

## ProECU Nissan GT-R



## Tuning Guide 2008-onward Model Year

v1.70

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# 1. ECU Map Descriptions

Please note that map names are shown in **bold**.

Live Data parameters can be used for Data Logging and are shown in *italic*.

## 1.1. Fuel Control

Live Data related parameters:

AFR Sensor V (Volts)

Air Fuel Ratio (AFR) #1 - #2

Air Fuel Ratio Target

Injector Pulse Width (ms)

Fuel Trim Short Term (%) #1 - #2

Fuel Trim Long Term (%) #1 - #2

Injector Duty #1 - #2

### Fuel Map MODE1 to MODE4

The Nissan GTR fuel control is fully closed loop from Idle all the way to the rev limiter (including light load and full load). The fuel map contains an AFR TARGET based on Engine Speed (RPM) and Calculated Engine Load (%).

The vehicle has two factory fitted wideband sensors (one for bank 1 and another for bank 2). The ECU uses *Fuel Trim Short Term* Bank 1 and Bank 2 to ensure the target AFR is achieved. Further to this the *Fuel Trim Long Term* Bank 1 & 2 will make long term adaption trim for continuous Short Term Fuel Trim corrections.

The RaceROM Map Switching feature allows you to define four different calibrations in the ECU ROM. A separate fuel map is provided for each mode.

The four separate fuel maps are 26x19 in size providing 200% more resolution than the factory 16x16 fuel map (that is no longer used).

Engine Speed (RPM)	7.45	13.7	20.0	26.3	29.4	32.5	35.7	38.8	42.0	45.1	51.4	57.6	63.9	70.2	76.5	82.7	100	110	120	130	140	150	160	170	180	190
4000	100.00																									11.8 target afr
800	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7
1200	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7
1600	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7
2000	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7
2400	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7
2800	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7
3200	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7
3600	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7
4000	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7
4400	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7
4800	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7
5200	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7
5600	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7
6000	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7
6400	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7
6800	13.4	13.4	13.3	13.3	12.5	12.1	12.0	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8
7200	13.4	13.3	13.1	12.5	12.5	12.1	12.0	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8
7600	13.4	13.1	12.5	12.5	12.5	12.1	12.0	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8
8000	13.1	12.5	12.5	12.5	12.5	12.1	12.0	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8

**NOTE:** The factory 16x16 Fuel map is no longer used.

Engine Speed (RPM)	13.7	20.0	26.3	32.5	35.7	38.8	42.0	45.1	51.4	57.6	63.9	70.2	75.3	80.4	90.2	100
800	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7
1200	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7
1600	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7
2000	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7
2400	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7
2800	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7
3200	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7
3600	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7
4000	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7
4400	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7
4800	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7
5200	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7
5600	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7
6000	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7
6400	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7
6800	13.4	13.3	13.3	12.1	12.0	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8

## Fuel Map Safe Mode

This AFR target fuel map is used during Safe Mode.

## AFR Target – Max at WOT

This is the leanest AFR Target permitted for a given RPM when at WOT. Of the values returned by this map and the main 3d fuel map(s), the richest value will be used by the ECU. Raising the values in this map prevents rich AFR Targets interfering with the intended target AFR typically used on high power cars with catalysts removed. Setting all the values in this map to 14.7 will completely disable the effect.

## AFR Conversion Table B1/B2

These two maps, one for each bank, are used internally by the ECU to convert values in the main fuel map to bank specific AFR targets. The units are Equivalence Ratio and can be converted to AFR by dividing 14.7 by the values in the table, for example 1.00 gives an AFR of 14.7:1 and 1.336 gives an AFR of 11:1.

By default they do not give an output identical to the input, and it is different between each bank, and they typically translate values from the fuel maps at high load to slightly richer targets. To nullify this effect, set that the data values to exactly equal the input values, but be aware that the result is that the reported AFR target and AFR logging parameter will not match when long and short term fuel trims are 100 (no trimming).

**NOTE:** As the AFR logging parameters will generally read leaner than the actual AFR the vehicle runs we advise that a wideband sensor should always be used for accurate calibration.

## Fuel Enrichment Safe Mode (Early Gen 1 models only)

This is the fuel enrichment factor added when the ECU is in Safe Mode to protect the engine.

## Per Cylinder Fuel Trim

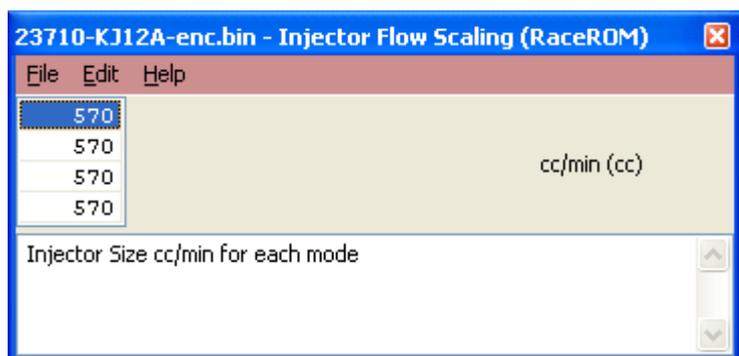
This map can be used to add extra fuel to certain cylinders.

## Injector Flow Scaling (RACEROM)

This map defines the injector size for each of the 4 different modes.

You can select Injector scaling values for each of the four Map Switch modes. This is useful if alternate fuels are used. When using E85 you can simply reduce the Injector scaling size by 30% and the fuelling will deliver +30% more injection volume.

The top value is MODE 1 the bottom value is MODE 4



If the Injectors are to be replaced then choose at least 800cc plus size injectors.

Ecutek can supply the high quality Bosch Motorsport Injectors that are 1050cc (good for 1000+bhp) and they are tried and tested and they do not suffer from some of the Idle and black smoke issues that some other brands do.

## Injector Lag Time Multiplier and Offset

This should be used to recalibrate for larger fuel injectors. This is sometimes called injector dead time or injector latency.

Different design fuel injectors will have a different response time to the original injectors so always check with the Injector manufacture if this information is available before purchasing. EcuTek offer the tried and tested 1050cc Bosch Motorsport Injectors that have better characteristics than the stock injectors! When using our injectors the multiplier is unchanged but the offset is increased to 1ms.

### Injector Minimum Open Time

This value may need to be reduced when fitting larger injectors over 900cc, we suggest around 1ms.

### Fuel Consumption Meter Calibration

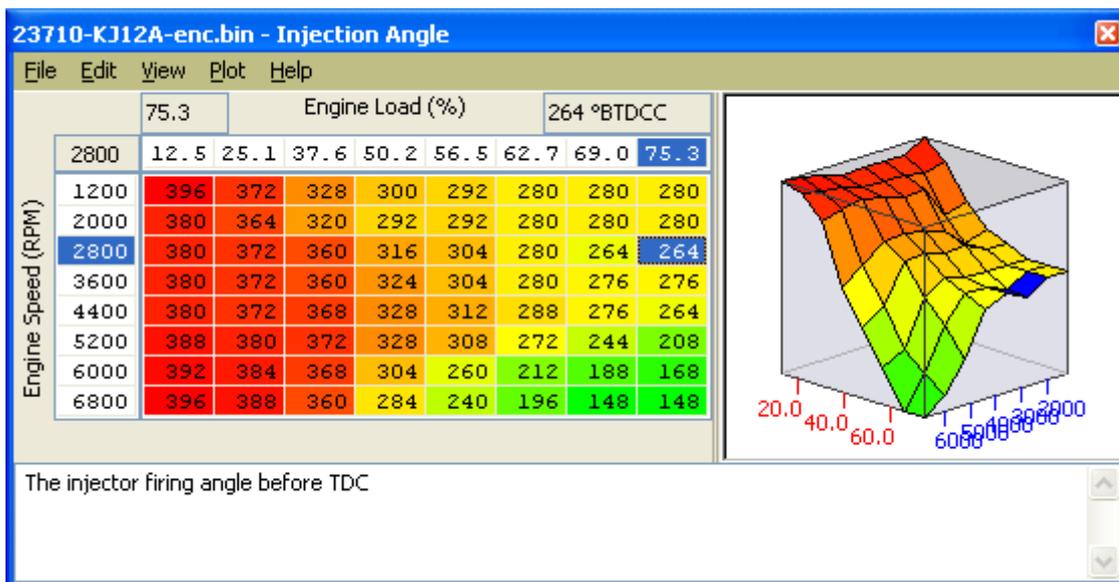
This value should be increased if larger injectors are fitted to keep the fuel consumption display accurate on the instrument cluster. Set the value the same as your Injector size.

### AF Learning Range RPM - Load

These are the breakpoints for the adaptive Fuel Trim Long Term stored correction values that are learnt over time. These can be adjusted to help calibrate Fuel Trim more accurately during tuning.

### Injection Angle

This shows the injector firing angle before TDC, increasing these values by around 40-60deg during spool and peak torque can help avoid black smoke, this can become more apparent where larger injectors and more increased cam advance has been used.



# 1.2. Ignition Control

Live Data related parameters:

Ignition Timing (Deg)

Ignition Timing Calculated (Deg)

Knock Correction (Deg)

Knock Sensor Cyl #1 - #6

Knock Threshold Cyl #1 - #6

## Ignition Timing MODE1 to MODE4

The map specifies ignition timing in degrees BTDC based on Engine Speed (RPM) and Calculated Engine Load (%).

The latest phase 3 or 4 RRFF (ver.12738 or newer) does not use the complex factory Mode A and B Ignition maps. These maps can be found under the category IGNITION TIMING > FACTORY - NOT RECOMENDED if an older RRFF version is being used.

The factory ignition maps have been replaced by four larger and more simplistic to understand versions and a map is provided for each of the four map switch modes (Mode 1- 4).

23710-KJ12A-enc.bin - Ignition Timing MODE 1

		Engine Load (%)																			10 °							
		100.00																										
		4000	6.27	12.5	18.8	25.1	31.4	37.6	43.9	50.2	56.5	62.7	69.0	75.3	81.6	87.8	94.1	100	110	120	130	140	150	160	170	180	190	200
Engine Speed (RPM)	800	17	18	20	18	10	3	-2	-4	-5	-5	-7	-9	-10	-11	-13	-14	-14	-15	-16	-17	-17	-18	-19	-20	-20	-21	
	1200	18	20	20	22	15	14	3	1	-1	-1	-3	-4	-5	-6	-6	-7	-8	-8	-9	-10	-11	-12	-13	-13	-14	-15	
	1600	35	35	45	31	25	17	14	11	5	2	0	-2	-4	-5	-6	-7	-8	-8	-9	-10	-11	-12	-13	-13	-14	-15	
	2000	50	43	50	38	30	22	18	14	10	9	6	4	0	-2	-1	-2	-4	-4	-5	-7	-8	-9	-10	-11	-12	-14	
	2400	50	50	50	37	31	24	22	19	14	11	9	7	6	5	3	2	1	0	-2	-4	-5	-7	-8	-9	-11	-13	
	2800	46	46	46	42	31	26	24	22	20	15	14	13	12	10	8	7	5	4	2	-1	-2	-4	-5	-7	-9	-12	
	3200	46	46	46	42	33	29	27	25	23	19	17	15	14	12	10	8	6	5	2	0	-1	-4	-5	-7	-9	-11	
	3600	46	46	46	42	33	31	29	25	23	21	18	16	15	13	11	9	7	6	3	1	0	-3	-4	-6	-8	-10	
	4000	46	46	46	43	33	31	29	26	23	21	20	18	16	14	12	10	8	6	4	2	0	-2	-4	-6	-8	-10	
	4400	46	46	46	43	33	31	29	27	24	22	20	19	17	15	13	11	8	7	5	2	0	-2	-3	-6	-8	-9	
	4800	46	46	46	43	34	32	29	27	24	22	20	19	17	15	13	11	9	7	5	2	1	-1	-3	-5	-7	-8	
	5200	46	46	46	43	35	33	30	28	25	23	22	20	18	16	14	12	10	8	6	4	2	0	-2	-4	-6	-8	
	5600	46	46	46	43	36	33	31	29	28	26	24	22	20	18	16	14	12	10	7	5	4	1	-1	-3	-5	-7	
	6000	46	46	46	43	37	35	33	30	29	27	25	23	21	19	17	15	13	11	9	7	5	3	1	-1	-3	-6	
	6400	46	46	46	43	37	35	33	31	29	27	25	23	21	19	17	15	13	11	9	7	5	3	1	-1	-3	-5	
	6800	43	43	43	43	37	35	33	31	29	27	25	23	21	19	17	15	13	11	9	7	5	3	1	-1	-3	-5	
7200	43	43	43	43	37	35	33	31	29	27	25	23	21	19	17	15	13	11	9	7	5	3	1	-1	-3	-5		
7600	43	43	43	43	37	35	33	31	29	27	25	23	21	19	17	15	13	11	9	7	5	3	1	-1	-3	-5		
8000	43	43	43	43	37	35	33	31	29	27	25	23	21	19	17	15	13	11	9	7	5	3	1	-1	-3	-5		

23710-KJ12A-enc.bin - Ignition Timing Mode A1 Adj Warm

		Engine Load (%)																			-12 °					
		100.00																								
		4000	6.27	12.5	18.8	25.1	31.4	37.6	43.9	50.2	56.5	62.7	69.0	75.3	81.6	87.8	94.1	100								
Engine Speed (RPM)	400	0	-1	1	3	-4	-6	-9	-9	-9	-7	-9	-10	-10	-10	-12	-12									
	800	-5	-6	-4	-4	-12	-15	-16	-15	-13	-13	-13	-13	-13	-13	-14										
	1200	-2	-4	-3	-3	-10	-13	-15	-17	-17	-15	-15	-16	-16	-16	-17	-18									
	1600	0	-1	0	0	-4	-8	-12	-14	-16	-14	-14	-14	-14	-14	-15	-17									
	2000	1	1	2	1	-3	-7	-7	-10	-12	-11	-12	-12	-13	-13	-15	-16									
	2400	2	2	3	1	-2	-5	-5	-7	-9	-8	-9	-10	-10	-11	-13	-15									
	2800	2	3	4	3	-1	-3	-4	-6	-7	-6	-7	-8	-9	-9	-12	-13									
	3200	3	4	4	3	-1	-2	-2	-4	-3	-4	-5	-7	-8	-8	-10	-11									
	3600	3	4	4	3	0	-1	-2	-4	-2	-3	-6	-7	-8	-8	-10	-12									
	4000	2	2	2	1	-1	-2	-3	-5	-4	-4	-4	-5	-6	-7	-10	-12									
	4400	0	1	1	-1	-4	-5	-5	-7	-7	-7	-6	-7	-9	-10	-12	-14									
	4800	0	1	-2	-2	-4	-6	-6	-7	-6	-5	-5	-8	-10	-12	-14										
	5200	2	2	-1	-1	-4	-4	-4	-5	-5	-5	-4	-4	-6	-9	-11	-13									
	6000	4	4	2	1	-2	-3	-3	-4	-4	-4	-4	-4	-7	-8	-10	-12									
	6400	4	4	3	1	-2	-3	-4	-4	-4	-3	-4	-4	-5	-7	-10	-12									
	6800	4	4	3	1	-2	-3	-4	-5	-5	-5	-5	-5	-6	-8	-11	-12									

These superior Ignition maps offer the following advantages:

Real Ignition Timing values.

High-power high-resolution ignition maps rescaled for over 1000bhp.

New 26x19 ignition maps provide 200% greater resolution than the stock 16x16 maps providing more accurate calibration at high RPM and high load.

Up to 8000% more resolution over the stock Nissan map axis scaling providing unparalleled smoothness and drivability.

Dynamic advance feature retained on Gen 2 models.

Dedicated intake air temp compensation.

Factory knock control retained, along with all other factory Ignition corrections.

The Ignition Timing is calculated in the following order:

Ignition Timing looked up from one of the four Ignition maps (Ignition Timing (MODE 1 to MODE 4)

Ignition Timing Intake Air Temp compensation is applied (IAT)

Other compensations and corrections are applied as normal (like cold start, gearshift, overrun, Idle and transient conditions).

Knock Correction amount is applied and this can be retard as well as advance on Gen 2 models

Detonation should always be listened for even though the ECU will remove Ignition timing if detonation occurs. This is shown under Live Data in Ignition Degrees as the **Knock Correction value**.

### **Ignition Timing IAT Comp (RaceROM)**

This map should be used to advance and retard the Ignition timing based on Intake Air Temperature, it should also be used when running a 'blow through' MAF setup when IAT measures Charge Air Temp or when Speed Density is enabled.

### **Knock Control Enable Cold – Warm - Safe**

This map can be used to turn the knock control ON/OFF at different RPM/Engine Loads when the engine is cold (below 60 Deg C), warm (above 81 Deg C) or in Safe mode. See RaceROM maps below for better control.

### **Knock Control Enable (RaceROM)**

These maps are available for Phase 4 RRFF (version 14389 or newer), they can be used to turn the knock control ON/OFF in each of the different map switch modes and they replace the factory OEM maps shown above.

### **Knock Sensitivity**

This per cylinder threshold map is the point where knock correction will become active for each cylinder. If the values against RPM are breached then the knock correction parameter will start to show knock retard.

Built engines often generate excessive engine noise that can be detected as knock, raising these values will help prevent this being detected as knock though care must be taken that the sensitivity will still show true knock! The centre two cylinders are noisier due to cylinders either side (1-3 or 4-6) so the noise thresholds are higher.

**NOTE:** *the logging rate cannot capture all knock events so use with caution and understanding!*

## 1.3. Boost Control

---

Live Data related parameters:

- *Boost B1/B2*
- *RBC Maximum Desired Boost*
- *Boost Target*
- *Boost Error*
- *Manifold Relative Pressure (Intake Manifold sensor)*
- *Desired Turbine Wheel Airflow*
- *Calculated Airflow*
- *Turbo Dynamics Proportional*
- *Turbo Dynamics Integral*
- *Turbo Dynamics Sum*
- *Surplus Airflow*
- *Desired Wastegate Flow*
- *Wastegate Angle Initial*
- *Wastegate Angle Correction*
- *Wastegate Angle*

EcuTek have rewritten the entire GTR Boost Control for the Phase 5 RaceROM Feature File Update, see the boost control tuning section 6 later in this manual for full details, we do NOT recommend the factory boost control maps are used for tuning.

### Boost Target (RACEROM)

Shows the target boost pressure to try and achieve for an Accel Pedal position and Engine Speed.

### Boost Target Max Allowed

This allows you to reduce the target boost pressure depending on the coolant temperature.

### Desired Turbine Wheel Airflow

This map must be calibrated to the characteristics of the turbo. Once set, desired boost can be adjusted via the **Desired Boost** map. This map will need to be modified if larger turbos are fitted. It will also need to be modified if the flow of the exhaust, intakes or intercooler are improved.

### Turbo Dynamics - Integral Step

This shows the Integral component value added to output of the *Surplus Airflow* value in proportion to the size of the current boost error. Note the factory map does very little to correct a boost error at lower airflow! (It only corrects midrange boost error). Only at higher airflow will the factory Integral values make a reasonable adjustment to wastegate duty correction.

Raising these values too high will make the boost unstable.

This Integral value is continuously added for any boost error.

### Turbo Dynamics - Proportional

This shows the Proportional component value added to output of the *Surplus Airflow* value in proportion to the size of the current boost error. Note the factory map does very little to correct a boost error at lower airflow! (It only corrects midrange boost error). Only at higher airflow will the factory Proportional values make a reasonable adjustment to wastegate duty correction. Raising these values too high will make the boost unstable. The Proportional value is a fixed value correction that is added to the *Surplus Airflow* and this will not increment like the Integral value.

## Turbo Dynamics – Sum

This Live Data parameter shows the Integral and proportional components combined addition. Consistently high positive values suggest the *Desired Turbine Wheel Airflow (DTWA)* values should be reduced (overboost condition), negative values suggest Target Boost is not reached and DTWA values should be increased to reach the Target Boost.

## Wastegate Angle to Duty Cycle

This map is the final wastegate duty that will be used by the ECU depending on the current boost pressure and the desired wastegate valve angle. These values can be reduced by 50%+ on vehicles fitted with stronger actuators (1bar+) and/or larger turbos.

## Boost Limit (RaceROM) and Boost Limit Resume (RaceROM)

The ECU will cut the Fuel Injectors if the Boost pressure (in Bar Absolute) exceeds the value in the **Boost Limit** map for a given atmospheric pressure. The Fuel Injectors will restore at the corresponding pressure shown in the **Boost Limit Resume** map.

**NOTE:** The factory maps called Desired Boost and Desired Boost compensation are no longer used.

## 1.4. Intake VVT

---

Live Data related parameters:

Intake VVT Bank #1 - #2

These four maps (MODE1 to MODE4) control the angle of the intake cam (note that 1 degree at the camshaft is 2 degrees at the crankshaft). This number is in camshaft degrees before Top Dead Centre.

The RaceROM Map Switching feature allows you to define four different calibrations in the ECU ROM. A separate Inlet VVT map is provided for each mode.

Modifying the cam timing map can increase power and turbo response, but too much advance can significantly increase in cylinder pressures. This is dependent on Camshafts, Turbocharger and naturally any item which will change. Increasing to 28-32 deg will significantly improve turbo spool at low rpm.

## 1.5. Accel Pedal and Throttle Angle

---

Live Data related parameters:

- *Accel Pedal*
- *Throttle Angle Bank #1 - #2*

The **Normal**, **Slow**, **Fast**, **Safe** and **Trustful Accel** Maps define the ratio between the Accel Pedal % and throttle butterfly opening angle.

The 3D map called **Accel Slow/Fast Switch** defines the vehicle speeds between the **Accel Map Normal Slow** and **Accel Map Normal Fast** 2D maps. The below screenshot shows that the

**Accel Map Normal Slow** map is used at lower vehicle speed (below 30kph)

**Accel Map Normal Fast** map is used at higher vehicle speeds (over 80kph), and 80% of the **Accel Map Normal Fast** map is used at 60 km/h (the other 20% is interpolated from the **Accel Map Normal Slow** map).



Alternate maps are used whilst in Safe Mode from the regular Normal Mode maps.

Always set the corresponding Trustful map the same as its corresponding map.

## 1.6. Torque Maps

Live Data related parameters:

- *Torque Actual (Nm)*
- *Torque Demand (Nm)*

The Torque Actual map contains the Torque figure that is given to the TCM for a given Engine Speed and Engine Load. This Torque value in Nm is then given to the TCM and various other modules on the vehicle.

There is also a Torque Demand Multiplier map that will increase the torque value for a certain gear (or Gear Ratio). See the tuning section 7 for more details of how to calibrate this map.

## 1.7. Airflow Sensor Scaling and Engine Load

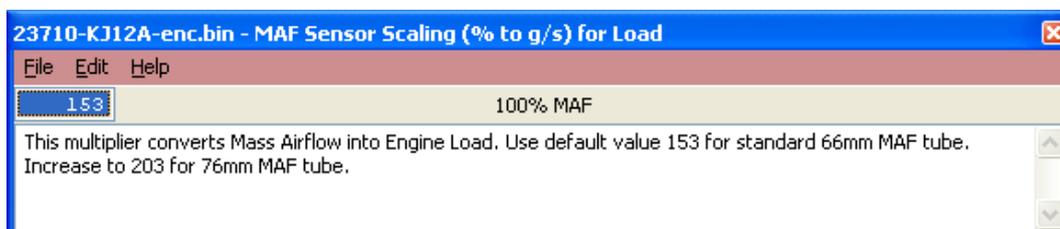
Live Data related parameters:

- *MassAirflow sensor B1 and B2 (Volts)*
- *MassAirflow B1 and B2 (g/s)*
- *MAF Sensor B1 and B2 (g/s)*
- *Base Fuel Schedule (BFS)*
- *Engine Load (%)*
- *Calculated Airflow (g/s)*

### MAF Sensor Scaling (% to g/s) for Load

When fitting larger MAF housings (or Induction kits) then this value should be increased proportionally relative to the surface area increase of the larger MAF housing,

This is a coarse adjustment for MAF scaling, it converts the MAF sensor % value into grams of air per second.



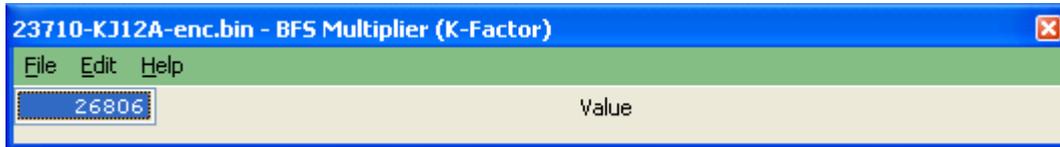
### MAF Sensor Scaling Bank 1 / 2

These maps should be used to fine tune the MAF sensor scaling after the MAF Sensor Scaling map has been calibrated. When fitting larger Intakes it is critical that the MAF scaling on both banks are corrected. This MAF scaling process can really be helped by utilising the Speed Density function in RaceROM. See the Hints and Tips section later for MAF Rescaling advice.

## BFS Multiplier (K-Factor)

Adjusting this value will rescale the engine load and it is not recommended to change this value. This value was named as MAF SIZE in older software but through phase 3 development it should NOT be used as it drastically affects many maps and many load and torque calculations that cause poor drivability in general.

**Important:** Always ensure the K-Factor is set to factory value of 26806 like shown below.



The RaceROM phase 3 and 4 release versions now allow Engine Load values in excess of 300% for the fuel and timing maps, so rescaling should only be necessary on very high horsepower vehicles.

## 1.8. Fuel Pump Control

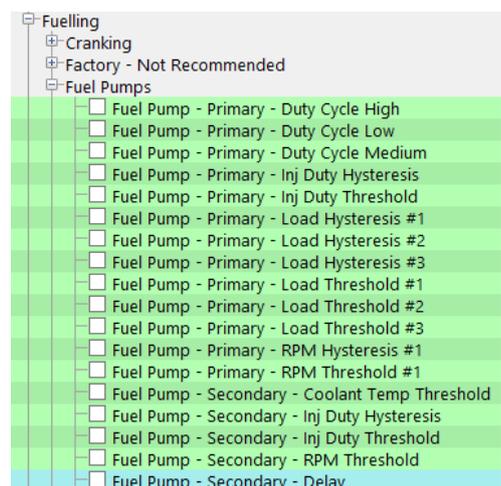
Shown in Live Data as:

- Fuel Pump Duty
- Fuel Pump Status Main - Sub

The Primary Fuel Pump is controlled by the ECU as a 3 stage Duty Cycle that switches as a certain Engine Load% is achieved, the Primary – Duty Cycle Low (34%), Medium (67%) and High (100%), these duty value amounts can be altered in the top 3 maps shown below.

The Primary – Load Thresholds #1 – #3 can be used to alter the Engine Load at when the ECU switches between Low/Med/High. The factory setting have been configured so that during a full load pull the Duty steps from 34% to 100%, this can be altered using the threshold maps.

Read the each individual maps HELP text to understand which Primary Load Threshold controls which control range.



The Secondary Fuel Pump is a simple ON/OFF switch and what is very important is that the 2<sup>nd</sup> fuel pump is switched ON against the Fuel Injector Open Time %.

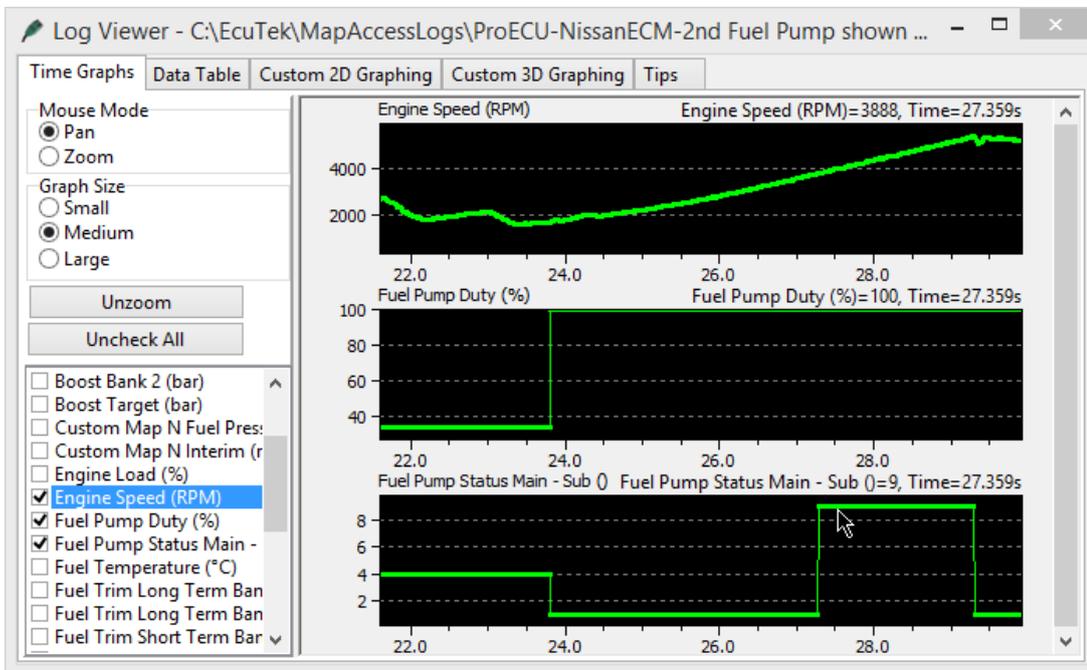
This is very important to change this when using larger Injectors, see the Tuning Sections for more info on recalibrating the 2<sup>nd</sup> Fuel Pump switch threshold.

The logging parameter called Fuel Pump Status Main – Sub will show the current status of fuel pump control as shown below the status is:

Fuel Pump Status 1 - Primary Pump High Duty

Fuel Pump Status 4 - Primary Pump Low Duty

Fuel Pump Status 9 – Primary Pump High and Secondary Pump ON



## 1.9. Idle Control

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Shown in Live Data as:

- *Engine Speed*

The **Idle RPM #1** and **#2**

## 1.10. Sensor Scaling

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Shown in Live Data as:

- *Boost Sensor #1 / #2*
- *Manifold Relative pressure*
- *Coolant Temp*
- *Air Temp*
- *Atmospheric Sensor*

### Map Sensor Scaling

This is the sensor located in the Inlet manifold, which is used for Driver Display Boost Gauge reading and is also used by RaceROM Speed Density. The standard sensor is a 2.80bar Absolute sensor. See the Hints and Tips section for more info on rescaling.

### Boost Sensor Scaling

The **Boost Sensor Scaling Multiplier** and **Offset** maps are the two sensors fitted pre throttle and are used for boost control. The standard sensors are 2.80bar Absolute. See Hints and Tips for more info on rescaling.

### Atmospheric Sensor Scaling

There is no need to adjust this sensor scaling map.

### Coolant and Intake Air Temp Scale

This map can be used to rescale the Coolant and Intake Air Temp sensor voltage to temperature scaling.

## **Engine Cold/Warm Thresholds**

The coolant temp thresholds that the ECU will swap between certain Cold and Warm maps like Ignition and VVT maps.

### **1.11. Limiters**

---

#### **Rev Limiter 1**

The Engine Speed at which the ECU will cut the Fuel Injectors.

#### **Rev Limiter 2**

The Engine Speed at which the ECU will close the throttle.

#### **Speed Limiter Throttle ON/OFF**

The Vehicle Speed at which the ECU will close the throttle to maintain a target vehicle speed.

#### **Speed Limiter Fuel Cut ON/OFF**

The Vehicle Speed at which the ECU will cut the fuel Injectors to maintain a target vehicle speed. It's not advised to use the fuel cut method of speed control.

### **1.12. Diagnostic Trouble Codes**

---

This can be used to turn off any DTCs like Cat efficiency and fuel tank pressure sensors.

Disabling DTCs should be done with care and understanding.

Example, if you disconnect the coolant sensor the engine will default to a 75 deg C coolant temp and run quite well, if your turn off the Coolant temp DTC then the ECU will use the Coolant temp sensor input and assume -40 deg C !

# 2. RaceROM Overview

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

## 2.1. RaceROM Features

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### 2.1.1. Map Switching

The Map Switching feature allows you to up to define four different calibrations in the ECU ROM. The driver can switch between the calibrations at the press of a button. It is envisaged that this feature will be used to provide a comfortable calibration for everyday road use and a hard-core maximum performance calibration for use at the track.

Alternatively you could use this feature to provide four calibrations optimised for different grades of fuel.

### 2.1.2. RaceROM Boost Controller

The RaceROM Boost Controller feature allows the driver to adjust the maximum desired boost using the cruise control buttons (when the cruise control is off). The boost level selected is displayed on the dashboard monitor.



### 2.1.3. RaceROM Launch Control

The RaceROM Launch Control feature allows you to adjust the launch control RPM live. This can be used to provide a higher or lower power/torque output during launch to suit the driver's requirements.

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

### 2.1.4. RaceROM Rolling Launch

The RaceROM Rolling Launch feature is a type of launch control that can be performed from a rolling start whilst maintaining a constant vehicle.

In addition, you can specify a pre-launch manifold pressure target and target AFR for each mapswitch mode that the feature is enabled in. The ECU will dynamically retard and advance the ignition timing in order to achieve the target.

### 2.1.5. RaceROM Valet Mode

The RaceROM Valet Mode feature allows the customer to select a special mode that will reduce engine power output via a unique key code entry process. This engine torque reduction feature is configured against vehicle speed, torque and distance. This feature can be used during vehicle servicing, valet parking or when the vehicle is driven by family members or loyal trusted friends etc.

### 2.1.6. RaceROM Knock Warning

RaceROM can be configured to flash the check engine light to warn the driver when knock exceeds a predetermined level.

### 2.1.7. Boost Target

RaceROM Boost Target replaces the standard Desired Boost map with an extended version that allows the tuner to set a desired boost to a much higher value.

When using RaceROM Feature File Phase 3 or newer the factory Desired Boost map is not used anymore and should be ignored.

### 2.1.8. Per Gear Boost Control

The Per Gear Boost Control feature (Mode 1 to Mode 4) allows you to adjust the target boost based on Gear and RPM. This can be used to provide a higher boost level in lower gears for rapid acceleration while maintaining the standard boost level for cruising in the higher gears.

### 2.1.9. Upshift Boost Spike Prevention

When the vehicle shifts into a higher gear, the sudden reduction in engine RPM can cause a momentary but substantial increase in boost pressure. The Upshift Boost Spike prevention feature can help to prevent this spike by reducing wastegate duty during the shift.

### 2.1.10. Boost Limit Maps

RaceROM replaces the standard Boost Cut maps with extended versions that allow the boost cut to be set to a higher value.

When using RaceROM Feature File Phase 3 or newer the factory Boost Limit map is not used anymore and should be ignored.

### 2.1.11. **Per Gear Rev Limits**

The Per Gear Rev Limits features allow you to define different rev limits for each gear. By setting a higher rev limit in lower gears you may be able to reduce the number of gearshifts required in attaining a given speed. E.g. 0-60mph or 0-100km/h tests.

### 2.1.12. **Large Fuel Injector Support**

The standard ECU supports a maximum injector size of 800cc. RaceROM removes this limitation so you can fit larger injectors. RaceROM also offer different Injector size configurations for each of the 4 map switch modes enabling dual fuels to be used (like E85 in Race Mode).

When using RaceROM Feature File Phase 3 or newer the factory Injector Flow Scaling map is not used anymore and should be ignored

### 2.1.13. **MAF Bank Switching**

The MAF Bank Switching feature allows you to correct the airflow measurement after fitting an aftermarket intercooler that swaps the airflow between the left and right banks of the engine.

### 2.1.14. **Speed Density - VE Based**

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

### 2.1.15. **Extended Maps**

RaceROM provides extended high-resolution Fuel and Torque Actual maps that allow smoother and more accurate control, particularly when tuning high-power vehicles.

### 2.1.16. **Simplified Ignition Timing**

The complex OEM ignition timing system has been replaced addition of a table that allows you to select ignition timing based on RPM and Engine Load, similar to many other vehicles you may be familiar with. This allows for much easier tuning, while retaining the OEM overrun, idle, knock control and dynamic advance compensations.

When using RaceROM Feature File Phase 3 or newer the factory Ignition Timing maps are not used anymore and should be ignored

### 2.1.17. **Boost Gauge Rescaling**

The boost gauge can be rescaled, and/or made to wraparound in order to display boost pressures in excess of the limitations of the standard gauge.

### 2.1.18. **Custom Parameter Logging**

RaceROM allows the tuner to log extra ECU parameters in ProECU which are not accessible using the Nissan Consult III tool or other third party tuning solutions.

### 2.1.19. **Custom Maps**

EcuTek RaceROM Custom Maps is an advanced feature for expert tuners only. It provides the tuner with the ability to modify the control algorithms within the ECU. The tuner can take advantage of this in order to develop their own features that few other tuner can provide. It can also be used to develop one-off fixes to overcome specific problems encountered while tuning a highly modified vehicle.

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

# 3. RaceROM Configuration

## 3.1. Map Switching Feature

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### 3.1.1. Method of Operation

The Map Switching feature is enabled by the **Map Switch Modes** option list in the **RaceROM Special Features** section. When this feature is operational, the ECU can be programmed with up to four different calibrations and the driver can switch between them.

You can optionally display a number for each mode on the coolant temp display, perhaps to remind the driver the octane level of fuel that this mode has been optimized for.

### 3.1.2. Switching between modes

The driver can select the map switch mode by holding down the cruise control "Cancel" button for 1 second when the cruise control is switched off.

The tachometer will move to 1000,2000,3000 or 4000, to indicate mode 1,2,3 or 4.

The mode number may optionally be displayed on the coolant temp gauge.

The driver can adjust the mode by using the cruise control Set/Cst and Res/Acc buttons. After selecting the desired mode, press "Cancel" again to save it.

### 3.1.3. Integration with Per Gear Boost Control Feature

The Per Gear Boost Control feature has separate maps for each of the four modes.

### 3.1.4. Integration with RaceROM Boost Controller (RBC) Feature

The driver can set different boost levels for each of the four modes. The tuner can set a different maximum limit for each mode.

### 3.1.5. Integration with Per Gear Rev Limits Feature

The Per Gear Rev Limits feature has separate maps for each of the four modes. The TCM will need to be in R-Mode to exceed 7000rpm gear change point.

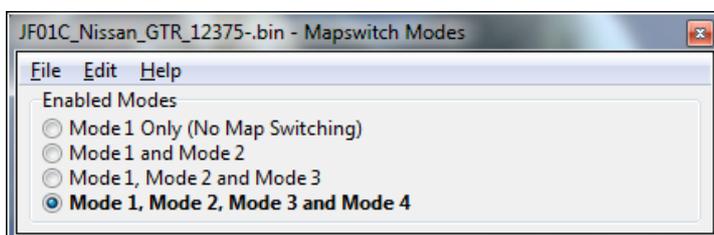
### 3.1.6. Integration with Large Fuel Injectors Feature

The Large Fuel Injectors feature has separate maps for each of the four modes. This can be used for multi-fuel set-ups like 92 Octane, 97 Octane, RaceGas and E85 in each of the four modes.

### 3.1.7. Related Maps

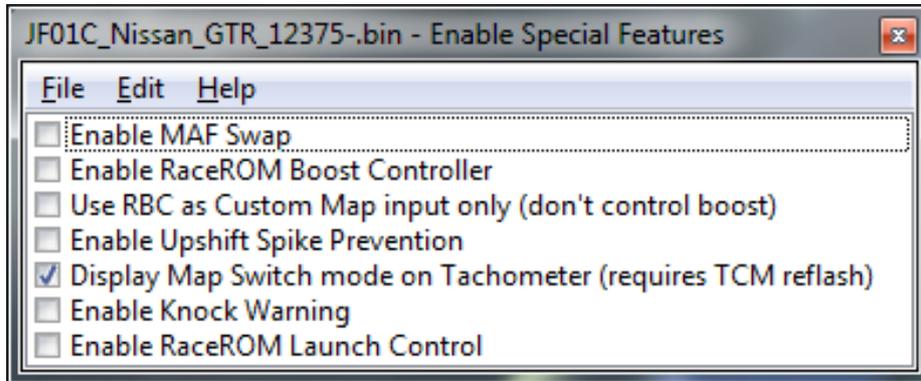
#### 1 Mapswitch Modes

This map specifies how many map switch modes to enable.



## 2 Enable Special Features

This map contains a checkbox that enables the map switch mode to be displayed on the Tachometer. If you enable this option, you should also install RaceROM patch into the Transmission Control Module to prevent the unit becoming confused by the inconsistent RPM signal



## 3 Fuel Map MODE1,2,3,4

These maps are used instead of the original ECU Fuel map.

## 4 Ignition Timing MODE1,2,3,4

These maps are used instead of the original ECU Ignition Timing strategy.

## 5 VVT Inlet MODE2,3,4

These maps are used in modes 2, 3 and 4. The original ECU "VVT Inlet Warm" map is used in mode 1.

## 6 Per Gear Boost MODE1,2,3,4

This map allows you to adjust the desired boost based on RPM and Gear for each of the map switch modes.

## 7 Per Gear Rev Limits MODE1,2,3,4

This map allows you to adjust the rev limit based on Gear for each of the map switch modes.

## 8 Boost Controller Maximum

This map allows you set the maximum value for the boost controller in each of the map switch modes.

## 9 Injector Flow Scaling (RACEROM)

This map allows you to set the injector flow scaling for each of the map switch modes.

## 10 Mapswitch coolant temp Display Mode1,2,3,4

These map control what is displayed on the coolant temp gauge during the map switch operation. You can choose a display either the coolant temp, or a fixed number (defined by the Mapswitch Coolant Temp Fixed Values map), or the output from a custom map.

For example, this can be used to display the octane requirements of the current calibration, or the fuel ethanol percentage from an ethanol content sensor.

## 3.2. RaceROM Boost Controller (RBC) Feature

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3.2.1. Method of

### Operation

- Ensure the cruise control is switched off.
- Press "RES/ACCEL" or "COAST/SET" to display the current desired boost.
- To increase desired boost by 0.1 bar, press "RES/ACCEL"
- To decrease desired boost by 0.1 bar, press "COAST/SET"
- To increase desired boost to maximum, hold "RES/ACCEL" for 2 seconds.
- To increase desired boost to minimum, hold "COAST/SET" for 2 seconds.
- After 2 seconds, the monitor display will revert to normal.

### 3.2.2. Configuration

The RBC feature operates as an upper limit on the desired boost. The feature will not increase the boost above the level set in the ECU desired boost map. For this reason, you must ensure that the ECU Desired Boost is set to the same or higher value than the RBC Max Boost. You should also set the Desired Boost Limit maps accordingly.

### 3.2.3. Related Maps

#### 1 Enable Special Features

This map contains the checkbox to enable the **RaceROM Boost Controller** feature.

#### 2 Boost Controller Minimum

This 1D map specifies the minimum boost level that the driver can specify.

#### 3 Boost Controller Maximum

This 1D map specifies the maximum boost that the driver can specify in each of the map switch modes.

#### 4 Boost Controller Increment

This 1D map specifies how much the boost is increased or decreased for each press of the button. By default this is set to 0.1 bar.

### 3.3. Boost Gauge Rescaling

---

The Boost Gauge Rescale feature allows the tuner to rescale the boost gauge in order to accurately display the level of boost when it exceeds the normal factory scaling. Please note that it is not possible to change the numbers on the gauge at this time and this feature will NOT change Target or Actual boost values, only the boost gauge display will be rescaled.

#### Examples of boost gauge rescaling

Boost Gauge Multiplier: 1

Boost Gauge Offset: -1.0

Manifold Relative Pressure	Gauge Reading
0.00	-1.00
0.50	-0.50
1.00	0.00
1.50	0.50
2.00	1.00
2.50	1.50

Boost Gauge Wrap Threshold: 1.5

Boost Gauge Wrap Subtraction: 2.5

Manifold Relative Pressure	Gauge Reading
-1.00	-1.00
-0.50	-0.50
0.00	0.00
0.50	0.50
1.00	1.00
1.50	1.50
2.00	-0.50
2.50	0.00
3.00	0.50

In the first example, we simply subtract 1 from the gauge reading, so 2 bar will show as 1 bar on the gauge.

In the second example, when the boost exceeds +1.5 bar, we subtract 2.5 bar from it, so the gauge returns to -1.0 bar.

### 3.4. Per Gear Boost Control Feature

---

#### 3.4.1. Method of Operation

The ECU will apply a multiplier to the Desired Boost based on RPM and Gear.

#### 3.4.2. Integration with Map Switching Feature

Separate per Gear Boost maps are provided for each of the map switching modes.

#### 3.4.3. Related Maps

##### 1 Per Gear Boost Mode<sup>1,2,3,4</sup>

These maps define a percentage multiplier based on RPM and current Gear. The multiplier is applied to the ECU Desired Boost Table.

## 3.5. RaceROM Launch Control (RRLC)

---

### 3.5.1. Method of Operation

The launch RPM is set in the Engine ECU and cannot be adjusted from the factory.

ECM ROM series	ECM Launch Control RPM
JF Series (LC1)	4500rpm
JW Series (LC3)	3300rpm
KB KJ 38 Series (LC4)	4100rpm

EcuTek have developed RRLC so the Launch RPM can be adjusted LIVE during the Launch Mode. This allows the driver to select the optimum launch RPM (and therefore engine power output) for the current conditions.

RRLC allows the driver to adjust the launch RPM by pressing the cruise control “res/accel” and “coast/set” buttons while the launch control system is active.

With launch control active, whilst fully depressing the accelerator pedal, press the “res/accel” button to raise the launch RPM. Press the “coast/set” button to lower the launch RPM.

The default Launch Control RPM (set in the ECM ROM) will be used after ECU Programming, ECU Reset or disconnecting the battery.

If the RRLC is used to change the default LC RPM, then this new RRLC RPM is stored ready for the next launch (unless the ECU is programmed or ECU Reset etc).

### 3.5.2. Related Maps

#### Launch Control Minimum and Maximum RPM

These are the minimum and maximum RPM that can be selected by the driver during Launch. Default values are 2500rpm and 4500rpm respectively

#### Launch Control RPM Step

The RPM increment or decrement for each press of the cruise control button. Default value is 250rpm.

#### Launch Control AFR Target

This is the AFR Target applied prior to launch.

#### Launch Control Manifold Pressure Target

This map allows you to specify a target manifold pressure in order to generate “Boost Off The Line”.

#### Launch Control Ignition Timing Base

This map specifies ignition timing based on Manifold Pressure Target and RPM. Retarding the timing generates more manifold pressure. When calibrated correctly, the ECU should be able to maintain the target pressure prior to launch.

#### Launch Control Ignition Timing Proportional

This map applies an adjustment to the base ignition timing based on the difference between the target and actual manifold pressure. If the pressure is below target, the map will retard the timing further, if the pressure overshoots the target, the map will advance the timing.

#### Launch Control VVT Adjustment

This can be used to adjust the VVT angle to provide greater airflow across the engine during launch, therefore increasing boost pressure during launch.

## 3.6. RaceROM Rolling Launch (RRRL)

---

### 3.6.1. Method of Operation

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

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

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

### 3.6.2. Related Maps

#### **Enable Rolling Launch :**

This map specifies which of the map switch modes to enable Rolling Launch in. It can also be specified only to operate when VDC is off. Used in conjunction with RaceROM Phase 4 TCM, it is possible to configure Rolling Launch only to activate when R-mode suspension is selected.

#### **Rolling Launch Accel Rest Point:**

This specifies the dummy accelerator position that is sent to the Cruise Control system when Rolling Launch is active. This should only need to be adjusted if you get DTC codes for incorrect accelerator position.

#### **Rolling Launch Accel Threshold:**

This specifies the accelerator position that triggers the anti-lag system to activate.

#### **Rolling Launch Antilag Timeout:**

This specifies the maximum time limit for the antilag system to be active.

#### **Rolling Launch Ignition Proportional:**

This is a proportional adjustment that gets added to the ignition timing according to the difference between the current manifold pressure and the target. The aim is to vary the ignition timing in order to keep the manifold pressure as close to the target as possible.

#### **Rolling Launch Ignition Timing Base:**

This specifies the base ignition timing according to the manifold pressure target. More retard will generate more boost, more advance will generate less boost.

#### **Rolling Launch Maximum Boost Target:**

This specifies a maximum boost target based on RPM to prevent the driver from over working the turbo and engine at low RPM.

#### **Rolling Launch Target AFR**

This specifies the target AFR when antilag is active. Separate targets may be specified for each of the four map switch modes.

#### **Rolling Launch Target Manifold Pressure**

This specifies the target manifold pressure when antilag is active. Separate targets may be specified for each of the four map switch modes. The ECU chooses base ignition timing via the "Rolling Launch Ignition Timing Base", then fine-tunes using the "Rolling Launch Ignition Timing Proportional" to try and achieve this target.

## Rolling Launch Throttle Compensation

This map adjusts the throttles in order to compensate for torque variations as the ECU varies the ignition timing to generate the antilag effect. If the car decelerates during antilag then increase the values slightly. If the car accelerates during antilag then decrease the values slightly. Otherwise do not adjust.

## 3.7. Large Fuel Injector Support

---

### 3.7.1. Method of Operation

The standard ECU supports a maximum injector size of 800cc. RaceROM removes this limitation so you can fit larger injectors. You can specify a different injector size for each of the 4 map switch modes in order to use different fuels (example E85 the value could be decreased by around 25% therefore increasing each Injector open time period by 25%)

### 3.7.2. Related Maps

Injector Flow Scaling (RACEROM)

This map is used instead of the normal **Injector Flow Scaling** map. Separate values can be specified for each map switch mode.

## 3.8. Upshift Boost Spike Prevention Feature

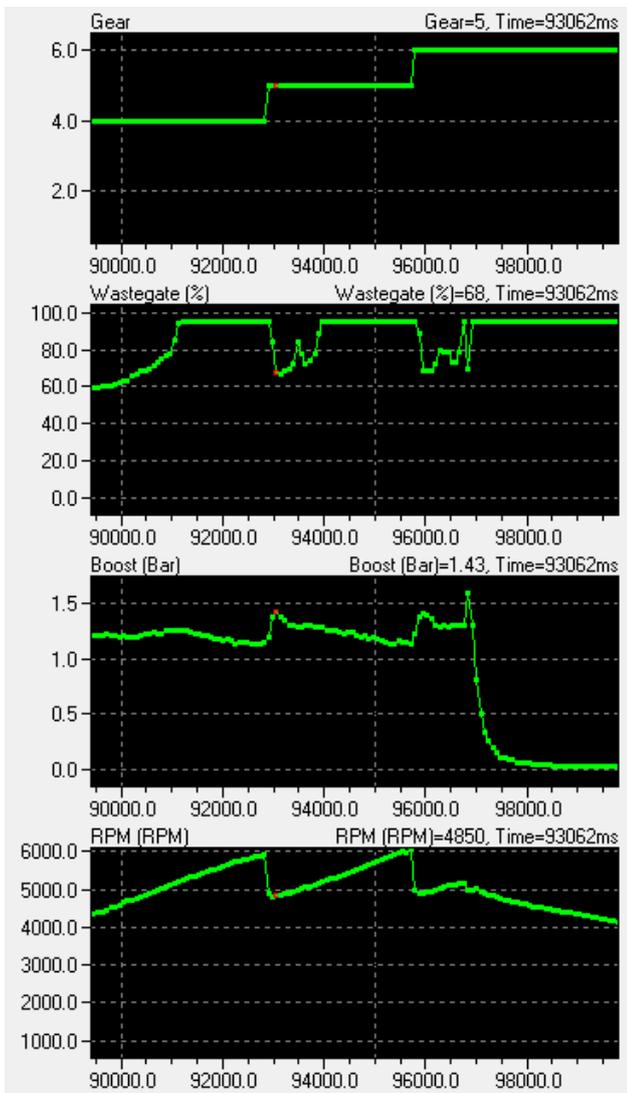
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### 3.8.1. Method of Operation

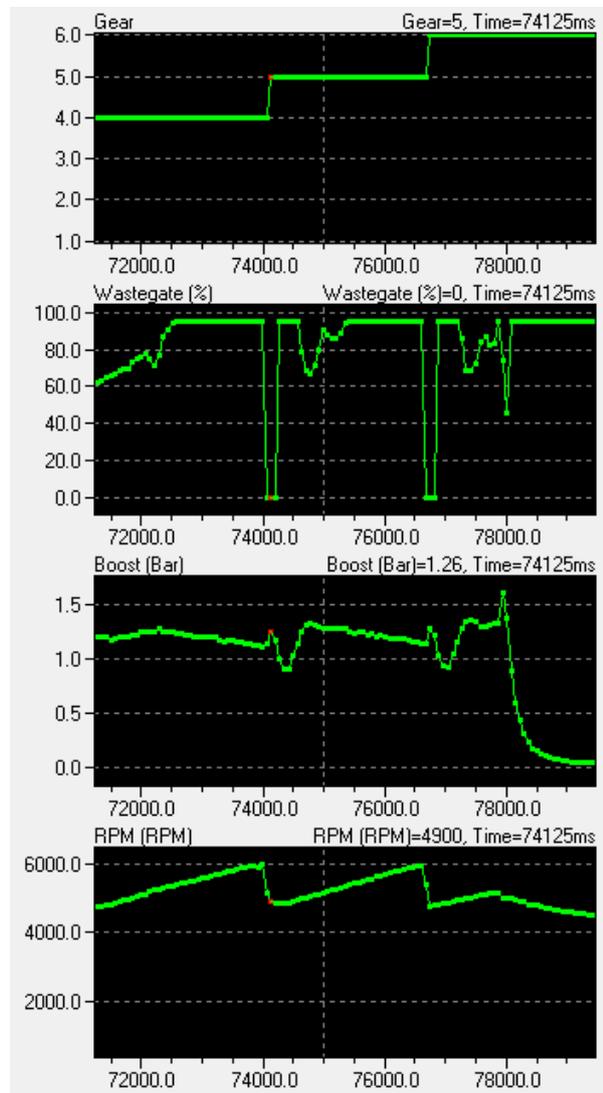
When the vehicle shifts into a higher gear, the sudden reduction in engine RPM can cause a momentary but substantial increase in boost pressure.

The **Upshift Spike prevention (USP)** feature can help to prevent this spike by reducing wastegate duty during the shift (see screenshot below for a before and after comparison).

This problem is exaggerated at higher boost pressures and also with larger turbo's fitted, Note, larger turbo's will take long to respond than the stock turbo's.



Without USP - Spike to 1.43bar



With USP - Spike reduced to 1.26bar

### 3.8.2. Related Maps

#### 1 Enable Special Features

This map contains the **Enable Upshift Spike Prevention** checkbox to enable this feature.

#### 2 USP Wastegate Multiplier

This 3D map allows you to specify a multiplier for the wastegate duty based on the current boost pressure and the time period after the gear change in milliseconds (ms). The wastegate duty will be multiplied by this value during/after an upshift has been performed.

## 3.9. Per Gear Rev Limits Feature

### 3.9.1. Method of Operation

The ECU will use separate rev limits for each gear. The TCM will need to be in R Mode to avoid changing gear before 7000rpm.

### 3.9.2. Integration with Map Switching Feature

Separate sets of Per Gear Rev Limit maps are provided for each of the four map switch modes.

### 3.9.3. Related Maps

#### 1 Per Gear Rev Limit MODE1,2,3,4

These maps hold the rev limits for each gear in each map switch mode.

## 3.10. Visual Knock Warning Feature

---

### 3.10.1. Method of Operation

The ECU retards ignition timing when knock is detected. When the amount of retard exceeds the threshold, and increases further, the **Check Engine Light** will flash rapidly **three times**.

### 3.10.2. Related Maps

Enable Special Features

This Map contains the checkbox for the **Enable Knock Warning** feature.

Knock Warning Threshold

This 1D map holds the retard threshold in degrees that will trigger a warning.

## 3.11. Alternative IAT Sensor Scale

---

### 3.11.1. Related Maps

Speed Density Enable

This Map contains the checkbox for the **Enable Alternate IAT Sensor Scale** feature.

Alternate IAT Scale

This map allows the factory Coolant and Air Temp sensor scaling to be split. This map should be used to calibrate the new IAT/CHT sensor if an aftermarket Air Temp sensor is fitted.

## 3.12. MAF Bank Switching Feature

---

### 3.12.1. Method of Operation

Some aftermarket intercoolers swap the airflow between the left and right banks of the engine. This feature compensates for the mechanical alteration by swapping the MAF sensor readings between left and right banks.

**WARNING** : Only check this box if the new Intercooler swaps the Intake flow between banks otherwise the ECU will be looking at the wrong throttle butterfly and wrong MAF sensor (for Mass Airflow reading) when controlling Idle and during Idle balance.

### 3.12.2. Related Maps

Enable Special Features

This Map contains the checkbox for the **Enable MAF Swap** feature.

## 3.13. Speed Density Feature

---

### 3.13.1. Method of Operation

The Speed Density feature is enabled by selecting the **Enable Speed Density** checkbox in the **Speed Density Enable** section. Speed Density can be selected for each of the four map switch modes. When this feature is active, the ECU will ignore the reading from the Mass Airflow sensors and will calculate Mass Airflow as follows:

A value is read from the 3D **Speed Density Volumetric Efficiency** maps, indexed by RPM and Manifold Absolute Pressure. This value is then combined with charge temperature, manifold pressure and engine speed to calculate the Mass Airflow.

In the default configuration, we assume a fixed charge temperature of 20°C then adjust the final result according to Air Intake Temperature using the Speed Density AIT Compensation map. However, RaceROM also supports measuring Charge Air Temperature directly using the AIT sensor or Fuel Temperature Sensor inputs.

### 3.13.2. Removal of MAF sensor (optional)

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

The Nissan **Intake Air Temperature sensor** is built into one of the MAF sensors. You should provide a temperature sensor within your replacement intake or the intake manifold. If this is not possible, disable the error codes relating to IAT sensor so that the ECU does not detect that the IAT sensor has been removed. Then update all maps that use IAT as an input to return a sensible output value regardless of the IAT input value.

### 3.13.3. Using Speed Density and MAF sensor together

The hybrid Speed Density feature can also be useful in applications where the MAF sensors are present, by configuring the **Speed Density activation** maps. In this scenario, the ECU can be programmed to use the MAF sensors at lower Mass Airflow values and switch to Speed Density for the higher values.

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

The threshold values are implemented using hysteresis. The 1<sup>st</sup> value (top value) should be higher than the 2<sup>nd</sup> value (lower value). The feature will activate when the parameter rises above the 1<sup>st</sup> value, and will deactivate when it falls below the 2<sup>nd</sup> value.

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

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

### 3.13.4. **Related Maps**

- 1 **EcuTek RaceROM Maps\Speed Density\Speed Density Enable**  
This map contains the checkbox to enable the Speed Density feature.
- 2 **Speed Density\Speed Density Volumetric Efficiency**  
This 3D map specifies volumetric efficiency based on RPM and Manifold Absolute Pressure.
- 3 **Fuelling\Speed Density\Speed Density AIT Compensation**  
This 2D map specifies a multiplication factor that is applied to the calculated Mass Airflow.
- 4 **Fuelling\Speed Density\Speed Density Activation MAF**  
This 1D map specifies that Speed Density mode should only be used above the given Mass Airflow reading. The ECU will switch from MAF sensors to Speed Density when the Mass Airflow rises above the first value. It will switch back to MAF sensors when the (actual) Mass Airflow falls below the second value. This map works in combination with the Activation RPM and MAP maps. Note that each bank is treated independently therefore one bank may switch from MAF to SD mode before the other.
- 5 **Fuelling\Speed Density\Speed Density Activation RPM**  
This 1D map specifies that Speed Density mode should only be used above the given RPM. The ECU will switch from MAF sensors to Speed Density when the RPM rises above the first value. It will switch back to MAF sensors when the RPM falls below the second value. This map works in combination with the Activation MAF and MAP maps.
- 6 **Fuelling\Speed Density\Speed Density Activation MAP**  
This 1D map specifies that Speed Density mode should only be used above the given Manifold Pressure. The ECU will switch from MAF sensors to Speed Density when the MAP rises above the first value. It will switch back to MAF sensors when the MAP falls below the second value. This map works in combination with the Activation MAF and RPM maps.

## **3.14. RaceROM Valet Mode**

---

### 3.14.1. **Method of Operation**

Valet Mode allows the driver to lock the car into a lower performance mode when lending it to a less experienced driver. It can also be used as a supplementary anti-theft system. We do not recommend that car owners rely on it as their only anti-theft solution.

### 3.14.2. **Related Maps**

#### **Valet Mode Torque Limiter and Valet Mode Speed Limiter**

Using these maps you can control how fast the car can accelerate, the maximum speed it can achieve, and the distance it can travel.

Distance Travelled axis is measured from when the valet mode is turned on and is subject to a maximum of just over 1150km (740 miles).

#### **Valet Mode Torque Reduction Rate**

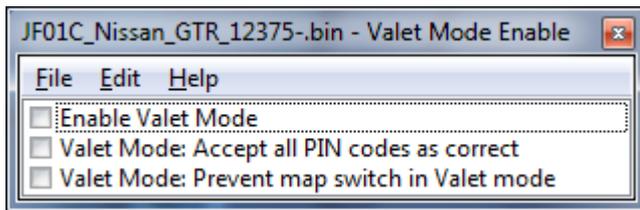
This map determines how quickly the ECU drops the torque when the speed limiter is exceeded. It's a proportional system. The rate of torque reduction is based on the number in the map and the amount of over speed.

#### **Valet Mode Enable**

The Enable Valet Mode checkbox enables the Valet Mode

The “Accept All PIN codes as correct” checkbox is a reduced security mode for owners who do not want to remember a PIN. Two presses of the CANCEL button will enable or disable the mode.

The “Prevent map switch in Valet mode” locks the map switch mode when the vehicle is in Valet mode is engaged.



### 3.14.3. Configuration

#### To turn on the Valet mode

- Handbrake On, Vehicle Stationary, Cruise Control On, TV showing Coolant Temp gauge.
- Hold CANCEL for 1 second, coolant gauge changes, cruise set light starts to flash slowly.
- Use cruise up/down button to choose a PIN number on coolant temp gauge
- Press CANCEL to engage valet mode.

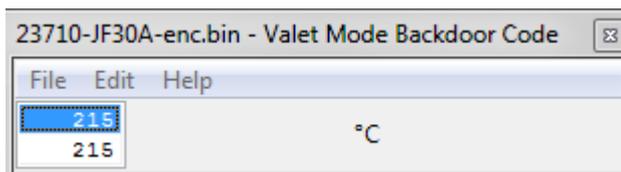
#### To turn off the Valet mode

- Handbrake On, Vehicle Stationary, Cruise Control On, TV showing Coolant Temp gauge.
- Hold CANCEL for 1 second, coolant gauge changes, cruise set light starts to flash fast.
- Use cruise up/down button to enter the correct PIN number on coolant temp gauge
- Press CANCEL to validate the code.
- Coolant temp shows \*\*\* for correct code or red for wrong code.

#### Wrong code timeout

After 3 incorrect attempts, the system will not let you try again for 5 minutes. This is to discourage somebody from trying all of the possible codes.

#### If you forget the code you have set



Enter the two backdoor codes one after the other. (The default codes will differ depending on the ROM file and RRFF used) The car will reject the first code but will then accept the second code. We recommend that you do not use the default backdoor codes in case they become widely known. The codes can be a maximum of 3 digits long and up to a maximum numeric value of 215. We suggest that you keep a record of the backdoor codes that you use in case any of your customers have a problem.

#### Non-metric temperature display

In some markets, the Coolant Temp gauge displays in Fahrenheit rather than Celsius. The vehicle ECU always uses Celsius internally. On a Fahrenheit car, some codes may not be selectable due to the rounding approximation when the gauge converts from Celsius to Fahrenheit. Remember the backdoor codes are set in Celsius.

# 4. Tuning Advice - Ignition

## 4.1. Ignition Control Mode 1 to Mode 4

Using RaceROM Feature File version 3 (12738 or newer) the factory Ignition maps are no longer used. They have been replaced with Ignition Timing MODE 1 to MODE 4, see ECU Map Descriptions in this manual for further information.

When calibrating Ignition timing then the four different Ignition maps can be set with more advanced or retarded values then simply map switch through the modes seeing how much timing the engine will take.

## 4.2. Dynamic Advance Gen 2 models

On Gen 2 models the Dynamic Advance map can be used to limit or increase the amount of positive advance that is added by the Knock Correction in the absence of any knock retard.

This can be an unwanted feature for most tuners so reducing these map values will prevent the ECU from Advancing the Ignition beyond the values shown in the RaceROM Ignition Timing maps.

In some regions there may be an offset value added or subtracted from these values.

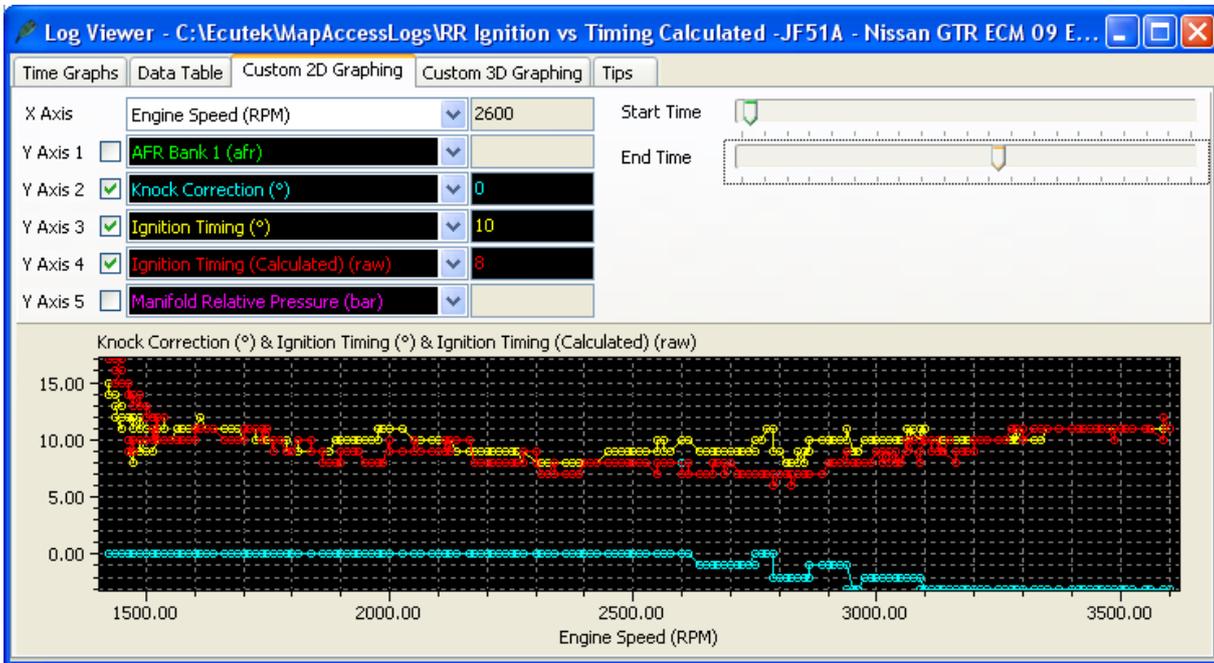
Always watch and log the Knock Correction parameter as the ECU may add an additional +2 deg of Knock Correction on full load to over what is shown in the Dynamic Advance Max Allowed map, (the Euro region 38B6A does this)

So some regions may require -2deg in this map to stop the ECU actively adding any Ignition Correction though Knock Retard negative values will still work as expected.

	50.2	Engine Load (%)						3.48
2800	12.5	25.1	37.6	50.2	62.7	75.3	87.8	100
1200	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60
2000	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60
2800	3.48	3.48	3.48	3.48	3.48	3.48	3.48	3.48
3600	5.10	5.10	5.10	5.10	5.10	5.10	5.10	5.10
4400	5.10	5.10	5.10	5.10	5.10	5.10	5.10	5.10
5600	5.10	5.10	5.10	5.10	5.10	5.10	5.10	5.10
6000	5.10	5.10	5.10	5.10	5.10	5.10	5.10	5.10
6800	5.10	5.10	5.10	5.10	5.10	5.10	5.10	5.10

An additional LIVE DATA parameter called 'Ignition Timing Calculated' will show what the factory Ignition timing would have been before it was overwritten with RaceROM Ignition Timing, this can be useful to ensure your timing is not excessively different to what the stock values would have been.

Shown below we can see the current Ignition Timing is 10 deg (output of MODE 1-4 Ignition map), this was the actual Ignition timing that was used at this RPM and Load. At the same point we can see the factory timing calculation would have been 8 deg for the same RPM and Load.



### 4.3. Coolant Temp display during Map Switch

The four ignition maps can be calibrated for different fuel, in addition we can change the values shown on the Coolant Temp Gauge during Map Switch Mode to indicate the fuel currently in the fuel tank.

Map Switch Mode	Coolant Temp Gauge display	Suggesting Fuel Type
Ignition Timing MODE 1	95	Regular Pump Fuel
Ignition Timing MODE 2	98	High Octane Pump Fuel
Ignition Timing MODE 3	106	Race Fuel
Ignition Timing MODE 4	85	Ethanol based fuel

Default values shown on the Coolant Temp display when Map Switching



Example values that could be shown on the Coolant Temp display when Map Switching



So when MODE 1 is selected the Coolant Temp gauge will show 95 (**203F**)

So when MODE 3 is selected the Coolant Temp gauge will show 106 (**228F**)

**NOTE:** The units are in Deg C (Celsius) but on US models the values will be displayed in Fahrenheit . So you will need to reduce the Deg C values so the correct Fahrenheit value is shown on the display. Google offers a simple online conversion.

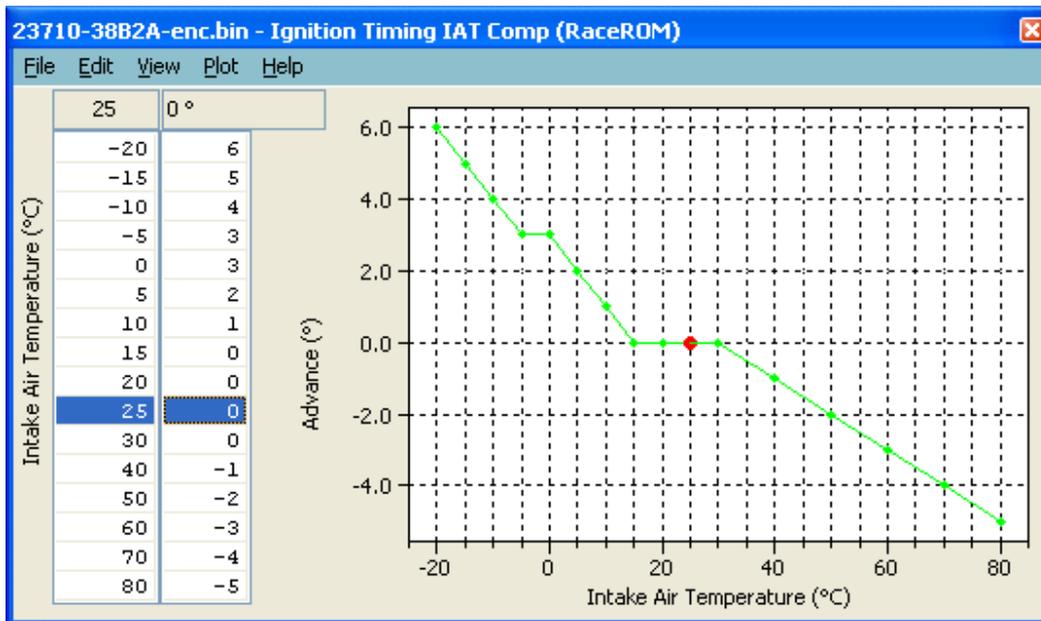
In addition by using the Rev Counter tacho indication for Map Switch Mode then we still have a visual indication of Modes 1 to 4 (requires TCM programming with the latest RRFF version for Tacho Indication).

### 4.3.1. Intake Air Temp compensation

The Intake Air Temp (IAT) compensation map is used to add or retard ignition timing for a given IAT. This is very useful for Charge Air readings (if a Nissan Juke type boost sensor with integrated air temp sensor is used). In this situation then IAT reading is actually Charge Air (post intercooler).

We have fitted and tested a very nice 'plug and play' charge air conversion kit where the Intake air sensor is substituted by the new replacement boost sensor that incorporates Charge Air temp.

This is a great solution for Speed Density conversions, contact Got Boost Performance for more info.



# 5. Tuning Advice - Fuel

The Nissan GTR fuel control is fully closed loop from Idle all the way to the rev limiter including light load and full load.

The logging parameter called AFR TARGET will show the current AFR the ECU is trying to achieve. EcuTek have converted the factory Nissan AF sensor voltage into a more useful logging parameter called *AFR Sensor Bank 1* and *AFR Sensor Bank 2*.

Typically on a stage 1 car the AFR Sensor Bank 1 or 2 might show 12:1 AFR but independent Wideband sensors (like Motec PLM) will show a more truthful and accurate 11.5:1 AFR. We suggest you always verify your AFR with an aftermarket wideband sensor until you have enough experience to trust the standard sensor readings. The AFR shown will tend to be slightly leaner than the car runs but this can change with full decat exhaust and larger turbo's (and higher EGT).

See the descriptions for the other important AFR maps found under section 1 in this manual. AFR Target – Max at WOT – This can hi-jack the AFR from the Fuel Map at higher RPM on MY14-models.

AFR Conversion Table Bank 1 and Bank 2 – This will convert the current AFR Target to a new AFR Target

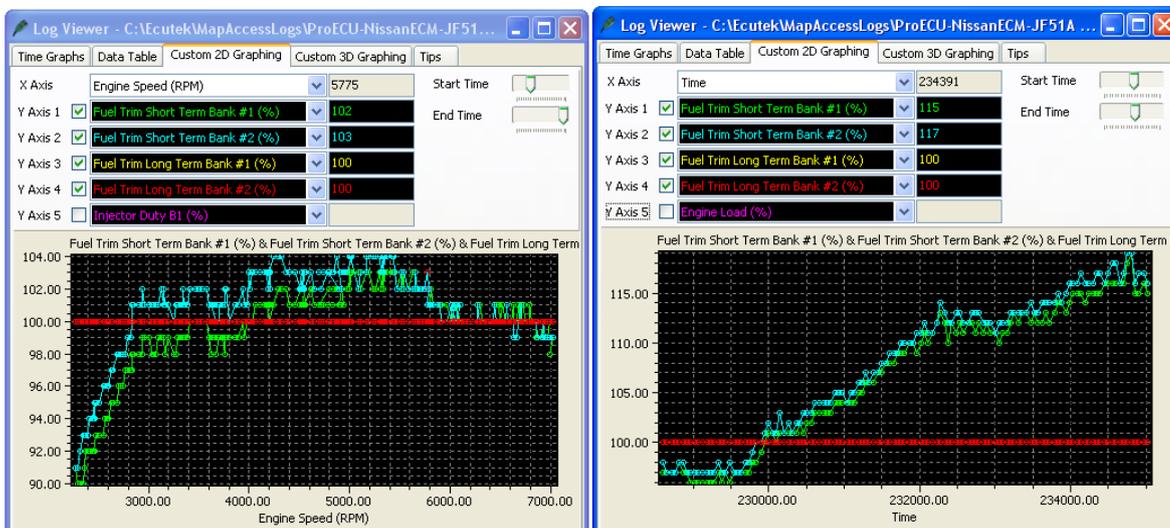
## 5.1. Fuel Trims

Increasing fuel pressure from say 3.0Bar to 4.0Bar will not change the AFR as the Short Term and Long Term Fuel Trim will compensate to achieve the Target AFR shown in the fuel map, so watch the Fuel Trims carefully.

Fitting a larger Intake MAF tube (stock 66mm to 76mm is a popular swap) will cause the Fuel Trims to compensate for the under reading MAF so ensure you watch the Fuel trims and rescale the MAF accordingly.

The short term fuel trim can add or subtract up to 25% (75% to 125%), the long term fuel trim can add or subtract up to 10% (90% to 110%). You should aim to keep the FT within 10% (90% to 110%) for a good calibration (ignoring transient movements), good calibration would be within 5% and the gearbox control will also show its appreciation.

Here are two examples of Fuel Trims in action, the left log file shows really good fuel trims but the right log file is adding +17% to the Injection Volume to achieve the target AFR. If this FT was 117% across the whole RPM range then the 1d MAF scale byte should be increased but as this is only at higher RPM then I could be a secondary fuel pump issue failing to deliver at higher RPM.



Long Term Fuel Trims can be cleared by using the ECU RESET under the Nissan GTR ECM Tool. They are also cleared after ECM programming.

Be sure to check both Bank 1 and Bank 2, as they have different MAF scaling due to different airbox designs. Also watch *Fuel Trim Long Term* and *Fuel Trim Short Temp* for Bank 1 and 2.

There are different ways to correct the fuel trims, for larger Injectors see below and for larger Intakes then see the MAF Scaling section.

## 5.2. Fuel Injectors

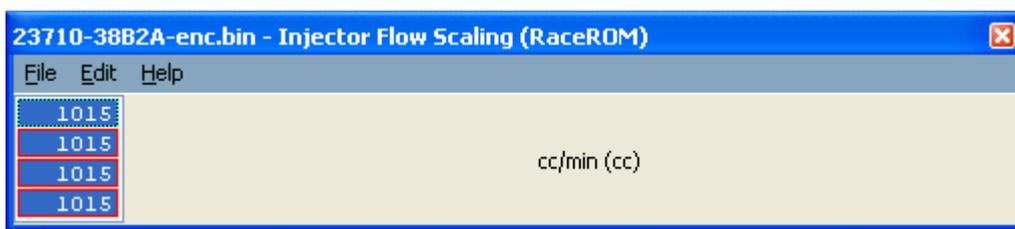
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The standard Injectors will be close to 100% open when running 1.1 bar boost at high rpm (6000rpm plus and 560bhp+) so watch carefully, a vehicle fitted with a full sport exhaust system running 1.2bar+ will max the injectors.

EcuTek can supply the high quality Bosch Motorsport Injectors that are 1050cc (good for 1000+ bhp), see them in the webstore.

The maximum Injector size you can enter in the factory map is 800cc, this is a limitation of the Nissan ROM code and not EcuTek.

For replacement Injectors over 800cc use the map called **Injector Flow Scaling (RaceROM)** you can choose a different Injector size for each of the map switch modes (useful for Ethanol tuning in different modes).



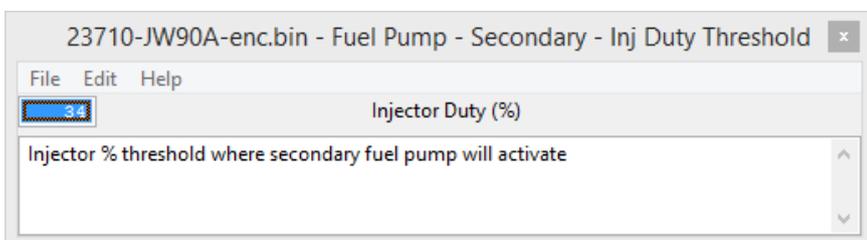
If the Injectors are to be replaced then choose at least 800cc plus. When fitting larger Injectors it's important to reduce the Minimum Open Time from 1.8ms down to 1.2ms, otherwise 1.8ms on 1000cc Injectors will mean 12:1 AFR at Idle. Using the EcuTek 1015cc Injectors we typically run a 1.0ms Offset combined with a 975cc Injector size and we achieve very tight fuel trims.

Some popular cheap injectors on the market cause black smoke, EcuTek injectors do not have the issue so choose wisely and remember you get what you pay for!

## 5.3. Fuel Pump (Secondary Control)

---

The Secondary Fuel Pump is only switched on when a certain Injector Duty is achieved (see the Fuel Pump Control section earlier in this manual for more information).



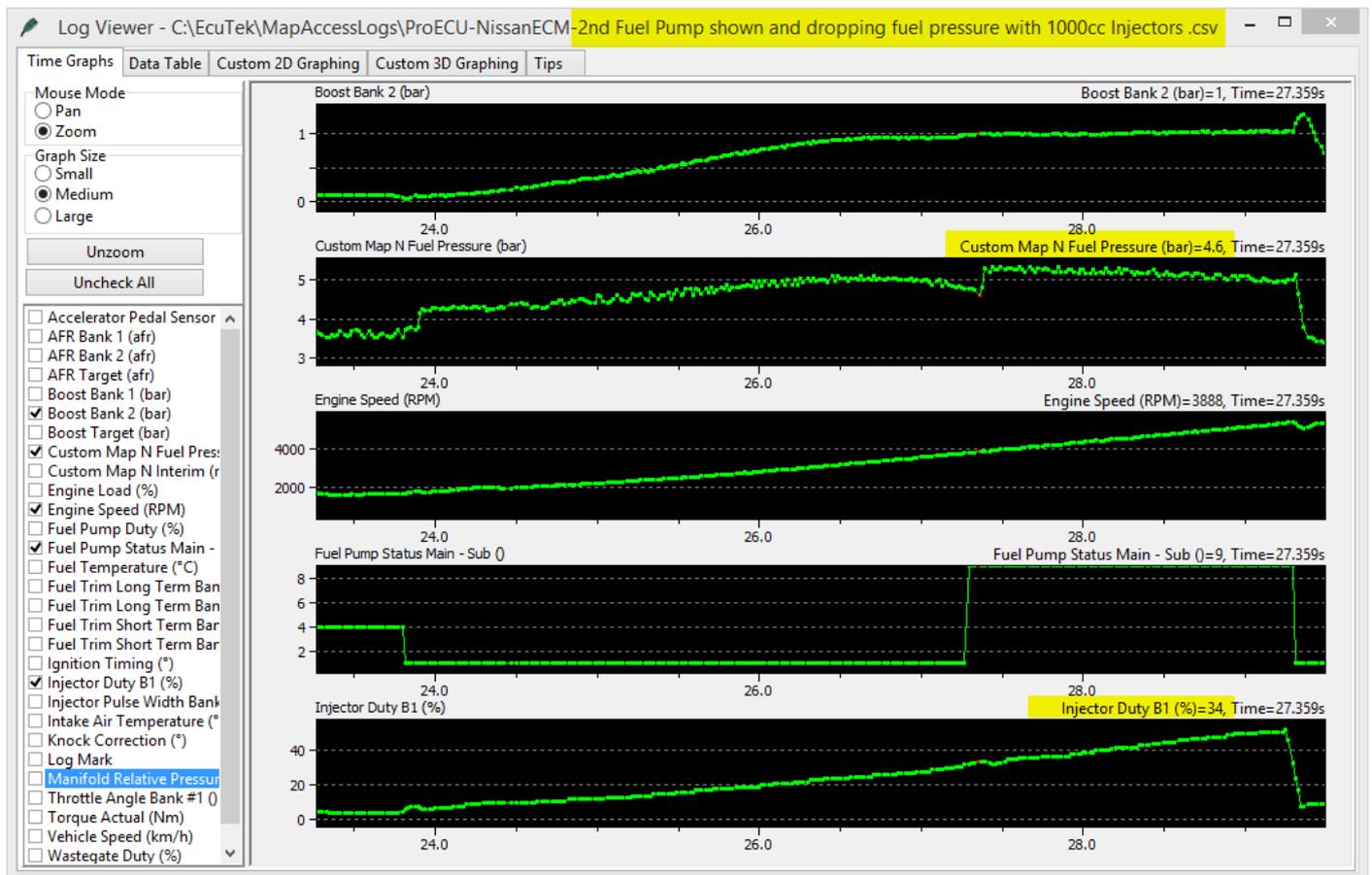
The 2<sup>nd</sup> Fuel Pump has been calibrated for stock 570cc injectors and the 2<sup>nd</sup> pump will activate around 2500rpm on full load (34% Injector Duty) BUT when fitting larger Injectors (1000cc for example) then the same Injector Duty will be around 3800rpm meaning the 2<sup>nd</sup> fuel pump switches on too late and the fuel rail pressure will start to as the Primary pump runs out of flow capacity!

So it is very important when fitting larger injectors that the Secondary Inj Duty% Threshold is reduced relative to the Fuel Injector size % increase otherwise the 2<sup>nd</sup> Pump will switch on too late and the fuel rail pressure will drop (as shown in the following log file screenshot).

In this example below a Fuel Pressure sensor has been imported through the Boost Sensor #1 and the Fuel Pressure is shown in the Log File as **Custom Map N Output**.

The GTR static fuel pressure at sea level is 4 bar (60psi), with 1 bar boost the fuel pressure should be 5 bar (75psi). During this power run you can see Boost Bank 2 climbing to 1 bar boost with the Fuel pressure climbing from 4 to 5 bar by 3000rpm but by 3500rpm the Primary pump has run out of capacity and rail pressure is starting to drop as low as 4.6bar during this dyno pull.

The 2<sup>nd</sup> pump finally kick in 3900rpm (34% Injector Duty) and the fuel pressure increases from 4.6 to 5.2bar and is regulated back down to 5bar.



### Fuel Rail Pressure dropping as the 2<sup>nd</sup> Fuel Pump switches on too late!!

See Custom Maps manual for more information on importing pressure sensors and how to log and display on the setup Fuel Pressure sensor Fail Safes.

## 5.4. MAF Rescale for Larger Intakes

When fitting larger Intakes the MAF sensor scaling will need to be recalibrated to ensure tight AF correction at light load and full load. These Fuel corrections are called Fuel Trim Short Term (FTST) and Fuel Trim Long Term (FTLT). Accurate FTST/FTLT are needed for accurate AFR tuning but also for correct Torque Output (Nm) for smooth TCM control and avoiding clutch slip.

The standard GTR Intake MAF Tube diameter is 66mm, most aftermarket intakes are 68mm, 72mm the most common is 76mm.

With larger Intakes (like 76mm) you MUST increase the 'MAF Sensor Scaling (% to g/s) for Load', this is a coarse adjustment for MAF scaling and this will make 90% of the MAF rescaling that is required, it's a MAF surface area constant.

The factory default value is **153** for the factory 66mm MAF tube, this should be increased to **203** for **76mm MAF tubes**. This is based on the surface area increment amount.

The surface area calculation is as follows: Radius squared \* PI = Surface area

So for **66mm MAF tubes**: 33mm Radius, 33x33=1089mm<sup>2</sup>, 1089 \* 3.14 (Pi) = 3419mm<sup>2</sup>

So for **69.5mm MAF tubes**: 34.9mm Radius, 34.9x34.9=1219mm<sup>2</sup>, 1219 \* 3.14 (Pi) = 3830mm<sup>2</sup>

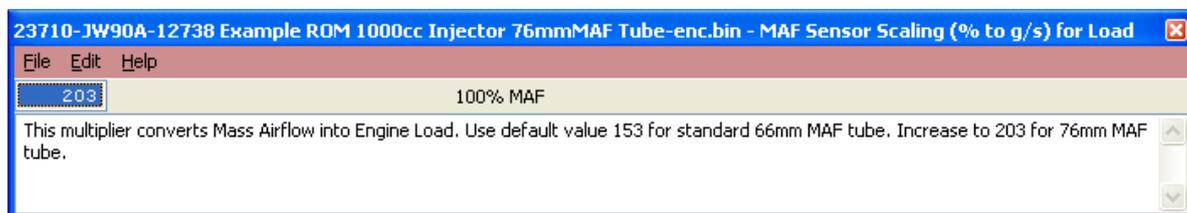
So for **76mm MAF tubes**: 38mm Radius, 38x38=1444mm<sup>2</sup>, 1444 \* 3.14 (Pi) = 4534mm<sup>2</sup>

Now if we divide the new 76mm MAF housing surface area by the stock 66mm MAF housing surface area we get the percentage increment amount.

So 4534/3419 = 1.326 or if you prefer 'the 76mm MAF tubes have a 32% greater surface area'.

So if we simply multiply the 1d map called 'MAF Sensor Scaling (% to g/s) for Load' by 32%

153 \* 1.326 = 203. If the MAF tubes are 69.5mm (2.75 inch) then enter 171



So with the MAF Tube now calibrated to the larger Intake size you can now make the Fine MAF tuning with the 2d MAF Scale for the corresponding bank (Bank #1 or Bank #2).

Start the car and make a log at Idle, Fast Idle, Light Load and Full Load watching carefully the AFR and Knock Correction. Be sure to including the following parameters in your log file:

Fuel Trim Short Term B1/B2

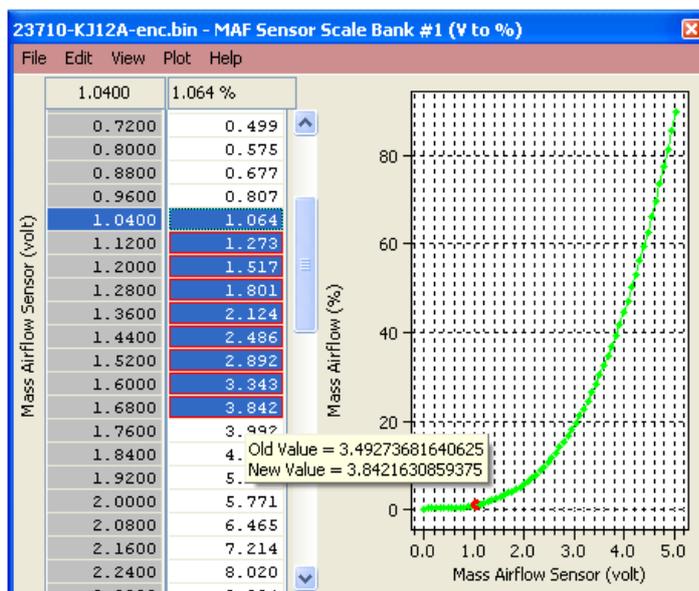
Fuel Trim Long Term B1/B2

AFR B1/B2

MAF Volts B1/B2

Mass Airflow (g/s) B1/B2

If the FTST is at 120% then the ECU is increasing the Injector Open Time ms by +20% to achieve your Target AFR from the Fuel map, if the FTST is 85% then the ECU is reducing Inj ms by -15% to make the target AFR. So for a reasonable FT error (over 110% or under 90%) the 2d Maf Scale (g/s) should be adjusted at this point by 50% of the FT correction value.



So as an example let's say we see Fuel Trim is about 120% between 1.04v and 1.7v MAF Volts.

We simply increase MAF Sensor Scale #1 by +10% on the 2d MAF Scale for Bank #1 therefore reducing the STFT at this point. The same sequence should also be followed for Bank #2 and all adjustments should be smoothed into the local values.

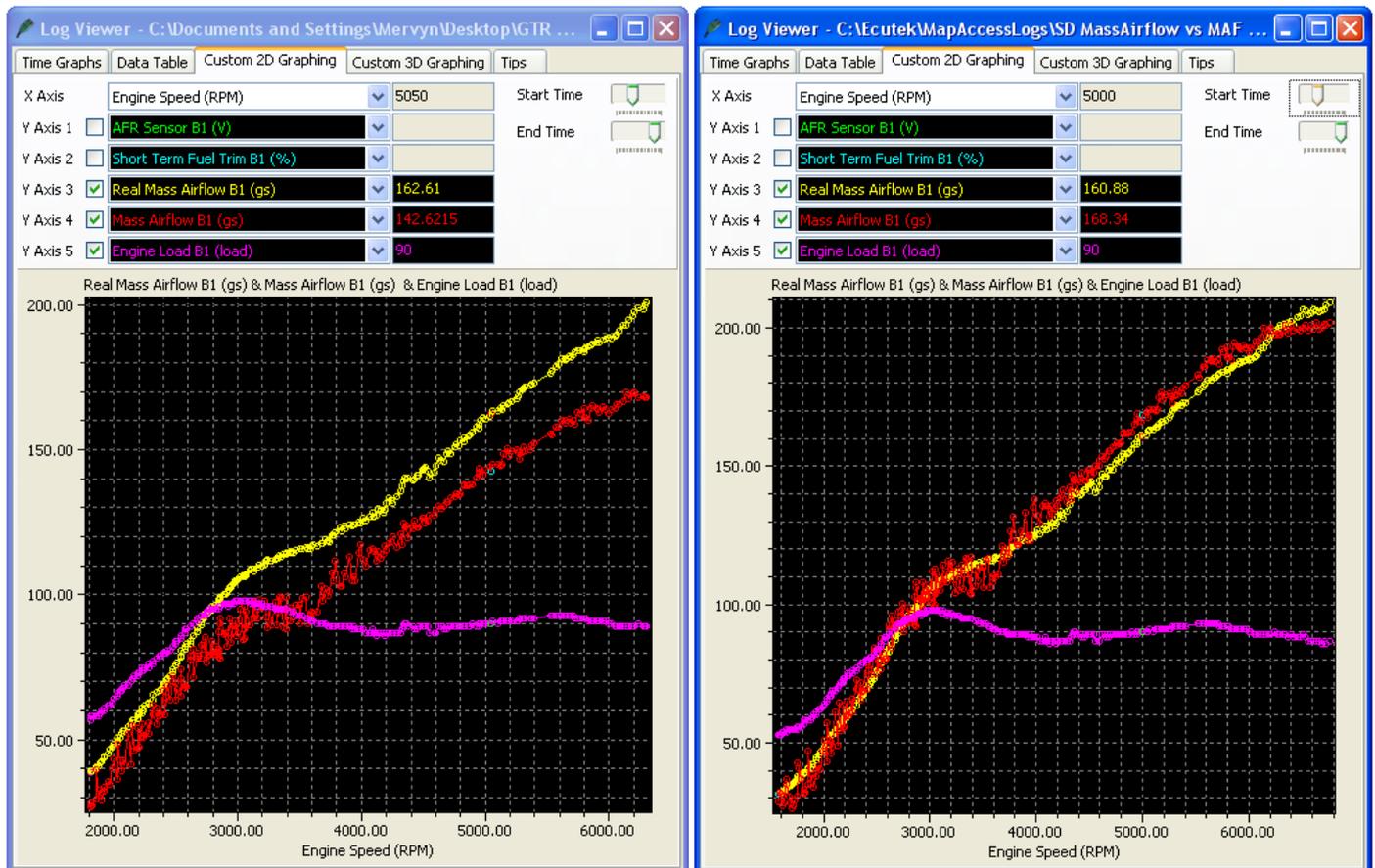
## 5.5.MAF Rescale for Larger Intakes using SD

It's also possible to rescale MAFs using Speed Density. This is very simple and provides verification that our MAF scaling is correct.

The screenshot below shows two log files created from a car running on SD.

76mm Intakes fitted running on SD

Stock 66mm Intakes fitted running on SD



You can see the right hand log shows a stock 66mm MAF tube and the Mass Airflow reading from SD (Yellow line) and MAF Mass Airflow (Red line) are very close.

After fitting the new 76mm Intakes you can see the left hand log file shows the MAF Mass Airflow B1 (Red line) reading has dropped but the SD Mass Airflow (Yellow line) is still accurate and the car runs fine as its running on SD.

Now we can leave the car on SD and simply increase the MAF scaling until the MAF Mass Airflow (Red line) reaches the SD Mass Airflow (Yellow line). See the previous pages on MAF rescaling for further info on the rescaling technique.

Once the MAF Mass Airflow is the same as the SD Mass Airflow then we can turn off SD as we have a perfectly scaled MAF curve!

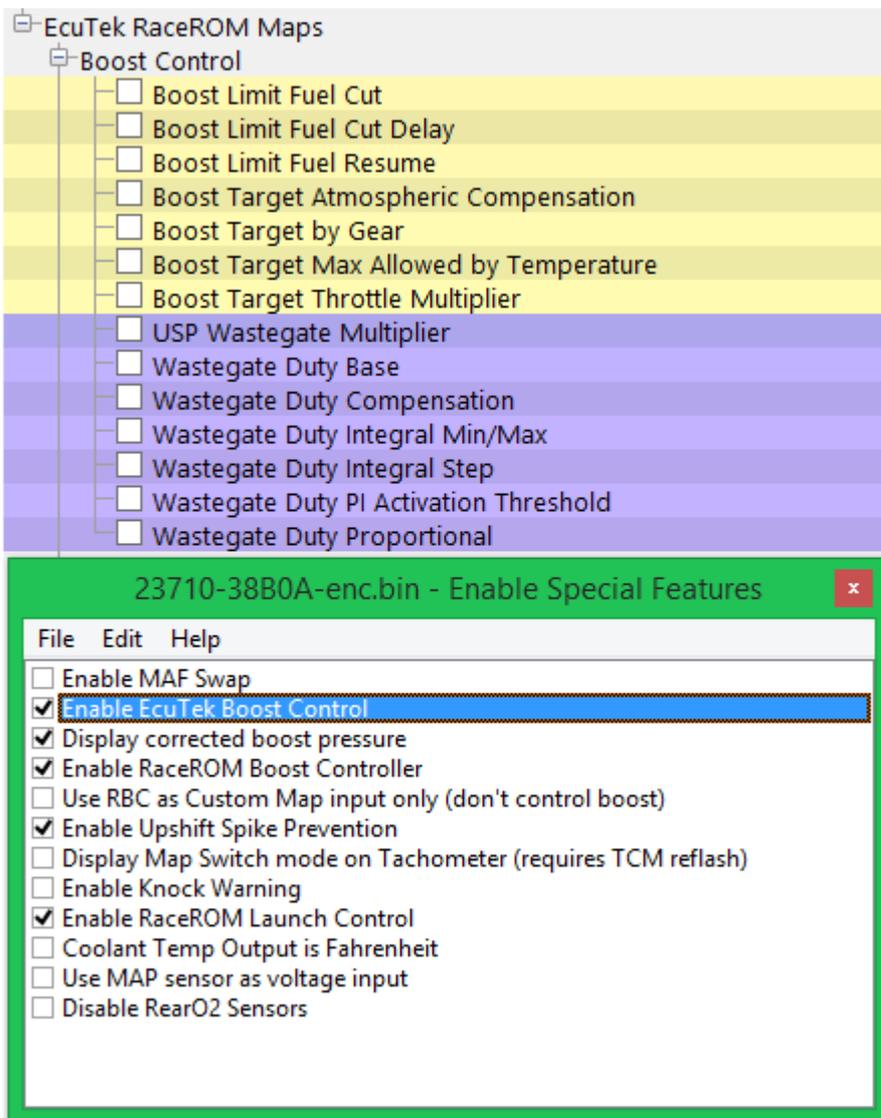
# 6. Tuning Advice - Boost Control

## RaceROM Boost Control Phase 5 Update

EcuTek have now completely rewritten the GTR Boost Control with a more simplistic and easy to calibrate control system, we strongly recommend that you use the Phase 5 RRFF **version 19472** or newer for any GTR ECM tuning.

To use the Phase 5 RaceROM Boost Control ensure that the Enable EcuTek Boost Control box is checked in the Enable Special Features window once checked the OEM Boost Control Maps will no longer work.

See the Phase 5 GTR supplement pdf manual for further details on the new RaceROM boost control maps.



## Factory Boost Control – Not Recommended

The factory boost control on the GTR is very clever even though it can appear complex at first glance.

EcuTek have spent many many hours on hard disassembly to understand the factory boost control strategy. Spend some time to look through the various boost control maps to understand the various limiters and airflow control logic. Below is a description of each of the important boost control maps.

## 6.1. Desired Turbine Wheel Air Flow

---

This map must be calibrated to the characteristics of the turbo. Once set, desired boost can be adjusted via the **Desired Boost** map. This map will need to be modified if larger turbos are fitted. It will also need to be modified if the flow of the exhaust, intakes or intercooler are improved.

## 6.2. Surplus Airflow to Wastegate Flow

---

The surplus Mass Airflow is multiplied by a value from this map in order to calculate the flow rate of exhaust gas that must be vented through the wastegate. This map may need to be modified if larger turbos are fitted, as the relationship between exhaust gas flow and pre turbo exhaust gas pressure will vary.

## 6.3. Wastegate Flow to Opening Angle

---

Once the required wastegate airflow is known, this map calculates the wastegate opening angle required to vent the desired flow. This map is calibrated to reflect the characteristics of the wastegate orifice. You only need to modify this map if you port the wastegate orifice.

## 6.4. Wastegate Angle to Duty Cycle

---

Converts desired wastegate opening angle to the wastegate duty required. Values vary with the current boost pressure, since the pressure feed to the actuator diaphragm is fed from the boost pressure. So for a higher boost pressure, a higher wastegate duty (bleed off) is required to maintain the correct opening angle. You only need to modify this map if you replace the wastegate actuator or alter the spring tension.

If correctly understood and calibrated the boost control will be extremely competent.

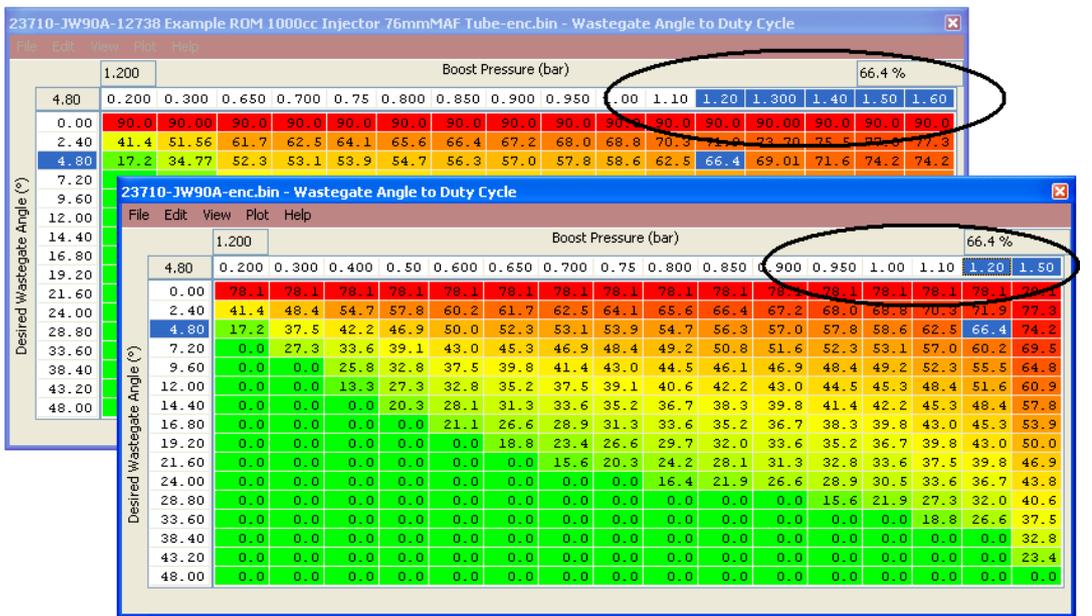
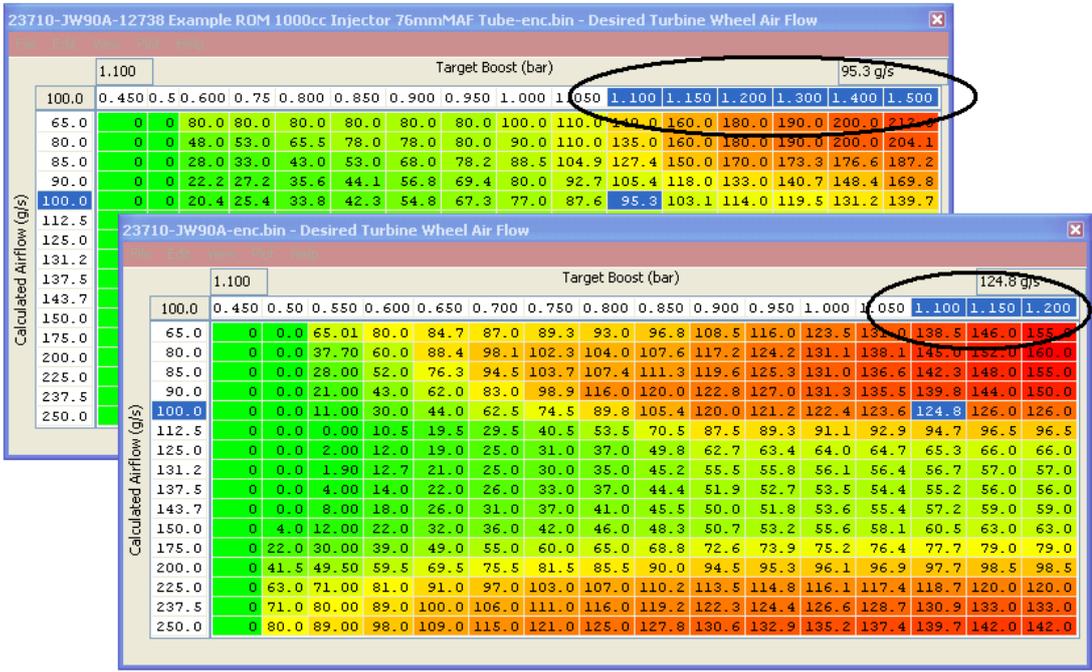
In our experience using the RaceROM Boost Controller we can accurately recalibrate the boost control for different pressures with precision calculations and detailed log files to cross reference.

In the majority of cases the only map that should be altered is the **Desired Turbine Wheel Air Flow** map. Following the steps below will enable you to make accurate boost control calibration.

- Make a log at 0.8 bar, 1 bar and 1.2 bar (assuming you are able to run these different pressures without risk of damage to the engine) be sure to include all the important parameters used in boost control as listed in Live Data section (like Calculated Airflow, Wastegate Angle and Turbo Dynamics)
- Compare Target Boost and Boost Error and Calculated Airflow. By opening the Desired Turbine Wheel Air Flow map you can now see the corresponding Target Boost and Calc Airflow lookup parameter and this can be verified as the diagnostic parameter called Desired Turbine Wheel Output.
- If the boost is under target then the Desired Turbine Wheel Air Flow values needed to maintain the turbine speed are too low (and hence the boost is low), so simply raise the values to increase the amount of airflow that will hit the turbine wheel and increase turbo speed!
- The same procedure can be applied for an over boost situation.
- For greater accuracy set both Turbo Dynamics Integral and Proportional to Zero during boost calibration.

A final boost tuning tip is if your Target Boost is 0.8 bar and you generate a steady 1 bar then simply copy and paste the Desired Turbine Wheel Air Flow column for 0.8bar into the 1 bar column! This can be repeated for other boost targets as well.

We also advise that you start your tuning based on any EcuTek example ROMs where available. The example ROMs have the Desired Turbine Wheel Air Flow maps calibrated and in addition the X axis rescaled for greater resolution at higher RPM.



# 7. Tuning Advice - Torque Control

The GTR Engine Control Module (ECM) and Transmission Control Module (TCM) depend completely on Torque calculations.

It is critical that the Torque value output from the ECM is accurately calibrated, if it is not then pulling away, gear shifting and gear selection will range from being unresponsive, hesitant and uncontrolled to dangerously aggressive and unbearably hard and this could drastically shorten the life of the transmission.

Calibrating the Torque values is not normally needed when using EcuTek RaceROM version 3 or newer, these later RRFF have superior high load rescaling and high resolution Torque map definitions which provide very smooth and detailed interpolation, they are calibrated to 1000Nm.

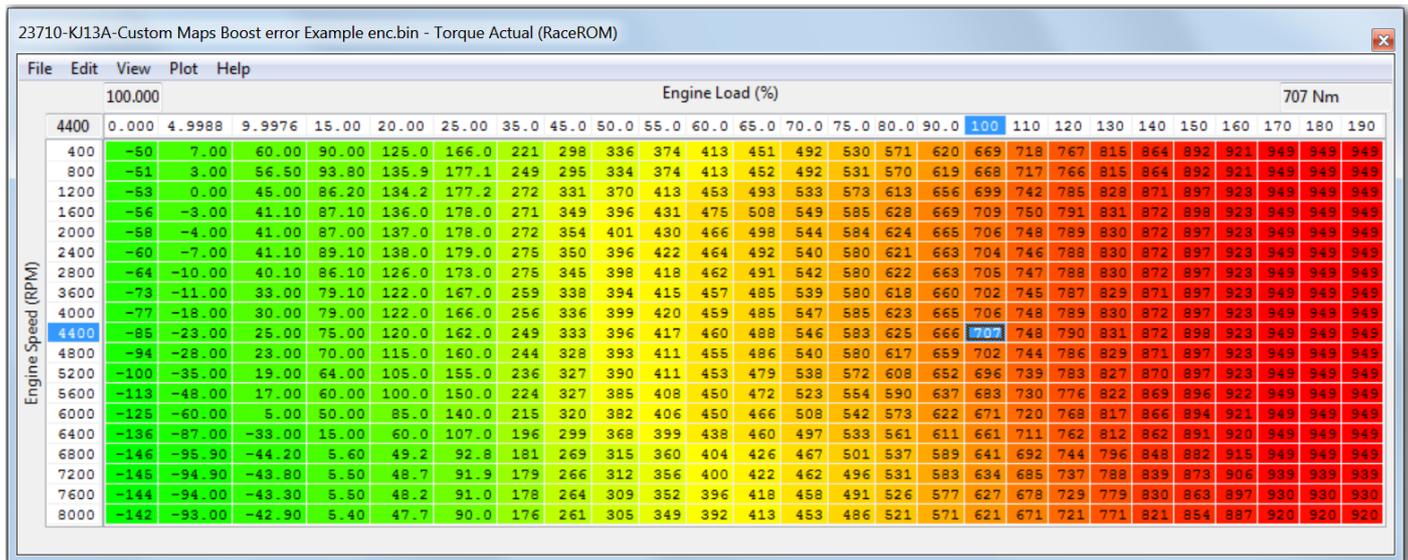
When used in conjunction with the latest LC5 TCM ROM (KJ or 38B series TCM ROMs) then the driveability will be better than any stock GTR and will be silky smooth.

## How to calibrate the Torque Actual map

Calibrate your Fuel Trims until they are between 90 to 110%, if you can fine tune them to be as tight as 95 to 105% then even better, this needs to be done at Idle, under cruise conditions and then full load all the way to the rev limiter.

Assuming the Fuel Injector scaling is correct then you need to adjust the MAF scaling (or the SD VE map if you are running on SD) until the fuel trims are as close as you can get to 100%.

By adjusting the MAF scaling or SD VE map you also correct your Engine Load (X axis of the Torque Actual map) and therefore the output of the Torque Actual map.



## Understanding the Torque map

To understand the effect of the Torque Actual map we need to exaggerate the changes for the purpose of example, see below.

- If you drastically reduce the Torque map values then the Torque value reported to the TCM will be lower and the clutches will slip when pulling away, on gear changes and also full time slip on full load, the clutch life will be counted in seconds if this happens.
- If you drastically increase the Torque map values then the Torque value reported to the TCM will be higher and the clutches will be engaged at Idle and the vehicle will creep in traffic and also the gearchange will be very firm.

Using RRFF version 3 or newer there is no reason to adjust this map.

If you have replaced the clutch packs with uprated clutch packs then you may need to reduce these values at lower Engine Loads for improved drivability (below 100% Engine Load). But try adjusting the Clutch Touch Points and Clutch Capacity before adjusting the Torque Actual map,

**NOTE:** Increasing the Torque values in the Torque Actual map will NOT make more power, it will only upset the drivability of the vehicle!

The torque value is sent over the CAN bus to the TCM, this is used to calculate clutch clamping pressures, as above if the torque value is too low then the clutches will slip.

Make a log file of the TCM (using the TCM ROM) then you will see the following:

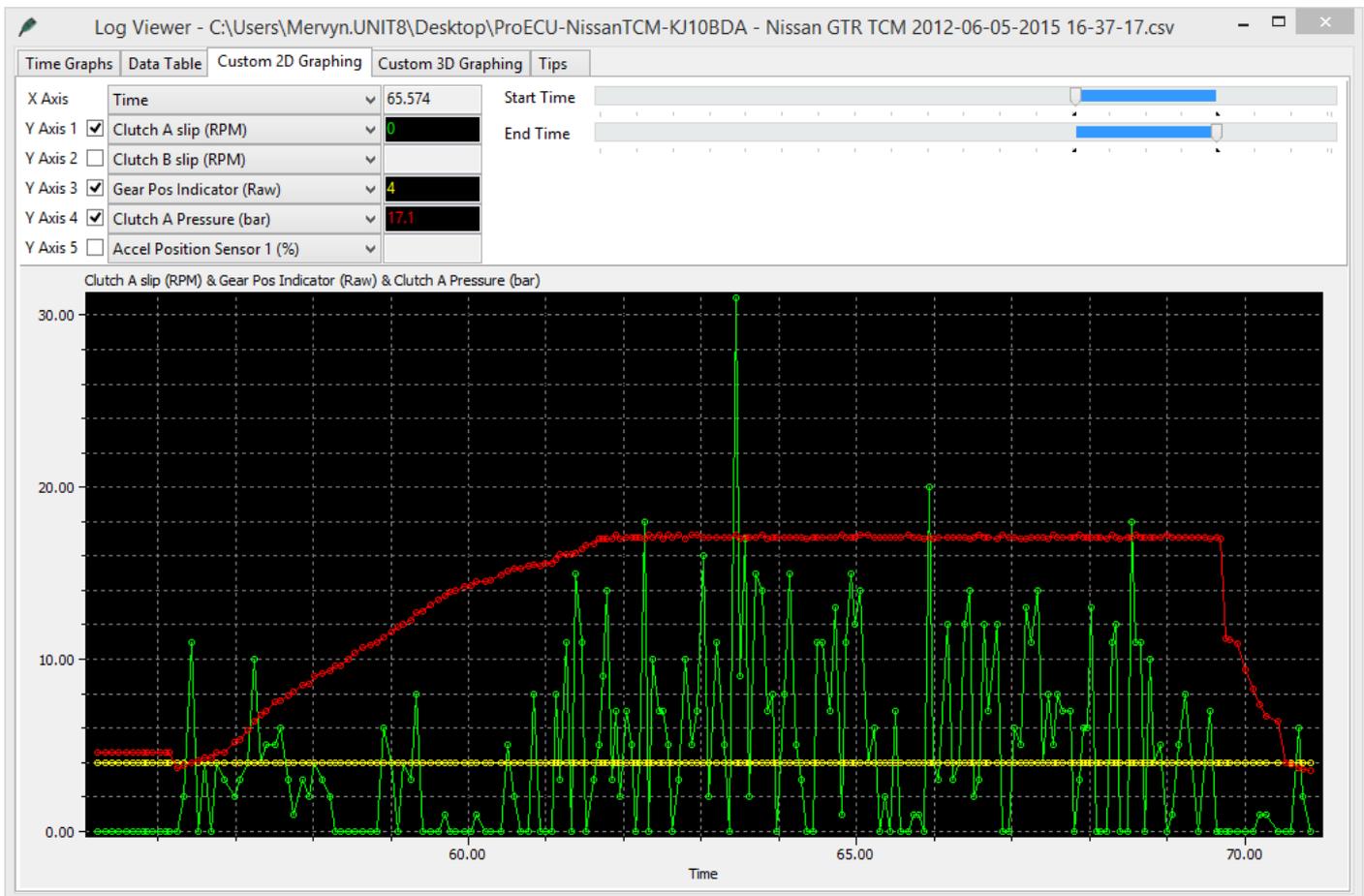
Clutch A will be used for gears 2, 4 and 6

Clutch B will be used for gears 1, 3 and 5

You can see that this log file below shows that in 4<sup>th</sup> Gear the clutch slip is between 0 and 15rpm, this is pretty normal.

You can see that Clutch A Pressure is flat lined at 17.1bar, this is slightly higher than normal as most clutch pressures will be around 16.5bar.

If you feel the clutches are slipping on full load then either add 20% to the Torque Actual map over 80% Engine Load or even easier and preferred is to increase the Clutch Capacity to +8 and make another power run and log of the TCM, see if the clutch slip reduces, if so then increase the values in the Torque Actual map.



# 8. Nissan Factory Launch Control

## 8.1. What is the Nissan GTR Launch Control?

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The Nissan GTR has a built in factory Launch Control Mode, when conditions are correct this will deliver an extremely effective launch condition. When entering the special mode the throttle butterfly will react quickly providing a burst of Engine Torque which will load the transmission and drivetrain for a blistering launch condition.

This launch condition is often mistaken and confused for the typical 'stall test' launch that can be induced by on most Auto gearboxes models at the traffic lights (left foot on the Brake, Accel pedal to the floor and wait for the lights to change). This low torque/low RPM slipping convertor/clutch launch is not the same or nearly as aggressive as the special Launch Control Mode, though this type of launch is still very effective on the GTR when used.

## 8.2. How do I make the Nissan GTR launch Control work?

---

When the Engine and Gearbox oils are up to temperature, the vehicle is stationary and the correct settings are applied to the 4WD and VDC switches along with Manual Gear Selection (not in Auto) then the factory Launch Control can be used (assuming the factory TCM ROM has it enabled by Nissan, see NOTE below!).

With your left foot on the brake and quickly pressing the Accel pedal to the floor, the engine RPM will rise very quickly to around 3300rpm or 4500rpm (depending on the exact LC version installed), this RPM will be held for around 5 seconds until the ECU will force release of the LC mode to prevent strain and heat on the clutches and gearbox.

If the 4WD switch is simply moved out of RACE mode and the test repeated then LC mode will not enable and the difference is clearly felt.

**NOTE:** LC2 and some LC3 have the factory LC mode disabled in the TCM ROM, this can be enabled using EcuTek software.

## 8.3. Launch Control versions defined

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### LC1 (early "JF" series TCM ROMs)

Early 2008-2009 GTR models have a built in Factory Launch Control system called LC1 which is an aggressive Launch Control Mode that put considerable strain on the drivetrain.

LC1 Launch RPM is factory set at 4500rpm and is found in the Engine ECU ROM in the 1D  
**Launch Control RPM** map:



LC1 Launch Control mode will only activate when:

Oil temp is over 65 Deg C

4WD is set in Race Mode (Red Light ON)

VDC is OFF so traction control does not operate (Yellow Light ON)

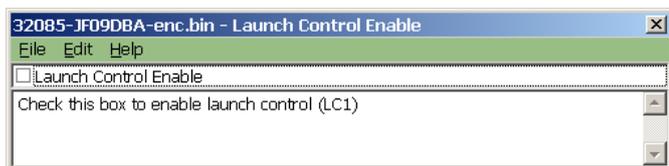
Gear Level selection is in MANUAL and 1<sup>st</sup> Gear is selected

## LC2 (“JF” series TCM ROMs)

On later JF cars Nissan simply disabled the launch control in the TCM ROM, this was sometimes applied during servicing at Nissan dealerships and it's claimed that the launch control functionality was removed to maintain manufactures warranty.

You can see below the LC2 TCM ROM called JF09DBA has the factory Launch Control disabled by Nissan, to re-enable simply check the box, save the ROM and program into the TCM ECU. This will enable the LC1 Launch Control code again in the LC2 ROM

LC1 and LC2 can only be used with VDC OFF and in Manual – R mode and conditions must be met as described above.



## LC3 (“JW” series TCM ROMs)

2010-2011 Gen 1 GTR models have a revised Factory Launch Control system which is enabled on all JW models. LC3 is less aggressive Launch Control Mode that is easier on the transmission and drivetrain. LC3 works with VDC ON (Traction Control working).

LC3 Launch RPM is factory set at 3300rpm and is found in the Engine ECU ROM in the 1D **Launch Control RPM** map.



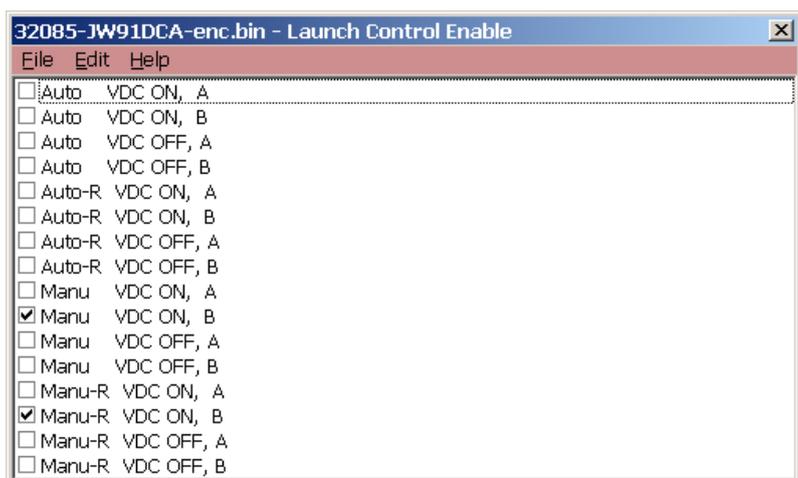
LC3 Launch Control mode will only activate when:

Oil temp is over 65 Deg C

VDC is ON so traction control is working (RED Light ON)

Gear Level selection is in MANUAL and 1<sup>st</sup> Gear is selected

As seen below LC3 can be enabled in Manual with or without 4WD in R mode (Race)



If you wish to allow LC to work in other conditions (like Auto or without VDC etc) then simply enable the condition in the TCM ROM (though the associated risks must be accepted).

**NOTE:** LC should be enabled in BOTH Mode A and Mode B if used with any Gen 1 GTR models.

## LC4 (“KB”, “KJ” and “38” series TCM ROMs)

2011-2014 Gen 2 GTR models have the latest and most refined gearbox control code, along with the most advanced Launch Control strategy with improved clutch control, faster gear selection and much smoother gear changes compared to earlier TCM code versions.

LC4 Launch RPM is factory set at 4100rpm and is found in the 1D **Launch Control RPM** map:

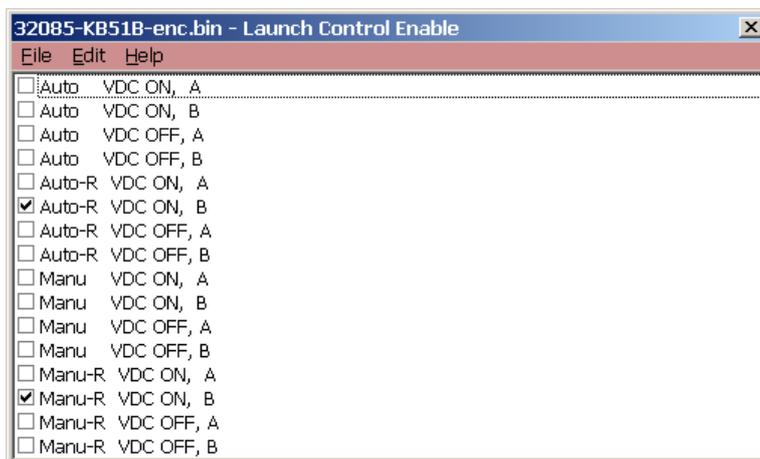


LC4 Launch Control mode will only activate when:

- Oil temp is over 65 Deg C
- VDC is ON so traction control is working (RED Light ON)
- Gear Level selection is in MANUAL and 1<sup>st</sup> Gear is selected

LC4 can be enabled in Manual with or without 4WD in R mode (Race).

If you wish to allow LC to work in other conditions (like Auto or without VDC etc) then simply enable the condition in the TCM ROM (though the associated risks must be accepted).



**NOTE:** LC should be enabled in BOTH Mode A and Mode B if used with any Gen 1 GTR models.

The different configuration settings that are required for Launch Control to be enabled are summarised below:

### JF series TCM (LC1)

	VDC on	VDC off
Auto	NO	NO
Auto-R	NO	NO
Manu	NO	NO
Manu-R	NO	YES

### JW series TCM (LC3)

	VDC on	VDC off
Auto	NO	NO
Auto-R	NO	NO
Manu	YES	NO
Manu-R	YES	NO

### KB, KJ, 38 series TCM (LC4)

	VDC on	VDC off
Auto	NO	NO
Auto-R	YES	NO
Manu	NO	NO
Manu-R	YES	NO

EcuTek ProECU Nissan GTR TCM software allows the tuner to modify the LC setting conditions so that launch control can be activated without R-mode, or with VDC off or however you want.

**NOTE:** It's recommended that the latest TCM ROM is used on all Gen1 or Gen2 vehicles.

## 8.4. TCM and ECM ROM compatibility

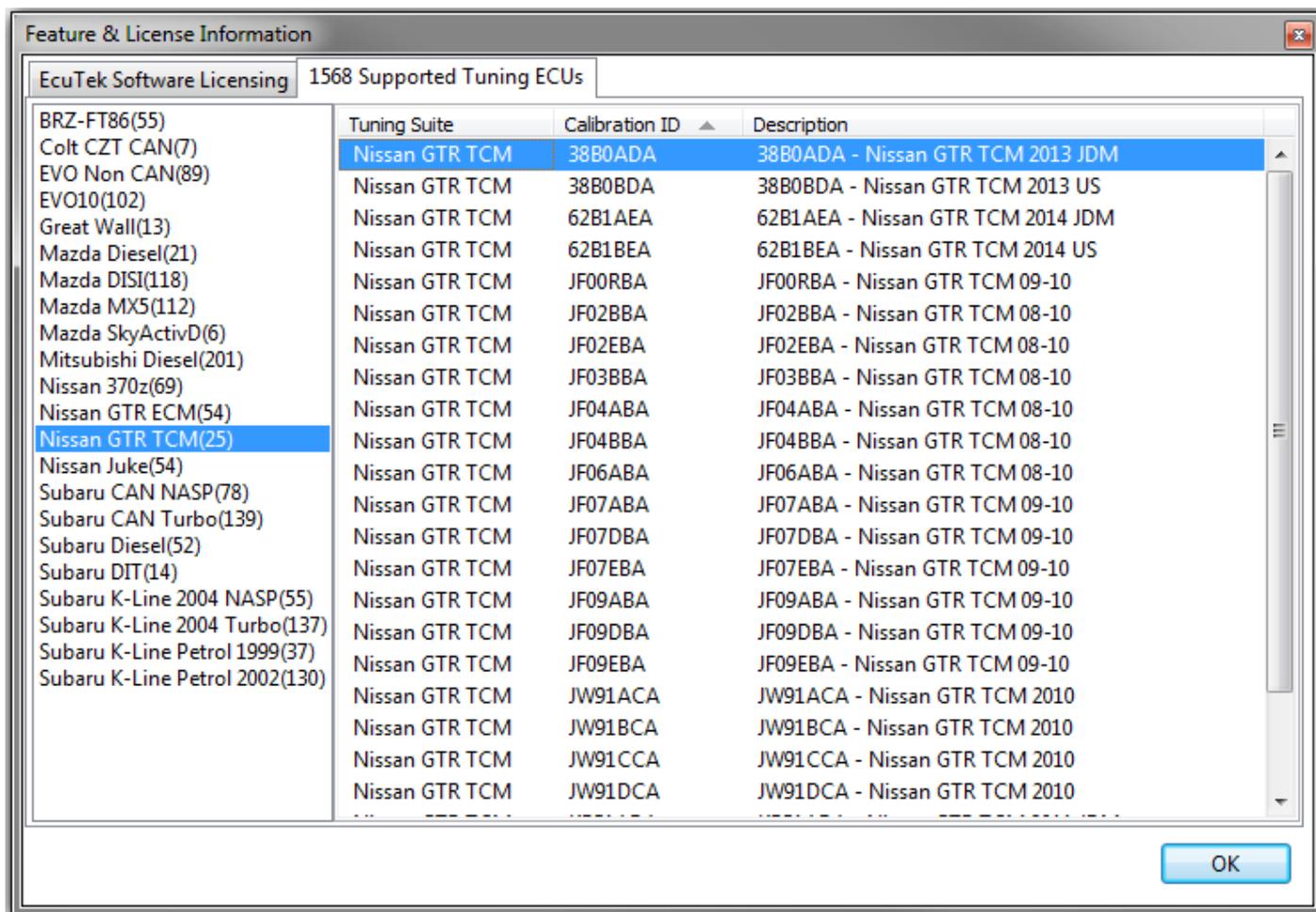
It's recommended that the latest Engine ECU ROM is also used in conjunction with the LC4-LC5 TCM code. The JW ECM code is better suited and more compatible for the later Gen 2 TCM code versions (LC4-5).

For Gen 1 models the latest ECM code version would be the JW series ECU ROM.

Some Examples are shown below for Gen 1 GTR:

Factory ECM ROM	Suggested ROM	Factory TCM ROM	Suggested ROM
JF51A Euro	JW93A Euro	JF04BBA	KB51BDA
JF04A Japan	JW90A Japan	JF02BBA	KB51BDA
JF30A USA	JW92A USA	JF09DBA	KB51BDA

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:



The Auto Gearbox Learning sequence should **always** be carried out after any TCM programming. The Clutch Capacity and Clutch Touch Points should also be calibrated after any TCM programming.

We recommend that the LC5 TCM called '32085-KJ10BDA-RRFF 14433 Rev Counter Map Switch Enabled LC5 enc.bin ' is used in all TCMs (even if the ECM has not or will not been programmed with ProECU). This can be found in the TCM Example Rom folder.

### 2008 JDM TCM issues

Some very early Gen 1 JDM region models may seem incompatible with later LC2 to LC5 TCM ROMs.

The CEL light is shown after programming but no DTCs are stored.

Programming the original LC1 TCM ROM version again will solve the DTC issue but it doesn't help us improve the TCM software.

It is possible to use the far superior LC5 ROM in these ECU by ensuring the ECM and TCM DTCs are cleared correctly and the ECM is Reset after programming the later TCM software.

The READ and CLEAR DTCs sequence will need to be repeated 2 or 3 times before the TCM DTCs are successfully cleared, so persevere and eventually the TCM CEL will clear.

You can carry out the TCM Auto Learn sequence followed by manual Clutch adjustments.

# 9. How to Setup

## 9.1. How to set up Speed Density

EcuTek RaceROM Feature Files (RRFF) offer a Speed Density tuning option, this is a MAP sensor based load input into the ECU (compared to the more forgiving factory MAF sensor based load input).

In certain situations Speed Density is more suitable over a MAF based input, this are usually:

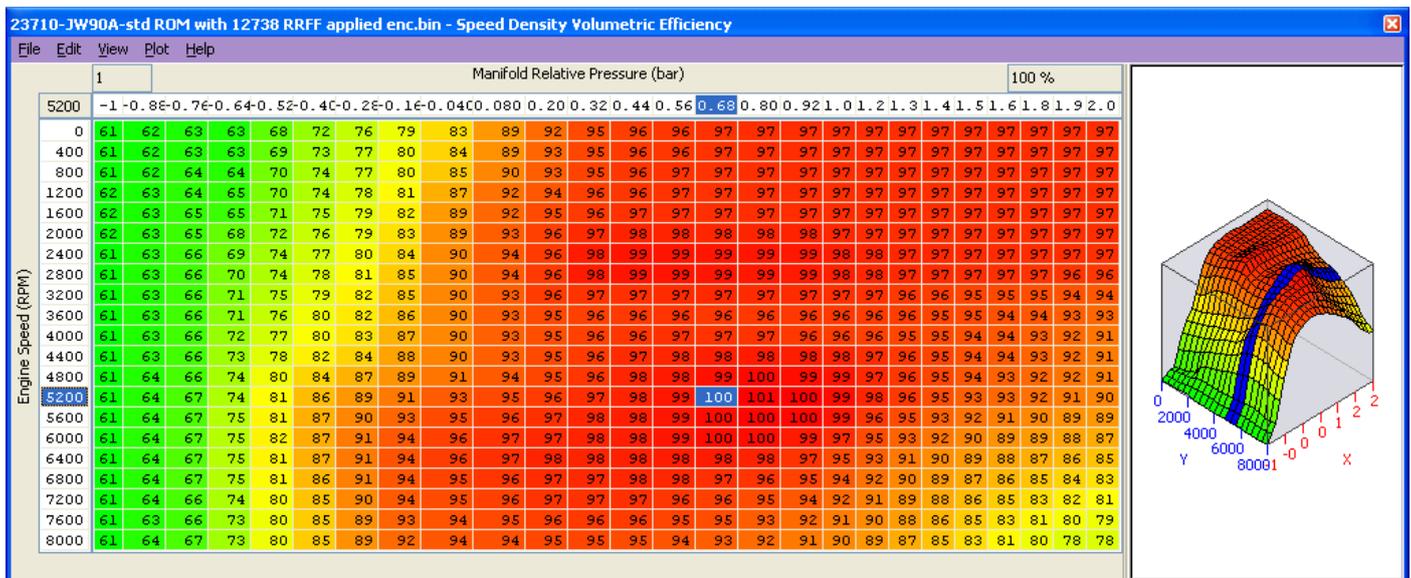
The air speed through Large MAF tubes is too slow to accurately measure for a stable Idle

Turbo compressor wheel cause reverberations up the intake pipe and upset the MAF sensor reading

Turbo installs use Vent To Atmospheric Blow Off Valves (BOV's) instead of preferred recirc designs

The stock MAF's are flat lined at 5volts and cannot read any higher than the 5v limit (where ideally a slightly larger MAF tube should be fitted like 66mm to 76mm)

In these situations the Speed Density or Hybrid Speed Density can be used.



The SD VE map is against Engine Speed (RPM) and Manifold Relative Pressure (Bar). The values in the map are volumetric efficiency (VE) %.

The older RRFF SD Map had Mass Airflow values in the SD map but the latest RRFF now uses a superior VE based SD calculation which we will cover here.

When the SD map is active it simply replaces the current Mass Airflow (g/sec) reading that would normally come from the MAF sensor, therefore ALL load calculations are not affected by the MAF sensor at all.

When the SD map is correctly calibrated there is little difference from running on MAF and the SD VE map works like this:

INCREASING the SD values will make Engine Load higher therefore retarding the Ignition and increasing the Injection volume amount therefore making the AFR richer.

REDUCING the SD values will make Engine Load lower therefore advancing the Ignition and reducing the Injection volume amount therefore making the AFR leaner

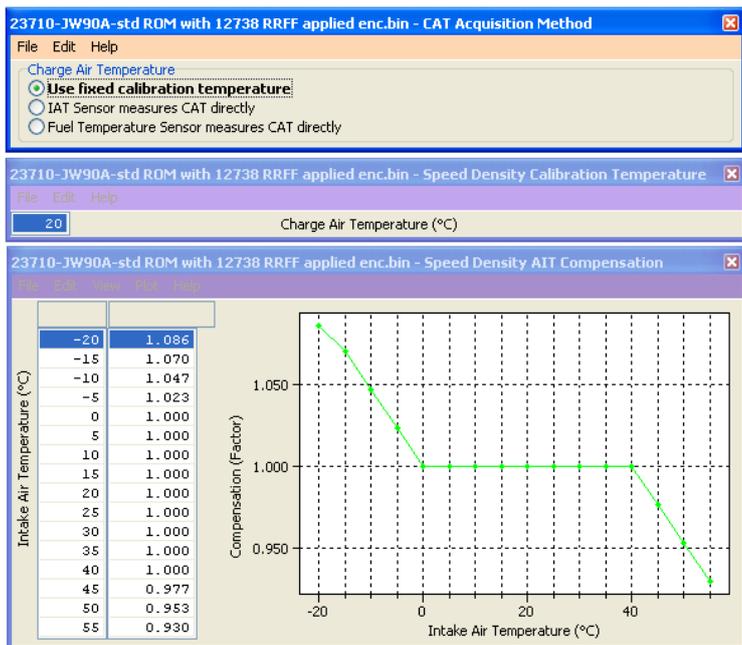
The SD map uses the Plenum based MAP sensor to calculate SD. It does NOT use the pre throttle Boost Pressure sensors. The stock MAP sensors can read to 2.7bar absolute, any pressure over 2.72bar absolute will need a 4bar MAP sensor fitting.

The default SD map has been calibrated for a stock vehicle, the VE based calculation will be seriously affected by any fundamental change in VE (like fitting larger turbochargers or changing the camshafts).

Charge Air Temp (CAT) also plays a critical part in the VE calculation and as a charge air temp sensor is NOT fitted by the factory we have to assume a fixed temperature and then make a calibrated compensation based against Intake Air Temp.

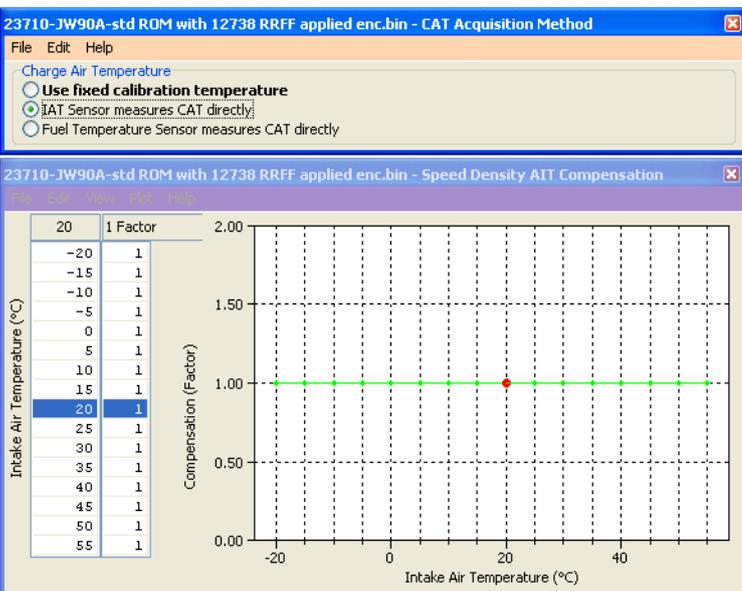
### 9.1.1. No air temp sensor fitted in the charge pipe

The Speed Density Temp Compensation map will adjust the SD VE calculation based on the current IAT, therefore attempting to calculate the true air density by calibration.



### 9.1.2. Intake Air temp sensor fitted in the charge pipe

If the Air Intake Temp sensor (AIT) has been placed in the charge pipe and the IAT is measuring true CAT (after the turbo and intercooler) then we do NOT need to use the 'Speed Density Temp Compensation' map (as VE calculation is including true CAT), in this situation we need to select the CAT Acquisition Method of 'IAT sensor measures the CAT directly' option.

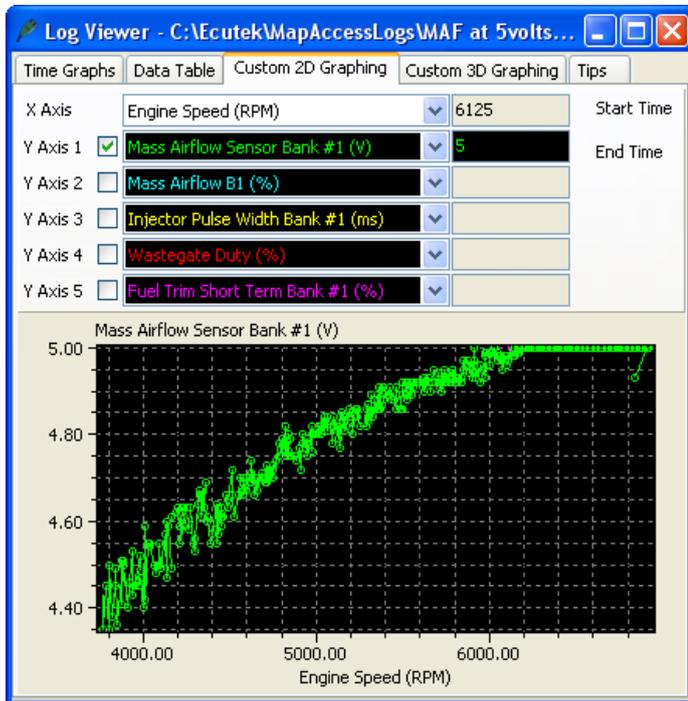


We also need to set the values in the 'Speed Density Temp Compensation' to 1 as we are not 'guessing' the CAT anymore.

## 9.2. How to set up Hybrid Speed Density

### Hybrid SD mode options

RaceROM's powerful Hybrid Speed Density allows the Load Input to be switched between MAF and SD as required. The transition can be 'MAF then SD' or 'SD then MAF'.



Hybrid SD is a great solution if your MAF volts are hitting 5volts at a higher RPM.

In this situation you can run the superior MAF load input for most of the time then switch to SD when the MAF is nearing 5 volts.

In this example to the left we would switch to SD around 5500rpm where the MAF is at 4.90volts and just before the MAF's hit 5volts. Remember to check the MAF volts on both Bank #1 and Bank #2 as one MAF might flow more than the other.

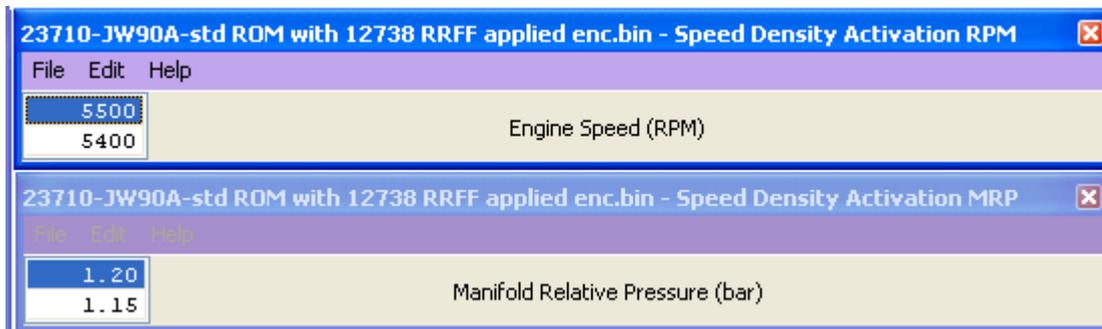
The hybrid SD condition to switch between MAF and SD or SD then MAF can be one or several of the following:

Engine Speed (RPM)

MAP (Bar)

Mass Airflow (g/sec)

In the previous example we would specify that past 5500rpm we switch to SD but we can also say that boost pressure has to be over 1.2bar as well, this would prevent the SD from ever working below 1.2bar **and** below 5500rpm.



So the engine will be running on MAF at Idle, low load and it will stay on MAF until 5500rpm AND the boost exceeds 1.2bar relative.

As soon as the RPM drops BELOW 5400rpm **or** the Boost drops BELOW 1.15bar then the ECU will switch back to MAF.

We need a smooth transition when swapping between 'MAF and SD' or 'between SD and MAF'. For this to happen the MAF and SD have to read very similar airflows at the switch point.

One major point to make is that ProECU can LOG the output of the MAF sensors even if they are not used by the ECU (i.e. the ECU is running on SD not MAF).

So to calibrate for a hybrid transition we need to Enable SD earlier than the switch point, if the switch point is 5500rpm then enable SD over 4000rpm. Even though the ECU is using SD past 4000rpm the MAF can still be logged, now we need to log the following three parameters.

Mass Airflow Absolute (MAF) (g/s) – The mass airflow reading from the MAF sensor

Mass Airflow Absolute (SD) (g/s) – The mass airflow calculation from the SD map

SD Volumetric Efficiency (%) – The output of the SD map

As seen below the ECU is currently running on SD, we know this because the SD VE shows 95% and Mass Airflow readings for MAF and SD are different.

If the ECU was using MAF the SD VE reading would be 0% and the Mass Airflow readings would be the same.

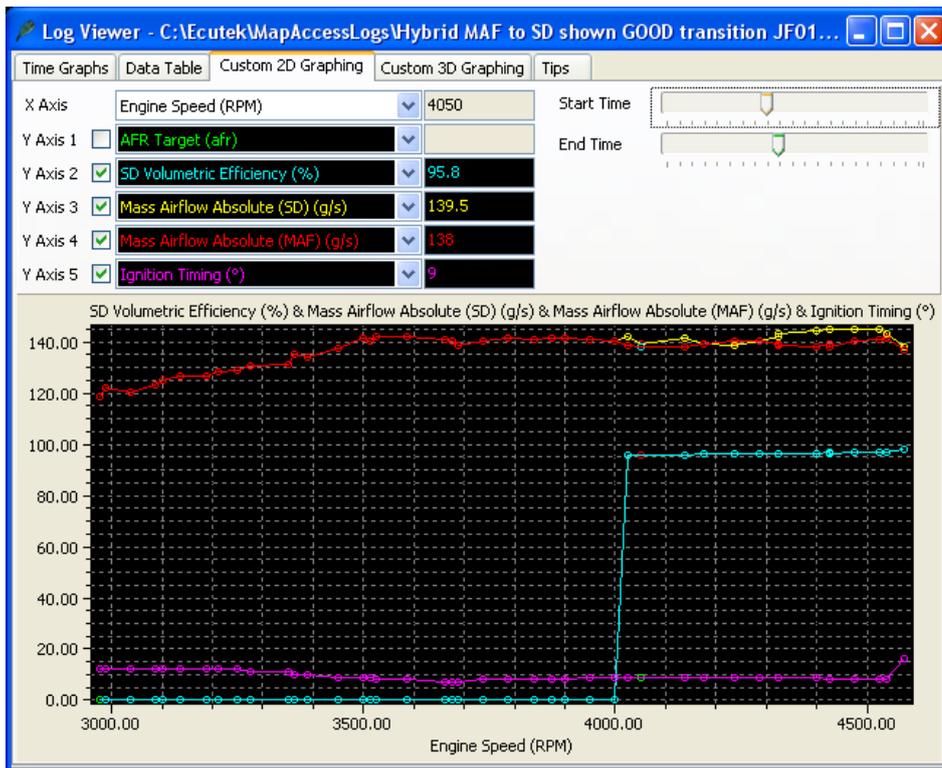
The Mass Airflow readings for MAF and SD are very close between 3500 and 4500rpm so it would be a very smooth transition to swap from MAF to SD (or SD to MAF) at any RPM shown below.

The log file shot below shows the ECU running on SD.

The Mass Airflow is from our SD map, the MAF sensor reading is also logged but is not used by the ECU.



## Here is a Good Hybrid SD transition



At 4000rpm the ECU swaps to SD and the SD VE value moves from 0 to 95.8%, the Mass Airflow reading comes from SD map and not the MAF sensor (but they read very similar values).

This is a great example and the switch point from MAF to MAP will be a smooth transition.

## Here is a BAD Hybrid SD transition



This is **BAD** hybrid tuning and the car even had clutch slip problems during transition. In this example the SD is switched ON at 3000rpm.

You can see the SD VE parameter go from 0% to 72.8% when SD activates and SD now provides the ECU with the Mass Airflow input value for its load calculations.

You can also see that the Mass Airflow calculated from the SD VE maps (in YELLOW) suddenly drops from 106 grams to 80 grams but the Mass Airflow shown by the MAF sensors (in RED) continue to read a more sensible and true Mass Airflow. In this case the SD map has been poorly calibrated!

As the SD is enabled the Mass Airflow drops and engine load drops drastically and Ignition timing jumps from 17 to 26 degrees. The Fuel Trim also went to 125% to add enough fuel.

The SD map needed increasing from 76% to 98% to fix this issue then all was good. So to make smooth transitions it's critical to make sure MAF and SD read close before and after the transition swap. You need to ensure that the FTs are correct running on MAF, if not then adjust the MAF scaling until they are correct. Then enable SD and ensure the FTs are correct and if not then adjust the SD map. Then you can set the conditions to switch as you wish! As you can enable SD in any of the 4 map switch modes you could use MAF in MODE 1 and SD in MODE 2 to get a back to back result.

### **9.3. How to rescale the MAP Sensor scaling**

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By using the RaceROM Hi Boost map feature we can increase the boost to 3 bar+.

There are 3 MAP sensors fitted to the GTR and they are all 2.83 bar absolute sensors. One MAP sensor is located in the plenum (Inlet manifold) and can show manifold vacuum, this MAP sensor is used for RaceROM Speed Density and the also the Boost Pressure display on the driver information display.

The other two MAP sensors are fitted pre throttle (one in each bank) and they are used for boost control and boost limit.

Any vehicle running more than 1.7bar boost will need 3 x new MAP sensors fitting pre and post throttle to be able to control boost pressures over 2.70bar absolute using the factory boost control system.

But if Custom Maps is used for boost control (where the plenum based MAP sensor can be used for the pressure reading) then the two pre throttle MAP sensors do not need to be replaced and the boost control can be based on the plenum based MAP sensor.

But please note that the boost limit is based on the pre throttle MAP sensors and if they are still stock items (2.83bar) then the boost limit will never trip with values greater than 2.7bar in the map. In this case you can create a custom map for fuel cut against the Inlet Manifold based MAP sensor.

Standard Map Sensor Scaling is as following:

Multiplier (bar/volt) 0.613

Offset (bar) -0.235

So :  $0.613\text{bar} \times 5\text{ volt} = 3.065\text{bar}$

$3.065\text{bar} - 0.235\text{bar Offset} = 2.83\text{bar}$  (for the standard MAP Sensors)

We have tried and tested the AMS supplied 4bar MAP sensors.

AMS recommend the following settings:

Multiplier (bar/volt) 0.83

Offset (bar) 0.00

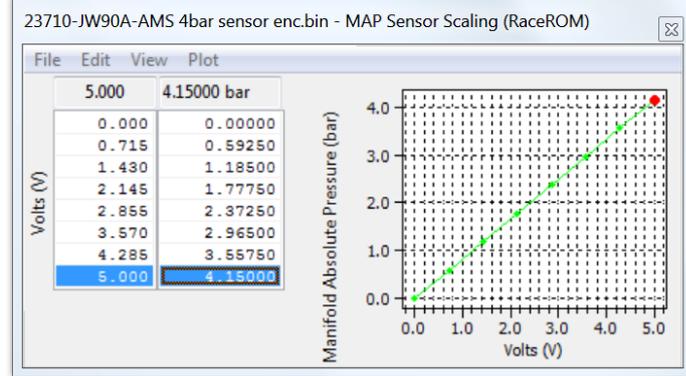
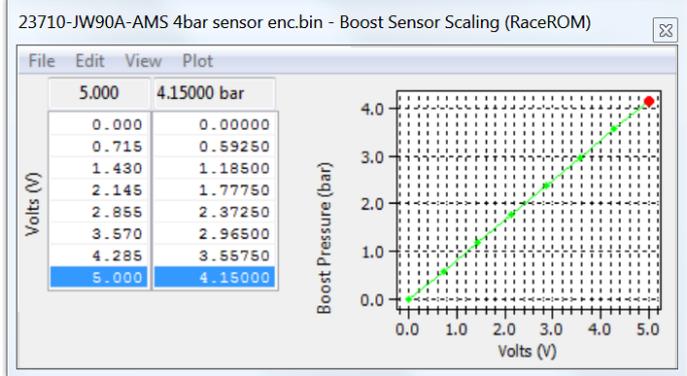
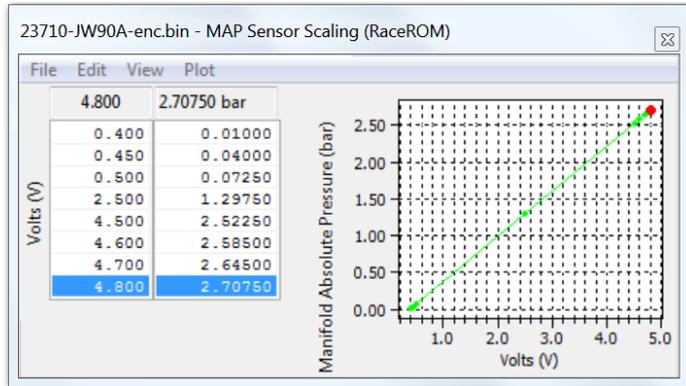
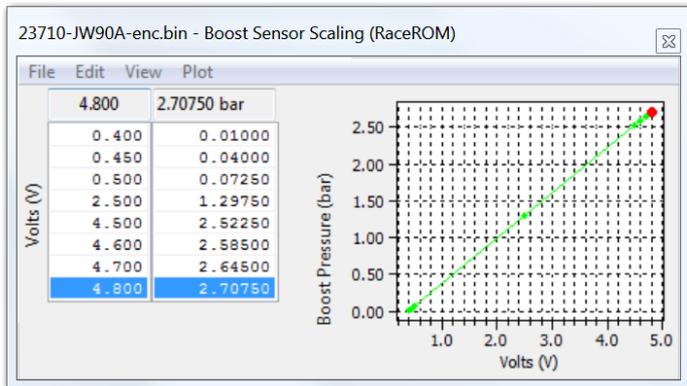
So :

$0.83\text{bar} \times 5\text{ volt} = 4.15\text{bar}$

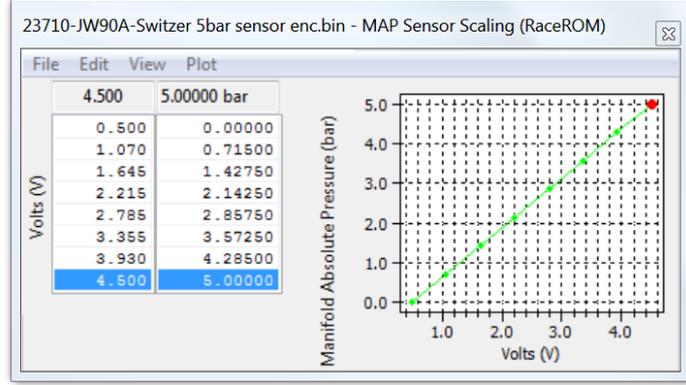
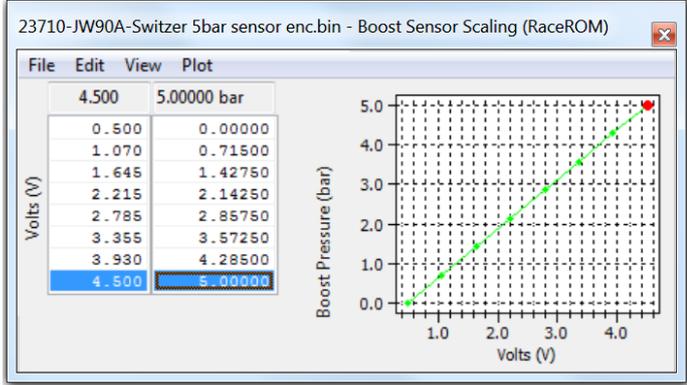
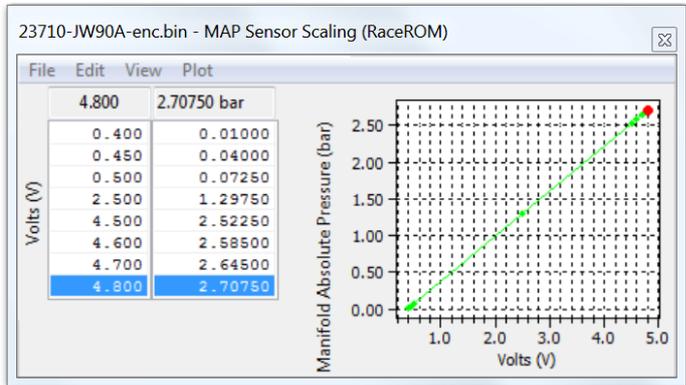
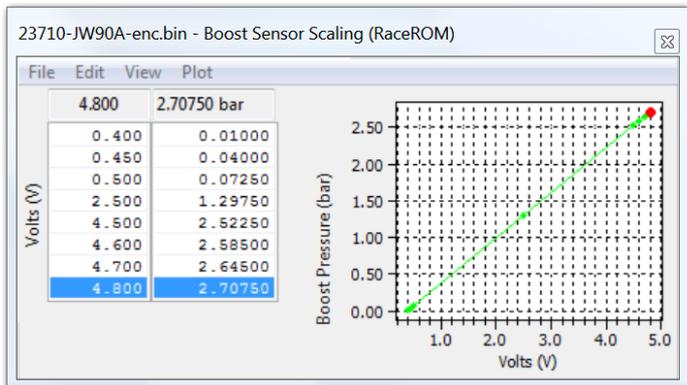
With zero Offset value the AMS sensors are rated at 4.15bar Absolute.

Below you can see the AMS recommended setting for their 4bar map sensor vs stock MAP sensor settings.

As you can see its possible to calibrate the input voltage values as well as the output pressure values.



Also below you can see the Switzer recommended setting for their 5bar map sensor that were supplied by Switzer.



## 9.4. How to set up Custom Maps Boost Control

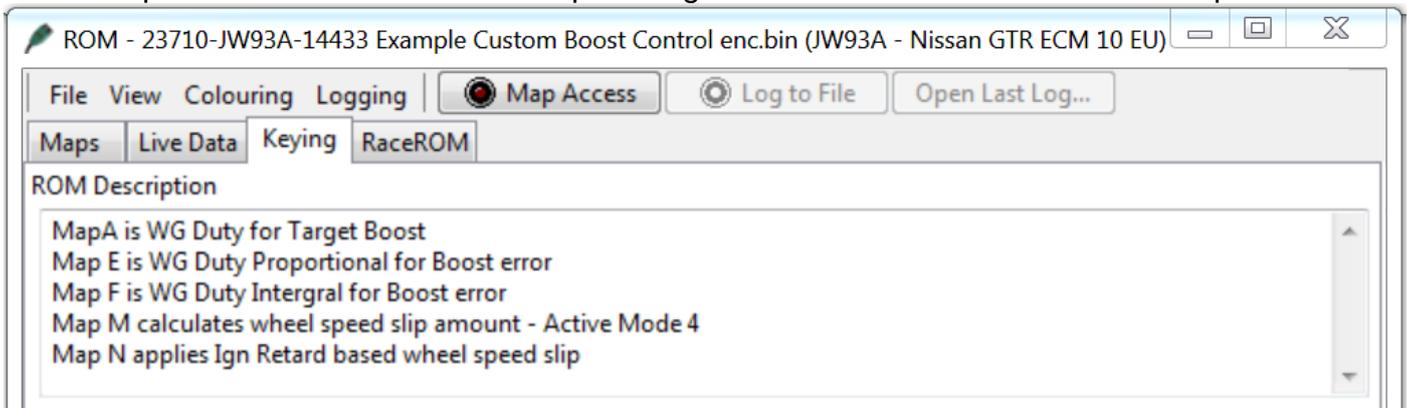
By using custom maps it possible to rewrite the factory boost control system, this can be useful when tuning for larger turbo's, stronger actuators and external wastegates.

You can set the wastegate duty as a fixed WG duty % for a target boost pressure, this is a very crude and basic open loop boost control system but it can be useful when setting up a heavily modified vehicle where there are a lot of variables at the start of the tuning.

Once the Ignition and Fuel calibration is dialled in then you can enable the proportional and integral compensations for the current 'boost error'. This will create a fully closed loop boost control system.

If you wish to use the boost control in open loop then simply do not enable the proportional or integral maps or simply enable them in other modes (like Mode3 or Mode4) so you can see the affect they have on the WG duty.

The example below shows 3 custom maps configured for a custom boost control setup.



Map A is WG Duty for a Target Boost pressure

Map E is WG Duty Proportional addition for boost error

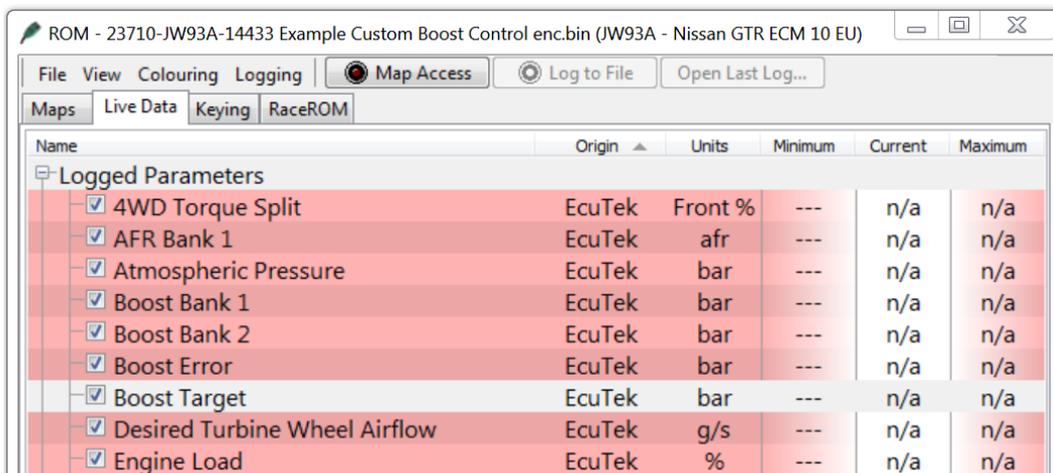
Map F is WG Duty Integral addition for boost error

The current Target Boost pressure is output of the 3d 'Target Boost' map, the RaceROM Boost Controller (RRBC) is then considered.

The current target boost is always the lowest boost target value, so if the output of the 3d 'Target Boost' map is 1.2bar but the RRBC setting is 0.9bar then the Target Boost Pressure is 0.9bar and this will be the X axis input value for Map A.

But if the current RRBC setting is 1.4bar then the Target Boost Pressure would be 1.2bar.

You can see and log the current Target Boost value shown under Live Data.



Name	Origin	Units	Minimum	Current	Maximum
Logged Parameters					
<input checked="" type="checkbox"/> 4WD Torque Split	EcuTek	Front %	---	n/a	n/a
<input checked="" type="checkbox"/> AFR Bank 1	EcuTek	afr	---	n/a	n/a
<input checked="" type="checkbox"/> Atmospheric Pressure	EcuTek	bar	---	n/a	n/a
<input checked="" type="checkbox"/> Boost Bank 1	EcuTek	bar	---	n/a	n/a
<input checked="" type="checkbox"/> Boost Bank 2	EcuTek	bar	---	n/a	n/a
<input checked="" type="checkbox"/> Boost Error	EcuTek	bar	---	n/a	n/a
<input checked="" type="checkbox"/> Boost Target	EcuTek	bar	---	n/a	n/a
<input checked="" type="checkbox"/> Desired Turbine Wheel Airflow	EcuTek	g/s	---	n/a	n/a
<input checked="" type="checkbox"/> Engine Load	EcuTek	%	---	n/a	n/a



23710-JW93A-14433 Example Custom Boost Control enc.bin - Custom Map A

File Edit View Plot Help		X channel (raw)																		
1.0																				
4200	-0.50	0.40	0.45	0.80	0.90	0.95	1.0	1.1	1.1	1.2	1.3	1.3	1.3	1.4	1.5	1.50				
1450	0.0	6.3	13	19	25	31	38	44	50	56	63	69	75	81	88	94	100			
1500	0.0	6.3	13	19	25	31	38	44	50	56	63	69	75	81	88	94	100			
2600	0.0	6.3	13	19	25	31	38	44	50	56	63	69	75	81	88	94	100			
2800	0.0	6.3	13	19	25	31	38	44	50	56	63	69	75	81	88	94	100			
3200	0.0	6.3	13	19	25	31	38	44	50	56	63	69	75	81	88	94	100			
3400	0.0	6.3	13	19	25	31	38	44	50	56	63	69	75	81	88	94	100			
3600	0.0	6.3	13	19	25	31	38	44	50	56	63	69	75	81	88	94	100			
4000	0.0	6.3	13	19	25	31	38	44	50	56	63	69	75	81	88	94	100			
4200	0.0	6.3	13	19	25	31	38	44	50	56	63	69	75	81	88	94	100			
4400	0.0	6.3	13	19	25	31	38	44	50	56	63	69	75	81	88	94	100			
4800	0.0	6.3	13	19	25	31	38	44	50	56	63	69	75	81	88	94	100			
5200	0.0	6.3	13	19	25	31	38	44	50	56	63	69	75	81	88	94	100			
5600	0.0	6.3	13	19	25	31	38	44	50	56	63	69	75	81	88	94	100			
6000	0.0	6.3	13	19	25	31	38	44	50	56	63	69	75	81	88	94	100			
6400	0.0	6.3	13	19	25	31	38	44	50	56	63	69	75	81	88	94	100			
6800	0.0	6.3	13	19	25	31	38	44	50	56	63	69	75	81	88	94	100			
7200	0.0	6.3	13	19	25	31	38	44	50	56	63	69	75	81	88	94	100			
7600	0.0	6.3	13	19	25	31	38	44	50	56	63	69	75	81	88	94	100			

Fill Map A columns with 0 to 100% values like shown to the left then make a few power runs starting at 0.7bar and increase the RRBC in 0.1bar increments and log the results. You can now see what boost pressure is created for a given WG Duty.

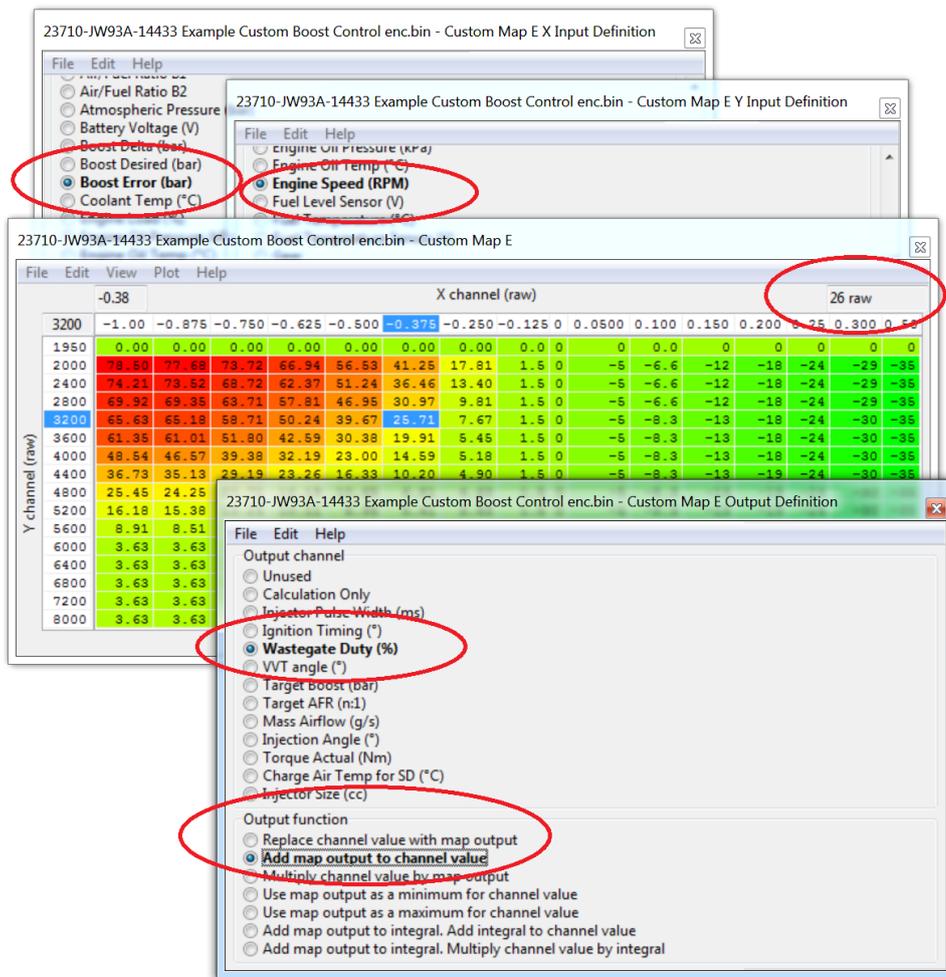
So if 20% WG Duty makes 0.9bar then enter 0.9 in the X axis column above the 20% column. If 40% produces 1.1bar and 60% produces 1.3bar then simply enter the boost value in the X axis above the corresponding WG Duty column.

## 9.4.2. Custom Map E - Wastegate Duty Proportional Control

- X axis is the current boost error (Bar)
- Y axis is Engine Speed (RPM)
- Map values are Wastegate Duty proportional compensation factor.

Custom Map E will add the map output value to the current WG Duty (output of Map A) for a given RPM and Boost Error.

In the example shown below the X axis is boost error (the difference between the Target Boost and Manifold Relative Pressure MRP). The Y axis is Engine Speed.



In this example above at 3200rpm and -0.375bar boost error (so under the boost target) Map E will ADD a value of 26 to the current WG Duty therefore increasing the WG Duty.

Assuming the current value for Map A to be 65 then the WG duty will increase to 91 (65 + 26) to give a final WG Duty of 91%.

As the boost (MRP) increases and nears the boost target then the size of proportional value added will decrease accordingly and as the Boost Target is achieved the proportional amount added will be zero.

If the boost overshoots the target boost value then Map E will REMOVE WG Duty as well.

NOTE: The Proportional value (output of map A) is a one time only added addition and it does not accumulate like an Integral value will do.

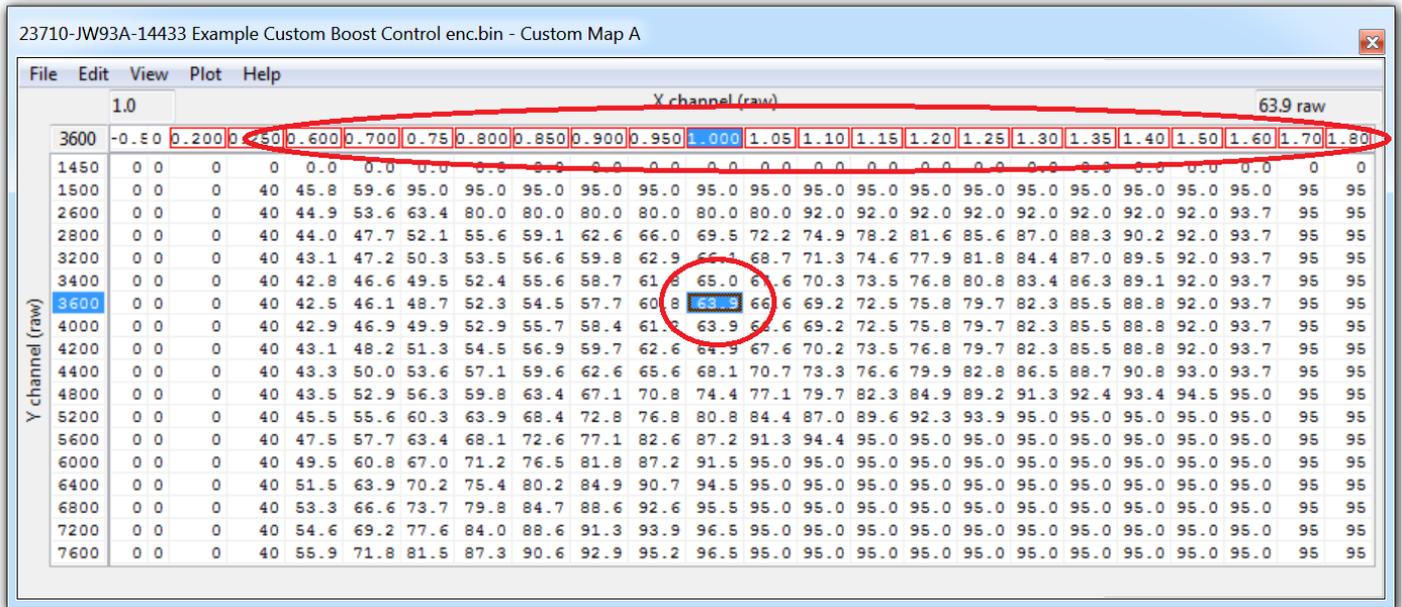
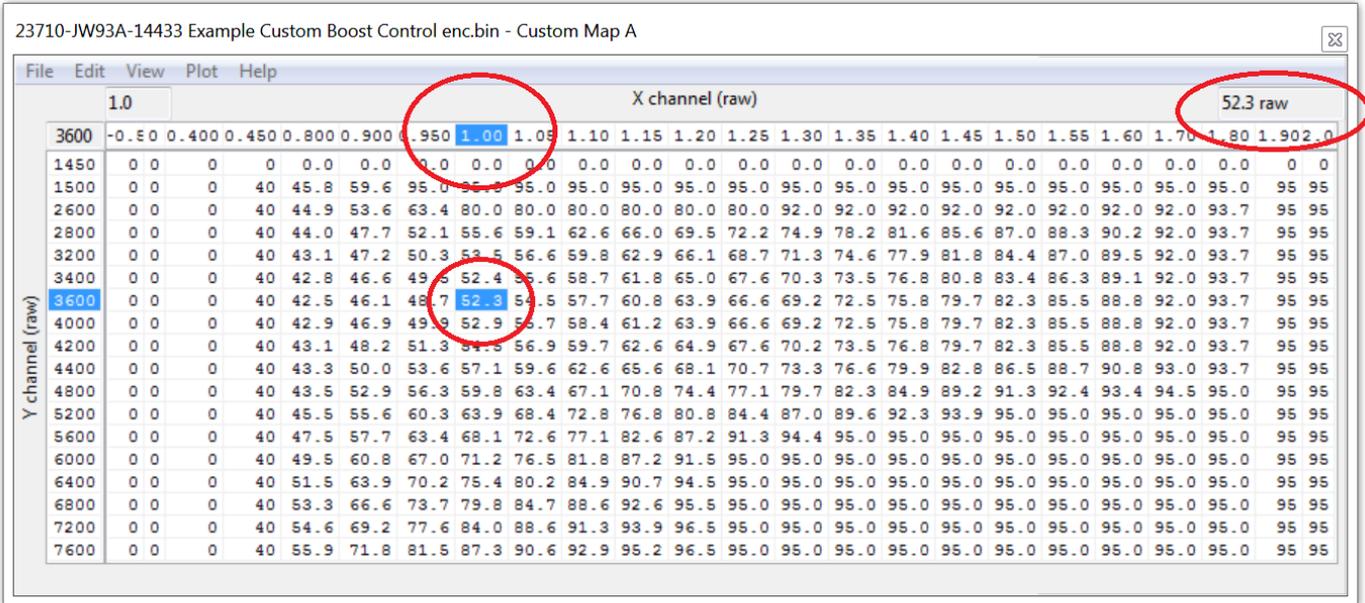
# Calibrating the Proportional Custom Map

We suggest that the proportional and integral maps are not enabled until Map A for base WG Duty has been profiled and is fairly close for good tight boost control.

We then suggest you create an overboost condition and then enable the proportional and integral maps in other modes to see the individual results.

The following sequence is great for producing an accurate proportional or integral map.

Ensure Map A is accurately calibrated so it delivers the correct boost pressure for a given target boost pressure then simply ADD minus -0.20bar to the X axis as shown below.



So now the column for 1.2bar becomes 1.0bar and WG Duty increases from 52% to 64%.

When you select 1.0bar with RRBC you will get 1.2bar and you can see how the Proportional control deals with the overshoot, log the INTERIM and RESULT of Custom Map E to see the proportional component working.

If the boost reduces from 1.2bar to 1.1bar then you have to increase the proportional values for a 0.1bar boost error so the boost can be reduced further.

If the boost reduces from 1.2bar down to 0.9bar then you have to reduce the proportional values in Map E for a 0.1bar boost error.

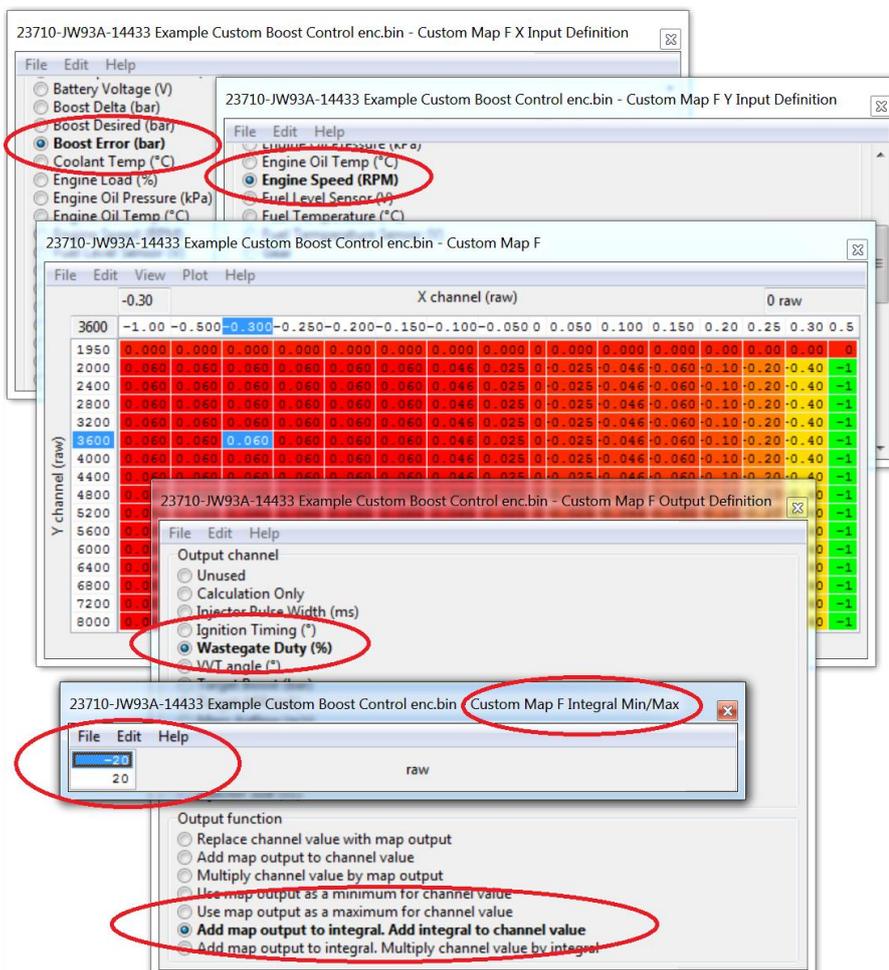
We suggest you double or halve the values in Map E to increase or reduce the boost accordingly. The proportional addition should correct the boost instantly and there should be no over or undershoot if the proportional values are correct. In fact the output of Map E (Map A WG duty plus Map E Proportional WG Duty component) should be the actual the WG duty value shown in Map A before you rescaled the X axis. Further on from this if you have not rescaled Map A X axis then the output of Map E shows the values you should enter into Map A at a given RPM if the boost error is zero(as Map E has corrected the WG Duty to produce the Target Boost pressure you have demanded).

This method can soon populate an accurate proportional map suitable for the size of your turbocharger. Once your proportional map is calibrated then turn off Map E and enable Map F to calibrate Integral map in the same way.

### 9.4.3. Custom Map F - Wastegate Duty Integral Control

- X axis is the current Boost Error (Bar)
- Y axis is Engine Speed (RPM)
- Map values are Wastegate Duty Integral compensation factor.

In the example shown below the X axis is boost error (the difference between the Target Boost and Manifold Relative Pressure MRP). The Y axis is Engine Speed. Custom Map F output value will be added the current WG Duty but as an integral, so the value will keep increasing over a period of time (several times a second). The proportional value (output of Map E) will also be added if the proportional map has been enabled.



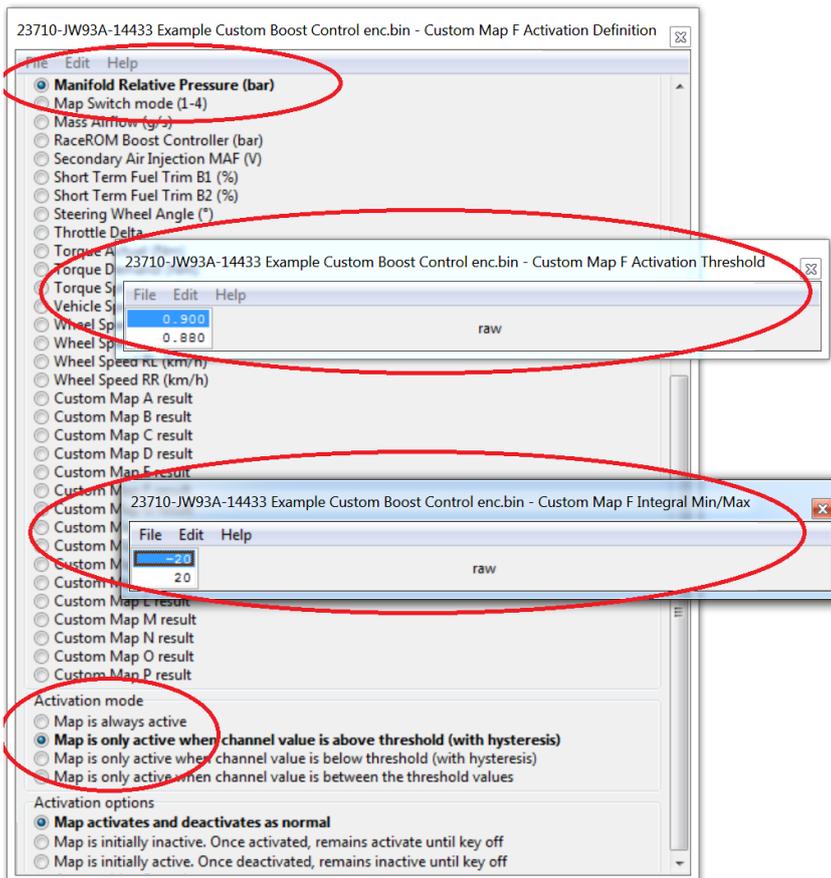
In this example on the previous page at 3600rpm and -0.3bar boost error (so under the boost target) Map F will ADD a value of 0.06 to the current WG Duty (Map A plus Map E) therefore increasing the WG Duty. Assuming the current value for Map A to be 65 and Map E to be 26 then the WG duty will increase from 91% to 91.06% (65 + 26 + 0.06).

But as the Output Definition is 'Add map output to Integral, Add Integral to Channel' then this 0.06 value will quickly increment on each calculation therefore causing the WG Duty to rise quickly over a time period for a continuous boost error.

If the boost pressure overshoots the Target Boost value then Map F Integral component will also REMOVE WG Duty.

If the rate of change (Increment or decrement) is too fast then halve the values and retest.

If the rate of change is too slow then double the values and retest.



The Integral Min/Max has been set so it can only add or subtract a maximum value of 20, this prevents the Integral from drastically changing the WG duty over a time period like during spool and part throttle conditions.

To further improve the boost control logic the Integral control (Map F) has been configured with an Activation Definition.

As shown to the left the Integral control (Map F) is only allowed to work when the MRP is over 0.9bar and it will stop working below 0.88bar. So the Integral control can only adjust the WG Duty on full load. This will prevent the Integral from ramping up (or down) the WG Duty at part throttle conditions.

## Calibrating the Integral Custom Map

The Integral will not correct the boost instantly like the proportional map does, the Integral takes times and you will see the boost reduce (or increase) over a time period (0.1 to 2 seconds).

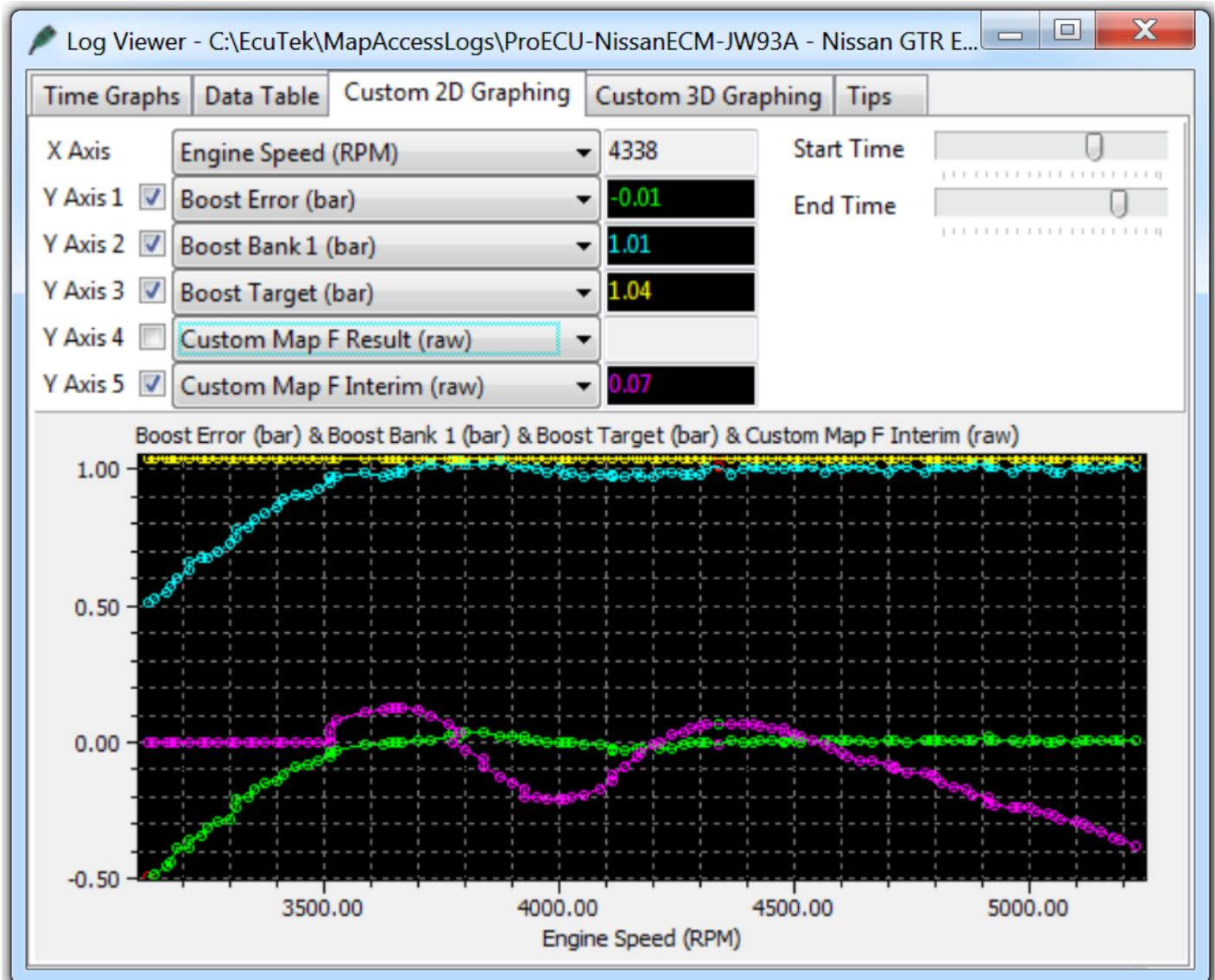
If the Integral takes too long to correct the boost pressure then double the values in Map F so the WG Duty reduces more quickly.

If the WG Duty reduces too quickly and the boost begins to oscillate then halve the values until the boost is more stable and then fine tune.

We cannot adjust the frequency of the integral addition but doubling or halving the values will have the same affect.

Below you can see an integral addition in action past 3500rpm when the activation pressure of 0.9bar was exceeded.

You can see the purple integral value (Map F Interim) constantly adjusting the WG Duty to maintain a zero Boost Error.



Our example screen shots and example ROM files have the proportional and integral values calibrated for stock turbo's, larger turbo's and stronger actuators will need smaller values in the maps (in theory).

#### 9.4.4. Additional Boost Control calibration

Other compensation factors can also be created, some examples below.

- Target boost pressure compensation for Coolant and Air temperature
- Per Gear Target Boost and WG Duty compensation
- Air Temp and Atmospheric pressure compensation

Note these compensations should be applied before any Proportional and Integral maps are implemented (so created as Map B, Map C or Map D)

## 9.5. How to set up Custom Maps Boost Control over 1.73bar

The Boost Error calculation is made using the pre throttle MAP sensors. If the pre throttle map sensors are still stock then they cannot calculate the boost error correctly over 1.73 bar (as 1.73 bar is the maximum they can read).

This becomes a problem when the Plug and Play Speed Density MAP sensor containing a charge air temperature sensor is used and a 4bar MAP sensor cannot be fitted.

The answer is to use a custom map to calculate the boost error by comparing the RaceROM Boost Controller (RRBC) Target Boost and Manifold Relative Pressure (MRP) like shown below.

### 9.5.1. Custom Map B - Calculating Boost Error

The difference between the Target RRBC value and the current Boost MRP is the boost error and this is stored as the Custom Map B Output. In the example screen shots shown below the RRBC target is 0.8bar but the MRP is actually 1.2bar so an overboost of 0.4bar (Custom Map B output)

- X axis is the RaceROM Boost Controller input (Bar)
- Y axis is Manifold Relative Pressure (Bar)
- Map values are Boost Error amount (Bar)

The screenshot displays the RaceROM Custom Map configuration interface. It shows three windows:

- Custom Map B X Input Definition:** Shows the selection of **RaceROM Boost Controller (bar)** as the input.
- Custom Map B Y Input Definition:** Shows the selection of **Manifold Relative Pressure (bar)** as the input.
- Custom Map B Output Definition:** Shows the selection of **Calculation Only** as the output channel, with the option **Replace channel value with map output** selected.

The main window displays a data table for Custom Map B. The X channel (raw) ranges from 0.0 to 2.00, and the Y channel (raw) ranges from 0.0 to 1.7. The table shows boost error values for various combinations of X and Y inputs. A red circle highlights the value **-0.400 raw** at X=1.200 and Y=0.800.

Y channel (raw)	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7
0.0	0.0	-0.1	-0.20	-0.30	-0.40	-0.5	-0.60	-0.70	-0.80	-0.90	-1.0	-1.1	-1.20	-1.30	-1.40	-1.50	-1.60	-1.70
0.1	0.1	0.0	-0.10	-0.20	-0.30	-0.4	-0.50	-0.60	-0.70	-0.80	-0.9	-1.0	-1.10	-1.20	-1.30	-1.40	-1.50	-1.60
0.2	0.2	0.1	0.00	-0.10	-0.20	-0.3	-0.40	-0.50	-0.60	-0.70	-0.8	-0.9	-1.00	-1.10	-1.20	-1.30	-1.40	-1.50
0.3	0.3	0.2	0.10	0.00	-0.10	-0.2	-0.30	-0.40	-0.50	-0.60	-0.7	-0.8	-0.90	-1.00	-1.10	-1.20	-1.30	-1.40
0.4	0.4	0.3	0.20	0.10	0.00	-0.1	-0.20	-0.30	-0.40	-0.50	-0.6	-0.7	-0.80	-0.90	-1.00	-1.10	-1.20	-1.30
0.5	0.5	0.4	0.30	0.20	0.10	0.0	-0.10	-0.20	-0.30	-0.40	-0.5	-0.6	-0.70	-0.80	-0.90	-1.00	-1.10	-1.20
0.6	0.6	0.5	0.40	0.30	0.20	0.1	0.00	-0.10	-0.20	-0.30	-0.4	-0.5	-0.60	-0.70	-0.80	-0.90	-1.00	-1.10
0.7	0.7	0.6	0.50	0.40	0.30	0.2	0.10	0.00	-0.10	-0.20	-0.3	-0.4	-0.50	-0.60	-0.70	-0.80	-0.90	-1.00
0.8	0.8	0.7	0.60	0.50	0.40	0.3	0.20	0.10	0.00	-0.1	-0.2	-0.3	-0.40	-0.50	-0.60	-0.70	-0.80	-0.90
0.9	0.9	0.8	0.70	0.60	0.50	0.4	0.30	0.20	0.10	0.00	-0.1	-0.2	-0.30	-0.40	-0.50	-0.60	-0.70	-0.80
1.0	1.0	0.9	0.80	0.70	0.60	0.50	0.40	0.30	0.20	0.10	0.00	-0.1	-0.20	-0.30	-0.40	-0.50	-0.60	-0.70
1.1	1.1	1.0	0.90	0.80	0.70	0.60	0.50	0.40	0.30	0.20	0.10	0.00	-0.1	-0.20	-0.30	-0.40	-0.50	-0.60
1.2	1.2	1.1	1.00	0.90	0.80	0.70	0.60	0.50	0.40	0.30	0.20	0.10	0.00	-0.1	-0.20	-0.30	-0.40	-0.50
1.3	1.3	1.2	1.10	1.00	0.90	0.80	0.70	0.60	0.50	0.40	0.30	0.20	0.10	0.00	-0.1	-0.20	-0.30	-0.40
1.4	1.4	1.3	1.20	1.10	1.00	0.90	0.80	0.70	0.60	0.50	0.40	0.30	0.20	0.10	0.00	-0.1	-0.20	-0.30
1.5	1.5	1.4	1.30	1.20	1.10	1.00	0.90	0.80	0.70	0.60	0.50	0.40	0.30	0.20	0.10	0.00	-0.1	-0.20
1.6	1.6	1.5	1.40	1.30	1.20	1.10	1.00	0.90	0.80	0.70	0.60	0.50	0.40	0.30	0.20	0.10	0.00	-0.1
1.7	1.7	1.6	1.50	1.40	1.30	1.20	1.10	1.00	0.90	0.80	0.70	0.60	0.50	0.40	0.30	0.20	0.10	0.00

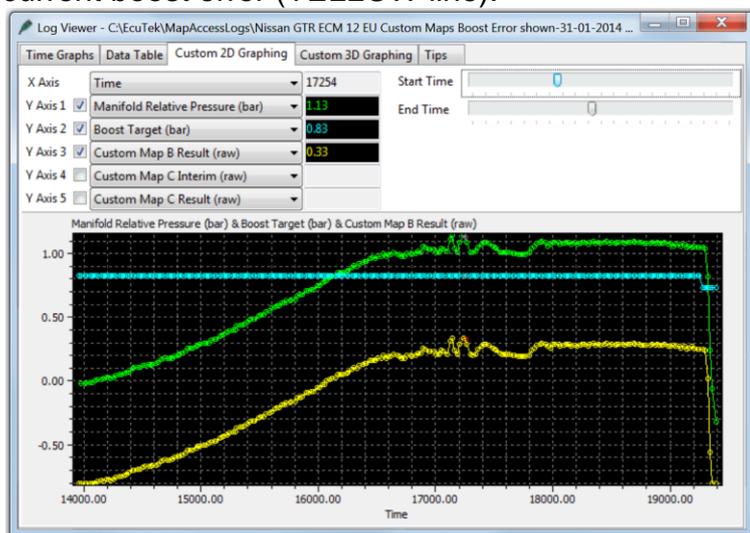
You can now use this Custom Map B boost error value as an input to the proportional or integral Wastegate duty maps like Map E or F on the previous Custom Maps Boost Control examples. In this example we have set Custom Map C as a proportional map and in this situation Custom Map B Result of 0.4bar overboost would ADD -25% to the Wastegate Duty (so reduce the WG Duty by 25%).

The image shows three overlapping windows from a software interface:

- Custom Map C X Input Definition:** Shows a list of inputs with **Custom Map B result** selected.
- Custom Map C Y Input Definition:** Shows a list of inputs with **Engine Speed (RPM)** selected.
- Custom Map C Output Definition:** Shows the output channel set to **Wastegate Duty (%)** and the output function set to **Add map output to channel value**.

The main window displays a 2D map grid with X-axis values from -1 to 1.3 and Y-axis values from 0 to 9800. A cyan line at 0.83 bar and a green line at 1.13 bar are visible. A yellow cell at approximately 3500 RPM and 0.4 bar is highlighted.

You can see from the example log file screen shot that follows the RRBC target is 0.83bar (CYAN Line) but the current MRP is 1.13bar (GREEN Line) and the Custom Map B result shows the current boost error (YELLOW line).



If you want to keep the same Custom Maps Boost Control example as shown in first section 8.4 (How to set up Custom Maps Boost Control) then make the following changes to the maps A, E and F.

- Map A: change Desired Boost to RaceROM Boost Control as the X axis Input
- Map E: change the X axis Boost Error input to the Output of Custom Map B
- Map F: change the Y axis Boost Error input to the Output of Custom Map B

In addition add Custom Map B as a new map so it can calculate Boost Error using the plenum based 4bar map sensor.

Note the pre throttle map sensors cannot and should not be removed as a DTC will occur and the ECU will enter SAFE Mode , in addition the WG Duty will drop to 0%. If the Boost Sensor DTCs are disabled then the ECU will still be in safe mode so we advise that you leave them connected at all time.

## 9.6. Custom Maps Boost Limit

In addition a custom map can be used as a boost limit, this is useful if the boost is over 1.7bar and only 1 x 4bar map sensor is fitted in the plenum (Inlet Manifold) or a Speed Density kit is used where the charge air sensor is built into the MAP sensor but a 4bar sensor is not available.

If the pre throttle map sensor sensors are NOT changed then they cannot read over 1.73bar and therefore cannot be used for an overboost fuel cut protection.

In this case set the Boost Limit (RaceROM) map to 1.9bar or greater so this limiter can never be reached (as standard MAP sensors can only read to 1.73bar) then we can configure a Custom Map as a boost Limit like shown below.

The X axis is MRP from the Plenum MAP sensor, the Y axis is RPM the output will multiply the Injector Size by 1 or 0. Note the X axis at 1.8bar will multiply the Injector size by 1 so will NOT change the Injector open time but at 1.81 will multiply the Injector size by zero which will cut the Injectors.

The activation for Custom Map G is set at 1.75 bar so the fuel cut cannot happen below this pressure but the resume is set to 1.1bar before the Injectors will restore, the timer activation is set at 1 second so quick spikes will not result in a fuel cut.

The screenshot shows the configuration of Custom Map G in RaceROM. The main window displays a table for Custom Map G with X-axis (Manifold Relative Pressure) and Y-axis (Engine Speed). The table shows a transition from 1 to 0 at 1.81 bar.

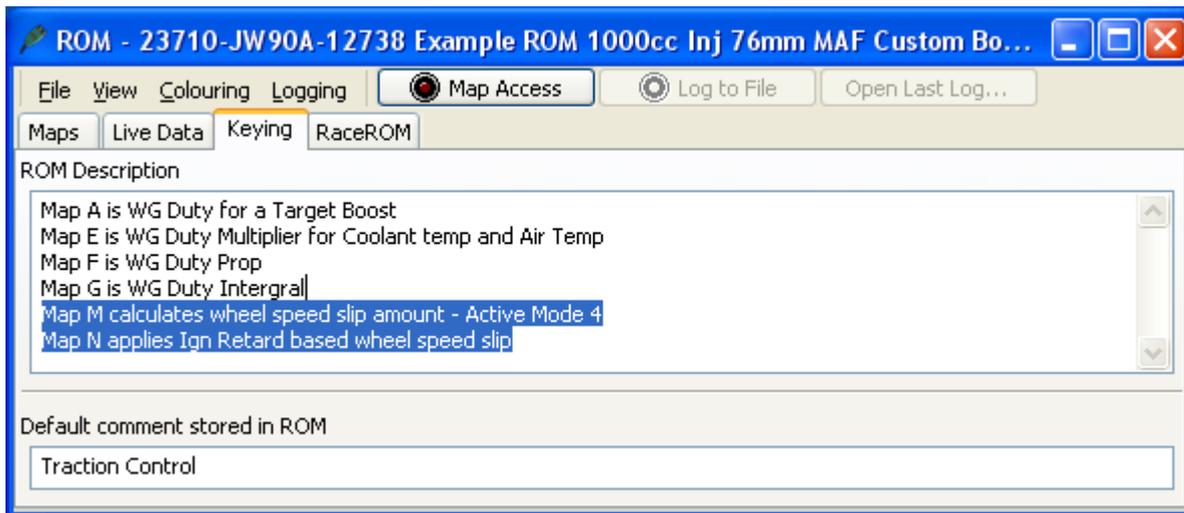
Engine Speed (RPM)	0	0.25	0.5	0.75	1	1.10	1.20	1.30	1.40	1.5	1.60	1.70	1.80	1.81	1.90	2
3600	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1950	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0
2000	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2400	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2800	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
3200	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0
3600	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0
4000	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0

Other configuration windows shown include:

- Custom Map G Activation Definition:** Shows the activation mode set to "Map is only active when channel value is above threshold (with hysteresis)".
- Custom Map G X Input Definition:** Shows the input selected as "Manifold Relative Pressure (bar)".
- Custom Map G Y Input Definition:** Shows the input selected as "Engine Speed (RPM)".
- Custom Map G Output Definition:** Shows the output function set to "Multiply channel value by map output".
- Custom Map G Activation Delay:** Shows the delay set to 1 second.
- Custom Map G Activation Threshold:** Shows the threshold set to 1.75 bar.

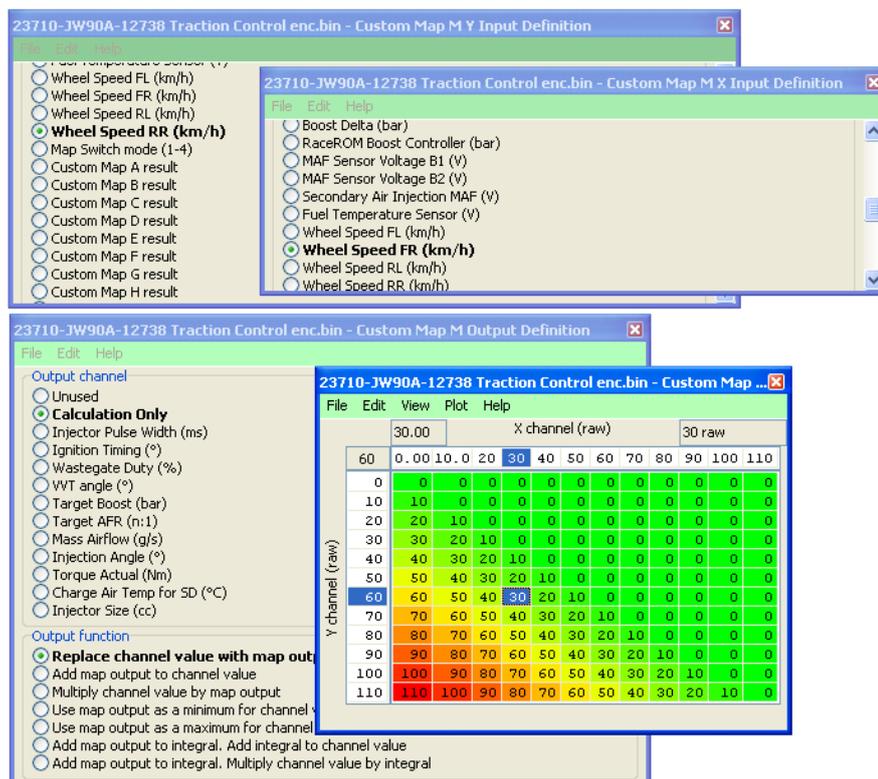
## 9.7. How to set up Traction Control

By using Custom Maps and our powerful 4 channel wheel speed logging its possible to create a torque reduction map for wheel speed differential.



### 9.7.1. Custom Map M – Wheel Slip calculation

Custom Map M calculates the amount of wheel slip by comparing the front wheel and rear wheel speeds.



The map will only output a value if the rear wheel speed is greater than the front wheel speed, although the GTR is 4wd it is prodomantly rear wheel drive with front wheel assistance so any loss of traction will be the rear wheels first.

If the front wheels are doing 30kph and the rear wheels are 60kph then the wheel speed differential is 30kph, this value is then stored as the Custom Map M Result.

## 9.7.2. Custom Map N – Torque reduction

Custom Map N applies an amount of Ignition retard based for the given wheel speed differential. By using the Custom Map M Result we can apply an Ignition Retard amount for a given wheel slip amount.

This Torque Reduction map is progressive and allows a small amount of slip before it really starts to retard the ignition timing (reducing engine torque) , it also reduces the torque output by a greater amount at higher RPM.

The screenshot shows three overlapping windows from the software interface:

- Custom Map N X Input Definition:** The 'X input channel' is set to **Engine Speed (RPM)**.
- Custom Map N Y Input Definition:** The 'Y input channel' is set to **Custom Map M result**.
- Custom Map N:** The 'Output function' is set to **Add map output to channel value**.

The main window displays a data table for Custom Map N. The X-axis represents RPM (3000, 3500, 4000, 4500, 5000, 6000, 7000, 8000) and the Y-axis represents wheel slip (0, 5, 10, 15, 20, 25, 30, 40, 50, 75, 100). The table shows ignition timing values in degrees, ranging from 0 to -50.

	3000	3500	4000	4500	5000	6000	7000	8000
0	0	0	0	0	0	0	0	0
5	0	-5	-5	-5	-5	-8.8	-13	-20
10	0	-10	-10	-10	-10	-13.8	-18	-25
15	0	-15	-15	-15	-15	-18.8	-23	-30
20	0	-30	-30	-30	-30	-35.0	-40	-50
25	0	-35	-35	-35	-35	-38.8	-43	-50
30	0	-40	-40	-40	-40	-42.5	-45	-50
40	0	-50	-50	-50	-50	-50.0	-50	-50
50	0	-50	-50	-50	-50	-50.0	-50	-50
75	0	-50	-50	-50	-50	-50.0	-50	-50
100	0	-50	-50	-50	-50	-50.0	-50	-50

In addition further maps can be added for vehicle speed where multipliers could be used to differentiate between a low speed acceleration wheel slip (1<sup>st</sup> or 2<sup>nd</sup> gear) vs a fast corner 'high speed' drift situation where you may want to dampen the torque rather than kill the torque.

Ensure that the factory Traction Control is disabled (VDC OFF).

Log each wheel speed sensor to fine tune.

# 9.1. How to set up an Oil Pressure Fail Safe map

By using Custom Maps its possible to create a fail safe condition should the oil pressure drop below an expected level at a certain engine speed. See below for further details.

## 9.1.1. Custom Map M – Fuel Cut for Oil Pressure drop

Custom Map M has been configured to induce a fuel cut should the oil pressure drop below 100kPa (1bar) over 3000rpm by multiplying the Injector Pulse Width by zero.

The map activation is set up against a Manifold Relative Pressure Activation Threshold so it can only work over 0.5bar boost. So if the oil pressure drops below 100kPa on boost the Fuel Injectors will switched off causing a harsh fuel cut and hopefully save the engine from damage.

**Oil Pressure Fail Safe**

The screenshot displays the configuration for Custom Map M in a software application. It consists of several overlapping windows:

- Custom Map M X Input Definition:** Shows 'Engine Oil Pressure (kPa)' selected as the input channel.
- Custom Map M Y Input Definition:** Shows 'Engine Speed (RPM)' selected as the input channel.
- Custom Map M Activation Definition:** Shows 'Manifold Relative Pressure (bar)' selected as the activation channel.
- Custom Map M:** A data table with 'X channel (raw)' values from 100 to 500 and 'Y channel (raw)' values from 2000 to 8000. The table contains '1' and '0' values, with a 3D bar chart to the right.
- Custom Map M Output Definition:** Shows 'Injector Pulse Width (ms)' selected as the output channel.
- Custom Map M Activation Threshold:** Shows a threshold value of '0.500' for the Manifold Relative Pressure.
- Activation mode:** Shows 'Map is only active when channel value is above' selected.
- Activation options:** Shows 'Map activates and deactivates as normal' selected.
- Output function:** Shows 'Multiply channel value by map output' selected.

Y channel (raw)	100	150	200	250	300	350	400	450	500
2000	1	1	1	1	1	1	1	1	1
800	1	1	1	1	1	1	1	1	1
1600	1	1	1	1	1	1	1	1	1
1999	1	1	1	1	1	1	1	1	1
2000	0	0	0	1	1	1	1	1	1
3000	0	0	0	1	1	1	1	1	1
4000	0	0	0	1	1	1	1	1	1
4800	0	0	0	1	1	1	1	1	1
5600	0	0	0	1	1	1	1	1	1
6400	0	0	0	1	1	1	1	1	1
7200	0	0	0	1	1	1	1	1	1
8000	0	0	0	1	1	1	1	1	1

# 10. Ethanol tuning

Using Custom maps it possible to tune the GTR for Ethanol based fuels (E85 etc), when running E85 we are able extract more energy from the fuel and this leads to more power and torque.

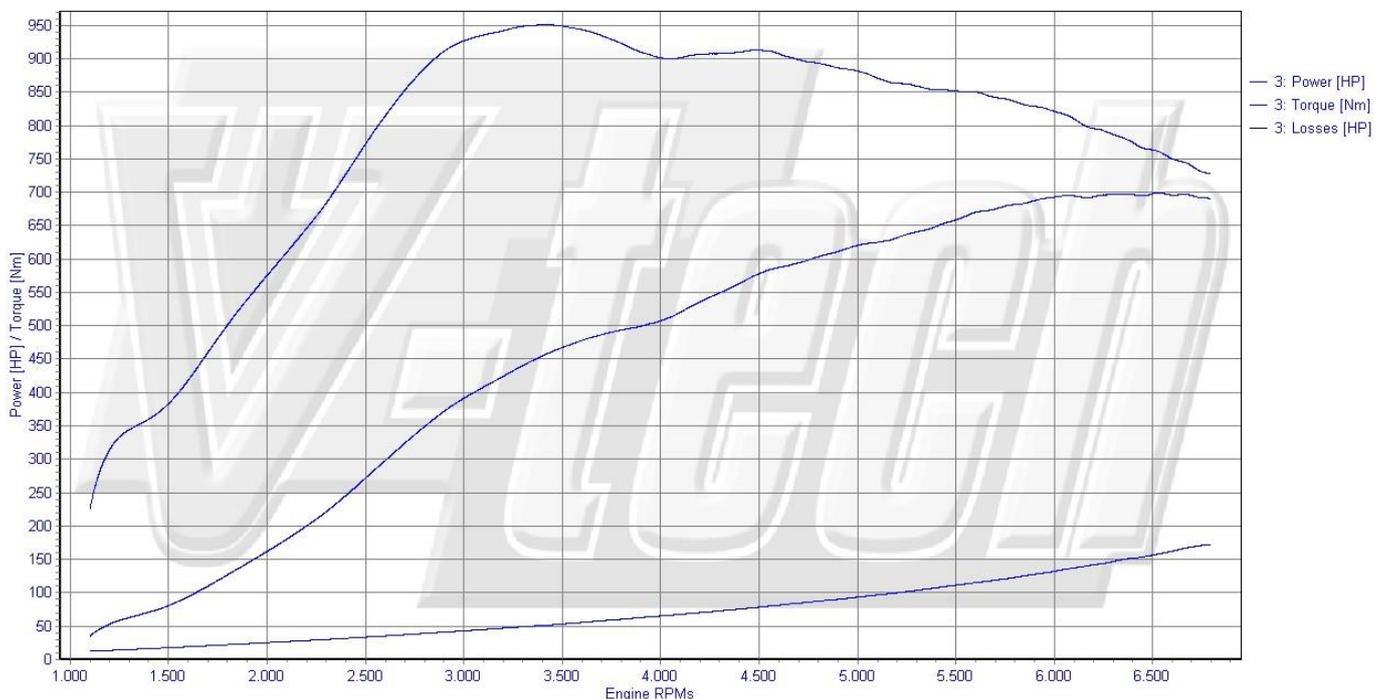
Typically you are required to inject around +30% more fuel, consider this fact and you may need larger Injectors fitting (minimum 1000cc are recommended), If you have tuned the engine on regular gas then ensure the injectors are under 70% open time before you start your ethanol tuning ensure.

## Typical Power Gains

An impressive 700bhp and 950NM of torque was delivered by this GTR running stock turbo's on E85, the following bolt on parts were fitted.

HKS Exhaust, HKS Intakes, HKS Turbo inlet pipes, HKS Intercoolers, HKS Spark Plugs  
EcuTeK 1000cc Injectors, DW Fuel Pumps  
EcuTeK tuning by JRM Racing in Sweden.

DynaVtech v4.9.6.225 (c) V-TECH TUNING. 2013-10-31  
Bank #1:  
Bank #2:  
Bank #3: PMAX= 698,8 (6531) NMAX= 951,0 (3423) Test2  
Bank #4:  
Client: WEMBO | Registration: NOU704 | Brand: Nissan | Model: R35 GTR E85



There are two methods of Ethanol tuning available using ProECU, '**With** and **Without** a Flex Fuel Sensor'.

EcuTek can provide base Ethanol calibrations to start your tuning like shown below.

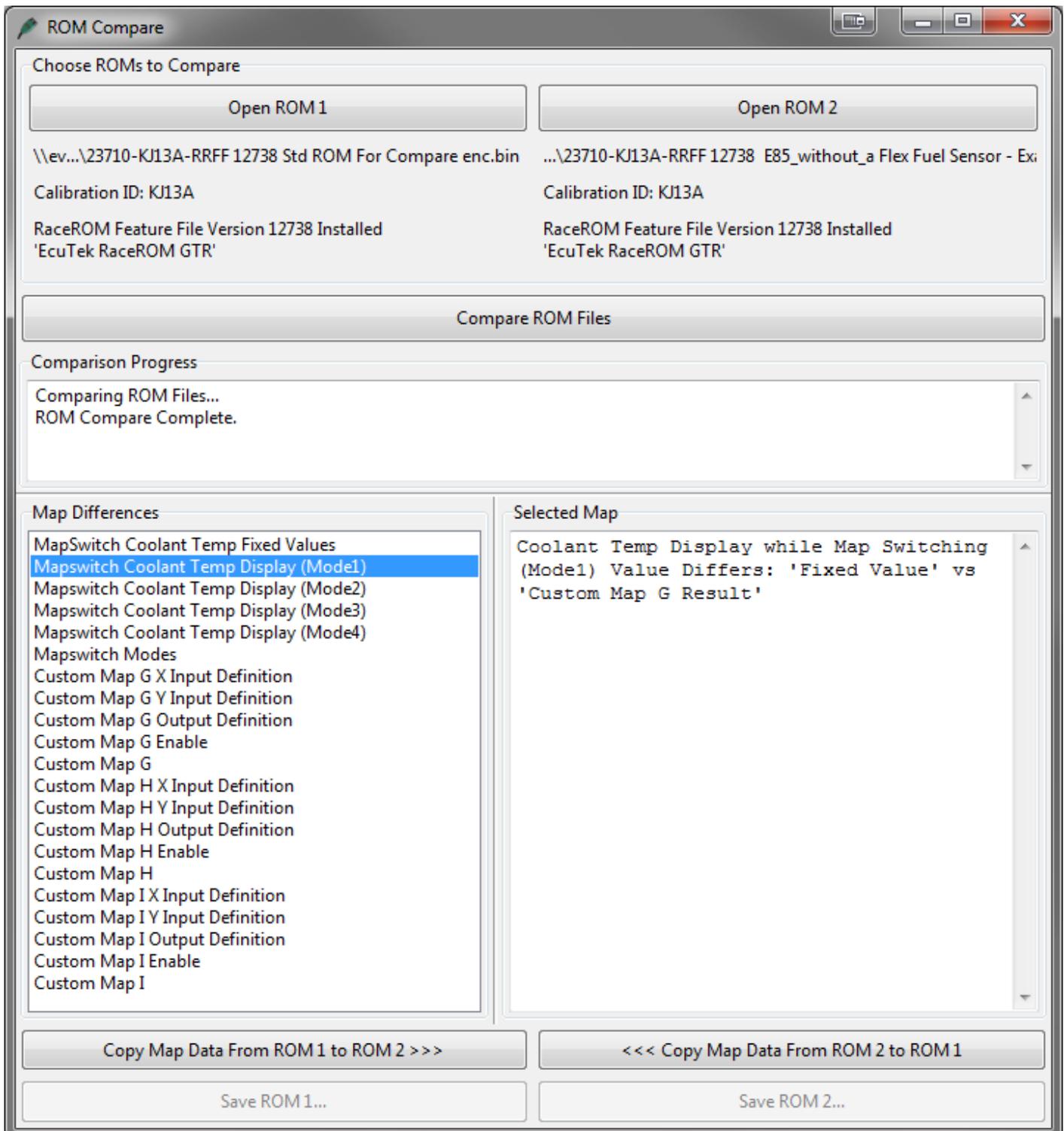
You will need to adjust the fuel multiplier and Ignition Timing to suit, these are NOT final settings and different tuners will prefer different settings.

## 10.1. How to set up for Ethanol WITHOUT fitting a Flex Fuel sensor

When you want to run E85 fuel you must ensure that the fuel tank is run as low as possible before charging the tank with E85.

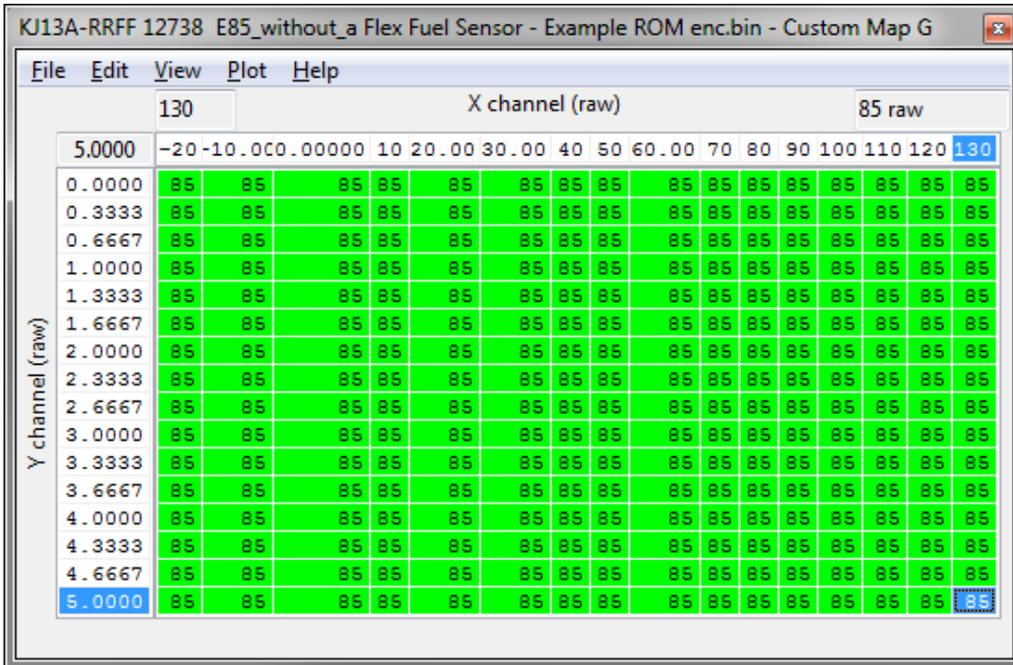
By using one of the 4 specific Map Switch modes as a dedicated E85 mode you can Increase the Injector Open Time and Advance the Ignition Timing using Custom maps.

See Example ROM called “**23710-KJ13A-RRFF 12738 E85\_without\_a Flex Fuel Sensor - Example ROM enc.bin**”



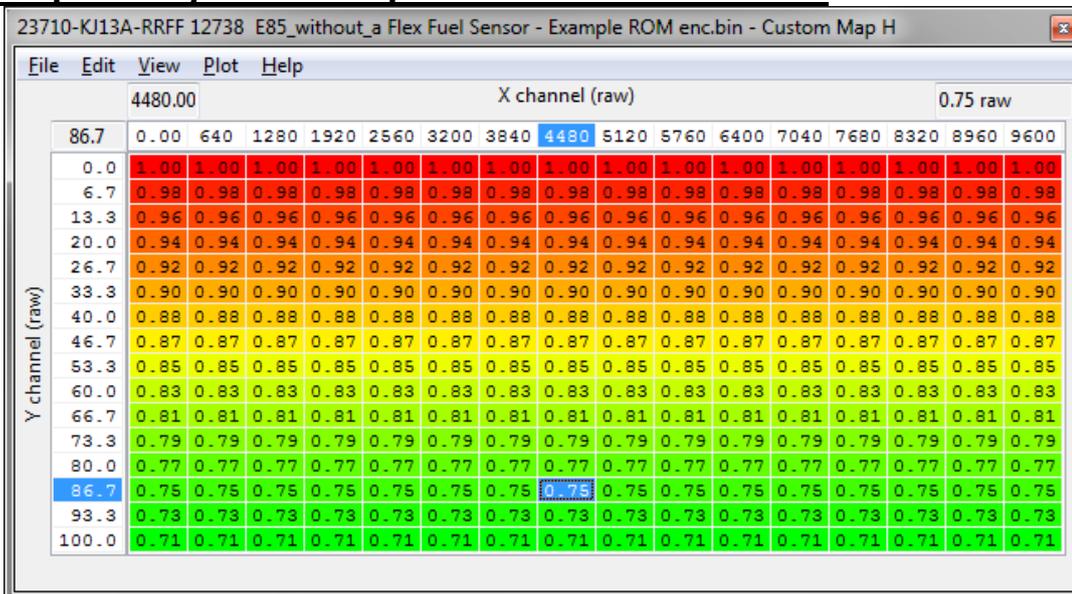
These are the Custom Maps that have been changed and this is how they work..  
**Map G** - Is the Ethanol Sensor Scaling Coolant vs Sensor volts - Fixed at E85% Ratio  
**Map H** - Is the Injector Size Multiplier based on RPM and Map G result  
**Map I** - Is Ignition Timing addition based on RPM and Map G result  
**Mapswitch Coolant Temp Display** - Configured to show the E85 whilst in Map Switch Mode (Output of Map G)  
**Mapswitch Modes** - Configured so all 4 Mapswitch modes are available

**Map G – Ethanol Sensor Scaling fixed at E85**



- Custom Map G** : Filled with the value 85 for Map Switching display purpose.
- Custom Map G** : X Axis Input Definition is Coolant Temp
- Custom Map G** : Y Axis Input Definition Y axis is Secondary MAF Volts (which would be from an Ethanol Sensor if fitted but in this case is NOT fitted)
- Custom Map G Output Definition** : Is configured as a ‘CALCULATION ONLY’ and will REPLACE CHANNEL VALUE so this output can be used by other Custom Map actions
- Custom Map G Enabled** : Map G is ENABLED to work in all 4 Mapswitch modes.

**Map H – Injector Multiplier for Ethanol Content**



**Custom Map H** : This map is filled with 1 to 0.715 will multiply the Injector Size Byte by the current Ethanol Content ratio provided by the result of Map G (in this case a fixed E85 as no Flex Fuel Sensor is fitted)

**Custom Map H** : X Axis Input Definition is Engine (Speed RPM)

**Custom Map H** : Y Axis Input Definition is the output of Map G which will be a consistent 85

**Custom Map H Output Definition** : The output will be around 0.76 and this will be multiplied against the Current Injector Size, this will make the Injector open for a longer period to deliver the required volume of fuel.

**Custom Map H Enabled** : Map G is ENABLED to work in all 4 Mapswitch modes.

## Map I – Ignition Addition for Ethanol Content

		X channel (raw)															
		4.00 raw															
		0	640	1280	1920	2560	3200	3840	4480	5120	5760	6400	7040	7680	8320	8960	9600
100.0	0.0	0	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
	6.7	0	0.20	0.20	0.20	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27
	13.3	0	0.40	0.40	0.40	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53
	20.0	0	0.60	0.60	0.60	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
	26.7	0	0.80	0.80	0.80	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07
	33.3	0	1.00	1.00	1.00	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33
	40.0	0	1.20	1.20	1.20	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60
	46.7	0	1.40	1.40	1.40	1.87	1.87	1.87	1.87	1.87	1.87	1.87	1.87	1.87	1.87	1.87	1.87
	53.3	0	1.60	1.60	1.60	2.13	2.13	2.13	2.13	2.13	2.13	2.13	2.13	2.13	2.13	2.13	2.13
	60.0	0	1.80	1.80	1.80	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40
	66.7	0	2.00	2.00	2.00	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67
	73.3	0	2.20	2.20	2.20	2.93	2.93	2.93	2.93	2.93	2.93	2.93	2.93	2.93	2.93	2.93	2.93
	80.0	0	2.40	2.40	2.40	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20
	86.7	0	2.60	2.60	2.60	3.47	3.47	3.47	3.47	3.47	3.47	3.47	3.47	3.47	3.47	3.47	3.47
	93.3	0	2.80	2.80	2.80	3.73	3.73	3.73	3.73	3.73	3.73	3.73	3.73	3.73	3.73	3.73	3.73
100.0	100.0	0	3.00	3.00	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

**Custom Map I** : This map is Ignition Timing in Degrees, it is filled with 0deg to 4Deg (in this case a fixed E85 as no Flex Fuel Sensor is fitted)

**Custom Map I** : X Axis Input Definition is Engine Speed (RPM)

**Custom Map I** : Y Axis Input Definition is the output of Map G which will be a consistent 85

**Custom Map I Output Definition** : The output will be between 0 and 4 degrees, this will be ADDED to the current Ignition timing.

**Custom Map I Enabled** : Map G is ENABLED to work in all 4 Mapswitch modes.

So when the E85 mode is selected by the user the Coolant gauge will show '85' during the Map Switching mode selection period, after the correct mode has been selected then the Coolant gauge will return to showing the engine coolant temp.

**NOTE:** Any coolant temperature display units are in Deg C (Celsius) but on US models the values will be displayed in Fahrenheit. So you will need to reduce the Deg C values so the correct Fahrenheit value is shown on the display. Google offers a simple online conversion.

For USA vehicles the **Mapswitch Coolant Temp Display** will need converting to Fahrenheit. (so enter 29.4C to see 85F on the coolant temp gauge)

## 10.2. How to set up for Ethanol USING a Flex Fuel sensor

---

By fitting an aftermarket Flex Fuel sensor in the fuel return line (like the Zeitronix Ethanol Content Analyser) it's possible to measure the current Ethanol content and adjust the tuning to suit. ProECU can import this 0 – 5v signal from the Flex-Fuel sensor into the factory ECU via the Secondary MAF sensor signal wire.

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.

The current Ethanol Ratio can also be displayed on the Digital Coolant Temp Gauge during Mapswitch mode in any of the 4 modes if required.

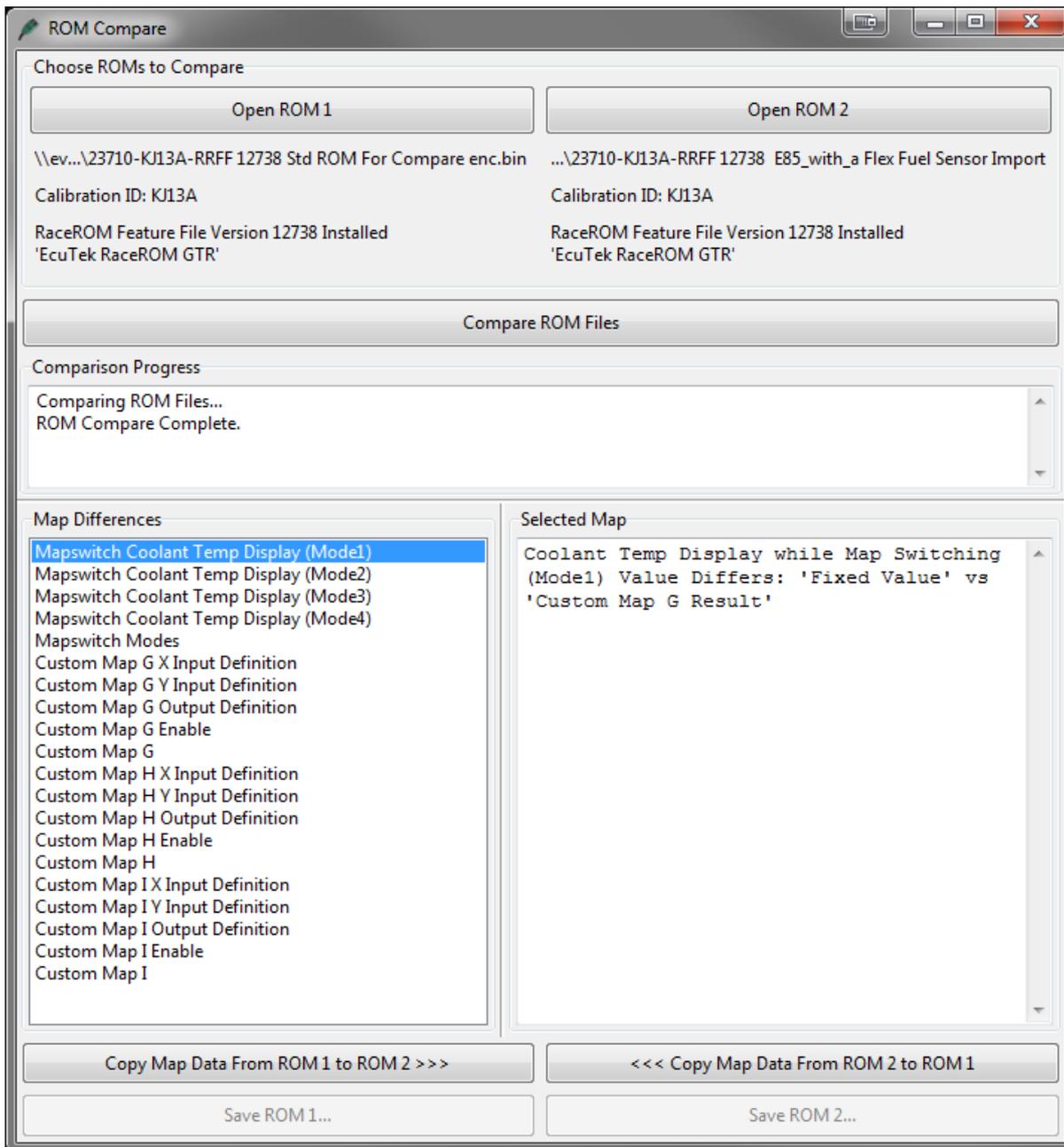
When implementing Flex Fuel sensor, we also recommend disabling the below list of DTC codes.

- P0411 - Secondary air injection system incorrect flow detected
- P0491 - Secondary air injection system insufficient flow (bank 1)
- P0492 - Secondary air injection system insufficient flow (bank 2)
- P0507 - Idle speed control system RPM higher than expected
- P1421 - Cold start emission reduction strategy monitoring
- P2432 - Secondary air injection system mass air flow sensor circuit low input
- P2433 - Secondary air injection system mass air flow sensor circuit high input

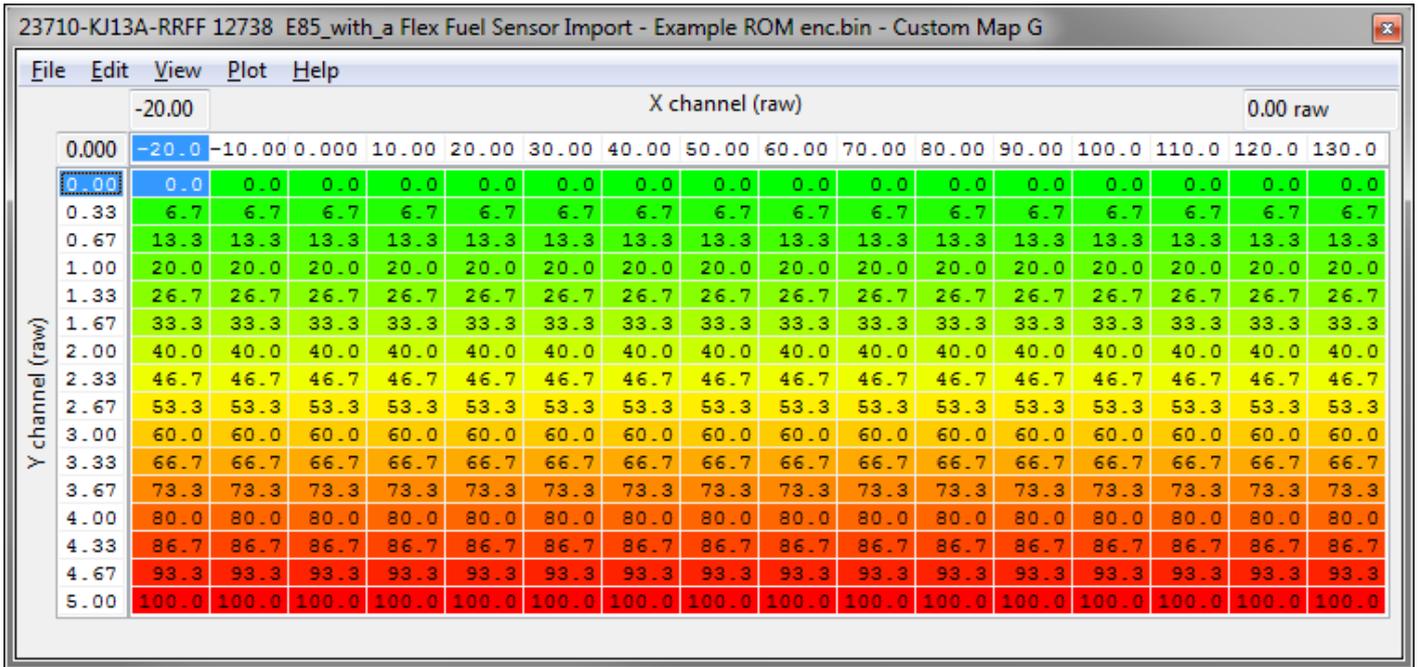


See Example ROM called “**23710-KJ13A-RRFF 12738 E85\_with\_a Flex Fuel Sensor Import - Example ROM enc.bin**”

These are the maps that have been changed.



## Map G – Ethanol Sensor Scaling for Flex Fuel Sensor Import



**Custom Map G** : Will import and convert the signal from the Flex-Fuel Ethanol sensor from Voltage to a % ratio.

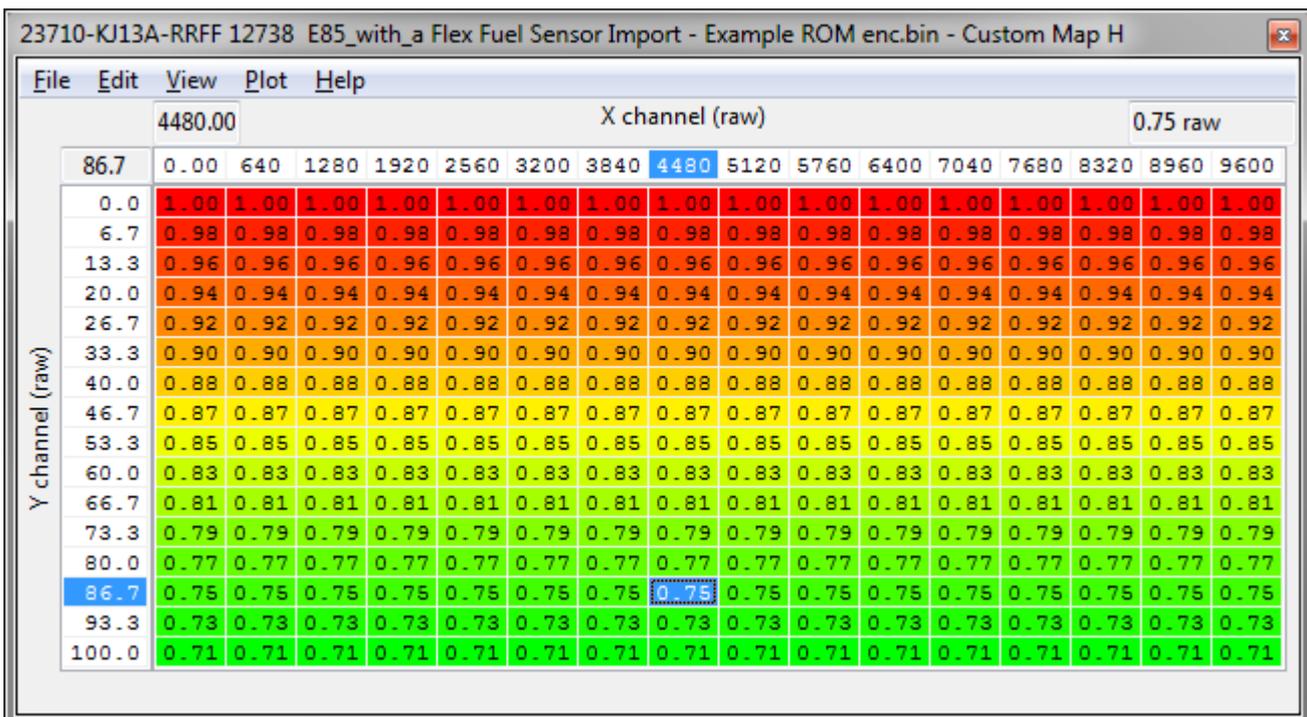
**Custom Map G** : X Axis Input Definition is Coolant Temp

**Custom Map G** : Y Axis Input Definition Y axis is the Secondary MAF Volts (which now has the Ethanol Content Ratio Sensor connected)

**Custom Map G Output Definition** : Is configured as a 'CALCULATION ONLY' and will REPLACE CHANNEL VALUE so this output can be used by other Custom Map actions

**Custom Map G Enabled** : Map G is ENABLED to work in all 4 Mapswitch modes.

## Map H – Injector Multiplier for Ethanol Content



**Custom Map H** : This map is filled with 1 to 0.715 will multiply the Injector Size Byte by the current Ethanol Content ratio provided by the result of Map G (in this case a fixed E85 as no Flex Fuel Sensor is fitted)

**Custom Map H** : X Axis Input Definition is Engine (Speed RPM)

**Custom Map H** : Y Axis Input Definition is the output of Map G which will be a consistent 85

**Custom Map H Output Definition** : The output will be around 0.76 and this will be multiplied against the Current Injector Size, this will make the Injector open for a longer period to deliver the required volume of fuel.

**Custom Map H Enabled** : Map G is ENABLED to work in all 4 Mapswitch modes.

## Map I – Ignition Addition for Ethanol Content

		X channel (raw)															
		4.00 raw															
		0	640	1280	1920	2560	3200	3840	4480	5120	5760	6400	7040	7680	8320	8960	9600
100.0	0	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
93.3	6.7	0.20	0.20	0.20	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27
86.7	13.3	0.40	0.40	0.40	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53
80.0	20.0	0.60	0.60	0.60	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
73.3	26.7	0.80	0.80	0.80	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07
66.7	33.3	1.00	1.00	1.00	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33
60.0	40.0	1.20	1.20	1.20	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60
53.3	46.7	1.40	1.40	1.40	1.87	1.87	1.87	1.87	1.87	1.87	1.87	1.87	1.87	1.87	1.87	1.87	1.87
46.7	53.3	1.60	1.60	1.60	2.13	2.13	2.13	2.13	2.13	2.13	2.13	2.13	2.13	2.13	2.13	2.13	2.13
40.0	60.0	1.80	1.80	1.80	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40
33.3	66.7	2.00	2.00	2.00	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67
26.7	73.3	2.20	2.20	2.20	2.93	2.93	2.93	2.93	2.93	2.93	2.93	2.93	2.93	2.93	2.93	2.93	2.93
20.0	80.0	2.40	2.40	2.40	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20
13.3	86.7	2.60	2.60	2.60	3.47	3.47	3.47	3.47	3.47	3.47	3.47	3.47	3.47	3.47	3.47	3.47	3.47
6.7	93.3	2.80	2.80	2.80	3.73	3.73	3.73	3.73	3.73	3.73	3.73	3.73	3.73	3.73	3.73	3.73	3.73
0.0	100.0	3.00	3.00	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

**Custom Map I** : This map is Ignition Timing in Degrees, it is filled with 0deg to 4Deg (in this case a fixed E85 as no Flex Fuel Sensor is fitted)

**Custom Map I** : X Axis Input Definition is Engine Speed (RPM)

**Custom Map I** : Y Axis Input Definition is the output of Map G which will be a consistent 85

**Custom Map I Output Definition** : The output will be between 0 and 4 degrees, this will be ADDED to the current Ignition timing.

**Custom Map I Enabled** : Map G is ENABLED to work in all 4 Mapswitch modes.

So when the Flex-Fuel mode is selected by the user the Coolant gauge will show the true ethanol content at present, after the correct mode has been selected then the Coolant gauge will return to showing the engine coolant temp.

**NOTE:** Any coolant temperature display units are in Deg C (Celsius) but on US models the values will be displayed in Fahrenheit. So you will need to create a custom map that is dedicated to converting the Deg C into a Deg F to be shown on the Coolant temp gauge.

### Cranking Fuel

In addition cranking fuel may need an additional multiplier depending on your climate, ethanol is particularly bad at starting the engine in colder weather and the flex fuel solution will help this issue if a reduce ethanol ratio is used (like E70 or E50) as the tune will automatically be correct.

We have tested the Zetronic Flex-Fuel sensor like shown below (on a BRZ/86 model), it works very well and provides a 0-5v output signal depending on Ethanol content. This signal can be imported into the factory Engine ECU through the Secondary Air Pump. There are various aftermarket kits available that can supply 'plug and play' loom adaptors to make this a very simple fitment.

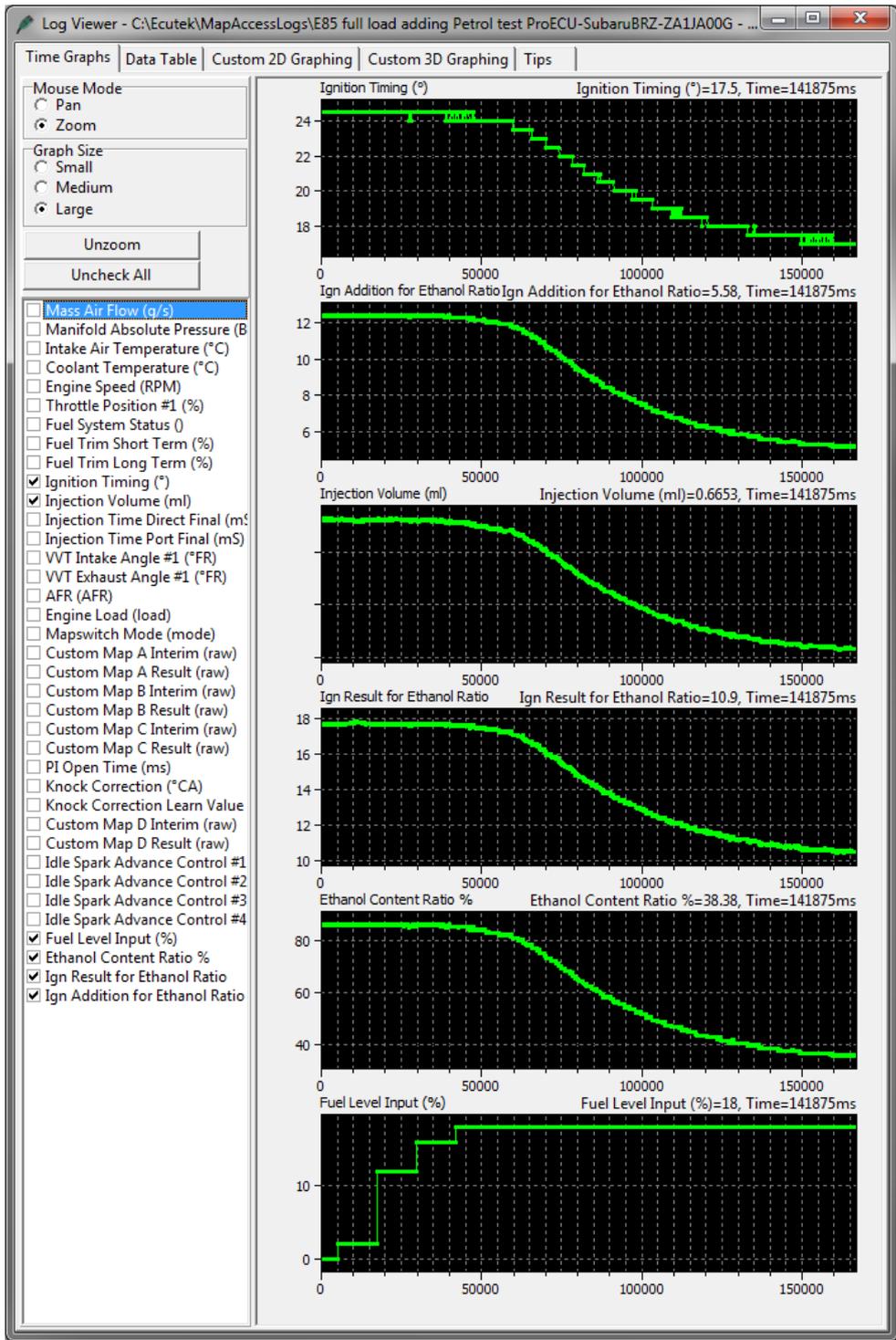
To show the Flex-fuel ability we held a car on full power at 2000rpm with pure E85 in the fuel tank, we then added regular 98 Octane Petrol into the fuel tank.

The results were logged with ProECU.

Using Custom Maps logging we can see the changes happening as shown below.

The Ethanol content ratio reduced from 85% (E85) down to 30% (E30)

The log file clearly shows whilst adding the Petrol to the E85 how the Injection Volume was reduced and the Ignition Timing was retarded as the Ethanol content was reduced.



# 11. MFD custom data display

You can set up a custom maps to show certain values on the MFD digital coolant temp gauge. These logging parameters can be displayed during the map switching mode or can be configured to display a value permanently.

This feature has to be used with caution and understanding and should be used occasionally and not continuously as other modules on the vehicle will receive an incorrect coolant temp.

The example below shows how to set up for AFR Display in Map Switch Mode 4

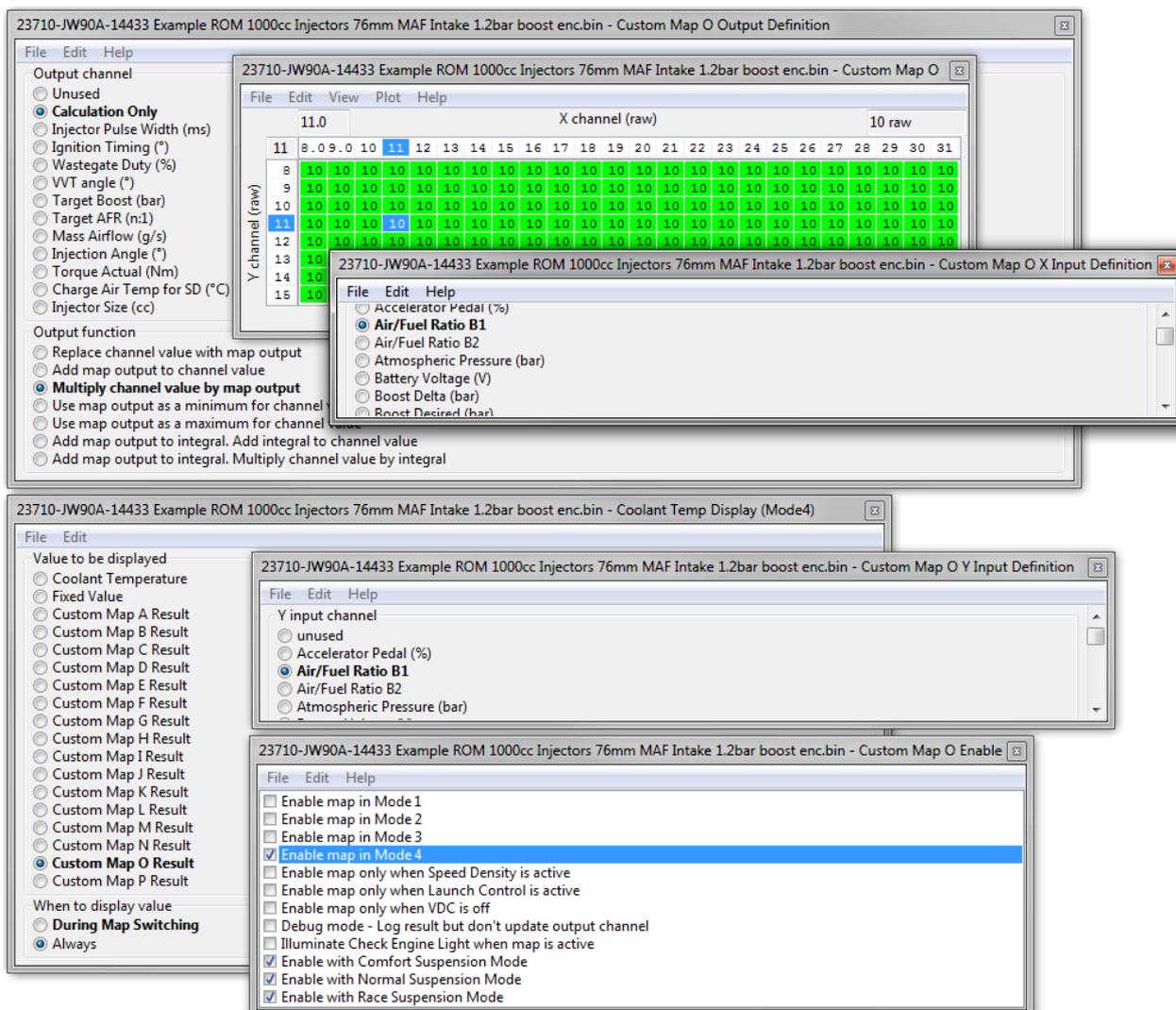
The X and Y axis are the AFR Bank 1 logging parameter input.

The Output of Map O is a calculation only and changes nothing.

The output value is multiplied by 10 so 12.5 (AFR) would be 125.

The Coolant Temp Display setting for Mode 4 is configured to show the result of Map O ALWAYS. So when mode 4 is selected then the Digital Coolant Gauge will show AFR

You can also show Ethanol Fuel Content, Fuel Trim, Knock Correction, Ignition Timing but you need to consider the units that can be shown by the Coolant Gauge (no decimal points and Centigrade)



# 12. Summary

With the powerful datalogging of ProECU and RaceROM maps configurability there are very few limitations of what can and cannot be achieved.

Never before has so much power been available from the factory ECU.

# 13. Questions and Answers

## Which TCM ROM should I use ?

We recommend that the LC5 TCM called '32085-KJ10BDA-RRFF 12771 Rev Counter Map Switch Enabled LC5 enc.bin ' is used in all TCMs (even if the ECM has not or will not been programmed with ProECU).

## When should I use Speed Density ?

You should only need to run SD if the MAF sensor are maxed out, this will be 600bhp on stock 66mm MAF tubes and 850bhp on 76mm MAF tubes. You can use SD to develop a MAF calibration for larger intakes.

## When should I use Hybrid Speed Density ?

Hybrid SD is a great solution if your MAF volts are hitting 5volts at a higher RPM. In this situation you can run the superior MAF load input and only switch to SD when the MAF is nearing 5 volts. See the Hybrid SD section for more details

## What Engine Load should I expect to see

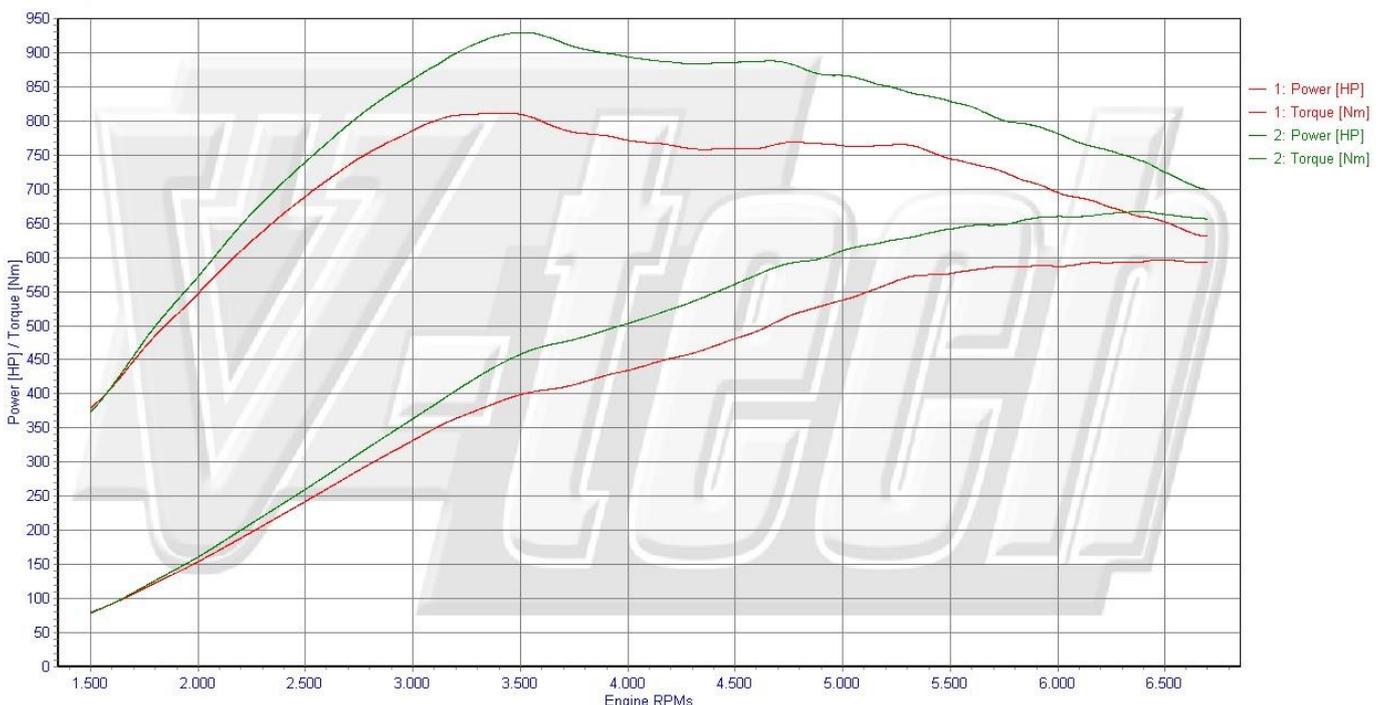
Stage1 and 2 typically hit around 100% to 110% at 1.2bar boost, 1000bhp cars are hitting around 200% Engine Load at 2bar boost, You can rescale the X axis for over 180% Engine Load. This is running on MAF , but the Engine Load will be lower when running on the MAP based SD calculations.

## How much extra power can I get on E85 ?

On a typical stage1/2 setup we see about +60bhp, with further gains on a high power vehicle.

The example below shows a power increase from 600bhp to 670bhp along with a torque increase from 810NM to 930NM, running stock turbo's.

DynaVtech v4 9.6.225 (c) V-TECH TUNING. 2013-10-31  
Bank #1: PMAX= 596.6 (6509) NMAX= 811.8 (3430) Test3  
Bank #2: PMAX= 667.2 (6415) NMAX= 929.8 (3506) Test4  
Bank #3:  
Bank #4:  
Client: | Registration: JRM | Brand: Nissan | Model: GT-R 2009 US



## **Can I calculate the Engine Power Output ?**

The maximum Mass Air Flow reading in grams can be used to calculate the theoretical engine power output (assuming a standard air Intake Tubes is still fitted). By multiply the Mass Airflow by 1.25 we can get a rough engine power output. So a peak Mass Air Flow reading of 200 grams at 7000rpm would be calculated as 250BHP. On Nissan GTR there are two MAF sensors and the output should be added together to calculate power output.

Standard GTR develops around 190 grams Mass Air Flow at peak power, so  $190 \times 2 = 380$ grams  $\times 1.25 = 475$  (BHP). This works on most engines but does depend on the engines design and efficiency, it can also works on naturally aspirated engines.

## **The car is not smooth on gear changes.**

Ensure you have the LC5 TCM ROM installed and use the latest RRFF phase 3 (12738) or newer installed, the phase 3 provides incredible smoothness and driveability. Also ensure on Gen 1 cars that you are running the JW series ROM.

## **The clutches slip on full load**

It's critical that the Fuel Trims are within +/-10% so that the Engine Torque value sent to the TCM is accurate. If it's too low the clutches will slip, watch the Clutch Slip logging parameter in the TCM ROM. Make a log of the TCM during a full load run, the maximum clutch pressure is normally 16.5 to 17.2bar, the clutch seals cannot hold more that this during our testing. See section 7 for advise on adjusting the Torque Actual map to avoid the clutches slipping.

## **Why doesn't Race ROM Launch Control work?**

Ensure coolant temp is over 70 deg C, ensure your TCM ROM has RRLC enabled in the mode you are using. Also see the Launch Control section for more help.

## **The car doesn't launch well**

If the car bogs on launch or just after launch then make a TCM Learning sequence then adjust the clutch capacity and touch points as per the Special Tools section later in the manual. Too much clearances on the touch points can cause this.

## **Why doesn't Rolling Launch work?**

Ensure the RRRL feature is enabled for the current selected mode , ensure the Cruise Control is enabled and set to a specific speed then press full throttle, see the RRRL section for full instructions.

## **Using Rolling Launch I sometimes get a P0605 DTC**

If the RRRL feature is enabled we advised to disable all P0605 DTCs, these DTCs can occasionally occur on some models at random times, just turn the P0605 DTC off to avoid this potential problem.

## **I cannot get the Idle Learning or Gearbox Learning to work**

Ensure the oil temps are hot, if bigger MAF tubes are fitted then try adding plus 5% to the MAF scale in the Idle region , there is a minimum airflow g/sec required for the learning sequence to commence.

## The Idle is not smooth or stable after programming

Make sure you make an ECU Reset after programming either ECU and also carry out the Idle Airflow Learning sequence.

If you have fitted larger injectors ensure you reduce the Minimum Injector Open Time.

If you have fitted MAF Tubes then Enable SD to see if the Idle improves and the MAF tubes are causing the problem.

Check the Throttle voltage between Bank #1 and Bank #2

Check for Dump Valves sticking open at Idle

## I get an error message trying to program the ECM or TCM

The engine should not be running and in PARK, also ensure headlights and interior fan blower are off, see the ECU programming section for further advise.

## I get Torque error DTCs when pulling away or driving

Ensure you are running RRFF phase 3 or newer.

Ensure the K Factor values are stock (as K Factor will distort the engine torque values given to the TCM). See the previous Idle stability questions as well.

Some aftermarket BOV with strong springs can cause this.

Try enabling Speed Density as a test to help you understand the problem.

## 13.1. ECU Programming

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- Make sure you have plenty of battery power before commencing ECU programming. ECU programming will take 3-4 minutes when installing the RaceROM Feature File.
- The ECU reprogramming progress can be seen on the Coolant Temp gauge on the Driver Instrument Display!
- 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  
If the above conditions are not met then program may fail to start or possibly fail during programming!
- 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. Please note that the Gen 2 model ECM are 1.5MB and that Gen 2 TCM from 2014 on are 1.5MB. So it's very important!!, If you have further problems then try to disconnect the battery then retest. If you have further problems then send your log file to EcuTek for analysis (C:\EcuTek\ProECU-NissanECU.log).
- If the ECU cannot be programmed it may be possible it has another 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 forced over programming guidance.
- We cannot guarantee compatibility with other products on other modules (like TCM).
- To put a standard ROM back into the ECM or TCM then simply choose the stock ROM from the Nissan GTR folder, C:\EcuTek\ProECURomFiles\Nissan\GTR\R35\ECM. If you wish to completely remove all licence information (which cannot be credited back to your licence key) then contact EcuTek for guidance.

# 14. Special Tools

EcuTek have developed several special tools for various modules on the GTR.

Special Tools are available for the ECM, TCM, ABS and TPMS modules.

The special tools can perform an unprecedented level of features that have never been available to the aftermarket and tuning industry.

Some of these features include:

Clutch Pressure Adjustments

Clutch Touch Points Adjustments

Temperate and Warning History read/clear

Gearbox Learning

Steering wheel sensor calibration

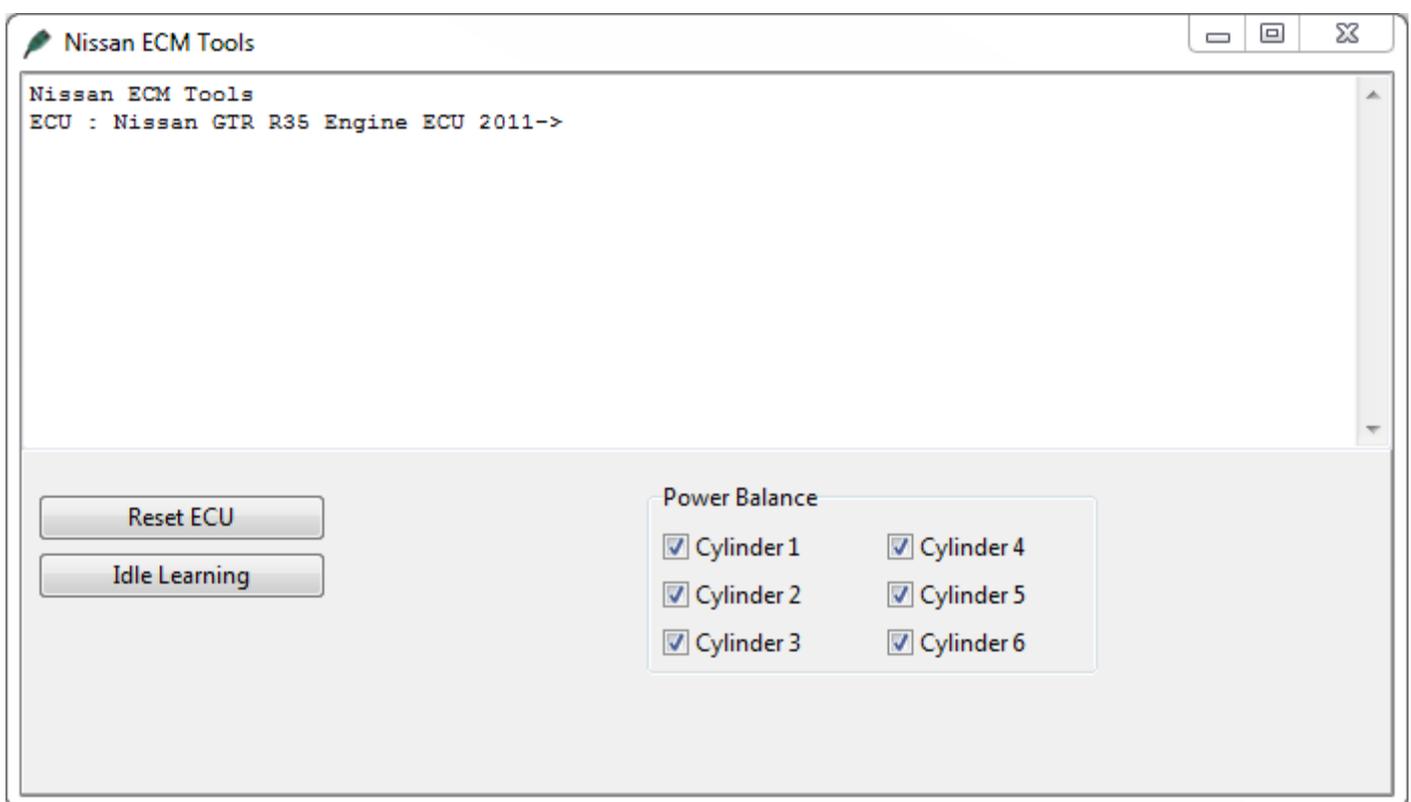
Idle Learning

Power Balance

Brake Sensor calibration

Tyre Pressure Sensor registration

## 14.1. ECM Tool

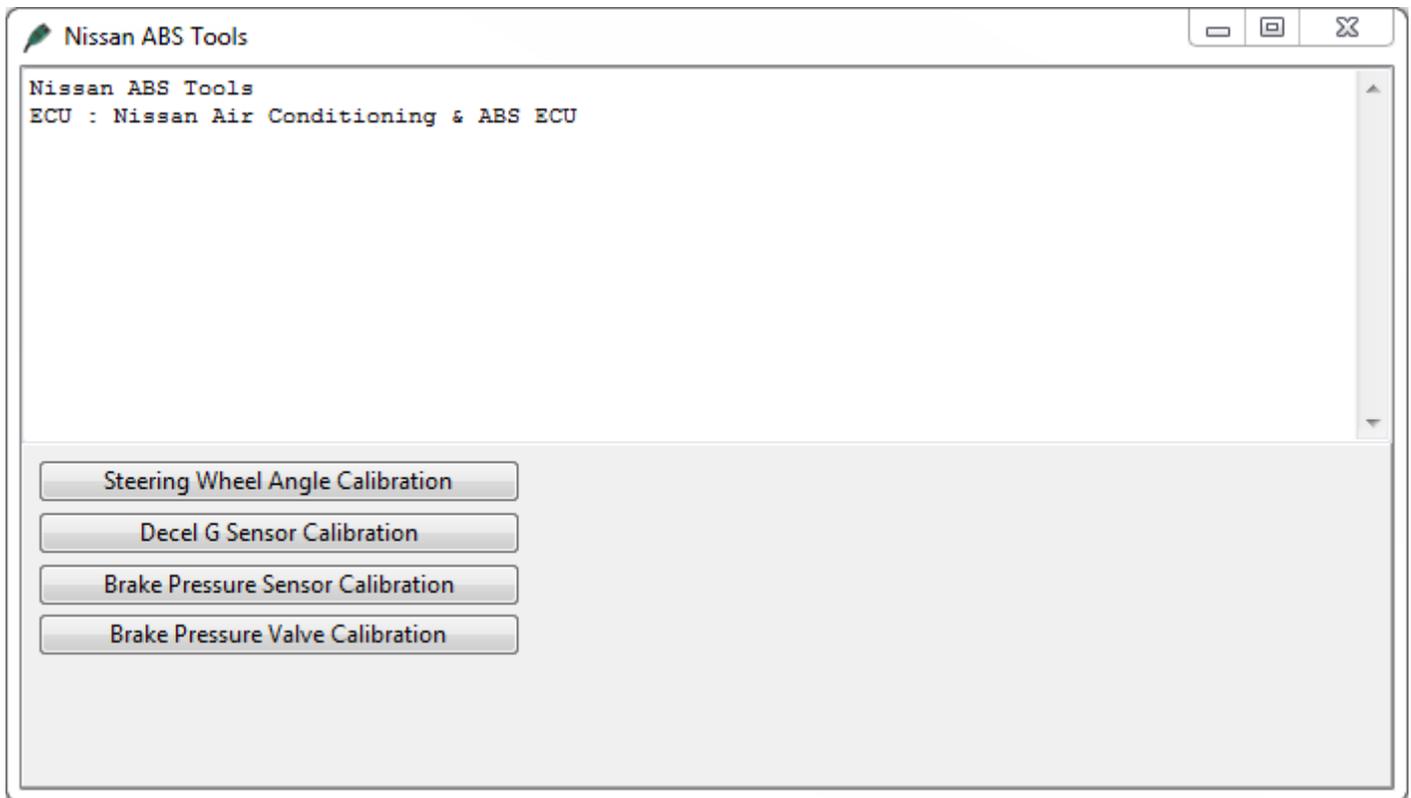


**Reset ECU** – This will clear all learnt values for Idle Control and Fuel Trims

**Idle Learning** – This will commence an auto learn airflow/throttle balance sequence, ensure that the Engine and TCM are over 65 deg C, the vehicle is in Park with handbrake ON and no DTCs are current or historic then start the auto learn sequence.

**Power Balance** – Will cut individual fuel injectors to help isolate problem cylinders

## 14.2. ABS Tool

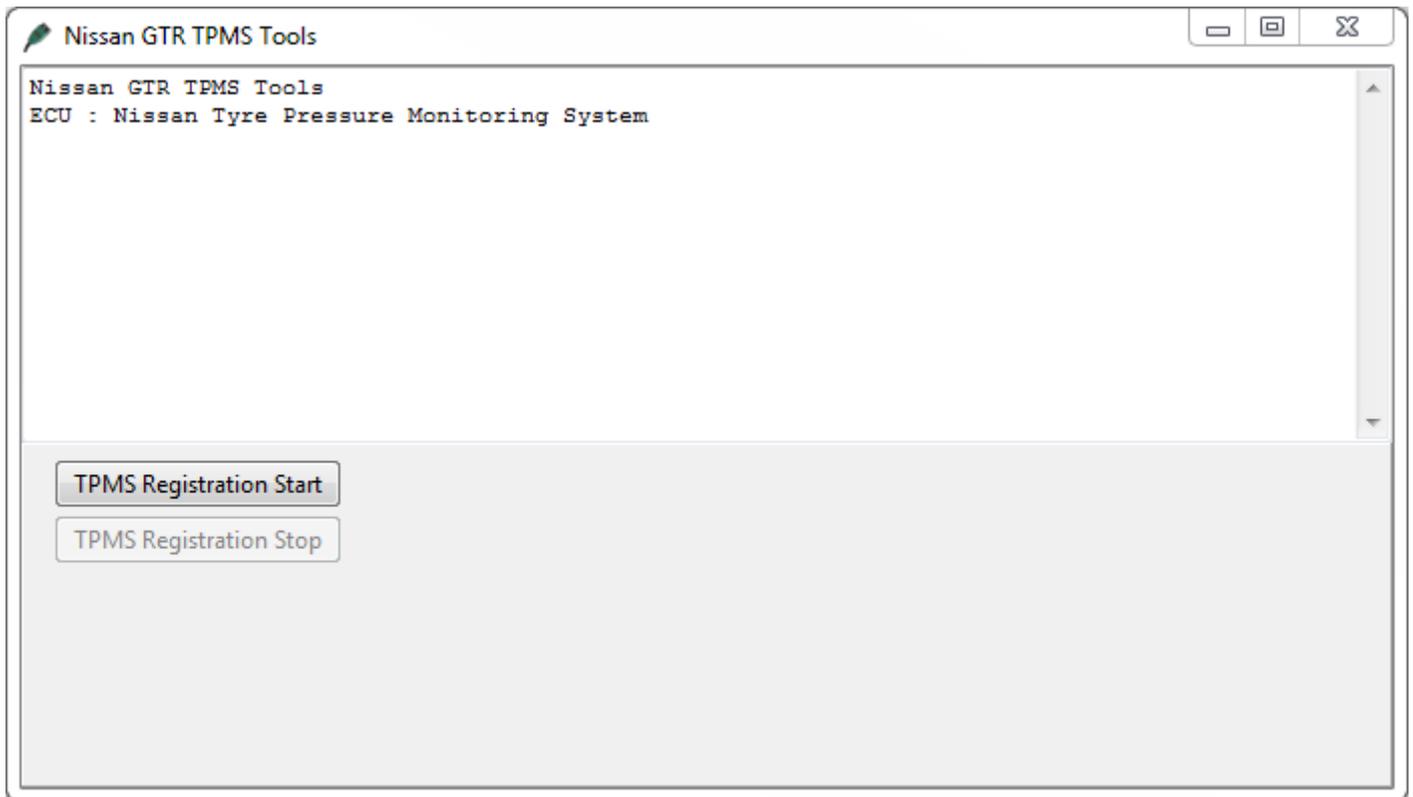


**Steering Wheel Angle Calibration** – This should be used to calibrate the steering wheel alignment for the driver display and other modules, set the steering wheel in the straight ahead position then start the calibration process.

**Decel G Sensor Calibration** – Ensure the vehicle is on level ground, in PARK , Handbrake ON with steering wheel straight ahead position.

**Brake Pressure Sensor Calibration** and **Brake Pressure Valve Calibration** – Ensure the vehicle is on level ground, in PARK, Handbrake ON with steering wheel straight ahead position before commencing this test, you will hear noise and experience movement so be prepared!

## 14.3. Tyre Pressure Monitor System



Start the registration sequence then visit the indicated wheel and press the button on the handheld TPMS tool for registration.

There are various TPMS tool on the market but we have recently tested the ATEQ universal TPMS tool shown below, the model is VT30 and the cost is around 170usd from companies like Amazon. This will work on the latest 2014- model GTRs.



## 14.4. TCM Tool

Nissan GTR TCM Tools  
ECU : Nissan GTR R35 Transmission ECU ->2008MY

Launch Control Counter (VDC Off) : 3

Oil Temperature Frequency 1 (-50°C/-58F to -20°C/ -4F) : 0  
Oil Temperature Frequency 2 (-20°C/ -4F to 80°C/176F) : 185  
Oil Temperature Frequency 3 ( 80°C/176F to 110°C/230F) : 10  
Oil Temperature Frequency 4 (110°C/230F to 140°C/284F) : 0  
Oil Temperature Frequency 5 (140°C/284F and over) : 0

Clutch A Protection 1 : N  
Clutch A Protection 2 : N  
Clutch A Protection 3 : N  
Clutch A Protection 4 : N  
Clutch B Protection 1 : N  
Clutch B Protection 2 : N  
Clutch B Protection 3 : N  
Clutch B Protection 4 : N  
Clutch Overheat Protection History : N  
Line Pressure Loss History : N  
High Oil Pressure History 1 : N  
High Oil Pressure History 2 : N  
High Oil Pressure History 3 : N

Clutch Capacity A: 1  
Clutch Capacity B: 1  
Clutch TouchPoint A: -1  
Clutch TouchPoint B: -1

Warning History  
Read Clear

Oil Temperature History  
Read

Launch Counter (VDC Off)  
Read

Clutch Learning  
Read Clear  
Auto Adjust

Adjust Clutch Capacities  
Clutch A Clutch B  
1 1

Adjust Clutch Touchpoints  
Clutch A Clutch B  
-1 -1

### 14.4.1. Clutch Gear Learning

This process will initiate the TCM ECU to self calibrate the clutch pressure, clutch touch points along with pump and solenoid duty learning.

Once the sequence starts it should be allowed to complete fully and takes around 5 minutes in total.

The vehicle should be up to temperature with coolant temp over 80 deg C and Gearbox oil temp over 65 deg C.

The vehicle should be on a level smooth surface while steering wheel is straight.

You should be in the driver seat of the vehicle whilst the learning sequence is active.

It is normal for the engine rpm to rise and fall during the test.

The vehicle will also shunt back and forth during the test as the gears and clutches are engaged and disengaged.

Once the learning sequence is complete the learned values can be checked under **Read Learned Data**.

## 14.4.2. Clutch Touch Points

These touch points are the actual engagement point of the clutch plates to connect the engine crankshaft drive to the input shaft of the gearbox.

It's the bite point which normally is experienced when raising the clutch pedal on a vehicle fitted with a conventional manual gearbox.

There are two gearbox shafts, Bank A (even gears 2-4-6) and Bank B (odd gears 1-3-5).

With the gearbox in Drive (manual or Auto) press the accel pedal so that the engine rpm rises, the clutch will engage and the vehicle will start to creep forward.

On a poorly calibrated touch point where the value would be below 8 (example 5) the engine rpm will rise too high (around 1200-1400rpm) and the vehicle will not really move forward, and then suddenly the clutch will engage causing an unpleasant jolt forward.

If the Touch point is too high the clutch will be engaged at idle and if the foot brake is on to prevent the vehicle from moving then the clutch will be slipping creating heat and excessive wear, when the foot brake is released (off) the vehicle will creep forward, as the accel pedal is pressed the clutch is already partially engaged and any accel movement will directly increase the vehicle speed further.

The setting required for each bank should be trial and error as each vehicles tolerance and amount of wear may be different.

The touch points should be increased until the vehicle just starts to creep and then reduced by a value of 1 so that the vehicle can almost move forward on a smooth surface.

## 14.4.3. Clutch Pressure

The Clutch pressures are applied for each clutch: Clutch A (even gears 2-4-6) and clutch B (odd gears 1-3-5).

Raising the clutch pressure values will give a more positive pull away and gear change, reducing these values will encourage clutch slip along with a smoother pull away with smooth undetectable gear changes.

On high power vehicles these pressures should be increased to minimise torque slip on gear changes. Its good practise to create a TCM log file and look closely at the Clutch slip RPM during gear shifts, especially after tuning and the power output has been increased.

**Read Clutch Temps** – This will display the maximum clutch temps that have been achieved

**Read Oil Temp History** – This will show the Oil Temp history including frequency of oil temp .

**Read Warning History** – This will display any protection thresholds that have been triggered.

**Clear Warning History** – This will clear the TCM warning history.

**Reset Clutch Adjustment** – These will clear and reset all current Clutch Capacity or Touchpoints.

## 14.5. Map Editor Features (with useful hints)

- It is possible to open a map with flipped X and Y axis by simply **right-click** on the map name and left click on the **Open Map with Flipped Axis**.

The screenshot shows the ProECU Map Editor interface. The top window displays a fuel map grid for '23710-KJ13A-Std ROM with 12738 RRF enc.bin - Fuel Map MODE1'. The x-axis represents Engine Load (%) from 7.45 to 190, and the y-axis represents Engine Speed (RPM) from 4000 to 8000. The bottom window shows the 'Maps' list on the left, with 'Fuel Map MODE1 Beginner' selected. A context menu is open over this entry, highlighting the option 'Open Map with Flipped Axes'. The right window in the bottom pane shows a similar fuel map grid with Engine Speed (RPM) on the x-axis and Engine Load (%) on the y-axis.

- If a map is too big for the screen then use the CTRL-ALT-F (Fewer Significant points) to reduce the size of the values in the map and make the map smaller.
- You can increase or decrease the text size of the Maps list and Live Data parameters by holding down the **Ctrl** key and using the **mouse wheel** to scroll up or down. It is also possible to go to the View menu and select Increase Font Size (or use Cntr+Alt+I or Cntr+Alt+D).
- You can save your current map editor layout by choosing **View** menu selecting **Save Rom Editor Layout As Default** (or use Cntr+Alt+E)
- You can **drag-and-drop** ROM Files and Log files onto the ProECU header bar to open the log file or ROM. This saves time navigating the File menu, Open Rom File or or Open Log File! You can also drag-and-drop a RaceROM Feature File file onto the open ROM file.
- Check and contribute to the EcuTek ProECU Forum. We can all share information that will increase our understanding of the factory ECU, this feedback will allow EcuTek to further develop and improve this new generation ProECU Nissan GTR product. You can navigate to the EcuTek Forum from the **Help** menu.

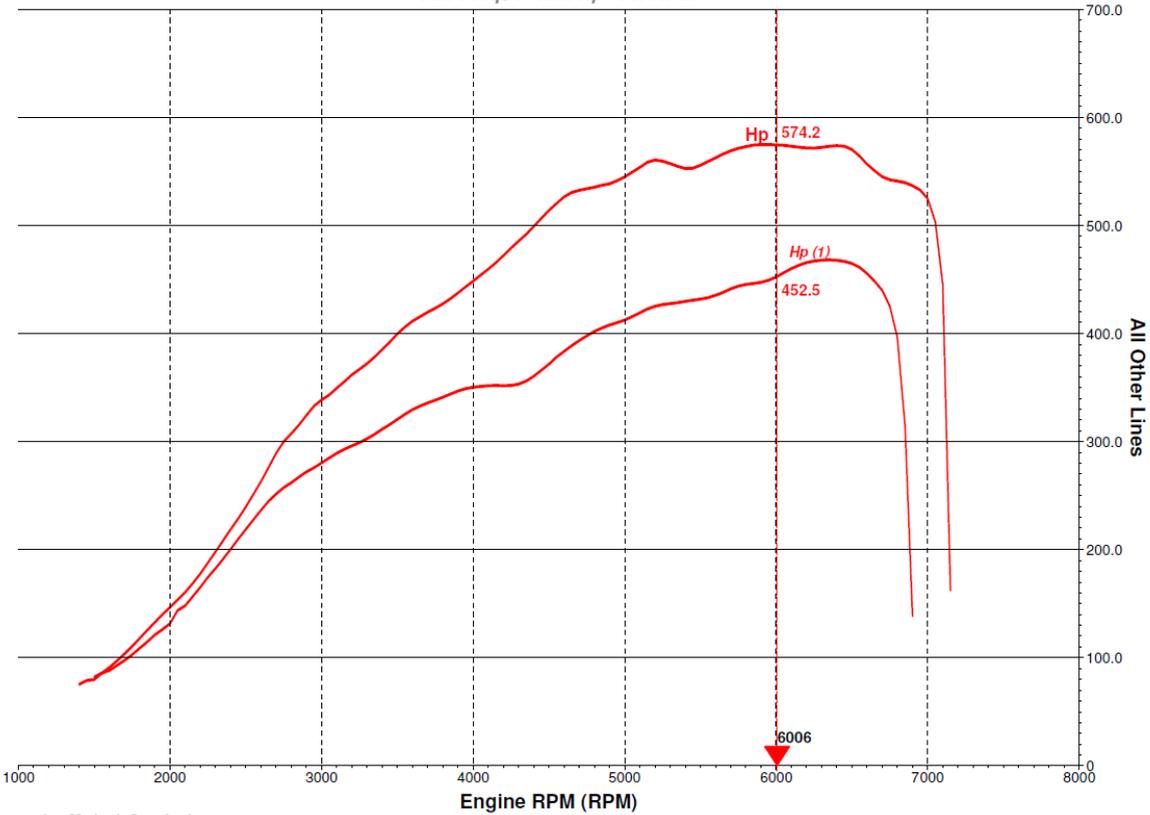
- You can add extra columns to the **Maps** window and **Live Data** window by doing a right-click on the name bar and then left-click on other columns (such as: Min, Max, Units and Origin)
- When you have selected ORIGIN and you click ORIGIN to order the parameters then its clear to see the vast amount of custom parameters that we have defined and add. See the EcuTek values in red and the Nissan parameters in Green shown below.

Name	Units	Min	Cu...	Ma...
<input type="checkbox"/> Custom Map K Result	EcuTek raw	---	n/a	n/a
<input type="checkbox"/> Custom Map L Interim	EcuTek raw	---	n/a	n/a
<input type="checkbox"/> Custom Map L Result	EcuTek raw	---	n/a	n/a
<input type="checkbox"/> Custom Map M Interim	EcuTek raw	---	n/a	n/a
<input type="checkbox"/> Custom Map M Result	EcuTek raw	---	n/a	n/a
<input type="checkbox"/> Custom Map N Interim	EcuTek raw	---	n/a	n/a
<input type="checkbox"/> Custom Map N Result	EcuTek raw	---	n/a	n/a
<input type="checkbox"/> Custom Map O Interim	EcuTek raw	---	n/a	n/a
<input type="checkbox"/> Custom Map O Result	EcuTek raw	---	n/a	n/a
<input type="checkbox"/> Custom Map P Interim	EcuTek raw	---	n/a	n/a
<input type="checkbox"/> Custom Map P Result	EcuTek raw	---	n/a	n/a
<input checked="" type="checkbox"/> Desired Turbine Wheel Airflow	EcuTek g/s	---	n/a	n/a
<input type="checkbox"/> Desired Wastegate flow	EcuTek l/sec	---	n/a	n/a
<input type="checkbox"/> Dig: Economy Mode	EcuTek Digital	---	???	---
<input type="checkbox"/> Dig: Safety Mode	EcuTek Digital	---	???	---
<input type="checkbox"/> Dig: Speed Density	EcuTek Digital	---	???	---
<input checked="" type="checkbox"/> Engine Load	EcuTek %	---	n/a	n/a
<input type="checkbox"/> Engine Load Absolute (MAF)	EcuTek g/rev	---	n/a	n/a
<input type="checkbox"/> Engine Load Absolute (SD)	EcuTek g/rev	---	n/a	n/a
<input checked="" type="checkbox"/> Gear	EcuTek gear	---	n/a	n/a
<input type="checkbox"/> Ignition Timing (Calculated)	EcuTek raw	---	n/a	n/a
<input checked="" type="checkbox"/> Ignition Timing Base Mode B	EcuTek *	---	n/a	n/a
<input type="checkbox"/> Initial Wastegate Angle	EcuTek *	---	n/a	n/a
<input type="checkbox"/> Injection Angle	EcuTek *	---	n/a	n/a
<input checked="" type="checkbox"/> Injector Duty B1	EcuTek %	---	n/a	n/a
<input type="checkbox"/> Injector Duty B2	EcuTek %	---	n/a	n/a
<input checked="" type="checkbox"/> Knock Correction	EcuTek *	---	n/a	n/a
<input type="checkbox"/> Knock Sensor Cylinder 1	EcuTek	---	n/a	n/a
<input type="checkbox"/> Knock Sensor Cylinder 2	EcuTek	---	n/a	n/a
<input type="checkbox"/> Knock Sensor Cylinder 3	EcuTek	---	n/a	n/a
<input type="checkbox"/> Knock Sensor Cylinder 4	EcuTek	---	n/a	n/a
<input type="checkbox"/> Knock Sensor Cylinder 5	EcuTek	---	n/a	n/a
<input type="checkbox"/> Knock Sensor Cylinder 6	EcuTek	---	n/a	n/a
<input type="checkbox"/> Knock Threshold Cylinder 1	EcuTek	---	n/a	n/a
<input type="checkbox"/> Knock Threshold Cylinder 2	EcuTek	---	n/a	n/a
<input type="checkbox"/> Knock Threshold Cylinder 3	EcuTek	---	n/a	n/a
<input type="checkbox"/> Knock Threshold Cylinder 4	EcuTek	---	n/a	n/a
<input type="checkbox"/> Knock Threshold Cylinder 5	EcuTek	---	n/a	n/a
<input type="checkbox"/> Knock Threshold Cylinder 6	EcuTek	---	n/a	n/a
<input checked="" type="checkbox"/> Manifold Relative Pressure	EcuTek bar	---	n/a	n/a
<input type="checkbox"/> Mapswitch Mode	EcuTek	---	n/a	n/a
<input checked="" type="checkbox"/> Mass Airflow B1	EcuTek %	---	n/a	n/a
<input type="checkbox"/> Mass Airflow B2	EcuTek %	---	n/a	n/a
<input type="checkbox"/> Mass Airflow Estimated (SD)	EcuTek g/s	---	n/a	n/a
<input type="checkbox"/> Mass Airflow Measured (MAF)	EcuTek g/s	---	n/a	n/a
<input type="checkbox"/> MBT Timing	EcuTek *	---	n/a	n/a
<input type="checkbox"/> RaceROM Version	EcuTek raw	---	n/a	n/a
<input type="checkbox"/> RBC Maximum Desired Boost	EcuTek bar	---	n/a	n/a
<input type="checkbox"/> SD Volumetric Efficiency	EcuTek %	---	n/a	n/a
<input type="checkbox"/> Secondary Air Injection MAF	EcuTek V	---	n/a	n/a
<input type="checkbox"/> Surplus Airflow	EcuTek g/s	---	n/a	n/a
<input type="checkbox"/> Throttle Delta	EcuTek raw	---	n/a	n/a
<input type="checkbox"/> Timing Adjustment	EcuTek *	---	n/a	n/a
<input type="checkbox"/> Timing Desired	EcuTek *	---	n/a	n/a
<input checked="" type="checkbox"/> Torque Actual	EcuTek Nm	---	n/a	n/a
<input type="checkbox"/> Torque Demand	EcuTek Nm	---	n/a	n/a
<input type="checkbox"/> Turbo Dynamics Integral	EcuTek g/s	---	n/a	n/a
<input type="checkbox"/> Turbo Dynamics Proportional	EcuTek g/s	---	n/a	n/a
<input checked="" type="checkbox"/> Turbo Dynamics Sum	EcuTek g/s	---	n/a	n/a
<input type="checkbox"/> Wastegate Angle	EcuTek *	---	n/a	n/a
<input type="checkbox"/> Wastegate Angle Correction	EcuTek *	---	n/a	n/a
<input type="checkbox"/> Wheel Speed FL	EcuTek km/h	---	n/a	n/a
<input type="checkbox"/> Wheel Speed FR	EcuTek km/h	---	n/a	n/a
<input type="checkbox"/> Wheel Speed RL	EcuTek km/h	---	n/a	n/a
<input type="checkbox"/> Wheel Speed RR	EcuTek km/h	---	n/a	n/a
<input type="checkbox"/> A/F Adjustment Bank #1	OEM	---	n/a	n/a
<input type="checkbox"/> A/F Adjustment Bank #2	OEM	---	n/a	n/a
<input type="checkbox"/> A/F Heater Bank #1 Sensor #1	OEM %	---	n/a	n/a
<input type="checkbox"/> A/F Heater Bank #2 Sensor #1	OEM %	---	n/a	n/a
<input type="checkbox"/> AC PPressure Sensor	OEM V	---	n/a	n/a
<input checked="" type="checkbox"/> Accelerator Pedal Sensor #1	OEM V	---	n/a	n/a
<input type="checkbox"/> Accelerator Pedal Sensor #2	OEM V	---	n/a	n/a
<input type="checkbox"/> AFR Sensor Bank #1	OEM V	---	n/a	n/a
<input type="checkbox"/> AFR Sensor Bank #2	OEM V	---	n/a	n/a
<input checked="" type="checkbox"/> Atmospheric Pressure	OEM Bar	---	n/a	n/a
<input type="checkbox"/> Base Fuel Schedule	OEM ms	---	n/a	n/a
<input type="checkbox"/> Battery Voltage	OEM V	---	n/a	n/a
<input type="checkbox"/> Boost Sensor Voltage Bank #1	OEM V	---	n/a	n/a
<input type="checkbox"/> Boost Sensor Voltage Bank #2	OEM V	---	n/a	n/a
<input checked="" type="checkbox"/> Coolant Temperature	OEM °C	---	n/a	n/a
<input type="checkbox"/> Distance Travelled Since MIL Illuminated	OEM km	---	n/a	n/a
<input type="checkbox"/> Engine Oil Temperature	OEM °C	---	n/a	n/a
<input checked="" type="checkbox"/> Engine Speed	OEM RPM	---	n/a	n/a
<input type="checkbox"/> Evap Control System Pressure Sensor	OEM	---	n/a	n/a
<input type="checkbox"/> Fan Duty	OEM %	---	n/a	n/a
<input type="checkbox"/> Fuel Level Sensor	OEM V	---	n/a	n/a
<input type="checkbox"/> Fuel Pump Duty	OEM %	---	n/a	n/a
<input type="checkbox"/> Fuel Pump Status Main - Sub	OEM	---	n/a	n/a
<input checked="" type="checkbox"/> Fuel Temperature	OEM °C	---	n/a	n/a
<input checked="" type="checkbox"/> Fuel Trim Long Term Bank #1	OEM %	---	n/a	n/a
<input checked="" type="checkbox"/> Fuel Trim Long Term Bank #2	OEM %	---	n/a	n/a

# Typical Power Gains

Here are some example power gains that can be achieved with ECU tuning:

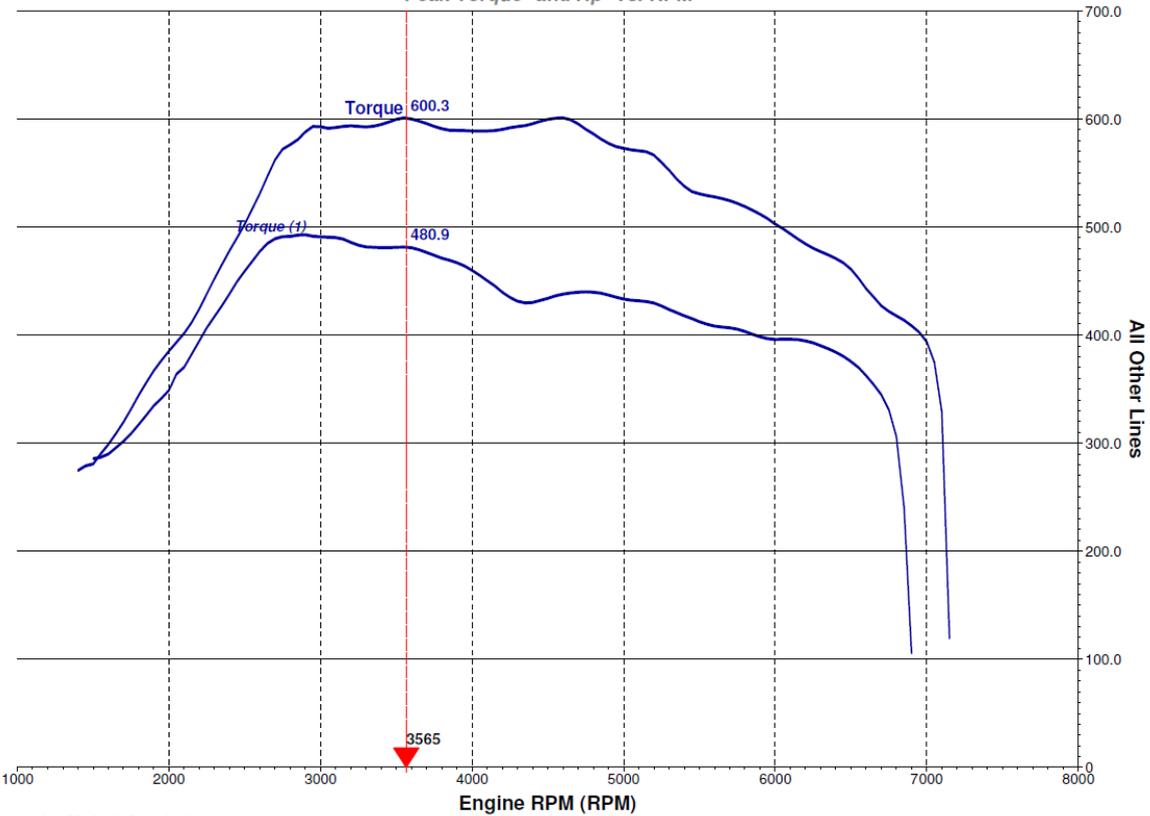
Peak Torque\* and Hp\* vs. RPM



\* Correction Method: Standard  
Notes: Standard vs EcuTeK RaceROM

Peak Power: 574.6 Hp @ 5950 RPM

Peak Torque\* and Hp\* vs. RPM



\* Correction Method: Standard  
Notes: Standard vs EcuTeK RaceROM

# 15. Technical Support

## 15.1. What we Support

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### 15.1.1. Bug Fixes

EcuTek provide technical support on ProECU Nissan GTR. 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.

### 15.1.2. ECU Additions

We will also add support for newly released or reported ECU versions, as and when they are made available – the turnaround time adding new ECU support is around 7 days.

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.

## 15.2. What is NOT Supported

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### 15.2.1. 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.

## 15.3. Contacting EcuTek for Technical Support

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Technical support must initially be via email, not via telephone. This is for the following reasons:

Emails may be routed to the individual best placed to reply to them.

Depending on customer location, time zones are likely to be different, making phone calls difficult and expensive.

Writing down the question or problem often helps provide the answer or solution to it. It is also easier to understand, reproduce and fix a well-documented issue, than notes made from a phone call.

# 16. 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