

Wayne's way

'Carburettors suck,' says Wayne Schofield. Yes, we know that. In fact, their sole purpose is to suck in air in order to mix it with fuel in the precise proportions required for optimum combustion. But what RLR's engine-mapping wizard means, of course, is that he doesn't like them.

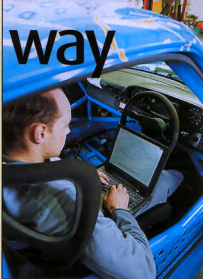
Old-style engine tuning almost invariably involved lumpy camshafts and big carburettors that produced high power outputs only at high revs, argues Schofield. But the advent of electronically controlled fuel-injection and ignition systems meant that anyone with the knowledge to reprogramme the 'chip' in a given car's electronic control unit could coax smooth and progressive power from an engine never even imagined in the days of 'conventional' tuning. Which is what Red Line's so-called Tailor Chips do most effectively for both road and race cars.

The chip, says Wayne, is the only way to go in the Porsche Cup simply because changing external components (camshafts, exhausts and so on) is not permitted. But for someone looking for a power increase for a road car this approach isn't always quite so cut and dried.

If you're looking for a relatively modest increase with no loss of flexibility or smoothness, then a reprogrammed chip is the best move. But if you want even more power then you have to set yourself a target, and consider other forms of tuning, such as a tubular exhaust system or a high-performance camshaft, before altering the chip to match fuel and ignition requirements to the new specification.

This approach, argues Schofield, will give the greatest power increase but – inevitably – it will also mean a less flexible and less fuel-efficient engine, as well as one that is noisier.

Like much of what goes on at RLR's Teesside base, the company's racing involvement has nurtured a service for the enthusiast who never takes to the tracks. Experience gained from setting up Chris Healey's race-winning 944 Turbo, for example, can provide a 20 per cent power improvement for a road-going Turbo, and 10–15 per cent in a normally aspirated 944.



Wayne Schofield at his 'desk'. Engine mapping isn't a black art, but a much better way of producing power than playing around with carburettors

Wayne does, however, add the caution that before anyone starts to look for a power increase in any 16-valve 944 he checks that the timing chain and its tensioner have been replaced. The chain, which drives the inlet camshaft, is prone to failure in high-mileage cars, whether tuned or standard. He is also adamant that the balance-shaft belt in all forms of the 944 engine should be left in place as normal.

'Any big four-cylinder engine such as this is inherently out of balance, because the piston acceleration rates vary at the top and bottom of the stroke. You won't overcome this, though, however carefully the pistons, connecting-rods and crankshaft are dynamically balanced,' he suggests. 'And too much vibration is likely to cause the oil pick-up in the sump to crack.'

An associated problem is that the crankshaft speed (believe it or not) varies very slightly depending upon the position of the pistons, resulting in an effect that is known as torsional vibration. And it's for that reason that the crankshaft damper is also an absolutely essential piece of equipment.

With a background that has 'performance' written all the way through it, Wayne Schofield came to RLR via building his own rally cars and racing engines, plus a lot of invaluable time on the electronic side of engine performance.

Reprogramming a chip, Wayne promises, isn't the black art most people believe it to be. 'Visions get clouded when people look at engines,' he suggests. 'Electronics aren't a big problem. You just need to concentrate on the essentials.'

Concentrating on the essentials has made Wayne a leading exponent of the art of mapping engines for maximum tractability and performance. Obviously the Red Line-prepared cars in

the Michelin Porsche Cup benefit from his attentions, but so do many of the team's rivals who have come to the company for remapping.

While racing drivers are mostly concerned about outright power, the way the engine behaves all through the rev range is ultimately more important for road cars. And it's here that the well-mapped ECU can score over the big carburettors or the wild camshaft.

But, says Wayne, chips don't mean that every car (Porsche or otherwise) offers optimum performance straight from the factory. In his experience no two engines are identical, although factory chips are, hence the settings within them are a compromise for most situations.

The Red Line approach to mapping is to treat each unit as an individual, and custom-write the correct programme for each engine. Hence Tailor (tailor-made; get it?) Chips, which RLR finds can almost always provide improved performance, even over conventional off-the-shelf 'power' chips which are themselves a compromise.

Says Wayne: 'The eight-valve 944, for example, has a spark plug that isn't central within the combustion chamber. To achieve maximum efficiency we have to run a richer mixture to achieve a good spread of flame than, say, with the 16-valve 944, where the spark plug is more centrally placed.'

It's the exhaust-gas analyser that measures the mixture settings. A full-power, full-load run on the rolling-road should ideally see a 5–6 per cent CO (carbon monoxide) reading, which is an air/fuel mixture of about 12 to 1, while at part throttle a 0.1 per cent reading (16 to 1) is a typical setting. Incidentally, maximum fuel economy is achieved at around 18 to 1 – if the engine will run that lean.

Note here that engines with exhaust catalysts are a bit of a headache as far as mapping for fuel efficiency is concerned. Once the catalyst reaches operating temperature the so-called lambda sensor operates and effectively overrides the chip to achieve what is generally regarded as the optimum air/fuel mixture of 14.8 to 1.

Note, too, that given the fact that a catalyst frequently doesn't reach its correct operating temperature, many engineers consider that a properly set-up, so-called lean-burn engine can be cleaner than one with a cat.

And what, I asked, does remapping the fuel-mixture settings do to a car when it rolls up for its annual MoT test? 'Nothing much,' replies Wayne. 'The MoT requirements are only a gesture. The measurement is carried out at idle, remember, and a 1.5 per cent CO reading is sufficient.'

Stage two of the process is where the power increase takes place. Here the ignition-timing settings are amended to achieve maximum power throughout the engine's rev range, although Wayne believes in reducing maximum advance slightly as what he calls a safety margin.

Although these two stages produce the remapped chip, various other detail alterations are possible depending upon the vehicle. The 968 engine, for example, can have its variable valve timing altered, while the 944 Turbo has a separate electronic control unit that is in charge of its boost settings.

What does mapping a car cost? Unlike the company's service menus, there's no fixed price. RLR reckons a typical set-up will require about half a day's work on both rolling-road and computer – at £100 per hour plus VAT. So reckon on around £4–500. ■



Race cars stand alongside road cars in the RLR workshops (left). Company devotes around half of its time to general Porsche servicing, upgrades and repairs