

TECH: HOW TO SUPPORT GROUP

Pre-G50 911s famously have a gear change often described as ‘awkward’, ‘challenging’ or even ‘impossible’, but US-based Stomski Racing reckons it has the affordable and effective solutions – in the shape of a precision coupling for the main longitudinal shift rod, and a choice of harder powertrain mounts. Chris Horton followed a typical installation in a 911SC. Photographs by the author



We began last month's technical feature – an analysis of Classic Retrofit's ingenious bolt-in, no-drilling air-conditioning system – by suggesting that effective cabin heating and ventilation are not high among the earlier 911's attributes. And sadly – without wishing to sound as though we have a vendetta going here – the same must be said of the pre-964 cars' gear-shift quality, too.

The post-1986 Carrera 3.2, with its G50 transmission, is a vast improvement over the previous 901 and 915 gearboxes (although still not as good as either the 964 or the 993), but in cars with those previous units any modest performance gain that might accrue from increased engine power is more than likely to be largely negated by the time – and the concentration – it still takes to shift cleanly and precisely from one ratio to the next.

Proponents of those earlier gearboxes will (correctly) argue that they are strong and reliable, with a proven world-class competition pedigree, and (incorrectly, this writer believes) that anyone who can't cope with their idiosyncrasies ought to stick with a contemporary 944. (Which, paradoxically, has a by and large exemplary gear shift. But then I would say that, wouldn't I?)

Maybe so, but the fact is that these are meant to be high-performance sports cars we are talking about, not some antediluvian lorry. And, even if you are not overly concerned about 0–62mph times, they ought to be capable of delivering a more fluid, a more efficient and ultimately a rather more rewarding driving experience, without the constant fear of damaging either the gearbox itself or, worse still, ‘buzzing’ an expensive air-cooled engine.

And they *can* be that good, too – perhaps for the sake of just a few hundred pounds, and barely more than two hours' relatively

easy work. There is, understandably, no guarantee that you will achieve a miraculous improvement merely by the addition of a few after-market peripheral components – however well designed and engineered they may be, they cannot overcome possible problems within the gearbox itself – but based upon our own hands-on experience with this 1981 911SC, it certainly has to be worth a try.

So, what are those peripheral items that we are dealing with here? Primarily the universal-jointed coupling at the rear end of the primary longitudinal shift rod, which is accessible beneath a metal cover on the central tunnel, behind the front seats. And after that – a little more ambitiously, but not impossibly so – the four metal-and-rubber bushings via which the engine and the transmission are suspended beneath the body shell. More on these in a moment.

The logic is simple. That coupling, pulling, pushing and/or twisting hundreds

The gear shift in our guinea pig 911SC was tolerably mediocre – but still offered scope for improvement. Uniquely, the car's situation would allow us to fit the uprated items above, and see if the owners noticed any difference: a sort of blind tasting. Key to the process was undoubtedly the shift-rod coupler: original was quite noticeably worn, but crucially this one is not only more precise to start with, but should resist any future deterioration. Engine and gearbox mounts offer three easily swapped levels of firmness: details on next spread

This set of pictures is surely about as self-explanatory as it gets. The only significant point is to engage second gear before you disconnect the shift-rod coupling, and to make sure that it is still selected when you fit the new one. Red marks on the primary rod and the original coupling (middle row, far right) presumably date from earlier work that involved disconnecting them, but have no relevance here. The protective rubber boot over the coupling should be dry inside. The oil here indicates a leaking seal where the secondary shift rod enters the gearbox. Needless to say, that is now earmarked for replacement as soon as possible. Bushes in original coupling are clearly worn around the central pin – and logic and experience suggest that even a brand-new Porsche item (far right) would sooner or later go the same way



THE KNOWLEDGE

You will need very little in the way of tools and equipment for this one. We used a wheel-free lift for the installation of the transmission mounts, because that's what was available (and also simplified the photography), but the work could almost as easily be carried out with the car on the ground and – safely, of course – supported on axle-stands. In which case you will need further to support the power unit, while the mounts are detached, with a good trolley jack. (And the two engine mounts, as you will see, require the car to be on the ground, too.) Other than that, it's sockets, ring spanners, screwdrivers, and an Allen key for the grub screw securing the shift coupling to the secondary longitudinal shift rod.

The job was done for us by Rob Nugent, one of the senior technicians at BS Motorsport in Westcott, near Aylesbury, Buckinghamshire (01296 658422; www.bsmotorsport.co.uk). All told, it took him about two hours, so reckon on a labour charge for around that time if you elect to have the work done by another independent. (Or, indeed, by BS Motorsport

Make sure – with engine off – that you can reliably and easily select all five forward gears, and reverse. If not, all it should take is a little trial and error – loosening the nut and bolt and resetting the lever again. Interestingly, this car also has a (very common) problem with the pawl that is meant to prevent the inadvertent selection of reverse gear when downshifting from fifth to fourth. The spring that is provided to push it into the position shown is broken. Parts easily available, though, so we'll be looking at this in the months to come

itself; they'll be more than happy to help.)

Key to successfully installing the gear-shift relationship between the two rods that it connects or, if they were misaligned in the first place (which could also have hindered clean and precise gear shifts, of course), to reset them such that they are as Porsche intended. Rob's method is to select second gear and then, assuming that correctly selects the same ratio within the transmission itself, to maintain the secondary rod, passing through the back of the tunnel, in exactly the same position.

'The rear end of the coupling is fixed to the secondary rod with a grub screw into a machined hole,' he says, 'so that can fit in only one position. All you have to do then is join the two splined sections with the gear lever still hard over to the left in second, and that should give you the required movement in all directions. Sometimes it takes a bit of trial and error to get it right – and you need to make sure you can get all gears before you test-drive the car – but it's pretty straightforward.'

Interestingly, during the course of adjusting

the shift mechanism, Rob discovered a not unusual problem with the 'gate' at the base of the gear lever itself, which features an ingeniously simple lock-out device designed to prevent the inadvertent (and obviously potentially disastrous) selection of reverse gear as you attempt to change from fifth to fourth.

Essentially there is a spring-loaded pawl which is meant to push the lever back toward the middle of the double 'H'-pattern gate. Here, though, as in many similar cars, the spring in this now 36-year-old 911SC had long since broken, such that the pawl naturally remained in the 'open' position to which it had been pushed by the forward movement of the lever into the fifth-gear position.

The spring is available from Porsche, though (the complete top plate, with spring and pawl, costs around £42 plus VAT; at that price it's arguably not worth bothering with the spring alone), and although we were unable to obtain one quickly enough to incorporate the job within this story, we shall be tackling it soon – look out for a short piece in *Technical Topics* either next month or in the November issue.



TECH: HOW TO



or perhaps even thousands of times during any one journey, is the vital single link that transmits the movement of your hand, via the gear-shift lever, to the shift rods inside the transmission. Any free play within the coupling, which could be the result of either manufacturing tolerances and/or wear and tear, will necessarily dull the essential sharpness of that connection.

And the fact is that these hard-working devices do wear out. The original Porsche component extracted from this car was showing a substantial gap between the central pin and the nylon outer bushes, and naturally the resulting free play would have been magnified at the top of the gear lever, both longitudinally and laterally. Bigly. (Or *big-league*, as Donald Trump almost certainly actually said in that TV debate,

even if that is not nearly as amusing.)

New couplings are available from Porsche, at around £72 plus VAT, but there is nothing in their rather basic design to suggest that they will retain any additional precision for long. Far better, then, to spend a little extra on an after-market device, such as the one shown here from US-based Stomski Racing (US\$198). Inside its sealed-for-life rubber boot is a small but robust pin-and-block universal joint, and that should remain as-new more or less indefinitely. Fitting and adjustment could easily take little more than half an hour.

The science behind the same company's symmetrical, semi-solid polyurethane engine and transmission mounts is a little harder to grasp, but is based on the none the less sound premise – espoused by Porsche itself

in the electro-magnetic 'active' mounts it later fitted to ultra-hard-core track cars such as the 997 GT3 RS – that by limiting the (small) movement of the power unit against the pushing and pulling of the shift lever, you will transmit more of said lever's input, more quickly, to the internal mechanisms that actually do all the work.

Installing those, currently priced at US\$376 per set of four for this 911SC (see the panel on the opposite page), is naturally a little more complicated – you need good, safe access to the underside of the car, and unsurprisingly to support the powertrain with either a jack or a transmission stand for the duration – but, even so, the job should no more than around 90 minutes from start to finish.

This car's owners were understandably

Transmission mounts are built in to a plate secured to the floor at the front end of the gearbox, and which needs to be removed. But that is possible only after the rear anti-roll bar has been partially detached. Loosen nut and bolt at the lower end of each ARB link; this will allow the bar to swivel downwards far enough once the mounting brackets have been removed. With transmission supported, undo and remove the four nuts and washers securing plate to the underside of the gearbox. Remove the two large bolts securing the plate to the floor – one at each end – and it should drop clear. One of the four studs unscrewed from the gearbox, but that's no big deal: either treat it as a bolt when you refit it, or first remove the nut and refit the stud alone, perhaps helping it stay put with Loctite

Original mounts are secured to the plate by ordinary M8 nuts, bolts and washers; new ones go on the same way – but make sure you fit them the right way up, as here. Engine mounts, using the same beautifully machined aluminium blocks, are mounted with the large central boss facing down. New Stomski mounts have a slightly thicker outer flange, but length of all fixings is more than sufficient to cater for that. BS Motorsport's Rob Nugent used new M8 fixings, and crucially with a so-called wave washer (arrowed) in place of the original Porsche spring washer: see *Technical Topics* in this issue for an explanation. Aluminium grease will make sure everything comes undone again, far into the future. Red intermediate bushes selected first, later changed to softest yellow items. Either way, don't forget spacer and so-called Schnorr washer (both supplied) to help lock main through-bolt

Engine mounts work on exactly the same principle. Car needs to be on the ground this time, but again with some suitable support beneath the engine while the mounts are removed. A trolley jack beneath the crankcase is fine; just make sure that its saddle is padded to avoid damaging the relatively soft alloy. Arrow in photo top right highlights the point where some previous mechanic has casually levered the transverse engine-mounting bar against the engine lid's slam panel, presumably to get the eye at the end to line up with the main through-bolt: don't make the same elementary mistake. Again we started with the red intermediate blocks, but later changed these to the softer yellow items at the owners' request



happy with our handiwork. (Which, so far uniquely, we had carried out as something of a 'blind tasting', in order to attempt to determine whether any improvement in the shift quality was genuinely that, rather than the mind telling the hand that it had to be.) And so, too, were we.

There was a marked improvement in the precision and overall feel of the shift, even

after the coupling alone had been installed, and although the engine and gearbox mounting bushes (initially the middle of the three grades supplied in the kit) brought about only a marginal further improvement in what remains essentially a fairly 'soft' car, we have no doubt that for even occasional track use – and the odd cross-country thrash – it will be a far more confidence-

inspiring and certainly enjoyable set-up.

In truth, the owners later had those middle-grade bushes replaced with the softest ones, but profess themselves big fans of the coupling's greater 'connectedness' with what is going on inside the gearbox, and we have heard nothing since. And in that context – as in most others – no news is good news. **PW**

STATIONARY ENGINE

It is generally accepted that the more rigidly you mount a power unit within its chassis, so the better (albeit perhaps only marginally) will be the car's driving characteristics – including throttle response, acceleration, handling, and not least the precision of any old-fashioned rod-based gear-shift mechanism.

(That will be less noticeable in a more modern cable-based gear-shift system, which by definition tends not to exert a significant force on the combined engine and gearbox assembly, but it didn't deter Porsche itself from equipping the 997 GT3 RS, among others, with sophisticated mounts that can instantaneously become firmer or softer at the behest of an electronic control system.)

The major disadvantage of this approach is that the more rigidly you mount the engine and gearbox, so the more NVH (Noise, Vibration, Harshness) you transmit to the body shell. And while that might be acceptable for a full-on race or even trackday car, you would very quickly tire of it out on the road. Hence the GT3 RS's 'switchable' engine and gearbox mounts.

The answer, says Steven Stomski, the proprietor of Annapolis, Maryland-based Stomski Racing, is what he claims to be the first truly symmetrical semi-solid engine and transmission mounts for a wide variety of Porsches, and crucially all of them offering the optimum compromise between comfort and firmness. The best of both worlds, basically.

'We offer three different grades of polyurethane inserts for our mountings,'

he says, 'which allows you to custom-tune your ride now, and then later if your requirements should change. And because the aircraft-grade aluminium blocks in which they are located are effectively symmetrical, you can legitimately use them as either engine mounts or, inverted, as transmission mounts. They fully support – and thus fully absorb movement and vibration – in both directions.

'Mildest of the inserts is our "S" grade, colour-coded yellow. It's stiffer than the stock factory rubber mount, and provides a significant increase in control, but without any major reduction in refinement. After that there's the "RS" set-up, colour-coded red – harder still, but with only a modest increase in noise or vibration – and then the black "RSR" bushes. Those are close to full-on solid mounts, but again transmit very little vibration, even with open exhausts, solid-bushed suspension, and no creature comforts inside the car.'

Normally, adds Stomski, you would need to specify which grade you required when ordering, but for a limited introductory period he is offering all three in each pack, allowing a considerable degree of fine-tuning for those who might require it. (Each car needs a total of two pairs of mounts: one pair for the engine and one for the transmission. You don't have to fit both pairs at the same time, although that will tend to limit any benefits.)

Also included are the necessary sleeves and washers (flat and so-called Schnorr type), but neither the main through-bolts nor the M8 fixings securing the aluminium blocks to the chassis, so you might wish to order some of

those from Porsche before you start. The through-bolts are prone to damage if they have previously been removed and refitted by a less than expert mechanic.

Prices? For a 1965–1971 911 you will need two SR016 mounts for the engine (US\$94 each), and two SR017s for the transmission (US\$95 apiece). Cars built from 1972 to 1986 (to the end of pre-G50 Carrera 3.2 production, in other words) require two pairs of SR016s. For the 1976–1989 Turbo you will need two SR016s for the engine, and two SR017s for the transmission. There are similar devices available for the 964, 993, and even the later water-cooled cars, including the Boxster and Cayman. See the Stomski website for details.

Stomski's SR010 gear-shift couplers cost \$198 each for pre-G50 cars (including the 930-model 911 Turbo and the 912), and there is a similar device (SR060) for G50-equipped vehicles – albeit intended primarily for competition work – at \$250. To use that in a road car you will need an adaptor (SR061) for \$125. Owners of 356s can take advantage of the technology, too, with a coupler for 'B' and 'C' models (SR010-356) at \$228. All of those figures exclude shipping and duty.

More details on all these products – and the rest of the company's exciting range of tuning hardware and special tools, further examples of which we hope to showcase in future how-to stories – at stomskiracing.com. See also the September 2016 edition of the magazine for a how-to feature demonstrating Stomski's clever drilling jig for 996/986 etc exhaust-manifold fixings.

