Making your LS1 engine MAFless gives you total freedom of tuning meaning that you aren't locked into a convoluted intake to mount the airflow meter in position

HOME TUNER 3

WE CONTINUE OUR SERIES ON TUNING YOUR OWN LS-EQUIPPED COMMODORE

STORY AND PICS BY MARTIN DONNON

In the last instalment of our Home Tuner series, we addressed the basics of a MAF tune for your Commodore, and if you followed our guide closely enough, it's time to have a look at the process involved in making our 'test subject' VX go MAFless. It's a great way to hop-up the output of an older LS1 Commodore and providing you follow our steps, a pretty painless exercise.

THE INLET

There really is no point in going MAFless unless you have a decent inlet system to take advantage of the additional airflow. My recommendation would be an 'Over the Radiator Cold Air Induction' OTRCAI for the drag racer/dyno queen set. There are many different types of these available, some good and some junk, so it pays to know what it is you are actually buying. Always look for a K&N air filter element in the front, with these being the best performer (as a rule) while the cheap blue and paper/wire types are worse than sticking a bathplug in your throttle body.

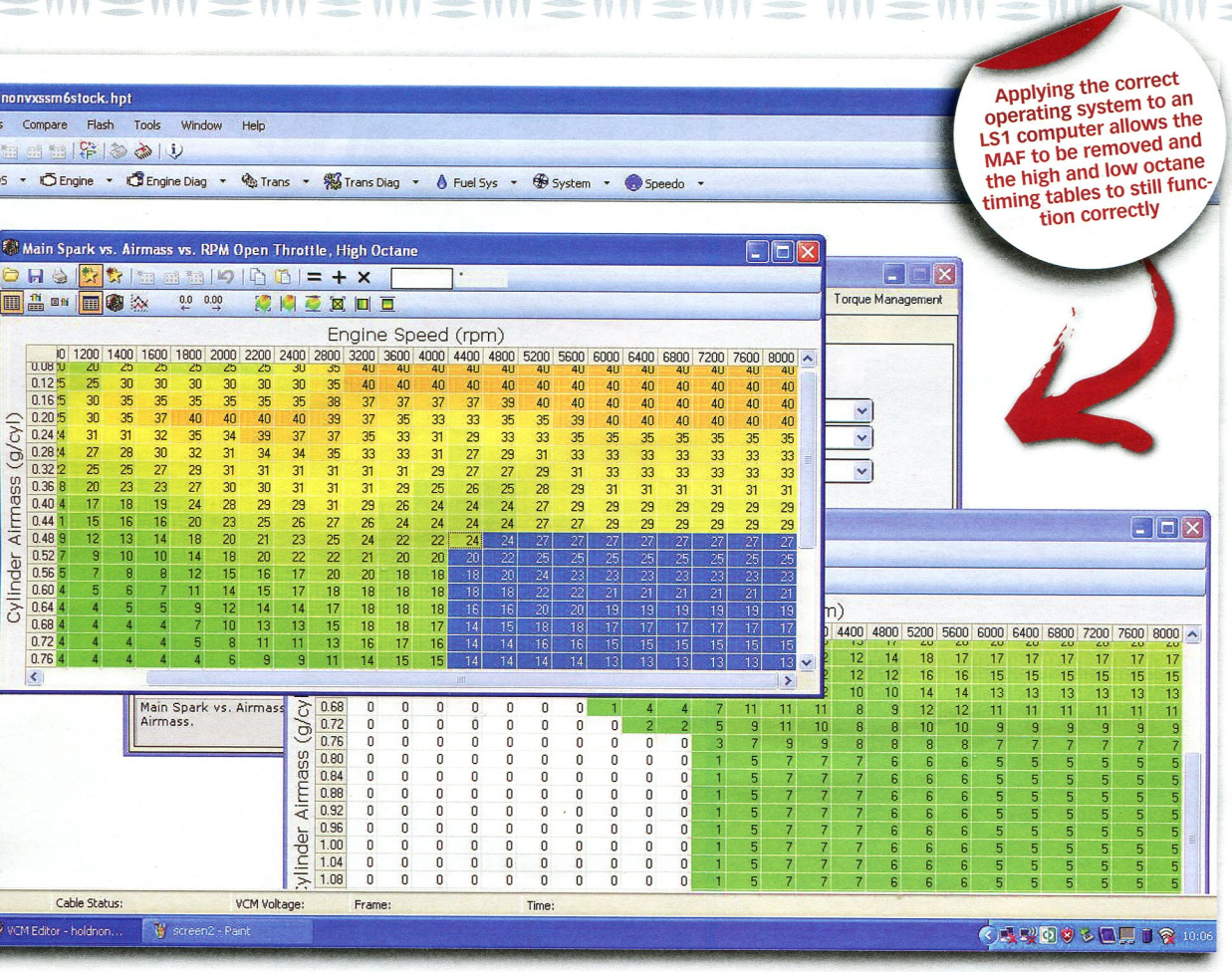
If it's any serious number of kilometres you do then I would advise that the maintenance intensive OTRCAI (the filters need constant cleaning) isn't as good as the original HSV GTS MAFless inlet pipe and adapter assembly. There have been some great power numbers made through this hardware over the years, so it's totally worthy of consideration and probably what I would have for a genuine daily driven Street Commodore.

CONVERT THE OPERATING SYSTEM

The very first part of making your tune MAFless is to convert over to a proper matching operating system that's a 'COS' in EFI Live or a '1 Bar Speed Density Enhanced' in HP Tuners. Either of these operating systems offer some great advantages over the stock Commodore arrangement, and will really allow you to take advantage of the MAFless conversion.

Notably the factory MAFless HSV offerings, the GTS range from VT–VY did not have a proper MAFless operating system installed, which meant that the whole time the GTS was running it was in full 'limp home' mode with the engine check light turned off so that the driver wasn't aware. Effectively this poor piece of factory calibration forced the engine management system to run off the low octane timing map the whole time, losing the flexibility of having true and effective knock learn.

A custom operating system allows you to unplug the MAF meter and then still retain full knock learn and twin table ignition timing, which is an important consideration when you live in an area that may have marginal fuel quality. It's always best to learn the correct tuning



Applying the correct operating system to an LS1 computer allows the MAF to be removed and the high and low octane timing tables to still function correctly

habits from the very beginning, that way you won't be tempted into cutting corners and making some very basic mistakes later on.

With the correct MAFless operating system applied you will have to perform a total rewrite of the engine management computer, meaning that the tuning process will no longer be a twenty second exercise, but rather a one-off operating system setup that will actually take a few minutes to achieve. Once this is done, the car should now start and run in MAFless form, but the check engine light will still be active.

BACKGROUND FIXES

Even with the correct operating system applied there are still a couple of background fixes that you need to perform in the software to ensure proper and correct operation. The first is to turn off the Check Engine light (SES Enable) for diagnostic code P0102 (MAF sensor low frequency) which is reported the moment the air flow meter is unplugged and the ignition switched on. If you don't turn the light off for this code, it will constantly bug you.

The other fix that needs to be considered is that for the 'Burst Knock Retard'. From the factory Burst Knock is an amount of ignition timing that the engine management system takes out of the total timing in response to rapid changes in engine airflow. In other words, if you stomp on the throttle the computer can take a 'Burst Knock' amount of timing

away to stop the engine pinging before it actually happens.

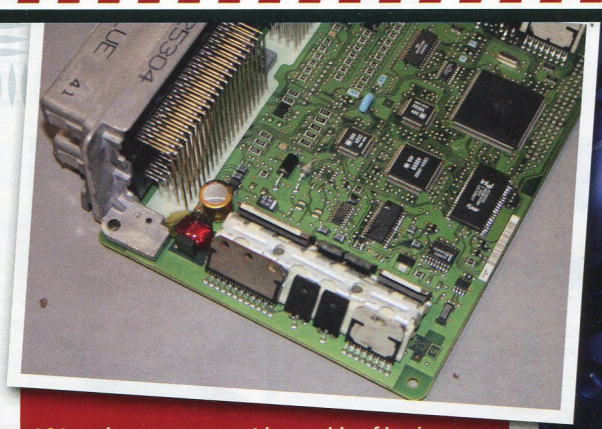
A problem with going MAFless is that this Burst Knock amount (the RPM dependent value in the table) is actually pulled in the whole time as a self-protection measure, and can drastically reduce engine performance. The key then is to zero out the Burst Knock tables and then ensure that your ignition timing is correctly set in the actual high and low octane maps to avoid detonation in the first place.

With these two small changes made and rewritten to the engine management system you can then start the engine and run in true MAFless mode, and it will run fairly fine too!

MASSAGING THE VE

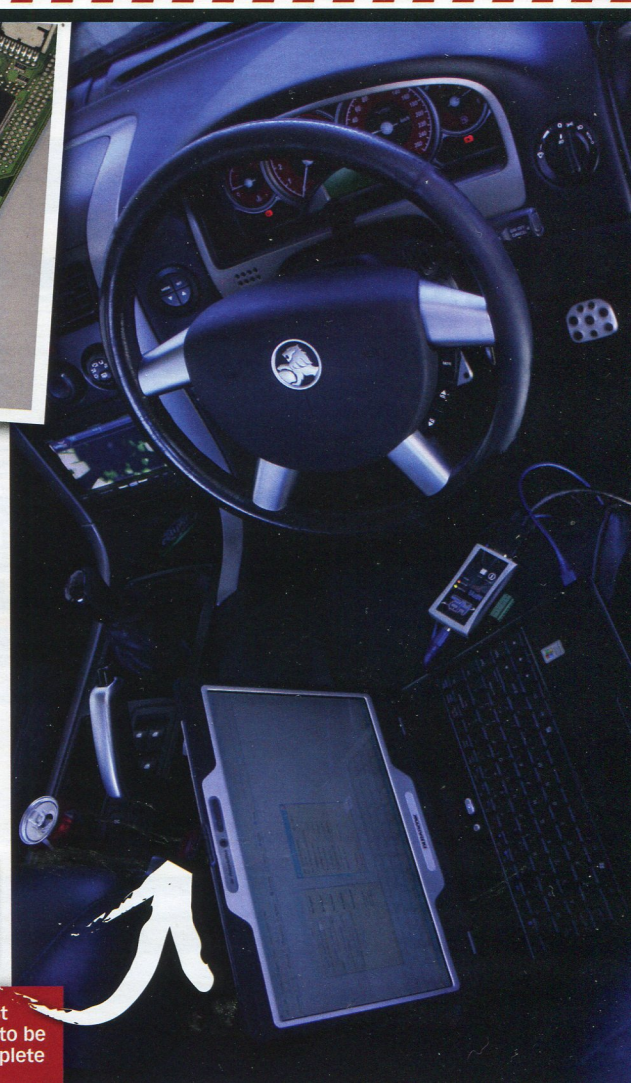
The big difference with a MAFless tune in place is that the engines primary fuelling information is now coming from the Primary VE or Volumetric Efficiency table that exists in the management system rather than from the MAF Frequency curve. The Primary VE table exists to allow the computer to supply fuelling information for rapid airflow events that may be a little quick for the MAF, and also to run the engine in the case of a MAF failure.

As you might expect then there hasn't been hundreds of hours of work go into the Primary VE table from the factory. The engine simply isn't designed to run solely off this table, but now with a MAFless tune in place it actually does so there will be some work

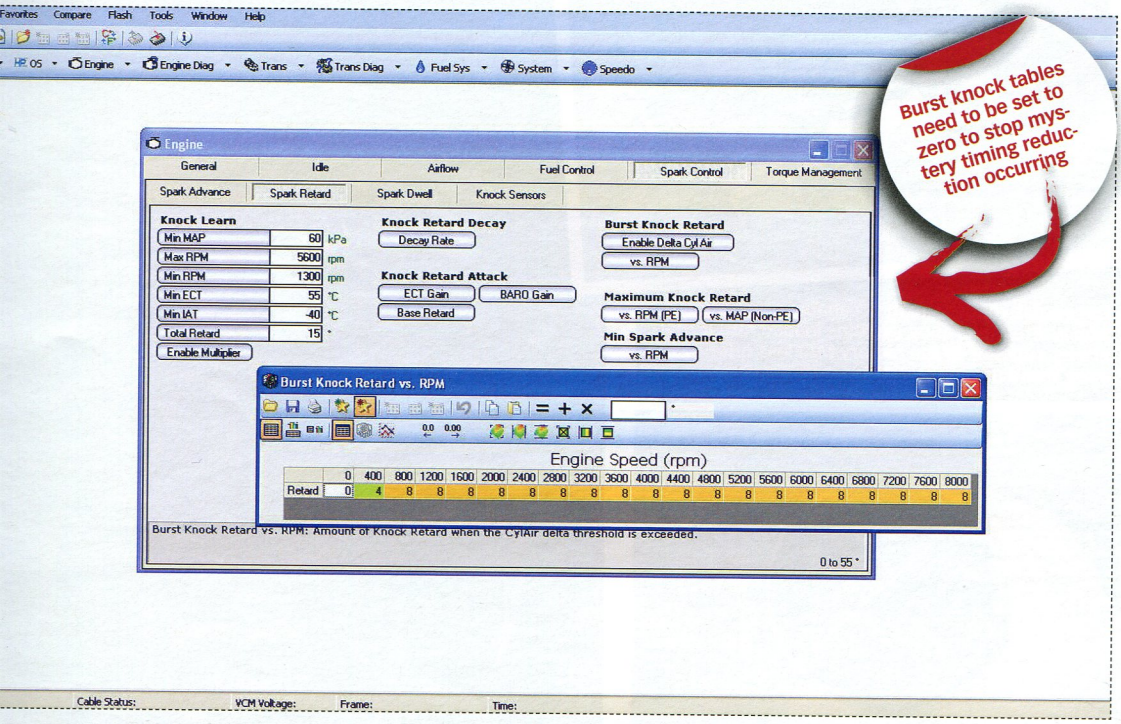


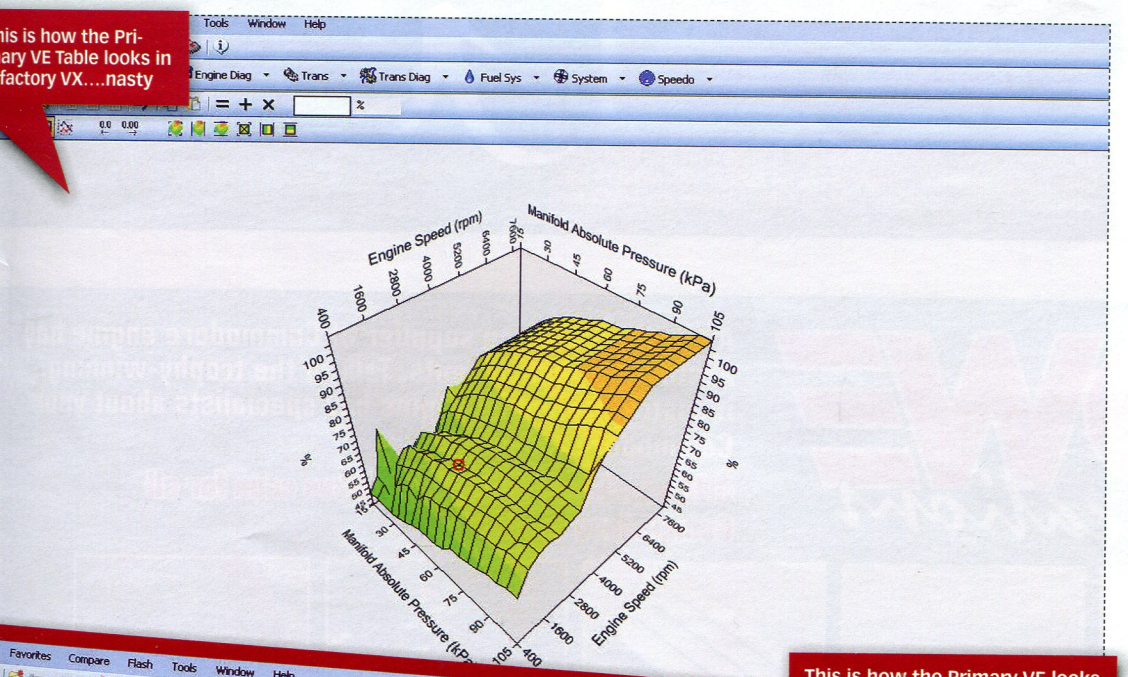
LS1 engine management is capable of having custom written operating systems loaded into it that are far superior to the factory MAFless offerings, even those used in the GTS

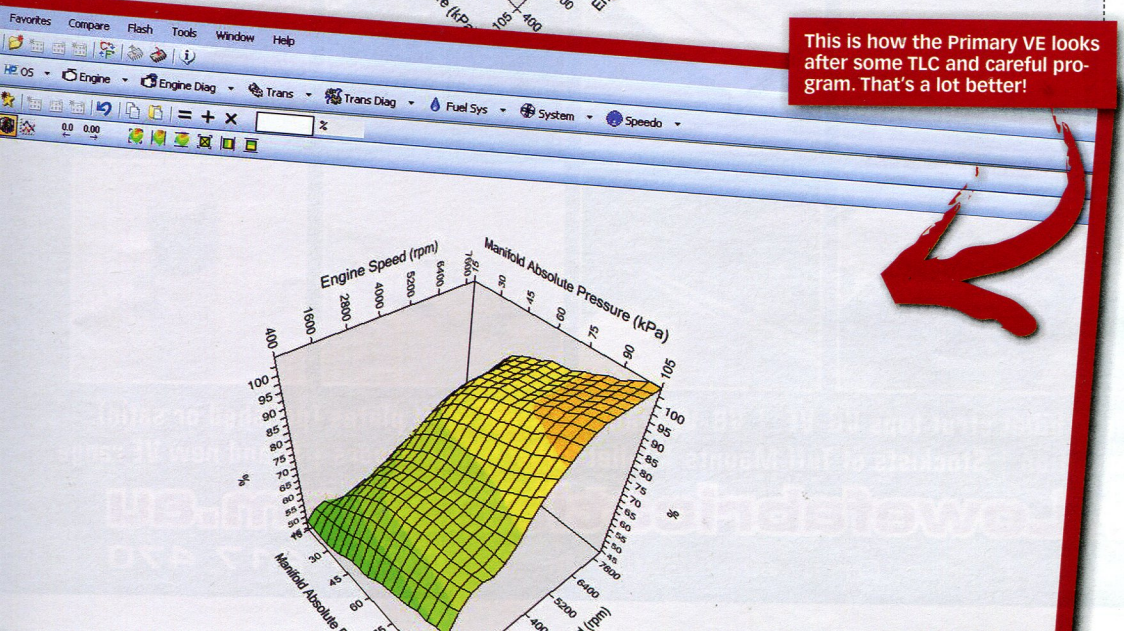
LS1 airflow meter or MAF is the most restrictive of those used on all the LS-series of engines, and as such is the one that is best removed to give the greatest gains



Applying a new Operating System means that the first time you program a complete 'Write Entire' will need to be performed. This normally takes a few minutes to complete







required to get the values right.

The first thing we do is to remove the 'Himalayas' which is my fond term for the massive peaks and troughs that exist in the factory Primary VE table. These aren't specifically dyno selected number designed to make the car run best, but rather are overlooked and ill-regarded values that don't do an awful lot. If you have any doubt then move your eyes over to the supplied graphs and have a look at the peaks and troughs in the stock version!

SMOOTH IT AND TUNE IT

While smoothing maps for the sake of having them smooth is a little on the dumb side, the Polynomial 'smoothing' function in HP Tuners is best used on the factory Primary VE table to get it into a workable shape. A few short and sharp clicks on the map will give a nice starting point from which to work, but don't consider you are done yet, as the fuelling calculation will now be all over the place at high engine loads.

Get back to the Power Enrichment table that we modified at our last outing and now change the numbers across the entire range to 1.1347 that gives a nice calculated AFR of 12.5:1 or so on the scanner for those interested in such things, and also delivers a ball park amount of fuel from which we can adjust maps and tune around.

Logging is a very important part of our VE table mapping, and using the Histogram function will allow you to accurately place and see the exact cells through which the computer is travelling when determining the correct air fuel ratio. For example it's quite common for the management system to traverse through both 100kpa, 105kpa, and 95kpa load sites when being held during a full throttle run, so set all of these values the same.

Only the dyno will tell you the kind of changes you need to make to the Primary VE table to get some good total power numbers. Let the air fuel ratio meter guide you over a number of power runs, and understand that by removing the MAF its now going to be harder to get a 'dead smooth' AFR line across the range. Not that dead smooth AFR lines actually mean anything in the first place. Eventually your tune will be back to where it was in terms of control and fuel delivery before the MAF was initially removed... and that's where you want to be.

WHY THEN?

Removing the MAF and performing a MAFless tune isn't going to gift your early model Commodore with any more power. Read that again...and again. What performing a MAFless tune does do thought is enable you to use a low restriction inlet system which will increase the engines ability to breath, reduce intake pressure drop and naturally gift the engine a handful of kilowatts. Make the best of what you have and don't expect miracles here.

Next month we will get on with the consideration of adding a camshaft and show you how it's done... the programming is not that hard! SC