Hyperspace ECU Ver 3.6 Settings

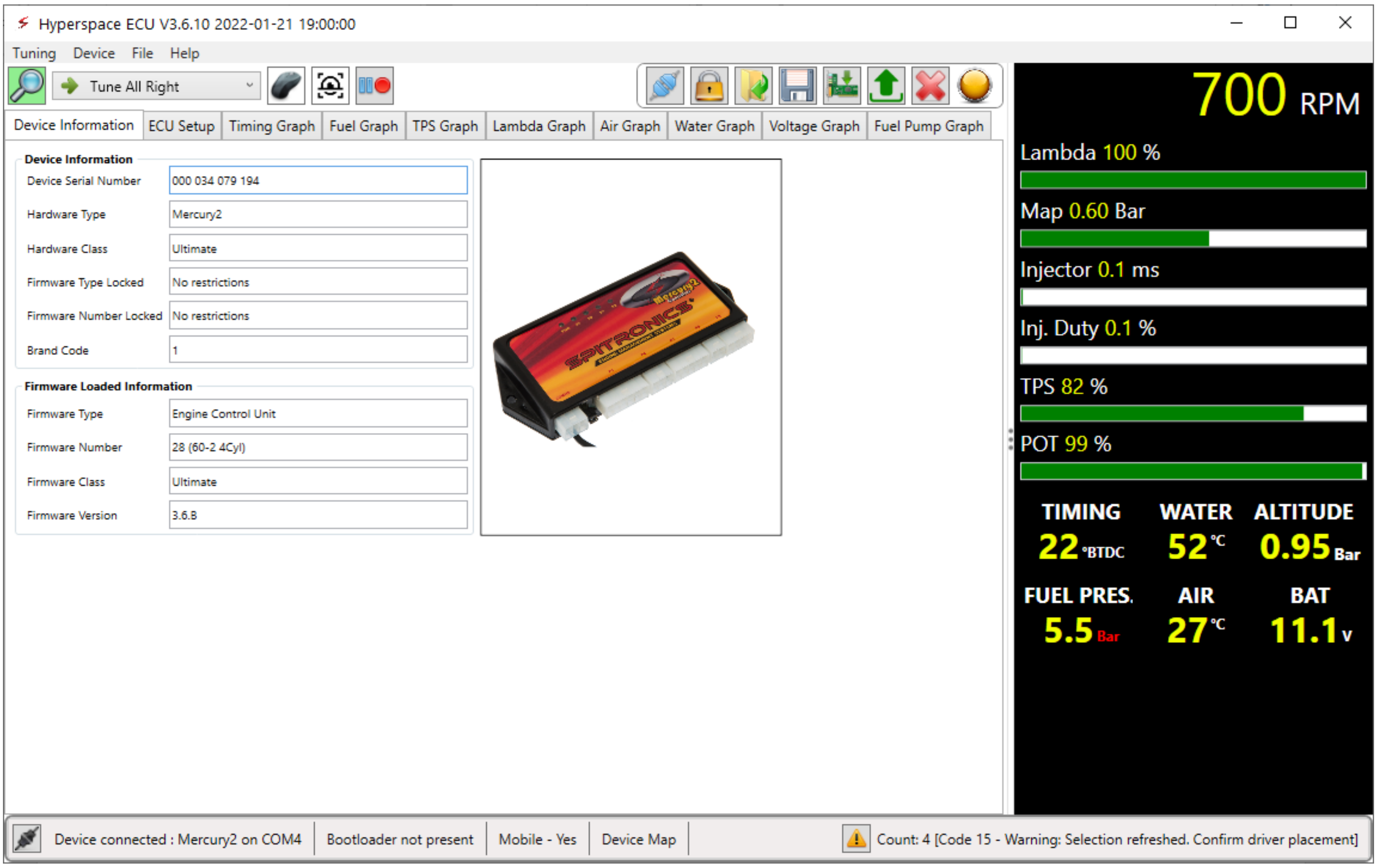
This is not a detailed manual. It is only a quick explanation to the settings in the same order as is found in the Hyperspace software. This manual has all the possibilities of the software but it may not be visible for your product. On the left of this PDF document there will be a Index file which will help you get to the part you seek as quickly as possible.

Throughout this settings manual there are Hyperlinks that will guide you to an online document with detailed explanations on that feature. All these documents are available under Online Manuals from the Spitronics Website. For wiring information use the online Wiring diagrams for each product. It can be found at Manuals/Online Manuals/ECU/*(Product Name)*.

Startup Screen

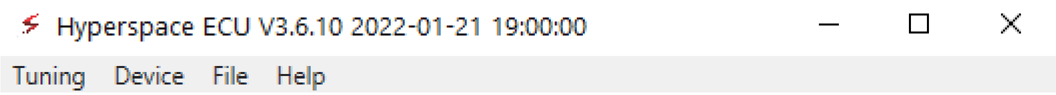
For more detailed explanation look in the ECU Home Screen Manual

If you open the software without a live device connected, you will come to the main pallet or screen which forms the framework of the Hyperspace software. It looks the same for all the devices. From here you can open map files, connect to devices and set basic settings required for the software to operate.



Once you connected to a Device you will get a screen like this.

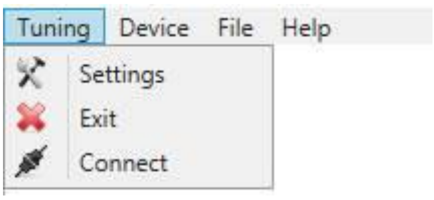
Top Toolbar



Notice the Version and Date in the name. this will help dealers to see if you have the latest software installed.

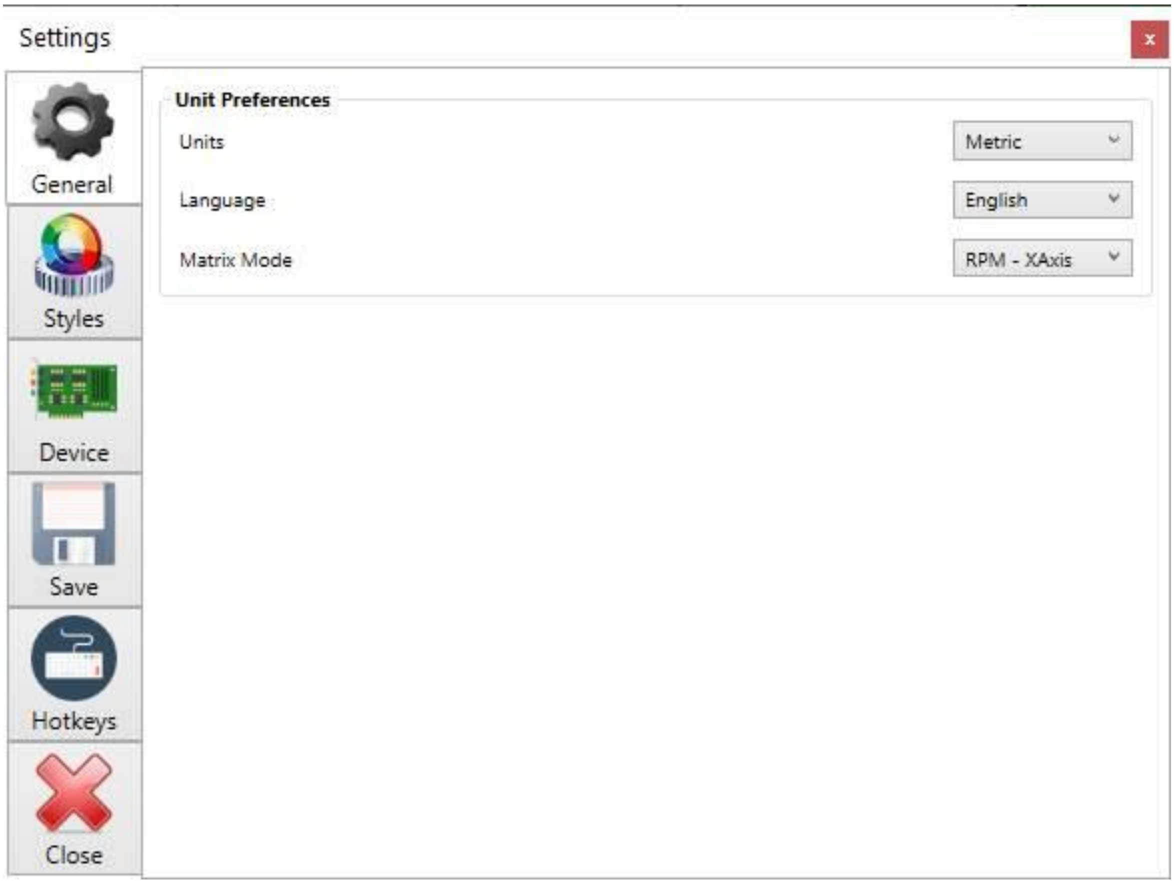
Like any Windows program you will find standard menus and buttons which relate to program settings and preferences. Offline Map files could also be selected and edited with the file button.

Tuning Menu



Settings is to set up units, software and device communications and auto map save settings.
Exit is to quit the software.
Connect is to connect or dis-connect to the ECU,

General Settings



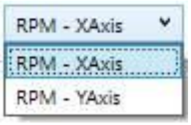
Units selection

Select Metric or Imperial units.

Language

Select Language if it is available.

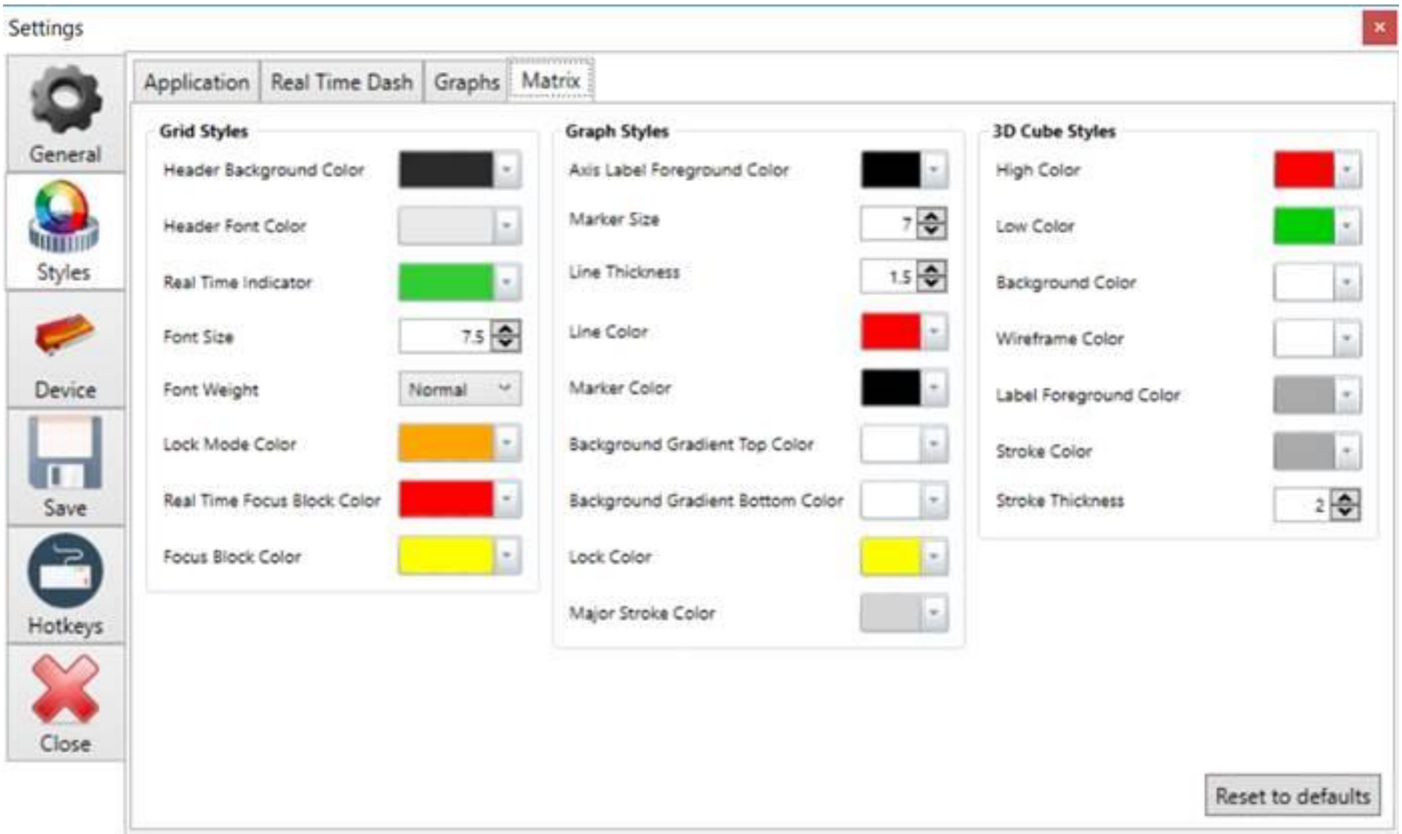
Matrix Mode



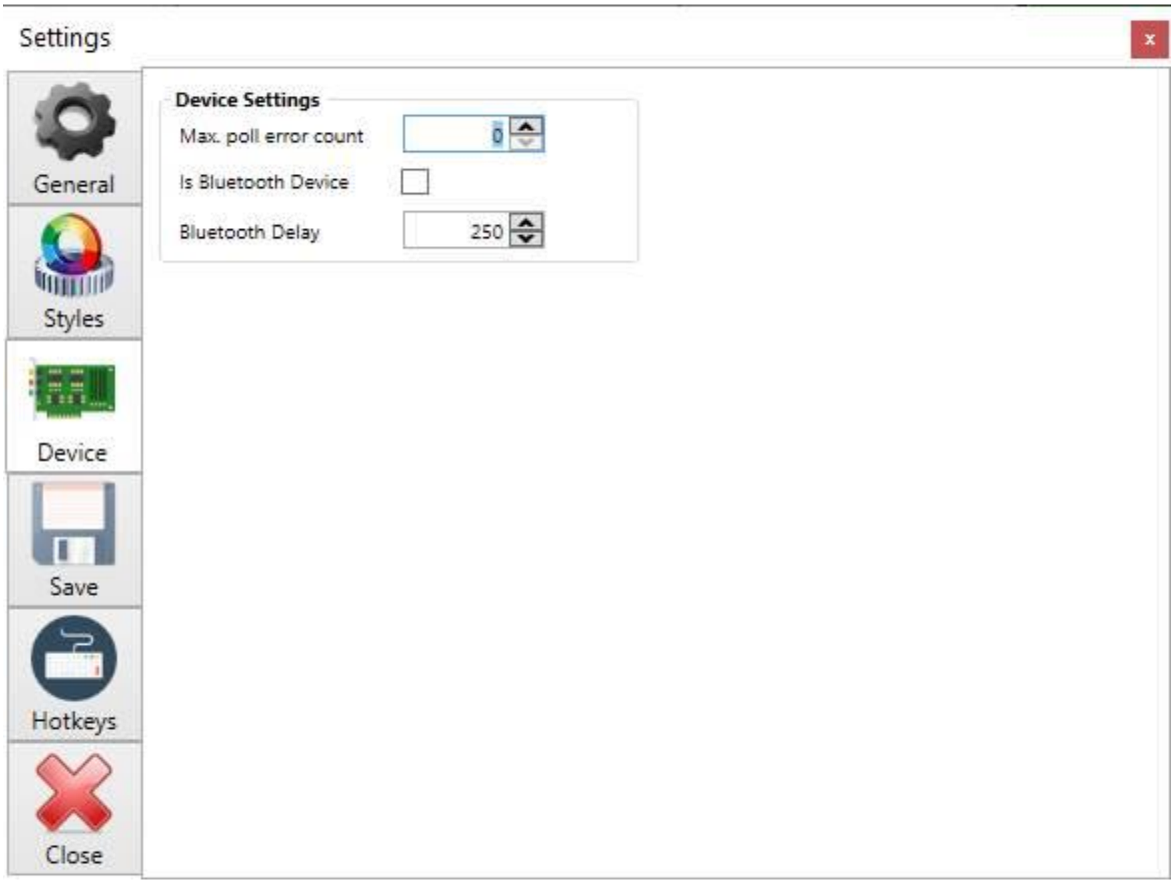
Select the RPM Axis you prefer for matrix tuning.

Styles

Custom your own tuning pallet to suit the collars and font size that works for you. Remember these settings is saved in the Config file. If you upgrade versions, then rename your Config file to carry your settings over.



Device Settings



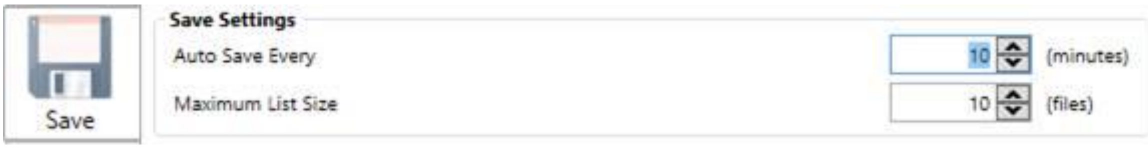
Max Poll error count:

This is the time it takes to read the real time values from the device via the Blue Tooth serial port.

Blue Tooth Delay

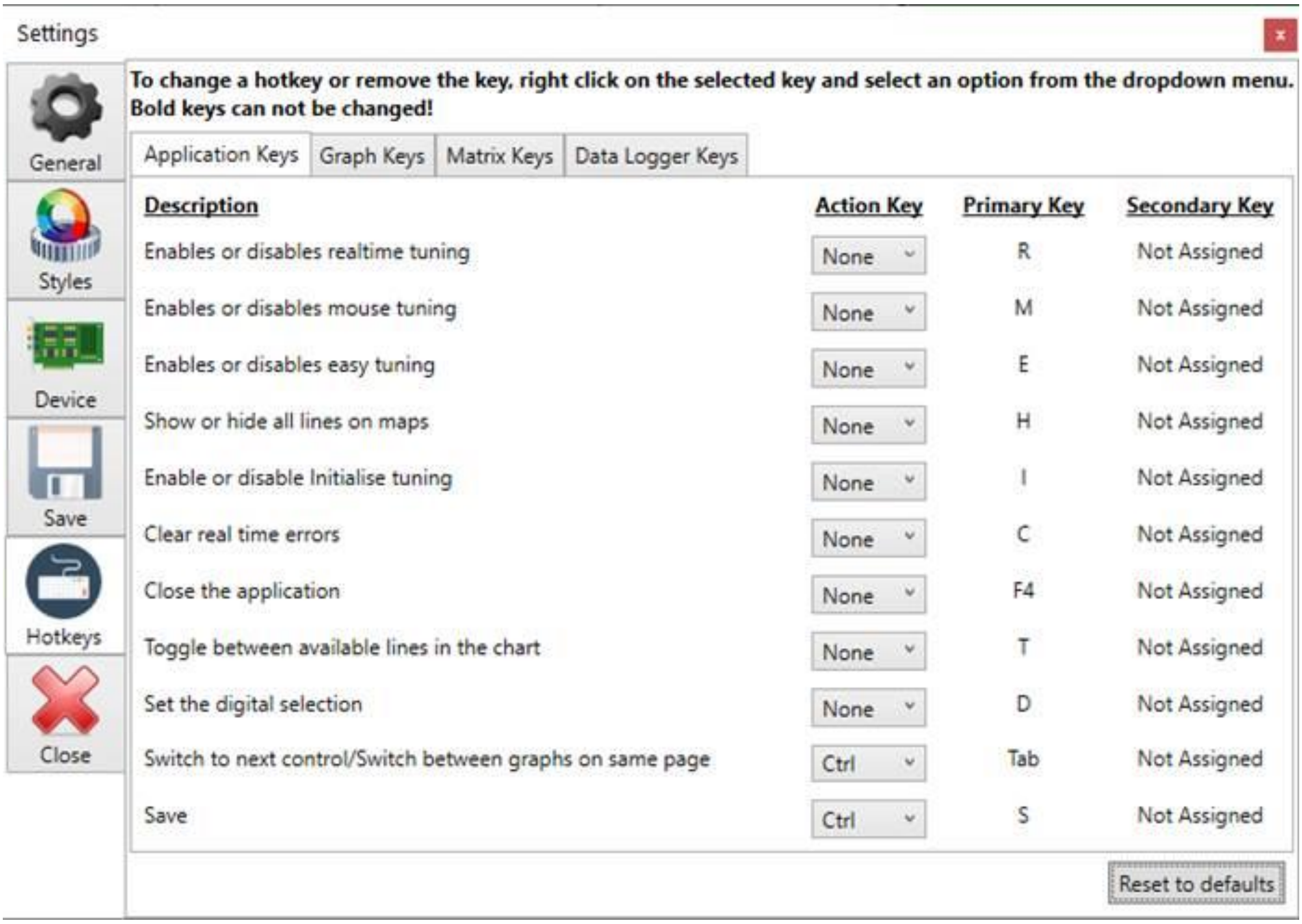
This setup will add a delay that some blue tooth modules will require to operate. Leave it at zero if not used.

Save Settings



The software will do ***Auto saves*** at time intervals. The intervals can be adjusted here. It will also have a max display list on the open file menu. Then the software will also make a backup copy of each download to ECU and it is called ***Device Saves***. File location for these maps is in the folder where the Hyperspace is saved on the hard disk.

Hotkeys

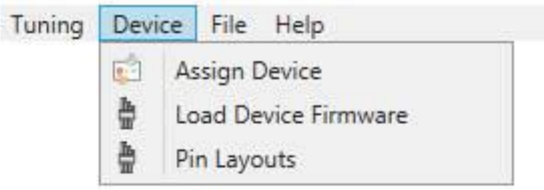


These settings let you customise quick keyboard keys to fast track moving between screens and functions. They are completely customisable. In the factory we will set up basic keys for your convenience. You may restore to default when you chose to. Remember these settings is saved in the Config file. If you upgrade versions, then rename your Config file to carry your settings over.

Close Button

Close will save your selections in the Config file and go back to the tuning pallet.

Device



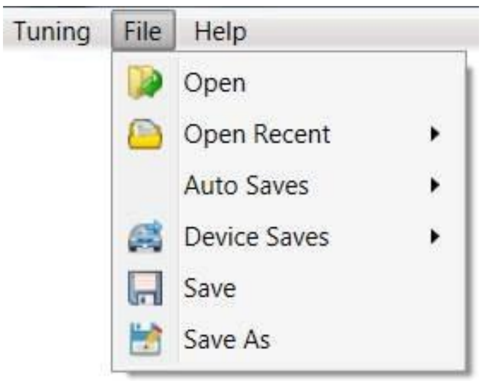
Assign Device
For your convenience Assign Device is built into the Hyperspace Tuning Software. If a system is upgraded or activated on the Portal, the customer only need to have internet connection to activate his system. When you click Assig and there is an active allocation on the Portal, this message will appear:

Load Device Firmware
Mercury2 still use the USB Debug Adapter to load firmware. This message will not be visible. See that section in another document.

Orion2 and Venus3 have a built in bootloader and you may load firmware from the Hyperspace tuning software. This firmware is only saved on the Internet so you will have to have a live internet connection.

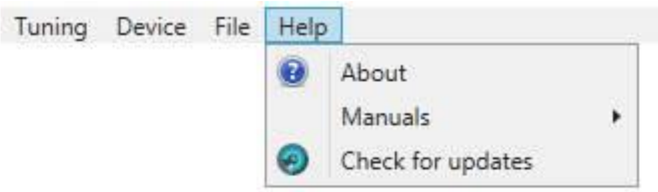
Pin Layouts
This feature will allow you to export the setup of Orion2 connection to an Excel spreadsheet. Spitronics products are universal with inputs and outputs. first do a setup in the software on a simulater then print the wiring Pin outs.

File Menu



This menu is to open the different saved maps or to save a map from a device onto the pc. The software will save periodic files in Auto Saves folder and also when you do a Device save it will make a copy in the *Device Save folder.*

Help Menu



This menu holds information.

About
About will indicate all the release fixes and changes between versions released.

Manuals
It also unlocks the embedded manual and will save a copy of it in the Hyperspace folder where the software was saved initially.

Check for Updates
You may also update the software from this menu. If it up to date then this message will appear.

ECU Toolbar

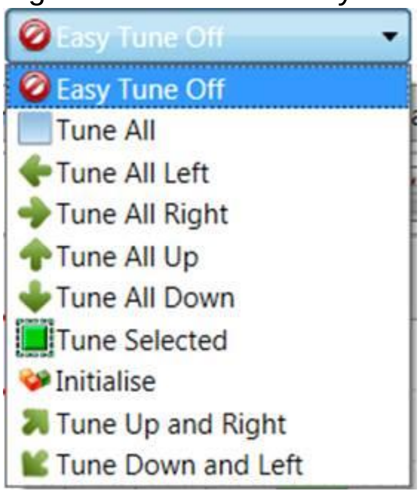
ECU Toolbar Shortcut Buttons guide you to basic operations. Some buttons have a keyboard hotkey to make it easy to activate them. The hotkey is in the title block of each button description. Green background means activated on some of them.

Hide button - H

This button is used to show all lines on a graph or hide the ones that is not selected. It is handy if graphs are on top of each other to see each one separately.

Easy tune - E

This is a very handy feature if you have to lift graph dots simultaneously. There are different algorithms. That will only move dots from the tuning bar.



Initialise will make the whole line the same value as where the green tune bar cross
When easy tune is on then SHIF-Z will initialise every dot with the same selection to the same value as the bar.

Mouse on - M

This is handy to use mouse tuning on the graphs or disable it for arrow tuning.

Real-Time tracking - R

This is a very handy tool to move the green tuning bar with the real time bar of a graph. It is used with or without Easy Tune to adjust the same value that the device use at that time.

Data Logger

This feature is used for logging signal and tuning on the road.

Connect Button

This indicates if the unit is connected. If you click on it then it will toggle to the other option.

Map Lock Option

This is handy to lock tuning maps so that the customer cannot change parameters. It is also a feature to clone the device with calibrations from another device. *See the sub folder for explanation on its operation.*

Open Map file

This is to load a Map file from the hard disk into the device.

Save Map file

This is to save a Map file from the device onto the hard disk.

Save to device

If you made changes you can save them permanently in the flash with these buttons. You can also press CTRL-S for save or click on the yellow flashing LED.

Upload device memory

This is used with the simulator and when firmware is flashed to the device. It will refresh the software with restarting it.

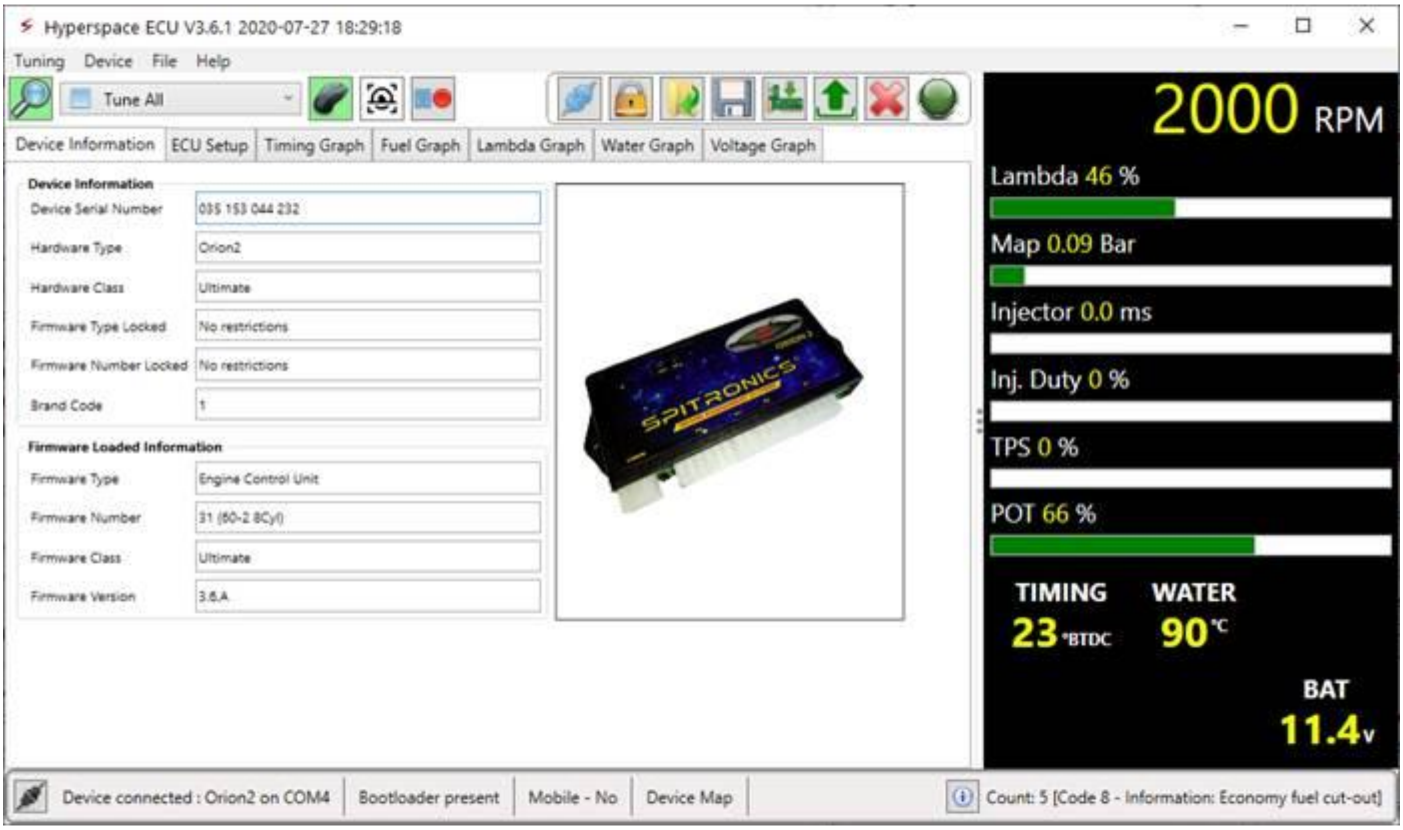
Quit button

Enough said

Communication LED

This indicates the status of the device.
Flashing green means the device flash memory and PC memory are the same. No save is required.
Flashing yellow means you have changed parameters in the device but you have not made them permanent by saving to the flash memory.
Flashing red means no communication to the device.

Device Information



The device information screen displays vital information regarding the Spitronics ECU that has been connected. Note: Firmware is the program that is loaded into the ECU to make the electronics operate in a specific way. This is normally Firmware file which is loaded into the product by a USB debug programmer or BootLoader. Software is the tuning interface that runs on the computer and it is used to tune the product's parameters.

Device Information

Device Serial Number

There is a unique number assigned to each product. It is saved on maps and recognized by the database on its status etc.

Hardware Type

Displays which type of device has been connected to the software. In this case and an Orion2 Engine Control Unit.

Hardware class

Displays the Hardware class of the product that has been connected to the software. The hardware class will determine which firmware can be uploaded onto the product. This feature allows the unit to open certain or all functions of the electronics. The amount of features determines the price of the unit. This feature can be changed over on the internet to allow for remote upgrades of the unit. The hardware classes are as follows:

1. Micro
2. Basic
3. Standard
4. Intermediate
5. Advance
6. Ultimate
7. Commercial
8. Racing

Firmware Type Locked

This block will indicate which type of firmware are allowed on the unit. If it indicates ***No Restriction,*** it means that any Type of Firmware for Orion2 can be programmed into the unit like ECU, TCU TxW etc. This feature is for sponsored units or specials which was approved by the manufacturer.

Firmware Number Locked

This block will indicate which firmware number in the firmware range are allowed on the unit. If it indicates ***No Restriction,*** it means that any firmware number for Orion2 can be programmed into the unit. This feature is for sponsored units or specials which was approved by the manufacturer.

Brand Code

This represent a specific brand like Spitronics which is 1. Orion2 may also be rebranded to large distributors which means this code will change. Once a brand is changed the unit will only connect to the software of that brand. This will bring exclusivity to that brands customers.

Firmware Loaded Information

Firmware Type

This block will indicate which type of firmware are loaded on the unit like ECU, TCU TxW etc.

Firmware Number

This block will indicate which firmware number is loaded and a short description.

Firmware Class

Displays the class of the firmware that has been downloaded onto the device. Each firmware program supplied will have a certain class according to the features used. You may load any firmware for a specific product into the unit as long as the firmware class does not outrank the hardware class of the Orion2. The firmware classes are as follows:

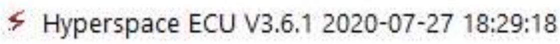
1. Micro
2. Basic
3. Standard
4. Intermediate
5. Advance
6. Ultimate
7. Commercial

8. Racing

Firmware Version

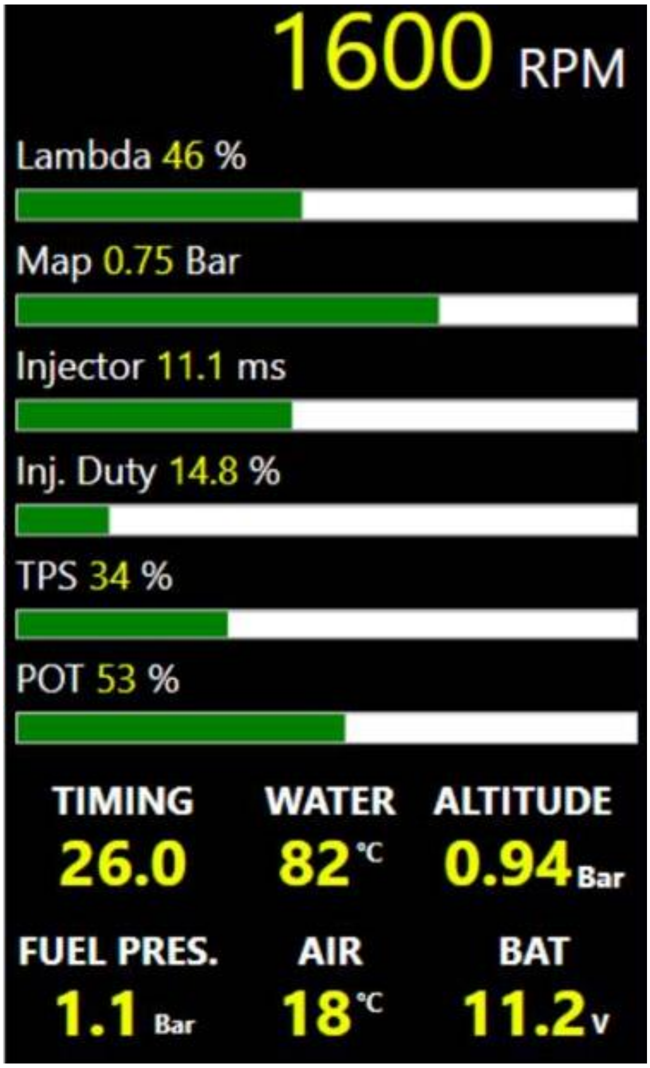
This block displays the software version as well as the firmware version that is loaded into the product. In the example 3.6 is the software version which is required to communicate with the product and A is the firmware version.
The firmware version no effect on the software version. Always use the latest versions available.

Software Version



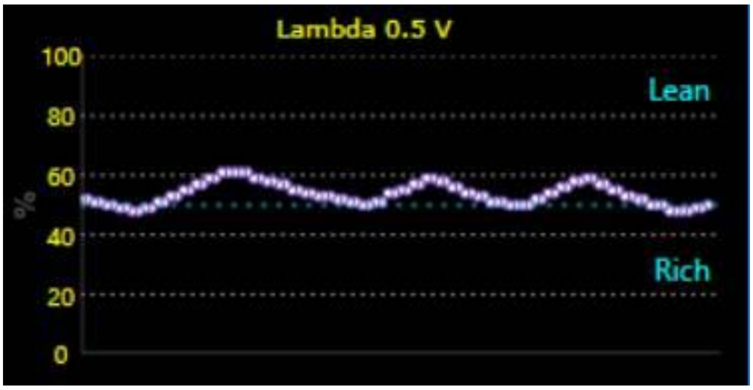
On the top bar you will find the product software version. Note that version 3.6 will be standard with the Firmware version 3.6.
The first 3 is version 3 PC Software.
The second 6 is the protocol version between the PC software and the firmware. When new features are programmed into the unit, this protocol version will change in the PC software and in the Firmware.
The .1 at the end is a sub version and has no effect on the firmware. This version will indicate corrective or improved PC software. Always use the latest version available.

Real-Time Display



This block displays all the analogue sensor values as they change in the ECU. You may change the appearance of some of the signals as well as the colors in the settings tab. Double click on certain fields will toggle between 2 types of views. Below is a description of the meaning of each signal.

Lambda Sensor



This is the Lambda sensor value displayed in %. Notice on the graph that the rich and lean is inverted between wideband and narrowband.

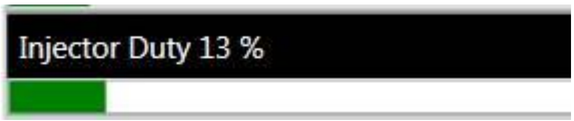
MAP Sensor

This value displays the manifold pressure and is scaled according to the MAP range setting.

Injection Time

This value displays the total injection time that is applied after all calculations are done. It is in 0.1 milliseconds resolution.

Injection Duty



This value displays the ratio of injection time to revolution time in %.

TPS Sensor

This value displays the throttle position opening in %.

POT Sensor

This input can be connected to a potentiometer or other connections to achieve functions like launch control etc.

RPM

This value indicates engine revolutions per minute.

Ignition Timing

This value displays the total ignition timing that is applied after all calculations are done. It is in 1 degree's resolution.

Water Temperature Sensor

This value displays the current engine water temperature.

Altitude Sensor

This value displays the altitude pressure of your location.

Fuel Pressure Sensor

This value displays the fuel pressure in the header.

Air Temperature Sensor

This value displays the current air temperature at the air intake.

Battery Voltage

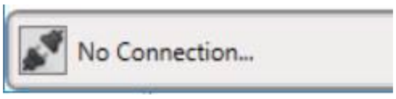
This value displays battery voltage that is connected to the ECU.

Status Bar

Messages

This block at the bottom of the software displays all kinds of status, information and fault codes. Below is a description on types of messages.

Connection to Device

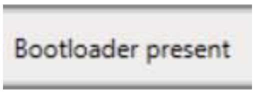


When no device is connected, the connection button will be open indicating that no device is recognized. If you use a different USB cable, you may need to click on the connect button to tell the software to search other Comms ports as well. Once a port is found with a recognized device the software will lock onto that port to minimise start up times. It will then display the device type and COM port as below.

Scanning

At bottom right corner is connection information. This will indicate which Comms Port is being polled for a device. If you have changed the USB cable to another one, then this Comms Port may not be the Port number that the software remembered. Click on the Connect button then the software will look on all the available Ports for a device. Once a device is found, this will be saved in the Config file to cut down on start time for the next connection.

Bootloader

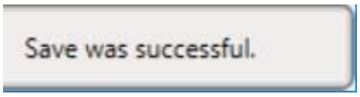


Orion2 and Venus3 has a BootLoader to load firmware. This indication will show if it is active on that device. This means firmware can be loaded by the USB cable. Bluetooth cannot be used to load firmware. Mercury2 does not have a Bootloader and requires the Firmware Programmer.

Mobile Capable

This message indicates if the unit is mobile software capable or not. Some mobile applications will run only if this is set. Contact your supplier for activation.

Random Messages



The software will also give occasional indications on tasks like if the map was saved successful or not.

Error Codes

This message will indicate Errors, Warnings and Information. This is helpful to the user to find errors in the setting up of the device. If you click on the  button left of the error, a list of the errors will appear with the last one on top. If you go out of the error list it will be cleared. See the list of errors in the sub folders.

Error List

2018-12-14 15:52:30:409		6	Emergency engine shutdown
2018-12-14 15:52:24:896		11	Water hot/cold temperature limiter reached
2018-12-14 15:52:12:127		8	Economy fuel cut-out
2018-12-14 15:52:08:508		9	RPM limiter reached
2018-12-14 15:52:07:049		3	Incorrect crank TDC slot
2018-12-14 15:52:07:037		1	Missing crank pulses
2018-12-14 15:52:05:261		1	Missing crank pulses
2018-12-14 15:52:05:232		1	Missing crank pulses
2018-12-14 15:51:56:132		1	Missing crank pulses

Error Codes

The ECU software has Error, Warning and Information codes displayed in the Status tool bar at the bottom. These codes will help the tuner to find problems during startup and tuning, also to see if the ECU is functioning correctly. Some of the functions on the ECU will indicate to the tuner what is happening. He can then see if these functions are operating correctly.

Press the ''**C**'' key to clear the error codes. This is handy as you will not be able to see is the code is still present or if it was only listed once.

Note: If you crank an engine and it does not start, there will be one error code, error code 6 for ***Emergency Engine Shutdown***. This is normal and not an actually an error. The ECU was expecting more trigger pulses but pulses were stopped. Therefore, the ECU goes into a safe shutdown of coils and injectors etc. A tip, press C then crank the engine. There should be no error and it will read 200 RPM's on the rev counter until the key is released.

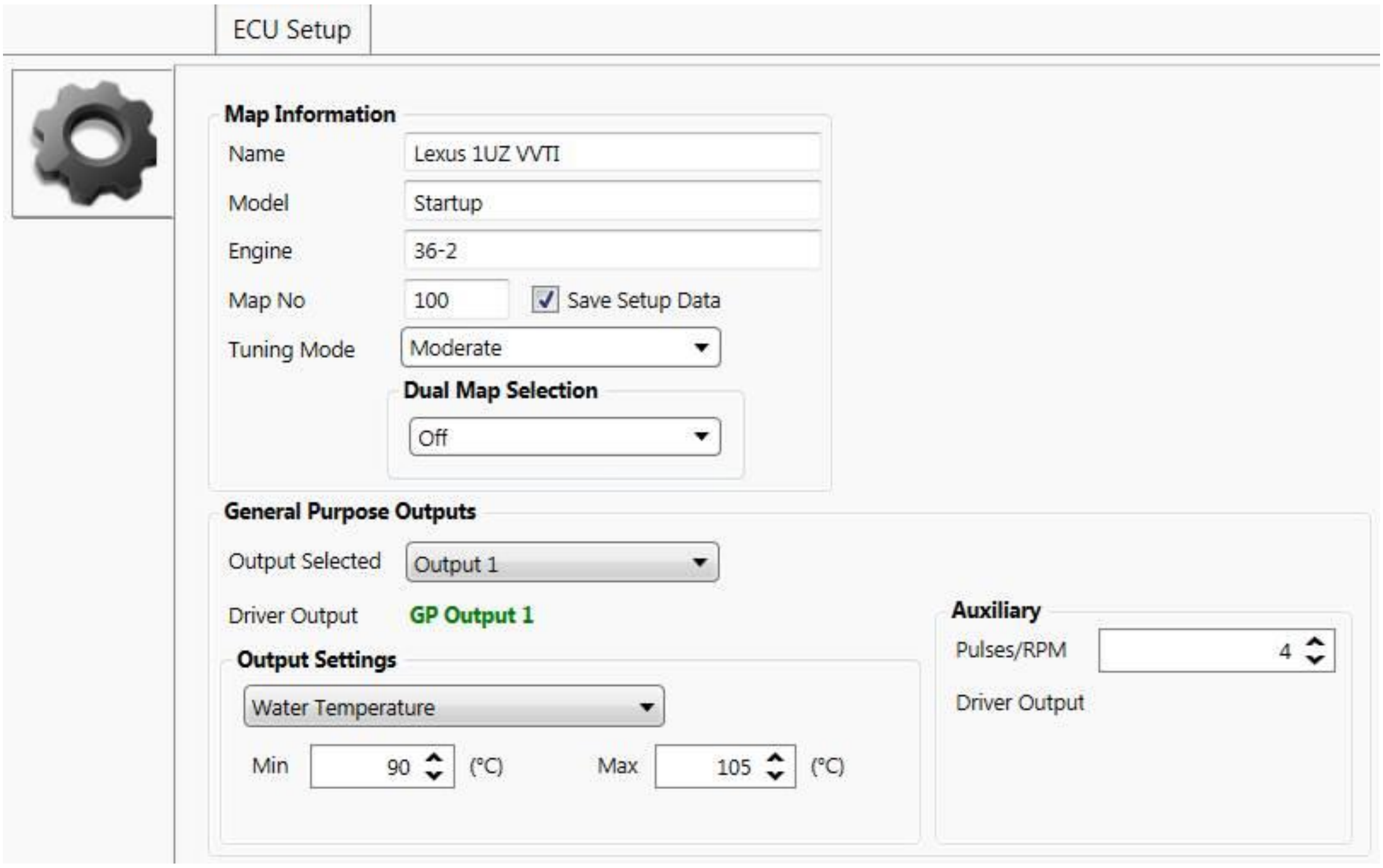
The **blue** codes are for crank, cam and other sensor related errors. The **red** codes are warnings like over temperature etc. The **green** codes are for information of functions that were activated. The colors are only for explanation in this document.
The following list explain the different error codes

1 - Missing crank pulses – The crank sensor senses too little teeth per revolution
2 - Too many crank pulses or spikes – The crank sensor senses too many teeth per revolution
3 - Incorrect crank TDC slot – The crank sensor did not sense a TDC slot. (Maybe incorrect wiring)
4 - Missing TDC pulse – The TDC pulse is not present
5 - Missing home pulse – The Home pulse is not present
6 - Emergency engine shutdown – Safe shutdown of engine due to lack of or incorrect signals
7 - Fuel pressure safety cut-out – The fuel pressure sensor low limit has been reached
8 - Economy fuel cut-out – The fuel economy cut is implemented
9 - RPM limiter reached – The engine RPM limiter has been exceeded
10 - Max boost limiter reached – The boost pressure limit has been exceeded
11 - Water hot/cold temperature limiter reached – The water temperature limit has been exceeded
12 - Launch limiter reached – The launch limit RPM has been exceeded
13 - Lambda control limits reached – The lambda control limit has been reached
14 - Battery low voltage limit reached – The battery voltage falls below a critical limit
15 - Selection refreshed. Confirm driver placement – The ECU changed driver output configurations
16 - Timing retarded – Ignition timing is retarded during an automatic transmission shift procedure
17 - Flood control injector cut-out – Fuel is cut by injectors during cranking when the throttle is fully opened
18 - Flat-shift activated – Ignition or fuel is cut for a moment to enhance gearshift for racing engines
19 - Ignition power switched off – Ignition key power is switched off
20 - Sponsor counter depleted – The sponsor counter is depleted for sponsored ECU's
21 - Anti-Lag activated – Anti-Lag is activated on the Launch features
22 - Hardware Class don't support this feature – Incorrect firmware loaded
23 - Speed Limit Reached – Speed Limit was exceeded
24 - Bootloader Not Present – This indicate if the BootLoader firmware was not loaded in the newer products
25 - Overcharge Limit Reached – This error will come when the charge time plus graph times exceed the maximum charge times
26 - Test Mode is Selected – This is used for calibrating TxW firmware
27 - Map was Reloaded – This indicate that a Ma was reloaded from memory and installed in RAM to be used.
28 - Map Sensor Error – This indicate MAP Sensor failure
29 - TPS Sensor Failure – This indicate TPS Sensor failure
30 - Lambda Sensor Failure – This indicate Lambda Sensor failure
31 - Water Temperature Sensor Failure – This indicate Water Temperature Sensor failure
32 - Air Temperature Sensor Failure – This indicate Air Temperature Sensor failure
33 - Altitude Sensor Failure – This indicate Altitude Sensor failure

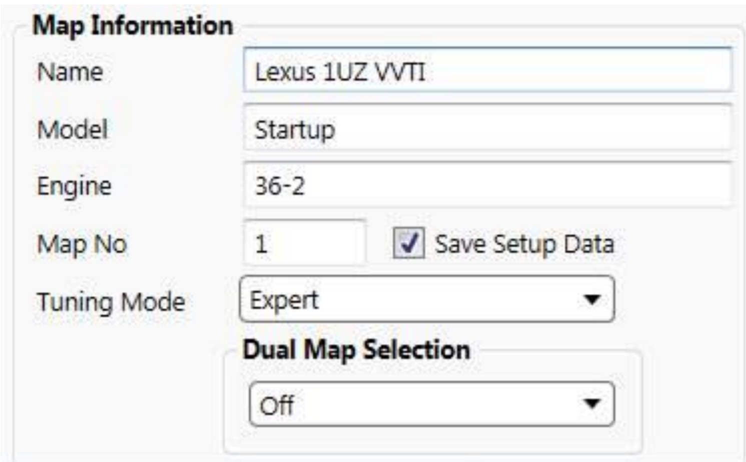
34 - Fuel Pressure Sensor Failure – This indicate Fuel Pressure Sensor failure

General Settings

For more detailed explanation look in the General Settings Manual.

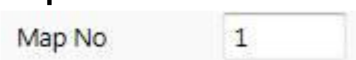


MAP Information



The Map information screen, **Name Model** and **Engine**, contains info for the ECU application for a specific vehicle. This helps the tuner to recognize previous work and tuning data. It is saved in the ECU and also in PC maps. It does not affect any tuning on the engine.

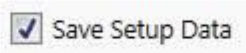
Map Number



The firmware can save up to 2 maps for different fuel setups or tuning algorithms. This is only an indication and the map cannot be forced on this page.

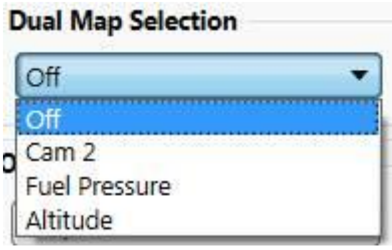
different products have different ways to select Dual Maps. In some conditions maps may be changed while driving. Usually the Dual Map switches is duel purposed with different functions.

Save Setup Data



This feature is handy if you want to load a map to change the tuning graphs without altering the setup data. If it is on it will load the setup settings and the graph and matrix data. If it is off it will only load the graph and matrix data. Critical settings and calibrations are not altered when loading a map. Any changes on the setup while the ECU is connected is saved as normal. This feature is permanently saved in the ECU and can only be changed when the ECU is connected.

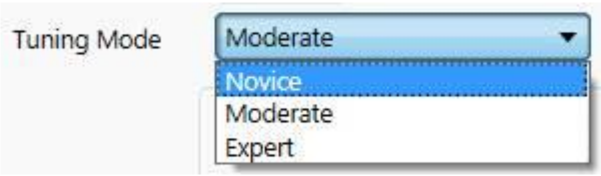
Dual Map Selection



The map loaded in the ECU is determined by the Dual Map Selection switch. Some products like Orion2 and Venus3 has a dedicated input which is hard wired for Map selection. Mercury2 has options for different signal that is not used. This input can also be used for other tasks and this setting in software will indicate if it is used as dual map input or not. In certain conditions Maps may be changed while driving. Do not swop Maps at full power as there may be settings that clash with graphs as the map are loading. They load in about 1 second.

NB! This is a Critical setting that alters wiring connections. Do not change it on a running vehicle. It could damage drivers or components on the engine.

Tuning Mode



These Tuning features allows the tuner to select variations of tuning according to his skills. The firmware will enable more features as the level of progress is made and hide features on lower levels so that confusion for beginners is kept to a minimum.

Novice

This level is set up as the first generation of Spitronics ECU's. There are however new features which is explained further in the manual. This mode is used for graph tuning and were developed by Spitronics. It is also easier for road tune where a Dyno is not present.

Moderate

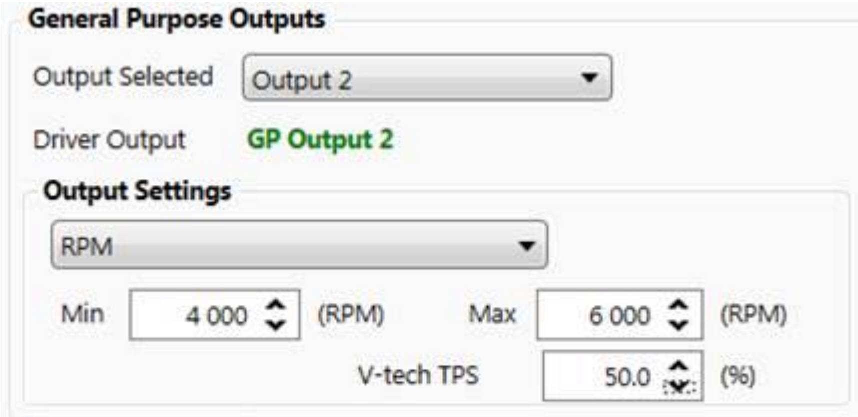
This level is more for tuners with Dyno facilities. Here the matrix tuning is present as well as the graph method for fuel and timing. There is also a selection for MAP or TPS tuning versus RPM. Included in this level is a mixture, possibly for racing engines with poor vacuum but with turbo chargers where MAP pressure needs to be compensated for. The tuner can select his preferred option. **Note**: The graph and matrix data uses its own memory space and both types could be tuned without losing the data on selection changes. This allows the tuner to tune both options and chose the best for his application.

Expert
This level is to assist the tuner to tune racing engines and different fuels where more refined parameters are required. Here parameters like Start Prime Pulse, Start enrichment, and the two Accelerator pump Enrichment values are tuned on a graph versus engine temperature. This is very useful for methanol cars also in extreme cold conditions when fuel does not ignite easy.

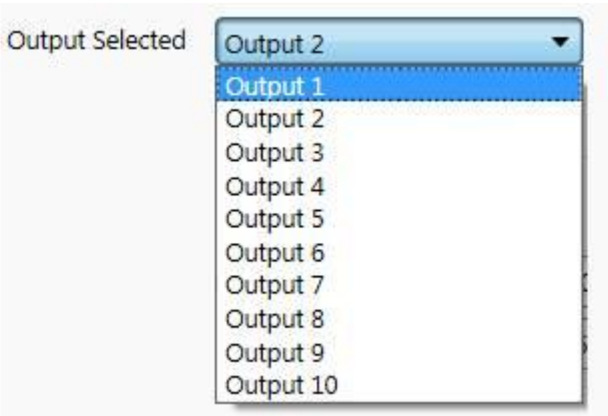
General Purpose Outputs

Output selection

Hyperspace Ver 3.6 can handle up to 10 General Purpose (GP) outputs to configure for several different functions. These outputs can be configured to use any of the analogue signals to switch relays on or off when certain limits are reached. Due to the number of GP outputs this block was developed to be generic block. That means there is a dropdown menu to choose which output is adjusted by the tuner. Not all firmware has the ability for 10 GP outputs so the number of selections may be limited. This depends on which features are activated in the ECU. Note the operating current and requirements of each product in the electrical drawings, so that damage to the ECU will not occur. See the GP Priority register and the wiring of the specific output for that ECU. Some drivers may be positive output and some negative output.



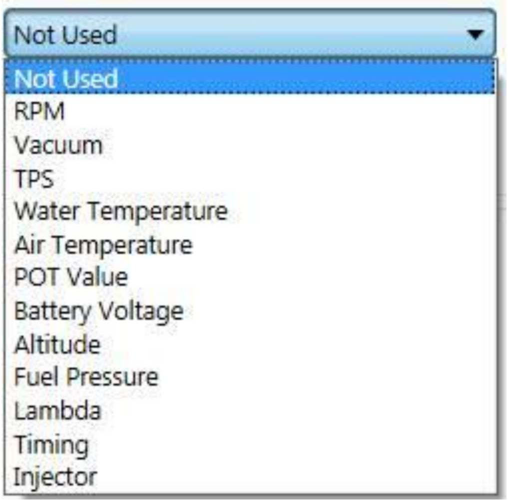
Output selection



Driver Output

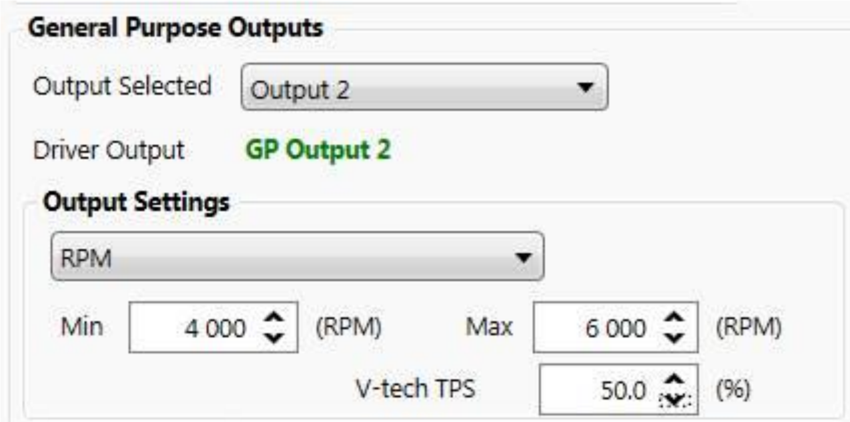
If an output is available, the software will show the location of the driver that is used with this GP output. Should an output not be available the driver will be blank and the Output settings will be locked on not used.

Selections
The tuner has a number of selections to use in the GP output. Use the drop down menu to display the others.



Not used – this saves processor time
RPM – RPM/min 100rpm increments
Vacuum – pressure 0.1 Bar increments
TPS – percentage at 1% increments
Water temperature – degrees at 1°C increments
Air temperature – degrees at 1°C increments
POT value – percentage at 1% increments
Battery voltage – voltage 0.1volt increments
Altitude – pressure 0.01 Bar increments
Fuel pressure – pressure 0.1 Bar increments
Lambda – percentage at 1% increments
Timing – degrees at 1° increments
Injector – fuel at 0.1milli second increments

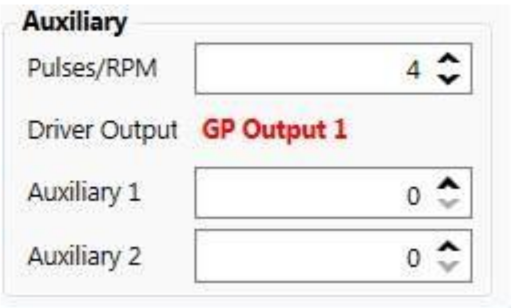
V-Tech



GP2 output is the only one with the V-Tech TPS limit added for the RPM setting.

Note! If you don't use these outputs, select ***Not Used*** so that valuable processor time can be saved.

Auxiliary RPM Output



Pulses/RPM

This feature is used for Rev counter calibration. You can adjust the number of pulses per revolution for the RPM output. This is handy for engine conversions. A value of 1 to 60 pulses can be achieved with this function. On some firmware you may enter 61 which will then divert the crank angle signal onto the RPM output. This is also handy if the standard ECU is still active and doing other functions in the car. Note different electrical connections in the drawings to connect the different RPM gauges onto the Spitronics ECU. When you select 0 the software will refresh and free this driver for other functions like General Purpose output on specific firmware.

If this feature is not used select zero to free up some valuable microprocessor time.

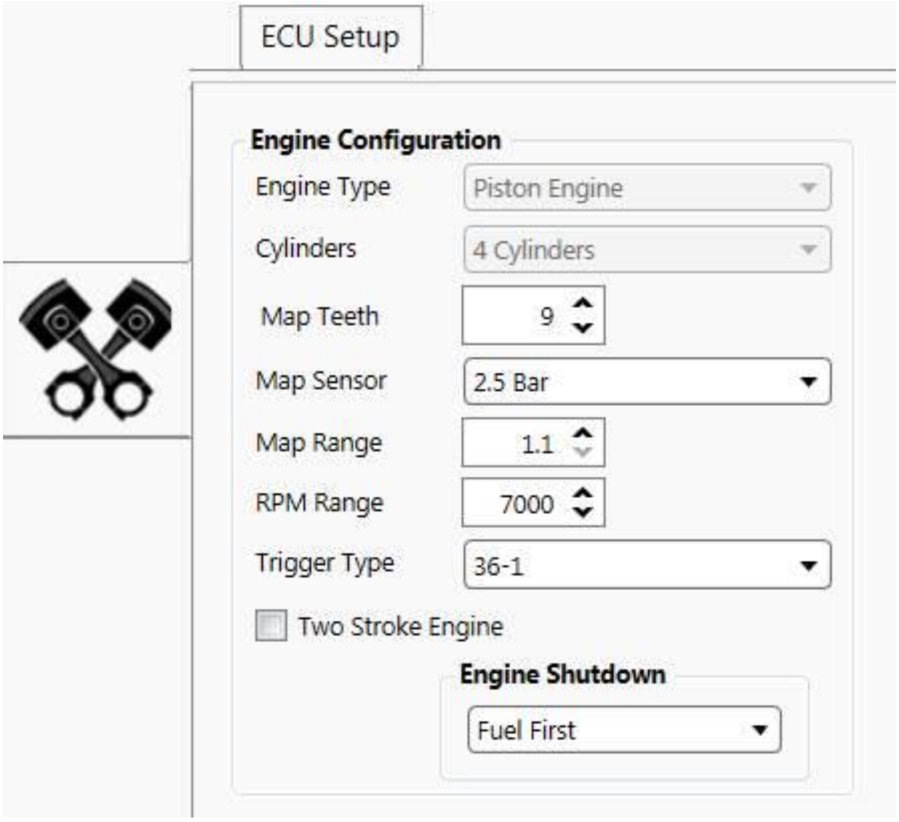
NB! This is a Critical setting that alters wiring connections. Do not change it on a running vehicle. It could damage drivers or components on the engine.

This **Auxiliary Values** is used on certain firmware to achieve certain functions. It is only used in new development where the features were not yet developed in the Tuning Software*. See the specific instructions for that engine type.*

Engine Settings

For more detailed explanation look in the Engine Settings Manual.

Engine Configuration



Engine Type

The ECU firmware will lock this selection for a Piston or Rotary engine. For Rotary it will enable a Trailing degree graph and also a Maximum trailing degree setting. For most firmware this block will be hidden.

Cylinders

Most ECU firmware will lock this selection for a specific number of cylinders. Other firmware like the standard unit will open this dropdown menu for the tuner to decide for which engine it is required.

Map Teeth (Gear Type Trigger Only)

This setting is used to synchronize the crank angle degrees where the manifold vacuum is sampled. This is very useful for engines with individual throttle bodies that has poor vacuum signal due to a common vacuum rail. This setting can be adjusted up to 180° of engine rotation after TDC. If it is a 36-1 gear as in this example, then 9 teeth will result in 90° after TDC. Start at 90° after TDC and adjust the teeth more or less at idling till the best vacuum signal is achieved. Start with the gear teeth divide by 4. For 60-2 it will be 15.

Throttle Selection

On multiple throttle bodies you only connect one cylinder to the Map sensor. It must be cylinder 1, or the one that shares the same TDC degrees with it. Do not use a common vacuum rail. Set the setting as below.

Map sensor

Spitronics have a selection of 4 Map Sensors to choose from. 1.1 Bar, 2.5 Bar, 3.0 Bar, 4.0 Bar and a Custom sensor option. Select the one that is supplied with the ECU. The most popular one is 2.5 Bar.

If you use a standard MAP sensor from an engine you may choose Custom and calibrate it yourself. You need to give is a Map range where you will operate the engine in. A calibration bar will appear next to the Map sensor selection in Sensors page.

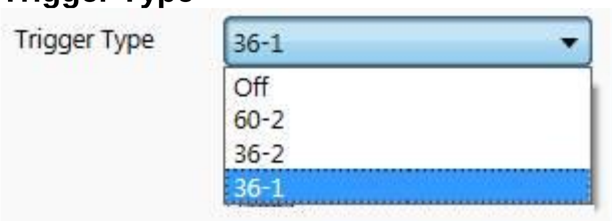
Map Range

Spitronics can use any MAP sensor to fuel even a normal aspirated engine. Note however, that it is best to use a sensor that is just higher than your maximum manifold pressure. It is more accurate because the sensor has better resolution over the 0 to 5-volt range. On this field you select the maximum boost pressure that you will use in the application. For example, if the engine is required to run at 0.8 Bar boost, select 1.9 Bar. This means at sea level you can run 0.8 Bar boost without running the tuning pressure off the scale. Making the scale too large will reduce valuable tuning space on the graphs or matrix. For normal aspirated engines always select 1.1 bar.

RPM Range

This setting is used to adjust the ranges of the RPM tuning graphs or matrix. Set it to a value of 500 RPM above the engine max RPM. If you use a higher value, you will reduce valuable tuning space.

Trigger Type



Selective firmware may let the user choose the crank angle sensor type. This program is written to minimise stock on the shelf for retail stores.

Two Stroke

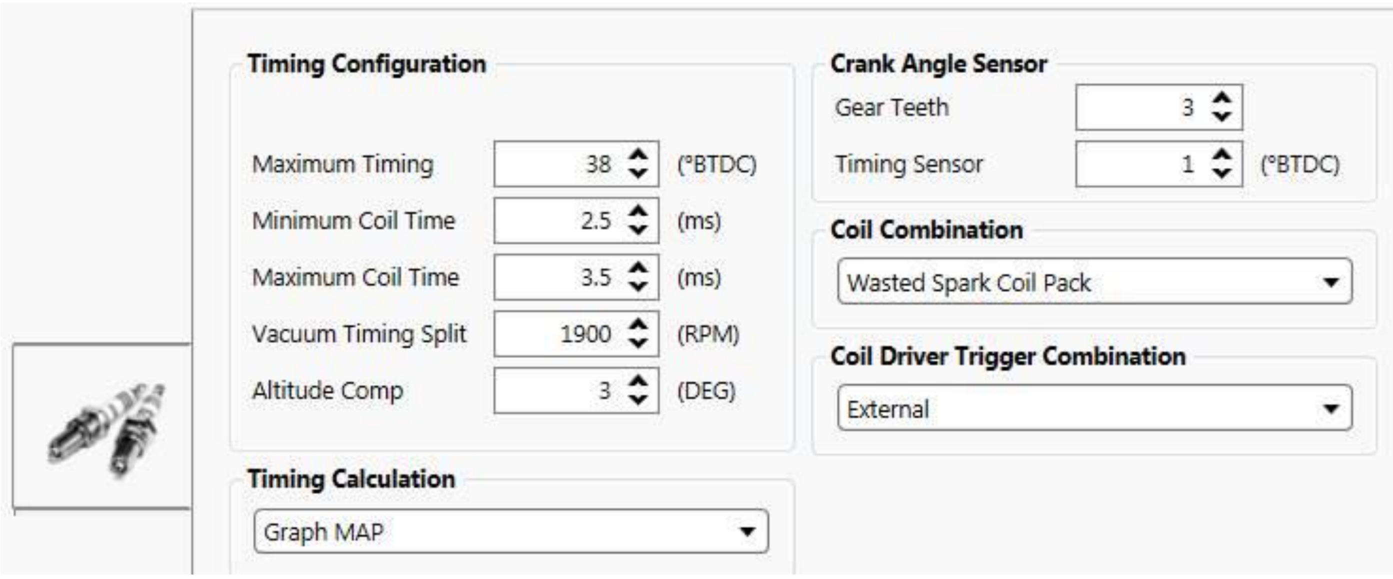
This Setting will select between 2 or 4 stroke to correct the injector duty % indication bar. If it is on 4 stroke the injector time is calculated over 2 RPM's while on 2 stroke the injector time is calculated over 1 RPM. For example, on a split sequential setup, 10 milliseconds on 4 stoke means that the injector will inject 5 milliseconds each RPM to make up 10 milliseconds. While on 2 stroke 10 milliseconds will inject the full 10 milliseconds on each RPM.

Engine Shutdown

This setting will select how the engine is shut down. **Fuel first** means that the ECU will run normally but stop injecting fuel when the key is turned off. This will let the spark burn all the unwanted fuel from the cylinder. That is handy for rotaries where the injectors are far from the intake valve. It may sound as if the engine keeps going for a moment after the key is switched off. **Fuel & Spark** cuts both immediately when the key is turned off. There may be unburned fuel on the cylinder but the engine dies immediately. **Note**: This feature is only available with cetain products that have Power management capability.

Timing Settings

For more detailed explanation look in the Timing Settings Manual.



Timing Configuration

Maximum Trailing

This is for rotary engines and prevents the trailing degrees from being adjusted to far from the leading plugs. In piston engines this block is hidden.

Maximum Timing

This is the maximum combined timing allowed in degrees by all the timing maps combined. If the graphs are tuned for more degrees, it will be limited by this value. On the Timing Matrix this will also prevent the tuner from selecting higher values there.

Minimum coil time

This is the minimum coil charge time which the tuner can select. The ECU will vary the charge time automatically according to engine load from the minimum to the maximum value. It can be adjusted in 0.1 millisecond intervals from 1ms to 5ms. Standard coil setting is about 60% from the maximum value. Example if Max value is 3ms then make min 1.8ms. see the Maximum Coil Time to determine the right setting.

Maximum coil time

This is the maximum coil charge time which the tuner can select. The ECU will vary the charge time automatically according to engine load from the minimum to the maximum value. It can be adjusted in 0.1 millisecond intervals from 1ms to 5ms. Standard coil setting is 2.5 to 3.5 milliseconds for coils of around 0.9 ohms but some new coils are lower resistance and may need shorter times. Normally the driver will heat up and may damage if it runs too hot. Always start with a min value if you are not sure. Start with 2.0 to 2.5ms. Coils with a lower resistance in the 0.4 to 0.5-ohm region, use a value of 1.5 to 2ms. Always a good idea to put a 5-Amp fuse in the power line of each coil. If you go too high the fuse will blow. If you use the Mercury Coil driver, then you can look at the overload LED. It comes on at 4-amp current. Most coils are rated at 5.5A. adjust maximum so that the OVL LED may come on at full load but not on at less than 70% load. During cold starting, this maximum value is used till the engine reaches 60°C. Thereafter spark control will commence.

Vacuum Timing Split

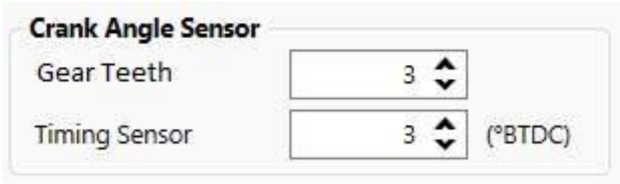
This value sets the RPM split between the Low & High Vacuum Timing maps. This value is selected about 500 to 1000 RPM's above idling.

Altitude comp.

This value sets the timing advance ratio for every 1000 meter above sea level. A value of 3 means that the timing will be advanced by 6 degrees at 2000 meter above sea level. If you tune the vehicle at a higher altitude, make sure this value is set. Then when the driver descends to lower altitude the ECU will retard the timing automatically.

Crank and Cam angle Sensors

For more detailed explanation look in the Crank and Cam angle Sensors Manual.

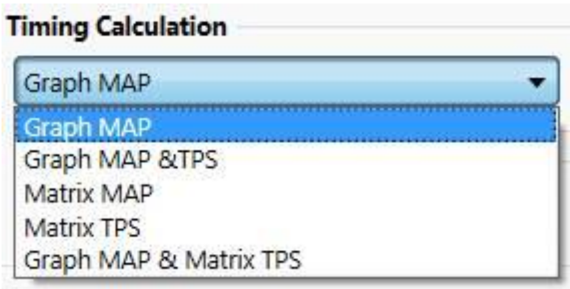


This block is used to indicate to the ECU where the exact TDC point is on the crank. It works differently for the different style of crank angle sensors. These settings will allow the ECU to synchronize software timing with the actual spark timing on the engine.

On gear type trigger wheels, the **Gear Teeth** will indicate to the ECU the amount of teeth between the missing teeth slot and the Sensor position. The **Timing Sensor** will do finer adjustments to precisely set the timing in-between the teeth.

On single event triggers you will find that gear teeth adjust injection degrees in intervals as big as the pulses from the crank sensor. Mostly they are set to 1. On a 4Cyl Nissan for example the timing sensor may be adjusted to 180 degrees. If it is full sequential then it can adjust to 4 which is 720° at 180° intervals. Timing Sensor will adjust degrees between the pulses from the sensor. in a 6 cylinder is will be 120° values.

Timing Calculation



This block will allow the tuner to choose different options to set up timing for this engine. Each of these methods will be discussed in detail under the tuning chapter further in the manual.

Graph MAP

This method is for standard engines with a good vacuum signal and it allows for easy tuning in the street. It has a Dynamic timing map on top which is tuned at WOT. It has 2 vacuum tuning maps for pull-off and cruise timing adjustments.

Graph MAP+TPS

This method is used for engines with a poor vacuum signal at low RPM’s and it still allows for easy tuning in the street. The ECU will use the TPS signal to calculate a MAP signal at low RPM’s when there is no or little vacuum. It is used for engines where the vacuum signal is correct and above 1500RPM’s.

Matrix MAP

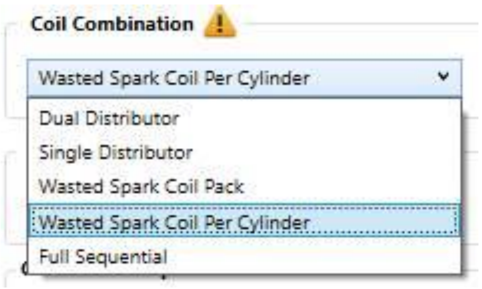
This is for standard engines with a good vacuum signal and allows for easy dyno tuning. Here the MAP sensor versus RPM is used and the blocks are set in 1-degree resolution.

Matrix TPS

This is for normal aspirated engines with poor vacuum signal or throttle bodies and allows for easy dyno tuning. Note: It is recommended to add the altitude sensor to compensate for altitude pressure changes. TPS versus RPM does not compensate for pressure changes. Here the TPS sensor versus RPM is used and the blocks are set in 1-degree resolution.

Graph MAP + Matrix TPS
The Matrix is the same as TPS Matrix above. This is for turbo racing engines with a good or poor vacuum signal and allows for easy dyno tuning. Note: It is recommended to add the altitude sensor to compensate for altitude pressure changes in the TPS matrix. Here the normal aspirated tuning is done on the matrix and the boost timing tuning is done on the two Cruise timing graphs. They will become visible in this mode. Here the TPS sensor versus RPM is used on the matrix and the blocks are set in 1-degree resolution. Then Map sensor is used to modify timing in the cruise graphs.

Coil Combination



This block indicates the type of coil combinations that can be used with this firmware. Firmware will block out the ones that is not allowed. On some if you select a wrong combination the software will refresh and cancel your selection. If you have an intermediate or lower hardware class ECU, it will also hide the multi coil settings. Most COP coil per cylinder engines are fired in wasted spark configuration and each coil will have its own driver. (See the wiring diagrams for connections.)

The combo files can be loaded into intermediate, advance or ultimate ECU's. In an intermediate ECU only the single Distributer option will be available. In an advance ECU the tuner my select between single and wasted spark. In Ultimate you may select Full Sequential on 4 Cylinder engines.

Note! On the Rotary programs the tuner may select between coil per cylinder or wasted spark. If the engine has the three coil setup where the leading spark plugs are on a wasted spark coil and the trailing are on coil per cylinder, this value is set on wasted spark. The two leading coil trigger wires must be tied together on the wasted spark coil negative. (See the connection diagrams). The charge time for the leadings will combine without overlapping and destroying the coil. Note that on high RPM's the leading spark will become weaker due to less time available to charge the coil. It has to charge twice per revolution.

NB! This is a Critical setting that alters wiring connections. Do not change it on a running vehicle. It could damage drivers or coils.

Dual distributor
Two ignition coil outputs will be activated and phased to run a dual distributor system as found on the Lexus 1uz-fe and BMW V12.

Single distributor
Only one ignition coil output will be activated and phased to run a single distributor. Old school engines use these types.

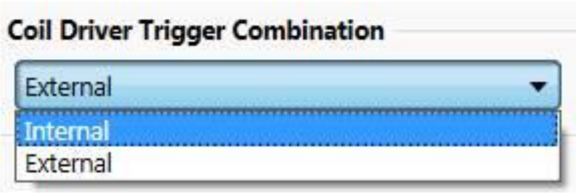
Wasted spark coil pack

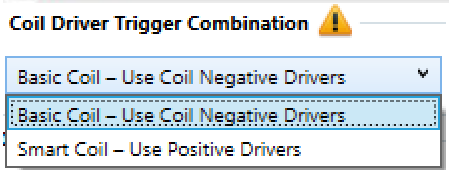
Coil outputs equal to the amount of cylinders, will be activated to COP coil per cylinder. They are fired in wasted spark sequence.

Wasted spark coil per cylinder
Coil outputs equal to the amount of cylinders, will be activated to COP coil per cylinder. They are fired in wasted spark sequence.

Full Sequential coil per cylinder
Orion2 have the capability to do Full Sequential Spark on 4 cylinder engines. This selection will require a Home pulse from a camshaft or distributor before the coils will be pulsed. You will need to set up the Home pulse signal.
Note that full sequential and wasted spark systems has no performance difference as both types will have a full load on the coil so spark is the same energy. It is merely required for overlap cams and NOS systems Also make sure that firmware is available for your application.

Coil Driver Selection





This block selects the coil type connected to the ECU. There are Basic Coils that requires an HV Coil driver and then there are Smart Coils that has built in drivers.

Basic Coils require a negative pulse to charge the coil and a positive pulse to fire the coil. This requires a high voltage power MOSSFET to control the high voltage found in the coil primary during the fire cycle. This setting wprks the same on all Spitronics ECU's with built in HV Coil drivers. Mercury and Mercury2 does not have HV drivers and requires a Coil Driver Module.

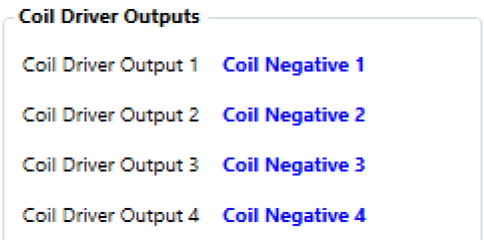
Smart Coils are coils with this high voltage driver built in. Most new cars come with Smart Coils. They require a positive pulse to charge and a negative pulse to discharge. This requires a positive driver to deliver 12V to the coil. On ECU's that has positive drivers like Orion, Orion2 and Mercury2 this setting will change the wiring position of the coils and no external components are required. On Venus3 and older product which dont have pos drivers this setting will invert the drive signal and an external 220Ohm resistor must be wired in to the 12V power. This will simulate a positive signal. Output wiring for coils will stay on the same connections.

Note! Do check if firmware is available before you do the wiring.

NB! The coils must get their power from the ECU power relay. At startup this relay is kept off till the ECU can read the map to see what type is selected in software. Having this wrong will destroy the drivers or the coils.

NB! This is a Critical setting that alters wiring connections. Do not change it on a running vehicle. It could damage drivers or coils.

Coil Driver Outputs

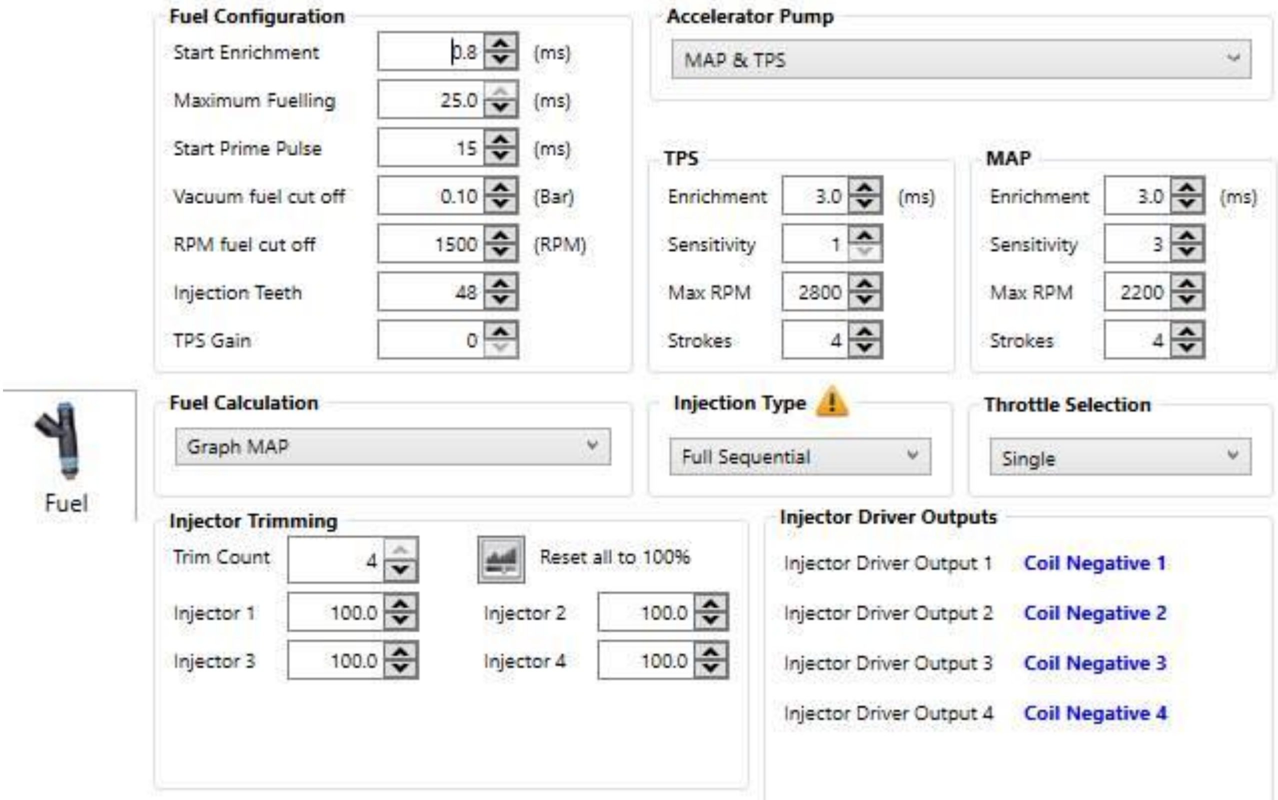


On Hyperspace 3.6 Software the drivers are now also displayed. This will indicate how many drivers are allocated to coils and will change according to Coil Driver Trigger Combination. This will allow the installer to do a printout of the drivers after setting up his unit.

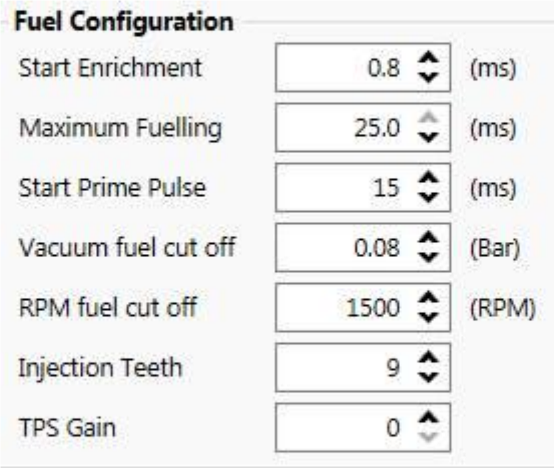
Note! This is the sequence of Coil Driver firing and not actual firing order. See the wiring diagrams on that.

Injector Settings

For more detailed explanation look in the Fuel Settings Manual.



Fuel Configuration



Start enrichment

This value will help an engine to stabilize after starting. This amount will be added to the injector time after the engine is started and reaches 500 RPM. It will then be phased out in a couple of revolutions. This value is also compensated with the water temperature %, and is not active in Expert mode. Then the Water Temperature graph is used. The value is set in milliseconds. In **Expert** mode this value for Start Enrichment will be blanked out and the graph value for that temperature interval will be used.

Maximum fueling

This setting is to protect against over fueling from all the graphs with accelerator pumps etc. It will limit the final injection time to this value if it is higher.

Start prime pulse

This setting is to assist in the starting of the engine. When the engine starts to crank and reaches 100 RPM a set amount of fuel is injected on all the injectors to get the first one with spark to ignite and turn the engine. A colder engine requires more initial fuel to start. This value is also compensated with the water temperature and is not active in Expert mode. Then the Water Temperature graph takes over this value. In **Expert** mode this value for Start Prime pulse will be blanked out and the graph value for that temperature interval will be used.
The Spitronics ECU's have a manual prime function where you can press the accelerator pedal before starting to inject fuel in the system. This fuel is measured at 50% of the start prime pulse setting. It is injected each time the throttle is pressed more than 25 % opening.

Should the engine be flooded, you may keep the pedal fully pressed to the floor during cranking. This will indicate the ECU to cut injectors and only provide spark. Press the throttle in all the way before putting the ignition on. It will prevent the prime pulse from injecting more fuel when the pedal is pressed. Once the engine starts release the pedal and then injection will commence as normal.

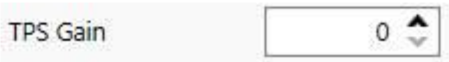
Vacuum fuel cut off & RPM fuel cut off

This feature is useful in town and downhill driving and will save fuel. It will let the engine run against compression as you are decelerating. It will also prevent flaming in the exhaust during accelerator blip. Injectors will be cut when the MAP sensor value is below the vacuum setting and the engine RPM is above the RPM setting. There is a dead band feature built into these settings to prevent jerking when cruising close to the parameters. If you feel a jerk when the feature is activated or deactivated, adjust these settings till it changes over smoothly. This is normally where the change from positive to negative drive on the prop shaft is.

Injection teeth

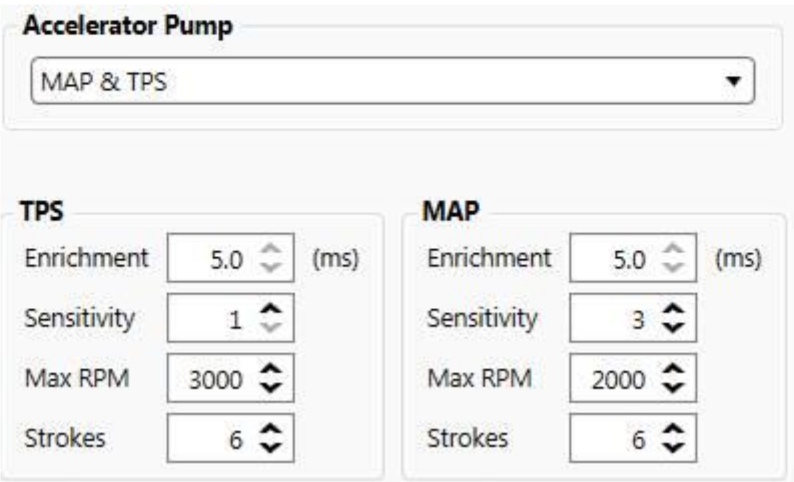
This feature adjusts the start injection degrees. It is only available on gear type triggers as low as 12 teeth per revolution. Normal injection timing starts just after the intake valve closes. The warm valve helps atomizing the fuel and makes the engine use less fuel. Put the engine on the degrees where you want to start injection. Count the number of teeth from the slot or missing teeth in the gear, in an anti-clockwise direction, to the sensor. If the pickup is in the slot imagine the tooth there and count it as well. Even if it is 60. The firmware will move injection in the slot to the closest teeth as this is not as critical as spark timing. You may change this value during tuning to see if you get better atomization and performance increase. Usually this is best seen at idle. Find the spot where it runs rich and make idling leaner. Start with low teeth and move to larger numbers to see when the valve closes. It will go rich at that point.

TPS Gain

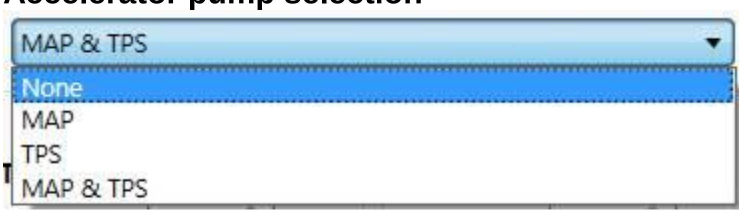


This setting will adjust the rate at which the TPS sensor will move the MAP bar to the right of the graph during Graph Map + TPS calculation mode. This will simulate a MAP signal and the gain adjustment will produce the right amount of fuel during pull-off. (For further details see the tuning section).

Accelerator pump tuning



Accelerator pump selection



The accelerator pump setting is used to richen the fuel mixture when accelerating to avoid flat spots or bog. Here you can select not to use it, use either the TPS or MAP or both signals. Below is the selections to setup each pump for TPS and MAP.

Enrichment %

This is the amount of fuel that will be added momentarily when the accelerator pump is activated. This value is divided by the number of strokes and each stroke the value is reduced by the division value. It will start with 10 and reduce to zero so that fuel is gradually reduced. This value is also compensated with the water temperature graph value. In **Expert** mode this value for MAP and TPS will be blanked out and the graph value for that temperature interval will be used.

Sensitivity

The activation sensitivity can be adjusted from 1 to 10. The lower the value, the more sensitive the accelerator pump will be. If the accelerator pump is set too sensitive it will activate randomly and cause the vehicle to over fuel. Rather keep the activation sensitivity as high as possible to avoid this from happening. For the TPS signal this value can be lower as it is more stable than MAP value and it reacts faster.

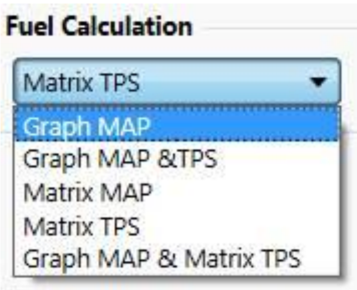
Max RPM

This is the maximum RPM that the pump settings will be active. At high RPM you do not need an accelerator pump. A standard is 1500 to 3000 RPM for TPS and 1500 to 2200 RPM for MAP. If a value was initiated before this limit was reached it will finish the decay cycle.

Strokes

This is the number of engine strokes that the fuel must be applied to and then decayed over the amount of cycles. If it is a 4 cylinder engine, a value 0f 8 will inject 4 full revolutions of fuel. There are two firing strokes per revolution. If it was a 6 cylinder engine, a value 0f 12 will inject 4 full revolutions of fuel. Always tune for the lowest value to eliminate flat spots. If a value of example 10 is selected it means that the enrichment amount will be decayed by a tenth every cycle till the tenth stroke.

<u>Fuel Calculation</u>



This block will allow the tuner to choose different options to set up timing for this engine. Each of these methods will be discussed in detail under the tuning chapter further in the manual. You can see the ***Tuning*** section for detailed description on the tuning side.

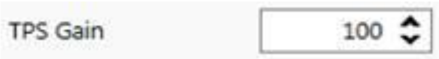
Graph MAP

This is for standard engines with a good vacuum signal and allow for easy tuning in the street.

Graph MAP+TPS

This method is used for engines with a poor vacuum signal at low RPM's and it still allows for easy tuning in the street. The ECU will use the TPS signal to calculate a MAP signal at low RPM's when there is no or little vacuum. It is used for engines where the vacuum signal is correct and above 1500RPM's. The graphs are the same as above with the addition of the following settings:

When the RPM's are below the RPM fuel cut off, then TPS idle is activated. The Vacuum Fuel Cut off setting then becomes the minimum manifold pressure value to start off from.



The TPS gain value will use the TPS signal to calculate a projected vacuum signal on the graph. When the actual vacuum is below the calculated vacuum then the ECU will use the lowest vacuum signal of the 2. Once RPM's is above the RPM fuel cut off, then TPS idle is de-activated.

Matrix MAP

This is for standard engines with a good vacuum signal and allows for easy dyno tuning. Here the MAP sensor versus RPM is used and the blocks are set in 0.1 milliseconds resolution.

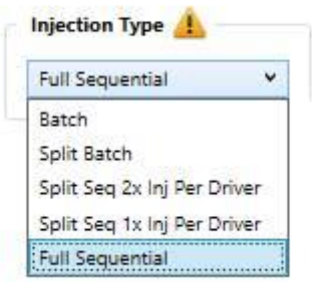
Matrix TPS

This is for normal aspirated engines with poor vacuum signal or throttle bodies and allows for easy dyno tuning. Note: It is recommended to add the altitude sensor to compensate for altitude pressure changes. TPS versus RPM does not compensate for pressure changes. Here the TPS sensor versus RPM is used and the blocks are set in 0.1 milliseconds resolution.

Graph MAP + Matrix TPS

The Matrix is the same as TPS Matrix above. This is for turbo racing engines with a good or poor vacuum signal and allows for easy dyno tuning. Note: It is recommended to add the altitude sensor to compensate for altitude pressure changes in the TPS matrix. Here the normal aspirated tuning is done on the matrix and the boost tuning is done on one Fuel Load graph. It will become visible in this mode. Here the TPS sensor versus RPM is used on the matrix and the blocks are set in 0.1 milliseconds resolution. Then Map sensor is used to modify fuel under boost. Notice how there is no fuel if there is no boost. This fuel is calculated as % boost compensation.

Injection Type



This setting will allow different methods of fuel injection. The firmware in the ECU will blank out the methods that are not adjustable. In some firmware a refresh will be forced to reshuffle GP outputs or cancel an illegal setting.

Batch Injection

This method all the injectors are pulse at the same time. It is not good practice as the cylinders does not get the fuel under the same conditions or injection angle, and is poor on power and economy. Spitronics programs does not use the feature unless for specific tasks.

Split Batch Injection

This method will pulse two sets of injectors 180° apart from each other. It is used where the trigger has even pulses and no cam signal is present. It is used on the standard systems where budget is of importance. For a 4 cylinder, the injectors are paired so that each cylinder gets fuel under the same condition or injection angle.

Split Seq 2x Inj Per Driver

This method will pulse two injectors connected per driver for the two cylinders that moves together. There are up to 4 drivers in the sequence. This means it can do up to 8 cylinders in split sequential mode. The injectors will pulse once per revolution and the injection time on the software will be divided by 2. With other words for each revolution only half the calculated fuel is injected. This method does not require a home pulse and is the popular choice. There is very little difference in power and economy to a full sequential system. Note that driver sequence is not cylinder sequence. You need to wire according to your engines firing order. See the drawings for this.

Split Seq 1x Inj Per Driver

This method will pulse one injector per driver. There are up to 4 drivers in the sequence. This means it can do up to 4 cylinders in split sequential mode. The injection time on the software will be divided by 2. With other words for each revolution only half the calculated fuel is injected. This method does not require a home pulse and is the popular choice. There is very little difference in power and economy to a full sequential system. Note that driver sequence is not cylinder sequence. You need to wire according to your engines firing order. See the drawings for this.

Full Sequential Injection

This method will pulse one injector per driver. The injector will pulse once every two revolutions and it will inject all the fuel calculated on the software. Here a cam pulse or home signal is required to sink the injectors with a certain stroke one the engine. If there is no home pulse it will still do full sequential injection, but stroke phasing may vary from start to start. Note that an engine is normally started in split sequential mode and then goes over to full sequential after 500 rpm is reached or when a home pulse is established. This helps for faster starting. This feature can only be used on 4 cylinder engines. Note that driver sequence is not cylinder sequence. You need to wire according to your engines firing order. See the drawings for this. Tip: if you don’t have a home pulse set injection angle to inject just after the intake valve has closed.

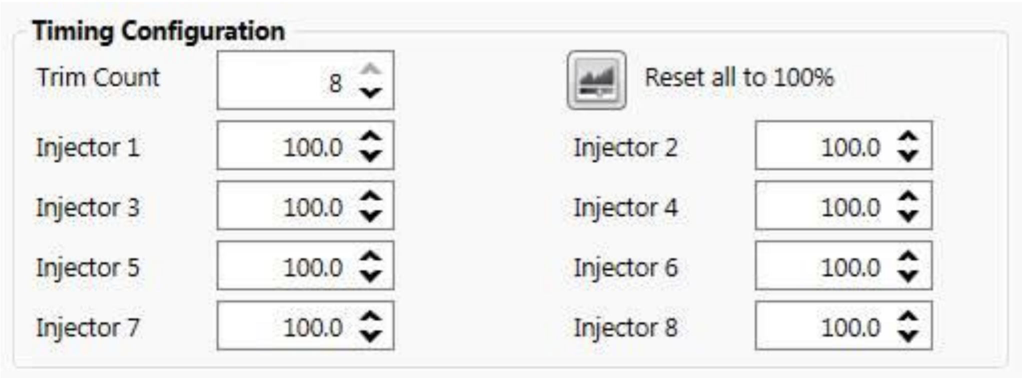
NB! This is a Critical setting that alters wiring connections. Do not change it on a running vehicle. It could damage drivers or fill cylinders with fuel which may bend conrods.

Throttle Selection

This setting is developed to use a MAP signal on multiple throttle body engines. The problem with them is there is no intake plenum where the vacuum could be measured. The vacuum signal only makes a spike when the valve opens. This spike is also there only once in two RPM’s. This makes it important to read the signal on crank degrees when the vacuum signal is present. This setting is only available for gear type triggers as low as 12 teeth.

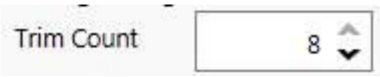
On multiple throttle bodies connect only cylinder 1, or the cylinder that shares the same TDC degrees with it to the Map sensor. Do not use a common vacuum rail. You will need to set the Map teeth in the Engine Settings page.

<u>**Injector Trim**</u>



This feature allows the tuner to trim each injector individually for the ultimate performance. This is done by individual Lambda or EGT sensor on the exhaust runner to measure individual air fuel ratios. It is only selected Orion2 firmware that has this feature.

No of Injectors

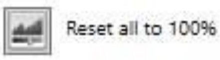


This is the number of drivers selected by the tuner. The Orion2 has 4 injector drivers and can work full sequential for 4 cylinders. A setting of zero will disable this feature and free up valuable microprocessor time.

Injector Trim Setting

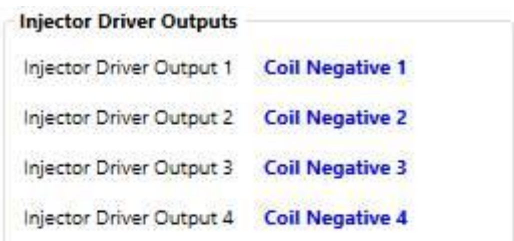
These tuning blocks allow the tuner to adjust the register from 90.0 to 110.0 % for each cylinder. Adjustments can be made in 0.5 % resolutions.

Reset



This block is to clear all the registers to 100.0 % to start with. First tune the engine is as good as possible, then do minor changes here to calibrate the injectors. A tip is to use the middle average of the injectors ant tune to that. Example if the injectors differ by 10 % between high and low. Then use the middle vale and some will be 5% high and some 5% low.

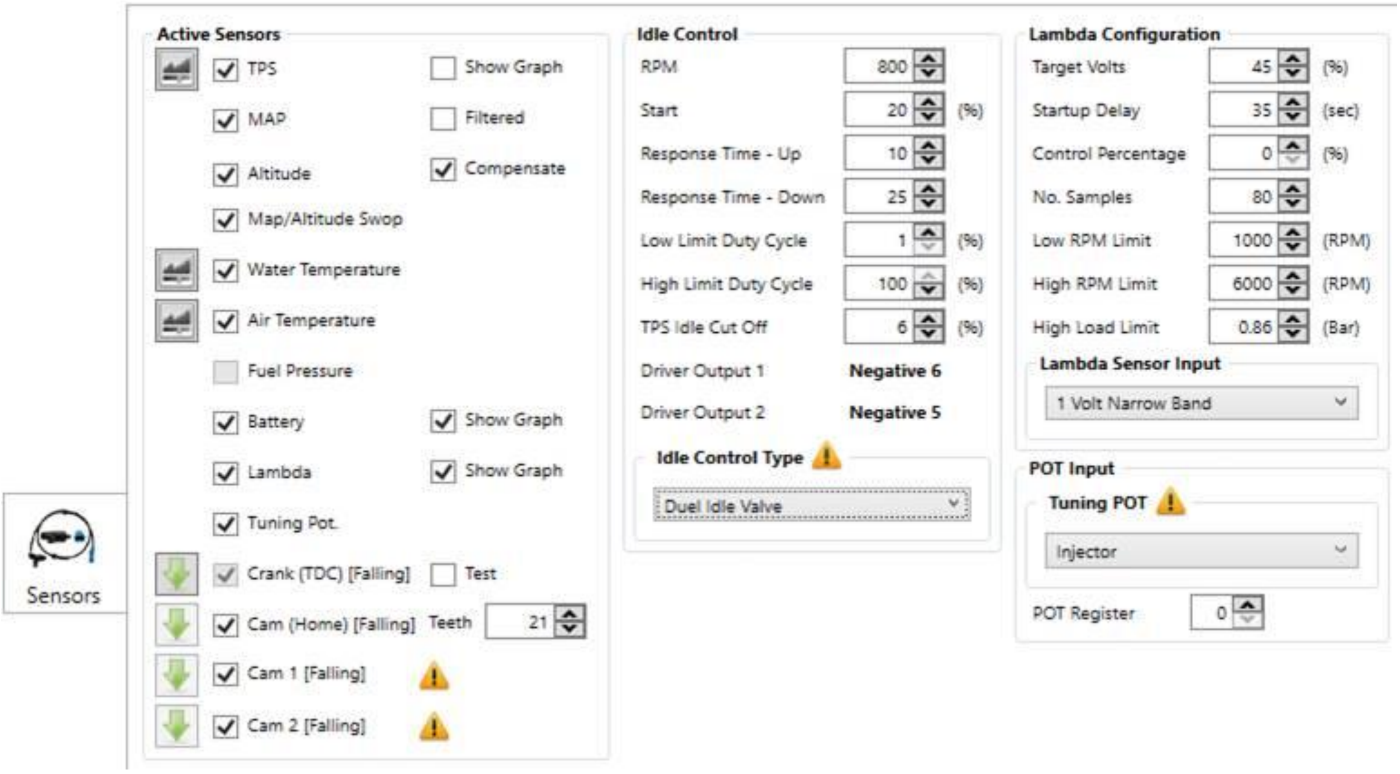
<u>**Injector Driver Outputs**</u>



On Hyperspace 3.6 Software the Injector drivers are now also displayed. This will indicate how many drivers are allocated to Injectors and will change according to Injector Type setting. This will allow the installer to do a printout of the drivers after setting up his unit.

Note! This is the sequence of Injector Driver firing and not actual firing order. See the wiring diagrams on that.

Sensor Settings



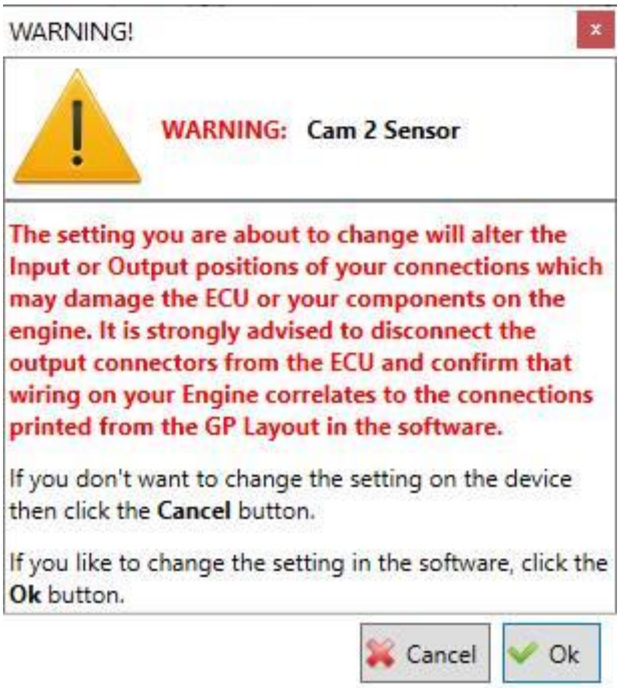
This block lets the tuner select the different sensors that he requires for his application. Not all the sensors are used but each one has different features that makes the engine perform at its best. If a sensor is not used, leave the block unchecked. This will free up valuable microprocessor time. Also make sure the wiring to that sensor is properly isolated as there is power on the leads that could short circuit and damage the ECU as a result. Some of the sensors cannot be altered or will be forced on by the firmware. There may be other settings that work with this sensors on other pages. make sure you go through all the settings.

Calibration

Some of the inputs can be calibrated by clicking on this calibrate button next to it. This allows for a wider range of sensors to be used and calibrated in the software.

Warning

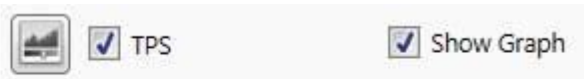
This warning sign at certain critical settings will change wiring connections on the device. Do not change them while the engine is running. Disconnect the relevant output connectors of the ECU. You could accidently connect a coil or injector to a GP algorithm which may damage the driver or coil or fill the cylinder with fuel. If you do change the setting a warning will pop up reminding you of the hazard.



All Critical settings will be saved separately in the Orion2 which means when you load a map they will not be changed. Except if you press the Clone button. Critical settings can only be altered on a live device or with the clone function.

TPS Sensor

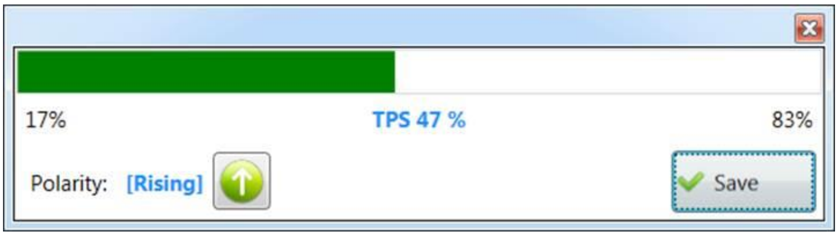
For more detailed explanation look in the Throttle Position Sensor Manual.



This sensor indicates to the ECU what the driver wants to do. It is also used for many features in the ECU, such as fueling, accelerator pump, idling control, fuel cutoff, cam control, automatic transmission control, etc. It is possible to control the engine without this sensor but with limited drivability. If there is a TPS sensor on the engine, rather connect it. If not, un-select the check box and isolate the wiring.

For the ECU to operate correctly this sensor needs to be calibrated. **Note**: When pressing the throttle while calibrating, the Fuel Prime function may squirt some petrol on the cylinders. You may disconnect the P2 and P3 connectors so that these functions will have no effect.

Click on the *Calibrate*  button left of the TPS check box and do the following procedure:



The TPS value must increase with throttle depression. If it is decreasing, click on *Polarity* to select *Negative*. This feature is normally used where the original ECU is still connected and wiring cannot be altered. In this case you connect only the ECU TPS signal wire to the OEM signal wire. Do not connect the ground or 5-volt signal wires but isolate them to prevent shorts. Now click the *Calibrate* button. The current TPS value will be written into the two blocks *Min* and *Max*.

Press the fuel pedal in completely and release the pedal completely. The *Min* and *Max* values will be indicating the range of the TPS. Click the *Save* button. You may now test the TPS signal by pressing the pedal in and releasing it. The TPS real time value should operate from 0 to 100%.

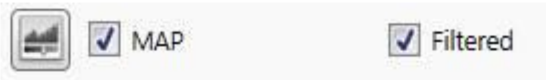
Then click on the '*Save to ECU*'  button to make the changes permanent.

Show Graph

This checkbox will enable the TPS compensation graph. With this graph it is possible to add fuel % with the TPS position. It is handy to enrich the fuel mixture at full throttle conditions. There is no timing compensation for this graph.

MAP Sensor

For more detailed explanation look in the MAP Sensor Manual.

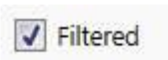


This sensor measures the MAP (Mean Absolute Pressure) in the intake plenum. This is the main sensor for the ECU to calculate the fuel amount which is injected into the engine at different conditions and load requirements.

This 'calibrate' button will only appear when the custom sensor is selected under ***Engine Settings***.

Only custom sensors can be calibrated. Click on it to adjust calibration.

The offset value will change the MAP reading. Adjust it to read the same as the barometric pressure of your altitude above sea level. **Note**: Remember to take temperature into account.

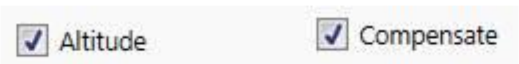


The Filtered checkbox can be used to smooth an erratic map sensor signal. It will average the current sample with the previous sample. The down fall is that it may create a minor flat spot under blip conditions. This needs to be corrected with the accelerator pump feature.

If the sensor is not used, uncheck it to free up valuable processor time.

Altitude Compensation

For more detailed explanation look in the Altitude Sensor Manual.



The ECU can compensate for altitude differences in pressure. It will adjust the fuel mixture and the timing in relation to altitude. This is optional MAP sensor and has to be ordered separately. Some products like Mercury2 has an external sensor and other products like Venus3 and Orion2 has onboard 3Bar sensors.

Select *Altitude* and click on *Compensate*. Compensate will activate Altitude compensation. Make sure the Altitude sensor read the barometric pressure at your altitude correctly.

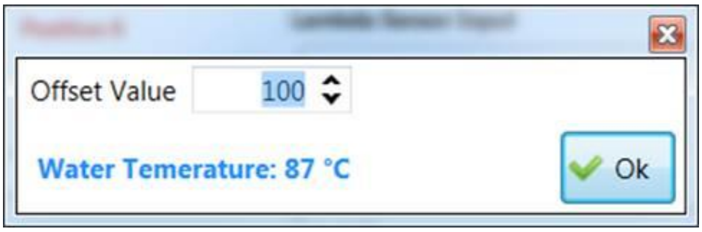
MAP / Alt Swop

With Map/Alt Swop on Orion2 or Venus3 the Altitude and MAP Sensor can be swapped. This is handy if you have different value sensors or want to use the onboard sensor for a MAP Sensor. On Mercury2 this Map/Alt Swop will select between a 1.1Bar Altitude Sensor or a 2.5Bar Altitude Sensor. Off is 1.1Bar.

Water Temperature

For more detailed explanation look in the Water Temperature Sensor Manual.

The water temperature sensor is used mainly for cold start compensation with fuel and spark timing graphs. There is however a couple of functions that requires compensation with temperature like idle control, accelerator pump, prime pulse etc. Neglecting to wire the sensor in may result in the engine not being drivable when it is cold. All fuel injected engines have water temperature sensors mounted in the thermostat housing area. Not all are compatible with the Spitronics ECU but there are aftermarket sensors that can be fitted. Spitronics ECU's use a 2K NTC (Negative Temperature Co efficient) resistor. It is the standard for water temperature sensors for most engine manufacturers. It has a fixed calibration curve which is programmed in the firmware and it cannot be altered. It can however be slightly calibrated by giving it an offset percentage. The normal setting is 100%. Click on the calibrate  button left of the Water sensor check box.

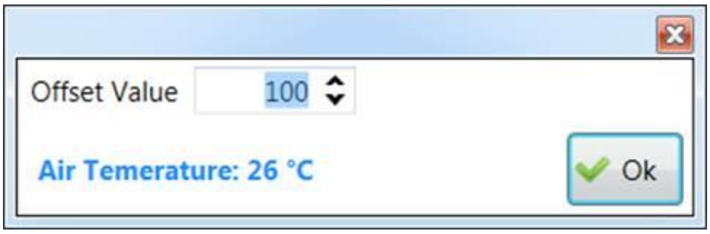


Reduce or increase the value to slightly shift the reading value. Do this at the critical temperature for instance where the fan must come on or off. If the error is too large you may need to replace it or get the correct sensor. These sensors are measured at 25°C with an ohm meter to see which type it is. If you have the wrong type you may need to change the sensor to a 2K sensor. *Save to ECU*  button will make the changes permanent.

Air Temperature

For more detailed explanation look in the Air Temperature Sensor Manual.

The Air temperature sensor is used to compensate with fuel and spark timing for density changes in warm or cold air. Neglecting to wire it in may result in the engine detonating when it is Hot. Not all engines have air temperature sensors mounted on them. Most sensors were incorporated in the MAS meter. This sensor deviates plenty between manufacturers so it is difficult to cater for all manufacturers. However, it can be installed and utilized effectively. Spitronics use a 10K NTC (Negative Temperature Co efficient) resistor. It has a fixed calibration curve which is programmed in the firmware and it cannot be altered. It can however be slightly calibrated by giving it an offset percentage. The normal setting is 100%. Click on the calibrate  button left of the Air sensor check box.



Reduce or increase the value to slightly shift the reading value. Do this at the critical temperature for instance where the engine is at running temperature. If the error is large you may need to replace it or get the correct sensor.
These sensors are measured at 25°C with an ohm meter to see which type it is. If you have the wrong type you may need to change the sensor to a 10K sensor. *Save to ECU*  button will make the changes permanent.

Fuel Pressure Sensor

For more detailed explanation look in the Fuel Pressure Sensor Manual.

Some ECU's has the ability to control fuel pressure by speed controlling the fuel pump with Pulse Width Modulation (PWM). This is achieved by pulsing the driver at 300 Hz with a required duty cycle and then measuring the actual fuel pressure with an electronic pressure sensor. The duty cycle is then adjusted to reach the required fuel pressure in loop control.

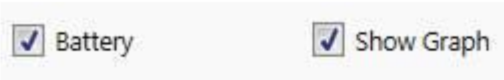
Calibrate

Click the calibrate button and type in 100. Click OK.

If you have an accurate fuel pressure gauge or a different fuel pressure sensor you may calibrate it with this value. It is a percentage correction which allows for range calibration only. That means calibration is accurate at the working pressure. The sensors supplied are calibrated according to the manufacturer signal specs. See the ***Fuel Pressure Sensor Settings*** page for other adjustments.

Battery Charge volts

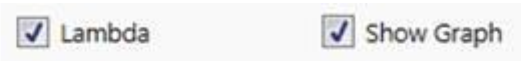
For more detailed explanation look in the Battery Charge Volts Manual.



Battery and alternator voltage have a great influence on ECU systems. When an engine cranks, battery voltage can drop as far as 9 volts on cold days and when the engine is running, voltage can go up to 14.3 volts. This difference has a big influence in coil energy and injector opening speeds. So to compensate for that the Spitronics ECU's has 2 graphs. One graph is a fuel compensation graph which adds more fuel during cranking. The other is a charge time compensation graph that will act on the charge time of the coils. This will improve spark energy to help the engine start. It is not a clear cut tune as you need to put a variable power supply in place of the battery.

Lambda Sensor

For more detailed explanation look in the Lambda Sensor Manual.

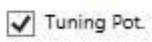


All Spitronics ECU's have the capability to do loop control with a lambda sensor connected. The tuner may set up parameters for lambda control and then the ECU will compensate the main air fuel ratio according to the lambda sensor in real time. This will result in the optimum mixture even if all the maps are not setup accurately or/and due to variations in environment which are difficult to tune in, such as moisture, air density etc. You need to tune the engine properly first and then activate this control afterwards.

To setup this feature, click on the *Lambda* and *Show graph* check box. If you only check Lambda, then it will display the values but not control AFR. This is handy while you do the base tuning. See the ***Lambda Sensor Settings*** page for other settings.

Tuning POT

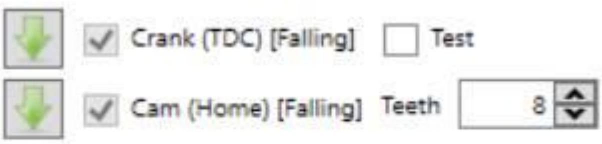
For more detailed explanation look in the Tuning POT Manual.



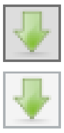
This Tuning POT is a Potentiometer or variable resistor that lets the tuner or driver change settings in real time while the ECU is operating. It cannot be calibrated but will adjust from 0 to 255 values. It is used for different functions which can be further under the ***Sensor Settings Page***.

Crank and Cam angle Sensors

For more detailed explanation look in the Crank and Cam angle Sensors Manual.



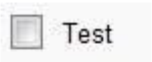
These inputs are required by the ECU to determine exact crank and cams angles so that spark and injection timing can be calculated.



Clicking on the arrows will alternate rising or falling edge. in some cases up arrow means positive and down arrow means negative signals.

Crank (TDC)

The crank angle sensor is used by the ECU to determine exact crank degrees as it rotates. This sensor could be situated on the crank or in a distributor or encoder called a CAS. If it is situated on the cam gear like a distributor, then it will have enough pulses for 2 revolutions to represent the crank signal. For example, Toyota uses what we called a 24+TDC pattern. If the sensor is on the crank there will be 12 teeth. If it is on the cam there will be 24 teeth. If a pulse is generated on a 36-1 gear on a crank for example, then the missing tooth is used as a TDC pulse. A TDC pulse represent a signal that comes once every revolution. It is not necessary at TDC of the engine. In a distributor it may have a TDC pulse or Home pulse. If a pulse come once in two revolutions it is called a home pulse.



The crank sensor has a test function. Each firmware file is programmed for a specific sensor pattern. The test function will activate a test procedure of the crank sensor pattern during cranking, to ensure that it is read correctly. If it is incorrect or has the wrong firmware, the software will show errors and not attempt to start the engine.

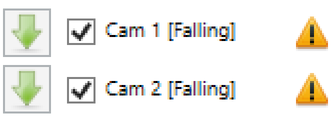
Cam (Home)

The cam angle sensor will always be situated on a cam shaft. It could be a lone sensor in the valve cover or in a distributor. This signal only came with later models when full sequential injection was introduced. Some distributors like Nissan and Toyota had both sensors in the distributor. The cam signal will give a unique pattern over two revolutions, allowing the ECU to detect which revolution is the firing stroke. This signal could be one pulse or a number of pulses. The ECU can compare it with the crank signal pattern and determine firing stroke.

Cam Home Teeth

This feature is used to set up cam timing to establish a home pulse. Each manufacture uses a different cam pattern. One of the cam sensors must be connected to the ECU and selected. During setup, start with teeth 1 and crank the engine. It should show missing home pulses on the error codes. Increase the value and press C for clear after each adjustment. If the error stops appearing, at for example 4, then continue increasing till you see the error again. If the value is 10, for example, then set the teeth setting in the average of 7 teeth. Now the ECU knows the difference in stroke 1 and stroke 3 of the engine. One will have a pulse within 7 teeth after the slot and 3 will have no pulses. Note that Full Sequential Injection or Full Sequential Spark must be on to produce errors. Also note that Full Sequential Injection is still possible without a Cam (Home) pulse but not Spark. You need to have the Cam sensor setup correctly for spark.

Cam1 & Cam2



This feature consists of 2 cam control settings for inlet or exhaust cams. Control is still open loop so for V engines the 2 Intake Cam solenoids are connected on the same driver and the same with the Exhaust Cams. No input Cam sensors are required in open loop control. Also note that cam control will be 25% duty cycle when ***Off*** and 75% duty cycle when ***On***. If your engine requires different control parameters, then you need to load the engine specific firmware.

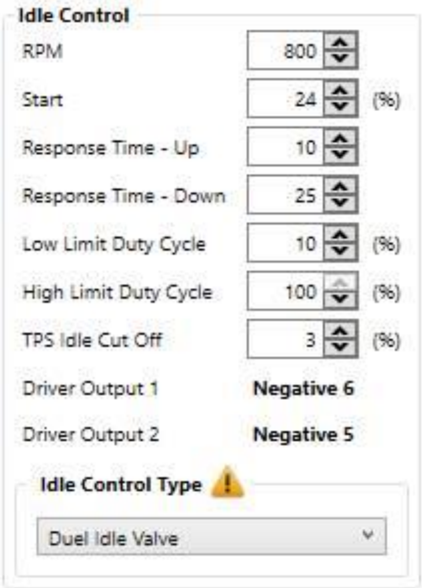
First you need to select 1 or 2 cam outputs. Note that the software will refresh the setup data as these drivers are shared with GP output drivers. If you don't use cam outputs, then un select them to free up the GP drivers.

Then the cam control settings will become visible under the Turbo Settings Page. You will need to set them there.

Take note that Cam1 is used Cyl1 in V engines or Intake Cam. Cam2 is used for the opposite cam than Cam1 or the Exhaust Cam.

Idle Control

For more detailed explanation look in the Idle Control Manual.



The ECU has the feature to control different types of idle motors found on an engine. Before adjusting the idle control settings, you need to select which type of valve or stepper is on the engine. **Note**: The stepper types idle motor (4 to 6 wire), require the external electronic driver. Also note that the electronic unit differs between the 4 Wire bipolar type motor and the 6 Wire common supply type motor.

RPM
This setting is the target RPM's when the engine is on running temperature. When it is cold the ECU will automatically increase engine RPM's with up to 300 RPM's. This is calculated according to fuel enrichment on the water compensation map. Every 15% will increase 100 RPM on the Idle control.

Start %

This setting is used to increase the air intake when the engine is started hot or cold. The ECU will open the idle valve with this %. Note that on stepper controls it will activate 25% every time the key is switched on. If you don’t start it, it may idle high at first then come back to idle target.

Response Time Up

This setting will determine the rate at which the valve opens when the actual RPM’s fall below the set point in *Idle RPM*. The further the RPM fall below the set point, the faster the ECU will open the valve to let in more air. Low values will create a faster response time and high values will create a slower response time. This setting must prevent the engine from stalling when you switch the air conditioner on, or put it in drive.

Response Time Down

This setting will determine the rate at which the valve closes when the actual RPM’s go above the set point in *Idle RPM*. The further the RPM goes above the set point, the faster the ECU will close the valve to decrease airflow into the engine. This value is set higher than the *Response Up* value, to eliminate hunting. Low values will create a faster response time and high values will create a slower response time. This setting must bring fast idling down as fast as possible without hunting the engine.

Low Limit duty cycle

This setting will preload the solenoid against the spring in the idle valve so that the valve starts to open immediately when the ECU starts increasing the value. It can also be used to set minimum idling RPM for throttle valves that closes completely. To set the value start with a larger % and decrease until the desired idling RPM is reached.

High Limit duty cycle

This setting is used to limit the maximum idle RPM’s. No need to open the valve more than necessary. It also allows for the use of large valves in smaller engines. Make sure that when the engine is cold, it can still lift the RPM up to approx. 1500 RPM. This can be tested by entering a large *Idle RPM* value and limit the ECU from increasing it too high.

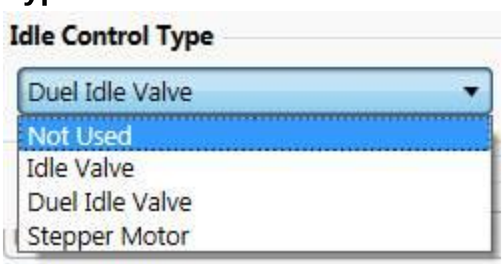
TPS Idle Cutoff %

This value is used to disable the idle control when the driver touches the throttle. The reason is that the ECU must know when not to control idle as the driver may need just a minimal amount of revs with slight throttle.

Drivers

This indication will show the installer which wires to connect on which outputs of the ECU. Driver 2 is only used for the dual valve to close. Note that positive and negative drivers may be used for idle control. If a valve is used, then make sure the Diode across it is wired correctly. (See the wiring diagrams and general purpose priority spreadsheet for correct installation.)

Type Selection



The ***Type Selection*** can select between the two-wire spring-loaded ***Idle Valve****,* the three-wire spring or non-spring loaded ***Dual idle valve****,* the Bipolar ***Stepper motor*** or common supply ***Stepper motor****.* Stepper motors do not use the Low Limit and High Limit settings as they keep their position when there is no signal present. If there is no idle control, select '*Not' used* to free up valuable processor time and general purpose outputs.

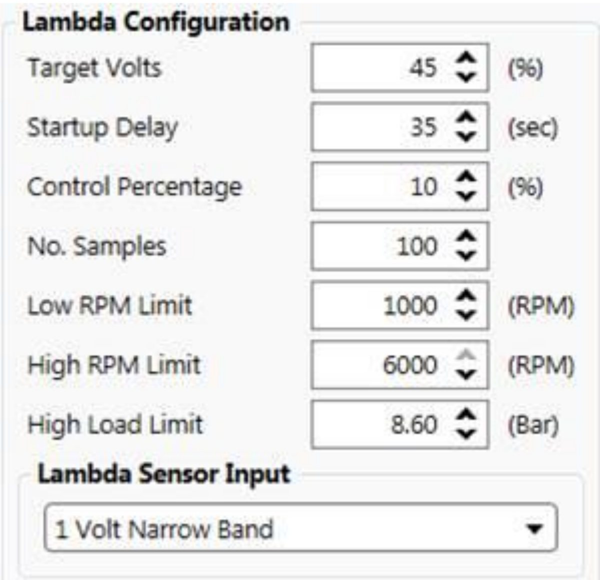
Idle Valve
Two wire spring loaded idle valve only use one output from the ECU.

Dual Idle Valve
Three spring or non-spring loaded idle valve two outputs from the ECU.

Stepper Motor
Four or Six wire idle valves operate with a Spitronics Type 1 or Type 2 stepper motor controller, use one output from the ECU.

Lambda Configuration

For more detailed explanation look in the Lambda Sensor Manual.



Target Volts
This is the desired Stoic area where the sensor determines the best mixture of 14.7 air to fuel ratio. These narrow band lambda sensors have a voltage output of 0.1 to 0.9 volt. A voltage of 0.45 volt = 14.7 A/F ratio = 45%. Spitronics work in % as this is easier to simplify between the 1 volt and 5 volt signal. This unit can receive a wide band signal of 0 to 5 volts but the electronics for driving the sensor is not built in the ECU. It will require a separate electronic board. The ECU does not convert this volt signal in A/F ratio or lambda values as it is not required for control. There is a difference in volts for different type wide band sensors. The tuner uses an accurate test instrument to tune the engine and set his AFR correctly in real time.

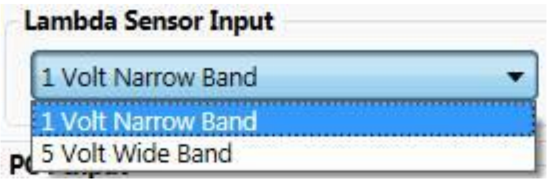
Startup Delay
This will give the sensors' element time to heat up so that it can measure accurately. A normal setting here is 30 to 45 seconds. If the temperature of the engine is below 30°C, then lambda control will be disabled. When you start the engine time the sensor with a stopwatch till you can see that it measures correctly.

Control Percentage
This is the value of injector compensation. It can be adjusted from 0 to 20%. This means that if on 10%, the ECU will lengthen or shorten the injector signal by 10% to achieve stoic. Always try and tune the engine accurate in open loop and give the lambda just a little control to smooth it out. If you give it a large % and the sensor fails your engine may be out of AFR.

No. Samples
This Setting is the number of samples that is used as an average to prevent the control from becoming erratic. Because the sensor has a 0.6 seconds reaction time the ECU tends to over react. Increasing the number of samples will bring more stability to the control program.

The 3 limits
This will set the control range to where the narrowband sensor is accurate. A narrow band sensor cannot always control where a slightly richer or leaner mixture is required. The control will be active between the RPM limits and below the vacuum limit. Do not use this control at high RPM and high boost. It may be too slow to react when a mixture is lean. These settings are displayed on the graphs as short bars.

Sensor input

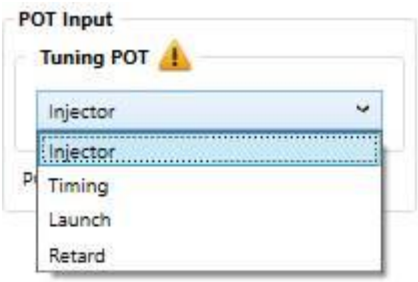


This input is used to select between a narrow band 1 volt signal and a wideband 5 volt signal. A wideband signal is linear and can cover a wider range of A/F measurements. It can be used for idling and high load readings. Notice that the rich and lean % change between the 2 sensors. Narrowband is inverted and wideband is linear.

POT Input

For more detailed explanation look in the Tuning POT Manual.

The following functions can be selected.



NB! This is a Critical setting that alters wiring connections. Do not change it on a running vehicle. It could damage drivers or components on the engine.

Injector
Injector setting will change the injector time with the set % richer or leaner. The POT needs to be in the middle to have no effect on current fuelling. This is handy in a race car if the driver has an A/F Ratio gauge installed. Then he can manipulate fueling and remember under which conditions he has to lean or richen the mix. Then he can make adjustments on the graph at a later stage.

Timing
Timing will advance or retard the ignition timing by 5 degrees in this example. The POT needs to be in the middle to have no effect on current timing. It is useful in racing for tuning time while driving. Ensure that the driver has a knock sensor and light fitted to the engine.

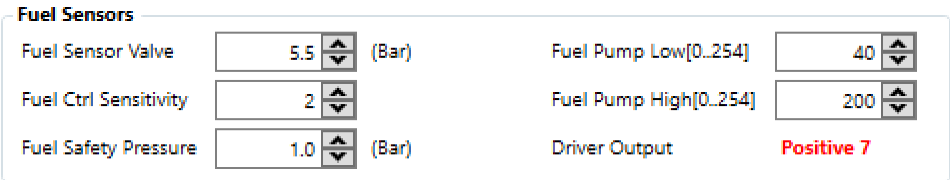
Launch
The Launch Control feature will spin a turbo to higher RPM's while the vehicle is stationary. This is done by adjusting the RPM limiter, enrich the fuel mixture and retard the ignition timing. This will create boost pressure so that when the driver launches, there will be no turbo lag. See the Hyperspace Ver 3.6 manual for complete explanation as there are many different ways to set this up.

Transmission Retard
This feature is for automatic transmissions to retard the engine timing during gear shift. This will make the shift smoother and protect the transmission. The launch control circuit will be used and this system will disable launch control.

POT Register
Some tasks requires a value input. The pot register is used for user values.

Fuel Sensors

For more detailed explanation look in the Fuel Pressure Sensor Manual.



Fuel sensor value
Type in the Fuel sensor value that you are using. They come in 4 Bar MAP, 5.5 Bar Differential pressure, and 7 Bar MAP. The most popular sensor is the 5.5Bar DP. Note: The low pressure side of the DP sensor must be tied to the intake manifold pressure just as a normal fuel pressure regulator. This sensor will automatically compensate for the intake manifold pressure.
The fuel pressure real-time gage will also be scaled to this Fuel Sensor value setting.

Fuel Control sensitivity
This setting will adjust how the ECU will react to pressure changes. Fast or slow reaction will control the pressure range. '1' is for the fastest reaction. If it is set too fast the fuel pressure will become erratic. Select the fastest value which will stabilize the pressure against hunting.

Fuel Safety Pressure
This setting is the protection feature that will cut the fuel pump in case of fuel line breakage. Especially to the sensor as this is a thin line. Use a 1 Bar setting.

Fuel Pump Low
This setting is to control the minimum duty cycle of the pump. If it is too low the pump will stop start and make the fuel erratic. Some fuel pumps need to do a minimum RPM or their veins will not deploy to pump fuel. If this is the case the pump will start to make funny noises and the fuel pressure becomes erratic. Sometimes it helps to turn the pump position so that the veins protrude downwards. Set the minimum duty cycle so that the pump runs smooth at lowest pressure. If it is

too high the pump will not be able to control at the lowest pressure. A value out of 254 will make up 100% of duty cycle, it means that 127 will be 50% duty cycle.

Fuel Pump High

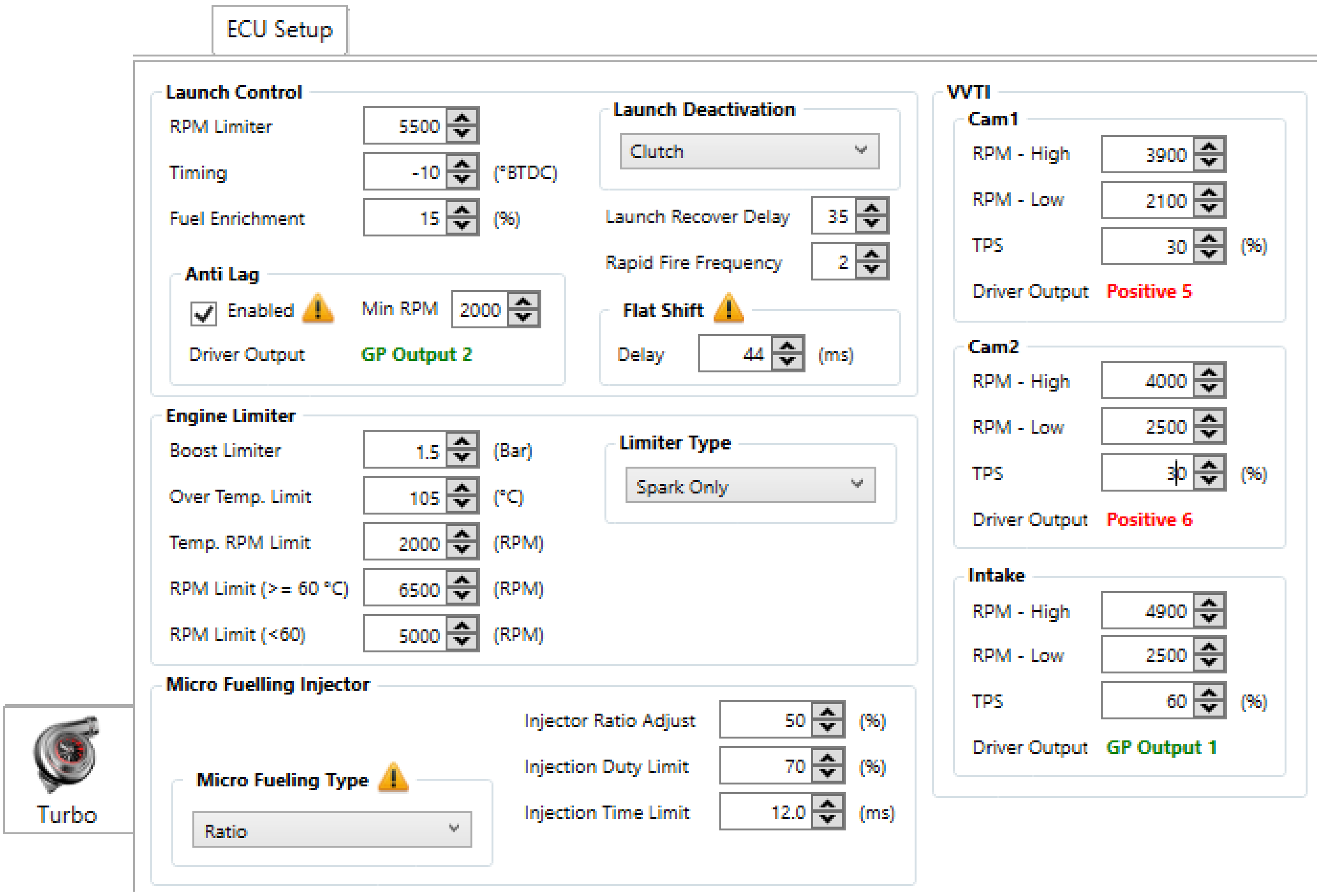
This setting is to control the maximum duty cycle of the pump. The high setting will limit the pump at a certain pressure. This is handy to prevent the pump from over pressure on the thinner fuel lines to the sensor. Make sure that the pump can supply the right pressure at full load high RPM. Always go for the lowest setting and keep a note on the fuel pressure at high load.

Driver Output

This setting will indicate to the installer which output is dedicated to the pump. This output must be positive and is used with the Spitronics Electronic relay. Make sure on the wiring connections.

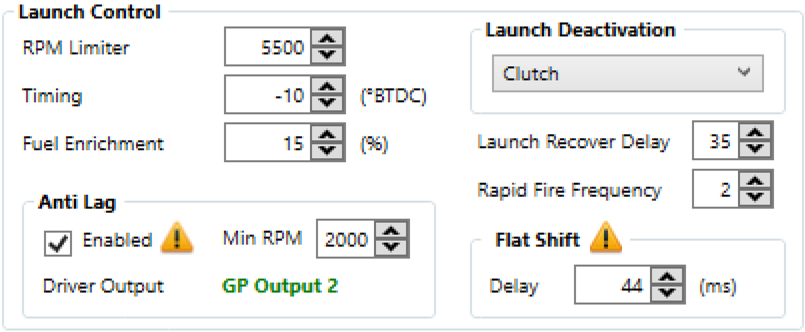
The driver will only be visible when Show Graph is on and Fuel Pressure Control is activated.

Turbo Settings



Launch Control

For more detailed explanation look in the Launch Control Manual.



Launch Control Operation

The Launch Control feature will spin a turbo to higher RPM's while the vehicle is stationary. This is done by adjusting the RPM limiter, enrich the fuel mixture and retard the ignition timing. This will create boost pressure for stationary launches and reduce turbo lag. Launch Recover Delay will bring the launch limiter slowly back to normal revs. This will improve traction during pull off. RapidFire will keep the engine on power while spinning and make exhaust noises that sounds like a machine gun. See your product's hardware manual for the different wiring options for the different activation methods like Clutch or TPS 90% options.

RPM Limiter

This is the maximum RPM that the engine will reach in launch control. The moment engine revs reaches this value minus 500RPM timing and fuel compensation will be implemented. Example: If the limiter is set as 5000RPM then the timing and fuel compensation will only start above 4500RPM. This will help the engine to rev up to launch effortlessly. Should the engine revs go above 5000RPM the fuel or spark will be cut to limit the engine from over revving. If the engine limiter is set to Soft or Hard Cut, then fuel will be cut. If it is set to Spark Only, then the RapidFire feature will come in place and only spark will be cut.

Timing

When launch is activated, timing will be retarded to this value. If you have ultimate class hardware then you can adjusted this value from -30 to 30 degrees. Advance and lower class can only be adjusted from 0 to 30 degrees.

Fuel Enrichment

To spin the Turbo requires more fuel to burn through the Turbo and spin it up. This setting will add a percentage value.

Launch Recover Delay

This feature allows for a slow increase in Launch limiter RPM when the clutch is released. It will help with traction because then engine power is slowly returned to normal. For this feature to operate Tuning POT must be set to Launch and Launch Activation must be set to Clutch so that a launch button can be used.

This value is adjustable in 100 milliseconds resolution. A value of 30 will result in 3 seconds delay to rise 2000 rpm. Ex. If launch rpm is 4000 and you release the clutch, then the limiter will increase over 3 seconds to 6000 rpm. Another example if the value is 23 then it will take 2.3 seconds to raise the limiter from 4000 to 6000 RPM. It can be used during shifts to higher gears by touching the launch button. The rise time will be the same for all the gears.

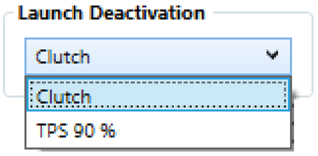
RapidFire

This feature will randomly spark coils when you go above the Launch Limiter for up to 500 RPM above it. Example if the launch limiter is set at 5000RPM, then it will be active from 5100 to 5500

RPM. The advantage is that the occasional adjusted spark will ignite the fuel in the exhaust making a sound like a machinegun. To get this feature to work you need to put the engine limiter on ***Spark Only***. This is ideal for the spinning guys when you want to keep power at a maximum. Note that your exhaust and silencers must be modified to accommodate the explosions in them. Normal systems will be damaged.

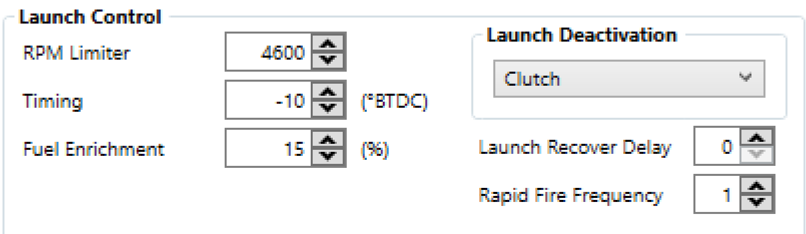
A value of 1 in the RapidFire block will then spark once in 2 rpms. A value of 2 will spark once in 4 rpms and so on till a maximum value of 10. The spark will be alternated so that each cylinder gets a spark in turn to clear the plugs from getting wet. Always go for the lowest count that makes the desirable effect. If the engine revs go to 5500 in this example, then increase the RapidFire setting to minimize engine power.

Launch Deactivation



There are 2 methods to deactivate the Launch feature. ***Clutch*** is with hardwire switches and ***TPS 90%*** is for a semi-automatic method.

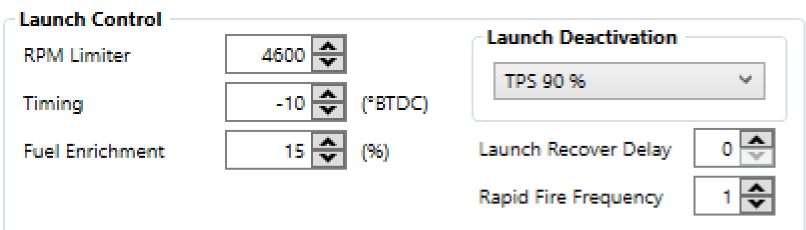
Manual Launch (Dashboard Switch and/or Clutch Switch)



You need to install a push to make button switch. You need to press the switch and hold it to activate launch. Press the accelerator. The launch parameters will be activated. Then when you are ready to launch release the switch with the clutch.

You need to install a push to make button switch and the clutch pedal switch with resistor combination. You need to press the clutch in to activate the clutch pedal switch. Now press the dashboard switch once and launch is activated. No need to keep the dashboard switch pressed. Press the accelerator. The launch parameters will be activated. The moment the clutch is released the launch switch will break and launch is deactivated. To activate this feature again you need to repeat the procedure. This feature lets the driver concentrate on his pull-off and free his hands for other tasks.

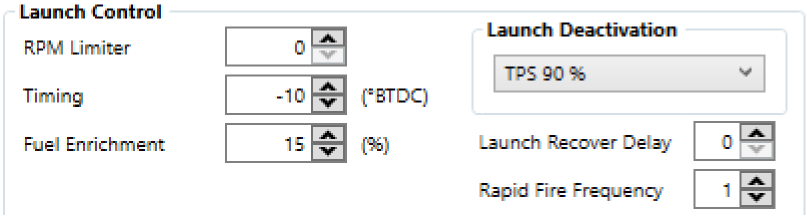
Automatic Launch (TPS 90%)



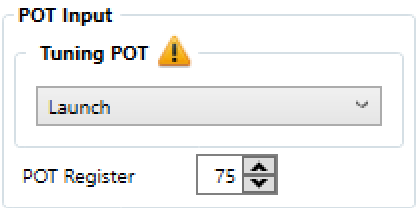
You need to install the dashboard On/Off switch. To activate launch put the switch on. This method requires the driver not to press the pedal over 90% during launch activation. Pressing above 90% throttle will deactivate launch. The driver may need to practice this. He may also use a GP output to switch a light on at 80% TPS to ensure that he does not press it too deep. Both methods require the engine to rev lower than 3000RPM before activating the launch feature for the next launch. This will prevent the feature from activating during gear shift. To deactivate this feature put switch off.

Adjustable Launch RPM (TPS 90%)

This feature is useful as different race tracks give better traction and allows for higher launch PRM's. The customer can then fine tune his launch RPM's on race day. It does not have a launch button but you need to install the Tuning Potentiometer.



Set the desired *RPM limit* to 0. This will indicate to the ECU that it must use the POT value to calculate a RPM limit value. Set the desired *Timing* and *Fuel Enrichment*.



Now set the *POT register* to your engines maximum RPM plus 500rpm. If engine can rev to 7000RPM then select 7500RPM. The reason is that this POT is also used to deactivate the launch control by adjusting launch RPM higher than the engine can achieve. Simply turn the POT fully clockwise.

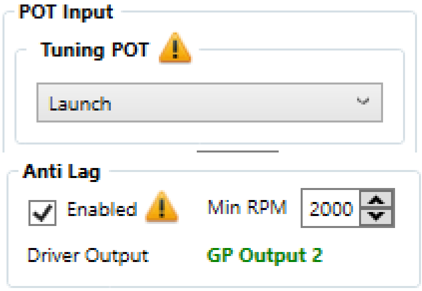
To activate this feature, the driver simply presses the clutch and applies the accelerator till just below 90%. The driver may need to practice this. He may also use a GP output to switch a light on at 80% TPS to ensure that he does not press it too deep. Now he adjusts the tuning POT till he sees the desired RPM on his rev-counter. When he wants to launch he releases the clutch and press the accelerator 100%. Launch will then deactivate. This feature will re-activate automatically once the revs falls below 3000RPM because it does not have the Dash Board switch. You can make increments on his tuning POT to calibrate it to his engines' RPM's and his favorite settings.

Anti Lag

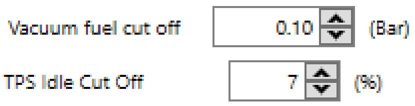
For more detailed explanation look in the Anti Lag Manual.

The Anti-lag function will help to keep the boost pressure up when decelerating in corners on the race track. This function will use the launch control settings which will add fuel and retard the timing. The correct installation requires an EGR valve to bypass boost pressured air from the turbo before the throttle body, into the exhaust between the engine and turbo. The extra fuel with this air will ignite and the pressure will cause the turbo to spin creating boost. If the valve is not installed, then the min throttle setting must be opened slightly as to let air pass through the engine to burn the excess fuel. You may need to retard the timing further after TDC to prevent the engine from making power.

Settings

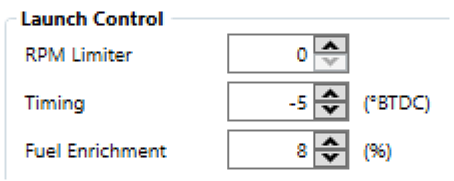


Enable the feature and set the minimum RPM setting. This RPM setting is the limit which will disable the function. If the engine revs fall below this value normal fuel economy cut will resume. During racing the driver will gear down keeping the engine revs high.



These two setting will activate the Anti-lag. When the boost pressure inside the intake manifold falls below the ***Vacuum fuel cut off*** value and the throttle position is below the ***TPS idle cut off*** value. When the boost pressure goes above the ***Vacuum fuel cut off*** the feature will be deactivated and normal functions will resume.

To disable the normal ***Econo Fuel Cut off*** function make this value higher than max RPM.



The launch settings ***Timing*** and ***Fuel Enrichment*** are also used for the Anti-lag feature. If it is activated, the timing will be retarded to the launch timing and the fuel will be enriched to improve burn pressure in the exhaust to spin the turbo.

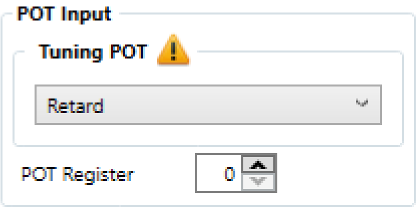
Transmission Retard

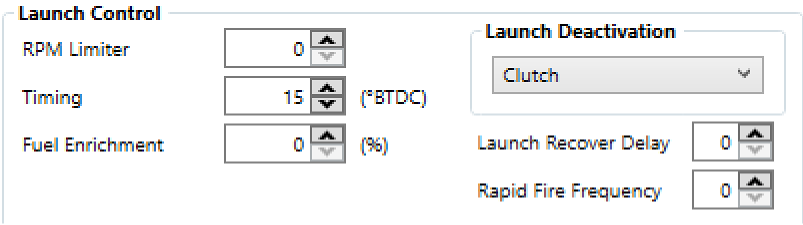
For more detailed explanation look in the Tuning POT Manual.

This feature is for automatic transmissions to retard the engine timing during gear shift. This will make the shift smoother and protect the transmission. The launch control circuit will be used and this system will disable launch control.

Set the tuning POT on.

Set the POT on Retard and Pot Register on 0.





Set the RPM limit on zero. Set the launch control timing on 5 to 15 degrees depending on the feel of the shift in the transmission. Launch deactivation must be on Clutch. Fuel enrichment is not used here.

Now connect the relevant wires from the TCU to the ECU. When the TCU makes a shift it will put a negative driver on. It will connect to the POT input of the ECU. The POT real-time bar will be high and the moment of shift it will go low, activating the retard feature.

Flat Shift

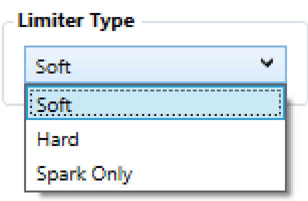
For more detailed explanation look in the Flat Shift Manual.

This feature will momentarily cut the fuel or spark or both for a pre-set time during shifting. This will slow the engine RPM momentarily to ease shifting process in the gearbox. It is initiated by a negative going transition pulse of a switch, or electronics or load cell that will give an earth contact. The switch is combined with movement of the gear lever. Note: This feature is only available on specific firmware. Ask your dealer on it before you buy.

Settings

The following settings is done to activate this feature. The input is shared with the dual map input. This means dual map will not be able to operate on the fly. It will load map 1 or map 2 at start up. Then the input will be used for a flat shift input. This means dual map will not be able to operate on the fly. Normally an open switch will mean Map 1 is loaded when the ECU starts. Then if this contact is earthed the flat shift delay will be activated. If you want to start in Map 2 hold the switch in and put the ignition on. Then Map 2 is loaded, from there on the flat shift work as normal.

A delay can be adjusted from 0 to 350 milliseconds. Zero will deactivate the feature. Zero will disable the flat shift feature. This feature is disabled at RPM below 2000.

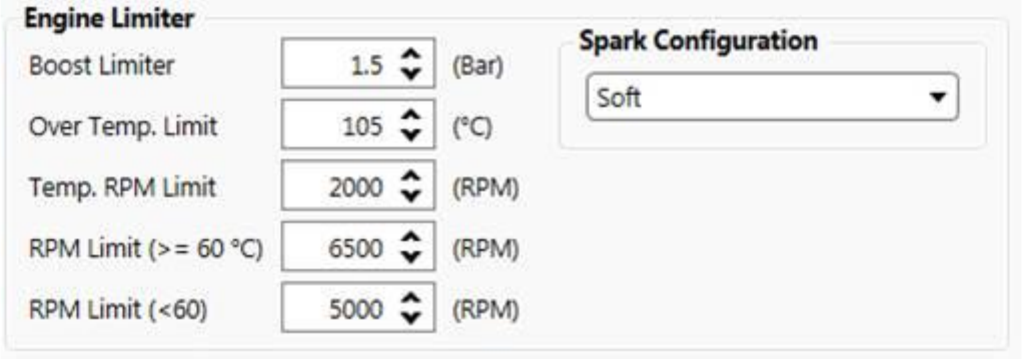


You may select the type of engine cut which is the same as the normal rev limiter settings. Soft will cut only fuel, Hard will cut fuel and spark and Spark Only will cut spark.

Engine Limiter

For more detailed explanation look in the Engine Limiters Manual.

This block has a few protection features. Setting them may prevent the driver from damaging the engine in normal and racing conditions.



Boost limiter

This feature will cut the injectors clean if the MAP sensor detects a manifold pressure that is higher than the set value. It is not a boost controller but it is to protect against boost controller or waste-gate failure. It can be adjusted in tenths of a bar resolution. The spark will not be cut.

Over temperature limit

This feature and the next one will protect the engine against over temperature. The injectors will be cut until the revs fall below the next setting.

Temperature RPM limit

This is the maximum limp mode RPM's when the engine is over temperature. If it is due to a burst hose it is better to switch off before the engine is damaged. If it is due to low water the lower revs will help to cool it down instead of disabling the engine.

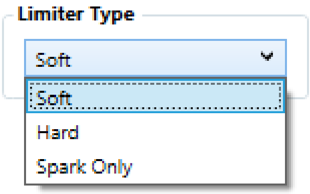
RPM limit (>=60°)

This feature will prevent the engine from over-revving under normal temperature conditions. It can be adjusted in 100 RPM intervals. RPM limit can be achieved by three methods.

RPM limit (<60°)

This feature will prevent the engine from over-revving under cold temperature conditions. It can be adjusted in 100 RPM intervals. This method will only cut the fuel and is just a protection.

Limiter Type



Soft

This mode will retard the timing in three stages and then cut the fuel completely. The result will be a smooth soft loss of power. Each 100 RPM over the limit, timing will be retarded further. First retard is 15 °BTDC, then 10 and then 5 °BTDC. Then during the third stage, fuel will be cut but not the spark. This will prevent fuel from entering the exhaust and backfire there. This is the preferred method for engine over-rev limiting. **Note**: The engine may reach 300RPM above the set value.

Hard

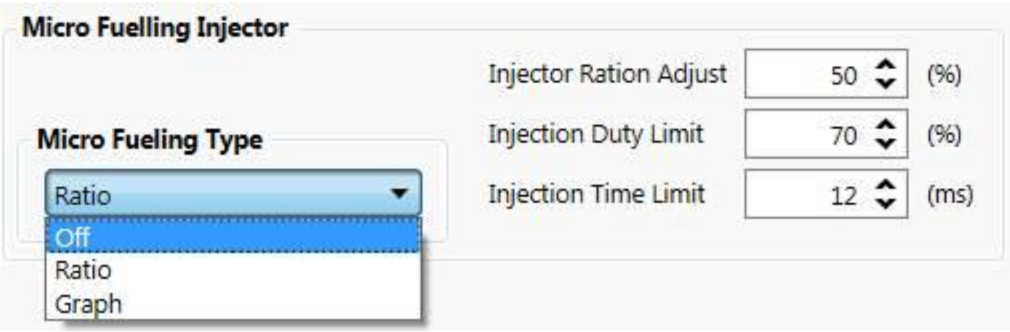
This mode will cut the fuel and spark completely. It has a jerk type feel and may result in small detonations in the exhaust.

Spark Only

This mode will cut only the spark. This will give the backfire sensation when unburned fuel is ignited in the exhaust. **Note**: Damage to the exhaust system might occur in this method.

Micro Fueling

For more detailed explanation look in the Fuel Settings Manual.



Some products have the ability to use two injectors per cylinder. The way these injectors are implemented vary for different applications. If you use only one type of fuel and the primary and secondary injectors does not differ too much in size, then the Ratio method is preferred. If you want to use different fuels together or the secondary injector is a lot bigger than the primary injector, then the Graph method is preferred. On the hardware side, there is also different wiring configurations for different firmware. If there are enough drivers for all the injectors, then they can be used. If there are not enough drivers, then an extra electronic relay and isolating diodes are used to power the secondary injector's separately. So please see on the wiring diagram. This feature is only available on specific firmware.

If you are not using micro fueling, set it to 'OFF' to free up some microprocessor time.

Micro Fueling Type

Select the type of injection method to use for dual injectors.

Injector Ratio Adjust

This ratio will reduce the injection time when the secondary injectors start injecting with the primary. This means the fuel amount of both injectors must be the same as it was when just the primaries were injecting.

The Injector ratio adjust **%** field is calculated by the primary injector cc divided by the total injector cc multiply by 100.

Example: Primary = 100cc, Secondary = 200cc.

$$\text{Compensation} = \frac{\text{Primary Injector x 100}}{\text{Primary + Secondary Injectors}} = \frac{\text{100cc x 100}}{\text{100cc + 200cc}} = 33\%$$

Injection Duty Limit

This is a change over Duty limit from single to duel injectors. When injection duty is higher than this value, duel injectors will be activated. Below this value only primaries will inject. This will result in a lower Duty limit.

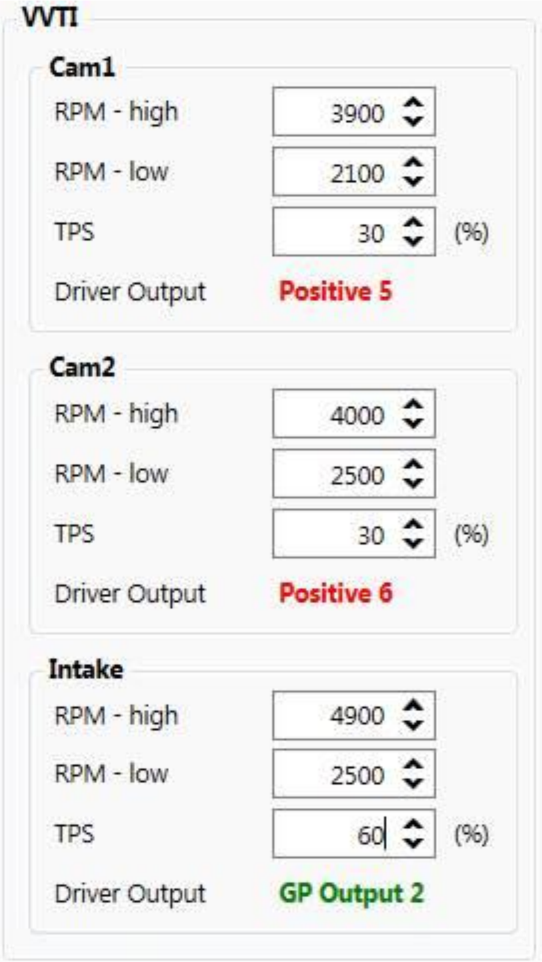
Injection Time Limit
This is a change over Injection Time limit from single to duel injectors. When injection time is higher than this value, duel injectors will be activated. Below this value only primaries will inject. This will result in a lower injection time limit.

Any of the 2 limits will activate dual injectors. There is also a dead band incorporated to prevent erratic activation of this feature.

Graph Adjust
This feature is ideal for Methanol Injectors. It will not influence the primary injector time like the ratio method. It will just bring a secondary set of injectors in at a certain boost pressure and progressively adjust the injector time for the secondary injectors on a graph in milliseconds. If you select ***Graph***, a second graph on the Fuel graph will become visible. Note that the ECU must have enough drivers available for this feature. otherwise it will be forced in the OFF condition.

VVTI Cam 1 & Cam 2

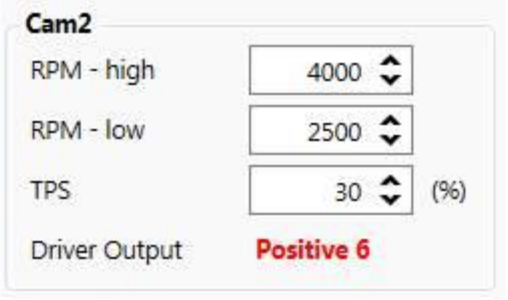
For more detailed explanation look in the Crank and Cam angle Sensors Manual.



This block is used to set up open loop cam control with TPS limits. It is also used to open variable intake runners found on some engines like the Lexus 1UZ VVTI. This feature is only available on specific firmware and products depending on features selected as they may share drivers with other features

Cam1

Cam2



RPM High
The high limit where the Cam output will be forced off if the engine RPM is higher.

RPM Low
The low limit where the Cam output will be forced off if the engine RPM is lower.

TPS
The TPS limit where the Cam output will be forced off if the throttle opening is lower.

Output Driver
This indicates which driver from the product is selected for this output.

Example: In the top block the output will be on between 2300 and 4600 RPM if the TPS value is above 30%, This is how most V-Tec cams are applied. The driver output will indicate where the solenoid must be connected on the ECU. Cam 1 is always used for the Intake cam or Cyl1 bank cam. Cam 2 is always used for the Exhaust cam or opposite Cyl1 bank cam.

VVTI Intake

RPM High
The high limit where the Flap output will be forced off if the engine RPM is higher.

RPM Low

The low limit where the Flap output will be forced off if the engine RPM is lower.

TPS
The TPS limit where the Flap output will be forced on if the throttle opening is lower.

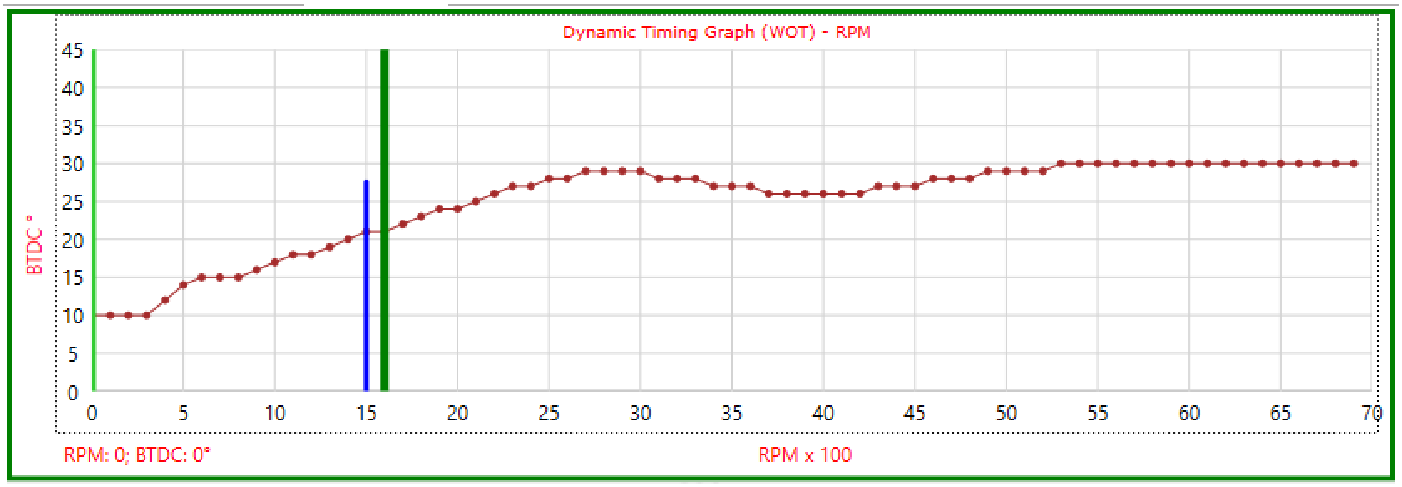
Output Driver
This indicates which driver from the product is selected for this output.

This block is firmware dependent on control according to requirements. For Toyota V8 the flap will be powered or activated whenever the RPM's are between 2500 and 4900 in this sample regardless of throttle position. It will also be powered if the throttle is less than 60% depressed regardless of RPM. Said in another way, the flap will not be powered at over 60% throttle and at lower than 2500 RPM or higher than 4900 RPM.

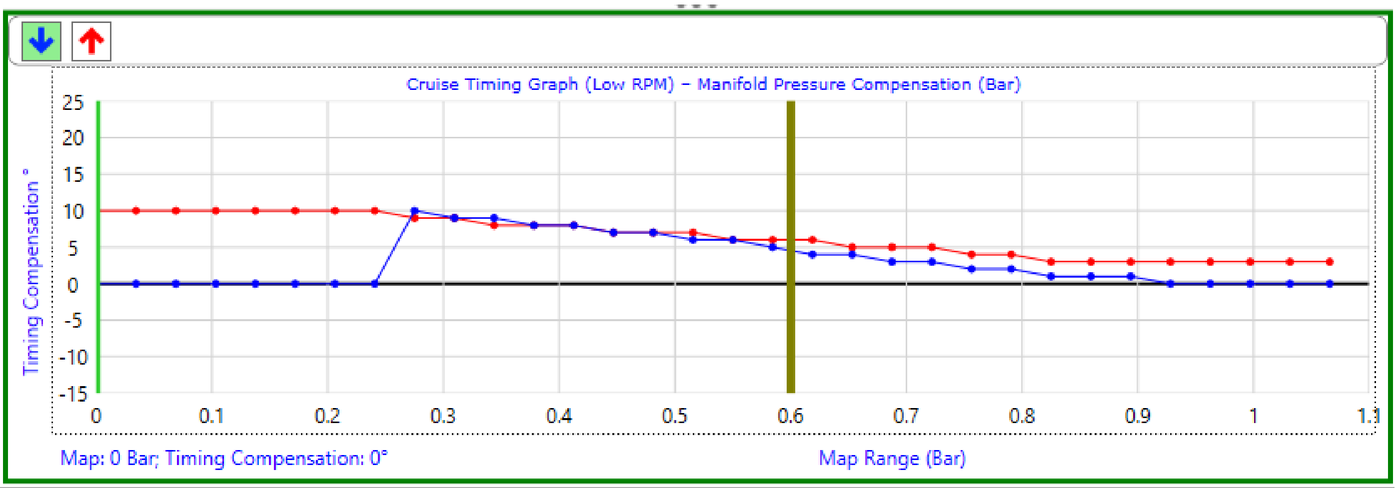
Graphs

Timing Graph

For more detailed explanation look in the Graph Map Tuning Manual



This graph will adjust Ignition Timing versus Engine RPM.
Y-Axis = Timing Degrees BTDC from 0° to 45°
X-Axis = RPM value of engine from 0 RPM to 15000 RPM

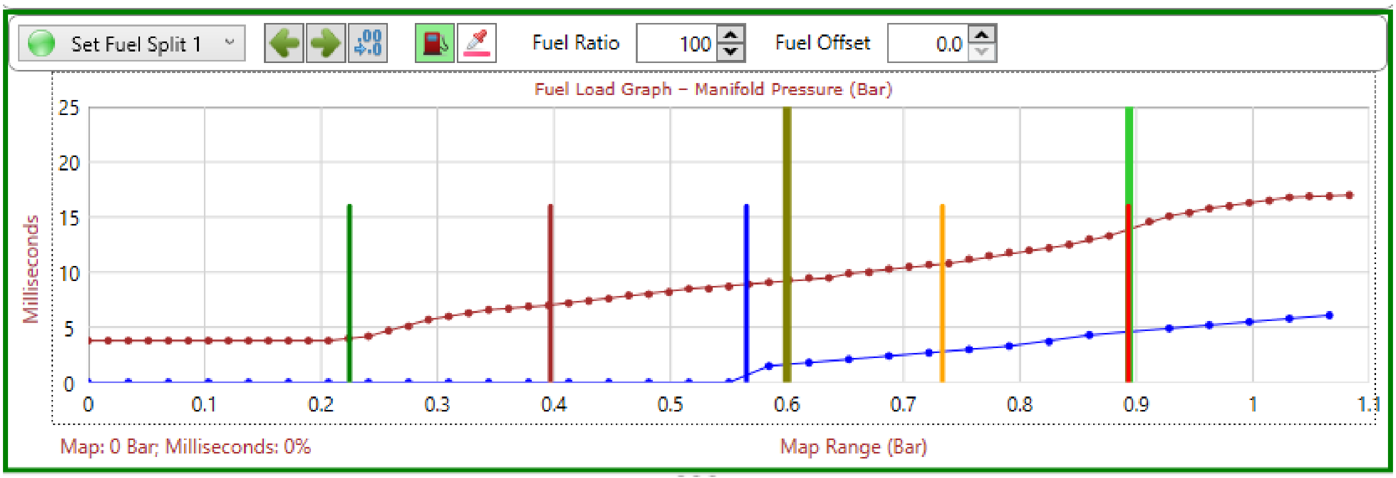


This graph will adjust Ignition Timing versus Engine Load.

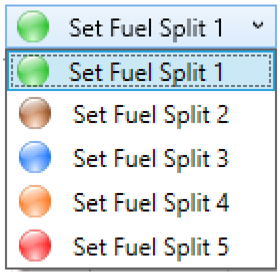
Y-Axis = Timing Degrees BTDC from -50° to 50°
X-Axis = Load value of engine. Can be MAP Sensor or TPS sensor

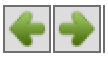
Fuel Graph

For more detailed explanation look in the Graph Map Tuning Manual



This graph will adjust Injection Time versus Engine Load.
Y-Axis Brown = Primary Injection Time in milliseconds from 0 to 25
Y-Axis Blue = Secondary Injection Time in milliseconds from 0 to 25
X-Axis = Load value of engine. Can be MAP Sensor or TPS sensor



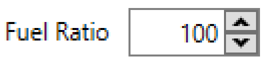


This selection adjusts the vertical bars which determine the operating area of each of the 5 Fuel RPM graphs. Select a Split Fuel bar and use the green arrows to adjust it on the graph. Change over point is in the middle of the lines. Green bar go all the way to the left axis and red bar go all the way to the right axis.

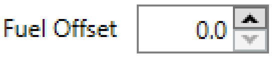
Selection for Main or Primary Injection Graph

Selection for Secondary Injection Graph

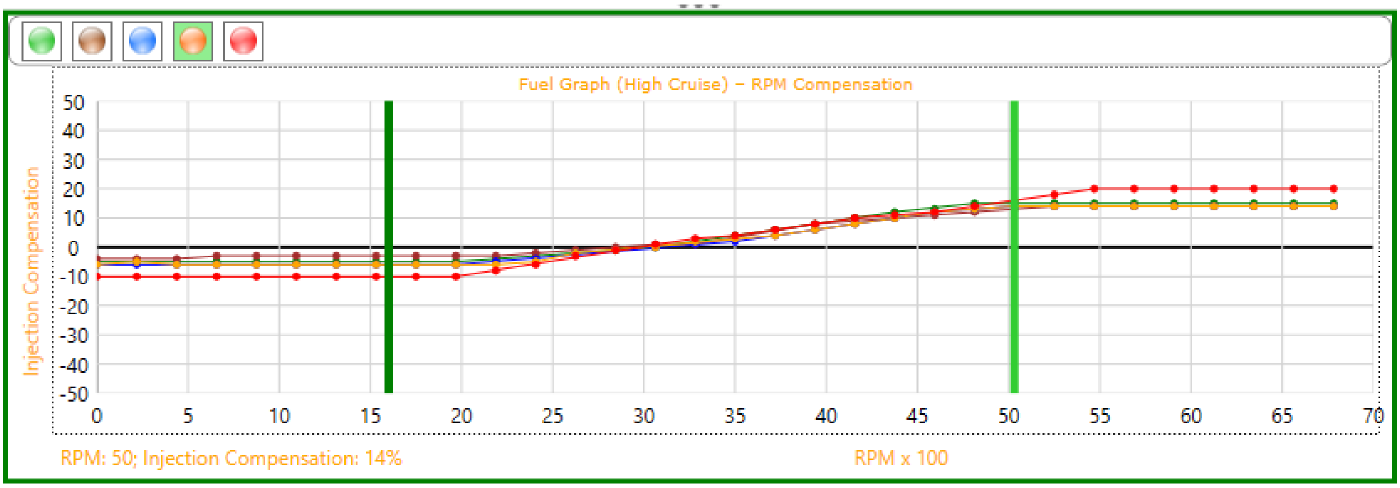
Adjustment resolution. Will adjust values in increments of 1 or 0.1 resolution.



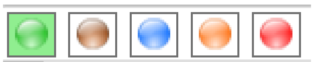
This setting will multiply the final fuel calculation or injector time with this % value. This is handy if you want to use a similar engine's map. Sometimes injector sizes or fuel pressure may differ between engines. adjusting the ratio will have a general effect on all tuning. Always start to tune with Ratio 100%.



The injector offset is used for injector dead band. This value will add injector time at the end of calculations to compensate for the time it takes to open and close the injector. It will not affect the total real-time value displayed on the software. So make sure it is zero if you don't use it. The big advantage of this is for Altitude compensation. On older versions altitude compensation took dead band into calculations and caused a slight error by going leaner at higher altitude. The dead band value is also added on Micro Fuel graph.
Always start to tune with an offset 0. If you add an offset remember it will be added to all your fuel values.



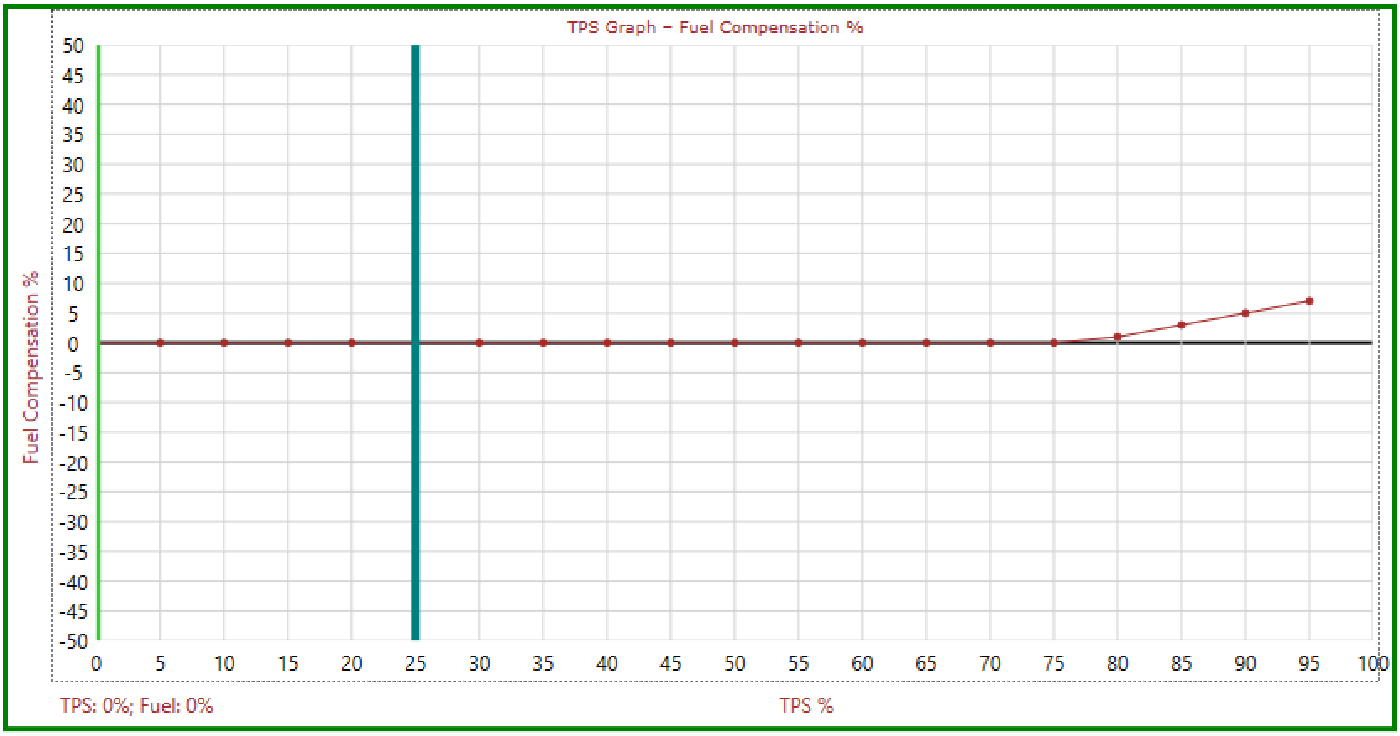
This graph will adjust Injection Time versus Engine RPM on 5 graphs. Each graph operate in a certain load section determined by the selection bars in the Fuel Load graph above.
Y-Axis = Injection Time Compensation in percentage from -50% to 50%
X-Axis = RPM value of engine from 0 to 15000 RPM



Click on one of these correspondent color dots to adjust the same color graph.

TPS Graph

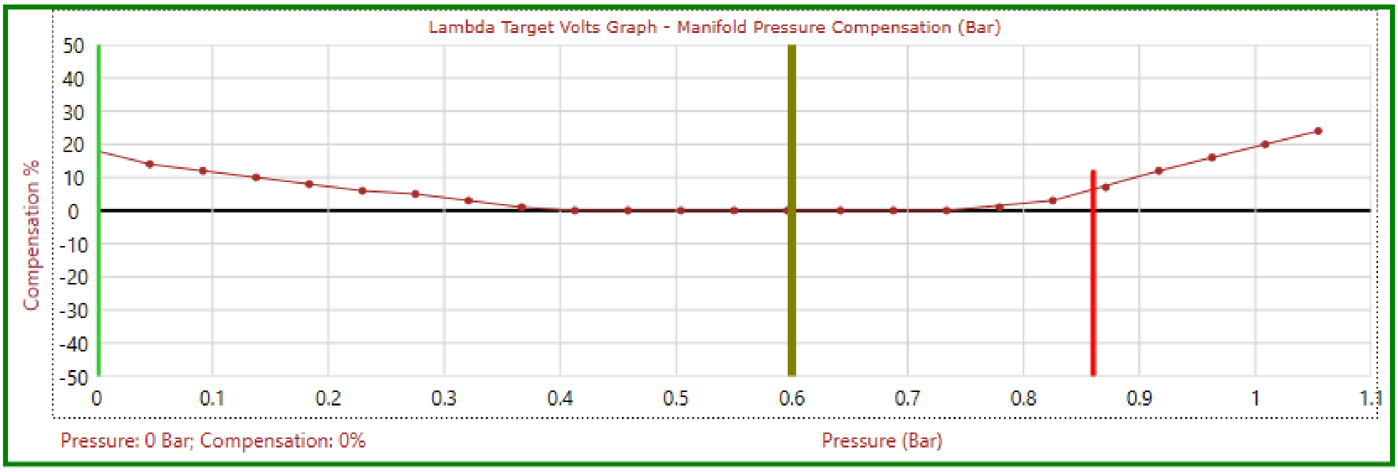
For more detailed explanation look in the Throttle Position Sensor Manual



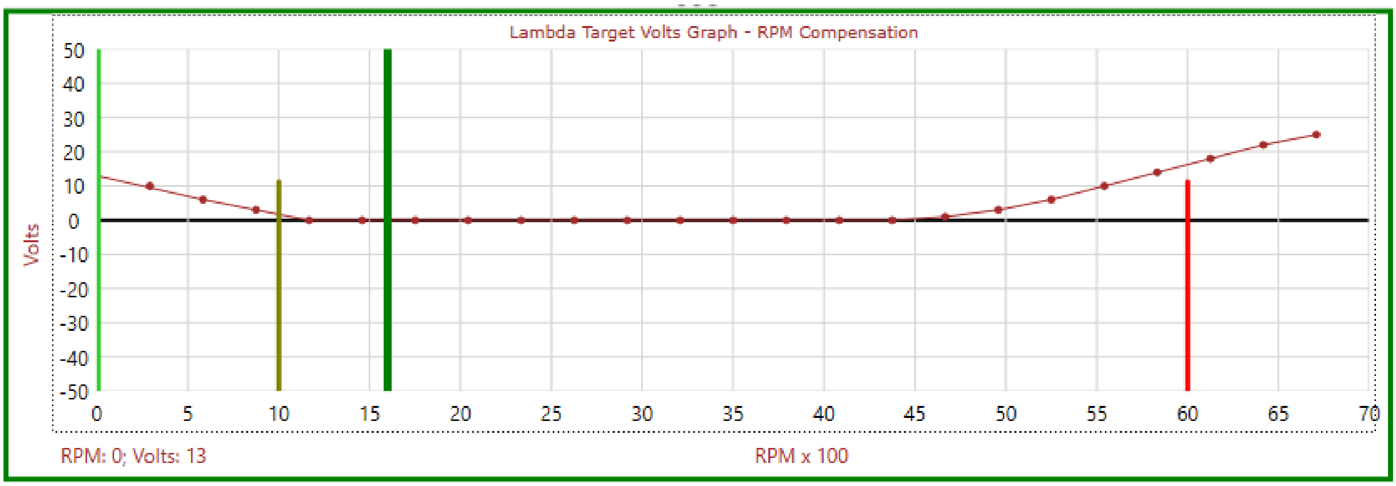
This graph will adjust Injection Time compensation versus TPS position.
Y-Axis = Injection Time Compensation in percentage from -50% to 50%.
X-Axis = TPS value of engine from 0 to 100%.

Lambda Graph

For more detailed explanation look in the Lambda Sensor Manual



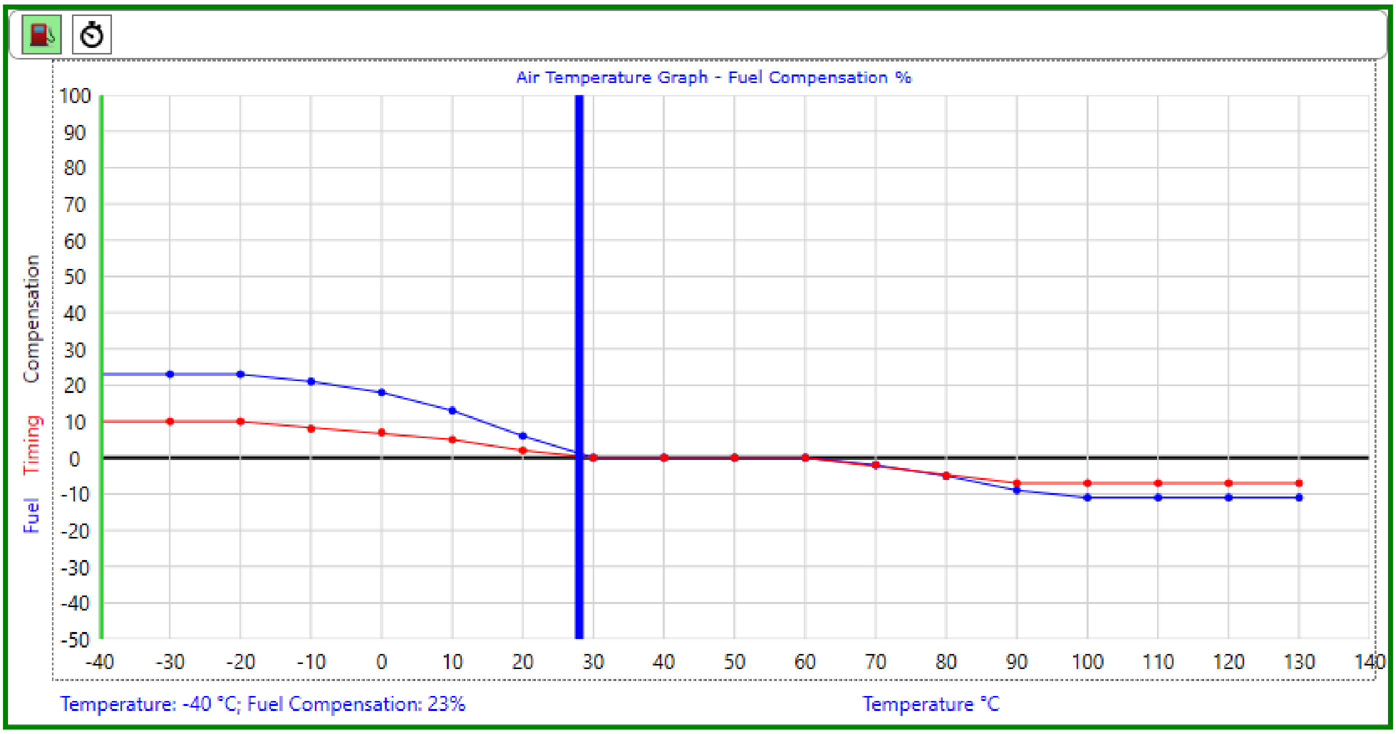
This graph will adjust Lambda Target Volts compensation versus Engine Load.
Y-Axis = Lambda Target Volts Compensation in percentage from -50% to 50%.
X-Axis = Load value of engine. Can be MAP Sensor or TPS sensor



This graph will adjust Lambda Target Volts compensation versus Engine RPM.
Y-Axis = Lambda Target Volts compensation in percentage from -50% to 50%.
X-Axis = RPM value of engine from 0 RPM to 15000 RPM

Air Graph

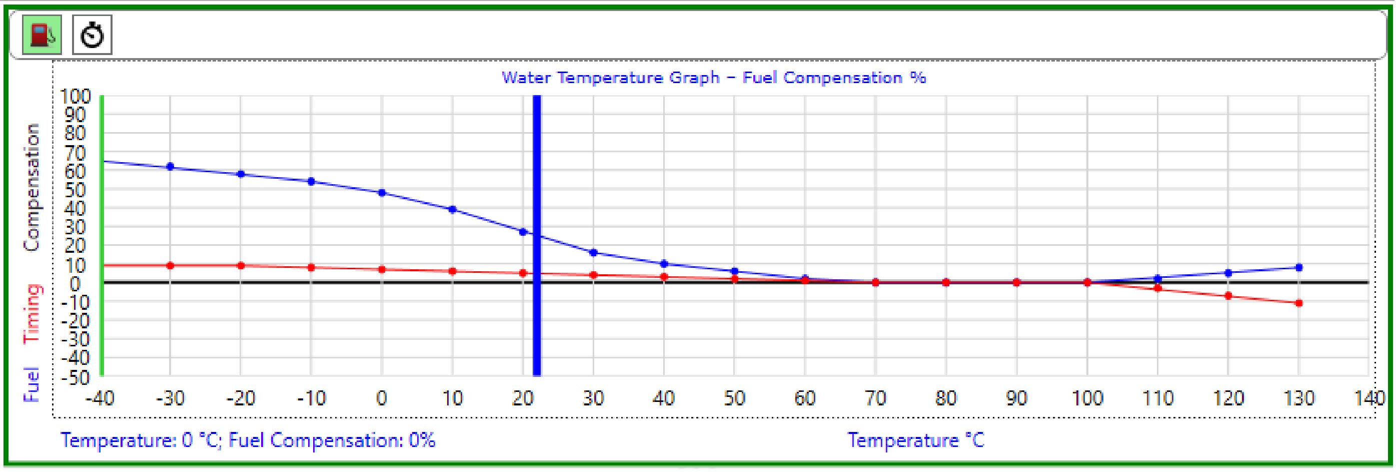
For more detailed explanation look in the Air Temperature Sensor Manual



This graph will adjust Injection Time compensation versus Air Temperature.
Y-Axis Blue = Injection Time Compensation in percentage from -50% to 100%.
Y-Axis Red = Ignition Timing Compensation in ° BTDC from -50° to 100°
X-Axis = Air Temperature value of intake from -40°C to 140 C.

Water Graph

For more detailed explanation look in the Water Temperature Sensor Manual



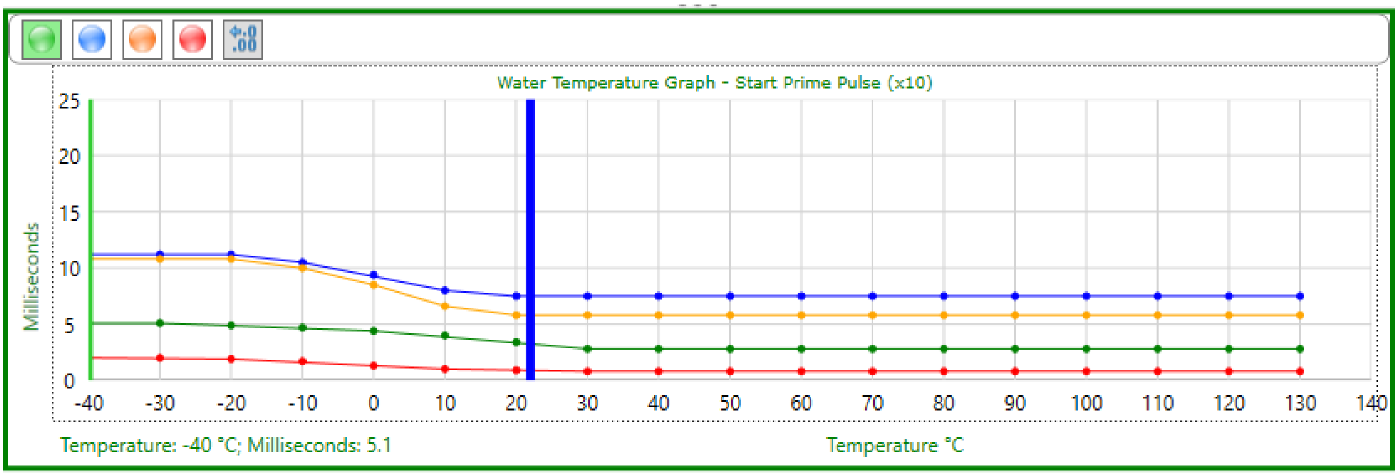
This graph will adjust Injection Time compensation versus Engine Temperature.

Y-Axis Blue = Injection Time Compensation in percentage from -50% to 100%.

Y-Axis Red = Ignition Timing Compensation in ° BTDC from -50° to 100°

X-Axis = Temperature value of engine from -40°C to 140 C.

Select between Blue Fuel Graph or Red Ignition Timing Graph



This graph will adjust Prime Pulse, Start Enrichment, Accelerator Pump Map and TPS signals versus Engine Temperature. It is only visible in Expert Tuning Mode.

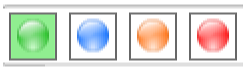
Y-Axis Red = Prime Pulse Value in milliseconds from (0 to 25)x10.

Y-Axis Orange = Map Accelerator Pump Pulse Value in milliseconds from 0 to 25.

Y-Axis Blue = TPS Accelerator Pump Pulse Value in milliseconds from 0 to 2.

Y-Axis Green = Start Enrichment Value in milliseconds from 0 to 25.

X-Axis = Temperature value of engine from -40°C to 140 C.

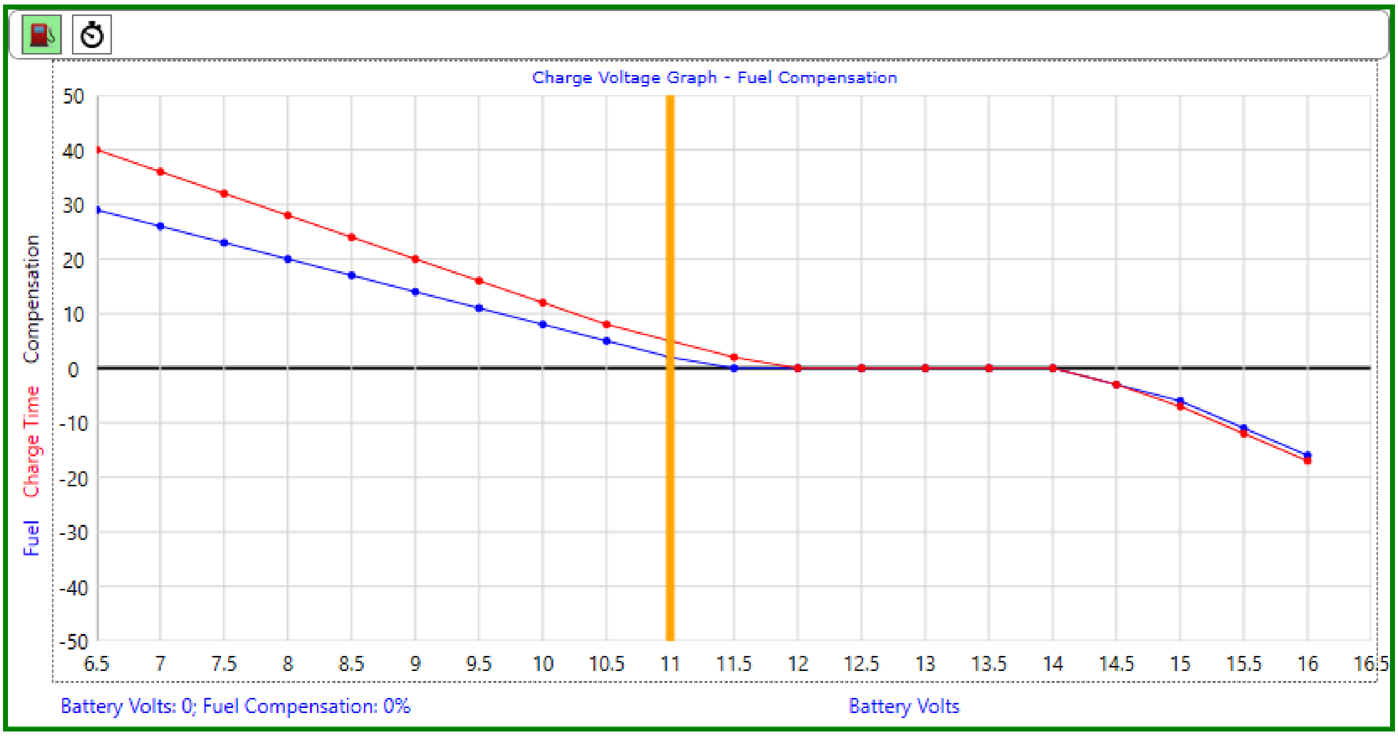


Select between the 4 graphs. Nothe that the name change to indicate which graph you are adjusting.

Adjustment resolution. Will adjust values in increments of 1 or 0.1 resolution.

Voltage Graph

For more detailed explanation look in the Battery Charge Volts Manual

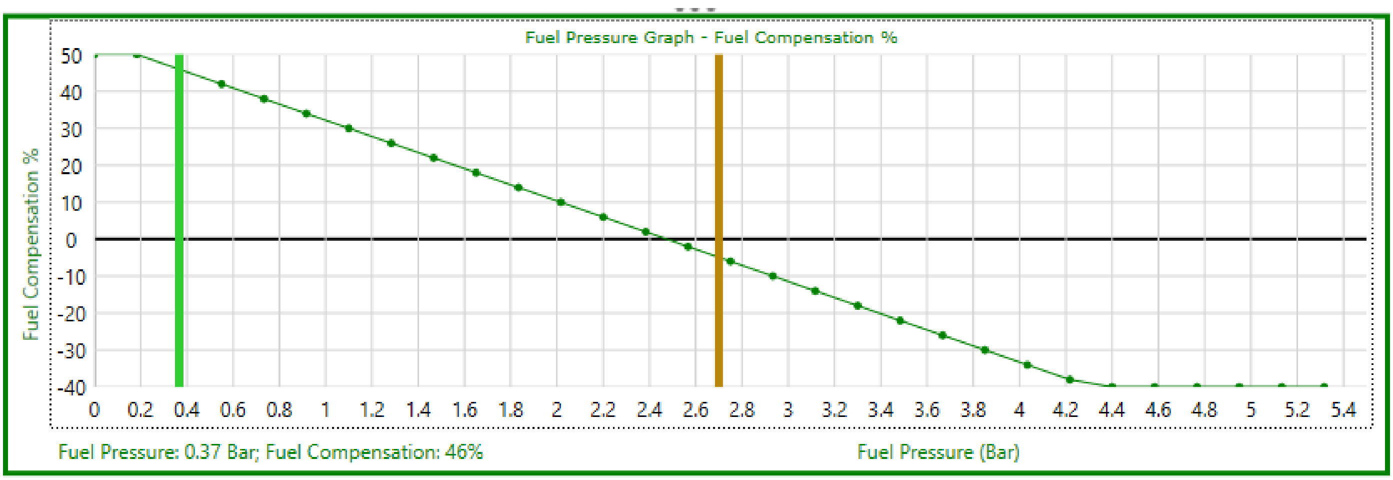


This graph will adjust Injection Time compensation versus Battery Voltage.
Y-Axis Blue = Injection Time Compensation in percentage from -50% to 50%.
Y-Axis Red = Coil Charge time Compensation in percentage from -50% to 50%
X-Axis = Battery Voltage value from 6.5V to 16.5V.

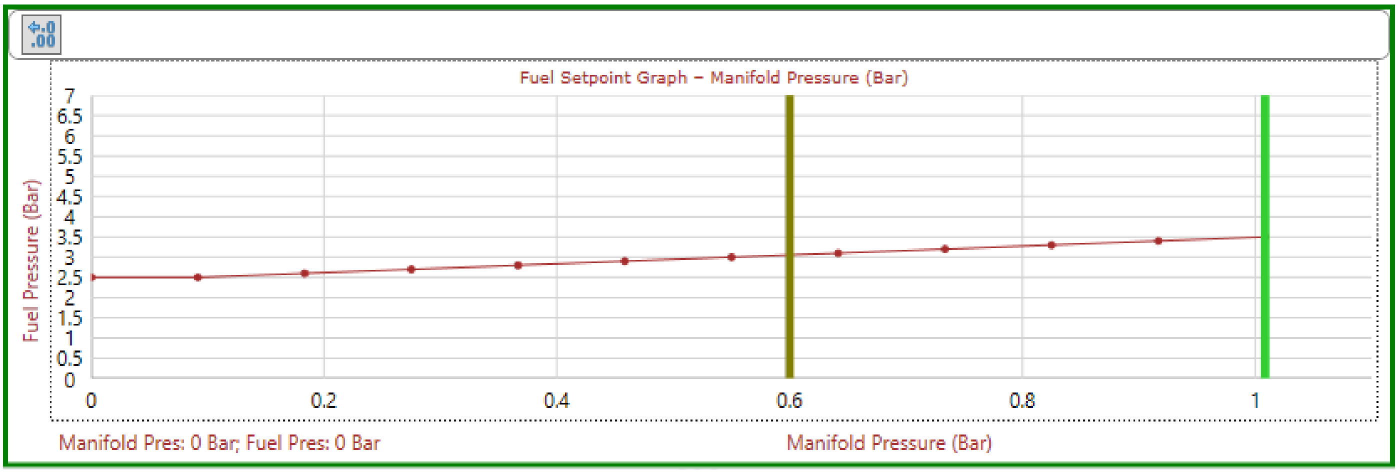
Select between Blue Fuel Graph or Red Coil Charge time Graph

Fuel Pump Graph

For more detailed explanation look in the Fuel Pressure Sensor Manual



This graph will adjust Injection Time compensation versus Fuel Pressure.
Y-Axis = Injection Time Compensation in percentage from -40% to 50%.
X-Axis = Fuel Pressure value from 0Bar to 7Bar.



This graph will adjust the Fuel Pressure versus Load.
Y-Axis = Fuel Pressure Setpoint from 0Bar to 7Bar.
X-Axis = Load value of engine. Can be MAP Sensor or TPS sensor.

Adjustment resolution. Will adjust values in increments of 1 or 0.1 resolution.