

## 1. Idle Tuning - Helpful Info Inside

I posted this over at LS1Tech.com. But just incase someone searches for info here, I thought I'd post up.

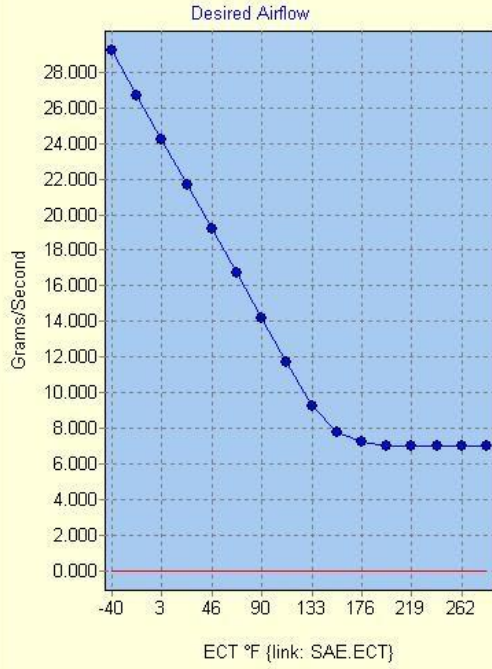
Someone PM'd me and I thought I'd share results...

*hey man,i have a couple q's that i hope you can help me with.i still haven't got the idle right...when i hit the throttle it almost dies or does die when it comes back down because it drops so fast. this tuning is much more difficult than i thought it would be,plus i'm a tard :bang: any help greatly apreciated.  
thanks*

I found the problem with my car finding idle (coming down too far) after I rev'd it was fixed by doing the following:

\*Note - The following worked for my '01 F-body M6 (232/238 cam w/ P&P'd 241's) after starting from the stock/default factory tables. Your car may require different changes. This is merely to help you find the right direction if you're still experiencing issues.

**Adjusted Desired Idle Airflow.** Log your STIT's and LTIT's to perform the [RAFIG process](#). You want to get this close. But, don't sweat the details. It will never be perfect as desired idle airflow will fluctuate day to day. \*\*Remember - logging the RAFIG is a correction. Values are added to the Desired Airflow table.\*\*



Units: Grams/Second Minimum: 0.000 Maximum: 63.999 EFLive limits.

Description User notes RTACS

Used to reduce airflow as the engine warms up. Although listed in the "Idle" section, this calibration also controls the base airflow for non-idle conditions.

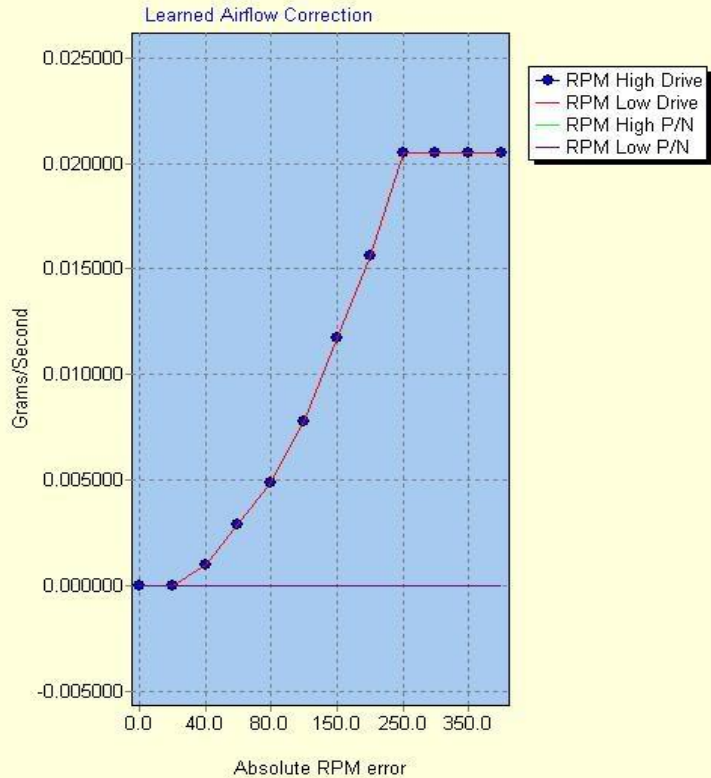
Desired Airflow (Grams/Second)

ECT °F (link: SAE.ECT)	In Gear	Park/Neutral
-40	29.200	0.000
-18	26.700	0.000
3	24.200	0.000
25	21.700	0.000
46	19.200	0.000
68	16.700	0.000
90	14.200	0.000
111	11.700	0.000
133	9.200	0.000
154	7.800	0.000
176	7.200	0.000
198	7.000	0.000
219	7.000	0.000
241	7.000	0.000
262	7.000	0.000
284	7.000	0.000

**Changed 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 pre-'01 f-body, you may have to work around this issue (i.e. don't change it) or upgrade to a newer OS.\*\**

Idle Learn Drive A/C On Limit Low (Grams/Second)	
Description	Value
{B4501} Idle Learn Minimum Temperature	160
{B4502} Idle Learn Maximum Temperature	234
{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	3.00
{B4325} Idle Learn Drive Limit Low	-3.00
{B4329} Idle Learn Drive A/C On Limit High	3.00
{B4328} Idle Learn Drive A/C On Limit Low	0.00

**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 choppier 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.



Units: Grams/Second Minimum: -32.000000 Maximum: 31.999023 EFILive limits.

Description: User notes RTACS

Correction to learned airflow when engine speed is too high or too low and transmission is in drive or Park/Neutral.

Absolute RPM error is the difference between current engine speed and desired engine speed.

Vehicles fitted with a manual gear box are assumed to be in gear unless the clutch is depressed.

See Also:

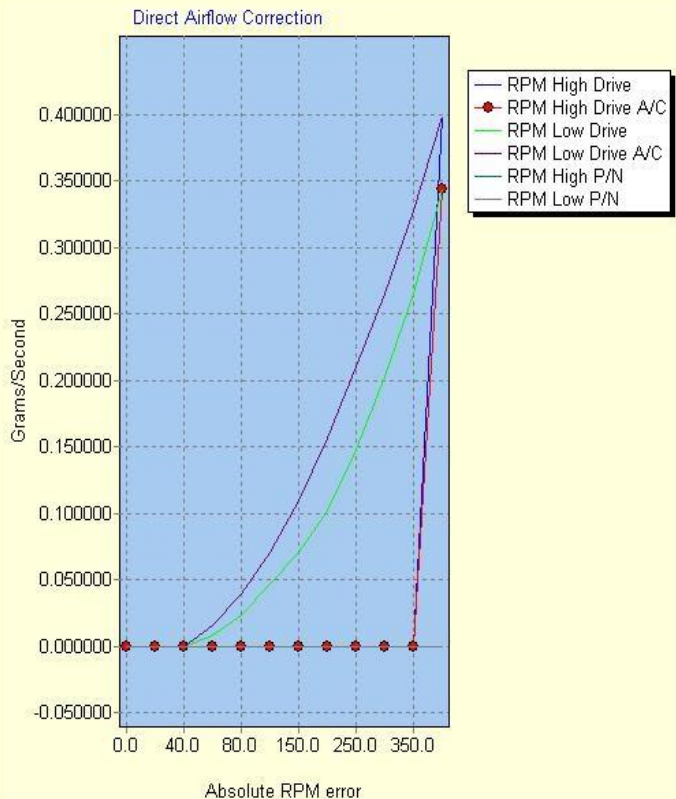
- {B4504} Airflow Learning Control Delay
- {B4519} (not available in this operating system)

Learned Airflow Correction (Grams/Second)

	RPM High Drive	RPM Low Drive	RPM High P/N	RPM Low P/N
0.0	0.000000	0.000000	0.000000	0.000000
20.0	0.000000	0.000000	0.000000	0.000000
40.0	0.000977	0.000977	0.000000	0.000000
60.0	0.002930	0.002930	0.000000	0.000000
80.0	0.004883	0.004883	0.000000	0.000000
100.0	0.007813	0.007813	0.000000	0.000000
150.0	0.011719	0.011719	0.000000	0.000000
200.0	0.015625	0.015625	0.000000	0.000000
250.0	0.020508	0.020508	0.000000	0.000000
300.0	0.020508	0.020508	0.000000	0.000000
350.0	0.020508	0.020508	0.000000	0.000000
400.0	0.020508	0.020508	0.000000	0.000000

**Changed the 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.*





Units: Grams/Second Minimum: -255.000000 Maximum: 255.000000 EFILive limits.

Description User notes RTACS

Correction to direct airflow when engine speed is too high or too low under various transmission and A/C conditions.

Absolute RPM error is the difference between current engine speed and desired engine speed.

Vehicles fitted with a manual gear box are assumed to be in gear unless the clutch is depressed.

See Also:  
 - {B4505} Airflow Direct Speed Control Delay  
 - {B4519} (not available in this operating system)

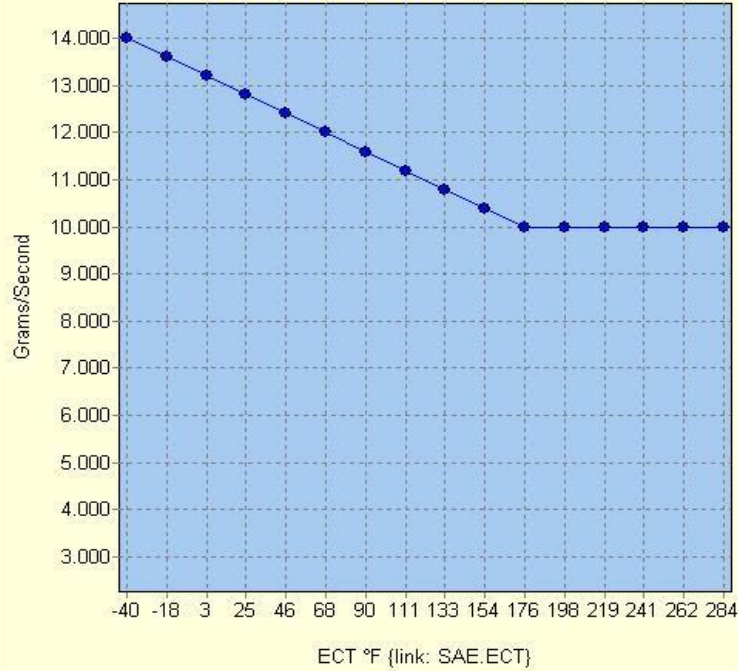
Direct Airflow Correction (Grams/Second)

	RPM High Drive	RPM High Drive A/C	RPM Low Drive	RPM Low Drive A/C	RPM High P/N	RPM Low P/N
0.0	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
20.0	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
40.0	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
60.0	0.000000	0.000000	0.007813	0.015625	0.000000	0.000000
80.0	0.000000	0.000000	0.023438	0.039063	0.000000	0.000000
100.0	0.000000	0.000000	0.046875	0.070313	0.000000	0.000000
150.0	0.000000	0.000000	0.070313	0.109375	0.000000	0.000000
200.0	0.000000	0.000000	0.101563	0.156250	0.000000	0.000000
250.0	0.000000	0.000000	0.148438	0.210938	0.000000	0.000000
300.0	0.000000	0.000000	0.203125	0.265625	0.000000	0.000000
350.0	0.000000	0.000000	0.265625	0.328125	0.000000	0.000000
400.0	0.398438	0.343750	0.343750	0.398438	0.000000	0.000000

**Increased the Startup 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 it's face or go hog wild after a warm start. Now, my warm start issues are gone. It was stumbling right after startup, 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.



Startup Friction Airflow Correction



Units:  Minimum:  Maximum:  EFILive limits.

Description  User notes  RTACS

Correction to idle airflow on startup to overcome initial starting friction and cold/stiff engine components.  
 This value is added to [\(B4304\)](#) "Startup Airflow Correction" for a final airflow correction value on startup.

- See also:
- [\(B4344\)](#) Startup Friction Airflow Decay
  - [\(B4345\)](#) Startup Friction Airflow Delay

Startup Friction Airflow Correction (Grams/Second)

ECT °F {link: SAE.ECT}	Value
-40	14.000
-18	13.600
3	13.200
25	12.800
46	12.400
68	12.000
90	11.600
111	11.200
133	10.800
154	10.400
176	10.000
198	10.000
219	10.000
241	10.000
262	10.000
284	10.000

**Adjusted 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.](#) \*\**

**SEE POST #8 FOR SCREEN SHOTS**

**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. \*\**

**SEE POST #8 FOR SCREEN SHOTS**

**Found the right commanded spark for idle.** 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%.

**SEE POST #8 FOR SCREEN SHOTS**

*\*\*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*

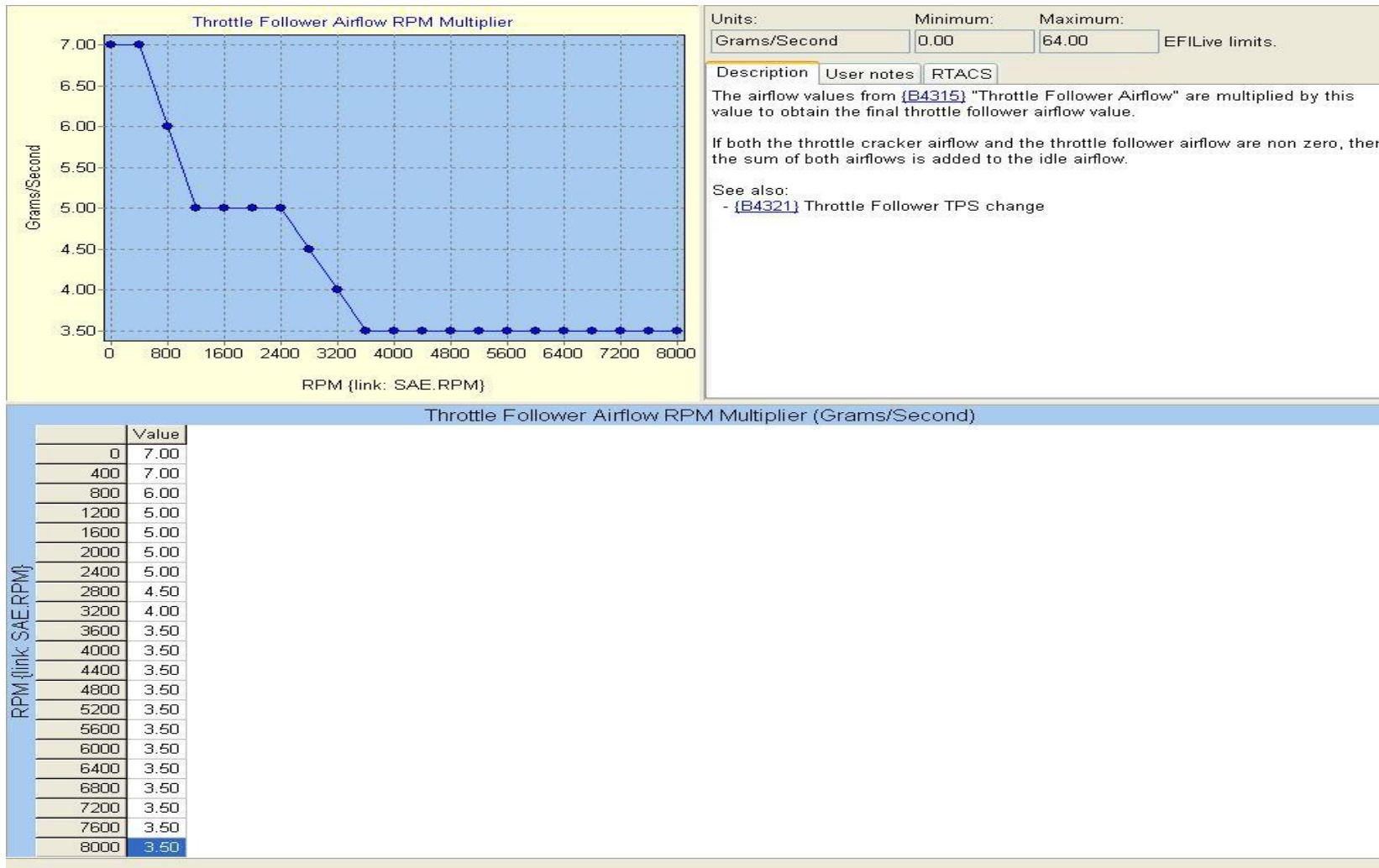
a max of ~35\* timing in my base spark tables and high/low octane tables. My surging is virtually gone other than the occasional bump or two below 1200rpms. I guess they were right. Playing with the **throttle cracker table** and **throttle cracker decay rate table** were an important piece of the puzzle. 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.

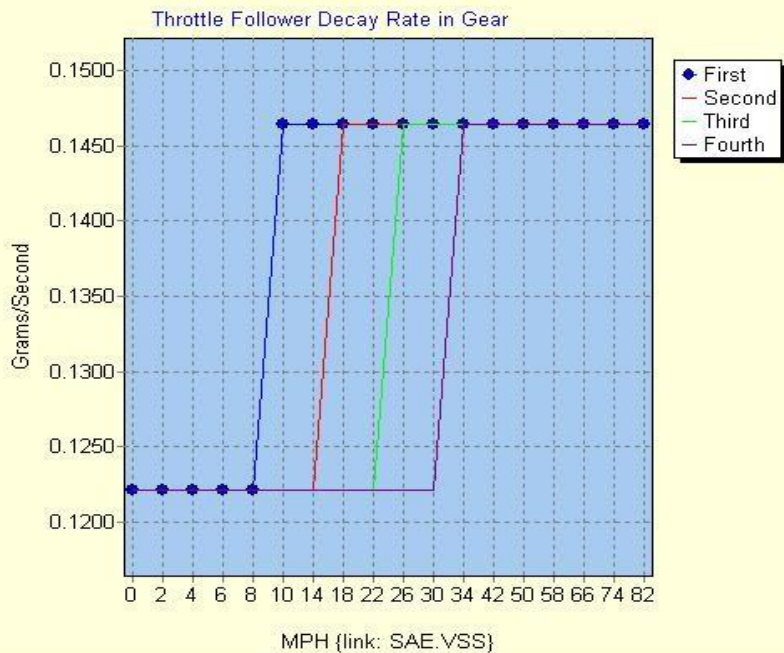




Hopefully, these things are easy to find if you're using HPT. I know EFI Live has most of these tables under the Engine>Idle>Learning and Engine>Spark>Idle directories. Let me know how you do and best of luck!

\*\*additional screen shots\*\*





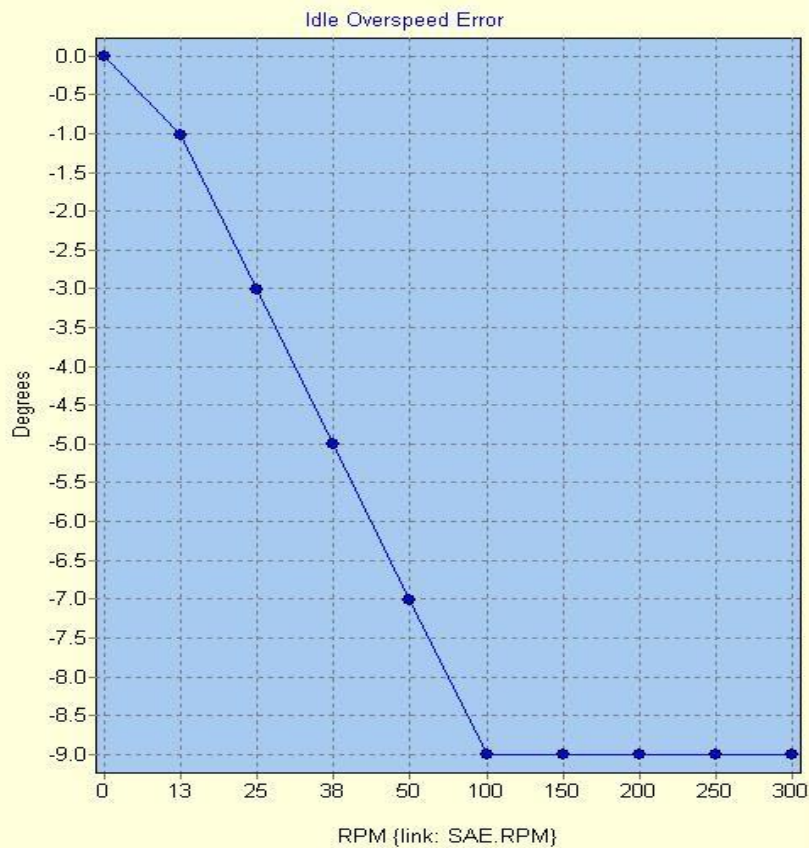
Units: Grams/Second Minimum: 0.0000 Maximum: 63.9990 EFILive limits.

Description: When the transmission is in gear, the throttle follower airflow value is decayed by this amount every 12.5ms.

User notes: RTACS

See also:  
 - [\(B4321\) Throttle Follower TPS change](#)

		Gear			
MPH {link: SAE.VSS}		First	Second	Third	Fourth
	0	0.1221	0.1221	0.1221	0.1221
	2	0.1221	0.1221	0.1221	0.1221
	4	0.1221	0.1221	0.1221	0.1221
	6	0.1221	0.1221	0.1221	0.1221
	8	0.1221	0.1221	0.1221	0.1221
	10	0.1465	0.1221	0.1221	0.1221
	14	0.1465	0.1221	0.1221	0.1221
	18	0.1465	0.1465	0.1221	0.1221
	22	0.1465	0.1465	0.1221	0.1221
	26	0.1465	0.1465	0.1465	0.1221
	30	0.1465	0.1465	0.1465	0.1221
	34	0.1465	0.1465	0.1465	0.1465
	42	0.1465	0.1465	0.1465	0.1465
	50	0.1465	0.1465	0.1465	0.1465
58	0.1465	0.1465	0.1465	0.1465	
66	0.1465	0.1465	0.1465	0.1465	
74	0.1465	0.1465	0.1465	0.1465	
82	0.1465	0.1465	0.1465	0.1465	



Units: Degrees    Minimum: -64.0    Maximum: 64.0    EFILive limits.

Description    User notes    RTACS

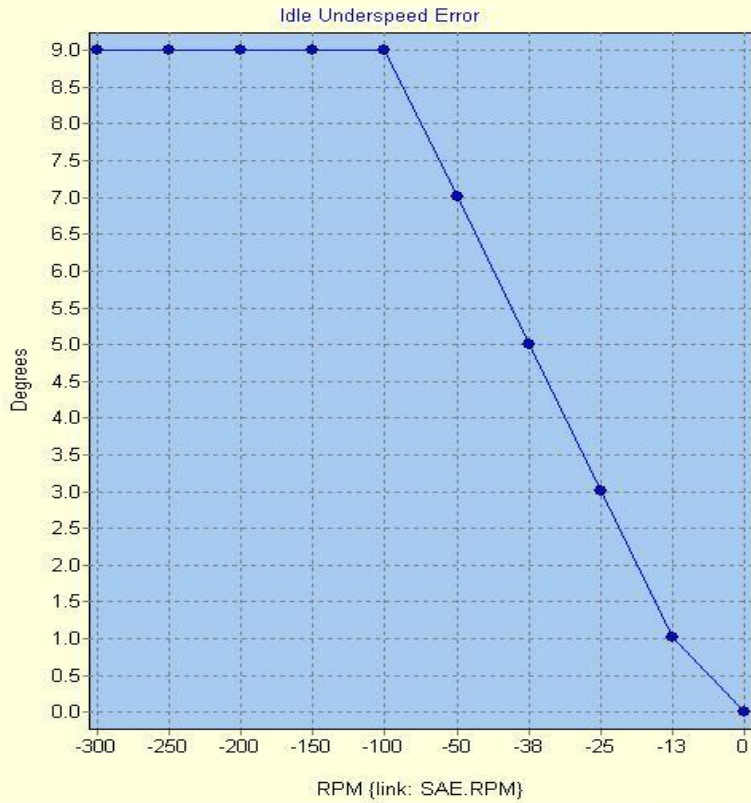
If the actual idle speed is above the desired idle speed value, then this table is used to make adjustments to spark timing. The RPM error values are in relation to the difference between actual idle speed and desired idle speed.

See also:  
 - [B4506](#) Spark Airflow Speed Control Delay

Idle Overspeed Error (Degrees)

RPM {link: SAE.RPM}	Value
0	0.0
13	-1.0
25	-3.0
38	-5.0
50	-7.0
100	-9.0
150	-9.0
200	-9.0
250	-9.0
300	-9.0





Units: Degrees Minimum: -64.0 Maximum: 64.0 EFILive limits.

Description User notes RTACS

If the actual idle speed is below the desired idle speed value, then this table is used to make adjustments to spark timing. The RPM error values are in relation to the difference between actual idle speed and desired idle speed.

See also:  
 - [\(B4506\)](#) Spark Airflow Speed Control Delay

Idle Underspeed Error (Degrees)

RPM {link: SAE.RPM}	Value
-300	9.0
-250	9.0
-200	9.0
-150	9.0
-100	9.0
-50	7.0
-38	5.0
-25	3.0
-13	1.0
0	0.0



RPM {link: SAE.RPM}  
 Grams/Cylinder {link: GM.DYNCYLAIR\_DMA}

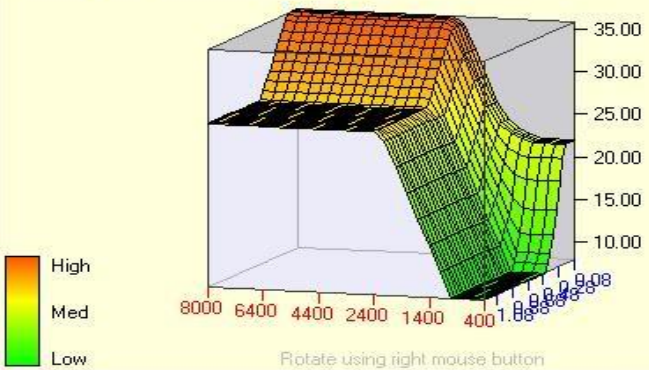
Data units: Degrees

Units: Degrees Minimum: -45.00 Maximum: 60.00 EFLive limits.

Description User notes RTACS

Defines the upper timing when good fuel, with adequate octane is being used, and the engine is not in an idle condition.  
 The PCM interpolates between the high octane map and the low octane map values based on knock activity.  
 The percentage weighting of the high/low octane tables being used can be monitored using the PID - {GM.ASPARK}

See also:  
 - {B5914} Spark Low-Octane Table



Rotate using right mouse button

Grams/Cylinder {link: GM.DYNCYLAIR\_DMA}

	0.08	0.12	0.16	0.20	0.24	0.28	0.32	0.36	0.40	0.44	0.48	0.52	0.56	0.60	0.64	0.68	0.72	0.76	0.80	0.84	0.88	0.92	0	
400	22.02	22.02	22.02	22.02	20.50	18.02	14.77	12.02	10.02	9.03	8.02	8.02	8.02	8.02	8.02	8.02	8.02	8.02	8.02	8.02	8.02	8.02	8.02	8
600	22.02	22.02	22.02	22.02	20.50	18.02	14.77	12.02	10.02	9.03	8.02	8.02	8.02	8.02	8.02	8.02	8.02	8.02	8.02	8.02	8.02	8.02	8.02	8
800	22.02	22.02	22.02	22.02	20.50	18.02	14.77	12.02	10.02	9.03	8.02	8.02	8.02	8.02	8.02	8.02	8.02	8.02	8.02	8.02	8.02	8.02	8.02	8
1000	22.02	22.02	22.02	22.02	20.50	18.02	14.77	12.02	10.02	9.03	8.02	8.02	8.02	8.02	8.02	8.02	8.02	8.02	8.02	8.02	8.02	8.02	8.02	8
1200	22.50	22.50	22.50	22.50	20.76	18.50	16.02	14.02	13.03	12.02	11.03	11.03	11.03	11.03	11.03	11.03	11.03	11.03	11.03	11.03	11.03	11.03	11.03	11
1400	23.03	23.03	23.03	23.03	21.49	20.02	18.50	17.03	16.02	15.03	14.02	14.02	14.02	14.02	14.02	14.02	14.02	14.02	14.02	14.02	14.02	14.02	14.02	14
1600	24.02	24.02	24.02	24.02	23.03	22.02	21.03	20.02	19.03	18.02	17.03	17.03	17.03	17.03	17.03	17.03	17.03	17.03	17.03	17.03	17.03	17.03	17.03	17
1800	26.02	26.02	26.02	26.02	26.02	25.03	24.02	23.03	22.02	21.03	20.02	20.02	20.02	20.02	20.02	20.02	20.02	20.02	20.02	20.02	20.02	20.02	20.02	20
2000	29.03	29.03	29.03	29.03	29.03	28.02	27.03	26.02	25.03	24.02	23.03	23.03	23.03	23.03	23.03	23.03	23.03	23.03	23.03	23.03	23.03	23.03	23.03	23
2200	32.01	32.01	32.01	32.01	32.01	31.03	30.01	29.03	28.02	27.03	26.02	26.02	26.02	26.02	26.02	26.02	26.02	26.02	26.02	26.02	26.02	26.02	26.02	26
2400	35.02	35.02	35.02	35.02	34.76	34.01	33.02	32.01	31.03	30.01	29.03	28.02	27.11	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27
2800	35.77	35.77	35.77	35.53	35.02	34.01	33.02	32.01	31.03	30.01	29.03	28.02	27.11	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27
3200	35.77	35.77	35.77	35.53	35.02	34.01	33.02	32.01	31.03	30.01	29.03	28.02	27.11	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27
3600	35.77	35.77	35.77	35.53	35.02	34.01	33.02	32.01	31.03	30.01	29.03	28.02	27.11	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27
4000	35.77	35.77	35.77	35.53	35.02	34.01	33.02	32.01	31.03	30.01	29.03	28.02	27.11	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27
4400	35.77	35.77	35.77	35.53	35.02	34.01	33.02	32.01	31.03	30.01	29.03	28.02	27.11	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27
4800	35.77	35.77	35.77	35.53	35.02	34.01	33.02	32.01	31.03	30.01	29.03	28.02	27.11	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27
5200	35.77	35.77	35.77	35.53	35.02	34.01	33.02	32.01	31.03	30.01	29.03	28.02	27.11	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27
5600	35.77	35.77	35.77	35.53	35.02	34.01	33.02	32.01	31.03	30.01	29.03	28.02	27.11	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27
6000	35.77	35.77	35.77	35.53	35.02	34.01	33.02	32.01	31.03	30.01	29.03	28.02	27.11	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27
6400	35.77	35.77	35.77	35.53	35.02	34.01	33.02	32.01	31.03	30.01	29.03	28.02	27.11	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27
6800	35.77	35.77	35.77	35.53	35.02	34.01	33.02	32.01	31.03	30.01	29.03	28.02	27.11	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27
7200	35.77	35.77	35.77	35.53	35.02	34.01	33.02	32.01	31.03	30.01	29.03	28.02	27.11	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27
7600	35.77	35.77	35.77	35.53	35.02	34.01	33.02	32.01	31.03	30.01	29.03	28.02	27.11	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27
8000	35.77	35.77	35.77	35.53	35.02	34.01	33.02	32.01	31.03	30.01	29.03	28.02	27.11	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27.03	27

RPM {link: SAE.RPM}