

# ***RAFIG IDLE TUNING PROCESS***

I decided to PDF this process and bring everything I found into one document as when I went to idle tune it was in bits and pieces so I have gathered SSpdmon's info and put it into a PDF including some other stuff I had to do to keep it idling with AC and Thermo fans kicking on. This was performed on a VX SS M6 with a 227/241@50 - 109LSA with 563 Lift. If you have an auto you will need to do RAFPN as well.

## PIDS REQUIRED FOR RAFIG

IAC Long Term Correction, In Gear, A/C off - GM.IAC\_LTD\_DMA

IAC Short term correction, In Gear, A/C off – GM.IAC\_STD\_DMA

Idle Airflow Correction AC off, In Gear – CALC.RAFIG

RAFPN PIDS (AUTO ONLY)

IAC Long Term Correction, In P/N, A/c off – GM.IAC\_LTPN\_DMA

IAC SHortTerm Correction, In P/N, A/c off – GM.IAC\_STPN\_DMA

Idle Airflow Correction AC off P/N – CALC.RAFP

I also log TPS% and IAC Count as a minimum. Save the new PID selection as RAFIG/RAFPN it will look somewhat like this

EFLive Scan V7.5

File Edit View Info Dashboard Charting Calibration Bidirectional FlashScan Window Help

Console (F6) OBD II (F7) PIDs (F8) Data (F9) Dashboard (F10) Maps (F11) DVT (F12)

PID file: RAFIG IDLE.pid

System: [All]

Description	Caption	Units	Default	System	Channels	Parameter
Absolute Throttle Position	TP	%	-	Throttle	1	SAE.TP
Air Flow Grams/Cyl - Speed Density	DYNCLAIR_DMA	Grams/cyl	-	Tune	2	GM.DYNCLAIR_DMA
Base Efficiency Numerator Bank 1, Serial ...	BEN1	factor	-	W/D2-Serial	0	CALC.BEN1
Commanded Air Fuel Ratio	AFR	:1	-	Fuel	2	GM.AFR
Engine Coolant Temperature	ECT	"C,"F	Metric	Temperature	1	SAE.ECT
Engine RPM	RPM	RPM	-	Conditions	2	SAE.RPM
External Wideband AFR	W/D2AFR1	AFR	-	W/D2-Serial	0	EXT.W/D2AFR1
Heated O2 Sensor Voltage Bank 1 - Senso...	H02S11	mV	-	O2	1	GM.H02S11
IAC - Long term correction, In Gear, A/C Off	IAC_LTD_DMA	Grams/s,Lb...	Metric	Idle	2	GM.IAC_LTD_DMA
IAC - Long term correction, In P/N, A/C Off	IAC_LTPN_DMA	Grams/s,Lb...	Metric	Idle	2	GM.IAC_LTPN_DMA
IAC - Short term correction, In Gear, A/C Off	IAC_STD_DMA	Grams/s,Lb...	Metric	Idle	2	GM.IAC_STD_DMA
IAC - Short term correction, In P/N, A/C Off	IAC_STPN_DMA	Grams/s,Lb...	Metric	Idle	2	GM.IAC_STPN_DMA
Idle Air Control Position	IAC	Steps	-	Air	2	GM.IAC
Idle Airflow Correction AC Off, In Gear	RAFIG	Grams/s,Lb...	Metric	Idle	0	CALC.RAFIG
Idle Airflow Correction AC Off, P/N	RAFPN	Grams/s,Lb...	Metric	Idle	0	CALC.RAFP
Ignition Timing Advance for #1 Cylinder	SPARKADV	Degrees	-	Spark	1	SAE.SPARKADV
Injector Base Pulse Width Bank 1	IBPW1	ms	-	Fuel	2	GM.IBPW1
Injector Duty Cycle Bank 1	INJDC1	%	-	Fuel	0	CALC.INJDC1
Intake Air Temperature	IAT	"C,"F	Metric	Temperature	1	SAE.IAT
Intake Manifold Absolute Pressure	MAP	kPa,PSI	Metric	Air	1	SAE.MAP
Long Term Fuel Trim - Bank 1	LONGFT1	%	-	Fuel	1	SAE.LONGFT1
Retard Due to Knock	KR	Degrees	-	Spark	1	GM.KR
Vehicle Speed Sensor	VSS	KMH,MPH	Metric	Conditions	1	SAE.VSS
3-2 Downshift Solenoid Duty Cycle	SHIFT32	%	-	Transmission	1	GM.SHIFT32

Total PIDs: 377 Selected PIDs: 16 Selected Channels: 20 Selected Packets: 4

Frame: Not connected [ GM [ 6H8VXK69F1L687255 [ Manual [ 12202088 ]

Time: 00:00:00.000

4:02 PM 12/03/2016

I found this step helpful in getting the IAC to have more control without going outside its boundaries. For this you will have to remove your throttle body to access throttle stop,

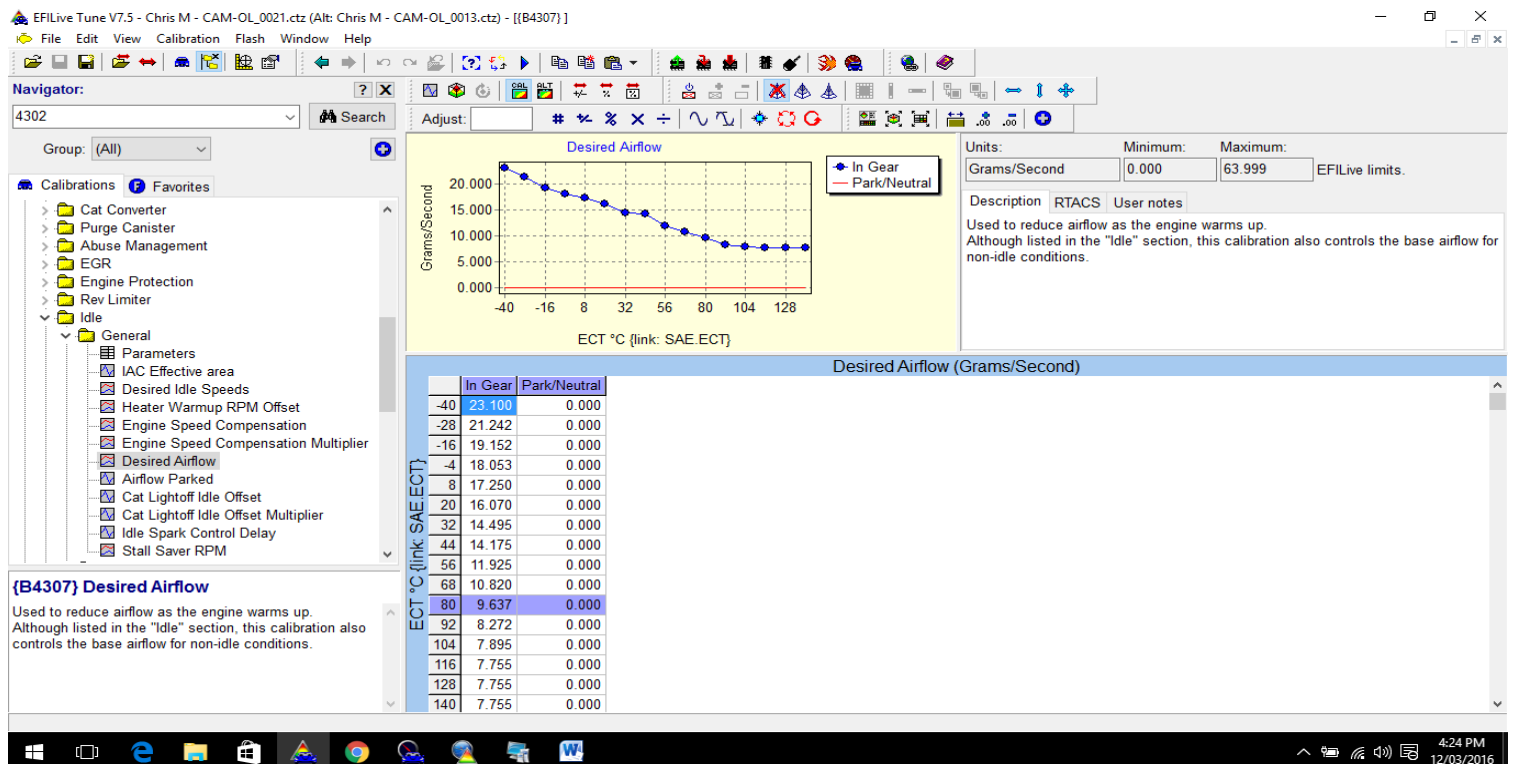
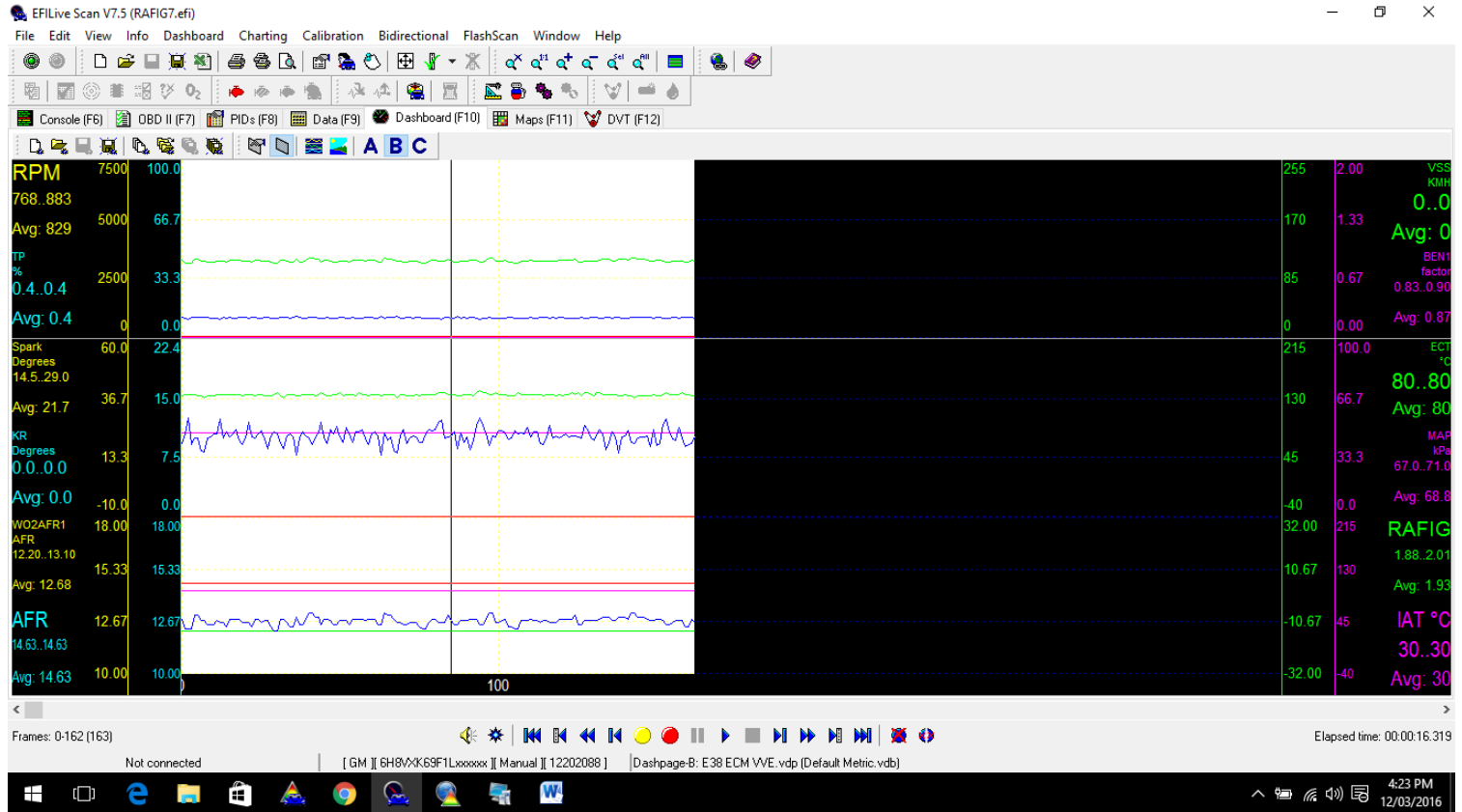
Log TPS% and it will be at 0% turn the small screw with a torx bit and get the reading to 3-4% turn off the ignition unplug the TPS, turn IGN back to red and count to 5 turn back off and plug the TPS back in and check, this should have reset it to 0%. By doing this it avoids having to drill out the TB blade hole. Once the RAFIG process is complete were looking for IAC counts of 40-50.

Now for the RAFIG process, do this from a cold start and log until it gets to around the 117degrees Celsius, I achieved this by pressing F12 (DVT) and activating and taking control of the engine fans and leaving them off. Just make sure once it gets hot to turn the fans on to bring the ECT back to 90degrees Celsius or there about.

Once you have got a log that ranges from 20 degrees to 117 degrees, press F10 and goto the dashboard and view the histogram. Create a filter as below for each temp range that is in B4307 – Desired Airflow as this is the table we will be modifying. As you can see this filters all data that isn't 80 degrees c.

The screenshot displays the EFILive Scan V7.5 software interface. A 'Data filters' dialog box is open, showing a filter named 'RAFIG' with the control 'Include data frames' and the parameter '[0] Engine Coolant Temperature (°C) (SAE.ECT)'. The filter type is set to 'Greater than' with a value of '79.00 °C'. The 'Join using' options are 'And', 'Or', and 'None'. The filter list shows a single filter: '(SAE.ECT.C) is greater than 79.00 °C AND (SAE.ECT.C) is less than 81.00 °C'. The background dashboard shows various engine parameters: RPM (7500), TP % (0.0), Spark Degrees (60.0), KR Degrees (13.3), WO2AFR1 AFR (18.00), AFR (12.67), VSS (255), BEN1 factor (0.00), ECT °C (170), MAP (1.33), CYLAIR (1.00), and IAT °C (0.00). The status bar at the bottom indicates 'Not connected' and 'Time: 00:00:00.000'.

Apply this filter then select what is left on the histogram, this will give you a max –min and an average of the selected data as shown below. You can see under RAFIG that the ECT is 80degrees and RAFIG average is 1.93. Take this number and add it to your B4307 table Or if the number is a minus, take this number away.



After doing this step a couple of times your RAFIG should come to around .010 -.040 carry out the same process for the RAFPN.

I followed these next steps from SSpdemon's Idle Info.

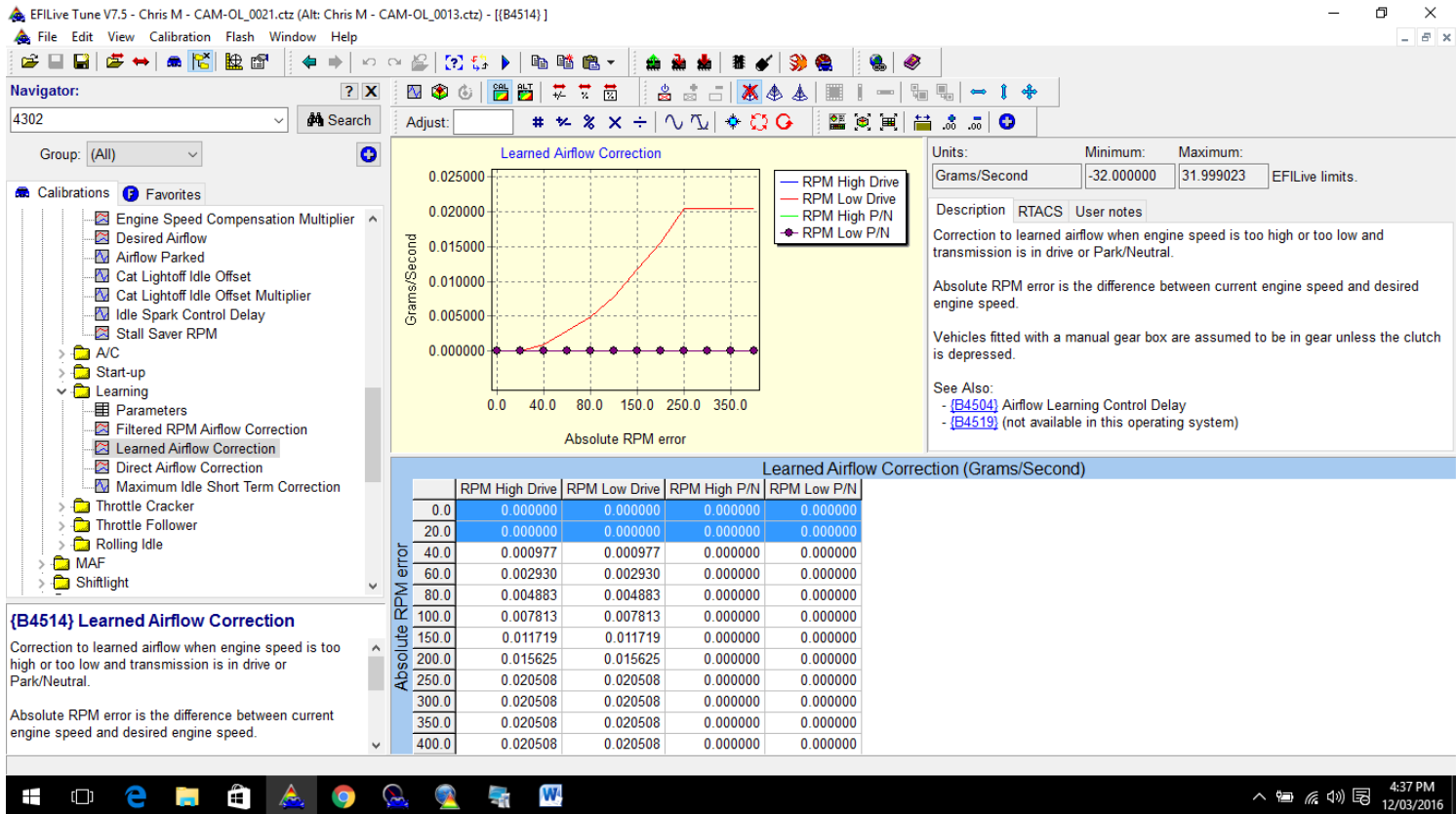
Changed **B4504** Airflow Learning Control Delay, from 1.3 seconds to 4.3 seconds. What I noticed happening was it was taking more than 1.3 seconds for the idle to come back down when I rev'd it up...even without it hanging or coming down too slow. The PCM would then start correcting the 'learned' desired idle airflow with the STIT's and reducing the learned values too much. This would drop the idle down too far and the other correcting factors had to make up the difference, which would cause huge swings in idle. \*\*Pre-'01 f-bodies only have one, combined delay timer. If you have a pre01 f-body, you may have to work around this issue (i.e. don't change it) or upgrade to a newer OS.\*\*

The screenshot shows the EFLive Tune V7.5 software interface. The title bar indicates the file is 'Chris M - CAM-OL\_0021.ctz' and the current calibration is '(B4504) Engine Calibration, Idle, Learning: Airflow Learning Control Delay'. The interface is divided into several sections:

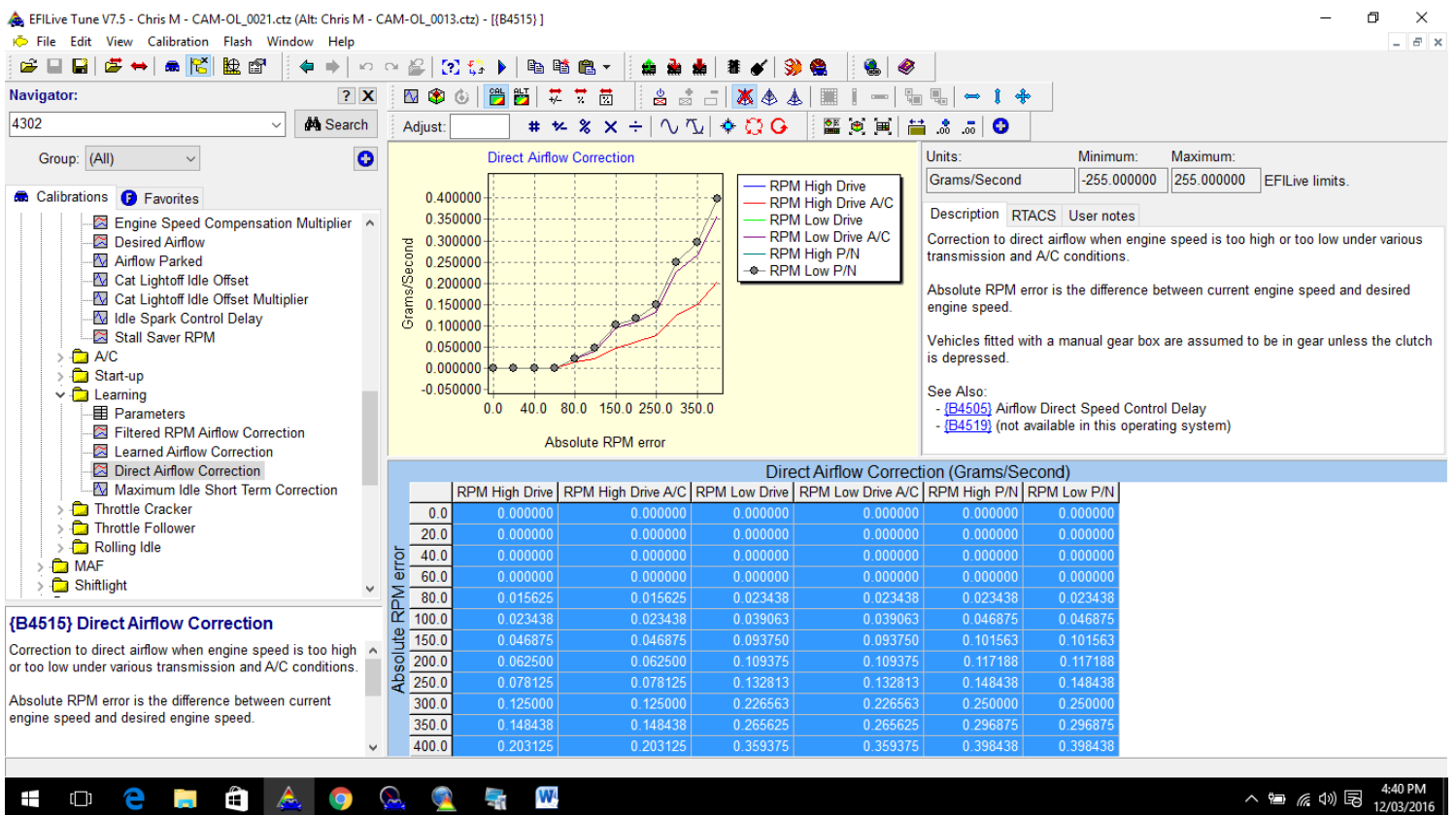
- Navigator:** Shows a tree view of calibrations. The 'Learning' folder is expanded, showing 'Parameters' and 'Airflow Learning Control Delay'.
- Parameters:** A list of parameters with their values. The 'Airflow Learning Control Delay' parameter is highlighted with a value of 4.3.
- Adjust:** A section for adjusting the parameter. It shows 'Units: Seconds', 'Minimum: 0.0', and 'Maximum: 409.6'. The 'Adjust' field is set to 4.3.
- Description:** A text box describing the parameter: 'Airflow learning is enabled this many seconds after the engine speed drops below the PCM's desired engine speed.' It also includes a link to '(B4514) Learned Airflow Correction'.

Description	Value
(B4501) Idle Learn Minimum Temperature	80
(B4502) Idle Learn Maximum Temperature	112
(B4503) Filtered RPM Airflow Control Delay	1.3
(B4504) Airflow Learning Control Delay	4.3
(B4505) Airflow Direct Speed Control Delay	0.3
(B4506) Spark Airflow Speed Control Delay	1.3
(B4507) Airflow Learning RPM Time	1.5
(B4508) Airflow Learning RPM Threshold	60.0
(B4509) Airflow Direct Speed Control Threshold	50.0
(B4510) Airflow Control Startup Delay	1.2
(B4511) Startup Engine Underspeed Time Limit	4.5
(B4322) Idle Learn P/N Limit High	0.00
(B4323) Idle Learn P/N Limit Low	0.00
(B4331) Idle Learn P/N A/C On Limit High	0.00
(B4330) Idle Learn P/N A/C On Limit Low	0.00
(B4324) Idle Learn Drive Limit High	0.50

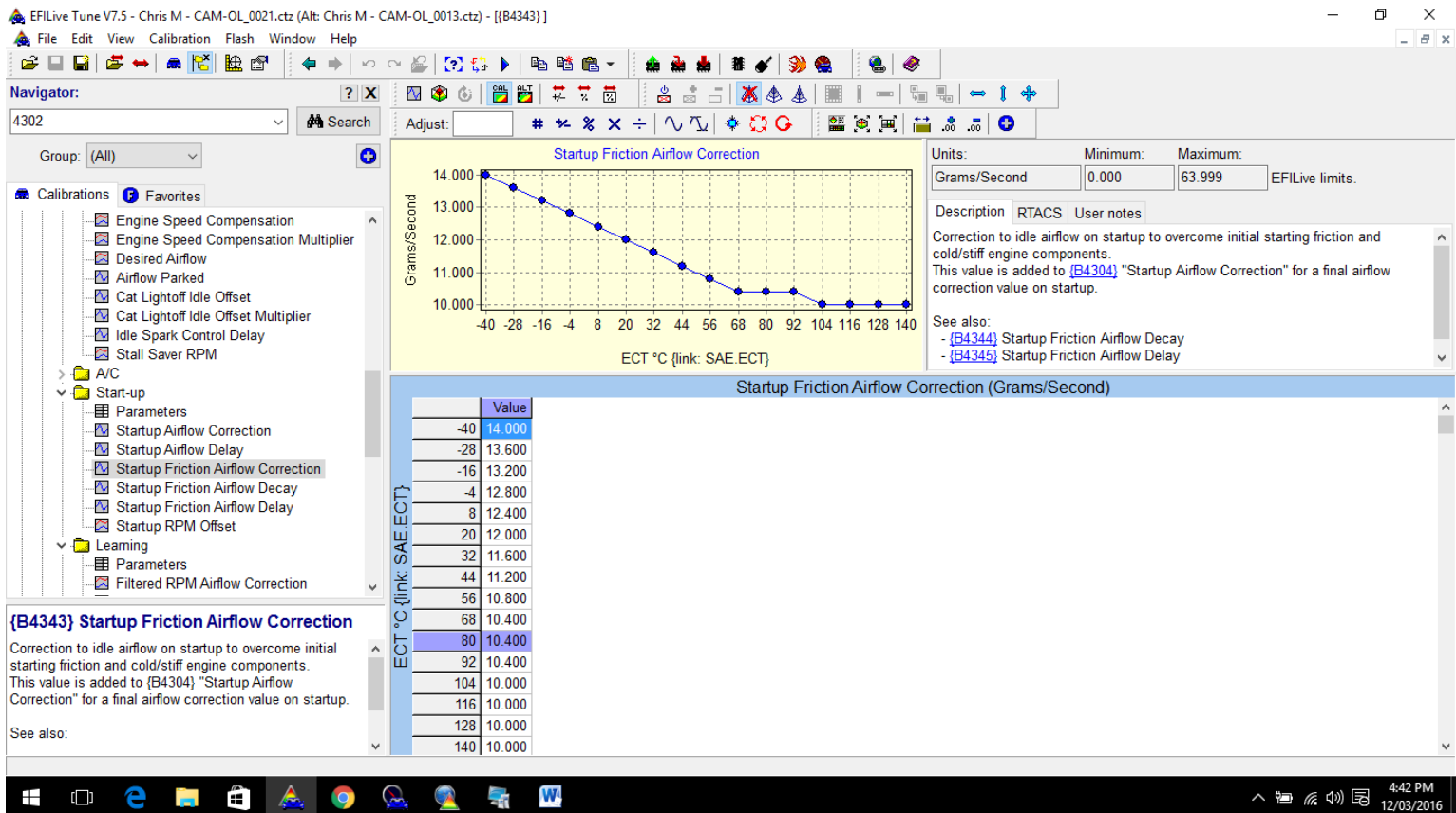
Changed the Learned Airflow Correction table by zeroing out the 0-20 absolute rpm cells. This means the car won't correct the learned airflow values (STITs/LTITs) until it's more than 20 rpms above/below desired idle speeds. With cam'd cars that have a choppy idle, the STIT/LTIT settings can be too aggressive. This softens them up a little. I also tweaked the remainder of the table to make the Low RPM learning a little more aggressive than the High RPM column. This allows the car to learn up faster than it will learn down.



Changed the **B4515** Direct Airflow Correction table, for High and Low RPM scenarios (Drive, A/C on, etc.). IMO, this was also making very aggressive airflow corrections - pulling too much if the idle was high and adding too much when it was low. By zeroing out the 0-40rpm cells and reducing the remaining cells to start, I was able to prevent the idle from over-correcting and swinging up & down. The "low idle" cells shouldn't require major changes - maybe 10~20% reductions to start if they are overcompensating. However, I suggest severely reducing the "high idle" cells by 50+% for two reasons: 1-Your RAFIG should be tuned and too much airflow shouldn't be an issue. 2-The Learned Airflow Correction Table will learn down the idle trims if desired idle airflow is too high due to environmental changes. Therefore, this becomes a stall saver for when the car isn't moving (or wherever your idle learning thresholds are set). THIS TABLE ALONG WITH THE DELAY TIMERS ABOVE HAD THE LARGEST EFFECT ON FIXING MY IDLE SWING PROBLEM. IF YOU'RE LOOKING FOR A PLACE TO START, START WITH THESE.



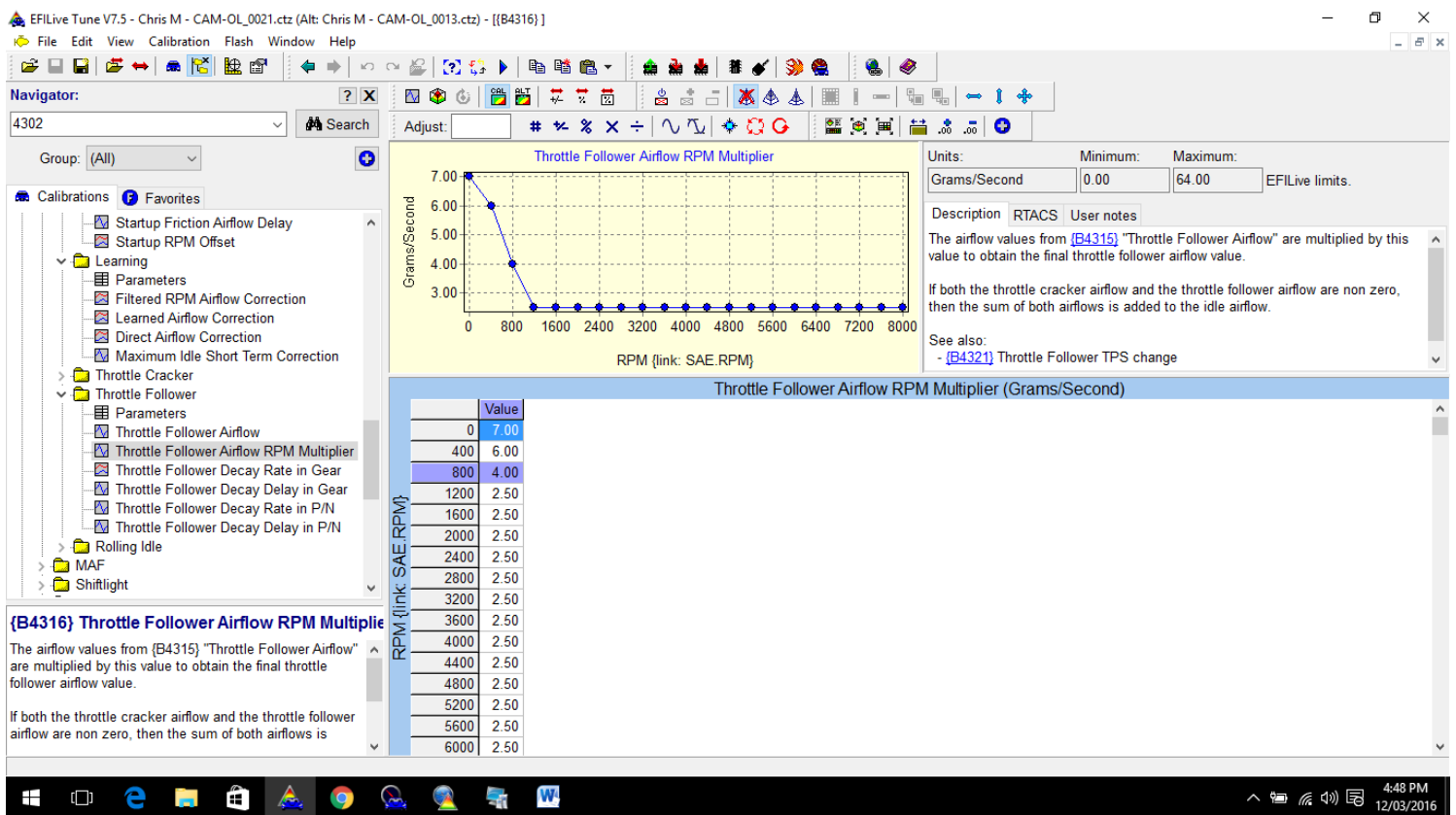
Increased the **B4343** Start-up Friction Airflow Correction table for better starts. Although this doesn't really have to do with idle swing, I thought I'd include it because it seems to be a common problem. I increased this table significantly across the board to start. Pin-pointing by ECT, you can add a little in more or take out a bit where needed to ensure the car doesn't fall on its face or go hog wild after a warm start. Now, my warm start issues are gone. It was stumbling right after start-up, barely running because there wasn't enough initial airflow. Adding air in here is a good, temporary way to add in the airflow, which will be decayed out after the first 30 seconds or so.



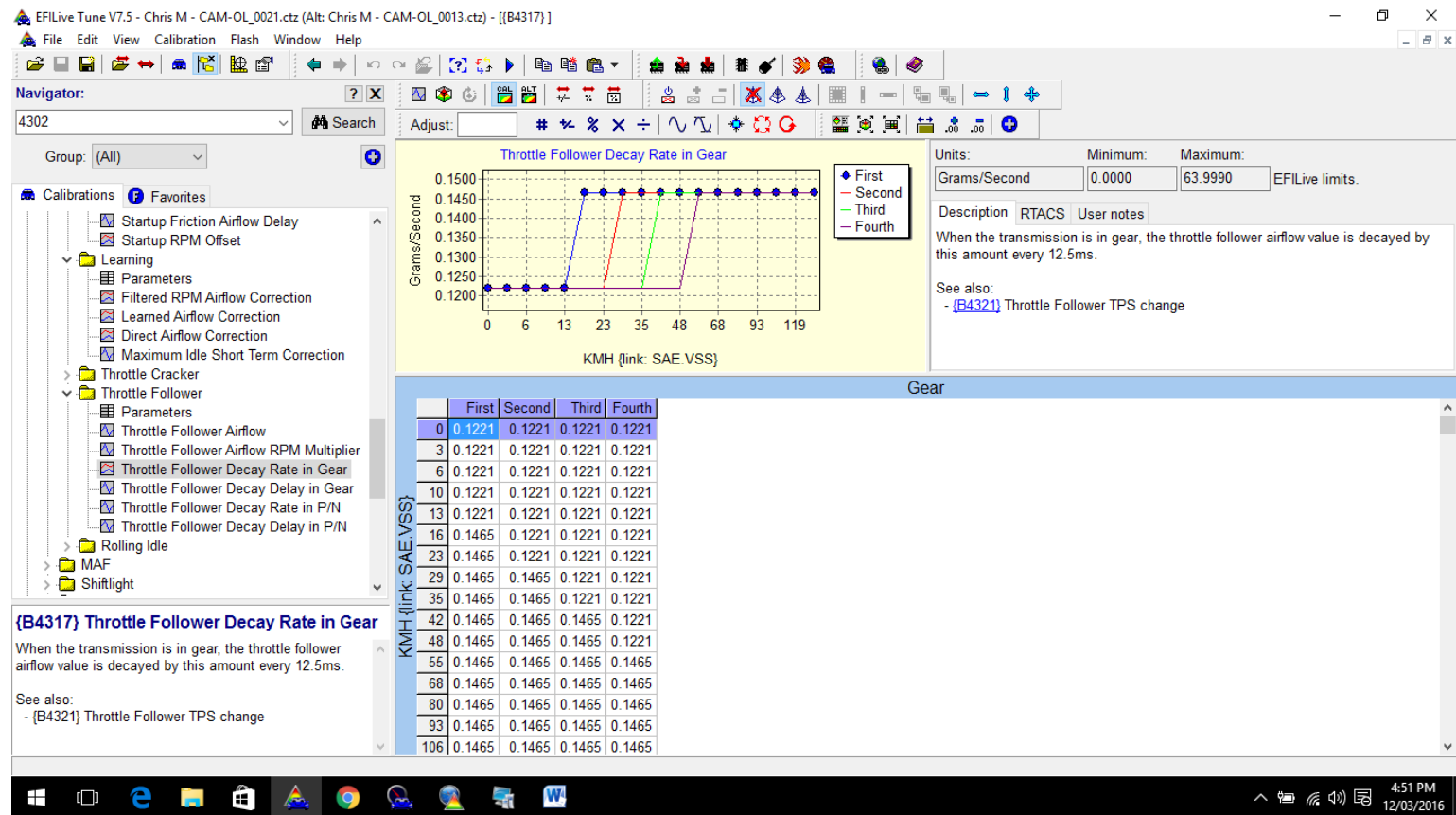


Adjusted **B4316** Throttle Follower Airflow Multiplier and its rate of decay. For light load, low RPM bucking, you can increase the multiplier to bump up the throttle follower airflow that is added. Remember, this is for surging while your foot is on the gas. If you have problems with surging off the throttle and believe it's airflow related, that's addressed in the throttle cracker tables. Keep in mind, when bumping up the multiplier, you need to increase the decay rate as well. If the decay is set too low, idle will hang up around 1200rpms or more until the follower fully decays out. I bumped up the multiplier to 3~5 depending on RPM (more down low) and increased the decay rates. Don't forget the P/N decay rates too. \*\*This is working from an '01~'02 f-body throttle follower airflow table. Pre-'01 and C5 cars have different throttle follower settings. Copying all of the follower tables from an '01~'02 f-body tune may help as a starting point if using this tutorial.\*\*

If throttle hangs continue to increase the decay rate. I would rev up to say 2000rpm and see how long it takes and do so for 3000 & 4000 and increase decay rate accordingly until your happy.

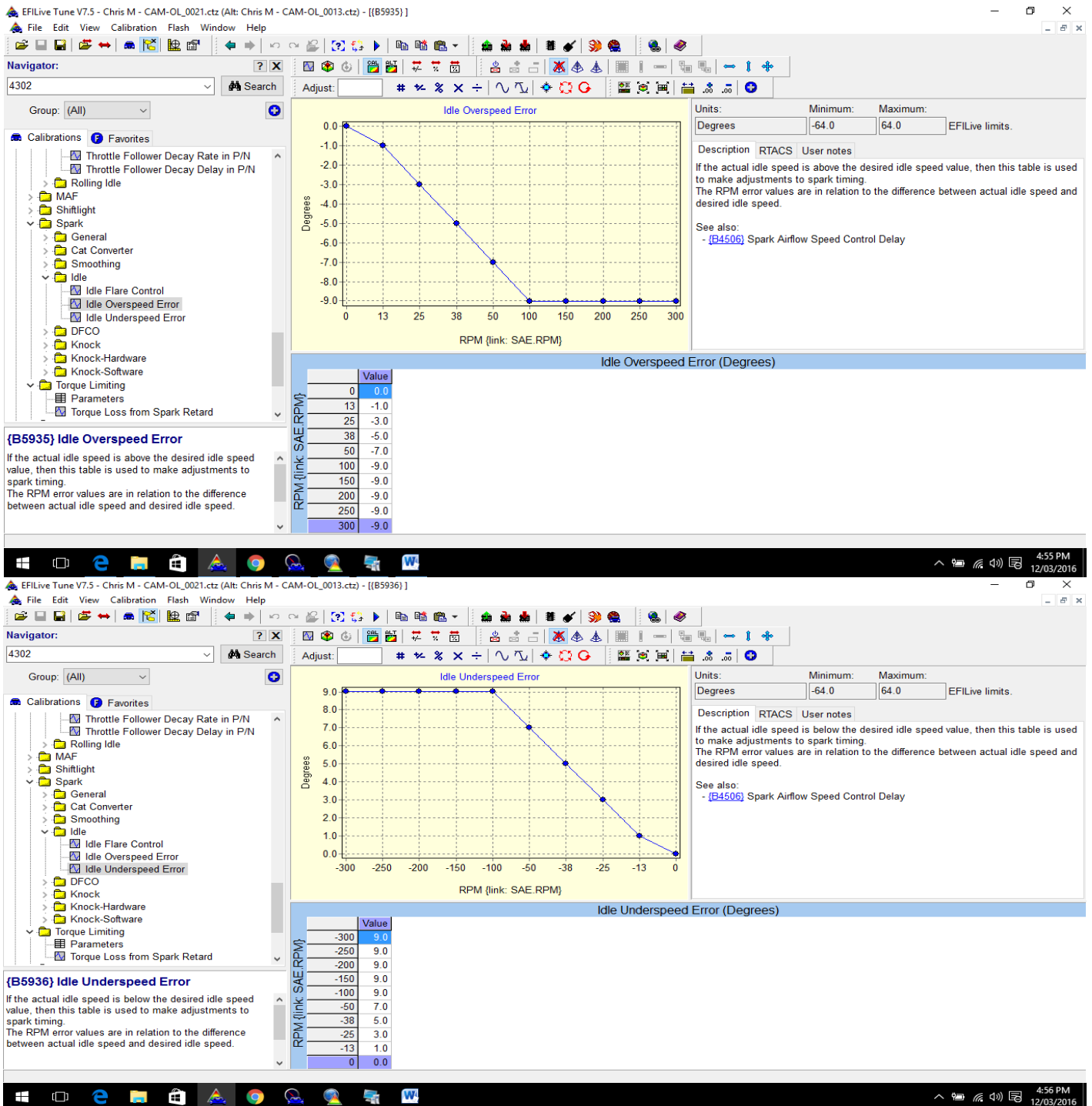


The tables you can't see are 2.50.



The last few tables that you can't see are all 0.1465.

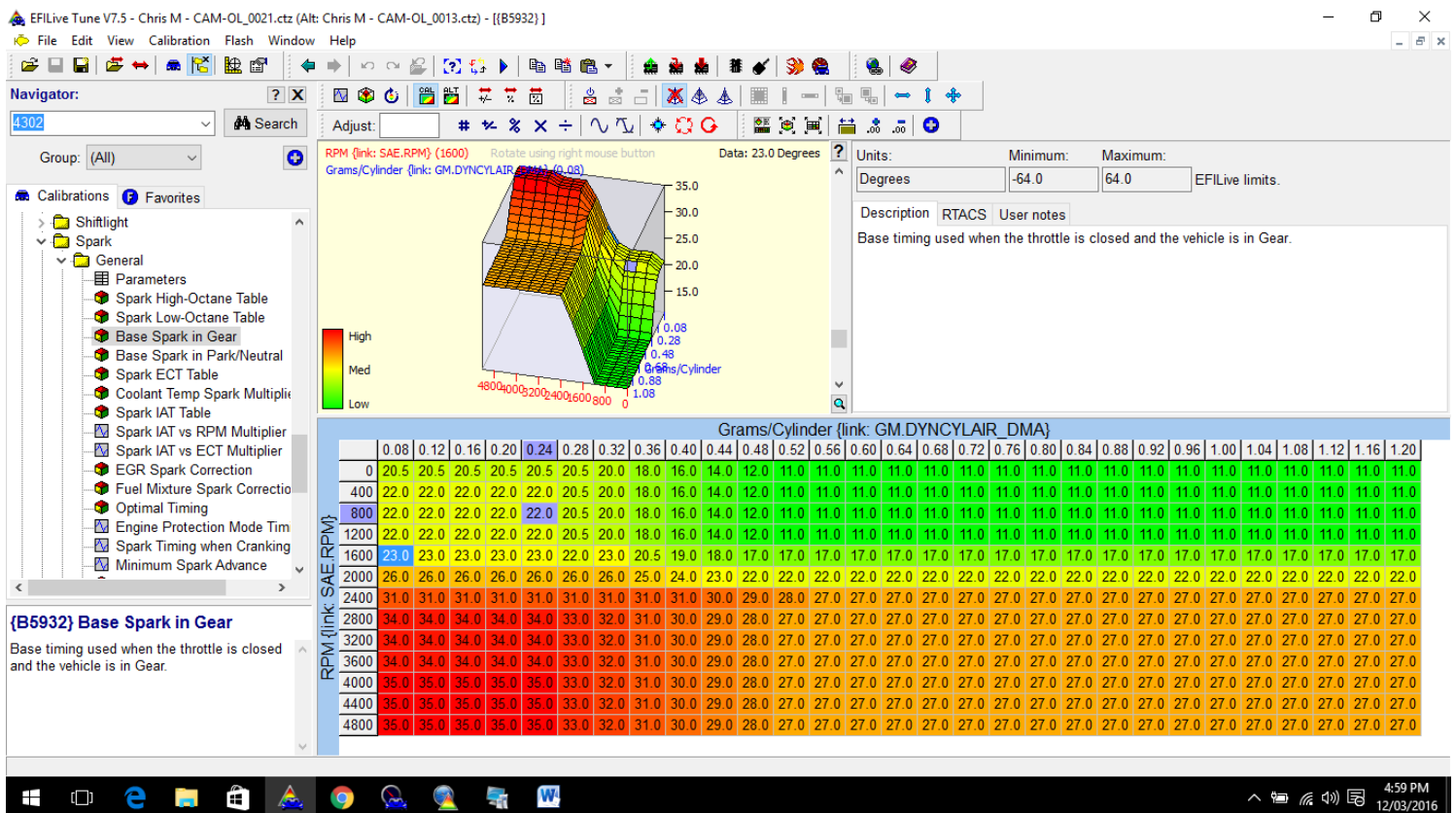
Changed the Idle Spark Overspeed/Underspeed Correctors. The stock settings are too aggressive in some areas and not enough in others IMO. I capped the swing to +/-9 degrees. Also, I brought up the underspeed spark correction for -200~300 rpms. The stock table drops off...I changed those cells to 9 degrees. Just make sure this won't command too high of a spark based on how you have set the base spark and high/low octane tables. \*\*A4 cars may have different spark settings. Ideally, you want to make sure that it doesn't go overboard with pulling timing for high idle scenarios OR it doesn't just quit adding timing if the RPMs drop 300rpm or more below target.\*\*



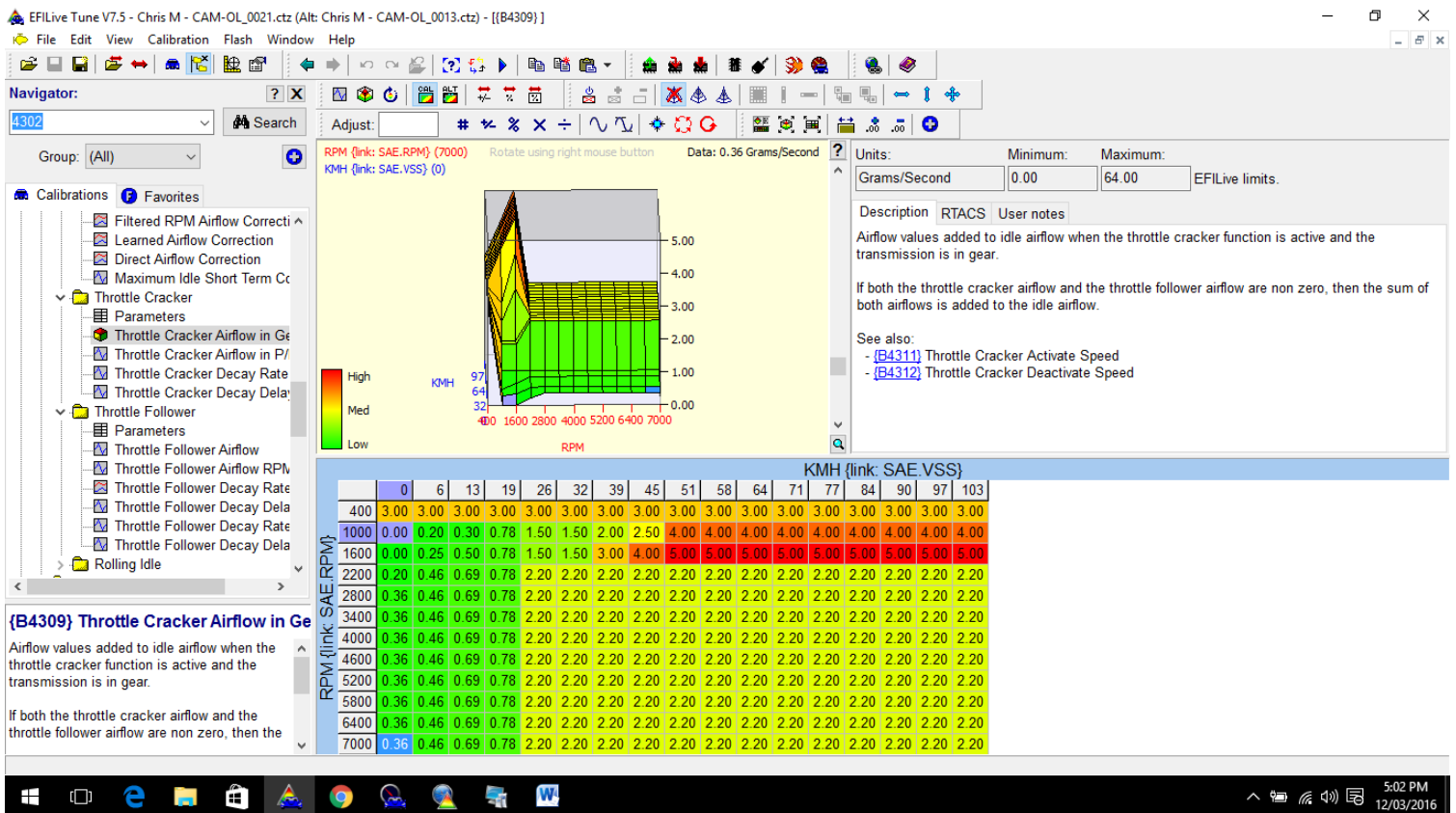
Found the right commanded spark for idle in the base spark MAP B5932. Right now, I'm commanding ~23° of timing at idle in my base spark tables (idle set at 850rpms when warm). The idea here was to find a good medium between what the car likes at idle and what it likes when first pulling away from a stand still (in my case <20°). The reason this is important is...the greater the jump from idle to non-idle spark, the more jerky the car may be while pulling away from a stop. What surprised me was the fact that the stock high/low timing tables were too high in the low rpm, low airflow portions of the table. I've included some pics of my base and high octane timing tables to show what is working for me. The key with the timing tables is to make sure you understand which timing tables are active depending upon your setup. Then, you can make the changes needed in the right tables (Base Spark vs. High/Low Octane). \*\*A4 cars will require more base timing to idle for 'in gear', but similar base P/N and high octane/low octane timing tables should work. For base in gear, try 31° in the 800~1200rpm rows, 32° in the 1600rpm row, 34° in the 2000rpm row, and 35~36° in the rows below (for .28grams/cyl and less). You will also have to change B5916 (1.19%) and B5917 (255mph) to ensure you fall into the base timing tables when off the throttle.\*\*

Another thing to note about timing - make sure you have your map enablers set appropriately. Knowing where the commanded timing is coming from (base vs. high/low) is key to getting the car to run the way you want it to. Personally, I like my car to be in the base timing tables anytime my foot is off the gas. Therefore, I set the MPH enabler to 255mph and the TP% enabler to 1.19%.

I copied this whole table across for my base spark and it was perfect, either do the same or just use it as a good smooth starting point.



**\*\*Note** - Since we're on the topic of surging...I used to believe more spark is the way to cure surging issues. However, I was wrong. Someone once stated that LS1's rarely require more than 40\* of timing and surging issues can be cured with the IAC and the right timing. I currently have a max of ~35\* timing in my base spark tables and high/low octane tables. My surging is virtually gone other than the occasional bump or two below 1200rpms. I guess they were right. Playing with the throttle cracker table and throttle cracker decay rate table were an important piece of the puzzle. Currently, my 1000 & 1600 rpm rows are zeroed out completely. I have 4 grams/second in the 400 rpm row to help prevent the revs from dropping too far when putting the clutch in or other similar scenarios (for M6 cars only). This combined with the timing adjustments sealed the deal with off throttle surging. I was having issues with the foot off the throttle rolling from 100kmh to 70kmh in 6<sup>th</sup> gear so I added some airflow in those RPM areas and also some issues with stalling when coming to a stop with AC on so added some extra to the lower 400rpm tables.



I also found that if my thermo fans would kick in the PCM wasn't compensating enough air, I changed the fans to .50 in the B4301 and B4302 tables. This fixed the issue with stalling with the fan on.

EFILive Tune V7.5 - Chris M - CAM-OL\_0021.ctz (Alt: Chris M - CAM-OL\_0013.ctz) - [{B0107} Engine Calibration, Idle, General: Max Speed for Idle Mode]

File Edit View Calibration Flash Window Help

Navigator: 4302 Search Adjust: # % X ÷ Units: Minimum: Maximum: KMH 0 412 EFLive limits.

Calibrations Favorites

- EGR
- Engine Protection
- Rev Limiter
- Idle
  - General
    - Parameters
    - IAC Effective area
    - Desired Idle Speeds
    - Heater Warmup RPM Offset
    - Engine Speed Compensator
    - Engine Speed Compensation
    - Desired Airflow
    - Airflow Parked
    - Cat Lightoff Idle Offset
    - Cat Lightoff Idle Offset Multip
    - Idle Spark Control Delay
    - Stall Saver RPM
  - A/C
  - Start-up

Description User notes

If vehicle speed is above this, and throttle position is above [B0108] "Max Throttle for Idle Mode" then airflow will be calculated as "non-idle".

Max Speed for Idle Mode (KMH)

Description	Value
[B0107] Max Speed for Idle Mode	0
[B0108] Max Throttle for Idle Mode	0.0
[B4401] Default IAC Motor Park Position	310
[B4402] Maximum IAC Steps	365
[B4601] Max Idle RPM in Gear	1200
[B4602] Max Idle RPM in P/N	0
[B4612] RPM Set Point Adjust in Gear	2
[B4613] RPM Set Point Adjust in P/N	0
[B4614] RPM Set Point Adjust Timer	0.500
[B4610] Heater Warmup Intake Temp Threshold	-40
[B4611] Heater Warmup Decay	1
[B4301] Fan #1 IAC Correction	0.50
[B4302] Fan #2 IAC Correction	0.50
[B4349] ETC Throttle Area Conversion	0.0255
[B4350] Maximum Desired Idle Area	84.0

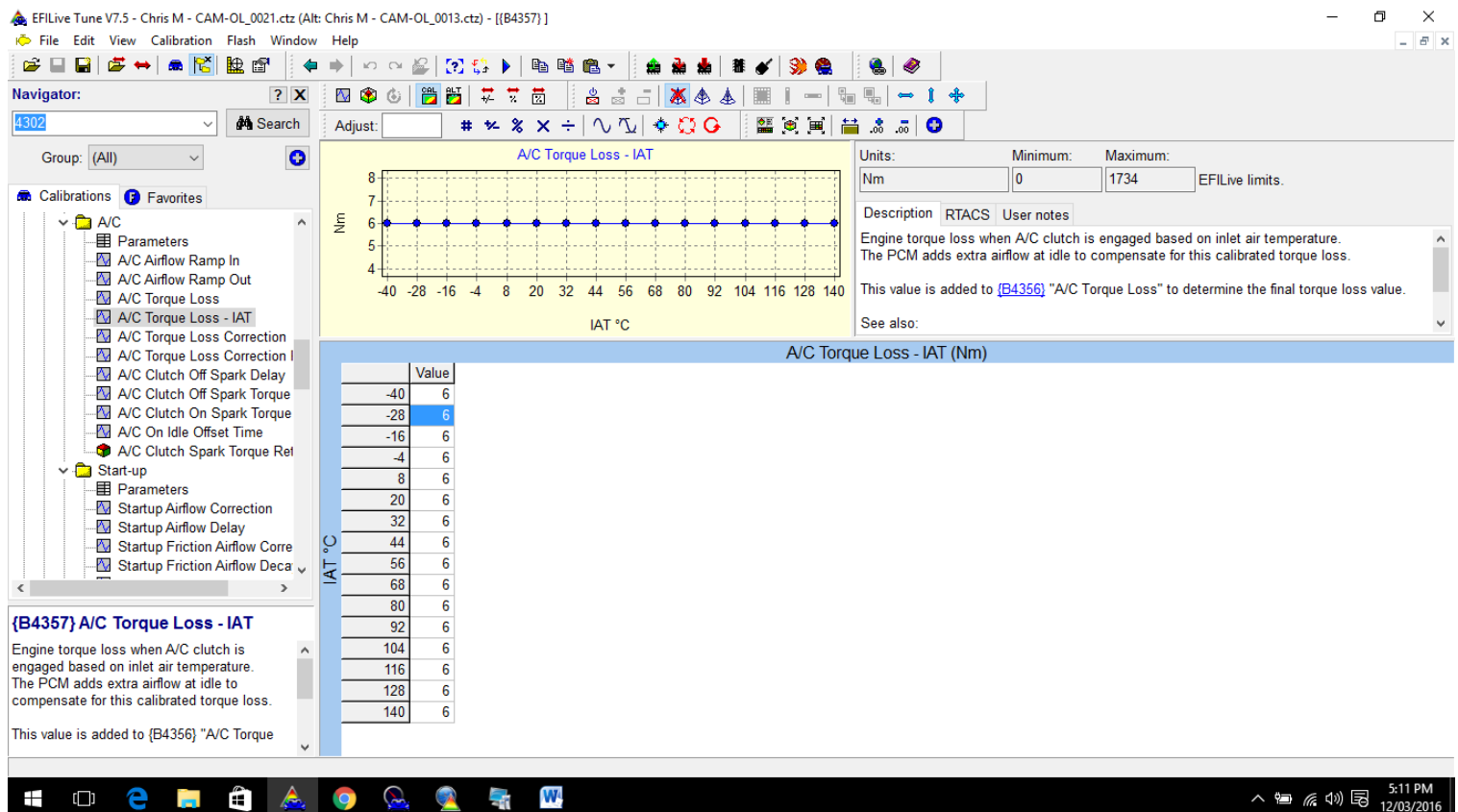
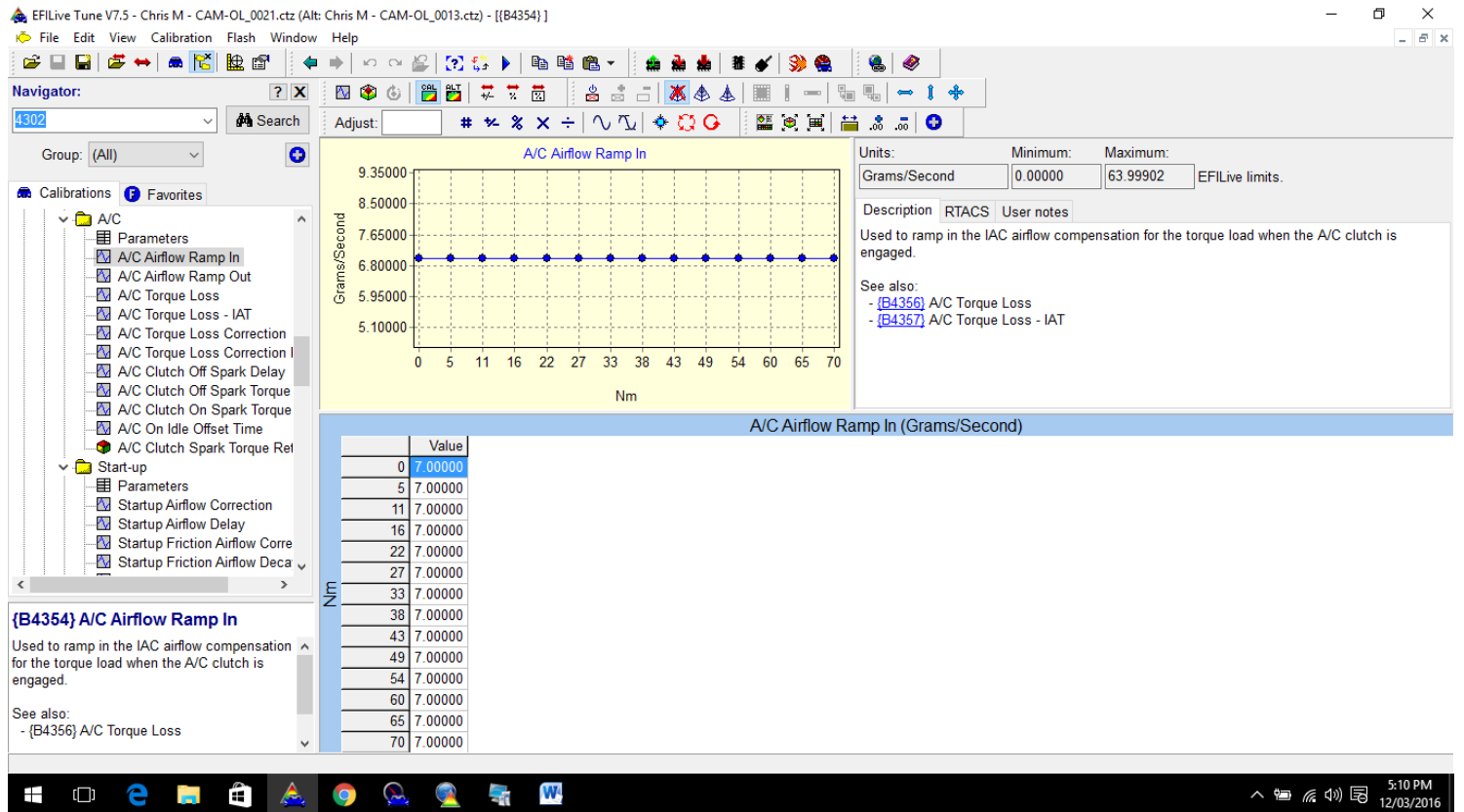
Parameters

- [B0107] Max Speed for Idle Mode
- [B0108] Max Throttle for Idle Mode
- [B4401] Default IAC Motor Park Position
- [B4402] Maximum IAC Steps
- [B4601] Max Idle RPM in Gear
- [B4602] Max Idle RPM in P/N

Windows taskbar: 5:06 PM 12/03/2016



I was also having issues with the AC causing stalling when coming to a stop, I changed **B4354** and **B4357** to correct the engine torque loss airflow. I also corrected the follower settings for under 400rpm to catch the RPM drop when the engine was loaded down low with the AC on.



I hope this helps some people with understanding the RAFIG process and the other Idle tuning tips from SSpdmon as well as some extra AC stalling issues. I found the stuff from SSpdmon as a very good starting point and it got the VX idling and running near perfect with just some minor tweaking to stop some idle hang and drop offs. This should put all the information in one spot and if someone who is better with PDF wants to re-do in the Auto.VE style format I will be happy to send the original editable copy.