

ECUTEK



RaceROM
Features
for
Subaru FA20 DIT

v1.09

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Warning

!!! CAUTION !!!

EcuTek ProECU tuning tools should only be used by experienced tuners who understand the product and engine calibration.

If you do not fully understand this product then you WILL damage your engine, ECU or your vehicle.

Please ensure you fully read all EcuTek manuals BEFORE attempting to use ProECU with your laptop or your vehicle.

Use with extreme caution and understanding at all times, if in doubt then do not proceed.

EcuTek accepts no responsibility for any damage to the engine, ECU or any part of the vehicle that results directly or indirectly from using the product.

** If you are in any doubt that you do NOT have the experienced required to use this product then you should NOT USE IT **

Retail customers

** If you have any doubt that you do NOT have the experienced required to use this product then you should NOT USE IT, you should simply contact your EcuTek Master Tuner shown clearly on the top of your Programming Kit or visit your preferred tuning shop to have a professional tuner to use it for you **

Introduction

EcuTek RaceROM is a package of special software features that can be installed into the ECU of the supported vehicles. You simply open your ECU ROM file using EcuTek software, apply the RaceROM Feature File (Patch) to it, adjust the RaceROM maps as necessary, and then program the ROM file into the vehicle.

Please read the **ProECU Tuning RaceROM Feature File Guide** for info on how RaceROM works, how to install and uninstall RaceROM feature files, and further hints and tips.

Please also see our website for various videos and webinars for further information.

Feature list

EcuTek RaceROM for Subaru DIT currently includes the following features:

- Map Switching
- Boost Controller
- Speed Density
- Launch Control with Boost Off The Line
- Flat Foot Shifting*
- Custom Maps
- Custom Gauge

For technical reasons, some vehicles are not able to support all of the features

* currently in testing and available soon

Supported Vehicle Models

This product supports all Subaru vehicles fitted with the FA20 Direct Injection Turbocharged engine, controlled by Hitachi 1.5 megabyte or 2.0 megabyte ECU. This includes Legacy (2012 onwards), Levorg, Forester and WRX (2014 onwards) in all worldwide markets.

We have similar products are available for other vehicles. Please contact our sales team for further details.

Availability

EcuTek RaceROM Feature Files (RRFF) will be made available via EcuTek Update, always use the latest RRFF version that is in the RaceROM folder.

Overview

This section gives a brief description of the RaceROM features. More detailed information is available later in this document.

Map Switching

The Map Switching feature allows you to define three different calibrations in the ECU ROM. The driver can switch between the calibrations using the cruise control lever. Alternatively the map switching can be seamlessly integrated with the SI drive system.

The Map Switching feature can also be used as a trigger to activate other RaceROM features. For example: the Launch Control and Flat Foot Shift features can each be configured to operate in any of the three modes.

Boost Controller

The RaceROM Boost Controller feature allows the driver to adjust the maximum desired boost using the cruise control buttons (when the cruise control is off). The boost level selected is displayed on the dashboard boost gauge. For vehicles that are not equipped with a boost gauge it can be displayed on the cruise speed indicator.

Speed Density

The Speed Density feature changes the way that mass airflow is calculated. When SD mode is activated, the ECU will disregard the MAF sensor reading and calculate mass airflow based on Engine Speed, Manifold Pressure and Air Temperature instead. This allows you to remove the MAF sensor and fit a larger intake if desired.

Launch Control with Boost Off The Line

The Launch Control feature limits maximum RPM during launch in an attempt to control wheel spin and allow the fastest possible take off. The driver can adjust the launch RPM using the cruise control buttons.

In addition, you can specify a pre-launch manifold pressure target for each map switch mode. The ECU will dynamically retard and advance the ignition timing in order to achieve the target.

Flat Foot Shifting*

The Flat Foot Shifting feature allows the driver to up-shift without lifting his foot from the accelerator pedal. * this feature is not available at this time

Custom Maps

EcuTek Custom Maps is an advanced feature for expert tuners only. It provides the tuner with the ability to modify the control algorithms within the ECU. The tuner can take advantage of this in order to develop their own features that no other tuner can provide. It can also be used to develop one-off fixes to overcome specific problems encountered while tuning a highly modified vehicle.

The Custom Map feature is described in detail in a separate **ProECU RaceROM Custom Maps** manual.

Custom Gauge

Custom Gauge allows the tuner to display either a fixed value, or the output of a custom map, on the dashboard gauges. The exact functionality depends on the type of gauge cluster fitted to the vehicle.

It can be used, for example, to display the required fuel octane for each map switch mode, to display current AFR, or the output of an external fuel ethanol content sensor.

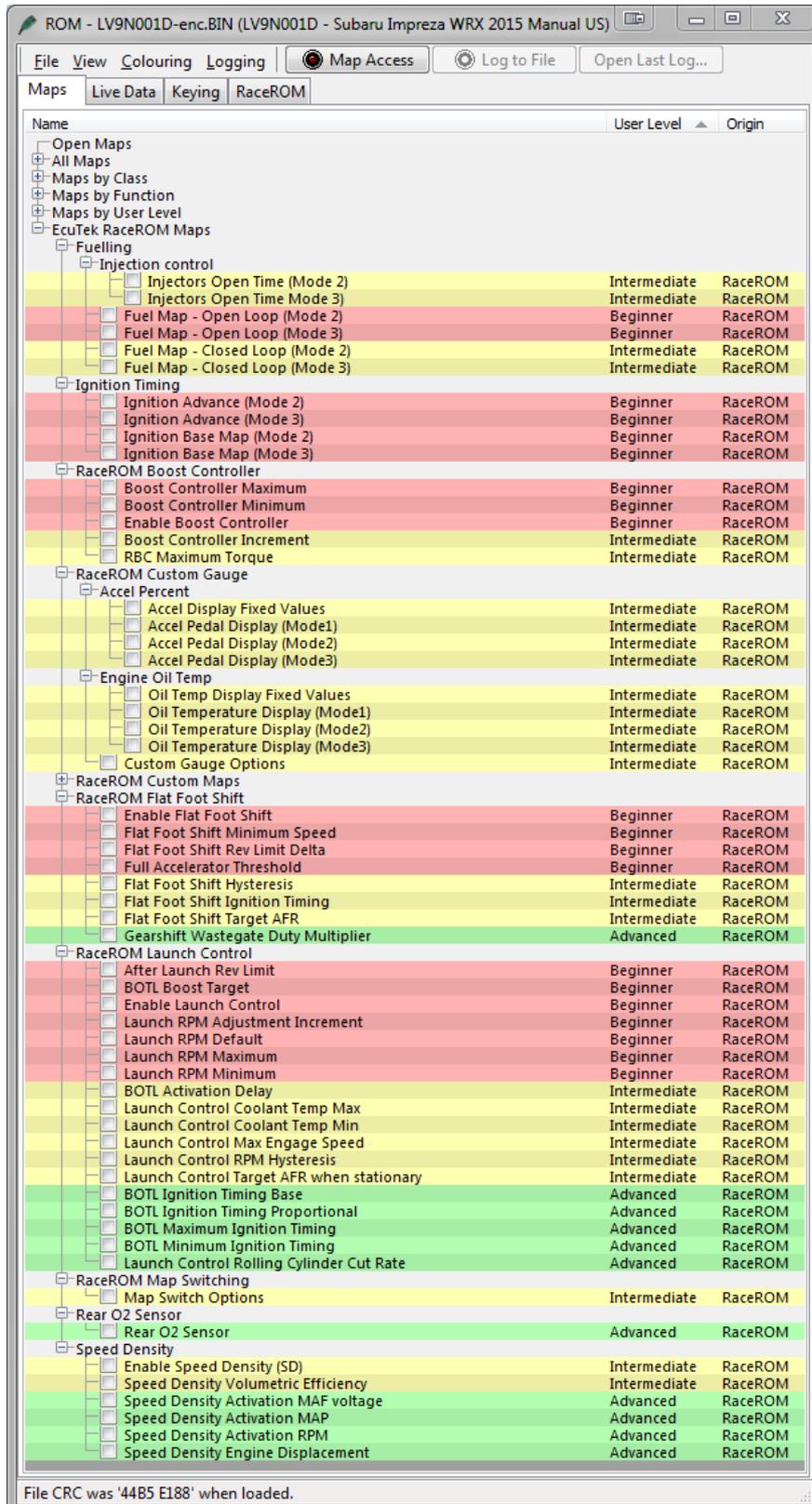
RaceROM Feature File Installation

Please refer to the **ProECU RaceROM Feature File Guide** found under the Help menu of ProECU for more info on how to install, remove and update RaceROM Feature Files.

Configuration

Custom Feature Control Maps

Go to the 'Maps' Tab, expand 'EcuTek RaceROM Maps'. This will show you all of the maps that have been added by the RaceROM Feature File.



Name	User Level	Origin
Injectors Open Time (Mode 2)	Intermediate	RaceROM
Injectors Open Time Mode 3	Intermediate	RaceROM
Fuel Map - Open Loop (Mode 2)	Beginner	RaceROM
Fuel Map - Open Loop (Mode 3)	Beginner	RaceROM
Fuel Map - Closed Loop (Mode 2)	Intermediate	RaceROM
Fuel Map - Closed Loop (Mode 3)	Intermediate	RaceROM
Ignition Advance (Mode 2)	Beginner	RaceROM
Ignition Advance (Mode 3)	Beginner	RaceROM
Ignition Base Map (Mode 2)	Beginner	RaceROM
Ignition Base Map (Mode 3)	Beginner	RaceROM
Boost Controller Maximum	Beginner	RaceROM
Boost Controller Minimum	Beginner	RaceROM
Enable Boost Controller	Beginner	RaceROM
Boost Controller Increment	Intermediate	RaceROM
RBC Maximum Torque	Intermediate	RaceROM
Accel Display Fixed Values	Intermediate	RaceROM
Accel Pedal Display (Mode1)	Intermediate	RaceROM
Accel Pedal Display (Mode2)	Intermediate	RaceROM
Accel Pedal Display (Mode3)	Intermediate	RaceROM
Oil Temp Display Fixed Values	Intermediate	RaceROM
Oil Temperature Display (Mode1)	Intermediate	RaceROM
Oil Temperature Display (Mode2)	Intermediate	RaceROM
Oil Temperature Display (Mode3)	Intermediate	RaceROM
Custom Gauge Options	Intermediate	RaceROM
Enable Flat Foot Shift	Beginner	RaceROM
Flat Foot Shift Minimum Speed	Beginner	RaceROM
Flat Foot Shift Rev Limit Delta	Beginner	RaceROM
Full Accelerator Threshold	Beginner	RaceROM
Flat Foot Shift Hysteresis	Intermediate	RaceROM
Flat Foot Shift Ignition Timing	Intermediate	RaceROM
Flat Foot Shift Target AFR	Intermediate	RaceROM
Gearshift Wastegate Duty Multiplier	Advanced	RaceROM
After Launch Rev Limit	Beginner	RaceROM
BOTL Boost Target	Beginner	RaceROM
Enable Launch Control	Beginner	RaceROM
Launch RPM Adjustment Increment	Beginner	RaceROM
Launch RPM Default	Beginner	RaceROM
Launch RPM Maximum	Beginner	RaceROM
Launch RPM Minimum	Beginner	RaceROM
BOTL Activation Delay	Intermediate	RaceROM
Launch Control Coolant Temp Max	Intermediate	RaceROM
Launch Control Coolant Temp Min	Intermediate	RaceROM
Launch Control Max Engage Speed	Intermediate	RaceROM
Launch Control RPM Hysteresis	Intermediate	RaceROM
Launch Control Target AFR when stationary	Intermediate	RaceROM
BOTL Ignition Timing Base	Advanced	RaceROM
BOTL Ignition Timing Proportional	Advanced	RaceROM
BOTL Maximum Ignition Timing	Advanced	RaceROM
BOTL Minimum Ignition Timing	Advanced	RaceROM
Launch Control Rolling Cylinder Cut Rate	Advanced	RaceROM
Map Switch Options	Intermediate	RaceROM
Rear O2 Sensor	Advanced	RaceROM
Enable Speed Density (SD)	Intermediate	RaceROM
Speed Density Volumetric Efficiency	Intermediate	RaceROM
Speed Density Activation MAF voltage	Advanced	RaceROM
Speed Density Activation MAP	Advanced	RaceROM
Speed Density Activation RPM	Advanced	RaceROM
Speed Density Engine Displacement	Advanced	RaceROM

File CRC was '44B5 E188' when loaded.

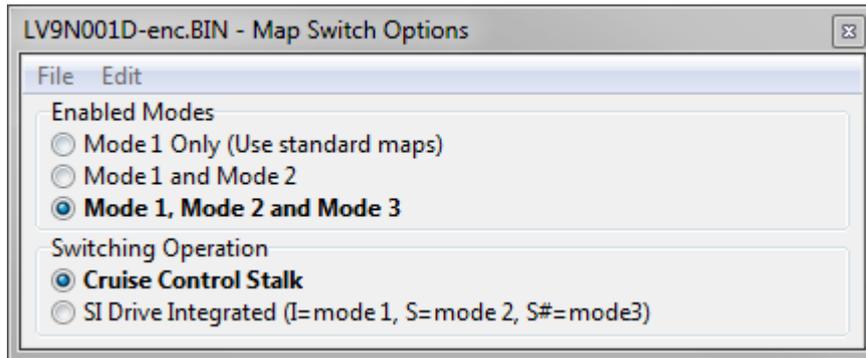
Map Switching Feature

Method of Operation

The Map Switching feature is enabled by the option buttons in the 'Map Switch Options' map. Three modes are allowed by default, but this can be reduced if desired.

In "Mode 1", the ECU will use the original ECU maps for Fuelling, Injector Flow, Base Ignition Timing and Ignition Advance.

In the other three modes, the ECU will use the new Fuel, Injector Flow and Ignition Timing maps labelled Mode2 and Mode3 as appropriate.



Switching mode using the cruise control stalk

- Ignition must be ON
- Ensure cruise control master switch is OFF
- Pull the cruise lever towards you (i.e. cancel position) and hold for 1 second.
- The tachometer will move to 1000, 2000, 3000 or 4000 rpm to indicate the currently active mode.
- Move the cruise lever up (res/acc position) to increase the mode.
- Move the cruise lever down (set/cst position) to decrease the mode.
- Save the selected mode by pulling the cruise lever towards you (cancel position) or waiting 3 seconds.

Switching mode using the SI drive

The driver can switch modes using the Subaru SI drive. "Intelligent" selects mode 1, "Sport" selects mode 2 and "Sport #" selects mode 3.

Integration with Launch Control and Flat Foot Shifting*

The Launch Control and Flat Foot Shifting* features can be independently enabled in each of the three modes.

Logging

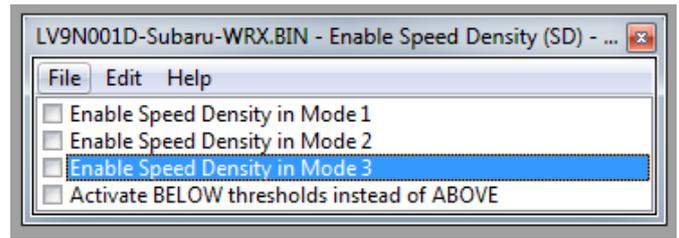
The "Mapswitch Mode" diagnostic parameter can be used to log the current map switch mode.

Speed Density Feature

Method of Operation

The Speed Density feature is enabled by selecting the checkbox in the Speed Density Enable map.

The Speed Density Feature can be enabled in any of the three calibration modes by selecting the appropriate checkboxes in the “Enable Speed Density (SD)” map.



When this feature is active, the ECU will ignore the reading from the Mass Airflow sensor and will calculate mass airflow as follows:

- Estimated mass airflow is calculated from RPM, Manifold Pressure, Charge Air Temperature, and VE (read from the Speed Density Volumetric Efficiency map)

Speed Density		
<input checked="" type="checkbox"/>	Enable Speed Density (SD)	Intermediate RaceROM
<input type="checkbox"/>	Speed Density Volumetric Efficiency	Intermediate RaceROM
<input type="checkbox"/>	Speed Density Activation MAF voltage	Advanced RaceROM
<input type="checkbox"/>	Speed Density Activation MAP	Advanced RaceROM
<input type="checkbox"/>	Speed Density Activation RPM	Advanced RaceROM
<input type="checkbox"/>	Speed Density Engine Displacement	Advanced RaceROM

NOTE: When using full time Speed Density the ‘Intake Cam Advance – Low Load’ map values should be set the same as ‘Full Load’ or ‘Medium to Full Load’ Cam Advance maps, this prevents the ECU from entering light load emission phase cycle (Internal EGR) which will change the Inlet and Exhaust Cam Timing which will distort the MAP based SD calculation.

Removal of MAF sensor (optional)

It is expected that this feature will be used in applications where you wish to replace the MAF sensor with a custom intake. If you remove the MAF sensor, you must go to the “Enabled Diagnostic Trouble Codes” map and disable the codes relating to MAF sensor errors. If you do not disable these codes then the ECU will detect a “Mass Airflow sensor failure” and use its fallback processing instead of the Speed Density feature.

Using Speed Density and MAF sensor together

The Speed Density feature can also be useful in applications where the MAF sensor is present, but the amount of airflow is higher than the MAF sensor can measure. In this scenario, the ECU can be programmed to use the MAF sensor at lower mass airflow values and switch to Speed Density for the higher values.

You can specify threshold values of MAF, RPM and MAP that are required for Speed Density activation. The ECU will activate the Speed Density feature only when all three of these values are **above** their respective thresholds.

The threshold values are implemented using hysteresis. The 1st value should be higher than the 2nd value. The feature will activate when the parameter rises above the 1st value, and will deactivate when it falls below the 2nd value.

You can also use the Speed Density feature in applications where the amount of airflow is lower than the MAF sensor can accurately measure. In this situation, enable the “Activate BELOW thresholds instead of ABOVE” checkbox. The ECU will activate the Speed Density feature when MAF, RPM and MAP are all **below** their respective thresholds.

The default value for the thresholds is zero. If you use the “Activate BELOW thresholds instead of ABOVE” checkbox, then the feature will only be activated when all three parameters are below their respective thresholds. Therefore you need to set a high value into any thresholds that you are not using, otherwise the feature will not activate.

Integration with Map Switching Feature

Speed density can be enabled in each of the three map switch modes. There is only one set of speed density maps. If you require separate speed density maps for each mode, use the custom maps feature to apply adjustments to the base map depending on which mode is selected.

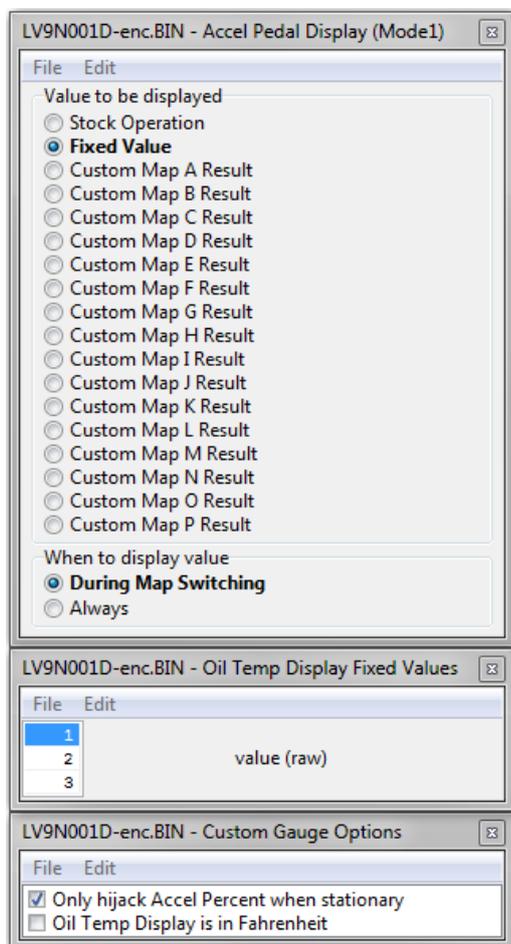
Custom Maps

Please refer to the separate **ProECU RaceROM Custom Maps** manual and the more feature specific **Subaru DIT – Tuning** manual found under the Help menu of ProECU.

Custom Gauge

The custom gauge feature allows custom values to be displayed on the dashboard gauges. The functionality differs depending on which gauges are fitted to the vehicle.

In the example shown here, the Accel % gauge has been configured to show the fixed values 1, 2 and 3 during map switching when the vehicle is stationary.

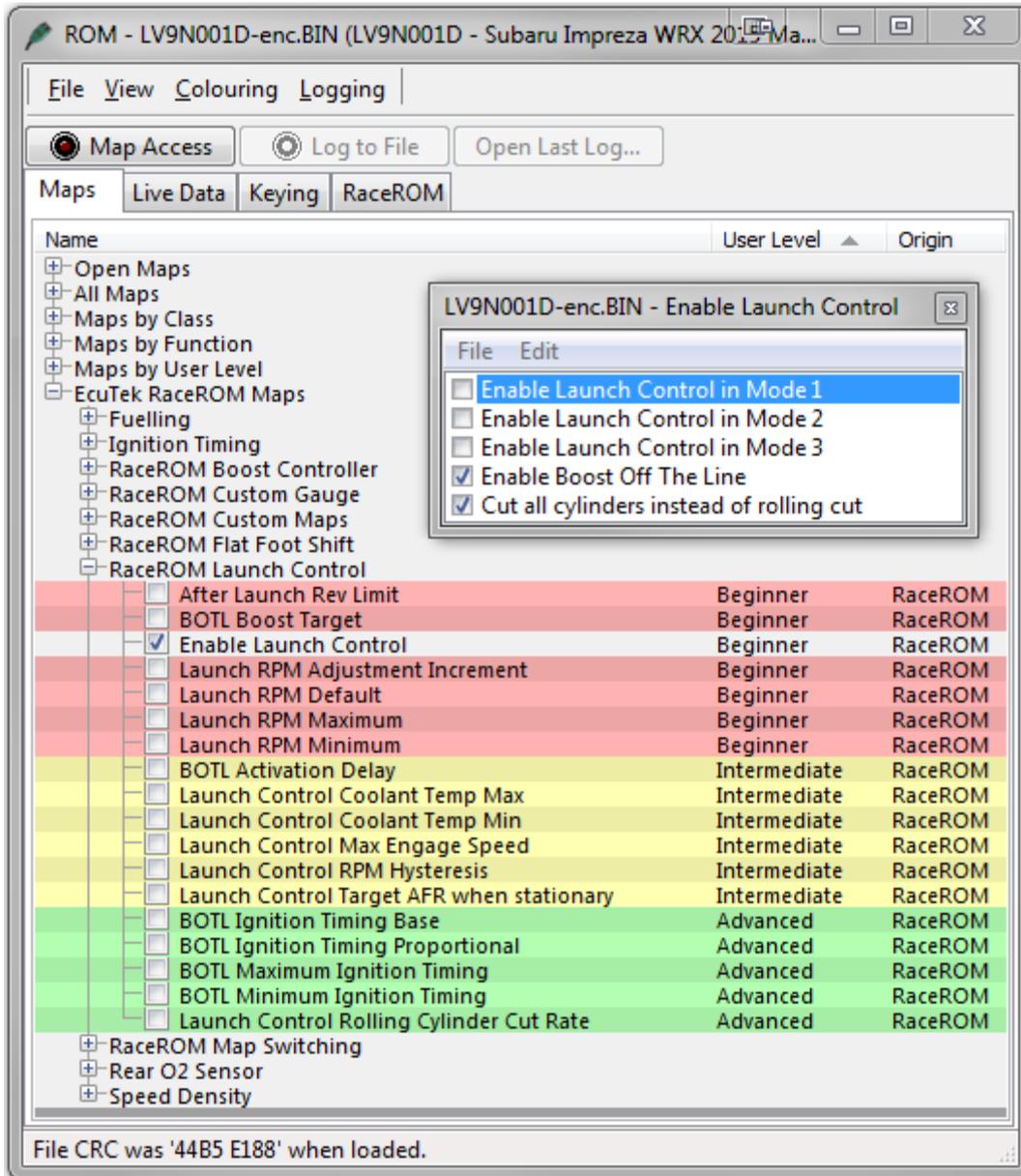


When tuning vehicles with automatic transmissions you should only hijack the Accel gauge when the vehicle is stationary, because the Transmission Control module may use the displayed value as part of its gear selection decision.

Note that some gauges have a limited range and may not be able to display the desired value. This is a feature of the gauge and is not something we are able to control.

The Oil Temp gauge cannot display below 100F and any value below this will be shown as dashes (---).

Launch Control with Boost Off The Line



Method of Operation

Activate the launch control as follows

- Ensure the 'Launch Control Enable' checkbox is ON for the current Map Switch Mode
- Engine must be running and Vehicle must be stationary
- Engine coolant temperature must be within the allowed range
- Press clutch pedal and move the gear stick to 1st position
- Quickly press the accelerator all the way to the floor
- Adjust launch RPM using the cruise control stalk
- Release the clutch to commence launch

When Launch Control is active, the rev limit will be set to the 'Launch RPM'. This limit defaults to the 'Launch Control RPM Default' value and can be adjusted up and down using the cruise control stalk. Select "Res/Acc" to increase the launch RPM and "Set/Cst" to decrease it.

During the launch, the rev limit increases according to the 'After Launch Rev Limit' map , This 2D map, indexed by elapsed time, is added to the Launch RPM and has multiple columns to allow you to set up a multi-stage system for best results.

An adjustment is provided that allows you to control the target AFR when the vehicle is stationary if necessary. This adjustment is removed as soon as the vehicle starts to move.

The ECU will choose a boost target according to the BOTL boost target values. There is one for each map switch mode. It will then set the ignition timing according to the BOTL ignition timing base map. Then it adjusts the ignition timing in a closed loop manner according to the BOTL Ignition Timing Proportional map which is driven by boost error. If the boost is too low, timing will be retarded to increase the anti-lag effect, if the boost is too high, timing will be advanced to reduce the effect.

The Launch Control feature is deactivated when one of the following conditions occurs:

- The vehicle speed exceeds the last column on the 'After Launch Rev Limit' Map.
- The driver lifts off the accelerator
- The driver performs a flatfoot shift

Integration with Map Switching Feature

The Launch Control Feature can be enabled in any of the three calibration modes by selecting the appropriate checkboxes in the "Enable Special Features" map. A separate manifold pressure target can be set for each of the three modes.

Rolling Fuel Cut

By default, the ECU will cut the fuel to all four cylinders in order to maintain the launch RPM. An alternative method can be employed which cuts individual cylinders in rolling pattern, which may be preferred in some cases. This can be activated by un-checking the box in the "Enable Launch Control" map.

Vehicles with automatic transmission

The Launch Control feature is not available on vehicles with automatic transmission.

Example of use

Please see our website video showing the adjustable Launch Control feature in operation.

Programming

Please refer to the **ProECU Programming Overview** manual found under the Help menu of ProECU for more info on how to program the ECU.