

How to Tune a 1G V3 SD ECM LINK with no MAF

Version - 1.3

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ECM link tuning is just like painting a car, 90% prep 10% paint. In this article 90% of it is going to be explaining setup, and the actual tuning is very easy and a small part.

Step 0 – Get your head right

Getting started with ECMLink is a LOT easier if you begin with the basics. And there are a number of pages on the ECMLink support wiki and on the ECMTuning website that can help with that.

For starters, here's the top-level "ECMLink 101" page on the wiki.

<http://www.ecmtuning.com/wiki/ecmlink101>

You really should read through that if you have absolutely no idea where to even begin with ECMLink. It walks you through the process of installing the application and setting up your initial connection as well as how to start datalogging.

In addition, that page contains links to other high-level concept pages you may find useful. For example, the following is the "engine theory 101" page that many beginners may find useful.

<http://www.ecmtuning.com/wiki/engineandecu101>

And, of course, there are several demo videos on the ECMTuning website as well. Those can be accessed here:

<http://www.ecmtuning.com/demos.php>

By ALL means, watch those videos and read up on the basics first. If you do not have a good basis on which to build your knowledge, then you will probably find yourself frustrated and confused a lot when, in fact, everything is actually pretty simple.

The following is a more complete list of the topics available on the wiki if you want to start browsing through sections.

<http://www.ecmtuning.com/wiki/start?do=index>

Now that you know WTF is going on with V3 we can continue.

This first thing is the car has to be mechanically sound. Bad lifters, bad turbos, blown head gaskets, shady plugs, leaky exhaust before the wideband are all things I can guarantee to you to be problems. Fix your car, if you don't have the time or money then you don't have the time to tune it and fix more broken parts. I can't tell you how many post I have read where people have known problems and are still trying to diagnose/tune ECMLink, we can't help you until you help yourself first.

Step 1 – Mechanical setup

Set base FP, and the car doesn't have to be running to do this, just ground your FP relay and set your AFPR (this is not totally necessary you can run whatever FP you want however your initial global setting would be incorrect so I would set it to stock first then adjust after you get the car running).

If you already connected to ECM link you can turn the FP on by selecting the activate FP box under the MISC tab. I prefer this method because there are no vibrations and the mechanical FP gauge is easier to read therefore easier to set and make sure is right.

NOTE: If you are concerned about draining your battery while running the fuel pump with the engine off, try connecting a set of jumper cables over to a running car parked nearby. Just be CAREFUL not to cross the wires when doing this...the ECU can easily be fried beyond repair in a split second mistake.

TEST FOR BOOST LEAKS, TEST FOR BOOST LEAKS, TEST FOR BOOST LEAKS. TEST FOR BOOST LEAKS,

I can't tell you how important this is, you can tune an entire SD setup fine with boost leaks and you will never know it because unlike a mass air car it won't care about a leak.

Make sure engine timing is set to a proper 5degrees BTDC, of course if the car has never ran this will have to be done later.

Step 2 - Wiring in the sensors:

You will need an IAT, MAP sensor, and wide band sensor. ECM link sells the IAT and MAP sensors with pig tails and I would suggest just buying theirs since they are new and work well with their program. This article is based using an AEMwb however the guys at ECMTuning actually strongly recommend **against** the AEM because so many people have so many issues with them. They tend to prefer something like the Innovate LC-1 or NGK AFX. But I haven't had any problems with the AEM, so that's what this article covers.

Here is a discussion where to put the MAP sensor

<http://www.ecmtuning.com/wiki/sdhose?s=vacuum>

Here is a discussion where to put the IAT sensor

<http://www.dsmlink.com/forums/showthread.php?t=37575&highlight=put+IAT>

IAT: There are two wires for the IAT which are interchangeable, they go to ECU pin #s 8 & 24.

MAP:

(+)5V reference goes to ECU pin # 23 which is Grn wire w/ red stripe.

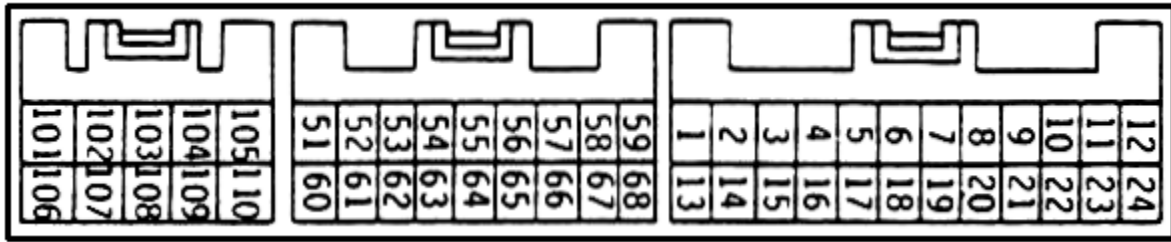
(-)ECU sensor ground goes to ECU pin # 24 which is Grn w/ a black stripe

Sensor input wire goes to ECU pin # 15 which is Blue w/ a yellow stripe the EGR temp wire.

Wide Band: The AEMwb's white wire goes to ECU pin # 16 a Grn w/ yellow stripe wire the Baro sensor.

Here are the pinouts for a 1G. The same pin-out information for a 2G is available on the ECMTuning wiki:

<http://www.dsmlink.com/images/forums/2GECUPinout.pdf>



Pin	Connection	Pin	Connection
101	Ground	106	Ground
102	Power supply	107	Power supply (to MPI Control Relay and ??)
103	Battery backup power supply (constant 12V)	108	Ignition switch - ST
104	Neutral safety switch (AT only, grounded in MTs)	109	Ignition pulse detect (tach)
105	Wastegate solenoid valve	110	Ignition switch - 1G
Pin	Connection	Pin	Connection
51	No. 1 Injector	60	No. 3 Injector
52	No. 2 Injector	61	No. 4 Injector
53	EGR Control Solenoid Valve (90-93 CA only, 94 all)	62	Purge control solenoid valve
54	Power transistor for #1 and #4 coils	63	MPI Control relay
55	Power transistor for #2 and #3 coils	64	Check engine light
56	MPI Control relay	65	Air conditioner relay
57	Fuel pressure control valve	66	MPI Control relay
58	Coil "A1" for idle speed control motor	67	Coil "B1" for idle speed control motor
59	Coil "A2" for idle speed control motor	68	Coil "B2" for idle speed control motor
Pin	Connection	Pin	Connection

1	Self-Diagnosis Output	13	Control relay (Fuel pump drive signal)
2	Diagnosis/Data transfer select terminal	14	Air flow sensor active filter reset (idle switch) (switch with 6 if using a 91-94 ECU in a 90 or vvs) Stock wire color - Green
3	Turbo gauge	15	EGR temperature sensor (90-93 CA only, 94 all)
4	Oxygen Sensor	16	Barometric pressure sensor (MAF)
5	Power steering oil pressure switch	17	Sensors ground
6	Idle position switch (switch with 14 if using a 91-94 ECU in a 90 or vvs) Stock wire color - Green/White	18	Vehicle speed sensor (reed switch)
7	Air conditioner switch	19	Throttle position sensor
8	Intake air temperature sensor (MAF)	20	Coolant temperature sensor
9	Detonation sensor	21	Crank angle sensor (RPM)
10	Air flow Sensor (MAF)	22	Top dead center sensor
11	ABS control unit (AWD, ABS only)	23	Power supply for MAF sensors (5volts)
12	Ignition timing adjustment connector	24	Sensors ground

Step 3 - Connecting to the ECU:

Obviously download or install the program that came with your purchase onto your laptop. There are firmware updates that need to be done on occasions (these are changes to the programming that ECMTuning is continually making), please review this link on how to do so,

<http://www.dsmlink.com/forums/showthread.php?t=36992&highlight=firmware+updates>

Hook up the provided cable from the diagnostic port near the interior fuse panel to a USB port on your laptop. Run the program, turn the key to the “start” position (don’t actually start the car), and hit the connect button. It will run through a few

things and will say connected if everything works out, if not refer here
<http://www.ecmtuning.com/wiki/connectionproblem>

Step 4 - Setting up parameters:

If connected, click on ECU configure live. I am going to run through setting up each tab.

RPM/TPS tab:

Idle: Select your desired idle.

Launch: Rev limit imposed when speed is UNDER “Launch Spd”. Input what RPM you want to launch the car at.

Rev Limit: Once past the “Launch Spd” your car will now shift to this set RPM limit. You do have Kiggly valve springs, RIGHT? I wouldn’t go past 8K on stock valve train.

Enable Clutch Cut: Select Enabled clutch cut if you have connected the clutch switch to the ECU as outlined in the DSMLink instruction sheet that came with the wire (if you have a 1990 DSM you will need to follow the instructions located on the [90 clutch cut wire page](#) instead). Once enabled and connected properly, you can select a shift rev limit that will be active anytime the clutch pedal is in and vehicle speed is greater than “Launch Spd”. If you installed a clutch switch select the NLTS and select an appropriate RPM. This is where you want the ECU to hold the RPMs even though the throttle is floored between shifts.

Launch Spd: Used to determine the point at which the rev limit changes from launching revs to the ECU fuel shut off limit. Enter a value slightly lower than the speed at which you’d expect the car to be moving in 1st gear.. Entering a launch speed value that’s too high will effectively make the Launch limit your new Rev limit in 1st gear because the car won’t reach the shut off speed under normal conditions by the time the Launch rev limit is reached. Disable launch should be set at about 8 mph.

Coast FC adj: Used to tweak the lower limit on [coasting fuel cut](#). Enter a value in here when you select an idle point greater than 900 RPM and observe any odd behavior while coasting down or letting the revs drop. As a general rule of thumb, you should enter the difference between your selected idle point and 900. So if you select an idle of 1100 RPM, you might try entering 200 into the Coast FC adj box.

For right now just skip over the TPS stuff, we will come back to it later.

Fuel tab: I personally do not use the fuel sliders, changing them will change your target A/F already dictated by the direct access table just making things more confusing, however they can be used for quick tuning adjustments that can be used to make adjustments in the OpenloopmaxOct table, but I would lean toward never using the fuel sliders.

Input your injector's global and dead time info in at this time. Click here to help you decide what they should be

<http://www.ecmtuning.com/wiki/baseinjectordata?s=injector%20data>

If running E85 read this:

<http://www.ecmtuning.com/wiki/e85fuel?s=running%20e85>

The usec thing is just the increment number at which the dead time will adjust each time the up/down arrows are clicked.

Timing: The same holds true for the timing sliders as the fuel sliders, it can be used for quick changes but I ultimately let the TimingMaxOct table dictate my timing and never touch it.

Maf comp and **Maf clamp** tabs are completely ignored on true SD cars, just ignore them and don't use them. However in the Maf comp tab you need to select "speed density" under base maf type.

Speed Density tab: This will be used in dialing in your setup later but can be ignored for now. If you are using a stroker motor then input your engine's displacement size.

Aux maps tab: Skip

Idle air: Skip

NBO2 sim tab: Skip, unless you are going to be using your WB O2 to simulate the normal O2 sensor, if so read this to set it up:

<http://www.ecmtuning.com/wiki/v3narrowbandsim>

Anti/lag tab: Antilag is tool to help build boost at the line while waiting to launch your car in a drag race. If you choose to do this some basic rules of thumb are set the activate RPM about 500RPMs less than you launch RPMs. As for timing and fuel enrichment, the more you increase them the more they will build boost. I would try each in increments of 3 and then see what happens. However keep in mind this is not the best thing for the turbo itself. Last, if your clutch switch is hooked up you can select the “During Shifts” box and this will help keep the turbo spooled between shifts, but your NLTS RPM will still be used.

I use the knock part to ignore phantom knock, I set it to 2200rpm and over 50%. Here are two links for setting up the clutch switch

<http://www.ecmtuning.com/wiki/cltchsw>

<http://www.ecmtuning.com/wiki/clutchcutwire>

and if you have a 90 for the clutch wiring read this:

<http://www.ecmtuning.com/wiki/90clutchcut>

FPS tab: Skip

EGR tab: Skip

Bst/WG tab: This is not necessary to do tuning, so I am not going to talk about it but if you must do it read here:

<http://www.ecmtuning.com/wiki/boostcontrol?s=boost%20control>

Dash tab:

**Knock: 1 degree of knock = 3 counts, I hate knock... all knock, so I set mine at 1 degree.

**Coolant: Should be set based on yours car thermostat and coolant temps. I would think you would want to be warned if the car got hotter than 215-220 degrees.

****Coolant offset:** leave at 0.

****Boost gauge:** If you want it can show a few different things other than the useless stock estimated boost. Here is what is available:

<http://www.ecmtuning.com/wiki/dsmlinkdashgaugeranges>

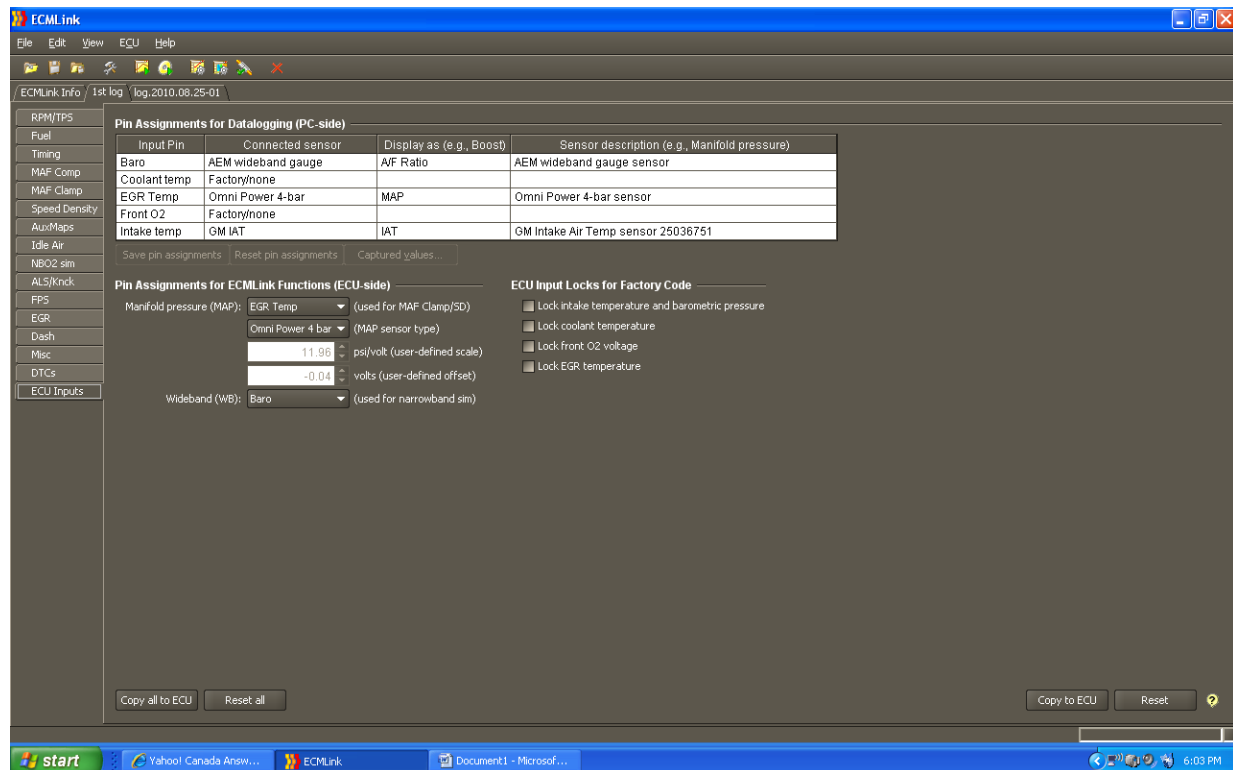
Misc tab: There is nothing to activate here, I would suggest that pure E85 cars probably do not need the hot start enrichment box selected but this isn't a biggie.

DTC tab: You shouldn't have any at this point, but if you do, please address.

ECU input tab: There is one thing that is VERY VERY important here, when using an AEM WB gauge there are several choices. If you look at this chart it shows you the switch over point. You have to know what AEM gauge you are using and then reference that specific gauge's manual to determine which selection you are going to make. There is a chart in the AEM manual showing this stuff and the reference point at which you will look for in the AEM manual chart is 14:7. See what they have listed and select from the choices below.

Wideband kit	Switch point (volts)
AEMWB	4.07
AEMWBGauge	2.34
AEMWBGaugeR1	2.53
AEMAnalogWB 30-5130	3.12

Everything else in the pic below is what yours should look like after selecting each sensor if you used all the same wiring and sensors as me, if not input your corrects sensor info. When you are done make sure to select the save pin assignments button on the screen.



Lastly click “copy all to ECU”!

Step 5 – Captured and displayed values:

All right that was a lot, moving on. This is worth reading through just so you can get an idea of what you are looking at when reading a log:

<http://www.ecmtuning.com/wiki/dsmlinkloggableparams?s=loggable%20parameters>

Next, set up your captured values by hitting F10, this will only work if you are connected to the ECU.

Your wideband, IAT and Map sensors all need to be selected they will be labeled by the name that you gave them, double click them to select them.

These are the things you should be capturing, if they are already in bold you are capturing them, if they are not just double click the item to capture it:

A/C rqst Pin	FrontO2	LTFT LO	SDRatio
A/T D Pin	FuelFlow	MAF	SelectedLTFT
AFRatioEst	IdleSw	MAFRAW	Speed
Airflow	IdleSwPin	Mileage	STFT
AirflowPerRev	InjDuty	OldAFRatioEst	ThrotPos
Battery	InjOn	Open Loop	Timing
BoostEst	IntTemp	P/S load Pin	TotalMileage
ClosedLoop	KeyStart	PacketInt	TPSVolts
CltchSw	KnockRet	RPM	VE
CombinedFT	LoadFactor	RPM/Speed	WBFactor
CoolTemp	LTFT HI	SDAirflowPerRev	TPS Delta

These videos demonstrate some capturing:

<http://www.ecmtuning.com/demos/capturedvalues.html>

<http://www.ecmtuning.com/demos/streamcapture.html>

Now that you have selected your captured items, it is important to tell the program you want to display them because it won't automatically display them for you. You have to tell ECMLink what items you want to show on your display while logging. The easiest thing to do is just start a capture and then stop it immediately. Then right click in the area where all the values are at the bottom of the screen and then click on "displayed values". Double click on each value you want to be displayed that are listed in the left box. At this time here is what you will want to be displayed:

RPM	AFRatioEST
Airflow	InjDuty
Timing	Speed
Coolant temp	Load Factor
Knock Ret	Battery
Throttle Pos	Closed Loop

CombinedFT
BoostEst
TPS Delta

Front O2
TPS Volts

Again make sure your IAT, MAP, and WB have been selected as well. Make sure, “save as default” is selected in the displayed values section, then hit OK. All your choices will now appear at the bottom of the screen. I will go through each one telling you what they should read and how to set them up as well.

RPM: If I have to explain this you shouldn't be using ECM link.

Airflow: You want this to read in lbs/min so go up to the Edit tab on the top of the screen, in that window select the last choice “App preferences,” go to the units tab and change airflow mass to lbs/min. This number is generally a good idea of what kind of wheel hp you are making... GENERALLY. Take the numbers shown, multiply it by 10, and that is your estimated WHP.

Timing: This will vary there is no “SET” value it should read.

Coolant temp: Normal operating temps should read around 180-210. Temps have to be about 184 or greater for fuel trims to adjust and about 190 for LTfuel trims to adjust. Also keep in mind that internal combustion engines operate most efficiently at 180+ temps so there is no need to run really low thermostat, also fuel economy will suffer.

Knock Ret: This should be zero at WOT and at cruise.

ThrotPos : Should range from (closed 0V- 5V WOT).

CombinedFT: Should hover around 0 but not greater than +/- 8% with the car fully warmed up.

AirflowPerRev: Should read .25 at idle for a 2.0L motor, and .27 for a stroker.

BoostEst: Right click on the value listed for BoostEst, and then select “preferences” at the top. In this menu change you motor size if it is different than a 2.0, also input your altitude/elevation. Most GPS systems will tell you altitude but if not just Google your city's altitude and input that number, be sure to click the save as defaults, then apply, then ok.

AFRatioEST: There are several preferences changes that can be made, but these are largely unneeded. Leave them alone unless you REALLY know what you're doing. Fuel flow factor should be left at 1.0, offset should be left at 0 and displayed stoich ratio should be left at 14.7.

InjDuty: Properly sized injectors should not read over 80-90% duty cycle throughout a pull.

Speed : Just leave the correction at 1 in the preferences.

Load factor: This is just kind of nice to view but isn't totally necessary, this would only really be important if you were messing with the load points at which you go from closed loop to open loop, but those limits are set up well and do not need fiddling with.

Battery: Should be 13.5-14.5V with the car running.

Closed loop: Just tells you when you are in closed loop or open loop.

Front O2: This is not critical to monitor but is probably the most crucial sensor to make sure is working. When running ECMLink a good working O2 is an ABSOLUTE MUST, if it is wrong, everything will be wrong. A normal sensor should cycle up and down at operating temps, if there are any doubts, go buy a new sensor, they are cheap and a worth while investment. A Bosch O2 for a DSM at AutoZone is about \$60, don't be a cheap skate, use a good working O2.

TPS volts: Told you we would get to this later. Just use this to verify that voltage is reading .63 volts. If not adjust the TPS itself, or you can also run the TPS adjust tool as shown in this demo: <http://www.ecmtuning.com/demos/initialsetup.html>

TPS Delta: You look for areas where the mixture appears to have gone lean as a result of a rapid throttle increase. Then you look at TPSDelta around that area and just increase the corresponding entries in the BaseTipIn table in direct access. Just smooth out the table as you're making changes so there aren't any big sudden dips and you should be fine.

Step 6 – Configuring the direct access table:

I do this to make my life easier. Go to the live datalog screen that you created when you captured earlier and at the top there is a yellow box at the top of the screen that is, “edit graph view preferences”, select it. Then click the global settings tab and click on the box that says, “File-auto zoom-all” What this does is automatically bring up the entire log instead of a segment, and since you always have to hit the 1:1 button to find the WOT part of the log this will just save you time in your tuning career.

Since you have already done a capture you can now access the direct access table. We want to go ahead and make some initial changes there as well. At the bottom of the log screen just click the direct access button. A window will pop up, click don't show me again (after you carefully read it and understand what it's saying, of course), and then the direct access table is going to pop up... starting from the top.

Airflow smoothing tab: This is not typically used on a full SD no MAF car, but can be useful when running MAP sensors with poor resolution at low pressure (like the AEM 5-bar, for example). In those cases, it can be useful to smooth the airflow signal a bit under idle conditions even when running SD. But how to configure that and the values to use are beyond the scope of this document.

BasetipinADJ tab: This table is used to provide an extra injector “squirt” when throttle position changes rapidly. This can be very useful with an SD setup if you find that the mixture momentarily goes lean when you jab the throttle. In that case, try raising these values to get more fuel on throttle change. Log the item called “TPSDelta” to see which elements of this table are being used in your testing.

CoolanttempADJ tab: Adjusts fuel delivery based on coolant temperature. This shouldn't probably need any adjustment.

FastIdleISCPos: Just leave it alone.

InjBatteryAdj: Basically look to see if there is a sudden drop in voltage when the fans or headlights are to come on, also then look to see when they do come on if the a/f ratio changes, if it does adjust the injbatteryadj table until these A/Fs stay the same after the acc has come on.

<http://www.ecmtuning.com/wiki/injbatadj?s=injbatteryadj>

Also read this:

<http://www.dsmlink.com/forums/showthread.php?t=37203&highlight=Theory+dialing+injectors+InjBatteryAdj>

LTFT tab: Leave alone.

Load scale tab: Leave alone unless a stroker motor. It should read 114.8 for all 2.0L cars, if you questions why read here,

<http://www.dsmlink.com/forums/showthread.php?p=434014#post434014>

OpenLoopMaxOct tab: First thing is first, the vertical column is load, the smallest number is like -20hg on your boost gauge, 1 on the scale = 0psi on the gauge, 2 = 15psi, and so on (basically reading in BAR). If the car is on pump gas I would leave this table alone for now, if starting the car on race gas I would change the table starting at 1.4 @ 3000rpm all the way over to the right, all the way down, and all the ones in between to 3.4 @ 10,000 to 11s. The ECU will try to run to 9.X:1 air fuels which is way too rich for race gas and even worse for E85 car, so if you are running E85 I would start at the same point listed above and change it to 11.5s all the way over to the right, all the way down, and all the ones in between to 3.4 @ 10,000.

You can also find a few basic replacement tables for this and the timing tables here: <http://www.ecmtuning.com/wiki/v3configs>

The EVO 8 (mod 1) file is a good starting point for any car.

OpenLoopMinOct tab: Ignore this tab always.

Open loop thresholds tab: The top two tables are fine and do not need to be messed with, but set the bottom table to 50.2% across the board.

SDTempwieghting tab : Ignore this tab always.

STFTandO2feedback tab : Ignore this tab unless using that WB for narrow band simulation which I linked to earlier.

TimingMaxOCT tab: This is what is used to actually tune the car, but for initial setup leave it be.

You can also find a few basic replacement tables for this and the fuel tables here:
<http://www.ecmtuning.com/wiki/v3configs>

The EVO 8 (mod 1) file is a good starting point for any car.

TimingMinOCT tab: Ignore this tab always.

WGSErrorcorrection and WGSMisc tabs: This is for ECU boost control which I linked you to earlier, but is not covered in the scope of this article

That is the last tab, Hit “copy all to ECU”, the direct access table can only be updated while the car is off. Your CEL should be flashing and your factory boost gauge should have an erection while the upload is working.

Step 7 – Start up and initial idle tuning

Go ahead and start your car, it should be set up properly to start, so give it a whirl, if it doesn't review everything and try again. Bring the car up to operating temps, keep them at least 195 or more so trims can adjust, under this they may not adjust fully. Once completely warm the first thing you should look at is combined fuel trim. You have to get it stable around 0 (+/- 5%). Hit the ECU configure live button and then go to the fuel tab, click the “save change as they are made button” so every time you make an adjustment you don't have to hit the save button. If combinedFT are mostly (-) decrease deadtime if mostly (+) increase deadtime. After giving the dead time button a few click go back to your live datalog and see if combinedFT got closer to 0 or not, keep repeating this process until you get the combinedFT around 0.

Once that is done you can now look at the Airflow/rev reading. It should be reading .25 if not an adjustment needs to be made, (it seems that when the fans are on this number increases, to my best guess, wait till the fans are off to set the SD cell to get that .25 number). Go to the SD tab under the ECU Configure live tab that you already opened at the top of the screen. Hit the track datalog button and it will show what cell the ECU is using at idle. Now if the airflow/rev is real low that means you got a boost leak but if it is around that .25 (+/- .05) you just need to adjust that cell the ECU is using to get Airflow/rev to that .25 number. So go ahead

and hit the track datalog button again to make it stop tracking so you can make an adjustment. If your Airflow/revs are too high subtract numbers from the highlighted cell in 2 point increments and if they are low add 2 points, and of course hit save to ecu after you have made a change. Immediately go back to the live log and see what happened to Airflow/rev, if it got closer you are on the right track and then stop and don't make any more adjustments until you check on the CombinedFT again to see how far out of adjustment it got. Get combinedFT back in line adjusting deadtime as you did earlier, it should only need a few clicks to have CombinedFT back in line again. Keep doing this until Airflow/rev is .25 and combinedFT is around 0. Don't worry if the deadtime is a crazy number from what you started at.

Step 8 – Non WOT SD Tuning:

You have setup up idle so you can go cruising and get numbers for the cruising stuff, there is where the ECMLink is sweet. It will figure this stuff out for you and you just have to apply the findings. To do this go to the direct access area and select the OpenLoopThresholds tab and change the top two rows to all 1.1 and your bottom row should already be at 50.2%. Start a capture and go on a cruise for say 20-30 mins and try to experience all types of terrains such as hills, stop and go, highway, etc, but stay out of WOT. When done cruising stop the capture and right click the values area in the bottom of the datalog and select the SDVE Adjust (Combine FT) option. Note: in a true SD only car this is the only one you will use the MafComp Adjust (combinedFT) and SDVE Adjust (SD Ratio) are not used at all. After selecting the SDVE Adjust (combined FT) option the SD table will pop up and show numbers in bold, these are the suggestions made by the ECM, click apply and these new values will be used and you are done. Doing this once or twice is all that is necessary because those suggestions will always vary a point or two after the initial changes, but are not crucial to change. Make sure to get those values in the OpenLoopThresholds tab back to stock by clicking the back arrow on the top of the page that reset all the values on the screen to stock, readjust the last row to all 50.2% and you are ready for WOT tuning.

Step 9 - WOT tuning:

WOW! We are finally done setting this thing up, like I said 90% setup 10% tuning.

Find your favorite FLAT road and just make half of a 3rd gear pull to verify boost is low and you are not knocking. You don't have to make a drag pass to tune the car, if there is knock STOP going WOT immediately, that is why that CEL light thing is there. Knock means there is a problem and it must be addressed immediately before any more tuning can be done. Now assuming you made this pull and it was clean, pull over, turbo time your DSM, turn it off, and start to review the log.

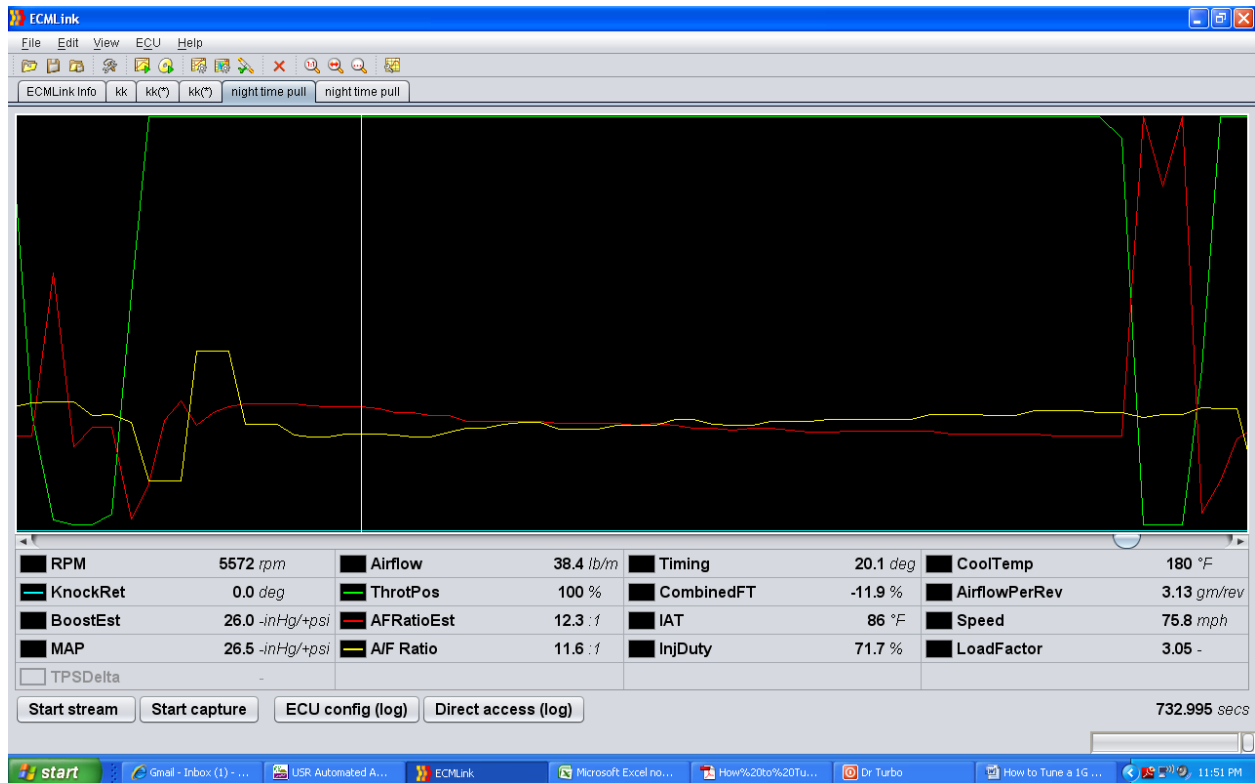
I always "save as" the log to my desktop and don't save it by the log time and date, change the name to something memorable at that moment (like just before dusk) so you know what log you will be looking at a later time, like a week later. Go ahead to the desktop and pull the log up. Hit the 1:1 button on the top of the screen to see the entire log at once, then hit CTRL Q to hide everything, then select ThrotPos so you can see where you were WOT, click and drag the entire WOT area with your mouse pad and double click the selection so you can see just the WOT part of the log. Next select your AEM WB log by clicking on that in the display at the bottom.

Quickly verify that you were not running dangerously lean. Next select and look at KnockRet, see if you had any, even small amounts. If the tune was not to lean and there was knock reduce the timing at those knock points by a degree or two in the TmingMaxOct tab in the direct access table, remember the track datalog trick?

If the pull was too lean select the AFRatioEst and AEMwb readings to see how far they were off. If actual is saying about 13s and estimates that you set in the OpenLoopMaxOct table are supposed to be 11.5s you need to change your global to get these babies to line up. If this is your case (the 13 and 11.5 example above) then you need to increase Global in the Fuel tab (or go in the direction that would ultimately be 0 Global, IE: richer).

So start the car back up and increase the Global a few clicks and then go back to the live log and see what has happened to CombinedFT, it will be out of whack so you need to adjust your deadtime the same way as before.

The key here is to get the wide band reading to mimic your AFRatioEst, but it isn't going to be an exact match, you just want to get the majority of the wideband reading to overlap the estimate, at that point you are done adjusting the global. This screen shot below shows a proper set global but a SD table that is need of adjustment.



Once AFRatioEst and your WB are close use the SD to fine tune in the areas where the actual is not matching the real. You will also notice the closer you get them to match you will see your AirflowEst become a straight line and mimic your OpenLoopMaxOct table numbers. This is a quote from the link forums which sums up this previous paragraph,” This is what happens when changes are made to the SD tab: Increasing VE without making any other changes will increase the ECU's airflow estimation at that point and increase fuel as a result. So increasing VE makes a richer mixture. Decreasing VE makes a leaner mixture.”

Here is a nice little piece of advice, “How should you apply if multiple cells are highlighted in the table?

Apply the adjustment to each of the two or four cells the same as if only one was highlighted”.

I have got to be honest about this next part, I really don't even use this at all, it is more of a checks & balances thing than a tuning one. Select BoostEst and your MAP sensor (or whatever you named it). These numbers should be fairly close even on your first pull, if not I would suspect a boost leak. They should be within about 3 psi, if more than that boost leak test your car. This really is not that important though because you can only really reference one point, 5500, where boost estimate assumes 100% VE at 70 degrees IAT, so for the most part this is not all that important. Here is another good quote from the forum, “Boostest is simply a re-scaled AirflowPerRev, so anything that alters the airflow reading, primarily the SD VE table when running SD, will change Boostest.

Remember this is not an AFC you are tuning with. We do not tune knock via fuel per say. We are telling the car what A/F we want it to run so when there is knock and the A/F is where it is supposed to be we have to adjust timing via the TmingMaxOct tab to get rid of knock. If there is no knock add timing until there is and then back it off. If there is knocking reduce timing at those cells in the TmingMaxOct table where knock is present until it goes away.

Once you think you got everything in line and you are not getting knock during your 3rd gear pulls, go ahead and make a 1-4th gear pull and see how your tune looks. The entire tuning process can take several hours because you are making one pull at a time and then adjusting, a very slow process, but time well spent to make maximum power and RELIABILITY.