

Volvo 850 T5



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Introduction:

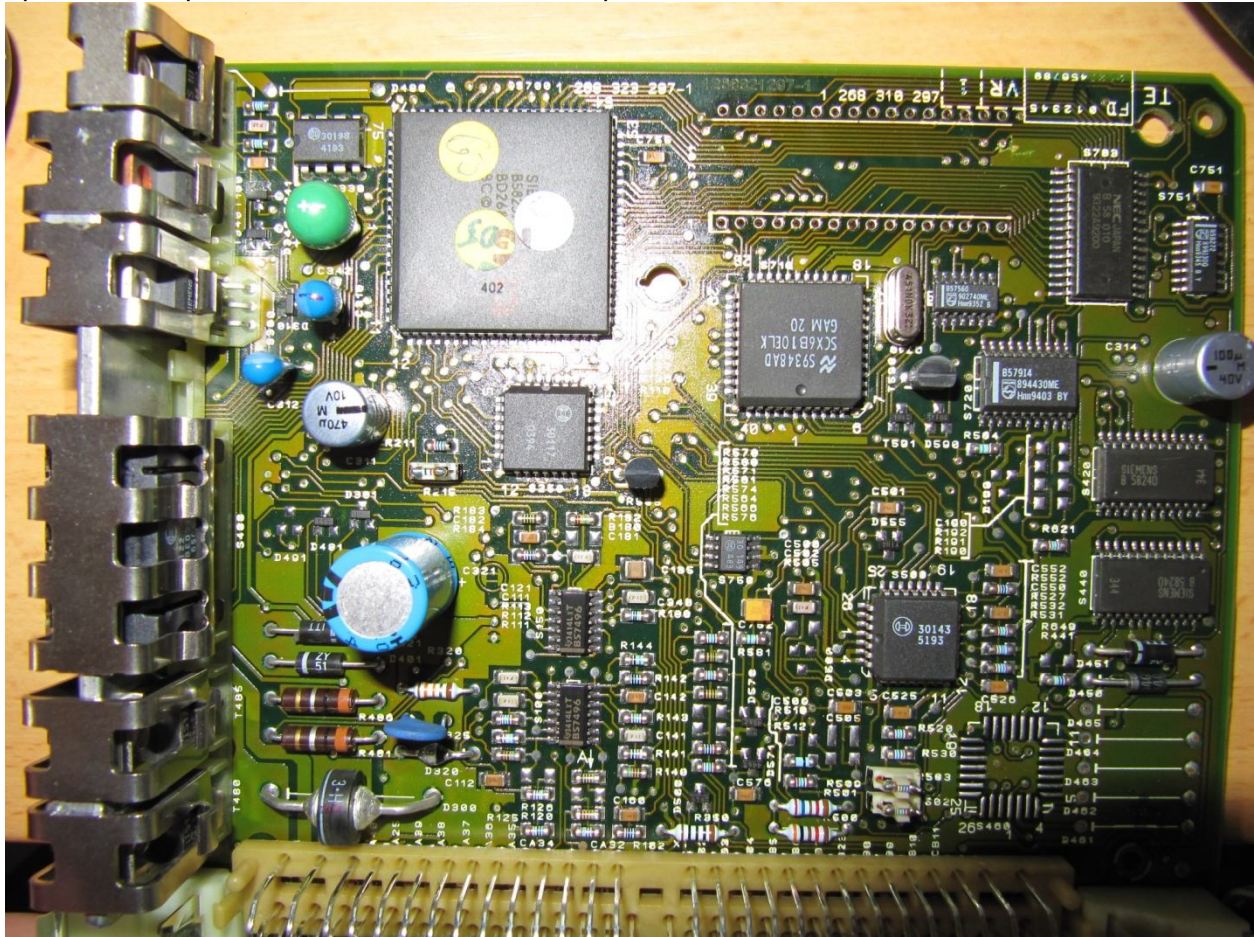
The Volvo 850 T5 uses a Motronic 4.3 ECU. This car has a 28F512 EEPROM inside which is soldered onto the board. To tune this car by yourself you need the following:

- New 28F512 chip (not necessary, but better) cost around 7 euro.
- DIP32 socket cost around 1 euro
- A programmer which can handle a 28F512, I suggest a GALEP 4 or 5, but others also will do the trick. Please do not use a Willem programmer, they just screw your file up often! A used Galep or similar programmer costs about 100-200 euro.
- Edit software like WinOLS, TunerPro or ECM2001. TunerPro is freeware and able to do the editing.
- A solder station can be bought for 20 euro second hands.
- A bit solder and litze (desolder-wire) can be bought for just 5 euro.

The socket, litze, solder and the chip can be ordered from Farnell or another electronic supplier. The programmer and solder station can be bought second hands on eBay or so. Tunerpro is freely downloadable.

Getting started:

Open the computer and desolder the "old" chip. The ECU then looks like this:



Picture X.X: The ECU after desoldering the chip

Remember that the gap on one and of the chip was facing towards the left(if we look at picture X.X).

Next step is to read this chip using our programmer. Set the programmer up for the 28F512 device and save the file when you read it as "my_original_T5.ori".

At this point we have the original file out of the car. Now we need to modify the file to gain more power. To modify the file I love to work with WinOLS, but if you cannot buy this TunerPro will also do.

Finding the maps:

These are the maps that needed to be changed to create more power from your T5.

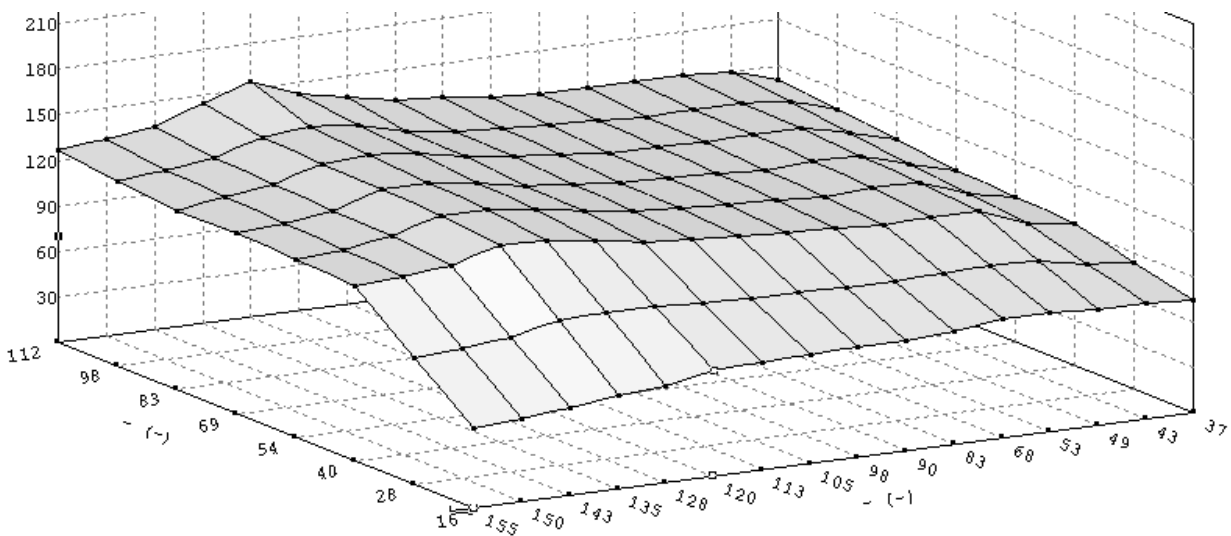
- Turbo Control map
- Turbo limiter map
- Fuel correction map

You probably have no idea how you can even find those maps. So I made it a bit simpler for you. I marked the addresses where the maps are and how big they are:

Map:	Address:	Size:
Turbo Control map	F8C9	16x8
Turbo limiter map	FA4F	8x1
Fuel correction map	EC62	16x16

Changing the maps:

Turbo control map:

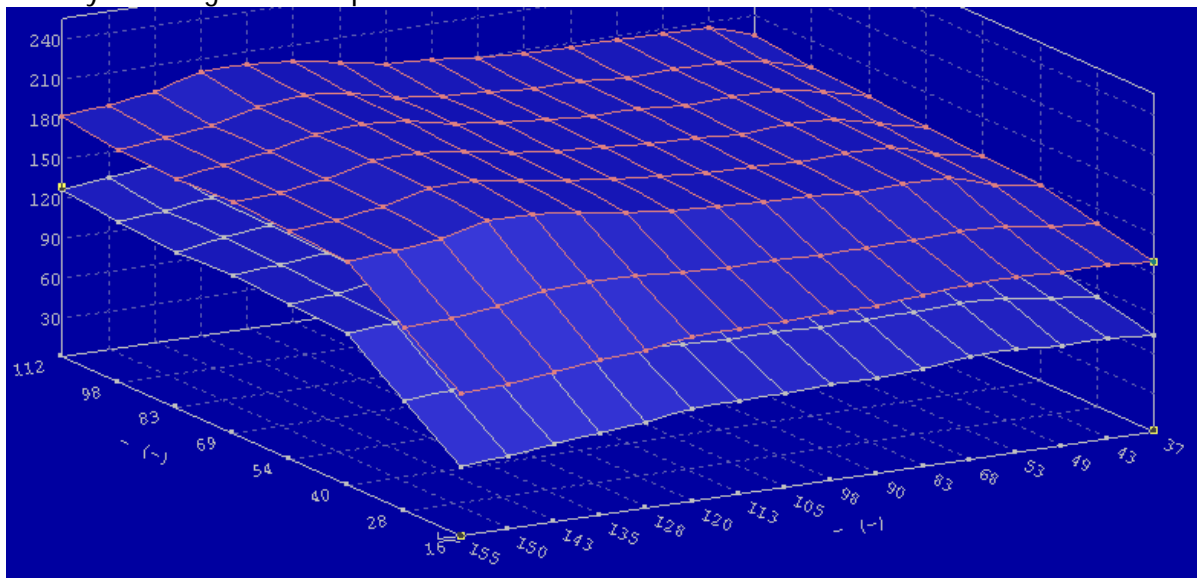


As you can see the axis from 37 to 155 is the RPM. But how do we get "readable" rpm values? Just multiply the value by 40. If we do that we see a range from $(37 \times 40 = 1480)$ up to $(155 \times 40 = 6200)$. So we have a range from 1480 to 6200rpm on the X-axis.

The Y-axis is Load. Value 16 is low loads, value 112 is high load.

The output from this map is in absolute pressure. So we can see that at the highest point of this map the turbo pressure will be about 1.55 bar absolute pressure, which means 0,55 bar boost.

Now we want to change this. The stock turbo of this car can produce around 1.05 bar boost. The next step is to adjust the map to 200, which means that we let the turbo make 2.00 bar absolute-boost, that is 1 bar boost. So we are on the safe site of the limitations of the turbo. When you changed the map it should look close to this:



As you can see the Turbo control map is raised to produce 1 bar boost. If you are not sure about how good your turbo is, just make your map a bit lower. If you stay below the margins I gave in this example you are on the safe side. The red curve is the modified map!

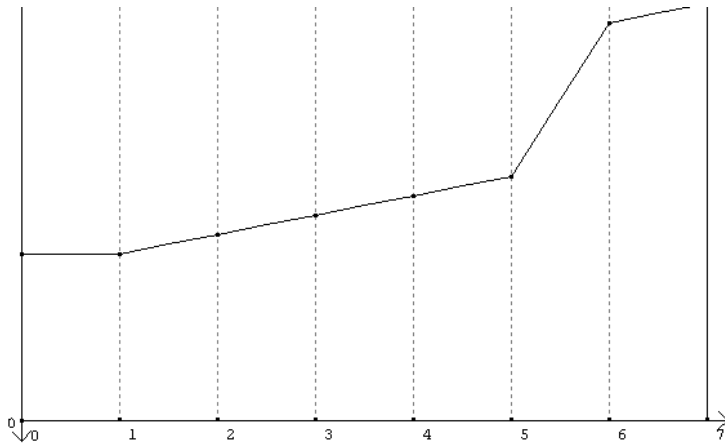
The Text-view of the turbo map original:

-	-(-,-)/-														
	37	49	68	90	105	120	135	150							
	43	53	83	98	113	128	143	155							
16	74	76	78	78	74	72	72	71	70	70	64	62	58	55	53
28	84	87	93	94	93	92	92	93	93	94	97	97	96	89	84
40	94	98	110	110	109	111	112	114	116	119	125	129	130	121	117
54	96	102	113	114	112	114	115	117	120	124	130	134	134	125	120
69	98	106	115	116	114	116	117	119	122	125	132	136	136	126	122
83	102	110	117	117	116	118	118	121	124	128	135	138	136	127	123
98	106	115	119	119	118	120	121	123	125	129	138	141	138	129	125
112	110	120	122	122	122	122	124	128	130	136	143	155	145	134	130

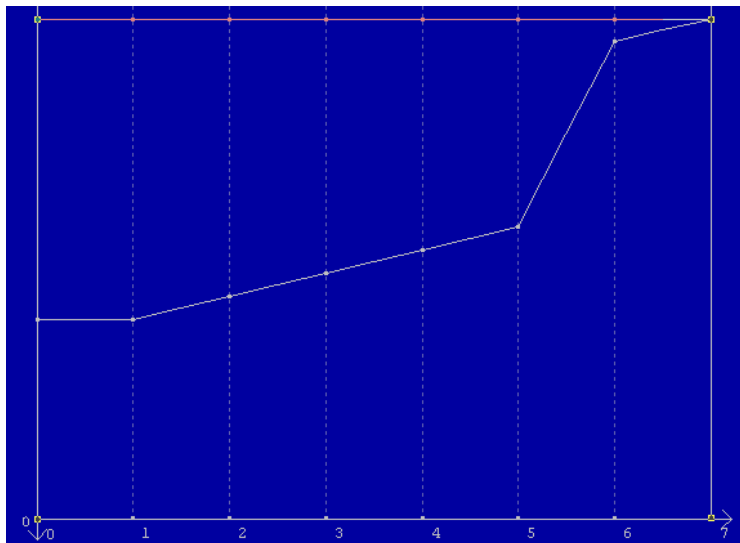
The Text-view of the turbo map modified:

-	37	49	68	90	105	120	135	150								
	43	53	83	98	113	128	143	155								
16	129	131	131	133	133	129	127	127	126	125	125	119	117	113	110	108
28	139	142	148	149	148	147	147	148	148	149	152	152	151	144	141	139
40	149	153	165	165	164	166	167	169	171	174	180	184	185	176	172	170
54	151	157	168	169	167	169	170	172	175	179	185	189	189	180	175	173
69	153	161	170	171	169	171	172	174	177	180	187	191	191	181	177	175
83	157	165	172	172	171	173	173	176	179	183	190	193	191	182	178	173
98	161	170	174	174	173	175	176	178	180	184	193	196	193	184	180	177
112	165	175	177	177	177	177	179	183	185	191	198	200	200	189	185	182

At this point the most important thing is done: Changing the turbo pressure.
BUT: The T5 computer is a smart one, it has a boost limitation map. This small map looks like this:



So this map will limit our changes we just made in the turbo map. To change this map we just need to think logical. We didn't want more boost than 1 bar. So that is 2.00 bar absolute pressure. So this map must be set at 200 over the whole line. That way the map will look like this:

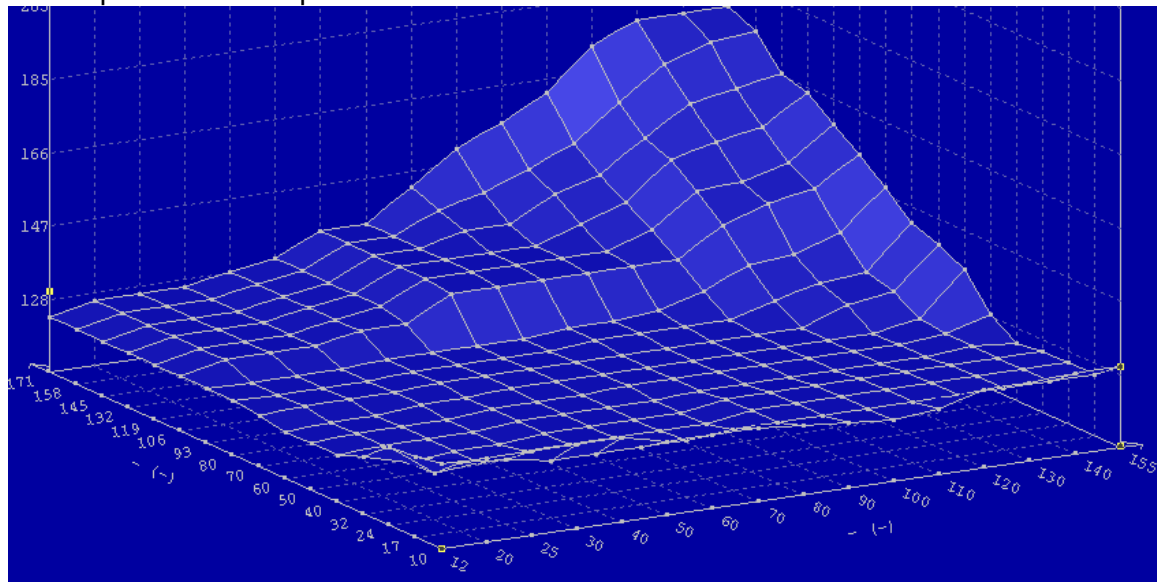


At this point we have the turbo pressure we want for the car. This computer calculates the needed fuel based on the air mass sensor. So we add more air into the engine by increasing the turbo pressure, **the computer will automatically add the right amount of fuel!**

The engine will become a bit hotter due to the more power it has now. So we need to cool the engine using fuel. That sounds weird, but yes, we cool the engine with fuel.

So we need to change the map that gives a correction on the amount of fuel which is injected into the engine.

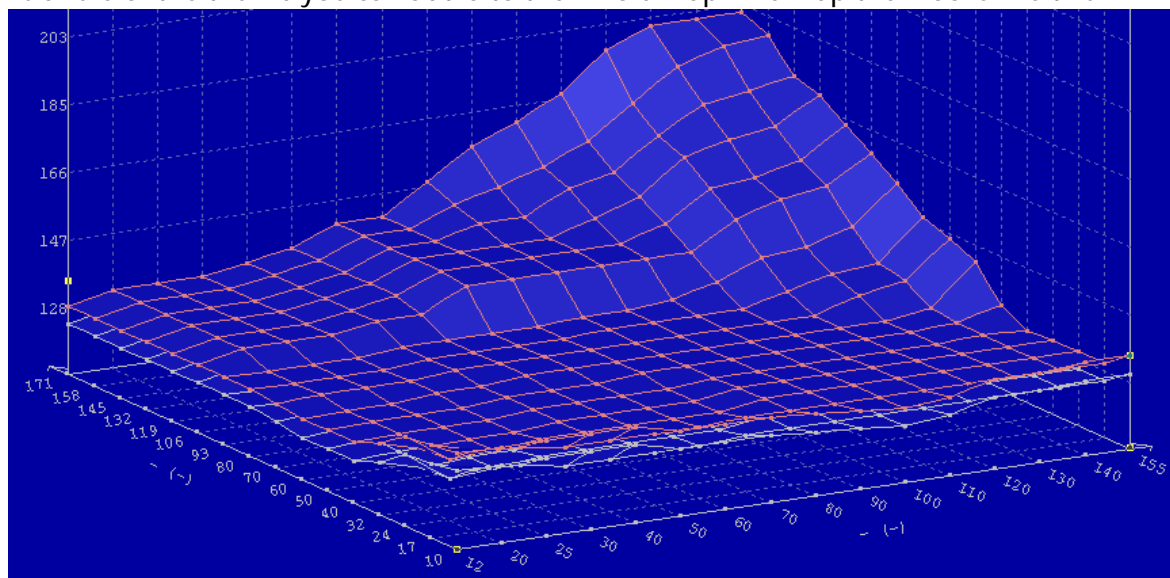
The map is the fuel map and looks like this:



Again you can see that the value 12-155 is rpm (if we multiply it with 40) and the other axis is the load axis.

The height of the fuel map is the correction onto the amount of injected fuel. Value 128 means no correction. 127 means decrease the injected value by 1, and 129 means increase the injected value by 1.

As a rule of the thumb you can add 5 to the whole map. The map then looks like this:



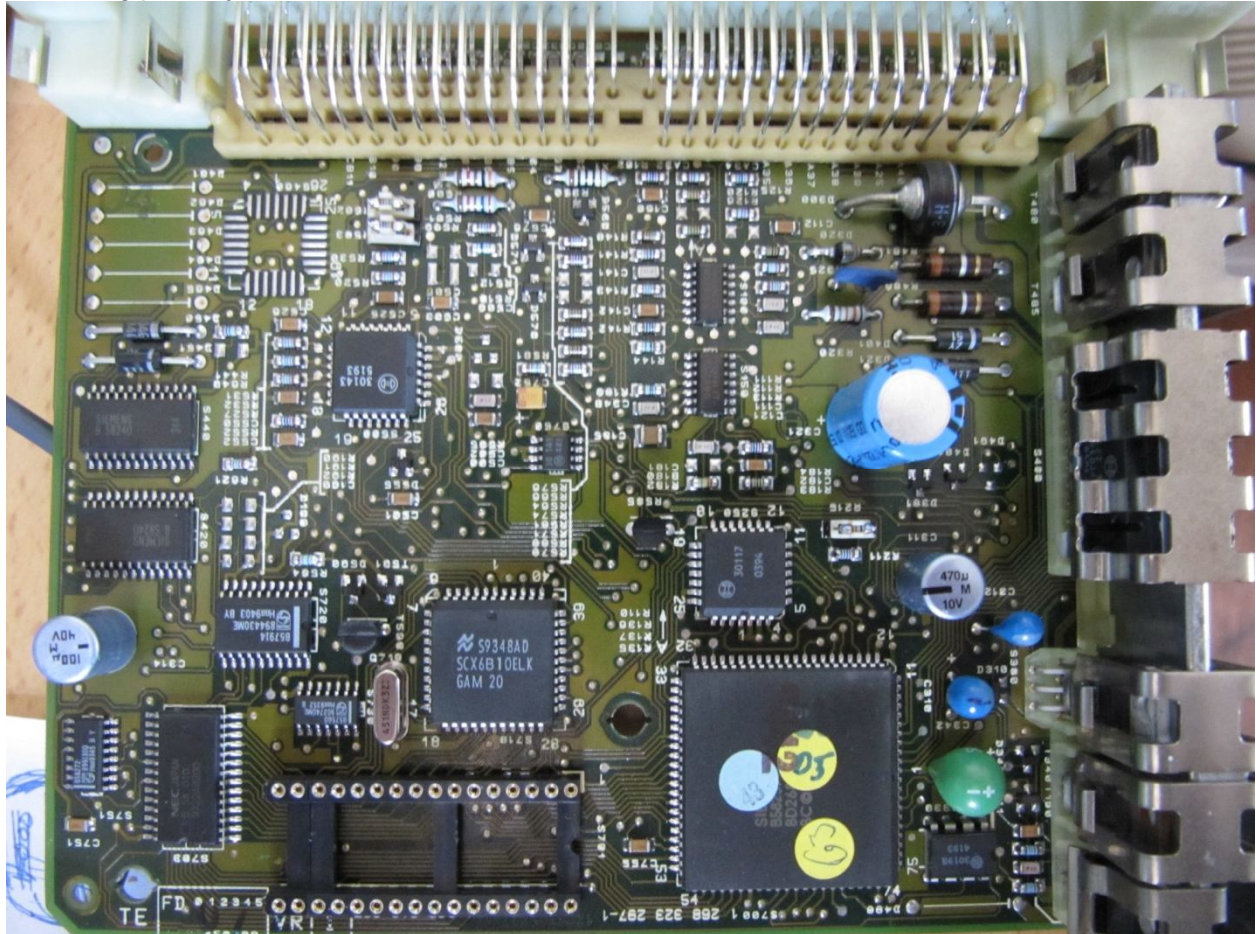
At this point we have set all the parameters right. We just need to correct the checksum (only when you are using ECM2001 or TunerPro). WinOLS does auto-change of the checksum.

Then we save the file as: "my_modified_file.mod".

Now we created our own "fast" file for our car. Mind that the values I gave in the examples above are all tested in a 850 T5 and works fine.

The finishing touch:

Now we need to program the modified file onto the new chip. When we have done that the remaining part is just to solder a DIL32 socket onto the board. The board then looks like this:



At this point we only need to put the chip into the socket (hole on the right side if we look to this picture) and plug the ECU back into your car.

Conclusion:

All information I gave is for DIY-purposes. I do not take any responsibility if you broke your turbo, engine or anything. The examples I gave are all tested. Once you have a bit experience you can start changing your maps the way you like them. For automatic cars I suggest to raise the turbo pressure from higher revs, not from 1480 rpm but a bit higher. This is done in order to keep your transmission in good condition.

When you are unsure about how to install this, or want to have the empty chips or sockets I can deliver the chips and sockets. If you lost your original file or chip I also can help you.

I do not want to make big money out of this, I just want to help you all, the DIY tuners.

Rest me to say that I hope you enjoyed this guide, but even more enjoyed your car after these modifications!

Cheers!