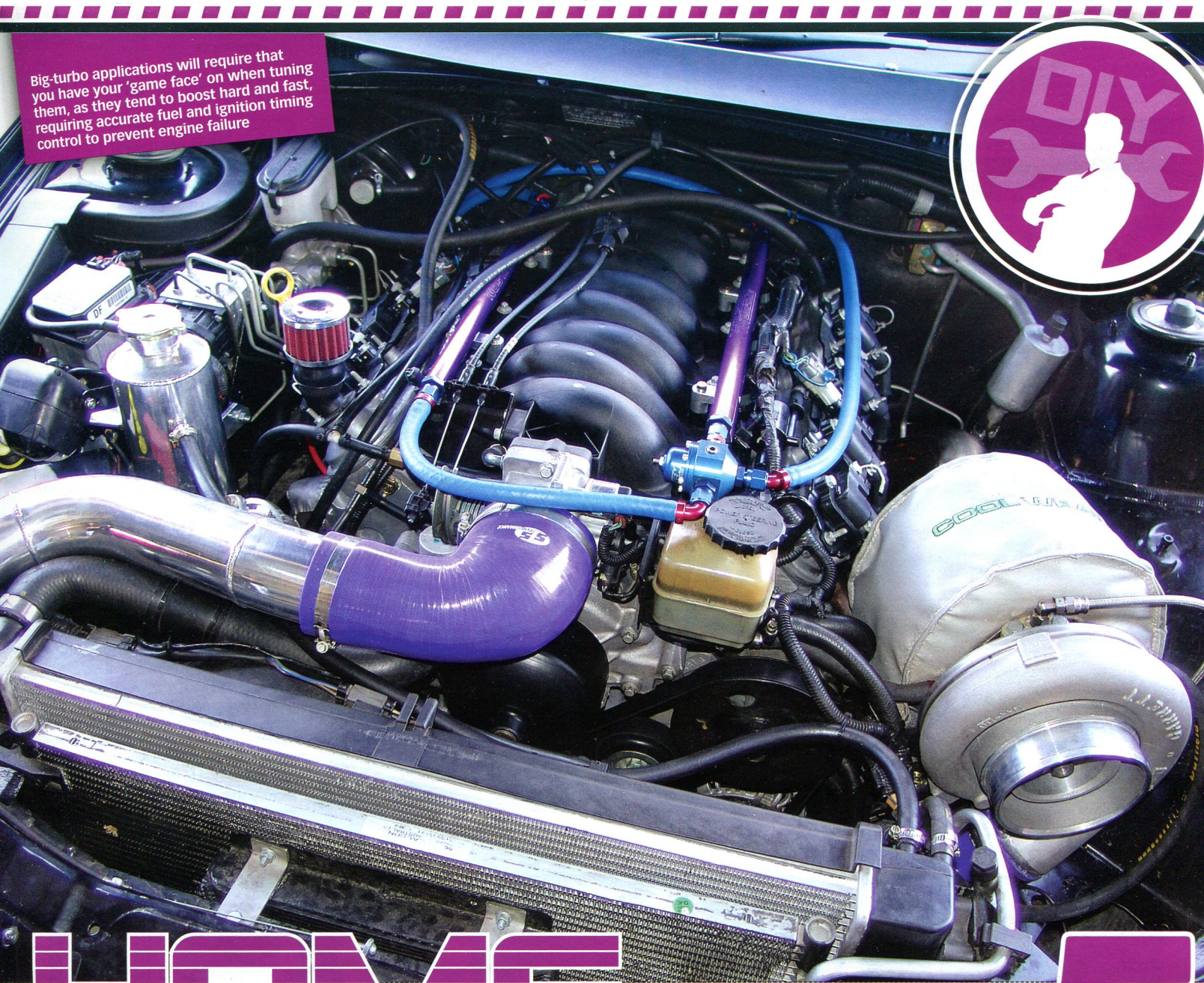


Big-turbo applications will require that you have your 'game face' on when tuning them, as they tend to boost hard and fast, requiring accurate fuel and ignition timing control to prevent engine failure



HOME TUNER 5

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

STORY AND PICS BY MARTIN DONNOR

Now it starts to get really interesting, as our attention turns to applying forced induction and 2bar tuning to our LS1 engine. There are some good reasons to look down this boosted route too, as the cost of high quality forced-induction solutions is incredibly low these days with supercharger and turbocharger kits able to be sourced for around the \$5,000 mark if you look around some.

The bottom line is that when installed and tuned correctly, a boosted LS1 is going to beat a normally aspirated LS1 every time. That holds true for both the dyno racers and the track clan, with the undisputable fact being that blowing more air into the cylinders is always going to produce a bigger bang, resulting in greater power and torque output. All of this comes at a price, though.

POINT TO REMEMBER

An ultimate price for a forced-induction LS1 that goes wrong is a new engine. This always has to be in the back of your mind when installing, tuning and logging a boosted Commodore. The bottom line is that these engines were never designed for a forced-induction application and need to be managed very carefully to ensure that they live a long and healthy life when boosted air is added to the equation.

While failing a boosted LS1 is a very simple process if you don't perform a thorough check list of your set-up and tuning, it is also avoidable if you approach the job sensibly and with a concept of engine longevity in mind. Forget about tuning the maximum power out of your forced-induction LS1, and instead focus on getting the most reliable power.

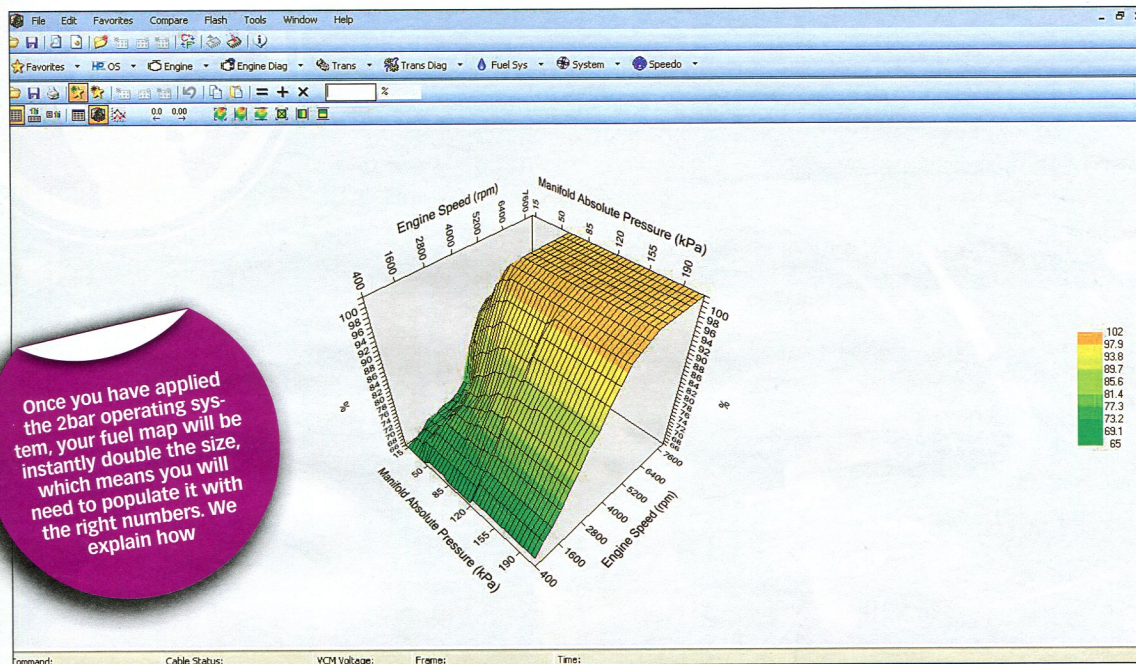
HARDWARE CHECKLIST

Don't even bother attempting to tune a forced-induction LS1 without making sure that you have the right hardware in place. The check list is a simple one, so there is no excuse to get it wrong. The first thing you will need is a set of injectors that are up to the task. Now, there are a million different types and styles of fuel injectors around, but we only have one recommendation, and they are 60lb/hr types. While this might be a bit of overkill for a stock engine and low-boost kit, they do give you room to grow some, and will allow the use of E85 fuel if need be.

The next thing you need is an upgraded fuel pump. The stock LS1 fuel pump is out of puff at 300rwhw or so in a 5psi boost application. In fact, the fuel pump will not support

as much horsepower in a boosted arrangement as it will normally aspirated, and the reason for this is manifold boost pushing back against the fuel injector, effectively reducing its output. A Walbro inline or drop in 255L/hr fuel pump is a great upgrade and will do the job in lower-powered applications; however, nothing beats a proper surge tank arrangement with external pump(s) and a boost-referenced pressure regulator.

If your budget stretches to a surge tank, you can completely bypass the problems associated with low tank levels starving the engine under high-RPM high load conditions. In fact, if I cast my mind back through the memory banks, it is the externally surge tanked boosted LS1 engines that have lived the longest and happiest lives. Take that on board as good advice.



APPLYING THE OPERATING SYSTEM AND INITIAL SCALING

The first step in tuning your freshly boosted LS1 engine is to apply the correct operating system to the tune. For HP Tuners examples, this requires you click the 2bar operating system button, save the file under a new name (normally just add '2bar' to the end of the filename) and then reopen it as the file will shut automatically.

Scaling the injectors is simplicity itself. The necessary tables to do this can be found under ENGINE, FUEL CONTROL, FLOW RATE vs. KPA. This table gives a calculated injector flow rate at different manifold pressure and will need to be changed when fitting 60lb/hr injectors. The amount to scale this table by is simple, with the 60lb/hr injector being double the size of the factory LS1 injector. In other words, you select the whole table and then multiply every single value (using the multiply function at the top of the table) by a factor of 2.

The ENGINE, AIRFLOW, PRIMARY VE vs. RPM vs. MAP table will then need to be copied and pasted from your original file which will populate this table to 105kPa, but the table will now go all the way to 210kPa. For each line in the table over 105kPa, add a value of 2 to each row, which will give fuelling that gradually increases with boost pressure. Of course, this won't be the optimum solution, but it will give you a relatively sane starting point for further mapping.

All you need to do then is remove the factory 1bar map sensor found just behind the throttle body, plug the 2bar map sen-



You know you have pushed the envelope way too hard when the pistons get damaged and the ring lands broken from detonation

The perfect 'one size fits all' performance fuel injector for the LS1 is the Siemens Deka 60lb/hr item. Good, cheap, reliable, and with plenty of headroom, why would you use anything else?





Positive-displacement superchargers will support bigger ignition timing numbers as a rule

There is no need to try and incorporate the MAF sensor in a boosted LS1 engine. The MA-Fless 2bar operating systems are that good, you simply don't need a MAF anymore



High-performance superchargers like this Vortech require less timing in the top-end, as they make more overall power than a positive-displacement type



DYNO AIMS

There is no point in stepping you through the basics of adjusting the fuel and ignition tables, you should already have this down pat, so now we need to look at the kinds of numbers you should expect on the dyno. The aim of the game here is to be conservative, and not to aim for the sky with power numbers. This means you need to really work on your air-fuel ratios and ensure that under no conditions does the air-fuel ratio go leaner than 12.0:1, on or approaching boost at full load.

In fact, rich is your friend here, as it reduces the likelihood of detonation and keeps the combustion temperatures down. You shouldn't see any power degradation running as rich as 11.0:1 at full load, so this is a great safe place to be. Timing also needs to be extremely conservative. If you log any knock at all, then find the point on the logger and start taking out a degree at a time until the detonation goes away.

Unfortunately, there is no way to short cut this process. You can't mess around with the tables to make an 'on the edge dyno number' and then expect to have the engine run

safely and reliably over a long period of time under different real-world conditions. This isn't how it happens anywhere other than Fantasyland, so don't trick yourself into chasing the kilowatt. It ends in tears every time.

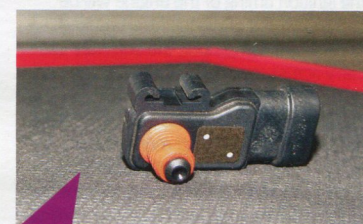
KEEP YOUR MIND CLEAR

As we keep on hammering into you here, there is no 'she will be right mate' with boosted LS1 engines. If you cut corners, you will be up for an engine possibly sooner rather than later. Take the time and make sure you invest in the necessary dyno expense to get the job done properly. You simply cannot log a 320rwhk-plus LS1 on the road as they bite, and bite hard.

All that being said, there is no reason why if you keep detonation away and keep the engine running rich enough at full noise that you can't enjoy a trouble free and responsive 'home tuned' LS1 engine. As the pro tuners like to say, 'your attitude determines your altitude', and no truer words have ever been spoken when it comes to a 2bar-boosted LS1. **SC**



The drop-in Walbro 255 litre per hour fuel pump is a common fitment for boosted applications, and will work well



2bar GM Map sensor is available from any good LS1 performance shop and online as well for as little as \$75

We can't recommend external surge tanks highly enough. When done properly they are a real boon to reliability and performance, helping a stock engine live a long and happy life

