ProECU Honda

Image courtesy of http://www.evo.co.uk/honda/civic/10309/mugens-honda-civic-type-r

Honda Tuning Guide

V1.0

Contents

1. 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, the 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 **

2. Introduction

The EcuTek ProECU Honda tuning suite provides an all-in-one OBD-II tuning solution for the 2-litre i-VTEC Honda Civic Type R/Si & Acura CSX Type S. The Honda Civic Type R is the highest performance version of the Honda Civic made by Honda Motor Company of Japan. It features a lightened and stiffened body, specially tuned engine and upgraded brakes and chassis. The third generation Civic Type R was offered in two distinct forms: one developed for the European market and one for the Japanese domestic market, matching the availability of their regular 8th gen. counterpart.

Race ROM

RaceROM offers special custom written features for the Honda, these are only available from EcuTek using ProECU. RaceROM support for the Honda is extensive and the exact details are covered in separate RaceROM and Custom Maps HELP manuals.

Launch Control – Stationary, driver adjustable rev limiter for fast takeoff.

Flat Foot Shifting – Allows you to change gear without lifting your foot from the accelerator.

Throttle Auto-blip – Temporarily blips the throttle when downshifting to match engine speed to road speed.

Custom Parameters – Provides infinitely variable inputs into custom maps.

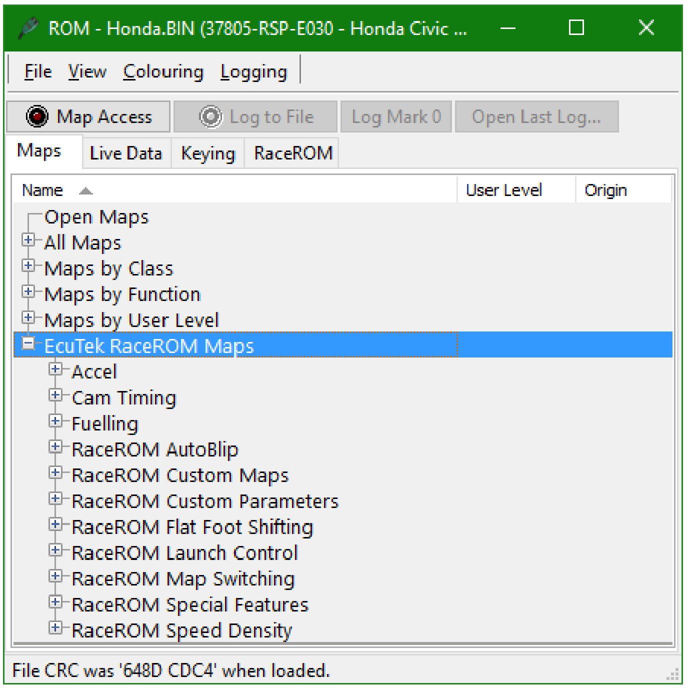
Accelerator Trim – Allows you to adjust the accelerator pedal response.

Map Switching – Provides up to 4 sets of switchable maps with visual feedback on the current mode displayed on the tachometer.

Speed Density & Alpha N – Replace the MAF system with a MAP or TPS based load sensing.

Increased Engine Load Limit – for high horsepower forced induction installations.

Custom Maps – RaceROM Custom Maps provide completely adjustable user defined maps.



In addition, by using Custom Maps we are able to enter a whole new dimension of control.

Custom Maps enables us exciting new functionality, a few examples are shown below.

- Boost Control including a fuel cut Boost Limiter
- Ethanol Flex-Fuel Tuning
- Traction Control

These examples are defined in more detail in the Tuning section later in this training manual.

Live data

A full list of live data parameters can be found in the ROM file itself, however the most important ones are listed below.

Accel Position (%)	Actual Accel pedal driver input
AFR (AFR)	Actual AFR measured from standard sensor
AFR Target (AFR)	Target AFR from fuel maps (with corrections)
Atmospheric Pressure (bar)	Atmospheric pressure
Catalyst Temperature (°C)	Estimated Catalyst temperature (from internal calculation)
Charge Air Temperature (°C)	Charge Air temperature estimated for IAT
Coolant Temperature (°C)	Engine Coolant Temperature
Dig: Engine Load Mode (Digital)	Shows the different load modes use, Factory MAF, Factory SD, EcuTek SD
Engine Load (Final) (mg/str)	The final Engine load used for fuel volume calculation
Engine Load (MAF mode) (mg/str)	The Engine load derived from the OEM MAF sensor calculation
Engine Load (MAP mode) (mg/str)	The Engine load derived from the OEM MAP sensor calculation
Engine Oil Level (mm)	Engine oil level
Engine Speed (rpm)	Engine speed
Fuel Injector Pulse width (ms)	The measured fuel injector pulse width excluding lag time
Fuel Temperature (°C)	Temperature of the fuel (derived from fuel tank sensor)
Fuel Trim Long Term (%)	Learnt Closed loop fuel trim applied to reach target AFR
Fuel Trim Short Term (%)	Instantaneous Closed loop fuel trim applied to reach target AFR
Ignition Maximum (°)	Ign. Maximum map output PLUS the Ignition Addition for AFR Target
Ignition Retard Combined (°)	Combined retard value includes Ign. addition, Advance/Retard & overrun
Ignition timing (°)	Actual Final Ignition timing
Ignition Timing Base (°)	From Timing Base map (MBT map), the Ign. Timing cannot exceed this value
Ignition Timing Retard (°)	Value from Ignition timing retard maps
Inj. Base Pulse width for Lam (ms)	The pulse width of the designated injector that will achieve $\lambda = 1$
Injector Duty (%)	Injector open time in percent
Intake Air Temperature (°C)	Inlet Air temperature measured from MAF
Gear Position (-)	Current calculated Gear position
Knock Advance (°)	Amount of learnt advance from knock calculations
Knock Retard (°)	Output of knock retard map multiplied by knock retard multiplier
Knock Retard Multiplier (-)	The current value of knock multiplier used in knock retard value
Knock Sensor Voltage (Volt)	Voltage returned from knock sensor
Manifold Absolute Pressure (bar)	Manifold pressure the MAP sensor detects
Map Trace AFR (n:1)	AFR used for map trace function
Map Trace Knock (°)	Knock retard used for the trace function
Mapswitch Mode ()	The current map switch mode the vehicle is using
Mass Airflow (g/s)	The Current mass airflow calculated from MAF voltage/SDVE maps
Mass Airflow Sensor (Volt)	MAF sensor voltage output
SD Engine Load (Calc) (mg/str)	Engine load calculated from the SD map
SD Engine Load (Real) (mg/str)	Engine load calculated the factory MAF/MAP system
SD Volumetric Efficiency (%)	Speed Density Volumetric Efficiency map value
Throttle Angle Actual (°)	Actual Throttle angle
Throttle Angle Target (°)	Target Throttle angle
Vehicle Speed (km/h)	Measured vehicle speed from ABS system
VTC Intake Advance Actual (°)	Intake cam advance angle measured
VTC Intake Advance Target (°)	Intake cam advance angle target from map outputs
VTC Solenoid Duty (%)	Solenoid duty used for VTC angle target
VTEC Solenoid State (-)	VTEC Solenoid state 1 = on, 2 = off 3 = switch on, 0 = switch off

All of the Honda ROMs currently supported are 1mb in size.

3. ECU Map Descriptions

Fuelling

Live Date Related Parameters

Fuel Injector Pulsewidth (ms)	The measured fuel injector pulse width excluding lag time
Fuel Temperature (°C)	Temperature of the fuel (derived from fuel tank sensor)
Fuel Trim Long Term (%)	Learnt Closed loop fuel trim applied to reach target AFR
Fuel Trim Short Term (%)	Instantaneous Closed loop fuel trim applied to reach target AFR
Injector Duty (%)	Fuel injector opening time

Fuel Maps

Like most ECU's the Honda has a series of calculations that measure or estimate an airflow which is then tuned into an engine load amount (Honda uses mg/stroke) which is then used to calculate a matching volume of fuel depending on the target AFR. The first task of tuning fuel is to get the actual AFR to match the target AFR after this you can adjust the targets to find more power.

The Fuel Maps contain target AFR based on Engine Speed (RPM) and Manifold Absolute Pressure (Bar Absolute). These maps are used in both open loop and closed loop conditions. Fuel Map (Full Load) will be used when the ECU detect WOT and will use its Fuel Map – Full Load VTEC when it goes past the VTEC switch point. The X and Y axis scaling can be adjusted to suit higher RPMs or higher MAP if required.

The fuel maps are an AFR Target value and these work in closed loop on full load up to 12.6:1 AFR (the AFR Target Minimum). When not using WOT the Fuel Map & Fuel MAP VTEC are used with the same CL/OL switchpoint. There is also a safe mode fuel map pair that should not normally need adjustment.

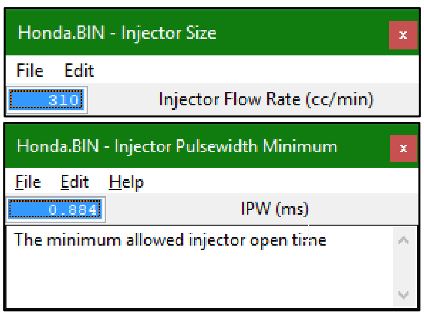
The factory AF sensor is a wide-range sensor, this sensor has a good range but may not be particularly accurate, the Front AF sensor can be rescaled using a calibrated aftermarket wideband Lambda sensor for reference.

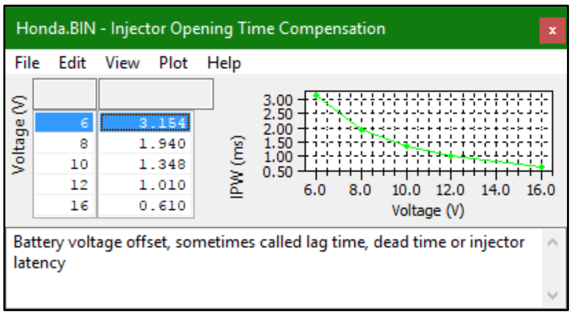
Fuel Compensations

The Compensations maps allow you to alter the injector pulse width for given parameters such as IAT and ECT. The maps are an adjustment percentage multiplier (100% = No change). These are applied after the fuel pulsewidth is calculated from engine load.

Injector Scaling

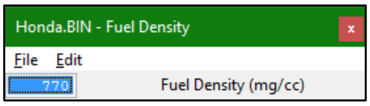
The Injector scaling methodology for the Honda uses a base Injector pulse width for Lambda 1 map and makes compensations and adjustment to give the correct amount of fuel for the stock injectors. Using a RaceROM patch modifies this OEM methodology and adds a real injector sizing value that can be used to accurately scale the injectors. When using RaceROM to scale the injectors all you will need to change is the Injector size, open time compensations and minimum open time, which are generally available from quality injector suppliers.



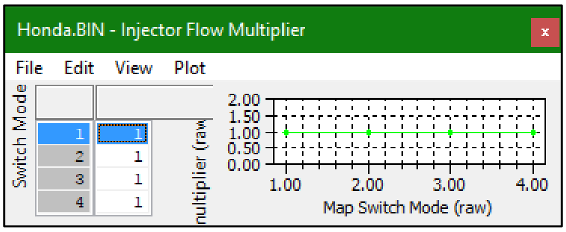


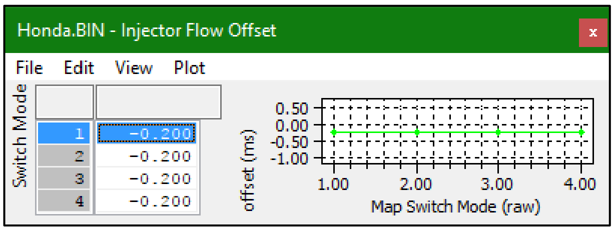
Some other features that have been added are

- fuel density maps, which allows alternative fuel densities to be accommodated for example if the car uses a specialised Race fuel mix.
- Accurate injector size maps (cc/min), shown above



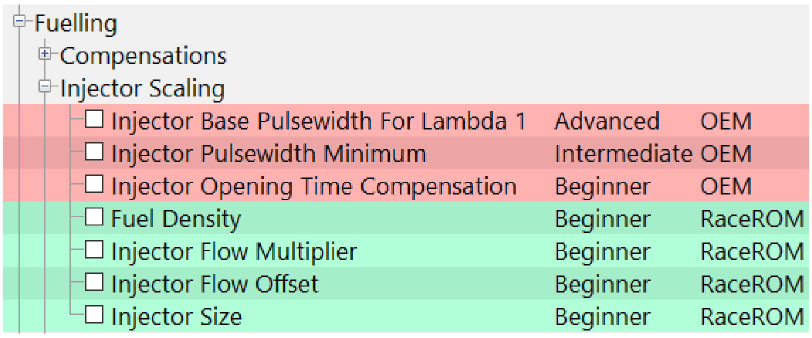
- Injector Flow Multiplier and Offset, which allow for map switch mode dependant flow multipliers and offsets (to lag time) to be chosen. This could help account for the injector latency and flow rate changes when using the alternative fuels in discrete MS modes.





Injector size is 310cc on Euro and USA models and 370cc on JDM FD2 models. For more information on how to accurately scale injectors in general please see the tuning guide or the knowledge base.

The list of maps below



Fuelling		
Compensations		
Injector Scaling		
Injector Base Pulsewidth For Lambda 1	Advanced	OEM
Injector Pulsewidth Minimum	Intermediate	OEM
Injector Opening Time Compensation	Beginner	OEM
Fuel Density	Beginner	RaceROM
Injector Flow Multiplier	Beginner	RaceROM
Injector Flow Offset	Beginner	RaceROM
Injector Size	Beginner	RaceROM

Overrun Fuel Cut & Recovery

When under deceleration an overrun fuel cut condition is triggered, while not all of the maps are fully defined here the recovery maps are most essential to good running. There are 3 fuel cut recovery maps, two vehicle speed based recovery RPM's and one coolant temperature based RPM limit, It is recommended to change all three of these maps by the same amount.

There is a time delay map which must pass before the vehicle will go into overrun fuel cut mode. It is gear dependent and may allow fuel to be maintained at the start of overrun.

AFR Limits

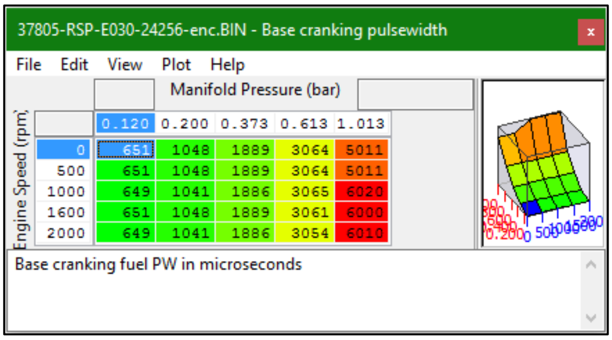
The Honda will run in closed loop fuelling as long as the fuel map target is below the AFR Target minimum closed loop value. There are also absolute AFR target thresholds, The AFR target minimum value will prevent a richer AFR being targeted and must be changed if you wish to target a lower AF then 10.2.

Fuel Trims and Rear O2 Corrections

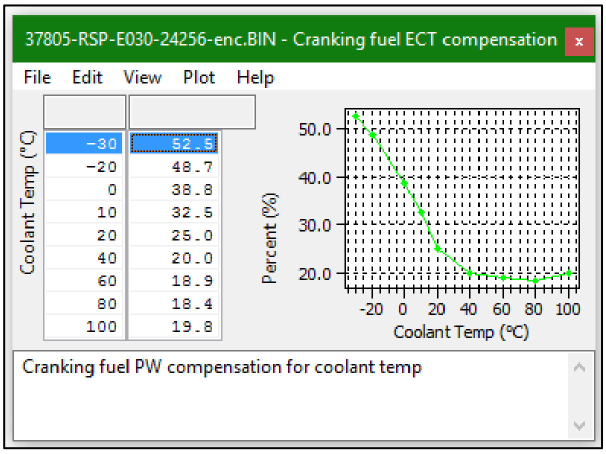
The range of the short term fuel trim can be limited using the short term maximum and minimum this will take effect during closed loop. The long term fuel trims cannot yet be disabled. Rear O2 sensors can be disabled using the HO2S Enable and Monitoring Enabled check boxes. The trimming effects of the rear O2 will be disabled when the HO2S systems are disabled.

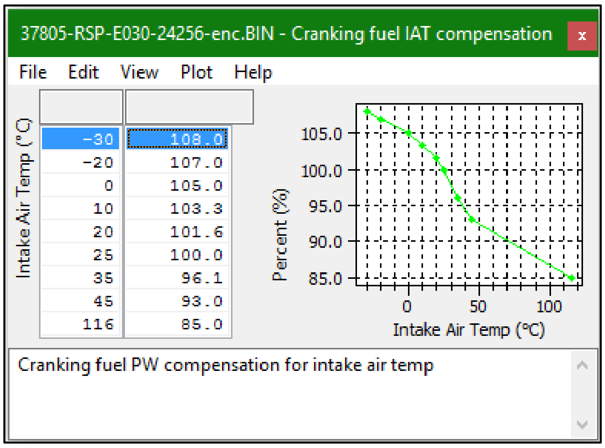
Cranking and Starting

As with most ECU the Cranking fuelling is independent of the injector sizing calculation and the injector time is directly controlled until the cranking condition has ended. There is a base cranking pulsewidth map which may need to be adjusted when running larger injectors.

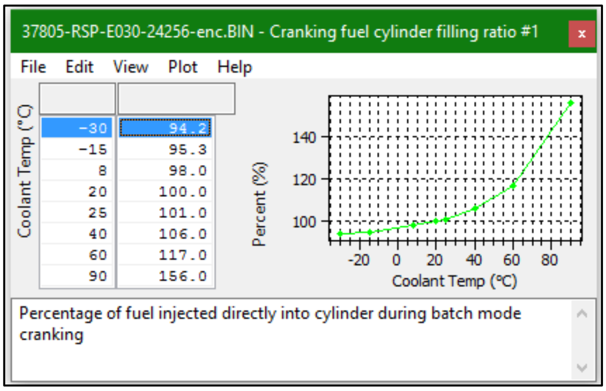


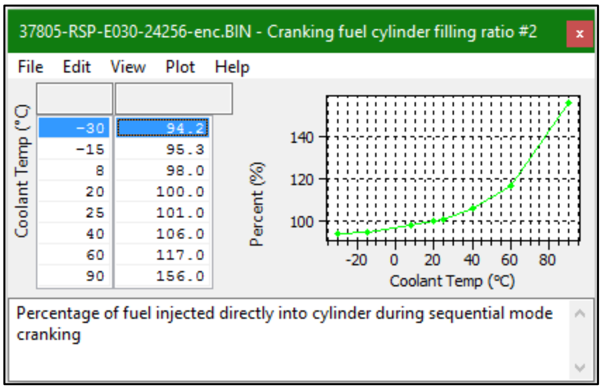
The ECT and IAT are also used to make corrections to this value and can be altered if required.

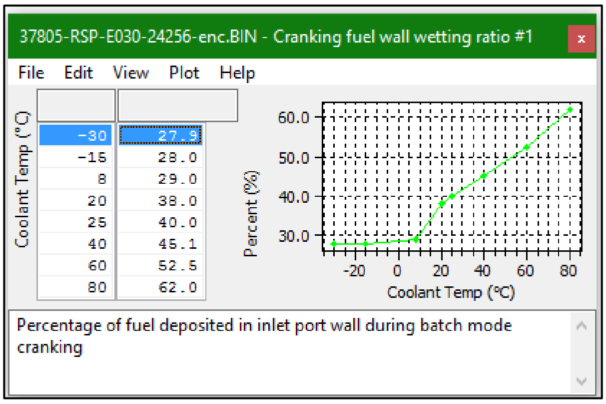


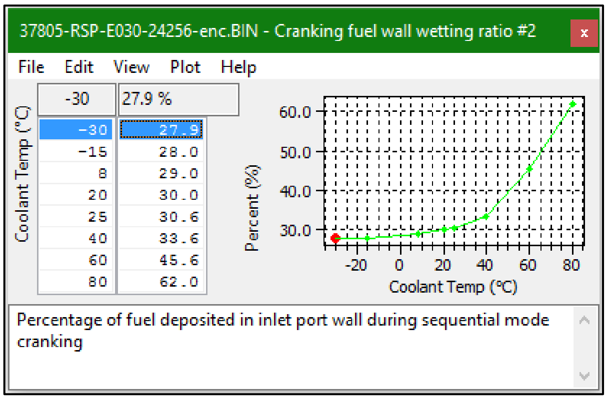


Cranking fuelling is split into two modes the initial batch mode injection (before full synchronisation of the engine has occurred) and the sequential injection modes (after full crank signal synchronisation). These two modes are listed as #1 & #2 in the maps if you are adjusting the cranking fuelling ratio maps for larger injectors make sure to adjust both modes by the desired amount.









There is also a cranking ignition timing 2D map, this map is the base timing used when the engine is in a cranking condition, after the engine starts ignition timing will be referenced from the normal ignition maps (after a short delay).

Ignition Timing

Ignition live data

Ignition Maximum (°)	Ign. Maximum map output PLUS the Ignition Addition for AFR Target
Ignition Retard Combined (°)	Combined retard value includes Ign. addition, Advance/Retard & overrun
Ignition timing (°)	Actual Final Ignition timing
Ignition Timing Base (°)	From Timing Base map (MBT map), the Ign. Timing cannot exceed this value
Ignition Timing Retard (°)	Value from Ignition timing retard maps
Knock Advance (°)	Amount of learnt advance from knock calculations
Knock Retard (°)	Output of knock retard map multiplied by knock retard multiplier
Knock Retard Multiplier (-)	The current value of knock multiplier used in knock retard value
Knock Sensor Voltage (Volt)	Voltage returned from knock sensor

Ignition Maps

The Ignition maps are against RPM and Man Absolute Pressure, there are dedicated maps for each Camshaft angle in 10deg steps and there are also maps for VTEC ON and VTEC OFF. There are a series of base, maximum, addition and retard maps as well as many compensations maps to give the finial ignition timing value.

The strategy employed uses a MBT map with a maximum allowable ignition value based on the known knock limit of the engine on a specified octane fuel. This base MBT and the knock limited maps then have corrections added and the knock sensor is used to specify how much of the values in the maximum knock limit maps can be added.

Ignition Timing Base

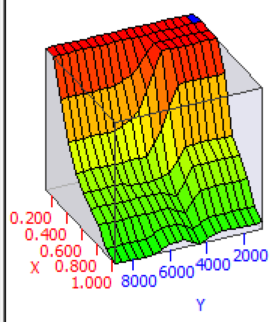
The Ignition Base map is an idealistic value to produce maximum best torque (MBT). There is a base map for VTEC ON and OFF and for each 10 deg cam angle. There is a logging parameter called Ignition Timing Base that follows the output of this map.

Honda.BIN - Ignition Timing Base 20° Cam VTEC

File Edit View Plot Help

Manifold Pressure (bar) / Engine Speed (rpm)

Engine Speed (rpm)	0.120	0.207	0.293	0.407	0.520	0.640	0.753	0.867	0.980	1.04
1000	45	45	45.0	45.0	41.5	34.5	33.0	31.0	28.5	27.5
2000	45	45	45.0	45.0	41.5	34.5	33.0	31.0	28.5	27.5
3000	45	45	45.0	45.0	41.5	34.5	33.0	31.0	28.5	27.5
3500	45	45	45.0	45.0	41.5	34.5	33.0	31.0	28.5	27.5
4000	45	45	45.0	45.0	41.5	34.5	33.0	31.0	28.5	27.5
4500	45	45	45.0	45.0	41.5	34.5	33.0	31.0	28.5	27.5
5000	45	45	45.0	45.0	41.5	34.5	33.0	31.0	28.5	27.5
5250	45	45	45.0	45.0	38.8	33.0	31.3	29.8	28.0	27.0
5500	45	45	43.8	42.5	36.0	31.5	29.5	28.5	27.5	26.5
5750	45	45	42.6	40.3	34.5	31.3	30.0	29.0	28.0	27.0
6000	45	45	41.5	38.0	33.0	31.0	30.5	29.5	28.5	27.5
6250	45	45	41.0	37.0	33.0	31.0	30.5	29.5	28.5	27.5
6500	45	45	40.5	36.5	33.0	31.0	30.5	29.5	28.5	27.5
6750	45	45	40.5	36.0	33.0	31.0	30.5	29.5	28.0	27.0
7000	45	45	40.5	36.0	33.0	31.5	30.5	29.5	27.5	26.5
7400	45	45	40.5	36.0	33.0	31.5	30.5	29.5	27.5	26.5
7800	45	45	40.5	36.0	33.0	31.5	30.5	29.5	27.5	26.5
8000	45	45	40.5	36.0	33.0	31.5	30.5	29.5	27.5	26.5
8600	45	45	40.5	36.0	33.0	31.5	30.5	29.5	27.5	26.5
9000	45	45	40.5	36.0	33.0	31.5	30.5	29.5	27.5	26.5



Increasing or decreasing these values will advance and retard the ignition timing, to adjust the timing map to get more or less ignition during dyno power runs it is advised to use this series of maps.

Ignition Timing Maximum

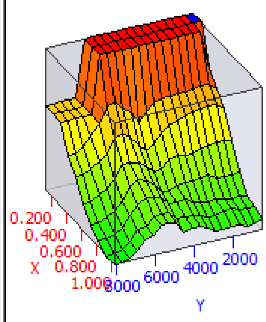
The Ignition Maximum map shows the knock point for low octane fuels. There is a maximum map for VTEC ON and OFF and for each 10 deg cam angle and a logging parameter called Ignition Maximum

Honda.BIN - Ignition Timing Maximum 20° Cam

File Edit View Plot Help

Manifold Pressure (bar) / Engine Speed (rpm)

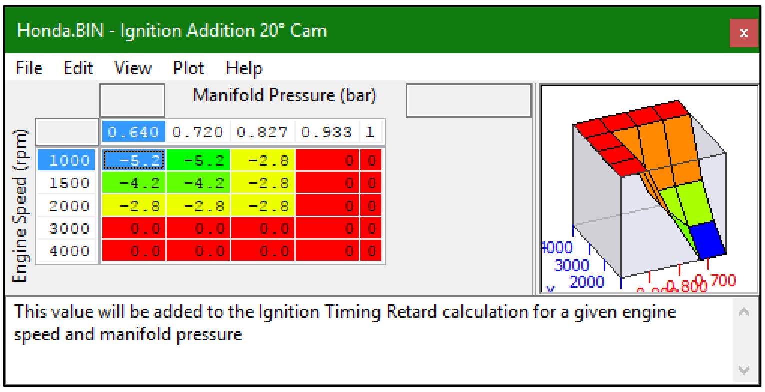
Engine Speed (rpm)	0.120	0.207	0.293	0.407	0.520	0.640	0.7533	0.8667	0.98000	1.0400
500	60	60	40.5	33.9	28.2	16.50	5.000	-2.800	-4.000	-6.40
750	60	60	60.0	37.4	31.7	17.50	4.500	-2.500	-4.400	-7.20
1000	60	60	60.0	37.9	31.7	17.50	4.500	-2.900	-4.200	-8.10
1250	60	60	60.0	37.3	31.0	16.20	4.900	-1.800	-2.400	-6.20
1500	60	60	60.0	36.6	30.3	16.50	6.900	-0.900	-2.900	-6.00
1750	60	60	60.0	36.2	29.7	14.50	6.200	-1.500	-4.100	-6.70
2000	60	60	60.0	35.7	28.1	14.50	5.900	-0.400	-4.000	-6.40
2250	60	60	60.0	36.0	26.7	15.80	6.200	0.500	-2.000	-3.90
2500	60	60	60.0	35.0	24.0	14.40	5.600	2.600	-1.300	-2.70
2750	60	60	60.0	30.8	19.5	10.80	3.100	2.300	-0.900	-2.30
3000	60	60	60.0	26.8	16.3	10.20	4.400	2.400	-1.000	-3.80
3500	60	60	60.0	32.7	20.7	14.00	9.000	6.300	2.900	1.70
4000	60	60	60.0	35.3	25.1	16.70	11.500	7.500	3.000	3.00
4500	60	60	60.0	40.1	28.1	17.60	13.400	8.000	2.500	2.50
5000	60	60	60.0	38.0	26.0	17.50	10.300	5.000	-0.900	-1.30
5500	31	31	31.0	30.5	19.8	10.60	4.100	1.000	-2.000	-3.00
5800	31	31	31.0	25.2	16.5	6.80	0.100	-4.000	-7.000	-7.00
6000	31	31	31.0	21.0	14.1	4.70	-2.200	-6.200	-9.700	-10.10
7000	31	31	31.0	18.1	11.5	2.30	-4.400	-8.000	-11.500	-11.80
8100	31	31	31.0	18.1	11.5	2.30	-4.400	-8.000	-11.500	-11.80



Decreasing these values will retard the ignition timing

Ignition Addition maps

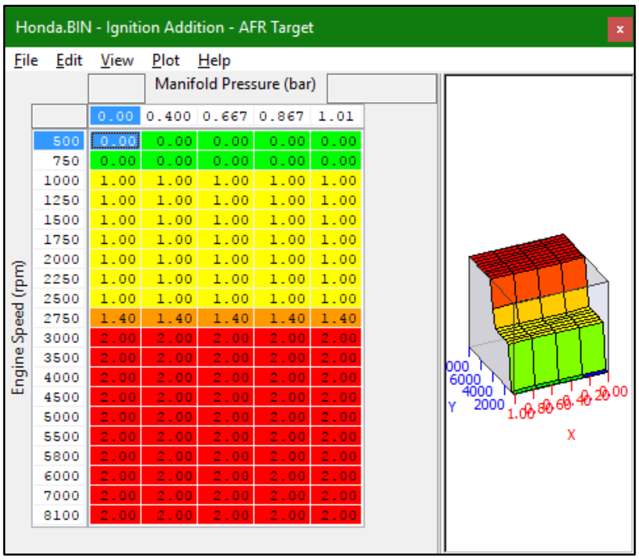
These maps are applied all the time and should be seen as a global addition, There are maps for each 10 deg cam angle but not VTEC ON and OFF. The Ignition Addition maps have negative values but they can be made positive



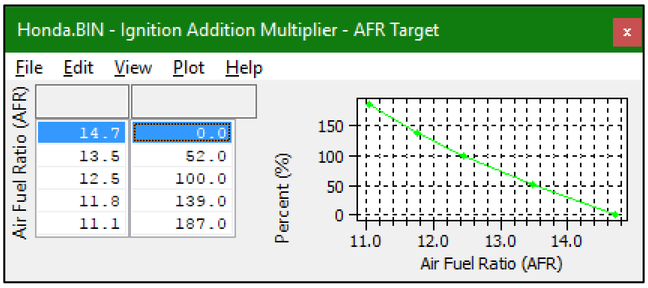
	0.640	0.720	0.827	0.933	1
1000	-5.2	-5.2	-2.8	0	0
1500	-4.2	-4.2	-2.8	0	0
2000	-2.8	-2.8	-2.8	0	0
3000	0.0	0.0	0.0	0	0
4000	0.0	0.0	0.0	0	0

Ignition Addition for AFR

The output of this map is added to the Ignition Maximum calculation for a given AFR Target. The values are multiplied for the current AFR Target, using the "Ignition Addition Multiplier – AFR Target" map, so the richer the AFR, the more advance is added. The map values can only be positive values not negative.



	0.00	0.400	0.667	0.867	1.01
500	0.00	0.00	0.00	0.00	0.00
750	0.00	0.00	0.00	0.00	0.00
1000	1.00	1.00	1.00	1.00	1.00
1250	1.00	1.00	1.00	1.00	1.00
1500	1.00	1.00	1.00	1.00	1.00
1750	1.00	1.00	1.00	1.00	1.00
2000	1.00	1.00	1.00	1.00	1.00
2250	1.00	1.00	1.00	1.00	1.00
2500	1.00	1.00	1.00	1.00	1.00
2750	1.40	1.40	1.40	1.40	1.40
3000	2.00	2.00	2.00	2.00	2.00
3500	2.00	2.00	2.00	2.00	2.00
4000	2.00	2.00	2.00	2.00	2.00
4500	2.00	2.00	2.00	2.00	2.00
5000	2.00	2.00	2.00	2.00	2.00
5500	2.00	2.00	2.00	2.00	2.00
5800	2.00	2.00	2.00	2.00	2.00
6000	2.00	2.00	2.00	2.00	2.00
7000	2.00	2.00	2.00	2.00	2.00
8100	2.00	2.00	2.00	2.00	2.00

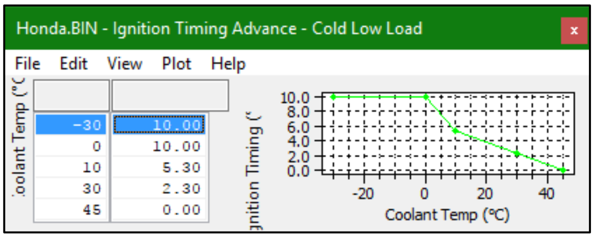


Air Fuel Ratio (AFR)	Percent (%)
14.7	0.0
13.5	52.0
12.5	100.0
11.8	139.0
11.1	187.0

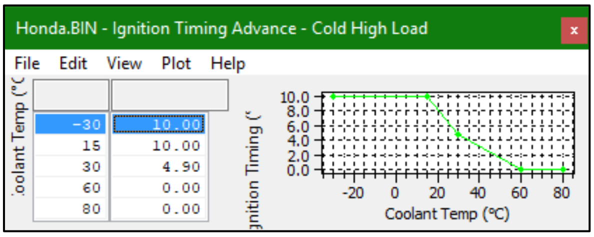
Ignition Advance and Retard

There are 3 sets of two ignition advance/retard maps, they advance the ignition timing from cold and retard the ignition timing when hot depending on High Load or Low Load.

The Ignition Timing Advance – Cold maps add ignition globally as per the map values in the high or low load map

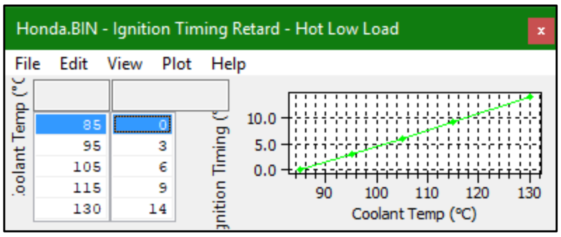


Coolant Temp (°C)	Ignition Timing
-30	10.00
0	10.00
10	5.30
30	2.30
45	0.00

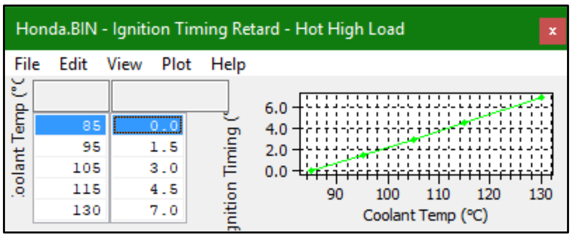


Coolant Temp (°C)	Ignition Timing
-30	10.00
15	10.00
30	4.90
60	0.00
80	0.00

The Ignition Timing Retard – Hot maps remove ignition timing globally as per the map values in the high or low load map

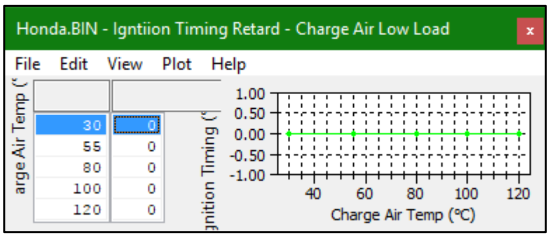


Coolant Temp (°C)	Ignition Timing (°)
85	0
95	3
105	6
115	9
130	14

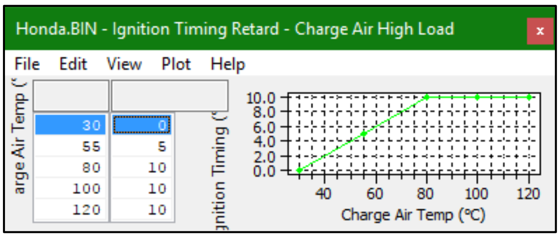


Coolant Temp (°C)	Ignition Timing (°)
85	0.0
95	1.5
105	3.0
115	4.5
130	7.0

The Ignition Timing Retard – Charge Air maps will remove ignition timing globally according to the values in the high or low load map



Charge Air Temp (°C)	Ignition Timing (°)
30	0
55	0
80	0
100	0
120	0



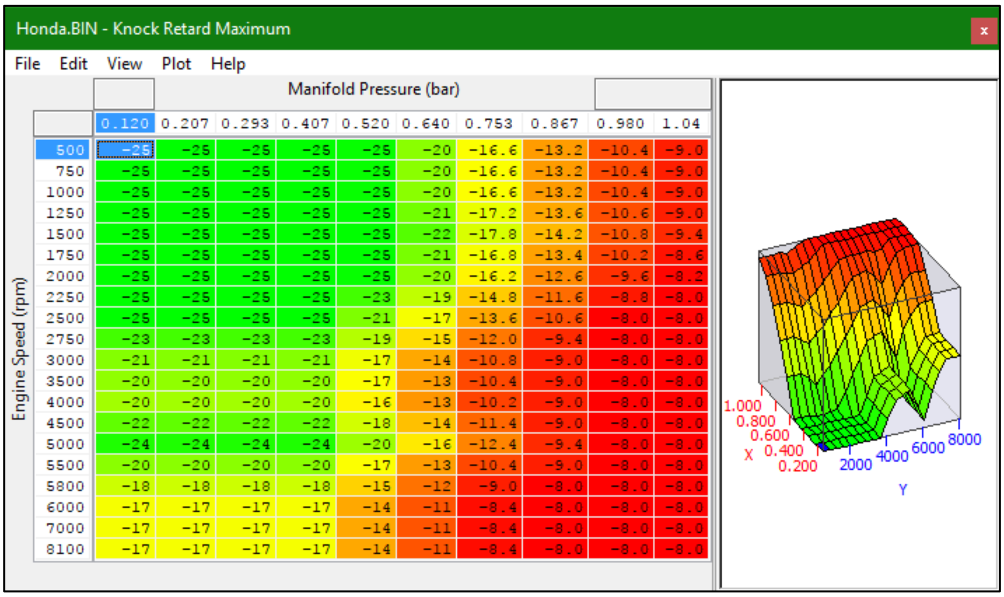
Charge Air Temp (°C)	Ignition Timing (°)
30	0
55	5
80	10
100	10
120	10

Knock Control Maps

Knock control in the Honda is used as a fuel octane adjustment to ignition timing as opposed to an instantaneous knock adjustment when improper combustion occurs. The system monitors the knock sensor values and averages them reducing the timing globally to reduce the level of knock sensed. The logging parameters that are relevant to knock control are repeated below.

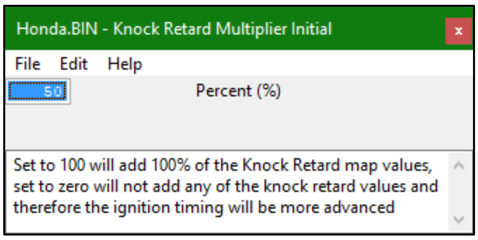
Ignition Maximum (°)	Ign. Maximum map output PLUS the Ignition Addition for AFR Target
Ignition Retard Combined (°)	The combined amount that will be subtracted from the Ignition Base (includes the following: Ignition addition, Ignition Advance and Retard and Ignition overrun)
Ignition timing (°)	Actual Final Ignition timing
Ignition Timing Base (°)	From Timing Base map (MBT map), the Ign. Timing cannot exceed this value
Ignition Timing Retard (°)	Value from Ignition timing retard maps
Knock Advance (°)	Amount of learnt advance from knock calculations
Knock Retard (°)	Output of knock retard map multiplied by knock retard multiplier
Knock Retard Multiplier (-)	The current value of knock multiplier used in knock retard value
Knock Sensor Voltage (Volt)	Voltage returned from knock sensor

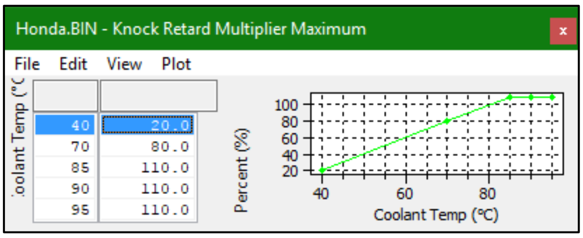
The Knock Retard Maximum maps are against RPM and MAP and there are maps for VTEC ON and OFF and are only active under higher load conditions.



Engine Speed (rpm) \ Manifold Pressure (bar)	0.120	0.207	0.293	0.407	0.520	0.640	0.753	0.867	0.980	1.04
500	-25	-25	-25	-25	-25	-20	-16.6	-13.2	-10.4	-9.0
750	-25	-25	-25	-25	-25	-20	-16.6	-13.2	-10.4	-9.0
1000	-25	-25	-25	-25	-25	-20	-16.6	-13.2	-10.4	-9.0
1250	-25	-25	-25	-25	-25	-21	-17.2	-13.6	-10.6	-9.0
1500	-25	-25	-25	-25	-25	-22	-17.8	-14.2	-10.8	-9.4
1750	-25	-25	-25	-25	-25	-21	-16.8	-13.4	-10.2	-8.6
2000	-25	-25	-25	-25	-25	-20	-16.2	-12.6	-9.6	-8.2
2250	-25	-25	-25	-25	-23	-19	-14.8	-11.6	-8.8	-8.0
2500	-25	-25	-25	-25	-21	-17	-13.6	-10.6	-8.0	-8.0
2750	-23	-23	-23	-23	-19	-15	-12.0	-9.4	-8.0	-8.0
3000	-21	-21	-21	-21	-17	-14	-10.8	-9.0	-8.0	-8.0
3500	-20	-20	-20	-20	-17	-13	-10.4	-9.0	-8.0	-8.0
4000	-20	-20	-20	-20	-16	-13	-10.2	-9.0	-8.0	-8.0
4500	-22	-22	-22	-22	-18	-14	-11.4	-9.0	-8.0	-8.0
5000	-24	-24	-24	-24	-20	-16	-12.4	-9.4	-8.0	-8.0
5500	-20	-20	-20	-20	-17	-13	-10.4	-9.0	-8.0	-8.0
5800	-18	-18	-18	-18	-15	-12	-9.0	-8.0	-8.0	-8.0
6000	-17	-17	-17	-17	-14	-11	-8.4	-8.0	-8.0	-8.0
7000	-17	-17	-17	-17	-14	-11	-8.4	-8.0	-8.0	-8.0
8100	-17	-17	-17	-17	-14	-11	-8.4	-8.0	-8.0	-8.0

The output of the knock retard Maximum maps is then multiplied by the Knock Retard Multiplier (KRM), there is an initial value set but after start the KRM may increase or decrease.



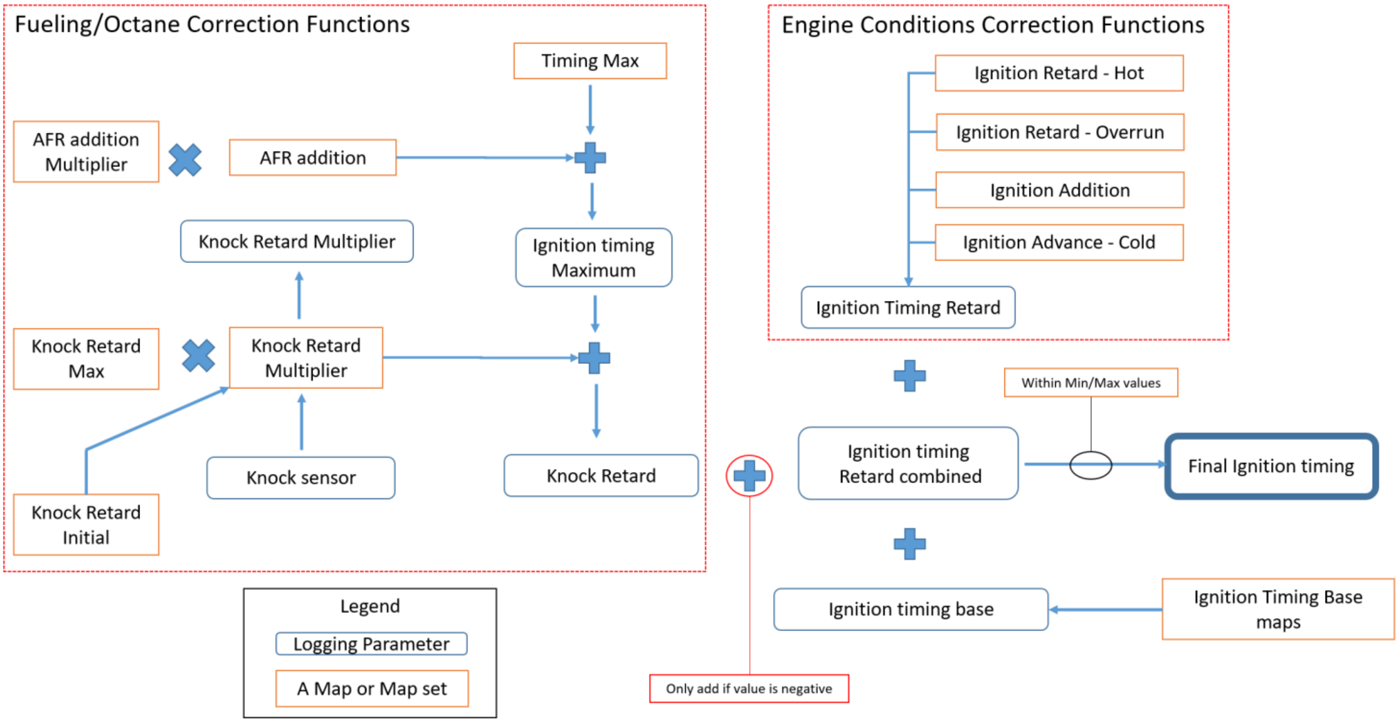


If the KRM is currently 100% then ALL of the Knock Retard value will be added to the logging parameter called Ignition Retard Combined. If the KRM is currently 0% then NONE of the Knock Retard value will be added to the Ignition Retard Combined calculation.

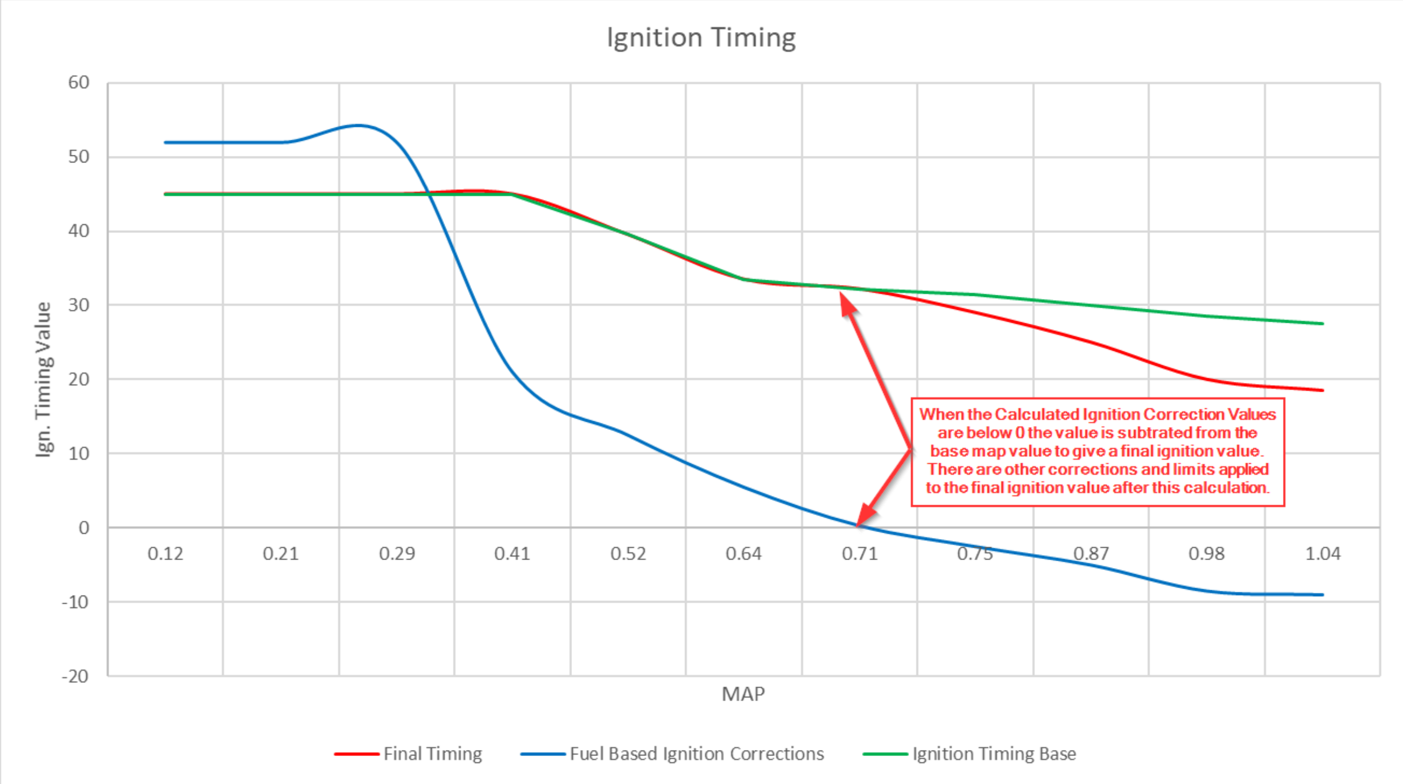
The Knock Retard Initial (KRI) can be edited and is set at 50% by default. If the engine is knocking then the KRM will increase and more of the Knock Retard map will be added to the Ignition Retard Combined calculation

Ignition Calculations & Tuning

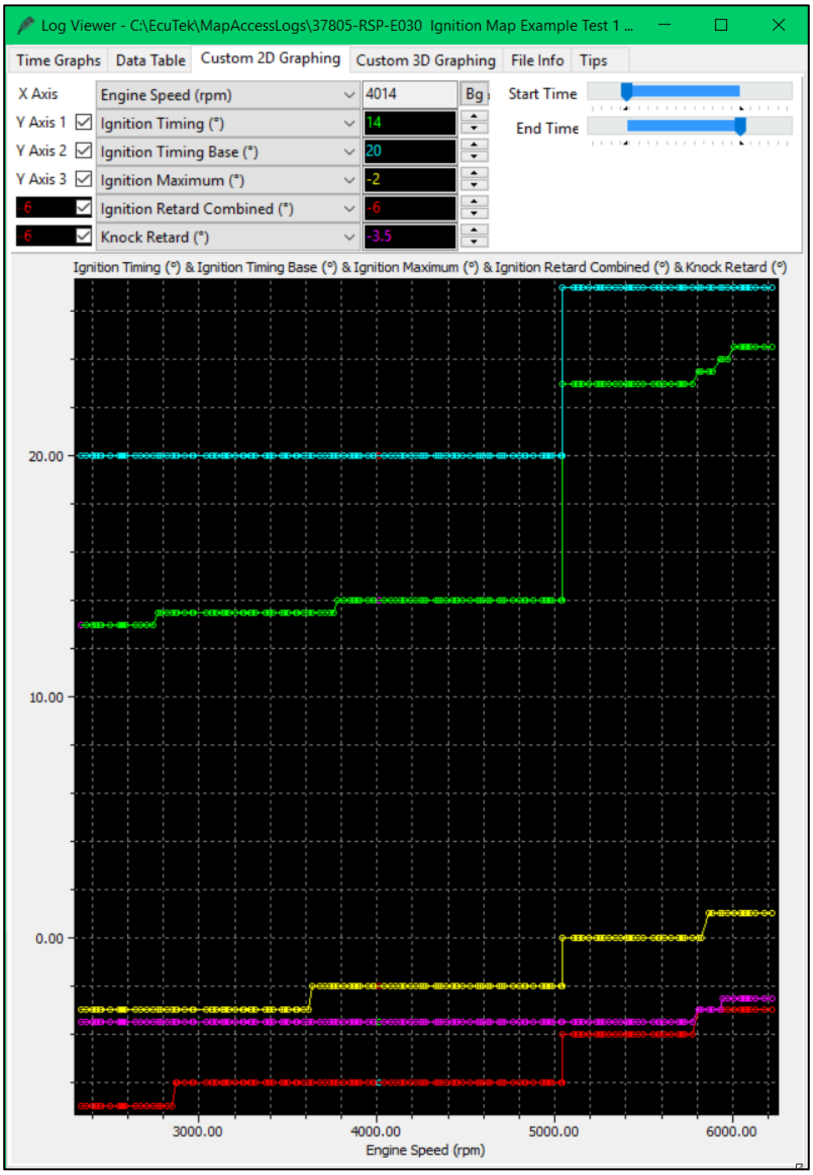
As previously discussed there are several defining function that the ECU uses to calculate where to set the ignition timing and the three components according to our understanding is a fuel based correction (octane correction), an engine conditions correction and the base ignition timing (MBT MAP). The maps and logging parameters interact roughly as per the image below.



The octane correction function includes the corrections for AFR plus the calibrated Max timing map and knock sensor activity. When you plot the maps out per RPM you will see that the octane correction factor function sum add up to a negative number this value is added to the base map. So for 5500rm the ingition timing output plot looks about like this (Timing Value vs MAP)



After the octane correction has been added to the base map the other orrections and limits are applied and the FINAL timing is then calculatedTo show this using the logging parameters you can see how the maps are shown represented at various points through the calculations.



Here is a simplistic view of the final ignition timing calculation

- Ignition Timing Base (20deg)

minus

- Ign Retard Combined (-6deg)

To calculate the Ignition Retard Combined (-6 deg) is calculated as follows:

- Knock Retard (KR) map output is -8deg
- Knock Retard Multiplier is 0.45 KR*KRM =-3.5deg Knock Retard amount

plus

- Ignition Maximum map output is -4deg *plus* +2deg from AFR Target map so: -4 *plus* +2deg = -2deg Ignition Maximum

If there were other corrections applied due to high IAT or ECT these would be applied to the sum of the Timing Base + Ign Retard Combined

Final timing

- Ignition Timing Final is 20-16 = 14deg final timing

Tuning the ignition timing can be done many ways, the base map could be changed and this would mean that the ECU will advance as much as possible from the base map depending on the knock sensor output. You could also adjust the Ignition timing MAX map which will effect how much timing can be added to a max but the tuning will have to be done with a KRM value at 1 which can take some time to build up.

If you are tuning a turbo car with much less ignition timing requested than normal, you start by adjusting the axis values to accommodate boost and use the base timing map to do the majority of the igntion changes you could use the ignition timing max maps to effect the amount of correction that is being applied when you start to encounter knock.

Cam Timing

The Honda VTEC system combined with the Variable Timing Control (VTC) gives control over an additional “wilder” camshaft lobe and also allows the tuner to vary the intake camshaft angle. These maps can make a significant difference to power and drivability when set up well, there are a series of OEM maps that can be calibrated as well as some RaceROM VTEC activation maps.

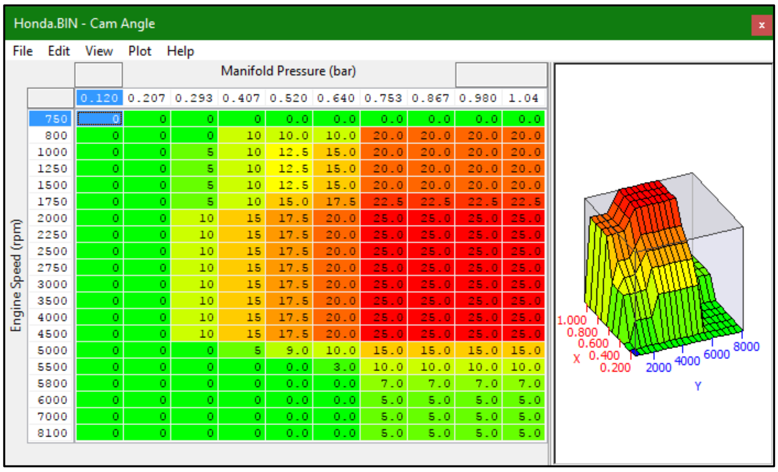
VTC is the target cam advance angle and there are maps for Full Load and VTEC ON and OFF

Cam Timing Live Data

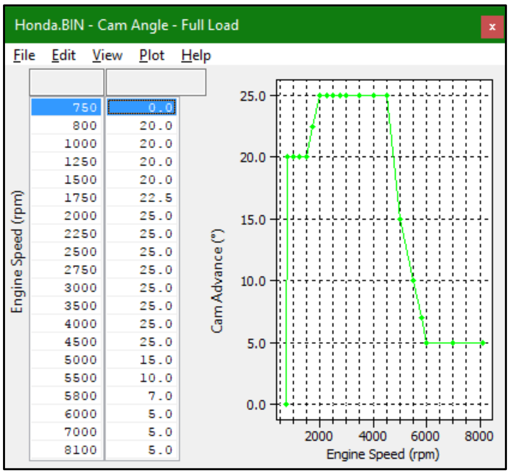
VTC Intake Advance Actual (°)	Intake cam advance angle measured
VTC Intake Advance Target (°)	Intake cam advance angle target from map outputs
VTC Solenoid Duty (%)	Solenoid duty used for VTC angle target
VTEC Solenoid State (-)	VTEC Solenoid state 1 = on, 2 = off 3 = switch on, 0 = switch off

Cam Angle

The Full load threshold to choose between the maps is believed to be manifold pressure but is yet to be defined



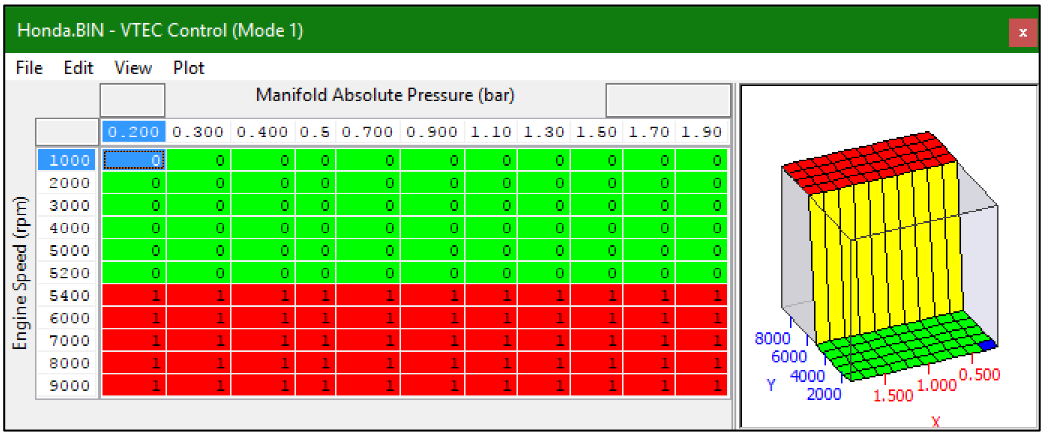
Engine Speed (rpm) \ Manifold Pressure (bar)	0.120	0.207	0.293	0.407	0.520	0.640	0.753	0.867	0.980	1.04
750	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0
800	0	0	0	10	10.0	10.0	20.0	20.0	20.0	20.0
1000	0	0	5	10	12.5	15.0	20.0	20.0	20.0	20.0
1250	0	0	5	10	12.5	15.0	20.0	20.0	20.0	20.0
1500	0	0	5	10	12.5	15.0	20.0	20.0	20.0	20.0
1750	0	0	5	10	15.0	17.5	22.5	22.5	22.5	22.5
2000	0	0	10	15	17.5	20.0	25.0	25.0	25.0	25.0
2250	0	0	10	15	17.5	20.0	25.0	25.0	25.0	25.0
2500	0	0	10	15	17.5	20.0	25.0	25.0	25.0	25.0
2750	0	0	10	15	17.5	20.0	25.0	25.0	25.0	25.0
3000	0	0	10	15	17.5	20.0	25.0	25.0	25.0	25.0
3500	0	0	10	15	17.5	20.0	25.0	25.0	25.0	25.0
4000	0	0	10	15	17.5	20.0	25.0	25.0	25.0	25.0
4500	0	0	10	15	17.5	20.0	25.0	25.0	25.0	25.0
5000	0	0	0	5	9.0	10.0	15.0	15.0	15.0	15.0
5500	0	0	0	0	0.0	3.0	10.0	10.0	10.0	10.0
5800	0	0	0	0	0.0	0.0	7.0	7.0	7.0	7.0
6000	0	0	0	0	0.0	0.0	5.0	5.0	5.0	5.0
7000	0	0	0	0	0.0	0.0	5.0	5.0	5.0	5.0
8100	0	0	0	0	0.0	0.0	5.0	5.0	5.0	5.0



Engine Speed (rpm)	
750	0.0
800	20.0
1000	20.0
1250	20.0
1500	20.0
1750	22.5
2000	25.0
2250	25.0
2500	25.0
2750	25.0
3000	25.0
3500	25.0
4000	25.0
4500	25.0
5000	15.0
5500	10.0
5800	7.0
6000	5.0
7000	5.0
8100	5.0

VTEC Activation

VTEC is the switching point that enables the engines “higher lift” camshaft lobe to be engaged, the factory VTEC switches at a fixed RPM of around 5400rpm. RaceROM offers 4 x new VTEC switch maps, one for each mode and they offer VTEC switch against RPM and Manifold Pressure.



Engine Speed (rpm) \ Manifold Absolute Pressure (bar)	0.200	0.300	0.400	0.5	0.700	0.900	1.10	1.30	1.50	1.70	1.90
1000	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0
3000	0	0	0	0	0	0	0	0	0	0	0
4000	0	0	0	0	0	0	0	0	0	0	0
5000	0	0	0	0	0	0	0	0	0	0	0
5200	0	0	0	0	0	0	0	0	0	0	0
5400	1	1	1	1	1	1	1	1	1	1	1
6000	1	1	1	1	1	1	1	1	1	1	1
7000	1	1	1	1	1	1	1	1	1	1	1
8000	1	1	1	1	1	1	1	1	1	1	1
9000	1	1	1	1	1	1	1	1	1	1	1

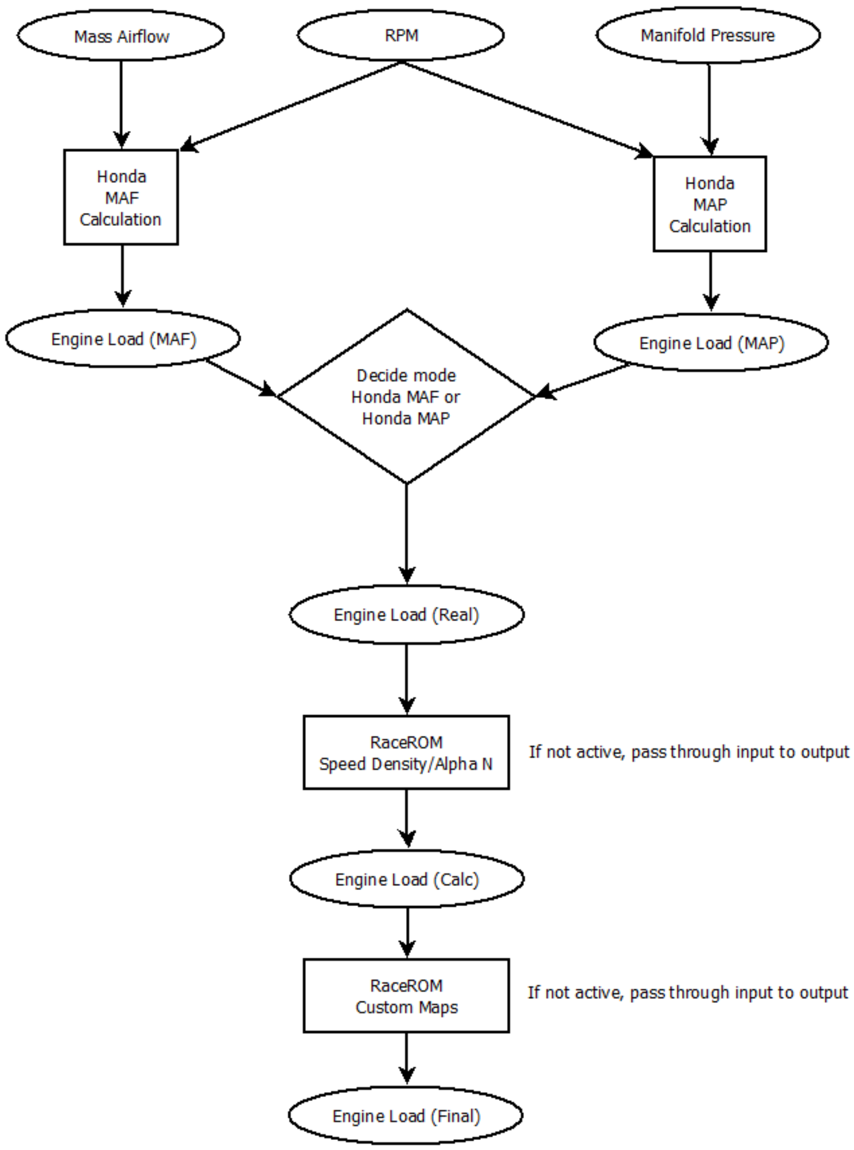
Engine Load

Like most ECU's the Honda has a series of calculations that measure or estimate an airflow which is then tuned into an engine load amount (Honda uses mg/stroke) which is then used to calculate a matching volume of fuel depending on the target AFR. The first task of tuning any induction modification is to get the target and actual AFR to match. This is done by calibrating the appropriate maps (MAF Curve or SDVE map) to ensure that the engine load calculated delivers the correct amount of fuel.

There are 2 different methods for engine load determination in the Honda ECU, Mass Air Flow measurement (MAF) and manifold Pressure determined airflow using Speed Density (SD) maps, the exception to this is the JDM region ROMs which only use SD and have no MAF sensor. For Cars that use the MAF sensor in normal operation there is a factory SD map set out to activate during a period of reverberation at particular loads rpm and throttle angles, to counteract this the ECU uses a simple 3x3 map to calculate engine load during this period. You can see this in the below logging parameters

Dig: Engine Load Mode (Digital)	Shows the different load modes use, Factory MAF, Factory SD, EcuTek SD
Engine Load (Final) (mg/str)	The final Engine load used for fuel volume calculation
Engine Load (MAF mode) (mg/str)	The Engine load derived from the OEM MAF sensor calculation
Engine Load (MAP mode) (mg/str)	The Engine load derived from the OEM MAP sensor calculation

The digital logging parameter called Engine Load Mode will show if the current Engine Load calculation is Honda MAF or Honda MAP based or even RaceROMSD. The choice for which mode for load generation is used is shown graphically below



Factory SD (Speed Density)

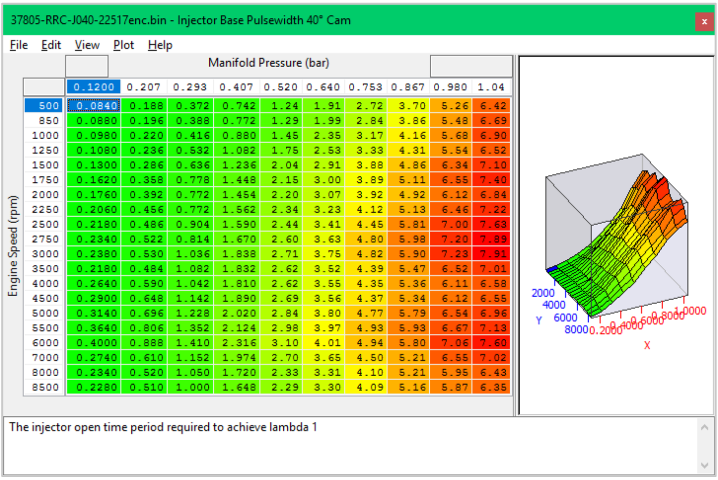
The factory SD mode is used when the following conditions are achieved

- RPM increases above either of the SD minimum RPM map – The minimum RPM required for the ECU to enter the factory SD mode, also consider the map called SD Minimum Throttle Angle
- Throttle angle increases above SD minimum throttle angle map – The minimum required throttle angle for the factory SD to become active

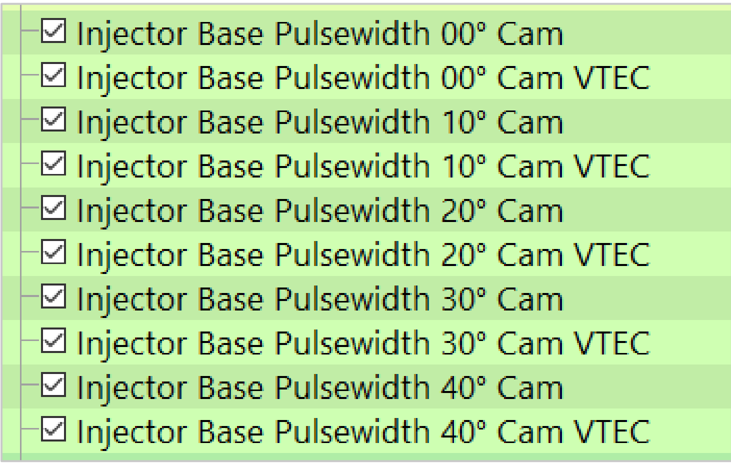
It will remain in the factory SD mode until the

- RPM exceeds the values in the SD to MAF switch RPM threshold – The ECU will switch from SD back to MAF past this engine speed
- The throttle angle or RPM drop to below the thresholds to go into SD mode.

JDM cars run full Time SD, if you are tuning one of these vehicles we would recommend that you use the RaceROM SD calibration method as it will be much simpler to tune. The standard full time SD method interpolates between a series of maps (for each cam angle) that output a value of injector (ms) open time to give 14.7 AFR (lambda 1). This method is very accurate but it takes a considerable amount of time to calibrate each individual map as the cam angle is always changing.



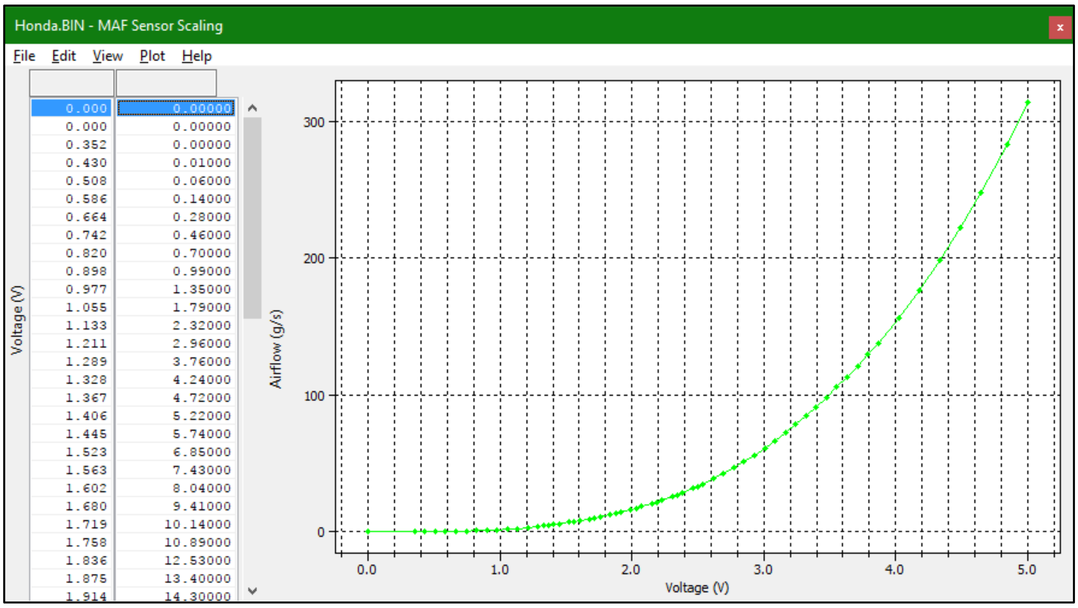
Engine Speed (rpm)	0.1200	0.207	0.293	0.407	0.520	0.640	0.753	0.867	0.980	1.04
500	0.0840	0.188	0.372	0.742	1.24	1.91	2.72	3.70	5.26	6.42
850	0.0880	0.196	0.388	0.772	1.29	1.99	2.84	3.86	5.48	6.69
1000	0.0980	0.220	0.416	0.880	1.45	2.35	3.17	4.16	5.68	6.90
1250	0.1080	0.236	0.532	1.082	1.75	2.53	3.33	4.31	5.54	6.52
1500	0.1300	0.286	0.636	1.236	2.04	2.91	3.88	4.86	6.34	7.10
1750	0.1620	0.358	0.778	1.448	2.15	3.00	3.89	5.11	6.55	7.40
2000	0.1760	0.392	0.772	1.454	2.20	3.07	3.92	4.92	6.12	6.84
2250	0.2060	0.456	0.772	1.562	2.34	3.23	4.12	5.13	6.46	7.22
2500	0.2180	0.486	0.904	1.590	2.44	3.41	4.45	5.81	7.00	7.63
2750	0.2340	0.522	0.814	1.670	2.60	3.63	4.80	5.98	7.20	7.89
3000	0.2380	0.530	1.036	1.838	2.71	3.75	4.82	5.90	7.23	7.91
3500	0.2180	0.484	1.082	1.832	2.62	3.52	4.39	5.47	6.52	7.01
4000	0.2640	0.590	1.042	1.810	2.62	3.55	4.35	5.36	6.11	6.58
4500	0.2900	0.648	1.142	1.890	2.69	3.56	4.37	5.34	6.12	6.55
5000	0.3140	0.696	1.228	2.020	2.84	3.80	4.77	5.79	6.54	6.96
5500	0.3640	0.806	1.352	2.124	2.98	3.97	4.93	5.93	6.67	7.13
6000	0.4000	0.888	1.410	2.316	3.10	4.01	4.94	5.80	7.06	7.60
7000	0.2740	0.610	1.152	1.974	2.70	3.65	4.50	5.21	6.55	7.02
8000	0.2340	0.520	1.050	1.720	2.33	3.31	4.10	5.21	5.95	6.43
8500	0.2280	0.510	1.000	1.648	2.29	3.30	4.09	5.16	5.87	6.35



If the injectors are scaled correctly the open time here would give 14.7 AFR, you would need to adjust these values to give the desired AFR if changes that effect the engine VE are made.

Factory MAF

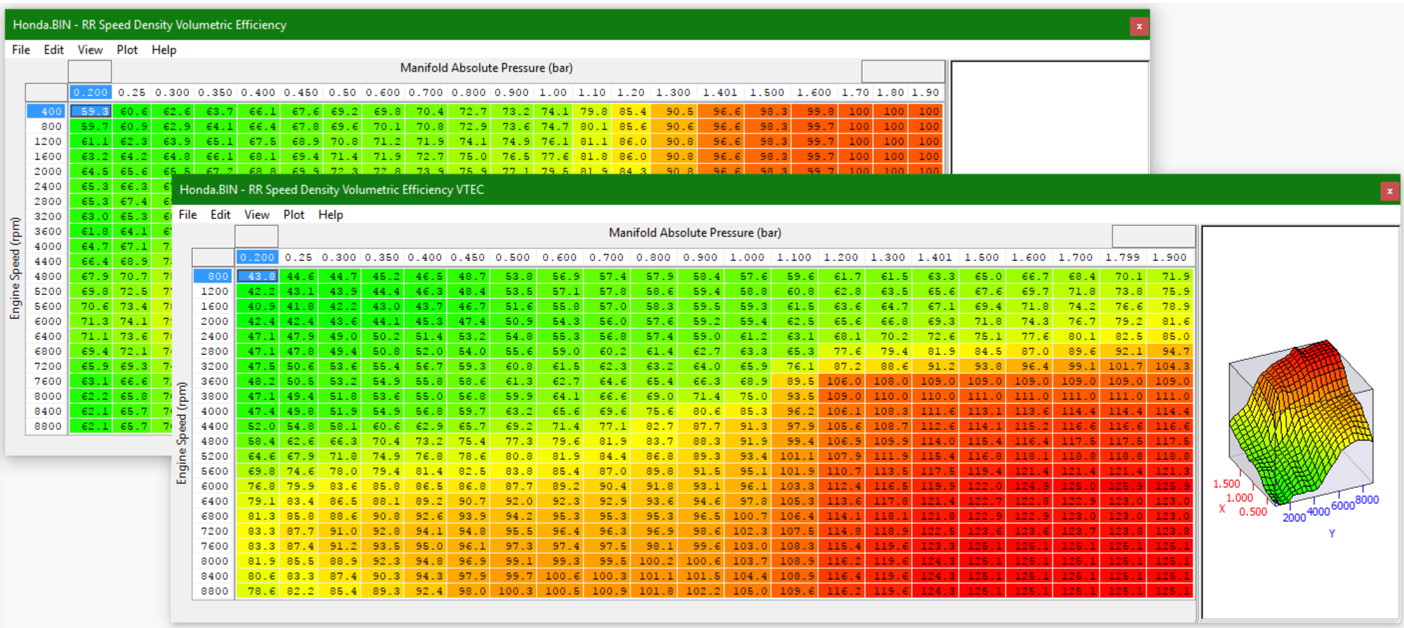
The factory MAF system in the Honda works similarly to any other modern MAF system, if you change the MAF tube size or make other changes that effect the airflow in the intake system you will need to check and if necessary adjust the MAF sensor scaling to suit.



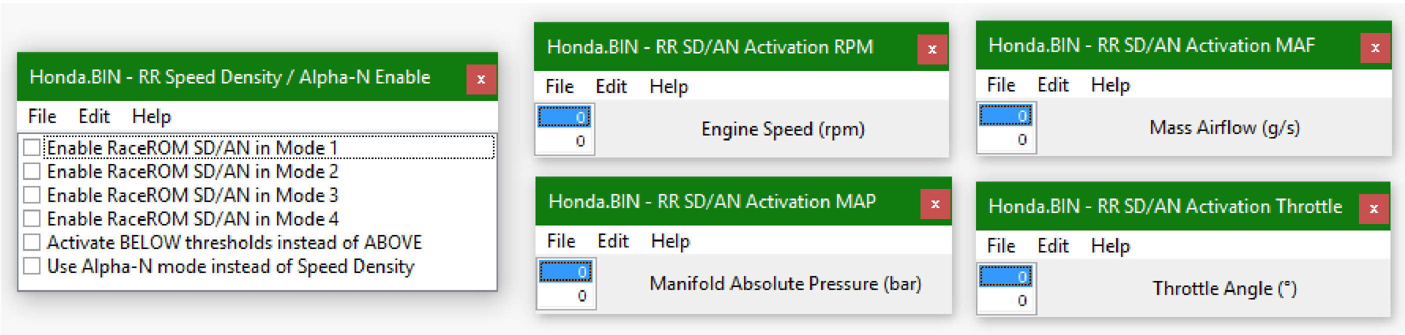
If your fuelling is showing 10% too rich (-10% Fuel trim) you will need to adjust the airflow value at the corresponding voltage point by approximately half of that value (so 5%), you should recheck the fuel trim / AFR to confirm your change has had the desired effect.

RaceROM SD

We have created a simplified set of Speed Density maps that allow you to calibrate the volumetric efficiency of the engine to deliver accurate and precise fuel delivery and ignition timing. We have separated the system into two maps one for VTEC ON and one for OFF. Two maps give the tuner finite control around the VTEC switch point.



To enable RaceROM Speed Density select which map switch modes you wish to enable SD and set the RPM, MAP, MAF and Throttle Angle thresholds to activate as you wish. For hysteresis the top value should be higher than lower value.



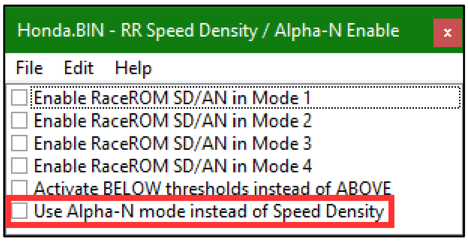
The logging parameter SD Engine Load (Calc) – is the calculated output after RaceROM SD (this could be SD-VE or Alpha-N based replacement). The Mass airflow is calculated using the Ideal Gas law constants incorporating intake air temperature and engine displacement to calculate the total mass of air consumed by the engine.

RaceROM Alpha N

Alpha N is a method of estimating airflow (and hence engine load) using throttle position as a reference.

This method is very useful when tuning cars with multiple throttle bodies (ITB'S) or inlet manifolds with poor MAP sensor reference positions. The Alpha N method can be invaluable if SD mapping cannot give you enough resolution to accurately calibrate the engine.

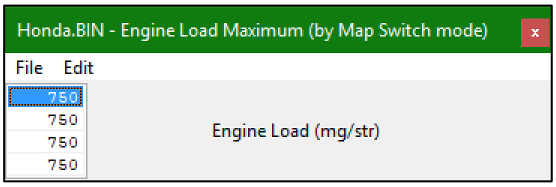
To enable Alpha N load estimation, you will need to enable Alpha N mode instead of Speed Density.



We have not specified a base MAP for Alpha N use in the RR patch due to the vast differences in hardware types available, however, if you need further information regarding this set-up please contact EcuTek support.

Engine Load Limits

There are many limits in the Honda control strategy, however the RaceROM feature file replaces these with a simple set of 1D values



If when tuning you are hitting these limits you should increase the values, the upper value is used in map switch mode 1 and counting down map switch modes 2,3,4.

Torque, Accelerator and Throttle

The relationship between Accel pedal and Throttle angle is a simple singular map

RaceROM's 4 x Accel Trim maps offering superior control

The logging parameter called Accelerator Position reads to 118% for some reason, this has been triple checked!

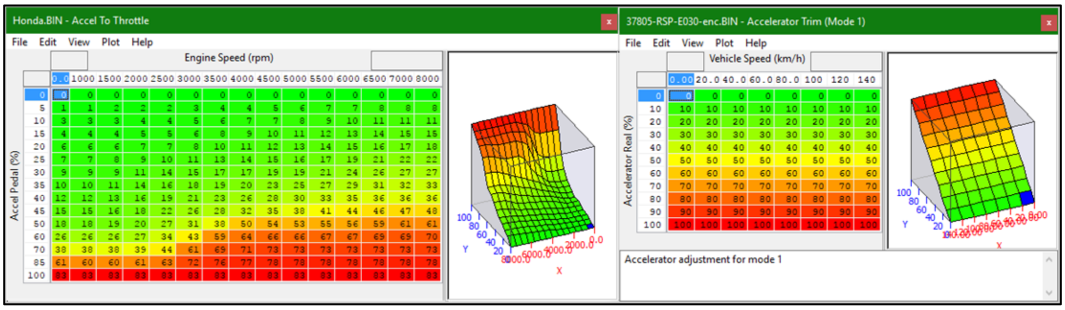
The torque maps do not do anything useful on manual gearbox models so should not be adjusted, they may however influence gearbox control on auto transmission models

Below is a selection of logging parameters that could be used to aid tuning or problem diagnosis.

Accel Position (%)	Actual Accel pedal driver input (Default Parameter)
Accel Position A (V)	Actual Accel Pedal sensor voltages
Accel Position B(V)	Actual Accel Pedal sensor voltages
Throttle Angle Actual (°)	Actual Throttle angle (Default Parameter)
Throttle Angle Target (°)	Target Throttle angle (Default Parameter)
Throttle Angle Target Idle (°)	Target Throttle angle required for Idle
Throttle Motor Duty (%)	Duty cycle the throttle motor is being driven at to achieve throttle angle
Throttle Position Sensor A (V)	Throttle position sensor A voltage
Throttle Position Sensor B (V)	Throttle position sensor B voltage

Accel to Throttle & Accel Trim Maps

These are simple, the Accel pedal to Throttle map is the throttle opening angle for a given engine speed and accelerator pedal % value. With RaceROM there are map switch mode specific maps that allow you to profile the trim of the accel to throttle map to any value you desire against vehicle speed.

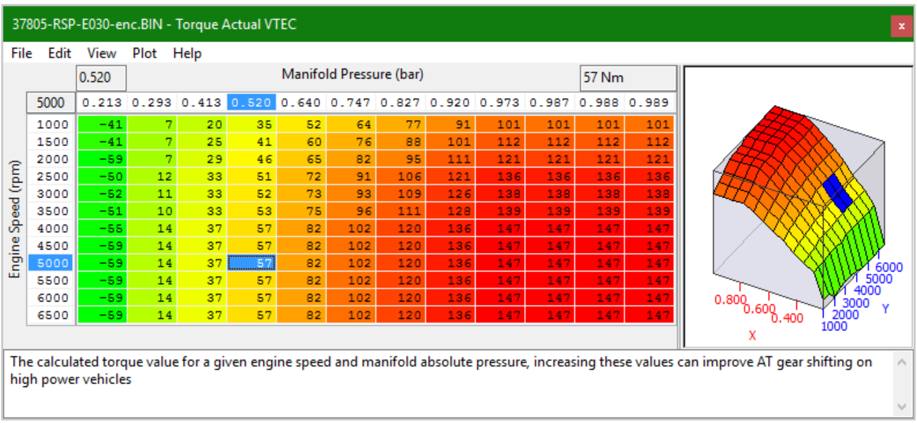


Accel Pedal (%)	0.0	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	8000
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	1	1	2	2	2	3	4	4	5	6	7	7	8	8	8
10	3	3	3	4	4	5	6	7	7	8	9	10	11	11	11
15	4	4	4	5	5	6	8	9	10	11	12	13	14	15	15
20	6	6	6	7	7	8	10	11	12	13	14	15	16	17	18
25	7	7	8	9	10	11	13	14	15	16	17	19	21	22	22
30	9	9	9	11	14	15	17	17	19	19	21	24	26	27	27
35	10	10	11	14	16	18	19	20	23	25	27	29	31	32	33
40	12	12	13	16	19	21	23	26	28	30	33	35	36	36	36
45	15	15	16	18	22	26	28	32	35	38	41	44	46	47	48
50	18	18	19	20	27	31	38	50	54	53	55	56	59	61	61
60	26	26	26	27	34	43	59	64	66	66	67	67	69	69	70
70	38	38	38	39	44	61	69	71	73	73	73	73	73	73	73
85	61	60	60	61	63	72	76	77	78	78	78	78	78	78	78
100	83	83	83	83	83	83	83	83	83	83	83	83	83	83	83

Accelerator Real (%)	0.00	20.0	40.0	60.0	80.0	100	120	140
0	0	0	0	0	0	0	0	0
10	10	10	10	10	10	10	10	10
20	20	20	20	20	20	20	20	20
30	30	30	30	30	30	30	30	30
40	40	40	40	40	40	40	40	40
50	50	50	50	50	50	50	50	50
60	60	60	60	60	60	60	60	60
70	70	70	70	70	70	70	70	70
80	80	80	80	80	80	80	80	80
90	90	90	90	90	90	90	90	90
100	100	100	100	100	100	100	100	100

Torque Actual

The torque actual values are used as an output to the automatic transmission (if equipped), there are two maps, one for normal and one for VTEC operation, these may need to be adjusted to improve the shift characteristics of the automatic gearbox.

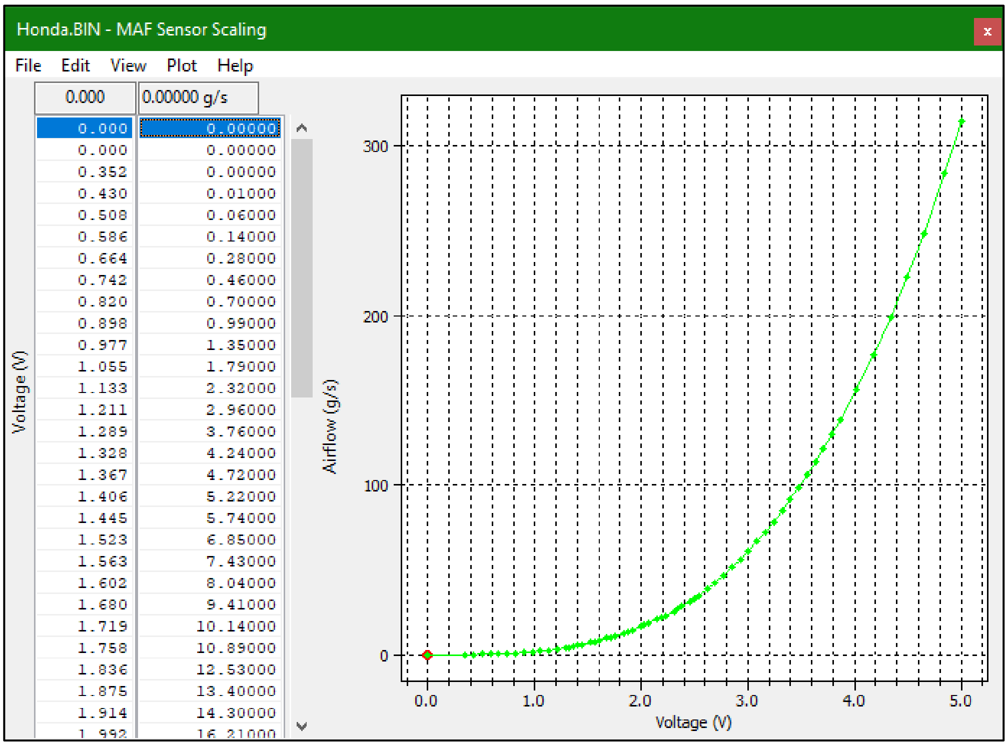


5000	0.213	0.293	0.413	0.520	0.640	0.747	0.827	0.920	0.973	0.987	0.988	0.989
1000	-41	7	20	35	52	64	77	91	101	101	101	101
1500	-41	7	25	41	60	76	88	101	112	112	112	112
2000	-59	7	29	46	65	82	95	111	121	121	121	121
2500	-50	12	33	51	72	91	106	121	136	136	136	136
3000	-52	11	33	52	73	93	109	126	138	138	138	138
3500	-51	10	33	53	75	96	111	128	139	139	139	139
4000	-55	14	37	57	82	102	120	136	147	147	147	147
4500	-59	14	37	57	82	102	120	136	147	147	147	147
5000	-59	14	37	57	82	102	120	136	147	147	147	147
5500	-59	14	37	57	82	102	120	136	147	147	147	147
6000	-59	14	37	57	82	102	120	136	147	147	147	147
6500	-59	14	37	57	82	102	120	136	147	147	147	147

Sensor scaling

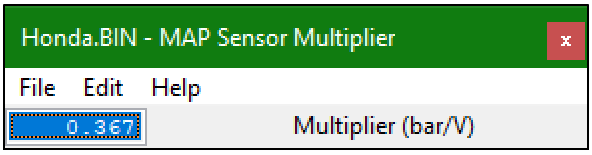
MAF Sensor

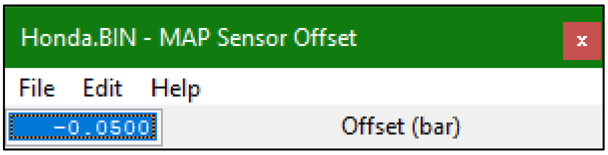
This map can be used to rescale the Mass Air Flow sensor relation between voltage and Mass Air Flow in g/s. Change this value if you have changed the MAF housing or intake system of if your AFR does not match the values in your fuel map.



MAP Sensor

The OEM Manifold Absolute Pressure (MAP) sensor reads up to 1.55 bar (Absolute), so if tuning a Turbo/Supercharged engine you will need to install a replacement sensor capable of reading higher manifold pressure.





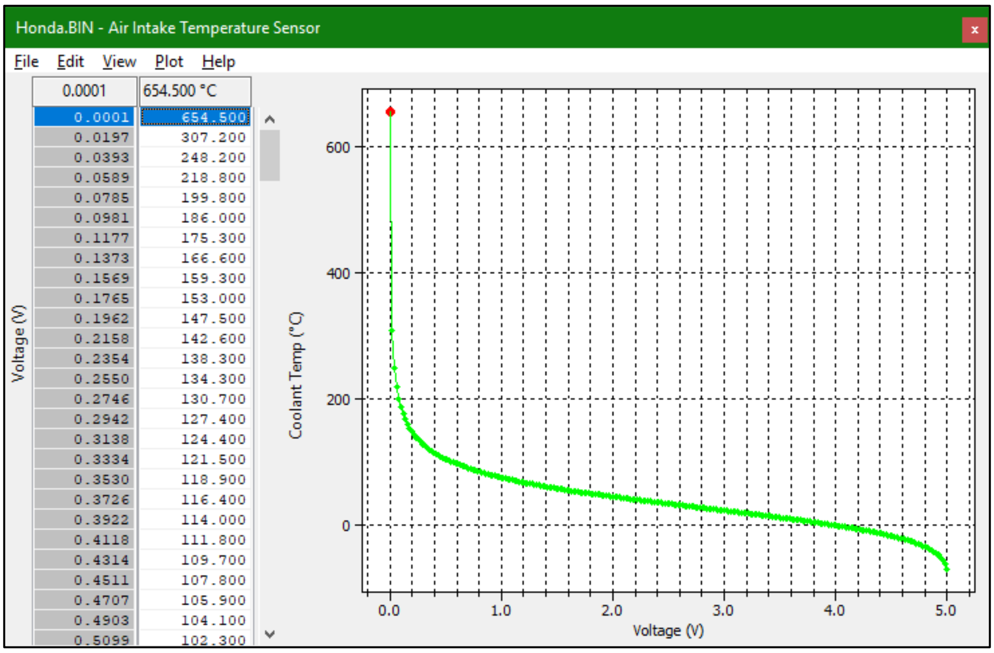
To adjust the sensor scaling you will need to use the scaling data from the manufacturer to set both the multiplier and offset value. Some common multipliers are below.

NOTE: It's very important that the MAP sensor scaling is accurate when using Speed Density, after fitting and calibrating an uprated sensor a quick sanity check is to view Manifold absolute pressure in live data, with ignition ON (engine OFF), and Map Access running it should read the same as the Atmospheric Pressure parameter.

Sensor scaling	Multiplier	Offset
1.55 Bar Factory MAP sensor	0.367	-0.05
3 Bar MAP sensor	0.617	0.03
4 Bar MAP sensor	0.825	0.031

Air Intake Temperature

This map can be used to rescale the intake air temperature sensor voltage to temperature scaling.



Coolant temperature

This map can be used to rescale the coolant temperature sensor voltage to temperature scaling. There are two coolant temperature sensors on the vehicle however only one is used for engine temperature calculations.

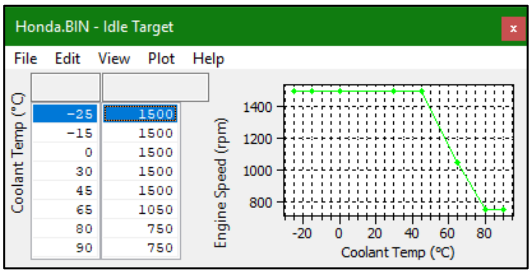
AF Sensor

This map converts the AF Sensor current draw (in milliamp) to an AFR value, there should not be any reason to change these maps. The stock sensor is a wide range type and is relatively accurate but you should always verify the AFR reading with a wideband gauge. You could also rescale the stock sensor if you were to follow the rescaling of the factory sensor using a wideband imported into custom maps. If you wish to do this please read the how to rescale the factory AF sensor guide further on in this manual.

Idle Control

Idle Target

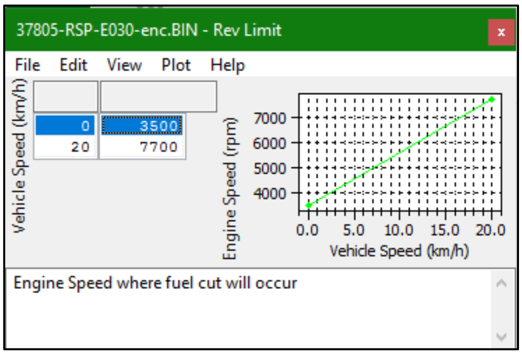
The Idle Target maps are available, there are two maps one for idle target out of gear and idle target when a gear is engaged, simply set the values for the desired idle speed.



Other Maps

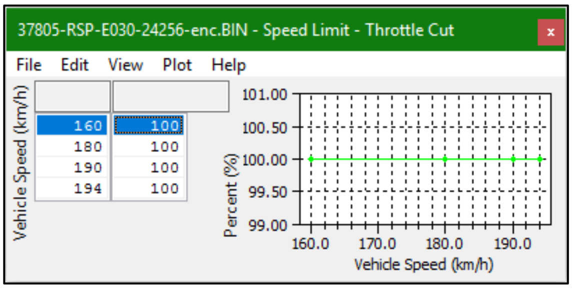
Rev Limiters

These maps control the engine speed that the fuel injectors will be cut to maintain a set RPM. There are several maps that set the Rev limit in the Honda ROMs and these are used by the ECU when VTEC is on or off, there are other limits (Rev Limits #5-#8 & alternative maps) that are used when the ECU is in different calculation modes. The rev limits use vehicle speed on the first axis but it is recommended to raise only the RPM column and change both values by the same amount.



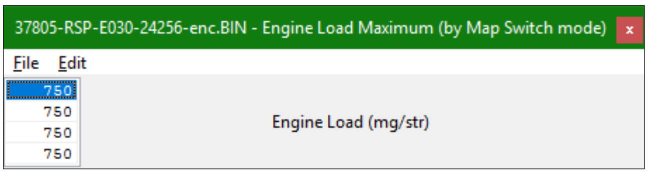
Speed Limiter – Fuel & Throttle Cut

There are two methods to reduce power at the speed limit these are the value at which either fuel will be cut or the throttle will be closed. The fuel cut value is a simple 1D map, adjust it to the desired value. The throttle cut is a set vehicle speed with a max allowed throttle opening, you could adjust either but changing the vehicle speed column is recommended.



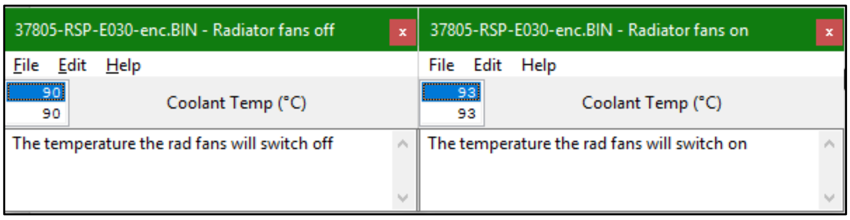
Engine Load

There are engine load limits that can be adjusted if required, these can be raised if there are high loads created by forced induction installations.

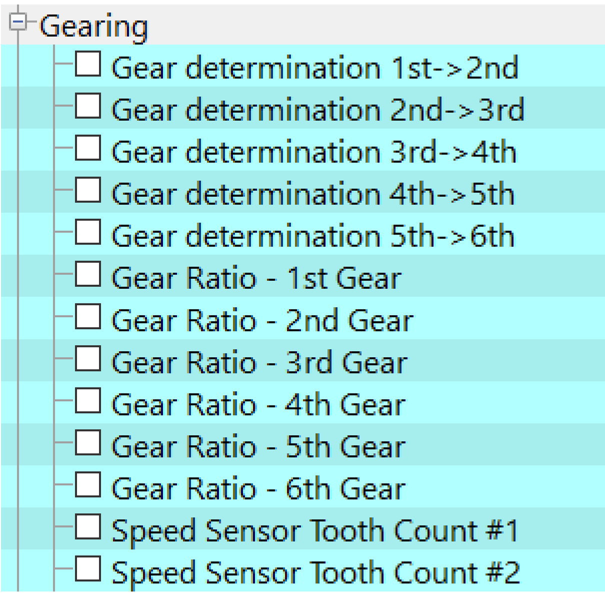


Fan Control

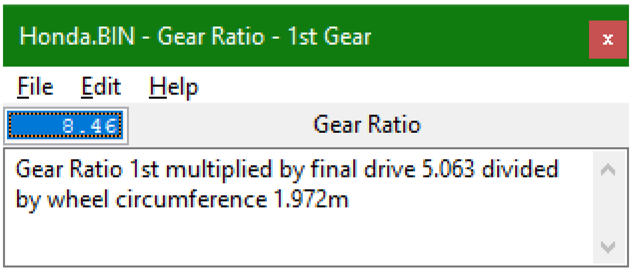
The Radiator fan control maps are used to control when the main radiator fans switch on and off. These can be adjusted as required and there is one map for switching ON and one for switching OFF.



Gearing



These maps are used in the functions that interprets vehicle speed setting the current gear and transferring the vehicle speed to the dash. For cars with different gearboxes or final drives these maps may need to be changed. To change what the ECU see as gears use the Gear ration maps 1st – 6th, the values include the final drive ratio and wheel circumference.



As an example for 1st gear, instead of it showing 3.267 (the actual gear ratio), you'll get 8.46, which is

$$Gear\ Ratio\ Value = Actual\ Gear\ Ratio\ (3.267) \times \frac{Final\ Drive\ Ratio\ (5.063)}{Wheel\ Circumference\ (1.955)} = 3.267 \times \frac{5.063}{1.955} = 8.46$$

if you have changed the gear ratios you should set the values by the following formula,

$$\text{New Gear Ratio value} = \text{New Gear Ratio} \times \frac{\text{Final Drive Ratio}}{\text{Tire diameter} \times \pi}$$

If you change only the final drive you will need to adjust the values by the percentage difference in final drive ratio as well for all gears. This is simply done by CTRL + P using the difference in ratios.

ROM Compatibility

There are Main Regions of ROM, these region ROMs are not generally compatible as there are many differences in the calibration and in some cases the Hardware (JDM cars do not have a MAF sensor):

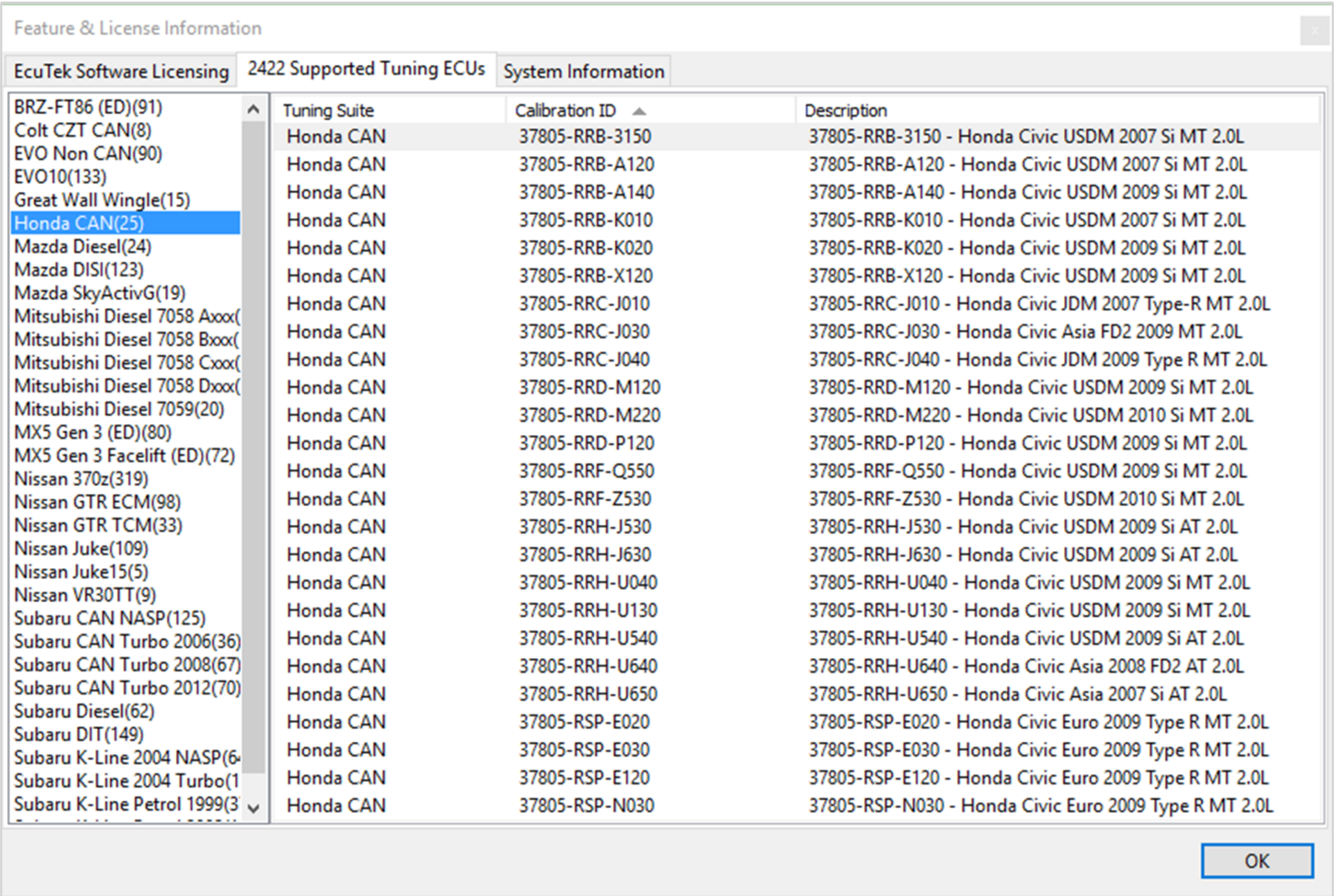
- Euro – FN2 Cars
- US – FN2 Si cars
- JDM – FD2 cars
- Asia – FD2 cars as well

To see the latest version ECM ROM that should be chosen for your region, go to **Feature & Licence Information** under the **Help** menu, and the select the **Supported Tuning ECUs** tab:

Which ROM version to use?

Cal ID’s

We recommend using the original ROM that came with the vehicle, if there are newer revisions like M120 and the M220 you may be able to swap these. If you connect to your vehicle and the ROM is unidentified please Dump the ROM using ROM dump in the programming window and submit the ROM with the relevant details through the ROM Dump Web form.



Tuning Suite	Calibration ID	Description
Honda CAN	37805-RRB-3150	37805-RRB-3150 - Honda Civic USDM 2007 Si MT 2.0L
Honda CAN	37805-RRB-A120	37805-RRB-A120 - Honda Civic USDM 2007 Si MT 2.0L
Honda CAN	37805-RRB-A140	37805-RRB-A140 - Honda Civic USDM 2009 Si MT 2.0L
Honda CAN	37805-RRB-K010	37805-RRB-K010 - Honda Civic USDM 2007 Si MT 2.0L
Honda CAN	37805-RRB-K020	37805-RRB-K020 - Honda Civic USDM 2009 Si MT 2.0L
Honda CAN	37805-RRB-X120	37805-RRB-X120 - Honda Civic USDM 2009 Si MT 2.0L
Honda CAN	37805-RRC-J010	37805-RRC-J010 - Honda Civic JDM 2007 Type-R MT 2.0L
Honda CAN	37805-RRC-J030	37805-RRC-J030 - Honda Civic Asia FD2 2009 MT 2.0L
Honda CAN	37805-RRC-J040	37805-RRC-J040 - Honda Civic JDM 2009 Type R MT 2.0L
Honda CAN	37805-RRD-M120	37805-RRD-M120 - Honda Civic USDM 2009 Si MT 2.0L
Honda CAN	37805-RRD-M220	37805-RRD-M220 - Honda Civic USDM 2010 Si MT 2.0L
Honda CAN	37805-RRD-P120	37805-RRD-P120 - Honda Civic USDM 2009 Si MT 2.0L
Honda CAN	37805-RRF-Q550	37805-RRF-Q550 - Honda Civic USDM 2009 Si MT 2.0L
Honda CAN	37805-RRF-Z530	37805-RRF-Z530 - Honda Civic USDM 2010 Si MT 2.0L
Honda CAN	37805-RRH-J530	37805-RRH-J530 - Honda Civic USDM 2009 Si AT 2.0L
Honda CAN	37805-RRH-J630	37805-RRH-J630 - Honda Civic USDM 2009 Si AT 2.0L
Honda CAN	37805-RRH-U040	37805-RRH-U040 - Honda Civic USDM 2009 Si MT 2.0L
Honda CAN	37805-RRH-U130	37805-RRH-U130 - Honda Civic USDM 2009 Si MT 2.0L
Honda CAN	37805-RRH-U540	37805-RRH-U540 - Honda Civic USDM 2009 Si AT 2.0L
Honda CAN	37805-RRH-U640	37805-RRH-U640 - Honda Civic Asia 2008 FD2 AT 2.0L
Honda CAN	37805-RRH-U650	37805-RRH-U650 - Honda Civic Asia 2007 Si AT 2.0L
Honda CAN	37805-RSP-E020	37805-RSP-E020 - Honda Civic Euro 2009 Type R MT 2.0L
Honda CAN	37805-RSP-E030	37805-RSP-E030 - Honda Civic Euro 2009 Type R MT 2.0L
Honda CAN	37805-RSP-E120	37805-RSP-E120 - Honda Civic Euro 2009 Type R MT 2.0L
Honda CAN	37805-RSP-N030	37805-RSP-N030 - Honda Civic Euro 2009 Type R MT 2.0L

4. Honda RaceROM

Introduction

In order to make any changes to a Honda ROM it is required that a RaceROM Feature File (RRFF) also be added, this is to ensure security for both the tuner and EcuTek. Honda RaceROM also installs FastFlash programming and adds custom features that compliment specific RaceROM features added to the ECM.

RaceROM Feature Files have an .ERP file extension and typically named in the following form:

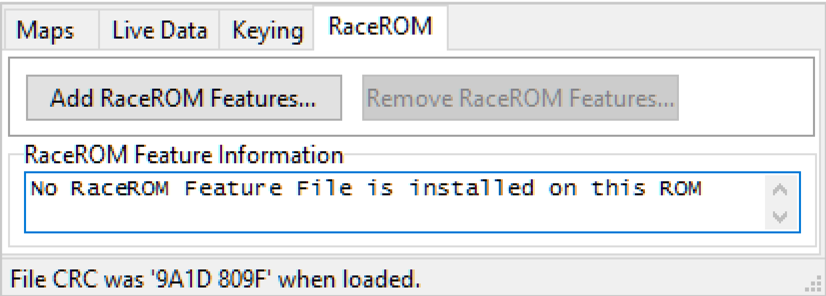
`37805-RSP-E030-RaceROM-24256.ERP`

Where RSP-E030 is the calibration ID and 24256 is the RaceROM version in this example.

The latest RaceROM Feature Files are installed in:

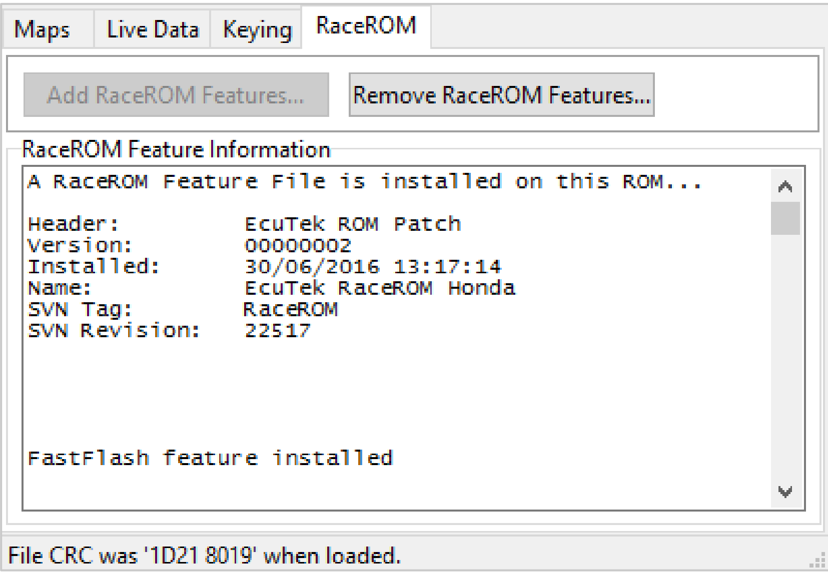
`C:\EcuTek\ProECURomFiles\Honda\RaceROM Feature Files\Version 1.1`

Adding a RaceROM Feature File



In order to add a RRFF to a ROM, first open the ROM file and the click on the **Add RaceROM Features** button found on the RaceROM tab, alternatively you can drag a RRFF directly to the ROM window using windows file manager.

Checking or removing RaceROM



Once a RRFF has been added to a ROM its details can be checked by clicking on the RaceROM tab in the ROM editor window. Details of the RRFF and any RaceROM maps are shown.

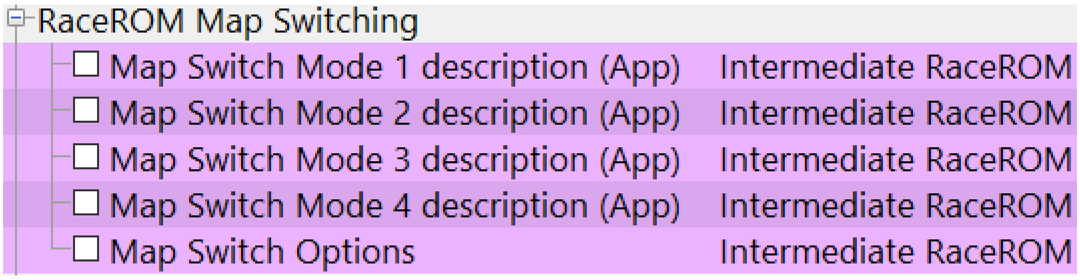
Should you wish to remove the RaceROM Feature File, you can drag and drop the original RRFF (the .ERP file) that was used to add the features into the map editor window. Or click on the **Remove RaceROM Features...** button and manually select the RRFF that matches the one currently added to the ROM.

Enabling RaceROM Features

To enable RaceROM features each feature has its unique tree and enable checkbox map, enabling them is simple checking the box. There are some RaceROM features that are enabled by default these include features such as fast flash, fast logging, RaceROM injector sizing, fuel maps, Ignition maps, CAM timing, Accel pedal maps, some are passive tables that are always active as long as the patch is installed.

Map switching

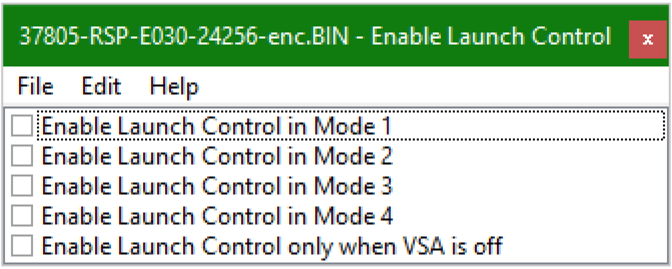
Four-way Map Switching (with rev-counter indication) Use Custom Maps to create four different calibrations; swap between them conveniently by using the cruise control switchgear or using ECU connect with a Bluetooth interface. There are options to name Each map switch mode which is limited to 64 characters, though text this long may not display correctly on the device. Simply enter the text into the desired MS modes to display it on the device when using ECU Connect.



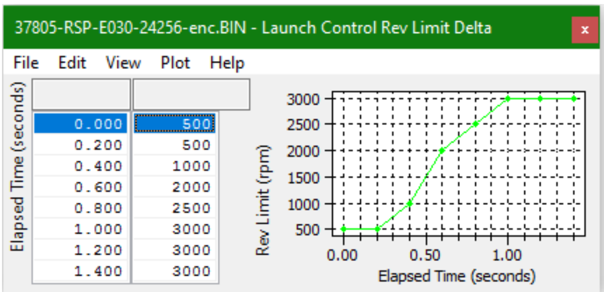
Launch Control

Adding the Race ROM feature file allows you to enable Adjustable Launch Control which when set up can be used to make adjustment of the launch RPM live, this is done using the cruise control switchgear or ECU connect when using the Bluetooth interface.

Launch control will become active when the it is enabled in the current Map switch mode, the vehicle speed is below the threshold and the Accelerator threshold has been is exceeded. There are launch control adjustment increments that can be changed for finer adjustment of the Launch RPM if required.

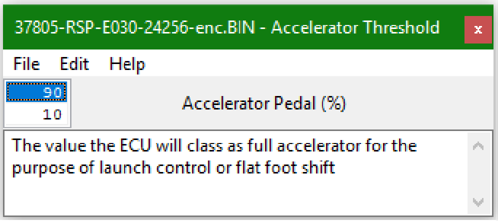


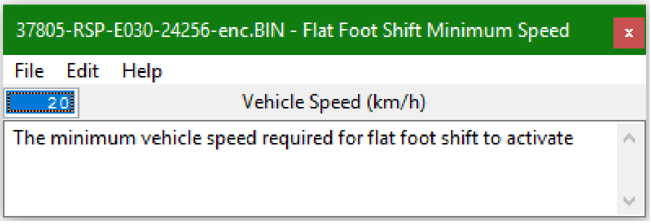
The Launch control Rev limit hysteresis value will control when the fuel cut is stopped and injection restarts. When the launch is in progress and the vehicle starts to move the Launch control Rev Limit Delta map is used to progressively raise the rev limit by the value in the map until the time limits have expired. If you need to perform traction control after the launch has completed.



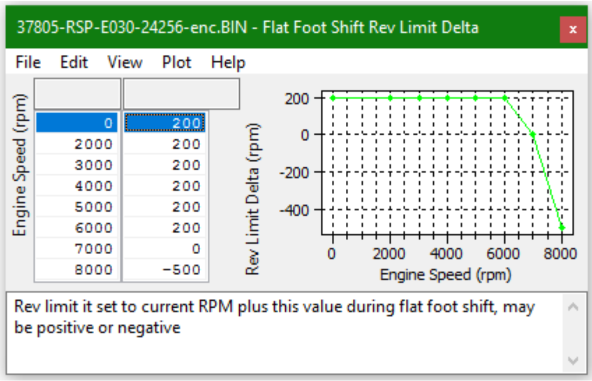
Flat Foot Shift

Flat-Foot Shift allow safe full-throttle gearshifts by reducing the engine torque and by controlling the air-fuel ratio during the shift. When enabled in a MS mode a Flat foot shift will start when the minimum vehicle speed is exceeded, the Clutch switch is triggered and the accel pedal is above the Accelerator threshold set for both LC and FFS (threshold value is in the LC map tree).





When the FFS mode is active it will set a temporary rev limit at the current RPM +the value in the Flat Foot Shift Rev Limit Delta map (which can be positive or negative) and use the hysteresis value to disable the cut.

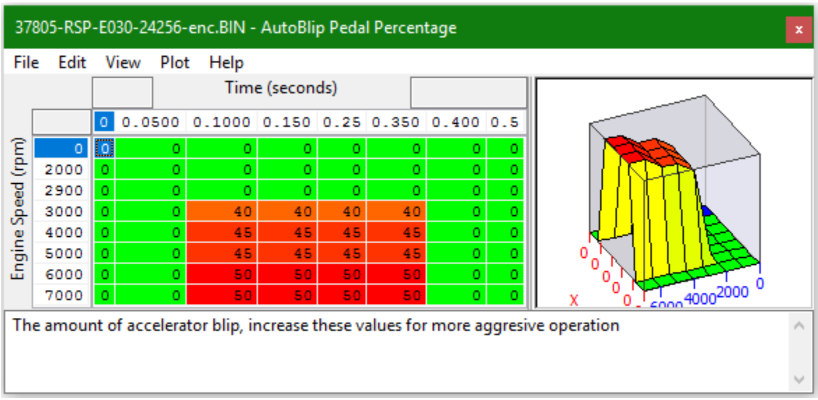


When in the FFS mode the ECU will use the FFS Ignition Timing Adjustment and Target AFR values which can be adjusted if required. You can also adjust the deactivation delay for the FFS rev limit and set a re-arm timer to prevent accidental reactivation.

When using flat foot shift it can inadvertently be activated by drivers resting their foot on the clutch pedal. Without a clutch switch logging parameter, you will have to rely on examining the log for any strange full throttle timing/ AFR target changes when you suspect the FFS is activating when not required.

Downshift AutoBlip

Downshift Auto-Blip Provides a smooth entry to the next lower gear. To trigger an AutoBlip (AB) you will need to be above the vehicle speed threshold and apply the brake then clutch switch, the throttle will be increased by the set percentage for the time given in the AutoBlip Pedal Percentage map.



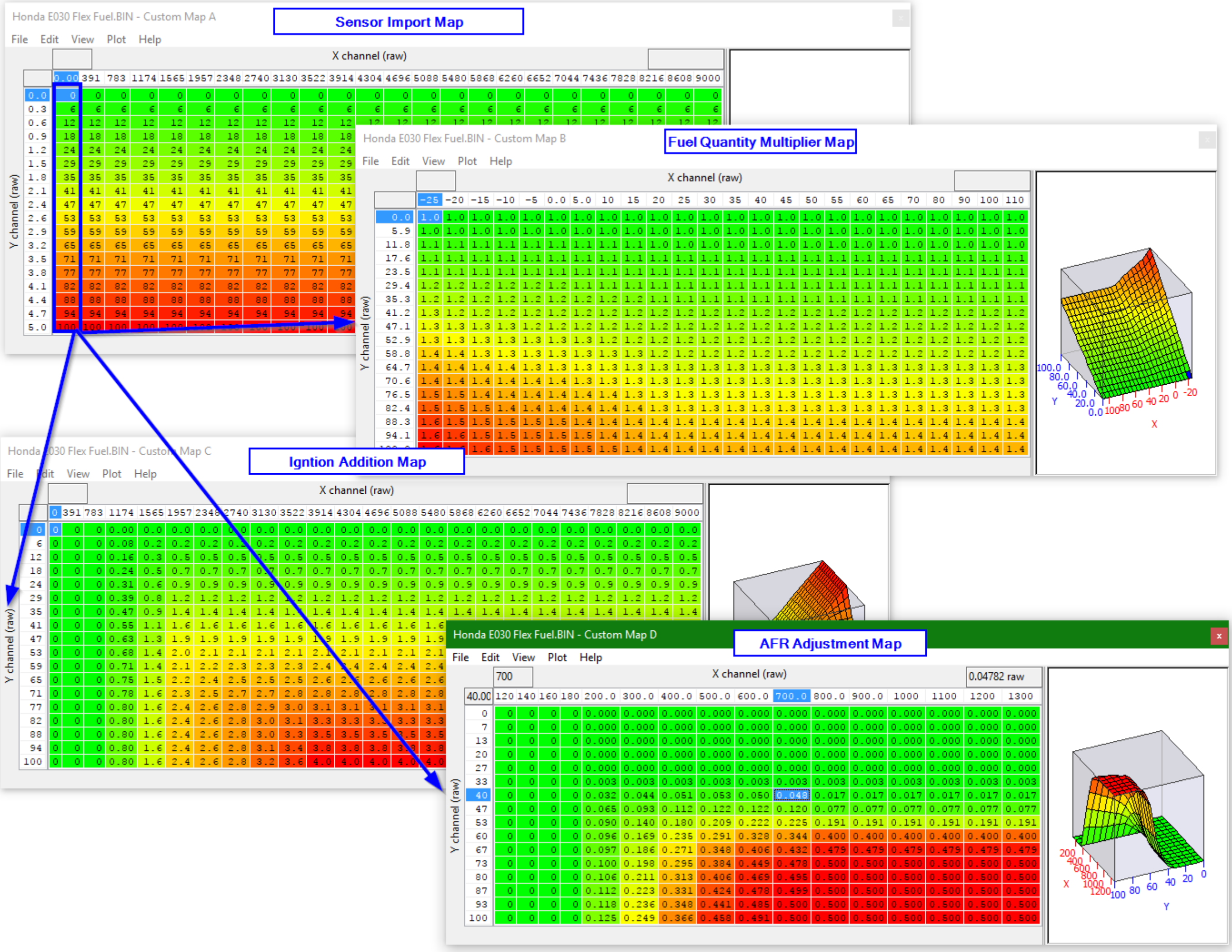
AutoBlip works by altering the Accel pedal input which in turn opens the throttle, if more throttle opening is required or the timing needs to be altered, simply change the values in this map.

E85 and flex fuel

With RaceROM Custom maps you can create a dedicated calibration for running E85 ethanol fuel or a Flex-Fuel variant, this is a similar set up to other EcuTek platforms.

When running E85 we are able extract more energy from the fuel and this leads to more power. Any 0-5V capable Flex fuel sensor can be used and it can be wired into any of the available 0-5 Inputs on the ECU, we would recommend using the Rear O2 sensor voltage input for Flex fuel importing which is covered in the next section.

Several adjustments will need to be made in the calibration to adequately adjust the tune for E85 or flex fuel, these are outlined below. The maps are set up similar to below.



Fuel Volume

When running on E85 we need to increase the amount of fuel volume that is added per cylinder fill, the extra fuel volume amount is typically between 25% and 35% more depending on the method used to increase the volume.

Ignition Timing

Along with extra fuel volume we also need to advance the Ignition timing as Ethanol takes longer to burn and longer to release all its energy, for this reason we needed to advance the timing on full load.

Cranking Fuel

In addition, cranking fuel is normally a fixed injection volume amount and needs increasing independently of the main fuel volume calculations.

Using Custom Maps it possible to adjust the Ignition and Fuel for the current true Ethanol Content Ratio, this eliminates the risk of engine damage and also avoids having to run an empty tank before refuelling with Ethanol. In addition the tuning will always be correct for whatever the current Ethanol Ratio is.

Another point worth mentioning is the fact that you are injecting 30% more fuel that the stock injection system will be at 100% by 230-240bhp instead of 280-300bhp for regular gas (petrol)

NOTE: On Forced Induction models with higher cylinder pressure the same amount of Ignition Advance should not be used, take care as E85 doesn't knock very easily. So to run on E85 we have to make the following calibration changes using Custom Maps.

- Adjust Ignition Timing on full load (depending on your region and modifications)
- Increase Injection Volume Amount by around +30% everywhere

You may find you also need to Increase Injector Open Time during Cranking by 30 to 50% depending on Coolant Temp however only if the normal fuel quantity multiplication does not give enough resolution.

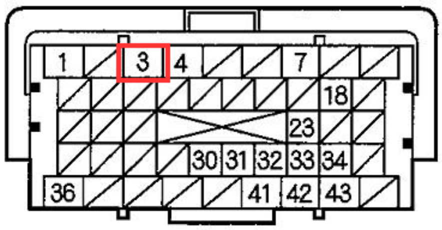
Boost Control

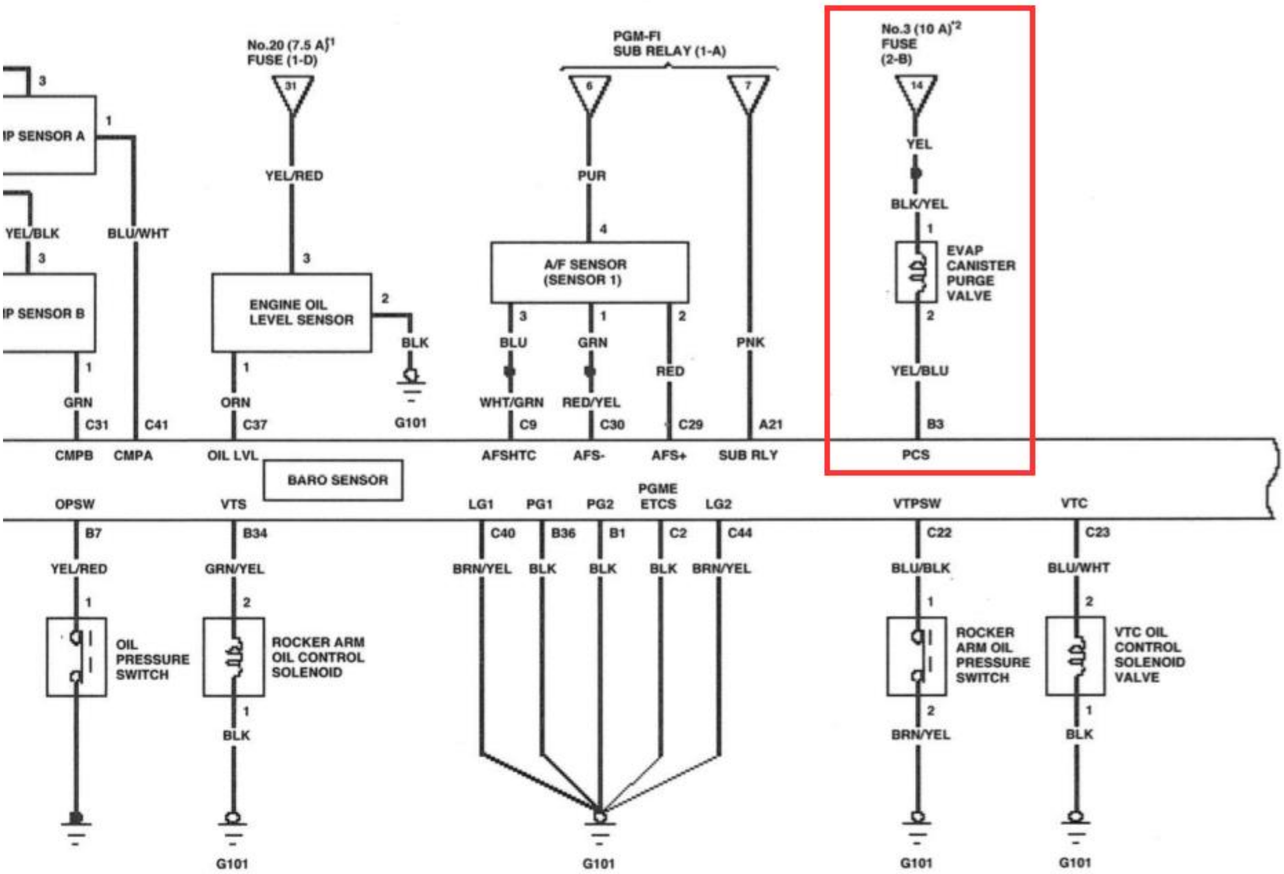
Boost control can be set up using the OEM ECU and EcuTek's RaceROM Custom maps. The feature can be set up to be a simple open loop WG duty map or a full closed loop system with adjustable target, compensations and failsafe's, it's all down to the number of maps available and the time spent when calibrating. Using the Carbon Purge Canister (CPC) valve will require some wiring to be made.

We believe the actual valve is down with the carbon canister at the back of the car (unconfirmed). You may just as easily be able to wire straight to the ECU though using the pinouts below.

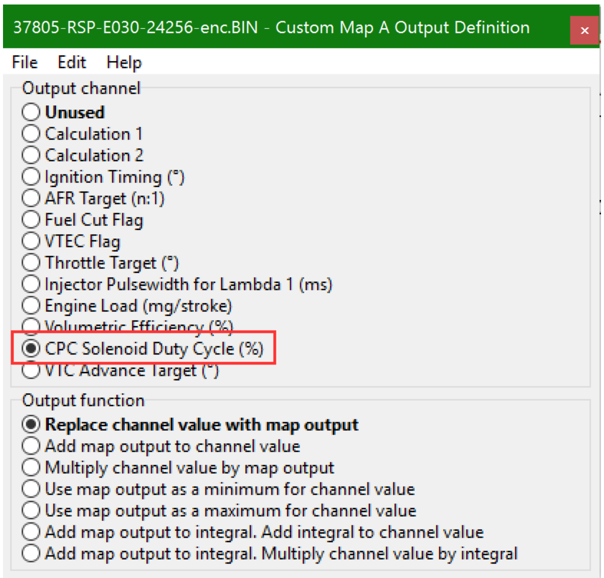
Connector B (Grey)		
Pin	Wire	Signal Description
B1	BLK/RED	PG2 (POWER GROUND)
B2	N/U	N/U
B3	YEL/BLU	PCS (EVAPORATIVE EMISSION (EVAP) CANISTER PURGE VALVE)
B4	BLK/WHT	SO2SHTC (SECONDARY HEATED OXYGEN SENSOR (SECONDARY HO2S) HEATER (SENSOR 2))
B5	N/U	N/U
B6	N/U	N/U
B7	YEL/RED	OPSW (OIL PRESSURE SWITCH)

ECM B (△) (44P)

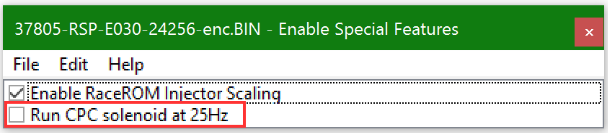




RaceROM custom maps also allows for 1x ECU Output Solenoid Driver (Frequency Based) by repurposing the factory CPC (Carbon Purge Canister) output driven at a duty cycle of your choice. This can be used as a wastegate solenoid control valve on turbocharged installations allowing features like closed loop boost control to be created.



The CPC solenoid valve runs at roughly 12hz operating frequency normally but using RaceROM code allows you to set the Frequency to 25Hz which is far more suitable for most popular aftermarket Wastegate solenoid valves. To set the solenoid valve operating frequency simply select the check box in the RaceROM special features menu.

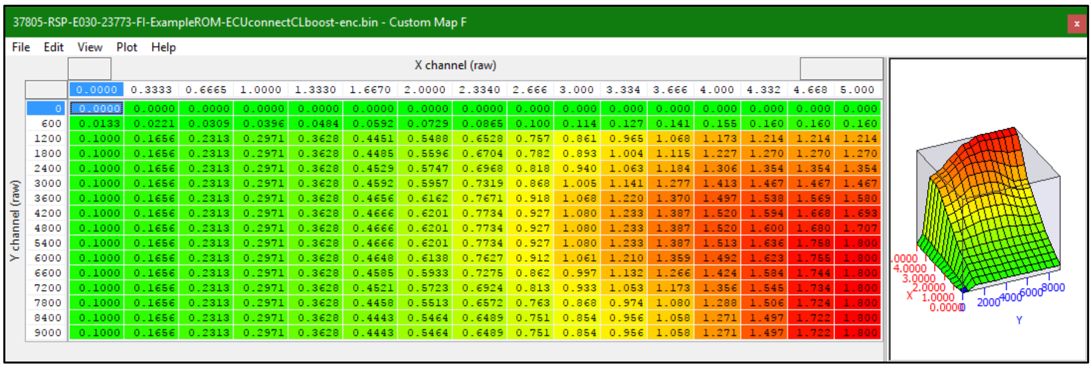


To set up custom maps to output a duty cycle the following functions will be required

- A boost target value
- Some corrections and adjustments e.g. custom parameters slider or AIT target corrections
- A base wastegate duty map
- A boost error calculation map (using boost target and MAP)
- A series of correction maps to make it closed loop (if you wish), this would include maps to support a proportional and an integral wastegate duty correction.
- Finally, failsafe's to protect the engine if the boost pressure goes too high.

The end result of this will look like the following ROM.

Custom map F sets the Target Boost in BAR absolute into calculation channel 1, the x axis is accel pedal and the y axis is engine speed, this map is active all of the time.



Y \ X	0.0000	0.3333	0.6665	1.0000	1.3330	1.6670	2.0000	2.3340	2.666	3.000	3.334	3.666	4.000	4.332	4.668	5.000
0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
600	0.0133	0.0221	0.0309	0.0396	0.0484	0.0592	0.0729	0.0865	0.100	0.114	0.127	0.141	0.155	0.160	0.160	0.160
1200	0.1000	0.1656	0.2313	0.2971	0.3628	0.4451	0.5488	0.6528	0.757	0.861	0.965	1.068	1.173	1.214	1.214	1.214
1800	0.1000	0.1656	0.2313	0.2971	0.3628	0.4485	0.5596	0.6704	0.782	0.893	1.004	1.115	1.227	1.270	1.270	1.270
2400	0.1000	0.1656	0.2313	0.2971	0.3628	0.4529	0.5747	0.6968	0.818	0.940	1.063	1.184	1.306	1.354	1.354	1.354
3000	0.1000	0.1656	0.2313	0.2971	0.3628	0.4592	0.5957	0.7319	0.868	1.005	1.141	1.277	1.413	1.467	1.467	1.467
3600	0.1000	0.1656	0.2313	0.2971	0.3628	0.4656	0.6162	0.7671	0.918	1.068	1.220	1.370	1.497	1.538	1.569	1.580
4200	0.1000	0.1656	0.2313	0.2971	0.3628	0.4666	0.6201	0.7734	0.927	1.080	1.233	1.387	1.520	1.594	1.668	1.693
4800	0.1000	0.1656	0.2313	0.2971	0.3628	0.4666	0.6201	0.7734	0.927	1.080	1.233	1.387	1.520	1.600	1.680	1.707
5400	0.1000	0.1656	0.2313	0.2971	0.3628	0.4666	0.6201	0.7734	0.927	1.080	1.233	1.387	1.513	1.636	1.758	1.800
6000	0.1000	0.1656	0.2313	0.2971	0.3628	0.4648	0.6138	0.7627	0.912	1.061	1.210	1.359	1.492	1.623	1.755	1.800
6600	0.1000	0.1656	0.2313	0.2971	0.3628	0.4585	0.5933	0.7275	0.862	0.997	1.132	1.266	1.424	1.584	1.744	1.800
7200	0.1000	0.1656	0.2313	0.2971	0.3628	0.4521	0.5723	0.6924	0.813	0.933	1.053	1.173	1.356	1.545	1.734	1.800
7800	0.1000	0.1656	0.2313	0.2971	0.3628	0.4458	0.5513	0.6572	0.763	0.868	0.974	1.080	1.288	1.506	1.724	1.800
8400	0.1000	0.1656	0.2313	0.2971	0.3628	0.4443	0.5464	0.6489	0.751	0.854	0.956	1.058	1.271	1.497	1.722	1.800
9000	0.1000	0.1656	0.2313	0.2971	0.3628	0.4443	0.5464	0.6489	0.751	0.854	0.956	1.058	1.271	1.497	1.722	1.800

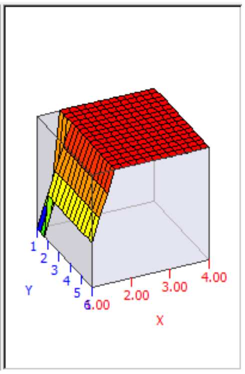
G is Per Gear and Mode that limits the channel value by the output of this map. The x axis is map switch mode and the y axis gear, the map is active full time.

37805-RSP-E030-23773-FI-ExampleROM-ECUconnectCLboost-enc.bin - Custom Map G

File Edit View Plot Help

X channel (raw) / Y channel (raw)

	1.00	2.00	3.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
1	1.30	1.40	1.50	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80
2	1.30	1.40	1.50	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80
3	1.30	1.40	1.50	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80
4	1.50	1.60	1.70	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80
5	1.50	1.60	1.70	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80
6	1.50	1.60	1.70	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80
6	1.50	1.60	1.70	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80
6	1.50	1.60	1.70	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80
6	1.50	1.60	1.70	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80
6	1.50	1.60	1.70	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80
6	1.50	1.60	1.70	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80
6	1.50	1.60	1.70	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80
6	1.50	1.60	1.70	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80
6	1.50	1.60	1.70	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80
6	1.50	1.60	1.70	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80
6	1.50	1.60	1.70	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80



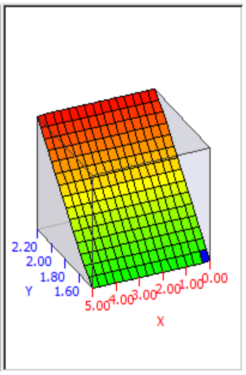
H is App boost slider that limits the maximum channel value depending on the ECU Connect custom parameter 1. The x axis is accel pedal voltage and the Y axis is the custom input parameter.

37805-RSP-E030-23773-FI-ExampleROM-ECUconnectCLboost-enc.bin - Custom Map H

File Edit View Plot Help

X channel (raw) / Y channel (raw)

	0.00	0.333	0.667	1.00	1.33	1.67	2.00	2.33	2.67	3.00	3.33	3.67	4.00	4.33	4.67	5.00
1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40
1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45
1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51
1.56	1.56	1.56	1.56	1.56	1.56	1.56	1.56	1.56	1.56	1.56	1.56	1.56	1.56	1.56	1.56	1.56
1.61	1.61	1.61	1.61	1.61	1.61	1.61	1.61	1.61	1.61	1.61	1.61	1.61	1.61	1.61	1.61	1.61
1.67	1.67	1.67	1.67	1.67	1.67	1.67	1.67	1.67	1.67	1.67	1.67	1.67	1.67	1.67	1.67	1.67
1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72
1.77	1.77	1.77	1.77	1.77	1.77	1.77	1.77	1.77	1.77	1.77	1.77	1.77	1.77	1.77	1.77	1.77
1.83	1.83	1.83	1.83	1.83	1.83	1.83	1.83	1.83	1.83	1.83	1.83	1.83	1.83	1.83	1.83	1.83
1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88
1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93
1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99	1.99
2.04	2.04	2.04	2.04	2.04	2.04	2.04	2.04	2.04	2.04	2.04	2.04	2.04	2.04	2.04	2.04	2.04
2.09	2.09	2.09	2.09	2.09	2.09	2.09	2.09	2.09	2.09	2.09	2.09	2.09	2.09	2.09	2.09	2.09
2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15
2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20



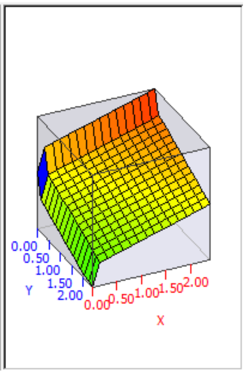
I is Boost Error calculated by comparing MAP to boost target defined at the end of all of the compensations and corrections (this case its map H), it compares the current MAP (x axis to the boost target from map H (y axis) and is active full time.

37805-RSP-E030-23773-FI-ExampleROM-ECUconnectCLboost-enc.bin - Custom Map I

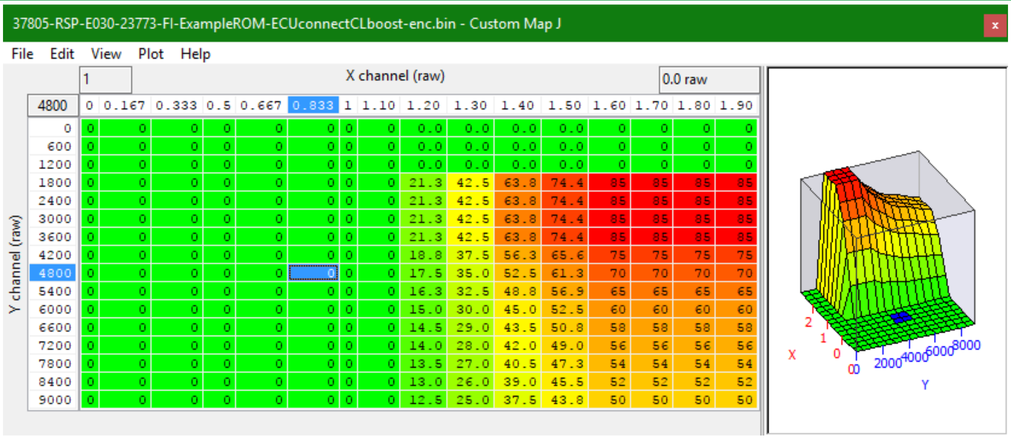
File Edit View Plot Help

X channel (raw) / Y channel (raw)

	0.00	0.99951	1.09961	1.20020	1.29980	1.40039	1.5000	1.5996	1.7002	1.7998	1.9004	2.0020	2.1016	2.2012	2.3027	2.4023
0.00	0.0	1.0000	1.0996	1.2002	1.2998	1.4004	1.5000	1.5996	1.7002	1.7998	1.9004	2.0000	2.0996	2.1992	2.3008	2.4004
1.00	-1.0	0.0000	0.1000	0.2000	0.3000	0.3999	0.5000	0.6001	0.7002	0.7998	0.8999	1.0000	1.0996	1.2002	1.2998	1.4004
1.10	-1.1	-0.1000	0.0000	0.1000	0.2000	0.3000	0.3999	0.5000	0.6001	0.7002	0.7998	0.8999	1.0000	1.0996	1.2002	1.2998
1.20	-1.2	-0.2000	-0.1000	0.0000	0.1000	0.2000	0.3000	0.3999	0.5000	0.6001	0.7002	0.7998	0.8999	1.0000	1.0996	1.2002
1.30	-1.3	-0.3000	-0.2000	-0.1000	0.0000	0.1000	0.2000	0.3000	0.3999	0.5000	0.6001	0.7002	0.7998	0.8999	1.0000	1.0996
1.40	-1.4	-0.3999	-0.3000	-0.2000	-0.1000	0.0000	0.1000	0.2000	0.3000	0.3999	0.5000	0.6001	0.7002	0.7998	0.8999	1.0000
1.50	-1.5	-0.5000	-0.3999	-0.3000	-0.2000	-0.1000	0.0000	0.1000	0.2000	0.3000	0.3999	0.5000	0.6001	0.7002	0.7998	0.8999
1.60	-1.6	-0.6001	-0.5000	-0.3999	-0.3000	-0.2000	-0.1000	0.0000	0.1000	0.2000	0.3000	0.3999	0.5000	0.6001	0.7002	0.7998
1.70	-1.7	-0.7002	-0.6001	-0.5000	-0.3999	-0.3000	-0.2000	-0.1000	0.0000	0.1000	0.2000	0.3000	0.3999	0.5000	0.6001	0.7002
1.80	-1.8	-0.7998	-0.7002	-0.6001	-0.5000	-0.3999	-0.3000	-0.2000	-0.1000	0.0000	0.1000	0.2000	0.3000	0.3999	0.5000	0.6001
1.90	-1.9	-0.8999	-0.7998	-0.7002	-0.6001	-0.5000	-0.3999	-0.3000	-0.2000	-0.1000	0.0000	0.1000	0.2000	0.3000	0.3999	0.5000
2.00	-2.0	-1.0000	-0.8999	-0.7998	-0.7002	-0.6001	-0.5000	-0.3999	-0.3000	-0.2000	-0.1000	0.0000	0.1000	0.2000	0.3000	0.3999
2.10	-2.1	-1.0996	-1.0000	-0.8999	-0.7998	-0.7002	-0.6001	-0.5000	-0.3999	-0.3000	-0.2000	-0.1000	0.0000	0.1000	0.2000	0.3000
2.20	-2.2	-1.2002	-1.0996	-1.0000	-0.8999	-0.7998	-0.7002	-0.6001	-0.5000	-0.3999	-0.3000	-0.2000	-0.1000	0.0000	0.1000	0.2000
2.30	-2.3	-1.2998	-1.2002	-1.0996	-1.0000	-0.8999	-0.7998	-0.7002	-0.6001	-0.5000	-0.3999	-0.3000	-0.2000	-0.1000	0.0000	0.1000
2.40	-2.4	-1.4004	-1.2998	-1.2002	-1.0996	-1.0000	-0.8999	-0.7998	-0.7002	-0.6001	-0.5000	-0.3999	-0.3000	-0.2000	-0.1000	0.0000



J is Base WG Duty, this outputs directly to the CPC solenoid output and has boost target on the x axis and engine speed on the y axis. It is active full time.


37805-RSP-E030-23773-FI-ExampleROM-ECUconnectCLboost-enc.bin - Custom Map J

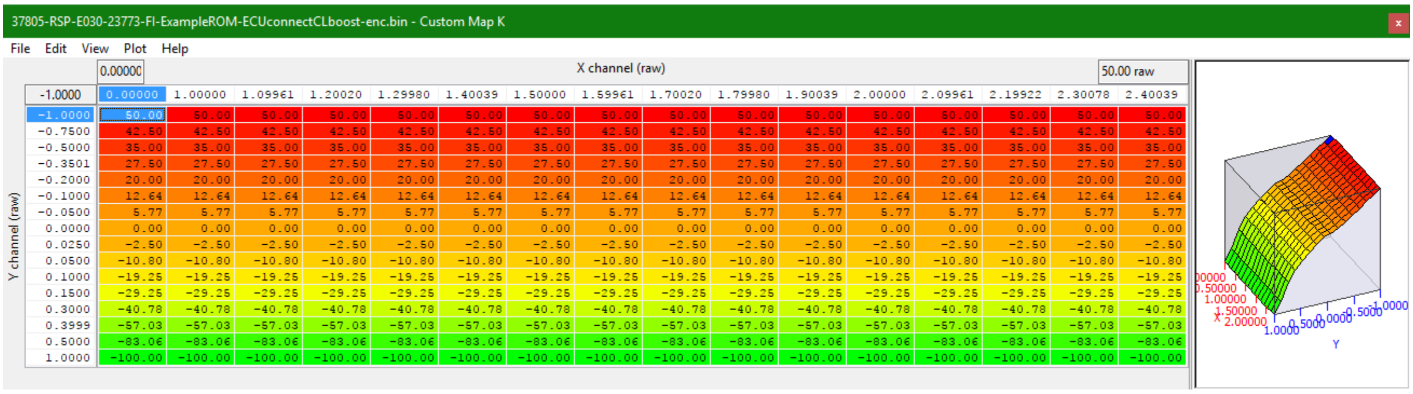
File Edit View Plot Help

X channel (raw) | 1 | 0.0 raw

Y channel (raw)

4800	0	0.167	0.333	0.5	0.667	0.833	1	1.10	1.20	1.30	1.40	1.50	1.60	1.70	1.80	1.90
0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0
600	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0
1200	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0	0	0	0
1800	0	0	0	0	0	0	0	0	21.3	42.5	63.8	74.4	85	85	85	85
2400	0	0	0	0	0	0	0	0	21.3	42.5	63.8	74.4	85	85	85	85
3000	0	0	0	0	0	0	0	0	21.3	42.5	63.8	74.4	85	85	85	85
3600	0	0	0	0	0	0	0	0	21.3	42.5	63.8	74.4	85	85	85	85
4200	0	0	0	0	0	0	0	0	18.8	37.5	56.3	65.6	75	75	75	75
4800	0	0	0	0	0	0	0	0	17.5	35.0	52.5	61.3	70	70	70	70
5400	0	0	0	0	0	0	0	0	16.3	32.5	48.8	56.9	65	65	65	65
6000	0	0	0	0	0	0	0	0	15.0	30.0	45.0	52.5	60	60	60	60
6600	0	0	0	0	0	0	0	0	14.5	29.0	43.5	50.8	58	58	58	58
7200	0	0	0	0	0	0	0	0	14.0	28.0	42.0	49.0	56	56	56	56
7800	0	0	0	0	0	0	0	0	13.5	27.0	40.5	47.3	54	54	54	54
8400	0	0	0	0	0	0	0	0	13.0	26.0	39.0	45.5	52	52	52	52
9000	0	0	0	0	0	0	0	0	12.5	25.0	37.5	43.8	50	50	50	50

K is Proportional correction to WG duty cycle, it adds a correction value to the channel value (which is cpc duty cycle) based on the boost error calculated in map I. the Y axis is boost error (custom map I) and the x axis is the boost tagret (custom map H), this map is only active when it gets to a positive boost pressure.


37805-RSP-E030-23773-FI-ExampleROM-ECUconnectCLboost-enc.bin - Custom Map K

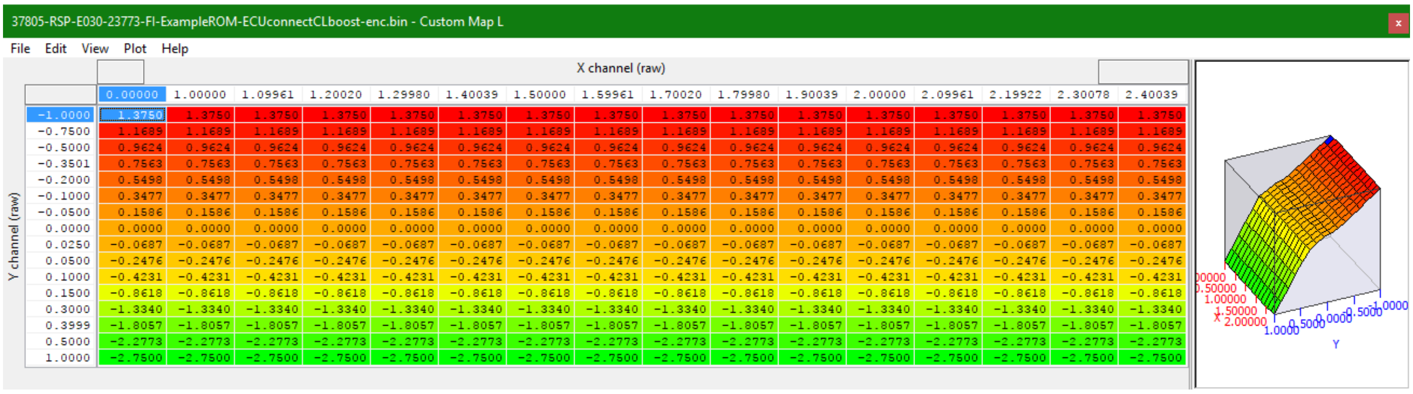
File Edit View Plot Help

X channel (raw) | 0.00000 | 50.00 raw

Y channel (raw)

-1.0000	0.00000	1.00000	1.09961	1.20020	1.29980	1.40039	1.50000	1.59961	1.70020	1.79980	1.90039	2.00000	2.09961	2.19922	2.30078	2.40039
-1.0000	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00
-0.7500	42.50	42.50	42.50	42.50	42.50	42.50	42.50	42.50	42.50	42.50	42.50	42.50	42.50	42.50	42.50	42.50
-0.5000	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
-0.3501	27.50	27.50	27.50	27.50	27.50	27.50	27.50	27.50	27.50	27.50	27.50	27.50	27.50	27.50	27.50	27.50
-0.2000	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
-0.1000	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64
-0.0500	5.77	5.77	5.77	5.77	5.77	5.77	5.77	5.77	5.77	5.77	5.77	5.77	5.77	5.77	5.77	5.77
0.0000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.0250	-2.50	-2.50	-2.50	-2.50	-2.50	-2.50	-2.50	-2.50	-2.50	-2.50	-2.50	-2.50	-2.50	-2.50	-2.50	-2.50
0.0500	-10.80	-10.80	-10.80	-10.80	-10.80	-10.80	-10.80	-10.80	-10.80	-10.80	-10.80	-10.80	-10.80	-10.80	-10.80	-10.80
0.1000	-19.25	-19.25	-19.25	-19.25	-19.25	-19.25	-19.25	-19.25	-19.25	-19.25	-19.25	-19.25	-19.25	-19.25	-19.25	-19.25
0.1500	-29.25	-29.25	-29.25	-29.25	-29.25	-29.25	-29.25	-29.25	-29.25	-29.25	-29.25	-29.25	-29.25	-29.25	-29.25	-29.25
0.3000	-40.78	-40.78	-40.78	-40.78	-40.78	-40.78	-40.78	-40.78	-40.78	-40.78	-40.78	-40.78	-40.78	-40.78	-40.78	-40.78
0.3999	-57.03	-57.03	-57.03	-57.03	-57.03	-57.03	-57.03	-57.03	-57.03	-57.03	-57.03	-57.03	-57.03	-57.03	-57.03	-57.03
0.5000	-83.06	-83.06	-83.06	-83.06	-83.06	-83.06	-83.06	-83.06	-83.06	-83.06	-83.06	-83.06	-83.06	-83.06	-83.06	-83.06
1.0000	-100.00	-100.00	-100.00	-100.00	-100.00	-100.00	-100.00	-100.00	-100.00	-100.00	-100.00	-100.00	-100.00	-100.00	-100.00	-100.00

L is Integral correction to WG duty, it calculates the integral value and adds it to the channel value (which is cpc duty cycle) based on the boost error calculated in map I. the Y axis is boost error (custom map I) and the x axis is the boost target (custom map H), this map is only active when it gets to a positive boost pressure and it has limits set to +5% and -50%.


37805-RSP-E030-23773-FI-ExampleROM-ECUconnectCLboost-enc.bin - Custom Map L

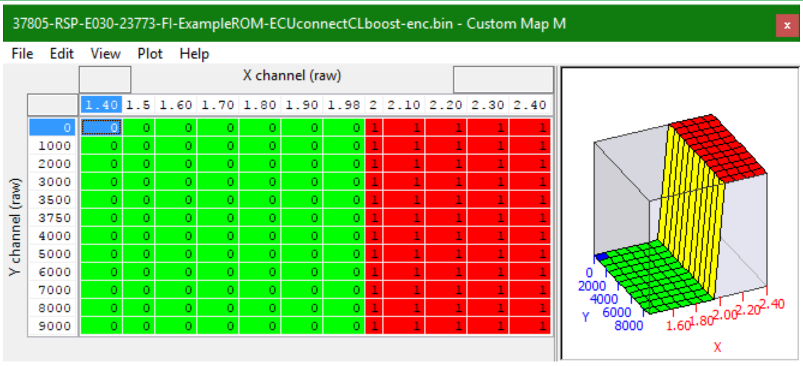
File Edit View Plot Help

X channel (raw)

Y channel (raw)

	0.00000	1.00000	1.09961	1.20020	1.29980	1.40039	1.50000	1.59961	1.70020	1.79980	1.90039	2.00000	2.09961	2.19922	2.30078	2.40039
-1.0000	1.3750	1.3750	1.3750	1.3750	1.3750	1.3750	1.3750	1.3750	1.3750	1.3750	1.3750	1.3750	1.3750	1.3750	1.3750	1.3750
-0.7500	1.1689	1.1689	1.1689	1.1689	1.1689	1.1689	1.1689	1.1689	1.1689	1.1689	1.1689	1.1689	1.1689	1.1689	1.1689	1.1689
-0.5000	0.9624	0.9624	0.9624	0.9624	0.9624	0.9624	0.9624	0.9624	0.9624	0.9624	0.9624	0.9624	0.9624	0.9624	0.9624	0.9624
-0.3501	0.7563	0.7563	0.7563	0.7563	0.7563	0.7563	0.7563	0.7563	0.7563	0.7563	0.7563	0.7563	0.7563	0.7563	0.7563	0.7563
-0.2000	0.5498	0.5498	0.5498	0.5498	0.5498	0.5498	0.5498	0.5498	0.5498	0.5498	0.5498	0.5498	0.5498	0.5498	0.5498	0.5498
-0.1000	0.3477	0.3477	0.3477	0.3477	0.3477	0.3477	0.3477	0.3477	0.3477	0.3477	0.3477	0.3477	0.3477	0.3477	0.3477	0.3477
-0.0500	0.1586	0.1586	0.1586	0.1586	0.1586	0.1586	0.1586	0.1586	0.1586	0.1586	0.1586	0.1586	0.1586	0.1586	0.1586	0.1586
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0250	-0.0687	-0.0687	-0.0687	-0.0687	-0.0687	-0.0687	-0.0687	-0.0687	-0.0687	-0.0687	-0.0687	-0.0687	-0.0687	-0.0687	-0.0687	-0.0687
0.0500	-0.2476	-0.2476	-0.2476	-0.2476	-0.2476	-0.2476	-0.2476	-0.2476	-0.2476	-0.2476	-0.2476	-0.2476	-0.2476	-0.2476	-0.2476	-0.2476
0.1000	-0.4231	-0.4231	-0.4231	-0.4231	-0.4231	-0.4231	-0.4231	-0.4231	-0.4231	-0.4231	-0.4231	-0.4231	-0.4231	-0.4231	-0.4231	-0.4231
0.1500	-0.8618	-0.8618	-0.8618	-0.8618	-0.8618	-0.8618	-0.8618	-0.8618	-0.8618	-0.8618	-0.8618	-0.8618	-0.8618	-0.8618	-0.8618	-0.8618
0.3000	-1.3340	-1.3340	-1.3340	-1.3340	-1.3340	-1.3340	-1.3340	-1.3340	-1.3340	-1.3340	-1.3340	-1.3340	-1.3340	-1.3340	-1.3340	-1.3340
0.3999	-1.8057	-1.8057	-1.8057	-1.8057	-1.8057	-1.8057	-1.8057	-1.8057	-1.8057	-1.8057	-1.8057	-1.8057	-1.8057	-1.8057	-1.8057	-1.8057
0.5000	-2.2773	-2.2773	-2.2773	-2.2773	-2.2773	-2.2773	-2.2773	-2.2773	-2.2773	-2.2773	-2.2773	-2.2773	-2.2773	-2.2773	-2.2773	-2.2773
1.0000	-2.7500	-2.7500	-2.7500	-2.7500	-2.7500	-2.7500	-2.7500	-2.7500	-2.7500	-2.7500	-2.7500	-2.7500	-2.7500	-2.7500	-2.7500	-2.7500

M is Boost Cut, this map sets the minimum value output of the fuel cut flag channel (use the “use as minimum channel value” output as the replace function overwrites rev limiters stopping them from working correctly). It is only active when it hits the boost limit and has a 1 second deactivation delay.

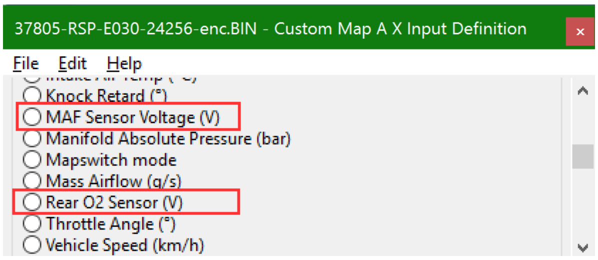


There are many other compensations for AIT and wheel slip etc that could be added however for this example it has been kept as simple as possible.

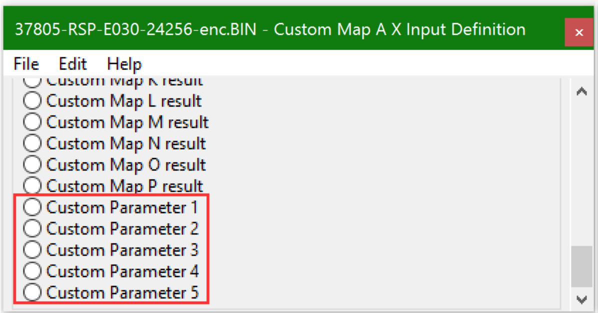
Auxiliary Inputs & Outputs

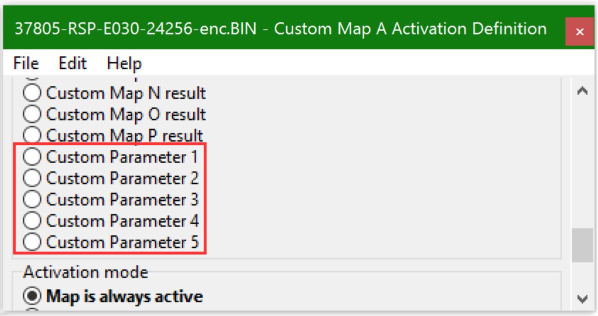
Custom Maps Inputs

The RaceROM custom code allows you to hijack 2x ECU Voltage Inputs (0-5V), these can be used to import sensor signals into custom maps and extend the functionality of the ECU. These two inputs are found in the custom maps axis input maps as per other vehicles. The two inputs to custom maps are input through the MAF sensor voltage (with the MAF removed, DTCs disabled and running full time SD) as below and the Rear O2 sensor signal with the Rear Oxygen sensor removed and the DTCs disabled.

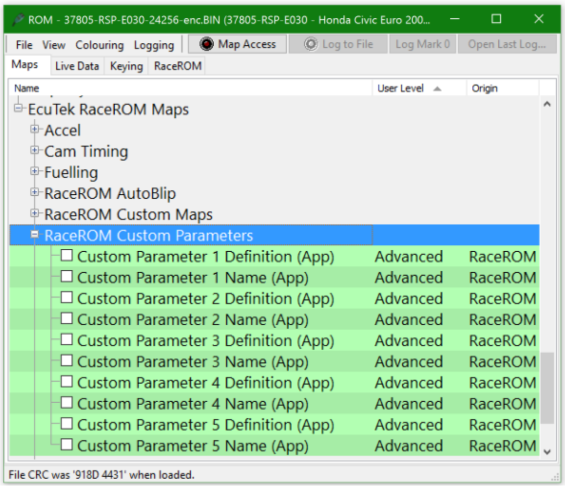


There are also Customisable Channels that interact with the EcuConnect App. These are set up in the ROM and interpreted by the app on a mobile device over Bluetooth. These values can be used as an axis and are customisable as per the feature set up. To import a custom Parameter into a custom map simply choose it as one of the axis values or activation definition parameters.





Setting up the parameters is covered in a later section but they are found in the RaceROM Custom Parameters tree in the ROM



Custom Map Outputs

RaceRom Custom maps can output to any available channel defined in the ECU, this means that you can make adjustments for AFR target, Fuel cut or camshaft advance. This allows you to compensate for many different engine and running conditions and can assist in tuning the vehicle.

Custom maps also allows for 1x ECU Output Solenoid Driver (Frequency Based) by repurposing the factory CPC (Carbon Purge Canister) output, this is covered in the previous section of the manual regarding boost control. The outputs can be modify the output channel value by

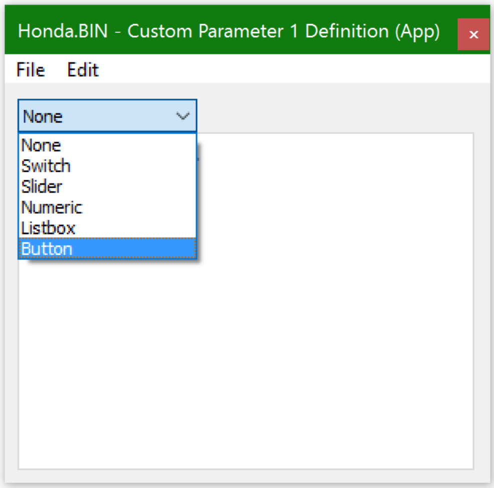
- Replacing the value totally (be wary of these as they can stop other functions from working)
- An addition or multiplication of the current value
- It can be used to cap the minimum or maximum of the channel (useful for limiting boost targets etc)
- An integral value can be calculated using the output which can then be added or multiplied by the channel value.

There are advantages and disadvantages to each method and they should be selected with caution and understanding. There are more details on what the outputs do and how to use them in the Custom maps manual.

Custom Parameters

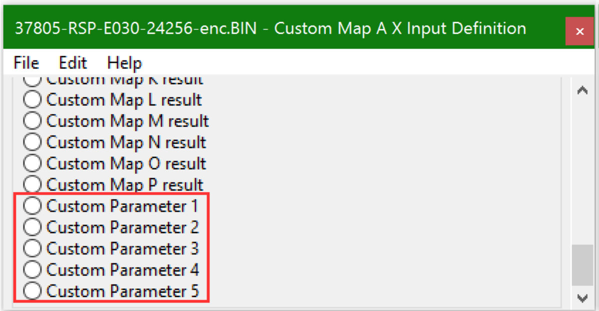
Custom Parameters provides five new inputs into the ECU that can be adjusted using an iOS device, these can be used to adjust Custom Maps. Though at first this ground breaking feature may seem difficult to understand and you may not comprehend the 'how and why' you might use these features the reality is they provide the ability to control features and functions in the factory ECU that were never before possible, and all controlled using a iPhone (or iPad/Android Device).

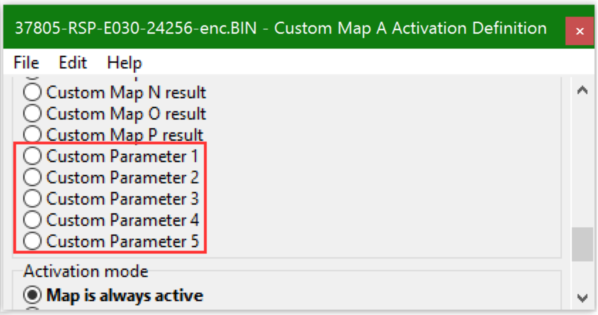
The five inputs are configured using ProECU and can be setup as a Switch, Slider control, a Numerical value, a List Box, or a Momentary Button.



Each of the 5 Custom Parameters have a Definition option – to define how the Custom parameter will work and a Name box where the description for the map can be written and this will be displayed in ECU Connect under the specific custom feature.

Each Custom Parameter, once configured, could be used a Custom Map Input Axis value or even as a Custom Map Activation Definition, see below.





So for Activation, when using ECU Connect and a switch is 'enabled' or a 'slider' moved to a certain position and its 'above or below' a threshold then a certain Custom Map would become active.

Equally the Custom Parameter input into a Custom Map could adjust the Ignition, the fuelling, the Inlet or Exhaust cam timing (or both at the same time), it could add a fuel cut flag to act as a safe mode. Custom Parameters makes the following features possible,

- Adjustable Boost – set min/max boost with driver-adjustable slider control
- Adjustable Traction Control – use a slider control for live variation of TC gain
- Live Adjustments – use slider or numerical control to add/remove ignition timing, adjust fuelling, vary cam timing or alter custom map outputs
- Live Adjustment – of the power output, also engage the CPC solenoid
- Valet Mode – turn this ON or OFF using your handheld device

All these features and many more can be created in Custom Maps and adjusted and controlled using your iOS device, the limitation is simply your imagination. Here are some examples of what is possible:

- Turn the VTEC ON and OFF whenever you like
- Configure a pit lane Speed Limiter and even import a gear level switch to enable the map
- Add and remove Ignition Timing
- Adjust the weighting factor on a throttle and/or ignition based traction control
- Adjust the maximum allowed boost pressure using the slider

If you would like further examples of various custom input parameter set-ups either contact support@ecutek.com or view the knowledgebase at https://ecutek.zendesk.com/hc/en-gb.

5. ECU Programming

General programming information

The Honda CAN ECU is reprogrammed via OBD using ProECU, the process can be carried out using the factory programming method which takes 7-8 minutes, or with EcuTek's proprietary FastFlash method after a suitable RaceROM equipped file is initially flashed to the ECU.

Programming Method

Prerequisites:

- Make sure the battery is fully charged and in good condition, standard ECM programming takes 7-8 minutes!
- Make sure all ancillaries are turned off before programming, please ensure the following :
    - Interior Fan Blower turned OFF (PUSH the Heater Blower knob to turn OFF)
    - Headlights OFF (exception of Daylight Running Lights)
    - Gear Lever selector in PARK position or in Neutral
- If the above conditions are not met then programming may fail to start or possibly fail during programming.
- Ensure the correct ECU type is selected either by selecting from the ProECU pulldown menu **Tools->Detect Vehicle** or **Tools->Manually Select Vehicle** or in some cases **Tools->Manually Select Single ECU**

Programming

- Select **Program Engine ECU** from either the Detect/Manually Select Vehicle pop-up window or from the **Tools-> Manually Select Vehicle ->Honda CAN** pulldown menu option.
- Ensure you have your required ROM file, it can be dragged to the programming window, or opened directly using the **Choose Rom File** button (by default ProECU automatically selects the last rom you opened/closed).
- Select the **Program ECU** button on the programming window.
- The ECU reprogramming progress can be seen in the bottom left corner of the programming window and progress displayed by the Coolant Temp gauge on the Driver Instrument Display.
- Once programmed, follow the instructions to switch the ignition off and on in order to fully clear the DTCs.

Notes

- If the ECU cannot be programmed it may be possible it has another software product already installed (married), uninstall the product before programming the ECU with EcuTek. If you cannot uninstall (un-marry) the device then contact EcuTek support for further guidance.
- We cannot guarantee compatibility with other products on other modules.
- To install a standard ROM back into the ECU, simply choose the stock ROM from the Honda Civic ROM folder, C:\EcuTek\ProECURomFiles\Honda\Civic. If you wish to completely remove all licence information (which cannot be credited back to your licence key) then contact EcuTek for guidance.

Failed Flash recovery

The ECU can be recovered if part programmed, though a licence might be lost. The ECU will NOT communicate in a part programmed situation so the ECU type or vehicle type will need to be manually selected from the ProECU menu. It's **VERY IMPORTANT** to select the correct ECU or vehicle type for the recovery. Once you have selected the programming window manually you can query the ECU which may be identified as part programmed allowing you to program with the appropriate ROM. If you have further problems first try to disconnect the battery for a short while (5mins) then re-attach the battery and try the programming sequence again. If you have further problems, then send your ProECU .log file to EcuTek for analysis (*C:|EcuTek|ProECU-Honda.log*).

FastFlash Programming

FastFlash (FF) will be enabled when a FF enabled RaceROM patch is flashed to the ECU. This means the first time you program with a FF enabled ROM the programming sequence and programming time may seem slow. Subsequent programming events will use Fast Flash. The minimum programming time is approximately 20 seconds on a Honda ECU and FF will always reprogram blocks 8 and 11. More changes will require more blocks to be reprogrammed taking additional time.

The programming sequence is exactly as described above.

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

FastFlash Failed Flash Recovery

FastFlash has been tested to ensure that it will not “brick” the ECU 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 using the normal sequence and ensuring all the normal prerequisites are met.

6. Questions and Answers

Can I put X ROM in My vehicle ?

We recommend using the original ROM that came with the vehicle if there are newer revisions like M120 and the M220 you may be able to swap these.

My car does not have cruise control can I still map switch?

It may be possible to wire cruise control switches into the ECU but it hasn't been proven at EcuTek, the ECU Connect App and Bluetooth interface can be used for map switching so ECU Connect may be the easier solution

My car does not have a top clutch switch can I still use FFS and Auto Blip?

We think that it may be possible to wire in a clutch switch, however we have not tried this and cannot guarantee that the feature will work.

Can I remove the MAF sensor totally?

Yes, though the car will need to use speed density full time to calculate the engine load.

What do the ignition values mean?

See the ignition timing section of the manual but ignition timing is the actual ignition advance set by the ECU, it can be viewed in ProECU or ECU Connect live data or dashboards.

Can I adjust the tune live?

We do not have the ability to "live tune" with ProECU, you can make adjustments to ignition and cam timing as well as AFR target live with ECU connect though which may help speed up the tuning process.

How much extra HP will a tune create?

This depends on the tuner and hardware installed on the vehicle but we have seen tuners exceed 400hp from built engines with turbo conversions.

My car does not display wheel speeds?

Some models do not broadcast wheel speed values over the can bus, we are not sure if speed sensors are not physically installed on the affected vehicles or if the ABS unit does not broadcast the data, currently we do not have a solution for this.

Can I change the final drive ratio and recalibrate the dash?

We do not currently have the ability to adjust for speed and gear ratio's in the ECU, research is underway and hopefully we will have a solution soon.

7. Technical Support

What we Support

Bug Fixes

EcuTek provides technical support for ProECU Honda. This means that we will endeavour to fix any bugs that you find in the software. If a feature doesn't work as described, then please contact us so that we can make any changes required.

ECU Additions

We will add support for newly released or reported ECU versions, as and when they are made available – the turnaround time for adding new ECU type can be up to 7 days but is usually faster.

Updates must be tested prior to release, so do not call us on the day when you have a car with a brand new ECU in for tuning. Be organised – when scheduling a car for tuning, you will always take details of its specification, so find out in advance what type of ECU it contains. There will then be no mad rush when the car arrives on your premises.

What is NOT Supported

Basic Tuning Tuition

EcuTek ECU Software is provided on the understanding that you are an experienced tuner. As such, you should already be familiar with the principles of engine tuning. This means that we do not provide support on tuning questions, such as 'what boost pressure should I run with an xxx turbo?' or 'what AFR should I run at xxx RPM and yyy boost pressure?' – That is for you to decide. We are here to make your job possible, not do your job for you! If we 'costed in' this kind of support, the experienced tuner would end up subsidising the others.

Contacting EcuTek for Technical Support

Technical support via email to support@ecutek.com can often be the best way to start as emails may be routed to the individual best placed to reply to them. Most often the information required to solve a problem or give tuning help is best conveyed in document form, by initiating contact via email a chain of events can be established.

When submitting your support request, please try and include the ROM(s) file you are using and logs of the car driving, ideally logs taken while the car exhibits the problem.

Each support enquiry is handled from start to finish using Zendesk and all the available support engineers at EcuTek can see all the enquiries throughout the process. You can also register for free on our Zendesk support portal to track all of your tickets individually.

8. 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