

TunerPro Tuning

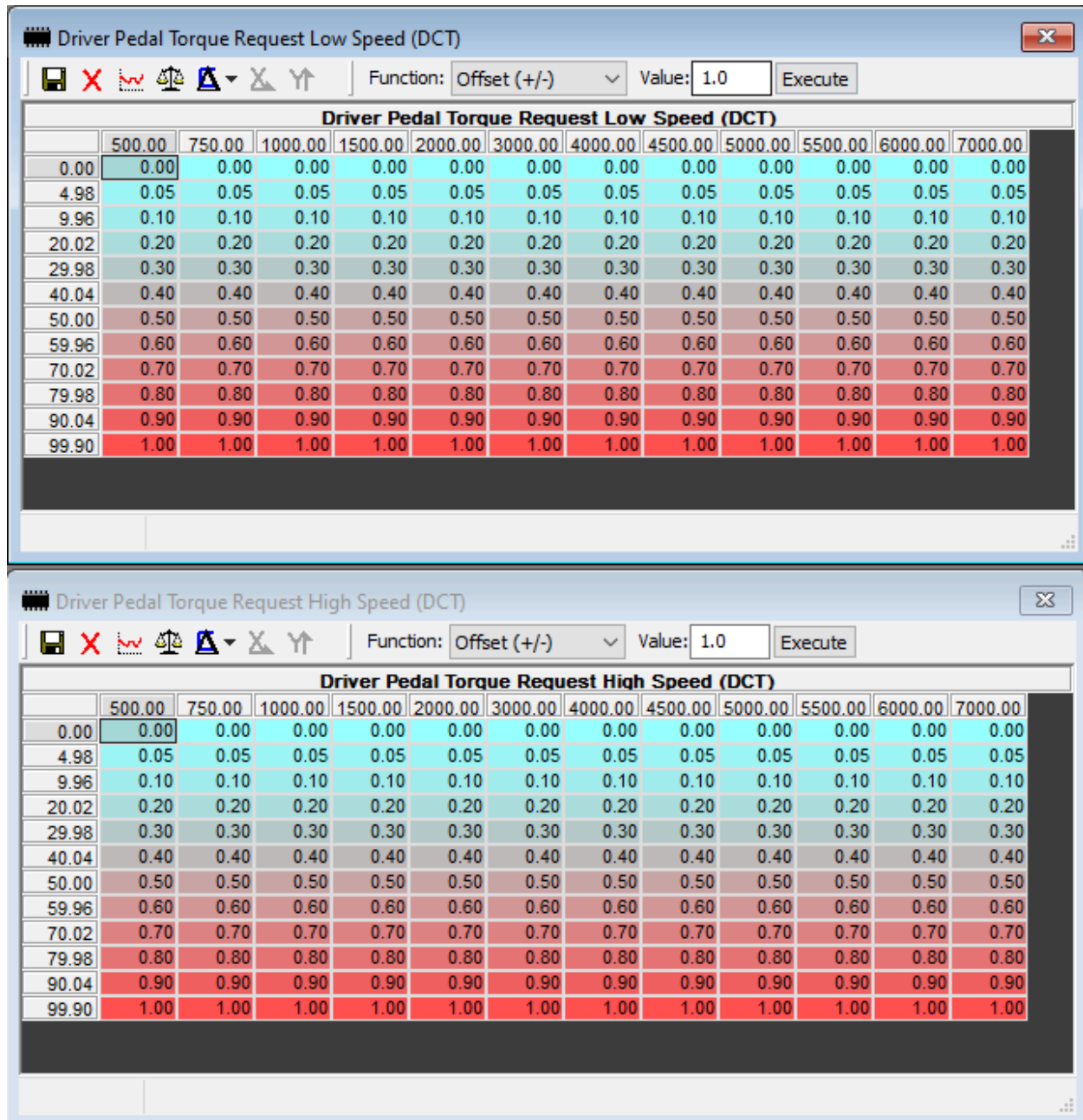
So, you got that fancy new hybrid going in along with all the other goodies, (MPI, LPFP, sensors, yadda yadda). Hopefully you've already been tuning your car using TunerPro and understand everything that was covered in the Basics guide, yes? Good, put on your big boy pants and let's get started.

Maximum Torque at Clutch

We don't want this to intervene at all. Move all the tables out of the way. We control power with boost and timing, there will be no torque intervention. Find the relevant transmission for your car (AT or MT) tables and move them up, 650 should be plenty.

[illegible]

Since we are running a flat torque request let's go ahead and make our pedal tables linear. Grab the two appropriate tables for your transmission type. Do both low and high speed.



Torque to Airflow

Our max torque is now 650. You want the last row to be a bit above that, like 600 to 620. Airmass at 600 should probably be close to 2,000. If you updated your tables using the Basic guide it might look something similar to this:

Torque	416.00	704.00	1024.00	1248.00	1504.00	1760.00	2016.00	2496.00	3008.00	3520.00	4000.00	4512.00	5024.00	5504.00	6016.00	6496.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25.00	99.87	93.34	88.59	86.81	90.20	87.36	85.80	83.68	83.30	84.99	86.31	87.11	87.36	87.03	86.14	84.74
50.00	173.92	175.62	168.92	158.92	151.88	147.52	150.36	143.57	150.78	142.77	147.47	144.04	151.08	141.07	140.65	140.22
75.00	248.91	254.13	243.99	226.91	217.84	219.66	221.74	213.64	215.08	209.96	217.08	215.00	214.49	214.75	218.26	218.09
100.00	351.16	336.19	314.57	296.35	301.01	294.35	287.61	288.21	283.97	271.84	285.58	283.42	280.79	282.70	287.78	289.78
150.00	405.67	452.68	452.93	420.55	449.37	440.81	438.48	428.01	430.04	412.92	420.12	412.92	414.61	414.53	419.83	422.75
200.00	401.81	561.53	579.08	491.17	558.27	572.73	581.50	562.76	555.56	539.83	552.25	552.59	544.07	544.88	545.17	553.95
250.00	659.07	694.64	695.02	670.77	769.62	798.66	723.84	701.34	677.34	673.06	677.39	685.27	677.43	682.22	689.30	664.03
300.00	810.40	809.51	809.51	810.15	858.98	868.94	853.77	836.69	804.05	805.06	815.32	814.18	815.45	803.83	791.20	787.81
350.00	944.40	944.31	944.19	944.14	937.45	890.18	971.36	977.63	945.92	945.71	946.35	946.35	930.37	933.25	919.73	952.15
375.00	1032.44	1032.27	1032.10	1032.06	1027.44	977.21	1037.40	1041.89	1009.59	1019.98	1008.83	1011.92	1005.86	1014.42	970.34	1018.07
400.00	1120.06	1121.84	1123.37	1124.17	1122.90	1069.79	1093.35	1110.01	1071.35	1087.08	1073.22	1076.06	1075.97	1086.15	1026.00	1082.88
425.00	1209.71	1214.25	1218.11	1220.10	1223.11	1140.79	1140.62	1180.29	1121.76	1143.37	1135.23	1132.56	1131.38	1143.37	1104.54	1141.68
450.00	1302.72	1307.63	1311.75	1313.82	1318.06	1211.54	1198.90	1256.34	1178.73	1207.17	1205.35	1196.83	1192.25	1206.62	1199.20	1208.31
550.00	1693.72	1688.97	1684.99	1682.95	1678.88	1605.29	1598.21	1598.38	1597.24	1600.76	1603.68	1601.27	1599.82	1600.80	1620.34	1601.82
600.00	1893.71	1888.96	1884.98	1882.94	1878.87	1805.29	1798.21	1798.38	1797.23	1800.75	1803.68	1801.26	1799.82	1800.79	1820.33	1801.81

That's 99% of the way there. Increase the last row (600nm) to 650nm and about 2,200 across the row. Done. Make same change to all TTA tables.

Airflow to Torque

I'll just leave this here again so it sinks in.

Between the TTA and ATT tables, it's important to keep a consistent and relatively accurate or realistic airflow – torque model. For a DSG car, it's even more important to send the TCU reasonable information so it's able to proactively set appropriate clutch clamping pressure. You often see tunes that under-report torque to the TCU and then the TCU is relying on its real-time microslip detection functionality to instead increase clamping pressure so it doesn't slip or to catch a slip. It's much better to get ahead of the issue than trying to bring back a clutch that's already slipping.

This is even more important now, especially if you are running E85 and gobs of timing pushing north of 420ftlbs in the 4k RPM range. DSGs are expensive, let's not ruin your clutchpacks. Grab one of your port flap low tables:

Airflow to Torque VVL 0 Intake 0 Exhaust 0

Function: Offset (+/-) Value: 100 Execute

	416.00	704.00	1024.00	1248.00	1504.00	1760.00	2016.00	2496.00	3008.00	3520.00	4000.00	4512.00	5024.00	5504.00	6016.00	6496.00
79.99	21.00	21.00	26.00	10.50	10.00	14.50	20.00	23.00	19.00	16.50	19.50	26.00	27.00	27.00	31.00	19.50
100.00	27.00	27.00	27.50	32.00	31.00	33.00	33.00	33.00	35.00	35.00	33.00	34.00	33.50	34.00	35.50	35.00
150.02	44.88	42.00	43.75	47.03	49.31	50.88	49.88	52.34	49.75	52.50	50.91	52.12	49.62	53.28	53.41	53.25
199.99	59.88	57.75	60.34	64.94	67.94	68.19	67.81	69.78	69.69	71.16	68.88	69.78	69.44	69.81	68.81	69.06
250.01	74.09	73.72	77.06	83.59	86.59	85.41	84.50	88.75	86.91	90.88	86.88	87.31	88.41	87.91	86.34	85.78
299.99	89.16	89.09	94.78	101.28	99.75	101.84	105.16	103.62	105.84	111.38	105.34	106.44	107.19	106.47	104.53	103.62
350.01	104.41	104.34	112.75	118.72	111.41	118.06	124.78	122.22	121.69	128.59	123.97	125.97	125.75	125.41	123.91	120.78
399.99	121.88	121.81	130.81	138.78	125.84	134.81	138.47	140.25	138.97	145.25	142.56	145.22	144.44	144.41	142.31	141.06
499.98	176.97	176.97	167.62	203.12	179.72	172.88	170.19	175.00	177.34	186.31	179.59	180.88	183.00	183.06	182.44	179.59
599.98	213.84	213.84	208.84	230.78	211.72	207.88	206.75	214.56	218.38	220.31	218.97	217.53	221.34	220.47	220.34	218.28
699.98	252.16	252.16	252.16	258.56	233.94	230.34	242.00	249.50	259.12	260.88	258.66	255.66	258.19	256.69	253.97	266.72
800.02	296.00	296.00	296.00	296.00	257.94	250.31	275.81	287.72	298.53	298.16	294.38	294.59	293.62	296.44	303.88	303.97
900.02	336.00	336.00	336.00	336.00	337.53	353.66	322.00	320.78	332.94	334.31	331.84	332.41	338.84	338.81	341.62	332.53
1049.99	380.00	380.00	380.00	380.00	381.09	394.00	380.00	378.00	391.00	385.50	390.97	389.50	390.00	386.50	408.50	387.09
1500.00	500.44	500.44	500.44	500.44	519.44	519.44	519.44	519.44	519.44	519.44	519.44	519.44	519.44	519.44	519.44	519.44
1899.98	600.44	600.44	600.44	600.44	600.44	619.44	619.44	619.44	619.44	619.44	619.44	619.44	619.44	619.44	619.44	619.44

Change the last row to 2200mg/stk on the axis. Make the entire row 700nm all the way across. Make same change to all ATT tables.

Boost

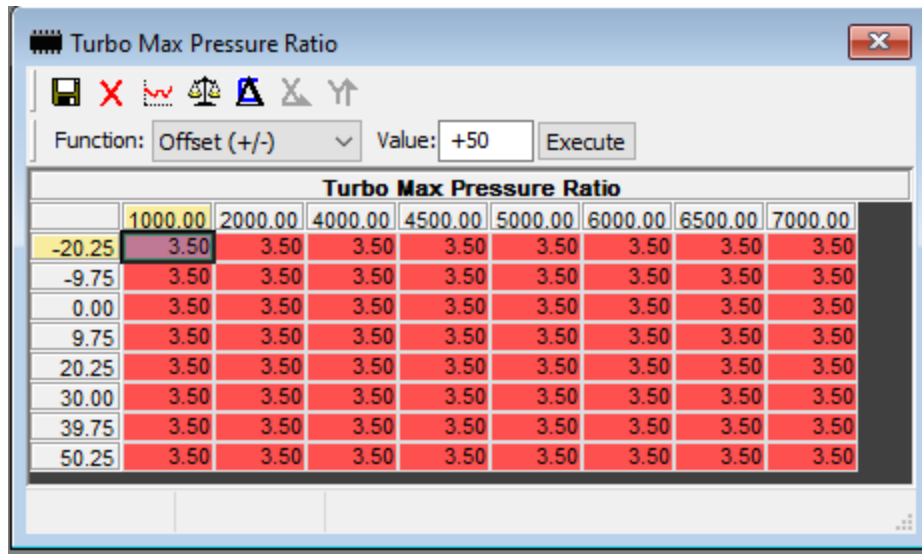
Set boost with PUT Setpoint table. I can't tell you how much boost your turbo can make before shitting it's turbine into your downpipe. If you just swapped on the turbo I'd suggest keeping it low to start, like 24-26psi flat and making sure it runs properly before adding boost. This is probably a decent starting point:

PUT Setpoint

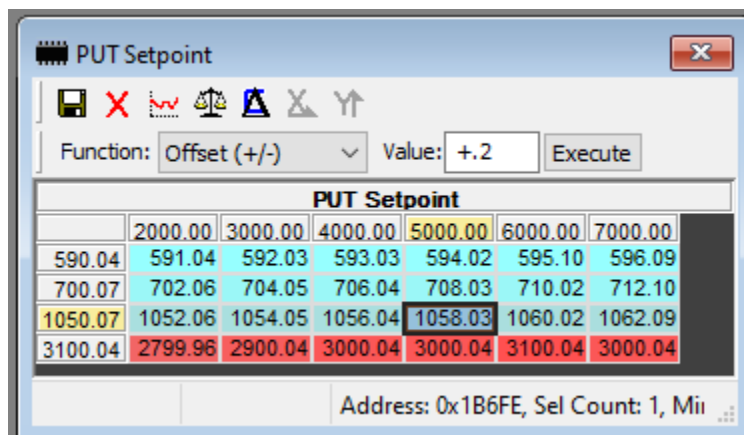
Function: Offset (+/-) Value: +.2 Execute

	2000.00	3000.00	4000.00	5000.00	6000.00	7000.00
590.04	591.04	592.03	593.03	594.02	595.10	596.09
700.07	702.06	704.05	706.04	708.03	710.02	712.10
1050.07	1052.06	1054.05	1056.04	1058.03	1060.02	1062.09
2699.96	2699.96	2699.96	2699.96	2699.96	2699.96	2699.96

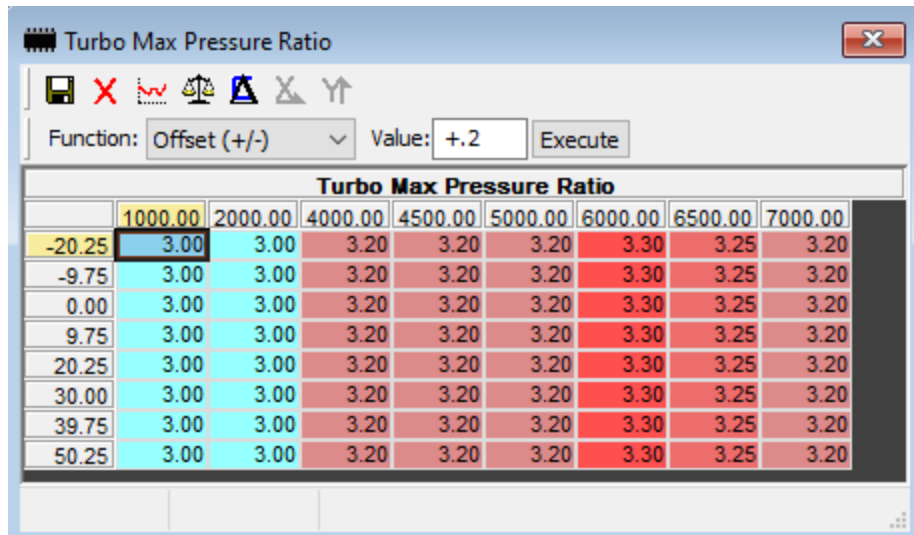
Move the Max Pressure Ratio table out of the way. 3.5 should be fine while you are tuning.



Your log should have Pressure Ratio data so I would probably cap it at like 0.2 above where you typically run your tune at your ambient pressure after you have finalized your boost curve. As an example let's say this ends up being your final boost curve:



Your Max PR table should look something like this:



Wastegate

Flow Factor wastegate tuning is fine for stock turbos but for hybrids and other aftermarket turbos it sucks. Time to go to Simple Wastegate (SWG). SWG can be added using BinToolz. Please see BinToolz guide on how to patch your bin for SWG.

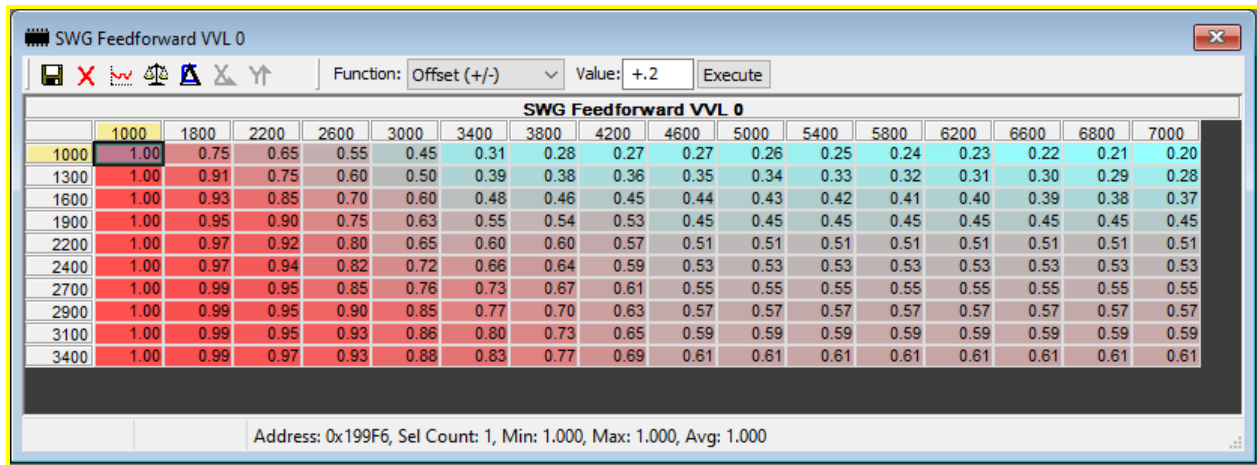
Step 1: *Start slow!* You did read above where I said to keep boost reasonable, right? You need to dial in your wastegate properly so it will actually hit your boost target without overboosting or underboosting massively.

Step 2: Apply the patch to enable SWG using Bintoolz. Good idea to also use the Check feature to ensure the patch was applied.

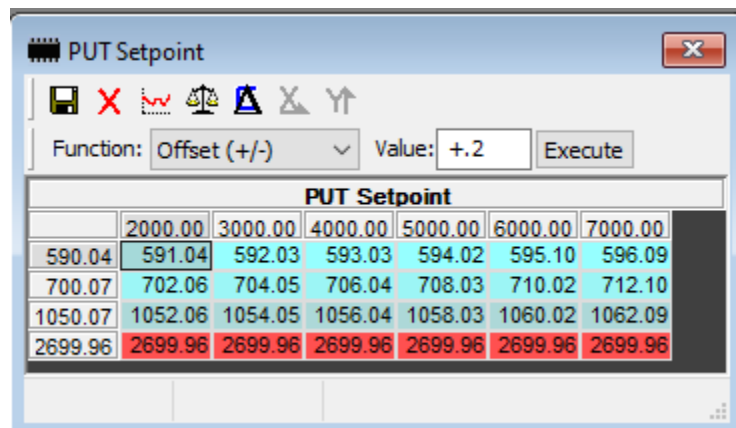
Step 3: Download appropriate XDF that contains SWG tables. Going forward you will only be modifying the two SWG tables. The original flow-factor tables will no longer be used, do not modify them.

Step 4: Adjust PUT SP (Y-axis) and RPM (X-axis) to your liking. If you plan on using flat boost then setting RPM won't matter much but if you want to taper up or down at a specific RPM then make changes to the RPM axis accordingly. Set a nice spread along the PUT SP axis going from 1000hpa up to a bit above your max boost you plan to run.

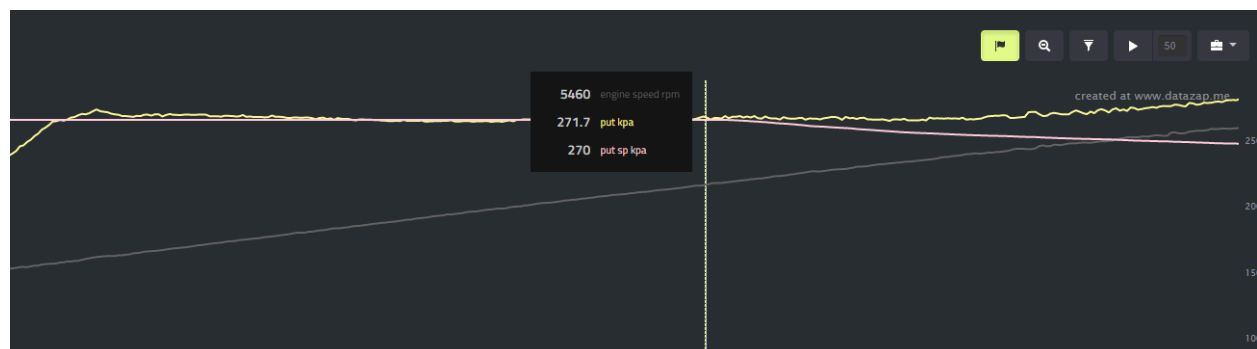
Step 5: Adjust the cells. Every turbo is different. Every setup is different. If it were me I'd probably not make any cell over 0.7 out past 4000rpm to start. This isn't a bad starting point:



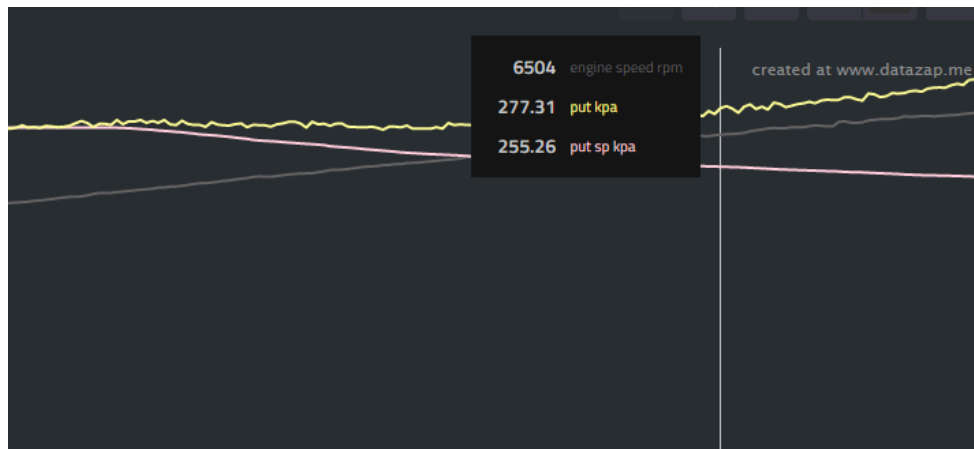
Using original starting boost example:



Go out for a spin and go WOT from 2500rpm. How does WG look? Did it underboost or overboost (compare PUT vs PUT SP in your log)? Adjust 2700 row on your SWG tables accordingly where it is underboosting and overboosting. Increase values to tighten WG to increase boost or lower to loosen WG to reduce boost. Example:



Looks good (perfect!) up to 5500. But after that it is overboosting. Not looking so great at 6500. WG needs loosening, more as rpms rise.



From our example above we need to work on the 2700 row:



Recall everything was set at 0.55 from 5400 up. I would lower everything above that by 0.03 increments along the 2700 row:

5800 to 0.52
6000 to 0.49
6200 to 0.46
6600 to 0.43
6800 to 0.40
7000 to 0.37

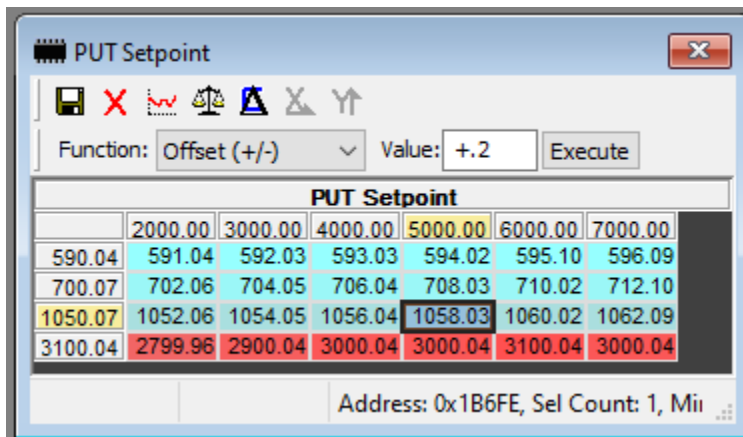
Remember, you can always change the axis. Having a hard time getting boost to stay on target between 6200 and 6600? Need more control at 6400? Change 6600 to 6400 on the axis. Change 6800 to 6600 and keep 7000 as is.

Eventually 2700 will get dialed in. When you are happy with it increase boost on your PUT SP table to next row corresponding to your SWG table (in this case 2900). More logging; lather, rinse, repeat. Easy peasy.

Boost-By-Gear (BBG)

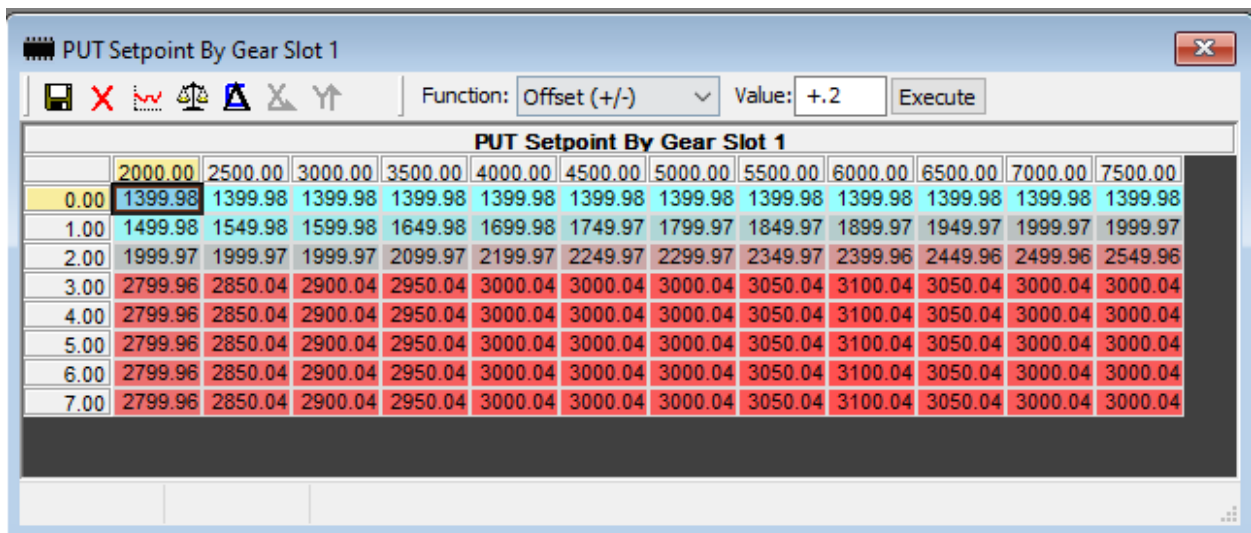
So, we've moved torque out of the way. Tune is rocking, got the boost curve all sorted but it sure would be nice to be able to run less boost in lower gears (FWD problems, yeah?). BBG can sort that out. If you are controlling boost using the Max PR table you must abandon it now. You cannot use BBG and control boost using that table.

If you recall the original boost curve we settled on :



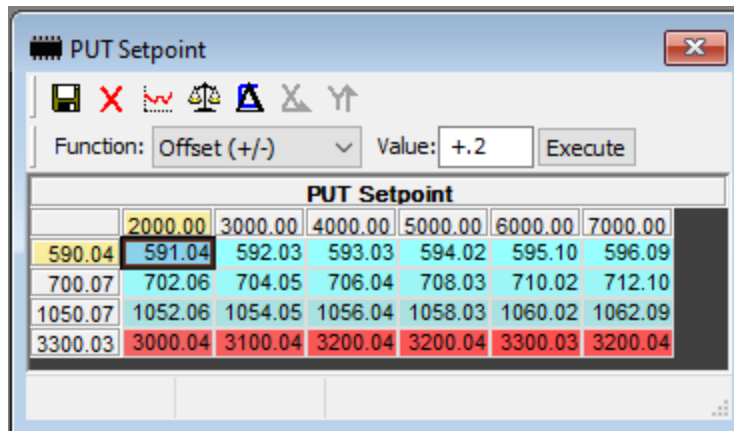
We need to recreate this under Map1.

Pull up your Mapswitching folder in your XDF.. Under the Map1 folder you will find a table for PUT Setpoint. The x-axis is RPM and the Y-axis is gear. Set Gear 0 to minimal boost, 1400 is fine. Set the rest of the gears however you would like. If the tires blow off then lower boost. Pretty straight forward. I run less boost in my GTI in 1st and 2nd. 3rd gear and up are running our finalized boost curve:



Go ahead and set your remaining maps 2-5 as you see fit.

To use effectively use BBG we need to move PUT setpoint above the max boost you plan to run. Using our previous example all we need to do is move the PUT setpoint table up to match the Max PR table. Now neither will interfere and boost is now controlled entirely by BBG:



Timing

I believe this should be pretty straight forward, but it should be pointed out that if you were running pump gas before on a stock turbo you probably won't be able to run the same timing when pushing out towards upper 20s psi on your new turbo. High combustion chamber pressure=more heat. More heat=more propensity to knock. As you are working on your boost keep an eye on knock and if you start seeing consistent knock at a certain rpm range you might want to start pulling timing back in that range. If knock seems sporadic and only affecting a single cylinder once in a while with no rhyme or reason it's probably dialed in well. If you want to clean up that knock let's look into how to do so.

Knock

Ahhh, knock. First there is knock detection, AKA sensitivity of the knock sensors. Then there is the knock correction factor, AKA how much timing to pull during a knock event. Lastly, there is how quickly should the timing pull be decayed to get back to the standard timing. Ever the argument, how much knock is ok?

Here are your cylinder sensitivity tables. I'd just suggest leaving them alone; let the knock sensors do their job.

- Knock detection threshold factor, used when IDX_FIL_GAIN_KNK is 1.
- Knock detection threshold factor, used when IDX_FIL_GAIN_KNK is 1.
- Knock detection threshold factor, used when IDX_FIL_GAIN_KNK is 1.
- Knock detection threshold factor, used when IDX_FIL_GAIN_KNK is 1.
- Knock detection threshold factor
- Knock detection threshold factor
- Knock detection threshold factor
- Knock detection threshold factor

Moving on, the knock corrections table is just that, how much correction (KR) to apply to a cylinder that detects knock. The stock tune settings are really aggressive at cutting timing. Again, this table is the same as the timing tables, RPM vs. airmass.

Initial Knock Correction

Function: Offset (+/-) Value: 1.0 Execute

	736.00	1248.00	1760.00	2240.00	3008.00	4000.00	4992.00	6016.00
348.99	-1.50	-1.50	-1.50	-1.50	-1.50	-1.87	-1.87	-2.62
648.01	-2.25	-2.25	-2.25	-2.25	-2.25	-2.25	-2.25	-2.25
899.00	-2.25	-2.25	-2.25	-2.25	-2.62	-3.00	-3.00	-3.00
1100.01	-2.25	-2.25	-2.25	-2.25	-2.62	-3.00	-3.00	-3.00

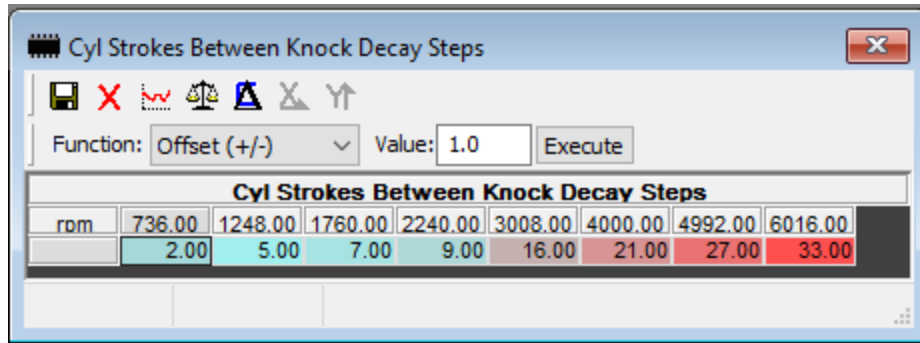
As you can see, a single knock event at any reasonable airmass is going to pull between 2-3 degrees of timing. That is a hefty chunk of power. I feel that this table can be toned down somewhat. If you wanted to cut every value in half that wouldn't be a bad start, perhaps leave the last row at -1.5 all the way across. That will still give it a lot of flexibility to cut decent timing for knock events at WOT as needed. Something like this:

Initial Knock Correction

Function: Offset (+/-) Value: 1.0 Execute

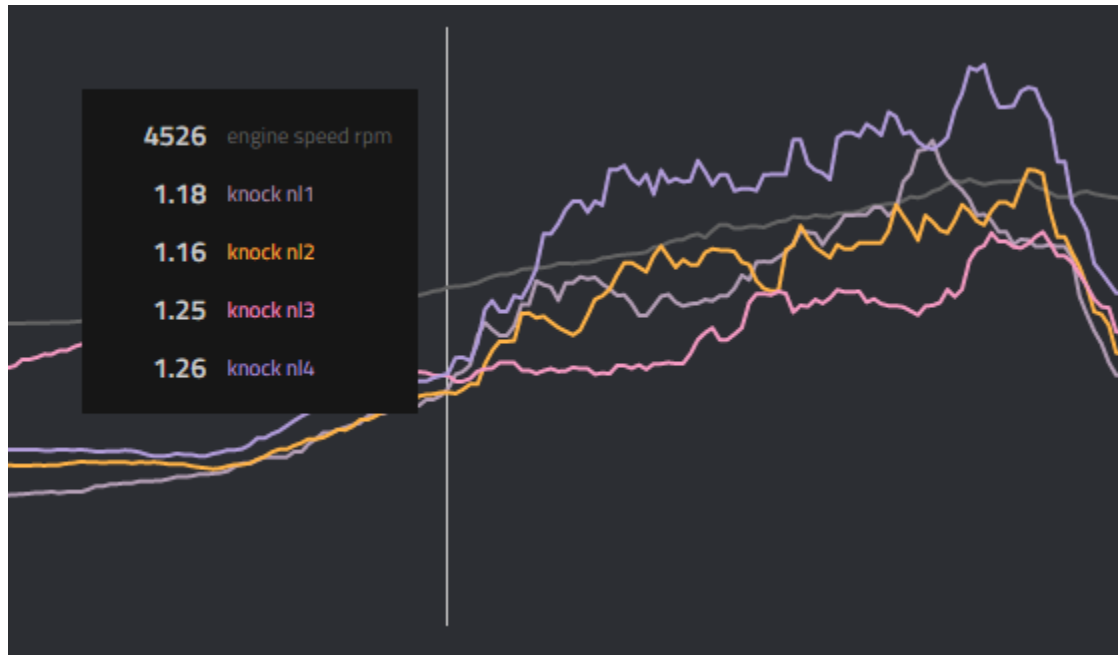
	736.00	1248.00	1760.00	2240.00	3008.00	4000.00	4992.00	6016.00
348.99	-0.75	-0.75	-0.75	-0.75	-0.75	-1.12	-1.12	-1.12
648.01	-1.12	-1.12	-1.12	-1.12	-1.12	-1.12	-1.12	-1.12
899.00	-1.12	-1.12	-1.12	-1.12	-1.50	-1.50	-1.50	-1.50
1100.01	-1.50	-1.50	-1.50	-1.50	-1.50	-1.50	-1.50	-1.50

Knock decay is another table that you might want to have a look into.

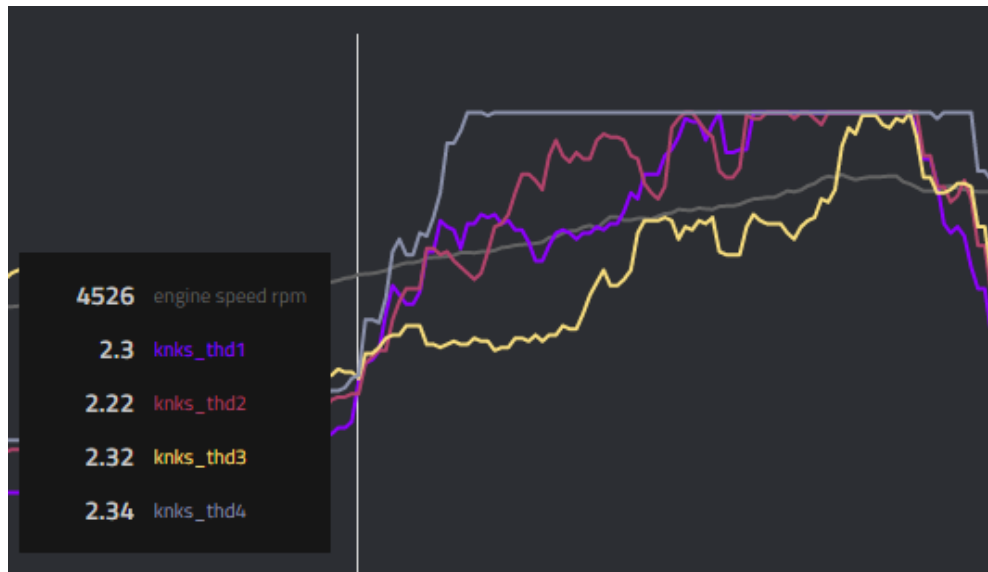


0.75 will give a decent recovery rate. You could get even more aggressive if you wanted (i.e. a dragstrip ethanol mix kill tune) by running 1 or so in each cell. That will get the knock event corrected even faster.

The last piece of the puzzle is tuning the knock sensor gain so that it can effectively detect knock. As RPM increases a motor will naturally get noisier. The sensors are most efficient with a noise level (nl) of 0.5V at idle rising to 1v by 6000rpm. We can log the noise level at each cylinder:



As the noise level rises beyond the 0.5-1V curve the sensors begin to get saturated and become fully saturated when noise reaches ~2V. The noise value is used to calculate the threshold value (thd). This is also loggable at each cylinder:



*EDITDirk's note: In case you were wondering how thd is calculated it's (nl*global knock threshold factor) + knock sum adder. Did your eyes just glaze over? Good. Carry on.*

The actual sensor feedback can be logged as well for each cylinder (rng). Once RNG>THD, a knock event is recorded. Here are 2 recorded knock events in CYL4::



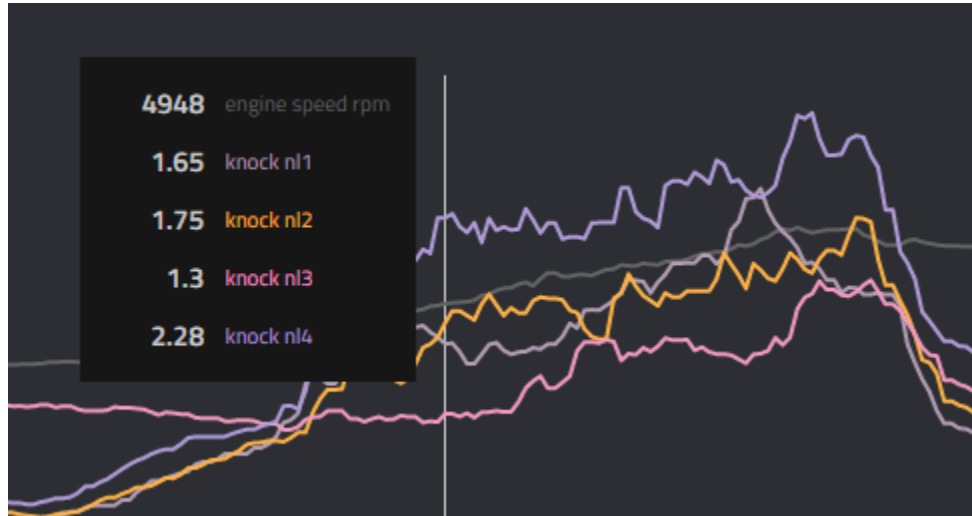
Once the threshold (thd) reaches 4V the sensor has been fully saturated and its ability to detect knock is compromised. Take our example above. The noise level has reached 2.26V, way past the 1V target at 6000 rpm (shit, let's be honest we're only at 5366 and it's been past 2V and thd has been flatlined at 4 for awhile...). The raised noise level has made thd flatline, limiting the effective knock threshold. The sensor heard something here, probably not knock but it couldn't adapt because the sensor was saturated due to the noise:



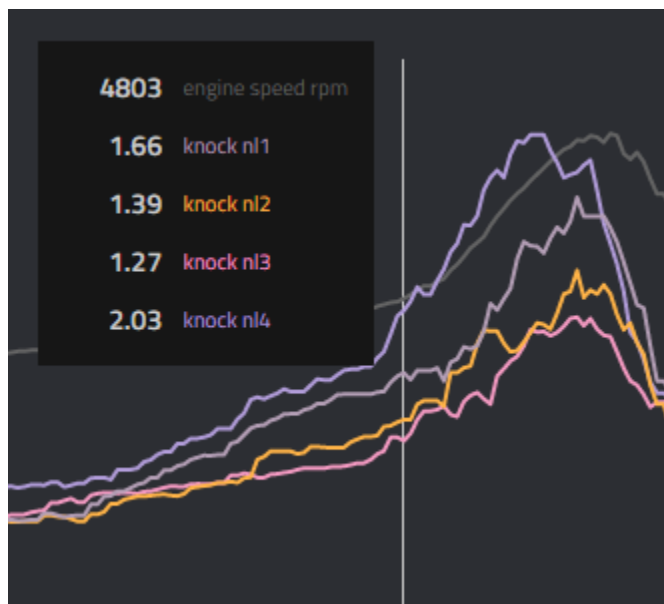
Contrast this vs CYL3 that isn't saturated (elevated, yes but that's ok):



So how do we solve this? We lower the gain for each cylinder with the gain tables so that the noise floor is lowered and keeps the sensor from being saturated. Let's take a look at 2 logs, first the one we've been looking at:



Number 4 is really having a difficult time. This might possibly be due to my BFI Stage 1 tranny mount? Inherent to my motor? Who knows. It needs to come down, they all do, but it does the most. CYL3 probably doesn't need much modification, if any at all. Let's not make conclusions on one log though, here is another. Look who's off to the races again.....



So, let's look at the tables for gain and see what we should do. There are 4 tables

Gain value for each cylinder
 Gain value for each cylinder
 Gain value for each cylinder
 Gain value for each cylinder

And this is CYL1 (259L for clarity, yours may differ)

The screenshot displays a software interface with a table titled "Gain value for each cylinder" and a configuration dialog box for a specific item.

Gain value for each cylinder table:

	896.00	1152.00	1536.00	2016.00	2496.00	3008.00	3488.00	3968.00	4000.00	4512.00	4960.00	4992.00	5504.00	5984.00	6016.00	6496.00
125.01	8.00	12.00	20.00	23.00	30.00	29.00	33.00	38.00	40.00	44.00	50.00	47.00	45.00	43.00	38.00	36.00
201.99	11.00	20.00	19.00	26.00	33.00	34.00	33.00	40.00	40.00	44.00	52.00	46.00	52.00	50.00	44.00	40.00
398.00	17.00	21.00	22.00	25.00	34.00	33.00	32.00	41.00	40.00	39.00	48.00	46.00	45.00	45.00	42.00	45.00
599.01	27.00	24.00	28.00	29.00	35.00	34.00	33.00	43.00	44.00	42.00	48.00	47.00	47.00	46.00	40.00	45.00
800.99	27.00	29.00	28.00	31.00	35.00	36.00	36.00	43.00	44.00	45.00	49.00	50.00	49.00	48.00	42.00	45.00
948.00	27.00	29.00	30.00	31.00	35.00	36.00	36.00	45.00	44.00	48.00	50.00	51.00	48.00	49.00	44.00	44.00
1149.01	27.00	29.00	32.00	31.00	37.00	36.00	38.00	47.00	45.00	47.00	50.00	52.00	48.00	49.00	44.00	44.00
1302.00	27.00	29.00	32.00	31.00	37.00	36.00	38.00	47.00	45.00	47.00	50.00	52.00	48.00	49.00	44.00	44.00

Configuration Dialog Box (ID:335986) Gain value for each cylinder:

Title: Gain value for each cylinder

Description: IP_KNKS_GAIN[0]
 X: ldpn_n_32_2_knck
 Y: ldpn_maf_h_rmg_2_knck

Address (Hex): 0x52072

Cell Data Size: 1 Byte (8 Bit)

Signed: ☐ LSB First: ☒

Floating Point: ☐ Major Order: Column

Major Stride (Bytes): 0

Minor Stride (Bytes): 0

Category A: Timing

Category B: Knock

Category C: Any Category

Use Low Range: ☒ 0.0000

Use High Range: ☒ 63.0000

Visibility Level: Always

Output Type: Floating Point

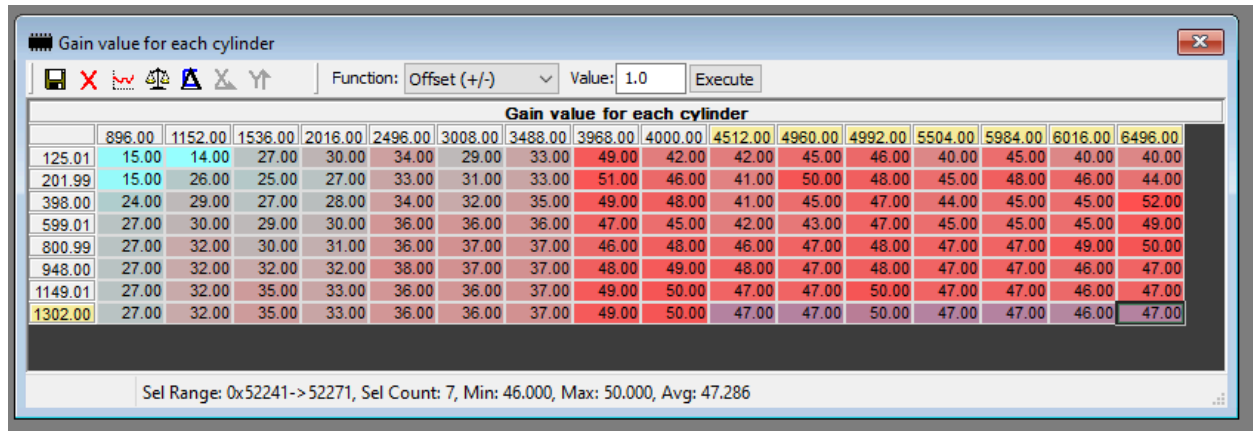
Decimal Places: 2

Cell Units: -

General Rows Columns Conversion DAAssoc.

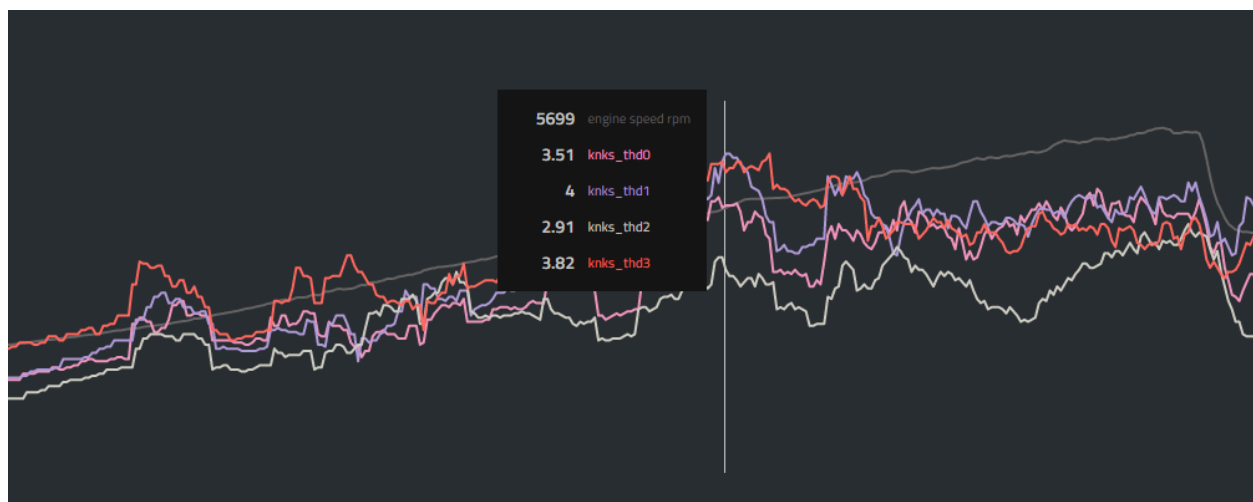
OK Apply Close

The axis are rpm and airmass mg/stk. I wouldn't touch anything outside the last 2 rows if not only just the last row. To lower the gain we ADD to these values. A good starting point is 10% or so. In my case CYL4 needs the most work (and on my big turbo I am well past 1300mg/stk so would only modify the last row) so I would probably take this purple area in the 4500+ rpm range and move it into the low 50s:



What you want to ultimately see is thd not hitting 4 so the sensor can perform its job effectively. Assuming you have a good handle on your timing curve this will help reduce any "ghost knock" you may be having. DO NOT reduce the gain just to eliminate real knock. That's a horrible idea. You've been warned.

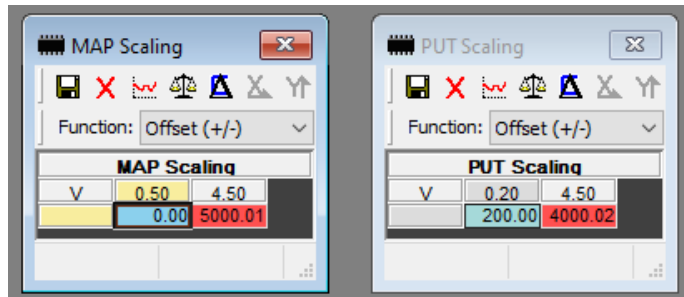
Here's an example of noise reduction implemented well. thd is elevated but not saturated. Just enough gain removed to keep it off 4V outside of this one fraction of a second...perfect:



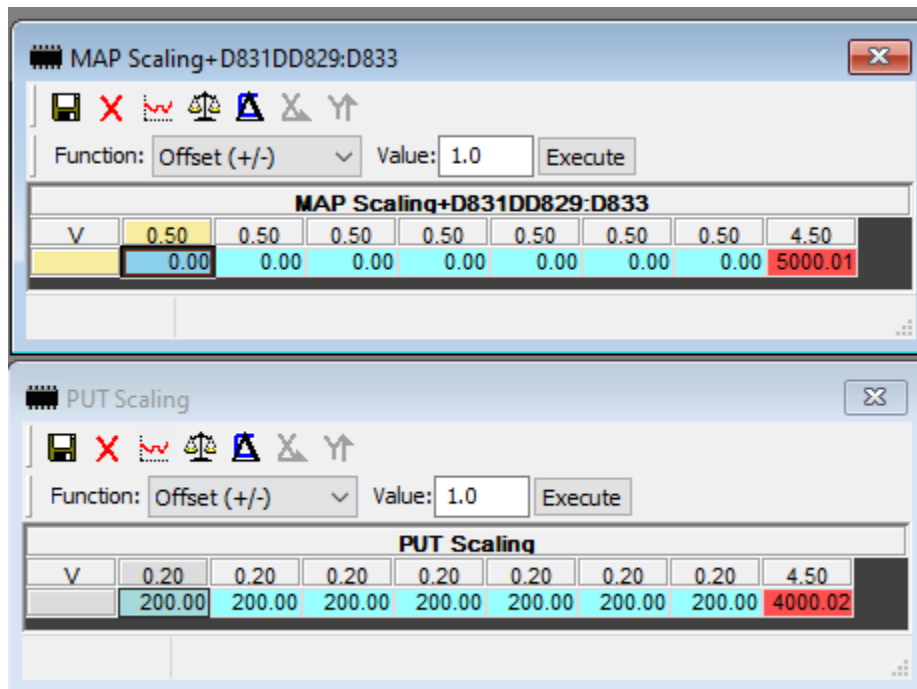
MAP and PUT Sensor Scaling

If you have upgraded either sensor here is the scaling to use. Your xdf should also have the axis defined to change the voltage as well, so make sure you change the axis as well.

S50

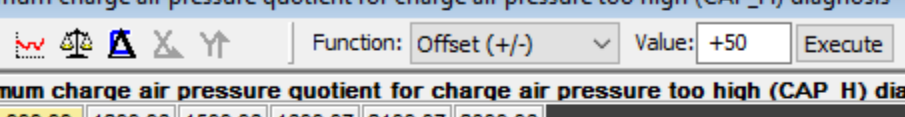


A05



Limiters

Move charge air pressure too high out of the way. Make this entire table 3500:



Maximum charge air pressure quotient for charge air pressure too high (CAP_H) diagnosis

Function: Offset (+/-) Value: +50 Execute

	999.99	1299.98	1599.98	1899.97	2199.97	2399.96
1504.00	2199.97	2199.97	2199.97	2349.97	2599.96	2649.96
2016.00	2199.97	2199.97	2199.97	2349.97	2599.96	2649.96
2496.00	2199.97	2199.97	2199.97	2349.97	2599.96	2649.96
3008.00	2199.97	2199.97	2199.97	2349.97	2599.96	2649.96
5800.00	2249.97	2275.01	2349.97	2499.96	2649.96	2699.96
5802.00	2399.96	2499.96	2549.96	2599.96	2699.96	2749.96

Under the Torque Management folder are 5 more torque tables. Move them out of the way. Just make every cell in all of these 1000.

- Maximum allowed torque at clutch for twin clutch transmission
- Maximum allowed torque at clutch MT
- Maximum allowed torque at clutch MT_4WD
- Maximum allowed torque at clutch in case of DROF (MT)
- Maximum allowed torque at clutch in case of DROF (MT, 4WD)

Injection Window

Go ahead and widen your DI injection window. Set this table to something like 500 or so (max 540).

[illegible]

And push the SOI table up at the higher airmass (900-1200 area), like this (the red area):

Start of injection for first injection during single injection

Function: Offset (+/-) Value: +.2 Execute

	50.02	100.00	150.02	200.04	300.03	400.03	500.03	600.02	750.00	900.02	1050.03	1200.01
1000.00	280.12	281.25	282.75	283.87	286.50	289.12	291.75	294.37	298.50	302.25	306.37	310.12
1250.00	282.75	283.12	283.87	284.62	285.37	286.12	288.75	291.00	295.87	301.12	304.50	308.25
1500.00	285.00	285.00	285.00	285.00	283.87	283.12	285.37	287.25	292.87	300.00	302.62	306.00
2000.00	290.25	290.25	290.25	290.25	290.25	294.37	297.37	301.12	309.37	312.37	313.50	317.25
2500.00	295.50	295.50	294.37	294.37	297.75	300.00	303.75	307.87	315.00	318.75	319.12	324.00
3000.00	306.37	306.75	307.87	307.12	310.12	310.12	310.12	316.12	320.25	322.87	322.87	325.50
3500.00	312.37	312.75	313.50	312.75	315.00	317.25	320.25	322.50	325.12	325.12	324.75	349.87
4000.00	318.37	318.37	319.12	321.37	325.50	327.00	328.12	330.00	330.00	330.00	355.12	375.00
4500.00	324.00	324.37	324.37	326.62	330.75	333.00	334.12	334.87	335.25	335.25	364.87	400.12
5000.00	327.75	328.50	328.87	330.75	334.12	336.37	337.12	338.25	339.37	340.87	375.00	415.12
5500.00	333.75	334.50	335.25	336.00	338.62	340.87	342.00	342.75	344.25	355.12	379.87	435.00
6000.00	339.37	340.50	341.62	342.75	345.00	346.50	347.25	348.00	348.75	370.12	400.12	450.00

Fueling

Upgraded LPFP

The stock fuel pump controller will only allow a set amount of current before it starts to overheat and melt. The stock PWM for Pressure vs Flow settings will easily overheat the controller and must be modified. Set maximum PWM by Voltage to 82. You *might* be able to get by with 85, but really if you are at this point you should be looking more at a brushless pump.

Maximum Low Pressure Fuel Pump PWM by Voltage

Function: Offset (+/-) Value: +50 Execute

V	6.00	8.00	12.00	14.00
	82.00	82.00	82.00	82.00

There are two tables for the fuel pump, one has 4WD for...4WD vehicles, duh. Pick the correct table to modify or just do both. Doesn't matter if you adjust both.

The x-axis is modeled fuel flow (g/min) and the y-axis is fuel pressure.

Bump the first row up to between 10-15. This is your starting pressure. You need to give it a little bump or it will start poorly, especially if you are running ethanol.

	15.02	24.08	50.07	99.90	200.03	400.07	600.10	799.89
0.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00

Adjust the fueling pressure target for RPM and fuel temp. Typically where you turbo fully spools you want it to be at max pressure. Most hybrids are in the 3000-4000rpm range for full spool so set the 3000 and up range to full fuel flow. 650kpa (6.5bar) is a good target.

	30.00	39.75	50.25	60.00	69.75	75.00	90.00	99.75	110.25	120.00
0.00	500.00	500.00	500.00	500.00	530.00	590.00	650.00	650.00	650.00	650.00
1000.00	500.00	500.00	500.00	500.00	530.00	590.00	650.00	650.00	650.00	650.00
2000.00	500.00	500.00	500.00	500.00	530.00	590.00	650.00	650.00	650.00	650.00
3000.00	650.00	650.00	650.00	650.00	650.00	650.00	650.00	650.00	650.00	650.00
4000.00	650.00	650.00	650.00	650.00	650.00	650.00	650.00	650.00	650.00	650.00
5000.00	650.00	650.00	650.00	650.00	650.00	650.00	650.00	650.00	650.00	650.00
6000.00	650.00	650.00	650.00	650.00	650.00	650.00	650.00	650.00	650.00	650.00
7000.00	650.00	650.00	650.00	650.00	650.00	650.00	650.00	650.00	650.00	650.00

Address: 0x1314E, Sel Count: 1, Min: 500.000, Max: 500.000, Avg: 500.000

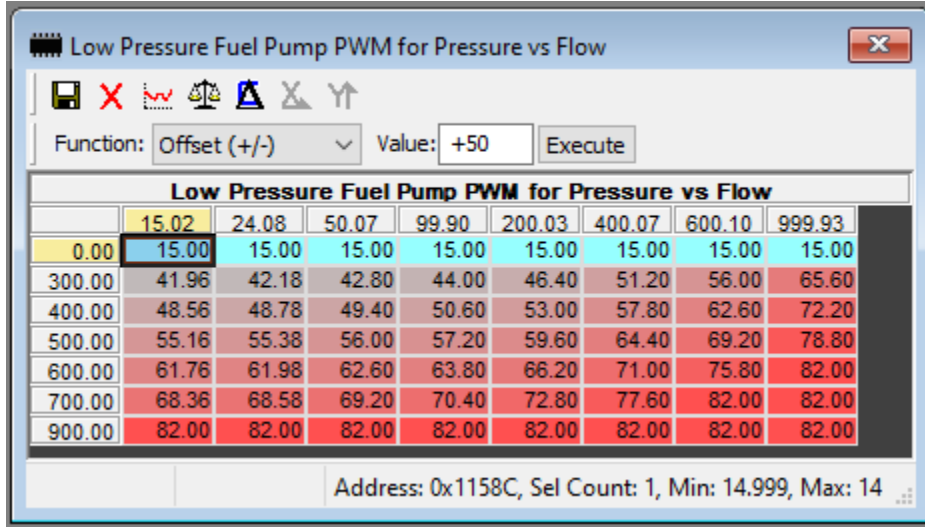
Set the Fuel Pressure Setpoint by Fuel Flow as your max fuel pressure.

g/min	50.07	99.90	250.10	299.93	600.10	799.89
0.00	650.00	650.00	650.00	650.00	650.00	650.00

For Brushed Pumps (Walbro, etc...)

There are two fuel pump tables, one has AWD in the title. Select the one appropriate for your car to modify (or modify both if you want).

Anywhere that it is at or over 80 in the table, adjust to 82. That's it. You just "tuned" for your new LPFP. Should look similar to this:



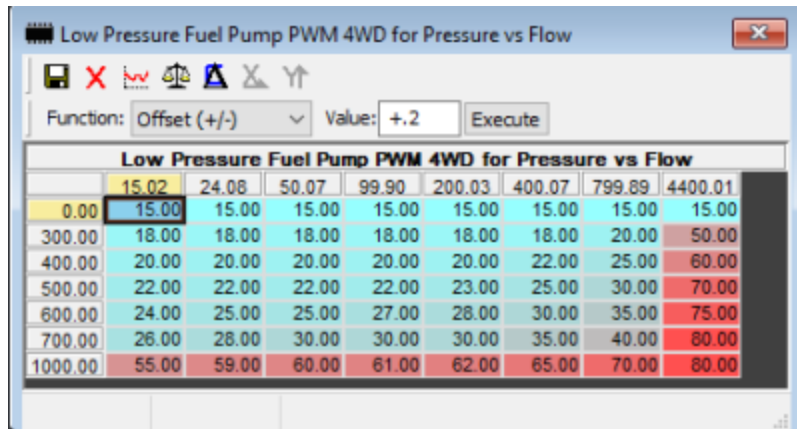
	15.02	24.08	50.07	99.90	200.03	400.07	600.10	999.93
0.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
300.00	41.96	42.18	42.80	44.00	46.40	51.20	56.00	65.60
400.00	48.56	48.78	49.40	50.60	53.00	57.80	62.60	72.20
500.00	55.16	55.38	56.00	57.20	59.60	64.40	69.20	78.80
600.00	61.76	61.98	62.60	63.80	66.20	71.00	75.80	82.00
700.00	68.36	68.58	69.20	70.40	72.80	77.60	82.00	82.00
900.00	82.00	82.00	82.00	82.00	82.00	82.00	82.00	82.00

Address: 0x1158C, Sel Count: 1, Min: 14.999, Max: 14

If you have installed a PM4 you can increase those values well above 82. If you are needing to run your LPFP out past 90% with your PM4 consider upgrading to a brushless RS3 pump.

For Brushless Pumps (RS3, etc...)

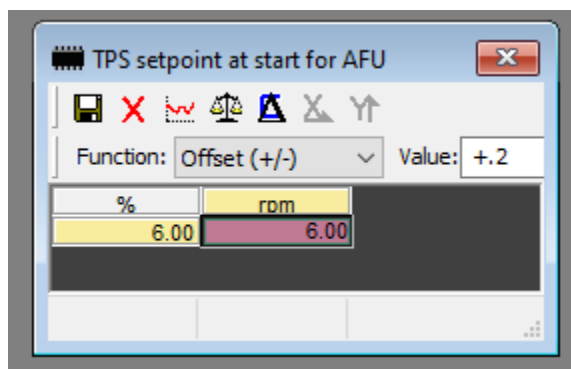
A brushed pump you are typically just going to run them for all they are worth. But with a brushless pump you should be in the 50-60 range for pump duty, 82+ is just way too much.. You'll need to modify the axis to push the g/min (x-axis) out. Most hybrid setups on ethanol will run in the 2000+g/min fuel flow range and we want the pump duty to fall in the 50-60 range. This table below should be a good starting point.



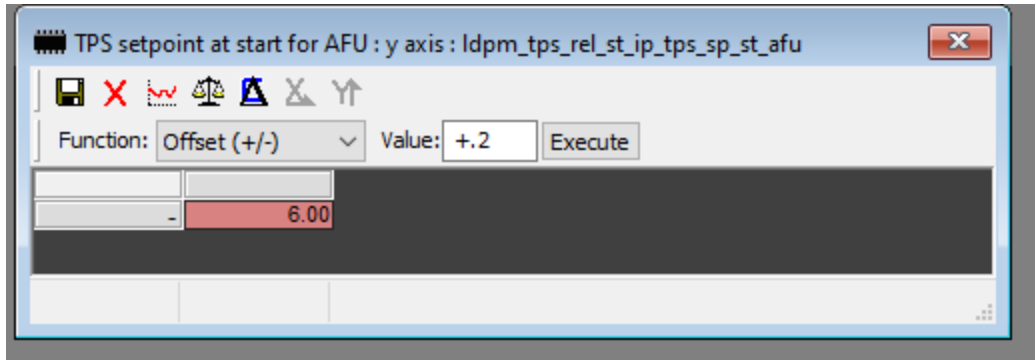
Now that you have your baseline you need to do some logging to see how your fuel pressure looks. Compare LPFP vs LPFP setpoint. If fuel pressure is above setpoint then pull up modeled fuel flow to see where along the x-axis you are. Triangulate your position in the table using fuel pressure and fuel flow. Increase duty to increase fuel pressure or lower duty to lower fuel pressure. Just make sure you don't go above your maximum table.

E85 Cold Starts

If you find your car is hard to start on ethanol when the engine is cold, bump this table up to 6%. This will help starting by holding the throttle body open a crack.



You need to set the Y axis to 6% as well so it looks like the image above:



In addition, you can manipulate timing at startup if the above change didn't help as much as you'd like. Everyone's box code has different values in these 2 tables but the strategy is to increase timing aggressive up to around 600-700 rpm and then retard it pretty significantly out past 800rpm. The more timing you pull out the more it will gurgle and fart. 10 degrees retard should be plenty for starting purposes. Example below:

	200.00	320.00	400.00	560.00	720.00	1200.00	
-35.25	4.12	4.12	5.62	5.62	3.00	0.00	
-20.25	4.12	4.12	4.87	4.87	1.87	-1.87	
-9.75	4.12	4.12	4.87	4.87	1.12	-4.12	
0.00	4.12	4.12	4.87	4.87	0.00	-6.00	
9.75	4.12	4.12	7.87	7.87	0.00	-7.87	
20.25	4.12	4.12	10.12	10.12	-1.12	-7.87	
39.75	4.12	4.12	12.00	12.00	-1.87	-9.00	
80.25	4.12	4.12	13.87	13.87	-3.00	-10.12	

	200.00	320.00	400.00	560.00	720.00	1200.00	
-30.00	4.12	4.12	5.62	5.62	3.00	0.00	
-20.25	4.12	4.12	4.87	4.87	1.87	-1.87	
-9.75	4.12	4.12	4.87	4.87	1.12	-4.12	
20.25	4.12	4.12	4.87	4.87	0.00	-6.00	
39.75	4.12	4.12	7.87	7.87	0.00	-7.87	
85.50	4.12	4.12	10.12	10.12	-1.12	-7.87	
95.25	4.12	4.12	12.00	12.00	-1.87	-9.00	
115.50	4.12	4.12	13.87	13.87	-3.00	-10.12	

Upgraded HPFP

After upgrading to a higher displacement high pressure fuel pump a few things need to be done to let the ecu know that more fuel will be pumped per pump stroke.

Upgraded internals increase the pump displacement by approximately 30%. By setting the max fuel flow per pump stroke to approximately 300 we tell the ecu the displacement is increased so that it can provide better control over the spill valve (232 stock *1.3= 300).

Set of interpolation tables for determination of basic fuel pressure setpoint

Function: Interpolate X Value: -.02 Execute

	704.00	992.00	1504.00	2016.00	2496.00	3008.00	3488.00	4000.00	4512.00	4992.00	5504.00	6496.00
0.00	20001.03	20001.03	20001.03	20001.03	20001.03	20001.03	20001.03	20001.03	20001.03	20001.03	20001.03	20001.03
70.01	29998.90	29998.90	40002.07	40002.07	40002.07	40002.07	40002.07	40002.07	40002.07	40002.07	40002.07	40002.07
75.01	29998.90	29998.90	43998.03	45001.00	45001.00	45001.00	45001.00	45001.00	45001.00	45001.00	45001.00	45001.00
80.01	29998.90	29998.90	44502.17	45001.00	45001.00	45001.00	45001.00	45001.00	45001.00	45001.00	45001.00	45001.00
95.00	33002.50	33002.50	49999.93	54998.86	54998.86	54998.86	54998.86	54998.86	54998.86	54998.86	54998.86	54998.86
100.00	34997.83	34997.83	54998.86	56999.50	56999.50	56999.50	56999.50	56999.50	56999.50	56999.50	56999.50	56999.50
130.01	40002.07	40002.07	56999.50	70000.96	70000.96	70000.96	70000.96	70000.96	70000.96	70000.96	70000.96	70000.96
175.01	74999.90	74999.90	90002.00	90002.00	90002.00	90002.00	90002.00	90002.00	90002.00	90002.00	90002.00	90002.00
220.00	109997.73	109997.73	120000.90	120000.90	120000.90	120000.90	120000.90	120000.90	120000.90	120000.90	120000.90	120000.90
290.01	149999.79	149999.79	149999.79	149999.79	149999.79	149999.79	149999.79	149999.79	149999.79	149999.79	149999.79	149999.79
510.01	179998.69	179998.69	179998.69	179998.69	179998.69	179998.69	179998.69	179998.69	179998.69	179998.69	179998.69	179998.69
729.99	202000.36	202000.36	202000.36	202000.36	202000.36	202000.36	221661.76	240001.79	240001.79	240001.79	240001.79	240001.79
1095.01	202000.36	202000.36	202000.36	202000.36	202000.36	202000.36	221661.76	240001.79	240001.79	240001.79	240001.79	240001.79

Do not copy this table above as every box code is different! The area you will be working in is the lower right.

49999.79	149999.79	149999.79	149999.79	149999.79	149999.79	149999.79
79998.69	179998.69	179998.69	179998.69	179998.69	179998.69	179998.69
02000.36	221661.76	240001.79	240001.79	240001.79	240001.79	240001.79
02000.36	221661.76	240001.79	240001.79	240001.79	240001.79	240001.79

Note for Brian: Only copy and paste the 12 cells you modified into each of the tables. Leave the other cells alone.

If you are finding that fuel pressure at the rail is dipping and you aren't at the 240000 setpoint you can try moving 240000 further down in the rpm range.

If you are working with a Simos 18.10 car (A05) the majority of those calibrations already have the mass fuel flow tables scaled out to accept 240bar. Eg. 5g0906259Q - 0002. If you are tuning a Simos 18.1 car (S50) those calibrations do not have the mass fuel flow table scaled out past 200bar so you must do this to increase pressure.

Last tables you need to adjust are in the Mass Fuel Flow folder. There you will find three Effective Injection Time tables. Raise the last row axis to 250bar.

Effective injection time map (80°C)

Function: Offset (+/-) Value: -2 Execute

	0.00	0.51	1.00	1.50	1.99	2.50	3.01	3.50	4.01	4.49	5.00	5.49	6.00	6.51	6.99	7.50	7.99	8.50	9.01	10.00	12.99	299.99
40002.07	190.40	240.80	293.60	338.40	369.60	414.40	509.60	566.40	616.80	671.20	712.00	795.20	900.00	932.00	1054.40	1097.60	1165.60	1193.60	1268.80	1394.40	1809.60	44726.40
49999.93	184.80	234.40	280.00	322.40	350.40	372.00	434.40	512.80	573.60	620.00	664.00	700.00	818.40	852.00	935.20	971.20	1049.60	1084.00	1136.00	1250.40	1612.80	39626.40
59997.79	180.00	225.60	268.00	304.80	332.80	358.40	394.40	467.20	530.40	584.00	626.40	665.60	740.00	803.20	859.20	913.60	944.80	985.60	1047.20	1138.40	1475.20	34450.40
70000.96	175.20	221.60	262.40	295.20	322.40	352.00	382.40	425.60	495.20	544.80	588.80	631.20	684.00	726.40	815.20	844.80	899.20	916.80	966.40	1063.20	1372.80	31283.20
79998.83	170.40	215.20	252.80	287.20	310.40	339.20	370.40	396.00	464.80	520.80	561.60	599.20	656.00	693.60	740.80	803.20	844.80	879.20	916.80	1003.20	1297.60	28082.40
99999.86	164.80	214.40	245.60	274.40	295.20	324.80	355.20	380.80	402.40	464.80	512.00	548.80	599.20	642.40	682.40	708.00	752.00	804.00	826.40	900.00	1151.20	24819.20
120000.90	162.40	210.40	240.80	266.40	287.20	312.80	338.40	363.20	388.80	412.80	468.00	505.60	562.40	593.60	628.80	664.80	688.00	712.80	772.80	837.60	1064.00	22381.60
149999.79	160.00	204.00	232.80	257.60	274.40	300.00	319.20	344.00	369.60	392.00	404.80	451.20	513.60	536.80	579.20	608.80	640.80	660.80	677.60	760.80	954.40	19468.00
179998.69	155.20	197.60	225.60	248.80	263.20	289.60	307.20	330.40	351.20	376.00	393.60	407.20	472.80	496.00	540.00	570.40	588.80	620.80	637.60	684.80	880.80	17855.20
249999.65	146.40	183.20	207.20	227.20	236.80	264.00	287.20	302.40	328.80	340.80	358.40	377.60	384.80	376.00	468.80	467.20	508.00	525.60	556.00	570.40	765.60	14580.00

Enhance

99999.86	164.80	214.40
120000.90	162.40	210.40
149999.79	160.00	204.00
179998.69	155.20	197.60
249999.65	146.40	183.20

ENHANCE

249999.65

For the fuel mass column you might need to scale it out. If you look at the last 2 columns you'll note the relationship of fuel mass (mg/stk) and injector PW. A lot of file (such as 259L) stop at 140:

0.00	12.99	139.99
3.20	120.99	1249.99
6.40	239.80	2558.80
9.60	358.61	3867.61
12.80	477.42	5176.42
16.00	596.23	6485.23
19.20	715.04	7794.04
22.40	833.85	9102.85
25.60	952.66	10411.66
28.80	1071.47	11720.47
32.00	1190.28	13029.28
35.20	1309.09	14338.09

Some files are already scaled out on this axis well (like 8V0906259Q) so may not need to be touched. If yours is low like 259L then read on.

You will more than likely exceed 140 mg/stk once you start cranking up the boost (and especially if you have a bigger turbo).

First we need to calculate our new 249999 row. Note how each row is an additional 30000, If you calculate the percent decrease from 209999 to 239999 (30,000 more) you'll come up with the following:

Original	209999	152	192	218.4	240
percent chg	209999 to 239999	97.94%	97.17%	96.81%	96.46%
	239999	148.865979	186.5587	211.4298	231.5113

The percent change from 239999 to 249999 is 4%. So we will take another 4% off the values to determine our 24999 row. You should arrive at something like this:

	0	0.5	1	1.5	2	2.5	3
249999	142.9	179.1	203.0	222.3	233.1	258.4	279.8

Calculate the new values for the entire 249999 row.

Now we need to calculate our new X-axis mg/stk.

If you calculate the percent increase of 2 adjacent cells you'd see that up top (1809 to 20800) is about 1150% increase and the bottom 2 cells (831 to 7727) is 930% increase.

	13	140	
40002	1809.6	20800	1076.92%
49999	1612.8	18433.6	1149.43%
59999	1475.2	16066.4	1142.96%
70000	1372.8	14608	1089.10%
79999	1297.6	13149.6	1064.10%
99999	1151.2	11624	1013.38%
120000	1064	10496.8	1009.73%
149999	954.4	9146.4	986.54%
179999	880.8	8392	958.34%
249999	753.0	6830.5	952.77%
			907.08%

So we need to increase the last column. We need to match our max fuel flow of 299 so our target will be 299mg/stk, more than enough. Go ahead and replace the 140 with 299 in the axis. Now we need to calculate new values that are 114% more. So take our percentages and multiply them by 2.14. This is our new percent increase for our new column.

2459.77%
2445.93%
2330.67%
2277.18%
2168.63%
2160.82%
2111.20%
2050.85%
2038.93%
1941.15%

Calculate the new values by multiplying the percent increase by the values in the 13 column. Here is our new 299 column:

13	299
1809.6	44512.0
1612.8	39447.9
1475.2	34382.1
1372.8	31261.1
1297.6	28140.1
1151.2	24875.4
1064	22463.2
954.4	19573.3
880.8	17958.9
753.0172	14617.2

Apply this column to all 3 tables:

- Effective injection time map (80°C)
- Effective injection time map (-20°C)
- Effective injection time map (20°C)

Lambda - Pump Gas

Assuming you applied all the changes from the Basics guide you should be fine here.

Lambda - E85 and blends

Assuming you applied all the changes from the Basics guide you should be fine here. Some people like to run it a touch leaner, like 0.02 leaner and keep things around 0.80 at WOT. It's up to you and it's your car. Some have found richer or leaner tends to result in less knock on their cars. If you've compared your car to others with similar mods and fuel and are finding yours seems more knocky you can try to adjust lambda up or down and see how it reacts. At the end of the day consensus is high 0.7s to low 0.8s at WOT will be safest and yield best performance.

MPI

Step 1: Apply patch to bin using BinToolz. Enabling MPI impacts a number of tables that don't make sense to the common man, and enabling MPI varies by box code. I wouldn't bother figuring it out, just apply the patch. None of the rest of this will work without the bin being patched. ANY TIME YOU APPLY A PATCH TO A BIN YOU MUST FULL FLASH FOR IT TO WORK. DO NOT CAL FLASH.

Step 2 (for S50): Set the torque (nm) point at which you want MPI to start firing and when you want it to stop (lower and upper limits). Really there is no upper limit you would want it to turn off, this isn't a EU car, we want the full business. Set the upper out of the way. A good starting point is 300 on the lower and anything on the upper. I use 800. 900...1,000....whatever that is

well above your max torque tables is fine. If you feel it is a bit rich as you roll into the throttle feel free to move the lower up in say .25 increments until you like how it performs. You might also make some modifications to the DI/MPI split in step 3 to limit the amount of MPI coming in as well. The Y-axis is Temp in Celsius. Not important here but just in case you were wondering.

Indicated engine torque lower limit for multiple injection request due to operating point												
	800.00	1000.00	1250.00	1500.00	2000.00	2500.00	3000.00	3500.00	4000.00	4200.00	5000.00	5500.00
-9.75	300.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00
5.25	300.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00
19.50	300.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00
20.25	300.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00
60.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00
84.75	300.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00

Indicated engine torque upper limit for multiple injection request due to operating point												
	800.00	1000.00	1250.00	1500.00	2000.00	2500.00	3000.00	3500.00	4000.00	4200.00	5000.00	5500.00
-9.75	800.00	800.00	800.00	800.00	800.00	800.00	800.00	800.00	800.00	800.00	800.00	800.00
5.25	800.00	800.00	800.00	800.00	800.00	800.00	800.00	800.00	800.00	800.00	800.00	800.00
19.50	800.00	800.00	800.00	800.00	800.00	800.00	800.00	800.00	800.00	800.00	800.00	800.00
20.25	800.00	800.00	800.00	800.00	800.00	800.00	800.00	800.00	800.00	800.00	800.00	800.00
60.00	800.00	800.00	800.00	800.00	800.00	800.00	800.00	800.00	800.00	800.00	800.00	800.00
84.75	800.00	800.00	800.00	800.00	800.00	800.00	800.00	800.00	800.00	800.00	800.00	800.00

NOTE: The 2 tables above are CASE 6. You can hit F2 to confirm. Do not modify any tables other than the two CASE 6 tables.

(ID:434470) Indicated engine torque upper limit for multiple injection request du... x

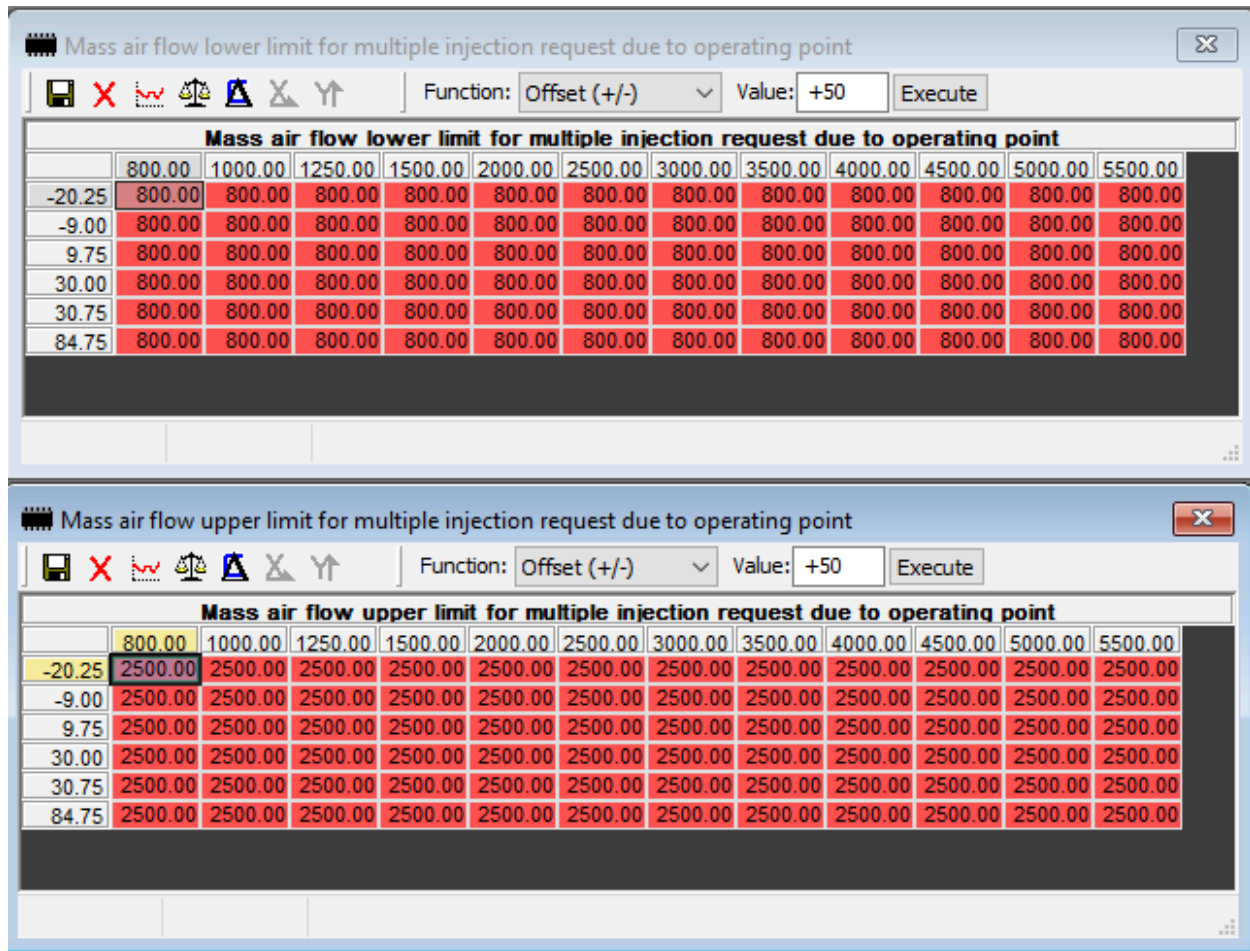
Title	Indicated engine torque upper limit for multiple injection request du	
Description	IP_TQI_THD_MPLH_OPP_MAX[CASE 6] X: ldpm_n_ip_tqi_thd_mplh_opp Y: ldpm_tco_ip_tqi_thd_mplh_opp	
Address (Hex)	0x6A126	Lookup Address 0x26A126
Cell Data Size	2 Bytes (16 Bit)	Use Low Range <input checked="" type="checkbox"/> 0.0000
Signed <input type="checkbox"/> LSB First <input checked="" type="checkbox"/>		Use High Range <input checked="" type="checkbox"/> 1023.9688
Floating Point <input type="checkbox"/>		Visibility Level Always
Major Order Column		Output Type Floating Point
Major Stride (Bytes) 0		Decimal Places 2
Minor Stride (Bytes) 0		Cell Units Nm
Category A	MPI	
Category B	Any Category	
Category C	Any Category	

General Rows Columns Conversion DAAssoc.

OK Apply Close

Step 2 (for A05): Set the air mass (mg/stk) point at which you want MPI to start firing and when you want it to stop (lower and upper limits). Really there is no upper limit you would want it to turn off, this isn't a EU car, we want the full business. Set the upper out of the way. A good starting point is 800mg/stk on the lower and anything on the upper. I use 2,000. 3,000...4,000....doesn't matter, just whatever that is well above your airflow tables is fine. If you feel it is a bit rich as you roll into the throttle feel free to move the lower up in say..25 increments until you like how it performs. You might also make some modifications to the DI/MPI split in step 3 to limit the amount of MPI coming in as well. The Y-axis is Temp in Celsius. Not important here but just in case you were wondering.

NOTE: Similar to the Maximum Allowed M_AIR_CYL_SP table the formula is wrong, so if you enter 800 it will save as 8 bajillion. Type 0.0008 for 800. Same for the upper, 0.002 for 2000.



NOTE: The 2 tables above are CASE 6. You can hit F2 to confirm. Do not modify any tables other than the two CASE 6 tables.

Step 3: You need to increase the single injection plus MPI start of injection table. For A05 it will just be a bunch of 220s:

Start of injection for first injection during single injection plus MPI.

Function: Offset (+/-) Value: 1.0 Execute

	50.02	100.00	150.02	200.04	300.03	400.03	500.03	600.02	750.00	900.02	1050.03	1200.01
1000.00	220.12	220.12	220.12	220.12	220.12	220.12	220.12	220.12	220.12	220.12	220.12	220.12
1250.00	220.12	220.12	220.12	220.12	220.12	220.12	220.12	220.12	220.12	220.12	220.12	220.12
1500.00	220.12	220.12	220.12	220.12	220.12	220.12	220.12	220.12	220.12	220.12	220.12	220.12
1750.00	220.12	220.12	220.12	220.12	220.12	220.12	220.12	220.12	220.12	220.12	220.12	220.12
2000.00	220.12	220.12	220.12	220.12	220.12	220.12	220.12	220.12	220.12	220.12	220.12	220.12
2500.00	220.12	220.12	220.12	220.12	220.12	220.12	220.12	220.12	220.12	220.12	220.12	220.12
3000.00	220.12	220.12	220.12	220.12	220.12	220.12	220.12	220.12	220.12	220.12	220.12	220.12
3500.00	220.12	220.12	220.12	220.12	220.12	220.12	220.12	220.12	220.12	220.12	220.12	220.12
4000.00	220.12	220.12	220.12	220.12	220.12	220.12	220.12	220.12	220.12	220.12	220.12	220.12
4500.00	220.12	220.12	220.12	220.12	220.12	220.12	220.12	220.12	220.12	220.12	220.12	220.12
5000.00	220.12	220.12	220.12	220.12	220.12	220.12	220.12	220.12	220.12	220.12	220.12	220.12
6000.00	220.12	220.12	220.12	220.12	220.12	220.12	220.12	220.12	220.12	220.12	220.12	220.12

For S50 it will have similar values as the DI only table. If you've been following this guide you will have already increased your DI start of injection table as follows:

Start of injection for first injection during single injection

Function: Offset (+/-) Value: +.2 Execute

	50.02	100.00	150.02	200.04	300.03	400.03	500.03	600.02	750.00	900.02	1050.03	1200.01
1000.00	280.12	281.25	282.75	283.87	286.50	289.12	291.75	294.37	298.50	302.25	306.37	310.12
1250.00	282.75	283.12	283.87	284.62	285.37	286.12	288.75	291.00	295.87	301.12	304.50	308.25
1500.00	285.00	285.00	285.00	285.00	283.87	283.12	285.37	287.25	292.87	300.00	302.62	306.00
2000.00	290.25	290.25	290.25	290.25	290.25	294.37	297.37	301.12	309.37	312.37	313.50	317.25
2500.00	295.50	295.50	294.37	294.37	297.75	300.00	303.75	307.87	315.00	318.75	319.12	324.00
3000.00	306.37	306.75	307.87	307.12	310.12	310.12	310.12	316.12	320.25	322.87	322.87	325.50
3500.00	312.37	312.75	313.50	312.75	315.00	317.25	320.25	322.50	325.12	325.12	324.75	349.87
4000.00	318.37	318.37	319.12	321.37	325.50	327.00	328.12	330.00	330.00	330.00	355.12	375.00
4500.00	324.00	324.37	324.37	326.62	330.75	333.00	334.12	334.87	335.25	335.25	364.87	400.12
5000.00	327.75	328.50	328.87	330.75	334.12	336.37	337.12	338.25	339.37	340.87	375.00	415.12
5500.00	333.75	334.50	335.25	336.00	338.62	340.87	342.00	342.75	344.25	355.12	379.87	435.00
6000.00	339.37	340.50	341.62	342.75	345.00	346.50	347.25	348.00	348.75	370.12	400.12	450.00

Copy all of these values and paste them into the single injection plus MPI start of injection table so they are the same.

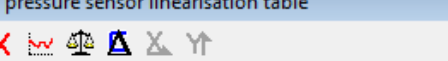
Step 4: Now we need to decide how much fueling each system is responsible for, how much DI and how much MPI is being utilized (AKA the fueling split). The tables for this are called "Factor for SDI pulse (1st) at normal operating point" and "Limiting Factor for SDI pulse (1st) at normal

<https://datazap.me/u/diggs24/60-130-847?log=0&data=17-34-35>

[illegible]

Step 5:

Confirm the lowside fuel pressure sensor scaling is accurate. Should look like this:



fuel pressure sensor linearisation table

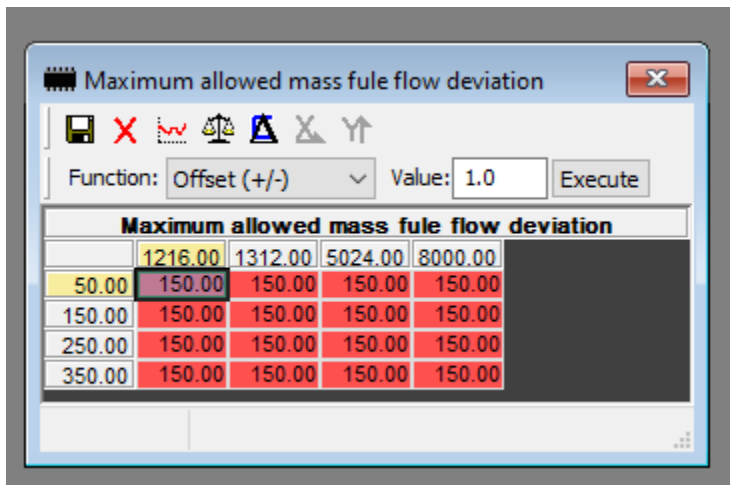
Function: **Offset (+/-)** Value: **+50** **Execute**

V	0.50	4.50	4.51
	1000.32	11000.83	11000.83

Step 6 (for 030 and LB6 ONLY)::

Set Maximum allowed fuel mass to 150:

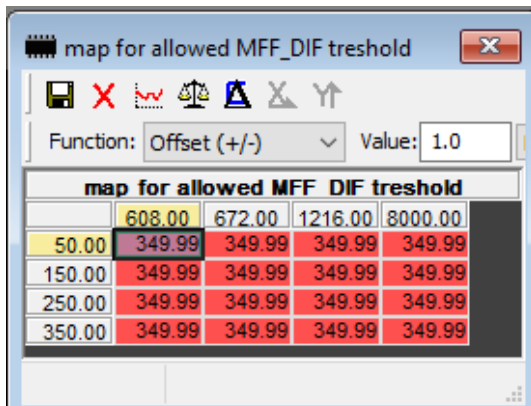
(for 030 and LB6 ONLY)



Maximum allowed mass fule flow deviation				
	1216.00	1312.00	5024.00	8000.00
50.00	150.00	150.00	150.00	150.00
150.00	150.00	150.00	150.00	150.00
250.00	150.00	150.00	150.00	150.00
350.00	150.00	150.00	150.00	150.00

Set Map for allowed MFF_DIF threshold to 350:

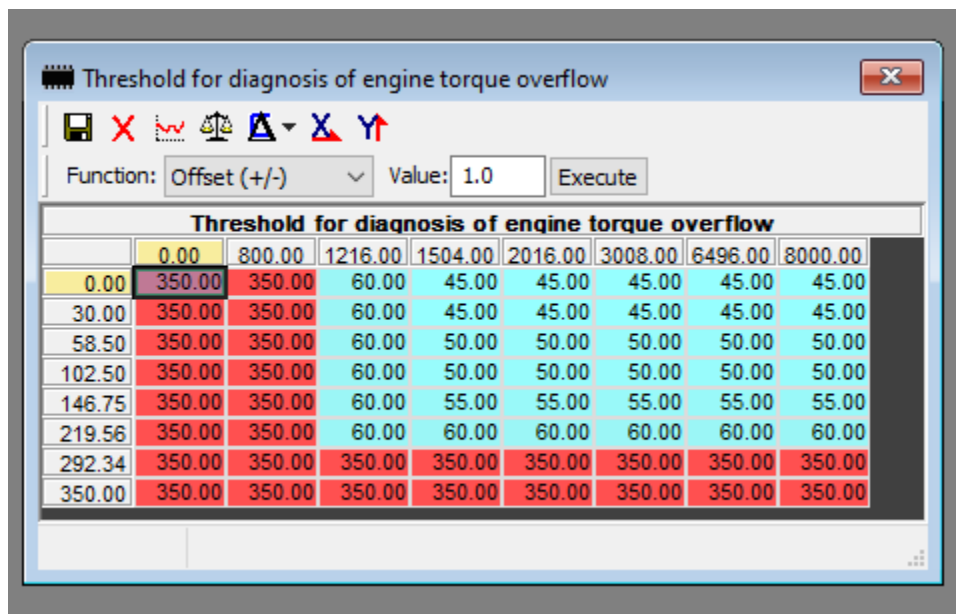
(for 030 and LB6 ONLY)



map for allowed MFF_DIF threshold				
	608.00	672.00	1216.00	8000.00
50.00	349.99	349.99	349.99	349.99
150.00	349.99	349.99	349.99	349.99
250.00	349.99	349.99	349.99	349.99
350.00	349.99	349.99	349.99	349.99

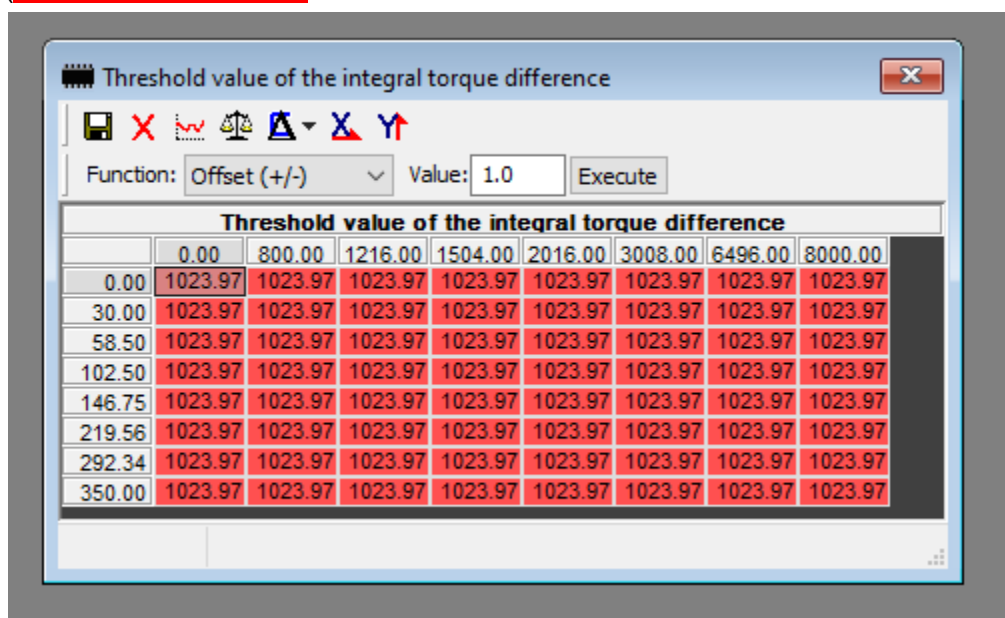
Set this table entirely to 800

(for 030 and LB6 ONLY)



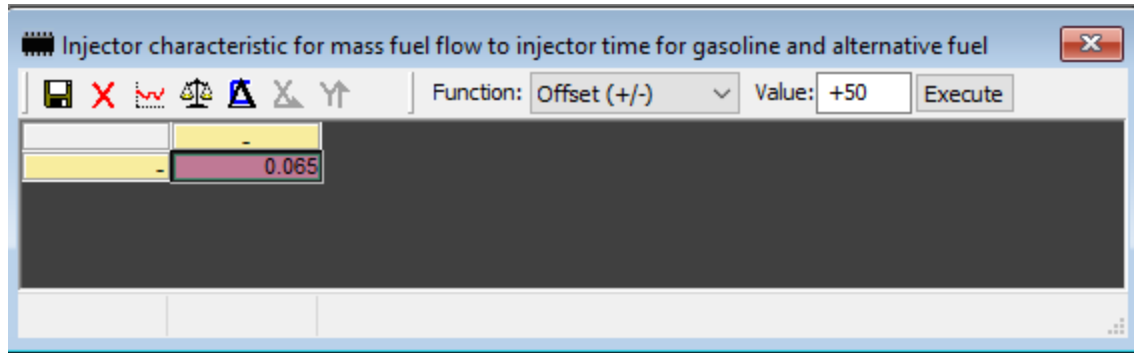
Set this table to 1000:

(for 030 and LB6 ONLY)



Step 7:

If using aftermarket injectors, adjust injector constant. Most people are running either 925cc or 1300cc injectors. For 925cc adjust this table to 0.06 or 0.065:



As you log keep an eye on STFT. +/-10% is good, don't need perfection here. If it is too high or low then adjust the constant in 0.005 increments.

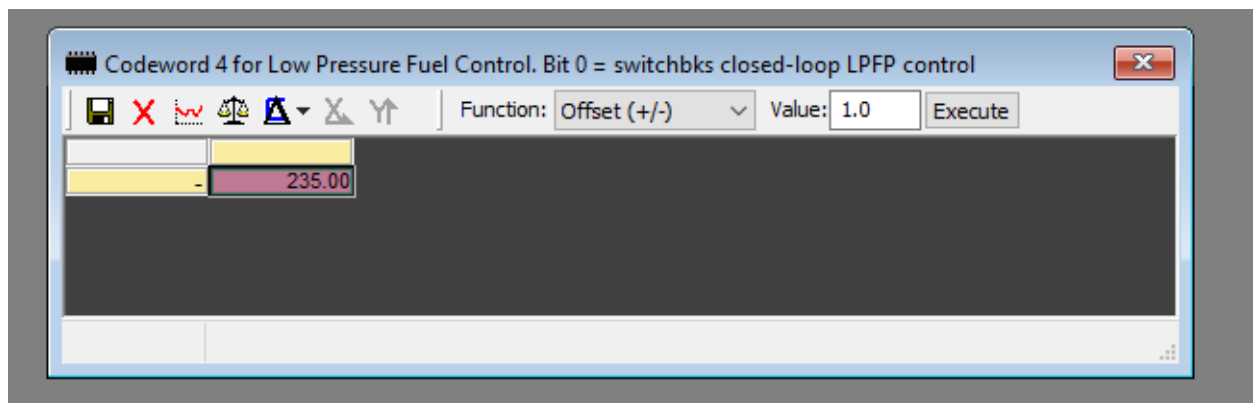
1300cc injectors will probably end up being in the 0.050 range, but every car varies and LPFP pressure seems to have an impact on what the final constant ends up being. Start in these ranges and adjust as you are adding boost, if needed.

Step 8:

Confirm and adjust injector dead time correction table as necessary. Your injector/MPI vendor should have these published somewhere online.

Step 9:

Set fueling to closed loop. Set this table to 235:



Step 10:

Keep an eye on Injector PW, DI and MPI. When in boost try to ensure DI injector PW is >4 once your turbo is making full boost. The DI injectors are right inside the combustion chamber and require fuel to keep them cool. If you put too much load on the MPI injectors you could melt your DIs. That would be no bueno. Everyone has their own opinion on this but I try to keep my

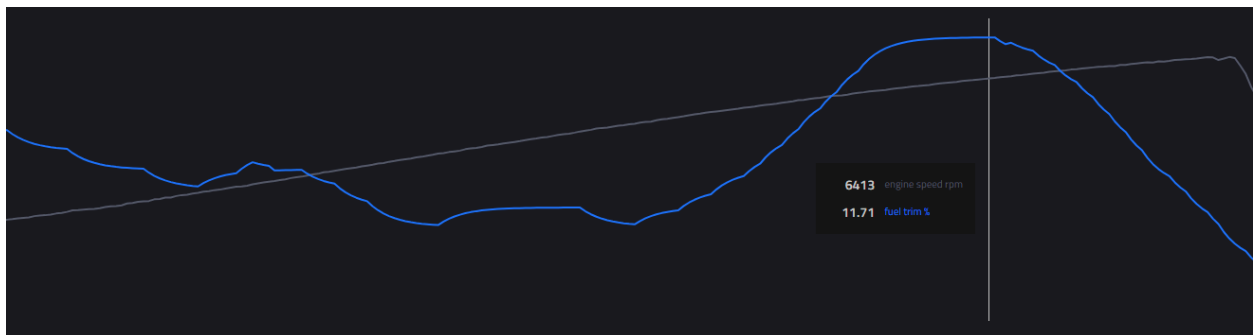
DI injector PW >6 and adjust my MPI/DI split (see step 3) to ensure this. MPI Injector PW can be whatever and will vary depending on how much fuel is needed to hit target lambda. Upper limit is around 20ms for MPI injectors. If you are getting close to that you either need bigger injectors, LPFP pressure is too low, or cut back on E85.

Fuel Trims

Once your tune is dialed in you will highly likely have some fuel trims adjustments to make.

Go out and get some 3rd or 4th gear WOT logs. The PID you want to monitor is Fuel Trim % as this will do LTFT + STFT.

Let's take this for example:



Terrible! This means the ECU injected more than 11% more fuel than expected in that area.

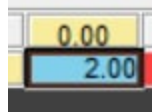
We will use the MAF correction tables for this example, but note that you can also use Fuel Mass to solve your trims.

First of all, go in the .ALL XDF and look for this table:

The screenshot shows a software window with a table titled "Index to select the valid IP_FAC_MAF_COR[i] depending on CMB-mode". The table has 21 columns, each representing a different CMB mode. The values in the table are as follows:

Index	0.00	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.00	12.00	13.00	14.00	15.00	16.00	17.00	18.00	19.00	20.00
Value	0.00	255.00	1.00	255.00	255.00	255.00	255.00	255.00	0.00	2.00	255.00	255.00	255.00	255.00	255.00	255.00	255.00	255.00	255.00	255.00	255.00

This map allocates the different combustion modes to the available MAF correction tables. Comb mode 0 is single pulse DI-only, which is what we are working with at WOT, except if your car has MPI, in that case it'll be Comb Mode 9 (you can see this on your PID list).



You can see that Comb Mode 0 (x-axis) is allocated to map 2 (cell value), so let's find it.

	750.00	1250.00	3500.00	3900.00	4600.00	5500.00	6400.00	6600.00
250.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
399.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
599.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
799.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
999.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1149.98	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1299.98	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1499.98	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1699.98	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1999.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2199.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2399.96	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

There are 4 available maps for these corrections. Hit F2 to confirm this is the right one:
This is [2] so we are good to continue.

(ID:309033) Global MAF_STND correction factor (High-res-interpolation) with se...

Title: Global MAF_STND correction factor (High-res-interpolation) with sel

Description: IP_FAC_MAF_COR[2]
X: ldpm_n_fac_maf_cor
Y: ldp_map_eff_vol_fac_maf_cor

Address (Hex): 0x4B729 Lookup Address: 0x24B729

Cell Data Size: 1 Byte (8 Bit) Use Low Range: ☒ -25.0000

Signed: ☐ Use High Range: ☒ 24.8047

Major Order: Column Visibility Level: Always

Major Stride (Bytes): 0 Output Type: Floating Point

Minor Stride (Bytes): 0 Decimal Places: 2

Cell Units: %

Category A: INSY_Combustion_condition_correction_of_volumetric_efficienc

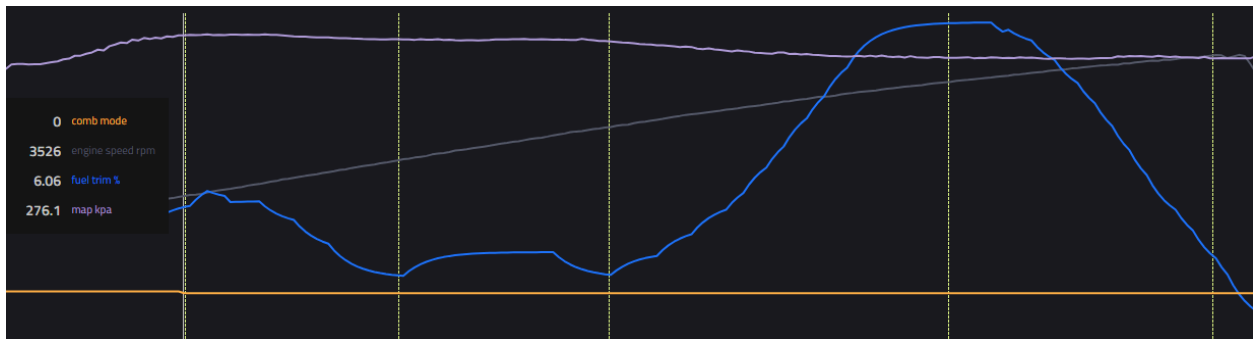
Category B: Any Category

Category C: Any Category

General Rows Columns Conversion DAAssoc.

OK Apply Close

This table will use MAP and RPM. I use flags to set the axis correctly.



Positive trim values mean that the ECU expects less air, so we need to put a positive value in the MAF Correction table to tell the ECU that more air will enter the cylinder in that area.

Global MAF_STND correction factor (High-res-interpolation) with select...

Function: Copy From Comp Value: -5 Execute

	750.00	1250.00	2000.00	3500.00	4400.00	5200.00	6300.00	7000.00
250.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
399.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
599.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
799.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
999.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1149.98	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1299.98	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1499.98	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1699.98	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1999.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2199.97	0.00	0.00	0.00	6.05	2.93	3.91	10.94	3.91
2399.96	0.00	0.00	0.00	6.05	2.93	3.91	10.94	3.91

Now go ahead and get some logs. MUCH BETTER. Rinse and Repeat, anything between -3 and 3% is good.

