

# EDC-16C9/C39



Written by: Someone

Date: 2014

Thanks to: A lot of helpful forum members!

For more info: [www.ecuconnections.com](http://www.ecuconnections.com)

Revision: 1.4

**Index:****Introduction:**

The EDC16C9 and EDC16C39 are used in Opel Vectra, Fiat Chroma, Alfa 156, SAAB 9000 and some other cars that use 1.9cdti engine. The system looks a lot like the EDC15 system, but the EDC16 system is based on Torque (Nm) instead of Injected Quantity. There are a few more differences that are explained in this document. For the examples in this document I used the pro tuned Opel Astra 1.9 cdti 16v 150bhp file. The pictures show tuned file and difference from original by Delta or %.

I chose to use different values in my remap, hope my explanation will not be confusing for you.

Here you can find the pro tuned file:

<http://www.ecuconnections.com/forum/viewtopic.php?f=152&t=15660&p=81062&hilit=pro+astra+150#p81062>

There are some mistakes in map-pack...

**This Guide has no intention to show how to save money by DIY remap as it is a Mission Impossible. This Guide intends to brief you about control and operation of the 1.9 DTH engines so can enjoy playing with it. Be aware that this could be an expensive hobby. Have fun.**

# Car data

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## Z19DTH - 1.9CDTI 150BHP



### Engine Specification

**Engine, location:** Front, transverse in front of axle 17° 24' forward inclined

**Cooling system:** Liquid, sealed circuit

**Cylinders, number:** 4

**Bore (mm)** 82

**Stroke (mm):** 90.4

**Displacement (cc):** 1910

**Compression ratio:** 17.5: 1

**Engine, type:** In line; 5 main bearings

**Cylinder block/ head, material:** Cast iron/ aluminium

**Camshaft (s), location:** 2 overhead (DOHC), driven by toothed belt

**Valve train:** Indirect, roller cam followers

**Valve, arrangement:** In line; 4 per cylinder Valve,

**Adjustment:** Automatic - hydraulic

**Fuel system:** Diesel direct injection, common rail

**Ignition system:** n/a

**Fuel pump:** High pressure mechanic

**Emission control system:** 2- way cat. conv. (oxidizing catalytic converter) exhaust gas recirculation DPF

**Output (kW/hp CEE at 1/min):** 110/ 150 at 4000

**Specific power (kW/l; hp/l):** 57.6; 78.5

**Max. torque (Nm at 1/ min):** 315 at 2000

**Specific torque (Nm/litre):** 164.9

**Mean effective pressure at max. power/ max. torque (kPa):** 1727.7/ 2073.4

**Average piston speed (m/ s):** 12.1

**Engine oil, capacity (l):** 4.3

**Cooling capacity (l):** 7.5

**Battery** 12 V,

**capacity (Ah):** 70

**Alternator** 14.2 V,

**Capacity (W):** 1420

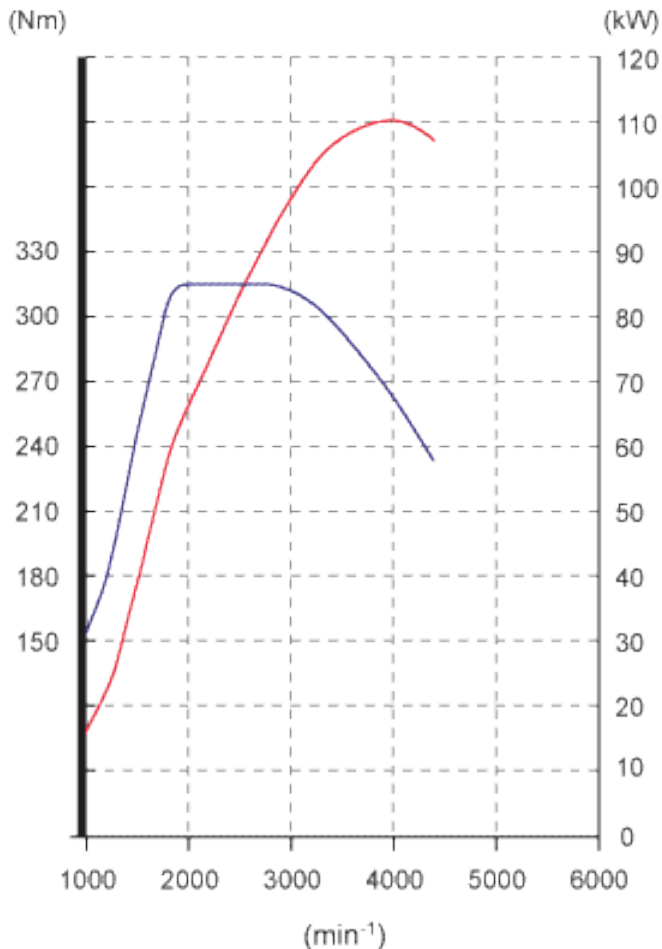
**Max. service interval:** 20,000 miles or 1 year

**Emission compliance:** Euro 4

**Engine mass (kg):** tba

**Charger system:** Turbo with intercooler

**Max. boost pressure (bar):** tba



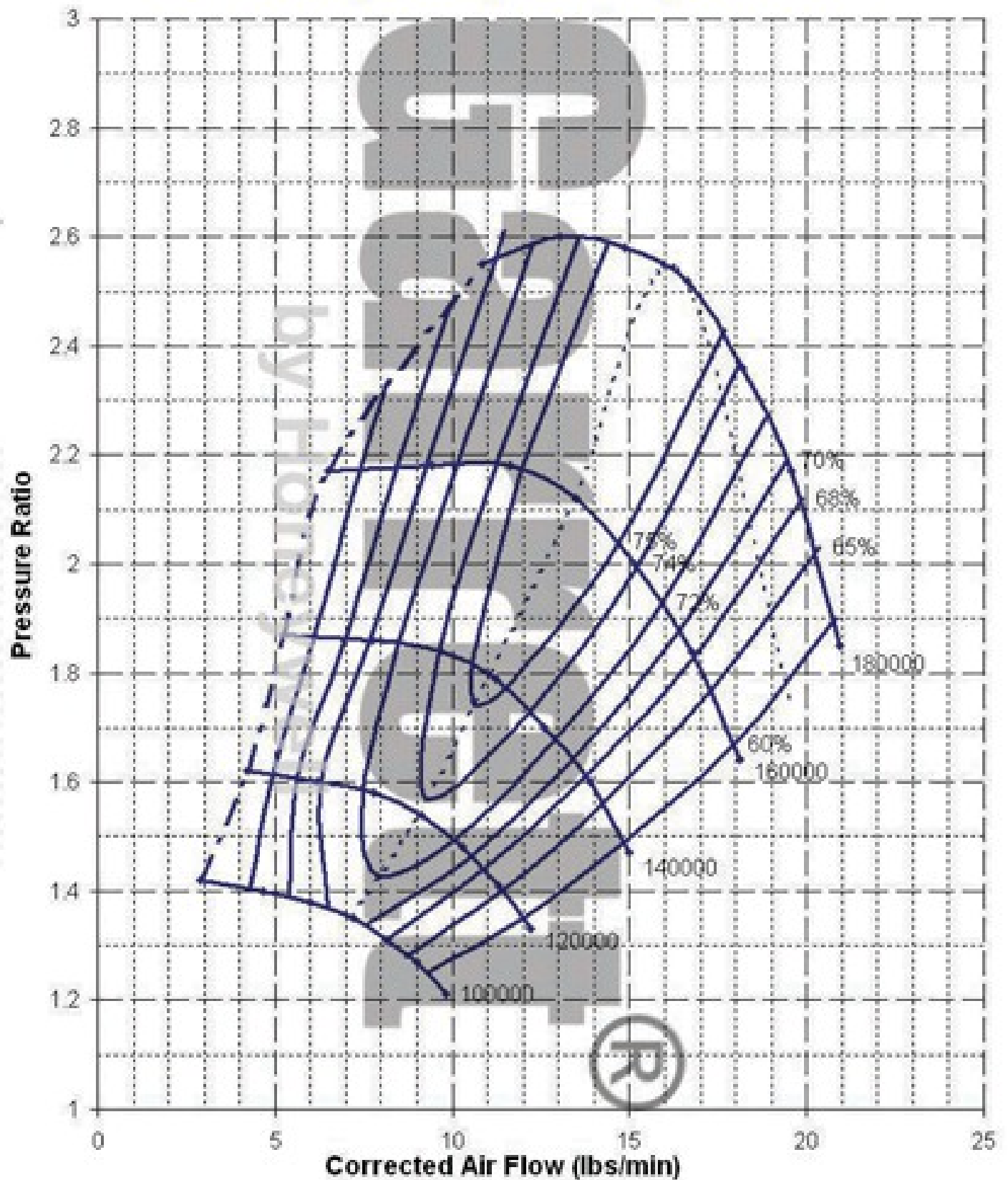
**Power Output (kW)** **Torque (Nm)**

2009 Aisin Warner AF40-6 (M36) FWD & (MXE) AWD Transmission		
Type:	six speed front wheel drive, electronically controlled automatic tansmission with torque converter clutch	
Maximum engine torque:	400 Nm (Gasoline), 450 Nm (Diesel)	
Gear Ratios:	M36 & MXE	
1st		4.15
2nd		2.37
3rd		1.56
4th		1.16
5th		0.86
6th		0.69
REV		3.39
F/D	2,561 / 2,666 / 2,774 / 2,839 / 2,955 / 3,075 / 3,200 / 3,329 / 3,464 / 3,640 / 3,750	
Ratio spread	6,05:1	
Maximum shift speed:	7000 rpm	

<b>Min input speed:</b>	650 rpm
<b>Maximum validated gross vehicle weight:</b>	2355 kg (MY09 Opel Insignia HB AF40 AWD A28NET)
<b>Shifting mechanism:</b>	Integrated position sensor with TCM
<b>Shifting positions:</b>	P,R,N,D (by cable) & Tiptronic (by CAN)
<b>Case material:</b>	Die cast aluminum
<b>Center distance:</b>	197 mm
<b>Overall length:</b>	358 mm
<b>Shift pattern:</b>	Pulse width modulated solenoid control
<b>Shift quality:</b>	Variable bleed solenoid
<b>Torque converter clutch:</b>	Pulse width modulated solenoid control
<b>Available control features:</b>	Eco Mode Selective Sport Mode Drivers Adaptive (Fuzzy) Manual Mode (Tiptronic) Up Hill Control Down Hill Control Torque Limitation (axle shaft protection) Fast Acceleration OFF Fast Acceleration ON Shift by Temperature Brake Assist Cornering Control Pass-by Noise Test Function Differential Protection Warm-up Shift Pattern (WUSP) Neutral Control L-up Slip Control (drive & coast) Tip Auto Down Tip Auto Up Improved Downshift Protection Up Shift Prevention Low m Conrol Highest Gear in Limp Home Gear Stabilization
<b>EOBD II, OBD</b>	
<b>Converter size:</b>	241 & 260
<b>k-Factor:</b>	142k - 225k
<b>Torque ratio:</b>	2,0 - 2,32
<b>Fluid type</b>	AW-1 (low friction), lifetime fill
<b>Transmission weight (dry):</b>	87 kg
<b>Fluid capacity</b>	6,96 kg (incl. cooler)
<b>Pressure taps available:</b>	Access to all clutches & brakes possible
<b>Assmbly site:</b>	Anjo City, Japan
<b>Applications:</b>	Opel Astra, Zafira, Vectra Saab 9-3, Cadillac BLS



# GT1749V, 49mm, 55 Trim, 0.46 A/R



# Map address, dimensions and factors

## Fuel related maps

### 1. Drivers wish Maps:

#### General:

This map shows the required torque based on the RPM and the Throttle position. The output of this map is Torque in Nm. There may be more drivers wish maps, in the file I used for this guide there were 3 drivers wish maps.

The image shows two side-by-side screenshots of the 'Properties of...' dialog box for engine maps. The left dialog is for a 'Torque' map, and the right is for a 'Throttle' map. Both show configuration options for description, unit, name, start address, dimensions, values, number format, organization, right side, value range, factor/offset, reciprocal, variable offset, and precision.

**Left Dialog (Torque Map):**

- Map: X-Axis, Y-Axis, Comment
- Description: Torque
- Unit: NM
- Name: Drivers Wish
- Start address: C10BC (From hexdumpcursor)
- Column x rows: 8 x 13
- Values: 16 Bit (HiLo)
- Number format: Decimal (Base 10 System)
- Sign: ☐ Difference: ☐ Original values: ☐ Percent: ☐
- Organization: Twodimensional
- Right side: Bar display
- Value range: 0 - 65536 (Auto)
- Factor, offset: ☒ Reciprocal: ☐ Value =  $\frac{0.100000 \cdot \text{Eprom}}{1} + 0.000000$
- Variable offset: (none)
- Precision: 0

**Right Dialog (Throttle Map):**

- Map: X-Axis, Y-Axis, Comment
- Description: Throttle
- Unit: %
- Data source: Eprom
- Start address: C10AC (From hexdumpcursor)
- Mirror map: ☐
- Values: 16 Bit (HiLo) Skip bytes: 0
- Number format: Decimal (Base 10 System)
- Sign: ☐
- Signature byte:
- Factor, offset: ☐ Reciprocal: ☐ Value =  $\frac{0.012207 \cdot \text{Eprom}}{1} + 0.000000$
- Precision: 1



Properties of...

Map X-Axis Y-Axis Comment

Description: RPM

Unit: 1/min

Data source: Eprom ...

Start address: C1092 From hexdumpcursor

☐ Mirror map

Values: 16 Bit (HiLo) Skip bytes: 0

Number format: Decimal (Base 10 System)

☐ Sign

Signature byte:

Factor, offset: Value =  $\frac{1.000000}{1} \times \text{Eprom} + 0.000000$

☐ Reciprocal:

Precision: 0

Bar °C 1  
% f(x) ▼

OK Cancel Help

## 2. Torque limiter:

### General:

This map limits the torque of the engine based on RPM and atmospheric pressure. The output of this map is also Torque in Nm. This is 2D map.

Properties of...

Map X-Axis Comment

Description: Torque

Unit: Nm Id:

Name: Torque Limiter

Start address: CBE2C From hexdumpcursor

Column x rows: 25 x 1

Values: 16 Bit (HiLo)

Number format: Decimal (Base 10 System)

☐ Sign ☐ Difference

☐ Original values ☐ Percent

Organization: Onedimensional

Right side: Bar display

Value range: 0 - 65535 Auto

☒ Factor, offset: Value =  $\frac{0.100000}{1} \cdot \text{Eprom} + 0.000000$

☐ Reciprocal:

Variable offset: (none)

Precision: 0 Bar °C 1 % f(x) ▼

OK Cancel Help

Properties of...

Map X-Axis Comment

Description: RPM

Unit: 1/min

Data source: Eprom ...

Start address: CBDFA From hexdumpcursor

☐ Mirror map

Values: 16 Bit (HiLo) Skip bytes: 0

Number format: Decimal (Base 10 System)

☐ Sign

Signature byte:

Factor, offset: Value =  $\frac{1.000000}{1} \cdot \text{Eprom} + 0.000000$

☐ Reciprocal:

Precision: 0 Bar °C 1 % f(x) ▼

OK Cancel Help

### 3. Nm to IQ conversion map:

General:

This map is a calibration map. This map converts the requested Torque in Nm into IQ (injected quantity).

Properties of...

Map

X-Axis

Y-Axis

Comment

Description:

Unit:  Id:

Name:

Start address:

Column x rows:  x

Values:

Number format:

☐ Sign ☐ Difference

☐ Original values ☐ Percent

Organization:

Right side:

Value range:  -

☒ Factor, offset: 
$$\text{Value} = \frac{0.010000 \cdot \text{Eprom}}{1} + 0.000000$$

☐ Reciprocal:

Variable offset:

Precision:

Properties of...

Map

X-Axis

Y-Axis

Comment

Description:

Unit:

Data source:

Start address:

☐ Mirror map

Values:  Skip bytes:

Number format:

☐ Sign

Signature byte:

Factor, offset: 
$$\text{Value} = \frac{0.100000 \cdot \text{Eprom}}{1} + 0.000000$$

☐ Reciprocal:

Precision:

Properties of...

Map X-Axis Y-Axis Comment

Description: RPM

Unit: 1/min

Data source: Eprom ...

Start address: CD8E2 From hexdumpcursor

☐ Mirror map

Values: 16 Bit (HiLo) Skip bytes: 0

Number format: Decimal (Base 10 System)

☐ Sign

Signature byte:

Factor, offset: Value =  $\frac{1.000000 \times \text{Eprom}}{1} + 0.000000$

☐ Reciprocal:

Precision: 0

Bar °C 1  
% f(x) ▼

OK Cancel Help

#### 4. IQ limiter map:

General:

This is map for engine speed dependent quantity limitation.

Properties of...

Map Y-Axis X-Axis Comment

Description: injection mass

Unit: mm<sup>3</sup>/hub Id: EngPrt\_qOvhtPrvNRng\_

Name: map for engine speed dependent quantity limit

Start address: CC204 From hexdumpcursor

Column x rows: 16 x 16

Values: 16 Bit (HiLo)

Number format: Decimal (Base 10 System)

☒ Sign ☐ Difference

☐ Original values ☐ Percent

Organization: 2D Inverse

Right side: Bar display

Value range: 0 - 65535 Auto

☒ Factor, offset: Value =  $\frac{0.010000 \cdot \text{Eprom}}{1} + -0.000000$

☐ Reciprocal:

Variable offset: (none)

Precision: 4 Bar °C 1 % f(x) ▼

OK Cancel Help

Properties of...

Map Y-Axis X-Axis Comment

Description: average engine speed

Unit: rpm

Data source: Eprom

Start address: CC1C4 From hexdumpcursor

☐ Mirror map

Values: 16 Bit (HiLo) Skip bytes: 0

Number format: Decimal (Base 10 System)

☐ Sign

Signature byte:

Factor, offset: Value =  $\frac{1.000000 \cdot \text{Eprom}}{1} + -0.000000$

☐ Reciprocal:

Precision: 2 Bar °C 1 % f(x) ▼

OK Cancel Help

Properties of...

Map Y-Axis X-Axis Comment

Description: minimum prevention factor calculated from ten

Unit: -

Data source: Eprom

Start address: CC1E4 From hexdumpcursor

☐ Mirror map

Values: 16 Bit (HiLo) Skip bytes: 0

Number format: Decimal (Base 10 System)

☐ Sign

Signature byte:

Factor, offset: Value =  $\frac{0.000122 \cdot \text{Eprom}}{1} + -0.000000$

☐ Reciprocal:

Precision: 5 Bar °C 1 % f(x) ▼

OK Cancel Help

## 5. Gear Dependent Torque Limiter

General:

From first to sixth gear and reverse, those map names speak for it. They look like that:

00002 00635 04000 10000 10000

In Opel cars the data after 10000 are unused till the next 00002 then starts the next limiter 2x1.

The image shows two side-by-side screenshots of the 'Properties of...' dialog box in a software application. The left dialog is for a 'Gear Dependent Torque Limiter' map, and the right is for an 'RPM' map. Both dialogs show various configuration options like description, unit, start address, values, and number format.

**Left Dialog: Gear Dependent Torque Limiter**

- Map: X-Axis
- Description: Gear Dependent Torque Limiter
- Unit: Nm
- Name: 1st Gear
- Start address: CE1EC (From hexdumpcursor)
- Column x rows: 2 x 1
- Values: 16 Bit (HiLo)
- Number format: Decimal (Base 10 System)
- Sign: ☐ Sign, ☐ Difference
- Original values: ☐ Original values, ☐ Percent
- Organization: Onedimensional
- Right side: Bar display
- Value range: 3000 - 16000 (Auto)
- Factor, offset: ☒ Factor, offset: Value =  $\frac{1.000000}{1} * \text{Eprom} + 0.000000$
- Reciprocal: ☐ Reciprocal
- Variable offset: (none)
- Precision: 0

**Right Dialog: RPM**

- Map: X-Axis
- Description: RPM
- Unit: 1/min
- Data source: Eprom
- Start address: CE1E8 (From hexdumpcursor)
- Mirror map: ☐ Mirror map
- Values: 16 Bit (HiLo) Skip bytes: 0
- Number format: Decimal (Base 10 System)
- Sign: ☐ Sign
- Signature byte: 8813
- Factor, offset: ☒ Factor, offset: Value =  $\frac{1.000000}{1} * \text{Eprom} + 0.000000$
- Reciprocal: ☐ Reciprocal
- Precision: 0

Those maps could start also with value 3000 and depending of the gear have the final value either 1000, 2000, 3000, 4000, 5000, 6000 or 0. Axis has values 01200 01250 01500 01750 02000 02250....(RPMs)

## 6. IQ limit by Coolant Temperature

General:

This map limits IQ depending of Coolant Temperature.

Properties of...

Map X-Axis Y-Axis Comment

Description: IQ

Unit: mg/s Id:

Name: IQ Limit 118/132 Coolant temp

Start address: CC140 From hexdumpcursor

Column x rows: 8 x 8

Values: 16 Bit (HiLo)

Number format: Decimal (Base 10 System)

☐ Sign ☐ Difference

☐ Original values ☐ Percent

Organization: Twodimensional

Right side: Bar display

Value range: 0 - 65536 Auto

☒ Factor, offset: Value =  $\frac{0.010000}{1} \cdot \text{Eprom} + 0.000000$

☐ Reciprocal:

Variable offset: (none)

Precision: 1

Bar °C 1

% f(x) ▼

OK Cancel Help

Properties of...

Map X-Axis Y-Axis Comment

Description:

Unit: °C

Data source: Eprom

Start address: CC124 From hexdumpcursor

☐ Mirror map

Values: 16 Bit (HiLo) Skip bytes: 0

Number format: Decimal (Base 10 System)

☐ Sign

Signature byte:

Factor, offset: Value =  $\frac{0.100000}{1} \cdot \text{Eprom} + -273.100000$

☐ Reciprocal:

Precision: 0

Bar °C 1

% f(x) ▼

OK Cancel Help

Properties of...

Map X-Axis Y-Axis Comment

Description: RPM

Unit: 1/min

Data source: Eprom ...

Start address: CC114 From hexdumpcursor

☐ Mirror map

Values: 16 Bit (HiLo) Skip bytes: 0

Number format: Decimal (Base 10 System)

☐ Sign

Signature byte:

Factor, offset: Value =  $\frac{1.000000 \cdot \text{Eprom}}{1} + 0.000000$

☐ Reciprocal:

Precision: 0

Bar °C 1  
% f(x) ▼

OK Cancel Help



## 7. IQ limit by Intake Fuel Temperature

General:

This map limits IQ depending of Intake Fuel Temperature.

Properties of...

Map X-Axis Y-Axis Comment

Description: IQ

Unit: mm3 Id:

Name: IQ Limit -20/120 Fuel T

Start address: CF112 From hexdumpcursor

Column x rows: 8 x 8

Values: 16 Bit (HiLo)

Number format: Decimal (Base 10 System)

☐ Sign ☐ Difference

☐ Original values ☐ Percent

Organization: Twodimensional

Right side: Bar display

Value range: 0 - 65536 Auto

☒ Factor, offset: Value =  $\frac{0.010000}{1} \cdot \text{Eprom} + 0.000000$

☐ Reciprocal:

Variable offset: (none)

Precision: 1

Bar °C 1

% f(x) ▼

OK Cancel Help

Properties of...

Map X-Axis Y-Axis Comment

Description: IAT

Unit: °C

Data source: Eprom

Start address: CF0EE From hexdumpcursor

☐ Mirror map

Values: 16 Bit (HiLo) Skip bytes: 0

Number format: Decimal (Base 10 System)

☐ Sign

Signature byte:

Factor, offset: Value =  $\frac{0.100000}{1} \cdot \text{Eprom} + -273.1000$

☐ Reciprocal:

Precision: 0

Bar °C 1

% f(x) ▼

OK Cancel Help

Properties of...

Map X-Axis Y-Axis Comment

Description: RPM

Unit: 1/min

Data source: Eprom ...

Start address: CF0DE From hexdumpcursor

☐ Mirror map

Values: 16 Bit (HiLo) Skip bytes: 0

Number format: Decimal (Base 10 System)

☐ Sign

Signature byte:

Factor, offset: 1.000000 \* Eprom

☐ Reciprocal: Value =  $\frac{1.000000}{1} + 0.000000$

Precision: 0

Bar °C 1

% f(x) ▼

OK Cancel Help

## 8. IQ limit by RPM

General:

This map limits IQ depending of Intake Air Temperature.

Properties of...

Map X-Axis Y-Axis Comment

Description: IQ

Unit: mm3/stk Id:

Name: IQ Limit by RPM

Start address: CF0C2 From hexdumpcursor

Column x rows: 12 x 1

Values: 16 Bit (HiLo)

Number format: Decimal (Base 10 System)

☐ Sign ☐ Difference

☐ Original values ☐ Percent

Organization: Twodimensional

Right side: Bar display

Value range: 0 - 65535 Auto

☒ Factor, offset: Value =  $\frac{1.000000}{1} \cdot \text{Eprom} + 0.000000$

☐ Reciprocal:

Variable offset: (none)

Precision: 0 Bar °C 1 % f(x) ▼

OK Cancel Help

Properties of...

Map X-Axis Y-Axis Comment

Description: RPM

Unit: 1/min

Data source: Eprom ...

Start address: CF0AA From hexdumpcursor

☐ Mirror map

Values: 16 Bit (HiLo) Skip bytes: 0

Number format: Decimal (Base 10 System)

☐ Sign

Signature byte: 7017

Factor, offset: Value =  $\frac{1.000000}{1} \cdot \text{Eprom} + 0.000000$

☐ Reciprocal:

Precision: 0 Bar °C 1 % f(x) ▼

OK Cancel Help

## 9. Start Of Injection map(SOI/SOE):

### General:

This map shows angle at which start injection against TDC. There is 10 maps, 5 of them are exactly the same and are used during DPF regeneration.

### Start of Energising of Pilot Injections

The structure of SOE calculation is nearly identical between Pil1 and Pil2. The difference can be found in their base. Pil1 is calculated relative to SOE of MI of the last injection cycle, while Pil2 is calculated relative to Pil1 of the same cycle. The calculation is based on some limits that must not be exceeded in a running system.

Pilot injections are always calculated relative to main injection, but their earliest SOE InjCrv\_phiPilMax\_C is implicated relative to TDC (namely 30deg BTDC for our cars, and it's a map close after SOE).

The screenshot shows the 'Properties of...' dialog box for the 'SOI' map. The 'Map' tab is selected. The 'Description' field contains 'SOI'. The 'Unit' is 'degCA'. The 'Name' is 'Start of Injection 1'. The 'Start address' is 'D0308'. The 'Column x rows' is '16 x 16'. The 'Values' are '16 Bit (HiLo)'. The 'Number format' is 'Decimal (Base 10 System)'. The 'Sign' checkbox is checked. The 'Difference' checkbox is unchecked. The 'Original values' checkbox is unchecked. The 'Percent' checkbox is unchecked. The 'Organization' is 'Twodimensional'. The 'Right side' is 'Bar display'. The 'Value range' is '0 - 65536'. The 'Factor, offset' checkbox is checked. The 'Reciprocal' checkbox is unchecked. The 'Value' is '0.023000 \* Eprom + 0.000000'. The 'Variable offset' is '(none)'. The 'Precision' is '1'. The 'Bar' checkbox is checked. The '°C' checkbox is checked. The '1' checkbox is checked. The 'f(x)' checkbox is checked. The 'OK', 'Cancel', and 'Help' buttons are at the bottom.

The screenshot shows the 'Properties of...' dialog box for the 'IQ' map. The 'Map' tab is selected. The 'Description' field contains 'IQ'. The 'Unit' is 'mm3/stk'. The 'Data source' is 'Eprom'. The 'Start address' is 'D02E8'. The 'Mirror map' checkbox is unchecked. The 'Values' are '16 Bit (HiLo)'. The 'Skip bytes' is '0'. The 'Number format' is 'Decimal (Base 10 System)'. The 'Sign' checkbox is unchecked. The 'Signature byte' is empty. The 'Factor, offset' checkbox is checked. The 'Reciprocal' checkbox is unchecked. The 'Value' is '0.010000 \* Eprom + 0.000000'. The 'Variable offset' is '(none)'. The 'Precision' is '1'. The 'Bar' checkbox is checked. The '°C' checkbox is checked. The '1' checkbox is checked. The 'f(x)' checkbox is checked. The 'OK', 'Cancel', and 'Help' buttons are at the bottom.

Properties of...

Map X-Axis Y-Axis Comment

Description: RPM

Unit: 1/min

Data source: Eprom ...

Start address: D02C8 From hexdumpcursor

☐ Mirror map

Values: 16 Bit (HiLo) Skip bytes: 0

Number format: Decimal (Base 10 System)

☐ Sign

Signature byte:

Factor, offset: Value =  $\frac{1.000000 \cdot \text{Eprom}}{1} + 0.000000$

☐ Reciprocal:

Precision: 0

Bar °C 1  
% f(x) ▼

OK Cancel Help

## 10. Injector opening time (Duration map):

### General:

This map is a calibration map. This map shows how much rotation it takes to achieve the required amount of fuel injected. The output of this map is in engine degrees.

Properties of...

Map

X-Axis

Y-Axis

Comment

Description:

IQ

Unit:

mm3/st

Data source:

Eprom

...

Start address:

DB5CA

From hexdumpcursor

☐ Mirror map

Values:

16 Bit (HiLo)

Skip bytes:

0

Number format:

Decimal (Base 10 System)

☐ Sign

Signature byte:

Factor, offset:

Value =  $\frac{1.000000}{1} \cdot \text{Eprom} + 0.000000$

☐ Reciprocal:

Precision:

0

Bar °C 1

% f(x) ▼

OK

Cancel

Help

Properties of...

Map

X-Axis

Y-Axis

Comment

Description:

Duration

Unit:

micro sec

Id:

Name:

Injectors Opening Time

Start address:

DB5F2

From hexdumpcursor

Column x rows:

20

x

20

Values:

16 Bit (HiLo)

Number format:

Decimal (Base 10 System)

☐ Sign

☐ Difference

☐ Original values

☐ Percent

Organization:

Twodimensional

Right side:

Bar display

Value range:

0

-

65536

Auto

☒ Factor, offset:

Value =  $\frac{1.000000}{1} \cdot \text{Eprom} + 0.000000$

☐ Reciprocal:

Variable offset:

(none)

Precision:

0

Bar °C 1

% f(x) ▼

OK

Cancel

Help

Properties of...

Map X-Axis Y-Axis Comment

Description: Rail Pressure

Unit: Bar

Data source: Eprom ...

Start address: DB5A2 From hexdumpcursor

☐ Mirror map

Values: 16 Bit (HiLo) Skip bytes: 0

Number format: Decimal (Base 10 System)

☐ Sign

Signature byte:

Factor, offset: 0.100000 \* Eprom

☐ Reciprocal: Value =  $\frac{0.100000}{1} + 0.000000$

Precision: 0

Bar °C 1  
% f(x) ▼

OK Cancel Help

## 11. CRS Rail Pressure:

### General:

This map shows how should be the rail pressure at certain RPM and IQ. There is 2 maps, 1<sup>st</sup> is used during DPF regeneration, 2<sup>nd</sup> during normal operation.

The image shows two side-by-side 'Properties of...' dialog boxes, likely from a vehicle tuning software. Both dialogs have tabs for 'Map', 'X-Axis', 'Y-Axis', and 'Comment'. The left dialog is for a map named 'IQ' and the right dialog is for a map named 'Rail Pressure'.

**Left Dialog (IQ):**

- Description: IQ
- Unit: mm3/stroke
- Data source: Eprom
- Start address: E4970 (From hexdumpcursor)
- ☐ Mirror map
- Values: 16 Bit (HiLo) Skip bytes: 0
- Number format: Decimal (Base 10 System)
- ☐ Sign
- Signature byte:
- Factor, offset: Value =  $\frac{0.010000}{1} \cdot \text{Eprom} + 0.000000$
- ☐ Reciprocal
- Precision: 0
- Buttons: OK, Cancel, Help

**Right Dialog (Rail Pressure):**

- Description: Rail Pressure
- Unit: Bar Id:
- Name: Rail Pressure normal
- Start address: E4990 (From hexdumpcursor)
- Column x rows: 16 x 16
- Values: 16 Bit (HiLo)
- Number format: Decimal (Base 10 System)
- ☐ Sign ☐ Difference
- ☐ Original values ☐ Percent
- Organization: Twodimensional
- Right side: Bar display
- Value range: 0 - 65536 (Auto)
- ☒ Factor, offset: Value =  $\frac{0.100000}{1} \cdot \text{Eprom} + 0.000000$
- ☐ Reciprocal
- Variable offset: (none)
- Precision: 0
- Buttons: OK, Cancel, Help



Properties of...

Map X-Axis Y-Axis Comment

Description: RPM

Unit: 1/min

Data source: Eprom ...

Start address: E4950 From hexdumpcursor

☐ Mirror map

Values: 16 Bit (HiLo) Skip bytes: 0

Number format: Decimal (Base 10 System)

☐ Sign

Signature byte:

Factor, offset: 1.000000 \* Eprom

☐ Reciprocal: Value =  $\frac{1.000000}{1} + 0.000000$

Precision: 0

Bar °C 1

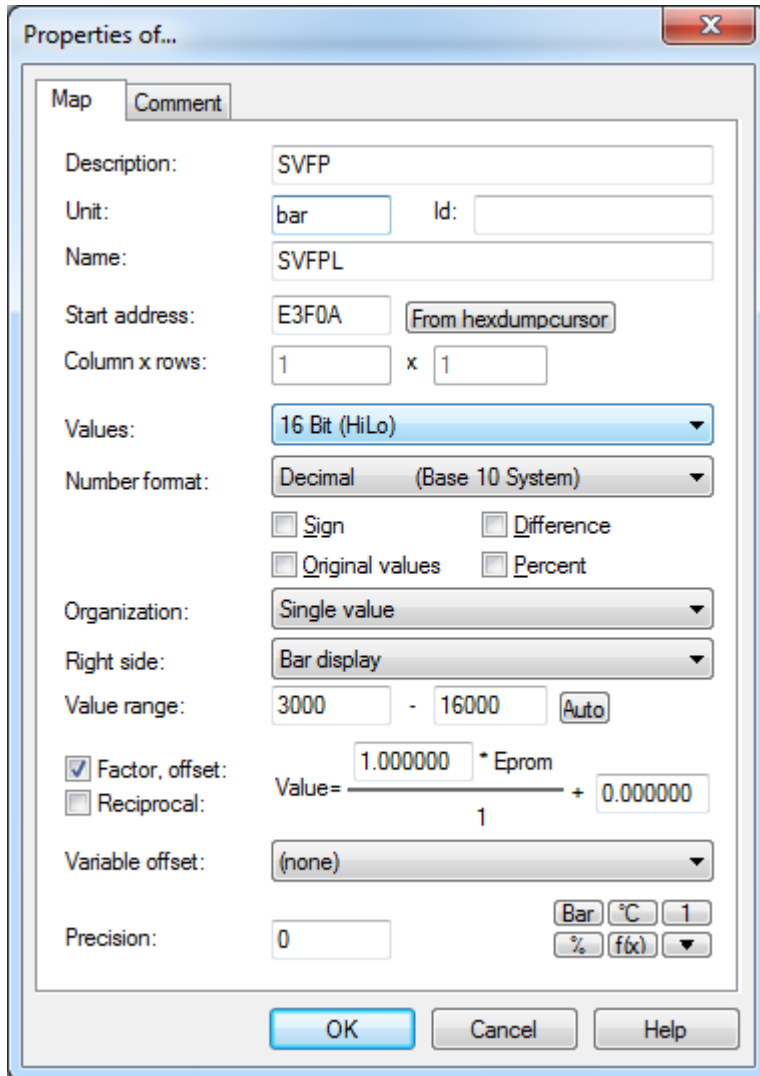
% f(x) ▼

OK Cancel Help

## 12. SV Rail Pressure:

### General:

This value limits the absolute common rail pressure. This value can be found behind the rail pressure map. There is 4 maps.



The image shows a 'Properties of...' dialog box for a map named 'SVFP'. The dialog has two tabs: 'Map' and 'Comment'. The 'Map' tab is active. The fields are as follows:

- Description: SVFP
- Unit: bar
- Id: (empty)
- Name: SVFPL
- Start address: E3F0A (From hexdumpcursor)
- Column x rows: 1 x 1
- Values: 16 Bit (HiLo)
- Number format: Decimal (Base 10 System)
- ☐ Sign ☐ Difference
- ☐ Original values ☐ Percent
- Organization: Single value
- Right side: Bar display
- Value range: 3000 - 16000 (Auto)
- ☒ Factor, offset: Value =  $\frac{1.000000 \times \text{Eprom}}{1} + 0.000000$
- ☐ Reciprocal:
- Variable offset: (none)
- Precision: 0
- Buttons: Bar, °C, 1, %, f(x), (dropdown arrow)

At the bottom are OK, Cancel, and Help buttons.

## Air related maps

### 13. EGR vs MAF map:

General:

This map regulates the Exhaust gas recirculation valve to limit intake MAF.

Properties of...

Map

X-Axis

Y-Axis

Comment

Description:

MAF

Unit:

mg/stroke

Id:

Name:

EGR vs MAF

Start address:

C2B98

From hexdumpcursor

Column x rows:

16

x

14

Values:

16 Bit (HiLo)

Number format:

Decimal (Base 10 System)

☐ Sign

☐ Difference

☐ Original values

☐ Percent

Organization:

Twodimensional

Right side:

Bar display

Value range:

0

-

65536

Auto

☒ Factor, offset:

Value =  $\frac{0.100000}{1} \cdot \text{Eprom} + 0.000000$

☐ Reciprocal:

Variable offset:

(none)

Precision:

0

Bar

°C

1

%

f(x)

▼

OK

Cancel

Help

Properties of...

Map

X-Axis

Y-Axis

Comment

Description:

IQ

Unit:

mm3/stroke

Data source:

Eprom

...

Start address:

C2B78

From hexdumpcursor

☐ Mirror map

Values:

16 Bit (HiLo)

Skip bytes:

0

Number format:

Decimal (Base 10 System)

☐ Sign

Signature byte:

Factor, offset:

Value =  $\frac{0.010000}{1} \cdot \text{Eprom} + 0.000000$

☐ Reciprocal:

Precision:

0

Bar

°C

1

%

f(x)

▼

OK

Cancel

Help

Properties of...

Map X-Axis Y-Axis Comment

Description: RPM

Unit: 1/min

Data source: Eprom ...

Start address: C2B5C From hexdumpcursor

☐ Mirror map

Values: 16 Bit (HiLo) Skip bytes: 0

Number format: Decimal (Base 10 System)

☐ Sign

Signature byte:

Factor, offset: 1.000000 \* Eprom

☐ Reciprocal: Value =  $\frac{1.000000}{1} + 0.000000$

Precision: 0

Bar °C 1

% f(x) ▼

OK Cancel Help

#### 14. EGR vs Temp map (Setpoint generation):

##### General:

There is several maps for EGR ambient condition correction.

For stationary reference, first the underlying AirCtl\_mDesBase\_mp from the target map AirCtl\_mDesBase\_MAP in function of the speed and the unlimited Eng\_nAvrg injection quantity InjCtl\_qRaw formed. Underlying this is a function of EGR and-balance, atmospheric pressure and temperature corrected by the cooling water temperature. Each of the corrections than the cooling water temperature correction can additively or multiplicative done.

Depending on the intake air temperature is determined with the IATSCD\_tAir characteristic AirCtl\_ATCor\_CUR a factor with one of the characteristic field of the speed AirCtl\_NQATCor\_MAP Eng\_nAvrg and the injection quantity InjCtl\_qRaw dependent factor is multiplied and the results Ansauglufttemperaturkorrekturwert. The correction value is dependent of the DAMOS switch AirCtl\_swtATCorVal\_C considered additive or multiplicative. Thus we obtain the desired value AirCtl\_mDesVal\_3\_mp. A change of the switch requires a new AirCtl\_swtATCorVal\_C DAMOS run because, the conversions change.

The image shows two side-by-side 'Properties of...' dialog boxes. The left dialog is for 'EGR Temperature' and the right is for 'EGR vs Temp map'. Both dialogs have tabs for 'Map', 'X-Axis', 'Y-Axis', and 'Comment'. The left dialog has a 'Description' field, 'Unit' set to '-', 'Id' field, 'Name' set to 'EGR Temperature', 'Start address' set to 'C262E', 'Column x rows' set to '10 x 8', 'Values' set to '16 Bit (HiLo)', 'Number format' set to 'Decimal (Base 10 System)', 'Sign' checkbox, 'Difference' checkbox, 'Original values' checkbox, 'Percent' checkbox, 'Organization' set to 'Twodimensional', 'Right side' set to 'Bar display', 'Value range' set to '0 - 65536', 'Factor, offset' checked, 'Reciprocal' unchecked, 'Variable offset' set to '(none)', and 'Precision' set to '0'. The right dialog has a 'Description' field, 'Unit' set to '°C', 'Data source' set to 'Eprom', 'Start address' set to 'C261A', 'Mirror map' checkbox, 'Values' set to '16 Bit (HiLo)', 'Skip bytes' set to '0', 'Number format' set to 'Decimal (Base 10 System)', 'Sign' checkbox, 'Signature byte' field, 'Factor, offset' checked, 'Reciprocal' unchecked, 'Variable offset' set to '(none)', and 'Precision' set to '0'. Both dialogs have 'OK', 'Cancel', and 'Help' buttons at the bottom.

**Left Dialog: Properties of... (EGR Temperature)**

Map: X-Axis Y-Axis Comment

Description: [ ]

Unit: - Id: [ ]

Name: EGR Temperature

Start address: C262E [From hexdumpcursor]

Column x rows: 10 x 8

Values: 16 Bit (HiLo)

Number format: Decimal (Base 10 System)

☐ Sign ☐ Difference

☐ Original values ☐ Percent

Organization: Twodimensional

Right side: Bar display

Value range: 0 - 65536 [Auto]

☒ Factor, offset: Value =  $\frac{0.012207 \cdot \text{Eprom}}{1} + 0.000000$

☐ Reciprocal

Variable offset: (none)

Precision: 0 [Bar] [°C] [1] [%] [f(x)] [v]

OK Cancel Help

**Right Dialog: Properties of... (EGR vs Temp map)**

Map: X-Axis Y-Axis Comment

Description: [ ]

Unit: °C

Data source: Eprom [ ]

Start address: C261A [From hexdumpcursor]

☐ Mirror map

Values: 16 Bit (HiLo) Skip bytes: 0

Number format: Decimal (Base 10 System)

☐ Sign

Signature byte: [ ]

Factor, offset: Value =  $\frac{0.100000 \cdot \text{Eprom}}{1} + -273.1000$

☐ Reciprocal

Variable offset: (none)

Precision: 0 [Bar] [°C] [1] [%] [f(x)] [v]

OK Cancel Help

Properties of...

Map X-Axis Y-Axis Comment

Description: RPM

Unit: 1/min

Data source: Eprom ...

Start address: C260A From hexdumpcursor

☐ Mirror map

Values: 16 Bit (HiLo) Skip bytes: 0

Number format: Decimal (Base 10 System)

☐ Sign

Signature byte:

Factor, offset: Value =  $\frac{1.000000 \times \text{Eprom}}{1} + 0.000000$

☐ Reciprocal:

Precision: 0

Bar °C 1  
% f(x) ▼

OK Cancel Help

## 15. Turbo (Boost request) map:

### General:

This map set the required boost depending on the requested torque and current rpm. There might be more than one boost map. In this file there is 2 maps, 1<sup>st</sup> is used during DPF regeneration, 2<sup>nd</sup> during normal operation. Boost request is measured in Absolute pressure (Bara, mBara, ect.)

☐ **Absolute pressure** is zero-referenced against a perfect vacuum, so it is equal to gauge pressure plus atmospheric pressure.

☐ **Gauge pressure** is zero-referenced against ambient air pressure, so it is equal to absolute pressure minus atmospheric pressure. Negative signs are usually omitted. To distinguish a negative pressure, the value may be appended with the word "vacuum" or the gauge may be labeled a "vacuum gauge."

The image shows two side-by-side 'Properties of...' dialog boxes for configuring boost maps. Both dialogs have tabs for 'Map', 'X-Axis', 'Y-Axis', and 'Comment'. The left dialog is for 'Boost pressure' and the right is for 'IQ'.

**Left Dialog (Boost pressure):**

- Description: Boost pressure
- Unit: mbar
- Name: Boost Pressure
- Start address: DFD14 (From hexdumpcursor)
- Column x rows: 16 x 16
- Values: 16 Bit (HiLo)
- Number format: Decimal (Base 10 System)
- Sign: ☐ Sign, ☐ Difference, ☐ Original values, ☐ Percent
- Organization: Twodimensional
- Right side: Bar display
- Value range: 0 - 65536 (Auto)
- Factor, offset: ☒ Factor, offset: Value = 1.000000 \* Eprom + 0.000000
- Reciprocal: ☐ Reciprocal
- Variable offset: (none)
- Precision: 0
- Buttons: OK, Cancel, Help

**Right Dialog (IQ):**

- Description: IQ
- Unit: mm3/stk
- Data source: Eprom
- Start address: DFCF4 (From hexdumpcursor)
- Mirror map: ☐ Mirror map
- Values: 16 Bit (HiLo) Skip bytes: 0
- Number format: Decimal (Base 10 System)
- Sign: ☐ Sign
- Signature byte:
- Factor, offset: ☐ Factor, offset: Value = 0.010000 \* Eprom + 0.000000
- Reciprocal: ☐ Reciprocal
- Precision: 1
- Buttons: OK, Cancel, Help

Properties of...

Map X-Axis Y-Axis Comment

Description: RPM

Unit: 1/min

Data source: Eprom ...

Start address: DFCD4 From hexdumpcursor

☐ Mirror map

Values: 16 Bit (HiLo) Skip bytes: 0

Number format: Decimal (Base 10 System)

☐ Sign

Signature byte:

Factor, offset: 1.000000 \* Eprom

☐ Reciprocal: Value =  $\frac{1.000000}{1} + 0.000000$

Precision: 0

Bar °C 1  
% f(x) ▼

OK Cancel Help



## 16. Turbo (Boost) limiter map:

General:

This map limits the required boost depending on the atmospheric pressure and the current rpm.

Properties of...

Map

X-Axis

Y-Axis

Comment

Description:

Unit:  Id:

Name:

Start address:

Column x rows:  x

Values:

Number format:

☐ Sign ☐ Difference

☐ Original values ☐ Percent

Organization:

Right side:

Value range:  -

☒ Factor, offset:  $\text{Value} = \frac{1.000000 \cdot \text{Eprom}}{1} + 0.000000$

☐ Reciprocal:

Variable offset:

Precision:

Properties of...

Map

X-Axis

Y-Axis

Comment

Description:

Unit:

Data source:

Start address:

☐ Mirror map

Values:  Skip bytes:

Number format:

☐ Sign

Signature byte:

Factor, offset:  $\text{Value} = \frac{1.000000 \cdot \text{Eprom}}{1} + 0.000000$

☐ Reciprocal:

Precision:

Properties of...

Map X-Axis Y-Axis Comment

Description: RPM

Unit: 1/min

Data source: Eprom ...

Start address: DFF5A From hexdumpcursor

☐ Mirror map

Values: 16 Bit (HiLo) Skip bytes: 0

Number format: Decimal (Base 10 System)

☐ Sign

Signature byte:

Factor, offset: Value =  $\frac{1.000000 \cdot \text{Eprom}}{1} + 0.000000$

☐ Reciprocal:

Precision: 0

Bar °C 1  
% f(x) ▼

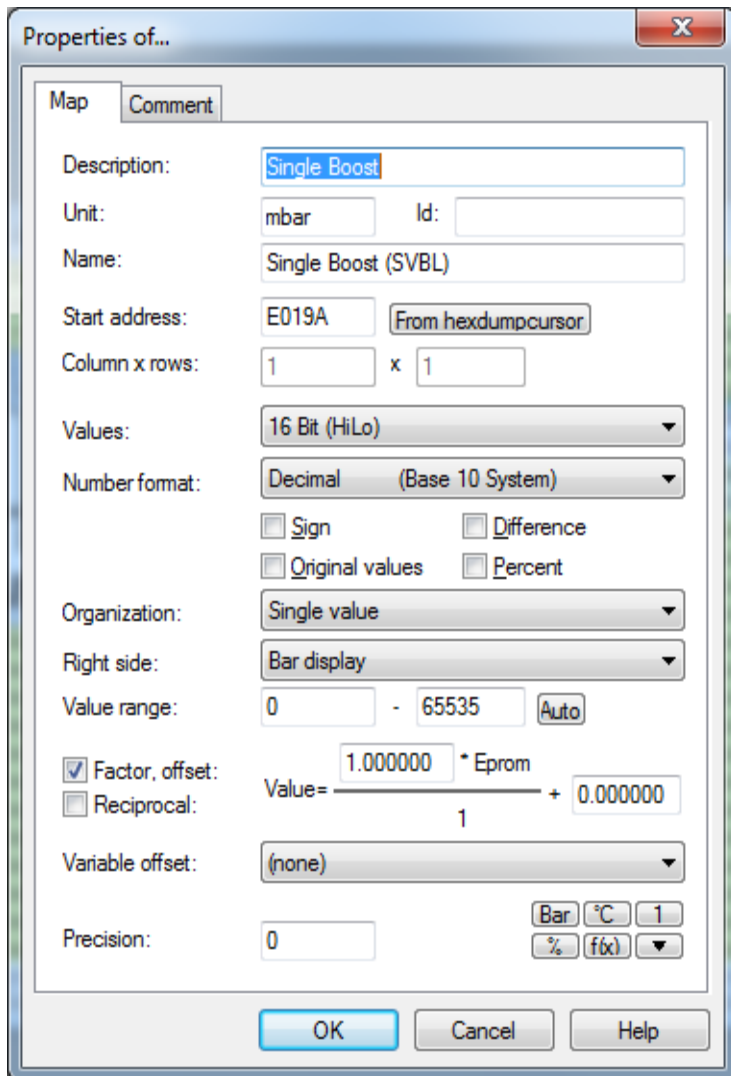
OK Cancel Help

## 17. Single value boost limiter:

### General:

This value limits the absolute pressure of the turbo. This value can be found by looking directly behind the turbo limiter map. If you look in 2D you see a series of bumps like this:

The SVBL is located at the end of the series of bumps, just before the line "falls" back to "0". In this case it is the highest value between the turbo limitation map and the next map. The value of the SVBL in this file is 2500mBar.



The screenshot shows a 'Properties of...' dialog box with a 'Map' tab selected. The dialog contains the following fields and options:

- Description:** Single Boost
- Unit:** mbar
- Id:** (empty)
- Name:** Single Boost (SVBL)
- Start address:** E019A (From hexdumpcursor)
- Column x rows:** 1 x 1
- Values:** 16 Bit (HiLo)
- Number format:** Decimal (Base 10 System)
- ☐ Sign
- ☐ Difference
- ☐ Original values
- ☐ Percent
- Organization:** Single value
- Right side:** Bar display
- Value range:** 0 - 65535 (Auto)
- ☒ Factor, offset: Value =  $\frac{1.000000 \cdot \text{Eprom}}{1} + 0.000000$
- ☐ Reciprocal:
- Variable offset:** (none)
- Precision:** 0
- Buttons: Bar, °C, 1, %, f(x), and a dropdown arrow.

At the bottom are 'OK', 'Cancel', and 'Help' buttons.

## 18. Turbo vanes (N75) map:

### *General:*

This map controls the vanes inside the turbo at a certain rpm and injected quantity. There is 4 maps, 1<sup>st</sup> is used during DPF regeneration, 2<sup>nd</sup> during normal operation.

**Requested** boost is how much boost the turbo should be making according to the map like in the ECU

**Actual boost** is how much boost the turbo is making, measured by the MAP (Manifold Absolute Pressure) sensor. this should obviously be similar to the requested value, however it's normal for it to have a little bit of lag, and then spike as the turbo spools up before returning to "about the same as the requested value"

**N75 Duty Cycle** this is given as a %, the highest it reads to is 75% and the lowest is around 30%. A low duty cycle equates to the ECU asking for more boost from the turbo, and a high duty cycle means the ECU has too much boost already and is requesting the boost be lower. so looking at the graph as accelerator is pressed, more fuel is injected and more boost is requested, as the boost is requested you will see the duty cycle go down, the boost will then rise to the required value as the turbo spools up and then the duty cycle will increase as you go up the revs. It does this because the amount of air flowing through the turbo is increasing, and with that increasing the need for the the vanes to close and build more boost is decreasing, hence the duty cycle rising.

You have the N75 tables, Boost tables and hysteresis tables that work together.

**OPENLOOP mode** - The turbo is controlled by the N75 wastegate tables only. The ECU does not care how much boost this gives...only that the requested VNT/N75 duty is met.

**FEEDBACK mode** - The turbo is controlled by the PID controller. The ECU looks up requested boost and compares to actual boost. It closes the wastegate to increase actual boost and opens the wastegate to lower actual boost.....whatever is required to get requested boost. The initial wastegate value chosen come from the N75 tables and works from there. So its best to get the N75 values as accurate as possible to begin with.

**HYSTERISIS tables** - Selecting which mode the turbo should be in is the job of the hysteresis tables. On mine 0-1500rpm @ 40mg + will swap from openloop to feedback. Dropping below 38mg between 0-1500rpm will fall back into openloop mode. Basically at low~ idle speeds the turbo is controlled by the N75 tables only.

You could set hysteresis between 40-38 mg down to 2-1mg instead. This would force Feedback mode at all times. You could set hysteresis to 100-98mg across the whole rpm range. This would force openloop mode at all times.

Properties of...

Map X-Axis Y-Axis Comment

Description: Vane angle

Unit: Deg Id:

Name: N75 - 2 regular

Start address: DDFE6 From hexdumpcursor

Column x rows: 16 x 16

Values: 16 Bit (HiLo)

Number format: Decimal (Base 10 System)

☐ Sign ☐ Difference

☐ Original values ☐ Percent

Organization: Twodimensional

Right side: Bar display

Value range: 0 - 65536 Auto

☒ Factor, offset: Value =  $\frac{0.012207 \cdot \text{Eprom}}{1} + 0.000000$

☐ Reciprocal:

Variable offset: (none)

Precision: 1

Bar °C 1

% f(x) ▼

OK Cancel Help

Properties of...

Map X-Axis Y-Axis Comment

Description: IQ

Unit: mm3/stroke

Data source: Eprom

Start address: DDFC6 From hexdumpcursor

☐ Mirror map

Values: 16 Bit (HiLo) Skip bytes: 0

Number format: Decimal (Base 10 System)

☐ Sign

Signature byte:

Factor, offset: Value =  $\frac{0.010000 \cdot \text{Eprom}}{1} + 0.000000$

☐ Reciprocal:

Precision: 1

Bar °C 1

% f(x) ▼

OK Cancel Help

Properties of... X

Map X-Axis Y-Axis Comment

Description: RPM

Unit: 1/min

Data source: Eprom ...

Start address: DDFA6 From hexdumpcursor

☐ Mirror map

Values: 16 Bit (HiLo) Skip bytes: 0

Number format: Decimal (Base 10 System)

☐ Sign

Signature byte:

Factor, offset:

☐ Reciprocal:

Value=  $\frac{1.000000 \cdot \text{Eprom}}{1} + 0.000000$

Precision: 0

Bar °C 1

% f(x) ▼

OK Cancel Help

## 19. Lambda:

### General:

Is calculated from the characteristic map FIMng\_rLamSmk\_MAP in dependence on the supplied to the cylinder air mass AFSCD\_mAirPerCylFil and the averaged motor speed Eng\_nArvg critical for this operating point lambda FIMng\_rLamSmk\_mp value determined. The lambda value is the ratio:

$$\lambda = \frac{\text{Air mass present in cylinder}}{\text{Stoichiometric air mass}} = \frac{\text{Air mass present in cylinder}}{\text{Injected fuel mass} * 14.5}$$

Properties of...

Map

X-Axis

Y-Axis

Comment

Description:

Lamba

Unit:

AFR

Id:

Name:

Smoke Limit Long term (Higher Lambda)

Start address:

CCB42

From hexdumpcursor

Column x rows:

16

x

16

Values:

16 Bit (HiLo)

Number format:

Decimal (Base 10 System)

☐ Sign

☐ Difference

☐ Original values

☐ Percent

Organization:

Twodimensional

Right side:

Bar display

Value range:

0

-

65536

Auto

☒ Factor, offset:

Value=

0.014500

\*

Eprom

+

0.000000

☐ Reciprocal:

1

Variable offset:

(none)

Precision:

1

Bar

°C

1

%

f(x)

▼

OK

Cancel

Help

Properties of...

Map

X-Axis

Y-Axis

Comment

Description:

Air Mass

Unit:

mg/strk

Data source:

Eprom

...

Start address:

CCB22

From hexdumpcursor

☐ Mirror map

Values:

16 Bit (HiLo)

Skip bytes:

0

Number format:

Decimal (Base 10 System)

☐ Sign

Signature byte:

Factor, offset:

Value=

0.100000

\*

Eprom

+

0.000000

☐ Reciprocal:

1

Precision:

0

Bar

°C

1

%

f(x)

▼

OK

Cancel

Help

Properties of...

Map X-Axis Y-Axis Comment

Description: RPM

Unit: 1/min

Data source: Eprom ...

Start address: CCB02 From hexdumpcursor

☐ Mirror map

Values: 16 Bit (HiLo) Skip bytes: 0

Number format: Decimal (Base 10 System)

☐ Sign

Signature byte:

Factor, offset: Value =  $\frac{1.000000 \times \text{Eprom}}{1} + 0.000000$

☐ Reciprocal:

Precision: 0

Bar °C 1  
% f(x) ▼

OK Cancel Help



# Tuning

## Fuel related maps

This example is from car tuned by popular tuner. While he works all over with increase of 20%, for safety I did my car with only 15% increases (and so in this example).

### 1. Drivers wish Maps:

If we want to tune a stock cdti/jtd engine it is enough to change the driver wish, torque limiter, smoke limiter, IQ limiter by IAT, IQ limiter by RPM, IQ limiter by Oil Temp, duration map (sometimes). EGR map and the turbo maps come later on.

The drivers wish can stay the same for pedal request up to 50% (to keep the MPG). Pro tuned Astra have manual transmission and got tuned only last column. To get more power also before the kick down I tune the last two columns. I increase mine by 15% but not more than 500NM, as the NM to IQ map is calibrated to this value. Pro tuner rise all to 500Nm.

The screenshot displays the WinOLS software interface. The main window shows the 'Opel Stage 1 Dyno Astra-H (Original), 379413, Drivers Wish' map. The map is a table with throttle position (1.0 to 65.0) on the x-axis and RPM (0 to 5900) on the y-axis. The torque values are shown in Nm. The 'Hexdump' window on the right shows the raw data for the selected map, with the first column highlighted in red. The status bar at the bottom indicates 'All CS ok - Checksum block 0: okay' and 'No OLS-Module: Cursor: C10AC => 00001 (00001) -> 0 (0.00%), Width: 8'.

Throttle (°)	1.0	5.0	10.0	12.5	35.0	65.0
0	0	118	183	266	381	444
400	0	94	146	220	356	434
1000	0	58	111	168	314	415
1500	0	41	77	130	288	400
2000	0	34	56	100	266	386
2500	0	24	47	84	245	369
3000	0	22	42	72	225	347
3500	0	16	37	60	206	325
4000	0	0	22	46	189	296
4500	0	0	0	24	166	261
5200	0	0	0	0	41	112
5900	0	0	0	0	0	0

WinOLS

Project Edit Hardware View Selection Search Miscellaneous Window ?

12 Point 12 Point Eprom

Projects, Versions & Maps:

Filter: M / A. Name Size

Opel Stage 1 Dyno Astra-H (Original)

Hexdump

00000 Hexdump

My maps

C10BC Drivers Wish 8x

C1300 Drivers Wish 8x

C1788 Map "Bosch-II 16" 8x

C412E EGR Switch 1 25x

C419A EGR Switch 2 25x

C4260 EGR Switch 3 25x

CBE2C Torque Limiter 25x

CC134 IQ Limit 118/132 High temp 8x

CC1F9 IQ Limiter MAP 16x

CCB42 Smoke Limit Long term (Higher Lambda) 16x

CCB86 Smoke Limit Lower Lambda 16x

CCFCE Smoke Limit Lambda Again 16x

CD91A Nm to IQ conversion 16x

CE1EC 1st Gear 2x

CE22A 2nd Gear 2x

CE268 3rd Gear 2x

CE2A6 4th Gear 2x

CE2E4 5th Gear 2x

CE322 6th Gear 2x

CE360 Reverse Gear 2x

CF0C2 IQ Limit by RPM 12x

CF0FE IQ Limit -20/120 by RPM and Temp 8x

D0308 Start of Injection 1 16x

D054C Start of Injection 2 16x

D0790 Start of Injection 3 16x

Opel Stage 1 Dyno Astra-H (Original), 379413, Drivers Wish

Torque (Throttle, RPM) / Nm

1/min 1.0 5.0 10.0 12.5 35.0 65.0 75.0

0 0 0 0 0 0 0 0 0 0

1000 0 0 0 0 0 0 0 0 0

1500 0 0 0 0 0 0 0 0 26

2000 0 0 0 0 0 0 0 0 43

2500 0 0 0 0 0 0 0 0 55

3000 0 0 0 0 0 0 0 0 71

3500 0 0 0 0 0 0 0 0 87

4000 0 0 0 0 0 0 0 0 111

4500 0 0 0 0 0 0 0 0 138

5000 0 0 0 0 0 0 0 0 236

5200 0 0 0 0 0 0 0 0 440

5900 0 0 0 0 0 0 0 0 0

Opel Org Astra-H (Original), 379413, Hexdump

00 00000 00000 00000 00000 00000 00000 00000 00000 00000 00

00 00000 00000 00000 00000 00000 00000 00000 00000 00000 00

72 00002 00000 00000 00050 00050 00050 00006 00500 01500 01700 01

00 06000 00200 00200 04500 05000 05500 06000 01500 01500 01500 01

00 01500 01500 01500 00080 00320 00000 01300 02128 00000 00000 01

01 00512 00256 00000 00080 00320 00000 01300 02128 00000 00000 01

00 03000 04000 05000 50304 60416 61696 63232 63296 01024 05120 15

92 08192 08192 08192 00000 00000 00000 00000 08192 08192 08192 08

92 08192 08192 08192 00000 00000 00000 00000 08192 08192 08192 08

92 08192 08192 08192 00000 00000 00000 00000 08192 08192 08192 08

92 08192 00000 00000 08192 08192 08192 08192 08192 08192 08192 08

92 08192 08192 08192 08192 08192 00000 00000 08192 08192 08192 08

00 00000 08192 08192 08192 08192 08192 08192 08192 08192 00000 00

92 08192 08192 08192 00000 00000 00015 00015 00002 01000 00003 00

04 00000 00000 05000 65535 60596 00000 05000 00769 12925 00258 04

00 00000 33540 17575 00100 00060 00060 00060 00060 00060 00060 00

20 01000 00002 00051 00972 00500 17377 00056 00069 00084 00103 00

59 00433 00512 00597 00677 00752 00816 00867 00905 00932 00950 00

92 00365 00438 00510 00583 00656 00729 00802 00875 00948 01021 01

58 01531 01604 01677 01750 00030 00030 00030 00030 00700 01024 00

71 00004 00000 00000 00004 00004 03584 00000 00328 00000 00000 00

40 63079 01400 01400 06000 01500 01400 01281 65535 00000 00000 00

57 00000 00050 00013 00008 00000 00400 01000 01500 02000 02500 05

00 05900 00082 00410 00819 01024 02867 04506 05325 06144 00000 01

45 05245 00000 00940 01463 02196 03560 04340 04625 05165 00000 00

45 05000 00000 00413 00770 01301 02878 04000 04285 05000 00000 00

45 05000 00000 00240 00470 00836 02452 03690 04012 05000 00000 00

55 05000 00000 00160 00370 00600 02058 03250 03685 05000 00000 00

93 05000 00000 00000 00000 00240 01655 02605 03259 05000 00000 00

78 05640 00000 00000 00000 00000 00000 00150 00400 00600 00000 00

00 00000 01300 01500 01800 00000 00000 00000 00000 00120 00270 00

00 01600 01650 01740 01850 00000 00000 00000 00000 00100 00250 00

00 01500 01600 01700 01850 00000 00000 00000 00000 00080 00220 00

50 01380 01470 01650 01850 00000 00000 00000 00000 00070 00170 00

50 01250 01300 01500 01700 00000 00000 00000 00000 00060 00150 00

50 01100 01200 01450 01600 00000 00000 00000 00000 00050 00130 00

Text/2d/3d/

Press F1 to receive help.

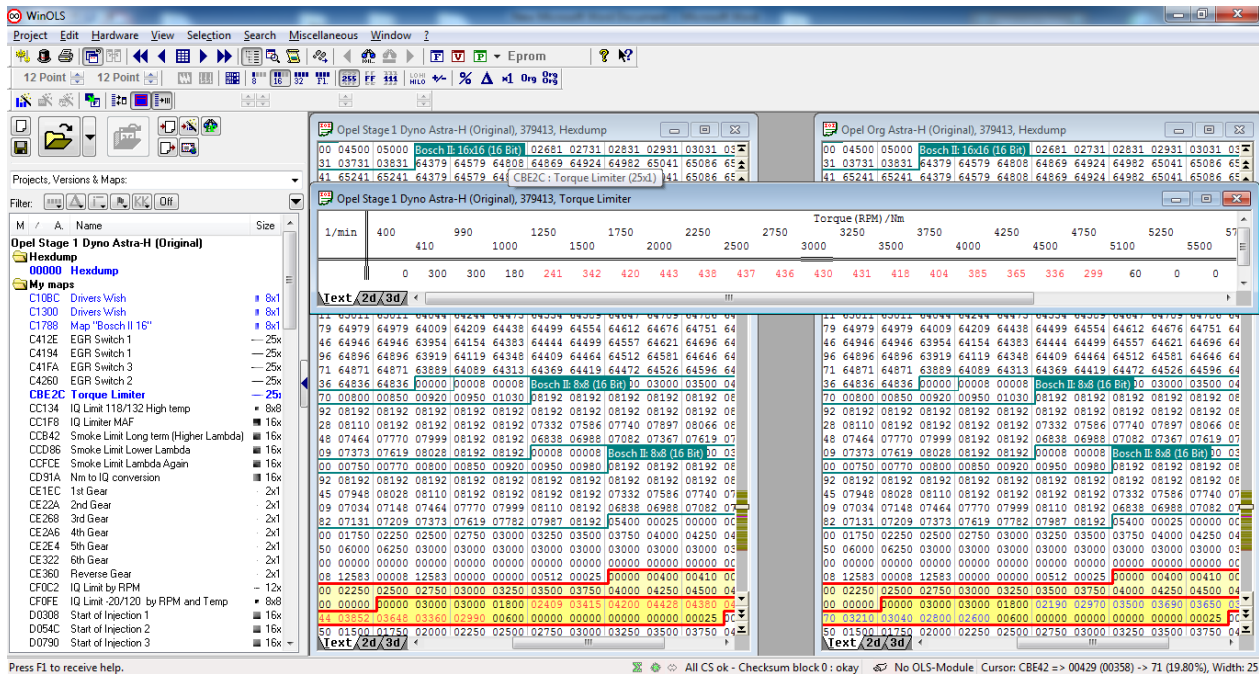
All CS ok - Checksum block 0 : okay No OLS-Module Cursor: C10D2 => 00000 (00000) -> 0 (0.00%), Width: 8

## 2. Torque limiter:

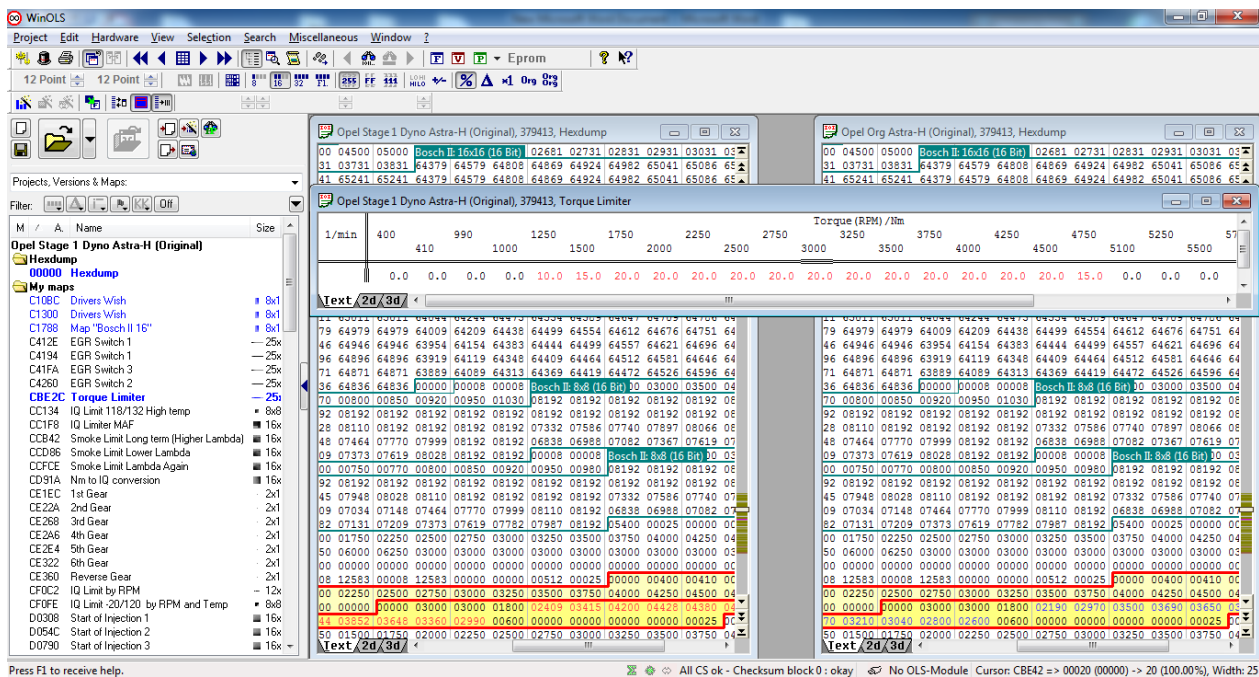
The torque limiter can be increased up to 4500rpm by  $\pm 15\%$ , leave car stock over those rpm (hard cut). Do not reduce the requested % in before 4500rpm as it will make your car powerful at low and powerless at high rpm (very inconvenient for overtaking, especially on auto-gearbox kick-down).

To avoid clutch problem start from 1250 with less %, and has the max % at 2000rpm on. So you will keep similar torque curve shape.

To give an example looks at the picture below. It is an original text view of the torque limiter.

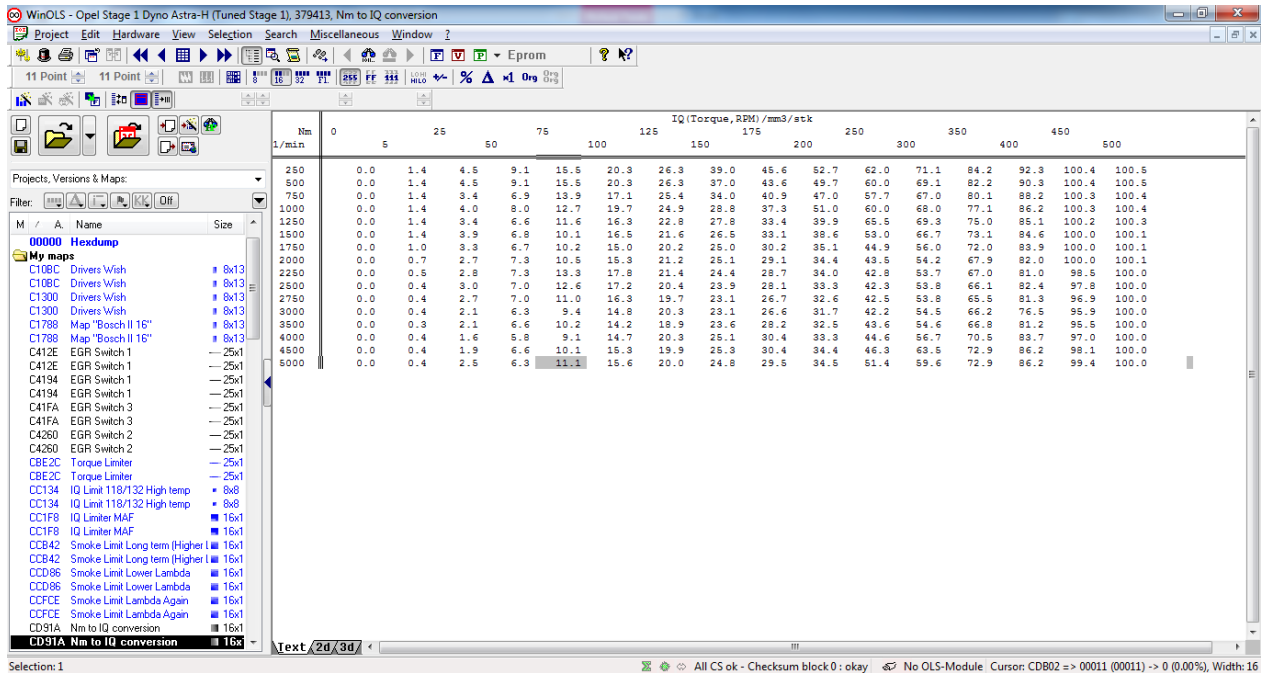


The modified torque limiter in % can look something like the picture below.




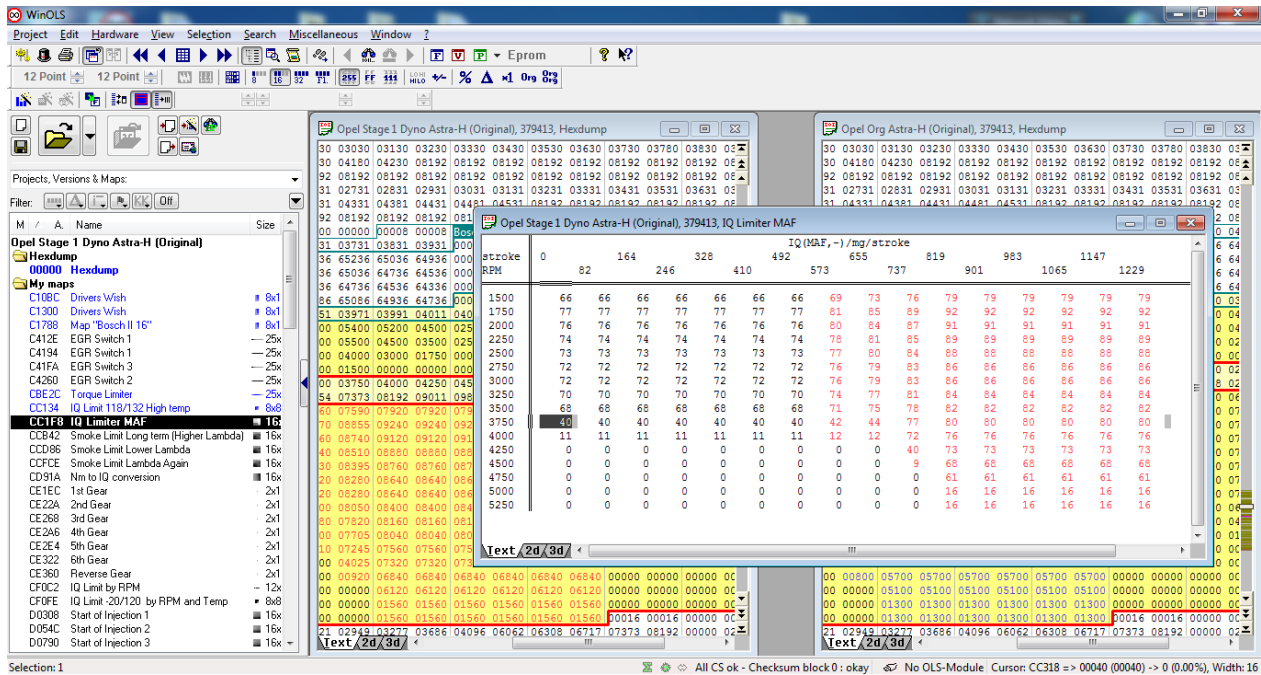
### 3. Nm to IQ conversion map:

This map usually stays stock for CRS. However when some of the SV limiters are missed to avoid being embarrassed paid tuners yield to temptation of de-calibrating the engine. Should be used with caution when tuning auto-gearbox cars. Many VAG owners got bad experience. As mention above Vectra got calibration to up to 500NM, so should be enough for stock tuning.

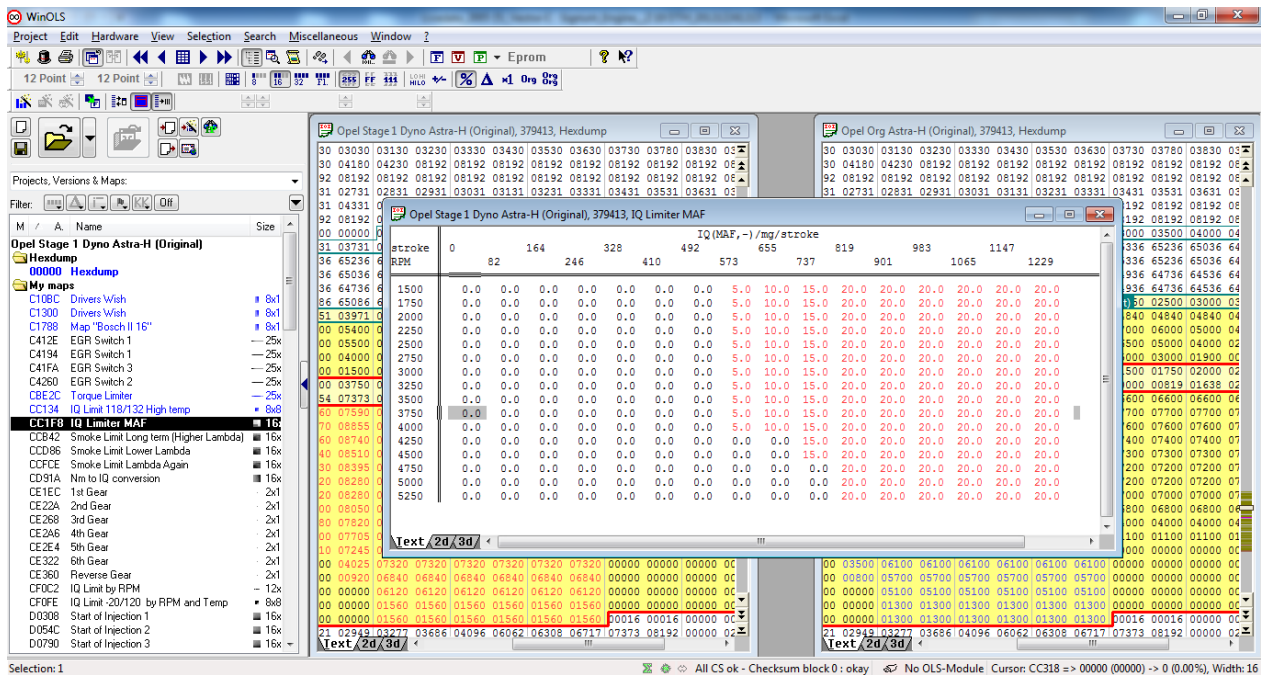


#### 4. IQ limiter map:

This is map for engine speed dependent quantity limitation and the X-Axes is “minimum prevention factor calculated from temperature curves”. I wrong to point it as Smoke map. So handle it as IQ limiter , add same increase in %. Let says you can start from half of the map area increasing by 5%, then 7.5%, 10%, 12.5% and make the whole last quarter +15% or 20%.



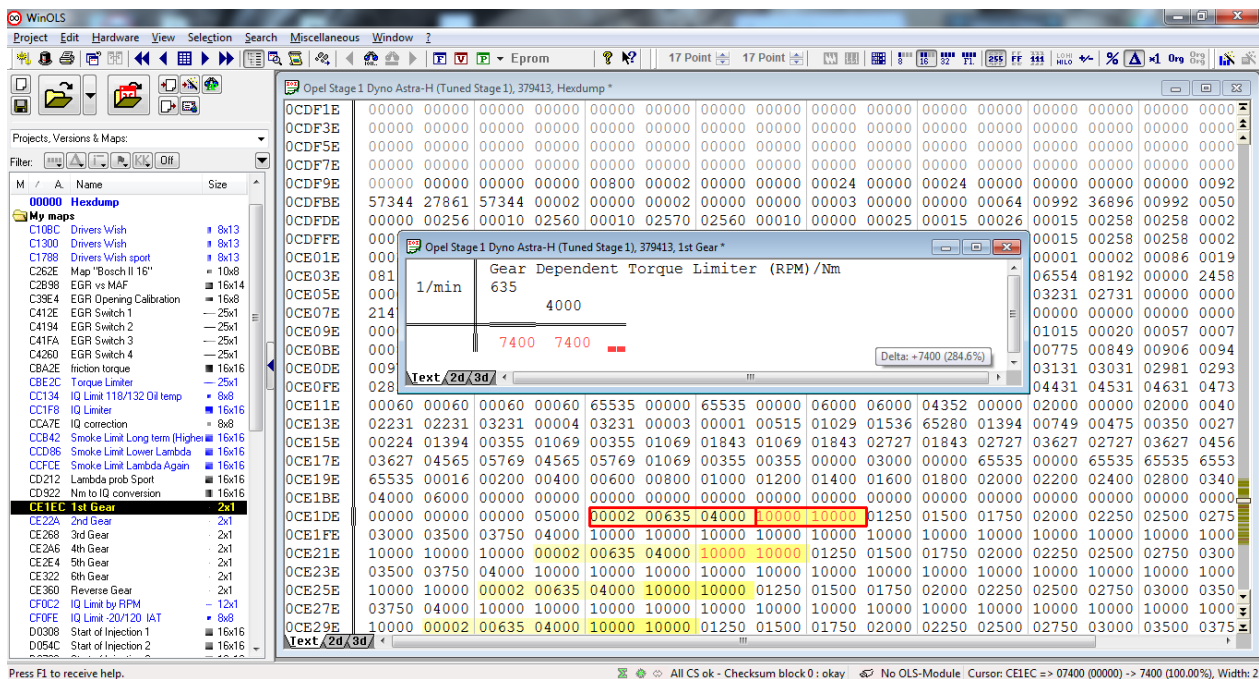
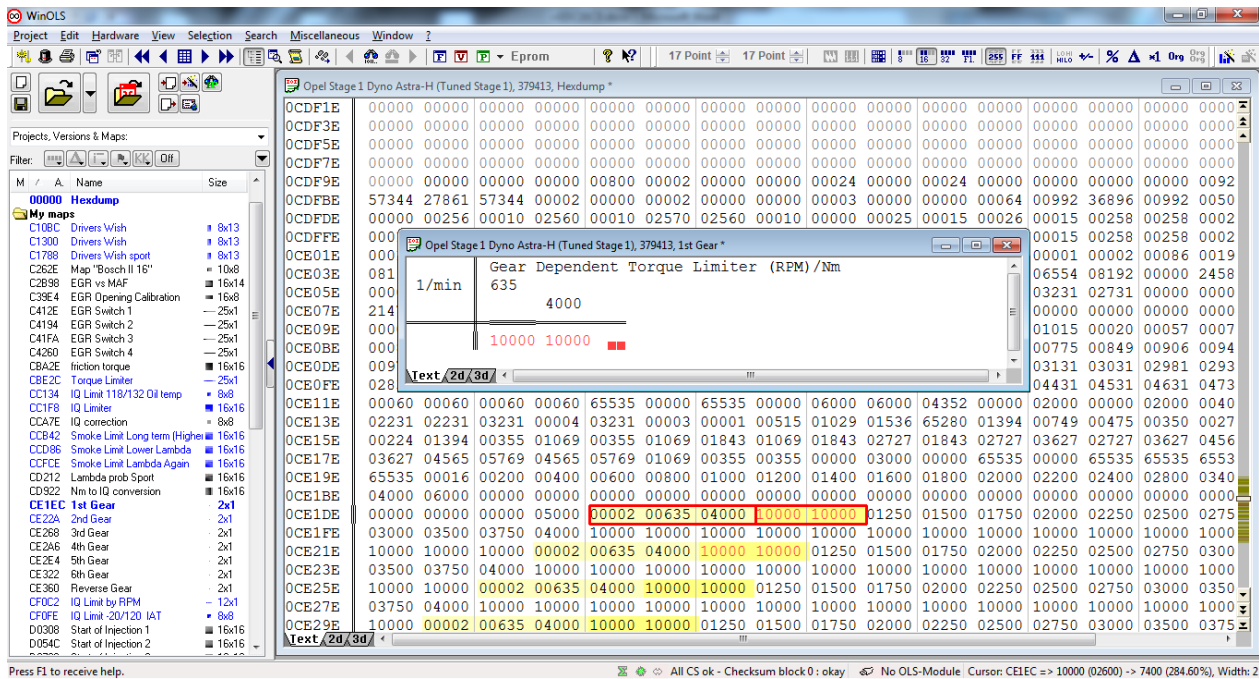
Original the text view of the smoke map looked like the picture





## 5. Gear Dependent Torque Limiter

For cars with manual transition first and second gears are limited to 260Nm. For automatic transition 1<sup>st</sup> and 2<sup>nd</sup> gear has the same limits as 3<sup>rd</sup>, 4<sup>th</sup>, 5<sup>th</sup>, and 6<sup>th</sup> gear of the manual. So on cars with automatic transition there is no need to touch those maps, limit is already 1000Nm. Aisin Warner AF40-6 is rated well above 260Nm. However be advised that 2<sup>nd</sup> gear is the one (in AF40 namely - clutch 1 or band 1) that fail in most auto gear boxes.





## 6. IQ limit by Coolant Temperature

I this map limit IQ based on the Engine Coolant Temp. I just follow pro tuners work and increasing the values by 15%, leaving last columns stock for safety margin.

WinOLS Project: Opel Stage 1 Dyno Astra-H (Original), 379413, Hexdump

Map: IQ Limit 118/132 High temp

°C	118	120	122	124	126	128	130	132
1000	5008	4840	4840	4840	4840	4840	4840	4840
1500	8145	6000	5600	5400	5200	4500	2500	2500
1750	8880	7320	7000	6000	5000	4500	2500	2500
2000	8719	7032	7000	5500	4500	3500	2500	2100
2500	8382	6900	6500	5000	4000	2900	1500	1000
3000	8197	6200	5500	4000	3000	1750	0	0
3500	7740	5700	5000	3000	1900	0	0	0
4000	7033	4700	3500	1500	0	0	0	0

Press F1 to receive help.

WinOLS Project: Opel Stage 1 Dyno Astra-H (Original), 379413, Hexdump

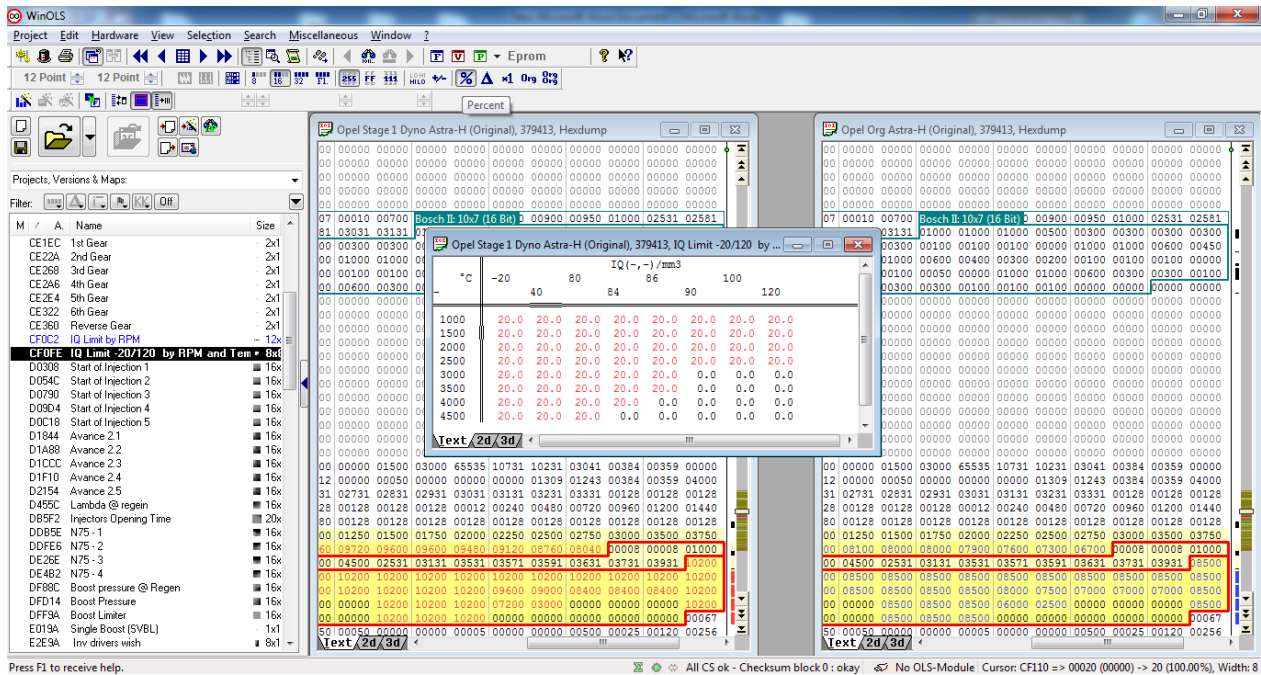
Map: IQ Limit 118/132 High temp

°C	118	120	122	124	126	128	130	132
1000	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1500	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1750	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2500	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3000	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3500	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4000	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4500	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

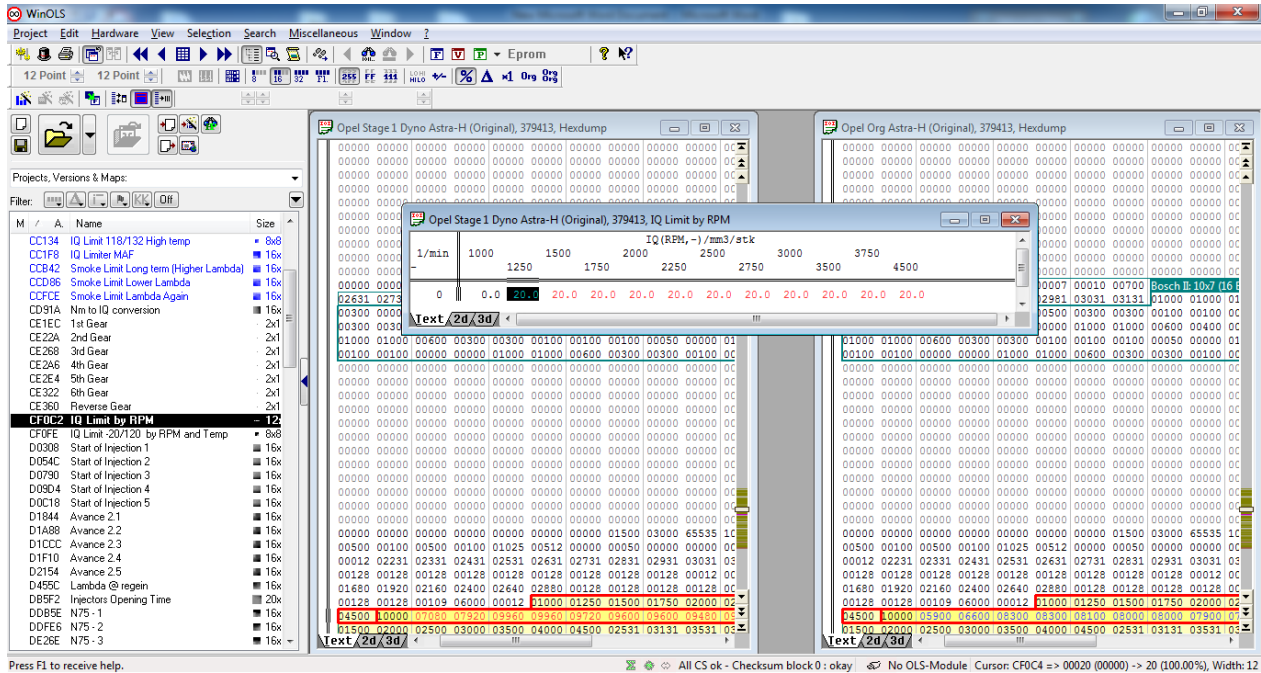
Press F1 to receive help.



I this map limit IQ based on the Fuel Temperature. I follow pro tuners work and increasing the values by 15%, leaving last three columns stock for safety margin. In my logs fuel T is always less than 40C (about 5C – 37C).



I this map limit IQ based on the engine RPM. I follow pro tuners work and increasing the values by 15%, leaving last columns stock for safety margin.

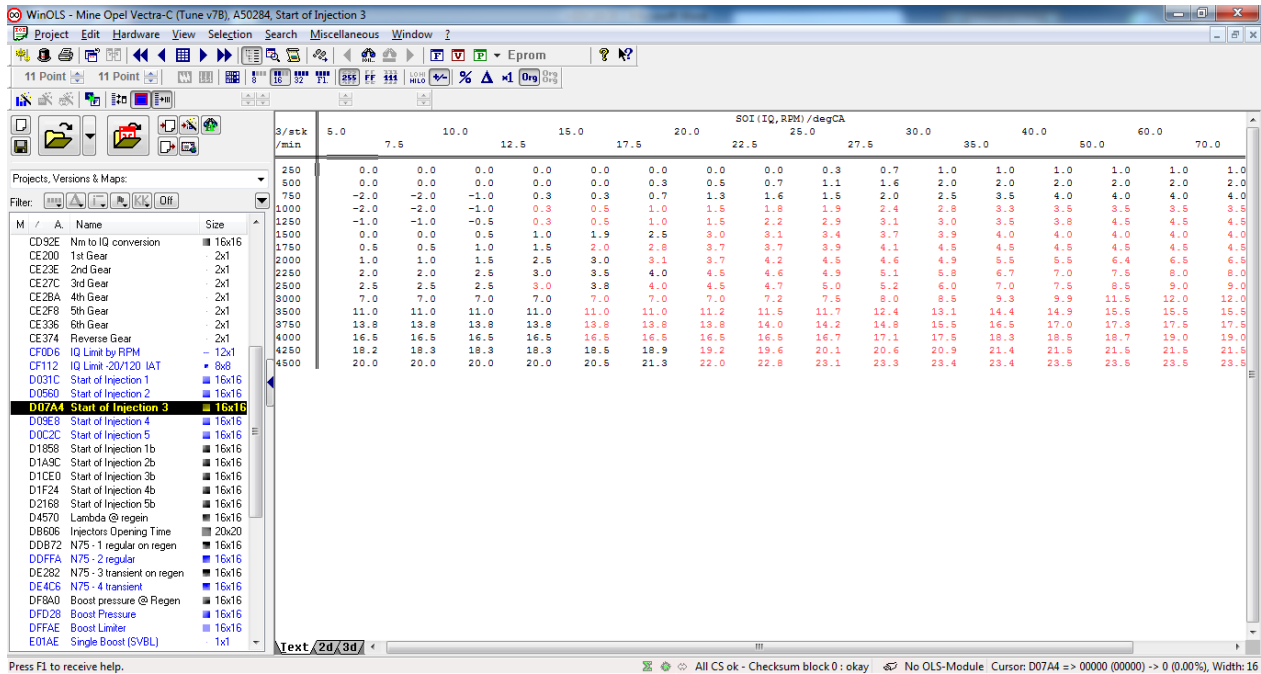


### 9. Start Of Injection map:

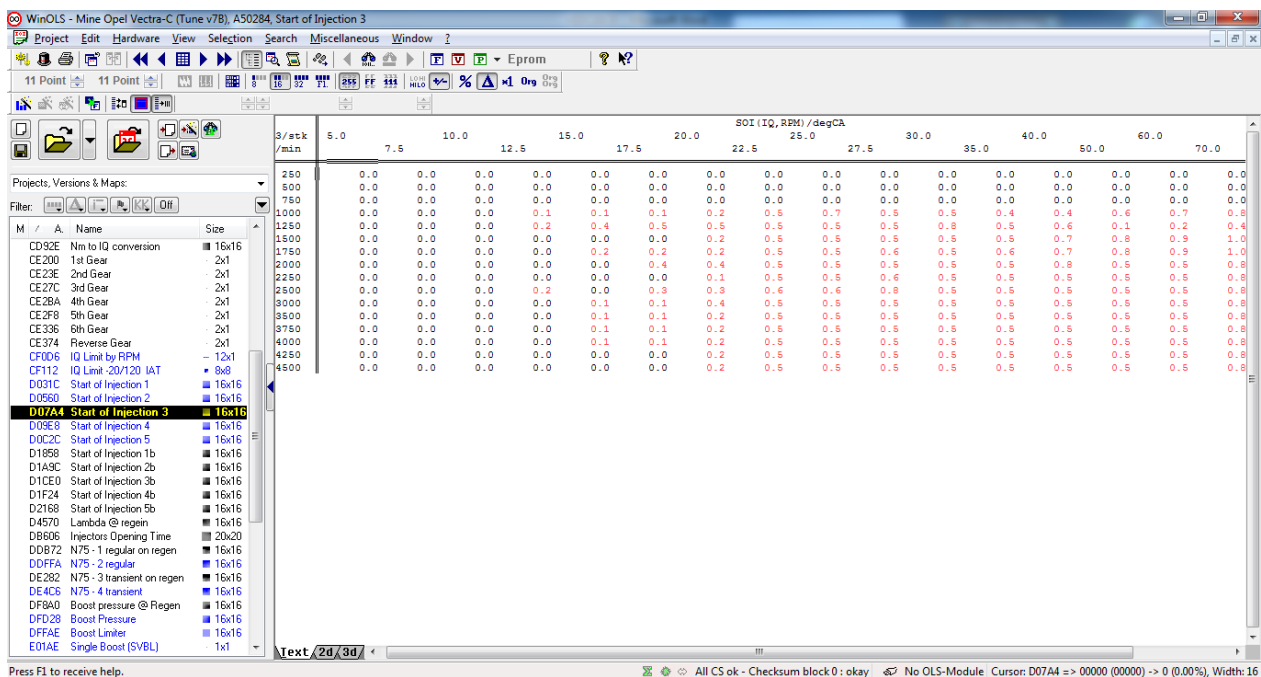
Pro tuner **left this map stock (better do the same)**. I advanced mine all over the IQ and revolution range by 2.0deg on steps by 0.5 deg at a time. "Luckily" I did blow out the O-ring of one of my injectors. So I go back to + 0.2/+1.0 deg rounding the 3D graph. Highest increase fills up the holes @1500rpm out of EGR working area.

You should bear in mind that switching off EGR increase speed of combustion, increasing boost advance start of combustion, and increasing rail pressure will make injecting higher quantity BTDC. So finally better stay on safe side and do not play too much with SOI. Comparing mine SOI to Astra w/o DPF I found out, my car running retarded with delta (-1 to -2) in low IQ and RPMs. Astra got also higher boost and rail pressure, but less EGR at this range.

## ORIGINAL SOI



TUNED



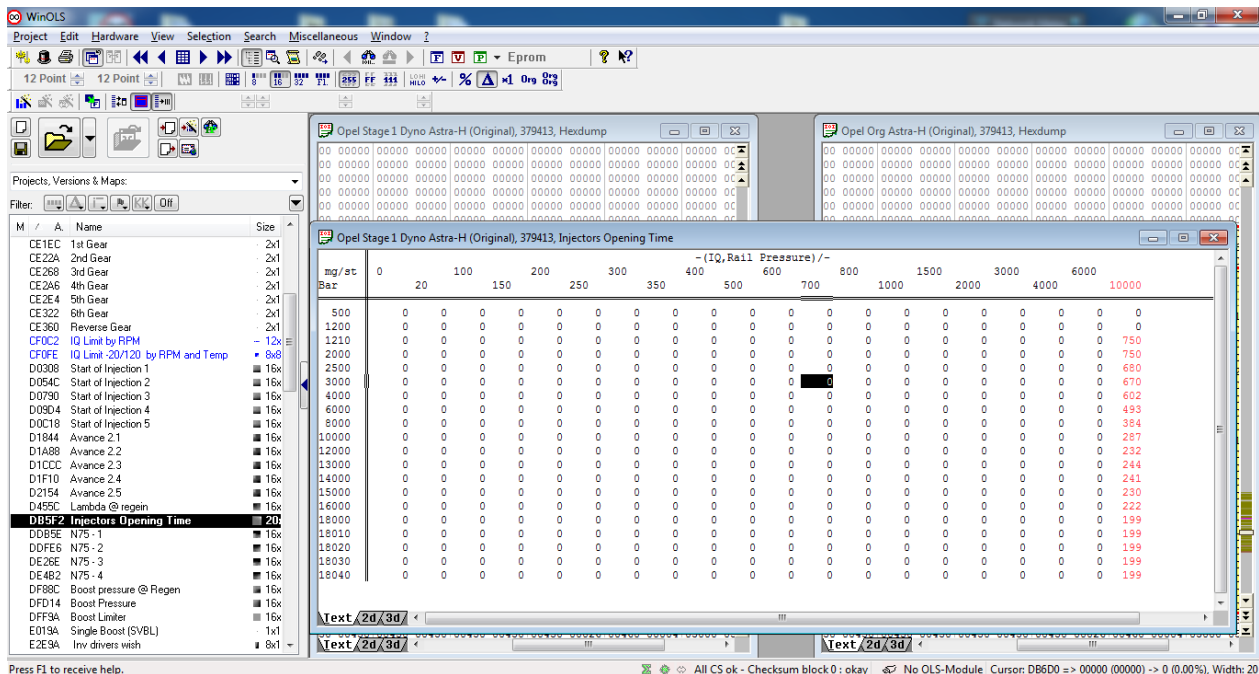
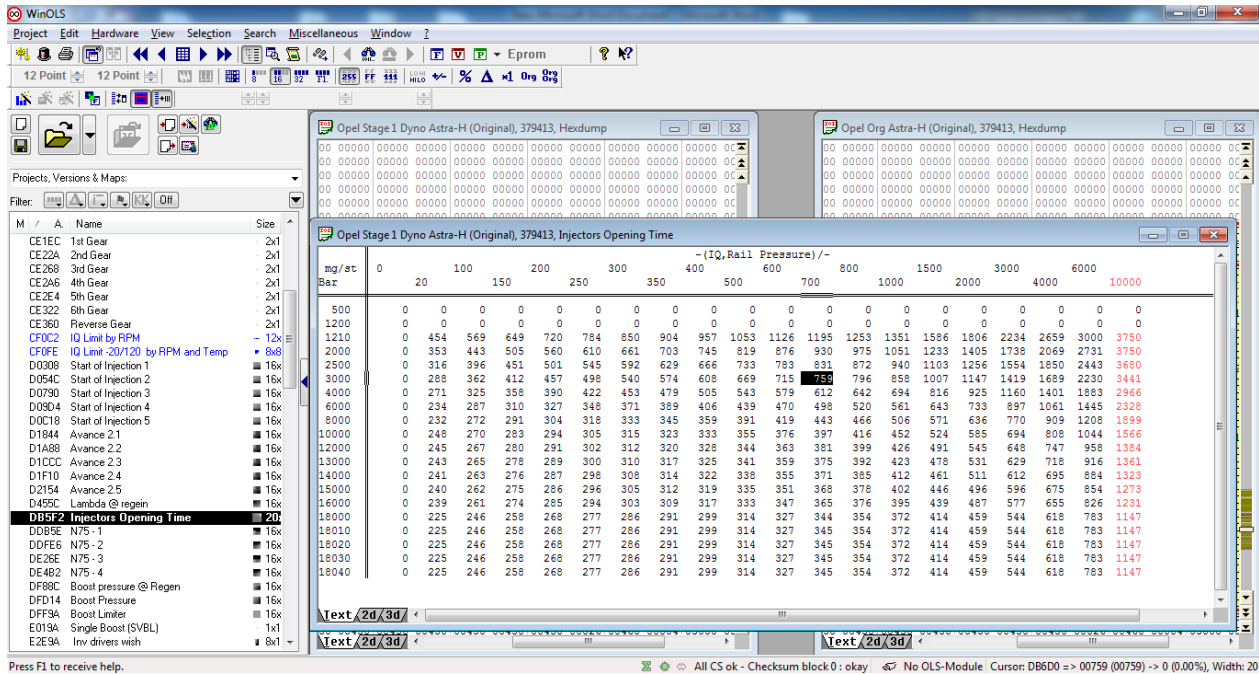
m3/stk l/min	SOI (IQ,RPM) /degCA															
	5.0	10.0		15.0		20.0		25.0		30.0		40.0		60.0		
	7.5	12.5	17.5	22.5	27.5	35.0	50.0	70.0								
250	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
750	1.3	1.5	0.6	0.0	0.4	0.2	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	
1000	1.5	1.7	1.0	0.2	0.5	0.5	0.4	0.5	0.7	0.5	0.5	0.4	0.4	0.6	0.7	
1250	0.8	1.3	1.2	0.8	1.0	1.1	0.8	0.5	0.5	0.5	0.8	0.5	0.6	0.1	0.2	
1500	0.3	0.8	0.7	0.7	0.2	0.1	0.2	0.5	0.5	0.5	0.5	0.5	0.7	0.8	0.9	
1750	0.3	1.0	0.7	0.6	0.6	0.3	0.2	0.5	0.5	0.6	0.5	0.6	0.7	0.8	0.9	
2000	0.4	1.1	0.9	0.2	0.1	0.5	0.4	0.5	0.5	0.6	0.6	0.5	0.8	0.5	0.5	
2250	0.1	0.6	0.6	0.4	0.4	0.1	0.1	0.5	0.5	0.7	0.5	0.5	0.5	0.5	0.5	
2500	0.3	1.0	1.2	1.2	0.5	0.6	0.6	0.8	1.1	1.2	0.9	0.5	0.5	0.5	0.5	
3000	0.0	0.0	0.0	0.0	0.1	0.1	0.4	0.5	0.8	0.8	0.7	0.6	0.6	0.5	0.5	
3500	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
3750	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
4000	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
4250	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
4500	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	



### 10. Injector opening time (Duration map):

The duration maps may need to be changed also. Otherwise the duration map will limit the injected quantity at the highest possible axis. So we need to change the axis value from 80mg/stroke to 100mg/stroke in this case. And extrapolate injector opening time for the new IQ axis. You can see in the example how pro tuner did it. However you can choose different values as it the opening time not rising in progression.

It is visible that when stock injector opening time is never more than 3000 micro sec, and got same values for lowest rail pressure and IQ 60 - 80mg/stroke(for all 1.9DTH engines including Opel, Fiat and SAAB). So maybe it is not advisable to go over those timing, even so I don't think the car will ever operate at that CRS pressure/IQ/RPM range.



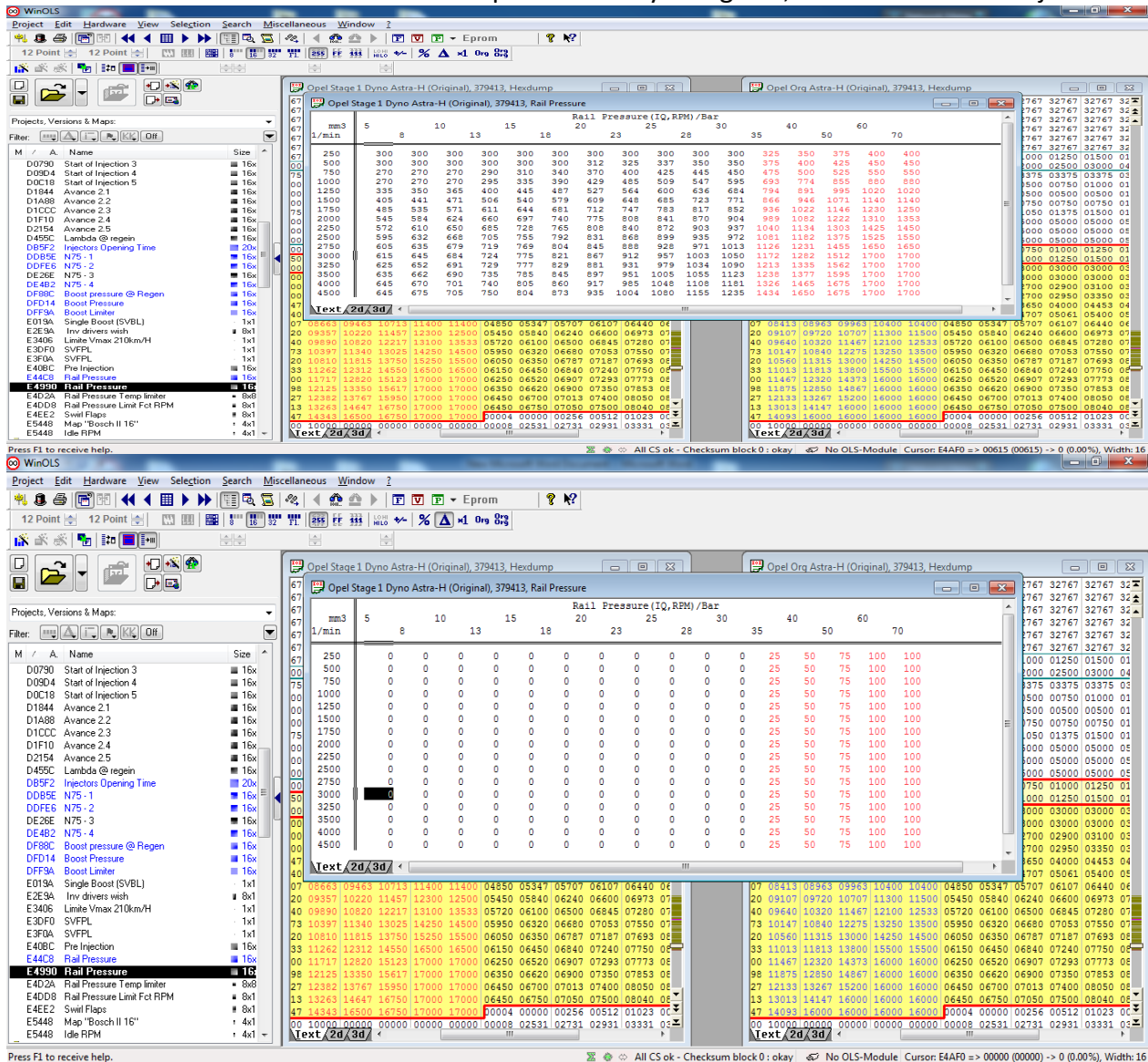
## 11. CRS Rail Pressure:

A positive effect of increased fuel pressure... is that forcing the fuel through the same injector at a higher pressure tends to improve fuel atomization. This will tend to improve fuel distribution and combustion efficiency, and may contribute to improved fuel economy. The benefits of higher pressure are accompanied by some additional concerns, the main one being safety. With fuel lines and connections being subjected to higher pressure, there naturally is an increased risk of leaks or outright failure. To ensure reliability, the standard Bosch parts are rated for pressures well above the normal operating range...

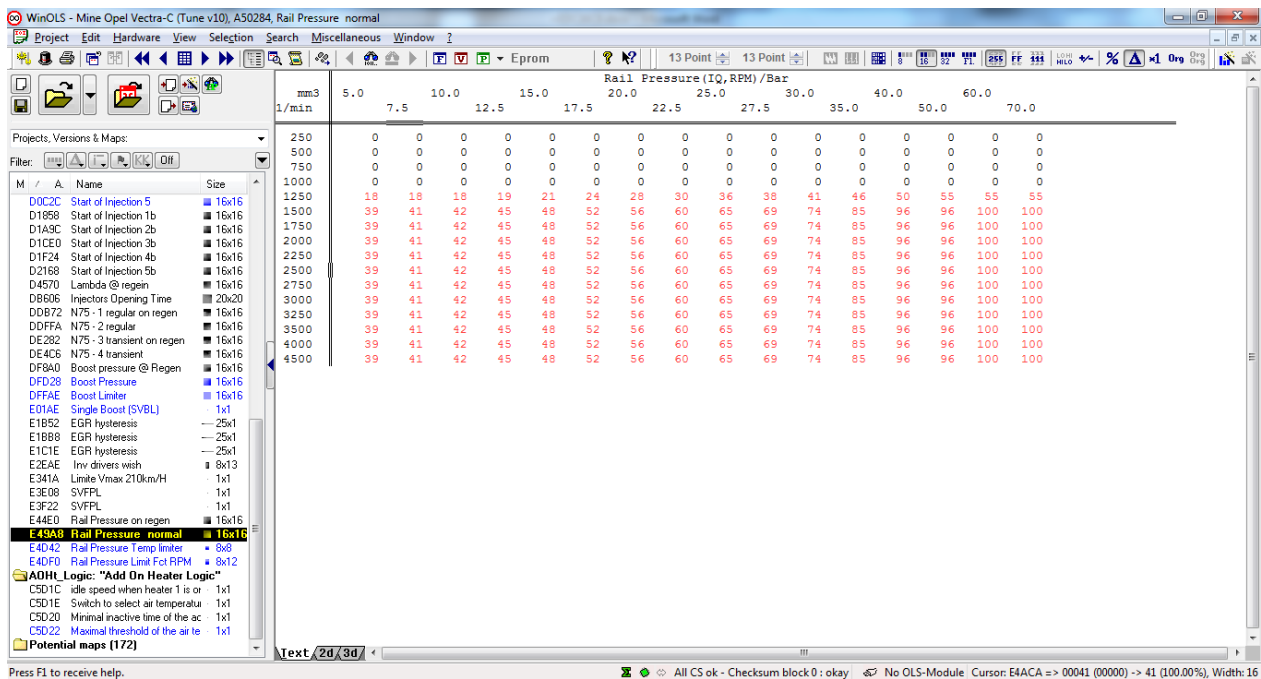
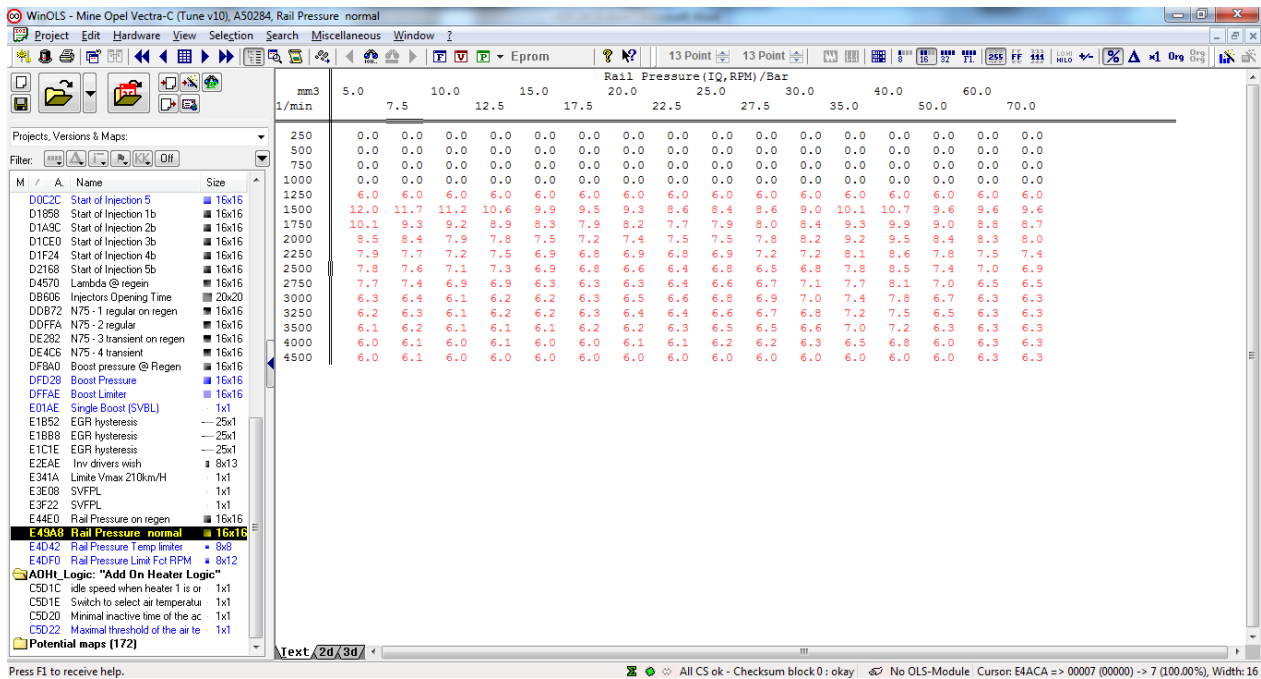
The pro tuner increased all pressure related maps using flat Delta (100bar) over the whole revolution range, same story here. In the beginning (to stay safe) I used +6% (max 1696bar) and extend this all over (1000rpm) the map even for low IQ values.

Now I changed my mind. At certain point of back pressure, efficiency of most pumps (especially centrifugal) will drop rapidly. After this point increase of RPMs will only generate more heat, however without increase of the flow rate. This fluid/gas passing through is used also to cool the pump.

Another change of mind 😊. Looks like increase of CRP is used to reduce NOx(O2 rich zones) and this cost higher BSFC. So now I use it same as the pro tuner only at high IQ, to advance end of injection.



# Mine Vectra difference in % and difference in “D”



## 12. SV Rail Pressure:

This value limits the absolute common rail pressure. This value can be found behind the rail pressure map. There is 3 maps like this. No need to touch them. They are set to 1750bar.

WinOLS - Mine Opel Vectra-C (Tune v12 Stanito) A50284, Hexdump

Project Edit Hardware View Selection Search Miscellaneous Window ?

12 Point 12 Point 8 16 32 255 FF 333 LOU HELD % A x1 0r9 Org Org

Projects, Versions & Maps:

Filter: [Icons] Off

M / A. Name

- D2944 time component SDE PI11 base value
- D3012 injection quantity PI12 base value ma
- D324A PI12 injection quantity maximum value
- D3850 quantity correction map for pilot injec
- D4570 time component SDE PI12 base value
- D70C8 Base value for PI11 start of energizing
- DBF8E MAP for fuel temperature depending
- DDA8C map for air pressure compensation to
- DD872 map to determine base value of boost
- DF8A0 First regeneration map to determine ti
- E0180 minimum allowed desired boost press
- ET852 speed dependent quantity threshold --
- ET8B8 Fuel quantity curve for switch off thre-
- ETC1E speed dependent quantity threshold --
- ETC84 Fuel quantity curve for switch on thre-
- E341A maximum speed of vehicle
- E380A Upper threshold for over pressure det
- E380C Lower threshold for over pressure det
- E3A62 Upper threshold for over pressure det
- E3A64 Lower threshold for over pressure det
- E30B2 maximum admissible rail pressure for**
- E30DC maximum admissible rail pressure
- E3E08 maximum admissible governor deviat-
- E3E8C minimum admissible rail pressure as fi-
- E3ED4 maximum allowed rail pressure
- E3F22 maximum curve of rail pressure devia-
- E3F64 minimum allowed rail pressure as func-
- E44E0 Rail-pressure-setpoint-Map for regen II
- E52CE maximum rail pressure setpoint value

Potential maps (172)

Text/2d/3d

Press F1 to receive help.

All CS ok - Checksum block 0: okay No OLS-Module Cursor: E3D82 => 17500 (17500) -> 0 (0.00%), Width: 10



### 13. EGR vs MAF map:

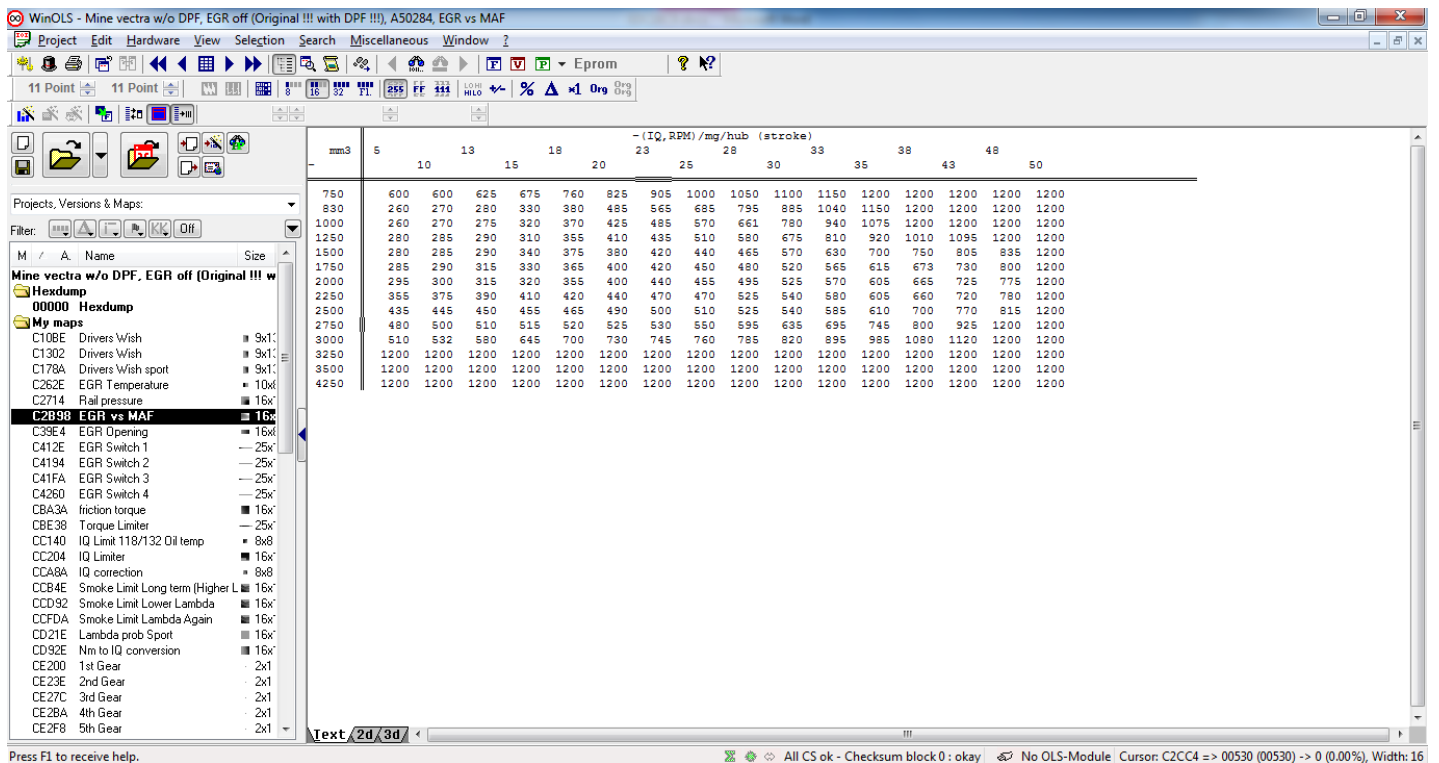
To prevent clogged intake and avoid future (Swirl flaps, MAP, EGR) problems the EGR map can be simply disabled using switch. However some tuners report less fuel consumption while leaving EGR working but reduced i.e increase allowed MAF. To reduce EGR and allow more air intake we need to increase the allowed MAF in mg/stroke. Do not go over the highest value, in this case it is 1200mg/stroke. On EDC15 this map is used to switch off DPF by setting all values equal to the highest one. Usually same as last column. The pro tuner did not switch of the EGR neither touch this map.

When reading data from the ECU log, the mass air flow is reported in kg per hour but in hexdump we work in mg per stroke. Converting one value to the other is quite simple:

One full cylinder filling is 1.910 ltr : 4 cyl = 0.4775 liter. Air is about 1290mg per liter.

So we can calculate  $0.4775 \text{ ltr/stroke} * 1290 \text{ mg/ltr} = 615.975 \text{ mg/stroke}$ . However, the cylinder is not fully filled as it has to suck in the air in a limited amount of time (and may get EGR). Therefore the value is a lower. If the turbo would be really working at idle, the air flow could be higher than 616 mg/stroke.

At 900 RPM a 4 cylinder 4 stroke engine makes  $900 \text{ RPM} * 2 \text{ strokes/revolution} * 60 \text{ minutes in one hour} = 108,000 \text{ strokes}$ . So if the ECU reads 616 mg/stroke at idle, it equals to  $108,000 * 616e-6 = 66.53 \text{ kg/hour air flow}$ .



This map will show how much MAF your car used to get. So this can be used as guide for lowering the boost if closing or reducing EGR.

The screenshot shows the WinOLS software interface. The top menu bar includes Project, Edit, Hardware, View, Selection, Search, Miscellaneous, and Window. Below the menu is a toolbar with various icons for file operations and engine simulation. The left sidebar, titled 'Projects, Versions & Maps', shows a tree view of the current project 'Opel Stage 1 Dyno Astra-H (Original)'. Under 'Humpend', there is a list of maps, with 'C412E EGR Switch 1' selected. The main workspace displays a large data table with columns for engine speed (l/min) and torque (Nm). The table is organized into rows representing different engine speeds and torque values. A graph on the right side of the workspace shows torque vs. engine speed. The status bar at the bottom indicates 'All CS ok - Checksum block 0: okay'.

[illegible]

When closing EGR you may need to adjust  $n_{75}$ !

- a) Looks like in those type of EGR arrangement  $N_{75}$  is used to create back pressure and divert EG flow to intake manifold.  
“Even though a variety of measures can be taken, the leading contender is to use a variable geometry turbine (VGT) that can effectively provide the desired EGR driving pressure without substantially sacrificing the performance of the turbocharged engine. In such systems, the EGR control is closely tied to the VGT control”

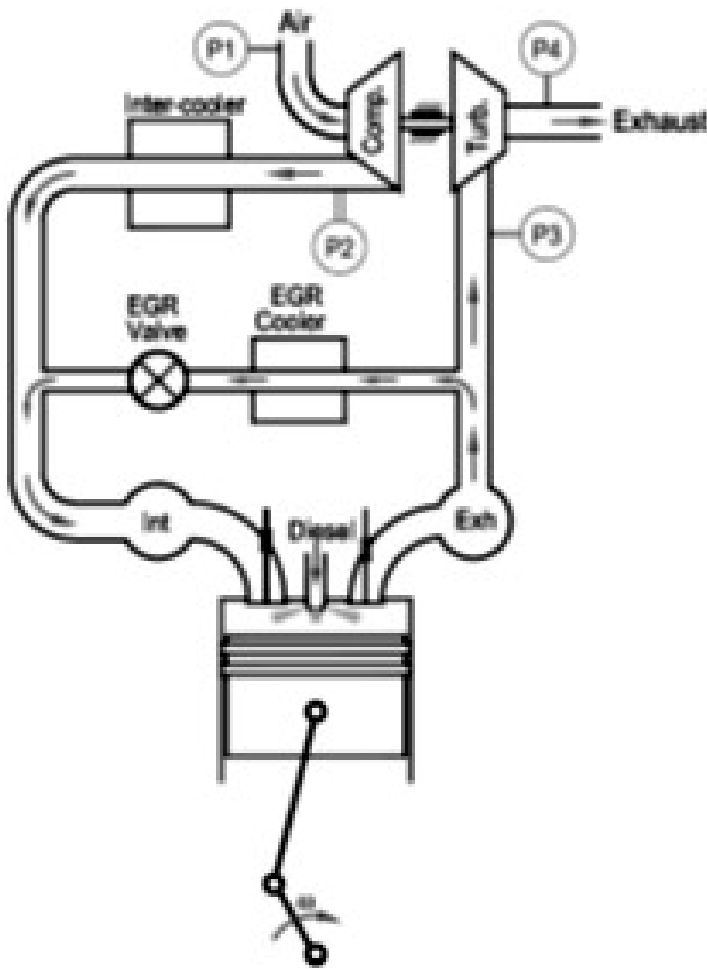


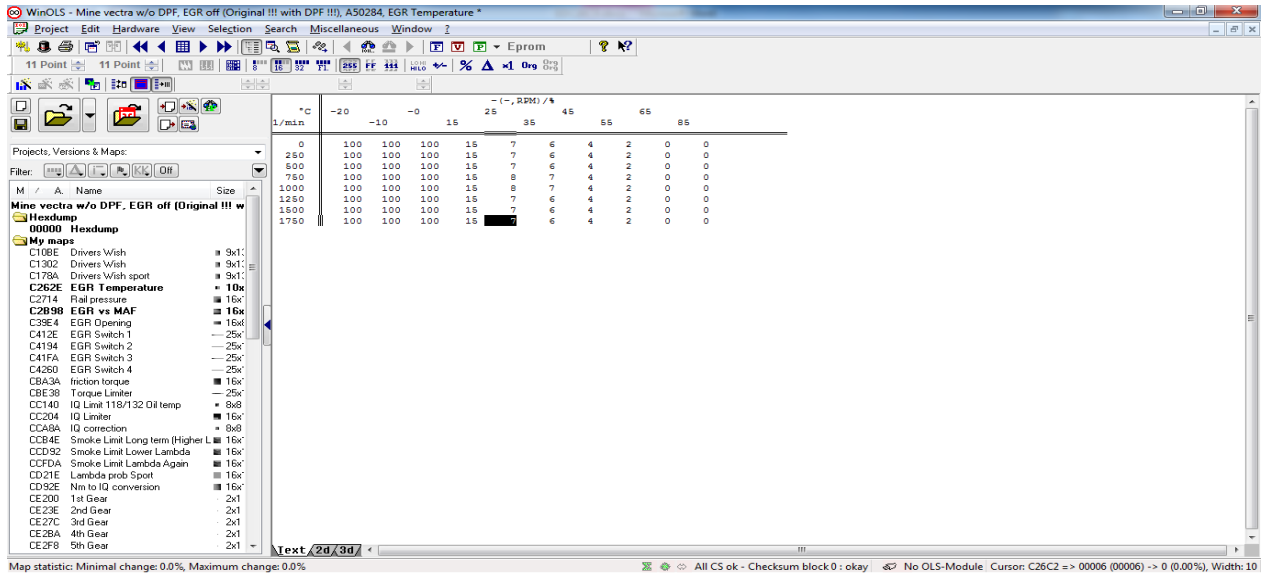
Fig. 3. High pressure loop EGR.

- b) Turbine will spool a bit faster - EG directed not to intake manifold but to the turbine side  
c) Turbine will spool a bit faster - More air at intake manifold = more EG at exhaust manifold

#### 14. EGR vs Temp map (Setpoint generation):

I want to make EGR working only at low Ambient Temperatures.

I'm not sure ho this map work!!! And planning some experiments and find is this correction is additively or multiplicative done.



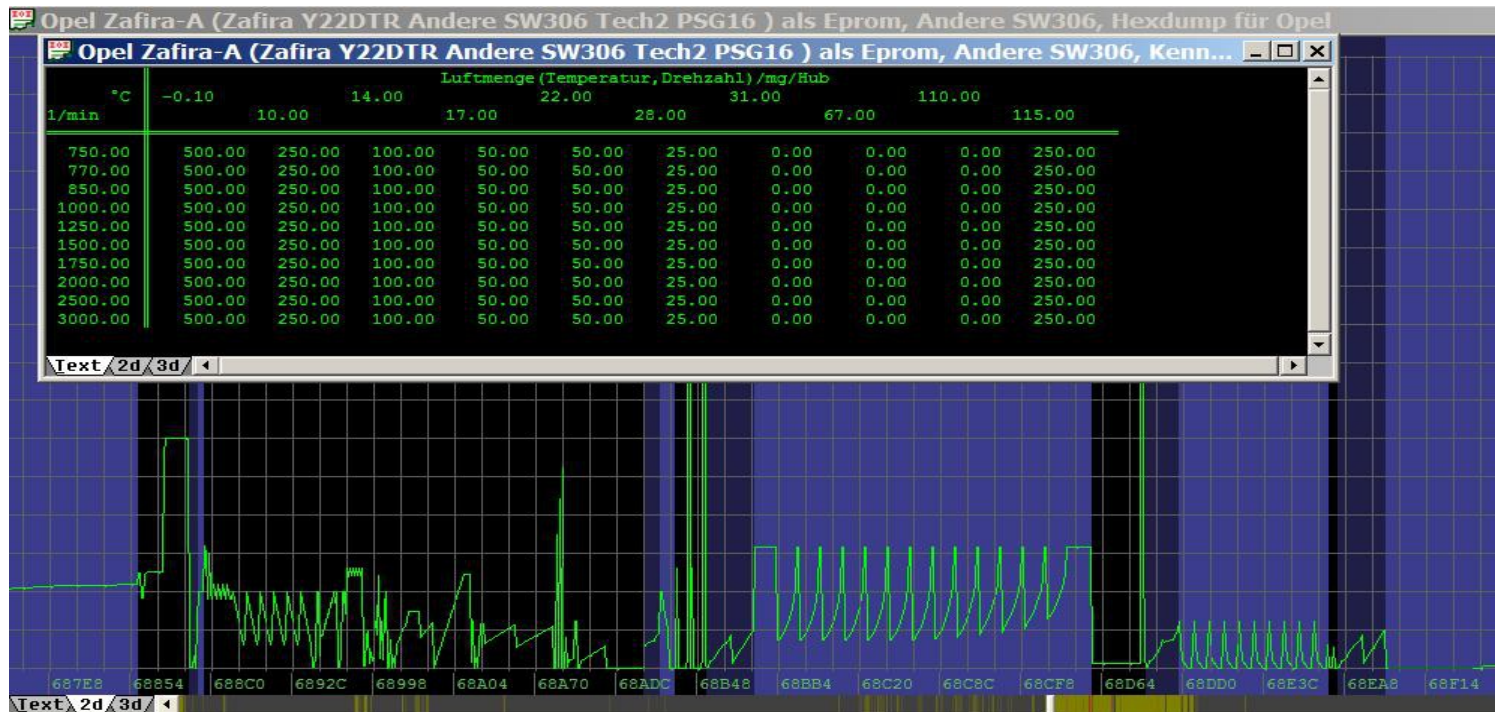
The EGR-Valve is normally working between 55°C and 100°C, upper it will be totally closed und lower 55°C - that's what it's difficult to explain because the map values are for internal settings and i don't know how it could be translated to values that i understand.

But i will show you in PSG16 what's the same like EDC16 !

My engine Y22DTR runs in idle about 850 1/min that makes approx. 520mg/Hub air mass without EGR.

The desired value of egr map - 850 1/min and 5 mg/Hub IE is 300mg/Hub air mass, so the EGR valve opens so long till the measured air mass is about 300 mg/Hub.

Now comes the coolant temp. correction map - see egr.jpg



850 1/min and 10°C coolant temperature = 250mg/Hub air mass to add to the desired EGR value =

300mg/Hub + 250mg/Hub = 550mg/Hub air mass to measure

So idle without EGR = 520mg/Hub and corrected EGR value 550mg/Hub = -30mg/Hub = EGR CLOSED !!!

The only difficult thing is to hold this values close together otherwise you get MIL

Now you have to play with your car a little and find a good solution that will make this function you want but it will work !

I hope you understand the function of this map like i explained and you ignore my bad english.

btw: This was the way i was closing the egr in my y20dtl ( EDC15M) zafira till i found a better way !

## 15. Turbo (Boost request) map:

“The turbo on this car, a GT1749V, can handle a max boost of around 2650mbar. So the max value in this map may be 2600mbar.” This turbo pressure is only for the 150hp version. The lower hp versions have also lower turbo pressure! As per Garrett this turbo can support around 175Hp, so I would not advise you going to 2600mbar. You can assume that the turbo pressure may be increased by around 7% max.

Since we are only tuning for max power only the 3-4 most right columns has to be changed. As you can see the boost goes up to max 2510mbar. Pro tuner work with fixed Delta and increase boost request for 70mm3 IQ by 150mbar. “Maybe use of flat value from the lowest to the highest rpms is not the best approach. I choose to increase mine working in %”.

It was before. As I said above Maybe ☺. However maybe it is better to request more boost while compressor work in its high efficiency islands, instead out of them and getting over speed to reach required Pressure Ratio. In my last tune I also use Delta values, trying to get higher boost when compressor is not on its maximum.

At the extreme upper right corner I copy some cells from Astra file. Probably to avoid surges, at this area stock manual Astra request up to 50% more than my stock automatic Vectra.

As you can see the axis value goes up to 70mm3/stroke. As we will inject about 80mm3/stroke (by my logging, with 15% increase) you can rescale axis and boost request. Pro tuner did not although he did 20% increase of IQ...

Economy tuning is much more complicated... At low RPM and IQ, EGR restrict MAF to 200 – 500 mg/stroke.

Naturally aspired 1.91ltr engine will get 0.48ltr/stroke \* 1290mg/ltr = 619 mg/stroke.

Applying correction for volumetric efficiency of the engine as a function of engine speed 619 mg/stroke \* 0.90 = 557.1 mg/stroke (+/- some error, should be the reading from MAF sensor)

So why should restrict natural aspiration by EGR and request boost for IQ less than 25mm3/stroke (and 1mm3 is only 0,86mg). Many tuners report better fuel economy with decreased boost request. **However I doubt that requesting 0.01mbar more at compressor side will bring more pumping losses (less beneficial) than 10 bars more requested at CRP.**

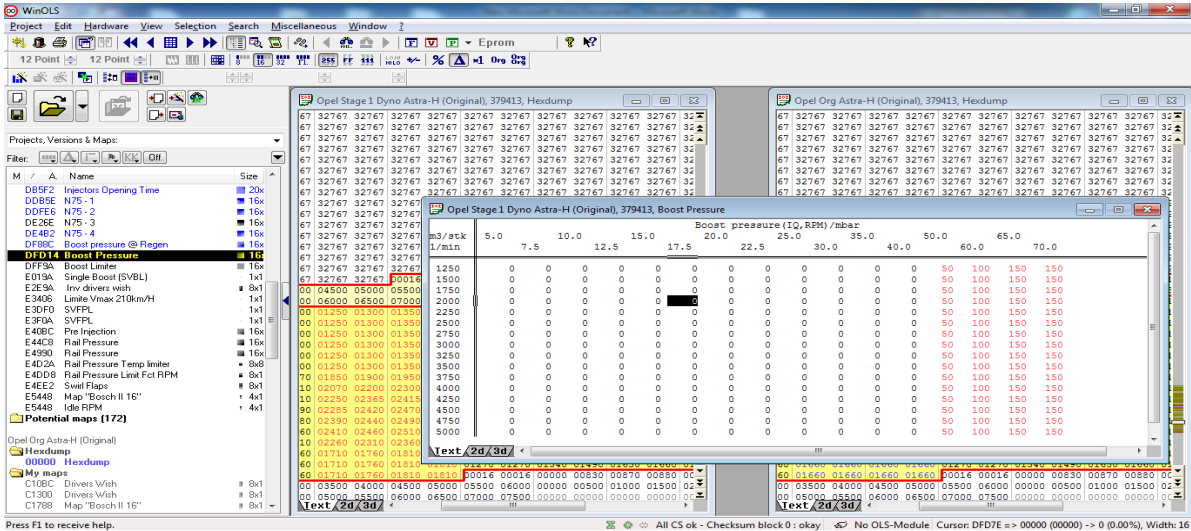
So now I give (EGR off) and force (higher reqst at high IQ) my engine to breathe more. N75 should also be adjusted to avoid spikes and lower back pressure on the exhaust system.

N75 should also be adjusted to avoid spikes and lower back pressure on the exhaust system.

In order to calculate actual MAF from Boost pressure should take in account also:

- map for air pressure compensation for boost pressure control
- map to determine base value of desired boost pressure (15. **Boost request**)
- curve for air temperature dependent factor for boost pressure control
- maximum allowed desired boost pressure according to air pressure (16. **Boost limiter map**)
- maximum allowed desired boost pressure (17. **SVBL**)
- overall efficiency turbocharger
- Default value environment air pressure for turbo model - 980mbar
- induction volume (effective volume between turbocharger and mixing point) - (lag from MAP to MAF control)
- Exhaust gas back pressure MAP
- correction factor for compensation of the dependency of the volumetric efficiency of the gas temperature upstream of the inlet
- volumetric efficiency of the engine as a function of engine speed and current injection quantity (This is the other map playing major effect, for mine 1.9cdti 16v correction is 86 to 93%)
- correction factor for volumetric efficiency as a function of engine speed and relative swirl valve position
- Factor for correction of the torque loss due to exhaust-gas back pressure caused by installed particle filter
- Limitation below of the torque loss due to exhaust gas back pressure caused by installed particle filter



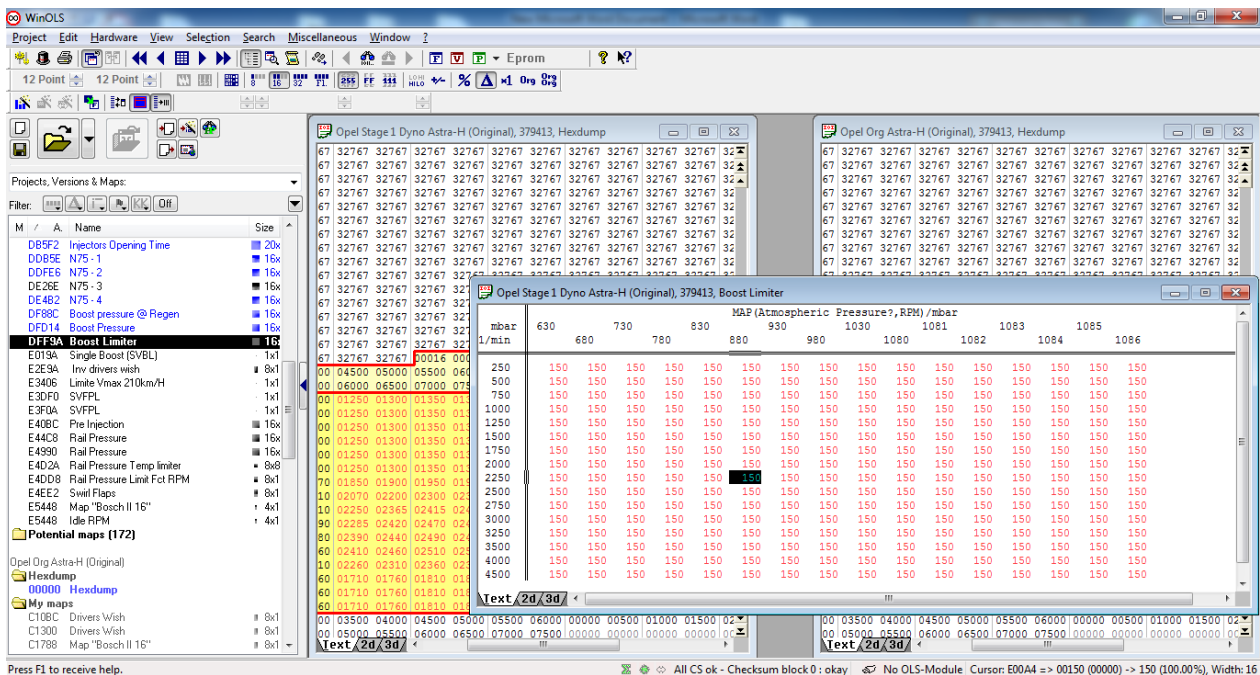


WinOLS - Mine Opel Vectra-C (Tune v10), A50284, Boost Pressure

At this point we have set the boost up to 2513 mbar in the turbo map, and prevent boost spikes by lowering the N75 map. But the boost limiter map will limit the 2513mbar back to 2500mbar as you can see in picture. Pro tuner increase boost request by 150mbar and so he did for the boost limiter. This way margin between boost request and limiter stay untouched. As I used 6.5% for my boost I used same value for the boost limiter.

The screenshot displays the WinOLS software interface, which is used for configuring engine management systems. The main window is divided into several panes:

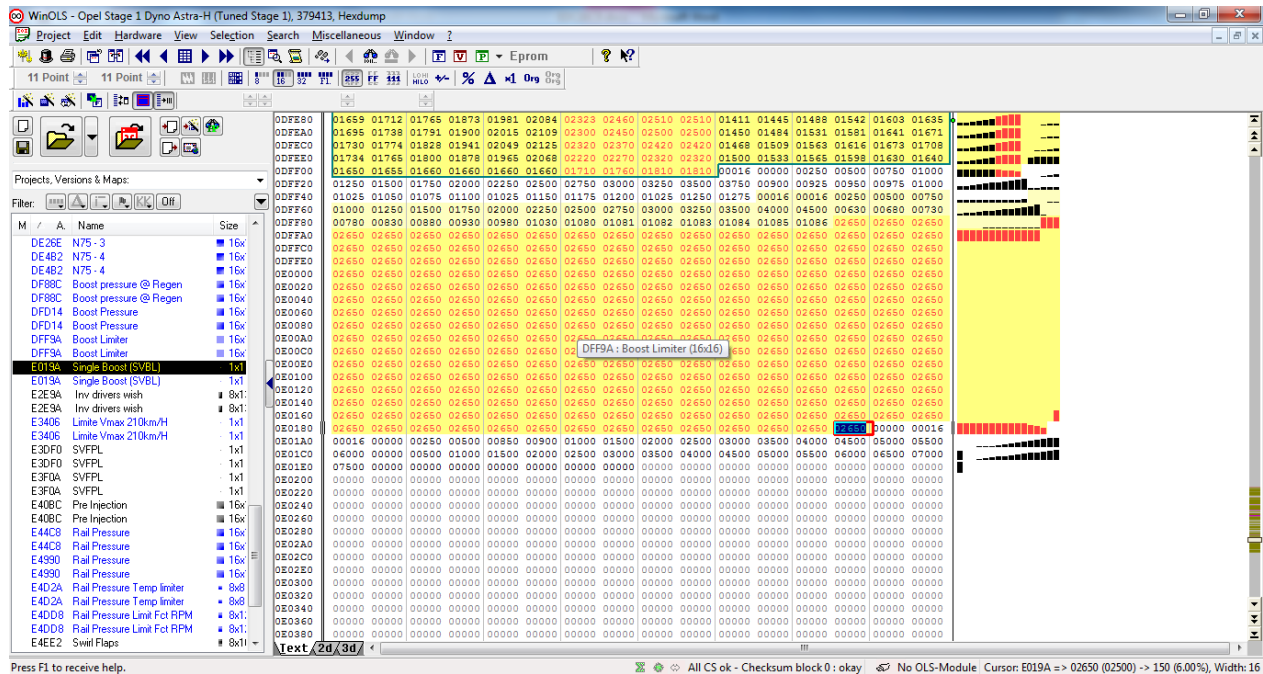
- Left Pane (Projects, Versions & Maps):** A tree view showing the project structure. The 'Maps' folder is expanded, listing various engine maps such as 'D05F2 Injectors Opening Time', 'D085E N75-1', 'D085E N75-2', 'D085E N75-3', 'D085E N75-4', 'D085E N75-5', 'D085E N75-6', 'D085E N75-7', 'D085E N75-8', 'D085E N75-9', 'D085E N75-10', 'D085E N75-11', 'D085E N75-12', 'D085E N75-13', 'D085E N75-14', 'D085E N75-15', 'D085E N75-16', 'D085E N75-17', 'D085E N75-18', 'D085E N75-19', 'D085E N75-20', 'D085E N75-21', 'D085E N75-22', 'D085E N75-23', 'D085E N75-24', 'D085E N75-25', 'D085E N75-26', 'D085E N75-27', 'D085E N75-28', 'D085E N75-29', 'D085E N75-30', 'D085E N75-31', 'D085E N75-32', 'D085E N75-33', 'D085E N75-34', 'D085E N75-35', 'D085E N75-36', 'D085E N75-37', 'D085E N75-38', 'D085E N75-39', 'D085E N75-40', 'D085E N75-41', 'D085E N75-42', 'D085E N75-43', 'D085E N75-44', 'D085E N75-45', 'D085E N75-46', 'D085E N75-47', 'D085E N75-48', 'D085E N75-49', 'D085E N75-50', 'D085E N75-51', 'D085E N75-52', 'D085E N75-53', 'D085E N75-54', 'D085E N75-55', 'D085E N75-56', 'D085E N75-57', 'D085E N75-58', 'D085E N75-59', 'D085E N75-60', 'D085E N75-61', 'D085E N75-62', 'D085E N75-63', 'D085E N75-64', 'D085E N75-65', 'D085E N75-66', 'D085E N75-67', 'D085E N75-68', 'D085E N75-69', 'D085E N75-70', 'D085E N75-71', 'D085E N75-72', 'D085E N75-73', 'D085E N75-74', 'D085E N75-75', 'D085E N75-76', 'D085E N75-77', 'D085E N75-78', 'D085E N75-79', 'D085E N75-80', 'D085E N75-81', 'D085E N75-82', 'D085E N75-83', 'D085E N75-84', 'D085E N75-85', 'D085E N75-86', 'D085E N75-87', 'D085E N75-88', 'D085E N75-89', 'D085E N75-90', 'D085E N75-91', 'D085E N75-92', 'D085E N75-93', 'D085E N75-94', 'D085E N75-95', 'D085E N75-96', 'D085E N75-97', 'D085E N75-98', 'D085E N75-99', 'D085E N75-100', 'D085E N75-101', 'D085E N75-102', 'D085E N75-103', 'D085E N75-104', 'D085E N75-105', 'D085E N75-106', 'D085E N75-107', 'D085E N75-108', 'D085E N75-109', 'D085E N75-110', 'D085E N75-111', 'D085E N75-112', 'D085E N75-113', 'D085E N75-114', 'D085E N75-115', 'D085E N75-116', 'D085E N75-117', 'D085E N75-118', 'D085E N75-119', 'D085E N75-120', 'D085E N75-121', 'D085E N75-122', 'D085E N75-123', 'D085E N75-124', 'D085E N75-125', 'D085E N75-126', 'D085E N75-127', 'D085E N75-128', 'D085E N75-129', 'D085E N75-130', 'D085E N75-131', 'D085E N75-132', 'D085E N75-133', 'D085E N75-134', 'D085E N75-135', 'D085E N75-136', 'D085E N75-137', 'D085E N75-138', 'D085E N75-139', 'D085E N75-140', 'D085E N75-141', 'D085E N75-142', 'D085E N75-143', 'D085E N75-144', 'D085E N75-145', 'D085E N75-146', 'D085E N75-147', 'D085E N75-148', 'D085E N75-149', 'D085E N75-150', 'D085E N75-151', 'D085E N75-152', 'D085E N75-153', 'D085E N75-154', 'D085E N75-155', 'D085E N75-156', 'D085E N75-157', 'D085E N75-158', 'D085E N75-159', 'D085E N75-160', 'D085E N75-161', 'D085E N75-162', 'D085E N75-163', 'D085E N75-164', 'D085E N75-165', 'D085E N75-166', 'D085E N75-167', 'D085E N75-168', 'D085E N75-169', 'D085E N75-170', 'D085E N75-171', 'D085E N75-172', 'D085E N75-173', 'D085E N75-174', 'D085E N75-175', 'D085E N75-176', 'D085E N75-177', 'D085E N75-178', 'D085E N75-179', 'D085E N75-180', 'D085E N75-181', 'D085E N75-182', 'D085E N75-183', 'D085E N75-184', 'D085E N75-185', 'D085E N75-186', 'D085E N75-187', 'D085E N75-188', 'D085E N75-189', 'D085E N75-190', 'D085E N75-191', 'D085E N75-192', 'D085E N75-193', 'D085E N75-194', 'D085E N75-195', 'D085E N75-196', 'D085E N75-197', 'D085E N75-198', 'D085E N75-199', 'D085E N75-200', 'D085E N75-201', 'D085E N75-202', 'D085E N75-203', 'D085E N75-204', 'D085E N75-205', 'D085E N75-206', 'D085E N75-207', 'D085E N75-208', 'D085E N75-209', 'D085E N75-210', 'D085E N75-211', 'D085E N75-212', 'D085E N75-213', 'D085E N75-214', 'D085E N75-215', 'D085E N75-216', 'D085E N75-217', 'D085E N75-218', 'D085E N75-219', 'D085E N75-220', 'D085E N75-221', 'D085E N75-222', 'D085E N75-223', 'D085E N75-224', 'D085E N75-225', 'D085E N75-226', 'D085E N75-227', 'D085E N75-228', 'D085E N75-229', 'D085E N75-230', 'D085E N75-231', 'D085E N75-232', 'D085E N75-233', 'D085E N75-234', 'D085E N75-235', 'D085E N75-236', 'D085E N75-237', 'D085E N75-238', 'D085E N75-239', 'D085E N75-240', 'D085E N75-241', 'D085E N75-242', 'D085E N75-243', 'D085E N75-244', 'D085E N75-245', 'D085E N75-246', 'D085E N75-247', 'D085E N75-248', 'D085E N75-249', 'D085E N75-250', 'D085E N75-251', 'D085E N75-252', 'D085E N75-253', 'D085E N75-254', 'D085E N75-255', 'D085E N75-256', 'D085E N75-257', 'D085E N75-258', 'D085E N75-259', 'D085E N75-260', 'D085E N75-261', 'D085E N75-262', 'D085E N75-263', 'D085E N75-264', 'D085E N75-265', 'D085E N75-266', 'D085E N75-267', 'D085E N75-268', 'D085E N75-269', 'D085E N75-270', 'D085E N75-271', 'D085E N75-272', 'D085E N75-273', 'D085E N75-274', 'D085E N75-275', 'D085E N75-276', 'D085E N75-277', 'D085E N75-278', 'D085E N75-279', 'D085E N75-280', 'D085E N75-281', 'D085E N75-282', 'D085E N75-283', 'D085E N75-284', 'D085E N75-285', 'D085E N75-286', 'D085E N75-287', 'D085E N75-288', 'D085E N75-289', 'D085E N75-290', 'D085E N75-291', 'D085E N75-292', 'D085E N75





### 17. Single values boost limiter:

At this point we have set almost everything to get a higher boost except the absolute limiter. That's the last one we need to change. Opel engineers use same value for SVBL and boost limiter despite the atmospheric pressure. So just use the same stock +6.5% (on my last tune Delta=175mbar). As per some tuners this value has to be a bit (read 50mbar) higher than the highest turbo map value.



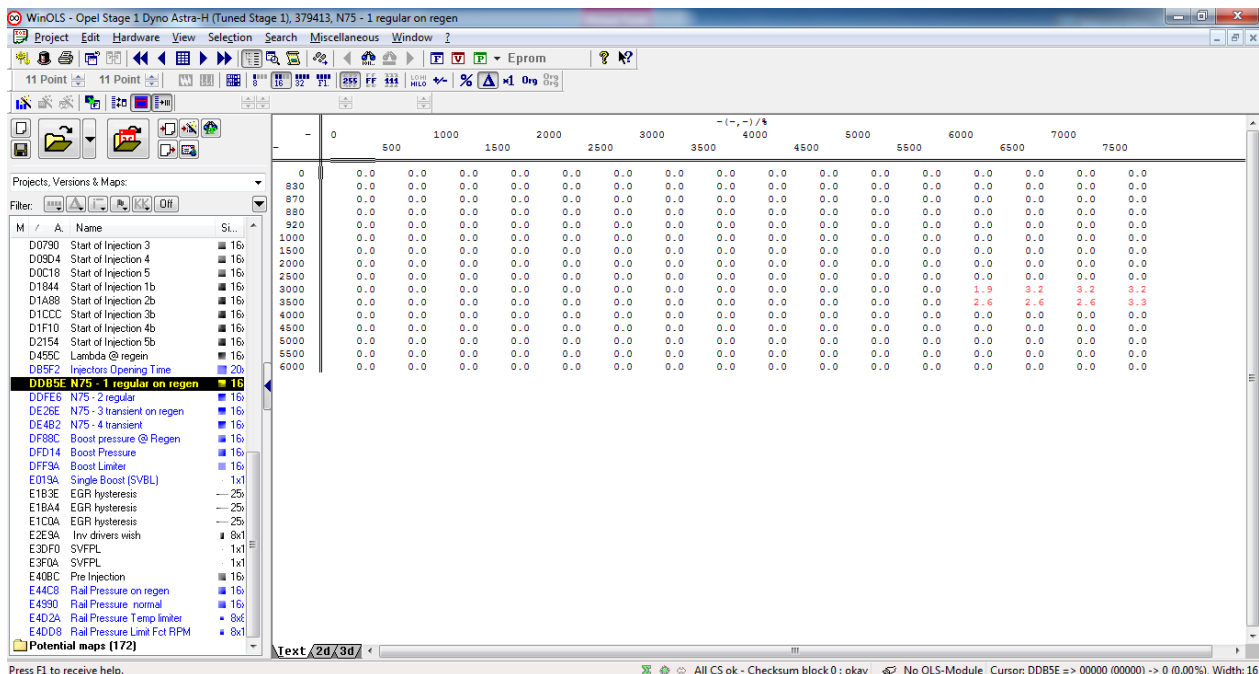
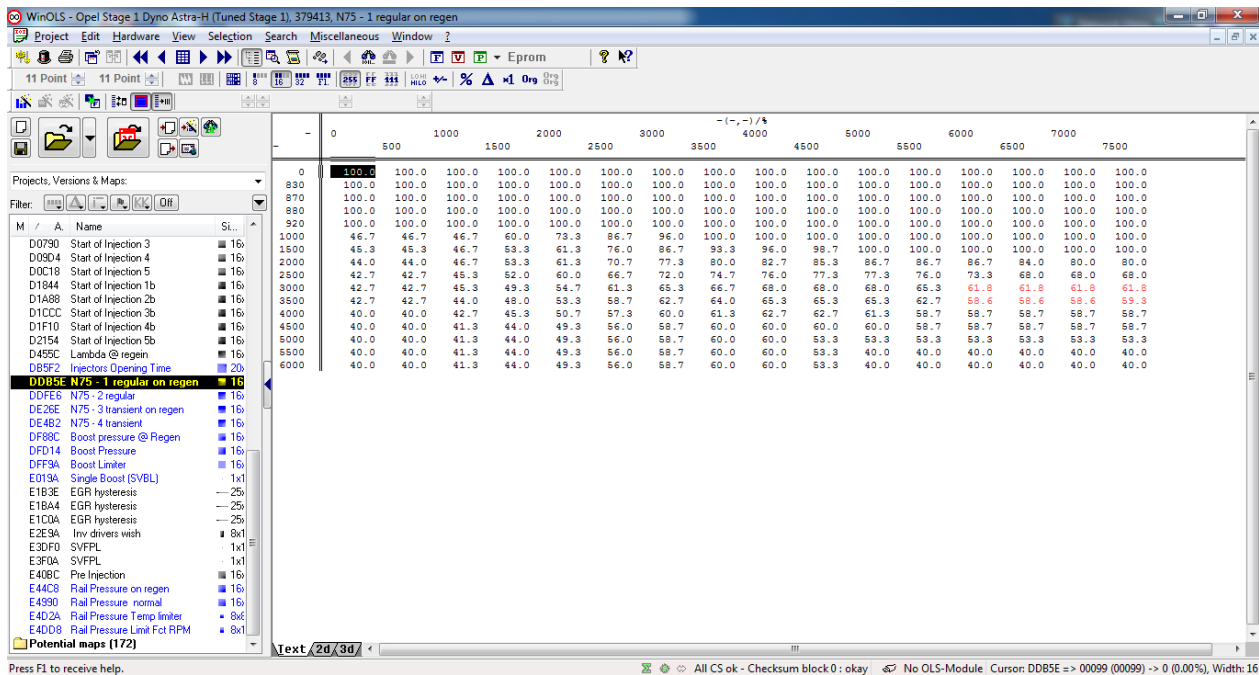
## 18. Turbo vanes (N75) map:

The N75 map controls the vanes inside the turbo, and when increasing IQ (or removing DPF) needs to be reduced to prevent turbo spiking. As we did not rescale boost map IQ axis will not rescale N75 axis neither. If you did so, better match N75 IQ axis to boost map IQ axis.

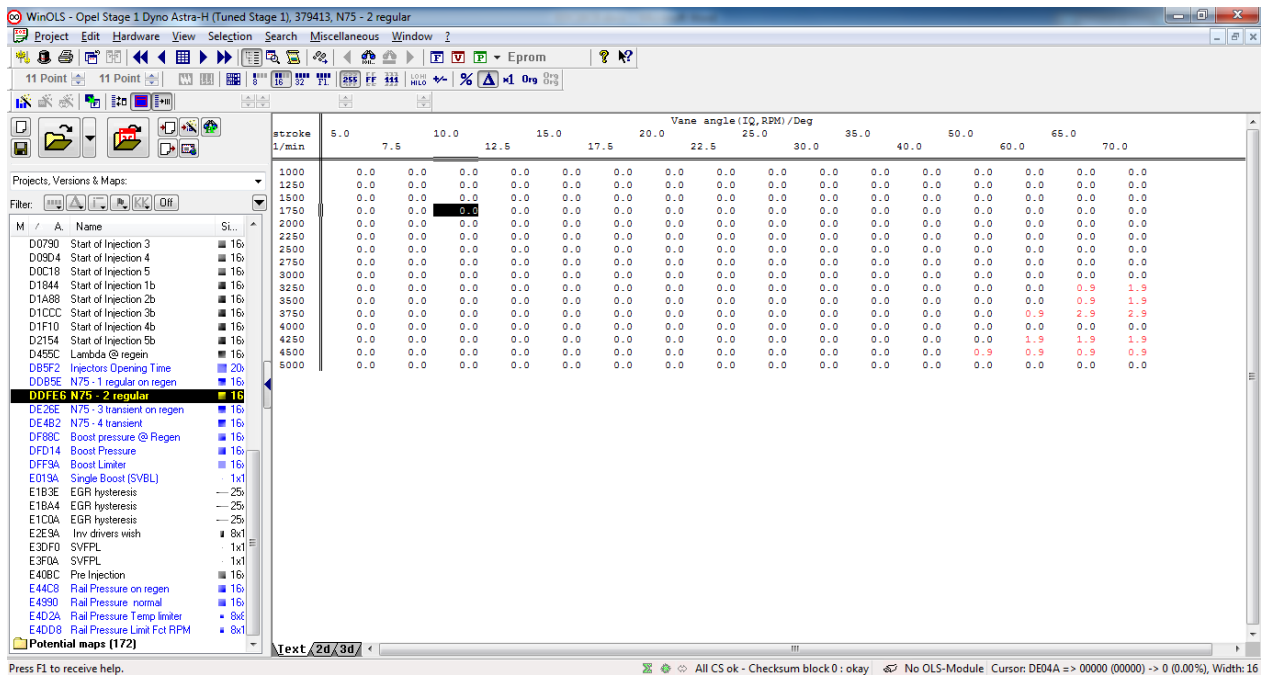
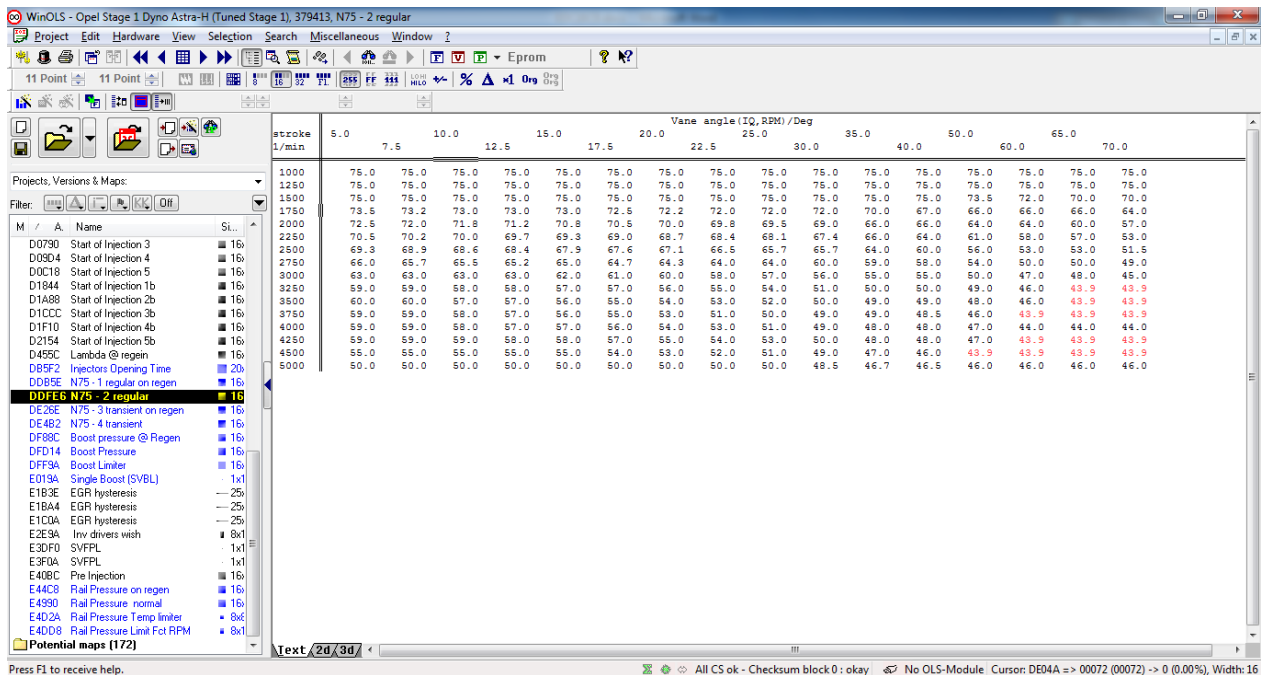
As a rule you can decrease the values from 1500-5000rpm at high IQ's by 8%. This is depending on the car, and how much boost spikes you have... still got boost spikes... reduce the map. You can see that the tuner choose to change all the maps same why, even those that are not in use (Astra didn't have DPF). He did the same for the rail pressure (but not for lambda) designated for DPF regeneration.

After a lot of logging I could not find any benefits from lowering the N75 and now I running with stock.

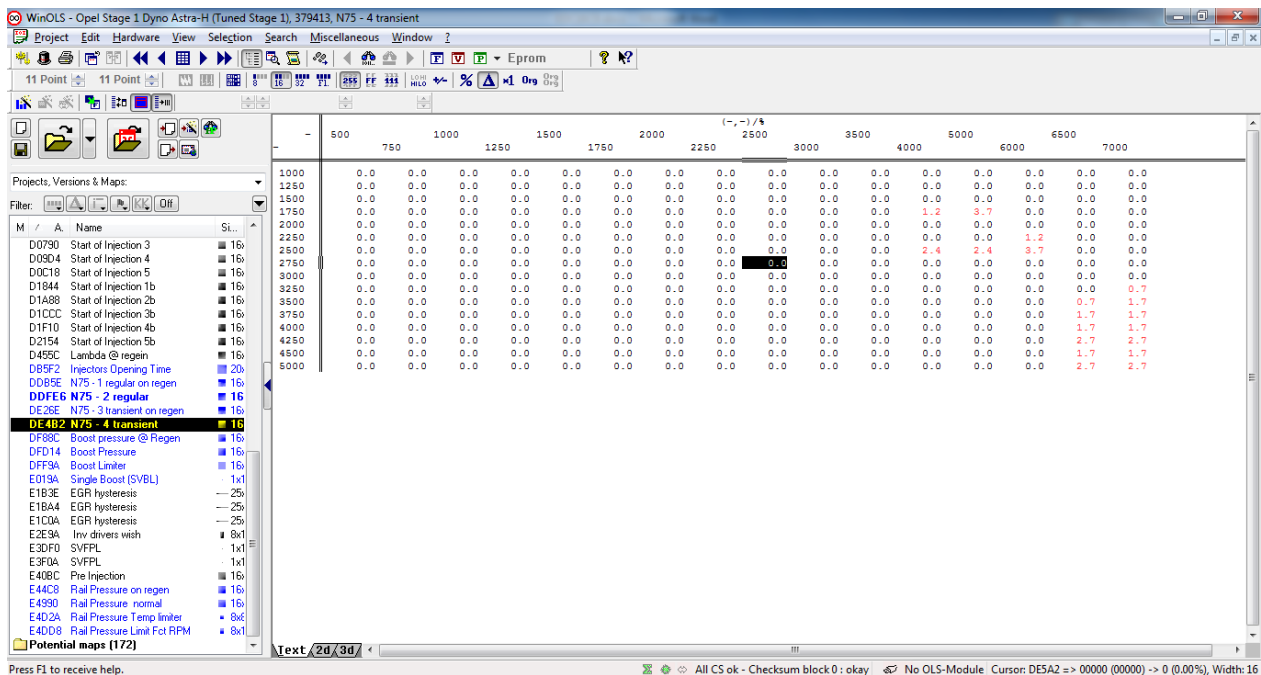
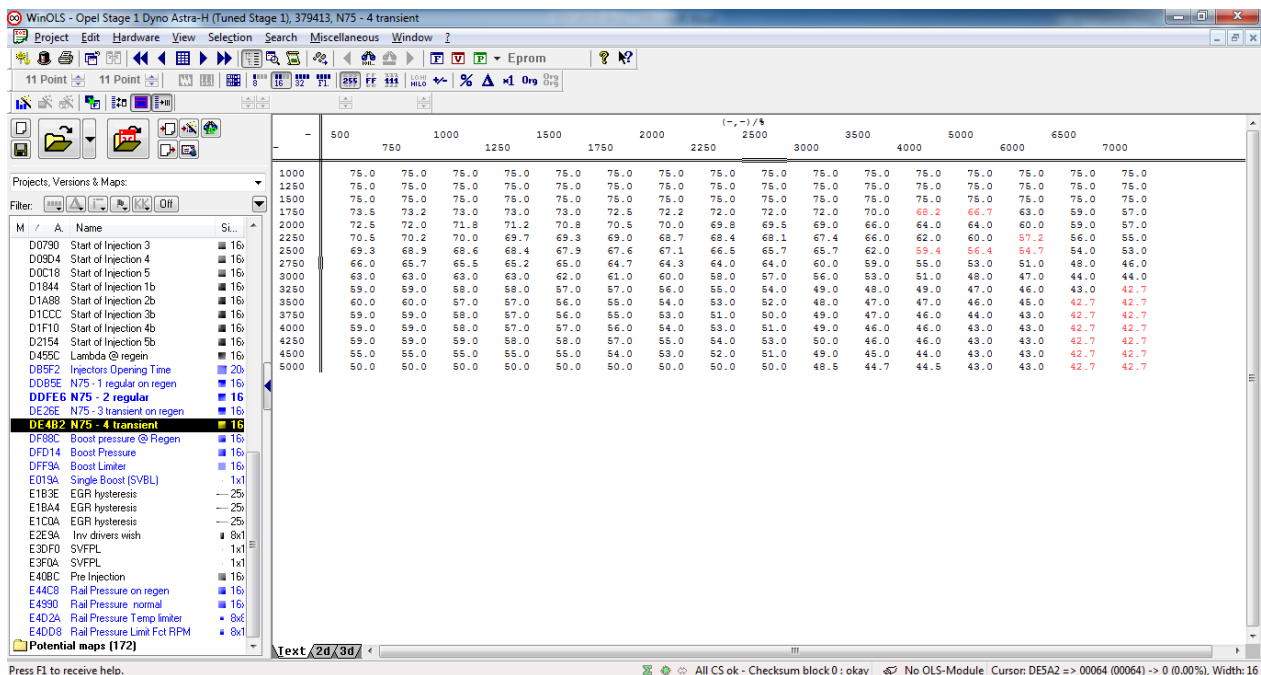
### Regular N75



## Regular N75 during DPF regeneration



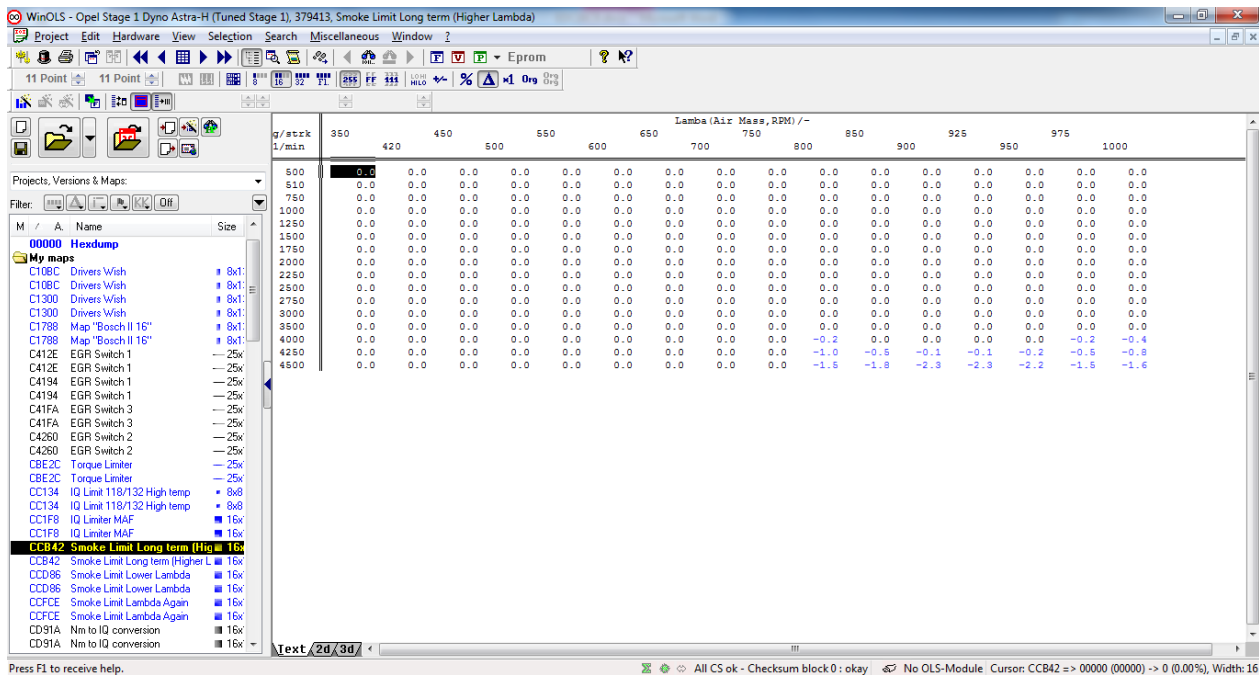
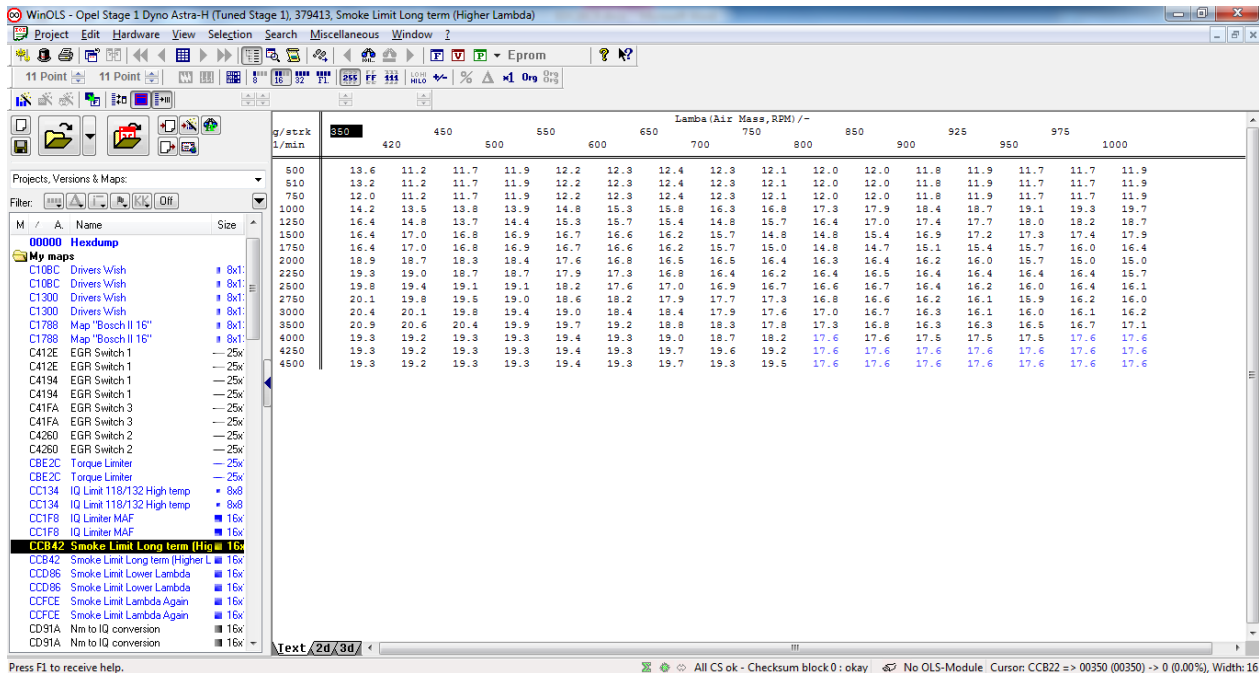
## Transition N75 during



## 19. Lambda:

Pro tuner change very few values at high rpm and MAF, In fact he just copy the Sport Button lambda for high RPM and MAF. He left the sport button lambda unchanged.

My car don't have sport button so I choose to copy whole Sport button lambda map, over the regular lambda map. To avoid being too smoky I set the minimum AFR value to 14,5



WinOLS - Opel Stage 1 Dyno Astra-H (Tuned Stage 1), 379413, Map "Bosch II 16" \*

Project Edit Hardware View Selection Search Miscellaneous Window ?

11 Point 11 Point 8 16 32 64 128 256 512 1024 2048 4096 8192 16384 32768 65536 131072 262144 524288 1048576 2097152 4194304 8388608 16777216 33554432 67108864 134217728 268435456 536870912 1073741824 2147483648 4294967296 8589934592 17179869184 34359738368 68719476736 137438953472 274877906944 549755813888 1099511627776 2199023255552 4398046511104 8796093022208 17592186044416 35184372088832 70368744177664 140737488355328 281474976710656 562949953421312 1125899906842624 2251799813685248 4503599627370496 9007199254740992 18014398509481984 36028797018963968 72057594037927936 144115188075855872 288230376151711744 576460752303423488 1152921504606846976 2305843009213693952 4611686018427387904 9223372036854775808 18446744073709551616 36893488147419103232 73786976294838206464 147573952589676412928 295147905179352825856 590295810358705651712 1180591620717411303424 2361183241434822606848 4722366482869645213696 9444732965739290427392 18889465931478580854784 37778931862957161709568 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# GLOSSARY

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IQ = Injection Quantity  
SOI = Start Of Injection = SOE = Start Of Energizing  
EOI = End Of Injection  
CRS = Common Rail System  
Mg = milligrams  
Str = Engine Stroke  
°CR = Degree Crankshaft Rotation  
°C = Degree Celcius  
rpm = Engine revolutions per minute  
BTDC = Before Top Dead Center  
ATDC = After Top Dead Center  
Nm = Newton metres (Torque)  
Mbar = Millibar (pressure)  
BMEP = break mean effective pressure  
CA = crank angle  
CO = carbon monoxide  
ECM = engine control module  
EGR = exhaust gas recirculation  
MAF = mass air flow sensor  
HCCI = homogeneous charge compression ignition  
NOx = oxides of nitrogen  
PM = particulate matter  
SI = spark ignition  
TDC = top dead center  
THC = total hydrocabon  
VGT = variable geometry turbine  
WGT = Waste gate turbine



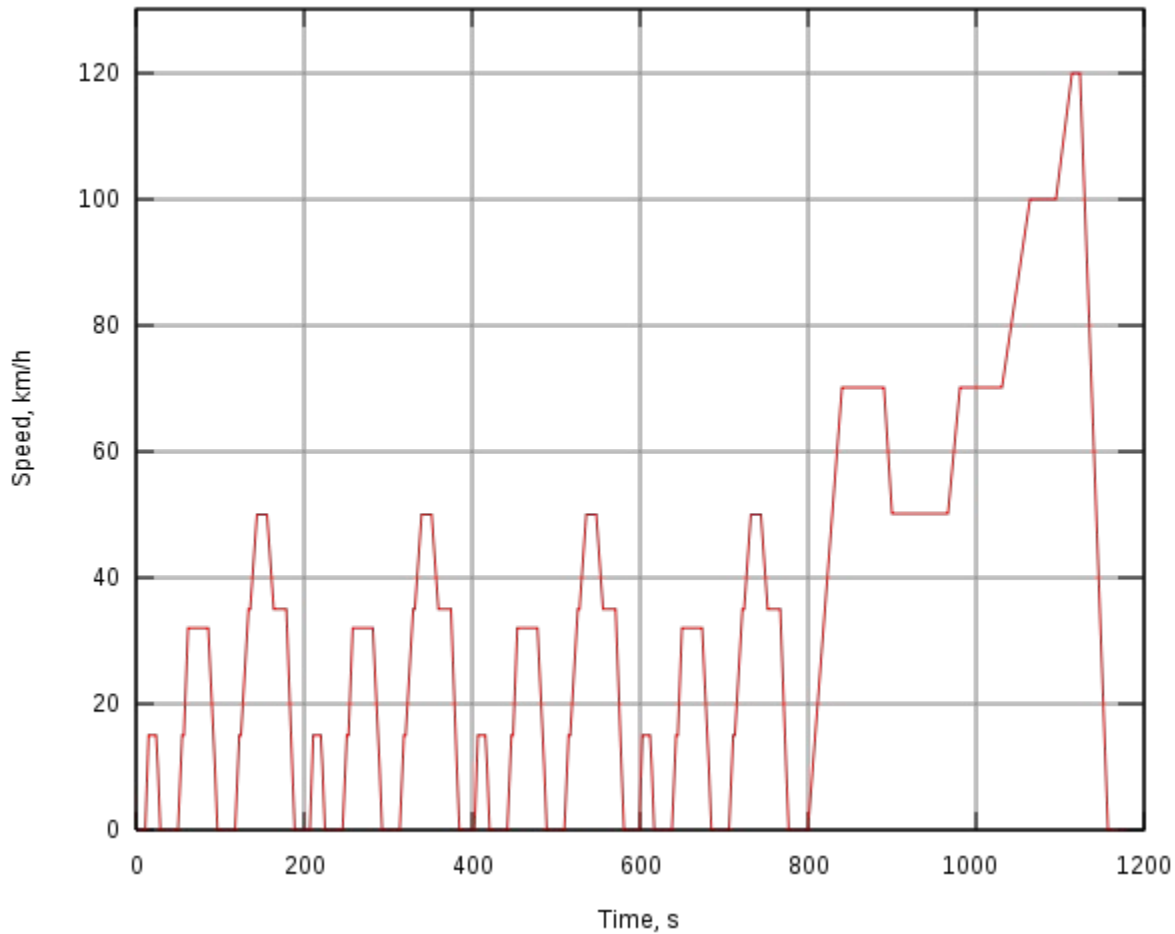
# Tips

1. All 0 maps are ignored
2. For everything higher than max, last known value is used.
3. Transient VNT maps are used when pedal change is more than 20% in one second.
4. VNT maps are only used in open loop mode, when closed loop kicks in PID controller takes over.  
If actual boost is too far from requested when PID takes over, you get boost oscillation, because PID control is slow.
5. Lambda maps limit IQ in relation to air mass mg/hub (hub means stroke), to keep the intended AFR.
6. 1ltr diesel is about 0.85 kg i.e 100mm<sup>3</sup> are 86mg
7. According to the CRC Handbook of Chemistry and Physics, the density of dry air at 20 degrees C at 760 mm of mercury (one atmosphere of pressure) is 1.204 milligrams per cubic centimeter. 1 liter = 1000 mL = 1000 cm<sup>3</sup> ; (1.204 mg / cm<sup>3</sup> ) \* 1000 cm<sup>3</sup> = 1204 mg = 1.204 grams
8. Lambda factor for EDC16 is 0.0145 as per Bosch EDC16 manual
9. You could increase rail pressure up to 1750 bar, 1,9DTH/CDTI engine has 1800-bar rail sensor.
10. GT1749V, can handle a max boost of around 2650mbar
11. Make torque limiter linear. The horse power comes in high RPM. If you increase suddenly the torque the clutch and the flywheel will die.
12. .. most work in good tuning goes to proper VNT tuning so your boost does not oscillate. There are 4 VNT maps in this ecu, 2 normal and 2 on regen. Normally you need to LOWER them on tuned car by 2 or 3%. You need logs for exact match as every car is little different.
13. Both of the boost readings they are in mBar and Absolute
14. 1.18 \*wheel power=flywheel power; Usually RWD-lose 10%; FWD-lose 15%; AWD-lose 20%; Auto-lose 5%
15. And the easy way to adjust the AFR without wideband AFR sensor is to observe the sooth from the exhaust. When it starts "smoking" - you need more air. Or more advance.
16. PD duration calibration - Make an interpolation or add approximately 5 degrees for each 5mg...
17. If the engine is running in low load you'll get white/grey smoke from late injection. Because the cylinder and exhaust gas is too cold to complete the combustion.
18. Since O2 has a molecular weight of 32, and air 29, on a mass/mass basis, this is  $0.21 \times 32/29 = 0.232$  kg O2/ kg air. That will be independent of temperature and pressure.
19. **Petrol gasoline, or benzin** is composed of a mixture of 2,2,4-trimethylpentane (an isomer of octane C<sub>8</sub>H<sub>18</sub> [octane rating 100]) and n-heptane (C<sub>7</sub>H<sub>16</sub> [octane rating 0]). Example of octane rating, petrol with the same knocking characteristics as a mixture of 95% iso-octane and 5% heptane would have an octane rating of 95.
20. **Diesel** is composed of about 75% saturated hydrocarbons (primarily paraffins including n, iso, and cycloparaffins), and 25% aromatic hydrocarbons (including naphthalenes and alkylbenzenes). The average chemical formula for common diesel fuel is C<sub>12</sub>H<sub>23</sub>, ranging approximately from C<sub>10</sub>H<sub>20</sub> to C<sub>15</sub>H<sub>28</sub>.

Fuel	Combustion formula	Density kg/l (lb/US gal)	CO2 kg/l (lb/US gal) emissions
Petrol gasoline	$2 \text{ C}_8\text{H}_{18} + 25 \text{ O}_2 \rightarrow 16 \text{ CO}_2 + 18 \text{ H}_2\text{O} + 2636 \text{ kcal}$	0.7197 kg/l (6.073 lb/gal)	2.3035 kg/l (19.24 lb/US gal)
Diesel	$4 \text{ C}_{12}\text{H}_{23} + 71 \text{ O}_2 \rightarrow 48 \text{ CO}_2 + 46 \text{ H}_2\text{O} + \text{energy}$	0.832 kg/l (6.943 lb/gal)	2.6256 kg/l (21.91 lb/US gal)
Biodiesel C <sub>19</sub> H <sub>34</sub> O <sub>2</sub>	$\text{C}_{19}\text{H}_{34}\text{O}_2 + (53/2) \text{ O}_2 \rightarrow 19 \text{ CO}_2 + 17 \text{ H}_2\text{O} + \text{energy}$	0.889 kg/l (7.42 lb/gal)	2.839 kg/l (23.69 lb/US gal)
Biodiesel C <sub>20</sub> H <sub>40</sub> O <sub>2</sub>	$\text{C}_{20}\text{H}_{40}\text{O}_2 + 29 \text{ O}_2 \rightarrow 20 \text{ CO}_2 + 20 \text{ H}_2\text{O} + \text{energy}$	0.884 kg/l (7.38 lb/gal)	2.816 kg/l (23.5 lb/US gal)



21. New\_European\_Driving\_Cycle – [http://en.wikipedia.org/wiki/New\\_European\\_Driving\\_Cycle](http://en.wikipedia.org/wiki/New_European_Driving_Cycle)



22. Fuel needed to reach torque target

**180 hp @ 3500rpm (0.38 lb hp hr)**

$0.38 \text{ lb hp hr} = 0.006333' \text{ lb hp min}$

$180\text{hp} * 0.00633 = 1.14 \text{ lb min fuel}$

$1.14 * 1000000 / 2.204 = 517,241 \text{ mg}$

$517,241 / \text{4 cylinder} / (3500 \text{ rpm} / 2 \text{ strokes}) = \textbf{73.89 mg/stroke}$

$180\text{hp} * 5252 / 3500 \text{ rpm} = 270 \text{ lb ft}$

$270 \text{ lb ft} = 73.89\text{mg/str}$

Lets see how much fuel the same torque at different rpm requires....

$270 \text{ lb.ft} * 2000\text{rpm} / 5252 = 102.818\text{hp @ } 2000\text{rpm}$

**102.818hp @ 2000rpm (0.38 lb hp hr)**

$102.818\text{hp} * 0.00633 = 0.65118 \text{ lb min fuel}$

$0.65118 * 1000000 / 2.204 = 295,454 \text{ mg}$

$295,454 / \text{4 cylinder} / (2000 \text{ rpm} / 2 \text{ strokes}) = \textbf{73.86 mg/stroke}$

Hence if the brake specific fuel consumption remains constant..

..mg/str is proportional to torque.

23. Density of air  $\rho$  vs. temperature  $^{\circ}\text{C}$

$^{\circ}\text{C}$	$\rho$ in $\text{kg/m}^3$
-10	1.342
-5	1.317
0	1.292
+5	1.269
+10	1.247
+15	1.225
+20	1.204
+25	1.184
+30	1.165

Air at 0 degrees Celsius has a density of  $1.292 \text{ kg/m}^3 = 1.292 \text{ g/L} = 0.001292 \text{ kg/dm}^3 = 0.00001292 \text{ kg/L} = 0.00001292 \text{ g/cm}^3 = 0.00001292 \text{ g/mL}$ .

24. I mean that to help with NOX gas reduction in cruise the manufacturers leave the SOI retarded but allow a small amount more advance to help with acceleration. As rightly said the dynamic advances up during acceleration because normal SOI map is retarded from optimum to reduce NOX gas. But they know that its retarded state is not good enough for transient or acceleration conditions.

# Review

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Had a good look at the file and I have to say it is way better than many of the "pro" tunes I have seen posted on the forums or read from actual tuned cars. I would have done it a bit different, don't know if better, but different 😊

What I like about the tune is that there are none nonsense adjustments done - the guy had a keep it clean and simple approach. The things that caught my attention are not stupid, only debatable. Many of the tunes I have seen have stupid changes, which you can't explain only by tuning approach. I think we have to agree that there are many tuning approaches and many different desirable results.

For instance you may want to squeeze every power there is or you may wish to play it safe. I personally don't like very aggressive torque limiters from low rpm, because in my opinion it is unhealthy for the clutch and for the dual mass flywheel. So I don't increase the torque figure by much in my mods, I tend to increase the top end of the rpm range more, to get more horse power. While other tuners simply say - replace the clutch and dmf if it starts to slip/vibrate and if the oem clutch isn't strong enough - replace it with something else.

The other point is what the customer expects. If you manage to explain him, that a lower torque increase will be better for his cars it is fine. But he may compare your tune with a harder tune and not be happy with the results, not thinking about the car. I have also had requests for a very strong tune, for a cars with 450 km on the odometer. As for driver wish maps - you can increase only the 100% end and use the extra power only when needed, you can increase the lower end - the car will feel more lively, but should produce higher fuel consumption. You can decrease the lower end for economy, BUT... I have had customer, that say: "I never use more than 70 percent of accelerator, because it surges the engine" and suddenly with the giving it max at 100% approach I am the worst tuner in the world because the car goes exactly the same. After a few similar experiences I increase the DW at almost the whole range by some percent, just for the car to "feel" more alive. I have done experiments with lowering the DW on the lower part - customer said that the car was very lazy, he pressed the pedal too much and fuel consumption increased. So it is not always the way you intend things to happen.

As for the mod itself, things I would do different (again, don't know if better):

1. Increase DW by 5% from the start.
  2. Increase TL less for 1750-2750 rpm and a small bit more at the top range. (20% in nm gives a bit more % in IQ)
  3. Decrease the maf tables a bit more from lower maf readings (they are low already).
  4. Change the SOI by a degree on the whole table and 2-3 degrees after rescaling for the new IQ. (This is a sensitive topic, many opinions here). Leaving it stock is a good idea for a safe remap 😊
  5. Wouldn't increase requested turbo pressure so much at low rpm - it may spike because of that from my experience.
  6. EGR - another thing of debate. I would turn it off just because it gives too much trouble by clogging the intake system.
- Maybe the tuner wanted extra money for that or believe the repair when broken approach 😊

Things that seem wrong:

1. Locked out on some IQ limiters. Some IQ limiter are lower than the main TL, can't find a logical explanation for this one.
2. Boost increase at lower IQ and no rescaling. From my experience lowering boost at lower IQ ,increase economy.

As for rail pressure - I doubt that he did now know the SVFP limiters. I sometimes increase the rail pressure by percentage

and leave it a bit higher than the limiter. The requested fuel pressure will be set at the SVFP value. Maximum rail pressure increase is a sensitive thing and usually gives trouble by overshooting or undershooting. I touch it only on the cars that I have or I know it works flawlessly. I remember tuning a 1.9 JTD Alfa, touched the SVFP limiters, and after giving full load car went into limp mode with a dtc of overshooting the fuel pressure. I believe the regulator control map needs adjusting, but it is a lot easier to leave it stock than to play and get it 100% right. You could develop a 100% perfect tune on a dyno, doing a lot of tests and runs, but the car would become golden then 😊

As for DW at 5000 rpm - it makes no difference at all, because TL is lower.

Overall the file is not bad and not perfect in my opinion (which is usually wrong 😊)

**Conclusion:**

Thanks to everybody!