

ProECU Nissan GT-R



Phase 5 Update Manual

Release Version

RaceROM Patch v19472

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1. Introduction

Our Nissan GTR Phase 5 update introduces a number of new features and builds on the existing specification. It brings increased functionality and fine tunes certain aspects to bring an easier to use, well rounded tuning solution.

Summary of new features.

Our latest Phase 5 update includes a number of new features including:

- FastFlash (block programming) for ECM and TCM
- Dedicated boost control strategy
- Nissan boost display now corrected for true Manifold Gauge Pressure
- Dedicated FlexFuel strategy
- 12 injector support
- Variable cylinder cut for use in launch control and Custom Maps
- Direct wheel spin measurement with configurable F/R speed options

Further updates have been made to existing features and maps including:

- Cranking fuel maps
- Transient fuel maps
- Idle ignition timing maps
- Per cylinder ignition maps
- Per gear ignition compensation maps
- Streamlined datalogging with increased flexibility and more values
- Simplified valet mode
- Custom Map notes
- Integral function with user configurable starting value
- Additional voltage inputs for use in Custom Maps
- Additional inputs and outputs for Custom Maps

2. FastFlash Programming

Method of operation

FastFlash (FF) will be enabled when a FF enabled RaceROM patch is already installed on an ECM/TCM. This means the first time you program with a FF enabled ROM the programming sequence and programming time will not change.

On subsequent programming operations FF will be used. The minimum programming time is approximately 20 seconds on a 1mb unit and FF will always reprogram blocks 8 and 15. More changes will require more blocks to be reprogrammed taking additional time.

Unfortunately at this time the same DTC clearing and power-off sequences still need to be followed after programming.

Failed Flash Recovery

FastFlash has been tested to ensure that it will not “brick” either the ECM or TCM if there is a programming failure, however the correct sequence must be used in order to recover from a failed programming attempt.

- Close the ProECU programming window
- Disconnect the battery for at least 15 seconds to stop the programming code continuing to run in RAM.
- Manually select the correct ECM or TCM programming window for the car. This is a critical step as ProECU will not be able to auto detect a part programmed ECM/TCM
- Select correct ROM
- Program

3. Map Descriptions

Boost Control (RaceROM)

Introduction

Starting with RaceROM Phase 5, OEM boost control is depreciated and we recommend tuners use our own simplified boost control which is an updated version of what was achieved partly through the use of Custom Maps in phase 4, and now has its own full set of dedicated maps. Upon adding a Phase 5 patch, this option is automatically enabled through the check box, and comes pre-populated with a sensible stage 1 boost control setup. All OEM boost control maps are redundant if EcuTek boost control is enabled and to tidy the map editing window, they are now found under **Boost Control->OEM** category in the map tree.

Live Data related parameters

- *Boost Bank1/Boost Bank2 – Absolute pressure in bar, measured by the two boost sensors*
- *RBC Maximum Desired Boost – Relative boost max target, matches number format on gauge*
- *Boost Target – Absolute pressure target in bar, measured by the intake manifold pressure sensor*
- *Boost Error – Difference between MAP and Boost Target, positive numbers are over boost*
- *Manifold Gauge Pressure – “Boost” pressure measure in bar above the current atmospheric pressure*
- *Manifold Absolute Pressure – Absolute pressure in bar, measured by the intake manifold pressure sensor*
- *Wastegate Duty – The duty cycle actually applied to the wastegate solenoid*
- *Wastegate Duty Base – Output from **Wastegate Duty Base** map*
- *Wastegate Duty Compensation – WG duty multiplier from **Wastegate Duty Compensation** map*
- *Wastegate Duty Final – WG duty from the EcuTek boost control strategy, also used by Custom Maps*
- *Wastegate Duty Integral – WG duty added by Integral correction of EcuTek boost control strategy*
- *Wastegate Duty Proportional – WG duty added by Proportional correction of EcuTek boost control strategy*

Absolute Boost

The single most important concept introduced with Phase 5 GTR is the use of Manifold Absolute Pressure (MAP) for all aspects of tuning the boost control. All boost target, boost limit and boost threshold values are all absolute values in Bar. Tuners will now find that all boost related maps and live data will give consistent readings regardless of altitude, and calculations will hold true in all circumstances.

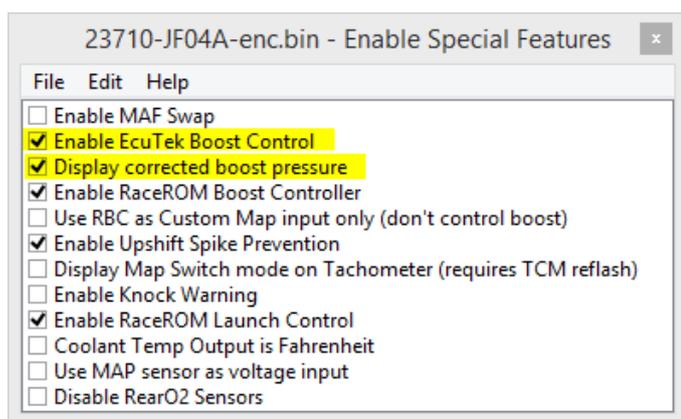
RaceROM Boost Controller values still correspond to the stock to the gauge, so 1.5bar still equates to 1.5bar of relative boost at sea-level.

To make tuning as simple as we can we have added an atmospheric compensation that by default gives a consistent “boost” at all altitudes, but the result is that your MAP will drop as a result, and power will be reduced at altitude if using the default **Boost Target Atmospheric Compensation** map.

To ensure that boost tuning is as simple and intuitive as possible, we have corrected the Nissan boost gauge display to show true manifold gauge pressure that will always correlate with the current atmospheric and absolute manifold pressure. Without this correction, your Nissan GTR boost display has been lying to you, displaying instead manifold absolute pressure – 1 resulting in strange behaviour at altitude. It has also been inconsistent with the actual boost level as measured by an independent gauge, such as the boost input on a dyno. This correction can optionally be disabled.

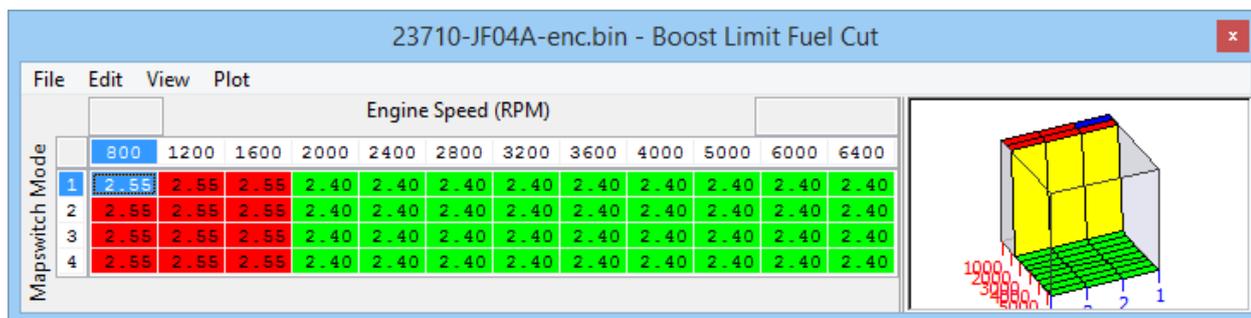
Enable EcuTek Boost Control / Display Corrected Boost Pressure

Within the **Enable Special Features** checkbox list, EcuTek boost control and our corrected boost gauge display can be disabled.



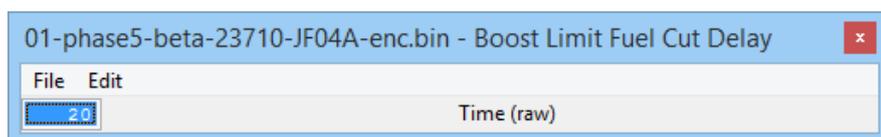
Boost Limit Fuel Cut

The manifold absolute pressure needs to exceed this limit, measured in Bar (relative) by the manifold pressure sensor, for a time period longer than the **Boost Limit Fuel Cut Delay** set, to trigger a fuel cut as an overboost safety measure.



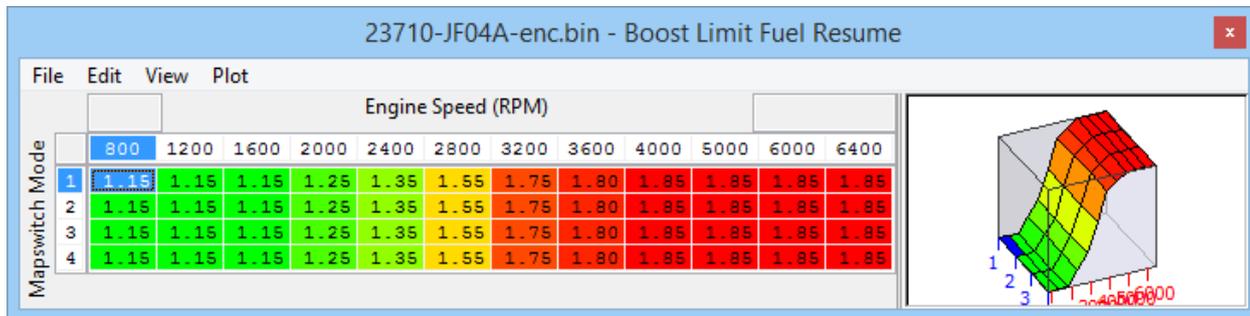
Boost Limit Fuel Cut Delay

Time period in seconds the ECU will wait before triggering a fuel cut when the manifold relative pressure exceeds the boost limit as set by the **Boost Limit Fuel Cut**.



Boost Limit Fuel Resume

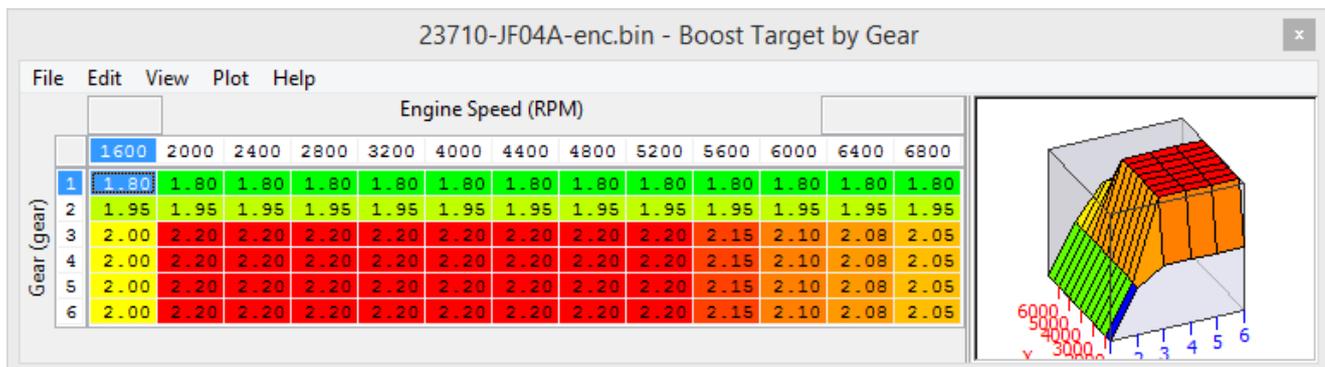
The boost needs to drop back below this limit, measured in bar (relative) by the manifold pressure sensor, for a time period longer than the **Boost Limit Fuel Cut Delay** in order for the fuelling to be resumed after a boost limit fuel cut has been triggered.



Boost Target by Gear

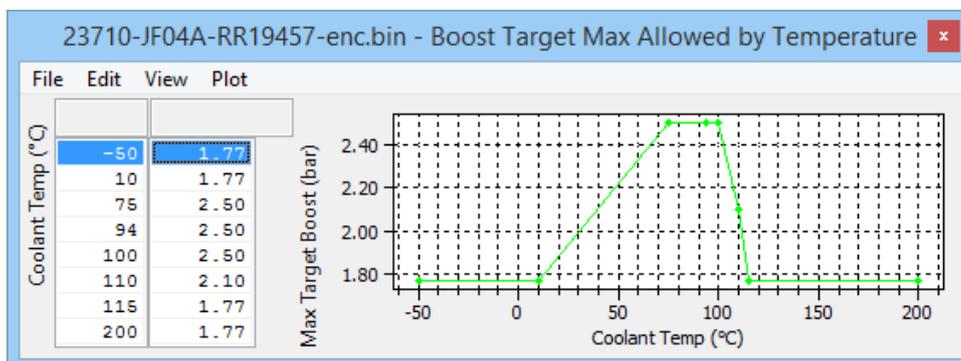
Boost target is no longer defined using a 3D map with RPM and throttle axis', instead the target is defined by gear and RPM, with throttle modulation coming in the form of a simple 2D map. There is also a corresponding boost target for FlexFuel operation named **FlexFuel Boost Target By Gear** and can be found in the *RaceROM FlexFuel* category.

An RPM dependant target boost profile is set on a per gear basis. Typically gears 1 and 2 have noticeably lower targets due to traction limitations.

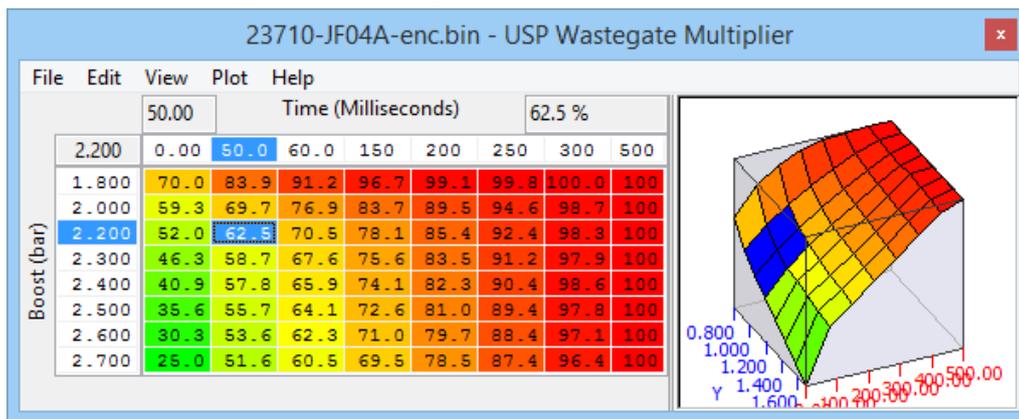


Boost Target Max Allowed By Temperature

Maximum target based on engine coolant temperature, used as a maximum limit for boost target at normal engine temps and reduced significantly at excessive temps for engine safety.



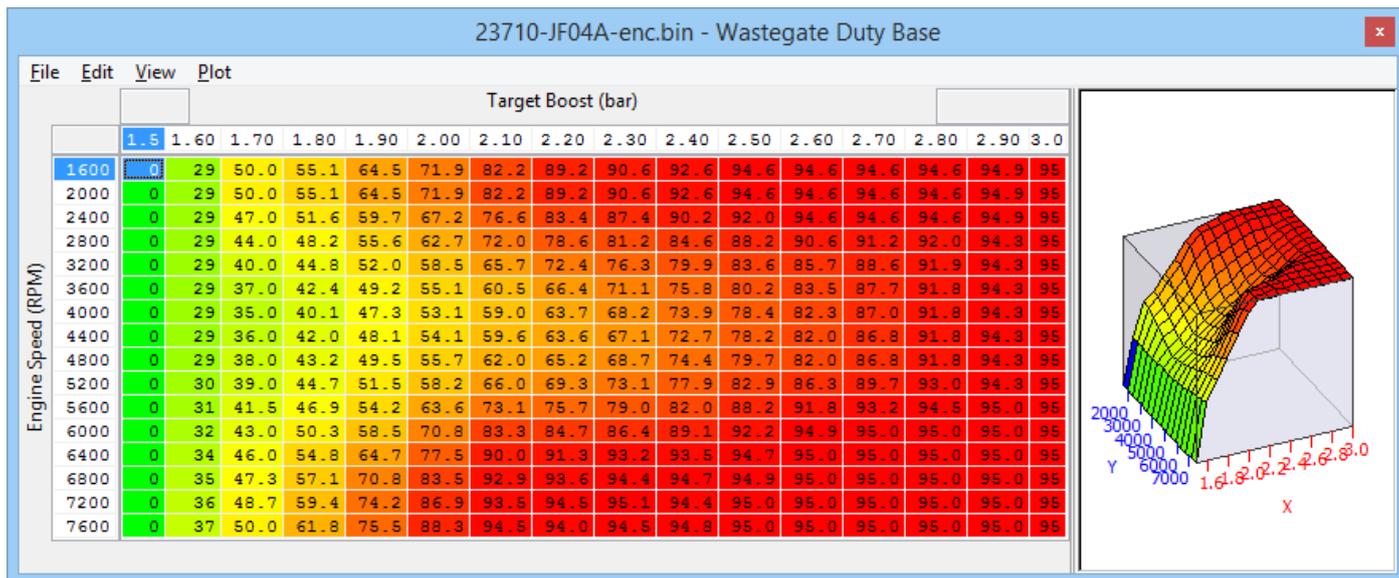
USP Wastegate Multiplier



A temporary change in the Wastegate duty triggered with an upshift to prevent the boost spikes on gearshift caused by a sudden change in the air consumption of the engine as the RPM drops. The X axis is time since the start of an upshift, and the Y axis is the relative boost in Bar at the time the shift was triggered.

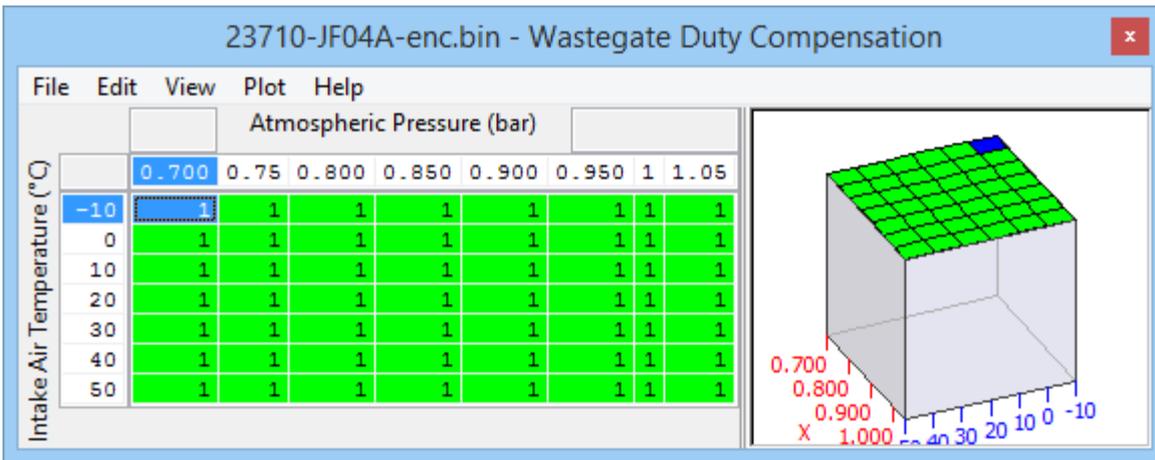
Wastegate Base Duty

This is the base wastage duty used before any closed loop corrections are made. The X axis is target boost in Bar(absolute) and the Y axis is engine speed.



Wastegate Duty Compensation

The output of the Wastegate base duty map can be multiplied to increase or decrease it to compensate for changes in atmospheric conditions. Typically duty is reduced at low intake temperatures to reduce over-boost. Corrections based on atmospheric pressure may be used to maintain preferred boost levels or protect turbos by increasing or decreasing the base duty respectively.



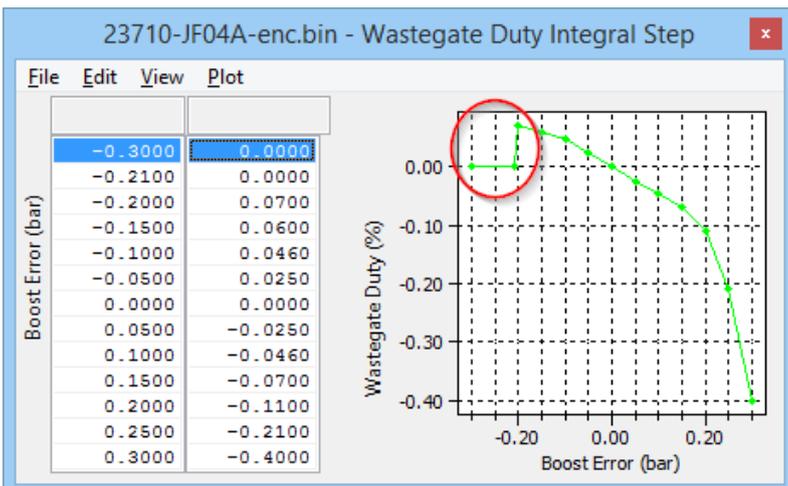
Wastegate Duty Integral Min/Max

The wastegate duty change can be limited with these two values. The lower limit is the top value and the upper limit is the lower value. On cars running significantly larger turbos than stock, these values can be scaled down in line with the expected lower wastegate duty



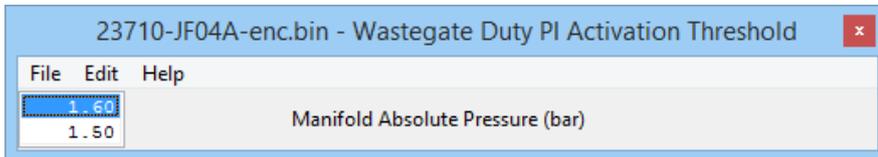
Wastegate Duty Integral Step

The integral correction adds an amount of duty cycle based on boost error for each cycle of the boost control loop (cycle time of 10ms). The default values are zeroed (circled on below image) with excessive negative error (boost under target) to prevent "integral windup" on spoolup. Without this the integral correction can quickly ramp up to the limits of the Min/Max and lead to excessive duty and over-boost just after target boost is reached.



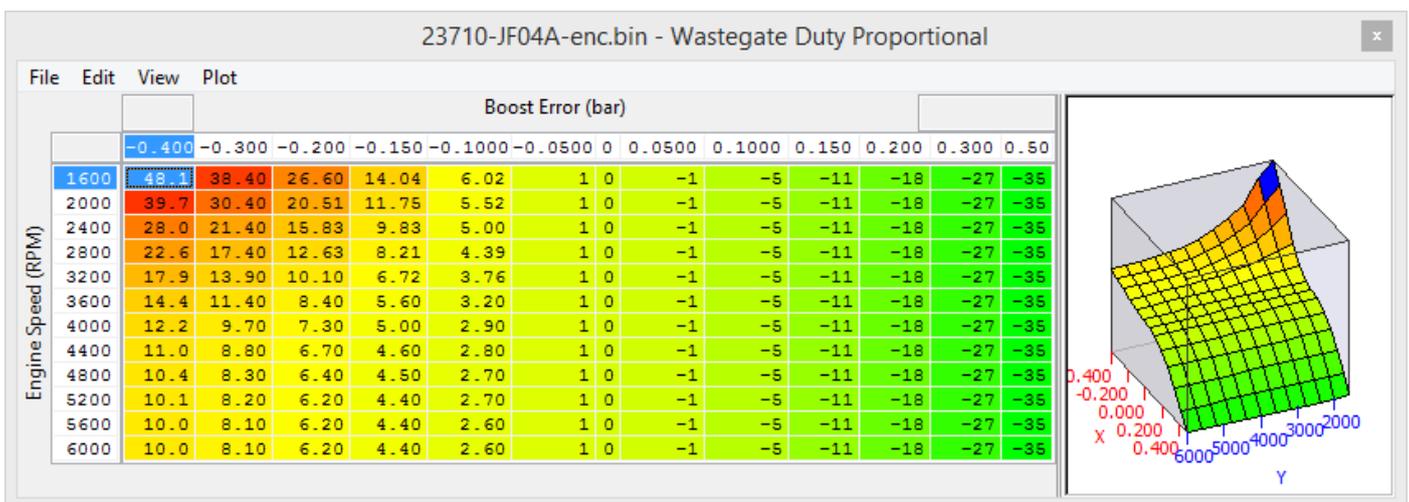
Wastegate Duty Proportional and Integral Activation Threshold

A threshold of manifold absolute pressure with hysteresis to enable proportional and integral closed loop control of the wastegate duty. Proportional and integral feedback is activated when the upper value is exceeded and remains active until the MAP drops below the lower value. This table can be used to stop overactive closed loop corrections under light load conditions. It's useful to have this value lower than the lowest normal target boost otherwise proportional corrections will not be added during spool up.



Wastegate Duty Proportional

Proportional correction is absolute wastegate duty added or subtracted at an instant in time based on the current boost error. The default maps have high positive values when the boost is under target at low RPM while in spool up. Using high proportional values is preferable to high integral values to prevent windup but still results in high wastegate duty on spool.



RaceROM FlexFuel

Introduction

FlexFuel support is now an integral part of the Phase 5 RaceROM upgrade. It uses a strategy of ignition and AFR target modifier maps for 100% E85 and 2d maps to determine how much of that modification is used. The difference in base fuel requirement is taken care of by the **FlexFuel Quantity Multiplier** map and a 2d blend map. Typically 40% extra fuel will be required for 100% E85 to maintain the same Lambda (therefore the same reported petrol AFR), and the transition will be quite linear. The change in ignition advance will probably more readily be applied with most, if not all of the additional advance added by 50% E85. For 100% E85 there is a second boost target defined by **FlexFuel Boost Target by Gear** and a corresponding blend map to set how the boost target is determined from the two maps.

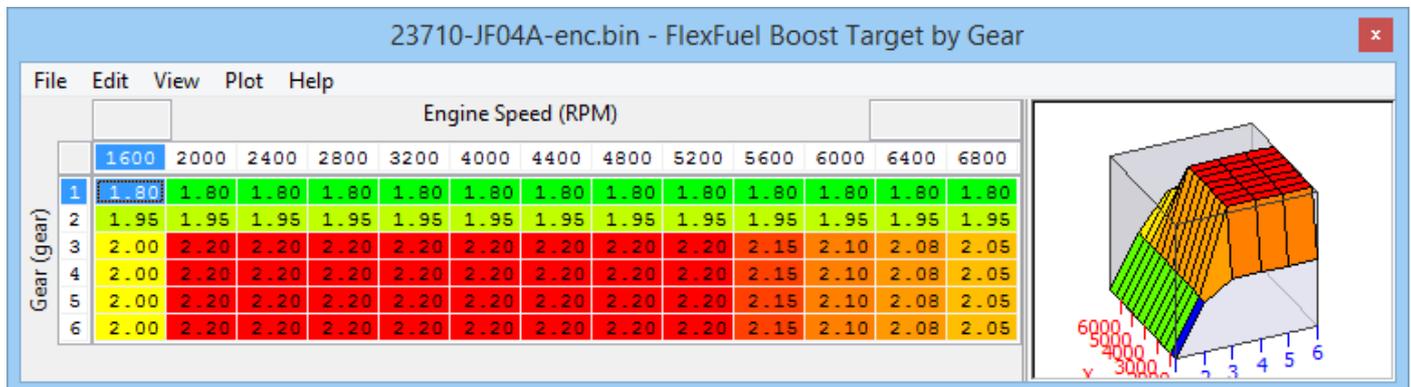
Currently the patch is supplied with typical values used in the **FlexFuel Quantity Multiplier** map so that any car with a FlexFuel sensor added should start and run reasonably well when E85 fuel is added. Remaining correction maps for ignition and AFR target are blank, and the **FlexFuel Target Boost** map has default values identical to those found in the **Target Boost** map.

Live Data related parameters

- *FlexFuel cranking multiplier – Injector opening time multiplier only used during cranking*
- *FlexFuel Ethanol content – Ethanol content in % used in all FF calculations*
- *FlexFuel Ignition Advance – Additional ignition advance after all FF compensations*
- *FlexFuel Quantity Multiplier – Current fuel multiplier based on ethanol content and engine temp*
- *FlexFuel Target AFR – Target AFR after changes by FlexFuel strategy*

FlexFuel Boost Target by Gear

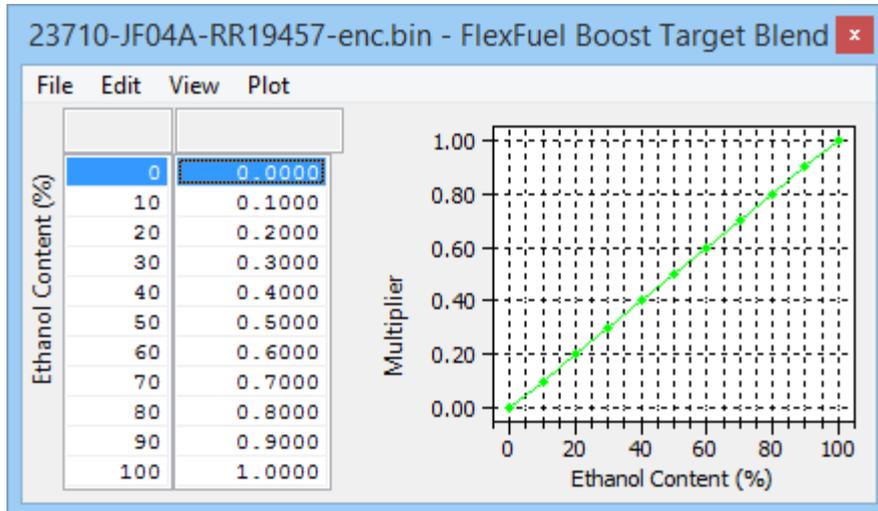
This is the boost target for maximum Ethanol content and the progression between this and the normal boost target map is set by **FlexFuel Max Boost Target Blend**. It would be sensible to lower the boost target for lower gears due to the likely increased torque available when tuning with high Ethanol contents; enough to overcome the available traction in first and second gear on cars with normal road tyres. When more traction is available it would be normal to increase the available boost where turbo size allows, on cars that would previously have been limited by octane when trying to run such high boost on pump gasoline.



FlexFuel Boost Target Blend

This map combines **Boost Target by Gear** and **FlexFuel Boost Target by Gear** to derive the final boost target based on *FlexFuel Ethanol content*. The eventual boost target is calculated as:

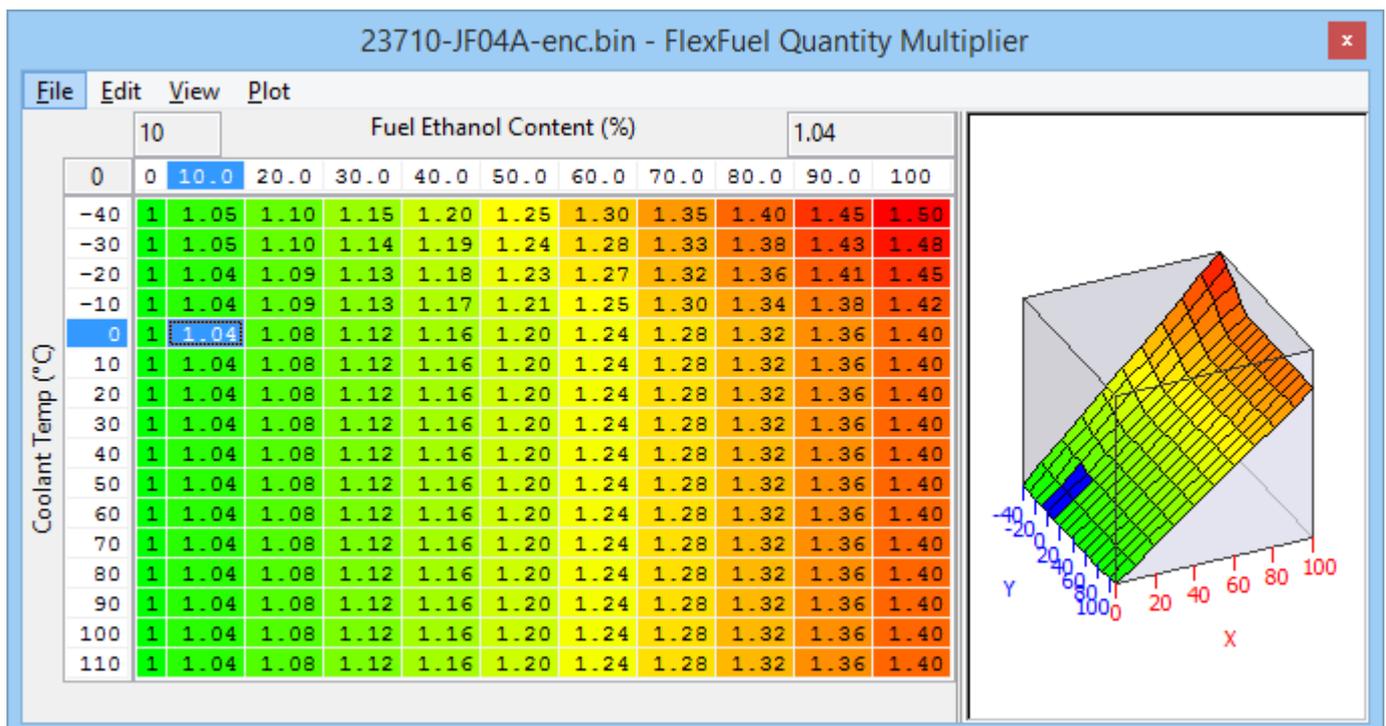
$$((\text{Gasoline Boost Target} * \text{Multiplier}) + (\text{Ethanol Boost Target} * (\text{Blend Multiplier} - 1))$$



FlexFuel Quantity Multiplier

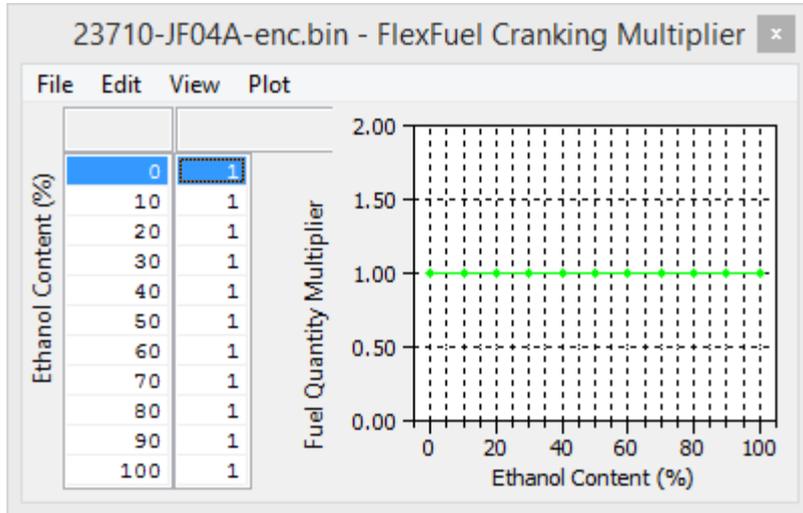
This dictates the additional fuel based on Ethanol content (0-100%) and coolant temperature. It would not be unusual to need to add additional E85 when cold due to some unburnt fuel going through the engine. Pure Ethanol typically requires 40% more fuel to maintain the same lambda (or apparent AFR) as gasoline, there is no significant change to injector flowrates when using E85.

If you want to run a richer or leaner AFR when using E85 do not try and compensate with this map as the ECU will use fuel corrections to hit the same target AFR you are running in a given map switch mode.



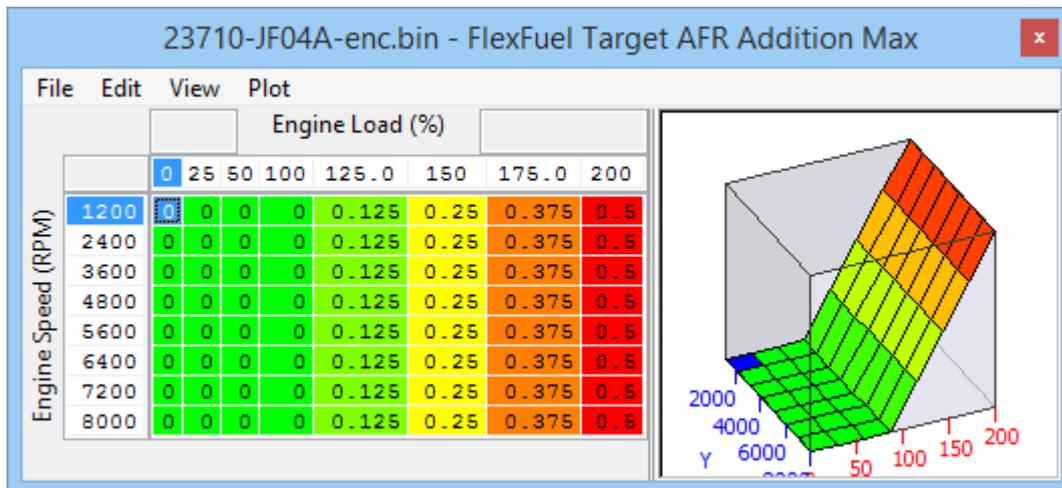
FlexFuel Cranking Multiplier

The fuel quantity at cranking will be affected by the **FlexFuel Quantity Multiplier** map however it may be required to change the fuelling further at low temperatures when cranking. This map is a 0-2 scalar and will multiply the base fuelling only when cranking.



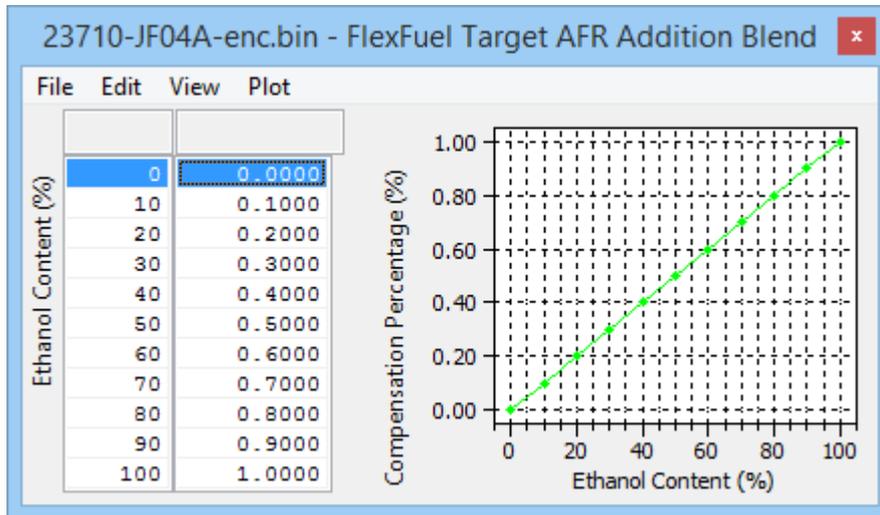
FlexFuel AFR Addition Max

This map has units of AFR and a positive number will add to the preceding target AFR resulting in a leaner final AFR. Blank by default, the pictured table uses +0.5 at high load to lean out the AFR from (for example) 11:1 at very high load on pump fuel to a cleaner and crisper 11.5:1. However if the base map is already using a good fuel or even a race fuel that would typically be mapped to run more like 12.2:1 then it would be entirely possible to want to lower the target AFR when using high levels of E85.



FlexFuel AFR Addition Blend

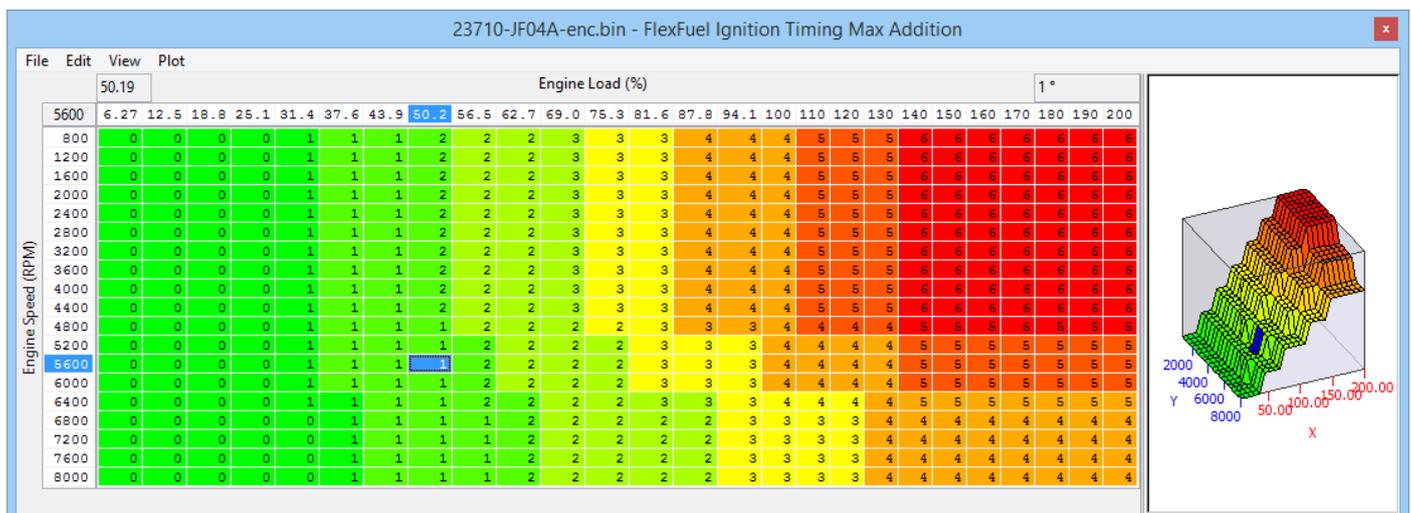
This map dictates how much of the AFR change is used for a given Ethanol content. The resulting *AFR target* is defined as ((Gasoline AFR Target + (Blend Multiplier * FlexFuel Target Addition)).



FlexFuel Ignition Timing Max Addition

This represents the absolute maximum ignition advance that can be added, typically at 100% E85 but it can be added at lower concentrations using the **FlexFuel Ignition Timing Addition Blend** map. The values in the table below are not tested but purely representative. They would result in significant torque gains and would not necessarily be suitable on a stock engine.

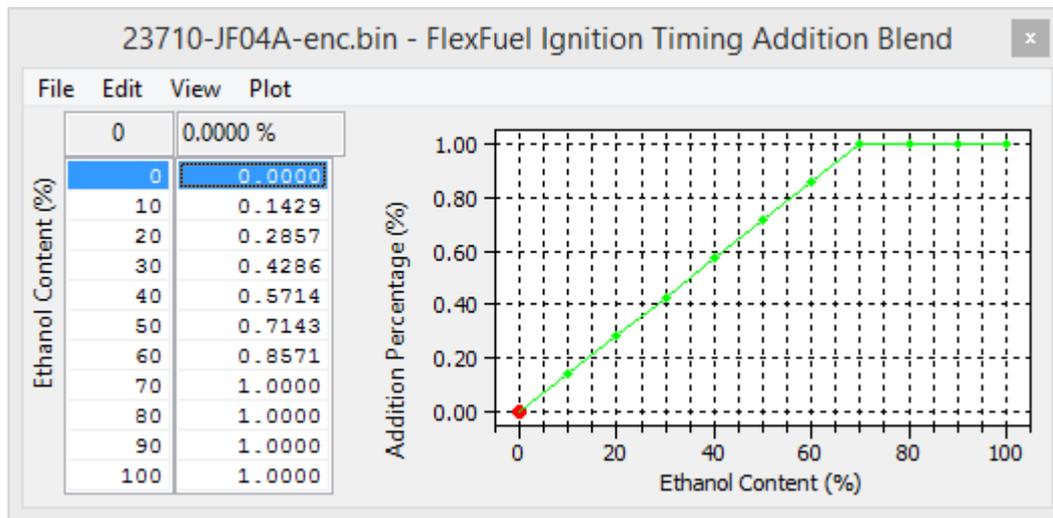
We have chosen to use an addition map as it would require 4 ignition maps, one for each MapSwitch mode in order to have totally independent maps. An adder map is easier to comprehend for most tuners but should you wish to use total advance maps, it can of course be done using Custom Maps.



FlexFuel Ignition Timing Addition Blend

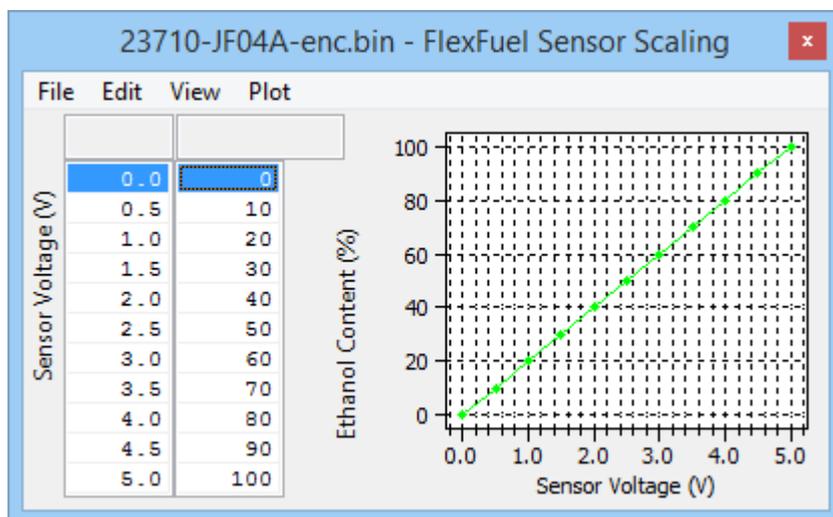
The values are a multiplier of the **FlexFuel Ignition Timing Max Addition** values and dictate how much of that advance is added for a given Ethanol content. The resulting ignition advance is calculated as ((Gasoline Ignition Timing + (Blend Multiplier * FlexFuel Ignition Timing Addition)).

The example shown below adds all the max advance by 70% E85 which is going to be close to ideal for many setups. The default map is linear 0-1.00 and will give conservative results at low to medium Ethanol content.



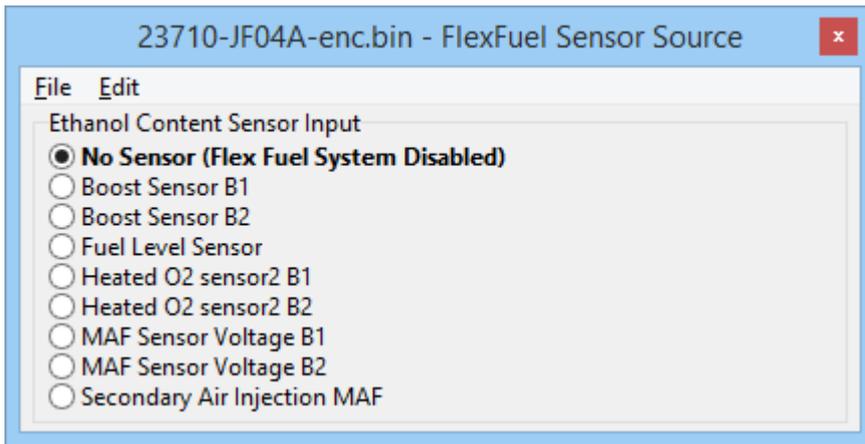
FlexFuel Sensor Scaling

This map sets the sensor scaling using a 0-5v input defined by **FlexFuel Sensor Source** that many aftermarket FlexFuel gauges or sensor interfaces use. The map is shown with its default values and many setups will not require anything different but you can fine tune to match the RaceROM Ethanol content to that of a gauge.



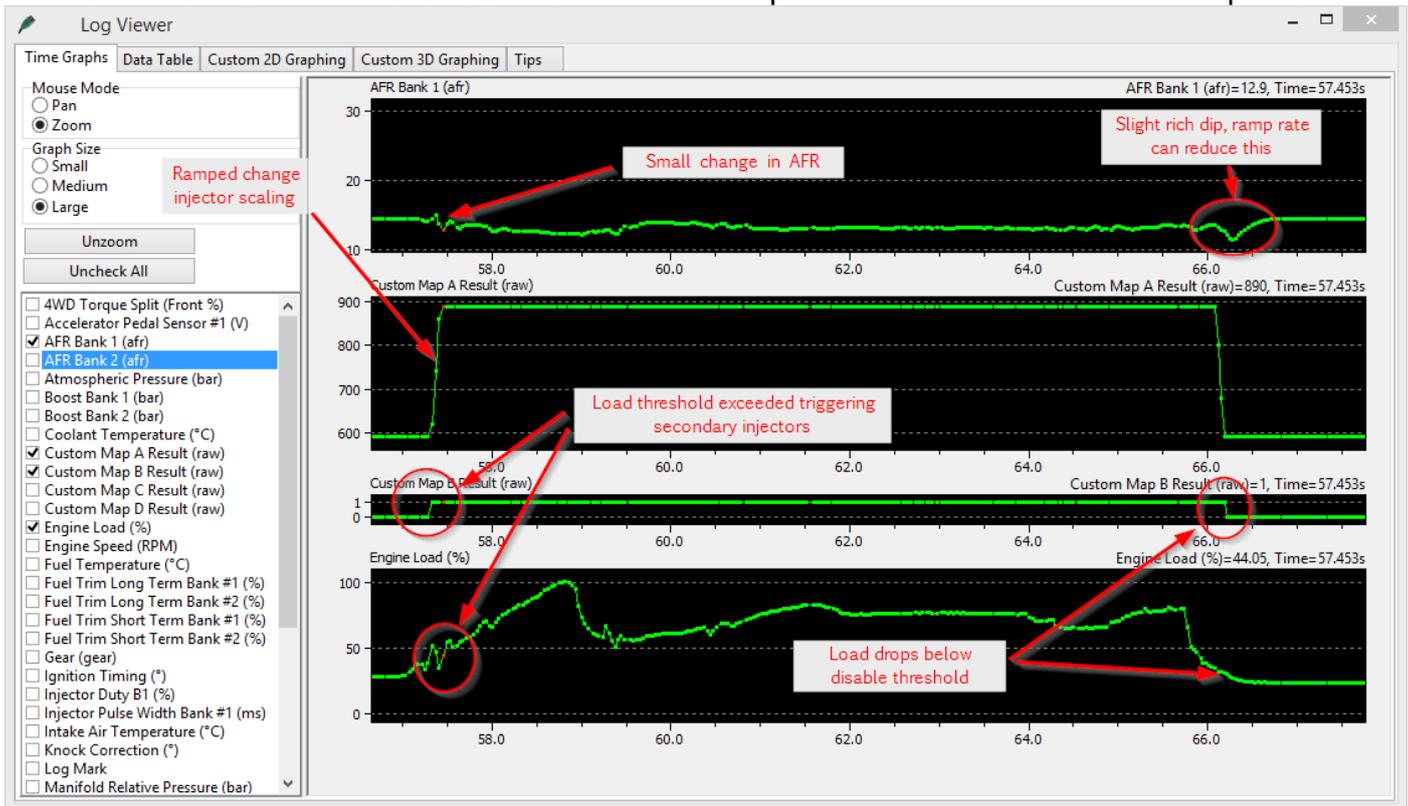
FlexFuel Sensor Source

Choose the ECU 0-5v input to use for the FlexFuel sensor. The option of a fuel level sensor is available only because it's possible and may suit circuit cars with replacement fuel tanks.



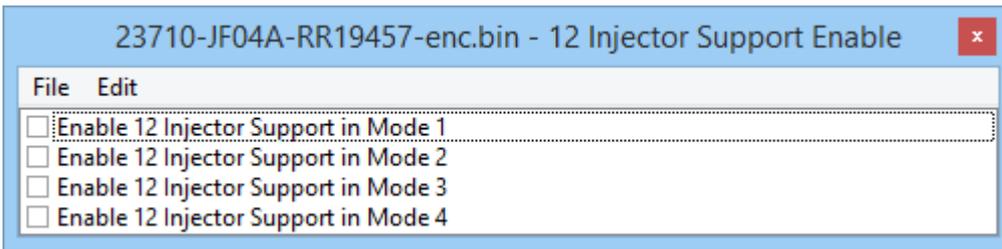
RaceROM 12 injector Support

A simple but effective 12 injector strategy has been implemented that allows 12 injectors to be run on the GTR using additional hardware. Due to the limited spare outputs and the difficulty of fundamentally changing the low level scheduling of outputs, 12 injector support is achieved by switching a secondary bank of injectors on at low to moderate load while scaling the injector constant during a “ramp in” period. The secondary air solenoid is the only output currently available to use with this feature. Details on how to implement this are available on request.



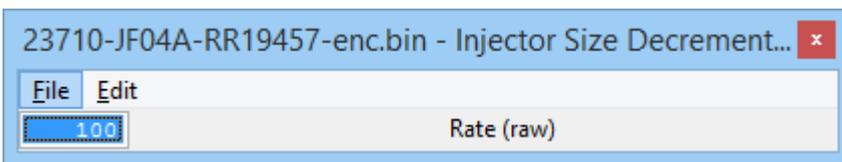
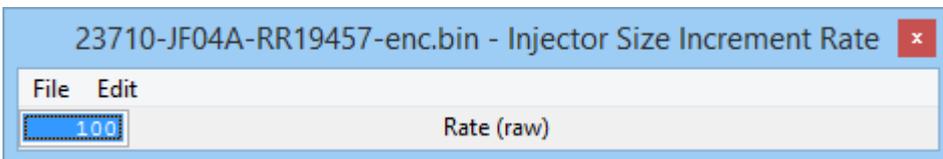
12 injector Support Enable

12 injector support can be enabled in each map switch mode individually.



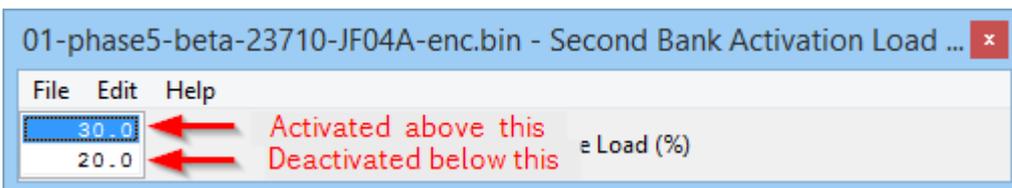
Injector Size Increment Rate – Injector Size Decrement Rate

This controls how fast the injector scaling is changed. The units are cc/10ms so large changes in injector scale will need a larger number to make the change in the same time. 40cc/10ms proved a good compromise when testing with 300cc/min secondary injectors taking 75ms to ramp in and out. If using 1050cc/min secondary injectors, a ramp rate of 140cc/10ms will give the same 75ms ramp time.



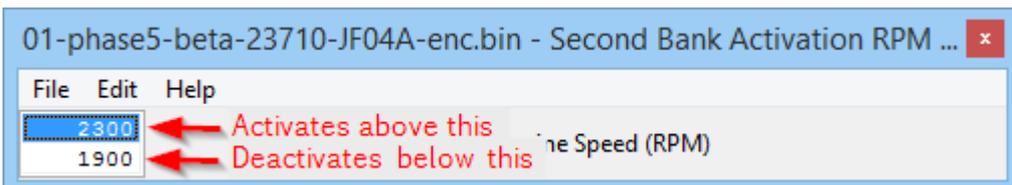
Second Bank Activation Load

The secondary injectors can be enabled above a specific load with hysteresis. Recommended activation is 30-50% depending on the injector size, and a 10% difference between activation and deactivation.



Second Bank Activation RPM

The secondary injectors can be enabled above a specific RPM with hysteresis. Recommended activation is 2000-3500RPM depending on the turbo spool, and a 100-500RPM difference between activation and deactivation.



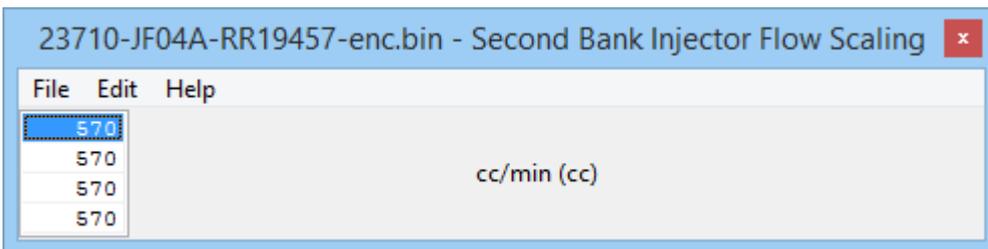
Second Bank Switch Delay

The delay value is used to prevent switching between 6-12 injectors with rapidly fluctuating load that is swinging beyond the thresholds. The thresholds need to be met for a time longer than the delay in order to actually switch between 6 and 12 injectors, when either activating or deactivating.



Second Bank Injector Flow Scaling

The secondary injectors are scaled in a similar way to the primary injectors in cc/min individually for each map switch mode and when enabled the primary and secondary injector scales are summed. When carrying out initial testing, it can be useful to use 3-4 different scales and map switch between them to test which setting gives the most consistent fuelling between 6 and 12 injectors.

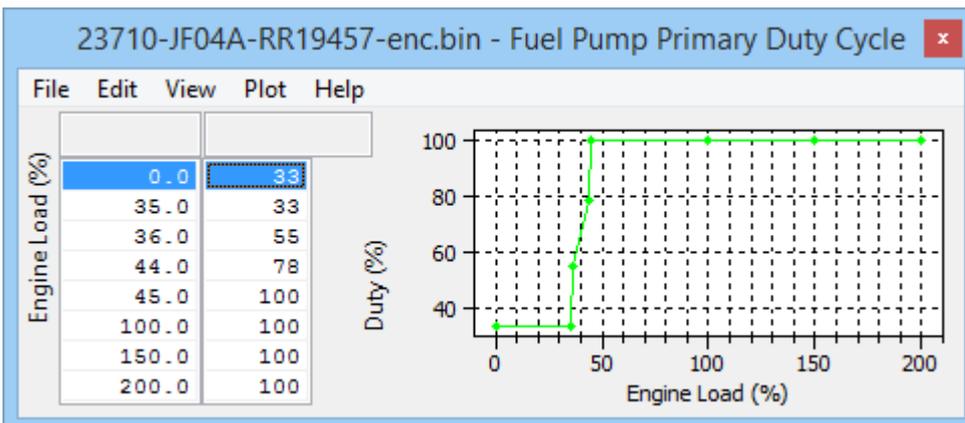


Fuel Pump Primary Duty Cycle

Direct fuel pump control is ONLY ENABLED WHEN 12 INJECTOR CONTROL IS ENABLED! So if you wish to use these maps, enable 12 injector control in all your map switch modes and set the enable RPM to 10000rpm so that it never comes on. Remember when 12 injector support is enabled the secondary air solenoid output will be hijacked.

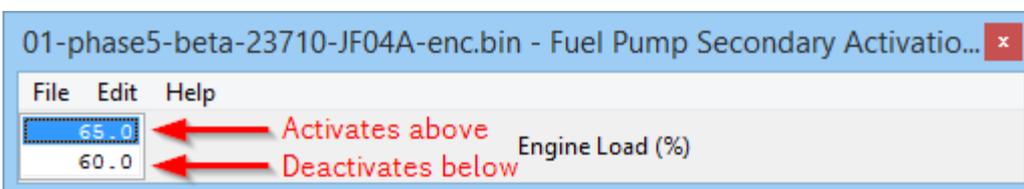
Engine load is used rather than injector duty because when secondary injectors are active, the injector duty will change significantly. These fuel pump maps can be used to avoid such issues.

This map uses engine load vs final pump duty cycle and overrides the factory primary pump control strategy.



Fuel Pump Secondary Activation Threshold

The secondary pump control is still an on/off output but can be directly controlled with engine load.

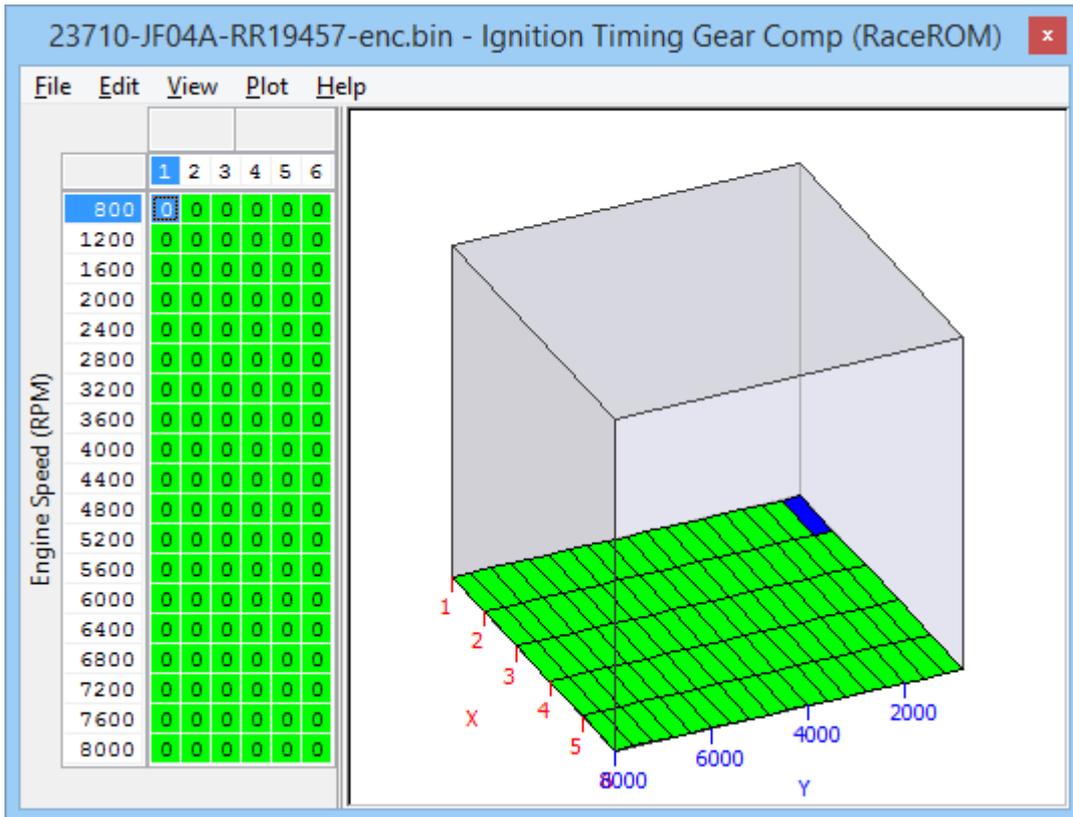


Ignition Timing

Additional factory and RaceROM maps have been added for ignition control. Some are new OEM maps and are included here for convenience, but not all are covered in this guide yet.

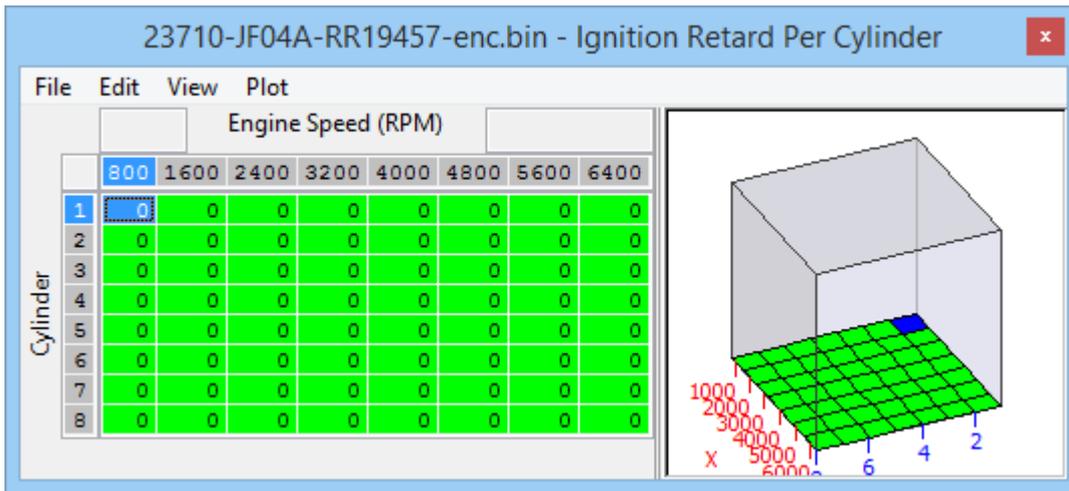
Ignition Timing Gear Comp (RaceROM)

Ignition advance can be trimmed on a per gear basis, relative to RPM using this map. It would be normal to reduce advance in higher gears at high RPM or at an RPM particular sensitive to detonation.



Ignition Retard Per Cylinder

A factory map which can be used to retard the ignition on cylinders especially prone to detonation. Through careful handling and using individual cylinder knock logging, this can gain small but useful amounts of power with no increase in engine risk.



RaceROM Rolling Launch

Rolling Launch throttle compensation has been updated with a different strategy for taking control of the throttle that should prevent spurious Drive-By-Wire related DTCs from being generated. The method of operation is otherwise unchanged and is detailed below (taken from existing manual).

Method of Operation

As the name suggests, Rolling Launch is a type of launch control that can be performed from a rolling start.

To operate Rolling Launch, drive the car at a steady speed in a low gear - 60km/h in 2nd gear is about right. Set the cruise control to maintain the vehicle speed. Now press the accelerator pedal all the way down to the floor. Instead of accelerating, the ECU will initiate an anti-lag effect. This will rapidly generate a large amount of boost, controlled using a proportional closed loop mechanism. But the car will continue to hold steady at the selected vehicle speed. When you are ready to launch, press the CANCEL button on the steering wheel. The cruise control will disengage, the throttles will open fully and the ignition timing will advance. This unleashes a large amount of torque and causes rapid acceleration in an instance.

The rolling launch feature will work in any gear and at any RPM or vehicle speed.

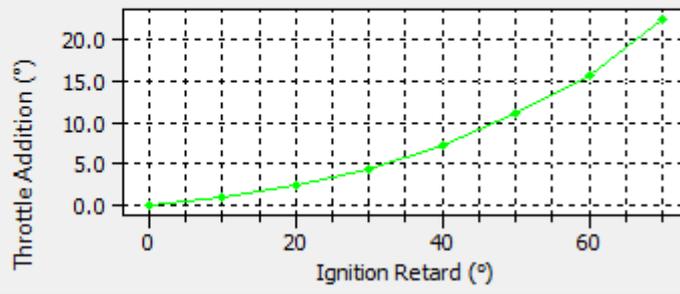
Rolling Launch Throttle Compensation

This map adjusts the throttles in order to compensate for torque variations as the ECU varies the ignition timing to generate boost. The compensation is now an absolute throttle angle adder and the above table has shown to give sensible results but may need fine tuning.



File Edit View Plot Help

Ignition Retard (°)	Throttle Addition (°)
0	0.00
10	1.09
20	2.50
30	4.50
40	7.31
50	11.00
60	15.69
70	22.44



4. RaceROM Valet Mode

Valet Mode allows the driver to lock the car into a lower performance mode when lending it to a less experienced driver, or as a theft deterrent that kicks in when the car is at a safe distance. Valet mode has been simplified in line with the strategy used on the 370z, as the previous version was frequently commented on as being too complicated to activate and deactivate.

Method of Operation

Valet mode is operated using the cruise control switches in the same way as map switching. Instead of selecting map switch mode 1, 2, 3 or 4, select mode 8. The map switch mode does not change.

To turn on the Valet mode

- Ensure that the cruise control is OFF.
- Hold the CANCEL button for 1 second.
- The rev counter will move to indicate the current mode.
- Use the cruise up until the tachometer shows 8000rpm (mode 8).
- Press CANCEL or wait 1 second to enable the valet mode, the rev counter will show current RPM

To turn off the Valet mode

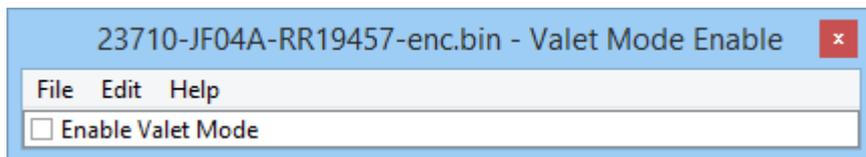
- Ensure that the cruise control is OFF.
- Hold the CANCEL button for 1 second.
- The rev counter will move to indicate the current mode.
- Use the cruise up until the tachometer shows 8000rpm (mode 8).
- Press CANCEL or wait 1 second to enable the valet mode, the rev counter will show current RPM

Cautionary Note for Tuners

Please take note that Valet Mode activation is now a toggle and it's relatively easy to activate. Car owners can in some cases activate it accidentally and it's not been unknown for car owners to end up at a main dealer to have their "problem" fixed!

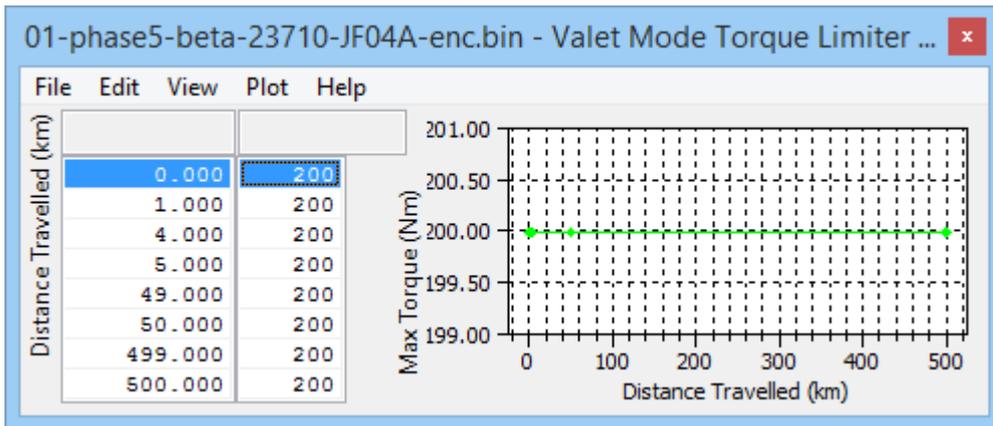
Valet Mode Enable

The "Enable Valet Mode" checkbox enables operation of the Valet Mode feature.



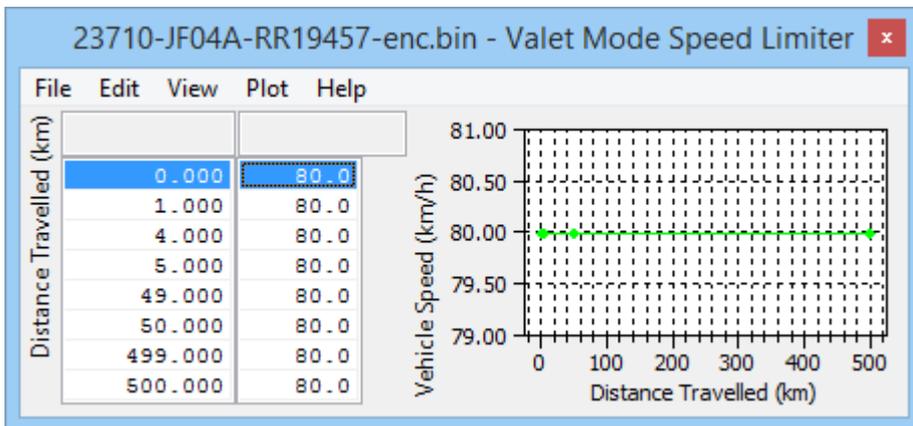
Valet Mode Torque Limiter

When Valet Mode is active the torque output can be limited to prevent a car being driven hard or recklessly. For use as an anti-theft measure it would be reasonable to reduce these values from the default 200Nm after a short distance.



Valet Mode Speed Limiter

When Valet Mode is active the maximum speed can be limited to prevent the car from being driven at anything beyond a sedate pace. For use as an anti-theft measure it would be normal to significantly reduce these default values to as low as zero after a shorter distance.



5. Custom Maps

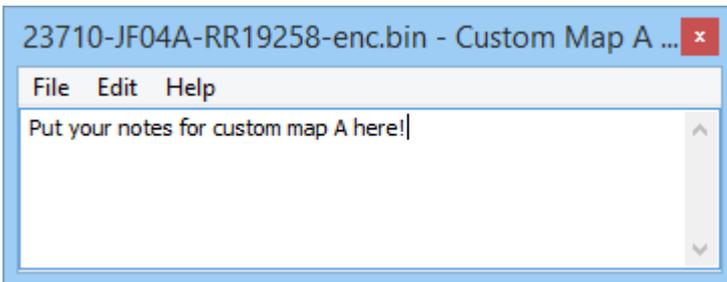
Introduction

We have improved our unique and innovative Custom Maps feature to enable even more tuning possibilities. With the addition of our dedicated boost control and FlexFuel strategies, all 16 custom maps are now available for the tuners to further exploit the power of RaceROM.

Additional inputs and outputs, combined with expanded possibilities for manipulating the values, allow for complex control strategies to be created from something as simple as a fuel pressure fail safe to a slip target based multi-layered traction control system.

Custom Map Notes

Notes relating to each custom map can be added here. There is a 100 character limit. The “delete” key cannot be used as it’s still a hot-key for triggering live data, and the “Ctrl-S” hotkey combination doesn’t work for the moment so quit and click *Yes* on the *Save Changes To Custom Map X* dialog box to save your changes.



New Inputs

Boost Sensor B1 (V) / Boost Sensor B2 (V)

When EcuTek boost control is enabled (which uses the OEM charge pipe) boost sensors can be used as voltage inputs for Custom Maps. There have been reports on some ROMs using later Phase 4 patches (v15xxx) where the use of the boost sensors has caused gradual fuelling changes, so please exercise caution if using these.

FlexFuel Ethanol Content

From the FlexFuel strategy this is a dedicated live data parameter that can be used as an input to Custom Maps to extend the base FlexFuel features.

Fuel Injector Duty (%)

Fuel injector duty cycle averaged across both banks.

Heated O2 Sensor B1 (V) / Heated O2 Sensor B2 (V)

The rear lambda sensor inputs can be used as voltage inputs into Custom Maps. Be sure to have the “Disable RearO2 Sensors” check box ticked in the **Enable Special Features** option list.

Ignition Timing (°)

The actual final ignition timing after all compensations or torque corrections. **WARNING** This input should not be combined with an output using ignition timing as it will produce unpredictable results. It can however be used to act upon extremes of ignition timing such as those seen during gear change, launch control and other torque reductions.

Knock Correction (°)

Ignition corrections created by the knock control system. This can be employed to reduce load, boost target or torque limits during excessive knock retard.

Launch RPM Target (RPM)

The current launch control target RPM. This can be used to make further changes to the engine running while in launch control.

Launch RPM Error (RPM)

The Launch RPM error defined as $RPM - \text{Launch RPM Target}$. This can be used to make further corrections to the engine running based on disparity between the actual and target RPM.

Map Sensor Voltage (V)

If the OEM boost control strategy is still used the manifold pressure sensor input can be used for voltage input to Custom Maps.

VDC Torque Limit Request (Nm)

The VDC torque limit sent to the ECU for traction control.

Wheel Slip Ratio (%)

Calculated as $100 * (\text{Rear WS} - \text{Front WS}) / \text{Front WS}$ and can be used for traction control strategies. This value is similar to the slip or spin values found in aftermarket ECUs.

Wheel Speed Front (km/h) / Wheel Speed Rear (km/h)

Wheel speed for each axle is now chosen from the **Wheel Speed Setup** option list and you can choose from left, right, max, min or average.

New Outputs

Calculation 1 / Calculation 2

These appear simple but greatly enhance the capabilities of Custom Maps as they can be created in one Custom Map and then manipulated by successive Custom Maps as a custom variable. This has been used on 370z to turn wheelspin into a torque reduction using a few Custom Maps to create a traction control setup that is variable with road speed, RPM, Lateral G and an external input or RaceROM controller.

Target AFR (n:1)

This can be used to manipulate the target AFR for engine safety, fuel trimming, lean spool etc

Charge Air Temp for SD (°C)

This can be used to manipulate the speed density calculation via the charge temp input.

Fuel Pump Duty (%)

This can be used to manipulate the primary fuel pump controller duty cycle for complex control.

Secondary Air Pump (0=off, 1=on)

Can be used for general purpose on/off control on cars with the secondary air system removed.

Secondary Air Solenoid (0=off, 1=on)

Also used by the 12 injector setup, but can be used for general purpose on/off control otherwise.

Secondary Fuel Pump (0=off, 1=on)

Can be used for overall on/off control of the secondary fuel pump.

Cylinder Cut Probability (%)

Uses a pseudo randomised cut of fuel which can be used for torque reduction in traction control, anti-lag system control with a jacked open throttle and many more applications.

Throttle Target (°)

EXTREME CAUTION! Be very careful to use the correct output type as using a “replace value” option can overwrite the intended throttle opening angle.

This can be used primarily to reduce the throttle for the regulation of power, but can also be combined with other Custom Maps and outputs like cylinder cut % to create interesting effects.

Torque Limit (Nm)

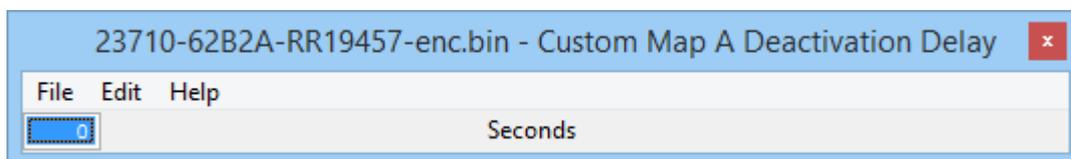
This can be used to reduce the available torque via throttle closure and can be very useful for failsafe Custom Maps, as it provides an easy way to reduce power in a predictable way. Please be aware that if Valet Mode is enabled, *Torque Limit* outputs from Custom Maps will be disabled.

Volumetric Efficiency (%)

Applied over the output of the SD Volumetric Efficiency (VE) map, and can be used for closed loop VE correction, TPS compensation (eg for individual throttle tuning) and for making temporary corrections to the VE using the RaceROM boost controller or external 0-5v input.

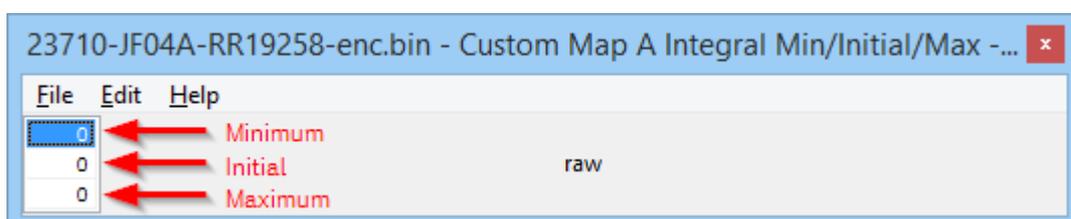
Deactivation Delay

Activation and deactivation now have independent delay times. This means you can trigger a custom map to be active immediately and it will remain on for a time even if the activation conditions are no longer met, for example a 10 second boost target increase.



Integral Min/Initial/Max

On our previous Custom Maps implementation the integral function would always start and default back to zero making multiplication via an integral impossible. An initial value of 1 will fix the issue.



6. Custom Map Examples

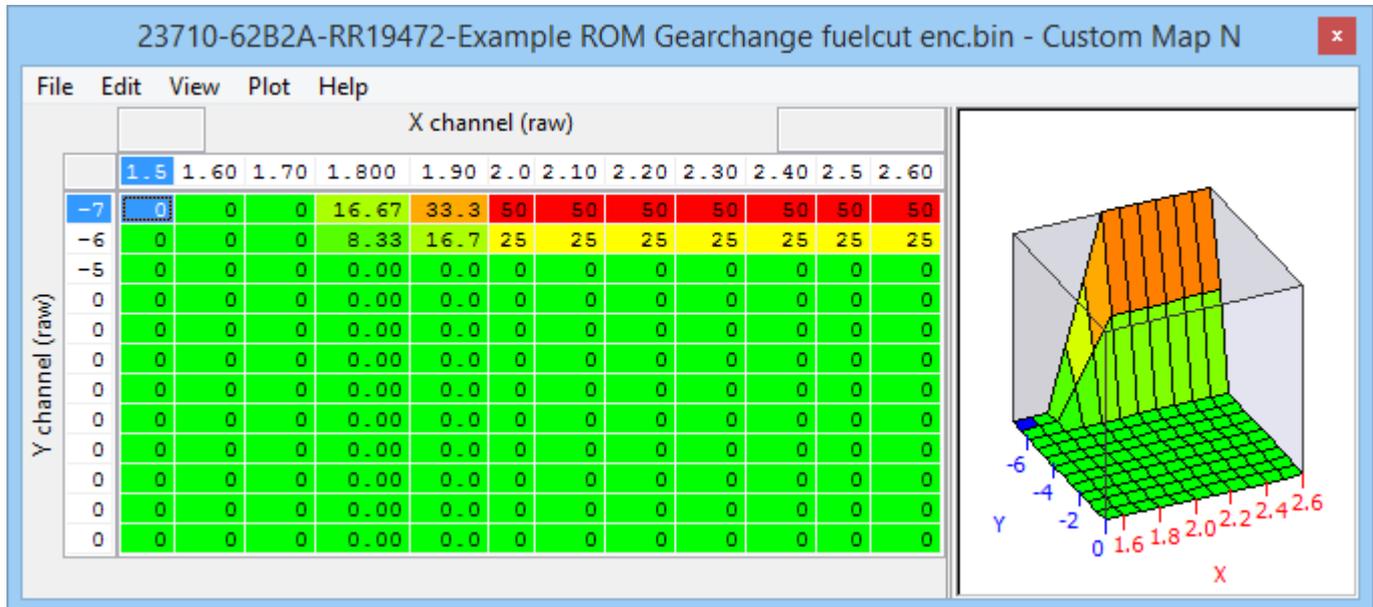
Gear change fuel cut

The following example enables a partial fuel cut on gearshift. The result is increased noise on the shift, but can also be used in very high powered cars to get a faster speed match and ultimately a faster shift. You can download the example rom used here by using EcuTek Update:

23710-62B2A-RR19472-Example ROM Gearchange fuelcut enc.bin

A Custom Map N is used to create a partial fuel cut when the ignition timing is below -6° , and the throttle angle is above 68° , this situation is only encountered during a gearshift. Manifold absolute pressure is used to vary the cut level, so at low boost even if at full throttle there will be no cut.

Custom Map N



Custom Map N Activation Definition

Activation Channel: *Throttle Angle*

Activation mode: *Map is only active when channel value is above threshold (with hysteresis)*

Activation options: *Map activates and deactivates as normal*

Custom Map N Activation Delay: *0 (zero)*

Custom Map N Activation Threshold: *Activates above 68, deactivates below 66*

Custom Map N Enable: *Enabled in mode 4 and all suspension modes in example*

Custom Map N Output Definition: *Cylinder Cut Probability (%)*

Custom Map N X Input Definition: *Manifold Absolute Pressure (bar)*

Custom Map N Y Input Definition: *Ignition Timing ($^\circ$)*

Throttle angle typically ranges from 0 to 74 in live data and custom maps.

Slip Target based Traction control

This is an advanced application of Custom maps, and for it to successfully work all 5 Custom Maps will need to be transferred your tuned ROM file in order for it to work. Also note that because a user variable in the form of *Calculation 1* is used the order of the custom maps is critical. You can download the example rom from EcuTek Update:

23710-62B2A-RR19472 Example ROM Gearchange fuelcut traction control enc.bin

Custom Map E

takes wheel slip and puts it back into the *Calculation 1* value, in this example the *RaceROM Boost Controller* is not used for boost target selection, but instead reduces the reported *Wheel Slip (%)* by a small amount (typically 1-3%), which has the same effect as increasing the slip target by the same amount.

Custom Map F

This is a slip target table, similar to aftermarket TC strategies, except they are negative numbers, the output is added to *Calculation 1* and the net result of that is we can subtract one number from another. This is one of the key tables used for TC tuning and you should compare your logged data for normal wheel slip to the values in this table, at low speeds Wheel Slip can be in 10-30 range even with no apparent slip, and in launch conditions at low speed values of 300 would not be unusual.

At this point $Calculation\ 1 = Wheel\ slip - Slip\ target = slip\ error$

Custom Map G

This is a TC “gain” table that varies with front wheel speed and RaceROM Boost Controller, it multiplies the stored *Calculation 1* value by the numbers in the table. The output of this map dictates how severe the torque reduction should be to correct the current wheel slip in excess of the targeted values (slip error) at different wheel speeds. In this example much reduced effects are used at low front wheel speed to be careful not to interrupt a launch process where a certain amount of wheelspin is required. Adding a potentiometer or multi-position trim switch via a free voltage input to the Y axis of this map can be a useful way of adding driver trim to the Traction control while freeing up the RaceROM Boost Controller.

At this point $Calculation\ 1 = gain * slip\ error = \% \text{ torque reduction}$

Custom Map H

This is a cylinder cut map used to momentarily reduce power based on % torque reduction (*Custom Map G Result*) and is activated by *Front wheel speed* going above 2km. The highest values in this table on the example rom are typically 35% and it should be considered in conjunction with **Custom Map I** which retards the ignition to reduce power. The effects are reduced in the example rom at low engine RPM to prevent bogging.

Custom Map I

This is an ignition retard table based on RPM and % torque reduction (*Custom Map G Result*), it has reduced effects at low engine rpm in the example RPM to prevent bogging.

Custom maps H / I should be activated by the accel pedal going above about 18% volts, so they are off on overrun and idle. As seen and used by Custom Maps, the accel Pedal ranges from 15.4% to 93.4% on our car.

Custom maps H and I are enabled in map switch modes 2 and 3 only with VDC off.

7. Glossary

AFM

Air Flow Meter

AFR

Air Fuel Ratio

Calculated Air Flow

The air flow sensor voltage is not linearly related to the amount of air flow. The ECU uses a scaling map to translate the air flow sensor voltage into an air flow rate value i.e. calculated air flow.

ECM

Engine Control Module

Engine Load

The ECU calculates engine load based on calculated air flow divided by engine RPM. It is effectively how much air enters the engine on each revolution.

FTST

Fuel Trim Short Term

FTLT

Fuel Trim Long Term

FMIC

Front Mounted Intercooler

MAF

Mass Air Flow (sensor)

MAP

Manifold Absolute Pressure (sensor)

MRP

Manifold Relative Pressure or boost pressure

MBT

Maximum Best Torque or Minimum Best Timing

O2 Sensor

Lambda Sensor (oxygen sensor)

RRLC

RaceROM Launch Control

RRBC

RaceROM Boost Control

RRFF

RaceROM Feature File (patch)

SD – Speed Density

The Mass Airflow in grams is calculated from MAP sensor not MAF sensors.

TCM

Transmission Control Unit or Gearbox ECU