Tuning by numbers

Revo Technik's latest performance software packages promise much to Porsche owners, but do they deliver? We put them to the test on a 996 Turbo and a GT3...

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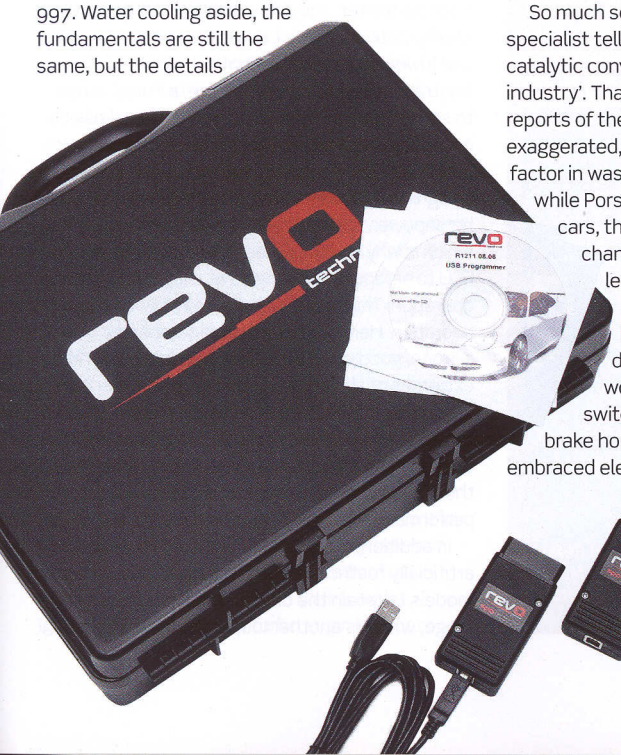
If you opened the engine hatch on a 1970s' 911 and glanced around, what would you see? A boxer layout? Yes. Overhead cams? You betcha. A turbocharger? Quite possibly. Masses of electronics and sensors? Er, no. None. Nada. Zilch. Back then, Porsches had 'electrics' in the form of a distributor, coil and six sparking plugs, but that was about it.

Now fast forward 30 years and compare and contrast that with the engine bay view of today's 997. Water cooling aside, the fundamentals are still the same, but the details differ dramatically. Electronics and sensors abound, controlling everything from throttle opening, to boost pressure, to cam timing and exhaust emissions. While this 'chip 'n' mother board' revolution has enabled a quantum leap forward in Porsche performance and drivability, for those wanting more urge from their contemporary Porsche, this wiring and circuitry represents a fresh challenge, beyond the realms of traditional tuning.

So much so, that I vividly remember one tuning specialist telling me that 'electronics and catalytic converters will kill the performance industry'. That was a decade ago and, thankfully, reports of the death of tuning have been exaggerated, because what this 'expert' didn't factor in was the tuners' sheer ingenuity. For, while Porsche loaded the electronics onto its cars, the tuners – the clever tuners – changed their rules of engagement, learnt new skills and took a different approach to extracting extra horsepower. Whereas our doomsayer friend was stuck in the world of changing carburettor jets and switching distributors in order to gain brake horsepower, forward-thinking tuners embraced electronics. Gradually, modern Porsche tuning changed from mechanical to digital.



And now, arguably, we have Porsche tuning for the iPod generation. How else can you describe a system where a tuner can remap a Porsche ECU in a few minutes to give a significant power increase? That also enables the owner to switch between standard and tuned maps, offers a degree of user tuneability and is pretty much undetectable to Porsche dealers, all without touching a soldering iron? Does it sound too good to be true? Not according to Revo Technik's performance software experts, who are behind this advance in Porsche tuning, so we took the opportunity to find out by testing Revo's claims in depth.

Certainly, the ability to electronically conjure additional brake horsepower and torque from an already highly-tuned Porsche lump sounds like automotive alchemy but, truth is, this form of tuning still relies on recognisable variables, such as fuelling, ignition timing and boost – it's simply that they're controlled digitally rather than mechanically. And it's this fine degree of electronic control that enables a tuner like Revo Technik to exploit compromises in the standard ECU settings, or 'map', to produce extra urge.

But what are these compromises? Well, Porsche sells its products into the UK, Europe, the USA, South Africa, Russia, the Far East and the Middle East. This globalisation of the sportscar market has enabled Porsche to produce a single model that's sold worldwide, with minimal regional or country-specific variations. While that simplifies production variables and helps to cut costs, it's a huge challenge for engineers and technicians to produce a car that performs consistently, due to the wide variety of climates, differences in petrol

PARAGON – REVO TECHNIK DEALER

'Revo works really well with our customers,' says Paragon's Mark Sumpter, 'because we insist they drive their car for six months or so before having it remapped. That's because, on a 996 Turbo, we want them to get used to a car with over 400bhp, as it's so much faster once it's been Revo'd and then they can really appreciate the difference."

Sumpter has been involved with Revo's Porsche program almost from day one. 'We built up slowly and I ran a car myself for six months with the product before we'd put our name to it and launch it with Paragon as the South-East Revo dealer,' Sumpter explains. 'It's important to do it this way, because you can't afford to make mistakes – and we had to be 100 per cent sure that there wouldn't be any glitches.'

So what does Sumpter think of Revo? 'With a turbo car, you do notice the difference straight away. With a normally-aspirated car, such as a Boxster, it gives you more torque and drivability. Our sales manager has been driving a Revo-mapped Boxster S for the last two years – and he really notices the extra torque and mid-range power. At the other end of the spectrum, on the GT3 – which is quite often used for trackdays – the owner normally wants more power, so Revo fits the bill nicely.'

Revo's Kevin hall (left) with Paragon's Mark Sumpter

quality and even geography.

For example, South African Porsches have to perform in the thin, oxygen-starved air around Johannesburg, some 1750 metres above sea level. Porsches have to give their all in the 50°C heat of Dubai, or in the freezing wastes of a Moscow winter. They also have to tolerate poor quality petrol in some central European countries and lower octane fuel for both the US and Australian markets. What's more, a Porsche has to shrug off these hardships with minimal risk to its expensive, warranty-covered engine.

In short, a Porsche engineer is tasked with designing a car that will produce the same reliable horsepower, irrespective of where it is in the world, which is why compromises are written into the ECU to safeguard the engine at these extremes of operation. Think of it as a wide 'window' of operation. Here in the UK, with a temperate climate, good-quality high-octane petrol and no extremes of altitude, life is somewhat easier on a Porsche motor, so there are less unpleasant surprises to be faced, which means that the ECU can function within a narrower window, without the compromises. And here's where the extra performance can be gained.

In addition, it's well known that Porsche artificially restricts the power output of certain models to retain the distinctive gaps between its range, which is another loophole that Revo

Models like the 996 Turbo have a lot of margin built in power wise, and have to be able to run on varying fuel quality the world over

Technik can exploit to good effect, as we'll see.

For example, Revo claims that a 3.2-litre Boxster S running its software gains 22bhp, while on a 996 Turbo, between 50 and 70bhp is reckoned to be the norm on 97/98 octane fuel. Even the exotic GT3 can be massaged, gaining 24bhp on Shell V-Power – or a staggering 53bhp on BP Ultimate 102 fuel. But, as Mitchell Simmons from Revo is keen to point out, the software upgrades are more than just about brake horsepower. 'Any monkey can make power,' he says, 'the real art to tuning is to make the car drivable, fuel-efficient and, overall, fun.'

To that end, a Revo'd 996 Turbo produces a mighty 100lb/ft more than the factory car, which makes the potential in-gear acceleration times mouthwatering, to say the least. Sounds tempting, but how does the Revo Technik software work in practice?

'When a car arrives at a Revo dealer for mapping, he will run a full diagnostics test on the vehicle prior to installing the software to check for errors and issues, then he can advise the customer to fix the fault first,' says Revo's Kevin Hall. That done, the Bosch ECU is accessed via the OBD2 port under the dashboard and hooked up to a lap top, where its control unit number is assessed. The new Revo map is then uploaded onto the ECU, which comprises a code that tweaks ignition, fuelling and (on turbo engines) boost pressure to suit the requirements of a customer requiring extra urge. 'Then the Revo dealer will set up the new map on the road to verify which fuel the car is running,' Hall continues, 'so that he can run as much ignition advance as possible, plus he'll fine-tune it to suit the driver's style.'

On current Porsche models, such as the 997 and the 987, Revo can tweak the drive-by-wire throttle settings, which will make the car more responsive to smaller throttle movements. This, when rolled into the extra performance on offer, is claimed to give a great improvement in response.

At its most basic level, Revo's mapping service produces a tailored performance map that's uploaded into your Porsche's ECU. But, enticingly, for an extra cost, the big appeal of Revo's software is the degree of user control on offer, via a unique device called a serial port switch (SPS). This little gizmo, around the size of a small

PRICES

Revo Technik
GT3 SPS software £997.57
GT3 software with Select switch £1172.75
GT3 software with Select Plus £1290.15
996 Turbo software £2407.57
996 Turbo software with Select switch £2582.65
996 Twin Turbo Select Plus software £2700.15

THE PERFORMANCE CODE

If remapping sounds easy, that's just half the story, because the design of today's Porsche electronics means that simply asking the engine to run more fuel and ignition timing might not have the desired effect. Let me explain. Any modern Porsche engine runs several sensors, with the two key units being the knock (detonation) sensor and the exhaust oxygen sensor (or lambda probe.) These probes communicate with the Bosch ECU via a two-way data stream – information gets sent to them on what values to look out for and they feed information about these back to the ECU, which then alters the engine's ignition timing, fuelling and boost pressure (where applicable) to keep it functioning reliably and efficiently. This is a form of 'closed loop' system, in which the engine effectively manages itself.

The trouble comes when a mapper attempts to alter the main parameters of the engine to gain more power, because these sensors will swiftly detect that the motor is now operating outside of its normal range and the ECU will react accordingly. For example, if the mapper tries to increase the injector delivery to richen the fuelling, the Lambda probe will inform the ECU – which will simply lean it back off, so that it can hit the correct values once more.

Clever, but frustrating for tuners. Revo overcomes this by tweaking the lambda probe values to allow the engine to happily run more performance-orientated settings without confusing the ECU. In practice, once uploaded onto a Porsche's Bosch ECU, Revo's new performance-orientated values become the target 'norms' that the ECU and probes work to, so there's no duplicity involved in the technique – it's exactly the same method as if Porsche was mapping the car straight from the factory.

Pleasingly, there's no obvious penalty when it comes to emissions, either, reckons Revo's Mitchell Simmons. 'Nine times out of ten, we'll be cleaner than the standard car. That's because we've optimised the ignition advance to extract more power out of the combustion burn. That means we're producing less of the pollutants that then have to be scrubbed out of the catalyst.' There's an added bonus, too, as Revo claims that such is the effectiveness of the fine tuning that most of its clients see an improvement in fuel efficiency, which seems like a win-win situation.

It's also a low risk one, because this form of remapping retains all the original electronic safeguards to protect the engine in the event of a genuine problem occurring. 'The ECU's not stupid,' Mitchell says, 'it's not going to let you destroy the engine. It's going to read if you're running too much ignition advance, for example, for it'll sense that the engine is going to knock and it'll retard the ignition. You're only kidding yourself if you try to run too much ignition or boost, because it simply won't let you.'

mobile phone, is simply plugged into the ECU's diagnostics port, allowing the owner to switch between a variety of performance settings. When used with Revo's 'Select' package, this allows the owner to change between the stock factory map, a 95-octane performance map and a 98-octane performance map. This has a number of uses, as Paragon's Mark Sumpter explains. 'For example, at Spa, where the fuel is pretty average, the fact that it's switchable is great, because you have to run it at less of a high state of tune than at Silverstone, where you can get better quality petrol.'

Revo's 'Select' software also incorporates anti-theft software, so that the car can't be started unless the SPS unit has been reinserted into the ECU, whether the thief has the key or not.

Finally, there's the cream of the Revo range – the new Select Plus software. This dispenses with the SPS controller and enables a laptop to hook up directly to the Porsche ECU which, in conjunction with Revo user software, allows a large degree of driver control. This includes switching between stock and performance modes, anti-theft security, savable user configurable settings for ignition timing, boost and throttle sensitivity (simply laid out using 1 to 9 divisions) and data logging. This allows the owner to maximise performance on race-style high-octane fuel, which would normally be out of the operating range of even Revo's performance software but, even so, all the factory fail-safes remain in operation. Basically, that's more than enough functionality to keep even the most hardcore petrolhead occupied, but does it actually work in practice? To find out, we took two 911s – a 996 Turbo and a 996 GT3 to the Bruntingthorpe Proving Ground to give Revo's Select Plus software a real work out.

Modifications were put to the test on Bruntingthorpe's two-mile straight and proved to be impressive

Our goal with these tests wasn't purely to focus on improvements in outright grunt that would show up in the 0–60mph times, but rather to establish whether the Revo software improved the Porsche's in-gear acceleration, which would showcase any increases in torque and tractability. Let's not forget that it's torque that accelerates a car, not brake horsepower, so any gains here would be beneficial.

With our V-Box MINI GPS timing gear hooked up, we started with the 420bhp 996 Turbo, initially running with standard settings to produce the in-gear, 0–60mph and 0–100mph times shown below. Running a mix of V-Power and BP Ultimate 102 fuel, two-up, on a damp, gusty day, we clocked 4.8 seconds to 60mph and 10.45 to 100mph, showing that we were in the ballpark. The in-gear times showed that, even in stock form, the 996 Turbo is no slouch, with the 40–120mph fifth-gear time of 15.95 seconds proving its flexibility.

Figures complete, here's where the fun started, as Revo's Kevin Hall hooked up the laptop and turned off the engine, then switched the ignition back on. A few seconds later, a bleeping indicated that the Revo Stage one map was accepted by the Bosch ME7 ECU and we were off again. Revo's 996 Turbo map raises boost levels up to 1.1bar and mildly tweaks the cam timing to improve drivability. On the dyno, the figures are astonishing. 'It's easy to see a 100lb/ft torque gain,' says Revo's Mitchell Simmons, 'but it's the area of the increase over the standard torque curve. We've got 490lb/ft at peak and, even at 6000rpm, it's still producing 410lb/ft.' So, how would this play out against the clock?

Right from the off, the Revo stage one map eclipsed the factory times, shaving nearly three tenths from the 0–60mph dash – and over half-a-second to 100mph. Tellingly, all the in-gear

It's one thing getting more power out of a Turbo engine, but from a normally aspirated engine, like the GT3's, it's another all together

acceleration times improved noticeably, with the Revo-mapped car now clocking a 40–120mph time in fifth 1.5 seconds quicker than before, while a staggering 2.5 seconds were sliced from the 60–140mph time in sixth. What's more, from behind the wheel the car felt eager, smoother and produced a torrent of torque from around 2500rpm upwards, allied to massive flexibility. Any scepticism I had about Revo's processes vanished at this point...

And yet there was one more party trick to try. Thanks to the Select Plus software and our tank of good-quality, high-octane fuel, we could now turn up the boost to a more aggressive setting. With the click of a mouse, Kevin Hall did just that – and the results were mighty, to say the least, as a couple of tenths were lopped off the 60mph sprint, plus a further half-second was cut from the 0–100mph time. Amazingly, the 30–80mph third-gear time fell by another 1.4 seconds although, in higher gears, the differences became less acute. Even so, this was now a very, very fast car by anyone's standards, as this Select Plus boost tweak gave it breathtaking torque. Thing was, could Revo repeat the trick on a non-turbo Porsche such as the GT3?

Obviously, the latitude that Revo's software gurus such as Mitchell Simmons have to play with is less but, even so, there are improvements to be had. And Mitchell should know, as this Team Eurotech-modified 996 GT3 was his own trackday toy, so he's tweaked the map on it literally countless times. Running a stock engine on BP 102 Ultimate juice, Revo claims 432bhp-plus drivability gains. 'We've dialled in as much torque as it's safe to and played with the throttle sensitivity,' Mitchell says, 'plus running on BP102 allows another 10 per cent of ignition advance.' Sounds good, so what's it like in practice?

Given the damp track (and suspension running plenty of negative camber), a 5.6-second 0–60mph run was respectable, backed by a 0–100mph time of 11.6 seconds. A 30–110mph third-gear run of 12.6 seconds showed the stock GT3's pace, reinforced by a 19.6-second 40–130mph fourth gear run. Post remap, with the Revo's Select Plus settings optimised for the BP 102 fuel, the GT3 shot to 60mph in 5.03 seconds (nearly six tenths quicker than stock), while the 0–100mph run was over a second quicker than before.

Such is the quality of Revo's work that the in-gear times yielded similar improvements, with a 0.7-second reduction in 30–110mph third-gear time, while the fourth-gear 40–130mph figure was 0.9 seconds quicker. Even in fifth and sixth gears, where the engine is really labouring, half-a-second in-gear acceleration improvements were clocked. Noticeably sharper and more responsive, it not only howled around to 7000rpm-plus with ease, its low-rev pull was significantly better.

Considering that the GT3's 3.6-litre boxer motor is already in a high state of tune from the factory gates, Revo's achievements are quite remarkable – and on the 996 Turbo little short of astonishing. So, aside from the initial costs – which seem good value given the gains produced – and having to run 97/98 octane fuel (or higher) to get the full benefit, there are few downsides. Also, as funds allow, the fact that the software can be uprated to take the Select switching facility is an enticing prospect, which means the arguments against not having your Porsche Revo'd look pretty thin.

TEST RESULTS (Seconds)

Test conditions: Damp, gusty winds, 17°C

996 TURBO

Fuel: Mix of Shell V-Power and BP Ultimate 102 octane

	Stock ECU	Stage1 Revo	Revo 'aggressive boost'
0-60mph	4.8	4.55	4.4
0-100mph	10.45	9.85	9.35
30-80mph 3rd gear	6.25	5.85	4.45
30-100mph 4th gear	11.3	10.55	10.25
40-120mph 5th gear	15.95	14.4	14.15
60-140mph 6th gear	20.4	17.9	17.9

996 GT3

Fuel: BP Ultimate 102 octane

	Stock ECU	Stage1 Revo
0-60mph	5.6	5.03
0-100mph	11.6	10.56
30-110mph 3rd gear	12.6	11.9
40-130mph 4th gear	19.6	18.7
50-140mph 5th gear	26.0	25.5
60-150mph 6th gear	35.9	35.5

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