Caution!

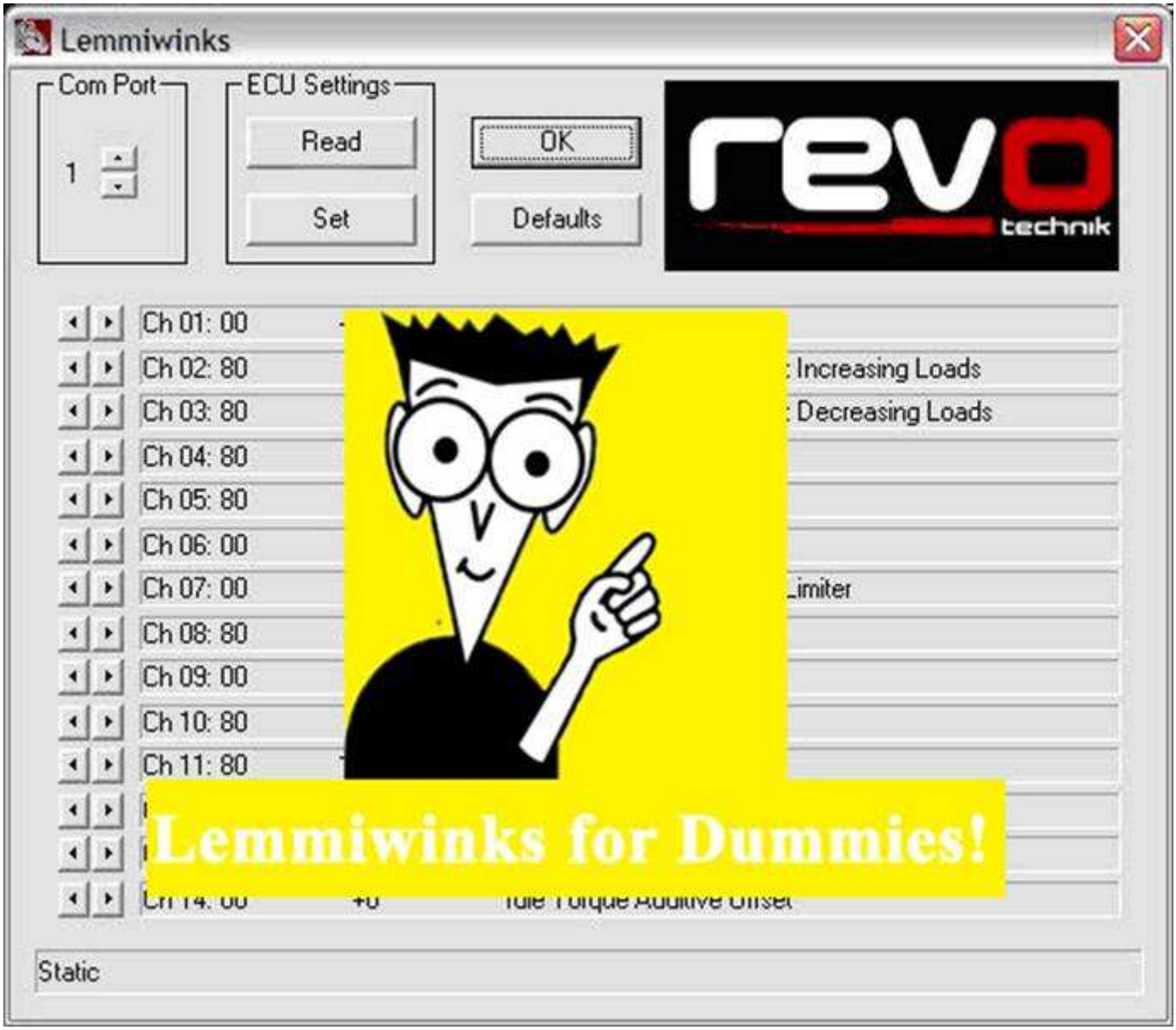
This information is purely for educational use. If you choose to use this information to alter your car you agree to take FULL RESPONSIBILITY for your actions.

You should not alter anything on your car unless you FULLY understand what it will do and how it will affect your car.

Basically if you blow it up your car it is not our fault.

If you'll like to add to this document please feel free to post or email me @ edyjun1@mac.com.

Tuning/Lemmiwinks/Fueling/Intake Notes ver 2.7



Ch01 : Idle Speed Offset

Adjust idle RPM level
- Higher number: increase idle rpm
- Lower number: decrease idle rpm

Ch02 : Fuel Tweak (Accel Pump); Increasing Loads
-This channel adjusts a fuel enrichment under load
-Modulates Throttle Response

Ch03 : Fuel Tweak (Accel Pump); Decreasing Loads
-This channel adjusts a fuel enrichment term coming off the gas or decelerating.

Ch04 : Start Up Fuel Enrich
Amount of fuel on any start ups?
- Higher number: enrich the mix
- Lower number: lean out the mix

Ch05 : Warm Up fuel Enrich
Amount of fuel on start ups E.G. on the first start in the morning?
- Higher number: enrich the mix
- Lower number: lean out the mix

Ch06 : Lambda Regulation
Controls how fast ECU adapts:
- Higher number: faster adaptation
- Lower number: slower adaptation

Ch07 : Additive Offset To Speed Limiter
Controls speed limiter in increments ok 1km/hr

Ch08 : Secondary Fuel Tweak
It adjust gain on the injectors response
- Higher number will increase the injector response (smooth out the ride)
- Lower number will decrease injector response (decrease backfires)

Ch09 : Ignition Timing Offset
Controls timing in steps of 0.75 degrees, all RPM range is altered
- Higher number advances timing
- Lower number retards timing

Ch10 : Primary Fuel Tweak
Controls fueling on run, usually change multiplicative fuel trims
- Higher number enrich the mix
- Lower number lean out the mix

Ch11 : Unused
Unused

Ch12 : SEL Scaling (Turbo Cars Only)
Adjust fueling maps according to boost settings
- Higher number increase injection period for higher boost
- Lower number decrease injection period for lower boost

Ch13 : OFF OFF
Unused

Ch14 : Idle Torque Additive Offset
Controls engine load at idle

- Higher numbers: spec load at idle is increased
- Lower numbers: spec load at idle is decreased

Aditional Information from Revotechnik:
Adaptation Channer Explanation
Revo Comparison of Adaptation Channels and Tuning

Download Lemmiwinks Now from Ecodetuning
Download Lemmiwinks Now from Unixprohost

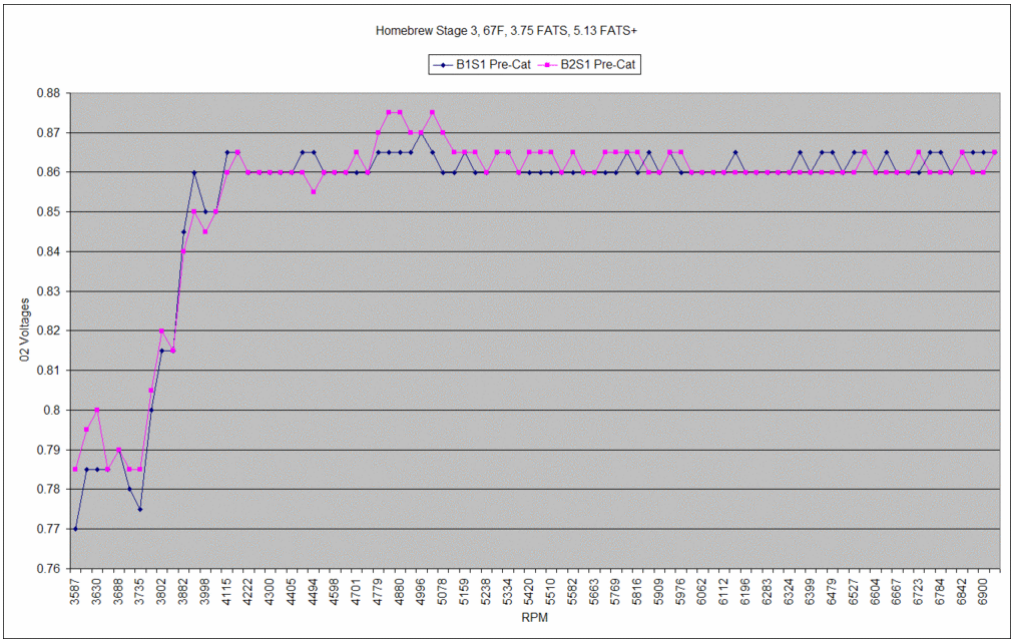
How to:
1. Place key in ignition, turn to on position.
2. Attach VagCom 'dongle'.
3. Bring up Lemmiwinks software
4. To store original ECU settings Click ON "Read". This reads your current settings.
5.Adjust settings at will.
6.Click on 'SET' to connect to the ECU and adapt settings.
7. When asked to cycle ECU, simply turn it off, then turn the ECU back on.
8. Enjoy (hopefully) new settings.

Hints
1. Take off your Instrument Cluster Fuse if you can't establish communication with the ECU. clear airbag DTCs.

Special thanks to Don R, MRP2001GTi and BMFJETTA for great information.

Some guidelines:

- Get the WOT set right using primary fuel adjustment before messing with secondary fuel, or any other settings for that matter.
- You want to make small changes to see how it affects everything. I would recommend doing 2% changes in Primary for fine-tuning.
- Keep an eye on your FATS time for overall performance.
- Try to get the WOT right and part/idle should fall into place. Primary affects idle, part throttle, and WOT. The ECU can compensate at idle and at part throttle so use primary to adjust WOT.
- Primary will adjust idle and part throttle as well, but hopefully within a range that the ECU can still compensate (+/10% at part throttle is fine, over that and you may want to re-evaluate your primary settings and WOT fueling).
- LTFT's (Block 032) of <+/-25% can be compensated by the system, so get WOT fueling right first, the ECU will adjust out anything <+/-25% at part throttle or idle, but it will respond to lemmi tweaks at WOT. <-/+15% ECU will have a code, <-/+25% ECU will have code and give you CEL.
- Adjust these with the car warm (Coolant pointing @ middle).
- WOT – tune for O2 V's of 0.85-0.87, (0.875 if you are using 91 octane) which equates to about 11.3-8 AFR – remember that is Narrowband and not nearly as accurate as required for proper tuning (just break down and get a wideband already).
- If your O2 v's are in the 0.88-0.9 you need to **pull** Primary.
- If your O2 v's are in the 0.78-0.8 you need to **add** Primary.
- **Here is what a good O2 graph looks like you want to be very close to this (K04 Turbos, RS6 wheels will not look like this). (Keep in mind some cars like to run richer and will perform better that way.)**



- Primary fueling should be adjusted in proportion to the size difference between stock and actual, in the combo of MAF size and injector size – see these posts for injector and MAF size and flow (EdyJun's S4 Directory: It is all about the Injectors , MAF size)
- Try to keep your injector Duty Cycle less than 120%. You can do this by lowering your Boost. (EdyJun's S4 Directory: 150% Injector Duty Cycle)
- At part throttle (up to a certain point, I don't know where – depends on the coding, some say dependant on the chip – i.e. GIAC vs. APR may switch at different load points) the ECU uses closed loop feedback to maintain stoich, then at WOT (or some point of greater load) the ECU simply uses lookup tables for MAF and inj duty cycles to dump fuel, and pri/sec fueling will affect this.
- Closed vs. Open loop - at part-throttle, low load, you will run in closed loop with ME7.1 trying to maintain stoich via O2V's. "It all comes down to load, which is usually determined by MAF, the open/closed loop mode switchover varies with the chip used and your intake setup. The best thing to do is to log g/s, load and AFR and watch for any correlations."
- On GIAC X (K03 code) the "sweet spot" seems to be between 255-285 g/s. If you can try to keep with in this range at high RPM. You may want to look into different MAF housing. (MAF size)
- "Fuel dump" can also be triggered by high EGT, if the ECU sees EGT hit or pass 980 C it will add fuel to try to cool it down. Try to make sure you don't reach 980 C on the EGT, make sure your car is not heat soaked when you are tuning or logging. (EdyJun's S4 Directory: EGT hit 980C)
- You want to log your setup a few times just to make sure the ECU isn't doing something unexpected. i.e. if your heat soaked, or EGT is too hot the ECU will compensate for it.

Secondary Fueling:

Mike Moore: As far as I can ascertain it affects injector pulse-width as a function of gross changes in MAF/LOAD but it really doesn't do much of anything until you tweak the crap out of it.

Startup tuning:

1.) You need to hook up a wide band so you can monitor fueling changes at startup, warm up, and WOT. Believe me, in climates that vary through out the year, EVERY car needs to be tweaked to get optimal performance.

2.) "My part throttle is very smooth on Green Tops. I can set the cruise control and watch the AFR adjust real time and hold stoich as well as logging 001 in VAG."

3.) If you had a wide band hooked up you can monitor the fuel on cold starts to see if it's lean or rich. THEN you adjust the Start up and Warm up enrichment and your misfores will go away. If your car is too rich or lean, there is no question it will misfire. FYI - any injector and any fueling kit will do that.

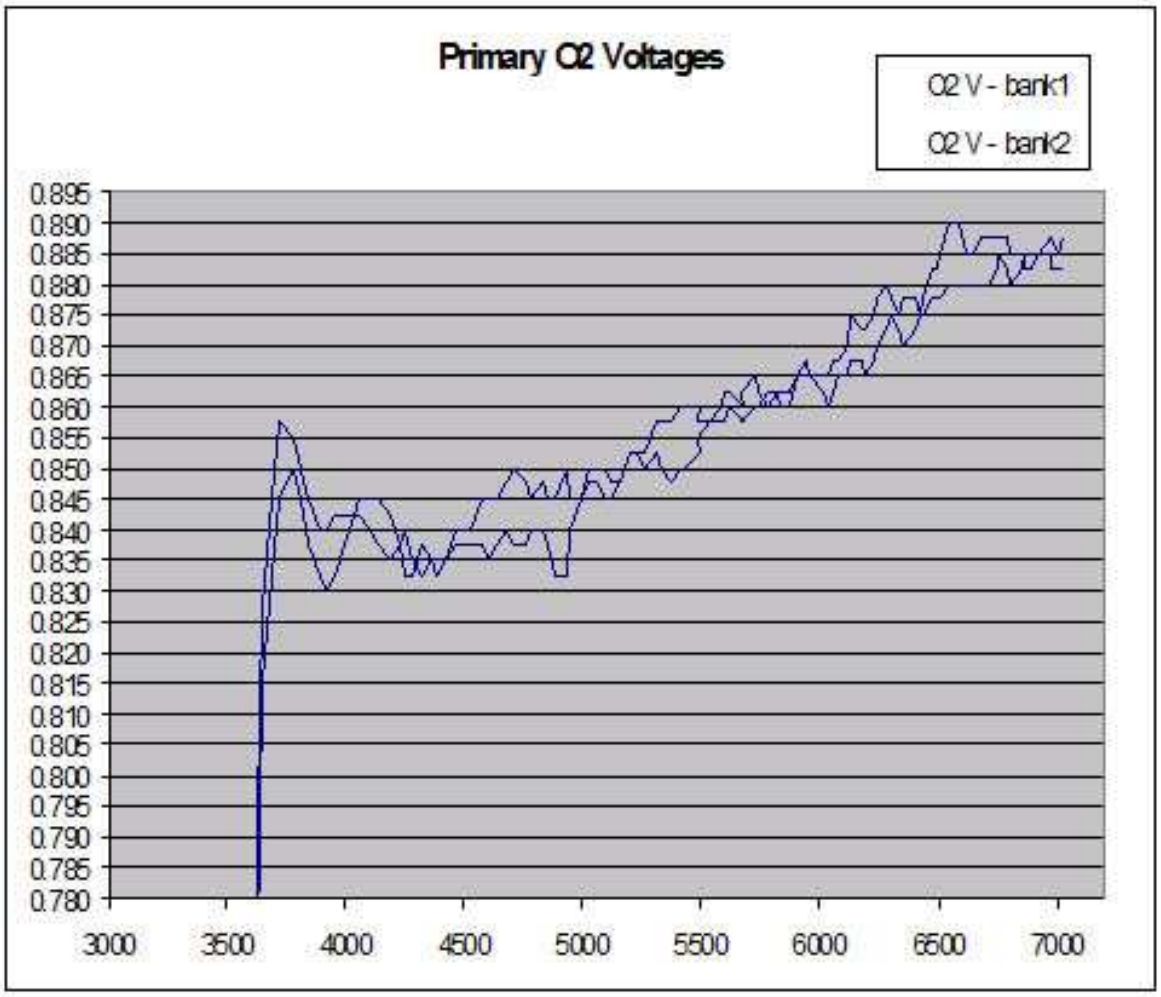
Stoich: 14.7:1 Air to Fuel Ratio

O2 Sensors: b2 = drivers side, b1 = passenger side, s1=precat, s2=postcat

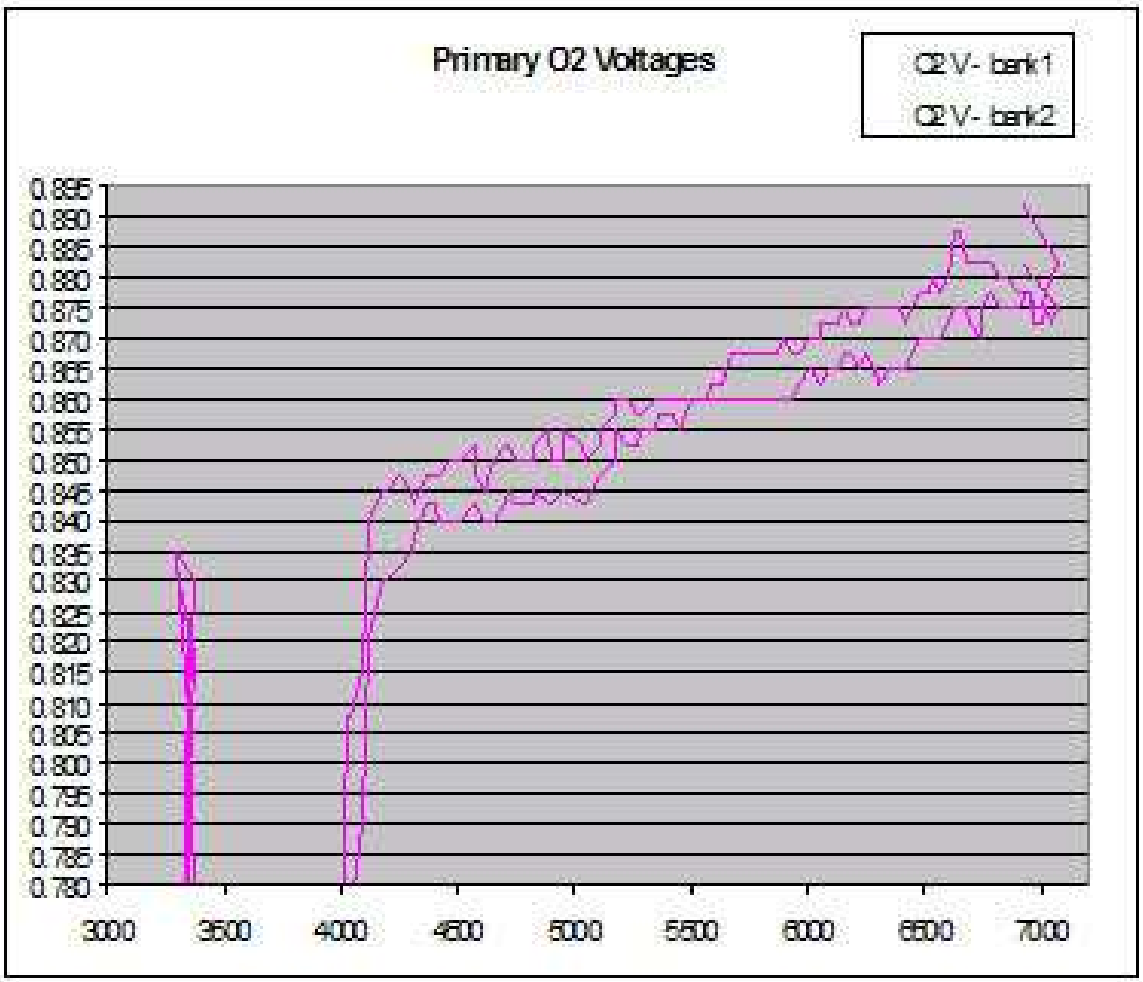
Some notes on Increasing loads settings:

All the load settings affect one another. The increasing loads seems to do it's work when the MAF readings are rapidly increasing, once it starts to level out in the higher end of the RPM range its effect is minimal. Decreasing loads is basically good for reducing the pop when you go off-throttle and making trailing throttle/lift throttle a bit smoother since most of the time the injectors shut-down when you let off the throttle anyhow.

All the other variables are pretty much the same. This **is 90% increasing**:



This is with 150% increasing:



Now you see on the initial punch, it was with a dip, and after bumping up increasing we actually smoothen out the dip and the car was faster!

Notes on Correction Factor (CF)

CF is the amount of timing that the ECU is pulling back from the overall advance. It is a function related to the Knock Voltages (KV), you want our KV to be about 24 for cylinder #2 and 5 (they are the closest to the sensor so they will see the highest KV). It is crucial to keep CFs low; I would say fewer than 12. The max CF is somewhere from 15-21, depending on who you ask. We are not shooting for 0 per say. The way I look at it, you want to tweak your timing for low double digit CFs in the hottest weather you'll ever possibly encounter so your car can adapt for cooler weather and still be safe for insanely hot temperatures. On the other hand, you can constantly tweak your timing for different weather conditions if you must.

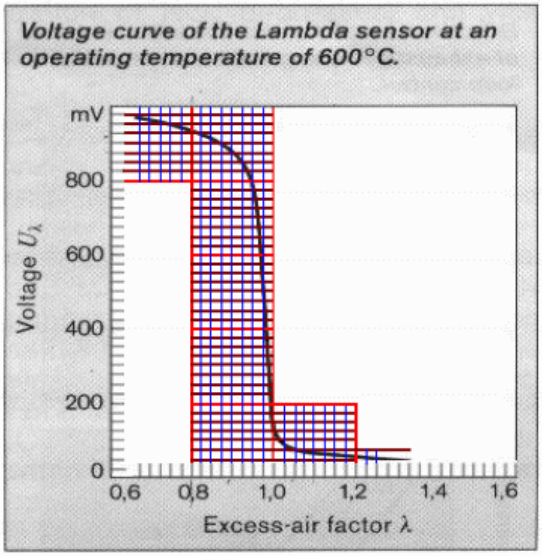
Mike2kS4@PEB - Mike Moore**:**

"Just remember to clear codes when you change fuel (Octane rating) or make other changes (Fueling or hardware) or your old CF values will stick for a while." Others have disputed this, but the fact remains that the computer does adapt, and it will adapt more quickly if the ECU is pulled (for about 20 min) and it has to learn "fresh" vice after changing lemmi settings.

Just remember: **Tune for high single digit CF's in the hottest weather your S will ever see. KV may be high, keep CF's low, and timing high** Timing is the desired timing minus the CF which is derived from KV's, Motronic makes some calculations to get to CF, and CFs are what you should use to tune

Boost notes: with the hybrids – goal of ~1.65 Bar (23PSI) tapering to 1.5 Bar (21PSI) at redline, start off at about 1.5 Bar (21PSI) peak tapering to 1.25 Bar (18PSI) at redline.

At Stage 3-, you can get some power out of timing tweaks, go +1 degree at a time and log each change, track the max CFs at redline



Lambda	Air Fuel Ratio			
	Petrol	Alcohol	LPG	Diesel
0.70	10.3	4.5	10.9	10.2
0.75	11.0	4.8	11.6	10.9
0.80	11.8	5.1	12.4	11.6
0.85	12.5	5.4	13.2	12.3
0.90	13.2	5.8	14.0	13.1
0.95	14.0	6.1	14.7	13.8
1.00	14.7	6.4	15.5	14.5
1.05	15.4	6.7	16.3	15.2
1.10	16.2	7.0	17.1	16.0
1.15	16.9	7.4	17.8	16.7
1.20	17.6	7.7	18.6	17.4
1.25	18.4	8.0	19.4	18.1
1.30	19.1	8.3	20.2	18.9
1.35	19.8	8.6	20.9	19.6
1.40	20.6	9.0	21.7	20.3
1.45	21.3	9.3	22.5	21.0
1.50	22.1	9.6	23.3	21.8
1.55	22.8	9.9	24.0	22.5
1.60	23.5	10.2	24.8	23.2

EGT – Don't let these go over 980 deg C, at those temps, the EGT sensor will trip, it only works in a small range between like 945-1045 deg C, and if "tripped" it will signal the ECU to dump fuel, richening the mixture and reducing the EGTs. You can read temp using the O2 sensor temps, or by installing an actual EGT gauge

VAG Blocks: These are some of the more common ones used

002 Injector time and MAF
003 overall timing and MAF
004 intake air temp and coolant temp
015 mis-fire count cyl 1~3
016 mis-fire count cyl 4~6
20/21 Timing correction (CFs), or "timing retard"
22-24 Timing related data
26/27 Knock Sensor for Cyls 2/5
034 EGT temp bank 1
035 EGT temp bank 2
031 O2 voltage
032 LTFT
114 N75 Duty Cycle
115 Boost (Request and Actual)
120 Torque

Intake notes:

Modified stock airbox -> 90mm buehn MAF (Bosch sensor) -> Gonna have to go Custom to get to y-pipe, or use RS4 Accordion hose ($$).

The way the MAF housing is mated makes a big difference in MAF readings and consequently fueling

Make sure the opening in front of the MAF has no areas that could cause turbulence.

Our MAF sensors are very sensitive and even this little bit of abnormal flow is enough to cause bad readings.

Turbulence in the area before the MAF can give a falsely elevated airflow reading causing the car to give more fuel than is needed.

To retain the stock clips, use a hole saw to enlarge the opening in the air box top, the stock "collar" stays in place, it just gets thinned so the ID is larger.

One way to do it:

“The collar is the only thing that stays, you might have a shred of plastic holding it to the box when you are done cutting into it... but not much. You cut straight in through the collar until you have a hole that is all the way through, into the box. no restrictions. Then you take duct tape and make a form from the collar to the box. next you cover the outside of the duct tape with jb weld and let it dry. When its done you remove the duct tape and shave away any imperfections. Lastly you paint it to make it look stock.”

EdyJun's S4 Directory