	0.0	0.0	0.0	0.0	50.0	50.0	100.0	100.0	100.0	100.0	100.0	100.0
6000	0.0	0.0	0.0	0.0	0.0	0.0	50.0	50.0	100.0	100.0	100.0	100.0	100.0	100.0
6500	0.0	0.0	0.0	0.0	0.0	0.0	50.0	50.0	100.0	100.0	100.0	100.0	100.0	100.0
7000	0.0	0.0	0.0	0.0	0.0	0.0	50.0	50.0	100.0	100.0	100.0	100.0	100.0	100.0
7500	0.0	0.0	0.0	0.0	0.0	0.0	50.0	50.0	100.0	100.0	100.0	100.0	100.0	100.0

Select the columns you wish to interpolate across. This can be all cells or a select few. Then click 'interpolate across columns or use the keyboard shortcut.

Advance Map Edit Degrees BTDC*

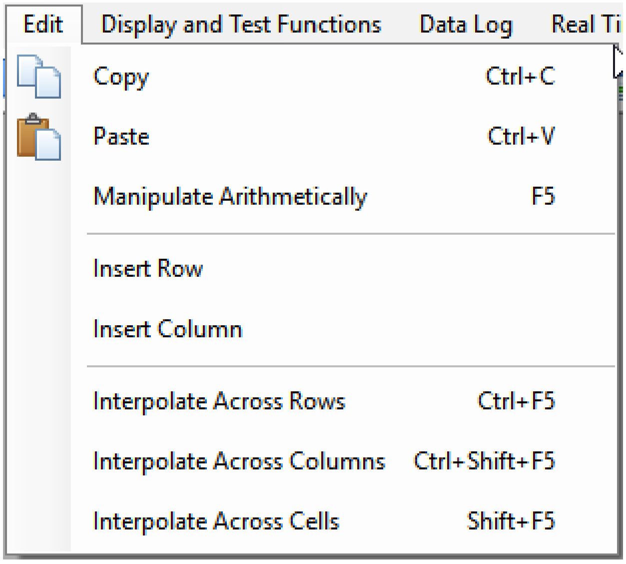
MAP kPa -> RPM	20	30	40	50	60	80	100	120	140	160	180	190	200	220
600	0.0	7.7	15.4	23.1	30.8	38.5	46.2	53.8	61.5	69.2	76.9	84.6	92.3	100.0
800	0.0	7.7	15.4	23.1	30.8	38.5	46.2	53.8	61.5	69.2	76.9	84.6	92.3	100.0
1000	0.0	7.7	15.4	23.1	30.8	38.5	46.2	53.8	61.5	69.2	76.9	84.6	92.3	100.0
1250	0.0	7.7	15.4	23.1	30.8	38.5	46.2	53.8	61.5	69.2	76.9	84.6	92.3	100.0
1500	0.0	7.7	15.4	23.1	30.8	38.5	46.2	53.8	61.5	69.2	76.9	84.6	92.3	100.0
1750	0.0	7.7	15.4	23.1	30.8	38.5	46.2	53.8	61.5	69.2	76.9	84.6	92.3	100.0
2000	0.0	7.7	15.4	23.1	30.8	38.5	46.2	53.8	61.5	69.2	76.9	84.6	92.3	100.0
2250	0.0	7.7	15.4	23.1	30.8	38.5	46.2	53.8	61.5	69.2	76.9	84.6	92.3	100.0
2500	0.0	7.7	15.4	23.1	30.8	38.5	46.2	53.8	61.5	69.2	76.9	84.6	92.3	100.0
2750	0.0	7.7	15.4	23.1	30.8	38.5	46.2	53.8	61.5	69.2	76.9	84.6	92.3	100.0
3000	0.0	7.7	15.4	23.1	30.8	38.5	46.2	53.8	61.5	69.2	76.9	84.6	92.3	100.0
3500	0.0	7.7	15.4	23.1	30.8	38.5	46.2	53.8	61.5	69.2	76.9	84.6	92.3	100.0
4000	0.0	7.7	15.4	23.1	30.8	38.5	46.2	53.8	61.5	69.2	76.9	84.6	92.3	100.0
4500	0.0	7.7	15.4	23.1	30.8	38.5	46.2	53.8	61.5	69.2	76.9	84.6	92.3	100.0
5000	0.0	7.7	15.4	23.1	30.8	38.5	46.2	53.8	61.5	69.2	76.9	84.6	92.3	100.0
5500	0.0	7.7	15.4	23.1	30.8	38.5	46.2	53.8	61.5	69.2	76.9	84.6	92.3	100.0
6000	0.0	7.7	15.4	23.1	30.8	38.5	46.2	53.8	61.5	69.2	76.9	84.6	92.3	100.0
6500	0.0	7.7	15.4	23.1	30.8	38.5	46.2	53.8	61.5	69.2	76.9	84.6	92.3	100.0
7000	0.0	7.7	15.4	23.1	30.8	38.5	46.2	53.8	61.5	69.2	76.9	84.6	92.3	100.0
7500	0.0	7.7	15.4	23.1	30.8	38.5	46.2	53.8	61.5	69.2	76.9	84.6	92.3	100.0

Graph

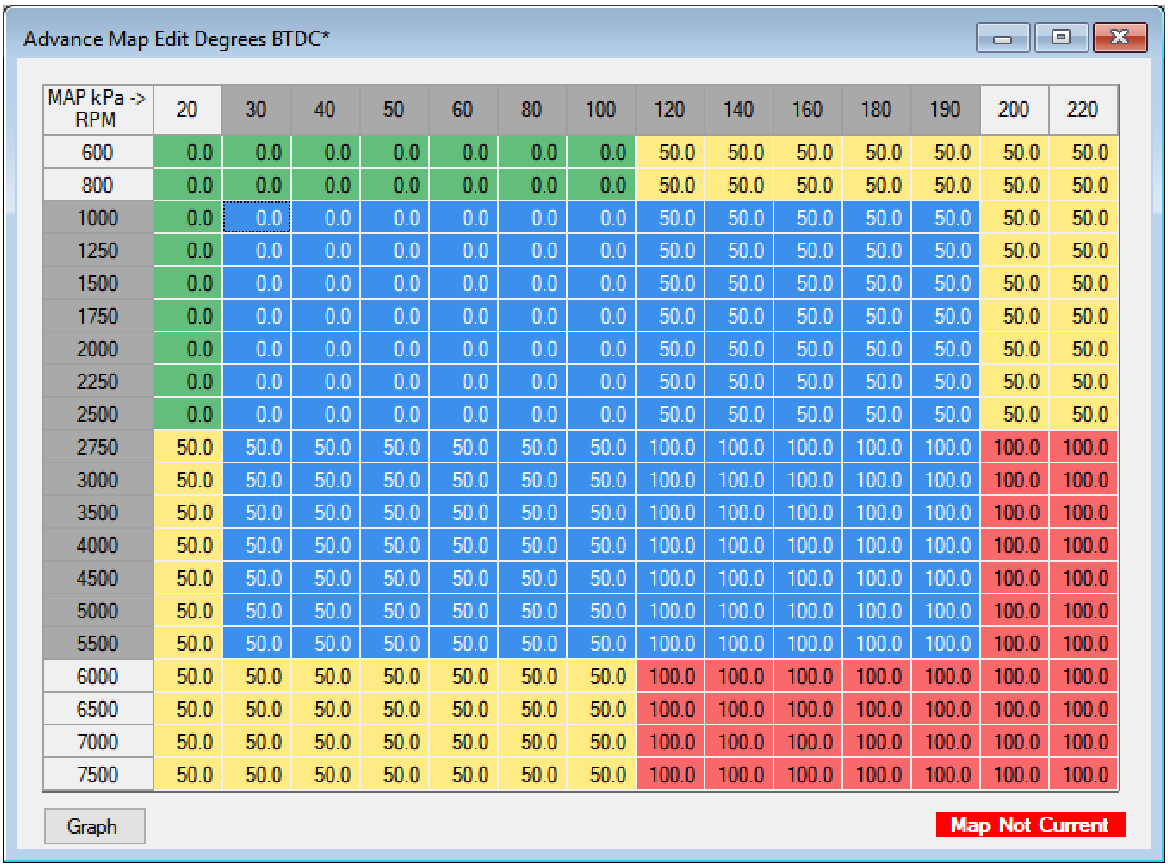
Map Not Current

The software will then take the number from the furthest Left selected column and the furthest right column and evenly split the values in between as shown.
If the change is to be kept press F4 or if not, close the window and Abandon any changes

3.8 Interpolate Across Cells



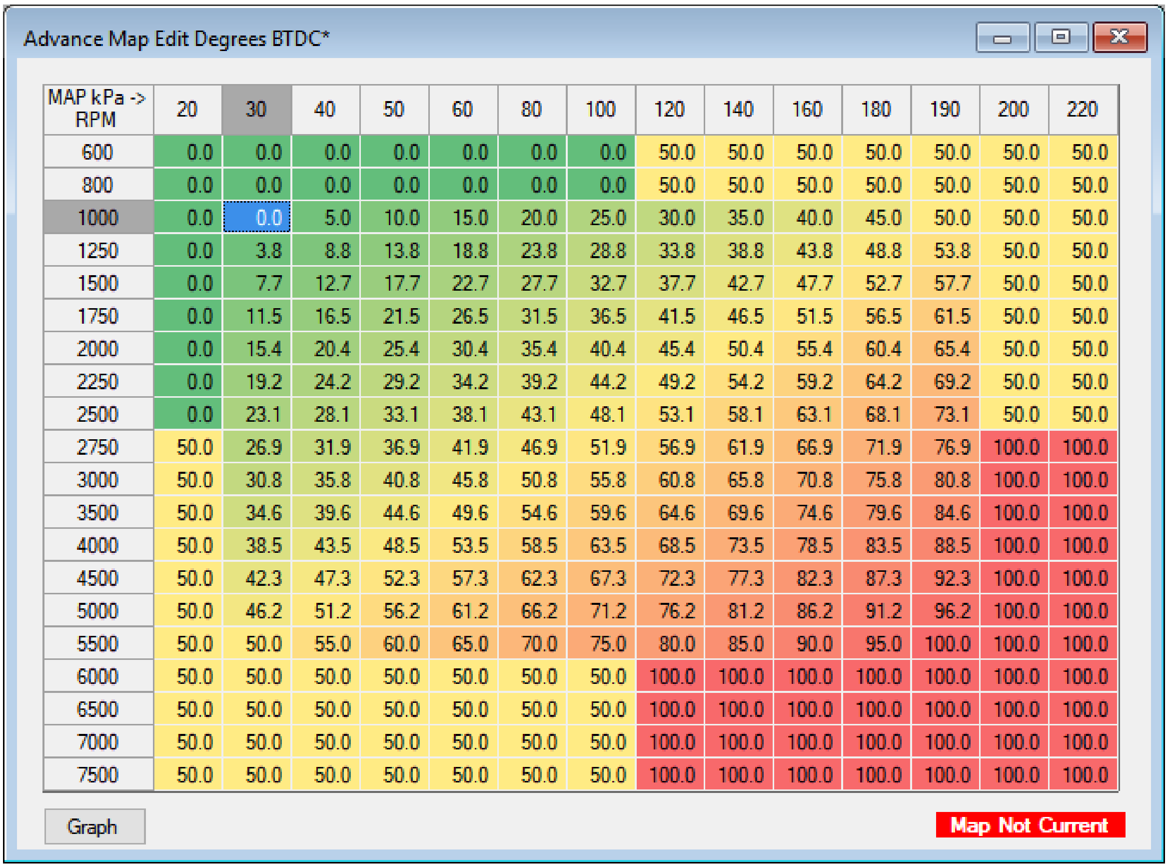
Interpolate across Cells can be found under the edit menu. The Keyboard shortcut Shift and F5 can also be used.


Advance Map Edit Degrees BTDC*

MAP kPa -> RPM	20	30	40	50	60	80	100	120	140	160	180	190	200	220
600	0.0	0.0	0.0	0.0	0.0	0.0	0.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
800	0.0	0.0	0.0	0.0	0.0	0.0	0.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
1000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
1250	0.0	0.0	0.0	0.0	0.0	0.0	0.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
1500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
1750	0.0	0.0	0.0	0.0	0.0	0.0	0.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
2250	0.0	0.0	0.0	0.0	0.0	0.0	0.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
2500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
2750	50.0	50.0	50.0	50.0	50.0	50.0	50.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
3000	50.0	50.0	50.0	50.0	50.0	50.0	50.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
3500	50.0	50.0	50.0	50.0	50.0	50.0	50.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
4000	50.0	50.0	50.0	50.0	50.0	50.0	50.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
4500	50.0	50.0	50.0	50.0	50.0	50.0	50.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
5000	50.0	50.0	50.0	50.0	50.0	50.0	50.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
5500	50.0	50.0	50.0	50.0	50.0	50.0	50.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
6000	50.0	50.0	50.0	50.0	50.0	50.0	50.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
6500	50.0	50.0	50.0	50.0	50.0	50.0	50.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
7000	50.0	50.0	50.0	50.0	50.0	50.0	50.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
7500	50.0	50.0	50.0	50.0	50.0	50.0	50.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Graph
Map Not Current

Select the Cells you wish to interpolate across. This can be all cells or a select few. Then click 'interpolate across Cells or use the keyboard shortcut.



MAP kPa -> RPM	20	30	40	50	60	80	100	120	140	160	180	190	200	220
600	0.0	0.0	0.0	0.0	0.0	0.0	0.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
800	0.0	0.0	0.0	0.0	0.0	0.0	0.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
1000	0.0	0.0	5.0	10.0	15.0	20.0	25.0	30.0	35.0	40.0	45.0	50.0	50.0	50.0
1250	0.0	3.8	8.8	13.8	18.8	23.8	28.8	33.8	38.8	43.8	48.8	53.8	50.0	50.0
1500	0.0	7.7	12.7	17.7	22.7	27.7	32.7	37.7	42.7	47.7	52.7	57.7	50.0	50.0
1750	0.0	11.5	16.5	21.5	26.5	31.5	36.5	41.5	46.5	51.5	56.5	61.5	50.0	50.0
2000	0.0	15.4	20.4	25.4	30.4	35.4	40.4	45.4	50.4	55.4	60.4	65.4	50.0	50.0
2250	0.0	19.2	24.2	29.2	34.2	39.2	44.2	49.2	54.2	59.2	64.2	69.2	50.0	50.0
2500	0.0	23.1	28.1	33.1	38.1	43.1	48.1	53.1	58.1	63.1	68.1	73.1	50.0	50.0
2750	50.0	26.9	31.9	36.9	41.9	46.9	51.9	56.9	61.9	66.9	71.9	76.9	100.0	100.0
3000	50.0	30.8	35.8	40.8	45.8	50.8	55.8	60.8	65.8	70.8	75.8	80.8	100.0	100.0
3500	50.0	34.6	39.6	44.6	49.6	54.6	59.6	64.6	69.6	74.6	79.6	84.6	100.0	100.0
4000	50.0	38.5	43.5	48.5	53.5	58.5	63.5	68.5	73.5	78.5	83.5	88.5	100.0	100.0
4500	50.0	42.3	47.3	52.3	57.3	62.3	67.3	72.3	77.3	82.3	87.3	92.3	100.0	100.0
5000	50.0	46.2	51.2	56.2	61.2	66.2	71.2	76.2	81.2	86.2	91.2	96.2	100.0	100.0
5500	50.0	50.0	55.0	60.0	65.0	70.0	75.0	80.0	85.0	90.0	95.0	100.0	100.0	100.0
6000	50.0	50.0	50.0	50.0	50.0	50.0	50.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
6500	50.0	50.0	50.0	50.0	50.0	50.0	50.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
7000	50.0	50.0	50.0	50.0	50.0	50.0	50.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
7500	50.0	50.0	50.0	50.0	50.0	50.0	50.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

The software will then take the number from the corners of the selected area and evenly divide the values over this area as shown.

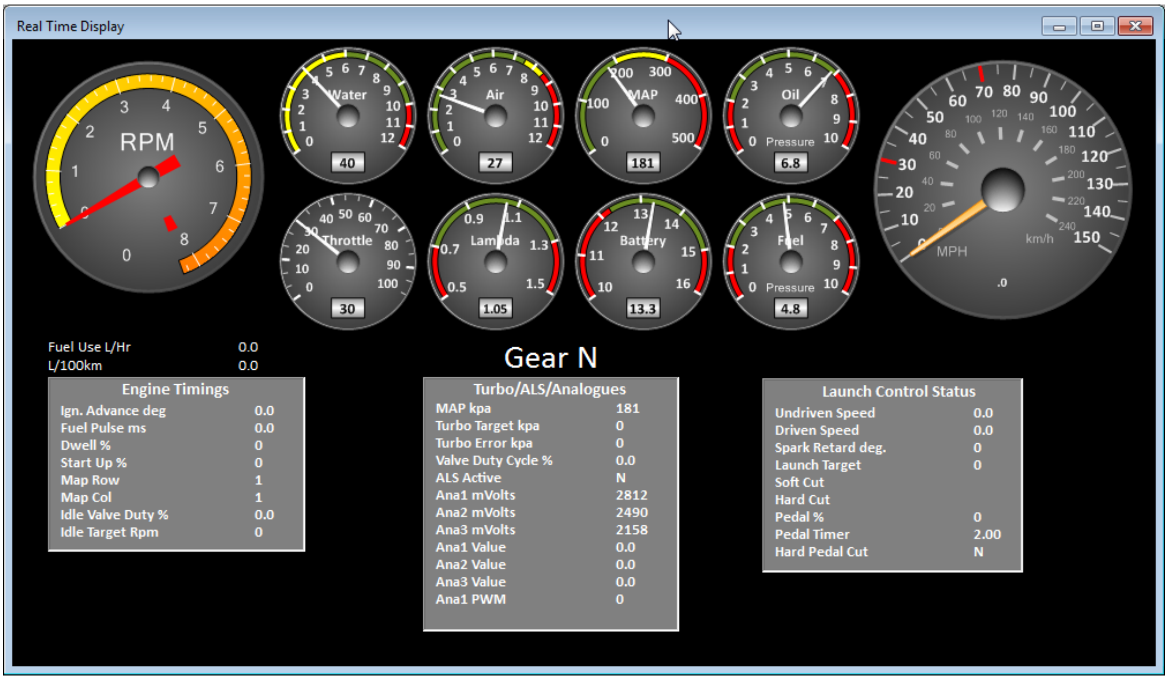
If the change is to be kept press F4 or if not, close the window and Abandon any changes

Display and Test Functions

4 Display and Test Functions

This section covers all the items found in the Display and Test Menu section.

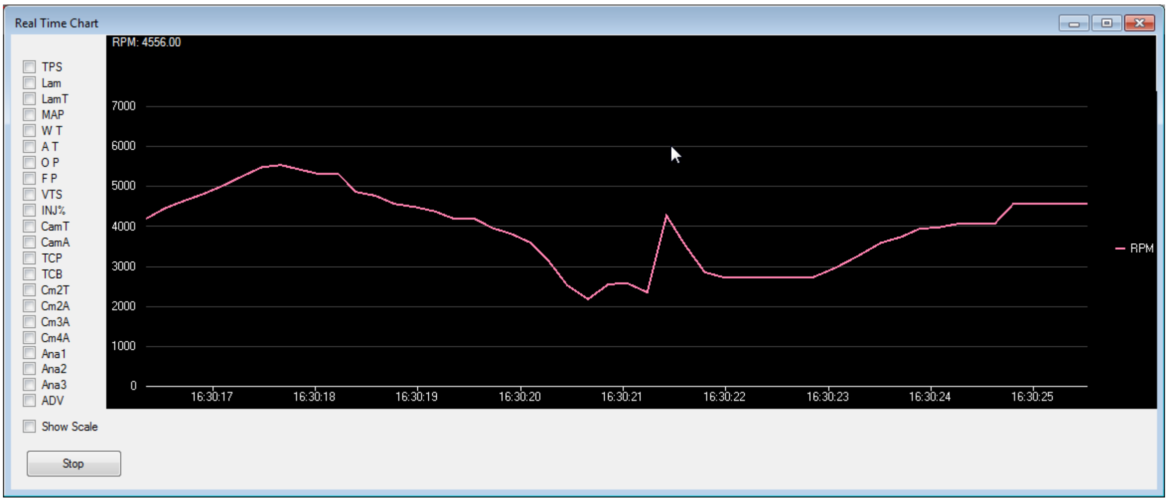
4.1 Real Time Info



The Real Time Display can be accessed under the 'Display and Test Functions' menu. This will show what the ECU is seeing and other useful information.

4.2 Real Time Chart

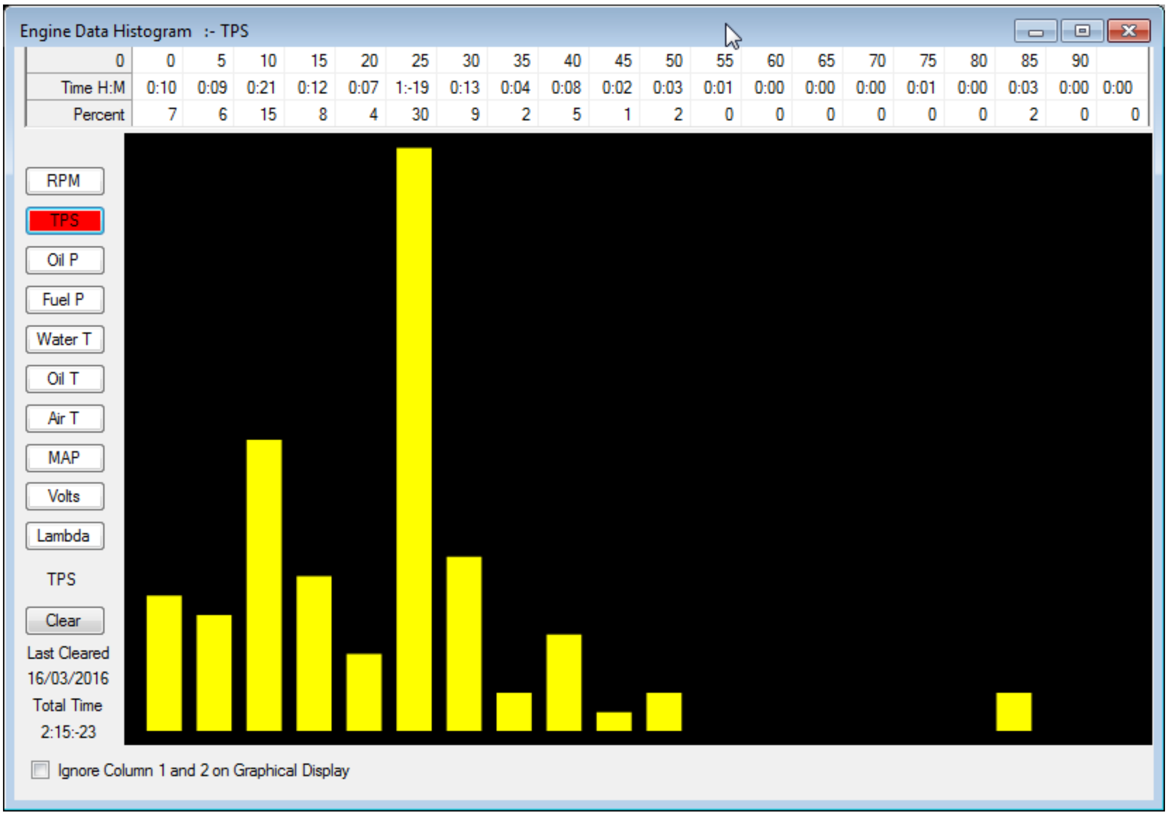
Shows in real time a chart of any of the items on the left menu of the screen.



Six items can be displayed at any one time. The chart can be slid from side to side, expanded or contracted by picking up the markers at the bottom of the chart.

Several hours of data can usually be collected.

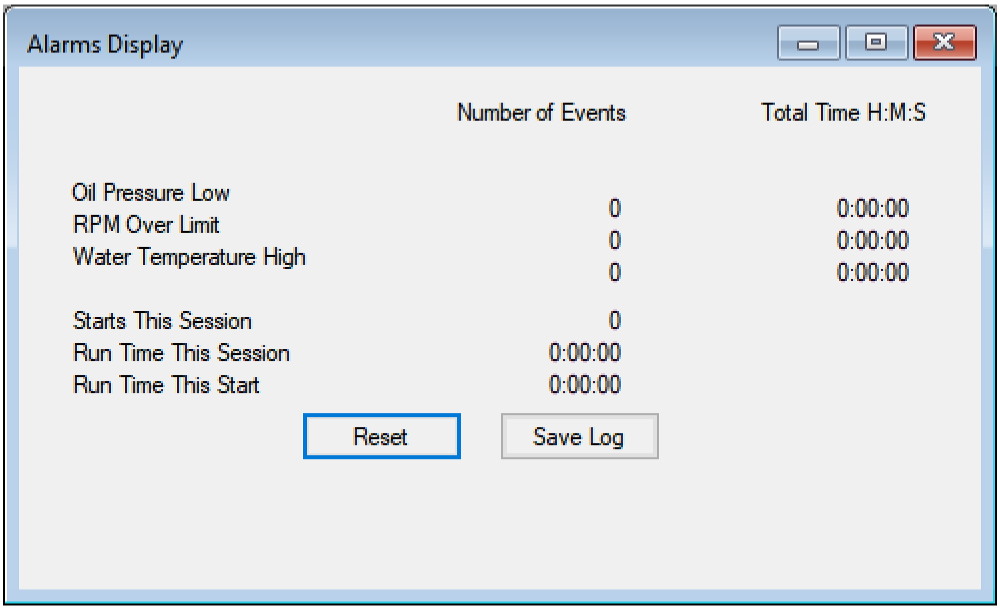
4.3 Engine Histogram



This is a record of the usage pattern of the engine. A bar chart gives a pictorial idea of the history of the chosen sensor, actual times are recorded down to the second and the percentage of the engine use this represents is also shown. A maximum of 18 hours can be recorder in any one “Bin”.

4.4 Alarm Totals

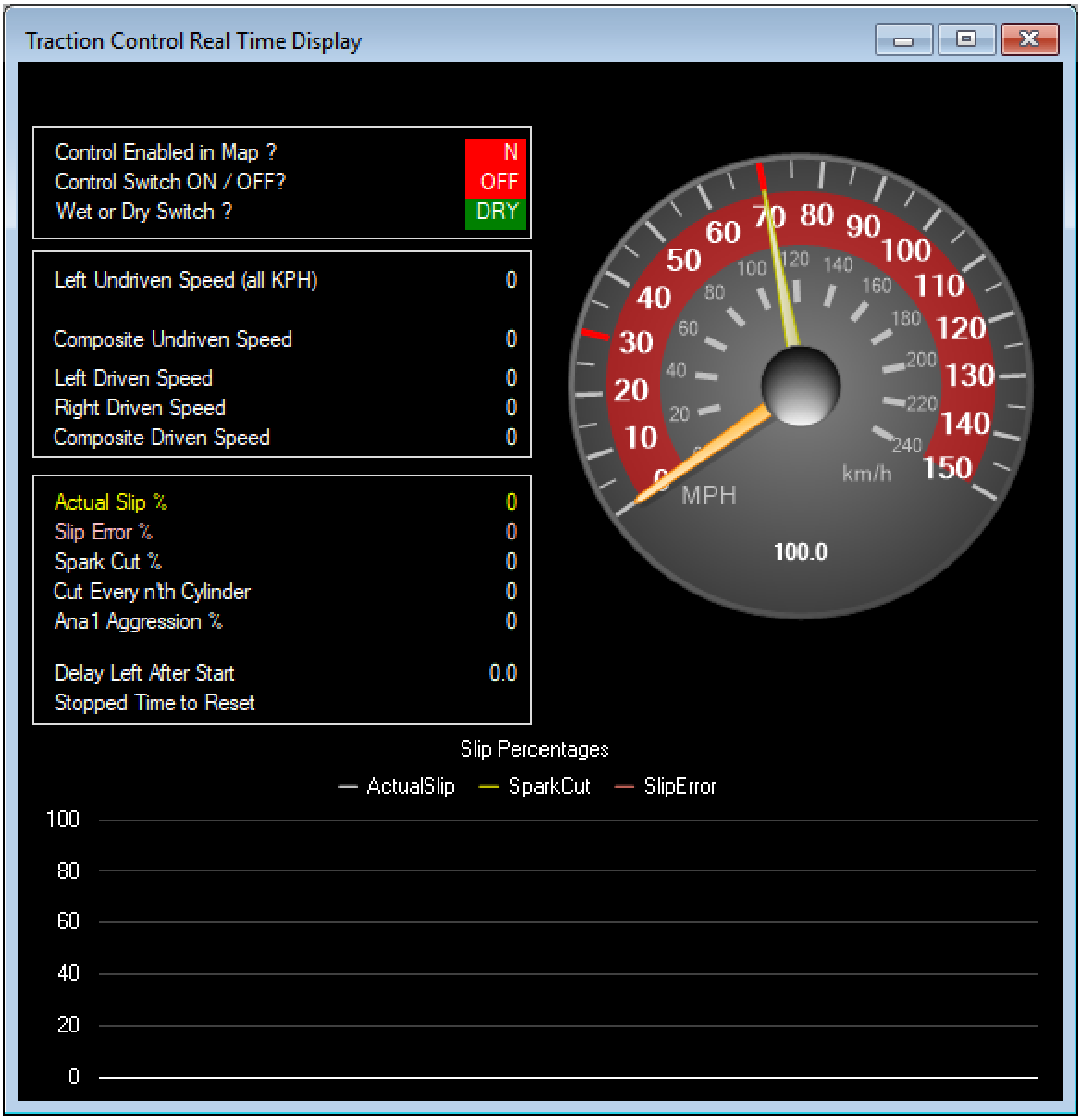
Total alarm numbers and times can be viewed in Display and Test Functions / Alarms Display as below. Reset clears the totals and the log of events. A maximum of 150 alarms can be logged.



The events will also be logged and this can be saved in a format suitable for input into a spread sheet as below.

EVENT TYPE;ENGINE STARTS;RUNTIME THIS START HOURS;MINS;SECS;
RPM High;1;0;0;0;
RPM High;1;0;0;5;
RPM High;1;0;0;8;
RPM High;1;0;0;11;
RPM High;2;0;0;37;
RPM High;2;0;0;40;
RPM High;2;0;0;43;
End;0;0;0;0;

4.5 Traction Control Info



AVAILABLE ON S60PRO AND ABOVE

The traction control system, available on S80PRO models and above, is a full 3 or 4 wheel implementation. It will limit the amount of driven wheel spin to any desired slip compared with the undriven wheels. Note that it is not applicable to 4 wheel drive vehicles. Two complete sets of parameters are available to allow for differing conditions. These are controlled by a switch on the dash of the car. If no switch is used then the dry settings are used. Besides the wet/dry switch an on/off switch must be fitted on the dash. This switch is not optional as the default for this function is off.

On an S60PRO the system uses a single wheel speed sensor and knowledge of the current gear to work out the driven wheel speed from engine RPM. Only one set of settings is available on an S60.

MINIMUM SPEED TO ACTIVATE

Below this undriven wheel speed the vehicle is considered to be stopped and the traction control will take no action.

MINIMUM RPM TO ACTIVATE

Below this RPM the traction control will take no action. Setting depends on engine performance and the desired car dynamics.

MINIMUM THROTTLE TO ACTIVATE

Below this throttle position the traction control system will take no action.

TARGET SLIP PERCENTAGE

The system constantly calculates the difference in wheel speed between driven and undriven wheels. Some slip is beneficial to maximum acceleration, say about 20%. Start line situations are different and require the use of Launch Control. If launch control is active then the traction control will take no action until this has relinquished control over the system.

BALANCE TO FASTER DRIVEN WHEEL

This setting is used to allow some speed averaging across the two driven wheels. For instance in the case of a free differential it should be set to nearly 100%. In a car with a very stiff limited slip differential it should be set to say 25%.

DELAY AFTER START

After the system detects that a car has stated to move it waits this length of time before engaging traction control (unless launch is active see above). There is also a delay before the system considers a car is stopped. This is to allow for the locked brake situation. See General Traction Settings.

EXCESS SLIP TO HARD CUT (Aggression)

This effectively decides how aggressive the cylinder cutting is when slip is detected. If it is too aggressive the car is unstable. Only testing can determine at what level this should be set. Note a LOW number makes the system more aggressive, a HIGH number less so.

ANA1 MINIMUM / MAXIMUM AGGRESSION / USE ANA1 TO SET AGGRESSION

When using a potentiometer connected to the ANA1 input to allow a dashboard settable “Aggression” for the traction control these numbers set the allowable range of settings. Because the switch on an S60 is not available to turn traction on and off, this knob allows the traction control to be turned off. A voltage above 4850mV presented to the ANA1 input turns off the traction control system.

MAXIMUM IGNITION CUT PERCENTAGE

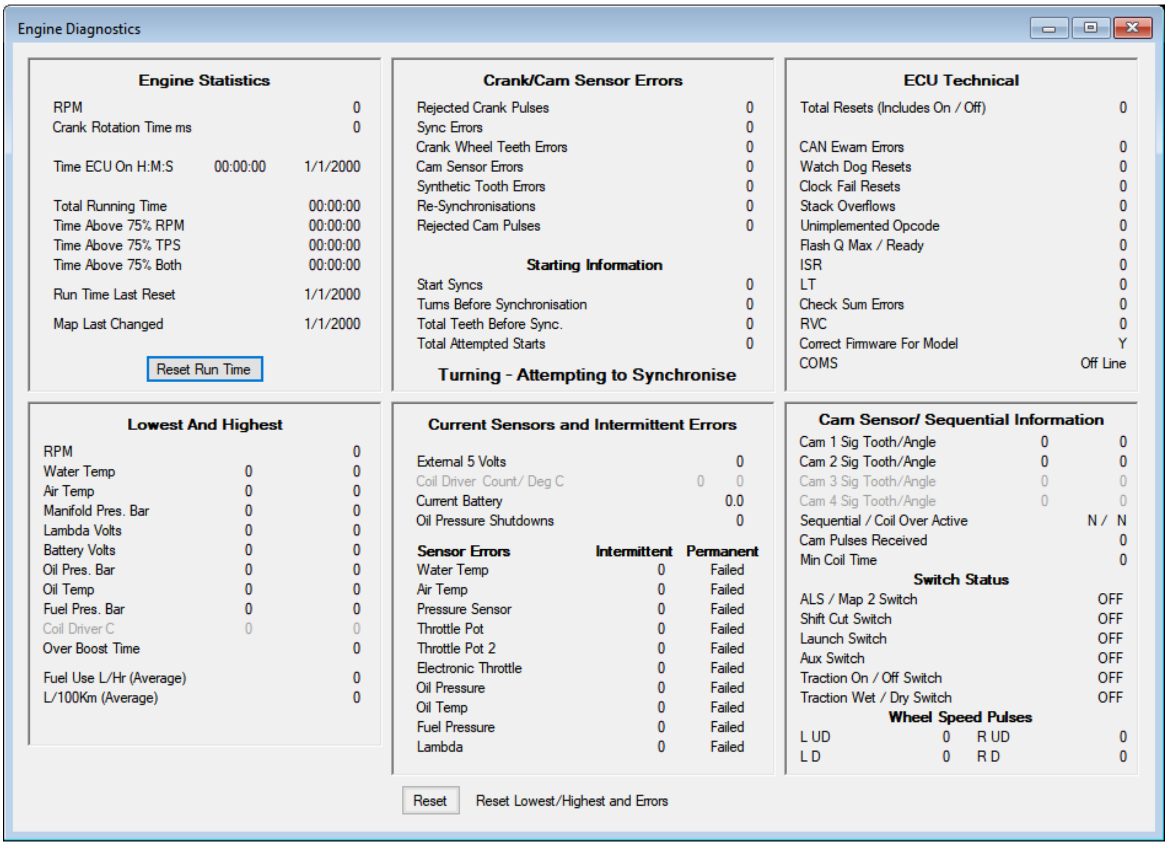
Provides an upper clamp on the amount of cut (aggression) which can be applied. Stops the engine being given a hard cut which can be unsettling.

USE UNDRIVEN WHEEL SPEED AND GEAR TABLE

The only method available on an S60, an alternative method on an S80 and above. The distance table must be filled out for each gear. This is the distance the vehicle travels for each rotation of the engine. This can be measured or easily calculated if you know the gear and final drive ratios.

NOTE That if launch control is activated then traction control will not engage until this has finished operating.

4.6 Diagnostic Display



ENGINE STATISTICS

RPM shows the current revolutions per minute of the engine. if the engine is not running this should read 0.
Crank Rotation time is the time for one revolution of the engine in milliseconds.

LOWEST AND HIGHEST

This shows the highest and lowest values seen by the ECU since it was last reset.
Coil Driver C (coil temperature) is only shown on the s40 and s40i models.

CRANK SENSOR ERRORS

Rejected crank pulses are signals received from the crank shaft sensor that the system does not recognise based on the information entered in general engine settings 99.
Signals may also be rejected because they represent over 20000 rpm, are from electrical interference (from the HT leads for example) you have an off-center crank wheel or loose/damaged crank sensor.

SYNC ERRORS

Because the system knows how many teeth you have on your crank wheel, it counts them every time the engine rotates. If the count is not correct then a sync error results. It is always possible to get these when the engine first rotates on the starter motor, this is not a problem. If this number moves upwards when the engine is running at over 1000 rpm then you have a problem. Possible causes are as above or just entering the wrong wheel specification will give you this problem.

Sync crank ratio error similar to above.

Cam Sensor errors

Only important when running unequal firing or coil on plug or sequential. Checks that the correct number of crank to camshaft pulses are received.

NOTE THAT ANY SMALL FIGURES IN ANY OF THESE ARE UNIMPORTANT. IF YOU HAVE A PROBLEM THEY WILL RAPIDLY REACH HUNDREDS WHEN THE ENGINE IS RUNNING.

Synthetic Tooth Errors and Re-Synchronisations

These are manifestations of a combination of the above errors. Missing teeth are reconstructed by the ECU to ensure correct timing. These are called synthetic teeth. Errors during this process are recorded here.

STARTING INFORMATION

When the engine is stopped the message “Engine Not Turning” is displayed at the bottom of this box in RED. If the engine reads as turning it is likely thier is a fault with the crank sensor or the wiring.
If the map is opened in offline mode this box is not coloured.

When the engine starts to crank the message “Turning – Attempting to Synchronise” appears in RED. The ECU is attempting to reconcile the information you have given it in General Engine Settings about the crank wheel to measure both the speed and position of the engine.
If this message is displayed the engine will not start and there will be NO injection or spark.

If the message remains this implies a problem with the general engine settings. Refer to the chapter on the crank shaft oscilloscope 71 to try to resolve the issue.

When synchronisation is achieved this box displays the message “Synchronised – Attempting to Start” in GREEN.
If the message “Synchronised – Attempting to Start” is displayed and the engine will not start this suggests a fuel or timing issue, a problem with your coils or injectors or the unit is incorrectly wired.
Coils and Injectors can be tested using the Test Injectors, coils and Auxiliaries 75 functions.

CURRENT SENSORS AND SHORT TERM ERRORS

OK and failed are the current status of the sensor. The number to the left of this is the number of transient errors the system has seen when the engine is running. A missing sensor (say Pressure) will always show as failed.

SXX VXX.XX Technical

In offline mode the ECU model number is not displayed.
this text shows the ECU model number and firmware version. This can be useful for DTA to know when diagnosing a fault as some functionality might only be available in a later firmware.
All other information is used by DTA to help find and diagnose issues and ECUs

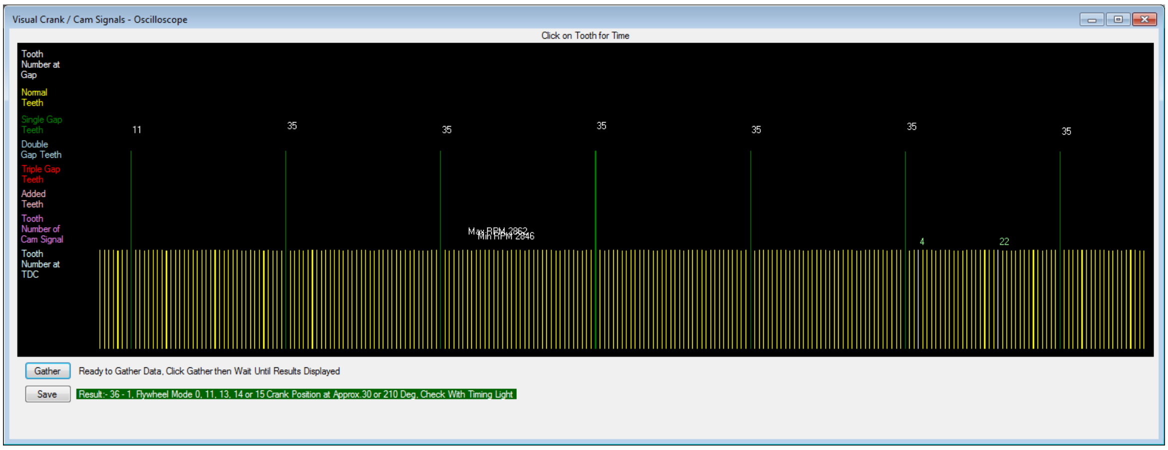
INFORMATION

Cam sensor position is measured for the user’s convenience.
Note that the ECU cannot know on which half of the four stroke cycle this occurs on.

Switch status can be used to test if the ECU is seeing a switch being activated. Note in some instances such as flat shift, the switch might only be active very briefly.

Wheel Speed

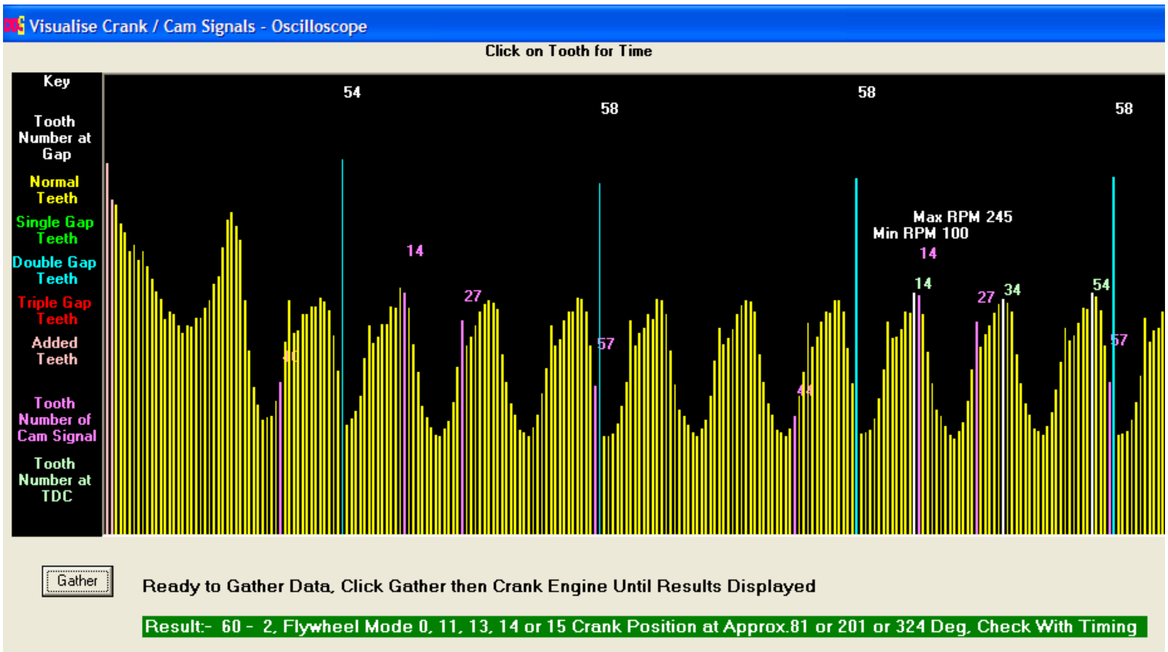
4.7 Crankshaft Oscilloscope



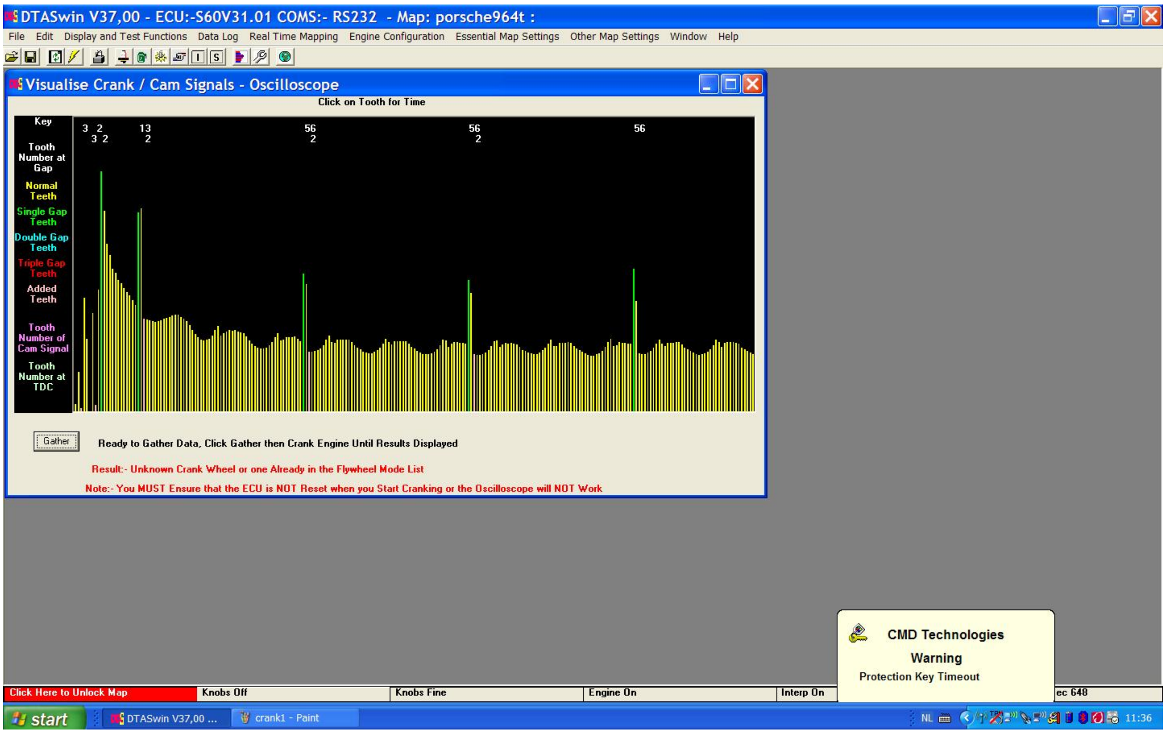
This is designed as an aid to starting an engine for the first time. Open the oscilloscope, press gather, crank the engine until the display as above is shown. For a single group of missing teeth the system will determine what is there and give you crank teeth numbers and missing teeth. An approximate position for the crank sensor is determined. Enter these in general engine settings and attempt to start the engine. When running use a timing light to get to the exact position for the crank sensor.

Note the crank mode is only determined for flywheel mode 0. Any other mode i.e. a specific engine like a Honda K20 then just load the sample map given with the software.

The crankshaft oscilloscope can determine various faults with the crank sensor and wiring. Particularly useful is it can determine the correct orientation of crank sensor wiring. Below is an excellent trace for a 60 – 2 wheel. Note this engine has a 4 tooth cam target resulting in multiple pink cam markers.

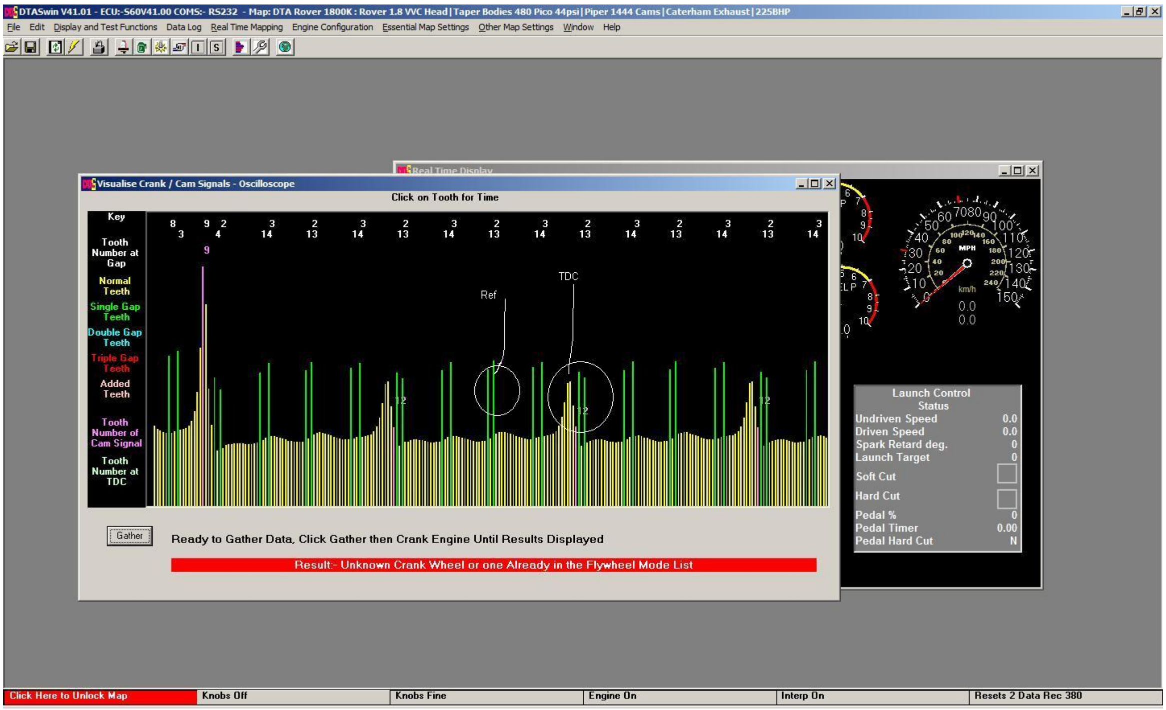


Note that the double gap tooth clearly shows as a blue line at tooth number 58, exactly what you would expect for a 60 – 2 wheel. Below is an example of a 60 – 2 wheel with the sensor connected the wrong way round.



Note that the gap appears as a single one with a green marker line and the next tooth after the green one is nearly as tall.

The crankshaft scope can also be used to determine which half of the four stroke cycle a cam signal is received. To do this remove all spark plugs except no 1. Generate a crankshaft scope picture as below.



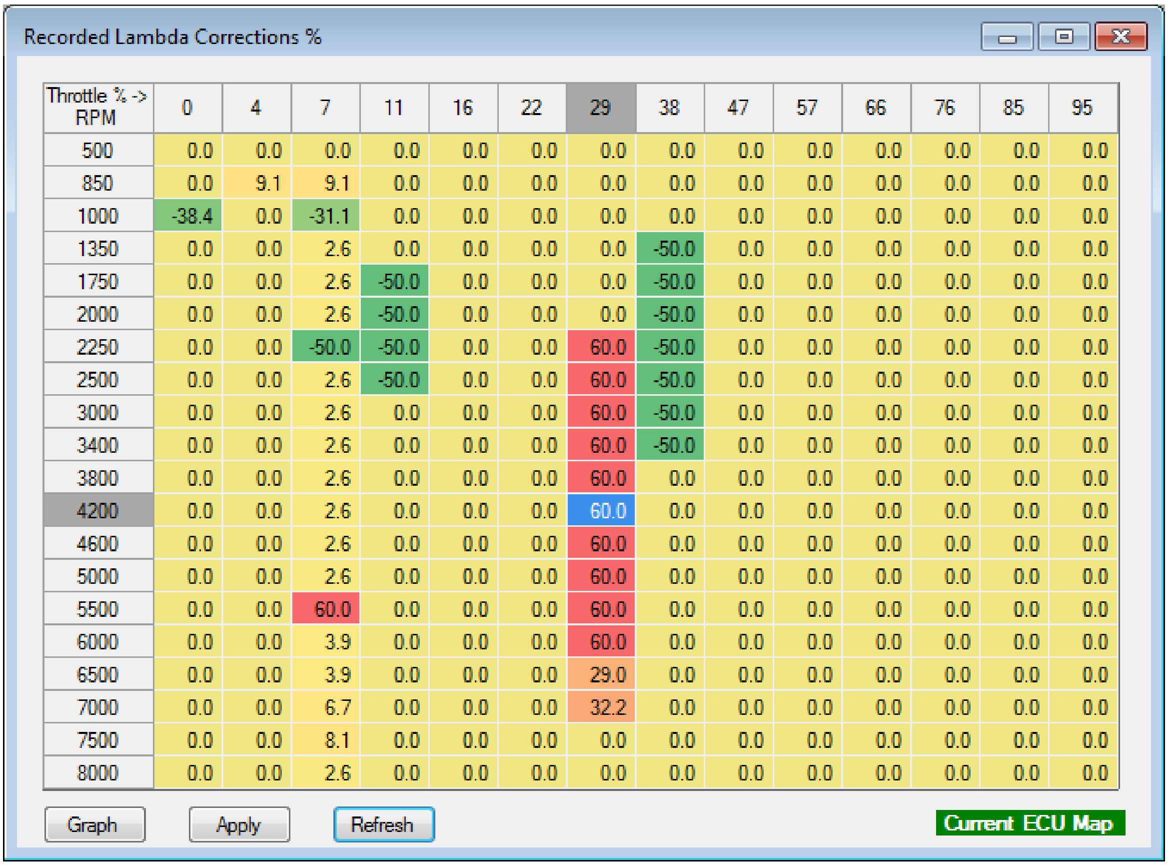
This a Rover K series with a 4 gap crank wheel. It has a single tooth cam target . Note that now we only have one peak in the normal crank teeth, the yellow ones, per 2 rotations of the engine, this is circled in white marked TDC. 2 teeth after this peak is the cam signal, the tooth in pink, marked as tooth 12. As this engine has 36 teeth on the crank wheel, the cam signal is two teeth after TDC no 1 firing stroke so the correct entry in the cam position box in *Engine Configuration/Sequential Injection* is +20 degrees.

SENDING A CRANKSHAFT OSCILLOSCOPE PICTURE TO DTA

We may ask you to email us a crankshaft oscilloscope picture to aid in remotely debugging your installation. To do this generate the picture as we ask you (either running or cranking).

Press the Save Pic button and choose a valid windows file name for the picture. This will save the picture as a .Bmp bitmap, the correct file extension will automatically be added. Make sure you remember where you have saved it! Email that as an attachment to office@dtafast.co.uk.

4.8 Lambda History



Throttle % -> RPM	0	4	7	11	16	22	29	38	47	57	66	76	85	95
500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
850	0.0	9.1	9.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1000	-38.4	0.0	-31.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1350	0.0	0.0	2.6	0.0	0.0	0.0	0.0	-50.0	0.0	0.0	0.0	0.0	0.0	0.0
1750	0.0	0.0	2.6	-50.0	0.0	0.0	0.0	-50.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	2.6	-50.0	0.0	0.0	0.0	-50.0	0.0	0.0	0.0	0.0	0.0	0.0
2250	0.0	0.0	-50.0	-50.0	0.0	0.0	60.0	-50.0	0.0	0.0	0.0	0.0	0.0	0.0
2500	0.0	0.0	2.6	-50.0	0.0	0.0	60.0	-50.0	0.0	0.0	0.0	0.0	0.0	0.0
3000	0.0	0.0	2.6	0.0	0.0	0.0	60.0	-50.0	0.0	0.0	0.0	0.0	0.0	0.0
3400	0.0	0.0	2.6	0.0	0.0	0.0	60.0	-50.0	0.0	0.0	0.0	0.0	0.0	0.0
3800	0.0	0.0	2.6	0.0	0.0	0.0	60.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4200	0.0	0.0	2.6	0.0	0.0	0.0	60.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4600	0.0	0.0	2.6	0.0	0.0	0.0	60.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5000	0.0	0.0	2.6	0.0	0.0	0.0	60.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5500	0.0	0.0	60.0	0.0	0.0	0.0	60.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6000	0.0	0.0	3.9	0.0	0.0	0.0	60.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6500	0.0	0.0	3.9	0.0	0.0	0.0	29.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7000	0.0	0.0	6.7	0.0	0.0	0.0	32.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7500	0.0	0.0	8.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8000	0.0	0.0	2.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

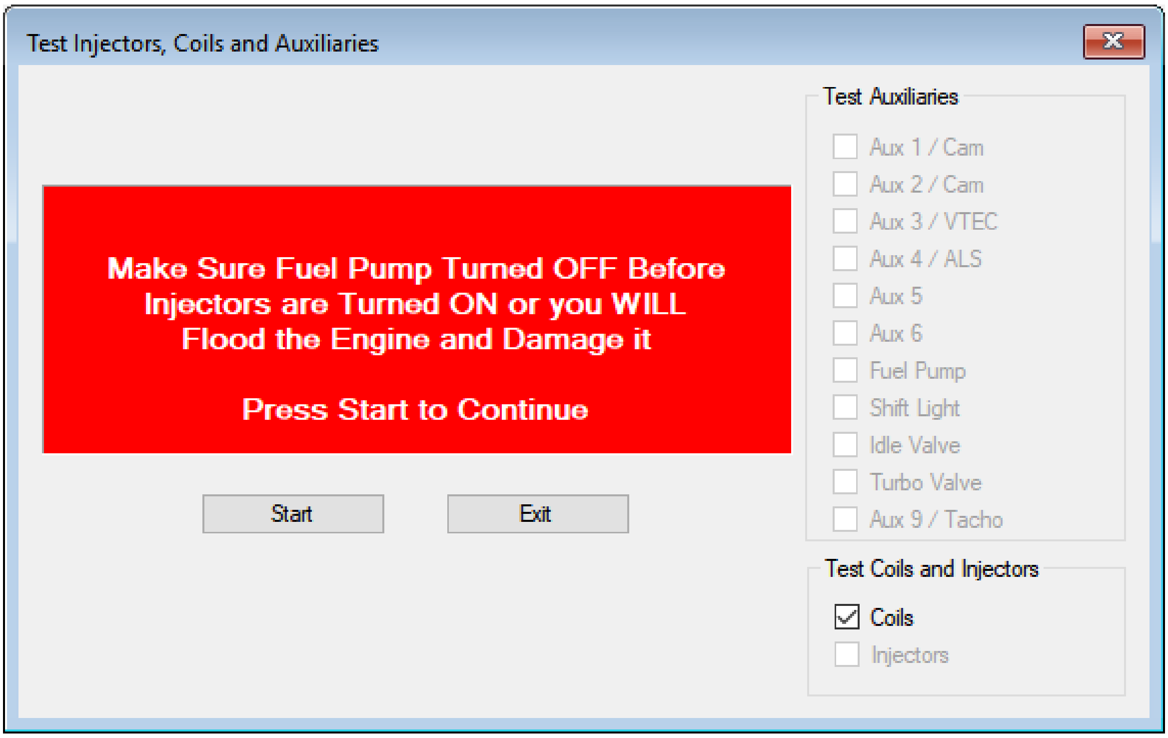
This is a record of the lambda values seen by a, preferably, wide band sensor in the exhaust of the engine. The average lambda value recorded in each cell during the current PC session is shown. Note this is stored on the PC not in the ECU. You can also view the number of “counts” of data averaged for each cell. High counts means that confidence can be placed in the lambda value in that cell, low counts implies that cell has just be passed through in a transient way and the value should be ignored.

The difference between this and target lambda map can be displayed in percentage terms and this percentage applied to the fuel map if required.
use this represents is also shown. A maximum of 18 hours can be recorder in any one “Bin”.

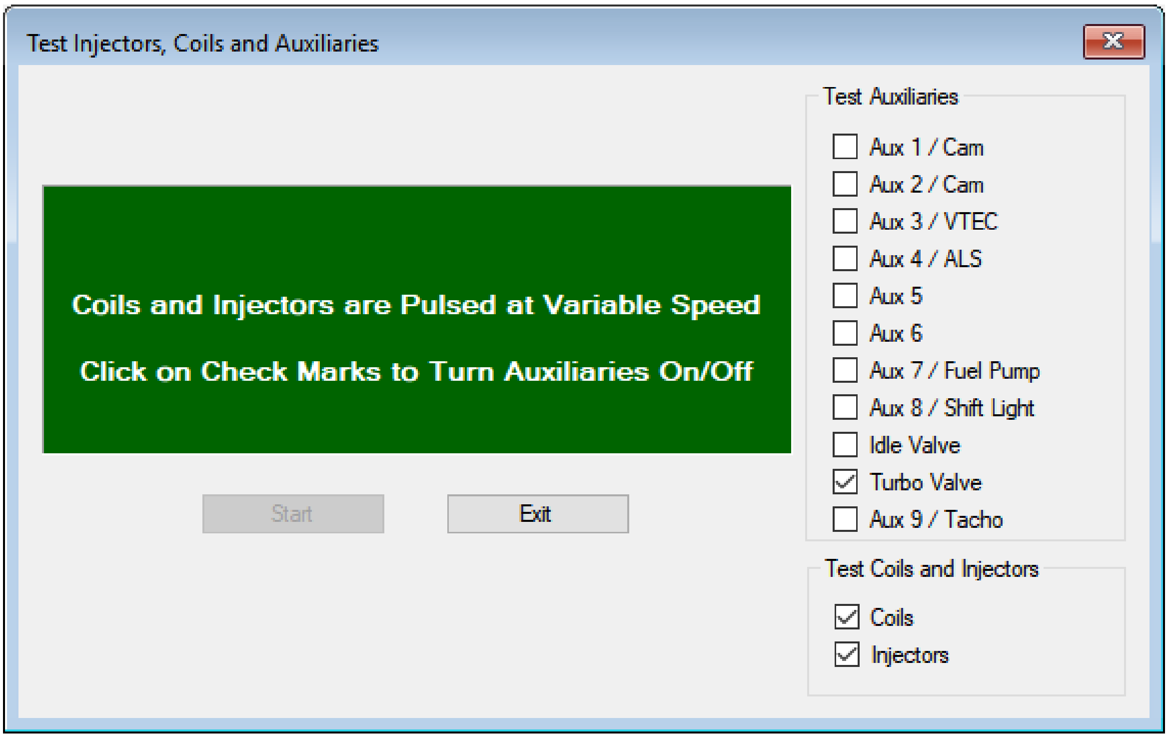
4.9 Test Injectors, Coils and Auxiliaries

This section allows the testing of the coil, spark plugs, injectors, wiring and auxiliary outputs without the engine running.

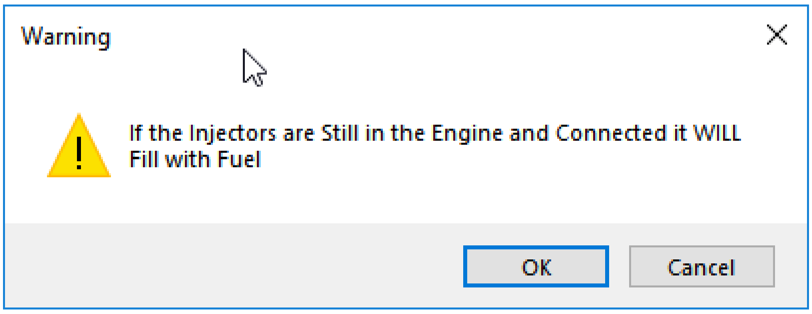
Just follow the instructions on screen.



To begin testing simply select start.
it is possible to start the testing without the Coils enabled if required.



When testing is active you can enable coils, injectors and one other auxiliary item at a time.
it is possible to only test auxiliaries by un-ticking the coil and injector boxes.



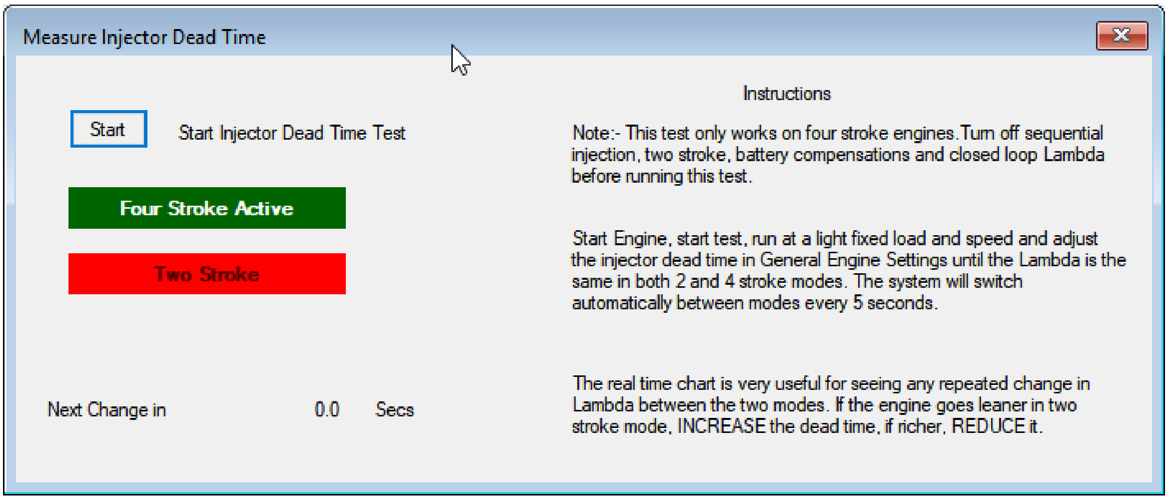
If you enable the injectors and the fuel pump at the same time you will be given a warning.
When injectors are fitted to the engine it is NOT recommended to turn on the fuel pump and injectors, as you will fill the engine with fuel.

4.10 Measure Injector Dead Time

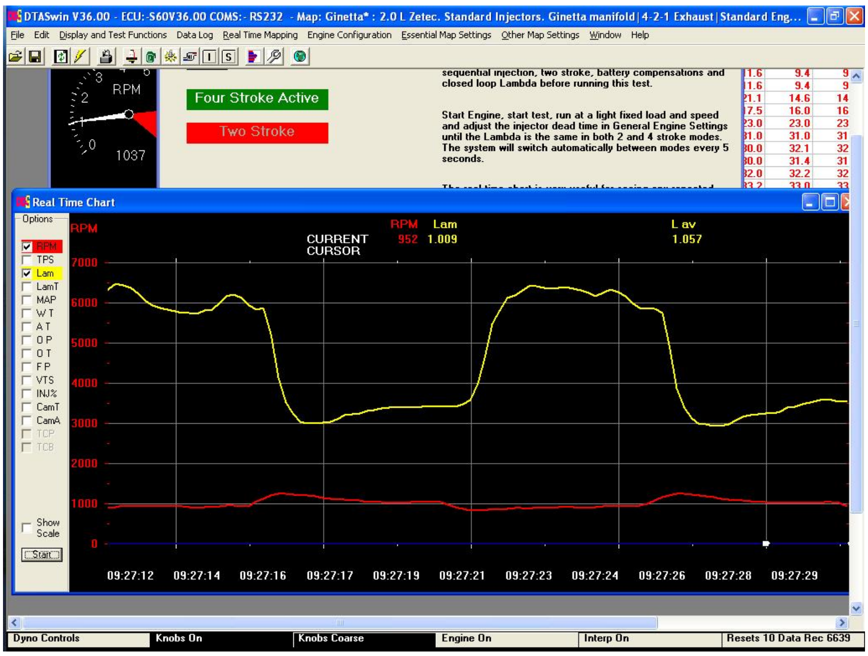
This function provides a neat and simple method of measuring injector dead time in the normal running condition of the engine. Injector dead time is important when running compensations (MAP, air temp etc.) to ensure that the compensations are accurately applied. The test relies on the fact that if the dead time is correct then running the engine in two stroke mode with half the fuel numbers in the fuel map and four stroke mode with the full amount will produce the same lambda value.

To run the test do the following:-

Turn off Battery Compensations.
Turn off Sequential Injection.
Start Engine.
Open Real Time Chart and display Lambda.
Start Test.



Adjust the dead time in *Engine Configuration/General Engine Settings* until the lambda value does not change through the 4 stroke, 2 stroke change.



Dead time incorrect is shown above.

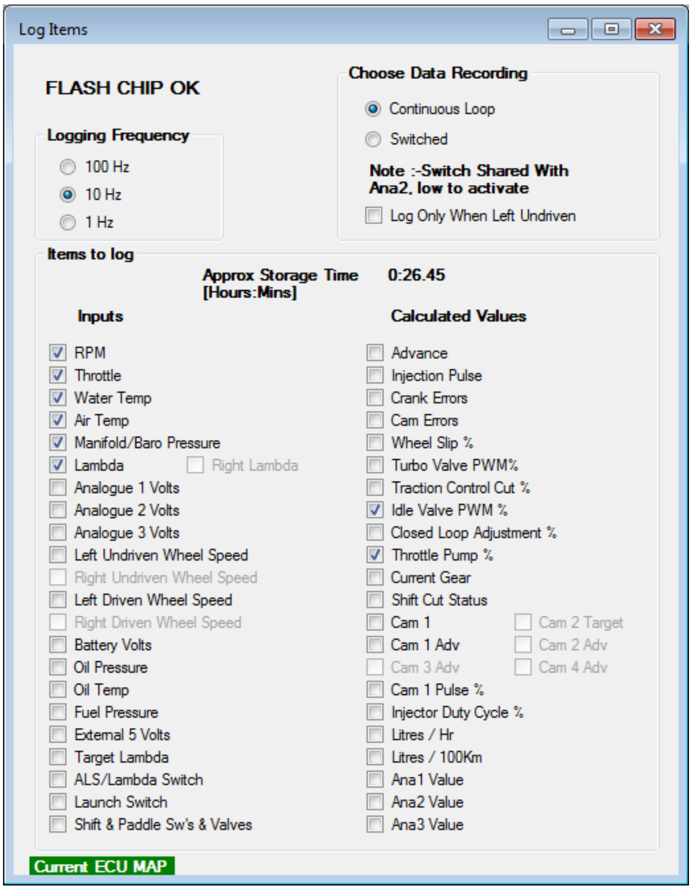
Dead time correct is shown above.

Data Log Menu

5 Data Log Menu

This section covers all the items found in the Data Log Menu section.

5.1 Logging Options



With the Continuous Loop button selected the oldest data in the log is continuously discarded and replaced with new data. When data is displayed or filed then the first data you see is the newest data, the oldest is at the end. Data is recorded all the time the engine is running.

With the Switched button selected data is only recorded when the switch is at 0 volts and the engine is running. When the log is full new data is discarded. When displayed or filed the first data is the oldest data. The last data is the newest.

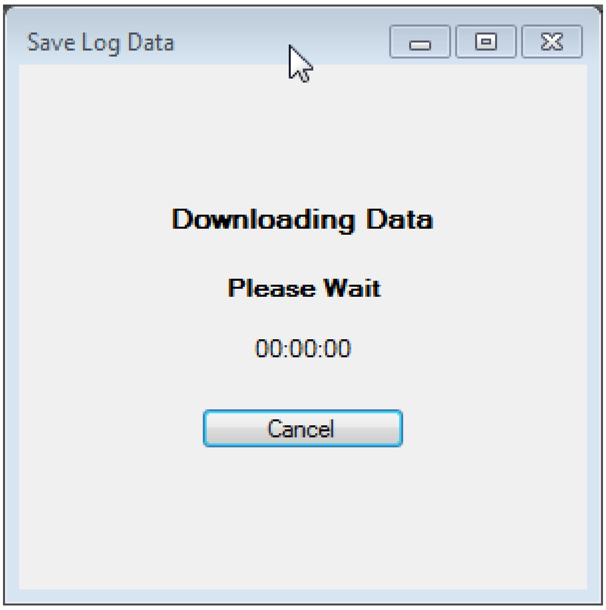
NOTE:- The switched input is shared with the Analogue 2 input.

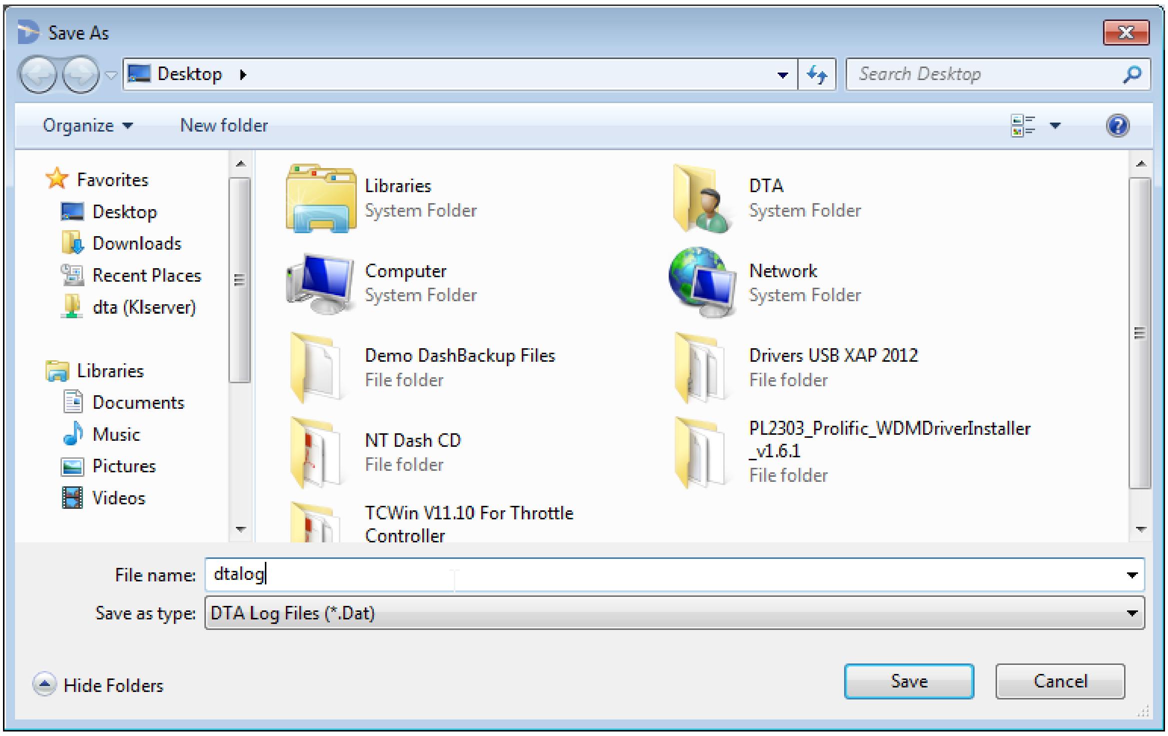
Only record when vehicle moving button requires a wheel speed sensor of the left undriven wheel and launch control enabled (but not necessarily switched on).

The fast logging option limits the number of recordable items to 7 and the recording time is reduced by 10 times, but it is extremely useful when looking at things like throttle transients and shift cut settings.

5.2 Save Log Data

Saves the logged data to a file in a semi colon delimited text file for import into either Excel or our own data analysis programs available from www.dtafast.co.uk free of charge.





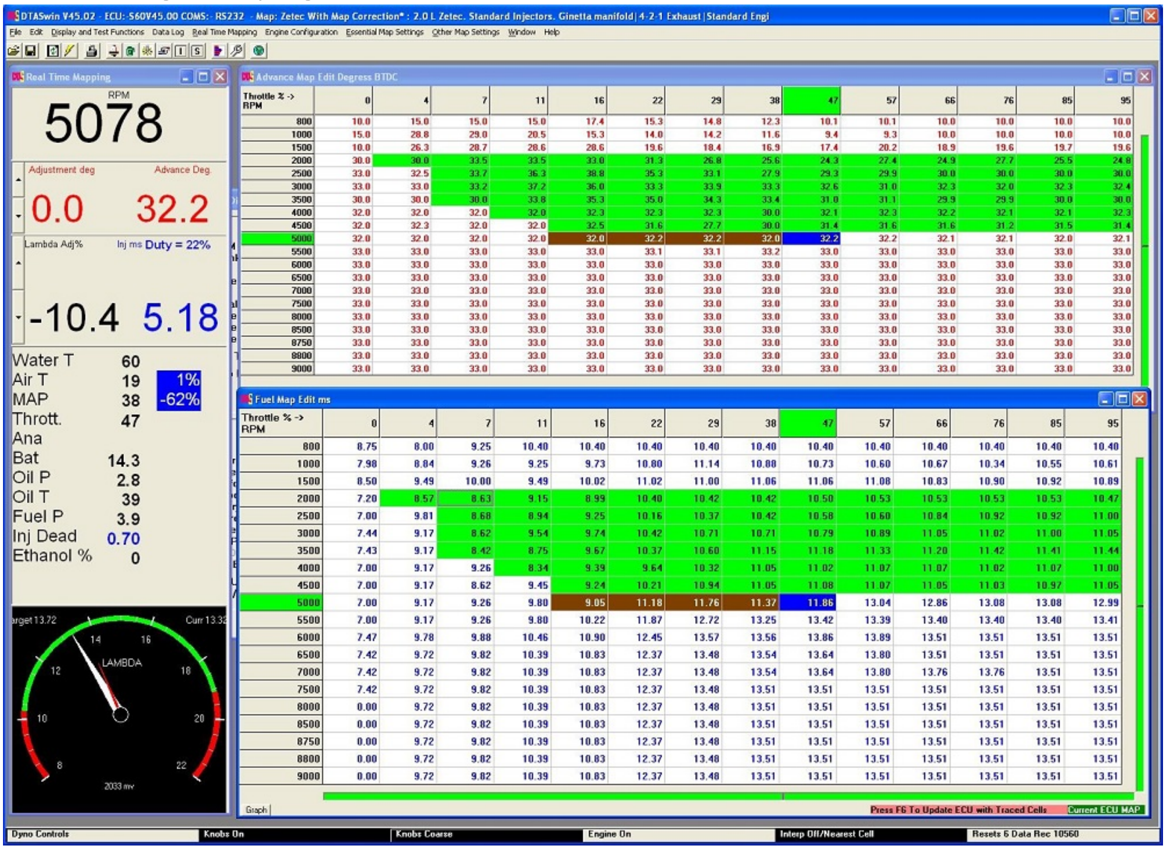
5.3 Clear Log

Clears the log stored in the ECU logging memory.

Real Time Mapping Menu

6 Real Time Mapping Menu

This section indicates exactly what the system is doing any moment in a graphic display. Values constantly monitor RPM, fuel flow, ignition advance and exhaust gas content (rich or lean) while all other sensors are displayed and warnings can be given if any of these become dangerously high or low.



Above is a typical partly finished mapping session The engine is running closed loop on the Dyno i.e. fuel is constantly being added or removed via feedback from a lambda sensor, ignition is being optimised using a Dyno Calibration Unit and the optimal fuel and ignition values recorded using the enter button on the box.
The green squares in the screen shot above have been optimised and sent to the ECU, the brown ones have been optimised but are not yet in the ECU.
When the 5000 RPM row has been finished these will be sent to the ECU by pressing F6 before the 5500 RPM row is commenced.
The triangular shape to the finished pattern of green squares is typical of what can be achieved on the Dyno, you cannot do 9000 RPM with zero throttle!

The **Dyno Calibration Unit** is a small box connected the to ECU which allows the user to modify the ignition and advance settings remotely whilst the engine is running. There are two knobs and three buttons on this box. The two knobs will vary the calculated ignition advance and fuel pulse length from the standard map by + or - 50% on fuel and 25 degrees on advance and 10% on fuel and 6.5 degrees on advance in course or fine settings respectively.

OTHER USES OF THE DYNO-BOX KNOBS

The left knob of the dyno box can be used for the following functions other than fuel %.

1) Adjust the cam advance target position, both cam1 and cam2 (e.g. inlet and exhaust on a twin VANOS engine).
2) Injection angle.
3) Turbo PWM percentage for the turbo control system.

These alternate uses can be accessed through the menu *Real Time Mapping/Control Box Controls.*

Dyno Control Box

The three buttons perform the same functions as the stop key, the enter key and the knobs on/off key as described below. All are clearly marked.

The bottom line of the screen gives the current status of the calibration box controls.

Dyno mode was designed to make tuning the engine on a dynamometer as simple and fast as possible (see below for hints on methods of use).

CONTROL KEYS IN REAL TIME MAPPING OR USE PULL DOWN MENUS

^A	DISPLAY ADVANCE MAP
^F	DISPLAY FUEL MAP
^P	TURN ON OR OFF CONTROL KNOBS ON CALIBRATION UNIT
^D	CHANGE CONTROL KNOBS TO COURSE OR FINE
^K	STOP THE ENGINE !
^T	CLEAR THE MODIFIED (TRACED) CELL LIST
^I	TURN ON/OFF INTERPOLATION
^M	TURN ON/OFF MAP TRAILS
^N	CLEAR MAP TRAILS
^L	TURN ON/OFF CLOSED LOOP CONTROL OF FUEL
^O	TURN ON/OFF SET INJECTOR OPENING POINT
^S	SET TARGET MIXTURE FOR CONTROL LOOP ON/OFF

^U OR F6	UPDATE THE ENGINE MAP WITH TRACED CELLS
^E	STORE CURRENT SETTINGS TO LOG (TRACE) MAP CELL OR press Enter on the Dyno Box.

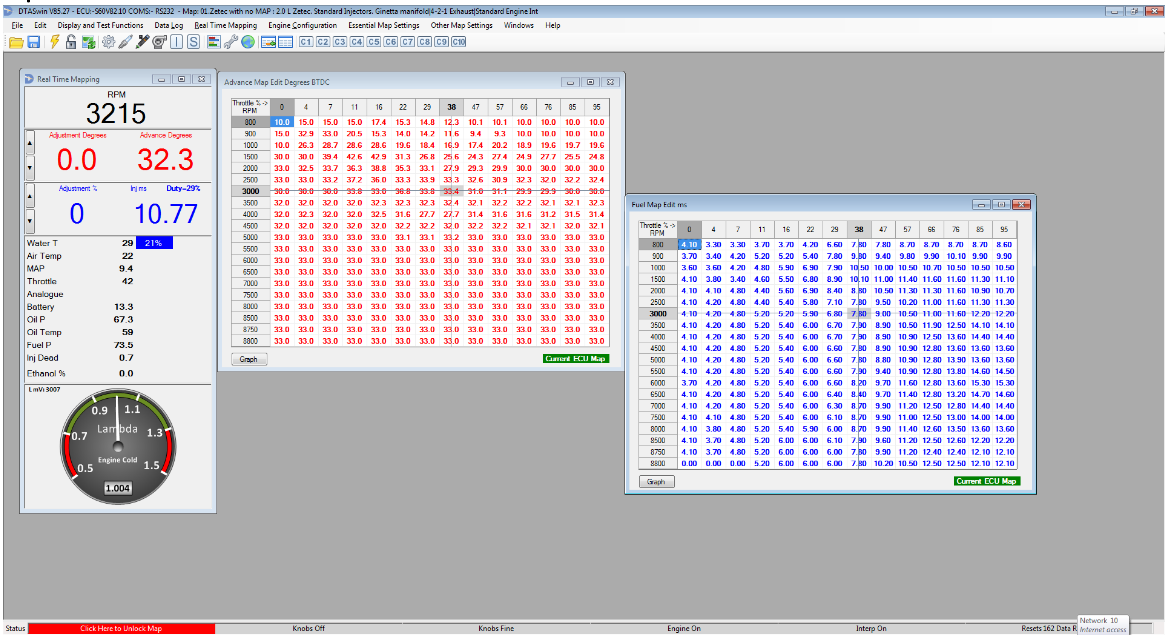
SUGGESTED USE OF REAL TIME MAPPING

1 Press "^I", use the drop down menu or click on the “Interp On” box along the bottom edge of the screen, to turn off the map interpolation and work to the nearest cell. Fire up the engine and set the dyno rpm to the rpm of interest.

2 With either the advance map or the fuel map or both showing as above and you will see the current cell position highlighted in black. Run the engine hard against the brake and adjust the knobs to give maximum power. When the fuel or advance map is displayed along the bottom and right hand edge of the map is a visual indication of the position within the cell. Always set the throttle position (or manifold pressure if using MAP as load) and rpm such that the small black markers line up with map grid lines. When the engine is within the predefined limits of closeness to the cell edges the row and column markers will go green (you can alter these limits in *Real Time Mapping/Display Options/Change Warning and Mapping Limits*). This will result in much more accurate maps. Press the enter key on the control box when you are happy power is optimised. The cell which has just been traced (marked) will be highlighted in brown (or blue if this happens to be the current active cell). If very little adjustment has been used to achieve maximum power, then continue for other cells you wish to trace. If a lot of adjustment has been used, you can make adjustments to the rest of the maps before continuing with the manual editing tools provided in *Edit*.

6.1 Main Display

This opens the main Real Time Mapping screen, and any others defined in the User Options.



6.2 Display Options

This section controls what options are displayed.

Leave Position Trails (Ctrl M)
Click this option of press Ctrl M to turn on position trails. This simply marks all the cells that have been entered since the trails were last cleared.
This is useful when mapping a section of the map that requires focus to be elsewhere.

Clear Position Trails (Ctrl N)
Clears the trails marked with the Leave Position Trails option on.

Show Advance Map (Ctrl A)
Toggles the main advance map

Show Fuel Map (Ctrl F)
Toggles the main fuel map

Show Advance Graph
Shows the Advance Graph. Can also be shown using the button on the Main Advance Map.

Show Fuel Graph
Shows the Fuel Graph. Can also be shown using the button on the Main Fuel Map.

Show Analogue Values
Shows the Analogue Values during real time mapping.

6.3 Actions

This section shows the keyboard actions available.

Log Current Cell (Ctrl E)
Keyboard short cut equivalent of pressing the Enter key on the Dyno Control Box.
Saves the current optimised values to the PC memory, NOT to the ECU.
To save these values to the ECU, F6 must be pressed. See below.

Stop Engine (Ctrl K)
Keyboard short cut equivalent of pressing the Stop button on the Dyno Control Box.
Kills the engine should an emergency shut down be required.

Closed Loop On/Off (Ctrl L)
Toggles using the lambda sensor to alter the fueling instead of the left Dyno Control Box knob.
The ECU will use the Lambda Target Map to adjust the fueling to suit.

Interpolation On/Off (Ctrl I)
Toggles Interpolation on or off.

Update ECU Map (Ctrl U or F6)
Writes all the optimised cells in memory to the ECU.
All optimised cells will be written. These are identified as green in all open maps.

Clear Traced Cells List (Ctrl T)
Clears all the optimised cells.

6.4 Control Box Options

This section shows the Dyno Control Box options.

6.5 Keyboard Trims

Shift F7	Ignition+
Ctrl F7	Ignition-
Shift F8	Fuel +
Ctrl F8	Fuel-
Ctrl P	Knobs on/off
Ctrl C	Knobs coarse/fine
Ctrl K	Stop Engine
Ctrl I	Interp on/off
Ctrl L	Closed Loop Lambda on/off
F6	Send Traced Cells to ECU
F7	Cam 1 target on left Dyno Box Knob
F8	Cam 2 target on right Dyno Box Knob

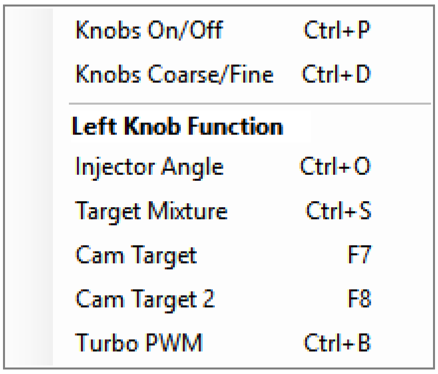
From v88, the following keys have been added:
Space Select the current load site highlighted by the cross hairs
a Advance up. Amount will depend whether coarse or fine is currently active.
s Advance down. Amount will depend whether coarse or fine is currently active.
d Fuel up. Amount will depend whether coarse or fine is currently active.
f Fuel down. Amount will depend whether coarse or fine is currently active.
Enter Same as pressing the Enter button on the dyno control box, but only if the Real Time Mapping form is the focused form.
These all function in the same way as using the dyno control box

To update a range of cells, highlight the cells (either with the arrow keys and Shift, or with the mouse), then use the Alt + Page Up/Page Down/Up Arrow/Down Arrow as above.
This requires F4 to be pressed to write these changes to the ECU.

6.6 Auto Throttle Control

Enter topic text here.

6.7 Save Traced Cells



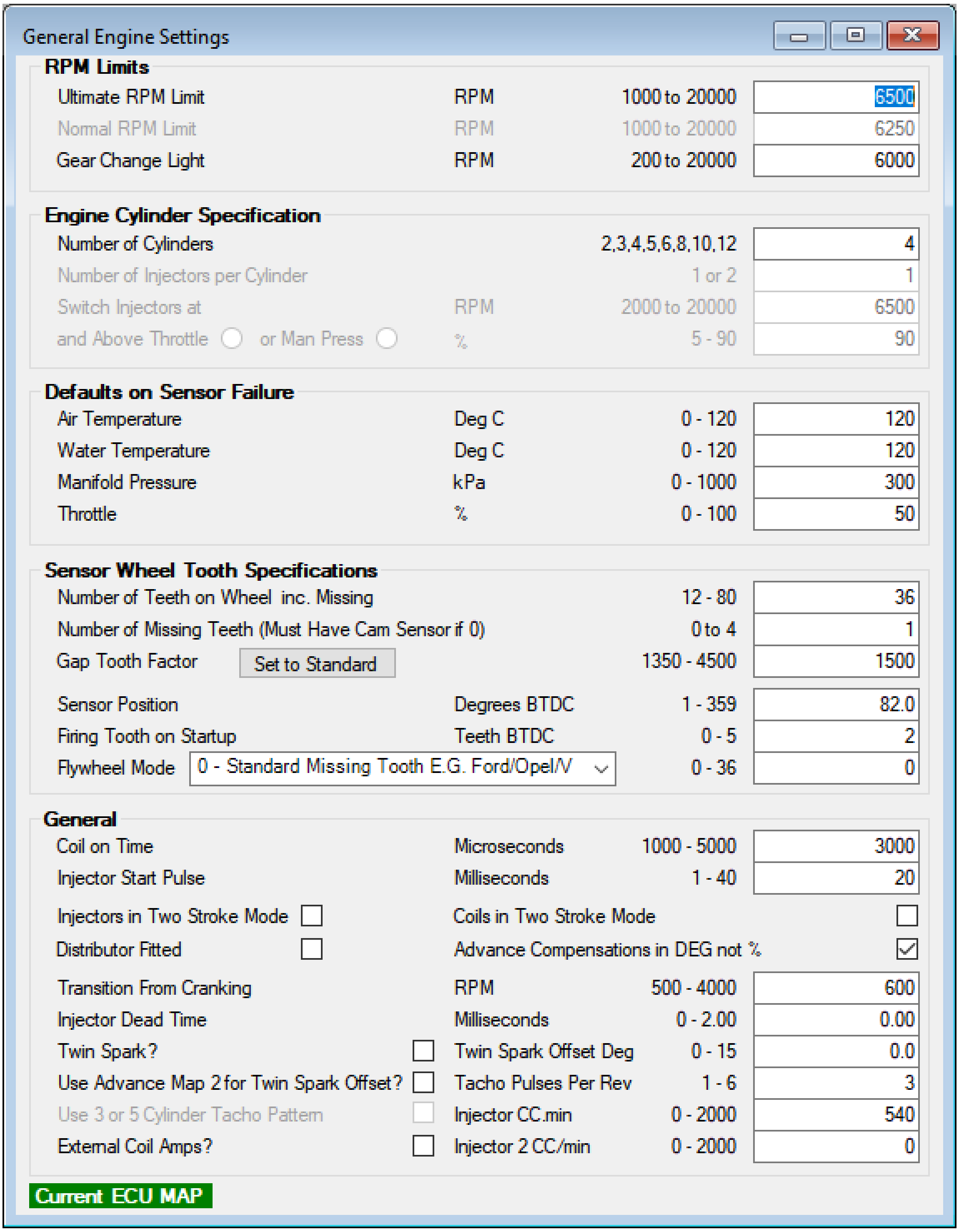
6.8 Restore Traced Cells

Enter topic text here.

Engine Configuration Menu

7 Engine Configuration Menu

7.1 General Engine Settings



This option contains various general engine settings as listed below. These must be set to suit the engine you are working with.

ULTIMATE RPM LIMIT

The engine will not go through this limit no matter what the conditions i.e. off load and full throttle. It is ,however ,fairly brutal in operation and should be set slightly higher than the normal rpm limit below.

NORMAL RPM LIMIT

This limit introduces a cut on each cylinder in rotation which would be enough to constrain rpm rise in a driving situation. It has a fairly soft action and does not upset the car. Normally set to 250 rpm below the ultimate limit.

GEAR CHANGE LIGHT RPM

The rpm figure at which the change light switches on. Normally set to 250 to 500 rpm below the normal rpm limit.

NUMBER OF CYLINDERS

The number of cylinders the engine has. Allowed figures are 4,6 or 8. NOTE The model of management box has to be able to support the number of cylinders.

NUMBER OF INJECTORS PER CYLINDER

(NOTE:- From Firmware Version 50 See "Using Twin Injectors")

The number of injectors per cylinder. Allowed figures 1 or 2.

NOTE The model of management box has to be able to support the number injectors.

SWITCH INJECTORS AT RPM

Above this RPM injectors 2 are used below it injectors 1. If fuel demand is high enough then both are used regardless of this setting.

AND ABOVE THROTTLE OR MAP

This is used in a twin injector setup. When the throttle is above this value and the rpm is above the rpm switching point then the ECU will use the second set of injectors. Note that if two sets of injectors are needed (decided by duty cycle) then they will be used regardless of this value.

DEFAULT VALUES ON SENSOR FAILURE

if the system detects a failed sensor, these are the values that the system will assume for these sensors. Make sure that the map values at these points are what you wish the engine to receive.

NUMBER OF TEETH ON SENSOR WHEEL

NUMBER OF MISSING TEETH

These two entries need some explanation. The usual Ford crankshaft timing wheel has 35 actual teeth. It is a 36 tooth wheel with one tooth missing. Similarly a Vauxhall or Peugeot wheel is 58 teeth, this being a sixty tooth wheel with 2 teeth missing. The figures for these two items are entered as below;

FORD number of teeth on wheel 36 number of missing teeth 1

VAUXHALL number of teeth on wheel 60 number of missing teeth 2

Other similar wheels must be entered in the same fashion.

36 – 1 Sensor Wheel and Sensor

GAP TOOTH FACTOR

The missing teeth are detected by the time difference from the previous tooth. The gap tooth factor determines how much bigger the missing tooth time is before it is recognised as a missing tooth. This can be determined by cranking the engine and using the crankshaft oscilloscope. Clicking on the missing tooth in the oscilloscope display will tell you how much longer the missing tooth is than the tooth immediately before it. Standard factors for 1, 2 and 3 missing teeth are as below. Clicking on the “Set to Standard Button” will set to these values automatically. Sometimes it may be beneficial to increase or reduce these.

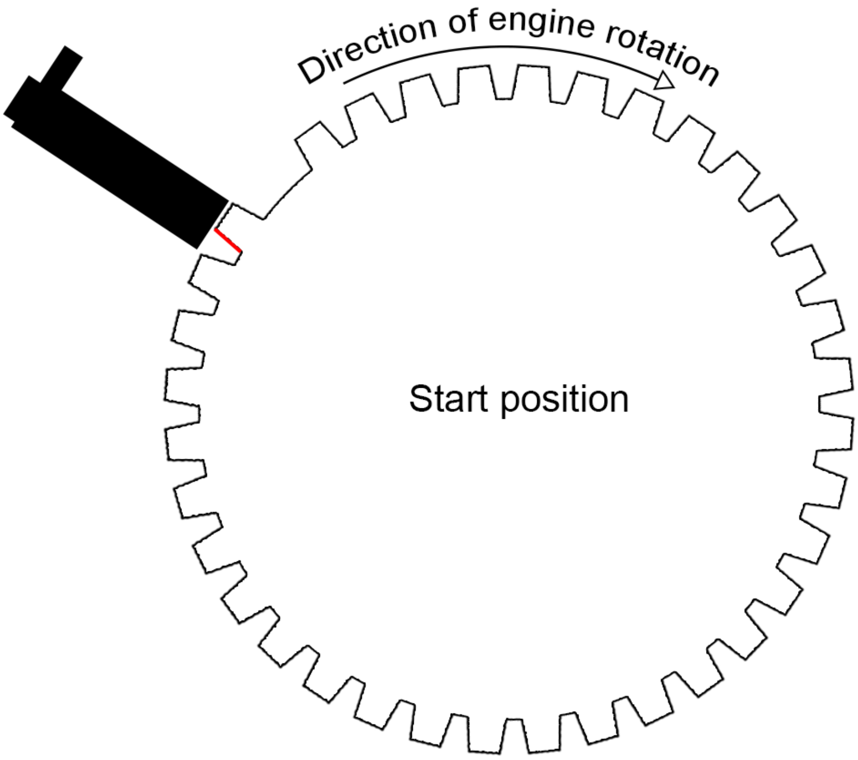
Missing Teeth	/ Gap Tooth Factor
1	1500
2	2000
3	3000

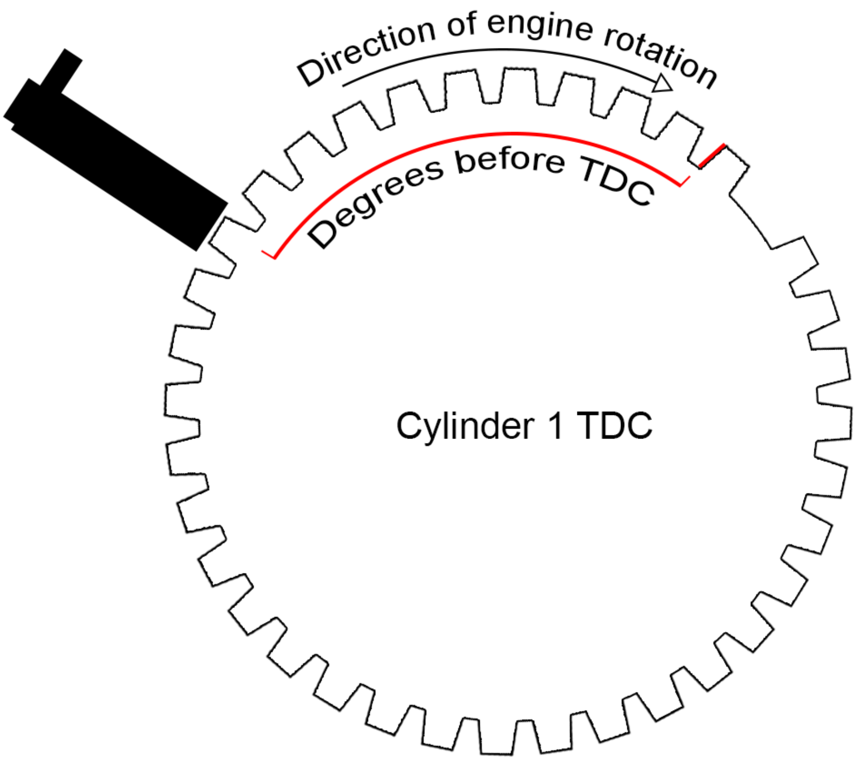
SENSOR POSITION

Known figures are as below. For some wheels the crankshaft oscilloscope will tell you where the sensor is.

Vauxhall/Opel 4 cylinder	117 degrees
Ford Zetec	90 degrees
Porsche 6 cylinder	90 degrees
BMW 6 cylinder	90 degrees

To measure the correct angle for the Crank Sensor Position value, position the engine with the sensor opposite the first falling edge of the tooth following the missing tooth (as illustrated below in red). Mark the position. Turn the engine in it’s normal direction of rotation to exactly TDC on number 1 cylinder. The number of degrees you have to turn the engine is the correct figure.





When the engine is running use a digital strobe light to measure the advance. Check this against the figure the system thinks it is using (say from dyno mode). If they do not agree, make adjustments to the sensor position until they do agree. This can be done whilst the engine is running.

Note also that unless you are using a specially modified strobe then the light will read twice the real advance when running distributor less i.e. if the strobe light says 50 degrees the real advance is 25 degrees!

.

FIRING TOOTH ON STARTUP

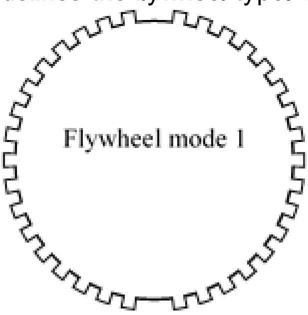
This is the position that the engine will fire below “Transition From Cranking” rpm and while on the starter motor. It is measured in teeth before TDC. So for a 36 tooth wheel, which is ten degrees per tooth and this figure set to 1 the engine will start at 10 degrees before TDC. With this set to 2 the engine will fire at 20 degrees BTDC. With a 60 tooth wheel this changes to 6 and 12 degrees respectively. Normally with a racing engine set this to 1. With a road engine then 2 may be acceptable but look for backfiring when attempting to start.

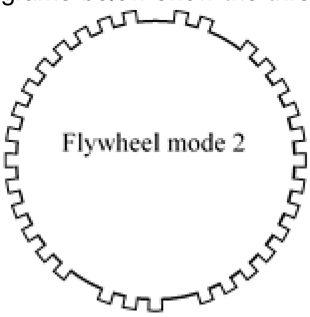
FLYWHEEL MODE

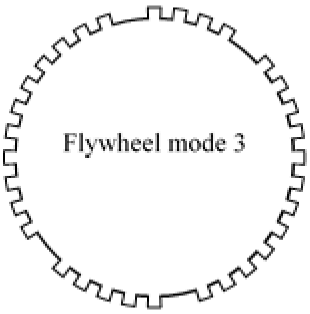
Different engines can have one of a number of flywheels, and which flywheel an engine is fitted with has an impact on the required programming for the DTA ECU. The list of engines in the drop down list is extensive and increasing and should be self explanatory if you know what engine you are dealing with. All aspects of the original rotating sensors must remain the same.

Flywheel mode 26 is a special mode to cope with the increasing proliferation of engines with multi-tooth cam target wheels. It works with a standard missing tooth crank wheel (say a 36 – 1 or a 60 – 2) and some parameters in *Engine Configuration/Coil Per Plug Settings* to choose the exact cam tooth to use as a synch trigger. See Coil Per Plug Settings for more information.

All of the Rover K series flywheels have trigger teeth set at 10° this means a total of 36 teeth. However a number of these trigger teeth will be missing and which teeth are missing defines the flywheel type. The diagrams below show the three types of flywheel.







It is important that you check the flywheel configuration on your engine and make sure that the values in the General Engine Settings of your DTA ECU are correct. The following table provides a guideline

	Mode 1	Mode 2	Mode 3

No of teeth on gearwheel	NOT ALLOWED	36	36
No of missing teeth		1	1
Sensor position		286	349
Distributor fitted		Can be Y or N	Can be Y or N

COIL ON TIME

This is the length of time the coil is turned on before firing (also referred to as the dwell time). This allows changes to suit different coils. Most coils require 2000 - 3000 micro seconds so unless you have specific information from the manufacturer of the coil leave this alone.

INJECTOR START PULSE

When the engine first starts to turn on the starter motor this pulse is given to the injectors once. It is used to clear air from the fuel system. Use the minimum required to ensure good starting.

DISTRIBUTOR FITTED

Set to Y if engine is firing through a distributor N if distributor less

INJECTORS IN TWO STROKE MODE

Set two Y if you wish the injectors to fire once per rev rather than once per 4 stroke cycle. Only recommended for two stroke engines. Note that the maximum allowed fuel in the fuel map will be halved.

COILS IN TWO STROKE MODE

Set two Y if the engine is a two stroke.

ADVANCE COMPENSATIONS IN DEGREES

Advance compensations coming from air temp, water temp, manifold pressure and flexible analogues are by default in the percentage of the current advance figure. This check mark allows these to all be in degrees. Note they are all percentage or all degrees.

TRANSITION FROM CRANKING

This is the speed when the engine is recognised as successfully running. Lightweight engines, for example motor bike engines, can "kick back" if this is too low. Once this transition has taken place the engine remains in running mode until the speed drops below 500 rpm when cranking mode is resumed.

INJECTOR DEAD TIME

Injectors take time to open and close. Setting this figure takes account of this and allows all the percentage changes that the ECU performs to the fuelling figure to be more accurate. Leave zero for compatibility with old maps. A normal switching figure would be approx. 0.75ms. S series ECU's can also measure the injector dead time themselves, see Display and Test Functions/Measure Injector Dead Time.

TWIN SPARK?

S60PRO and above. Only use this when the engine has 2 spark plugs per cylinder. First spark plug coil outputs coil 1 to coil (number of cylinders), second plug outputs are coil (number of cylinders) to coil (number of cylinders x 2), that is cylinder 1 first plug is on coil output 1, second spark plug on cylinder 1 is coil output (number of cylinders + 1).

This ability to run twin spark mode can be very useful for an engine which has individual coils but no cam sensor. Wire the coils as you would for running them with a cam sensor fitted and select twin spark on.

TWIN SPARK OFFSET

S60PRO and above. Allows small delay (in degrees) between 2 sparks on the same cylinder. If 0 then both sparks are at the same time. If 10 then the second spark occurs ten degrees later. Note that all advance figures relate to the first spark.

USE ADVANCE MAP2 FOR TWIN SPARK OFFSET

Allows the Map2 advance map to be used to calculate the twin spark offset. Allows complete variability over the 20 x 14 map. Map2 advance map is in Other Map Settings/ALS Parameters / Map2.

TACHO PULSES PER REV

Number of tacho pulses per rev, normally two for a four cylinder tacho, four for an eight cylinder.

USE 3/5 CYLINDER TACHO PATTERN

Emulates the cycle based tacho pattern of a 3 or 5 cylinder engine i.e. 1 ½ or 2 ½ pulses per revolution.

EXTERNAL COIL AMPLIFIERS

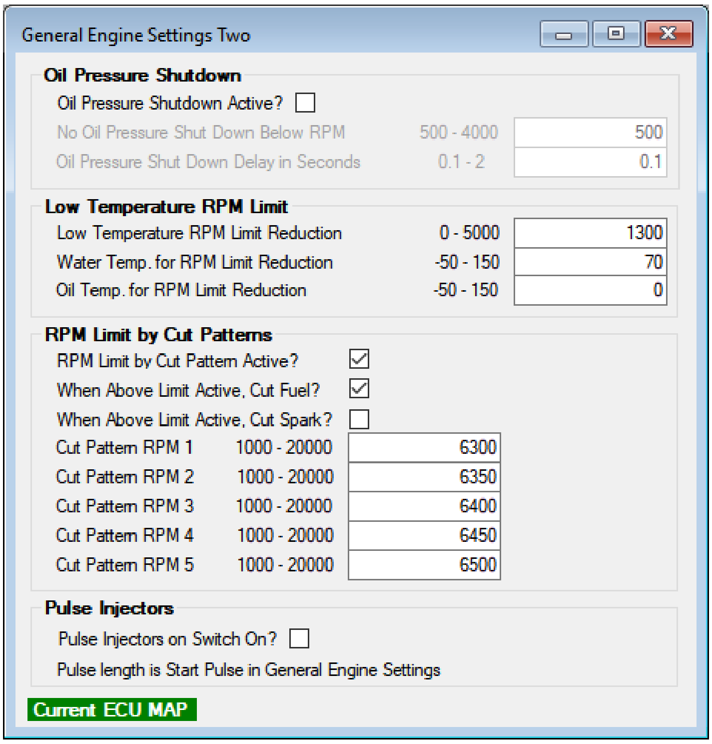
Select this check box if you are using external coil amplifiers. Normally the coil signal is inverted for external amplifiers and this function does this. Certain amplifiers need a "pull up" resistor between 12 volts and the ECU coil output. A 1K Ohm resistor is fitted internally in the ECU. Others have them fitted internally. If in doubt consult the coil manufacturer.

Do not check this box if you have an un-amplified coil connected to the system. Severe damage may result to the ECU.

INJECTOR CC/MIN

Used for fuel consumption calculations.

7.2 General Engine Settings 2



OIL PRESSURE SHUT DOWN SYSTEM

Linked to the oil pressure warning system in *Engine Configuration/Sensor Scaling/Oil Pressure Warnings*. Set the pressure you want the engine to shut down at in sensor scaling.

OIL PRESSURE SHUT DOWN ACTIVE?

Turns on the oil pressure shut down system. Note this will be “greyed out” unless oil pressure warnings are turned on.

NO OIL PRESSURE SHUTDOWN BELOW RPM

No shut down will occur below this RPM even if a warning is activated.

OIL PRESSURE SHUT DOWN DELAY

An oil pressure warning must have been active for this length of time before a shut down is tripped. One a shut down is tripped the shift light will continue flashing and the engine will not start until the ECU is turned off and back on again.

CUT PATTERN RPM TABLE

Linked to *Essential Map Settings/Spark and Fuel Cut Patterns*

Implements a flexible cut pattern determined by the user at the specified RPM. There are 5 table entries and the RPM of each must increase from top to bottom of the table as in the example above.

Note the “Normal RPM Limit” in General Engine Settings is disabled but the “Ultimate RPM Limit” is still active.

RPM LIMIT BY CUT PATTERN ACTIVE ?

Turns on the cut pattern system

WHEN ABOVE LIMIT ACTIVE, CUT FUEL (SPARK) ?

Allows just fuel, just spark or both to be cut using the cut pattern.

LOW TEMPERATURE RPM LIMIT REDUCTION

Allows RPM limit to be reduced when water and or oil temperature is low. Leave zero if no reduction required.

WATER TEMP FOR RPM LIMIT REDUCTION

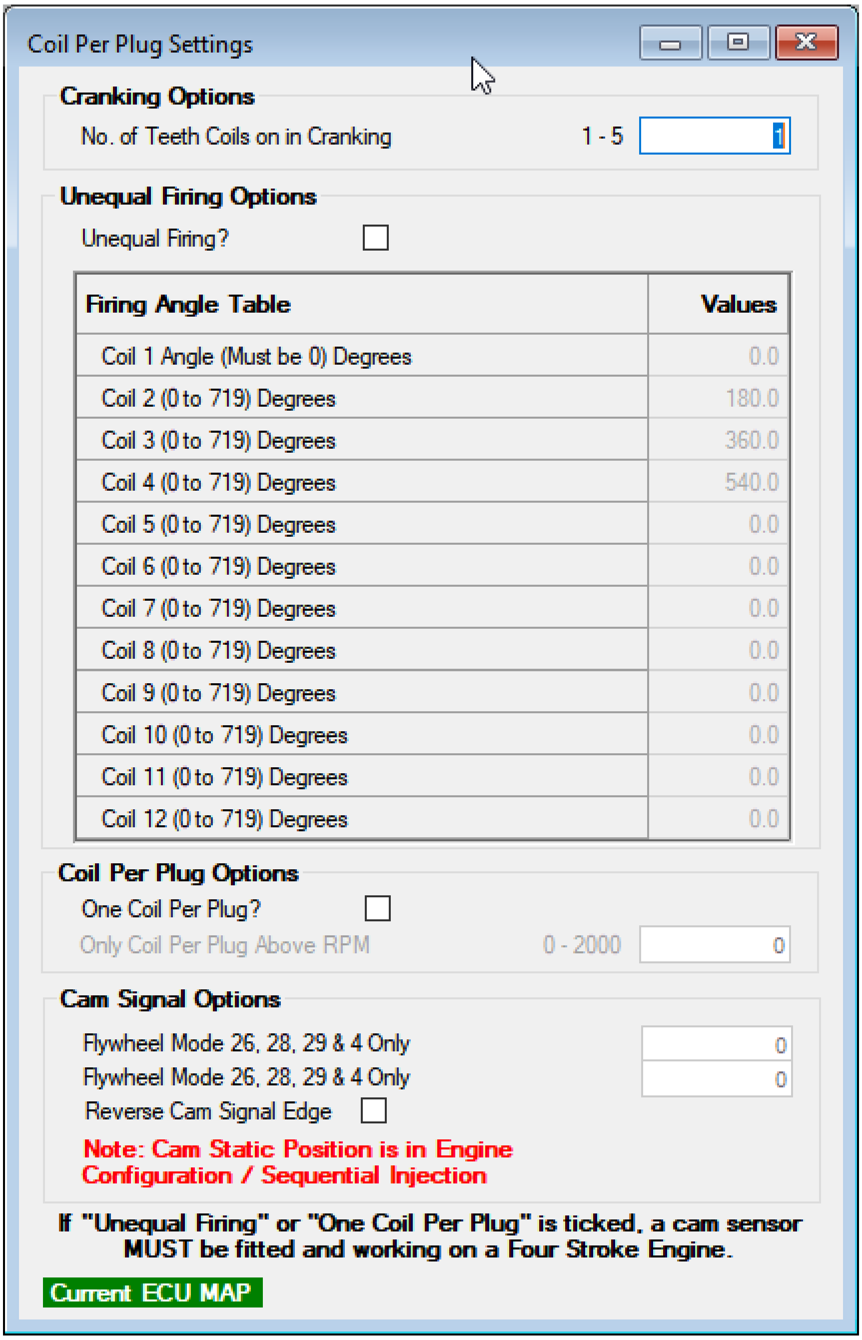
OIL TEMP FOR RPM LIMIT REDUCTION

Below these temperatures of oil or water then the RPM limit will be reduced by the above figure. Set to -50C if no action is required on one of them but is required on the other.

PULSE INJECTORS ON SWITCH ON

The injectors will pulse on ECU switch on or reset when this checkmark is active. The duration of the pulse is the “Injector Start Pulse” in General Engine Settings.

7.3 Coil Per Plug Settings



UNEQUAL FIRING OPTIONS

Some modern multi cylinder engines do not have equally spaced cylinders in a rotational sense. For example the Cosworth Opel V6 2.5 l ex DTM engine fires at 0, 75, 240, 315, 480, 535 degrees as against a standard pattern for a six cylinder engine of 0, 120, 240, 360, 480, 600 degrees. The first entry must always be zero, the others in order of firing the relevant cylinder spacing.

NUMBER OF TEETH COILS ON IN CRANKING

Controls temperature build up during cranking in small coil over plug coils. Set to 1 or 2. Increase only if the engine does not fire reliably at starter motor speeds.

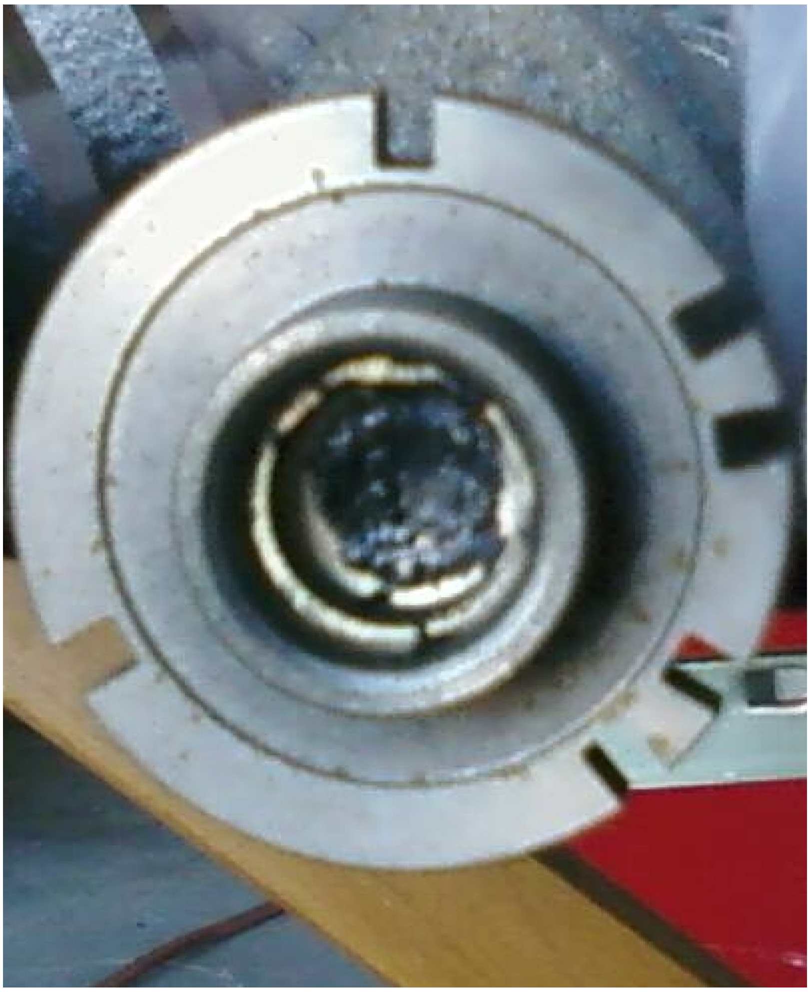
ONE COIL PER PLUG
Tick this if using one coil per plug. A cam sensor must be installed and working to use this option.
If you have coil on plug, and no cam sensor, leave this option off, and tick Twin Spark in General Engine Settings. This will run coil on plug in wasted spark mode.

ONLY COIL PER PLUG ABOVE RPM
This allows an individual coil engine to start without being able to see the cam sensor when starting (usually caused by an inductive cam sensor and a small cam target). The ECU starts the engine as a wasted spark/twin spark engine and changes to using the coils individually above this RPM.

SETTING UP FLYWHEEL MODE 26
LOWER CRANK PULSES LIMIT BETWEEN CAM PULSES
UPPER CRANK PULSES LIMIT BETWEEN CAM PULSES
REVERSE CAM SIGNAL EDGE

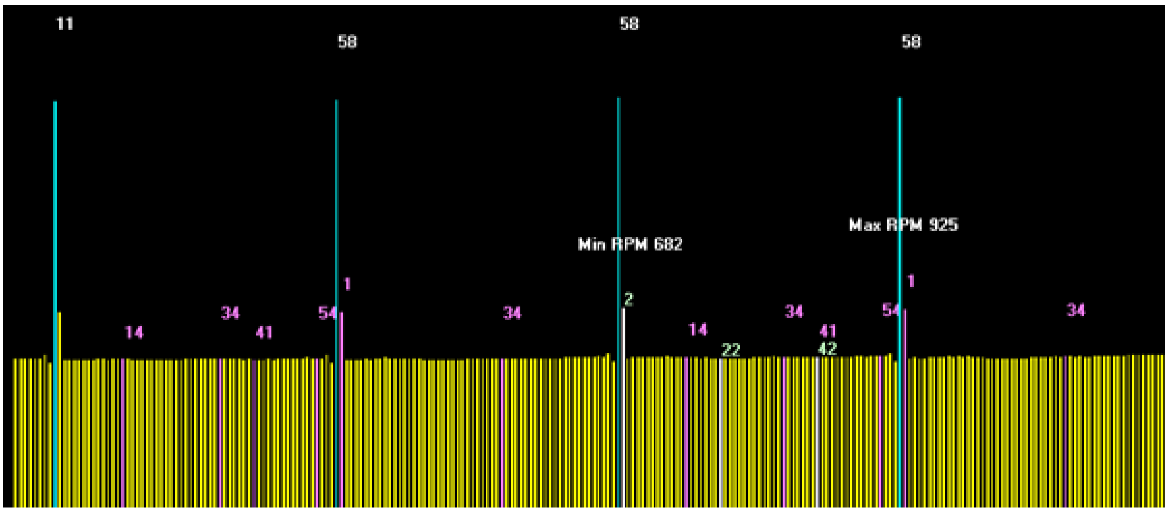
This mode is designed to be used with any flywheel with missing teeth (24 - 1, 36 – 1, 60 – 2, etc), and a cam trigger pattern with multiple teeth, where there is a unique gap between at least one of the cam teeth.

In this example, we’re setting up an engine with a 60 – 2 crank pattern, and a 6 tooth cam pattern.



There are unevenly spaced teeth on the cam, so we can easily pick out a single tooth to use as a reference point.

This is what the Crankshaft Oscilloscope looks like:

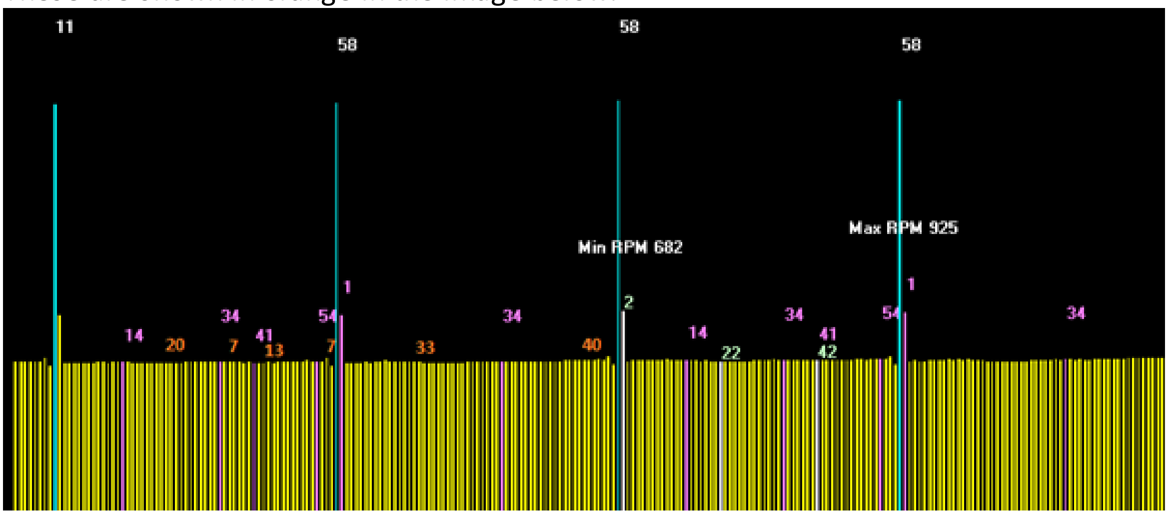


The 6 cam teeth are clearly visible, and occur for every two rotations of the crankshaft.

The first step is to calculate the number of crank teeth between each cam pulse. The table below shows the cam pulse tooth, and the corresponding number of teeth since the previous cam pulse.

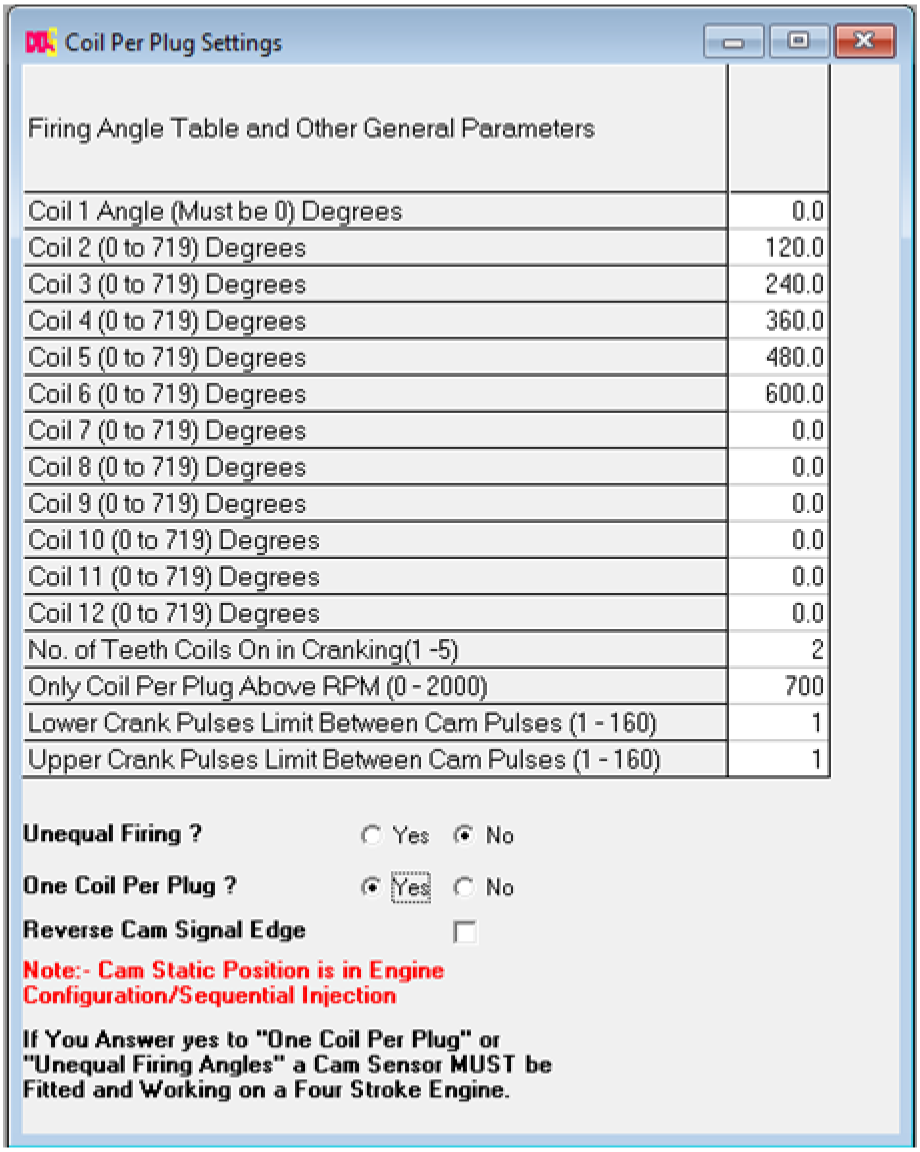
Crank Rotation	Cam pulse tooth	Teeth to Previous Cam Pulse	Unique Gap?
1	14	N/A	N/A
1	34	34 – 14 = 20	Yes
1	41	41 – 34 = 7	No
2	54	54 – 41 = 13	Yes
2	1	(1 + 60) – 54 = 7	No
2	34	34 – 1 = 33	Yes
3	14	(14 + 60) – 34 = 40	Yes

These are shown in orange in the image below:



Flywheel Mode 26 works by looking for a specific, unique number of crank teeth between each cam pulse. In this example, there are four options to choose from; 13, 20, 33 and 40. For this example we will use 40 (highest unique count is generally best), which is the cam pulse occurring on crank tooth 14. The other gaps of 13, 20 and 33 crank teeth will work in exactly the same way.

Make sure Flywheel Mode 26 is selected in General Engine Settings. Press F4 to update the map if you have to change this.
Open the Coil Per Plug Settings screen. It will look something like this:

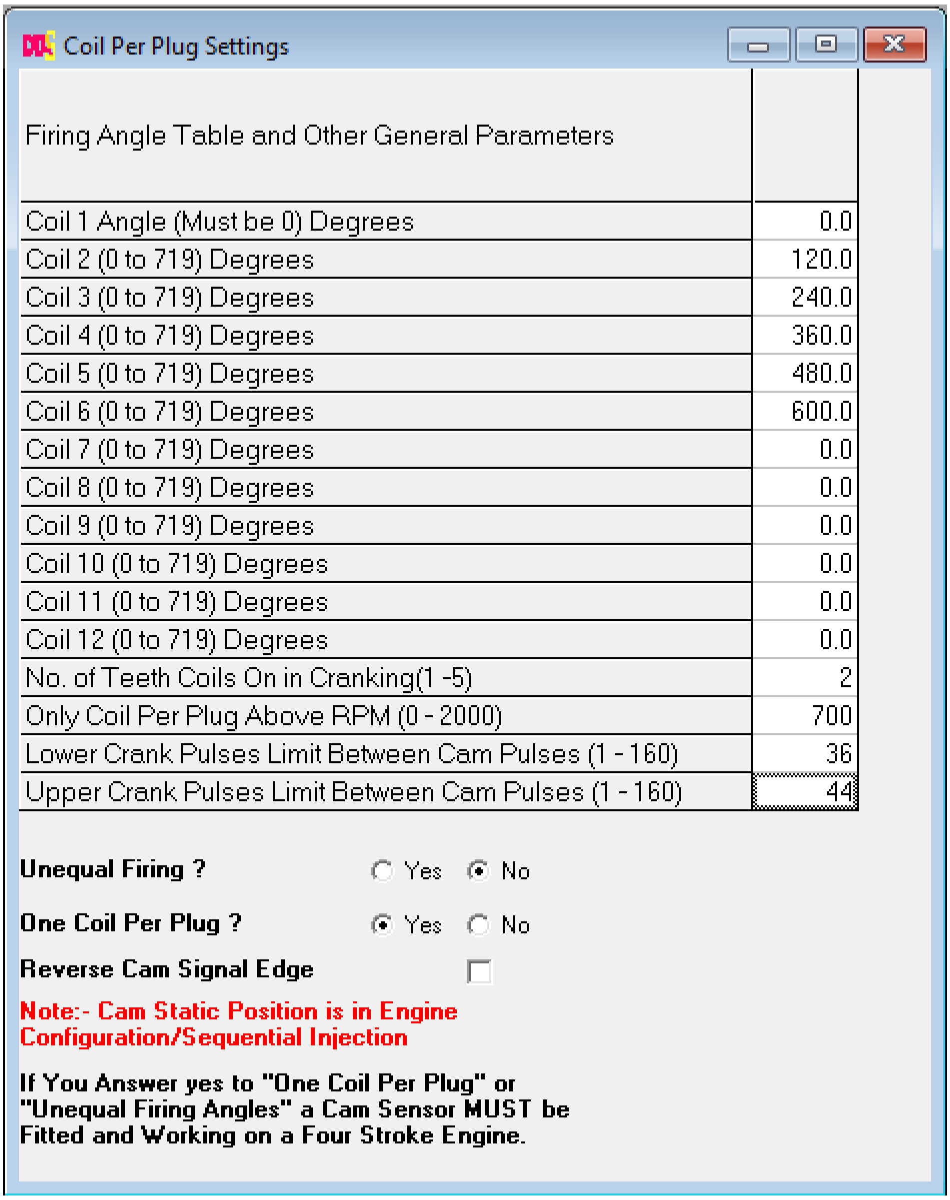


The boxes labelled **Lower Crank Pulses Limit Between Crank Pulses** and **Upper Crank Pulses Limit Between Cam Pulses** define the number of crank pulses the ECU will look for to pick out the cam pulse we have selected.

Ideally the actual number of teeth would be specified. However, the cam pulse can move between teeth, so a window has to be provided. This window must also ensure none of the other pulses are picked up.

The next lowest is number of crank teeth between cam pulses is 33, and there no higher values, which is what makes this a good choice. The window should therefore be from 36 to 44.

The easiest way to calculate this is to take the highest number of crank teeth between cam gaps (40), subtract the next highest number (33) and then divide by two. You can then add or subtract this number from the highest number of teeth to use as the upper or lower limit. E.g. (40-33)/2 = 3.5 – in this case, we need to round the number up (4) or down (3). It’s generally better to round up, so long as the upper/lower value doesn’t become too close to the tooth count of the next highest/lowest gap

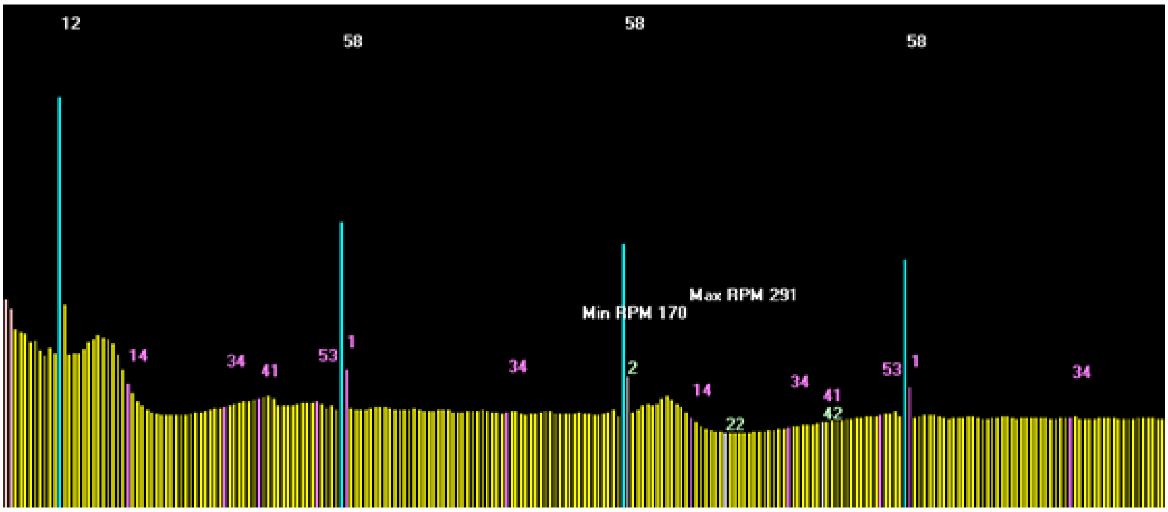


Now the correct cam angle needs to be calculated. This is the angle between TDC and the cam pulse when the cam is at it’s static (usually most retarded) position.

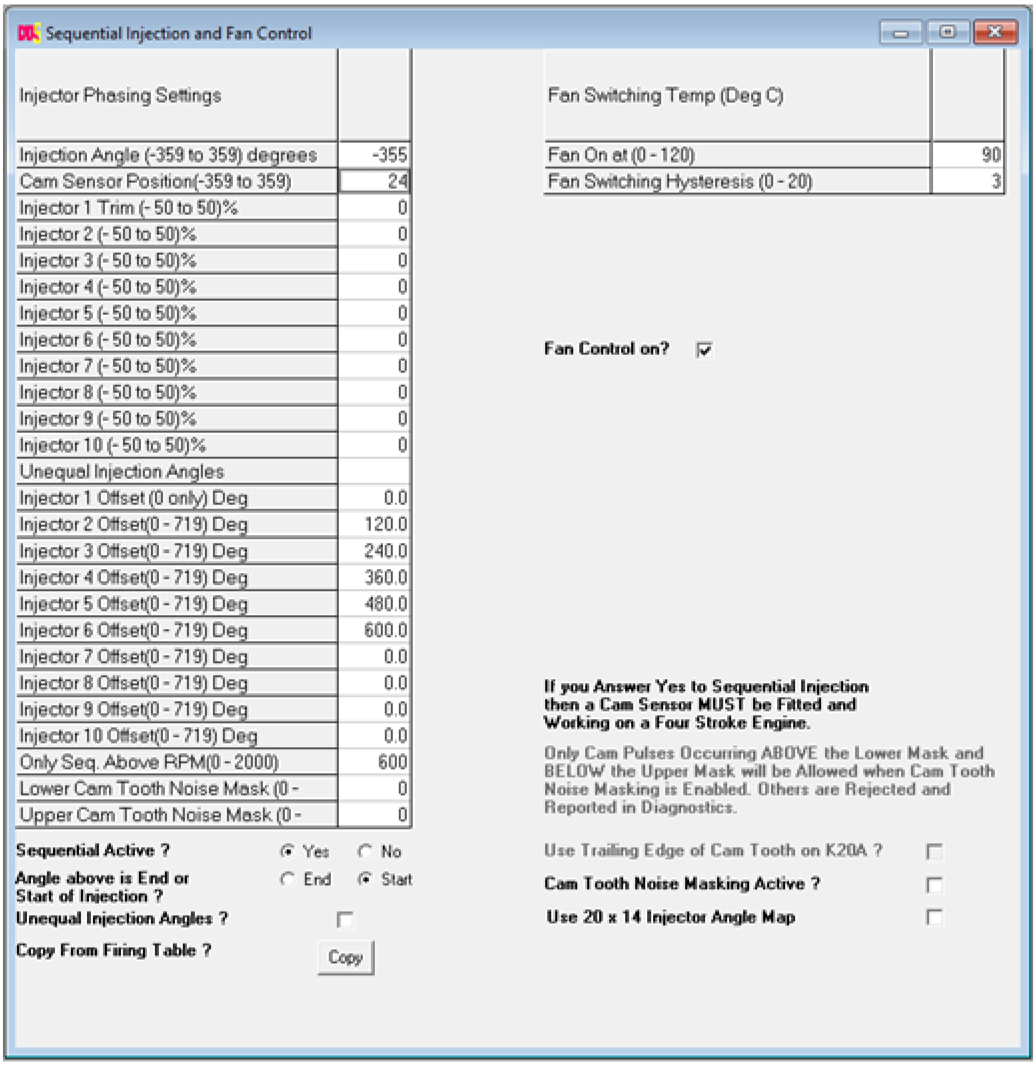
For this particular engine, the crank sensor angle is 61 degrees (see manual for calculating this figure), which means TDC is on crank tooth 10. This is because the crank trigger disc has 60 teeth, which means each tooth represents 6 degrees of rotation. 61 degrees divided by 6 degrees/tooth = 10 teeth. Even if TDC was not exactly on tooth 10, maybe halfway between, it does not matter as the upper/lower limit will account for that.

From the above graph (page 2), the cam pulse is on tooth 14.
This means the cam pulse must either be 4 teeth after the TDC crank pulse on tooth 10, which is 24 degrees, or it must be 56 teeth before the TDC crank pulse on tooth 10, which is -336 degrees. The minus signifies the cam pulse is before TDC.

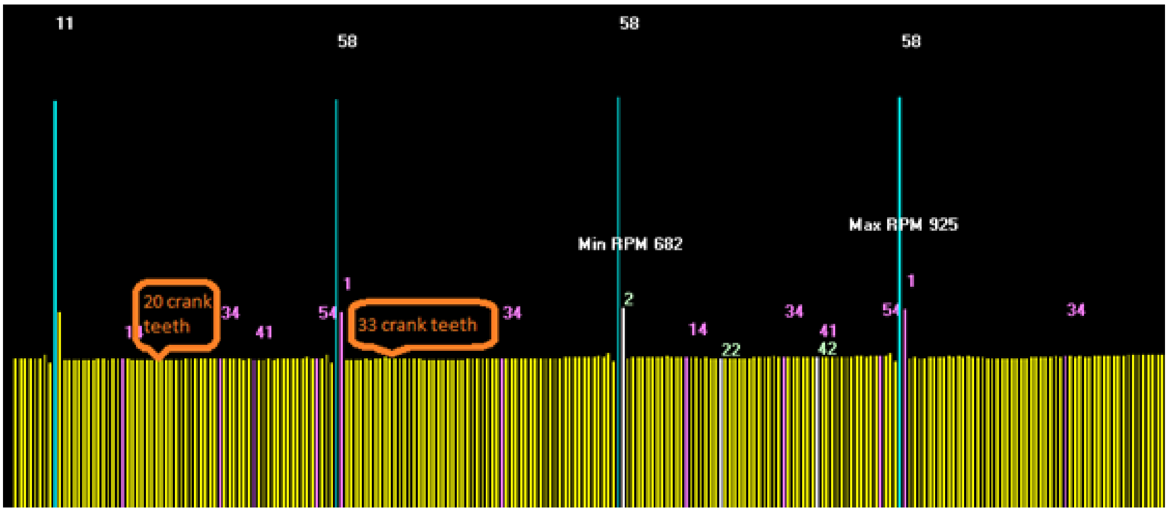
To verify which is the correct value, remove all spark plugs except those in cylinder 1. Re do the crank scope, and this will show which rotation crank rotation the TDC firing stroke is in.



This clearly shows the cam pulse is 4 teeth after TDC (highest point on graph), and the correct value to be entered in Sequential Injection -> Cam Sensor Position is 24 degrees.



The other three gaps would be calculated in the same way. Care must be taken, as there are two cam pulses occurring on tooth 34. These cam pulses have a different amount of crank teeth between them and the previous cam pulse, shown below:

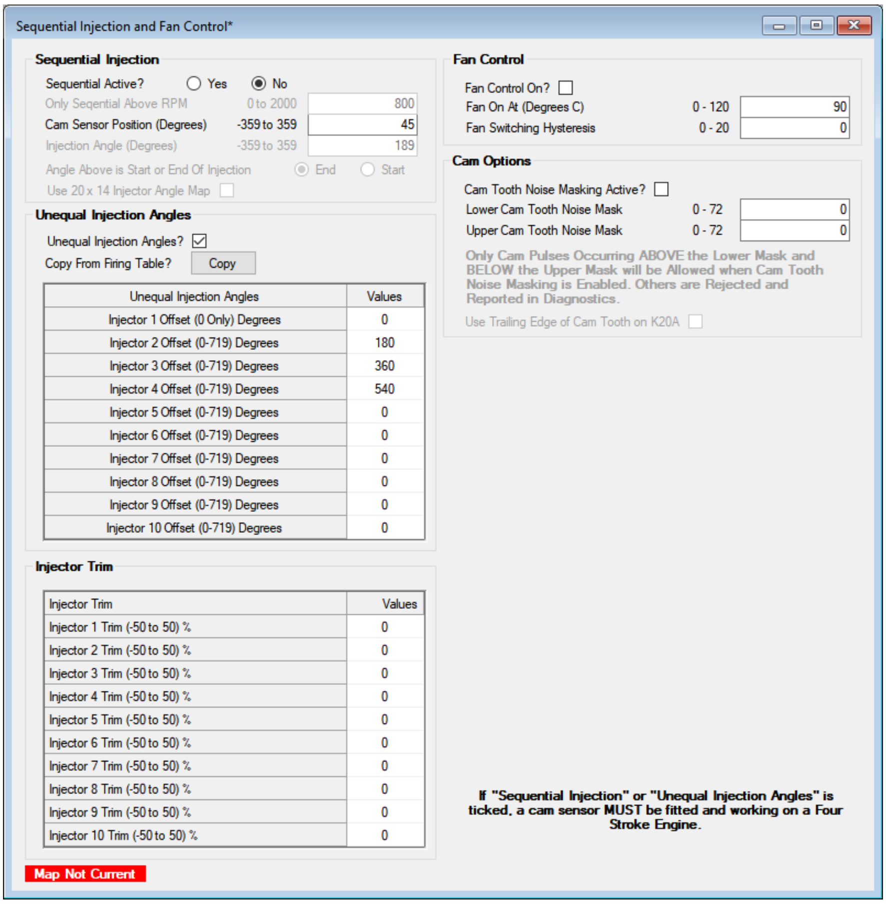


If the 20 tooth gap was to be used, the correct angle would be 24 teeth x 6 degrees = 144 degrees.

The 33 tooth gap would be slightly different, as this angle is negative. This is the cam pulse occurring on crank tooth 34. The maximum number of teeth the cam pulse can be from TDC is 60 teeth, one complete crank rotation. This means we need to use the cam pulse which is before TDC, meaning the angle is negative.
To complicate matters further, this cam pulse has the gap in the crank between it and TDC, so the number of crank teeth isn’t as obvious. To calculate this, we add the crank teeth either side of the gap. TDC is 10 teeth after the gap, and the cam pulse is on tooth 34, which is 26 teeth before the gap (60 – 34).
The angle would be (10 + 26) x 6 degrees, giving an angle of -216 degrees.

The engine should now run in sequential mode.

7.4 Sequential Injection Settings



This section allows the setting of the values for injector phasing on sequential systems only. All angular values are referenced to TDC number 1 cylinder **firing stroke.**

1 INJECTION ANGLE
The point at which the injector starts to open (or closes if the option below is taken).
i.e. if you want the injectors to open 90 degrees before TDC firing stroke then enter - 90. If you want them to open 90 degrees after TDC firing stroke then enter 90.

2 CAMSHAFT SENSOR POSITION
The position at which the camshaft sensor switches. The ECU will measure this position for you when sequential operation is active and it is displayed in Display and Test Functions/Diagnostic Display in the information panel. Note the ECU can only determine its position within one engine rotation, not one 4 stroke cycle.

3 INJECTOR TRIM
This allows the amount of fuel to be allocated to each individual cylinder to be varied + or - 50% from the map value. You can use this to correct for mechanical differences in the inlet tract. Normally they should all be zero. N.B. they are listed in the order the injectors fire, not the cylinder order. If the firing order of the engine is 1342 and you want +10% fuel on cylinder number 3 then the second entry box down should be set to 10.

4 SEQUENTIAL ACTIVE
Self explanatory but note that a cam shaft sensor must be fitted and the wiring correctly implemented but it will work.

5 UNEQUAL INJECTION ANGLES

If you have an unequal firing engine this will normally be the same as the unequal firing table and can be copied from there using the button provided. In rare circumstances such as the BMC “A” series engine then you will need unequal injection but equal firing.

6 ONLY SEQUENTIAL ABOVE RPM

Some, usually inductive, cam sensors do not give an adequate signal at cranking for the ECU to see it. Setting this value at about 1000 rpm will usually allow the engine to start in grouped mode and then switch as soon as the sensor can be seen. The engine stays in sequential mode until it stops.

7 LOWER AND UPPER CAM TOOTH NOISE MASK

Only applicable to engines with a single tooth cam target wheel. This allows a cam pulse to be accepted only in a specific crank tooth window. When running the engine the crank tooth of the cam pulse is reported in diagnostic display. Choosing the mask either side of this reported number allows electrical interference from the spark wires to be masked out as long as they are not coincident with the cam signal itself. The check mark “Cam tooth Noise Masking” enables this feature. Note the limits are twice the number of crank teeth.

8 END OR START

Either the beginning or the end of the injection pulse can be fixed in degrees. Normally end is the best.

9 USE TRAILING EDGE OF CAM TOOTH ON K20A

The Honda K20 has an extremely god cam sensor setup. Some engines though seem to exhibit an odd oscillation in the exhaust cam. This can lead to the ECU reporting cam sensor errors. If this happens then this check mark changes the tooth edge the ECU uses as the reference edge. This moves the reference point 15 degrees and will eliminate the problem. Note that the cam sensor position (above) will need changing.

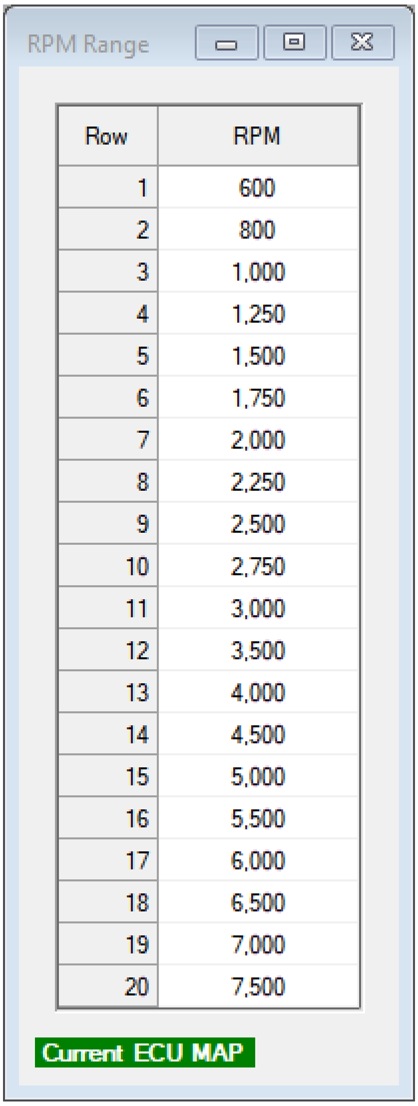
10 USE 20 X 14 INJECTION ANGLE MAP

Allows the injection angle, discussed in 1 above, to vary with speed and load of the engine. See Essential Map Settings/Injection Angle Map.

FAN RELAY SETTINGS

Just enter the temperature that you wish the fan to turn on. The hysteresis is variable from V62 on. Suggested value is 3 degrees C but you may need more if the fans turn on and off too rapidly.

7.5 Main Map RPM Range

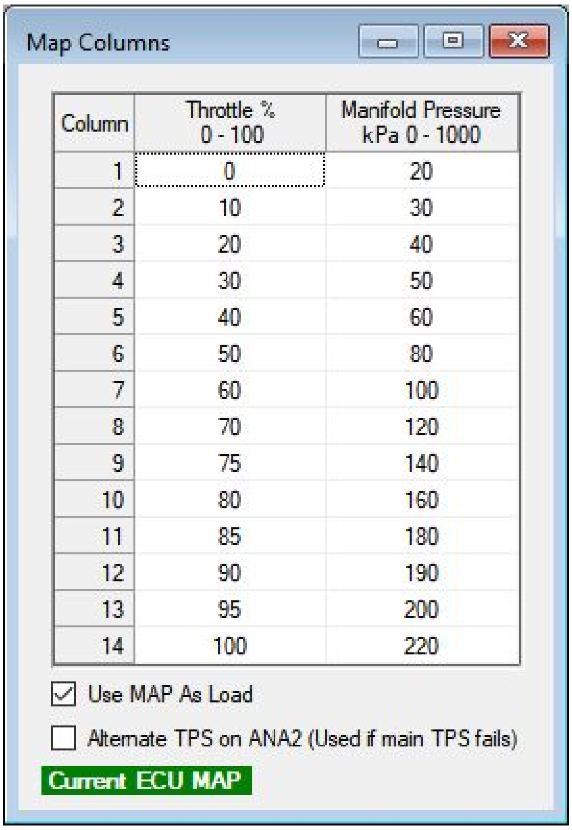


Row	RPM
1	600
2	800
3	1,000
4	1,250
5	1,500
6	1,750
7	2,000
8	2,250
9	2,500
10	2,750
11	3,000
12	3,500
13	4,000
14	4,500
15	5,000
16	5,500
17	6,000
18	6,500
19	7,000
20	7,500

Setting a suitable RPM scale for the engine in use. Just type in new figures. Use enter rather than the cursor keys to confirm each change.

The scale must increase from top to bottom. The rpm bands can be of any size but we recommend a minimum spacing of 250 rpm. You can make the spacing closer than normal for any area of interest for your particular engine e.g. close together at low revs for a trials engine or close together at the high revs for a peaky race engine.

7.6 Main Map Columns



Column	Throttle % 0 - 100	Manifold Pressure kPa 0 - 1000
1	0	20
2	10	30
3	20	40
4	30	50
5	40	60
6	50	80
7	60	100
8	70	120
9	75	140
10	80	160
11	85	180
12	90	190
13	95	200
14	100	220

Because the response of a butterfly or slide system is inherently non-linear this option is included to match the movement across the map when the accelerator is pressed to the amount of air entering the engine. The default map includes a set of points which will work well in most situations. If ,however, you find after testing on the dyno that a portion of the fuel map becomes very steep across the map, that is an indication that the column positions need closing up at that point.

To change use the cursor to get to the figure of interest and change as required. NOTE the figures must increase from top to bottom of the screen.

Similarly there is a scale based on MAP for those people who prefer to map with pressure as load.

USE MAP AS LOAD

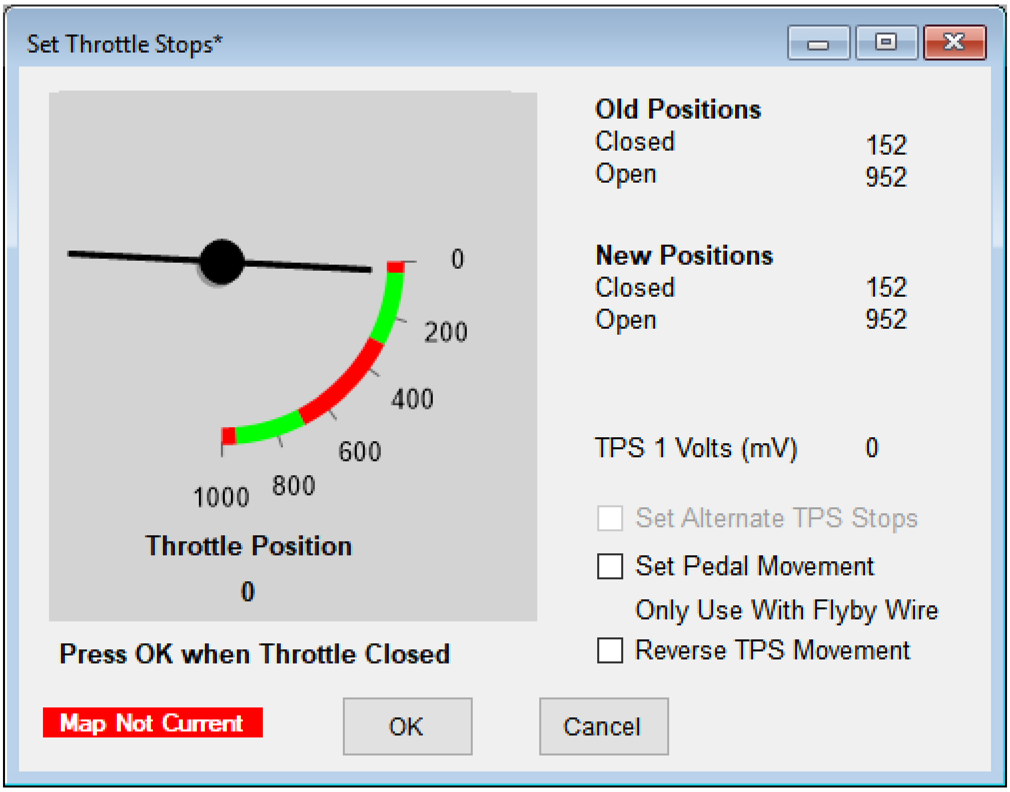
The check box allows the use of a manifold pressure sensor as the main load indicator, instead of throttle. This will apply throughout the system when checked. The scale will need to be rewritten to match whichever source is selected as load.

ALTERNATE TPS FITTED

Used when two TPS's are required, one for backup. Note the end points of this require setting *Set Throttle Stops* if this feature is used.

Save the changes by pressing F4 when complete.

7.7 Throttle Stops



Set throttle stops; locates the precise open and shut points of the throttle or slide mechanism to enable the program to sense accurately, and match the amount of opening to the 14 columns on ignition, fuel and other tables.

TO SET

a) First make sure the throttles are completely closed, then press the OK button.

b) Open throttle to maximum and again press the OK button.

If the values are correct then answer Y when asked to confirm ,if you answer N then start again from a).

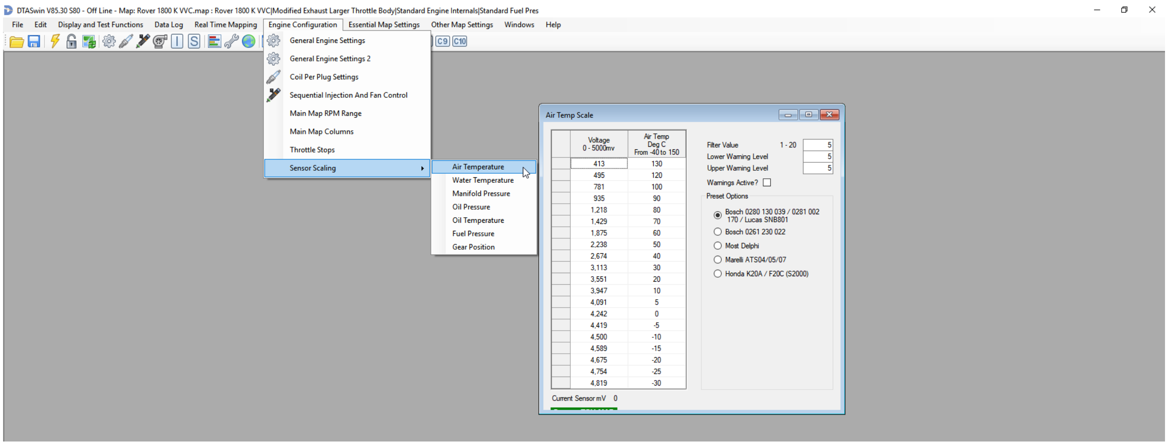
NOTE There are limits on throttle values available for use. The closed (idle) position must be higher than 50 (we recommend about 100) as lower values are used by the system to recognise that the throttle potentiometer (sensor) has failed. Similarly values above 1000 denote a failed sensor.

If two TPS sensors are fitted then this also needs setting the same way.
When using a DTA fly by wire controller the end points of the sensor on the pedal will need setting as well. Set the first end points as normal above (this reads the butterfly position), then tick the "Set Pedal Movement" Check box, and repeat the process.

REVERSE TPS MOVEMENT

If the TPS is incorrectly connected, that is 5V and Ground are the wrong way round, then the correct approach is to correct the wiring. In situations where this cannot be done such as when using an OEM sensor then this checkmark will reverse the operation in software.

7.8 Sensor Scaling



All sensors can have their voltages scaled to match the calibration curve of the sensors. If the sensor is listed in the preset options just click on the relevant button. If not we may not have seen the particular sensor and may do a calibration chart for you.

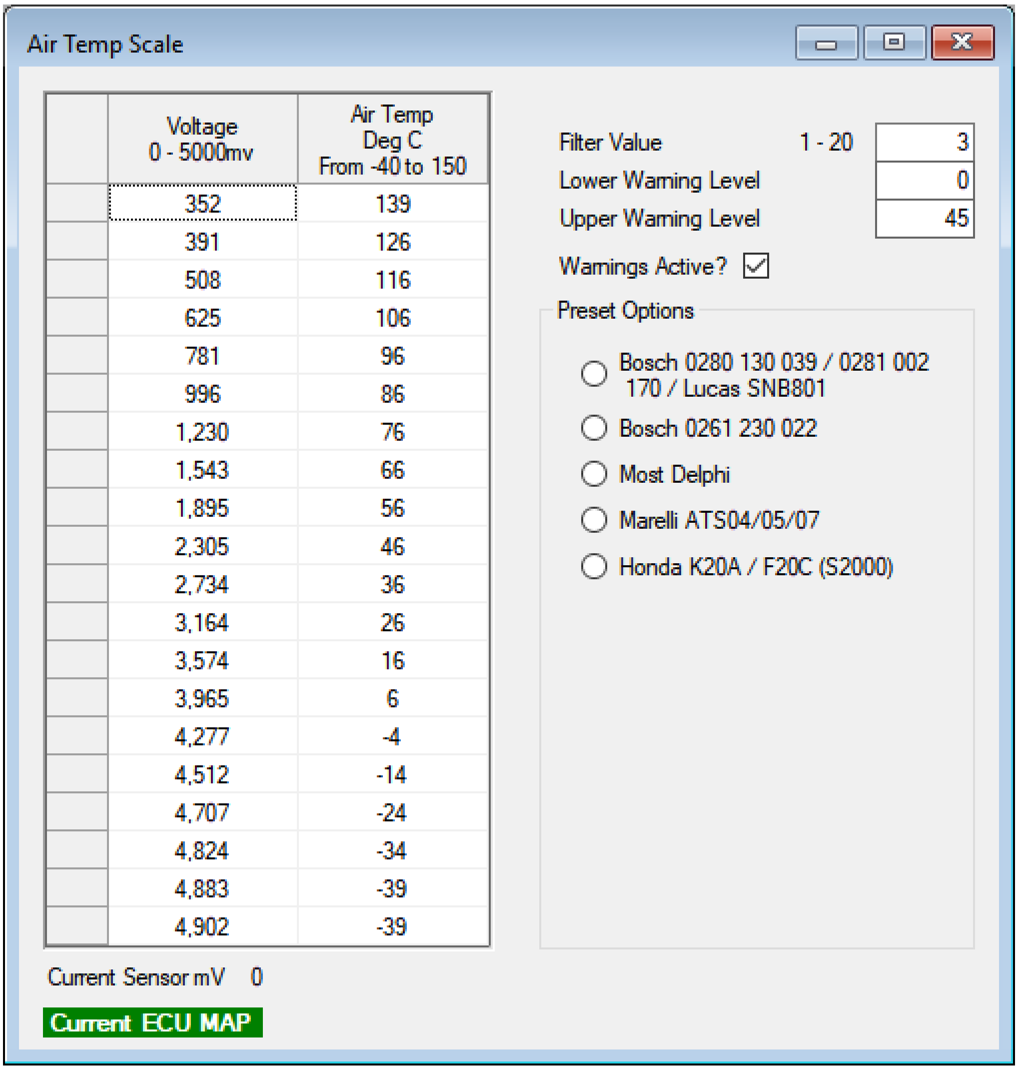
FILTER VALUE

This allows noise filtering. If you do not see any random variations then leave at one. If you do then increase the filter value.

LOWER AND UPPER WARNING LEVELS AND WARNINGS ACTIVE

If you want sensor warnings when in real time mapping and on the status line (as above) set these to where you want them. The gear shift light (if fitted) will also flash even if the PC is not connected. NOTE:- sensor warnings are only active above 900 rpm.

7.8.1 Air Temperature



All sensors can have their voltages scaled to match the calibration curve of the sensors. If the sensor is listed in the preset options just click on the relevant button. If not we may not have seen the particular sensor and may do a calibration chart for you.

If you already know the resistance curve for your sensor and are looking to convert to voltage, the ECU has a built-in 1kΩ pullup resistor, so: (sensor voltage x (resistance/(resistance+pullup resistor)) e.g. (5000x(820/(820+1000)).

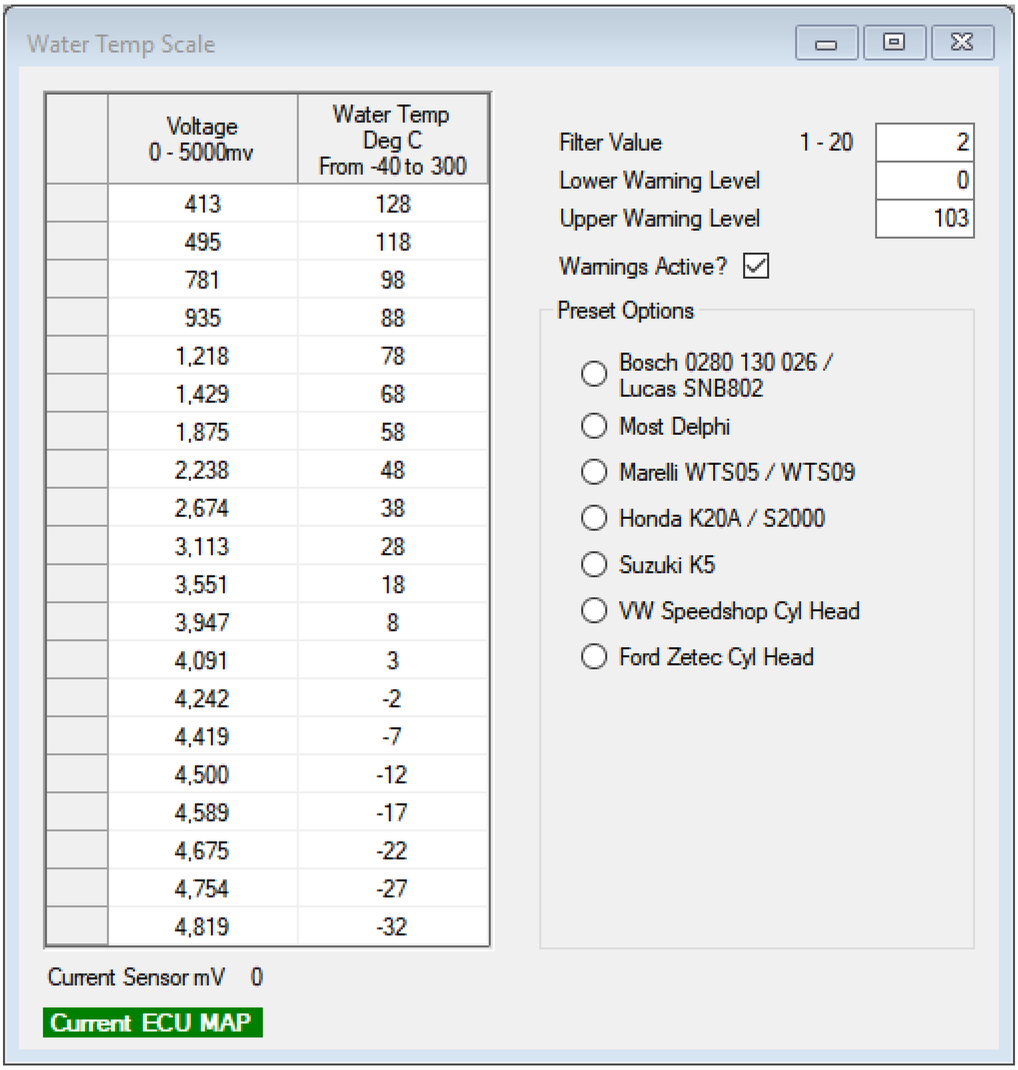
FILTER VALUE

This allows noise filtering. If you do not see any random variations then leave at one. If you do then increase the filter value.

LOWER AND UPPER WARNING LEVELS AND WARNINGS ACTIVE

If you want sensor warnings when in real time mapping and on the status line (as above) set these to where you want them. The gear shift light (if fitted) will also flash even if the PC is not connected. NOTE:- sensor warnings are only active above 900 rpm.

7.8.2 Water Temperature



	Voltage 0 - 5000mv	Water Temp Deg C From -40 to 300
	413	128
	495	118
	781	98
	935	88
	1,218	78
	1,429	68
	1,875	58
	2,238	48
	2,674	38
	3,113	28
	3,551	18
	3,947	8
	4,091	3
	4,242	-2
	4,419	-7
	4,500	-12
	4,589	-17
	4,675	-22
	4,754	-27
	4,819	-32

All sensors can have their voltages scaled to match the calibration curve of the sensors. If the sensor is listed in the preset options just click on the relevant button. If not we may not have seen the particular sensor and may do a calibration chart for you.

If you already know the resistance curve for your sensor and are looking to convert to voltage, the ECU has a built-in 1kΩ pullup resistor, so: (sensor voltage x (resistance/(resistance+pullup resistor)) e.g. (5000x(820/(820+1000)).

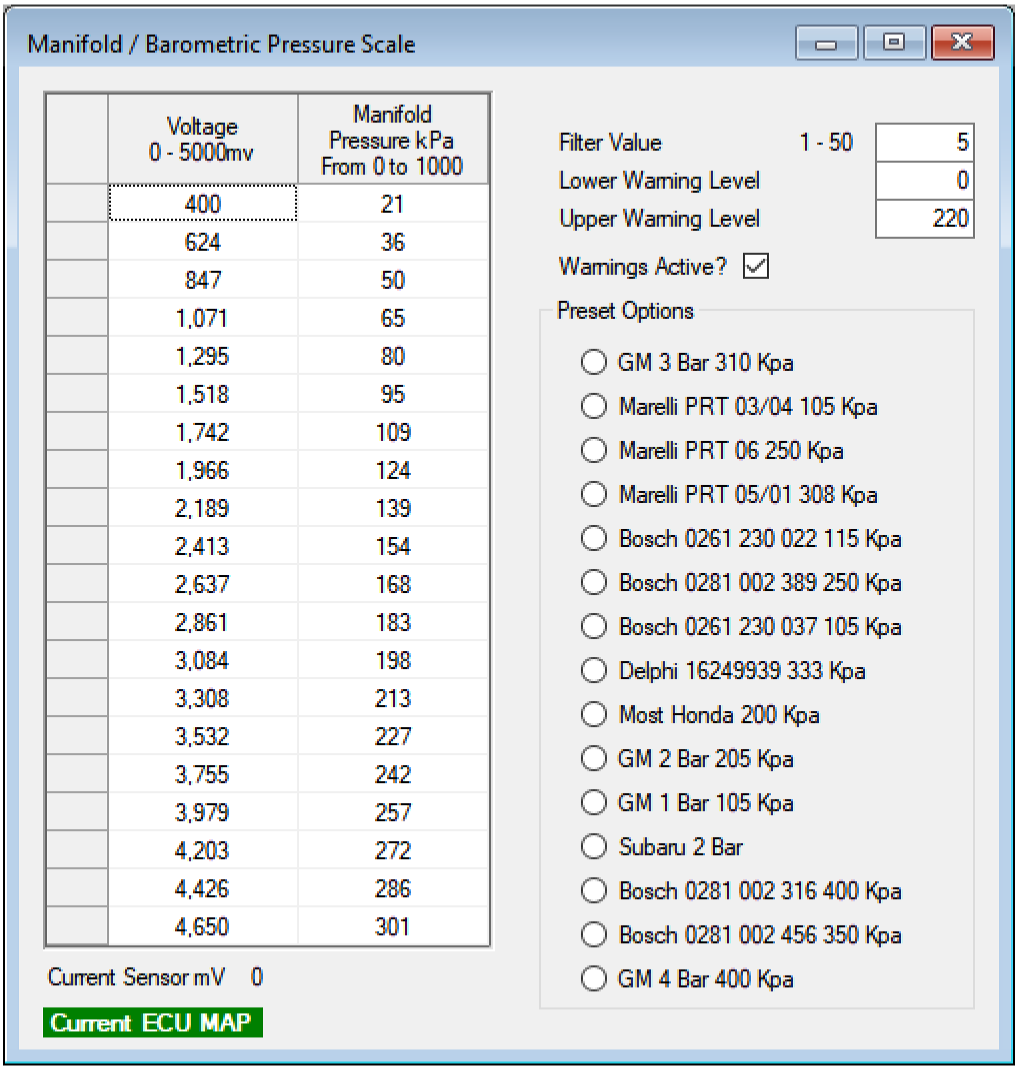
FILTER VALUE

This allows noise filtering. If you do not see any random variations then leave at one. If you do then increase the filter value.

LOWER AND UPPER WARNING LEVELS AND WARNINGS ACTIVE

If you want sensor warnings when in real time mapping and on the status line (as above) set these to where you want them. The gear shift light (if fitted) will also flash even if the PC is not connected. NOTE:- sensor warnings are only active above 900 rpm.

7.8.3 Manifold Pressure



All sensors can have their voltages scaled to match the calibration curve of the sensors. If the sensor is listed in the preset options just click on the relevant button. If not we may not have seen the particular sensor and may do a calibration chart for you.

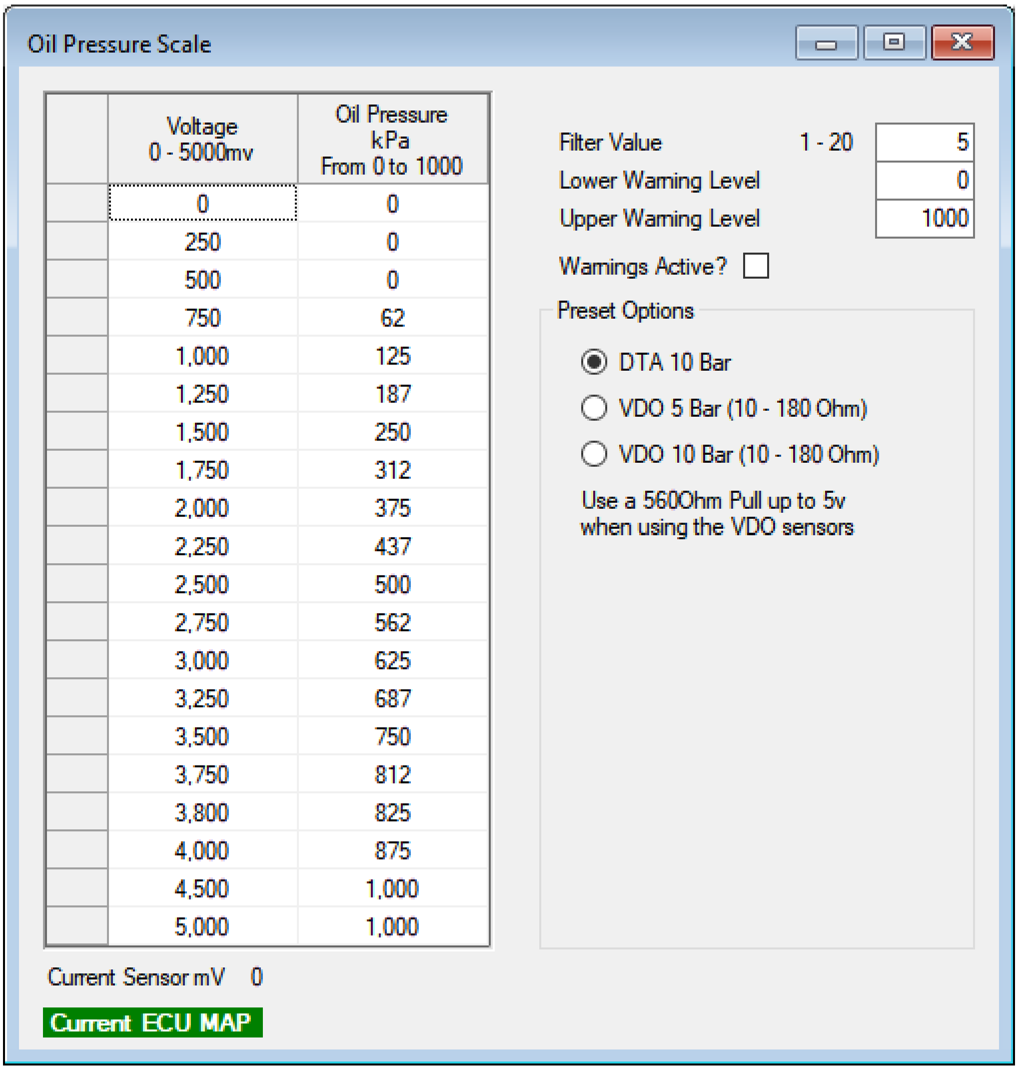
FILTER VALUE

This allows noise filtering. If you do not see any random variations then leave at one. If you do then increase the filter value.

LOWER AND UPPER WARNING LEVELS AND WARNINGS ACTIVE

If you want sensor warnings when in real time mapping and on the status line (as above) set these to where you want them. The gear shift light (if fitted) will also flash even if the PC is not connected. NOTE:- sensor warnings are only active above 900 rpm.

7.8.4 Oil Pressure



All sensors can have their voltages scaled to match the calibration curve of the sensors. If the sensor is listed in the preset options just click on the relevant button. If not we may not have seen the particular sensor and may do a calibration chart for you.

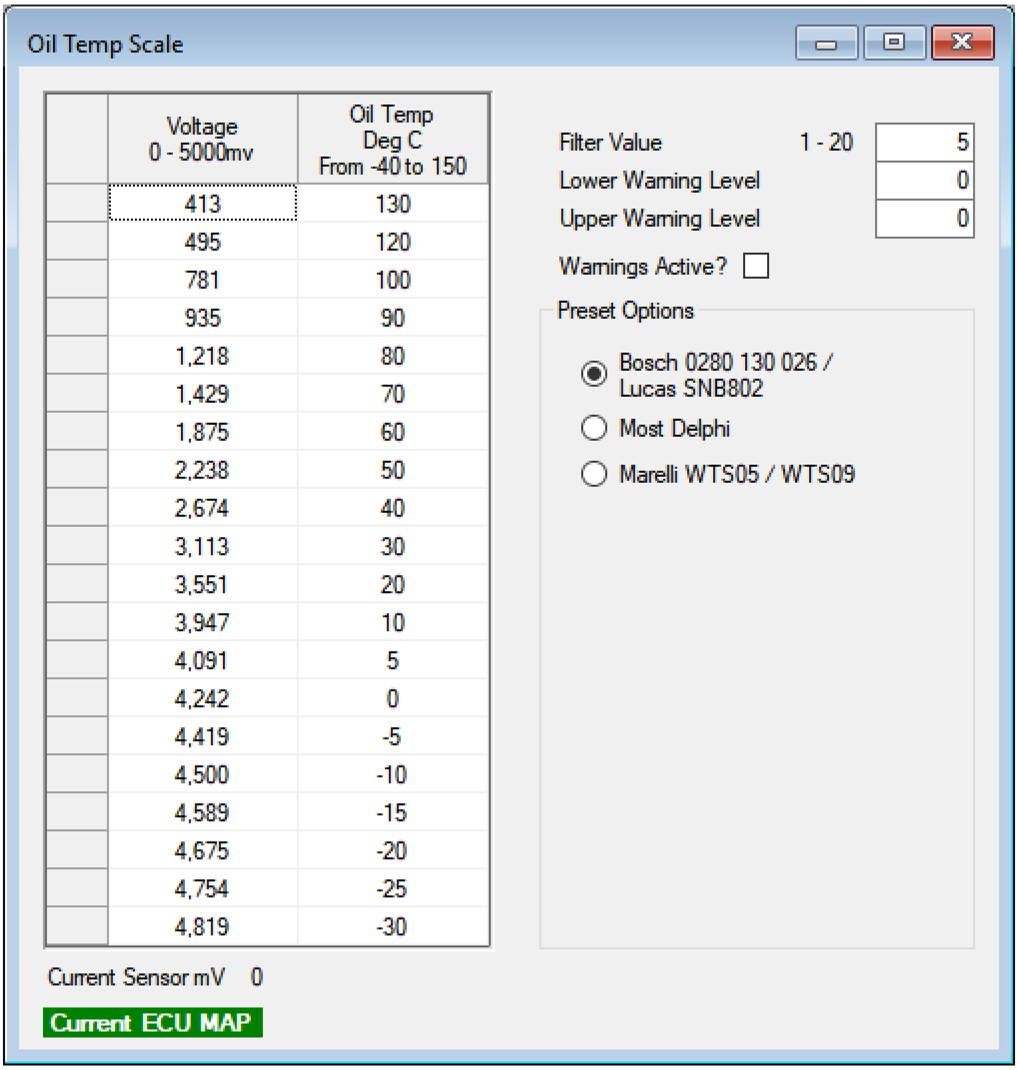
FILTER VALUE

This allows noise filtering. If you do not see any random variations then leave at one. If you do then increase the filter value.

LOWER AND UPPER WARNING LEVELS AND WARNINGS ACTIVE

If you want sensor warnings when in real time mapping and on the status line (as above) set these to where you want them. The gear shift light (if fitted) will also flash even if the PC is not connected. NOTE:- sensor warnings are only active above 900 rpm.

7.8.5 Oil Temperature



All sensors can have their voltages scaled to match the calibration curve of the sensors. If the sensor is listed in the preset options just click on the relevant button. If not we may not have seen the particular sensor and may do a calibration chart for you.

If you already know the resistance curve for your sensor and are looking to convert to voltage, the ECU has a built-in 1kΩ pullup resistor, so: (sensor voltage x (resistance/(resistance+pullup resistor)) e.g. (5000x(820/(820+1000)).

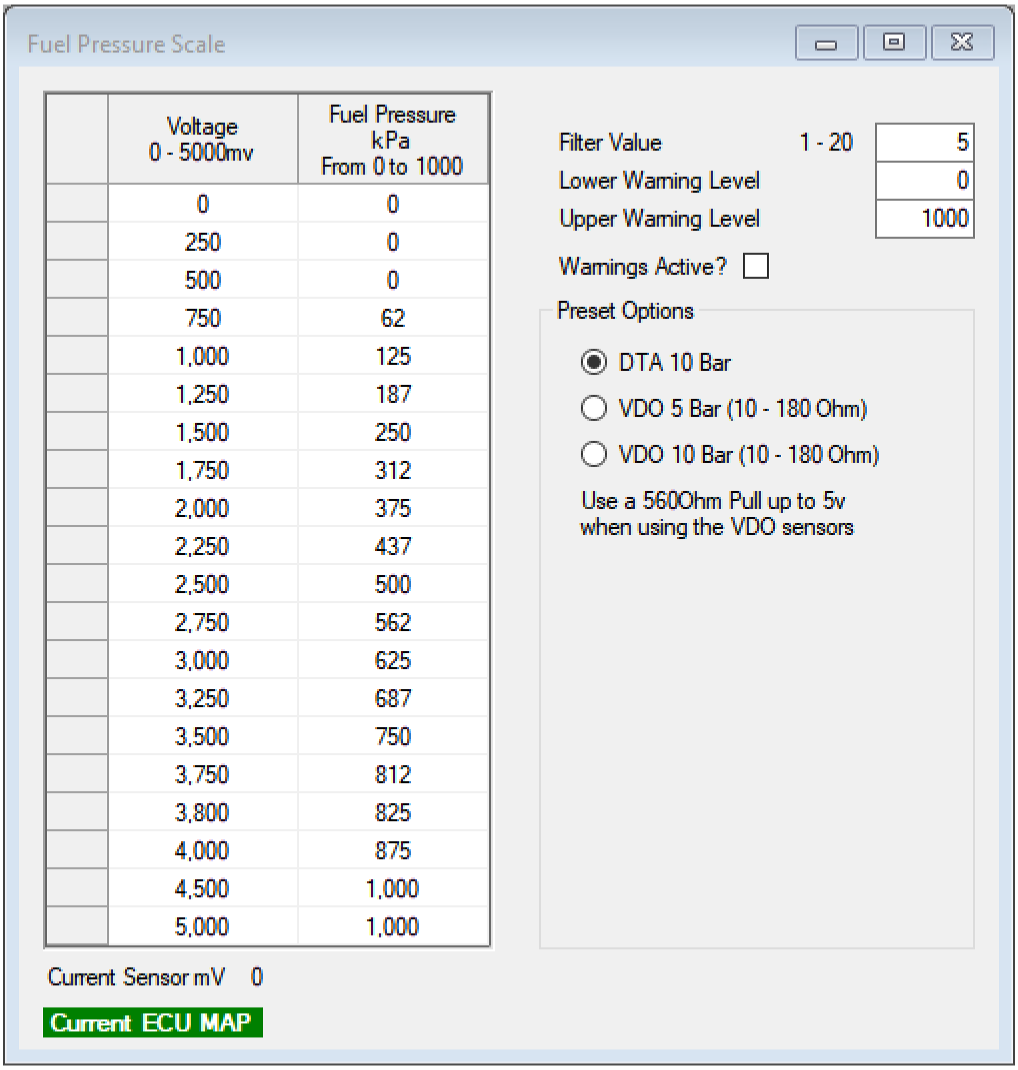
FILTER VALUE

This allows noise filtering. If you do not see any random variations then leave at one. If you do then increase the filter value.

LOWER AND UPPER WARNING LEVELS AND WARNINGS ACTIVE

If you want sensor warnings when in real time mapping and on the status line (as above) set these to where you want them. The gear shift light (if fitted) will also flash even if the PC is not connected. NOTE:- sensor warnings are only active above 900 rpm.

7.8.6 Fuel Pressure



All sensors can have their voltages scaled to match the calibration curve of the sensors. If the sensor is listed in the preset options just click on the relevant button. If not we may not have seen the particular sensor and may do a calibration chart for you.

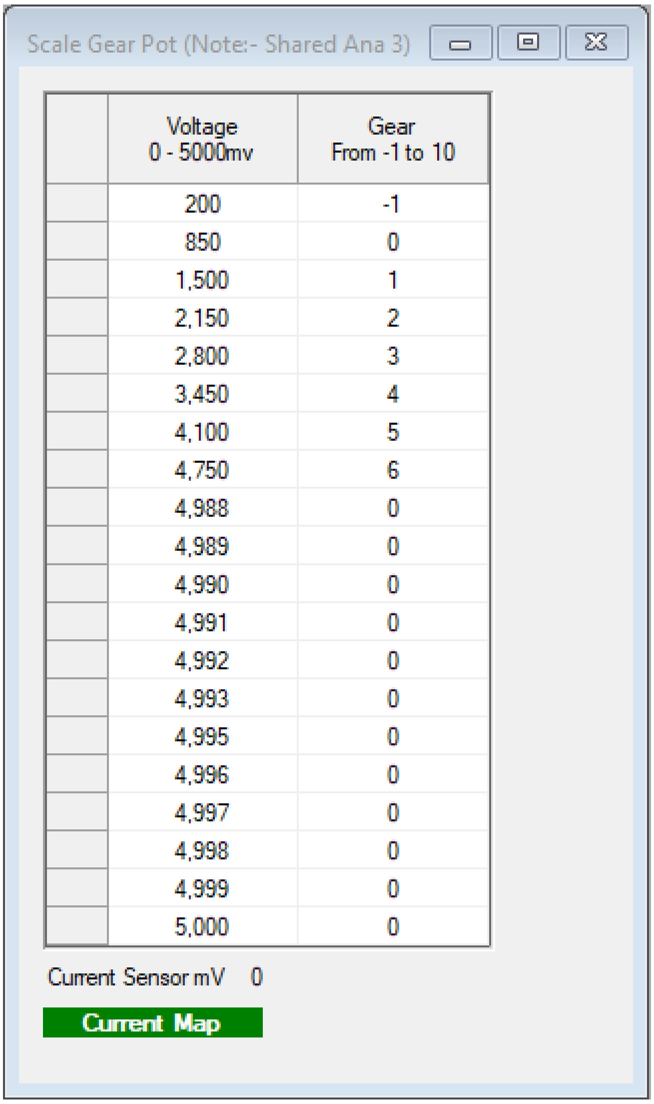
FILTER VALUE

This allows noise filtering. If you do not see any random variations then leave at one. If you do then increase the filter value.

LOWER AND UPPER WARNING LEVELS AND WARNINGS ACTIVE

If you want sensor warnings when in real time mapping and on the status line (as above) set these to where you want them. The gear shift light (if fitted) will also flash even if the PC is not connected. NOTE:- sensor warnings are only active above 900 rpm.

7.8.7 Gear Position



	Voltage 0 - 5000mv	Gear From -1 to 10
	200	-1
	850	0
	1,500	1
	2,150	2
	2,800	3
	3,450	4
	4,100	5
	4,750	6
	4,988	0
	4,989	0
	4,990	0
	4,991	0
	4,992	0
	4,993	0
	4,995	0
	4,996	0
	4,997	0
	4,998	0
	4,999	0
	5,000	0

If you have a sequential gearbox with a gear potentiometer and want to display your gear number on a dashboard, you can set it up here. Note: if using shift cut, this table is ignored.

Fill your table in as above, matching the sensor mV of the gear you are in to the gear number. -1 is reverse, 0 is neutral and anything above is a gear number.

Once you run out of gears, just fill the remaining voltage rows with increasingly higher values (which the pot will not output) and the remaining gear rows with 0. Shift+F5 is handy here.

NOTE: the whole table MUST be filled in and voltage must go from low to high.

Essential Map Settings Menu

8 Essential Map Settings Menu

Enter topic text here.

8.1 Main Ignition Map

Advance Map Edit Degrees BTDC

MAP kPa -> RPM	20	30	40	50	60	80	100	120	140	160	180	190	200	220
600	15.0	15.0	15.0	15.0	14.5	13.0	10.4	7.5	3.8	1.9	1.5	1.5	1.5	1.5
800	14.0	14.0	14.0	14.0	13.5	12.0	10.0	7.5	3.8	2.2	1.5	1.5	1.5	1.5
1000	14.0	14.0	14.0	14.0	13.5	12.0	10.0	7.7	3.8	2.2	1.5	1.5	1.5	1.5
1250	15.3	15.3	15.3	15.7	15.6	13.6	11.3	8.3	5.3	3.4	2.1	1.9	1.5	1.5
1500	16.5	16.5	16.5	17.0	17.3	16.5	14.7	12.0	9.0	6.1	4.6	3.5	2.9	2.4
1750	17.8	17.8	17.8	18.0	18.4	17.9	17.6	15.9	13.4	11.0	8.5	6.5	6.0	4.5
2000	19.0	19.0	19.0	18.8	19.0	18.5	18.5	18.4	16.9	14.8	12.5	10.6	8.9	6.1
2250	20.3	20.3	20.0	20.1	20.2	19.9	19.9	19.5	18.0	16.0	14.0	12.6	11.0	7.1
2500	21.5	21.5	21.3	21.3	21.5	21.2	21.1	20.3	18.0	16.0	14.0	13.0	11.9	7.6
2750	22.8	22.8	22.4	22.3	22.1	21.8	21.5	20.7	18.0	16.0	14.0	13.0	12.0	7.8
3000	24.9	24.9	24.2	23.4	22.7	21.8	21.5	20.7	18.0	16.0	14.0	13.0	12.0	8.0
3500	27.5	27.5	26.5	25.0	23.5	22.1	21.5	20.8	18.0	16.0	14.0	13.0	12.0	8.2
4000	31.0	31.0	30.0	28.0	25.3	22.9	21.5	20.8	18.0	16.0	14.0	13.0	12.0	8.4
4500	32.5	32.5	31.0	29.0	26.5	23.4	21.7	20.8	18.0	16.0	14.0	13.0	12.0	8.6
5000	32.8	32.8	31.3	29.3	27.4	23.8	21.9	20.8	18.0	16.0	14.0	13.0	12.0	8.8
5500	33.2	33.2	31.5	29.5	27.8	24.4	22.1	20.9	18.0	16.0	14.0	13.0	12.0	9.0
6000	33.5	33.5	31.8	29.8	28.0	24.7	22.3	20.9	18.0	16.0	14.0	13.0	12.0	9.0
6500	33.8	33.8	32.0	30.0	28.2	24.9	22.5	20.9	18.0	16.0	14.0	13.0	12.0	9.0
7000	34.2	34.2	32.3	30.3	28.3	25.2	22.8	21.0	18.0	16.0	14.0	13.0	12.0	9.0
7500	34.5	34.5	32.5	30.5	28.5	25.5	23.0	21.0	18.0	16.0	14.0	13.0	12.0	9.0

Graph

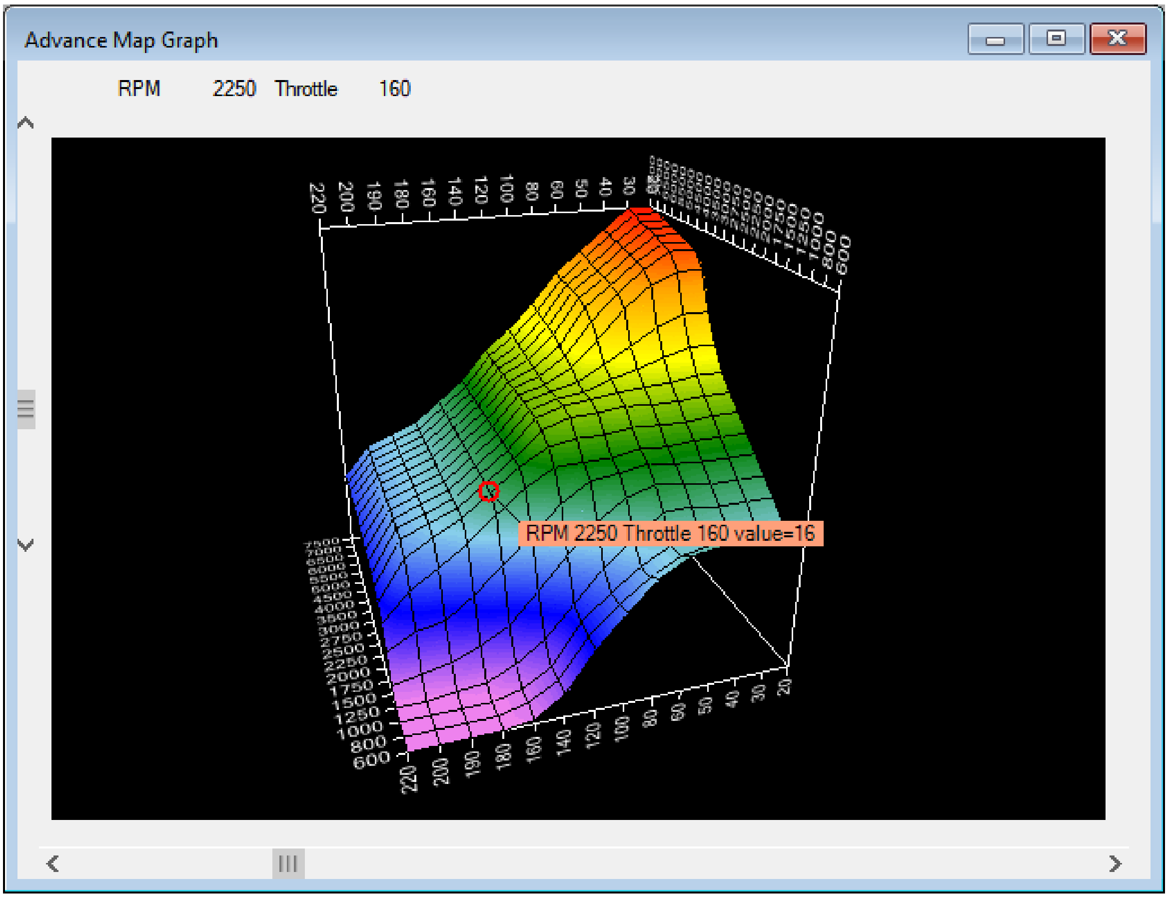
Current Map

Ignition map settings in RED of degrees BTDC.

If any of the cells are highlighted in green this indicates that the value of this cell has been set in Real Time Mapping whilst the engine was running.

To manipulate a group of cells then highlight the cells using the mouse and use copy/paste/manipulate from the edit menu.

A 3D Graph is always on screen This shows a "3D" wire frame graph of the map to allow ready visualisation of any "holes" in the map and other irregularities. Any point can be dragged with a mouse.



To send the changes to the ECU press F4 or click on the close cross and a confirmation message will be issued.

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8.2 Main Fuel Map


Fuel Map Edit ms

MAP kPa -> RPM	20	30	40	50	60	80	100	120	140	160	180	190	200	220
600	0.61	1.33	1.92	2.48	3.54	4.66	6.32	8.02	9.65	11.33	12.55	13.05	13.53	14.38
800	0.61	1.33	1.92	2.48	3.54	4.66	6.32	8.02	9.65	11.33	12.55	13.05	13.53	14.38
1000	0.61	1.33	1.92	2.48	3.54	4.66	6.32	8.02	9.65	11.33	12.55	13.05	13.53	14.38
1250	0.61	1.33	1.92	2.48	3.33	4.71	6.32	8.20	9.84	11.54	12.78	13.28	13.78	14.39
1500	0.61	1.33	1.92	2.48	3.43	4.55	6.26	8.20	9.84	11.54	12.78	13.28	13.78	14.70
1750	0.57	1.33	1.92	2.53	3.43	4.38	6.06	8.34	10.05	11.78	13.13	13.79	14.34	15.15
2000	0.57	1.33	1.92	2.53	3.32	4.44	6.18	8.34	10.05	11.78	13.57	14.11	14.63	15.58
2250	0.57	1.33	1.92	2.53	3.32	4.85	6.28	8.50	10.25	12.01	13.85	14.37	14.90	15.93
2500	0.61	1.35	1.93	2.58	3.32	5.00	6.51	8.33	10.40	12.27	14.10	14.66	15.21	16.25
2750	0.61	1.35	1.95	2.59	3.32	5.20	6.41	8.27	10.56	12.45	14.23	14.77	15.29	16.30
3000	0.61	1.37	1.94	2.59	3.59	5.31	6.72	8.48	10.86	12.63	14.41	14.98	15.53	16.55
3500	0.61	1.37	1.94	2.63	3.47	5.17	6.99	8.59	11.03	12.68	14.54	14.97	15.76	16.82
4000	0.61	1.37	1.94	2.59	3.44	5.23	7.17	8.89	11.27	12.96	14.65	15.30	16.16	17.02
4500	0.61	1.37	1.96	2.61	3.54	5.27	7.46	9.47	11.64	13.32	15.60	16.41	17.07	18.03
5000	0.61	1.40	2.01	2.69	3.57	5.35	7.47	9.95	12.16	14.00	16.61	17.17	17.57	18.69
5500	0.61	1.40	2.02	2.70	3.59	5.50	7.69	10.40	12.90	14.84	17.17	17.42	17.93	18.78
6000	0.61	1.40	2.04	2.75	3.62	5.64	7.96	10.64	13.26	15.18	17.17	17.68	18.18	18.78
6500	0.61	1.40	2.06	2.77	3.71	5.68	8.02	10.83	13.30	15.35	17.17	17.68	18.18	18.78
7000	0.61	1.42	2.09	2.81	3.88	5.78	8.16	11.03	13.47	15.53	17.17	17.68	18.18	18.78
7500	0.61	1.42	2.10	2.84	3.88	5.84	8.25	11.12	13.64	15.59	17.17	17.68	18.18	18.78

Graph

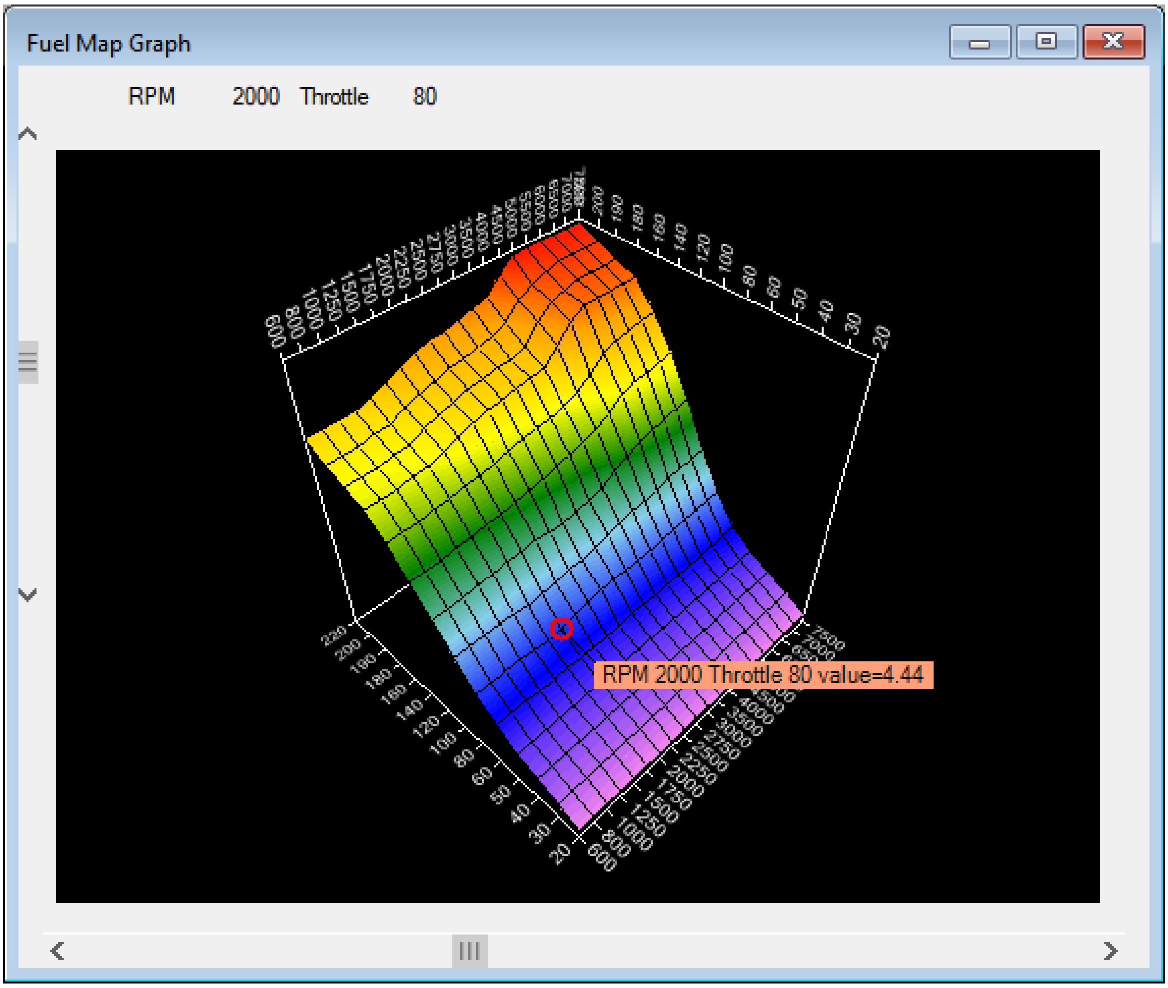
Current Map

Fuel map settings in BLUE as the time any injector will remain open and flowing fuel, in milliseconds (0.001 sec). The injectors fire once every TWO revs i.e. once every engine cycle unless in two stroke mode.

If any of the cells are highlighted in green this indicates that the value of this cell has been set in Real Time Mapping whilst the engine was running.

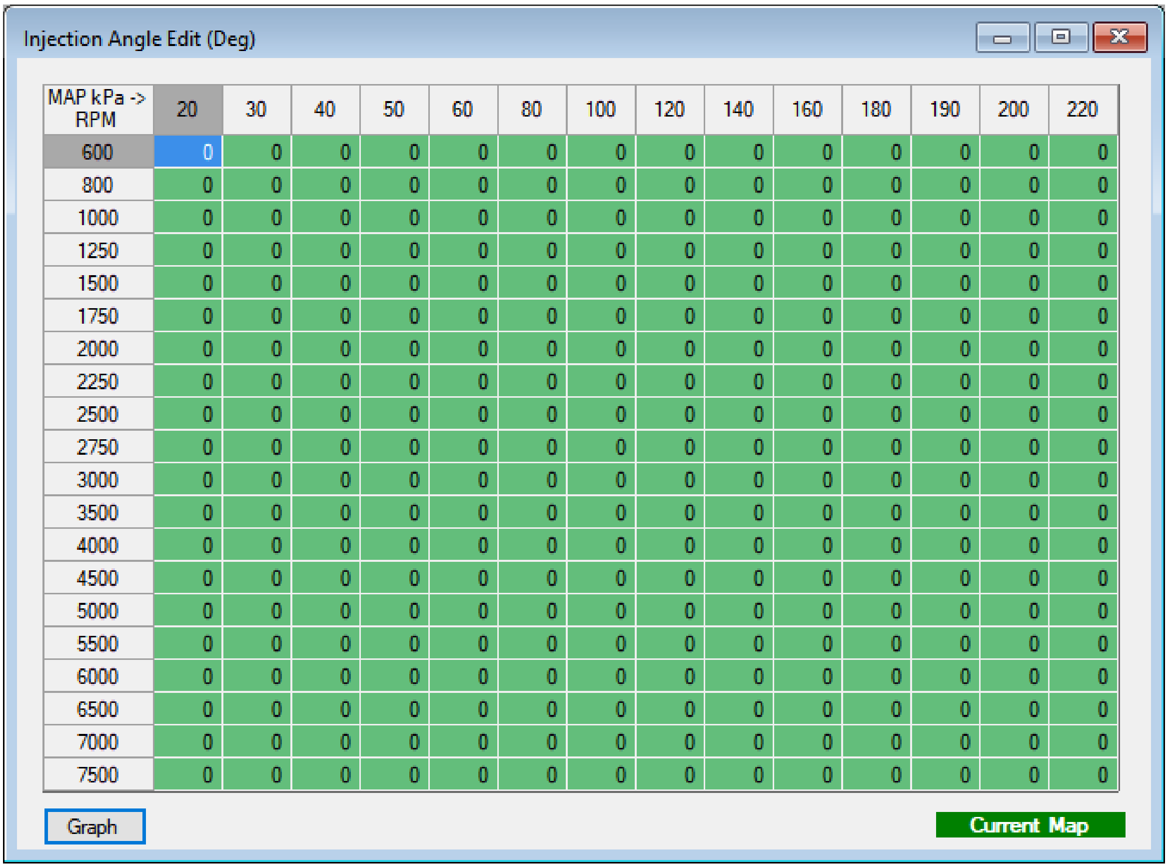
To manipulate a group of cells then highlight the cells using the mouse and use copy/paste/manipulate from the edit menu.

A 3D Graph is always on screen This shows a "3D" wire frame graph of the map to allow ready visualization of any "holes" in the map and other irregularities. Any point can be dragged with a mouse.



To send the changes to the ECU press F4 or click on the close cross and a confirmation message will be issued.

8.3 Injector Angle Map



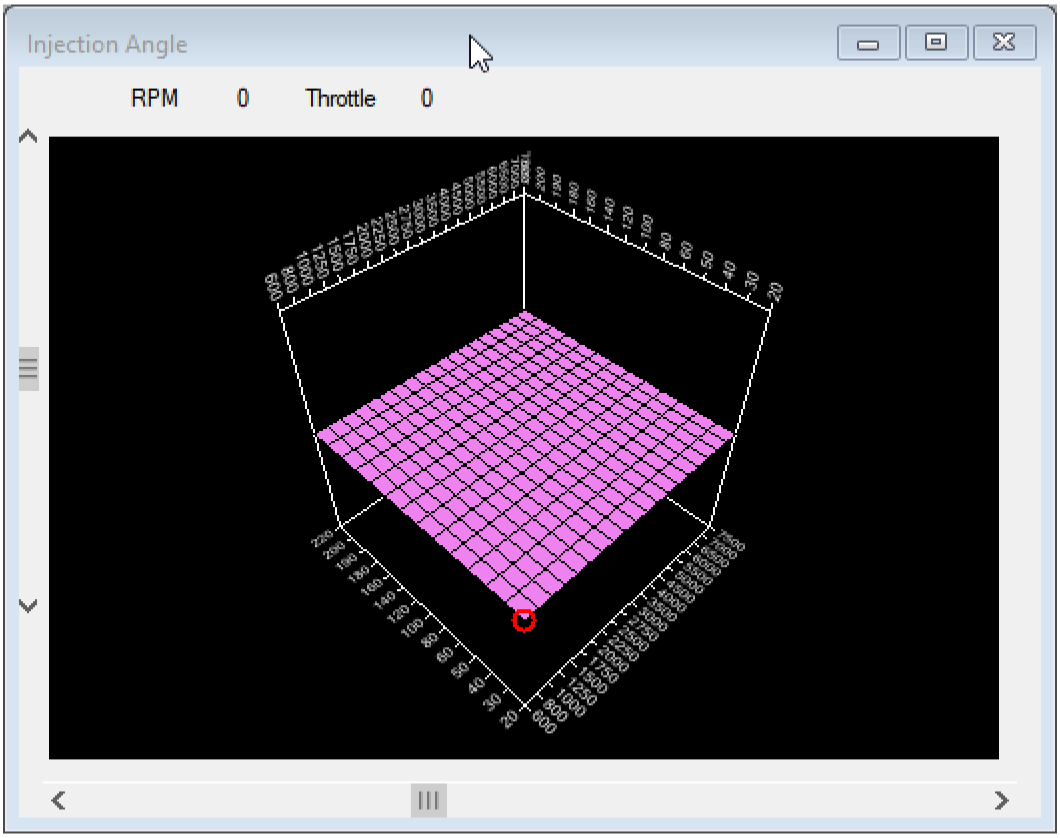
MAP kPa -> RPM	20	30	40	50	60	80	100	120	140	160	180	190	200	220
600	0	0	0	0	0	0	0	0	0	0	0	0	0	0
800	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1250	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1500	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1750	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2250	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2500	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2750	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3500	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4500	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5500	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6500	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7500	0	0	0	0	0	0	0	0	0	0	0	0	0	0

The injector angle is the point referenced to Top Dead Centre Firing Stroke when the injection starts or stops. Whether this angle affects the beginning or end of injection is defined *Engine Configuration / Sequential Injection and Fan Control.* As a matter of explanation if the definition is set to end of injection and -90 is entered in this table then the injection pulse will finish 90 degrees BEFORE top dead centre.

Some engine builders think this is a very important number, others think it is of no importance.

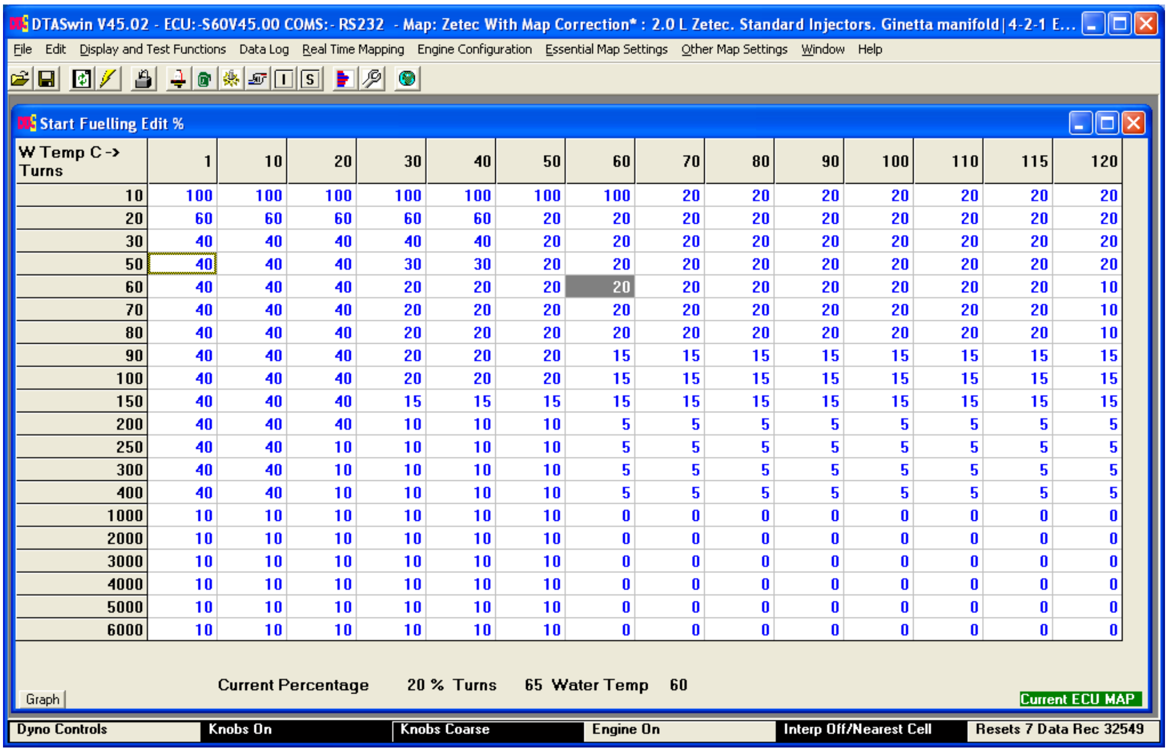
To manipulate a group of cells then highlight the cells using the mouse and use copy/paste/manipulate from the edit menu.

A 3D Graph is always on screen This shows a "3D" wire frame graph of the map to allow ready visualisation of any "holes" in the map and other irregularities. Any point can be dragged with a mouse.



To send the changes to the ECU press F4 or click on the close cross and a confirmation message will be issued.

8.4 Engine Start Fuelling



W Temp C -> Turns	1	10	20	30	40	50	60	70	80	90	100	110	115	120
10	100	100	100	100	100	100	100	20	20	20	20	20	20	20
20	60	60	60	60	60	20	20	20	20	20	20	20	20	20
30	40	40	40	40	40	20	20	20	20	20	20	20	20	20
50	40	40	40	30	30	20	20	20	20	20	20	20	20	20
60	40	40	40	20	20	20	20	20	20	20	20	20	20	10
70	40	40	40	20	20	20	20	20	20	20	20	20	20	10
80	40	40	40	20	20	20	20	20	20	20	20	20	20	10
90	40	40	40	20	20	20	15	15	15	15	15	15	15	15
100	40	40	40	20	20	20	15	15	15	15	15	15	15	15
150	40	40	40	15	15	15	15	15	15	15	15	15	15	15
200	40	40	40	10	10	10	5	5	5	5	5	5	5	5
250	40	40	10	10	10	10	5	5	5	5	5	5	5	5
300	40	40	10	10	10	10	5	5	5	5	5	5	5	5
400	40	40	10	10	10	10	5	5	5	5	5	5	5	5
1000	10	10	10	10	10	10	0	0	0	0	0	0	0	0
2000	10	10	10	10	10	10	0	0	0	0	0	0	0	0
3000	10	10	10	10	10	10	0	0	0	0	0	0	0	0
4000	10	10	10	10	10	10	0	0	0	0	0	0	0	0
5000	10	10	10	10	10	10	0	0	0	0	0	0	0	0
6000	10	10	10	10	10	10	0	0	0	0	0	0	0	0

This adds fuel on engine start whilst the walls of the throttle bodies and manifolds need to build up a puddle of fuel. It is added as a % of the main map. Above is a set of figures that has worked very well on one of our test engines. Note that this map can extend out to 10,000 engine turns. At a standard 1000 RPM idle speed then this lasts for 10 minutes. We find that whatever the starting temperature of the engine 10 minutes is the maximum an engine will need additional fuelling.

The current percentage, turns and water temp are shown across the bottom of the map.

The fuel is added until either the number of turns specified is exhausted or a 0 is found in the map.

On completion press F4 to save the data.

8.4.1 Start Fuelling Map

Start Fueling Edit %

W Temp C -> Turns	1	10	20	30	40	50	60	70	80	90	100	110	115	120
100	70	65	60	55	45	35	30	26	22	20	20	20	20	20
150	50	45	41	37	35	31	28	22	18	18	18	18	18	18
200	40	35	31	29	27	24	21	18	16	16	16	16	16	16
220	35	30	28	26	25	22	19	17	14	14	14	14	14	14
240	30	26	26	24	22	20	18	15	13	13	13	13	13	13
260	25	23	23	21	20	18	16	14	11	11	11	11	11	11
280	21	21	21	19	18	16	14	12	10	10	10	10	10	10
305	18	18	18	17	16	14	12	11	9	9	9	9	9	9
354	15	15	15	14	13	12	10	9	7	7	7	7	7	7
403	13	13	13	12	11	10	8	7	6	6	6	6	6	6
453	10	10	10	9	9	8	7	6	4	4	4	4	4	4
502	7	7	7	7	7	6	5	3	3	3	3	3	3	3
551	5	5	5	4	4	4	3	3	3	3	3	3	3	3
600	3	3	3	3	3	3	3	2	2	2	2	2	2	2
1000	3	3	3	3	3	3	3	2	2	2	2	2	2	2
2000	3	3	3	3	3	3	3	1	1	1	1	1	1	1
3000	2	2	2	2	2	2	2	1	1	1	1	1	1	1
4000	2	2	2	2	2	2	2	1	1	1	1	1	1	1
5000	1	1	1	1	1	1	1	0	0	0	0	0	0	0
10000	1	1	1	1	1	1	1	0	0	0	0	0	0	0

Graph Current Percentage : 0 Turns : 0 Water Temp : 0 Current Map

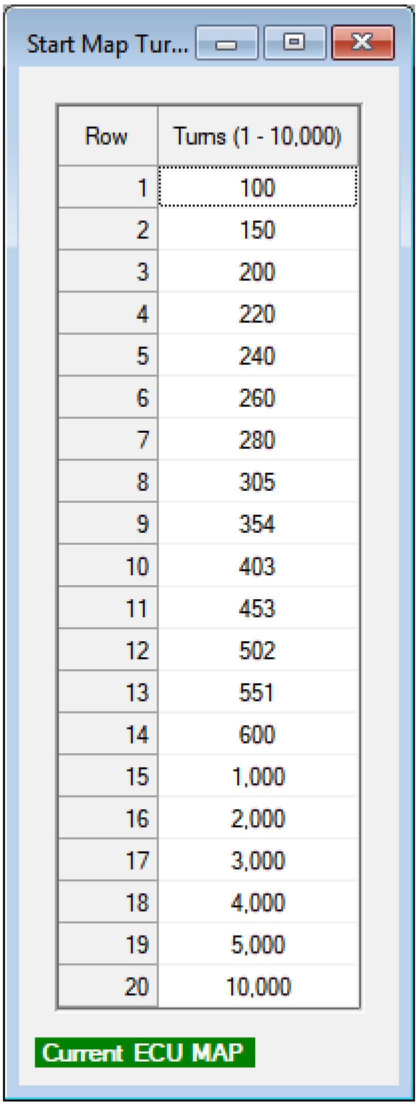
8.4.2 Start Map Turns

Start Map Te...

Column	Temperatures
1	1
2	10
3	20
4	30
5	40
6	50
7	60
8	70
9	80
10	90
11	100
12	110
13	115
14	120

Current ECU MAP

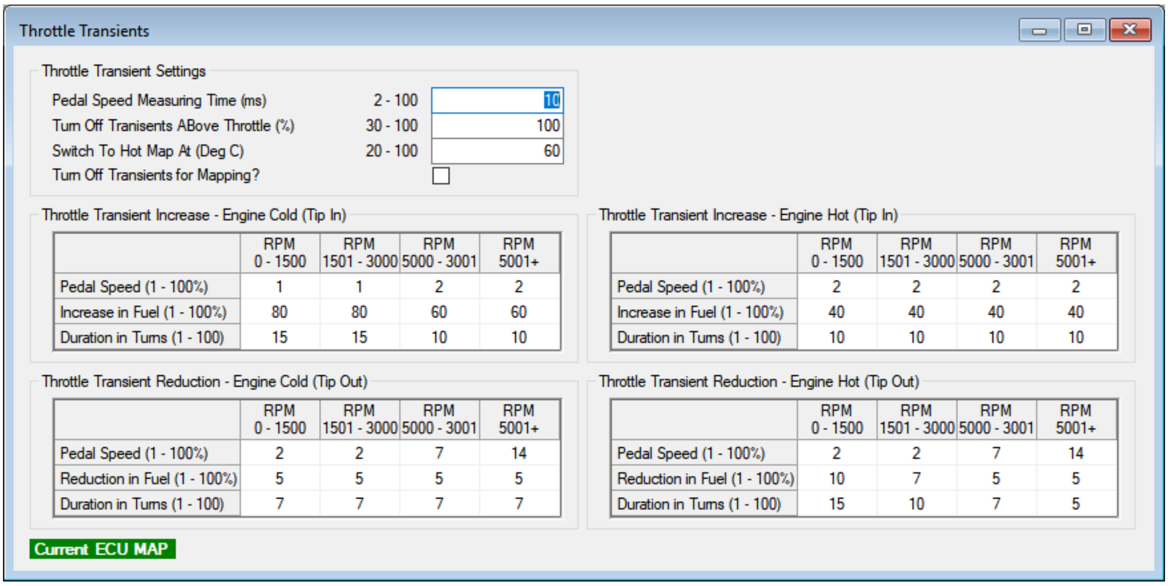
8.4.3 Start Map Temps



Row	Turns (1 - 10,000)
1	100
2	150
3	200
4	220
5	240
6	260
7	280
8	305
9	354
10	403
11	453
12	502
13	551
14	600
15	1,000
16	2,000
17	3,000
18	4,000
19	5,000
20	10,000

8.5 Throttle Transients

Separate maps are provided for hot and cold engine conditions.



As on a carburettor, this gives a shot of fuel for a limited time as the throttle is opened quickly. Very difficult to quantify, often varying between individual engines even of the same type and capacity. Normally needed if there is any hesitation or uncertainty when opening the throttle quickly. Only experiment will yield the best results. If you have a very fast wide band sensor you can set the data log to fast mode and record the % increase or reduction as it is happening. Stop the engine and graph the throttle position, lambda and pump %. The object is to keep the lambda value as close to constant as possible through the throttle transient. The engine without an uplift will tend to go lean.

A similar effect occurs on throttle reductions the engine will go rich for a short time without some transient reduction.

The effect on closing the throttle completely on the overrun makes for lambda readings which indicate the engine is very lean. This is not the case and it should be ignored.

There are four different rpm bands to which it can be applied. Generally, you will need a higher percentage of fuel uplift for a longer time at lower pedal speeds in the lower rpm bands and probably nothing at all in the higher bands.

The pedal speed row is the percentage of throttle movement recorded during the Pedal Speed Measuring time. If in doubt start at 5 for the lower bands increasing to 25/30 in the higher bands.

A very low figure will cause the throttle pump to work even with very slow movements of the pedal and values above 50 will mean it will probably never come into operation at all depending on the pedal speed measuring time. Again careful use of fast logging will help to identify the engine requirements.

The current percentage change being generated by the transients can be seen in real time mapping screen to the right of the throttle percentage in the senor box. Note also that this position is used for start fuelling as well and this takes priority.

SWITCH TO HOT MAP AT

Generally, an engine will need more transient fuelling when cold. We would normally switch maps at say 50C.

PEDAL SPEED MEASURING INTERVAL

This is the time in ms over which the pedal movement is measured. 10 – 20 ms is a reasonable figure.

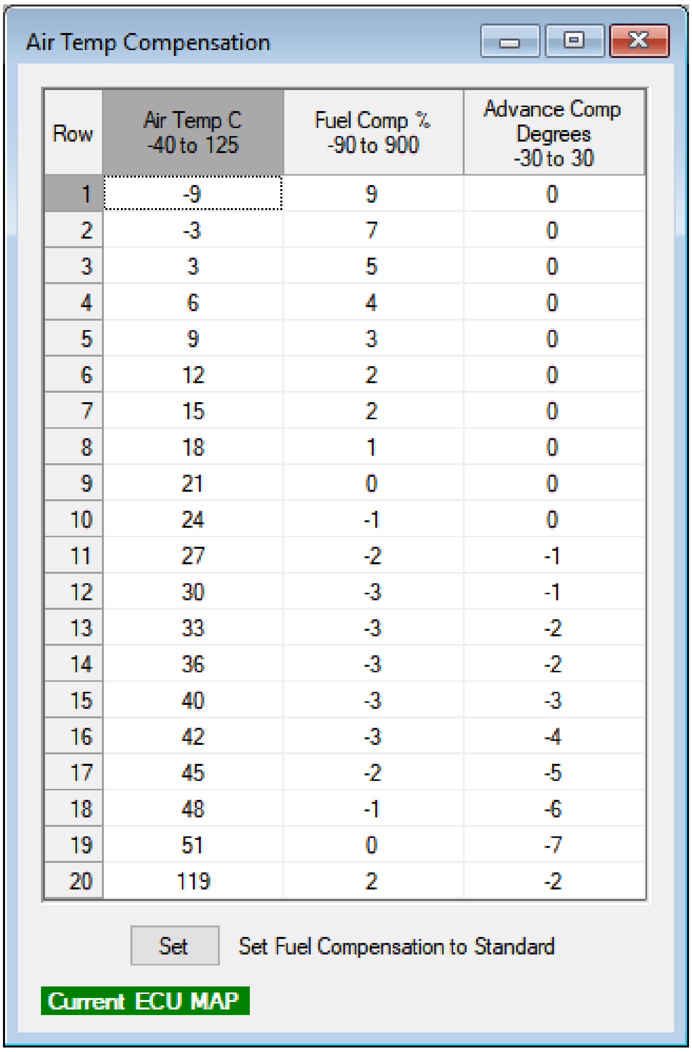
TURN OFF TRANSIENTS FOR MAPPING

Transients can interfere with mapping steady state. This allows transients to be turned off for this purpose. Remember to turn them back on after steady state mapping is finished.

Press F4 to save the changes.

8.6 Air Temperature Compensation

There is only one set of correct fuel compensation figures for this shown below.



Row	Air Temp C -40 to 125	Fuel Comp % -90 to 900	Advance Comp Degrees -30 to 30
1	-9	9	0
2	-3	7	0
3	3	5	0
4	6	4	0
5	9	3	0
6	12	2	0
7	15	2	0
8	18	1	0
9	21	0	0
10	24	-1	0
11	27	-2	-1
12	30	-3	-1
13	33	-3	-2
14	36	-3	-2
15	40	-3	-3
16	42	-3	-4
17	45	-2	-5
18	48	-1	-6
19	51	0	-7
20	119	2	-2

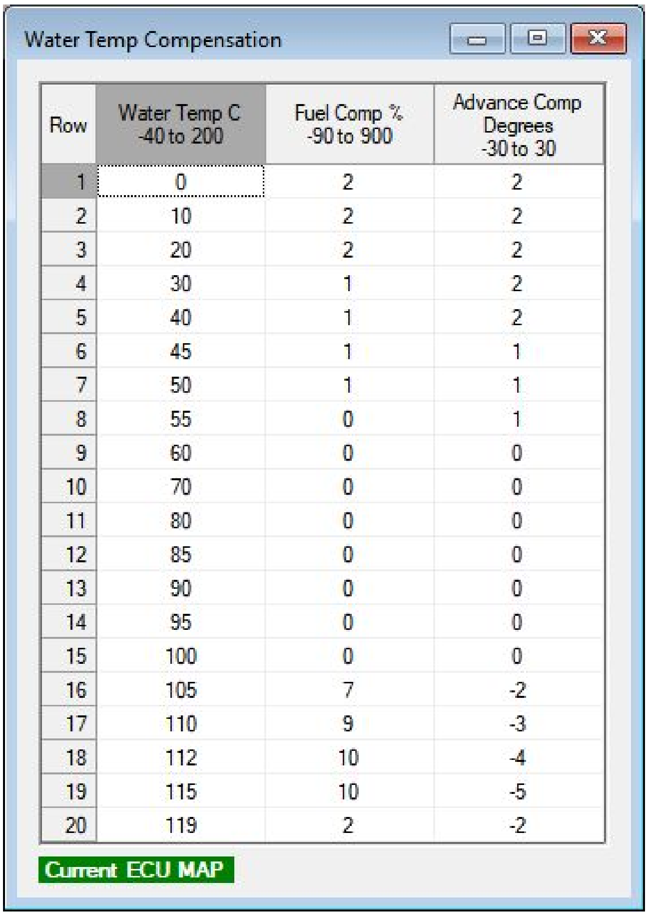
This section sets the correction to the basic map settings depending on the inlet air temperature. As an example you may wish to reduce the amount of fuel and retard the ignition slightly (say 10%) at high inlet temperatures.

All three columns are user settable. Move the cursor to the cell concerned and change the relevant figures. Note if you are intending to implement air temperature compensation this must be done before mapping.

The “Set to Standard” button will set the fuel compensation for using a knowledge of basic science. There are no other correct figures.

Press F4 to save the figures.

8.7 Water Temperature Compensation


Water Temp Compensation

Row	Water Temp C -40 to 200	Fuel Comp % -90 to 900	Advance Comp Degrees -30 to 30
1	0	2	2
2	10	2	2
3	20	2	2
4	30	1	2
5	40	1	2
6	45	1	1
7	50	1	1
8	55	0	1
9	60	0	0
10	70	0	0
11	80	0	0
12	85	0	0
13	90	0	0
14	95	0	0
15	100	0	0
16	105	7	-2
17	110	9	-3
18	112	10	-4
19	115	10	-5
20	119	2	-2

Current ECU MAP

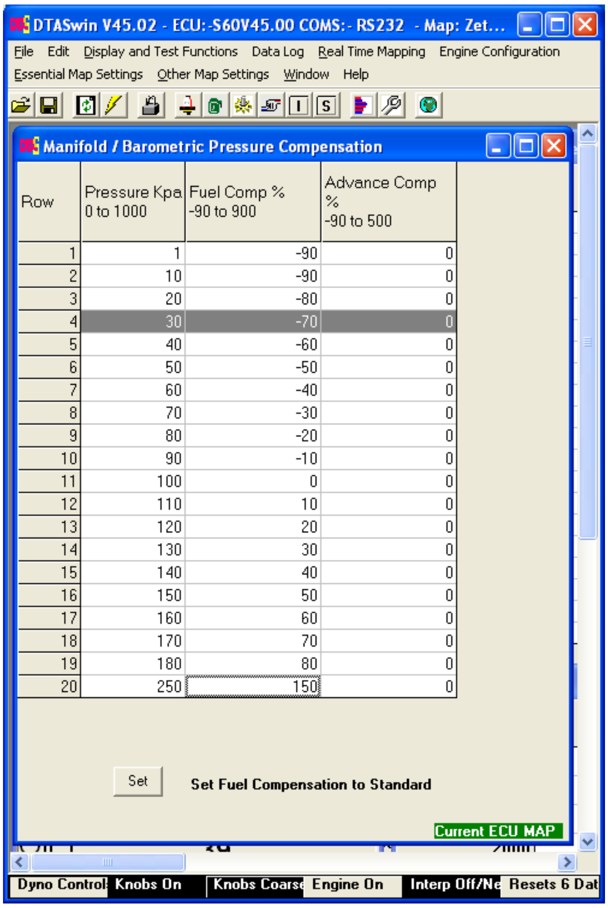
This section corrects the basic map settings depending on the engine water temperature. This provides the equivalent effect of a choke. As a general guide try gradually increasing the fuel increase percentage below 40 deg. C by about 20%. If the engine does not run cleanly on start up then either give it more or less fuel as required.

At DTA we no longer use this brute force approach to start fuelling and prefer to use the temperature and turns (effectively time) approach via the Start Fuelling Map. This if done correctly will reduce to the total amount of extra fuelling required especially when the engine starts from very low temperatures.

All three columns are user settable. Move the cursor to the cell of interest and change the relevant figures.

Press F4 to save the figures or ESCAPE to exit without saving.

8.8 Manifold Pressure Compensations



Row	Pressure Kpa 0 to 1000	Fuel Comp % -90 to 900	Advance Comp % -90 to 500
1	1	-90	0
2	10	-90	0
3	20	-80	0
4	30	-70	0
5	40	-60	0
6	50	-50	0
7	60	-40	0
8	70	-30	0
9	80	-20	0
10	90	-10	0
11	100	0	0
12	110	10	0
13	120	20	0
14	130	30	0
15	140	40	0
16	150	50	0
17	160	60	0
18	170	70	0
19	180	80	0
20	250	150	0

This section corrects the basic map settings for the engine inlet pressure or barometric pressure depending on where the sensor is fitted. If a barometric sensor is fitted then normally the fuel would be reduced at low pressures (to keep the mixture strength the same).

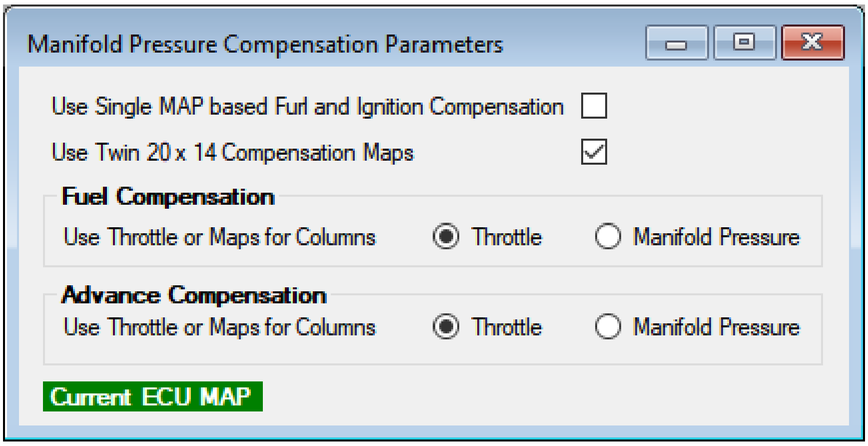
If the engine is a forced induction (or "blown") then it would be normal to make the main map reflect the "on boost" requirement and use the compensation map to accommodate the off boost situation.

All three columns are user settable. Move the cursor to the cell of interest and change the relevant figures.

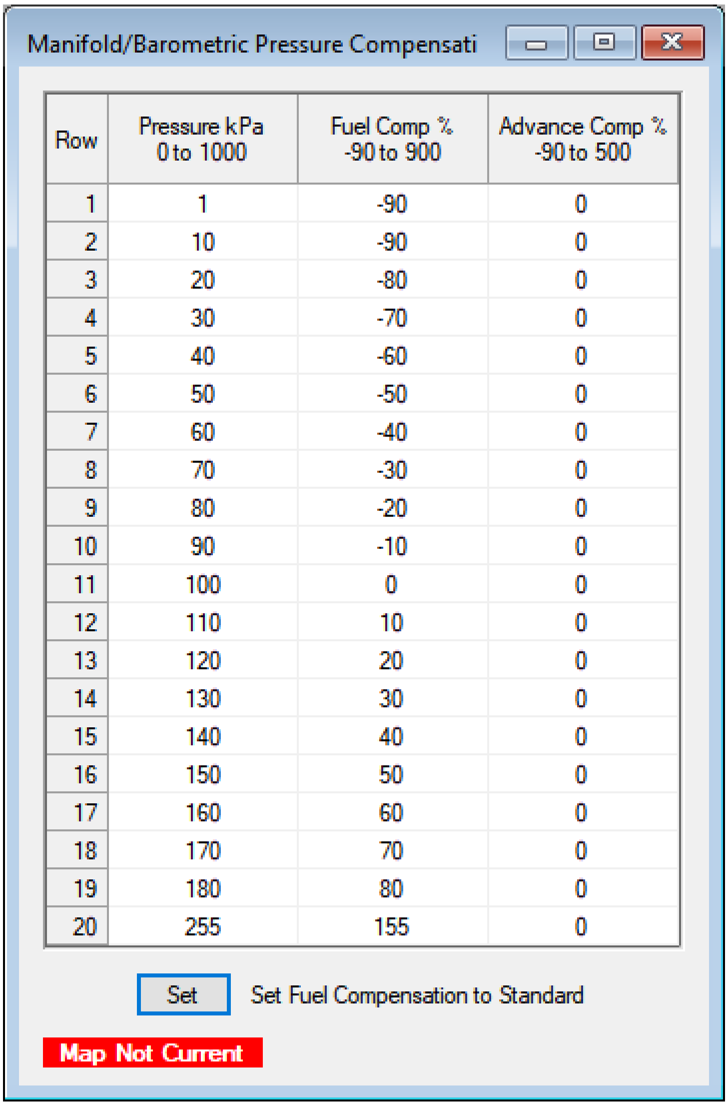
NB The above shows a sample set of figures for automatic correction of fuelling for air inlet pressure. Only use these figures if a pressure sensor is fitted if it is not set all fuel corrections to zero. If using MAP correction, set this before mapping. If using MAP as load then compensation is not required.

The button Set to Standard will fill out the fuel compensation to the correct amount. This is 16th Century physics not black magic, use other figures at your peril.

8.8.1 Manifold Pressure Compensation Parameters



8.8.2 Manifold Pressure/Baro Compensations



Row	Pressure kPa 0 to 1000	Fuel Comp % -90 to 900	Advance Comp % -90 to 500
1	1	-90	0
2	10	-90	0
3	20	-80	0
4	30	-70	0
5	40	-60	0
6	50	-50	0
7	60	-40	0
8	70	-30	0
9	80	-20	0
10	90	-10	0
11	100	0	0
12	110	10	0
13	120	20	0
14	130	30	0
15	140	40	0
16	150	50	0
17	160	60	0
18	170	70	0
19	180	80	0
20	255	155	0

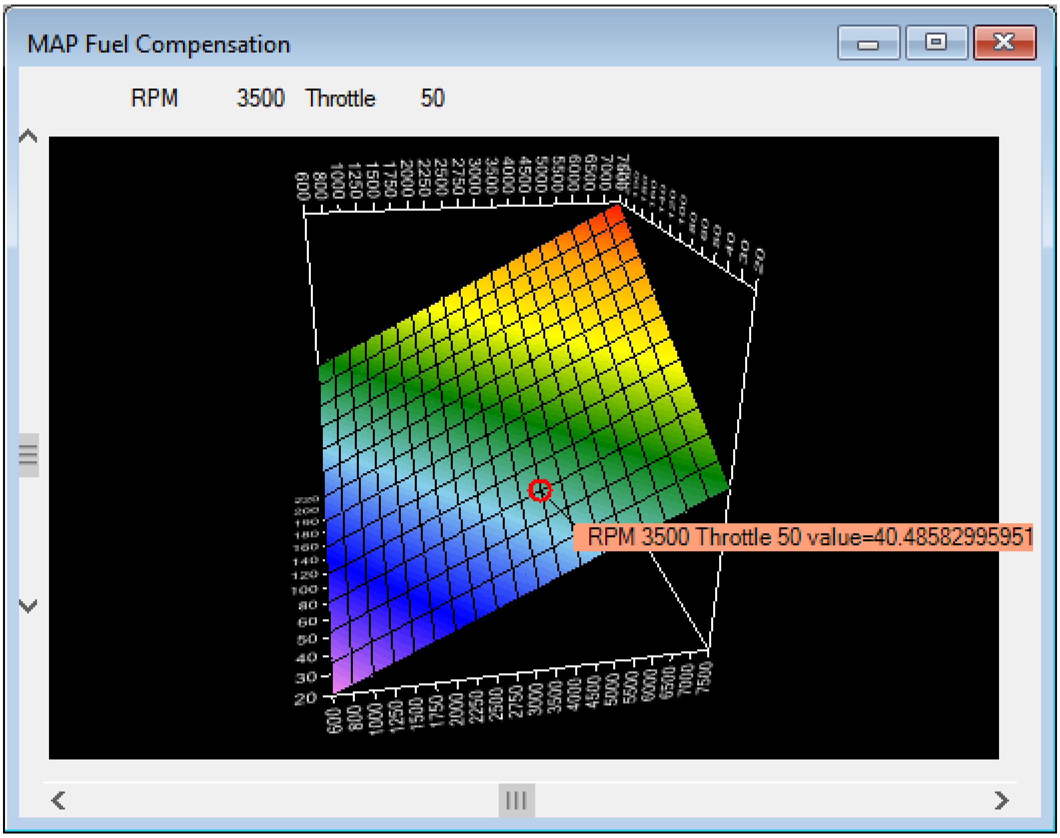
8.8.3 Manifold Pressure Fuel Compensations

Manifold Pressure Fuel Compensation (%)*

Throttle % -> RPM	0	10	20	30	40	50	60	70	75	80	85	90	95	100
600	0	4	8	12	15	19	23	27	31	35	38	42	46	50
800	3	6	10	14	18	22	26	30	33	37	41	45	49	53
1000	5	9	13	17	21	24	28	32	36	40	44	48	51	55
1250	8	12	16	19	23	27	31	35	39	43	46	50	54	58
1500	11	14	18	22	26	30	34	37	41	45	49	53	57	61
1750	13	17	21	25	29	32	36	40	44	48	52	55	59	63
2000	16	20	23	27	31	35	39	43	47	50	54	58	62	66
2250	18	22	26	30	34	38	41	45	49	53	57	61	65	68
2500	21	25	29	33	36	40	44	48	52	56	60	63	67	71
2750	24	28	31	35	39	43	47	51	54	58	62	66	70	74
3000	26	30	34	38	42	46	49	53	57	61	65	69	72	76
3500	29	33	37	40	44	48	52	56	60	64	67	71	75	79
4000	32	35	39	43	47	51	55	59	62	66	70	74	78	82
4500	34	38	42	46	50	53	57	61	65	69	73	77	80	84
5000	37	41	45	48	52	56	60	64	68	71	75	79	83	87
5500	39	43	47	51	55	59	63	66	70	74	78	82	86	89
6000	42	46	50	54	57	61	65	69	73	77	81	84	88	92
6500	45	49	52	56	60	64	68	72	76	79	83	87	91	95
7000	47	51	55	59	63	67	70	74	78	82	86	90	94	97
7500	50	54	58	62	65	69	73	77	81	85	88	92	96	100

Graph

Map Not Current



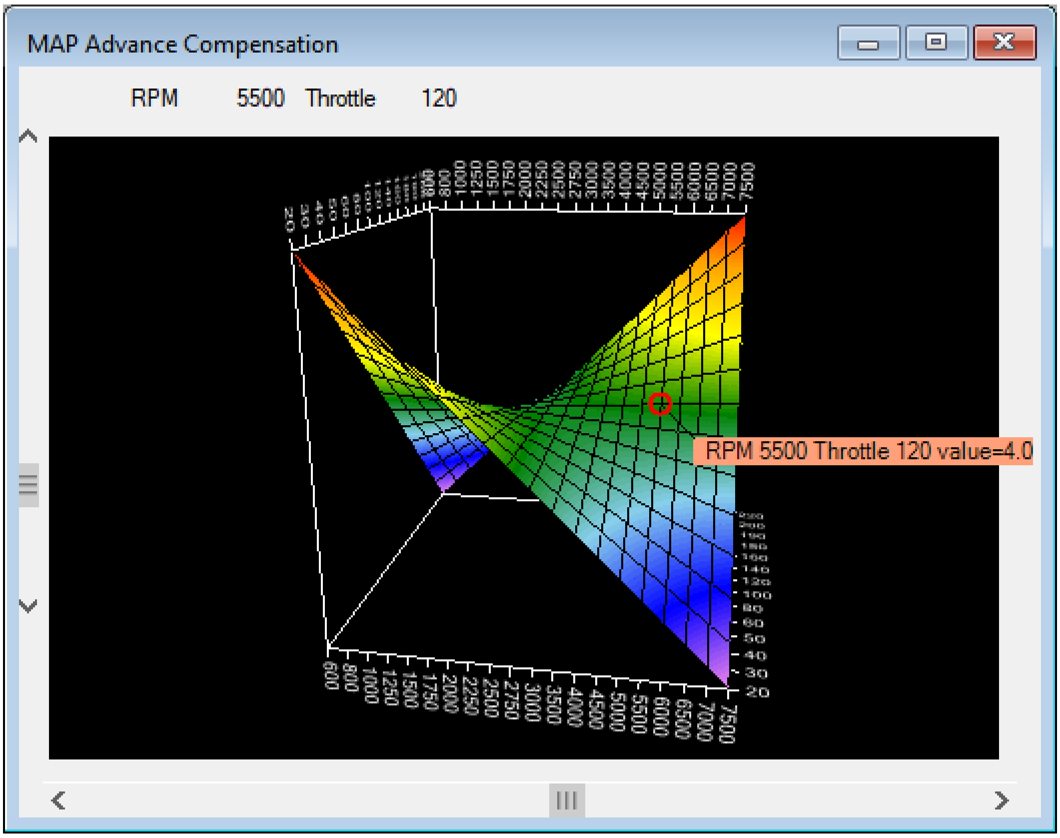
8.8.4 Manifold Pressure Advance Compensations

Manifold Pressure Advance Compensation (Degrees)*

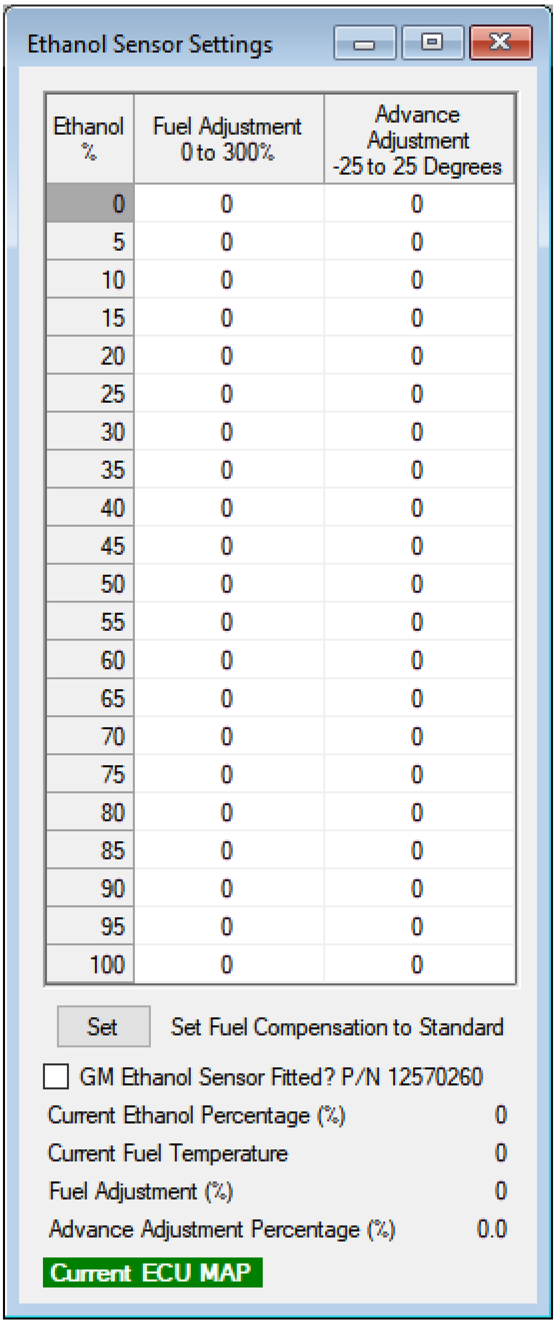
Throttle % -> RPM	0	10	20	30	40	50	60	70	75	80	85	90	95	100
600	90	76	62	48	35	21	7	-7	-21	-35	-48	-62	-76	-90
800	81	68	56	43	31	19	6	-6	-19	-31	-43	-56	-68	-81
1000	71	60	49	38	27	16	5	-5	-16	-27	-38	-49	-60	-71
1250	62	52	43	33	24	14	5	-5	-14	-24	-33	-43	-52	-62
1500	52	44	36	28	20	12	4	-4	-12	-20	-28	-36	-44	-52
1750	43	36	30	23	16	10	3	-3	-10	-16	-23	-30	-36	-43
2000	33	28	23	18	13	8	3	-3	-8	-13	-18	-23	-28	-33
2250	24	20	16	13	9	5	2	-2	-5	-9	-13	-16	-20	-24
2500	14	12	10	8	5	3	1	-1	-3	-5	-8	-10	-12	-14
2750	5	4	3	3	2	1	0	0	-1	-2	-3	-3	-4	-5
3000	-5	-4	-3	-3	-2	-1	0	0	1	2	3	3	4	5
3500	-14	-12	-10	-8	-5	-3	-1	1	3	5	8	10	12	14
4000	-24	-20	-16	-13	-9	-5	-2	2	5	9	13	16	20	24
4500	-33	-28	-23	-18	-13	-8	-3	3	8	13	18	23	28	33
5000	-43	-36	-30	-23	-16	-10	-3	3	10	16	23	30	36	43
5500	-52	-44	-36	-28	-20	-12	-4	4	12	20	28	36	44	52
6000	-62	-52	-43	-33	-24	-14	-5	5	14	24	33	43	52	62
6500	-71	-60	-49	-38	-27	-16	-5	5	16	27	38	49	60	71
7000	-81	-68	-56	-43	-31	-19	-6	6	19	31	43	56	68	81
7500	-90	-76	-62	-48	-35	-21	-7	7	21	35	48	62	76	90

Graph

Map Not Current



8.9 Ethanol Compensations



Ethanol %	Fuel Adjustment 0 to 300%	Advance Adjustment -25 to 25 Degrees
0	0	0
5	0	0
10	0	0
15	0	0
20	0	0
25	0	0
30	0	0
35	0	0
40	0	0
45	0	0
50	0	0
55	0	0
60	0	0
65	0	0
70	0	0
75	0	0
80	0	0
85	0	0
90	0	0
95	0	0
100	0	0

When running E85 fuel more liquid fuel is required to run the same lambda value, the stochiometric air/fuel ratio of Ethanol being approximately 8.9:1. The commercial source of this at the pump is E85, this nominally being an 85:15 mix of Ethanol and Petrol. This nominal mix varies depending on the time of year and the age of the fuel and whether the user has added neat Petrol to the tank at any point. Because of this a sensor must be fitted to measure the Ethanol content of the fuel being used. The S series is currently calibrated to use the GM sensor, part number 12570260.

Use of E85 is simple, fit the sensor, turn the system on by saying the senor is fitted and click on the “Set to Standard” button. The system will automatically add fuel as required.

It is self evident that larger injectors may be required if the vehicle was originally designed just to run Petrol.

8.10 Twin Injector Settings

These menu options are only available from firmware revision V50.00, before this revision see “General Engine Settings”

When using two injectors per cylinder various options are available. A straight switch between inner and outer injectors can be used as has always been the case, however, from firmware version 50 a blend between inner and outer injectors can be employed. Note that if either injector becomes open for 100% of the time any balance required will be transferred to the other injector.

8.10.1 Load All Twin Injector Settings

Enter topic text here.

8.10.2 Twin Injector Parameters

Twin Injector Parameters

1) Enrichment on First Switching

   When the second injector is used for the first time a percentage enrichment may be added to the demanded fuel pulse for a period defined by the Enrichment Duration parameter.

2) Enrichment Duration

   The number of engine rotations the above fuel enrichment is applied for.

3) Switch Above RPM and Above Throttle

   If not using the blend map these are the values that cause hopping from one injector to another.

4) Twin Injectors Fitted?

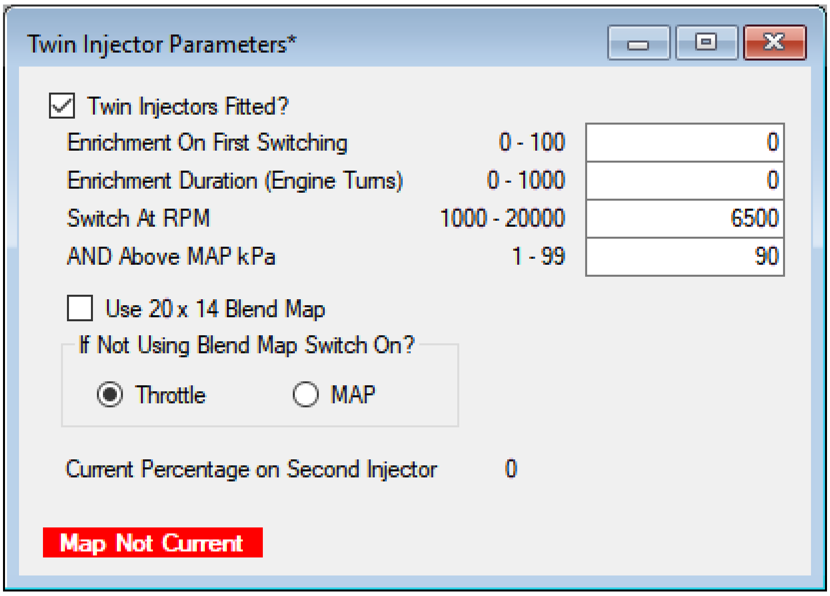
   Self explanatory, do NOT check this if you have only one injector per cylinder.

5) Use 20 x 14 Blend Map

   Checking this enables the use of the second injector blend map.

6) If Not Using Blend Map Switch On

   If just using a straight hop from one injector to the other and not using the blend map this radio button choices selects the load function as throttle or manifold pressure.



8.10.3 Second Injector Blend Map

Second Injector Blend Map

Allocates a percentage of the current fuel pulse to the second injector. 0% means all the fuel is from the first (usually inner) injector, 100% means that all the fuel is from the second, usually outer injector.

If this map contains the value of 30% and the current fuel pulse is 10ms then 7ms pulses are given to the first injector and 3ms pulses are given to the second injector. If ,however, there is only 6ms available for a fuel pulse (this occurs naturally at 20000 rpm in a four stroke engine) then 6ms will be given to the first injector and 4ms to the second.

Note that any active Injector Dead Time is added to both injector pulses.

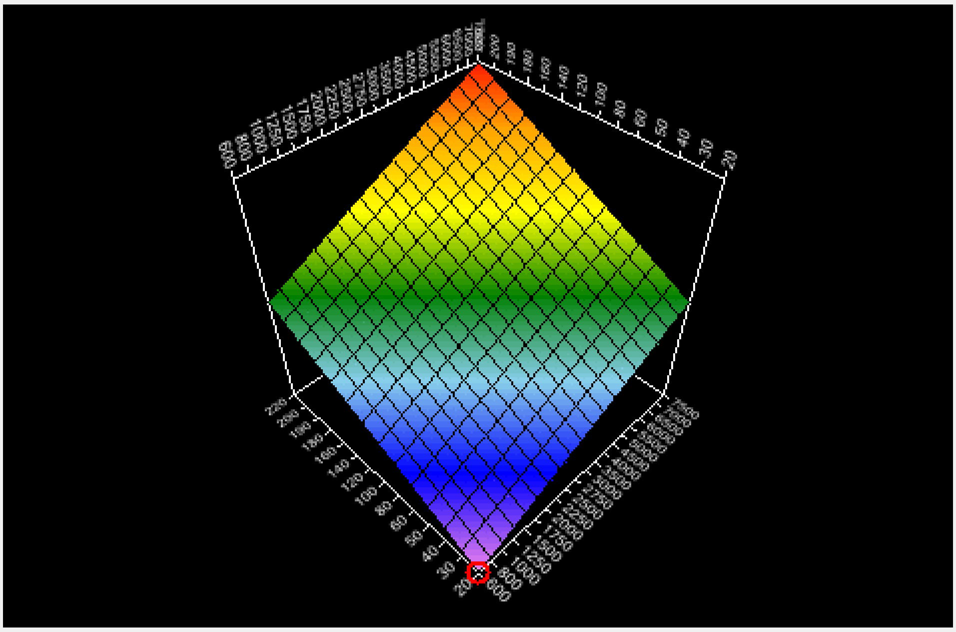
Second Injector Blend Edit %*

MAP kPa -> RPM	20	30	40	50	60	80	100	120	140	160	180	190	200	220
600	0	4	8	12	15	19	23	27	31	35	38	42	46	50
800	3	6	10	14	18	22	26	30	33	37	41	45	49	53
1000	5	9	13	17	21	24	28	32	36	40	44	48	51	55
1250	8	12	16	19	23	27	31	35	39	43	46	50	54	58
1500	11	14	18	22	26	30	34	37	41	45	49	53	57	61
1750	13	17	21	25	29	32	36	40	44	48	52	55	59	63
2000	16	20	23	27	31	35	39	43	47	50	54	58	62	66
2250	18	22	26	30	34	38	41	45	49	53	57	61	65	68
2500	21	25	29	33	36	40	44	48	52	56	60	63	67	71
2750	24	28	31	35	39	43	47	51	54	58	62	66	70	74
3000	26	30	34	38	42	46	49	53	57	61	65	69	72	76
3500	29	33	37	40	44	48	52	56	60	64	67	71	75	79
4000	32	35	39	43	47	51	55	59	62	66	70	74	78	82
4500	34	38	42	46	50	53	57	61	65	69	73	77	80	84
5000	37	41	45	48	52	56	60	64	68	71	75	79	83	87
5500	39	43	47	51	55	59	63	66	70	74	78	82	86	89
6000	42	46	50	54	57	61	65	69	73	77	81	84	88	92
6500	45	49	52	56	60	64	68	72	76	79	83	87	91	95
7000	47	51	55	59	63	67	70	74	78	82	86	90	94	97
7500	50	54	58	62	65	69	73	77	81	85	88	92	96	100

Graph | Current Second Injector Percentage : 0 | Map Not Current

Second Injector Blend

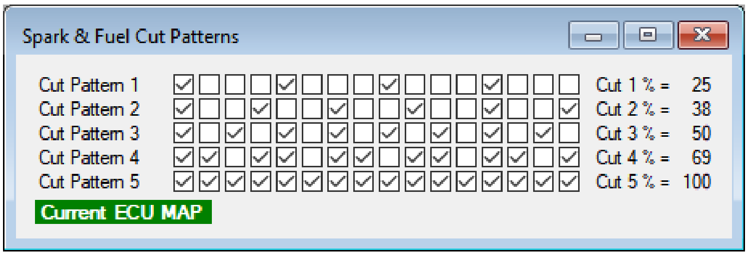
RPM 0 Throttle 0



8.11 Spark and Fuel Cut Patterns

Essential Map Settings/Spark & Fuel Cut Patterns

These are sets of 16 check mark tables to allow a flexible way of cutting a random pattern of spark or injection events. Note this may or may not happen at the same frequency depending on the configuration of the spark/fuel system i.e. injectors in two stroke mode and sparks in four.



If a check mark is present then that event is skipped. A complete set of check marks eliminates sparking or fuelling completely. The cut pattern is linked to RPM to act as an RPM limiter via *Engine Configuration/General Engine Settings Two*. The percentage of cut a set of check marks represents is calculated and displayed on screen.

Other Map Settings

9 Other Map Settings

Enter topic text here.

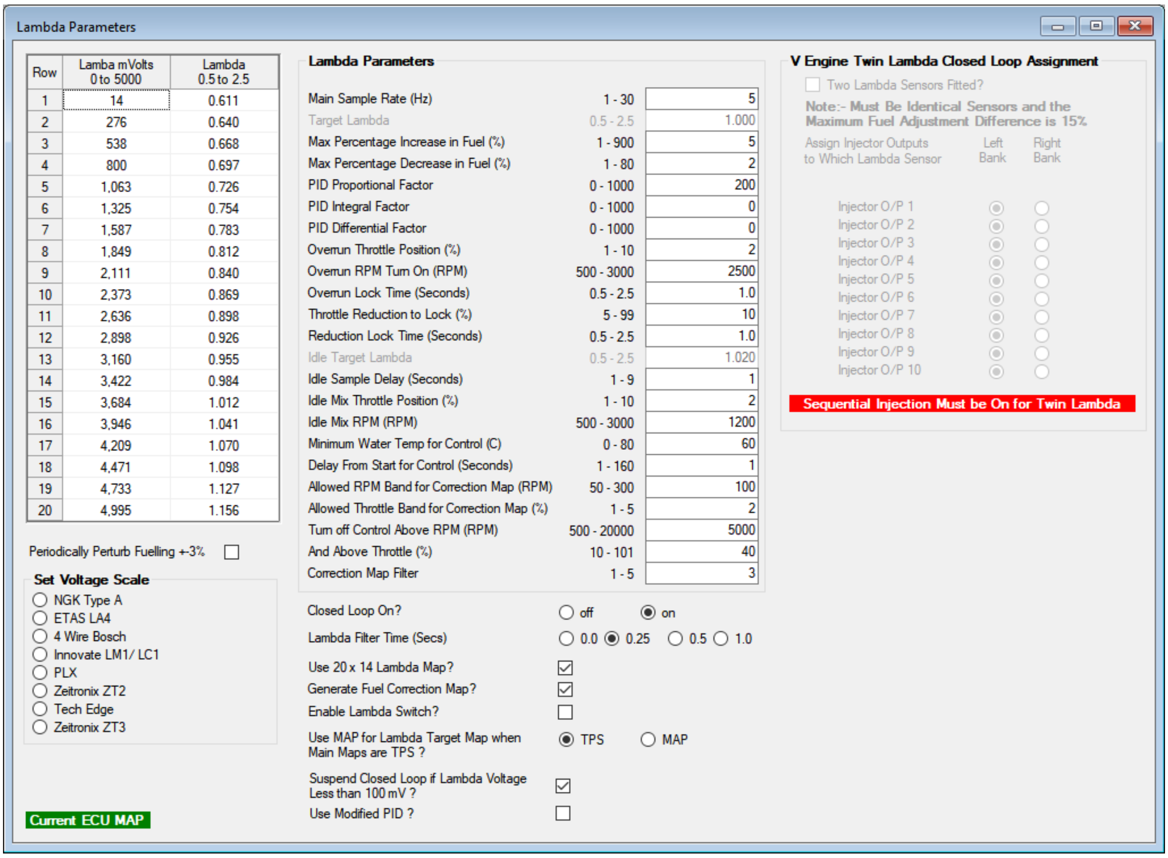
9.1 Lambda Functions

Enter topic text here.

9.1.1 Load All Lambda Parameters

Enter topic text here.

9.1.2 Lambda Parameters



This section is probably the most difficult for us to explain to you because most of the settings you need to adjust have nothing whatever to do with engines as such.

The settings vary greatly between a Lambda sensor and a wide band kit. Sample voltages for each unit can be set by buttons in the software. We advise that for serious work on the Dyno that better results are achieved using a DTA wideband sensor than a standard Lambda. These sensors are a much more linear device in the area of Lambda 0.7 to 2.0 i.e. the area where you will be running race engines for maximum power. Single cell Lambda sensors are essentially uncalibrated in this region and the results can vary greatly from one sensor to another. At the very least use a heated Lambda sensor for best results especially at low engine speeds and light throttle positions where the exhaust gas temperature can be very low.

LAMBDA VOLTS/LAMBDA VALUE TABLE

This is a set of 20 values which equate the voltage seen from the lambda sensor with the Lambda value this represents. Lamba is the normalised air fuel ratio and a value of Lambda = 1 is the stochiometric point (i.e. the fuel air mix has the optimum amount of oxygen to support complete combustion). On petrol/gasoline this equates to an air fuel ratio of about 14.7. The advantage of using Lambda as against a/f is that it is independent of the fuel used, that is Lambda 1 is Lambda 1 whether the fuel is for example petrol or methanol.

PERIODICALLY PERTURB FUELLING +/- 3%

This is a feature for use only on the Dyno.
Fueling will be adjusted up and down 10% with a two second period. Using fast logging this feature enables you to measure the response time of your engine/exhaust/Lambda sensor combination for accurate setting of the PID loop timings.

SET VOLTAGE SCALE

These check boxes will automatically full in the Lambda Volts/Lambda Value Table with known defaults.
The most common kit DTA provide is the Innovate Kit.
Note - checking one of these boxes will clear the values stored in the table. ensure you have a backup before making these changes.

LAMBDA PARAMETERS

MAIN SAMPLE RATE (Hz)

This is the frequency at which the sensor is checked to measure the air/fuel mixture when the engine is running hard. This is set at 1 times per second on the sample settings. This is fast enough to provide adequate setting speed on the dyno and is about as fast as a standard lambda sensor will respond. If when the closed loop is active the fuelling adjustment figure on the dyno display oscillates positive and negative wildly then set this figure lower. If the oscillation stops then you have a very slow sensor - buy a new one!

TARGET LAMBDA

This is the mixture at which the fueling will be adjusted to when the engine is running hard if not using the 20 x 14 target Lambda map.

MAXIMUM INCREASE IN FUEL

This is the limit on fuelling increase you wish to allow.

MAXIMUM REDUCTION IN FUEL

This is the limit on the fuelling reduction you wish to allow.

PID FACTORS

These three values alter the mathematics of the closed loop control. Only adjust the sample figures if you have problems. If the fuelling oscillates as described above and reducing the sample rate does not stop the oscillation then reduce the PID prop factor. If it still oscillates do it again. If the system still oscillates when the PID prop factor has been reduced to 100 then contact us for further advice.

OVER RUN SETTINGS

These settings control what happens when the engine goes into an overrun condition. You will have noticed from the visual lambda indication on your dyno that when the engine is on the over run it appears to be very lean until it reaches idle or the throttle is opened again. This is an apparent leanness only and the closed loop should be turned off when this happens or it will try to fuel the engine to remove the leanness which is incorrect.

The overrun throttle position should be set at about 2/3% above the throttle reading at idle. The overrun rpm turn on should be set say 200 rpm above the idle rpm and the overrun lock time to about 1 second. Now when the engine is in an overrun condition the control loop will be turned off until either the rpm has dropped to idle or the throttle is reopened. This lock condition will be displayed on the dyno mode screen display.

THROTTLE REDUCTION TO LOCK

When the throttle is quickly closed from a wide open condition (but not so much as to cause an engine over run) a similar condition happens to the overrun. This is very much engine dependent and might not happen at all. Leave the settings as per the sample settings and all should be well.

MINIMUM WATER TEMPERATURE FOR CONTROL

Below this water temperature closed loop will not engage

DELAY AFTER START

The system waits this length of time after every engine start before engaging closed loop.

ALLOWED RPM BAND FOR CORRECTION MAP

When the system is recording the corrections in the fuel correction table, this band is used to test whether the engine is in or close enough to a particular cell. If outside this band no corrections will be recorded.

ALLOWED THROTTLE BAND FOR CORRECTION

Same as the above put applied to throttle position

TURN OFF LAMBDA ABOVE RPM AND THROTTLE

Above this RPM AND Throttle the Lambda correction will be zeroed, effectively turning off the Lambda control and allowing the engine to run solely on the map. When the RPM or the Throttle % drops below this then the Lambda control is turned back on.

CORRECTION MAP FILTER

The proportion of the current Lambda adjustment that is added to the value stored in the correction map that is being built. This reduces sensitivity to spikes but means that several passes have to be made through any point to build the finished correction amount.

TURN ON CLOSED LOOP

This check box enables or disables lambda closed loop settings
This setting can be overridden in Real Time Mapping

LAMBDA FILTER TIME

This implements a filter between 0 and one second on the incoming Lambda voltage to smooth out short term transients and cylinder imbalances. Also helps with engines which have combustion instability at idle. Do not use if trying to look at the Lambda sensor using fast logging for transient work.

USE 20 X 14 LAMBDA MAP

Instead of the two values in this table for target lambda use the 20 x 14 target map.

GENERATE FUEL CORRECTION MAP

When running closed loop the system constantly generates a percentage correction figure to the base fuel map. When this feature is turned on the percentages generated are stored in a 20 x 14 table for updating the main fuel map when the engine is stopped.

ENABLE LAMBDA SWITCH

Allows the ALS/MAP2/Lambda switch to turn lambda control on and off.

USE MAP OR TPS FOR LAMBDA TARGET MAP

When running a turbo engine with TPS as load and manifold pressure corrections it may still be advantageous to run the lambda target as a function of manifold pressure. This option allows that. The main 20 x 14 lambda target map uses manifold pressure to determine the horizontal position in the map.

TURN OFF CLOSED LOOP BELOW 100 mV

Allows low voltage to be used to detect that the lambda has failed or not been switched on.

USE MODIFIED PID

Modifies the classic PID loop described at the end of this manual to give possibly a more stable control loop on some engines.

V ENGINE TWIN LAMBDA CLOSED LOOP ASSIGNMENT

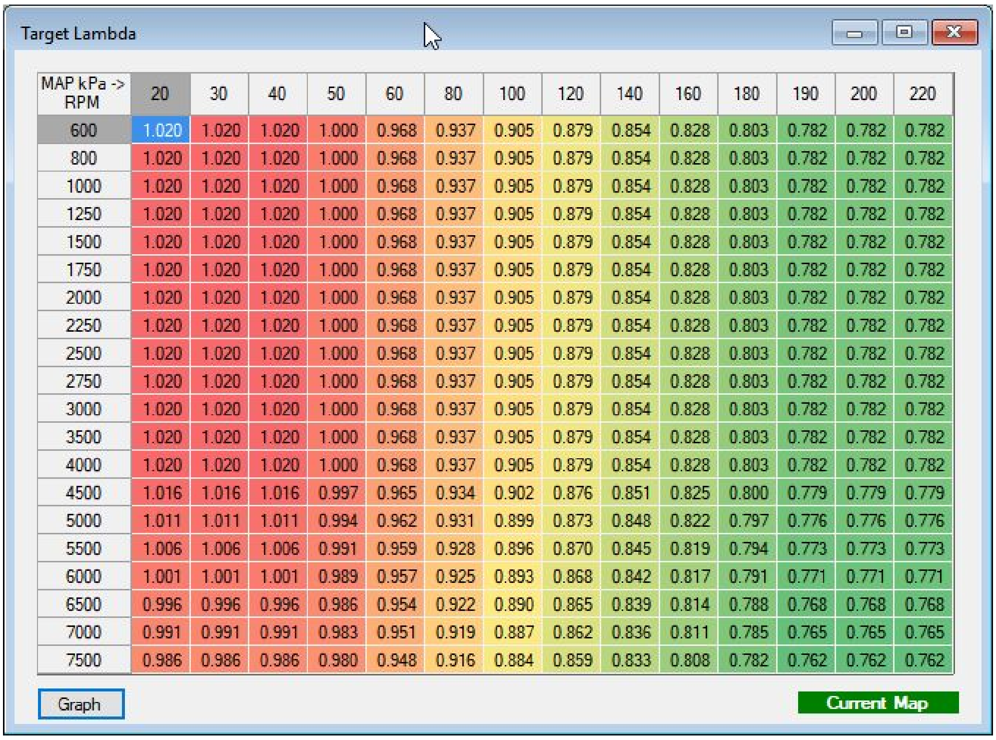
When check box is ticked the ECU will refer to two lambda sensor inputs.
Select which injector outputs are on each bank to allow to ECU to make adjustments to each side of the engine.

PID LOOPS

A brief explanation of how a PID loop works can be found towards the rear of this manual.

PLEASE NOTE THAT WHEN FIRST USING CLOSED LOOP CONTROL SET THE MAXIMUM AND MINIMUM FUELLING LIMITS LOW TO CHECK THAT THE SYSTEM IS WORKING CORRECTLY.

9.1.3 Lambda Target Map



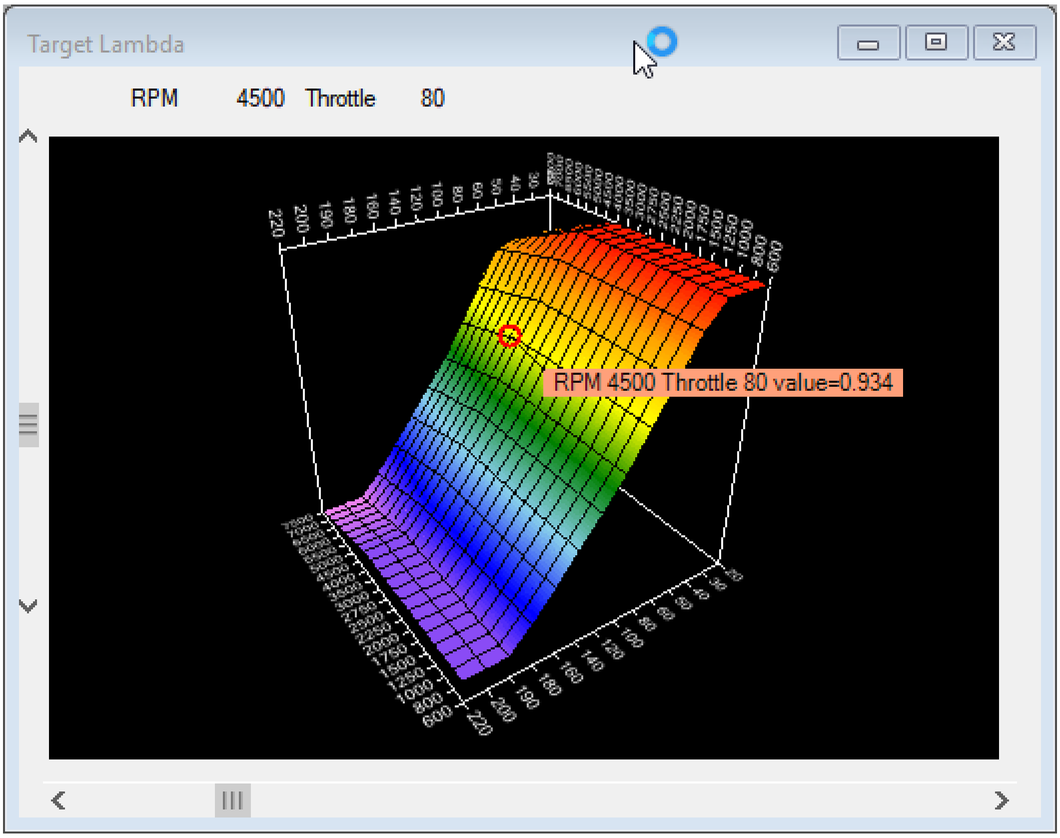
Target Lambda

MAP kPa -> RPM	20	30	40	50	60	80	100	120	140	160	180	190	200	220
600	1.020	1.020	1.020	1.000	0.968	0.937	0.905	0.879	0.854	0.828	0.803	0.782	0.782	0.782
800	1.020	1.020	1.020	1.000	0.968	0.937	0.905	0.879	0.854	0.828	0.803	0.782	0.782	0.782
1000	1.020	1.020	1.020	1.000	0.968	0.937	0.905	0.879	0.854	0.828	0.803	0.782	0.782	0.782
1250	1.020	1.020	1.020	1.000	0.968	0.937	0.905	0.879	0.854	0.828	0.803	0.782	0.782	0.782
1500	1.020	1.020	1.020	1.000	0.968	0.937	0.905	0.879	0.854	0.828	0.803	0.782	0.782	0.782
1750	1.020	1.020	1.020	1.000	0.968	0.937	0.905	0.879	0.854	0.828	0.803	0.782	0.782	0.782
2000	1.020	1.020	1.020	1.000	0.968	0.937	0.905	0.879	0.854	0.828	0.803	0.782	0.782	0.782
2250	1.020	1.020	1.020	1.000	0.968	0.937	0.905	0.879	0.854	0.828	0.803	0.782	0.782	0.782
2500	1.020	1.020	1.020	1.000	0.968	0.937	0.905	0.879	0.854	0.828	0.803	0.782	0.782	0.782
2750	1.020	1.020	1.020	1.000	0.968	0.937	0.905	0.879	0.854	0.828	0.803	0.782	0.782	0.782
3000	1.020	1.020	1.020	1.000	0.968	0.937	0.905	0.879	0.854	0.828	0.803	0.782	0.782	0.782
3500	1.020	1.020	1.020	1.000	0.968	0.937	0.905	0.879	0.854	0.828	0.803	0.782	0.782	0.782
4000	1.020	1.020	1.020	1.000	0.968	0.937	0.905	0.879	0.854	0.828	0.803	0.782	0.782	0.782
4500	1.016	1.016	1.016	0.997	0.965	0.934	0.902	0.876	0.851	0.825	0.800	0.779	0.779	0.779
5000	1.011	1.011	1.011	0.994	0.962	0.931	0.899	0.873	0.848	0.822	0.797	0.776	0.776	0.776
5500	1.006	1.006	1.006	0.991	0.959	0.928	0.896	0.870	0.845	0.819	0.794	0.773	0.773	0.773
6000	1.001	1.001	1.001	0.989	0.957	0.925	0.893	0.868	0.842	0.817	0.791	0.771	0.771	0.771
6500	0.996	0.996	0.996	0.986	0.954	0.922	0.890	0.865	0.839	0.814	0.788	0.768	0.768	0.768
7000	0.991	0.991	0.991	0.983	0.951	0.919	0.887	0.862	0.836	0.811	0.785	0.765	0.765	0.765
7500	0.986	0.986	0.986	0.980	0.948	0.916	0.884	0.859	0.833	0.808	0.782	0.762	0.762	0.762

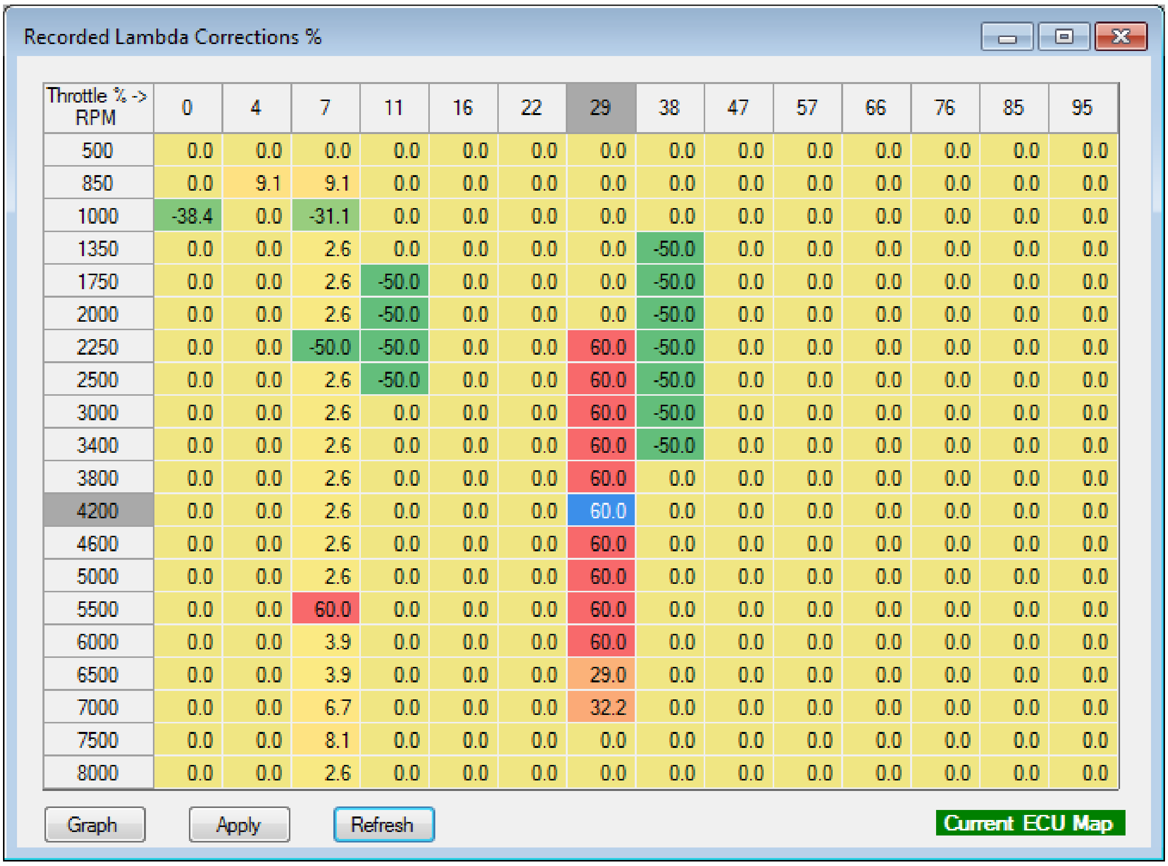
Graph

Current Map

This table contains the target Lambda ratio for any point in the operating point of the engine. Minimum is 0.5 and maximum is 2.5. Manipulate as with any other 20 x 14 map. Its operation is governed by a check box in Lambda settings. Above is a typical road car map.



9.1.4 Recorded Fuel Corrections



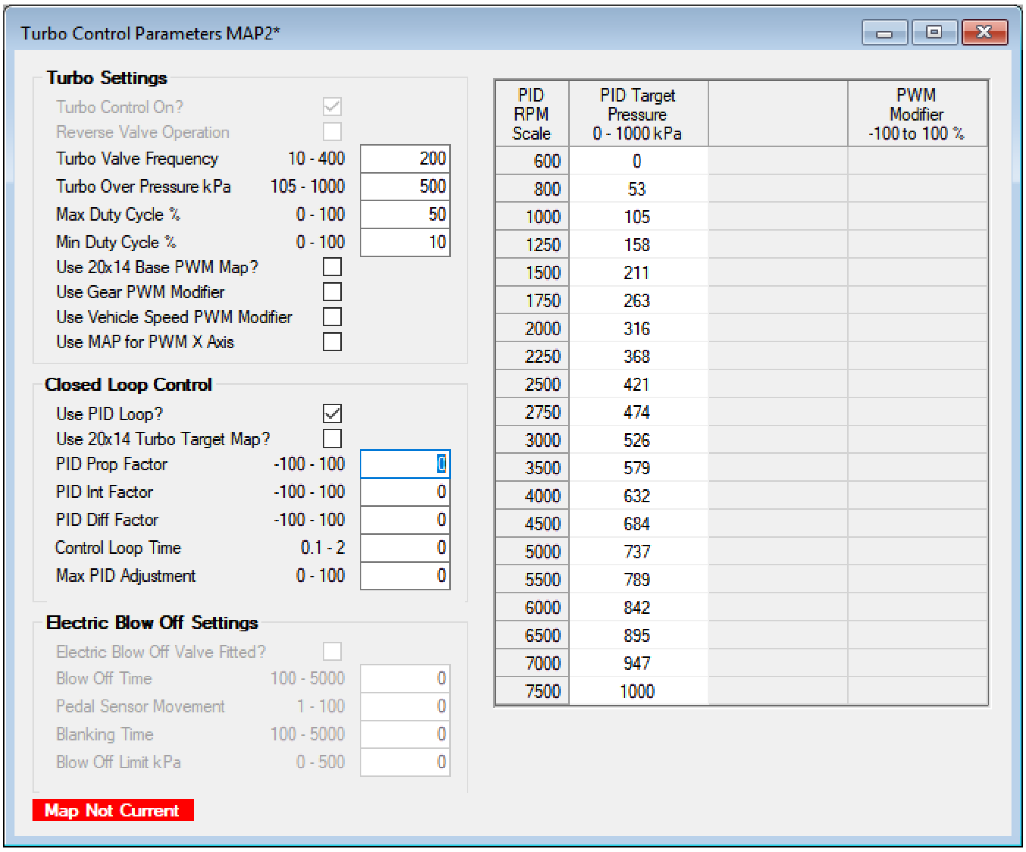
Throttle % -> RPM	0	4	7	11	16	22	29	38	47	57	66	76	85	95
500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
850	0.0	9.1	9.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1000	-38.4	0.0	-31.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1350	0.0	0.0	2.6	0.0	0.0	0.0	0.0	-50.0	0.0	0.0	0.0	0.0	0.0	0.0
1750	0.0	0.0	2.6	-50.0	0.0	0.0	0.0	-50.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	2.6	-50.0	0.0	0.0	0.0	-50.0	0.0	0.0	0.0	0.0	0.0	0.0
2250	0.0	0.0	-50.0	-50.0	0.0	0.0	60.0	-50.0	0.0	0.0	0.0	0.0	0.0	0.0
2500	0.0	0.0	2.6	-50.0	0.0	0.0	60.0	-50.0	0.0	0.0	0.0	0.0	0.0	0.0
3000	0.0	0.0	2.6	0.0	0.0	0.0	60.0	-50.0	0.0	0.0	0.0	0.0	0.0	0.0
3400	0.0	0.0	2.6	0.0	0.0	0.0	60.0	-50.0	0.0	0.0	0.0	0.0	0.0	0.0
3800	0.0	0.0	2.6	0.0	0.0	0.0	60.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4200	0.0	0.0	2.6	0.0	0.0	0.0	60.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4600	0.0	0.0	2.6	0.0	0.0	0.0	60.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5000	0.0	0.0	2.6	0.0	0.0	0.0	60.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5500	0.0	0.0	60.0	0.0	0.0	0.0	60.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6000	0.0	0.0	3.9	0.0	0.0	0.0	60.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6500	0.0	0.0	3.9	0.0	0.0	0.0	29.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7000	0.0	0.0	6.7	0.0	0.0	0.0	32.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7500	0.0	0.0	8.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8000	0.0	0.0	2.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

This is a record of the lambda values seen by a, preferably, wide band sensor in the exhaust of the engine. The average lambda value recorded in each cell during the current PC session is shown. Note this is stored on the PC not in the ECU. You can also view the number of “counts” of data averaged for each cell. High counts means that confidence can be placed in the lambda value in that cell, low counts implies that cell has just be passed through in a transient way and the value should be ignored.

The difference between this and target lambda map can be displayed in percentage terms and this percentage applied to the fuel map if required.
use this represents is also shown. A maximum of 18 hours can be recorder in any one “Bin”.

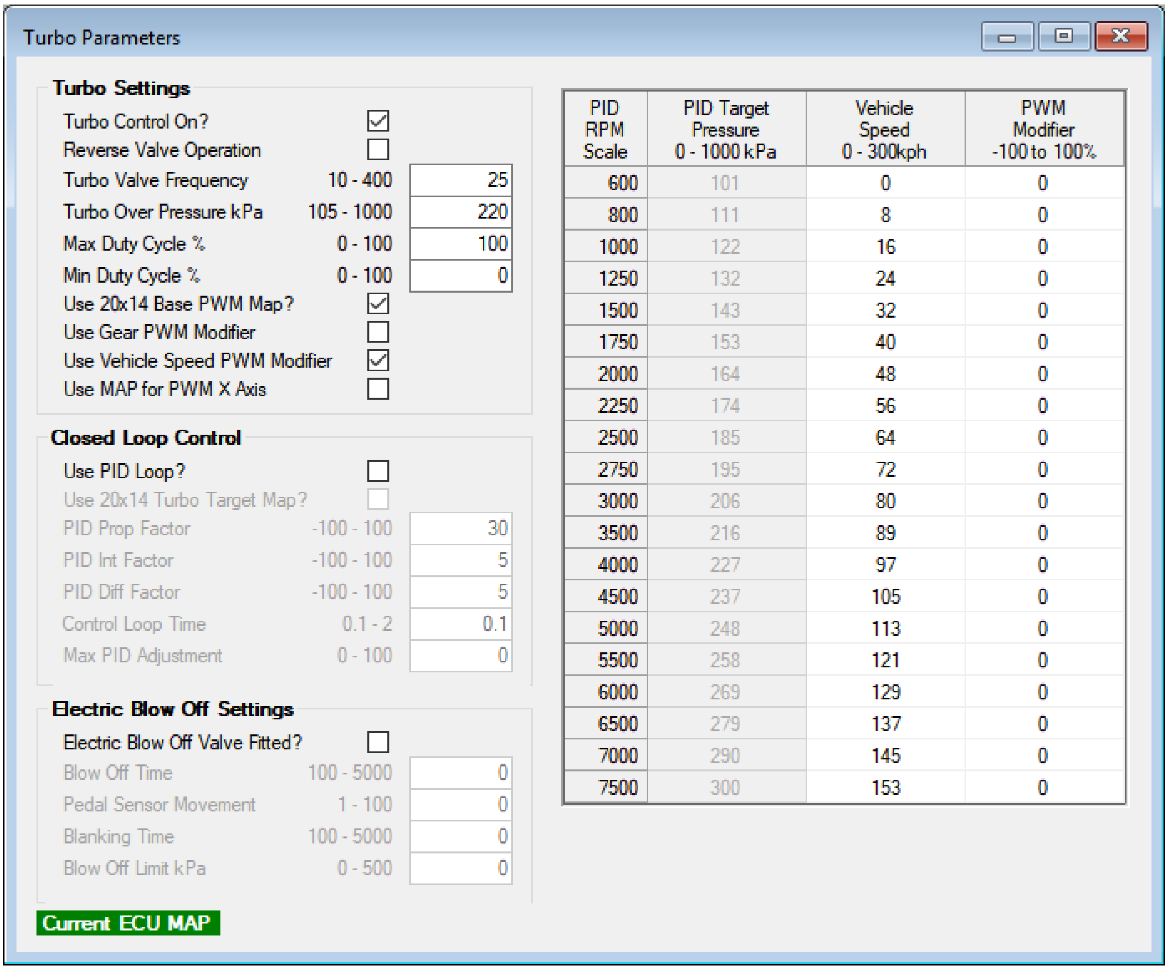
9.2 Turbo Functions

9.2.1 Load All Turbo Functions



This section controls the manifold pressure via a small valve such as those made by AMAL or LOCTROL. The target pressure is set for any RPM position and the system will ensure this is achieved (if possible given the engine/turbo combination).

9.2.2 Turbo Parameters



1 TARGET PRESSURE
This is the absolute pressure required at the rev band.

2 VALVE FREQUENCY
This is the frequency of switching of the control valve. Most small valves are happy with about 100 – 200 hertz.

3 PID PROP, PID INT, PID DIFF FACTORS
These relate to the control system mathematics. Normally set to 50,10,10. Varying these values alters the speed of response of the closed loop control system. If these figures do not work please feel free to contact us for advice concerning your particular installation. See the introduction to PID controllers at the end of the manual. Note these numbers may have to be NEGATIVE i.e. -50, -10 etc.

4 CONTROL DELAY
This is the delay between the system making a change to the valve and checking to see the result in manifold pressure. It depends on the size of the plenum, turbo and engine. A good starting point would be 0.3 secs.

5 CONTROL ON/OFF
Exactly what it says. If set to N then no control is used. When set to Y the system regulates the manifold pressure.

6 VALVE NORMALLY ON/OFF
This determines whether the switch is on or off when the pressure is below the target. When set to O then when the pressure is low the o/p is switched off. The opposite is true when set to F.

7 TURBO OVERPRESSURE

This turns off the injectors and sparks when the manifold pressure is above this limit. This protects the engine from damage if the boost pressure is far too high.

8 MAX PWM%
Limits the maximum % that will be supplied to the valve. Under no circumstances will this be exceeded.

9 MIN PWM%
Opposite of above, under no circumstances will the PWM% be less than this unless the engine is stopped.

10 MAX PID ADJUSTMENT ALLOWED %
Constrains the maximum adjustment the PID loop can make to this figure.

11 ELECTRIC BLOW OFF TIME
For turbo's with an inbuilt blow off valve these next four values control the timing
Blow off time is the time the valve is operated after activation. It will turn off again if the throttle is opened again before this time is finished.

12 ELECTRIC BLOW OFF PEDAL SENSITIVITY
Distance pedal must travel (in TPS %) towards closed position in the pedal measuring time (as in Throttle Transients) to trip the dump action.

13 BLOW OFF BLANKING TIME
Time before a repeat blow off activation is allowed when the current event finishes.

14 BLOW OFF LIMIT
Pressure below which no blow off action will happen

15 TURBO CONTROL ON?
Turns the control system on and off

16 REVERSE VALVE OPERATION
This inverts the PWM signal to the valve. We like more percentage in the 20 x 14 map to give higher manifold pressure. With some valves this does not happen and a lower percentage gives more pressure. Turning this feature on rectifies this. Note this purely a matter of our preference and is not required.

17 USE 20 X 14 BASE MAP
Essential that you use this. The base settings can be arrived at by using the alternate function of the left hand dyno box knob in real time mapping. Run the engine at the required speed and load and swing the knob until the desired pressure is achieved, press enter just are you would do with fuel and ignition adjustment. This is a lot safer when the engine is running closed loop fuelling so there is no chance of the engine being damaged by incorrect mixture.

18 USE PID LOOP?
Turns on the control loop over the top of the main map. See tutorial at the end of this manual for an explanation of how PID loops work.

19 USE GEAR PWM MODIFIER
Allows a percentage reduction in from the base map when in the lower gears to reduce manifold pressure and therefore wheel spin.

20 USE VEHICLE SPEED MODIFIER
Exactly the same effect as the above but based on vehicle speed.

21 USE 20 x 14 TURBO TARGET MAP
Allows a full 20 x 14 pressure target to be used by the PID control loop. See PID loop above.

22 ELECTRIC BLOW OFF VALVE FITTED
Ctivation of blow off control feature.

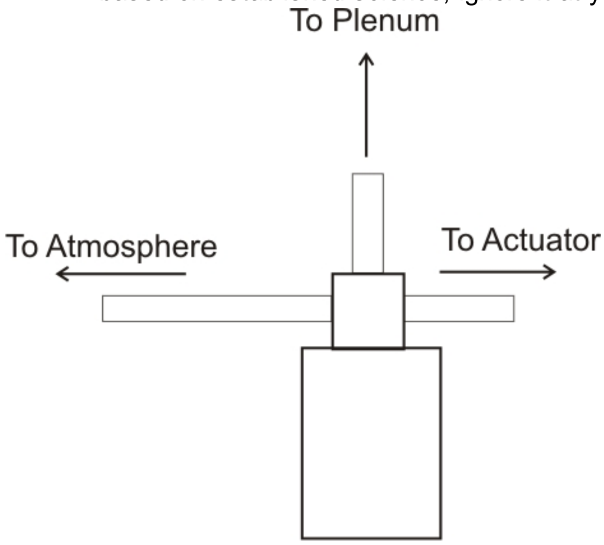
Mapping a Turbo Engine

You have a choice with a turbo engine to map with manifold pressure as load or TPS as load and use manifold pressure compensations. The choice is purely personal. Using pressure as load will mean that only a very limited number of cells can be calibrated on the dyno, the rest will be guesswork. Using TPS as load with manifold pressure compensations is our preferred method and many more cells can be calibrated accurately. Manifold pressure compensations ensure that during turbo spin up (lag conditions) then the engine is correctly fuelled.

It is essential that compensations are set before mapping commences if using this method. The software removes the compensation adjustment when mapping to make the map independent of manifold pressure.

Air temperature compensations must always be used, whichever method you are using. High inlet temperatures without compensation will cause the engine to run rich.

Air pressure and temperature compensation maps have a “Set to Standard” button. This is based on established science, ignore it at your peril.



VW Valve pipe connections.

9.2.3 Turbo Base PWM Map

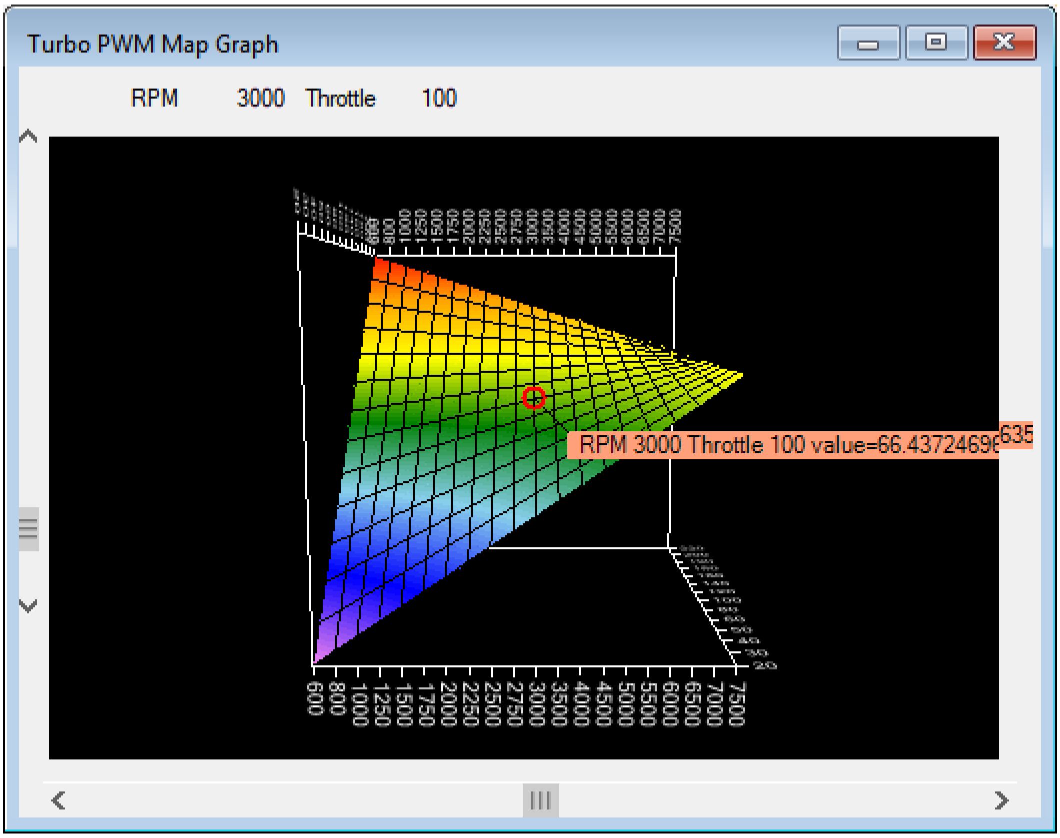
Base Turbo PWM Percentage %*

Throttle % -> RPM	0	10	20	30	40	50	60	70	75	80	85	90	95	100
600	20.0	26.2	32.3	38.5	44.6	50.8	56.9	63.1	69.2	75.4	81.5	87.7	93.8	100.0
800	22.9	28.7	34.6	40.4	46.2	52.0	57.9	63.7	69.5	75.4	81.2	87.0	92.9	98.7
1000	25.8	31.3	36.8	42.3	47.8	53.3	58.8	64.3	69.8	75.3	80.9	86.4	91.9	97.4
1250	28.7	33.9	39.0	44.2	49.4	54.6	59.8	65.0	70.1	75.3	80.5	85.7	90.9	96.1
1500	31.6	36.4	41.3	46.2	51.0	55.9	60.7	65.6	70.4	75.3	80.2	85.0	89.9	94.7
1750	34.5	39.0	43.5	48.1	52.6	57.1	61.7	66.2	70.7	75.3	79.8	84.4	88.9	93.4
2000	37.4	41.6	45.8	50.0	54.2	58.4	62.6	66.8	71.1	75.3	79.5	83.7	87.9	92.1
2250	40.3	44.1	48.0	51.9	55.8	59.7	63.6	67.5	71.4	75.2	79.1	83.0	86.9	90.8
2500	43.2	46.7	50.3	53.8	57.4	61.0	64.5	68.1	71.7	75.2	78.8	82.3	85.9	89.5
2750	46.1	49.3	52.5	55.8	59.0	62.2	65.5	68.7	72.0	75.2	78.4	81.7	84.9	88.2
3000	48.9	51.9	54.8	57.7	60.6	63.5	66.4	69.4	72.3	75.2	78.1	81.0	83.9	86.8
3500	51.8	54.4	57.0	59.6	62.2	64.8	67.4	70.0	72.6	75.2	77.8	80.3	82.9	85.5
4000	54.7	57.0	59.3	61.5	63.8	66.1	68.3	70.6	72.9	75.1	77.4	79.7	81.9	84.2
4500	57.6	59.6	61.5	63.5	65.4	67.3	69.3	71.2	73.2	75.1	77.1	79.0	81.0	82.9
5000	60.5	62.1	63.8	65.4	67.0	68.6	70.2	71.9	73.5	75.1	76.7	78.3	80.0	81.6
5500	63.4	64.7	66.0	67.3	68.6	69.9	71.2	72.5	73.8	75.1	76.4	77.7	79.0	80.3
6000	66.3	67.3	68.3	69.2	70.2	71.2	72.1	73.1	74.1	75.1	76.0	77.0	78.0	78.9
6500	69.2	69.9	70.5	71.2	71.8	72.4	73.1	73.7	74.4	75.0	75.7	76.3	77.0	77.6
7000	72.1	72.4	72.8	73.1	73.4	73.7	74.0	74.4	74.7	75.0	75.3	75.7	76.0	76.3
7500	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0

RPM	0
MAP kPa	0
Base PWM	0
PID Adjust	0
Total PWM	0
Current MAP	0
Current Target	0

Graph

Map Not Current



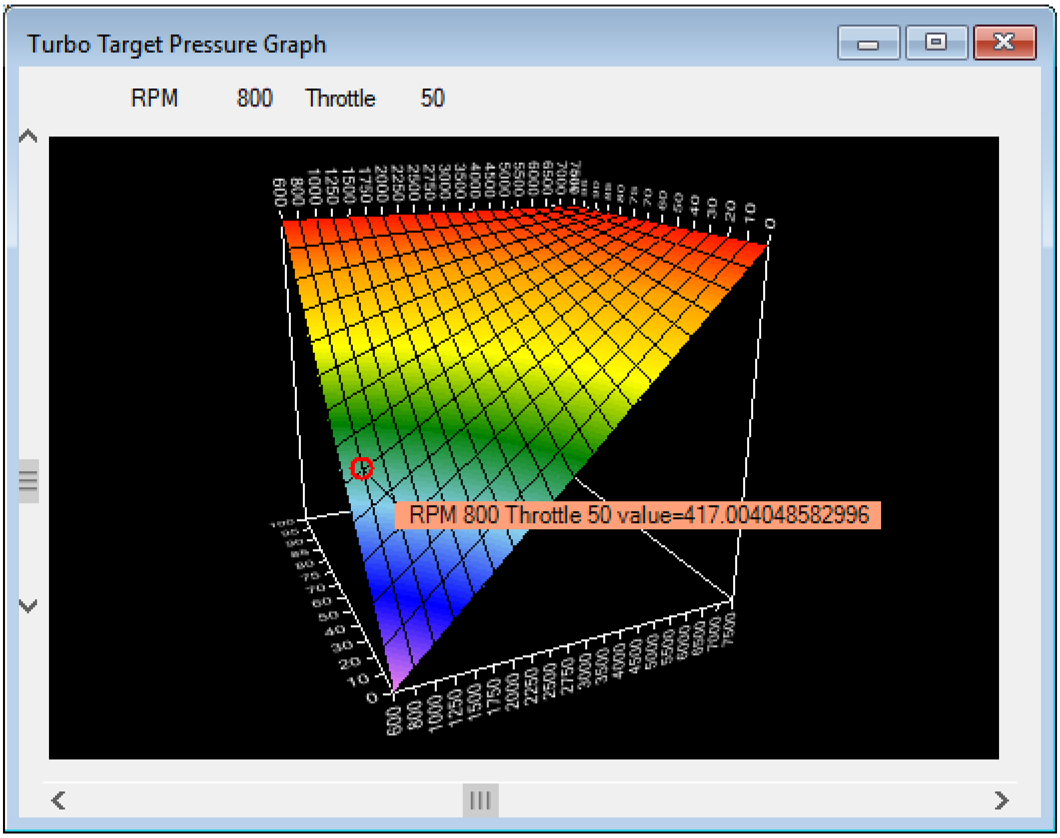
9.2.4 Turbo Target Pressure

Turbo Target Pressure*

Throttle % -> RPM	0	10	20	30	40	50	60	70	75	80	85	90	95	100
600	0	77	154	231	308	385	462	538	615	692	769	846	923	1000
800	53	126	198	271	344	417	490	563	636	709	781	854	927	1000
1000	105	174	243	312	381	449	518	587	656	725	794	862	931	1000
1250	158	223	287	352	417	482	547	611	676	741	806	870	935	1000
1500	211	271	332	393	453	514	575	636	696	757	818	879	939	1000
1750	263	320	377	433	490	547	603	660	717	773	830	887	943	1000
2000	316	368	421	474	526	579	632	684	737	789	842	895	947	1000
2250	368	417	466	514	563	611	660	709	757	806	854	903	951	1000
2500	421	466	510	555	599	644	688	733	777	822	866	911	955	1000
2750	474	514	555	595	636	676	717	757	798	838	879	919	960	1000
3000	526	563	599	636	672	709	745	781	818	854	891	927	964	1000
3500	579	611	644	676	709	741	773	806	838	870	903	935	968	1000
4000	632	660	688	717	745	773	802	830	858	887	915	943	972	1000
4500	684	709	733	757	781	806	830	854	879	903	927	951	976	1000
5000	737	757	777	798	818	838	858	879	899	919	939	960	980	1000
5500	789	806	822	838	854	870	887	903	919	935	951	968	984	1000
6000	842	854	866	879	891	903	915	927	939	951	964	976	988	1000
6500	895	903	911	919	927	935	943	951	960	968	976	984	992	1000
7000	947	951	955	960	964	968	972	976	980	984	988	992	996	1000
7500	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000

Graph

Map Not Current



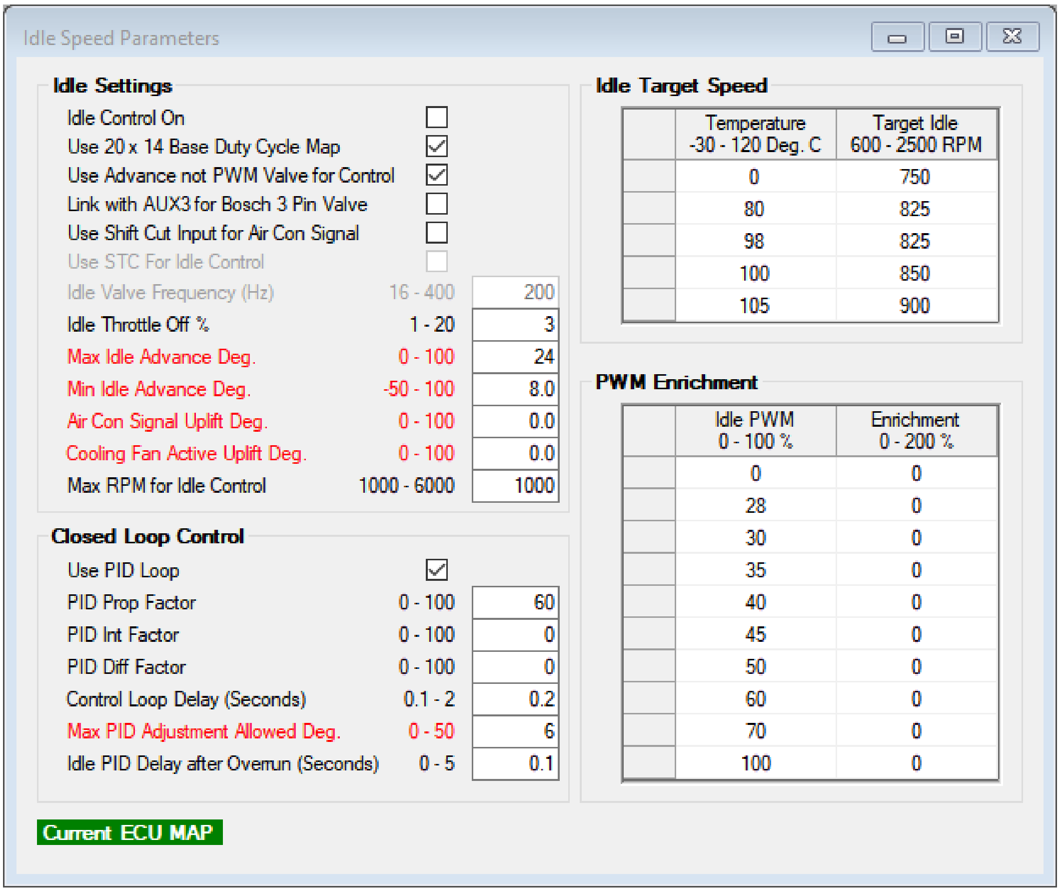
9.3 Idle Functions

Enter topic text here.

9.3.1 Load All Idle Functions

Enter topic text here.

9.3.2 Idle Speed Parameters



IDLE SETTINGS

IDLE CONTROL ON

To enable the idle control parameters check the tick box.
if this is not required ensure the tick box is unchecked.

USE 20 X 14 BASE DUTY CYCLE MAP

Uses the main PWM map to produce most of the required pulse width to run the engine at the required speed. Absolutely essential that this is turned on.

USE ADVANCE NOT PWM VALVE FOR CONTROL

Allows the use of engine advance for idle speed control on engines with no PWM valve fitted. Not as effective but better than nothing. If using this then set the butterflies more open than normal idle the engine with very small advance figures when hot. In this condition giving the engine more advance will naturally cause it to speed up in the same way as opening a valve would.

LINK WITH AUX3 FOR BOSCH 3 PIN IDLE VALVE

Some Bosch valves are un-sprung and need driving both ways. This allows the use of the idle valve output in combination with AUX3 to achieve this. See wiring diagram.

USE SHIFT CUT INPUT FOR AIR CON SIGNAL

This is where the input comes from if you require air conditioning pump uplift.

USE STC FOR IDLE CONTROL

Select this check box if you wish to use the STC fly-by-wire throttle controller to control the idle in place of an idle control valve.

IDLE VALVE FREQUENCY

This is the frequency at which the idle PWM valve operates. Initially try 200 Hertz.

IDLE THROTTLE OFF %

Below this throttle position the idle control is turned on. Above it is turned off.

MAX DUTY CYCLE %

This is the maximum allowed duty cycle of the valve. Setting a low value has the same effect as restricting the size of the valve.

MINIMUM DUTY CYCLE %

Whatever the 20 x 14 base map and the PID controller try to do the duty cycle cannot fall below these figures. This is a very important number and must be set accurately as it helps to eliminate the control system causing the engine to stop after a prolonged period of the engine being driven by the vehicle, for example stopping at a roundabout or junction.

With the engine warm and the idle controller acting stably note the resulting total PWM%. Set the minimum duty cycle to only 1 or 2% less than this resulting PWM.

AIR CON SIGNAL UPLIFT

Pulse width added to basic signal when air conditioning compressor is engaged, see wiring diagram.

COOLING FAN ACTIVE UPLIFT

Same as above but works when cooling fan is switched on by the ECU.

MAX RPM FOR IDLE CONTROL

Idle control will be off above this RPM and the valve will be closed

CLOSED LOOP CONTROL

USE PID LOOP

Allows the system to trim the base PWM% to achieve the required target speed. See the tutorial on PID loops elsewhere in this manual.

PID FACTORS (Prop/Int/Diff)

These factors are used in controlling the amount of air going through the valve to keep the idle speed as you require it. PID control loops are a well established method of achieving this. Initial settings of 40, 20 and 0 should be tried. If the idle speed oscillates up and down initially reduce the proportional factor. If the idle speed does not respond quickly enough increase the proportional factor. The integral factor should not normally be above 20. See end of manual for description of PID loops.

CONTROL LOOP DELAY

The value of this is very engine dependent. Manifold size, valve size, flywheel size are all influencing factors. Essentially this is the time delay between the PID loop making a change to airflow and looking again at the RPM to see what effect it had. If this time is too low then the engine speed will oscillate above and below the target speed. If it is too high then the idle speed will not respond quickly enough to small engine speed variations.0.5 seconds would be a good starting point.

MAXIMUM PID ADJUSTMENT ALLOWED

Limits the excursions the PID controller is allowed to make to the base PWM figures.

IDLE PID DELAY AFTER OVER RUN

This delays the PID controller from turning on until some seconds after the engine has passed through the MAX rpm for idle control when decelerating. This prevents the engine from stalling when decelerating on zero throttle without the clutch being depressed. This typically happens when slowly coming to a stop at a junction for example.

IDLE TARGET SPEED

Target speeds for the PID controller base map combination at differing water temperatures.

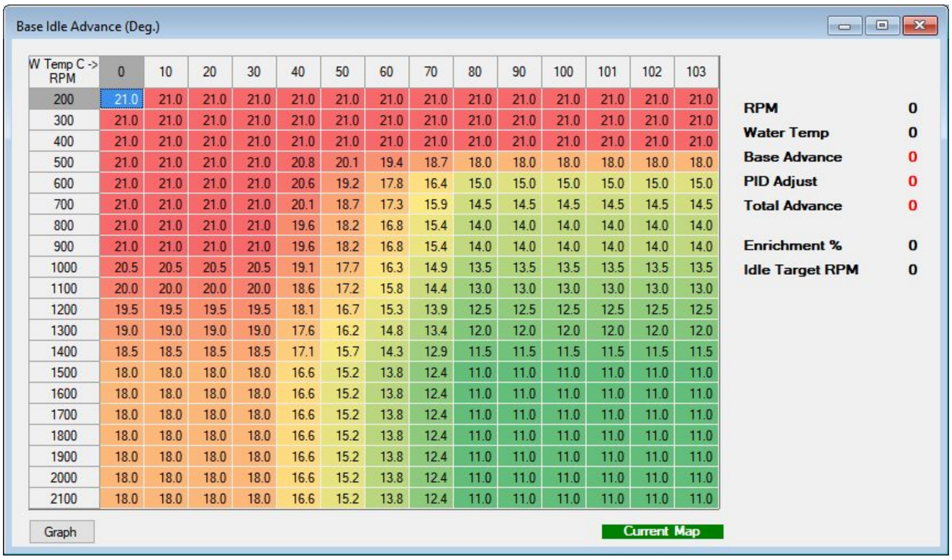
PWM FUEL ENRICMENT

This allows compensation to be made for different loadings on the engine and still maintain correct lambda values. A simpler method is to use a manifold pressure sensor and use fuel compensation based on this. This will automatically compensate for increased air flow when the valve opens (say to compensate for increased load caused by a fan or main lighting).

9.3.3 Idle Base PWM/Advance Map

BASE IDLE PWM PERCENTAGE

This must be used at all times for successful implementation of idle control.


Base Idle Advance (Deg.)

W Temp C -> RPM	0	10	20	30	40	50	60	70	80	90	100	101	102	103
200	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0
300	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0
400	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0
500	21.0	21.0	21.0	21.0	20.8	20.1	19.4	18.7	18.0	18.0	18.0	18.0	18.0	18.0
600	21.0	21.0	21.0	21.0	20.6	19.2	17.8	16.4	15.0	15.0	15.0	15.0	15.0	15.0
700	21.0	21.0	21.0	21.0	20.1	18.7	17.3	15.9	14.5	14.5	14.5	14.5	14.5	14.5
800	21.0	21.0	21.0	21.0	19.6	18.2	16.8	15.4	14.0	14.0	14.0	14.0	14.0	14.0
900	21.0	21.0	21.0	21.0	19.6	18.2	16.8	15.4	14.0	14.0	14.0	14.0	14.0	14.0
1000	20.5	20.5	20.5	20.5	19.1	17.7	16.3	14.9	13.5	13.5	13.5	13.5	13.5	13.5
1100	20.0	20.0	20.0	20.0	18.6	17.2	15.8	14.4	13.0	13.0	13.0	13.0	13.0	13.0
1200	19.5	19.5	19.5	19.5	18.1	16.7	15.3	13.9	12.5	12.5	12.5	12.5	12.5	12.5
1300	19.0	19.0	19.0	19.0	17.6	16.2	14.8	13.4	12.0	12.0	12.0	12.0	12.0	12.0
1400	18.5	18.5	18.5	18.5	17.1	15.7	14.3	12.9	11.5	11.5	11.5	11.5	11.5	11.5
1500	18.0	18.0	18.0	18.0	16.6	15.2	13.8	12.4	11.0	11.0	11.0	11.0	11.0	11.0
1600	18.0	18.0	18.0	18.0	16.6	15.2	13.8	12.4	11.0	11.0	11.0	11.0	11.0	11.0
1700	18.0	18.0	18.0	18.0	16.6	15.2	13.8	12.4	11.0	11.0	11.0	11.0	11.0	11.0
1800	18.0	18.0	18.0	18.0	16.6	15.2	13.8	12.4	11.0	11.0	11.0	11.0	11.0	11.0
1900	18.0	18.0	18.0	18.0	16.6	15.2	13.8	12.4	11.0	11.0	11.0	11.0	11.0	11.0
2000	18.0	18.0	18.0	18.0	16.6	15.2	13.8	12.4	11.0	11.0	11.0	11.0	11.0	11.0
2100	18.0	18.0	18.0	18.0	16.6	15.2	13.8	12.4	11.0	11.0	11.0	11.0	11.0	11.0

RPM 0
Water Temp 0
Base Advance 0
PID Adjust 0
Total Advance 0
Enrichment % 0
Idle Target RPM 0
Graph
Current Map

These are the base pulse widths used by the idle controller. When the engine is idling your position in the map is indicated at all times. All actions of the controllers are displayed in real time.

Idle RPM scale and temperature scales are self explanatory.

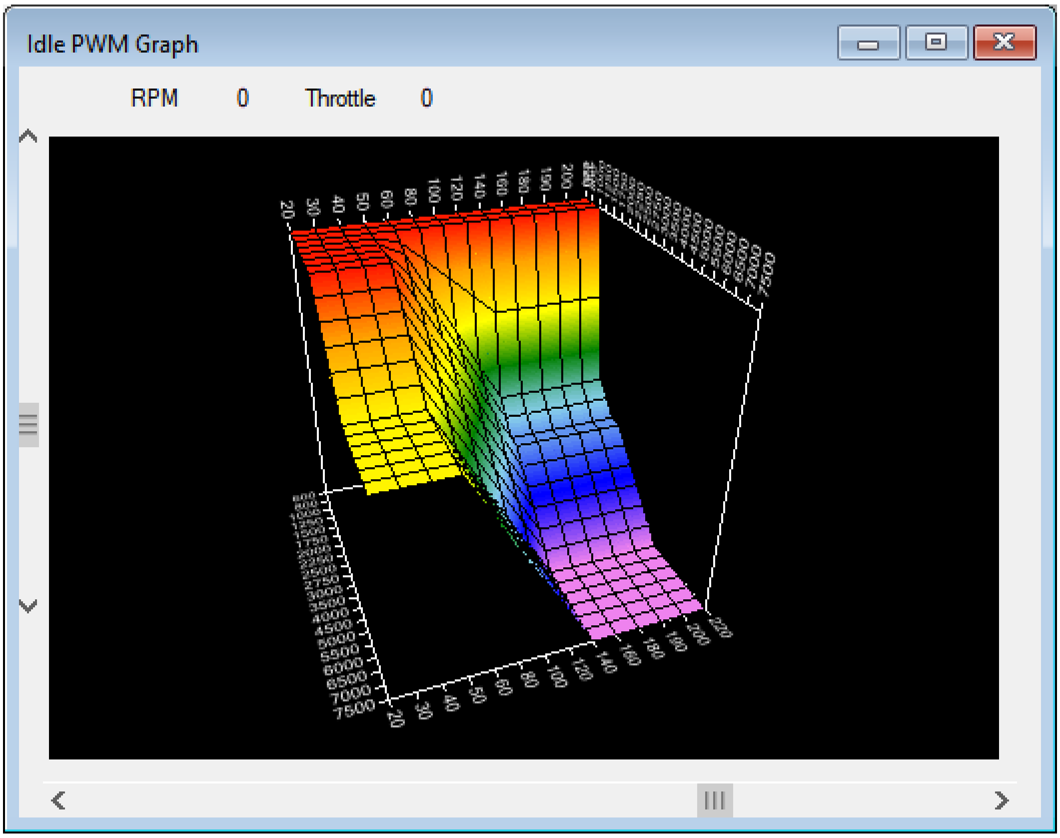
How to Set The Idle Parameters When Using a PWM valve

First fill out the tables as per the figures above in idle speed parameters. In most cases unless you can measure the frequency of the idle valve control in its original application you will have to try various frequencies by trial and error.

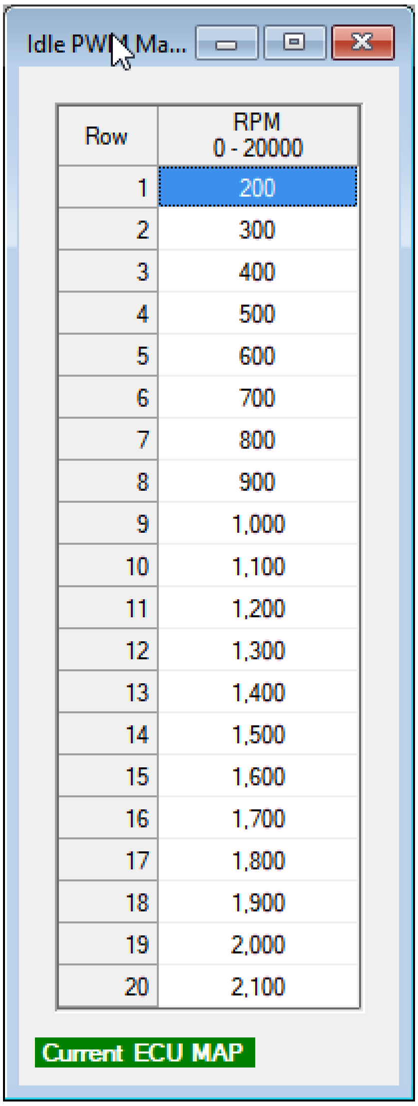
Turn ON the check mark “Use 20 x 14 Base Duty Cycle Map”. Make sure the PID loop is turned OFF.

Start the engine and adjust the percentage in the base map until the idle speed is 100 or 200 RPM above the desired idle speed at that engine temperature. You have to do this for each engine temperature so it can take some time.

When this has been achieved turn ON the PID loop. The PID controller will attempt to bring the idle to the appropriate speed. If the idle speed oscillates reduce the PID prop factor and/or increase the closed loop delay. If the response is too slow increase the PID prop factor and/or decrease the closed loop delay.

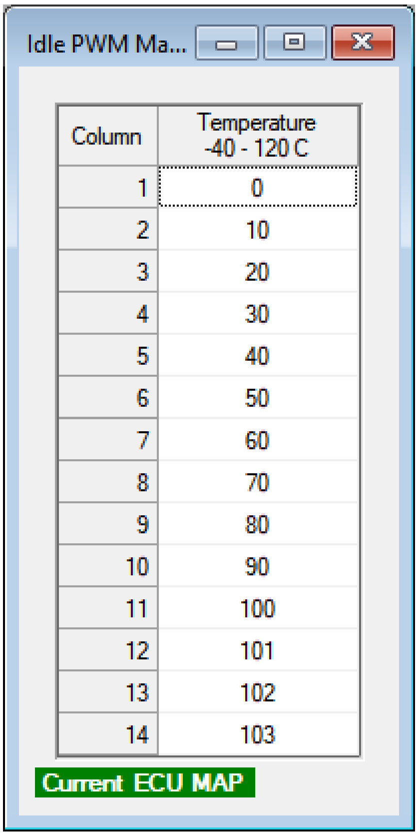

Idle PWM Graph
RPM 0 Throttle 0

9.3.4 Idle RPM Scale



Row	RPM 0 - 20000
1	200
2	300
3	400
4	500
5	600
6	700
7	800
8	900
9	1,000
10	1,100
11	1,200
12	1,300
13	1,400
14	1,500
15	1,600
16	1,700
17	1,800
18	1,900
19	2,000
20	2,100

9.3.5 Idle Temperature Scale



Column	Temperature -40 - 120 C
1	0
2	10
3	20
4	30
5	40
6	50
7	60
8	70
9	80
10	90
11	100
12	101
13	102
14	103

9.4 Cam Functions

Switching Systems
Sophisticated variable camshaft control is becoming an ever more present aspect of modern engines. Some of the control aspects for these are very simple such as the Honda V-TEC system. Simple switching systems like this can always be used via the V-TEC output on the S series ECU (or the shift light on the S40).

Continuous VVT systems
Continuously variable angle systems are more complex, but we now support most systems.
Some engines require us to have developed a solution especially for that engine. The following systems have been developed at the time of writing this manual and more will no doubt be done as time progresses.

Honda K20A iV-TEC
Toyota 2ZZ
Ford ST170
Rover VVC
BMW S50 Single VANOS
BMW S52 Twin VANOS
BMW S54 Twin VANOS
Nissan 350Z

The internal differences required to handle these various systems is effectively selected when the relevant flywheel mode is selected in General Engine Settings.

We support many other engines, such as the Toyota 1JZ, 2JZ, VW R32, all non-S BMW engines (M50/52/54 etc.), and most S engines (S50/52/54/65 etc.).

Cam Control Parameters
The cam control system is made up of several maps to control up to four camshafts. The parameter map is shared and common between the cams and each pair of cams has its own cam target map and base PWM map. When four cams are being controlled on a V engine then Cams 1 & 3 are linked and 2 & 4 are linked, that is for example, 1 & 3 are the inlets, 2 & 4 are the exhausts.

Note that the base PWM map is not used for the following engines:-

Rover VVC
BMW S50 Single VANOS
BMW S52 Twin VANOS
BMW S54 Twin VANOS

and is set to a fixed value for:-

Honda K20A iV-TEC
Toyota 2ZZ
Ford ST170

Nissan 350Z

SETTING THE CAM SHAFTS

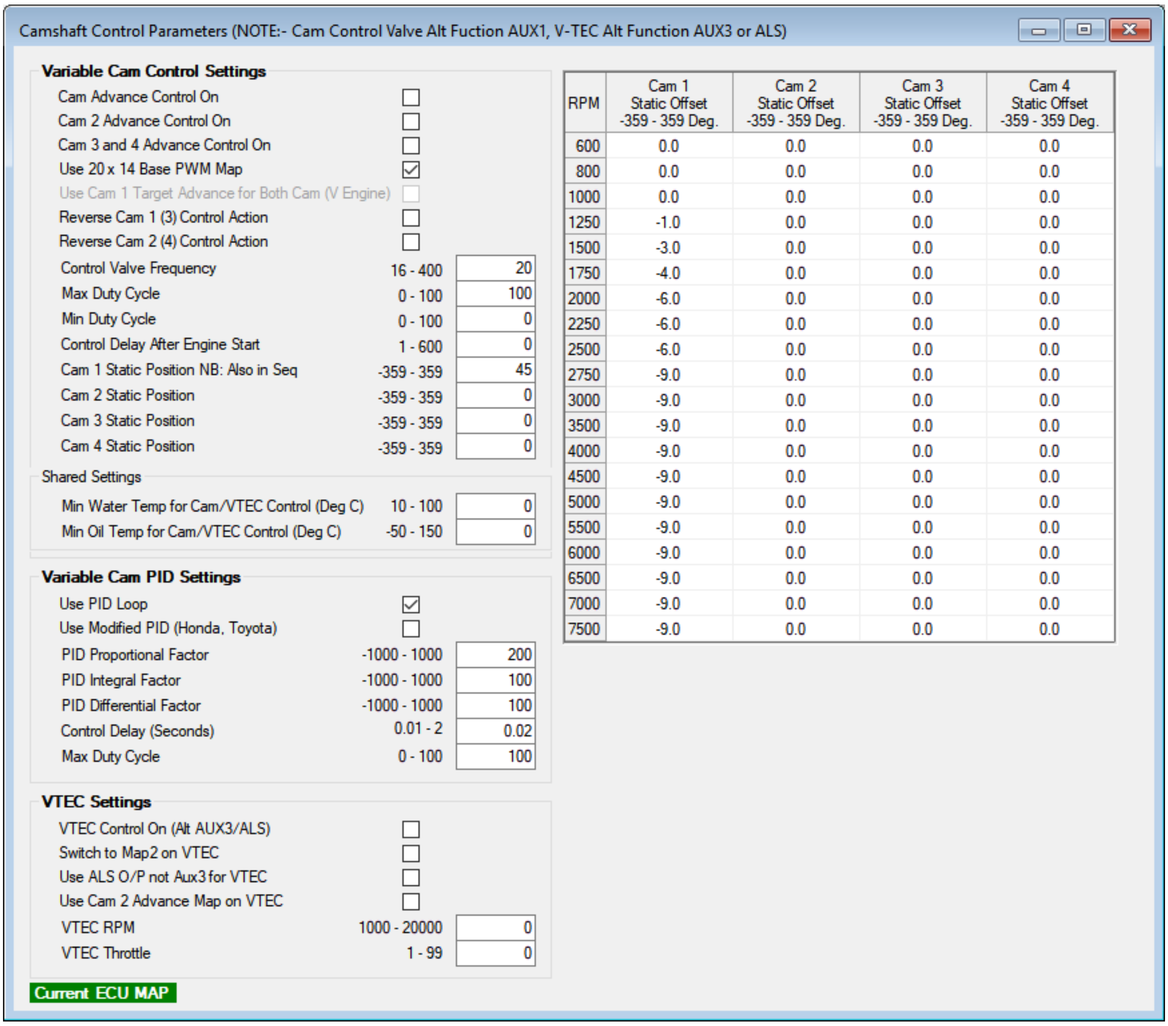
As with all the engine variables we control, the cam position must be optimized. This can be done in real time mapping using the dyno-box. By pressing F7 when in real time mapping the left hand knob of the dyno-box adjusts the target cam angle. This can then be rotated to find maximum power in real time just as you would with the advance and fuel knobs. This operation is safest when the engine is being run closed loop on the fuelling. When the optimum has been found then pressing the enter button will record the current fuel and advance as normal and the cam target will also be recorded. Pressing F8 will make the knob control cam2 target position.

The cam position must accurately follow the target. This can be verified to be happening using the real time chart with the CamA (cam advance) and CamT (cam target) options checked. This should result in the kind of picture below. The actual cam advance (blue line) follows the cam target (yellow line) closely.

9.4.1 Load All Cam Functions

Enter topic text here.

9.4.2 Cam Parameters / VTEC Control



CONTROL VALVE FREQUENCY

Frequency of the oil valve operation.

PID FACTORS/CONTROL DELAY/DUTY CYCLE MAX-MIN

Refer to idle speed control for details of these items.

NO CAM OR V-TEC CONTROL BELOW WATER TEMP

No action will take place until this water temp is exceeded

CONTROL DELAY AFTER ENGINE START

Wait for this length of time before moving cams etc.

V-TEC RPM

RPM to switch V-TEC or other simple switching system if throttle value below is also exceeded.

V-TEC THROTTLE

Throttle to switch V-TEC or other simple switching system if RPM value above is also exceeded.

CAM1/2/3/4 STATIC POSITION

Cam1 value is the same as in sequential injection. Cam2+ may or may not be needed.

NO CAM OR V-TEC CONTROL BELOW OIL TEMP

No action will take place until this oil temp is exceeded

USE 20 X 14 BASE PWM MAP

Needed on the systems listed above.

USE PID LOOP

Needed on the engines which need a base PWM map.

V-TEC CONTROL ON

Turn on simple switching output.

SWITCH TO MAP2 ON V-TEC

Switches to the second fuel and ignition maps when V-TEC is active

USE ALS O/P NOT AUX3 FOR V-TEC

Changes V-TEC output to the ALS output (Pin 32) from Aux3 (Pin 33)

USE MODIFIED PID

This is required for engines based on the Denso system. Includes Honda, Toyota and Ford ST170.

USE CAM2 ADVANCE MAP ON V-TEC

Normally the cam advance map of for cam 1 is used. This option allows using the cam2 advance map when V-TEC is active.

USE CAM 1 TARGET ADVANCE FOR BOTH CAMS

This is used when controlling two inlet cams on a V engine. The system uses only the CAM 1 target advance map for both cams as it is obvious they both need to move at the same time.

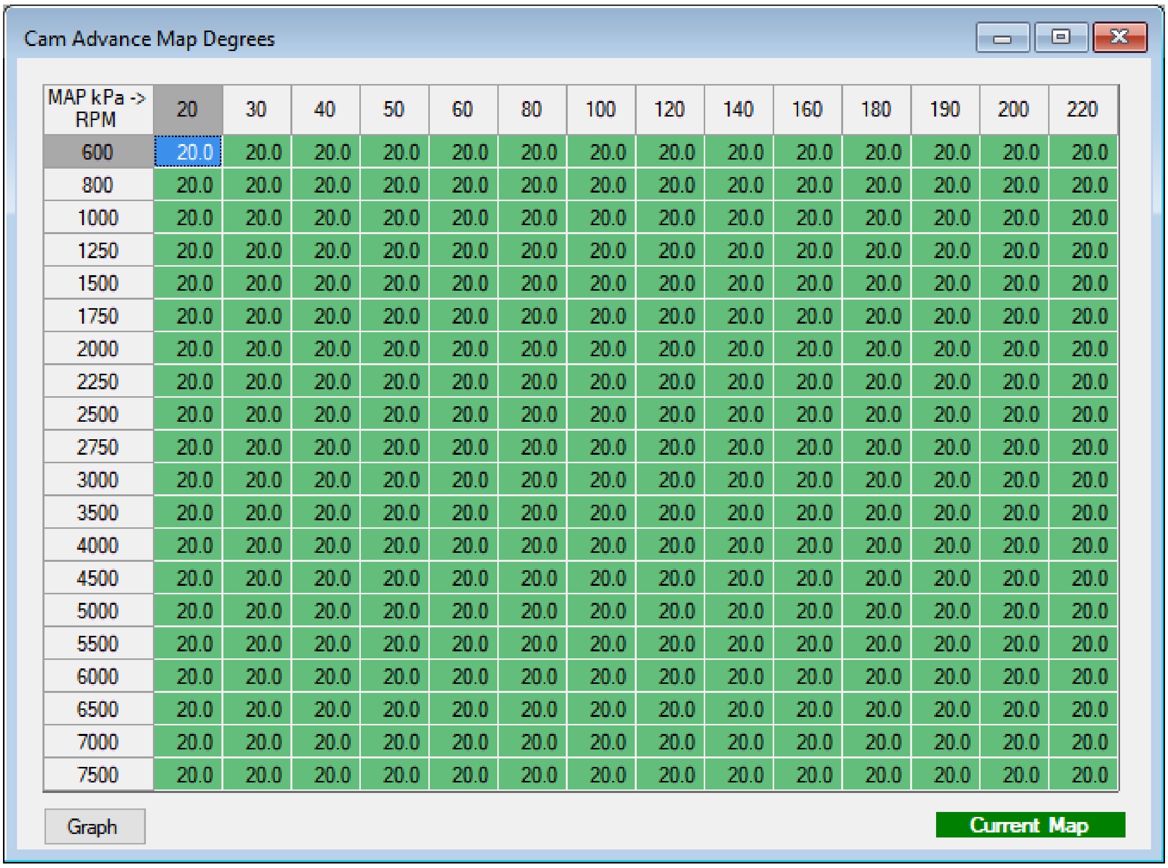
REVERSE CAM CONTROL ACTION

Used when both inlet and exhaust are variable. The exhaust is usually driven in the opposite direction by the oil control valve. Use these check marks as required. An example is the Audi RS4 V8. The exhausts are driven in the reverse direction.

CAM STATIC OFFSET TABLE

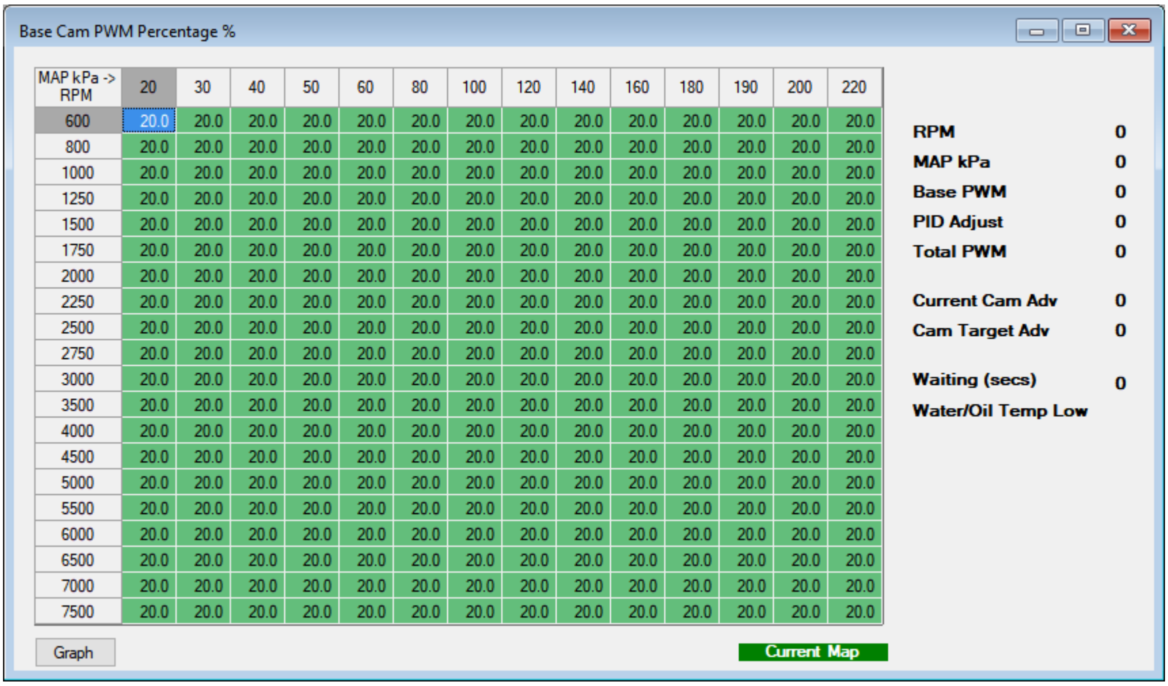
In almost all variable cam shaft systems there is a fixed offset even when the cam is in its most retarded position. Filling in this table allows this to be reduced to 0 to make control possible.

9.4.3 Cam 1 Target Map



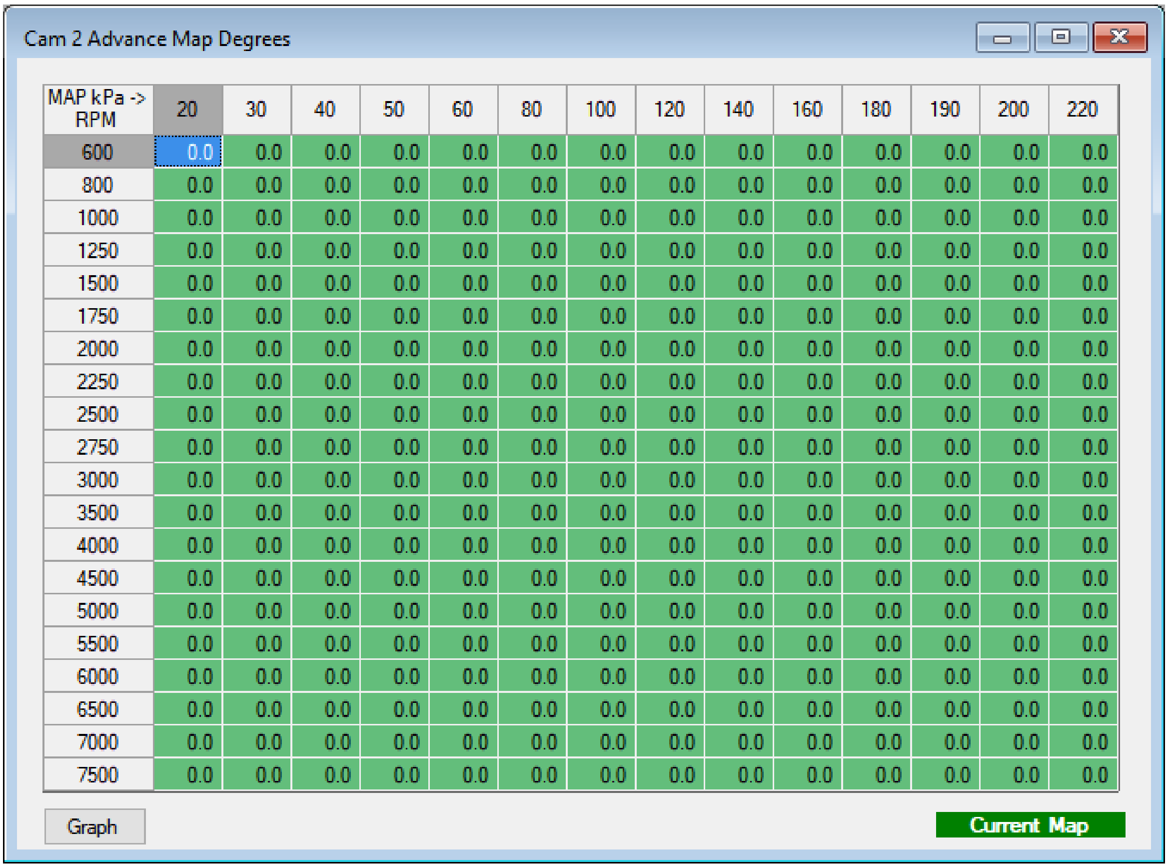
MAP kPa -> RPM	20	30	40	50	60	80	100	120	140	160	180	190	200	220
600	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
800	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
1000	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
1250	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
1500	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
1750	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
2000	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
2250	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
2500	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
2750	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
3000	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
3500	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
4000	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
4500	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
5000	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
5500	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
6000	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
6500	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
7000	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
7500	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0

9.4.4 Cam 1 Base PWM Map



MAP kPa -> RPM	20	30	40	50	60	80	100	120	140	160	180	190	200	220
600	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
800	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
1000	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
1250	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
1500	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
1750	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
2000	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
2250	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
2500	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
2750	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
3000	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
3500	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
4000	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
4500	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
5000	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
5500	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
6000	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
6500	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
7000	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
7500	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0

9.4.5 Cam 2 Target Map



Cam 2 Advance Map Degrees

MAP kPa -> RPM	20	30	40	50	60	80	100	120	140	160	180	190	200	220
600	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
800	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1250	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1750	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2250	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2750	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Graph

Current Map

9.4.6 Cam 2 Base PWM Map

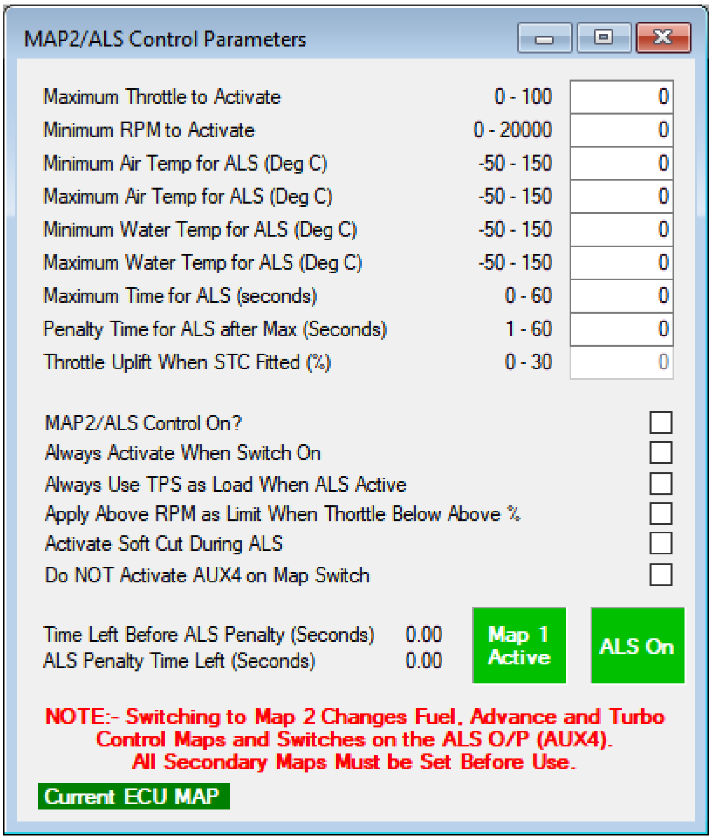
Enter topic text here.

9.5 ALS Functions/MAP2

This section covers all the items found in the ALS/Map2 Menu section.

9.5.1 ALS Parameters/MAP2

NOTE THAT IN ALL CIRCUMSTANCES WHEN THIS IS ACTIVATED ALL THE MAP2 VALUES MUST BE SET, THIS INCLUDES IGNITION, FUEL AND TURBO MAPS IF TURBO CONTROL IS IN USE.



This section controls the function of the turbo anti lag system or can just provide two switchable main maps.

WARNING:- TURBO ANTI LAG WILL RAISE THE EXHAUST VALVE, MANIFOLD AND TURBINE TEMPERATURES TO VERY HIGH VALUES. THIS MAY BE DETRIMENTAL TO THEIR LIFE. USE WITH CARE AND REMEMBER THAT TO RUN A LOT OF ANTI-LAG YOU NEED A BIG RACING BUDGET.

This anti lag system works in conjunction with an on/off switch on the dash and a solenoid controlled air valve. The bigger the valve the more retard will be needed and the more turbo pressure will be achieved. When in the anti-lag condition the valve is opened and the ignition map is switched to the ALS Ignition Map which will have large negative values to reduce the engine power even though air is entering the engine and it is firing. Because the engine is firing the turbo keeps spinning generating manifold pressure. This will also be associated with loud "popping" in the exhaust.

MAXIMUM THROTTLE TO ACTIVATE

Below this value the ALS is active. Above it switches off. Set to 100 if you want to use 2 separate main maps.

MINIMUM RPM TO ACTIVATE

Below this RPM the ALS system remains inactive, set to 0 if you just want to use 2 main maps.

MINIMUM / MAXIMUM AIR TEMP FOR CONTROL

Disables ALS system when air temp outside these limits.

MINIMUM / MAXIMUM WATER TEMP FOR CONTROL

Disables ALS system when water temp outside these limits.

MAXIMUM TIME FOR ALS / PENALTY TIME FOR ALS AFTER MAX

This is the maximum continuous time the ALS system is allowed to be active. Works in conjunction with penalty time for ALS. If the continuous ALS time is breached, further activation is disallowed for the penalty time.

To disable this function enter a zero in the MAXIMUM TIME FOR ALS.

Current timings and status of the temperature range inhibitors are shown near the bottom the PC page.

THROTTLE UPLIFT WHEN TC FITTED

If a DTA throttle controller is fitted this is the throttle percentage when ALS goes active. This is not available if a TC is not fitted.

ALWAYS ACTIVATE WHEN SWITCH IS ON

Implements a simple use of the dashboard switch to activate map2 and the ALS/AUX4 output without regard to any of the normal parameters in the map illustrated above.

ALWAYS USE TPS AS LOAD WHEN ALS/MAP2 IS ACTIVE

It is sometimes desirable to use TPS as load when in anti lag rather than MAP even if the ECU is set to do this normally. This check mark allows this.

APPLY ABOVE RPM LIMIT WHEN THROTTLE BELOW ABOVE %

This allows the use of an alternative anti-lag strategy if the valve is not available (say on a group N engine). The engine butterfly is opened by a fairly large amount. This will naturally result in a very high idle speed and make the car un-drivable. With ALS turned on in the software and the activation switch turned OFF the RPM to activate becomes the rev limit as long as the throttle is below the “maximum throttle to activate”. This allows the engine to be driven normally when the anti-lag switch is off.

When the switch is on the RPM limit returns to the normal one and engine performance at light throttles is controlled by large negative values of advance in the MAP2 ignition map.

ACTIVATE SOFT CUT DURING ALS

When the ALS system is activated a rotating soft engine cut is implemented. This is aimed at reducing turbo temperature.

DO NOT ACTIVATE AUX4 ON MAP SWITCH

Allows maps to be switched without activating Aux4/ALS Valve output. This frees up Aux4 for any of the other uses it has.

9.5.2 ALS Ignition Map/MAP2

These maps are used instead of the main maps when the ALS system is active. Normally large negative values are used in the advance map to limit engine power output when the ALS valve is activated.

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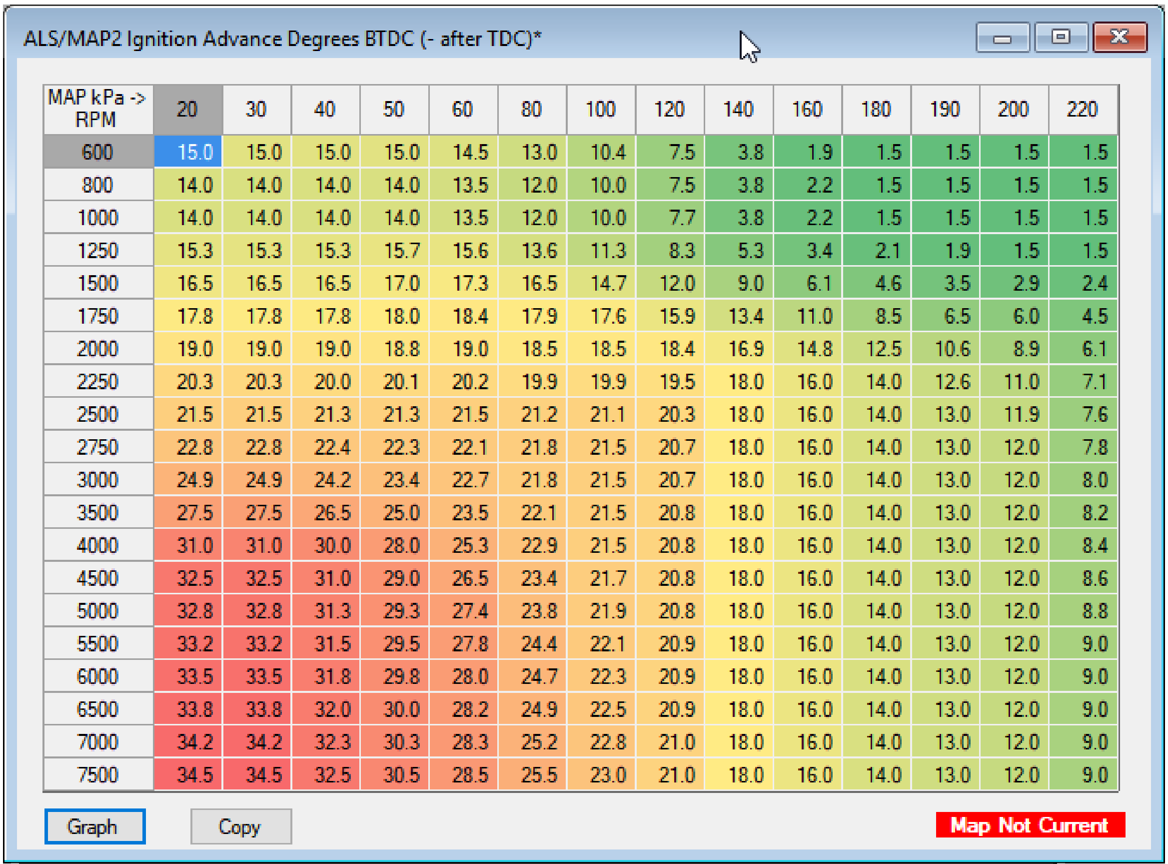
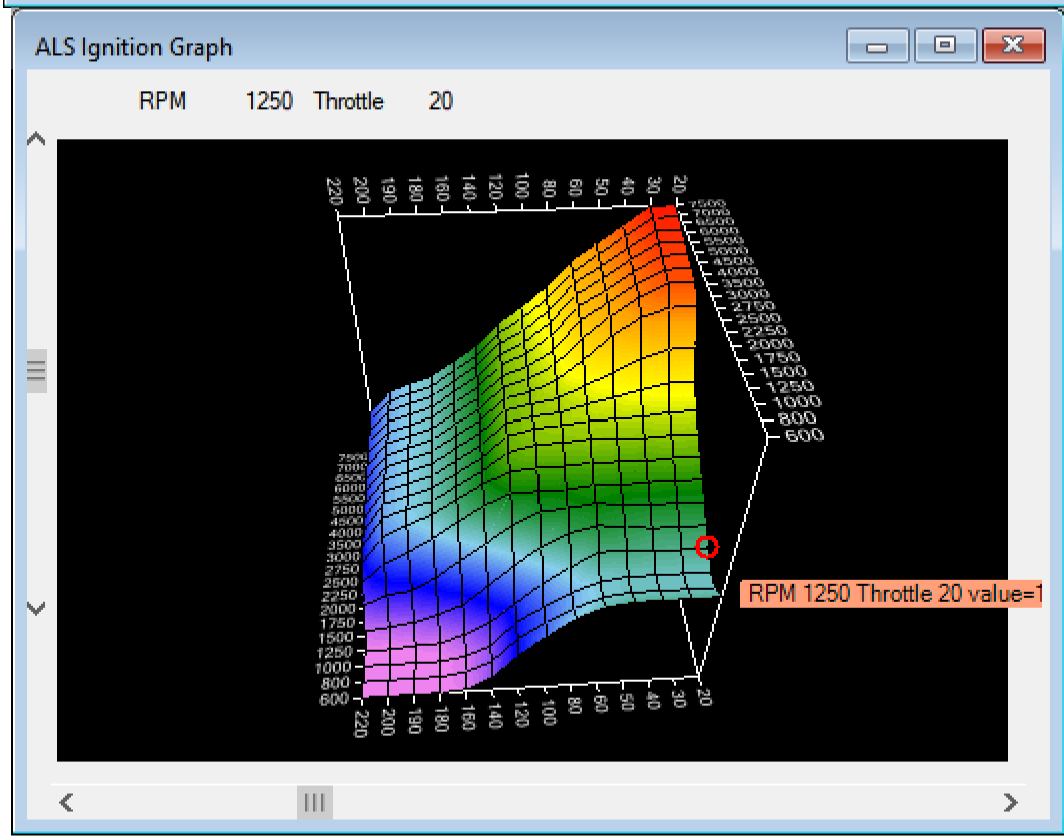


MAP kPa -> RPM	20	30	40	50	60	80	100	120	140	160	180	190	200	220
600	15.0	15.0	15.0	15.0	14.5	13.0	10.4	7.5	3.8	1.9	1.5	1.5	1.5	1.5
800	14.0	14.0	14.0	14.0	13.5	12.0	10.0	7.5	3.8	2.2	1.5	1.5	1.5	1.5
1000	14.0	14.0	14.0	14.0	13.5	12.0	10.0	7.7	3.8	2.2	1.5	1.5	1.5	1.5
1250	15.3	15.3	15.3	15.7	15.6	13.6	11.3	8.3	5.3	3.4	2.1	1.9	1.5	1.5
1500	16.5	16.5	16.5	17.0	17.3	16.5	14.7	12.0	9.0	6.1	4.6	3.5	2.9	2.4
1750	17.8	17.8	17.8	18.0	18.4	17.9	17.6	15.9	13.4	11.0	8.5	6.5	6.0	4.5
2000	19.0	19.0	19.0	18.8	19.0	18.5	18.5	18.4	16.9	14.8	12.5	10.6	8.9	6.1
2250	20.3	20.3	20.0	20.1	20.2	19.9	19.9	19.5	18.0	16.0	14.0	12.6	11.0	7.1
2500	21.5	21.5	21.3	21.3	21.5	21.2	21.1	20.3	18.0	16.0	14.0	13.0	11.9	7.6
2750	22.8	22.8	22.4	22.3	22.1	21.8	21.5	20.7	18.0	16.0	14.0	13.0	12.0	7.8
3000	24.9	24.9	24.2	23.4	22.7	21.8	21.5	20.7	18.0	16.0	14.0	13.0	12.0	8.0
3500	27.5	27.5	26.5	25.0	23.5	22.1	21.5	20.8	18.0	16.0	14.0	13.0	12.0	8.2
4000	31.0	31.0	30.0	28.0	25.3	22.9	21.5	20.8	18.0	16.0	14.0	13.0	12.0	8.4
4500	32.5	32.5	31.0	29.0	26.5	23.4	21.7	20.8	18.0	16.0	14.0	13.0	12.0	8.6
5000	32.8	32.8	31.3	29.3	27.4	23.8	21.9	20.8	18.0	16.0	14.0	13.0	12.0	8.8
5500	33.2	33.2	31.5	29.5	27.8	24.4	22.1	20.9	18.0	16.0	14.0	13.0	12.0	9.0
6000	33.5	33.5	31.8	29.8	28.0	24.7	22.3	20.9	18.0	16.0	14.0	13.0	12.0	9.0
6500	33.8	33.8	32.0	30.0	28.2	24.9	22.5	20.9	18.0	16.0	14.0	13.0	12.0	9.0
7000	34.2	34.2	32.3	30.3	28.3	25.2	22.8	21.0	18.0	16.0	14.0	13.0	12.0	9.0
7500	34.5	34.5	32.5	30.5	28.5	25.5	23.0	21.0	18.0	16.0	14.0	13.0	12.0	9.0



9.5.3 ALS Fuel Map/MAP2

These maps are used instead of the main maps when the ALS system is active. Normally large negative values are used in the advance map to limit engine power output when the ALS valve is activated.

WARNING SETTING THESE TO LARGE NEGATIVE VALUES WITH RAISE THE EXHAUST VALVE, MANIFOLD AND TURBINE TEMPERATURES TO VERY HIGH VALUES. THIS MAY BE DETRIMENTAL TO THEIR LIFE. USE WITH CARE AND REMEMBER THAT TO RUN A LOT OF ANTI-LAG YOU NEED A BIG RACING BUDGET.

Alter timing by moving the cursor to the chosen place and type in the new figures. Figures are degrees of advance before (negative values after) top dead centre.

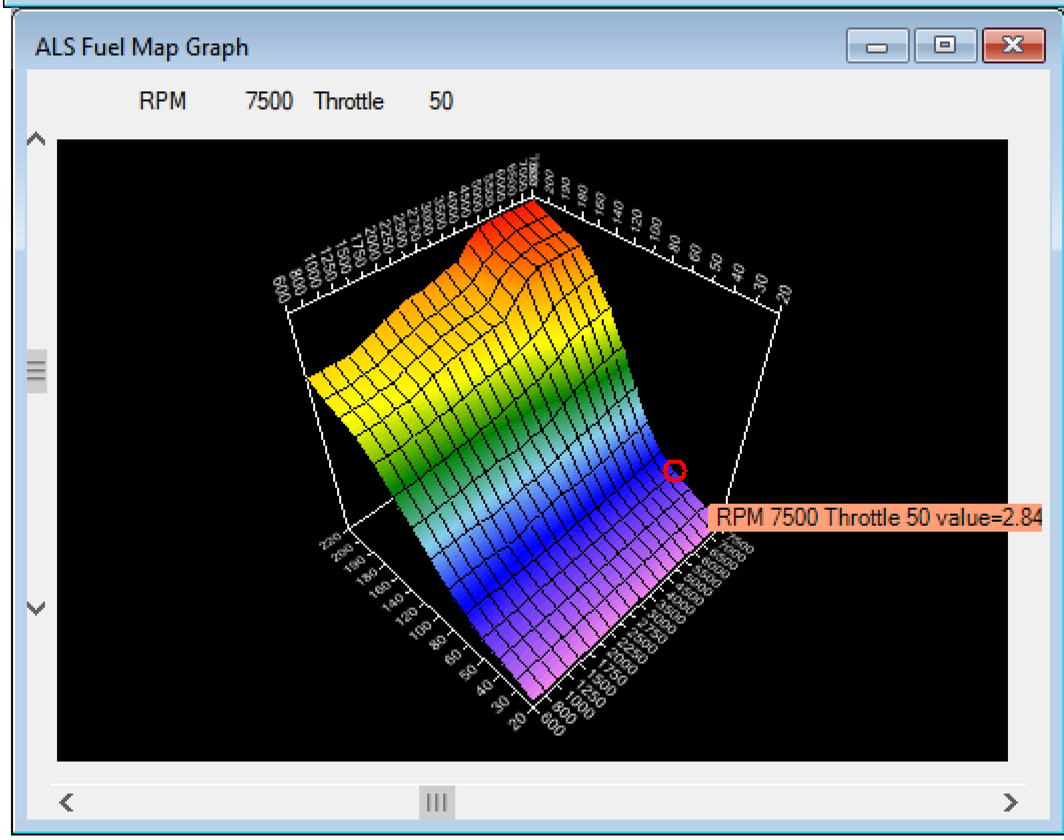
If you wish to manipulate a group of cells by a percentage or set to a value, drag the mouse over the group and use the edit menu.

A Fuel map has been added as well as the ignition map. This allows for a separate switchable main map pair. This can be used for many things including a separate map when NOS is used.

ALS/MAP2 Fuel timing ms*

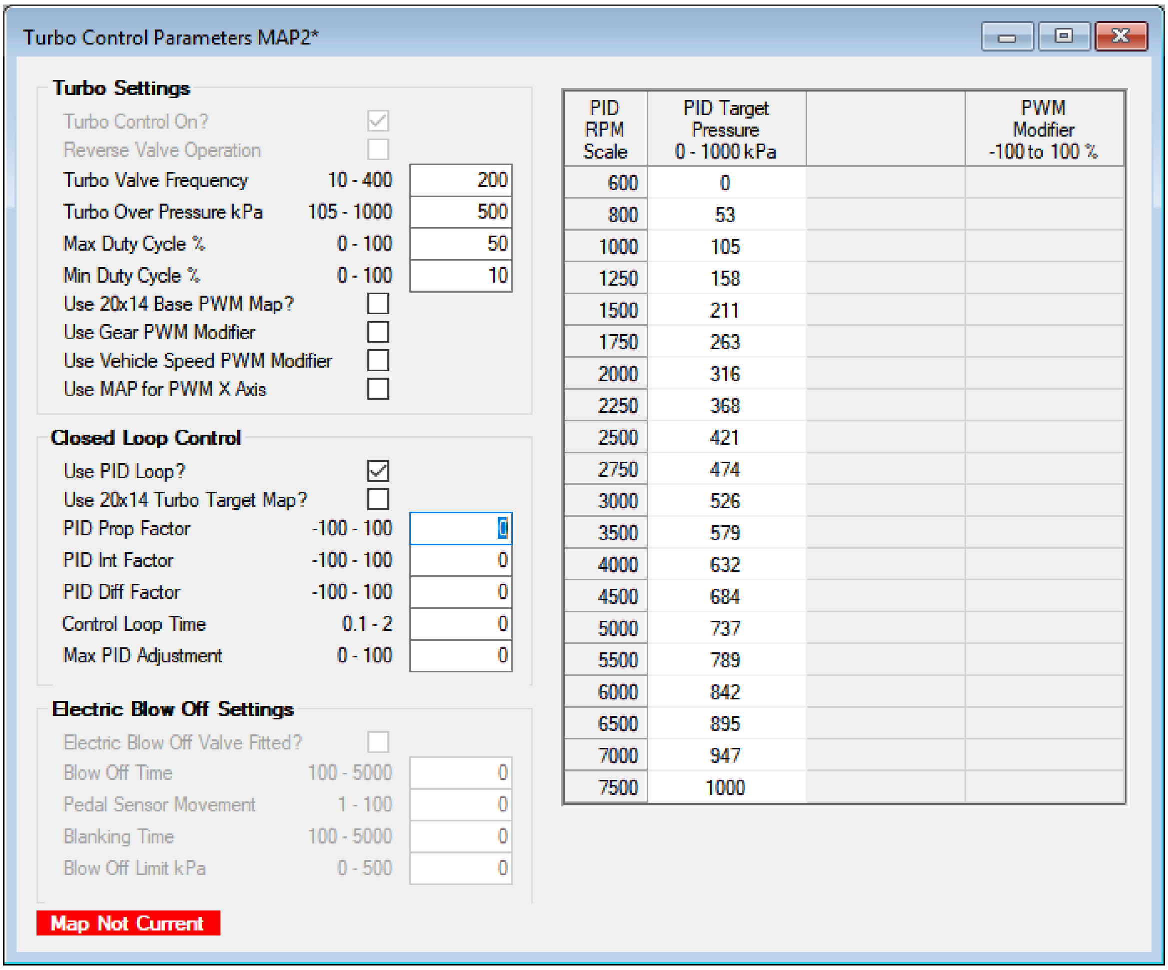
MAP kPa -> RPM	20	30	40	50	60	80	100	120	140	160	180	190	200	220
600	0.61	1.33	1.92	2.48	3.54	4.66	6.32	8.02	9.65	11.33	12.55	13.05	13.53	14.38
800	0.61	1.33	1.92	2.48	3.54	4.66	6.32	8.02	9.65	11.33	12.55	13.05	13.53	14.38
1000	0.61	1.33	1.92	2.48	3.54	4.66	6.32	8.02	9.65	11.33	12.55	13.05	13.53	14.38
1250	0.61	1.33	1.92	2.48	3.33	4.71	6.32	8.20	9.84	11.54	12.78	13.28	13.78	14.39
1500	0.61	1.33	1.92	2.48	3.43	4.55	6.26	8.20	9.84	11.54	12.78	13.28	13.78	14.70
1750	0.57	1.33	1.92	2.53	3.43	4.38	6.06	8.34	10.05	11.78	13.13	13.79	14.34	15.15
2000	0.57	1.33	1.92	2.53	3.32	4.44	6.18	8.34	10.05	11.78	13.57	14.11	14.63	15.58
2250	0.57	1.33	1.92	2.53	3.32	4.85	6.28	8.50	10.25	12.01	13.85	14.37	14.90	15.93
2500	0.61	1.35	1.93	2.58	3.32	5.00	6.51	8.33	10.40	12.27	14.10	14.66	15.21	16.25
2750	0.61	1.35	1.95	2.59	3.32	5.20	6.41	8.27	10.56	12.45	14.23	14.77	15.29	16.30
3000	0.61	1.37	1.94	2.59	3.59	5.31	6.72	8.48	10.86	12.63	14.41	14.98	15.53	16.55
3500	0.61	1.37	1.94	2.63	3.47	5.17	6.99	8.59	11.03	12.68	14.54	14.97	15.76	16.82
4000	0.61	1.37	1.94	2.59	3.44	5.23	7.17	8.89	11.27	12.96	14.65	15.30	16.16	17.02
4500	0.61	1.37	1.96	2.61	3.54	5.27	7.46	9.47	11.64	13.32	15.60	16.41	17.07	18.03
5000	0.61	1.40	2.01	2.69	3.57	5.35	7.47	9.95	12.16	14.00	16.61	17.17	17.57	18.69
5500	0.61	1.40	2.02	2.70	3.59	5.50	7.69	10.40	12.90	14.84	17.17	17.42	17.93	18.78
6000	0.61	1.40	2.04	2.75	3.62	5.64	7.96	10.64	13.26	15.18	17.17	17.68	18.18	18.78
6500	0.61	1.40	2.06	2.77	3.71	5.68	8.02	10.83	13.30	15.35	17.17	17.68	18.18	18.78
7000	0.61	1.42	2.09	2.81	3.88	5.78	8.16	11.03	13.47	15.53	17.17	17.68	18.18	18.78
7500	0.61	1.42	2.10	2.84	3.88	5.84	8.25	11.12	13.64	15.59	17.17	17.68	18.18	18.78

Graph   Copy   Map 1 Active   Map Not Current



9.5.4 Turbo Parameters MAP2

As other Turbo Parameters.



This section controls the manifold pressure via a small valve such as those made by AMAL or LOCTROL. The target pressure is set for any RPM position and the system will ensure this is achieved (if possible given the engine/turbo combination).

1 TARGET PRESSURE
This is the absolute pressure required at the rev band.

2 VALVE FREQUENCY
This is the frequency of switching of the control valve. Most small valves are happy with about 100 – 200 hertz.

3 PID PROP, PID INT, PID DIFF FACTORS
These relate to the control system mathematics. Normally set to 50,10,10. Varying these values alters the speed of response of the closed loop control system. If these figures do not work please feel free to contact us for advice concerning your particular installation. See the introduction to PID controllers at the end of the manual. Note these numbers may have to be NEGATIVE i.e. -50, -10 etc.

4 CONTROL DELAY
This is the delay between the system making a change to the valve and checking to see the result in manifold pressure. It depends on the size of the plenum, turbo and engine. A good starting point would be 0.3 secs.

5 CONTROL ON/OFF
Exactly what it says. If set to N then no control is used. When set to Y the system regulates the manifold pressure.

6 VALVE NORMALLY ON/OFF
This determines whether the switch is on or off when the pressure is below the target. When set to O then when the pressure is low the o/p is switched off. The opposite is true when set to F.

7 TURBO OVERPRESSURE
This turns off the injectors and sparks when the manifold pressure is above this limit. This protects the engine from damage if the boost pressure is far too high.

8 MAX PWM%
Limits the maximum % that will be supplied to the valve. Under no circumstances will this be exceeded.

9 MIN PWM%
Opposite of above, under no circumstances will the PWM% be less than this unless the engine is stopped.

10 MAX PID ADJUSTMENT ALLOWED %
Constrains the maximum adjustment the PID loop can make to this figure.

11 ELECTRIC BLOW OFF TIME
For turbo's with an inbuilt blow off valve these next four values control the timing
Blow off time is the time the valve is operated after activation. It will turn off again if the throttle is opened again before this time is finished.

12 ELECTRIC BLOW OFF PEDAL SENSITIVITY
Distance pedal must travel (in TPS %) towards closed position in the pedal measuring time (as in Throttle Transients) to trip the dump action.

13 BLOW OFF BLANKING TIME
Time before a repeat blow off activation is allowed when the current event finishes.

14 BLOW OFF LIMIT
Pressure below which no blow off action will happen

15 TURBO CONTROL ON?
Turns the control system on and off

16 REVERSE VALVE OPERATION
This inverts the PWM signal to the valve. We like more percentage in the 20 x 14 map to give higher manifold pressure. With some valves this does not happen and a lower percentage gives more pressure. Turning this feature on rectifies this. Note this purely a matter of our preference and is not required.

17 USE 20 X 14 BASE MAP
Essential that you use this. The base settings can be arrived at by using the alternate function of the left hand dyno box knob in real time mapping. Run the engine at the required speed and load and swing the knob until the desired pressure is achieved, press enter just are you would do with fuel and ignition adjustment. This is a lot safer when the engine is running closed loop fuelling so there is no chance of the engine being damaged by incorrect mixture.

18 USE PID LOOP?
Turns on the control loop over the top of the main map. See tutorial at the end of this manual for an explanation of how PID loops work.

19 USE GEAR PWM MODIFIER
Allows a percentage reduction in from the base map when in the lower gears to reduce manifold pressure and therefore wheel spin.

20 USE VEHICLE SPEED MODIFIER
Exactly the same effect as the above but based on vehicle speed.

21 USE 20 x 14 TURBO TARGET MAP
Allows a full 20 x 14 pressure target to be used by the PID control loop. See PID loop above.

22 ELECTRIC BLOW OFF VALVE FITTED
Ctivation of blow off control feature.

9.5.5 Turbo Base PWM MAP2

These maps are used instead of the main maps when the ALS system is active. Normally large negative values are used in the advance map to limit engine power output when the ALS valve is activated.

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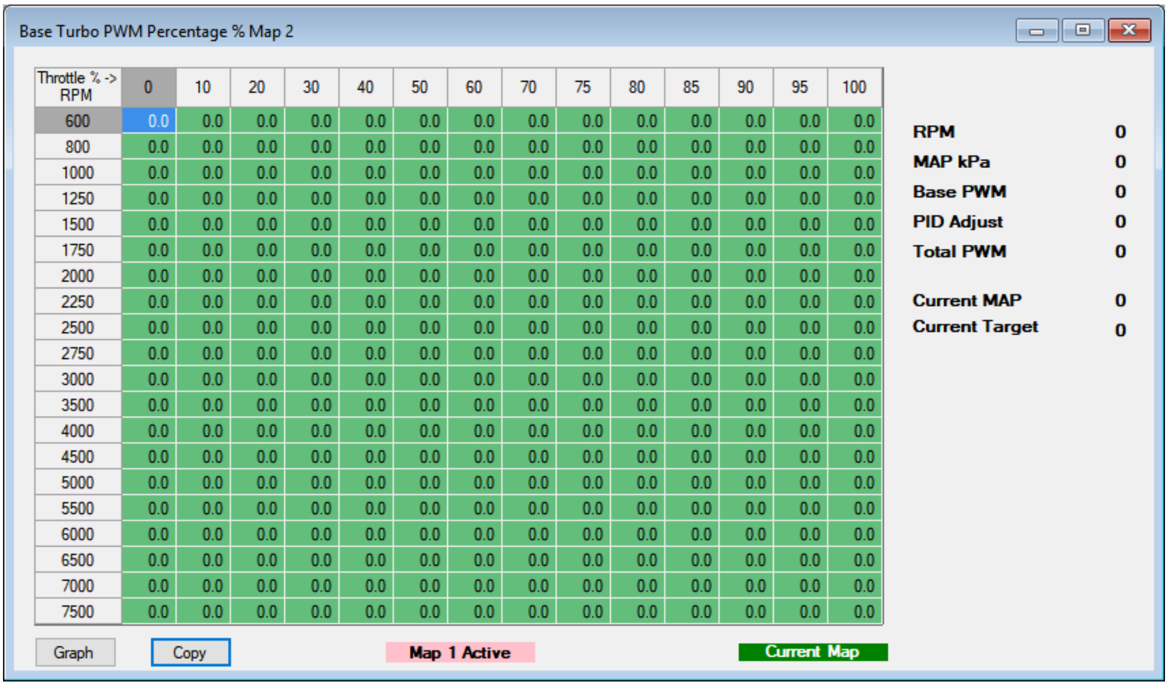
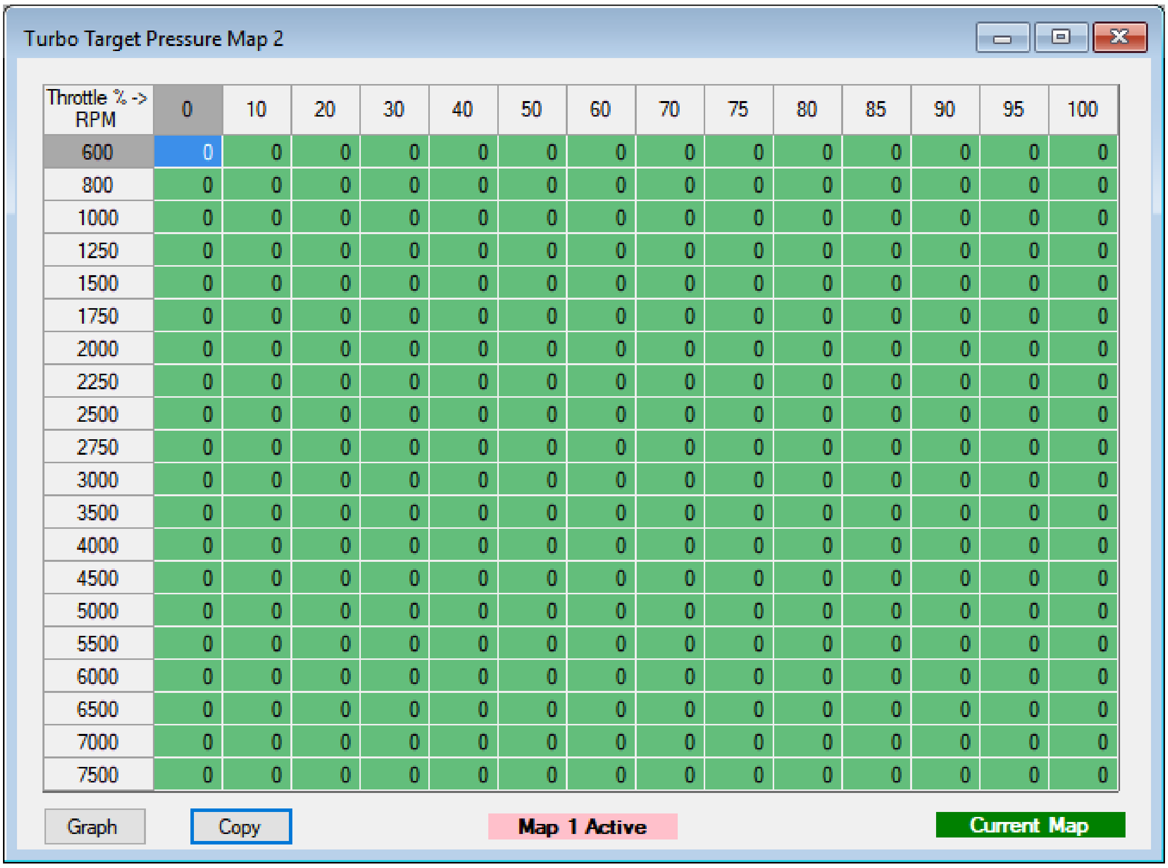


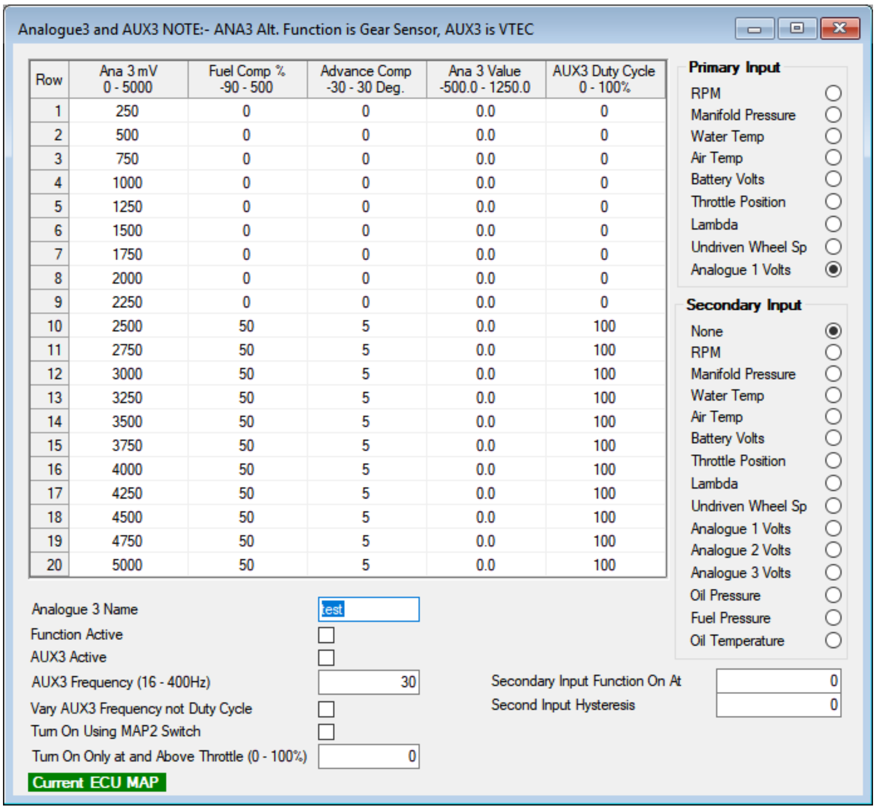
Throttle % -> RPM	0	10	20	30	40	50	60	70	75	80	85	90	95	100
600	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
800	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1250	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1750	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2250	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2750	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

9.5.6 Turbo Target MAP2



Throttle % -> RPM	0	10	20	30	40	50	60	70	75	80	85	90	95	100
600	0	0	0	0	0	0	0	0	0	0	0	0	0	0
800	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1250	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1500	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1750	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2250	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2500	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2750	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3500	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4500	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5500	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6500	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7500	0	0	0	0	0	0	0	0	0	0	0	0	0	0

9.6 Analogue 1 and AUX1



Row	Ana 3 mV 0 - 5000	Fuel Comp % -90 - 500	Advance Comp -30 - 30 Deg.	Ana 3 Value -500.0 - 1250.0	AUX3 Duty Cycle 0 - 100%
1	250	0	0	0.0	0
2	500	0	0	0.0	0
3	750	0	0	0.0	0
4	1000	0	0	0.0	0
5	1250	0	0	0.0	0
6	1500	0	0	0.0	0
7	1750	0	0	0.0	0
8	2000	0	0	0.0	0
9	2250	0	0	0.0	0
10	2500	50	5	0.0	100
11	2750	50	5	0.0	100
12	3000	50	5	0.0	100
13	3250	50	5	0.0	100
14	3500	50	5	0.0	100
15	3750	50	5	0.0	100
16	4000	50	5	0.0	100
17	4250	50	5	0.0	100
18	4500	50	5	0.0	100
19	4750	50	5	0.0	100
20	5000	50	5	0.0	100

These functions are designed to be the ultimate in meeting user defined auxiliary requirements. For instance they can be configured to provide multi stage NOS control, multi-stage water injection, speed related power reduction or even just a straightforward multi stage shift light.

The object is to provide an input, either a dedicated analogue voltage value or any input available to the ECU, to modify fuelling and ignition based on this value and link it to a pulse width valve connected to the output.

FIRST SELECT YOUR INPUT AND SET SCALE

Select your input from the options on the lower right of the screen (upper right V62+). These are self explanatory but the analogue input is an uncommitted 0 - 5 Volt signal from wherever you wish to derive it. Note: unlike the dedicated inputs, the "Analogue x" inputs do not have a pullup resistor and will require one to be wired in if using a resistance-based sensor (e.g. NTC temperature sensor).

Next fill in the scale values (left column) to the range you expect to see.

From V62 onwards a second input is also provided, on any input you choose, which turns on the main function. For instance with the main input set to RPM in the table, the second input could be throttle set to 50%. The function would only turn on above 50% throttle in this case. If the hysteresis is set to say 3% then the function would be on at 50% but would not turn off until 47% was reached. This eliminates hunting or flutter.

FUEL AND ADVANCE CORRECTIONS

Put in any fuel and advance percentage corrections you wish to see for the given input value.

ANALOGUE VALUE

These numbers represent the true physical value of what the input voltage means if the input is an uncommitted analogue value. This is only there for your convenience in remembering the function (i.e. if the voltage represents oil temperature put the correct values in here). These values can be logged and displayed in Real Time Info above firmware version 41.

PWM DUTY CYCLE

This is the on/off percentage of the linked output switch. 0% means the valve is off, 100% means the valve is on. Anywhere in between regulates the flow through the PWM valve (for instance a water injection valve).

ANA NAME

Another item for your convenience. A reminder of what the function does!

FUNCTION ACTIVE

Exactly what it says. If this is checked things happen, if not they don't.

AUX ACTIVE

If this checked then the linked auxiliary is working otherwise it does nothing or has its alternate function (for instance coil 8). Note that function active must be checked as well.

AUX FREQUENCY

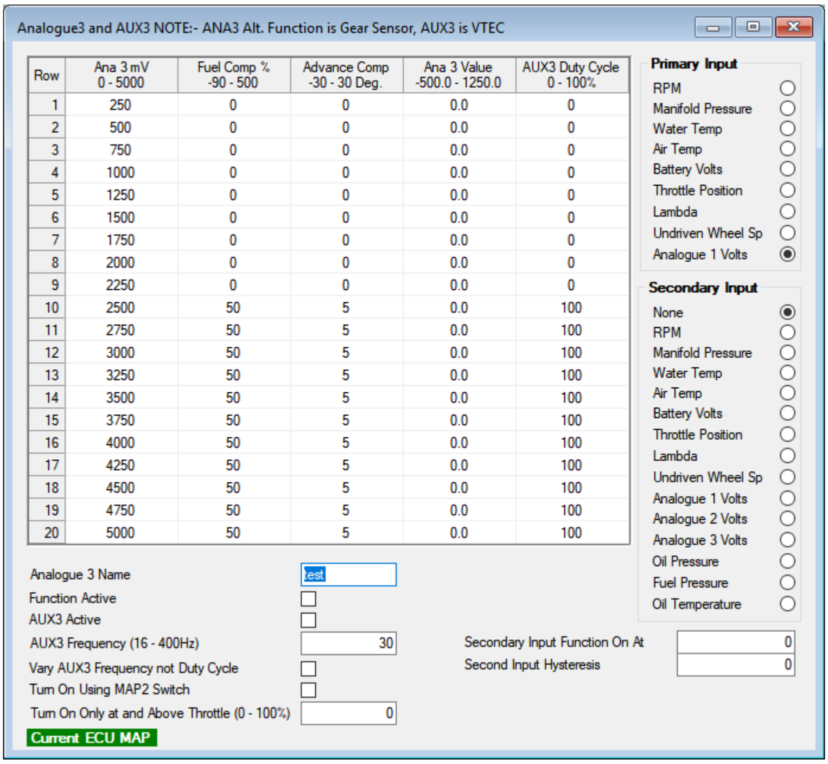
The operating frequency of the linked output. Some OE electric motors (fans, pumps etc.) have built-in controllers that will only allow the motor to operate if the PWM duty is received at a certain frequency. If you find a motor is wired correctly but not working when the Aux output is active, try adjusting the frequency.

TURN ON USING MAP2/ALS SWITCH

This puts the analogue function under control of the external switch. When the switch is turned on the function will work, otherwise no action is taken. This is useful for control of an external valve for controlling, say, NOS or water injection.

Note that there are various other options available in each analogue section which should be self explanatory.

9.7 Analogue 2 and AUX2



Row	Ana 3 mV 0 - 5000	Fuel Comp % -90 - 500	Advance Comp -30 - 30 Deg.	Ana 3 Value -500.0 - 1250.0	AUX3 Duty Cycle 0 - 100%
1	250	0	0	0.0	0
2	500	0	0	0.0	0
3	750	0	0	0.0	0
4	1000	0	0	0.0	0
5	1250	0	0	0.0	0
6	1500	0	0	0.0	0
7	1750	0	0	0.0	0
8	2000	0	0	0.0	0
9	2250	0	0	0.0	0
10	2500	50	5	0.0	100
11	2750	50	5	0.0	100
12	3000	50	5	0.0	100
13	3250	50	5	0.0	100
14	3500	50	5	0.0	100
15	3750	50	5	0.0	100
16	4000	50	5	0.0	100
17	4250	50	5	0.0	100
18	4500	50	5	0.0	100
19	4750	50	5	0.0	100
20	5000	50	5	0.0	100

These functions are designed to be the ultimate in meeting user defined auxiliary requirements. For instance they can be configured to provide multi stage NOS control, multi-stage water injection, speed related power reduction or even just a straightforward multi stage shift light.

The object is to provide an input, either a dedicated analogue voltage value or any input available to the ECU, to modify fuelling and ignition based on this value and link it to a pulse width valve connected to the output.

FIRST SELECT YOUR INPUT AND SET SCALE

Select your input from the options on the lower right of the screen (upper right V62+). These are self explanatory but the analogue input is an uncommitted 0 - 5 Volt signal from wherever you wish to derive it. Note: unlike the dedicated inputs, the "Analogue x" inputs do not have a pullup resistor and will require one to be wired in if using a resistance-based sensor (e.g. NTC temperature sensor).

Next fill in the scale values (left column) to the range you expect to see.

From V62 onwards a second input is also provided, on any input you choose, which turns on the main function. For instance with the main input set to RPM in the table, the second input could be throttle set to 50%. The function would only turn on above 50% throttle in this case. If the hysteresis is set to say 3% then the function would be on at 50% but would not turn off until 47% was reached. This eliminates hunting or flutter.

FUEL AND ADVANCE CORRECTIONS

Put in any fuel and advance percentage corrections you wish to see for the given input value.

ANALOGUE VALUE

These numbers represent the true physical value of what the input voltage means if the input is an uncommitted analogue value. This is only there for your convenience in remembering the function (i.e. if the voltage represents oil temperature put the correct values in here). These values can be logged and displayed in Real Time Info above firmware version 41.

PWM DUTY CYCLE

This is the on/off percentage of the linked output switch. 0% means the valve is off, 100% means the valve is on. Anywhere in between regulates the flow through the PWM valve (for instance a water injection valve).

ANA NAME

Another item for your convenience. A reminder of what the function does!

FUNCTION ACTIVE

Exactly what it says. If this is checked things happen, if not they don't.

AUX ACTIVE

If this checked then the linked auxiliary is working otherwise it does nothing or has its alternate function (for instance coil 8). Note that function active must be checked as well.

AUX FREQUENCY

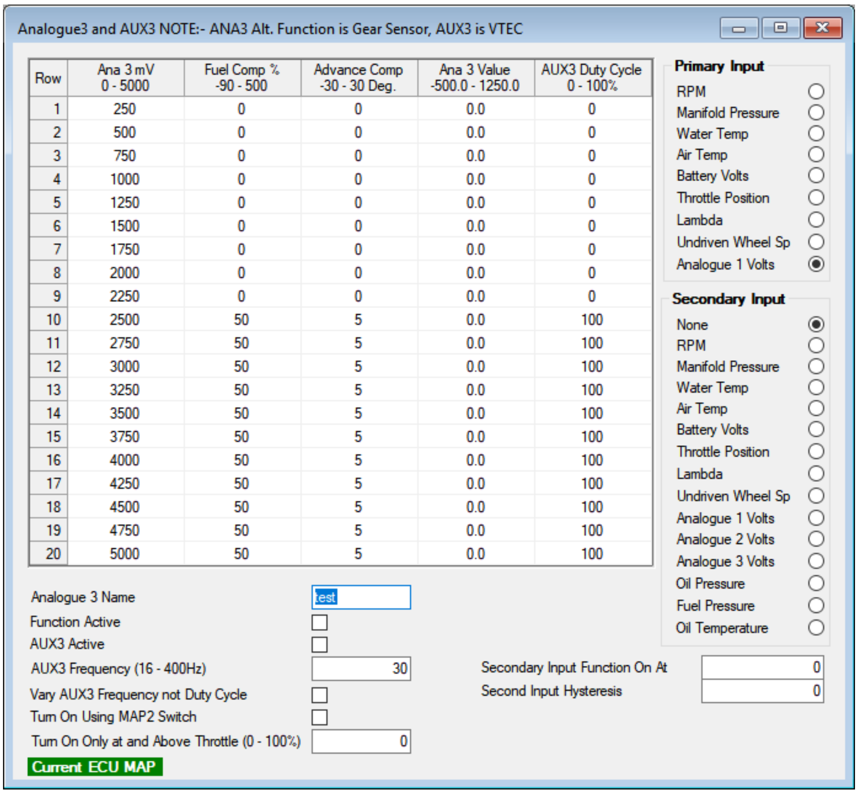
The operating frequency of the linked output. Some OE electric motors (fans, pumps etc.) have built-in controllers that will only allow the motor to operate if the PWM duty is received at a certain frequency. If you find a motor is wired correctly but not working when the Aux output is active, try adjusting the frequency.

TURN ON USING MAP2/ALS SWITCH

This puts the analogue function under control of the external switch. When the switch is turned on the function will work, otherwise no action is taken. This is useful for control of an external valve for controlling, say, NOS or water injection.

Note that there are various other options available in each analogue section which should be self explanatory.

9.8 Analogue 3 and AUX3



These functions are designed to be the ultimate in meeting user defined auxiliary requirements. For instance they can be configured to provide multi stage NOS control, multi-stage water injection, speed related power reduction or even just a straightforward multi stage shift light.

The object is to provide an input, either a dedicated analogue voltage value or any input available to the ECU, to modify fuelling and ignition based on this value and link it to a pulse width valve connected to the output.

FIRST SELECT YOUR INPUT AND SET SCALE

Select your input from the options on the lower right of the screen (upper right V62+). These are self explanatory but the analogue input is an uncommitted 0 - 5 Volt signal from wherever you wish to derive it. Note: unlike the dedicated inputs, the "Analogue x" inputs do not have a pullup resistor and will require one to be wired in if using a resistance-based sensor (e.g. NTC temperature sensor).

Next fill in the scale values (left column) to the range you expect to see.

From V62 onwards a second input is also provided, on any input you choose, which turns on the main function. For instance with the main input set to RPM in the table, the second input could be throttle set to 50%. The function would only turn on above 50% throttle in this case. If the hysteresis is set to say 3% then the function would be on at 50% but would not turn off until 47% was reached. This eliminates hunting or flutter.

FUEL AND ADVANCE CORRECTIONS

Put in any fuel and advance percentage corrections you wish to see for the given input value.

ANALOGUE VALUE

These numbers represent the true physical value of what the input voltage means if the input is an uncommitted analogue value. This is only there for your convenience in remembering the function (i.e. if the voltage represents oil temperature put the correct values in here). These values can be logged and displayed in Real Time Info above firmware version 41.

PWM DUTY CYCLE

This is the on/off percentage of the linked output switch. 0% means the valve is off, 100% means the valve is on. Anywhere in between regulates the flow through the PWM valve (for instance a water injection valve).

ANA NAME

Another item for your convenience. A reminder of what the function does!

FUNCTION ACTIVE

Exactly what it says. If this is checked things happen, if not they don't.

AUX ACTIVE

If this checked then the linked auxiliary is working otherwise it does nothing or has its alternate function (for instance coil 8). Note that function active must be checked as well.

AUX FREQUENCY

The operating frequency of the linked output. Some OE electric motors (fans, pumps etc.) have built-in controllers that will only allow the motor to operate if the PWM duty is received at a certain frequency. If you find a motor is wired correctly but not working when the Aux output is active, try adjusting the frequency.

TURN ON USING MAP2/ALS SWITCH

This puts the analogue function under control of the external switch. When the switch is turned on the function will work, otherwise no action is taken. This is useful for control of an external valve for controlling, say, NOS or water injection.

Note that there are various other options available in each analogue section which should be self explanatory.

9.9 AUX4, 5 and 6

These are simple switch settings to use either dedicated or dual use auxiliaries in a straightforward on/off manner.

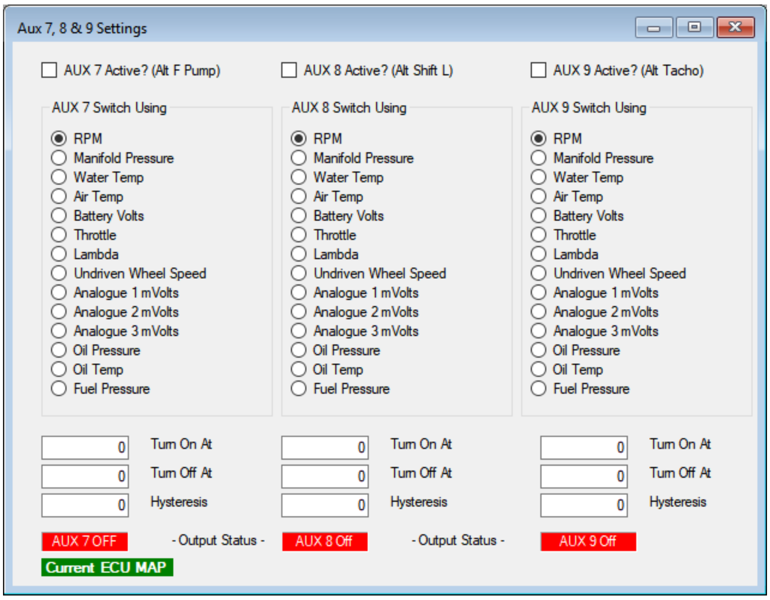
They are off when the engine is stopped or when below the "On At" value. They will turn off above the "Off At" value. "Off At" must always be higher than "On At".

Hysteresis may be added if required to eliminate switch bounce.

Turn the function on or off using the relevant check mark. They can all be handled individually. If the output is in use by some other dedicated function then this will take priority.

E.g. for a fan working off water temperature, you could turn on at 85 (celcius in this case) and off at 150 (a temperature it could never safely reach). When the fan cools the engine below 85°C, it will turn off. To prevent the fan cycling on/off rapidly between something like 85/84, you would add a suitable value in the "Hysteresis" (in this case, 5). This means that once the water temperature has exceeded 85, the fan will turn on but it won't turn off again until the temperature reaches 80.

9.10 AUX7, 8 and 9



These are simple switch settings to use either dedicated or dual use auxiliaries in a straightforward on/off manner.

They are off when the engine is stopped or when below the "On At" value. They will turn off above the "Off At" value. "Off At" must always be higher than "On At".

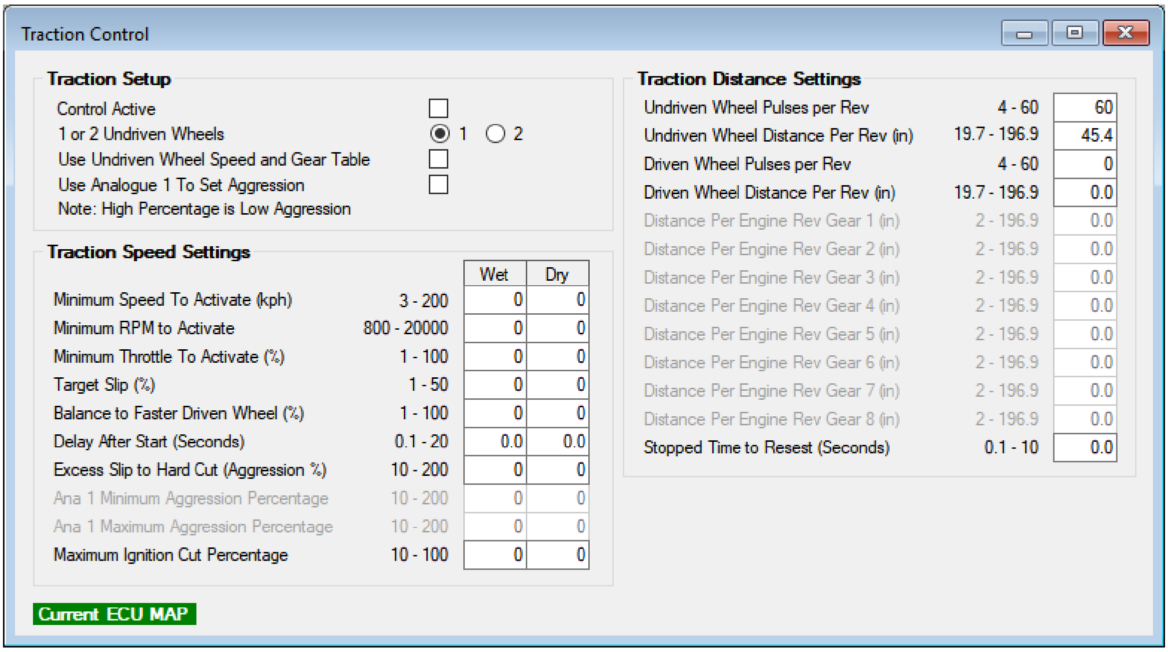
Hysteresis may be added if required to eliminate switch bounce.

Turn the function on or off using the relevant check mark. They can all be handled individually. If the output is in use by some other dedicated function then this will take priority.

E.g. for a fan working off water temperature, you could turn on at 85 (celcius in this case) and off at 150 (a temperature it could never safely reach). When the fan cools the engine below 85°C, it will turn off. To prevent the fan cycling on/off rapidly between something like 85/84, you would add a suitable value in the "Hysteresis" (in this case, 5). This means that once the water temperature has exceeded 85, the fan will turn on but it won't turn off again until the temperature reaches 80.

9.11 Traction Control Settings

AVAILABLE ON S60PRO AND ABOVE



The traction control system, available on S80PRO models and above, is a full 3 or 4 wheel implementation. It will limit the amount of driven wheel spin to any desired slip compared with the undriven wheels. Note that it is not applicable to 4 wheel drive vehicles. Two complete sets of parameters are available to allow for differing conditions. These are controlled by a switch on the dash of the car. If no switch is used then the dry settings are used. Besides the wet/dry switch an on/off switch must be fitted on the dash. This switch is not optional as the default for this function is off.

On an S60PRO the system uses a single wheel speed sensor and knowledge of the current gear to work out the driven wheel speed from engine RPM. Only one set of settings is available on an S60.

MINIMUM SPEED TO ACTIVATE

Below this undriven wheel speed the vehicle is considered to be stopped and the traction control will take no action.

MINIMUM RPM TO ACTIVATE

Below this RPM the traction control will take no action. Setting depends on engine performance and the desired car dynamics.

MINIMUM THROTTLE TO ACTIVATE

Below this throttle position the traction control system will take no action.

TARGET SLIP PERCENTAGE

The system constantly calculates the difference in wheel speed between driven and undriven wheels. Some slip is beneficial to maximum acceleration, say about 20%. Start line situations are different and require the use of Launch Control. If launch control is active then the traction control will take no action until this has relinquished control over the system.

BALANCE TO FASTER DRIVEN WHEEL

This setting is used to allow some speed averaging across the two driven wheels. For instance in the case of a free differential it should be set to nearly 100%. In a car with a very stiff limited slip differential it should be set to say 25%.

DELAY AFTER START

After the system detects that a car has stated to move it waits this length of time before engaging traction control (unless launch is active see above). There is also a delay before the system considers a car is stopped. This is to allow for the locked brake situation. See General Traction Settings.

EXCESS SLIP TO HARD CUT (Aggression)

This effectively decides how aggressive the cylinder cutting is when slip is detected. If it is too aggressive the car is unstable. Only testing can determine at what level this should be set. Note a LOW number makes the system more aggressive, a HIGH number less so.

ANA1 MINIMUM / MAXIMUM AGGRESSION / USE ANA1 TO SET AGGRESSION

When using a potentiometer connected to the ANA1 input to allow a dashboard settable “Aggression” for the traction control these numbers set the allowable range of settings. Because the switch on an S60 is not available to turn traction on and off, this knob allows the traction control to be turned off. A voltage above 4850mV presented to the ANA1 input turns off the traction control system.

MAXIMUM IGNITION CUT PERCENTAGE

Provides an upper clamp on the amount of cut (aggression) which can be applied. Stops the engine being given a hard cut which can be unsettling.

USE UNDRIVEN WHEEL SPEED AND GEAR TABLE

The only method available on an S60, an alternative method on an S80 and above. The distance table must be filled out for each gear. This is the distance the vehicle travels for each rotation of the engine. This can be measured or easily calculated if you know the gear and final drive ratios.

NOTE That if launch control is activated then traction control will not engage until this has finished operating.

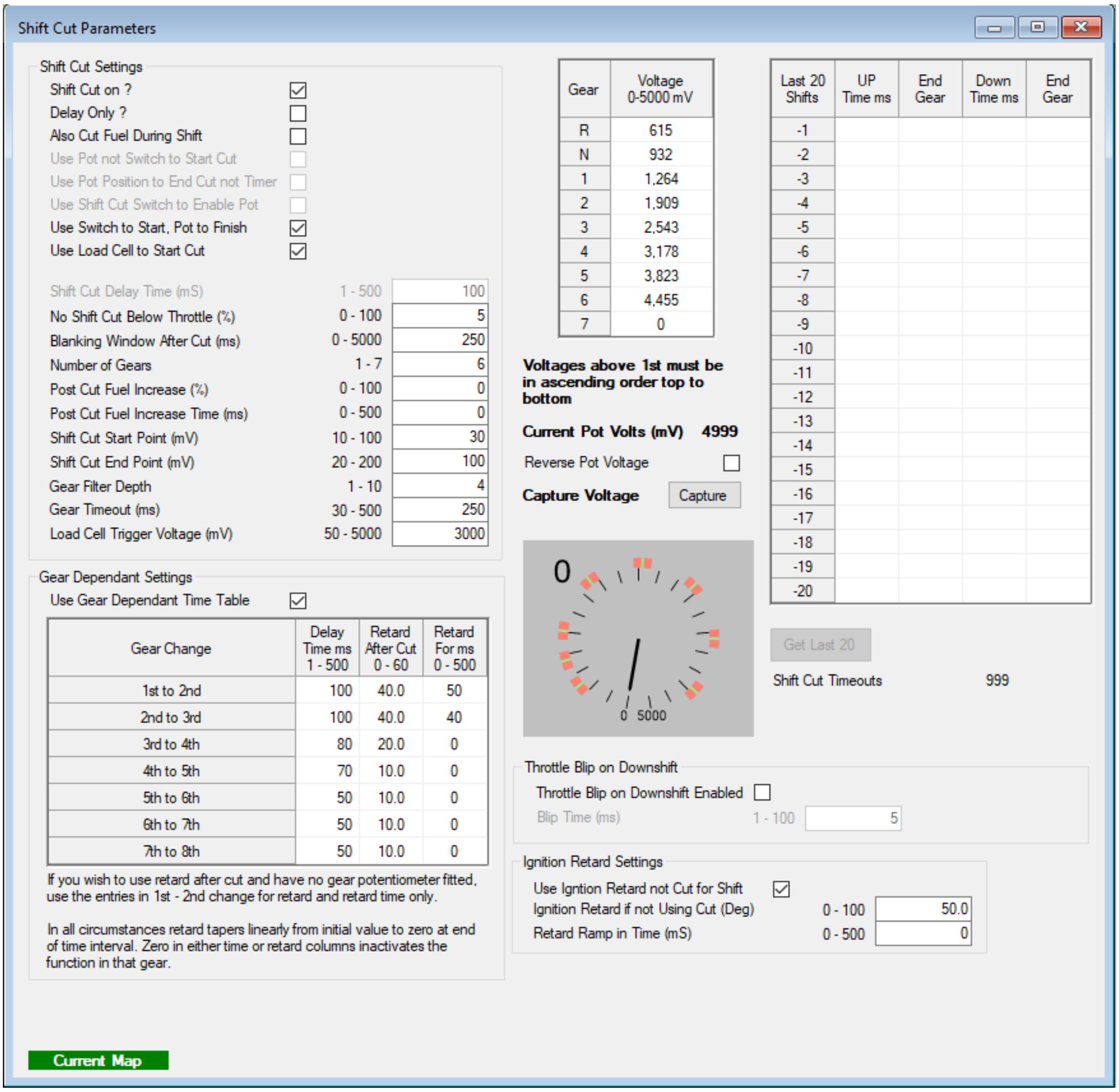
9.12 Launch, Shift Cut and Paddle Shift

Enter topic text here.

9.12.1 Launch Control and Shift Cut

Enter topic text here.

9.12.2 Shift Cut



The gear shift cut section allows the ignition to be turned off when a gear change is in progress with a sequential gear box. The signal is provided by a switch, usually mounted on the gear lever.

GEAR SHIFT CUT ON ?

Yes no answer, is this function active.

DELAY ONLY
This ignores the time the button is pressed and just uses the delay from first contact

CUT FUEL DURING SHIFT
This option adds fuel cut as well as ignition cut or retard during the shift time.

USE POT NOT SWITCH TO START CUT
Allows the use of the gear position potentiometer to initiate the gear cut.

USE POT POSITION TO END CUT NOT TIMER
With this option the shift cut is terminated when the next gear is seen to be engaged rather than relying on a timer. Also called “Closed Loop”.

USE SHIFT CUT SWITCH TO ENABLE POT
When using closed loop using the pot to initiate the cut the switch becomes available for other uses. Using this check mark allows the switch to be used as an enable function. Useful for times when the pot goes faulty.

USE SWITCH TO START, POT TO FINISH
Allows closed loop timing but the advantage of a positive switched start to the cut.

USE LOAD CELL TO START CUT (S60+)
Enables the use of a load cell attached to Analogue 2.

A load cell can only be used to initiate a cut, so either a potentiometer must be used to end the cut, or a simple delay must be used.

The Load Cell Trigger Voltage in millivolts is the voltage at which the cut is initiated. This value must be entered.

SHIFT CUT DELAY TIME
Time in milliseconds after the shift signal ends to continue to cut/retard the ignition. Used to allow mechanical settling of the gearbox after engagement. Consult gearbox manufacturer for a suitable figure.

NO SHIFT CUT BELOW THROTTLE
If the throttle position is below or equal to this figure then no engine cutting takes place. Used to allow engagement of first gear on the start line without stopping the engine!

BLANKING WINDOW AFTER CUT (MS)
Lock out period to prevent multiple cuts being initiated

SHIFT CUT START POINT (mV) and SHIFT CUT END POINT (mV)
The shift cut is started when the ana3 voltage is between current gear centre table voltage + the start point voltage and current gear centre table voltage + the end point voltage. For example if the gear centre voltage is 1200mV and the start point is 50 mV then a voltage of 1251mV will trigger a shift cut. If using pot position to end the cut this is terminated when the next gear centre position – the shift cut start point is reached. If the next gear is 1800mV and the start point is 50 mV then the cut is terminated when the voltage on ana3 = 1750 mV.

NUMBER OF GEARS
The number of forward gears.

POST FUEL CUT INCREASE / INCREASE TIME
If using both fuel and ignition cut or fuel cut and ignition retard then additional fuel may be needed after the change completion. This variable allows for this to be done and ramped out over the specified time.

GEAR FILTER DEPTH
Voltage smoothing filter on gear potentiometer signal. Start at 10.

GEAR TIMEOUT
Maximum time before change is considered failed and cut is terminated even if next gear is not reached. A count of these events is kept and displayed on the right hand side of the screen.

RETARD AFTER CUT *(Firmware V42 and upwards)*

After the shift cut delay has finished the engine can be retarded so power is reduced to eliminate wheel spin after the change. The retardation starts at the figure in the second column and reduces to zero at the end of the specified retardation time. If you are not using the gear dependent table then use the entries in the 1st to 2nd change.

NOTE:- This will not help if the cause of the wheel spin is a heavy flywheel.

RETARD IF NOT USING CUT
Provided as a less aggressive way of reducing engine power during the gear change event. Instead of completely cutting the engine, a very heavy retard (say 60 degrees+) can be used instead to facilitate load reduction on the gears during the gear change.

USE IGNITION RETARD NOT CUT FOR CHANGE
Activates the retard method rather than the complete cut method.

RETARD RAMP IN TIME
Ramps in the ignition retard specified above in a straight line over this time. If say 30 degrees is specified for the retard then the retard starts at 0 and increases to 30 degrees in the specified time.

Generally only needed on very small engines with light/no flywheels.

GEAR BASED DELAY TABLE
This allows differing times to change between different gears. Obviously a gear sensor must be fitted and calibrated in sensor scaling. The gear potentiometer is fitted and shared with Ana3.

Change times may be optimised by using fast logging mode and recording

Shift Cut Switch:-	Shows when switch is active
Ana3 Voltage:-	Shows exact movement of gear potentiometer
Shift Cut Status:-	Shows how long shift cut is in operation
Gear:-	Shows current gear

GEAR VOLTAGE TABLE
When on line to the ECU put the gearbox into each gear in turn, click with your mouse in the voltage column beside the relevant gear then click on the “Capture Voltage” button. This will insert the current voltage into the cell with the focus. Try this several times for each gear to get a feel for the spread of voltages involved.

REVERSE POT VOLTAGE
If the 5V and GND connections to the pot cannot be changed for any reason this allows the voltage to be reversed in software so the voltage in each gear always rises. Rising voltage with gear is required for closed loop shift cut control. The exception to this rule is neutral which can be between any pair of gears without causing a problem.

GEAR INDICATOR
Gives a visual indication of the current gear, the Dead Band selected and the trip point.

THROTTLE BLIP ON DOWN SHIFT
Enables throttle blip on down shift using the potentiometer to initiate the blip. AUX 6 must be connected to the electronic solenoid via a relay.

Use the checkbox to enable the function and enter the blip time.

The throttle opening angle is controlled by the device blipping the throttle.

This can be used with the STC drive by wire throttle controller to blip the throttle, for a complete solution.

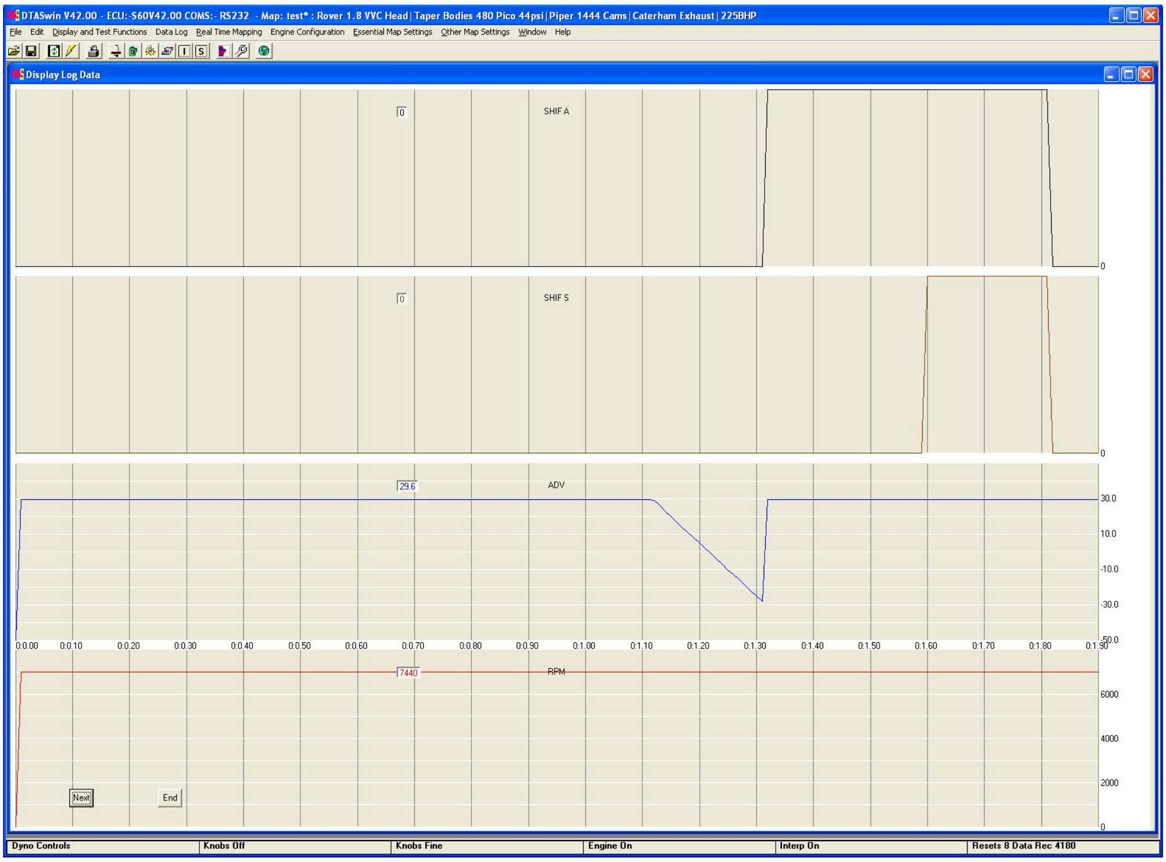
LOAD CELL
Enables the use of a load cell attached to Analogue 2.

A load cell can only be used to initiate a cut, so either a potentiometer must be used to end the cut, or a simple delay must be used.

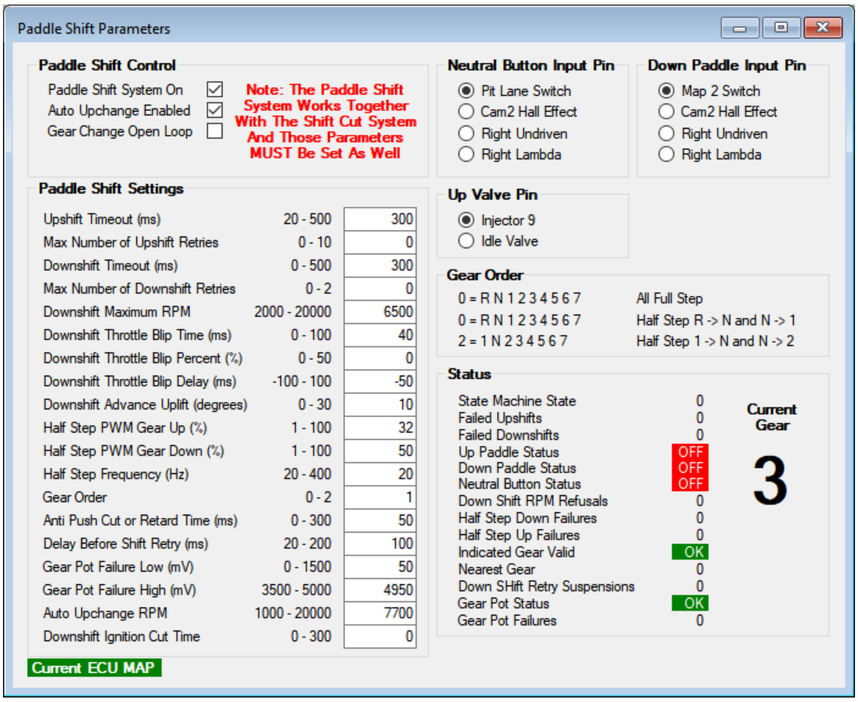
The Load Cell Trigger Voltage in millivolts at which the cut is initiated.

LAST TWENTY SHIFTS
Clicking on the button gives an indication of time taken for the last twenty gear shifts in closed loop together with the destination gear.

Below is a log output of actions during a shift cut and following advance retard.



9.12.3 Paddle Shift



The paddle shift system is designed to work in conjunction with the shift cut system and both need to run closed loop, i.e. Pot to Start, Pot To Finish in shift cut settings. The system expects to see an up paddle switch, a down paddle switch and a neutral button.

Outputs are provided for an up valve, a down valve, a throttle blipper and a neutral interlock valve.

A selection of inputs are provided for the down paddle switch and the neutral button, the up paddle is always connected to the shift cut input. Details of these can be found on the wiring diagram.

Any movement of gears below 1st requires the neutral button to be pressed e.g. 1st to N, N to R, R to N, N to 1st.

The above numbers are a working set from our test vehicle equipped with a Ford Duratec engine and a Sadev gearbox and can be used as a start point for most installations.

CHECK BOXES

PADDLE SYSTEM ON
Turns on the Paddle Shift system. Note Shift Cut must be enabled and working in closed loop.

AUTO UPCHANGE ENABLED
Turns on auto upchange. Refer to the Auto Upchange RPM section below for further detail.

GEAR CHANGE OPEN LOOP
Not for use in general but enables you to check the valves are all working as they should.

Parameter Settings:-

UPSHIFT TIMEOUT
Length of time in mS before an attempted shift is abandoned when the next gear has not been successfully reached. If re-trys are enabled a re-try will be executed else another pull on the paddle is required. Make this the same as shift-cut timeout.

MAX UPSHIFT RE-TRYS
Number of re-trys on a failed shift allowed.

DOWNSHIFT TIMEOUT
Length of time in mS before an attempted shift is abandoned when the next gear has not been successfully reached. If re-trys are enabled a re-try will be executed else another pull on the paddle is required.

MAX DOWNSHIFT RE-TRYS
Number of re-trys on a failed shift allowed.

DOWNSHIFT MAX RPM
If the engine RPM is above this limit a downshift request will be blocked and the attempt reported in the status frame.

DOWNSHIFT THROTTLE BLIP TIME
Length of time that the throttle blip valve is open for. Found by experiment on the vehicle. Around 50mS suits our car and pneumatic system.

DOWNSHIFT THROTTLE BLIP PERCENT
Only applies if you are using an STC to control a FBW throttle system. If you are this is the maximum throttle angle that will be achieved.

DOWNSHIFT THROTTLE BLIP DELAY
Note this can be a lead or lag on the blip. If this number is negative then after the down paddle is activated, the blip valve is activated for this length of time before the down valve goes active. If it is positive then the down valve is activated first before the blip. A negative value is normal.

DOWNSHIFT ADVANCE UPLIFT
During the blip the ignition advance can optionally be increased. This may help to unload the gearbox dogs. This is not often required.

HALF STEP PWM GEAR UP AND DOWN
A pneumatic valve cannot inherently do a half length step for engaging neutral on some gearboxes. By pulsing the valves the selection process can be slowed down such that the ECU can stop the action when neutral is reached. Too low a value and the change does not happen, too high a value and neutral will be bypassed and the next full step gear reached. Just experiment until the most suitable level is reached.

HALF STEP FREQUENCY
The frequency of the PWM pulses for the half step. Most likely value to use 20 Hz.

GEAR ORDER
Allowable values are 0, 1 and 2. The gear layout these correspond to are on the screen.

ANTI PUSH TIME
After a down change the engine may be cut or retarded (depending on the choices in Shift Cut Settings). This may be required to stop the car “Pushing On” after the change. Again experiment at the track with this.

DELAY BEFORE SHIFT RETRY
After a failed shift, if re-trys are enabled, this delay allows the valves all to relax to their non operative positions. 100mS should be enough but it can be quite difficult to test as failed shifts should be very rare.

GEAR POT FAILURE LOW AND HIGH VOLTS
Tells the system what are allowed voltages for the gear position sensor. If the pot is detected as failed re-trys will be suspended and the system will revert to open loop operation.

AUTO UPCHANGE RPM
If auto up change is enabled then this is the RPM at which the change will take place. Note auto up change is invoked by pulling the up paddle continuously. As an example when entering the straight after a corner, at the point you would normally select the next gear you pull the up paddle and hold it, subsequent changes will happen automatically at the change RPM. At the end of the straight let go.

DOWNSHIFT IGNITION CUT TIME
Some gearboxes require the ignition to be cut on downshift when the throttle is closed. Enter the required time here. 40 to 50ms is normally sufficient.

FULL THROTTLE DOWNSHIFT
This enables the driver to attempt a downshift when at full throttle, in the situation where a downshift has failed without the driver realising.

FULL THROTTLE DOWNSHIFT MAX THROTTLE
This is the maximum throttle opening allowed for this function.
WARNING - You MUST ensure you only allow this downshift to happen when appropriate for the gearbox installed. Using unsuitable values will damage the gearbox.
Consult the gearbox manufacturer for recommended settings.

STATUS PANEL

Most of these are self explanatory and show obvious error situations and counters. A few odd ones are listed below.

State Machine State:- Internal number used by DTA during development, not of any interest to the end user.
Indicated Gear Valid:- Shows if the gear position sensor is currently within the acceptance band of a gear centre as defined in Shift Cut Settings. If it is not then it indicates the gear pot may not be functioning correctly and therefore re-trys are suspended. This does not stop you pulling for another gear but the system will go open loop effectively in this situation.

The down paddle MUST be released between changes. Continuous down changes are not allowed for safety reasons.

Note the status of all the switches and valves can be logged during fine tuning of the settings. Below is a typical down change log from 3rd to 2nd :-

RPM	THROT	ANA3	GEAR	SHIF S&P	SHIF A
3842	0	2543	3	DB	0
3837	0	2543	3	DB	0

3814	3	2544	3	DB	0
3812	25	2543	3	D	0
3787	44	2543	3	D	0
3762	42	2544	3	DDV	0
3753	40	2543	3	DDV	0
3724	23	2543	3	DDV	0
3724	3	2453	3	DDV	0
3733	0	2370	3	DDV	0
3702	0	2279	3	DDV	0
3680	0	2130	3	DDV	0
3647	0	2060	3	DDV	0
3750	0	1906	2	A	0
3863	0	1886	2	A	0
3961	0	1885	2	A	0
4120	0	1902	2	A	0
4120	0	1899	2	A	0

Each record is 10 mS. The key on the Shift Switches and Paddles is

D = Down Paddle
B = Blip Valve
DV = Down Valve
A = Anti-push

This log shows a 30 mS blip time on a 50 mS blip lead. The down valve is open for 80 mS and once the barrel starts to move (ana3 volts) the change actually takes 60 mS. The anti push is active for 50 mS after the change is complete.

Note also the lag between the blip valve going active and the butterfly moving, air pressure takes time to build up. This is why most situations require a lead on the blip valve.

Below is an up change at full throttle from 2nd to 3rd .

RPM	THROT	ANA3	GEAR	SHIF S&P	SHIF A
5287	100	1900	2	-	0
5366	100	1899	2	UUV	0

5233	100	1900	2	UUV	0
5323	100	1904	2	UUV	0
5347	100	2001	2	UUV	1
5428	100	2014	2	UUV	1
5247	100	2018	2	UUV	1
4996	100	2021	2	UUV	1
4925	100	2026	2	UUV	1
4822	100	2051	2	UUV	1
4778	100	2145	2	UUV	1
4700	100	2497	2	UUV	1
4605	100	2472	3	U	0
4502	100	2524	3	U	0
4383	100	2563	3	-	0

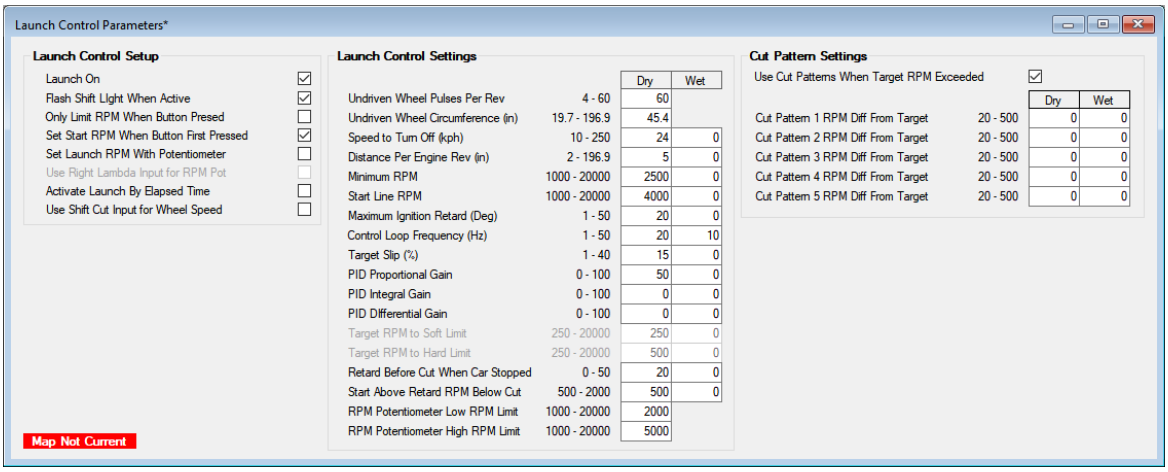
Each record is 10 mS. The key on the Shift Switches and Paddles is

U = Up Paddle
UV = Up Valve
Shift A is shift cut active.

With this change the up paddle and up valve occur simultaneously. After 30 mS the barrel starts to move and shift cut goes active, just as it would with a manual change. After a further 80 mS the shift is complete, shift cut and the valve are deactivated. Note the driver is still pulling the up paddle for a further 20 mS but this is ignored as it is within the Blanking Window set in Shift Cut Settings.

9.12.4 Launch Control

From V68 On Launch Control and Shift Cut have been split into two pages. Variable definitions remain the same.



Launch control is a means of allowing the ECU control of the engine power output during the race start phase to provide the best possible traction from the start line. The driver maintains full throttle at all times, even when stationary with the clutch depressed. As soon as the car begins to move the ECU reduces power output by first retarding the ignition advance and if this still does not control the rpm it will cut one or all cylinders as required to keep the engine RPM to the limits set in this section. An un-driven wheel speed sensor is required (hall effect wired as the wiring diagram) and a push button switch on the dashboard to activate the system. The driver comes to the start line, depresses the clutch and engages gear. The launch control button is pressed (the gear change light will flash repeatedly to signal that all is working) and presses the throttle fully open. The engine will be held at the start line rev limit as set below. This requires the use of the hard cut limit (done automatically by the system) so the engine sounds very peculiar. When the clutch is released the ECU will control the engine revs to maintain the target slip percentage until the turn off speed is reached. After this time it will allow the engine to run free until the button is pressed again.

LAUNCH CONTROL ON

This is main engagement switch. When set to N nothing will happen. When set to Y when the button is pressed the system is armed and the gear change light will flash. It will continue to flash until either the turn off speed is reached or the button is pressed again.

FLASH SHIFT LIGHT WHEN ACTIVE

When checked, this will flash the shift light rapidly to indicate that the launch control is activated.

LIMIT RPM WHEN BUTTON PRESSED ONLY

With this option no sensor is needed and the rpm is limited to the start line RPM as long as the launch button is pressed.

SET START RPM WHEN BUTTON FIRST PRESSED

The engine start line RPM is set at whatever RPM the engine is doing the instant the launch activation button is pressed.

SET RPM WITH POTENTIOMETER ON ANA1

A potentiometer connected on the ana1 input can be used to set the startline RPM limit between 1000 rpm and the soft rev limit.

USE RIGHT LAMBDA INPUT FOR RPM POT

Allows the pot to wired into the right hand lambda input instead of ANA1. Only available on an S80/S100.

ACTIVATE LAUNCH CONTROL BY ELAPSED TIME

This feature is used when a wheel speed sensor is not allowed or cannot be fitted. See separate section below.

USE SHIFT CUT INPUT FOR WHEEL SPEED

Allows the shift cut input to be used to measure left undriven speed. Note this cannot be used with high tooth counts on the sensor wheel (higher than 8).

UNDRIVEN WHEEL PULSES PER ROTATION

This is the number of pulses the hall effect sensor sees i.e. if using the brake disc the number of holes in the disc.

UNDRIVEN WHEEL CIRCUMFERENCE DISTANCE PER ROTATION (in mm)

Either measure the Circumference of the wheel of use 3.142 x diameter of the wheel.

SPEED TO TURN OFF

Undriven wheel speed to turn off the system. Normally set to the maximum speed in first gear.

DISTANCE PER ENGINE ROTATION

Distance the car travels in the start gear per rotation of the engine.

formula :-   distance = (wheel diameter x 3.142)/(fist gear ratio x final drive ratio)

example (584 x 3.142)/(2.57 x 3.89) = 184 mm

NB. if you change the tyre diameter or the first gear or final drive ratio this needs changing!

MINIMUM RPM

This is the absolute minimum rpm allowed by the control. At this point all retard etc. is removed as quickly as possible so that the engine does not bog down.

START LINE RPM

This is the RPM that the engine is held at while using full throttle on the start line. It is also the rpm that is targeted initially immediately the car starts to move. As the speed increases to the point that the target RPM is above this figure the engine is allowed to go faster.

PID GAINS

These figures control the mathematics of this function. Leave as originally set i.e. 80,20,0 unless you have problems, in which read the introduction to PID controllers at the end of this manual.

TARGET RPM TO SOFT LIMIT/HARD LIMIT

The system will initially try to control the engine using ignition retard. If this is not enough then first the soft limit will be invoked at this RPM ABOVE the target, secondly the hard limit will be invoked. The hard limit is very rarely hit in normal circumstances. Note that this is target rpm to so if the start line limit is say 6000 and you want a maximum of 6500 then this should be set to 500, not 6500.

RETARD BEFORE CUT WHEN CAR STOPPED (Firmware V47 and above)

When the car is stopped or the option limit RPM when button pressed only is chosen this and the following number allow for a large ignition retard to be applied. This helps in building boost on the start line for turbo engines. This number is the maximum retard that will be applied. This occurs just before the hard limit applies (at the start line RPM). The RPM band in the next number tells the system when to start. With a startline RPM of 7000, Retard RPM band of 2000 and a maximum retard of 60 degrees then at 5000 RPM there is no retard, 6000 RPM there is 30 degrees and 7000 RPM the retard is 60 degrees. This is added to the advance in the main ignition table to give the actual ignition timing on the engine. Setting the maximum retard to 0 disables the function.

RETARD RPM BEFORE CUT

See above.

RPM POT LOW / HIGH LIMITS

When using a potentiometer to set the launch start line RPM these numbers constrain the maximum spread the pot can achieve. Fully anticlockwise gives the low limit, clockwise the high one.

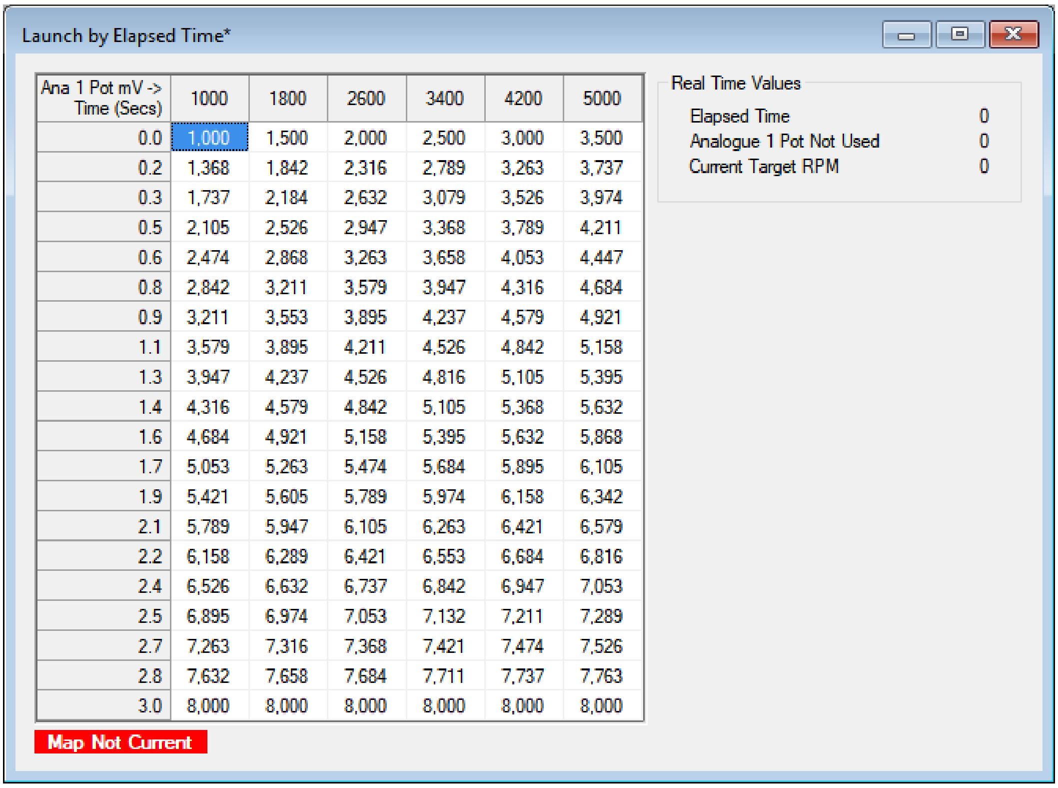
USE CUT PATTERNS WHEN TARGET RPM EXCEEDED/ CUT PATTERN RPMS

Instead of a simple RPM gap to the soft and hard limits this allows the newer random cut pattern technique to be used. Cut patterns are set in Essential Map Settings/Spark and Fuel Cut Patterns. These come into operation at the target RPM + RPM differences listed in the right hand table. For example if the target RPM is currently 4500 and Cut pattern 1 RPM Difference is set to 150 then cut pattern 1 operates at 4650 RPM.

Please remember that the settings for wet and dry situations are unlikely to be the same. Also in the wet some modulation of the throttle pedal will improve the performance.

S80 and 100 V45 and later have two sets of launch parameters for wet and dry conditions. These are controlled via the traction Wet/Dry switch

9.12.5 Launch by Elapsed Time



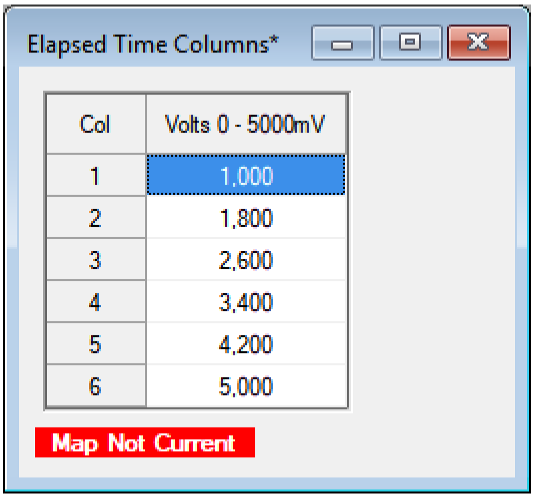
Ana 1 Pot mV -> Time (Secs)	1000	1800	2600	3400	4200	5000
0.0	1,000	1,500	2,000	2,500	3,000	3,500
0.2	1,368	1,842	2,316	2,789	3,263	3,737
0.3	1,737	2,184	2,632	3,079	3,526	3,974
0.5	2,105	2,526	2,947	3,368	3,789	4,211
0.6	2,474	2,868	3,263	3,658	4,053	4,447
0.8	2,842	3,211	3,579	3,947	4,316	4,684
0.9	3,211	3,553	3,895	4,237	4,579	4,921
1.1	3,579	3,895	4,211	4,526	4,842	5,158
1.3	3,947	4,237	4,526	4,816	5,105	5,395
1.4	4,316	4,579	4,842	5,105	5,368	5,632
1.6	4,684	4,921	5,158	5,395	5,632	5,868
1.7	5,053	5,263	5,474	5,684	5,895	6,105
1.9	5,421	5,605	5,789	5,974	6,158	6,342
2.1	5,789	5,947	6,105	6,263	6,421	6,579
2.2	6,158	6,289	6,421	6,553	6,684	6,816
2.4	6,526	6,632	6,737	6,842	6,947	7,053
2.5	6,895	6,974	7,053	7,132	7,211	7,289
2.7	7,263	7,316	7,368	7,421	7,474	7,526
2.8	7,632	7,658	7,684	7,711	7,737	7,763
3.0	8,000	8,000	8,000	8,000	8,000	8,000

The rows axis in this table is seconds, the columns axis is the voltage from the potentiometer connected to Analogue 1. Individual tables allow for the setting of each of these axis. The potentiometer on Ana1 is activated by the “SET RPM WITH POTENTIOMETER ON ANA1” check mark. If this checkmark is not set then the first column is used.

The individual table entries are the target RPM for that combination of RPM and Ana1 voltage. The only way to determine the best RPM profile is by experiment.

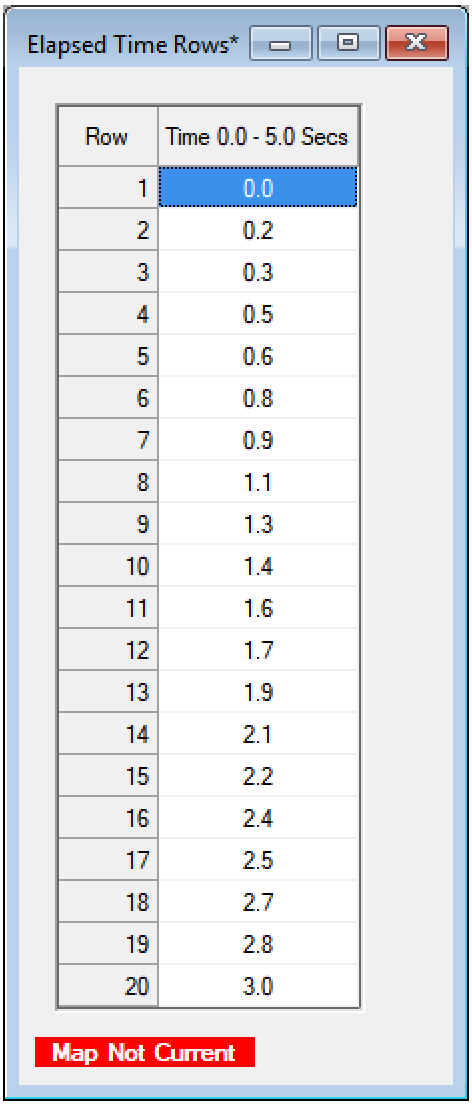
In use the driver presses and holds the launch button. This engages the RPM figure in the first row at the selected column as the startline RPM allowing the use of full throttle. When the clutch and the button are released simultaneously the timer will start, the target RPM changing to the appropriate cell selection. The system disengages when the highest time in the last row is exceeded.

9.12.6 Elapsed Time Columns Map



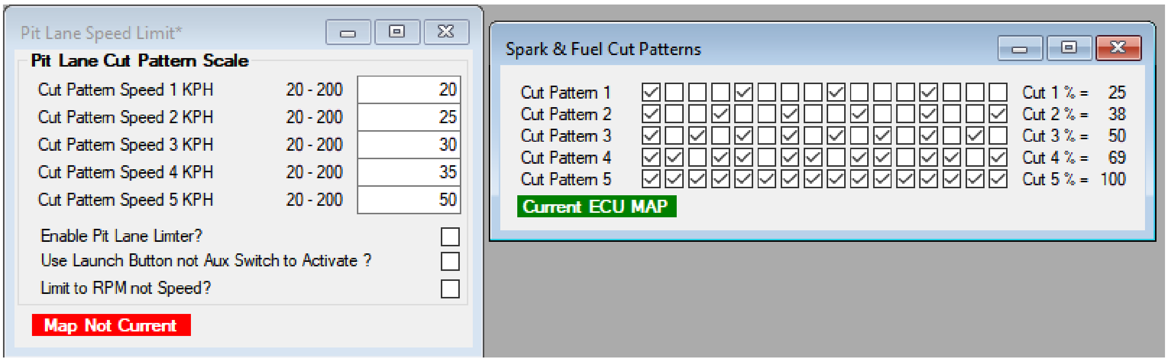
Col	Volts 0 - 5000mV
1	1,000
2	1,800
3	2,600
4	3,400
5	4,200
6	5,000

9.12.7 Elapsed Time Rows Map



Row	Time 0.0 - 5.0 Secs
1	0.0
2	0.2
3	0.3
4	0.5
5	0.6
6	0.8
7	0.9
8	1.1
9	1.3
10	1.4
11	1.6
12	1.7
13	1.9
14	2.1
15	2.2
16	2.4
17	2.5
18	2.7
19	2.8
20	3.0

9.13 Pit Lane Speed Limit



This function is used in association with the spark and fuel cut patterns used for normal RPM limit. This function shifts the RPM or speed at which these cut patterns are effective when the aux switch or launch button is activated depending on settings.

CUT PATTERN 1 – 5 RPM

This is the RPM or speed at which the associated cut pattern gets activated. The highest numbered cut pattern will normally cut all sparks or fuel or both. Note this is a scale value so must increase from top to bottom.

ENABLE PIT LANE LIMITER

Turn function on or off.

USE LAUNCH BUTTON TO ACTIVATE

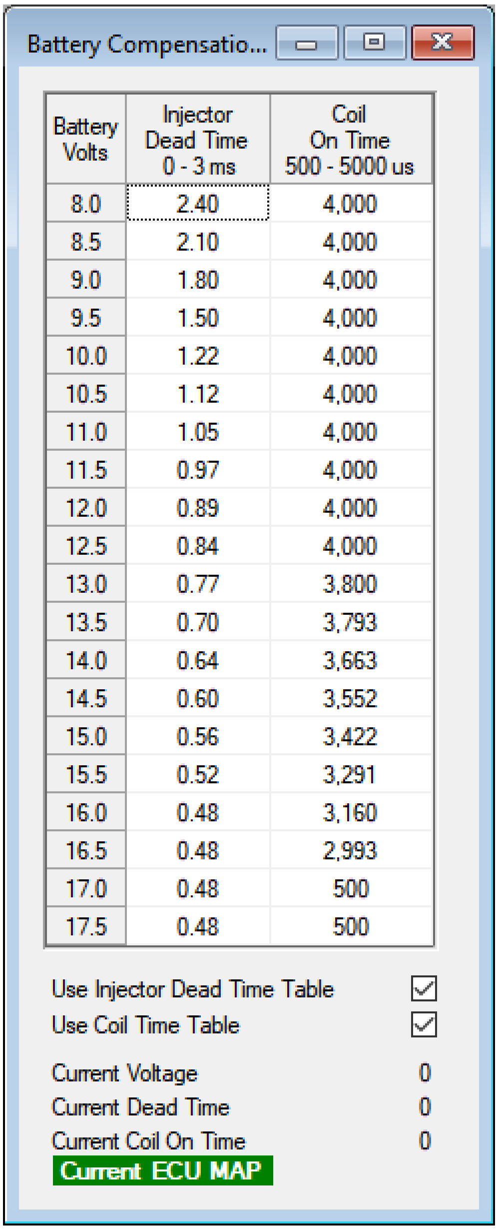
This function defaults to using the Aux Switch input on an S80/S100. If this is not present you can use the launch button instead by checking this box. Note you cannot use the launch feature simultaneously.

LIMIT TO RPM NOT SPEED

If a speed sensor is not fitted you can use RPM instead. Obviously this only translates to a specific speed in one gear.

9.14 Battery Compensations

Assuming information is available from your manufacture of coils and injectors this function can be filled out and used. Such information is not easy to obtain in a lot of cases.
Alternatively use the Injector Dead Time 77 test to check the injector dead times.
To work out coil on time (or dwell time) requires an oscilloscope with a current clamp. You can then work out the saturation point of the coils. In most cases, this is not necessary.



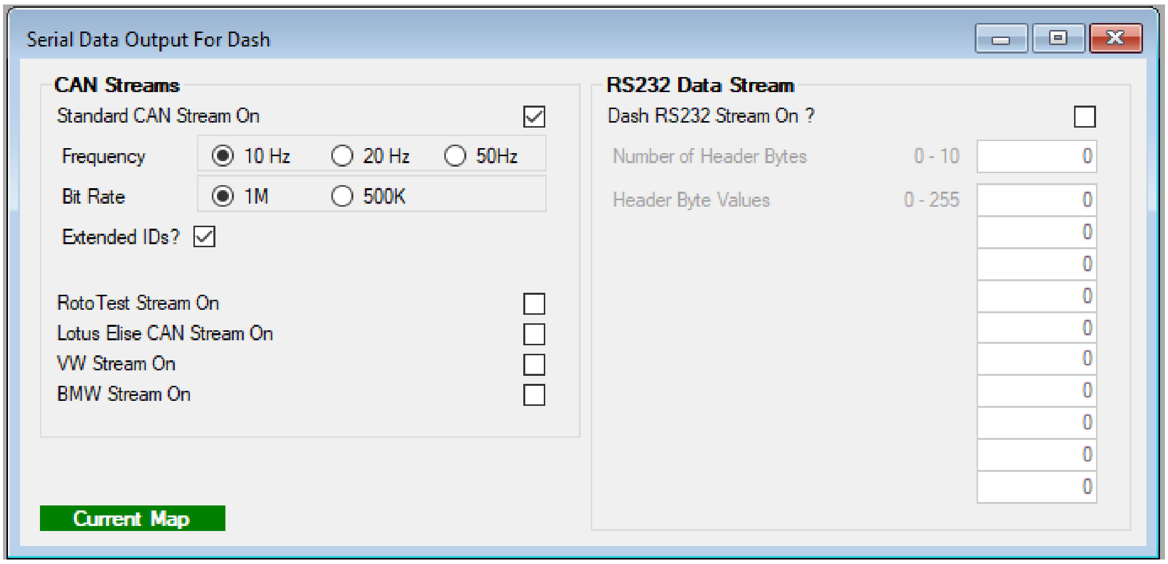
Battery Compensatio...

Battery Volts	Injector Dead Time 0 - 3 ms	Coil On Time 500 - 5000 us
8.0	2.40	4,000
8.5	2.10	4,000
9.0	1.80	4,000
9.5	1.50	4,000
10.0	1.22	4,000
10.5	1.12	4,000
11.0	1.05	4,000
11.5	0.97	4,000
12.0	0.89	4,000
12.5	0.84	4,000
13.0	0.77	3,800
13.5	0.70	3,793
14.0	0.64	3,663
14.5	0.60	3,552
15.0	0.56	3,422
15.5	0.52	3,291
16.0	0.48	3,160
16.5	0.48	2,993
17.0	0.48	500
17.5	0.48	500

Use Injector Dead Time Table ☑
Use Coil Time Table ☑

Current Voltage 0
Current Dead Time 0
Current Coil On Time 0
Current ECU MAP

9.15 Data Stream



Choose the required CAN stream. Only a single CAN stream can be selected at any one time.

Standard CAN Stream
This is the default DTA CAN stream as set out below in the CAN Stream Specification. Set the required transmit frequency, bit rate and whether or not to use extended IDs.

Defined CAN Streams
If you are using a device which requires a specific CAN stream, select the option from this list.

RS232 Data Stream
This is for devices that require an RS232 stream, such as the Android app.

CAN Stream Specification

General

CAN bus Baud Rate	1 MBd
Identifiers	All 29Bit
8 Data Packets	All 8 Bytes Ea.
Send Frequency	10Hz

From V87, the baud rate and identifier values can be changed

All Data Values Signed 16 bit sent LSB first (little endian)

Data Packets

Identifier	Data 1	Data 1 Units	Data 2	Data 2 Units	Data 3	Data 3 Units	Data 4	Data 4 Units

0x2000	RPM	RPM	TPS	Percentage (%)	Water Temperature	Degrees C	Air Temperature	Degrees C
0x2001	Manifold Pressure	kPa	Lambda x 1000	Lambda x 1000	Speed	kph x 10	Oil Pressure	KPa
0x2002	Fuel Pressure	kPa	Oil Temperature	Degrees C	Battery	Volts x 10	Fuel Consumption	L/Hr x 10
0x2003	Current Gear	Gear Position	Advance	Degrees x 10	Injection Time	ms x 100	Fuel Consumption	L/100km x 10

From V62.01 the items below were added.

Identifier	Data 1	Data 1 Units	Data 2	Data 2 Units	Data 3	Data 3 Units	Data 4	Data 4 Units
0x2004	Ana1	mV	Ana2	mV	Ana3	mV	Cam Advance	Degrees x 10
0x2005	Cam Targ	Degrees x 10	Cam PWM x 10	Percentage(%) x 10	Crank Errors	number of errors	Cam Errors	number of errors

From V79.02 the items below were added.

Identifier	Data 1	Data 1 Units	Data 2	Data 2 Units	Data 3	Data 3 Units	Data 4	Data 4 Units
0x2006	Cam2 Adv	Degrees x 10	Cam2 Targ	Degrees x 10	Cam2 PWM	Percentage(%) x 10	External 5v	milli Volts

From V79.04 the items below were added.

Identifier	Data 1	Data 1 Units	Data 2	Data 2 Units	Data 3	Data 3 Units
0x2007	Inj Duty Cycle	Percentage(%)	Lambda PID Target	Percentage(%) x 10	Lambda PID Adj	Percentage(%) x 10

From V86.04 the items below were added.

Identifier	Data 1	Data 1 Units	Data 2	Data 2 Units	Data 3	Data 3 Units	Data 4	Data 4 Units
0x2007							ECU Switches	See Below

s

ECU Switches

BIT	VALUE
0	LAUNCH BUTTON PRESSED
1	LAUNCH ACTIVE
2	TRACTION ON
3	TRACTION WET
4	FUEL PUMP ON
5	FAN OUTPUT ON
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	

From V87.01 the items below were added.

Identifier	Data 1	Data 1 Units	Data 2	Data 2 Units	Data 3	Data 3 Units	Data 4	Data 4 Units
0x2008	RD Speed	kph x 10	R UD Speed	kph x 10	LD Speed	kph x 10	L UD Speed	kph x 10
0x2009	Right Lambda	lambda x 1000						

FREQUENCY
When using the standard CAN stream the frequency with which the packets are sent is controlled by these radio buttons.

RS232 Stream
The following data is transmitted on pin 2 of the serial connection port at a frequency of 10Hz.

Header Bytes (if selected in software)

Data (all 16 bits, binary, LSB first)

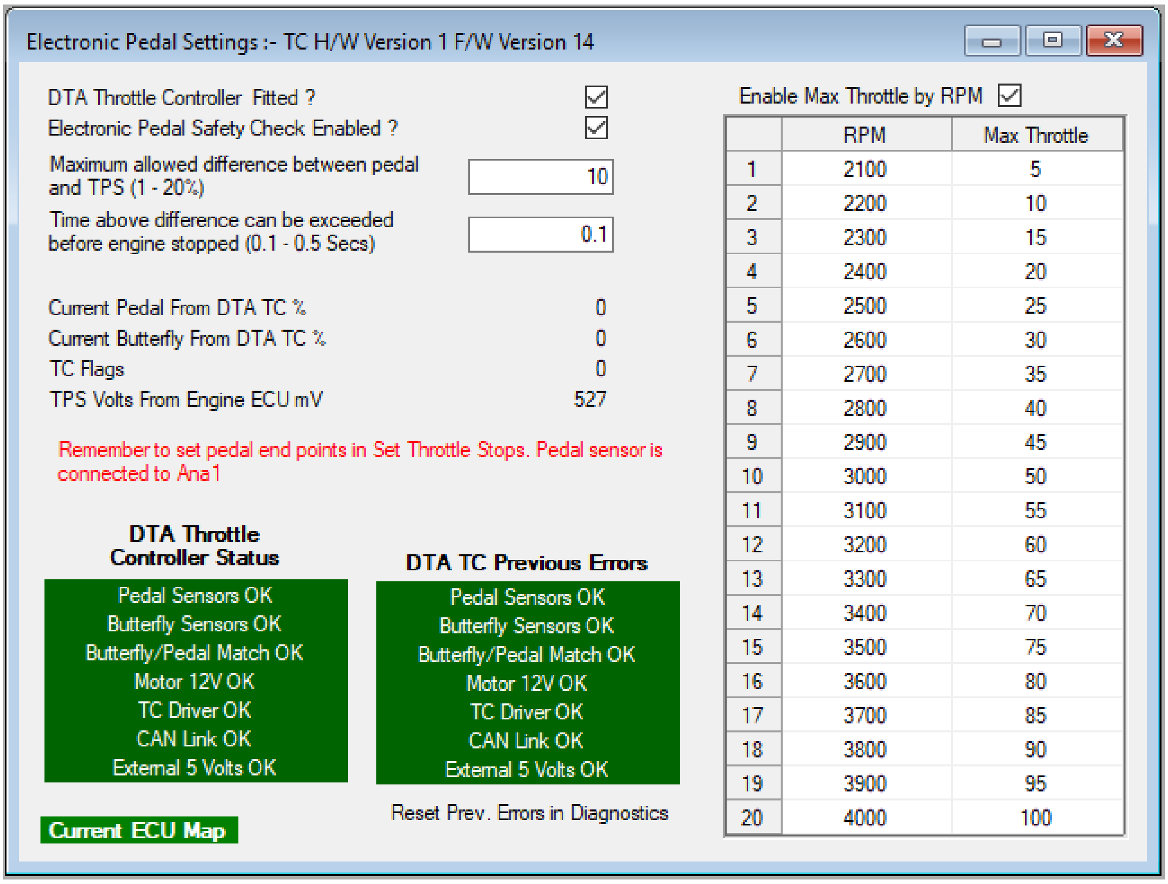
RPM
Throttle %
Water Temp C
Air Temp C
Manifold Pressure Kpa
Lambda (Unit Less)
Battery V (X10)
Undriven Wheel Speed Kph (x10)
Oil Pressure Kpa
Fuel Pressure Kpa
Oil Temperature C

Check Sum

16 bit subtractive Check Sum, including header bytes.
All RS232 levels at
57600 baud, 8 bits, 1 stop bit, no parity
At 10Hz frequency.

9.16 Electronic Pedal Settings

These settings act as a safety feature for an external throttle actuator.
The actuator works by having two potentiometers, one on the pedal and one on the butterfly. These are constantly compared and if they differ by more than the allowed amount for more than the specified time then the engine will shut down. This should only occur when either of the sensors fails or the actuator is stuck.



Settings Overview

DTA Throttle Controller Fitted?
Check this to enable this functionality

Electronic Pedal Safety Check Enabled
This is enabled by default. This can be turned off to check the throttle is working correctly. As soon as this form is closed, this setting will be turned back on.

Maximum Allowed Difference between Pedal and TPS
Sets the maximum allowed difference between the pedal and butterfly before the system recognises an error. This is independent of the STC checking mechanism.

Time Above Difference can be Exceeded
The time the maximum allowed difference can be exceeded for, before the system goes in to error mode.

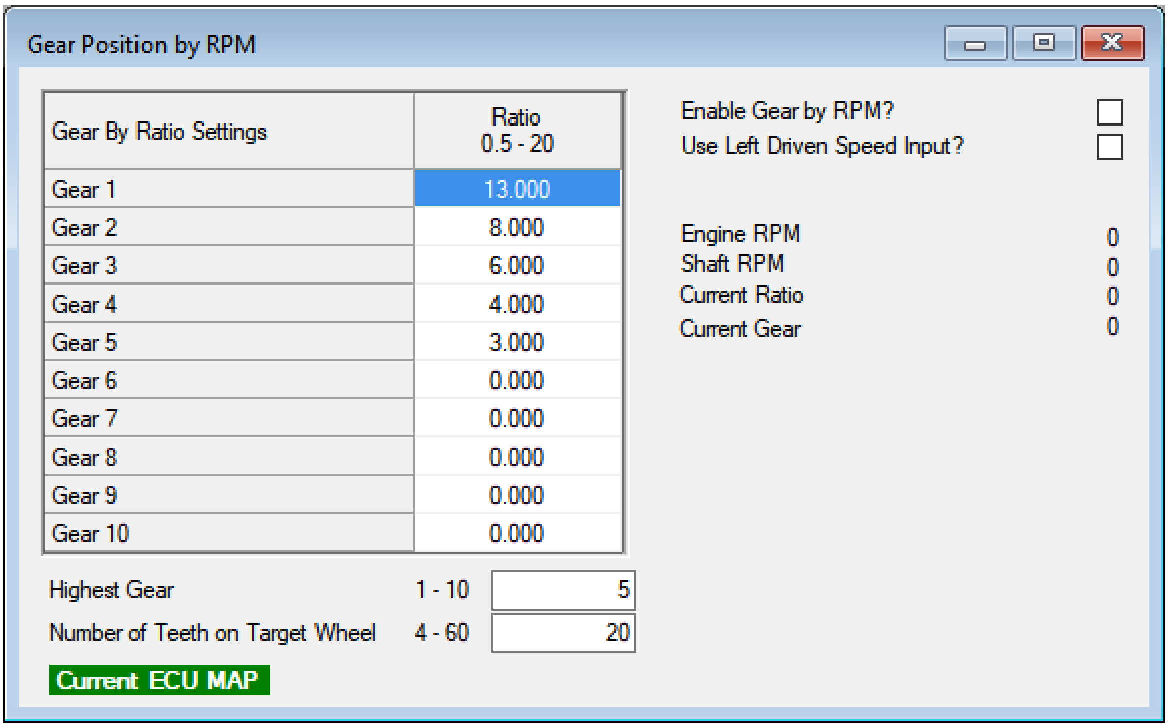
Remember to set pedal end points in Set Throttle Stops 121 to ensure the ECU knows the pedal movement.

Enable Max Throttle By RPM

This functionality allows the user to override the requested butterfly position. This is useful where the requested butterfly position will result in reduced engine torque. An example of this is on an normally aspirated engine with big throttle bodies where maximum torque at low RPM is achieved when the butterfly is not fully open.

To enable the functionality, click the "Enable Max Throttle by RPM" check box.
Note: If you are connected to an online ECU, the ECU will check if the STC firmware is high enough. If the STC Firmware Version is less than V14, you will get an error message, and the functionality will be disabled.
Once this has been turned on, set the RPM values and associated maximum butterfly angle at that RPM.

9.17 Gear by Shaft RPM



These parameters cover the calculation of current gear using a hall effect sensor looking at a toothed wheel on the prop-shaft or occasionally hall effect speed sensor built into the gear box. This is connected to the shift cut input and is an alternative function for that pin.

1 GEAR RATIOS
The gear ratio's need entering in the table (including any additions caused by drop down gears or final drive). If known these can be punched in directly or the ECU calculates and displays the current ratio on screen.

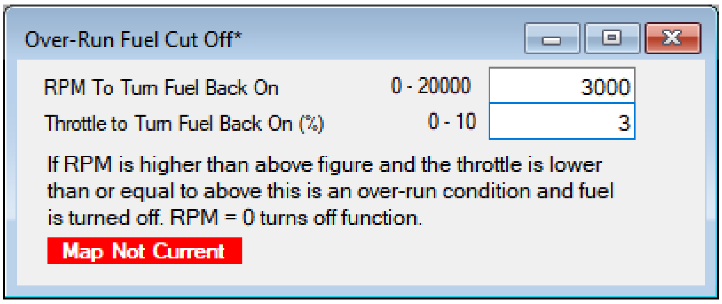
2 HIGHEST GEAR
Highest gear that can be selected.

3 NUMBER OF TEETH ON TARGET WHEEL
Number of teeth the sensor "sees" in one rotation of the shaft.

4 USE LEFT DRIVEN SPEED INPUT

Allows the use of the left driven wheel speed input instead of the shift cut input for measuring the prop-shaft RPM.

9.18 Overrun Cut Off Parameters



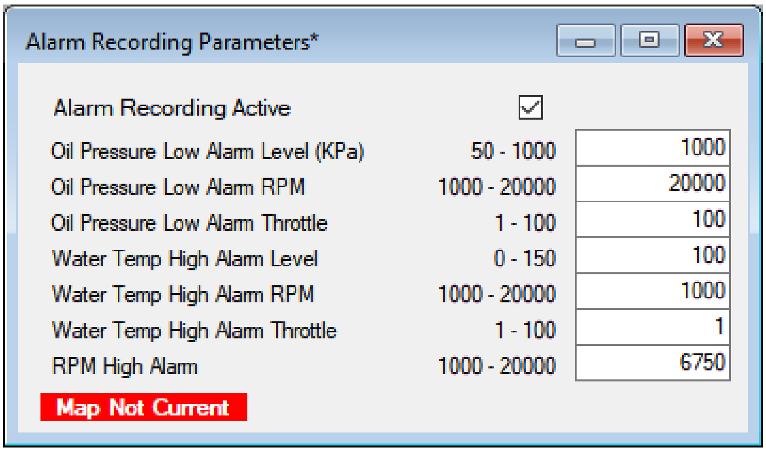
Over-run is a condition when the engine is being pushed by the car. In these circumstances cutting off the fuel reduces the overall fuel consumption.

There are only two settings and the rules are simple:-

If the RPM is above the set value and the throttle is less than or equal to the set value then the fuel is cut off. If either of these rules are not true then fuel is reintroduced as per the rest of the map.

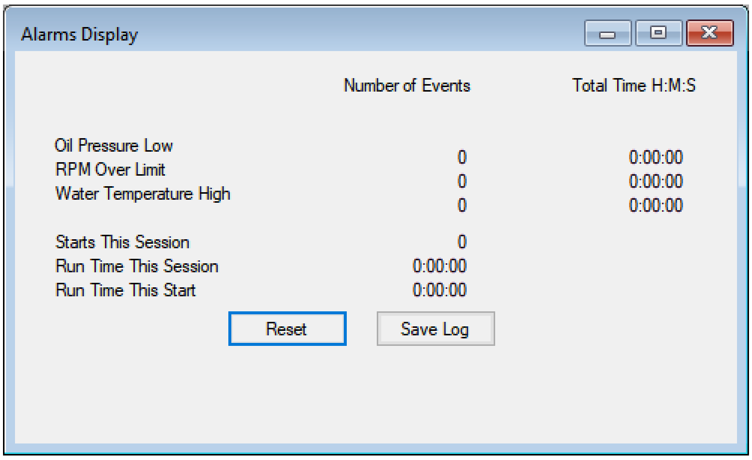
A zero value in the RPM box turns off the function.

9.19 Alarm Recording Parameters



Allows the recording of out of range engine operation as described on screen. Alarms are only triggered above the RPM and throttle levels associated with the alarm. The whole function is turned on and off with a simple check mark.

Total alarm numbers and times can be viewed in Display and Test Functions / Alarms Display as below. Reset clears the totals and the log of events. A maximum of 150 alarms can be logged.



The events will also be logged and this can be saved in a format suitable for input into a spread sheet as below.

EVENT TYPE;ENGINE STARTS;RUNTIME THIS START HOURS;MINS;SECS;
RPM High;1;0;0;0;
RPM High;1;0;0;5;
RPM High;1;0;0;8;
RPM High;1;0;0;11;
RPM High;2;0;0;37;
RPM High;2;0;0;40;
RPM High;2;0;0;43;
End;0;0;0;0;