



# Tech Articles

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## DIY Tuning, Part 3

In the last two issues of Fiero Focus, we discussed what hardware and software you needed to do your own ECM tuning, as well as getting started with the tuning for cold start and idle fuel. If you missed those articles, I recommend you obtain them because they contain valuable information needed to understand and use this segment and the following segment of this series of Do-IT-Yourself Tuning articles I am writing for our friends at Fiero Focus. These articles should be considered to contain basic instructions on how to perform the task of tuning. There are different and perhaps some more advanced ways to tune, but in the interest of our general reader, I will try to keep things as simple to understand and follow as possible.

Once you are confident you have got your idle fuel tuned in reasonably well, you can move on to part throttle tuning. Just like with idle tuning, you will probably want to tackle the fuel first and worry about fine tuning the spark advance later. However, if you are running into issues with the ignition timing being too far off, causing problems such as severe lack of power (late ignition timing) or pinging/detonation (too much timing advance), you will want to make some changes to correct those issues before moving on and dealing with the fuel.

What I like to do is set up my scanner to log data so I can concentrate on driving the vehicle safely while the laptop or scan tool collects data while I'm driving. Obviously, the current tune you are working with will need to be able to run the engine well enough so you can drive the vehicle. If it isn't, you will need to change the fuel and/or spark settings so you can drive the car. Of course, you can do this all on a load dyno but the cost of renting the dyno can get expensive quickly, especially if you are trying to tune a radical setup that requires a lot of work to tune properly. So there is an advantage in being able to tune your car on the street. Another nice thing about street tuning is you can feel how the engine is reacting to throttle inputs. Your ultimate goal for part throttle tuning is the same as it was for the idle tune.

## Part Throttle Tuning

Set your scanner to log the major data points such as RPM, MAP (or MAF), O2 voltage, Integrator, Block Learn, and Spark Retard (if applicable). Go for a drive and collect some data, varying the load you put on the engine so you can hit different MAP and RPM points and get a wide sample. When you have driven for a few minutes, you can return to your driveway and have a look at the data. Below is an example of what you might find in your log...

<u>RPM</u>	<u>MAP (kpa)</u>	<u>O2 (v)</u>	<u>INT</u>	<u>BLM</u>	<u>Spk Ret</u>
1500	32	0.672	118	124	0
2150	45	0.245	139	130	0
1875	67	0.819	104	122	0

In the example given above, what I see based on the fuel trim numbers (INT and BLM) is the engine is running too rich at 1500-1875 rpm at the MAP ranges (loads) sampled. And at 2150rpm, the engine is running too lean at 45 kpa MAP. What I would do to correct what I see above is to go into the main VE table and reduce the number in the cells closest to the corresponding RPM and MAP values for 1500 and 1875 rpm. And I would increase that value for the corresponding values for 2150rpm and 45kpa MAP. As with the idle tuning, you don't want to make a lot of huge changes at once; make a few changes and go for another test drive to see how the engine responds.

## Accel Enrichment

Accel enrichment or AE is tip-in fuel enrichment that occurs when the throttle is opened. Any time you open the throttle on a gasoline engine, the sudden change in air pressure causes fuel in the intake manifold to condense on the walls; this creates a sudden lean condition. To compensate, designers of fuel injection systems have built in a function called AE. Sometimes when you make changes to an engine such as use different size injectors, different

intake manifold, or different cam; you may need to make changes to the AE tables to find the correct settings the engine wants. The way to tell if you need to make a change to the AE tables is mainly by feel - how the engine reacts to throttle openings. But this should also be done while monitoring the O2 sensor voltage output. If the engine hesitates or bogs when you open the throttle and you see the O2 voltage go low (below 0.600 volts) at the same time, this means the engine is leaning out and is not getting enough AE fuel. To correct this, you will need to increase the values in the AE tables. As with anything else, you will want to make small changes at a time and check those. If you go too far (too rich), you could end up with a condition where the engine floods upon throttle tip-in; which can also cause a hesitation or bog. Tuning AE is going to involve more trial/error than anything, so you will need to work with it until you find something that works well.

In the next issue of Fiero Focus, we should be able to wrap up our discussion on DIY tuning.

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