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Disclaimer:
Before you begin, understand that I am in no way responsible for what you do
with this information. This write up is being posted for informational purposes
only. In other words, use at your own risk.

Credits:
It's not my intent to take credit for work that is not mine. The content of
this write up is largely derived from searching the WWW and my own personal
experience. If it looks like you originally wrote any part of this, you
probably did, and I thank you for sharing your information on the WWW.

Special thanks to Black02SS and EFILive.

Before you begin:

Please read the entire contents of this write up before performing any of the
steps.

You will need the following:
    1) EFILive/Flashscan – recommend upgrading to the latest release of
    software to ensure all features are available.

    2) Wide Band O2 sensor compatible with EFILive/Flashscan. This sensor
    must be installed, calibrated, and in proper working order before
    beginning.

Anyone running a 1999 – 2000 OS should consider upgrading to a 2001 or later OS.
The later OS's simplify the tuning process and offer the option of upgrading to
one of EFILive's custom OS's.

Contents:
   A) Select PID's for AutoTuning
   B) Create Maps for AutoTuning
   C) Configure OL SD Tune
   D) Data Logging
   E) Update Tune
   F) Return to Closed Loop SD

A) Select PID's for AutoTuning:

     1) Open the ScanTool

     2) Press F8 or select the PID's tab

     3) Select the following PID's for SD Tuning:

          Absolute Throttle Position
          Base Efficiency Numerator 1 - (*your WBO2 here*)
          Commanded Air Fuel Ratio
          Engine Coolant Temp
          Engine RPM
          External Analog Voltage *n*
          Ignition Timing Advance for #1 Cylinder
          Intake Air Temperature

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        Intake Manifold Absolute Pressure
        Retard Due to Knock
        Wide Band AFR 1 – n

        n = the number of the analog input your WBO2 is connected to
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4) Save your PID selection as "Autotune.pid"
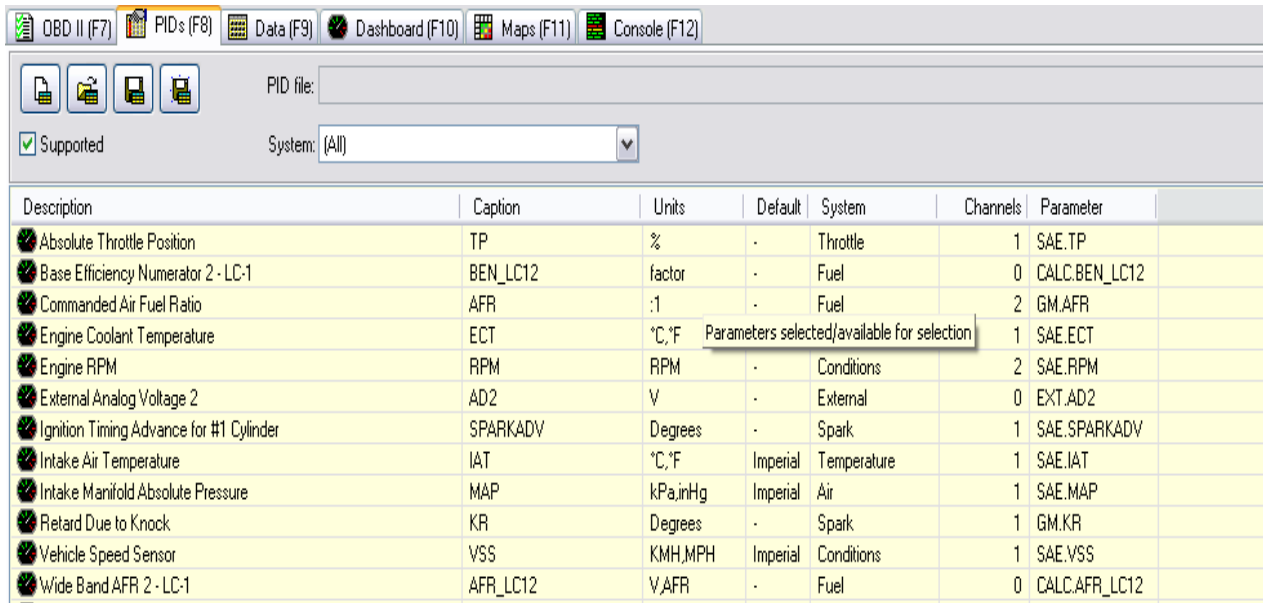
The above PID's are the *minimum* you need to AutoTune. You may wish to add additional PID's for monitoring while you tune.

B) Create Map's for AutoTuning:

1) Open the ScanTool

2) Press "F11" or select the Maps tab

3) Select Map "A" or the first available MAP you have

4) Press "CTRL+ENTER" to open the MAP properties page

5) Under the Data Tab, click the Parameter drop down box and select the "Base Efficiency Numerator 1 - *xxx*" PID

Where *xxx* = the WBO2 model you are using

6) Under the Column Tab, click the Column drop down box and select the "Intake Manifold Absolute Pressure (kPa)" PID.

7) Under the Column Tab, copy and paste the following into the Col Labels box:

,15,20,25,30,35,40,45,50,55,60,65,70,75,80,85,90,95,100,105

8) Under the Row Tab, click the Parameter drop down box and select the "Engine RPM" PID

9) Under the Row Tab, copy and paste the following into the Row Labels box:
,400,800,1200,1600,2000,2400,2800,3200,3600,4000,4400,4800,5200,5600,6000,6400,6800,7200,7600,8000

10) Click the "Save as" button and save the map as "AutoTuneVEPrimary.map"

If you have a 1999 or 2000 model LS1, you will need to create the following map:

11) Open scantool

12) Press "F11" or select the Maps tab

13) Select Map "B" or the first available MAP you have

14) Press "CTRL+ENTER" to open the MAP properties page

15) Under the Data Tab, click the Parameter drop down box and select the "Base Efficiency Numerator 1 - *xxx*" PID

Where *xxx* = the WBO2 model you are using

16) Under the Column Tab, click the Column drop down box and select the "Intake Manifold Absolute Pressure (kPa)" PID.

17) Under the Column Tab, copy and paste the following into the Col Labels box:

,20,30,40,50,60,70,80,90,100

18) Under the Row Tab, click the Parameter drop down box and select the "Engine RPM" PID

19) Under the Row Tab, copy and paste the following into the Row Labels box:
,400,800,1200,1600,2000,2400,2800,3200,3600,4000,4400,4800,5200,5600,6000,6400,6800,7200,7600,8000

20) Click the "Save as" button and save the map as "AutoTuneVEBackup.map"

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

A B C D E F G H I J

BEN_LC12 factor (Cell Count)

RPM	MAP kPa								
	20	30	40	50	60	70	80	90	100
400									
800									
1200									
1600									
2000									
2400									
2800									
3200									
3600									
4000									
4400									
4800									
5200									
5600									
6000									
6400									
6800									
7200									
7600									
8000									

C) Configure OL SD Tune:

1) Download the current tune from your PCM

2) Save 3 copies of your tune:
"Original Tune.tun"
"SDAutoTune.tun"
"OrgBackUp.tun"

3) Open the "SDAutoTune.tun" with the tuning tool

4) Go to {B0101} "Engine Calibration > Fuel > Airflow > Main VE Table"

5) Select all cells and increase by 15%

6) If you are tuning an '01 + OS skip to step 9

7) Goto {B0103} "Engine Calibration > Fuel > Airflow > Backup VE Table"

8) Select all cells and increase by 15%

9) Go to {B3313} "Engine Calibration > Fuel > DFCO > Parameters"

10) Set {B3313} "DFCO Temp Enable" = 250 deg F

11) Go to {B3618} "Engine Calibration > Fuel > Mixture > PE Modifier Based on RPM"

12) Set all values = 1.0

13) Go to {B3605} "Engine Calibration > Fuel > Mixture > EQ Ratio When in Open Loop"

14) Set all values per the following table:

	MAP kPa {link: SAE.MAP}																
	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
-40	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17
-30	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17
-20	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17
-10	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17
0	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17
10	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17
20	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17
30	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17
40	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.13	1.13	1.13	1.13	1.13	1.13
50	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.13	1.13	1.13	1.13	1.13	1.13
60	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.13	1.13	1.13	1.13	1.13	1.13
70	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.13	1.13	1.13	1.13	1.13	1.13
80	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.13	1.13	1.13	1.13	1.13	1.13
90	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.13	1.13	1.13	1.13	1.13	1.13
100	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.13	1.13	1.13	1.13	1.13	1.13
110	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.13	1.13	1.13	1.13	1.13	1.13
120	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.13	1.13	1.13	1.13	1.13	1.13
130	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.13	1.13	1.13	1.13	1.13	1.13
140	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.13	1.13	1.13	1.13	1.13	1.13

ECT °C {link: SAE.ECT}

15) Go to {B3801} "Engine Calibration > Fuel > Trim > Parameters"

16) Set {B3801} "Long Term Fuel Trim Correction" = "Disable"

17) Go to {4205} "Engine Calibration > Fuel > Trim > Closed Loop Temp Enable"

18) Set all values = 250 deg F

19) Go to {B0701} "Engine Calibration > Cat Converter > Parameters"

20) Set {B0701} "Catalytic Converter Protection Enable" = Disable
*Note: if you have cats, and get crazy on your drive,
you may damage the cats.*

21) Go to {B5913} "Engine Calibration > Spark > General"

22) Copy the {B5913} "Spark High-Octane Table" to the {B5914} "Spark Low-Octane Table"

23) Go to {C6002} "Engine Diagnostics > Engine DTC MIL Enablers"

24) Set {P0101}, {P0102}, and {P0103} = "No MIL"

25) Go to {C2901} "Engine Diagnostics > MAF > Parameters"

26) Set {C2901} "MAF High Frequency Fail 1" = 0

27) Pop the hood and unplug the MAF sensor (see note)

28) Save this tune and flash it into your PCM.

Note: If you MAF has a 5 pin plug your IAT sensor is built into the MAF.
You will need to make provisions to get the IAT signal into the PCM.
Various write-up's on this can be found on www.ls1tech.com.

D) Data Logging:

1) Start the engine and let it come to full operating temp.

2) While the engine is warming up, start the scantool and start monitoring your data (do not log at this time).

3) Once the engine is warm (180 deg. F or higher) start your drive and start logging. It helps to look at the BEN Factor map while monitoring cell count. You want to hit as many cells as you can, as many times as you can. Try to get a cell count of 50+ per cell.

4) After you have logged your data, save the log file as "AutoTune.log"

E) Update Tune:

1) Open "SDAutotune.tun" with the tuning tool

2) Open the scan tool and open "AutoTune.Log"

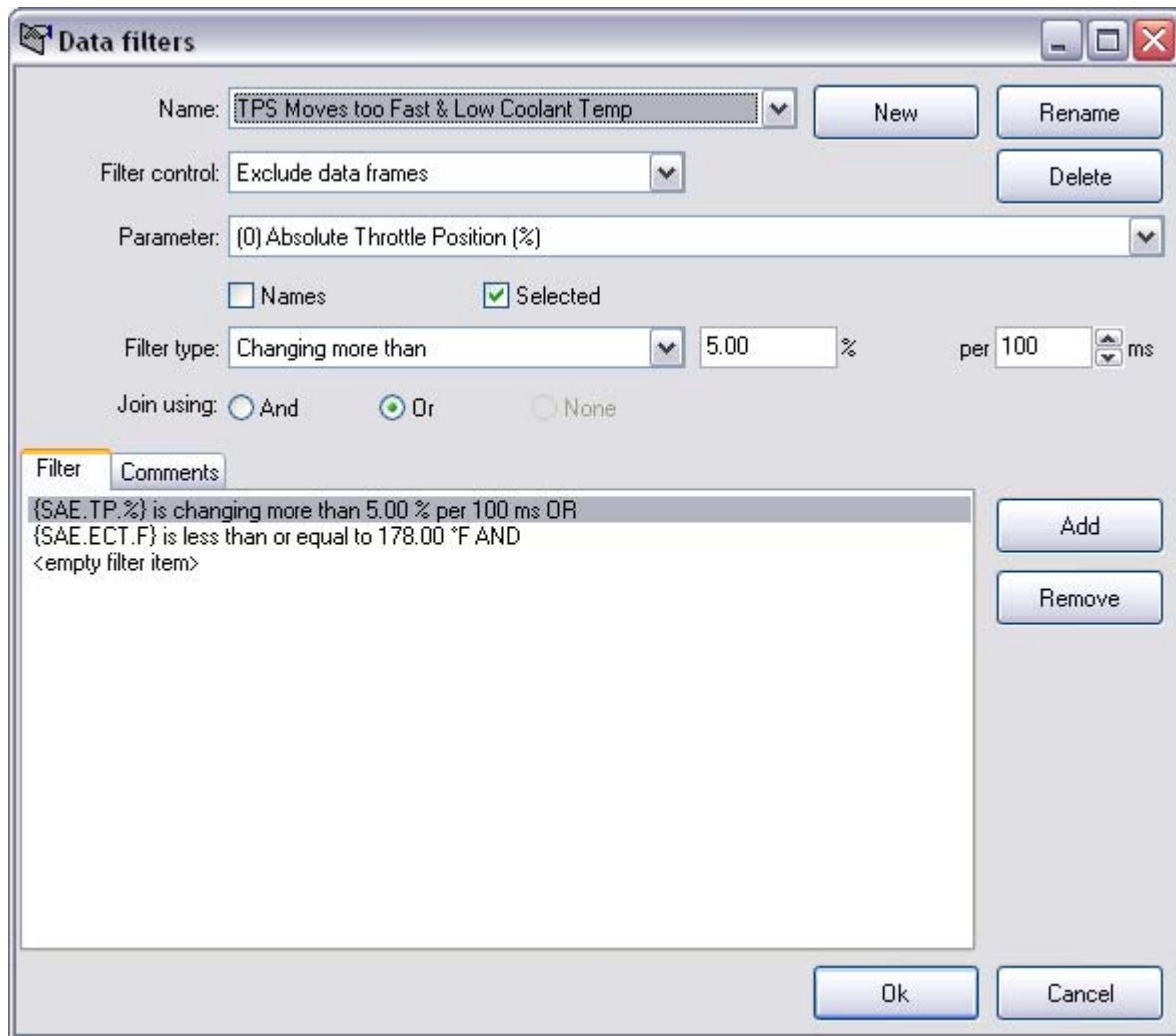3) Press "F11" to open your map displays

4) Press "A" to open your primary VE BEN factor map

5) Press "ctrl+-" to make map A display average values

6) Apply a filter to exclude the following values:
Coolant temp less than 178 deg F
TPS changes more than 5% in less than 100ms

7) Hide all cells with a value of less than 50

8) Select all cells on the table and press "CTRL+C"

9) Switch back to the tuning tool

10) Go to "Engine Calibration > Fuel > Airflow > Main VE Table"

11) Select all cells, right click, paste "as factor"

12) If you are tuning an '01 + OS skip to step 23

13) Open the scan tool and open "AutoTune.Log"

14) Press "F11" to open your map displays

15) Press "B" to open your backup VE BEN factor map

16) Press "ctrl+-" to make map B display average values

17) Apply a filter to exclude the following values:
Coolant temp less than 178 deg F
TPS changes more than 5% in less than 100ms

18) Hide all cells with a value of less than 50

19) Select all cells on the table and press "CTRL+C"

20) Switch back to the tuning tool

21) Go to "Engine Calibration > Fuel > Airflow > Backup VE Table"

22) Select all cells, right click, paste "as factor"

23) Save your tune as "SDAutoTune_0000.tun"

24) Flash SDAutoTune_0000.tun into the PCM

25) Repeat steps in section D) Data Logging to verify your BEN factor is now 1.00

26) If necessary repeat the steps in this section until all values in your BEN map(s) have a value of 1.00.

F) Return to Closed Loop SD:

1) Open "Original Tune.tun" with the tuning tool

2) Go to {C2901} "Engine Diagnostics > MAF > Parameters"

3) Set {C2901} "MAF High Frequency Fail 1" = 0

4) Go to {C6002} "Engine Diagnostics > Engine DTC MIL Enablers"

5) Set {P0101}, {P0102}, {P0103} = No MIL

6) Open Alternate Calibration by pressing "CTRL+F11" and select "SDAutoTune_0000.tun"

7) Copy the {B0101} Main VE Table from the "SDAutoTune_0000.tun" to "OriginalTune.tun"

8) If you are tuning an '01 + OS skip to step 10

9) Copy the {B0103} Backup VE Table from the "SDAutoTune_0000.tun" to "OriginalTune.tun"

10) Go to {B5913} "Engine Calibration > Spark > General"

11) Copy the {B5913} "Spark High-Octane Table" to the {B5914} "Spark Low-Octane Table"

12) Save your tune as "Original Tune_0000.tun"

13) Flash "Original Tune_0000.Tun" into your PCM.

14) Open the scan tool and the following PID's:

Long Term Fuel Trim – Bank 1
Long Term Fuel Trim – Bank 2

15) Start your engine and the scan tool and go for a drive.

16) Monitor Commanded AFR and WBO2 AFR - they should be spot on.

17) LTFT's should be within -4 and 0