EEC-Tuner

By Shiftmaster Enterprises

Tuning Notes and frequently asked questions

Q. What is the EEC Tuner?
A. The EEC Tuner is an electronic device that connects to the PCM and allows the user to change calibration data. The calibration data includes things like fuel mixture, timing, shift points, idle rpm, rev limit, and many more tuning parameters set up at the factory. What you can change depends on the type of processor you have and the support that is currently provided in the EEC Tuner software. In a general sense, the EEC Tuner can change any data in the EEC-IV address map from 2000 Hex to FFFF.

Q. Does the EEC Tuner support non-Ford applications?
A. No.

Q. What Ford vehicles does the EEC Tuner support?
A. In general, the EEC Tuner supports '89 - '95 Mass Air equipped 8 cylinder Mustangs. Specifically, the EEC Tuner supports processors, not vehicles. The following processors are supported; there are 5 general families that support several processors in each family:
A9L -- 88-93 Mustangs
Includes A9L, A3M, A3M1, D3D1, X3Z, S0Z
A9M -- 88-93 Mustangs
Includes A9M, A9P, C3W, C3W1
A9S -- 88-93 CA Mustangs
Includes A9S, 8LD
PE -- 2.3l Turbo applications
Includes PC1, PE, PF2, PF3, PK, PK1
ZA0 -- 94-95 Mustangs
Includes T4M0, U4P0, W4H0, J4J1, ZA0
Each family has a specific set of data parameters that are supported in the EEC Tuner software. See sample.htm for the Modification file for a given family.

Q. How do I know what processor is in my Mustang?
A. In order to be certain, you must look at the label on the outside of the processor.

Q. My processor is not listed - will the EEC Tuner work for me?
A. No - not really.
If you are a developer, a chip tuner, or computer hacker/car enthusiast, the answer is maybe. Here's how. You can use hex addresses to change memory locations to values you supply. The only value to this is if you know that, for example, location 0x8C10 and 0x8C11 is where the idle is stored and it is a value that is multiplied by 4. You could calculate the changes and deposit the new value by adding the following lines to the modification file you download to your Tuner:
0x8C10 0xFA #in this example, this changes the idle to 1000 (250*4). 250=0xFA
0x8C11 0x00
If the previous description does not make sense to you, forget about it. It’s only important for developers and tuners

Q. How do I get the stock settings for my PCM?
A. Get a copy of the Ford ROM image using your EEC Tuner. Then use the Parse Binary function from the EEC Tuner software, specifying the ROM binary file you just captured. The Parse Binary function extracts the stock values for the given ROM file, then opens the file and displays it in the edit window of the EEC Tuner software. The values shown in this file, named extract.eec, are the stock settings for your PCM.

Q. I currently have a chip and want to transition to an EEC Tuner. Can I program the EEC Tuner to use my chip settings as a starting point?
A. Yes. Send your chip to ShiftMaster, and for a $25 charge, we will extract the settings and create an EEC Tuner mod file that exactly matches the settings that were in you Chip. This is useful for radical combinations that are running pretty well and you would like to start tuning and modifying from where your chip left off.

Q. Do I need a laptop to use the EEC Tuner?
A. No. The EEC Tuner kit comes with a AC-DC adaptor that allows you to download modifications to the EEC Tuner board from your home desktop computer. The power supply is used to power the EEC Tuner board when it is not connected to you vehicles PCM. Connect the power supply and serial cable, download your modifications from your home desktop computer system, then disconnect the power adapter and install it in your vehicle.
Modifications that are downloaded to the EEC Tuner are stored in EPROM. They stay there even after power is disconnected. Note that this also means that modifications are not cleared when the battery is disconnected on the vehicle.

Q. Is the EEC Tuner simply an EPROM emulator? Does the EEC Tuner work like a chip?
A. Not really, sorta, kinda. Performance Chips and emulators store modified copies of the Ford ROM, while the EEC Tuner stores only your modifications. The Ford ROM image is copied into temporary memory on the EEC Tuner board when the key is turned to the ON position, then the stored modifications are applied to that stock image. The result is a temporary ROM copy that goes away once power is removed (when the key is turned off). Functionally, with the key in the ON position, the EEC Tuner works just like a chip.

Q. I know the data locations of a Ford PCM that is not currently supported in the EEC Tuner software, but I don't want to give out that information. Can I use the EEC Tuner to tune these vehicles?
A. Yes. You have to use the direct address and data byte modifications feature of the EEC Tuner in combination with the All tag. For example:
ALL
0x8C10 23
0x8C11 45
0x4678 0xCC
0x4679 0x1F
END

Q. How can I tell if my EEC Tuner is working?
A. There are two things to check - communication with your PC and Operation with your PCM. Use Shift-F4 to verify connection to the EEC Tuner. Change the idle to see that the modifications are taking effect.

Q. When do I use the power adapter supplied in the EEC Tuner Kit?
A. When downloading modifications to the EEC Tuner while it is not connected to the EEC-IV(V)PCM. Useful when you don't have a laptop, but do have a home computer or access to a friend who does.

Q. Will the EEC Tuner work with my Speed Density Mustang processor?
A. No. There is currently no EEC Tuner support for processor DA1, speed density processor.

Q. The Tuner mod file, XXX.eec, looks pretty complicated. Can I use the EEC Tuner without being a Techie?
A. Yes. Find a techie friend, bug someone on the forum, or have your local engine tuner contact ShiftMaster. Or, a better answer is, only download the modifications you do understand.
For example -
A9L
NEUTRAL_IDLE 900
WOT_SPARK_ADDER 8 # WOT spark adder (Deg BTDC)
END
The above is a simple modification file that sets the idle 900 rpms and adds 8 degrees of timing at wide-open throttle.

Q. Do my modifications stay after I disconnect the battery?
A. Yes. EEC Tuner modifications are stored in EPROM memory and exist until they are overwritten or erased.

Q. Does the EEC Tuner have any data logging capabilities?
A. No. However, if you have a Crane Interceptor, you can download the ShiftMaster data logging software on the ShiftMaster website.

Q. What about my T-bird, 6 cylinder Mustang, SHO Taurus, Lightning Truck, etc.can you add support for my vehicle?
A. First thing, get the processor code from your vehicle. Support is added by processor, not vehicle. I don't know what processor you have in your specific vehicle. Send an email to support@eec-tuner.com with the processor number, and someone will get back to you.

Q. Can I use my EEC Tuner in more than one vehicle?
A. Yes. You can hook up the EEC Tuner in any vehicle you have that has one of the supported processors. Of course, you can only use it in one vehicle at a time, and the active modifications must correspond to the processor in the vehicle you are working with.

Q. I want to use the EEC Tuner to change my idle from the stock 725 rpm to 950 to accommodate my new E303 Camshaft. I have an A9L processor. What do I do?

A. Open the EEC Tuner software. Click on the File->New menu item. Enter
A9L
NEUTRAL_IDLE 950
END
Save the file, then click on the DOWNLOAD button on the upper left of the application window.

Q. Why the EEC Tuner? Why not a chip or an aftermarket Engine management system?
A. Chips are great if you want someone else to set up you car, and don't want to make further modifications. Any changes once the chip is set up require going back to your chip vendor (and paying for reprogramming). All computers and engine management systems require the user to set up the base operation for their vehicle. The EEC architecture is widely accepted as the best mass-produced engine management system around. It makes sense to leverage off an excellent base that is already integrated to your current vehicle wiring harnesses, sensors (throttle position sensor, egr position sensor, oxygen sensors, mass airflow sensor, etc.) and actuators (fuel injectors, solenoid control, idle/bypass valve control, egr control, etc.). If you want to retain the Ford EEC computer, built for your vehicle, backed by extensive Ford research and development, and want to make you own modifications with no additional charges, the EEC Tuner is for you!

Q. Can I use low impedance injectors with the EEC Tuner.
A. The EEC Tuner alters the software used to operate your EEC-IV(V) processor. It does not change any hardware characteristics of the engine management system. Low impedance injectors require low impedance injector drivers in the PCM. The 89-95 Mustangs use high impedance drivers that would have to be changed. I know there are shops that do the conversion. If you have a recommendation for a shop that does this modification, send email (support@eec-tuner.com). We will post the pointer here to help folks out. Information on how to make the swap for DIYers is also desired.

Q. What are my support options?
A. Your EEC-Tuner dealer or http://www.egroups.com/group/EECTuner or www.sn95.com or www.eec-tuner.com

Q. What type of performance increase can I expect from the EEC Tuner?
A. That depends entirely on the modifications you make to your current vehicle set up.

Q. Can I make changes on the fly? Without turning off the vehicle?
A. No, you must turn the vehicle off. Turn the ignition to on and download your file. Then turn it back off and start the vehicle.

Q. Can I use the cable and software to dump my chip?
A. No, Shiftmaster can do this for you (25.00) or a Shiftmaster dealer

Q. Is the catch code the 4 char CARB code on the label in the driver door jamb?
A. Yes

Q. Do I need to clean the J3 connector? There is some grease already on it?
A. YES!!! Anything that inhibits the connection will cause problems!! It must be clean!!

Q. What about the EECV?
A. The latest EEC Tuners, v5.1 on the printed circuit board, can modify data in EECV processors in bank 8 and bank 1 over the entire ROM address range from 0X2000 to 0XFFFF.

Q Is there a detailed explanation of everything in the Ford PCM and exactly how to tune my car?
A. NO!! A lot of this requires some degree of experimenting; also not every vehicle responds the same to the same modification.

EEC Tuner tuning notes

Most of the information in this file is directed specifically at the A9L processor. However, the information is still applicable to the other processors in theory and description of operation.

This is a work in progress. Comments are welcomed and appreciated.

PIP

Think of this as a rev limiter using the following formula:

PIP = 6006250/maxRPM
maxRPM = 6006250/PIP
for example stock A9L
PIP= 961 maxRPM = 6006250/961
= 6250 rpms
Lower numbers give a higher rev limit.

The PIP is a sample rate frequency that limits the PCM program operating loop to a minimum rate. If the loop is sampled less then PIP times within one operating cycle (2 crankshaft revolutions), the PCM limits rpm.

With this logic, you should be able to set the pip to 1 and the car should run normally, but not limit RPM. I have tested this on an A9L processor.

WOT_VOLTAGE

The WOT_VOLTAGE defines the throttle position that WOT operating mode is entered. On A9L processors, the WOT_VOLTAGE is the measured TPS voltage minus the idle voltage. That makes the stock 2.71 volts really ~3.71 volts as read on the TPS signal line. TPS usually goes to 4.6V at full scale. So stock WOT operation is triggered at about 80% and up throttle. You can control when the WOT functions and scalars are used by adjusting this value.

The following tags are only active during WOT operating mode
WOT_SPARK_ADDEER
WOT_ADVANCE_VS_RPM
WOT_FUEL_MULTIPLIER_VS_RPM
WOT_ADVANCE_VS_ECT
WOT_ADVANCE_VS_ACT

CRANK_FUEL_PULSEWIDTH_MULTIPLIER_VS_TIME

(8191.88, 1)   (0, 1) (0, 1)
(0, 1) (0, 1) (0, 1)

This function is used to modify the CRANK_FUEL_PULSEWIDTH_VS_ECT values. The x value is the time in seconds, the y is the multiplier. This allows across-the-ECT-range pulsewidth changes without having to enter new ECT-dependent pulsewidths.

This is useful for reducing the pulsewidth when using larger injectors. This dramatically improves engine starting, and the surge that comes right after starting with larger injectors. I suspect the surging is burning latent fuel from a wet manifold that was over-doused with fuel. Set the multiplier in proportion to the size of the new injector.

For example: If going from 19 to 36 lb/hr injectors. You might use the following function. 19/36 =c

CRANK_FUEL_PULSEWIDTH_MULTIPLIER_VS_TIME

(8191.88, 0.53)   (0, 0.53)   (0, 1)
(0, 1) (0, 1) (0, 1)

The smallest pulsewidth appears to be about 2ms. A lower multiplier will not lower the pulsewidth below 2ms. However, a zero multiplier produces a 0ms pulse.

Using the 0 multiplier you can introduce a period where the engine is cranking, but the fuel injectors are not introducing fuel—just like WOT cranking without holding the throttle wide open. This can be useful for cars running very large injectors, such that a 2ms pulsewidth will still flood the engine on starting.

For example: I use this on my car with 50 lb/hr fuel injectors. Without this setting, it will not start when its warm—I will have to start it at WOT to clear the flooding

CRANK_FUEL_PULSEWIDTH_MULTIPLIER_VS_TIME

(8191.88, 0)   (3, 0)   (1.5, 0.35)
(1.5, 0)   (0.75, 0) (0, 0.35)

This function would gradually, over ¾of a second, reduce the injector pulsewidth from 0.35 full value to 0. Then from ¾of a second to 1.5 seconds, no fuel would be delivered. From 1.5 seconds to 3 seconds fuel delivery would decrease from 0.35 full value to no fuel. From 3 seconds to 8191.88 (infinity in relation to cranking), no fuel would be delivered. This would clear any flooding condition as I crank beyond 3 seconds.

CRANK_FUEL_PULSEWIDTH_VS_ECT

(65534, 0.00199893) (180, 0.00199893) (150, 0.0023003)
(70, 0.00569924) (40, 0.010502)(20, 0.0141489)
(0, 0.0218891)(-20, 0.0387617) (-65536, 0.0387617)
Format: (ECT in degrees F, injector pulsewidth in seconds). Notice how dramatic the pulsewidth changes as the ECT changes. For example, on the A9L series a 10.5 ms pulsewidth at 40F changes to a 2.3ms pulsewidth at 150F. This may be a critical adjustment for larger-then-stock injectors and easy starting.

CLOSED_THROTTLE_SPARK_ADDER, PART_THROTTLE_SPARK_ADDER, WOT_SPARK_ADDER -

GLOBAL_SPARK_ADDER

xxxSPARK_ADDERs can be positive to add timing, or negative to remove timing.

TIP_IN_RETARD A positive number pulls out that number of degrees right after a shift. A negative number here might, presumably, advance ignition after a shift. Probably a dangerous thing!

CHECKSUM_BASE_ADDRESS - This is the starting address used to calculate a checksum on the ROM. The checksum test processes blocks of code until it reaches a base address that is 0. Set this value to 0 to remove KOEO error code 15 (checksum test error). The ROM checksum is valid only on the stock calibration—Once you change anything, the checksum is invalid and error code 15 is generated.

It is not known if the presence of error code 15 effects PCM operation—such as not storing keep-alive memory.

OPEN_LOOP_IDLE_MULTIPLIER 1 #(ZA0 series)

This variable modifies the fuel mixture at idle when the vehicle is in OL mode

(during cold start). A lower value richens the mixture.

You might use this if you run a radical cam and the car won't idle smoothly until it gets warm

INTAKE_VOLUME 5.5 # Intake Manifold Volume

You should play with this a bit. It is a non-critical measurement. People tell me it has an effect on throttle response. The GT40 has a larger volume—try a value of 6. I don't know what the units are.

MAF_VOLTAGE 4.78523 # Max MAF voltage

MAF_VOLTAGE defines the maximum usable voltage as sent from the Mass Airflow Sensor signal line. This parameter essentially caps the maximum measurable airflow. When airflow reaches a rate such that the signal voltage is higher then MAF_VOLTAGE, the PCM fixes the fuel delivery rate as though MAF_VOLTAGE air is flowing. Raising this value from 4.7853 to 5.00 can increase the potential airflow measurement by 40%!. This assumes that your Mass airflow meter reports accurately at these higher rates.

FUEL_TABLE_ECT_SCALING #
(254, 9) (240, 9) (-30, 0)
(-256, 0) (-256, 0) (-256, 0)
This function defines the ECT values for the columns of the following tables:

STARTUP_FUEL_TABLE

BASE_FUEL_TABLE

FUEL_TABLE_LOAD_SCALING

(1.99997, 7) (0.899994, 7) (0.700012, 5)
(0.399994, 3) (0.149994, 1) (0.0750122, 0)
(0, 0)

This function defines the load (volumetric efficiency) values for the rows

of the BASE_FUEL_TABLE.

EMISSION_TABLE_LOAD_SCALING #
(1.99997, 7) (0.75, 7) (0.600006, 6)
(0.100006, 1) (0.0499878, 0)(0, 0)
This function defines the load (volumetric efficiency) values for the rows

of the following tables:

EXHAUST_PULSE_DELAY

HEGO_AMPLITUDE
HEGO_BIAS

EMISSION_TABLE_RPM_SCALING #
(16383.8, 3) (3000, 3) (900, 1)
(700, 0) (0, 0) (0, 0)
(0, 0) (0, 0)
This function defines the RPM values for the columns of the following tables:

EXHAUST_PULSE_DELAY

HEGO_AMPLITUDE
HEGO_BIAS

SPARK_TABLE_RPM_SCALING

(16383.8, 9)	(4000, 9)	(3000, 8)
(1500, 5)	(500, 0)	(0, 0)
(0, 0)		

This function defines the RPM values for the columns of the following tables:

BASE_SPARK_TABLE
ALTITUDE_BASE_SPARK_TABLE
LIMP_MODE_SPARK_TABLE
INJECTOR_TIMING_TABLE

SPARK_TABLE_LOAD_SCALING

(1.99997, 7)	(0.75, 7)	(0.600006, 6)
(0.100006, 1)	(0.0499878, 0)	(0, 0)
(0, 0)		

This function defines the load (volumetric efficiency) values for the rows

of the following tables:

BASE_SPARK_TABLE
ALTITUDE_BASE_SPARK_TABLE
LIMP_MODE_SPARK_TABLE
INJECTOR_TIMING_TABLE

NEUTRAL_IDLE 672 # Neutral Idle RPM

DRIVE_IDLE 672 # Drive Idle RPM

Defines the target base idle when the car is in Neutral and Drive. DRIVE_IDLE is used for automatic transmission equipped vehicles—it has no effect on cars with manual transmissions.

ENGINE_DISPLACEMENT 301.082 # Engine Displacement

Defines the cubic inch displacement of the engine. This parameter us important because is defines how load is calculated. The VE(Load) is calculated by the airflow, the RPM and the ENGINE_DISPLACEMENT. Engine_displacement/(Airflow/RPM) = VE(load)

Increasing ENGINE_DISPLACEMENT typically causes increased ignition advance and leaner mixtures. This parameter is closely coupled with the MAF_FUNCTION. Double this value, and you halve the calculated load value—that means leaner fuel mixtures and more timing. Be careful here!

LOW_INJECTOR_SLOPE 26.0995 # Injector slope lb./hr

This parameters compensates for the physical limitations of a particular fuel injector for unusually small pulsewidths (<~4ms). In general, real life fuel injectors are sloppy when the commanded pulsewidth is close to the duration of the opening and closing event time for the injector solenoid. Typical injectors take about 1 ms to open and 1 ms to close. That is a total open/close event duration of 2 ms. When the command pulsewidth is in this low-pulsewidth range (<~4 ms), the real-life fuel delivery is not linear to the rated full flow injector delivery rate. The LOW_INJECTOR_SLOPE is a fudge-factor that accounts for this deviation.

Injector pulsewidths are lowest when the RPM is high, and the throttle is closed. Idle pulsewidths are in the 2-4ms range. Larger injectors decrease all pulsewidths in direct proportion to the size increase. Double the injector size, halve the pulsewidths for any given airflow.

HIGH_INJECTOR_SLOPE(ZA0-series)INJECTOR_SIZE(all others

The fully-open fuel delivery rate in pounds(mass)/Hour, at 45 psi, of the fuel injector.

INJ_DELAY

0 # Global injector delay (crank deg.)

GLOBAL_ACCEL_MULTIPLIER 0.398438 # Global Accel pump multiplier

FAN_TEMP 220 # Coolant temp for Electric Fan (Deg F)

Fan operation temperature in degrees Fahrenheit.

FAN_ENABLE 0 # Electric Fan control enable(0=no, 1=yes)

1 enables fan operation, 0 disables

LOW_DWELL 0.500008 # Max low speed dwell (off time in ms)

Coil charge time in milliseconds. Don’t know what the purpose of this is.

HIGH_DWELL 0.2 # Max high speed dwell (off time in ms)

Coil charge time in milliseconds. Don’t know what the purpose of this is.

OPEN_LOOP_FUEL_MULTIPLER 0.996094 # Global open loop fuel multiplier

Across-the-board fuel mixture adjustment when operating in Open Loop mode (non HEGO controlled operation). Numbers less then one richen the mixture (increase fuel delivery) Numbers greater then one lean the mixture (decrease fuel delivery)

EGR_MULTIPLIER 1 # EGR multiplier

This is a gross scaling adjustment for the flow rate of a given EGR valve. Use a number larger then one to proportionately add more recirculated exhaust gas to the intake charge. Numbers less then one reduce the EGR flow.

For example, setting EGR_MULTIPLIER to 0.75 would deliver three fourths the amount of exhaust compared to stock. A setting of 1.5 would deliver 1 and a half times the EGR flow. Don't know why you would use this, but its fun to change the values and log EVP sensor output (pin 27).

EGR_TYPE 0 # EGR type (0=sonic, 1-PFE, 2=none)

Set to 2(none) to remove the EGR related error codes for a removed or non-functioning EGR. The effect on fuel mixture and ignition timing is unknown—probably stays exactly the same.

The Purge canister solenoid still works when the Thermactor and EGR are set to none. The Purge Canister solenoid opens at off throttle, car warm, and running for 5 minutes or so.

SECOND_SPEED_LIMITER_ON

The _ON must be set higher then the _OFF for this function to work. The engine cuts out when the speed on the speedometer reaches the speed set with SECOND_SPEED_LIMITER_ON, the engines starts running after the speed falls off to SECOND_SPEED_LIMITER_OFF

FIRST_SPEED_LIMITER_XXX

Doesn't seem to do anything.

Possibly used on automatic equipped mustangs, or when the car is under/over operating temperature.

HALF_FUEL_REV_LIMIT_ON 8000 # Turn on half-fuel rev limit
HALF_FUEL_REV_LIMIT_OFF 7500 # Turn off half-fuel rev limit

The _ON must be set higher then the _OFF for this function to work. The PCM cuts fuel delivery in half when the engine speed reaches the RPM of the _ON value. Fuel delivery remains cut in half until the engine speed drops below the RPM set in the _OFF speed.

NO_FUEL_RPM 7000 # Max RPM (no fuel)

Cuts all fuel when this RPM is reached. Harsh rev limiter. Avoid its use.

MIN_LOAD_FOR_CLOSED_LOOP 0.00500488 # Minimum load for CL control

?

TIME_AT_HIGH_LOAD_BEFORE_OPEN_LOOP 2 # Time at high load to force OL (sec)

The TIME_AT_HIGH_LOAD_BEFORE_OPEN_LOOP is the numbers of seconds that the car will stay in closed loop (HEGO fuel control) when it detects a high load demand (anything over about 1/3 throttle). A 0 works here also.

THERMACTOR_PRESENT 1 # Thermactor present (0-no, 1-yes)

Set to 0 to remove the Thermactor related error codes for a removed air pump belt or non-functioning air-diverter/air-bypass valves or their associated solenoids.

NUMBER_OF_HEGOS 2 # Number of HEGO's

Set to zero to force Open Loop fuel delivery operation?

MIN_ECT_FOR_FUEL_SHUTOFF 140 # Min ECT for decel fuel shutoff (Deg F)
MIN_RPM_FOR_FUEL_SHUTOFF 150 # Min RPM for decel fuel shutoff (Deg F)
MIN_ACT_FOR_ADAPTIVE_CONTROL 100 # Min ACT for Adaptive Control (Deg F)
MAX_ACT_FOR_ADAPTIVE_CONTROL 200 # Max ACT for Adaptive Control (Deg F)

?Does Anyone use these? The Cobra (X3Z) changes these values from the A9L, but I don't know why?

MAF_FUNCTION # Mass Air Transfer Function

(15.9998, 835.509) (4.76807, 835.509) (4.44312, 695.465)
(4.177, 595.977) (3.88599, 499.658) (3.54395, 399.219)
(3.35498, 347.574) (3.14893, 295.612) (2.90991, 243.334)
(2.69409, 201.828) (2.58203, 182.5) (2.44995, 161.272)
(2.31592, 142.261) (2.15405, 120.083) (1.98901, 100.122)
(1.88989, 90.2996) (1.80298, 82.3786) (1.69092, 72.8734)
(1.57397, 62.4176) (1.46802, 54.1798) (1.32104, 44.6745)
(1.18188, 36.7535) (1.09106, 32.6346) (0.884033, 23.7631)
(0.75, 18.6936) (0.571045, 13.6242) (0, 13.6242)
(0, 13.6242) (0, 13.6242) (0, 13.6242)

The x value is the Voltage on the MAF sig line. The y coordinate is the Kg/Hr flow rate. This allows you to use the data provided by Pro M (Best Products Inc.)

The following functions can be used to estimate flow data for various injector calibrations. V is the voltage read between the MAF sig (pin 50) and MAF return (pin 9). ** means "raised to the power of".

Calibration	Flow equation (Kg/hr)
19 lb/hr	Flow = 1.4925(1.384+V)**3.5.
24 lb/hr	Flow = 1.990(1.384+V)**3.5.
36 lb/hr	Flow = 2.85(1.384+V)**3.5.

WOT_ADVANCE_VS_RPM

WOT spark Advance vs. RPM

(16383.8, 26) (5000, 26) (3500, 22)
(2600, 22.5) (2150, 21.5) (1800, 18.5)
(1000, 8) (0, 8)

The x coordinate is the RPM. The y coordinate is the ignition advance. This is the same advance that you would read off the crankshaft timing marks with a timing light—the initial timing is included.

ACCELERATOR_PUMP_VS_TP_VOLTAGE

Accelerator Enrichment Multiplier vs. TP voltage

(4.98047, 0) (4.16016, 0) (2.20703, 0.296875)
(0.976562, 0.953125) (0, 1)

The x coordinate is the TP Voltage, the y coordinate is the enrichment multiplier.

WOT_FUEL_MULTIPLIER_VS_RPM

WOT Fuel Multiplier vs. RPM

(16383.8, 0.945312) (6000, 0.945312) (4400, 0.953125)
(3800, 0.976562) (3200, 0.945312) (2400, 0.96875)
(1600, 0.90625) (0, 1)

The WOT_FUEL_MULTIPLIER_VS_RPM function richens the mixture with numbers less then one. Numbers greater then on lean the mixture.

ACCELERATOR_PUMP_FUEL_TABLE

Accelerator Enrichment Fuel Table(LB/min)

	Throttle Rate (Deg/Sec)							
ECT	16	32	48	64	80	96	112	128
• 30	21	23	26	28	31	34	39	56
0	12	14	16	18	26	30	38	55
30	5	8	10	12	16.5	21	27	45
60	4	5	6	8	12.5	17	25.5	34
90	2	2	3	4.5	8	12.5	18	29
120	1.5	1.5	2	3	4.5	8	12	20
150	1.5	1.5	2	3	4.5	8	12	18

STARTUP_FUEL_TABLE

Startup Fuel Table (A/F ratio)

ECT											
Seconds		-30	0	30	60	90	120	150	180	210	240
0	3.375	4.125	3	1.875	1.875	1.875	1.875	1.375	1.875	3.375	
4	2.875	3.625	2.625	1.875	1.875	1.875	1.875	1.625	1.875	2.875	
8	2.75	2.75	2.375	1.875	1.875	1.875	1.875	1.5	1.875	2.75	
12	2.25	2.125	2.125	1.875	1.875	1.875	1.875	1.25	1.875	2.25	
16	1.625	1.625	1.5	1.375	1.25	1.375	1.375	1.125	1.375	1.625	
20	1.25	1.5	1.125	1	1	1.25	1.25	0.875	1	1.25	
24	1	1.25	0.875	0.5	0.375	0.875	0.875	0.25	0.5	1	
28	0	0	0	0	0	0	0	0	0	0	

The STARTUP_FUEL_TABLE uses larger numbers to richen the mixture.

BASE_FUEL_TABLE

Base Fuel Table (A/F ratio)(Load vs ECT)

ECT										
Load (VE)	-30	0	30	60	90	120	150	180	210	240
0.08 (8%)	17.875	17.875	17.675	17.25	16.625	16.375	16	15.25	15.25	15.25
0.15 (15%)	17.625	17.625	17	16.625	16.5	16.375	16	15.25	15.25	15.25
0.27 (27%)	14.125	14.25	14.25	14.375	14.5	14.75	14.75	15.25	15.25	14.375
0.40 (40%)	13.625	14.375	14.375	14.375	14.875	15.25	15.25	16	16	14.75
0.55 (55%)	12.75	13.875	14.25	14.375	14.875	14.875	15.25	16	16	15
0.70 (70%	12.125	12.125	13.5	13.5	13.875	14.375	14.125	14.25	13.625	13.625
0.80 (80%)	11.25	11.25	12.75	12.75	13.125	13.5	13.75	13.75	13.625	13.5
0.90 (90%)	10.5	10.5	12.5	12.5	12.75	13.125	13.5	13.5	13.5	13.5

BASE_SPARK_TABLE

Base Spark Table (Deg BTDC)(Load vs RPM)

			RPM							
Load (VE)	500	700	900	1100	1300	1500	2000	2500	3000	4000
0.05 (5%)	28	28	28	31	33	34	34	34	34	34
0.10 (10%	28	28	28	31	33	34	34	34	28	28
0.20 (20%)	28	28	33	36	36	37	38	38	28	28
0.30 (30%)	25	26	28	29	32	32	38	40	28	28
0.40 (40%)	20	21	25	28	31	32	33	34	28	28
0.50 (50%)	15	15	16	16	18	20	23	27	27	27
0.60 (60%)	8	10	10	11	13	15	21	21	21	21
0.75 (75%)	8	8	9	10	12	14	18	21	21	21

ALTITUDE_BASE_SPARK_TABLE # Altitude base spark table.

			RPM							
Load (VE)	500	700	900	1100	1300	1500	2000	2500	3000	4000
0.05 (5%)	28	28	28	31	33	34	34	34	34	34
0.10 (10%	28	28	28	32	34	35	35	34	28	28
0.20 (20%)	28	28	33	37	37	38	38	38	28	28
0.30 (30%)	25	26	30	37	38	36	36	38	28	28
0.40 (40%)	20	21	25	32	34	34	33	32	28	28
0.50 (50%)	15	16	16	16	18	20	26	27	27	27
0.60 (60%)	8	8	9	10	11	14	21	21	21	21
0.75 (75%)	8	8	9	10	11	13	21	21	21	21

LIMP_MODE_SPARK_TABLE

Limp Mode Spark Table (Deg BTDC)(Load vs RPM)

			RPM							
Load (VE)	500	700	900	1100	1300	1500	2000	2500	3000	4000
0.05 (5%)	28	28	28	31	33	34	34	34	34	34
0.10 (10%	28	28	28	31	33	34	34	34	34	34
0.20 (20%)	25	26	30.5	33.5	35	36.5	38	38	38	38
0.30 (30%)	20	21	20	24	31	32	33	33	33	33
0.40 (40%)	14	14	14	14	16	21	27	27	27	27
0.50 (50%)	8	9	10	11	13	17	22	22	22	22
0.60 (60%)	6.5	8	9	10	12	14	18	18	18	18
0.75 (75%)	6.5	6.5	9	10	12	14	18	18	18	18

INJECTOR_OUTPUT_PORT

Injector Output Port Table

Cylinder

	1	2	3	4	5	6	7	8
Port	0	0	0	0	2	2	2	2

WOT_ADVANCE_VS_ECT

(254, -4) (246, -4) (236, -2)
(200, 0) (120, 0) (86, 3)
(-256, 3)

The x coordinate is the ECT, the y coordinate is the timing in degrees that is added to the current timing to account for changes in engine coolant temperature. This function is only used at WOT—defined by the WOT_VOLTAGE.

WOT_ADVANCE_VS_ACT

(254, -6) (240, -6) (150, 0)
(-256, 0) (-256, 0) (-256, 0)

This function is only active during WOT operation node. The x coordinate is the ECT in farenheit, the y-coordinate is the amount of ignition advance that is added (or subtracted if the number is negative) to the overall ignition advance.

OL_FUEL_MULTIPLIER_VS_ACT

(254, 1) (76, 1)(0, 0.8125)
(-40, 0.640625) (-256, 0.640625) (-256, 0.640625)

This function is only active during OL operation node. Open Loop operation occurs at throttle postions of greater then one third throttle. The x coordinate is the ECT in farenheit, the y-coordinate is fuel multiplier. Multipliers lower then one richen the mixture(more fuel), numbers greater then one lean the mixture (less fuel).

PT_ADVANCE_VS_ACT

(254, -2) (190, -2) (160, 0)
(-256, 0) (-256, 0)

This function is only active during Part Throttle (not WOT) operation node. The x coordinate is the ECT in farenheit, the y-coordinate is the amount of ignition advance that is added (or subtracted if the number is negative) to the overall ignition advance.

ADVANCE_VS_BP

(31.875, 0) (27.75, 0) (26.5, 4)
(23.5, 4) (0, 12)

The x coordinate is the barometric pressure in inches of mercury, the y-coordinate is the amount of ignition advance that is added (or subtracted if the number is negative) to the overall ignition advance.

ADVANCE_RATE_VS_RPM

(8160, 1) (4000, 1) (3008, 1.5)
(992, 2) (0, 2) (0, 2)

The predicted advance rate between table lookups? Higher numbers here give a noticable increase in throttle response. Especially on modified cars with camshafts and high stall converters.

MIN_LOW_SPEED_DWELL

(4095.94, 0.00279999)(15, 0.00279999) (14, 0.00300027)
(12, 0.00399972) (10, 0.00449944) (0, 0.00449944)

MIN_HIGH_SPEED_DWELL

(4095.94, 0.00300027)(15, 0.00300027) (13, 0.00334931)
(12, 0.00370026) (10, 0.00499917) (0, 0.00499917)

DASHPOT_CLIP

(16383.8, 1.6001) (2000, 1.6001)(1500, 1)
(500, 0.120117) (0, 0.120117)

SEA_LEVEL_LUGGING_OL_FUEL_MULTIPLIER

(16383.8, 1) (1500, 1) (1200, 1.20312)
(750, 1.20312)(650, 1) (0, 1)

ALTITUDE_LUGGING_OL_FUEL_MULTIPLIER

(16383.8, 1) (0, 1) (0, 1)
(0, 1) (0, 1)

INJECTOR_OFFSET_VS_BATTERY_VOLTAGE

(15.9375, 0.90625) (14, 0.90625) (13, 1)
(12, 1.15625) (11, 1.40625) (10, 1.6875)
(9, 2.03125) (8, 2.59375) (7, 3.53125)
(6, 5.53125) (5.5, 7.5) (0, 7.5)

OL_FUEL_MULTIPLIER_VS_RPM

(16383.8, 0) (1100, 0) (1075, 1)
(0, 1) (0, 1) (0, 1)

DASHPOT_DECREMENT_RATE

(15.9998, 0.0625) (0.75, 0.0625) (0.649902, 0.0449219)
(0.449951, 0.00708008) (0.350098, 0.00195312) (0.0620117, 0.00292969)
(0, 0.00341797)

INJECTOR_TIMING_TABLE # Injector timing table Crank degrees

RPM

Load (VE)	500	700	900	1100	1300	1500	2000	2500	3000	4000
0.05 (5%)	352	352	352	352	352	352	352	352	352	352
0.10 (10%	352	352	352	352	352	352	352	352	352	352

0.20 (20%)	352	352	352	352	352	352	352	352	352	352
0.30 (30%)	352	352	352	352	352	352	352	352	352	352
0.40 (40%)	352	352	352	352	352	380	400	400	400	400
0.50 (50%)	380	380	380	380	380	380	420	420	464	464
0.60 (60%)	420	420	420	420	420	420	420	464	464	464
0.75 (75%)	420	420	420	420	420	420	420	464	464	464

INJECTOR_FIRING_ORDER # Injector firing order

1	3	7	2	6	5	4	8

EXHAUST_PULSE_DELAY # in Engine Revolutions

This is the amount of time in engine revolutions that it takes the exhaust charge to reach the oxygen sensor after ignition. Increase this value to improve idle on cars with long tube headers.

Here is a more specific definition contributed from a someone in the EEC-EFI mailing list: "EXHAUST_PULSE_DELAY is the time between when the injector

pulse width is calculated in the EEC (*not* when the injector

is fired), to when that pulse ends up reliably sensed at the HEGO

sensor. This is used to predict when the O2 signal will cross so

it can get the correct amplitude and bias results."

From an EEC Tuner user point of view, longer headers mean larger values in the table. Conceivably, changing the injector timing table could also have any effect here (I would presume only a negligible one though < 1).

RPM

Load (VE)	700	900	1950	3000
0.05 (5%)	10	10	10	10
0.10 (10%	10	10	10	10
0.20 (20%)	10	10	10	10
0.30 (30%)	10	10	10	10
0.40 (40%)	10	10	10	10
0.50 (50%)	10	10	10	10
0.60 (60%)	10	10	10	10
0.75 (75%)	10	10	10	10

HEGO_AMPLITUDE

Description taken from an EEC-EFI mailing list contributor:

" HEGO_AMPLITUDE is the desired amplitude of the O2 dither signal. This is modified primarily for emissions - it is set up to optimize the catalytic converter performance. A certain minimum is required to maintain the system in a limit cycle oscillation."

RPM

Load (VE)	700	900	1950	3000
0.05 (5%)	0.0332031	0.0332031	0.0332031	0.0332031
0.10 (10%	0.0332031	0.0332031	0.0332031	0.0332031
0.20 (20%)	0.0332031	0.0332031	0.0332031	0.0332031
0.30 (30%)	0.0332031	0.0332031	0.0332031	0.0332031
0.40 (40%)	0.0332031	0.0332031	0.0332031	0.0332031
0.50 (50%)	0.0332031	0.0332031	0.0332031	0.0332031
0.60 (60%)	0.0332031	0.0332031	0.0332031	0.0332031
0.75 (75%)	0.0332031	0.0332031	0.0332031	0.0332031

HEGO_BIAS

Description taken from an EEC-EFI mailing list contributor:

“The HEGO_BIAS allows the averaged air-fuel ratio to be shifted slightly rich or slightly lean. This makes virtually no difference in power but it has a huge impact on emissions. This is used to adjust the CO-HC vs NOx balance on the emissions test cycle. A rich mixture will lower NOx but raise CO, a lean mixture will do the opposite.”

RPM

Load (VE)	700	900	1950	3000
0.05 (5%)	0	0.00683594	0.00683594	0.00683594
0.10 (10%	0	0.00195312	0.00195312	0.00195312
0.20 (20%)	0	0	0	0
0.30 (30%)	0	0.123047	0.123047	0.123047
0.40 (40%)	0	0.123047	0.123047	0.123047
0.50 (50%)	0.123047	0.121094	0.121094	0.121094
0.60 (60%)	0.123047	0.119141	0.119141	0.119141
0.75 (75%)	0.117188	0.117188	0.117188	0.117188