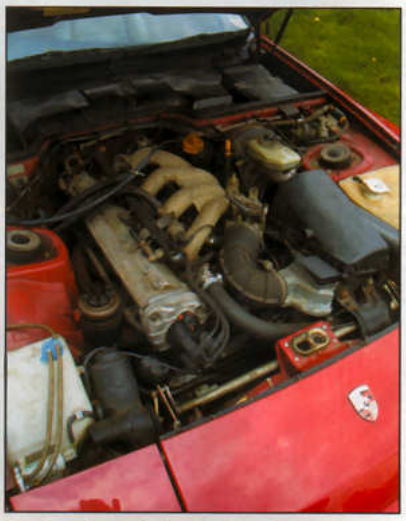
Swings and roundabouts

First Chris Horton had a 944S2 to look after, then a 944 Lux (his own), and now there's a second Lux – which disgraced itself by snapping its camshaft drive-belt. Read on to see how Horton fixed that particular problem, and for a brief update on his 1986 car. Photography by Peter Robain and the author

I hesitate to admit this, but there have been occasions during the last six months when I began to wish I had never even heard of the Porsche 944; times when I would have exchanged my entire fleet of automotive lost causes for one good book.

The lowest point came in December when, after I'd spent almost a week – outside, in the rain – repairing the carnage of a broken timing belt in one of the three 944 engines for which I seem to have become responsible,



Engine doesn't look like it's undergone open-heart surgery, does it?

the wretched thing later started leaking oil and coolant in roughly the same proportion.

Against that, however, I suppose I ought to confess that two of the three Porsches I now find myself looking after – Chris Moyses' 1989 S2, and my own 1986 Lux – have needed only minimal attention since I last wrote about them.

In the case of the S2 that's partly because it has covered only a few hundred miles since we last featured it in the December 1999 issue. And as far as my Lux is concerned it's almost certainly because the thing – like all these front-engined, water-cooled Porsches – is engineered like a nuclear-blast shelter. More on the Lux elsewhere in this piece (see the next spread), and on the S2 in the next instalment.

IT WAS ALL MY OWN FAULT. BEGUILED by the Lux's endearing combination of practicality, performance, style and affordability, I had persuaded my friend Karen to ditch her Vauxhall Astra in favour of something more in keeping with her professional image. (She's a partner in a firm of solicitors in north-west London.)

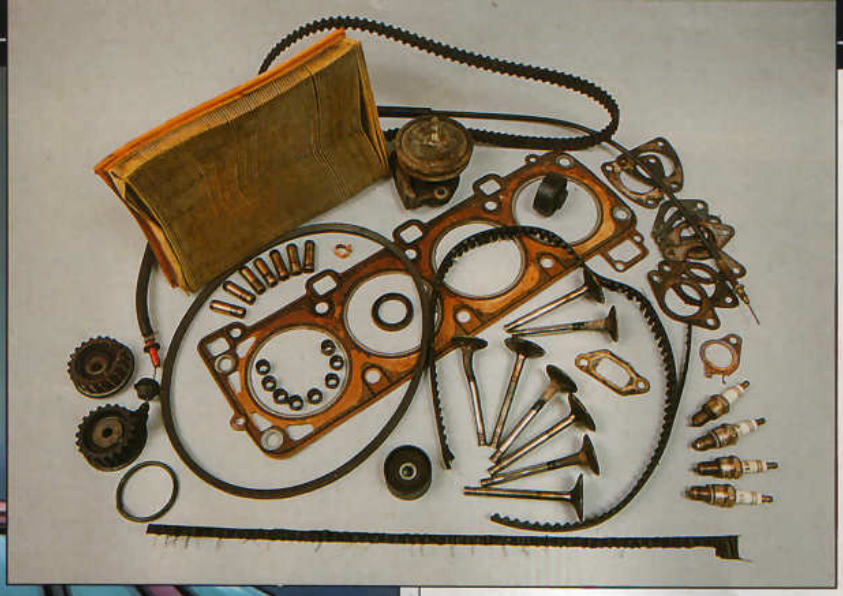
We viewed a number of candidates last summer, including a 944S which despite a good specification and appearance I ruled out on the grounds that it offered (I think) the worst of all worlds. Like a potentially troublesome 16-valve engine, but without the S2's demonstrable extra grunt, and all within a package that looks identical to the cheaper, older, eight-valve car.

There was some protest over that from Karen's 15-year-old son, Simon, but I held my ground, mindful of the potentially crippling bills that could ensue if (as I suspected might well be the case) the timing chain, its tensioner and possibly both camshafts needed to be replaced. You will begin to appreciate the irony of that stance in a moment.

A few weeks later Karen's partner, Martyn, spotted another possible. This time it was a

Water leak means rear-seat passenger has to sit on plastic bag...

1987/D 944 Lux in maroon (it's officially known as Malvenrot; that translates literally as mauve red), with 82,000 miles on the clock, and what was described as some history. It was sensibly priced – around £4000 – and came with both a CD player and an interior that had been retrimmed in what amounts to Porsche's so-called Linen-coloured leather.



Broken timing belt? Then you'll have to replace most of this little lot, too

It drove well, too. My only concern was the bearing noise from inside the timing-belt cover, and a gradual loss of coolant. The latter could have been due to a leaking cylinder-head gasket, but having detected no trace of oil in the coolant (or vice versa), and no sign of excessive pressure in the coolant header tank, I was confident it was probably just a faulty hose.

There were signs that the right-hand engine mount had failed, too (a roughness at idle, and vibrations coming up through the steering column), but having been through that with the S2 I was again confident that this time I could solve that easily and cheaply enough myself.

Anyway, the deal was done, and by mid-October 2000 Karen was at the wheel of her own Porsche. Don't worry about a thing, I told her. There's not much wrong with it you don't know about – or that you won't find in most similar 944s – and anything that does need doing will make great copy for the magazine. Famous last words.

My first task was probably the last thing I should have done – but you can't do much maintenance if the bonnet keeps dropping on your head. Like many 944s, this one's engine cover refused to remain open without the aid of a broom handle, so Martyn bought a pair of new struts from Berlyn Services, and one Saturday afternoon in November – when it wasn't pouring down – with Karen's help I fitted them.

It's a simple job in theory, but you do need a surprising amount of strength. The trick is to prop the bonnet as far open as it will go (but without straining the hinges; I'm told that could crack the windscreen). Next remove the clip retaining each upper clevis pin and, simultaneously pushing down on the upper end of the strut, slide out said pin. The lower end of the strut can then be pulled clear of the mount on the body.

Fit the new strut to the lower mount by pulling back the spring clip with a small screwdriver (not too far), and then, summoning all your energy, push down on the upper part of the strut (rubber gloves give you more grip) while guiding it into the bracket on the bonnet. Temporarily secure it with your screwdriver and then, using that to lever the two eyes into the correct position, have your assistant slide the clevis pin home.

The next job was to adjust the handbrake – never the later 944's strong point. This was necessitated by the fact that although neither Martyn nor I have any trouble with it, Karen – who as well as being, well, petite, is also left-handed – could neither apply it with sufficient force to hold the car on a slope, nor then release it again.

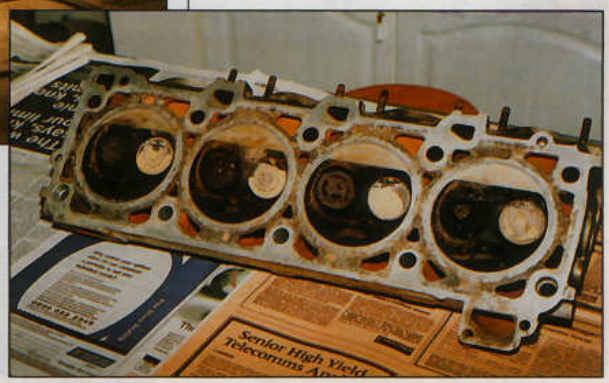
To reach the adjusters I took out the driver's seat (which made it easier to vacuum the carpet), and managed to eliminate a lot of slack from the two cables, but it made little difference. Karen has learned to leave the car in gear when it's parked on her sloping driveway, and to slip the clutch on hills. (Must teach her to heel-and-toe...)

Paper label on inside of rear panel proves metalwork is all original

Then followed some effective cosmetic work, which also had some beneficial side-effects. The car had been supplied with telephone-dial wheels, much like those fitted to my own Lux but, because Karen's is a later 944, with the same more widely spaced hubs as those fitted to cars with ABS brakes (which became an extra-cost option for the 1987 model year), with a different offset. In fact, the rims are *inset* slightly further from the centres of the wheels.

I had earlier bought a set of used 16-inch-diameter Design 90 wheels from a 964-model 911 Carrera 2. I had planned to fit these to my own Lux, but it became obvious that while they would physically fit the hubs, the rims themselves – because of that different offset – were set too far in to the wheelarches. I would have needed spacers to make them look right.

I abandoned the plan, and the wheels (by now



One exhaust valve was noticeably bent (above) but we replaced all eight (and their guides) to be safe. Head was checked for straightness

More haste, less speed

The only work I've had to carry out on my own car in the last six months has been the most basic servicing – an oil and filter change, essentially, as well as a set of spark plugs – and, not surprisingly, a quick look at the camshaft and balance-shaft belts. (Both seemed fine, I'm glad to say.)

fitted with some surplus tyres; see below) had been standing unused at the side of my house. Then it occurred to me that given the differences between the two cars' hubs the wheels would almost certainly fit Karen's Porsche.

So Karen now has what were the Dunlop front tyres from Moyses' 944S2 (all four of that car's tyres had been replaced by Colway retreads, you might recall) and the Dunlop rear tyres from one of my BMWs, which likewise were now surplus to requirements. And I have Karen's original tyres (albeit still on her wheels) ready to go on my Lux when its own covers wear out.

Between us Martyn and I tackled a few other minor jobs – replacing the sunroof seal and the rear hatch seal, for instance, although neither has proved particularly effective at keeping the rain out – and, as the days passed, so it became apparent that Karen (and Martyn, too, I think!) was really enjoying the car.

My only concern was that I still hadn't been able to check what was going on inside the timing case, but with an invoice to prove that the camshaft drive-belt had been replaced around 20,000 miles ago I wasn't unduly worried (Porsche recommends that the belt is changed every 48,0000 miles).

The tensioner and/or the various idler wheels were noisy, but I had never heard of them actually failing in service – and, besides, the weather was so bad that no-one in their right mind would want to spend any more time out in it than they had to (and Martyn's garage is even more full of immovable, er, junk than my own).

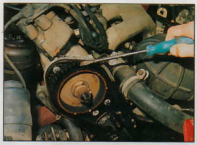
MY TROUBLES BEGAN ONE FRIDAY

evening in November when, as I was settling down for a glass (or three) of Rioja, the phone rang. It was Martyn, with the news that Karen had been driving to a meeting in central London when the engine 'simply died'. Fortunately she was able to coast to the side of the busy A40, whereupon she summoned the AA and later had the car transported home.

My first opportunity to inspect the stricken Porsche came between cloudbursts the following Sunday (the car was to remain out in the open for the duration of the repair; there was no way we could have pushed it up the driveway into the garage, even if the latter had been empty), and it didn't take long to establish the scale of the problem. By removing the upper half of the plastic timing-belt case I could see immediately that the camshaft belt was in big trouble.

The belt appeared at first not to have snapped completely, and for a moment I thought we might just have got away with it (and that the engine stoppage might have been due to some other less catastrophic fault), but as soon as I removed the lower half of the plastic cover I could see that the situation was, if anything, even worse.

The belt, soaked in engine oil, had first lost a number of teeth before breaking up completely (I extracted the pieces with a pair of side-cutters). And that would mean that instead of stopping



Not one of Horton's best pics, but it shows the remains of the cam belt

dead the camshaft (and thus the valves) might well have continued to operate out of synch with the crankshaft for a second or two. So we could be looking at major internal damage.

I won't bore you with a blow-by-blow account of how we tackled the job (although you will find below what I consider the most interesting and important bits). Suffice it to say that by the end of the day we had the cylinder head off, and that despite what you might have heard about 944 engines it was all fairly straightforward.

And at the time we were working with nothing in the way of a workshop manual beyond some pages from the official Porsche publication kindly faxed to us by Jonas Zambakides at JZ

Speakers and grilles are secured by four screws. Don't lose plastic spacers

Oh, and I also had to take the right-hand door to pieces for an emergency repair. Again, though, it was all my own fault. Struggling to defrost the car early one very cold morning last February, I attempted to lower the window so that I could use the exterior mirror to back out of my parking space.

Inner door trim comes off with armrest – but not lower pocket – still attached

Trouble was, the glass was frozen solid to the rubber channels around its upper edges, and all I succeeded in doing was pulling the metal channel, by which the pane of glass is attached to the winding mechanism, off its lower edge.

With no time to fix the problem there and then (I was on my way to Karen's; guess why...) I had to wedge the glass in place and hope it wouldn't suddenly crash to the bottom of the door and smash itself to pieces. Let's face it: after the year I'd been having

so far it was probably the least I could expect.

A few days later I got round to taking off the relevant inner trim panel (and the sad remnants of the plastic membrane that's meant to protect it from rainwater), and to my relief discovered that the necessary repair would actually be quite simple.

Extracting the glass was easy – it came up through the 'slot', with the forward end tilted down so that the pane cleared the upper part of the frame –

If it's in good condition carefully peel back this waterproofing membrane

Plastic sheet is trapped behind the internal door-handle mechanism

Remove the handle from the door shell and pass it through the hole in the sheet

Metal channel and associated rubber insulating strip had come off the glass

New strip would have been better, but old one seemed to fit reasonably well

Loosen motor mounts to allow mechanism to 'float' when you refit window

and likewise the offending metal channel came out through one of the cut-outs in the inner skin.

I would have preferred to buy (or even make) a new rubber strip to fit between the glass and the channel, but since that would have taken time I decided to refit the original parts and see what happened. And so far, I'm pleased to say (and this is being written at the end of April), both glass and channel have remained firmly attached.

I haven't found the time to refit the inner trim panels, but that's mainly because the new waterproof plastic membranes I bought (only about a fiver each including postage from Official Porsche Centre, AFN) look as if they might be real pigs to fit neatly (they're strongly self-adhesive), and I'm afraid I need to be in the right frame of mind to tackle a job like that! So more on this next time. ■

Plug gaps were about double what they should have been; amazing the thing ran

Machtech. Only later did Martyn buy the US-produced Haynes manual – although personally I think he might just as well have saved his money for all the practical help it offered.

Probably the most worrying part of the entire process was removing the camshaft and its housing. And easily the most awkward was disconnecting (leaving us the remotest chance of reconnecting them correctly) the many pipes, tubes, wires and cables running to and from the inlet manifold.

That said, the camshaft assembly is easy to deal with when you know how. Remove the six aluminium plugs at the top of the housing and then, using a top-quality hex key (a long one, and ideally attached directly to a suitable socket), reach down inside the housing and slacken and then remove the set-screws securing it to the cylinder head.

The trick then is simultaneously to lift the housing and to tilt it toward the exhaust (so that you don't lose the cam followers as you lift the assembly clear of the head). Likewise we gradually slackened the cylinder-head nuts (five of which are revealed by the removal of the camshaft housing) and, with hearts pounding, lifted off the head itself.

I was half-expecting to see bits of valve heads embedded in pistons, and the tops of the combustion chambers pitted with the resulting debris. Beyond one clearly bent exhaust valve, though,

Original tele-dial wheels replaced with these ex-964 Design 90 rims; look good

everything seemed to be remarkably normal.

No less encouraging was the state of the cylinder bores – there was barely a mark on them, even at over 80,000 miles – and the fact that the head gasket was clearly intact. I did wonder where the coolant might have been disappearing to, but it was only much later that I would get an answer to that particular question.

As it turned out, of course, we didn't escape quite so lightly. All four exhaust valves proved to be slightly bent, as did one of the inlet valves, so in the end we bit the bullet and replaced all eight.

Similarly the guide carrying the most badly bent valve appeared to have survived, but again we realised after extracting the valves that it was cracked; so given that they all appeared to be worn (not uncommon in this engine) we replaced all of those, too. Thanks here to Ian Flower at Middlesex Reboring for doing such a speedy, high-quality and inexpensive job, and also for checking the underside of the cylinder head for straightness (the castings are surprisingly prone to warping, and can only be very lightly skimmed to restore them).

Explosive mixture

According to the Haynes manual, the way to fill the cooling system is to open the bleed screw at the engine end of the top radiator hose and slowly to fill the coolant header tank until the level is at the 'maximum' mark.

Refit the tank cap, and now run the engine until it reaches normal operating temperature (ie the fan has turned itself on and off again), and the coolant issuing from the bleed screw no longer contains any air bubbles.

Now I'm prepared to admit that I should simply have held my nerve, but it seemed to me that the engine was getting very hot during this procedure, with no sign of the thermostat opening. Worse, the heater was blowing nothing but cold air, and I was concerned we might be in danger of cooking the new head gasket.

Moisture round spark plug forced rubber cap off with a real bang

And rightly so, Barry Hart of Hartech later told me. This procedure might well work for later cars such as our S2, which have an additional hose running between the header tank and the plastic elbow on the water pump (in earlier cars the elbow is blanked off internally), but we were, as I suspected, in serious danger of overheating the cylinder block. More on this next time.

Bleed screw (shown here removed) vital for proper filling of radiator

In the end, I'm glad to say, it all came good, but not before the car had contrived to give us (well, me actually, since I was the closest at the time) the fright of my life.

One of the obvious results of working outdoors was that everything in the engine compartment had at some time been soaking wet. That included the cylinder head, and more specifically the deep recess around each of the four spark plugs, which by the time we came to start the engine had been neatly sealed in by the rubber cap on each of the plug leads.

As the engine warmed up so the moisture trapped beneath the plug caps turned to steam and expanded, forcing one of the plug caps violently out of its recess – and right past my ear – with an incredibly explosive popping sound.

It took me a second or two to work out what had happened – my initial thought was that the plug had blown out of the cylinder head – but as soon as I realised that only the lead had flown off I gingerly pulled off the remaining three plug caps and let the water beneath them evaporate safely. I didn't want to go through that again. ■

Dismantling the camshaft housing was rather less straightforward. In theory we need not have bothered, but that's not my style – and anyway, we needed to replace the front oil seal, whose failure was almost certainly (or so we thought) the source of all the lubricant that had been flying around inside the timing-belt housing. Even the parts-catalogue pages we downloaded from the excellent Pelican Parts website (pelicanparts.com) weren't a great help.

Again, though, it's simple when you know how. Assuming you've removed the rotor arm (it's retained by a tiny socket-head grub screw), undo the larger grub screw (this time with a conventional hex head) securing the rotor-arm driver into the large hexagon section immediately in front of the belt sprocket. Pull out this adaptor, and behind it you'll see the splines of another socket-headed bolt.

Undo that bolt (it's vital to use good-quality, well-fitting tools; damage those splined bolt heads and you could have huge problems extracting them) while at the same time holding the large hexagonal 'nut' with a ring spanner.

Martyn, ever the desert engineer, unearthed some ancient contraption that (he claimed) was once part of a BMC Mini flywheel-nut wrench, but it did the job (just). By the way, don't ever be tempted to turn over the complete engine by means of a spanner on this hex section; use the crankshaft-pulley bolt instead.

With said bolt and large nut out of the way you can draw off the timing-belt sprocket (it might need gentle persuasion, perhaps with a couple of screwdrivers, to start it moving) and, finally, the rear half of the aluminium cover behind it.

Leaving Martyn to get on with replacing the oil seal and its associated components, I carried on with cleaning up the plastic timing case (bearing in mind that since – at the time – we had no way of removing the crankshaft pulley, the rear half of it was still attached to the engine), and then renewing the right-hand engine mount.

The latter was as easy as it had been difficult when I first attempted the job on the S2. With the engine supported on a piece of marine ply and a trolley jack I undid the single nut securing the base of the mount to the aluminium crossmember, the two 13mm nuts and bolts securing the top of the mount to the main engine bearer and, after raising the engine a few inches, slid it free.

With the new mount in place it was obvious how much the original item had deteriorated (and this despite the fact it appeared not to have been leaking its internal fluid). Both the oil filter and the rubber hose leading down from the thermostat housing were now much further from the nearby chassis member, and later, with the cylinder head on, it was obvious how close the steering column had been to the exhaust manifold.

Karen's 944 desperately needs so-called throttle-response cam like this

Reassembling the cylinder head was dead easy, too (we'd had the valve seats recut by Middlesex Reboring, so the valves needed only minimal lapping in), and once it was back on the engine again I began to feel a little happier. The end was in sight – or so I thought, anyway.

On went the new rollers for the balance-shaft and timing belts (after we'd removed the bal-

ance-shaft sprockets to check the seals behind for leaks); on went the clever spring-loaded timing-belt tensioner; and then on went the two belts themselves. This is much less daunting than it sounds, and considerably easier to do than to describe. Which isn't to say that it couldn't be easier still, but then you can't have everything.

Normally, of course, you would turn the engine to the correct timing position *before* you started dismantling it, but given the original circumstances there hadn't seemed much point (I didn't want to add to the possible internal damage).

To avoid any danger of the pistons touching the new valves, then, I had taken the precaution before fitting the cylinder head of first marking the crankshaft pulley in relation to the engine block with piston number one at top dead centre, and then continuing to turn the crankshaft in its normal direction of rotation (clockwise as viewed from the front) so that all four pistons were midway down their respective bores.

With the head bolted down I turned the camshaft so that the timing mark on the front of its sprocket lined up with the corresponding mark on the housing. Then, by hand pressure alone on the crankshaft pulley (the spark plugs were still out) I slowly turned the crankshaft back again to line up my painted-on TDC marks. We later found a TDC mark on the flywheel (it's actually marked 'OT') but it's hard to see, so I reckon my method, while primitive, is no less accurate.

Next we had to fit and tension the timing belt. Too loose and it could jump over the teeth on the sprockets; too tight, though, and not only might there be an unacceptable load on the water-pump and idler/roller bearings, but you also run the risk of the thing simply snapping. Which would, as you'll agree, be a Very Bad Thing.

Theoretically this tensioning process has to be carried out using a Porsche special tool, but these later engines (unlike that in my 1986 car) have what is nominally an automatic tensioner. Even so, it's essential to follow a specific routine or, as I discovered the second time I did the job (more on this in due course), even the automatic device can potentially over-tighten the belt.

What you have to do is make sure that the tensioner's two locking nuts are slackened off sufficiently for its built-in spring to push against the arm carrying the toothed roller, and then turn the crankshaft by hand through one complete revolution. Line up the camshaft timing marks again, and then turn the crankshaft anti-clockwise about 10 degrees, equal to about one and a half teeth.

Now, without touching the roller or its actuating arm, lock the tensioner. If you're the cautious type you'll probably want to have the tension checked by an Official Porsche Centre or an independent specialist who has the correct tool, but the above procedure should set the belt tension sufficiently accurately to get the car safely there in the first place.

Now you can turn your attention to the balance-shaft belt, characterised by its round-section teeth on both sides (and also much more expensive to buy than the camshaft belt). Again this is fairly straightforward to install, although it's deceptively easy to over-tighten it.

You should set the tension (by means of clockwise rotation of the eccentric mount for the idler sprocket adjacent to the lower shaft) so that – and this is our own rather unscientific interpretation – it actually feels quite loose. It should certainly be far less taut than the camshaft belt. In the absence of the Porsche tool the best advice is to set the belt a little too tight and again have it checked – a soon as possible – by an OPC or specialist who does have the correct kit.

Note, too, that if you remove the sprockets from the balance shafts (and particularly the lower shaft) it's vital to replace them correctly. Both sprockets are keyed, but gravity acting on the relatively heavy eccentrics will tend to pull the lower shaft round, and it's easy to refit the sprocket 180 degrees out. The engine will run, but it will probably feel very rough.

You should also be aware before you tackle this job that, even if you do manage to refit the sprockets correctly, the timing marks – particularly on the lower shaft – are very difficult to see. A small mirror will help, but (having now done this job twice) I prefer temporarily to set the sprocket in the correct position without the belt in place, and then make my own additional marks. It seems to work, anyway.

Contacts book

Berlyn Services
07000 911 924

JZ Machtech
07000 100 911

Middlesex Reboring
020 8959 1352

Hartech
07000 100 944 or
01204 302809

AFN Guildford
01483 408800

After that it was relatively plain sailing. All that remained was to refit the rest of the components at the front of the engine – distributor cap, timing case, auxiliary drive-belts and tensioners – and the various connections to the inlet manifold. We had a couple of false starts with that, but by using my own 944 as a reference we soon established what goes where.

EVENTUALLY, WITH HEART IN MOUTH, I turned the key, and much to my relief – if not amazement – the engine started literally first time. The oil pressure rose immediately (we had changed both the oil and filter while the cylinder head was off), the motor quickly settled down to a smooth and steady idle and, no less importantly, there appeared to be no leaks.

Refilling the cooling system was a little more traumatic (see sidebar on the opposite page), but once that was done I took the car for a spin round the block and was absolutely delighted by the way it performed. It was a shame that it wasn't to last, but for a week or two at least the Porsche behaved itself impeccably. More on how it further disgraced itself next time. ■