



## TECH NOTE

# Z22SE: CAMSHAFT AND BALANCER SHAFT CHAINS

With the Vauxhall 2.2 motor's habit of wearing out or snapping chains, here's a foolproof way to swap camshaft and balancer shaft chains.

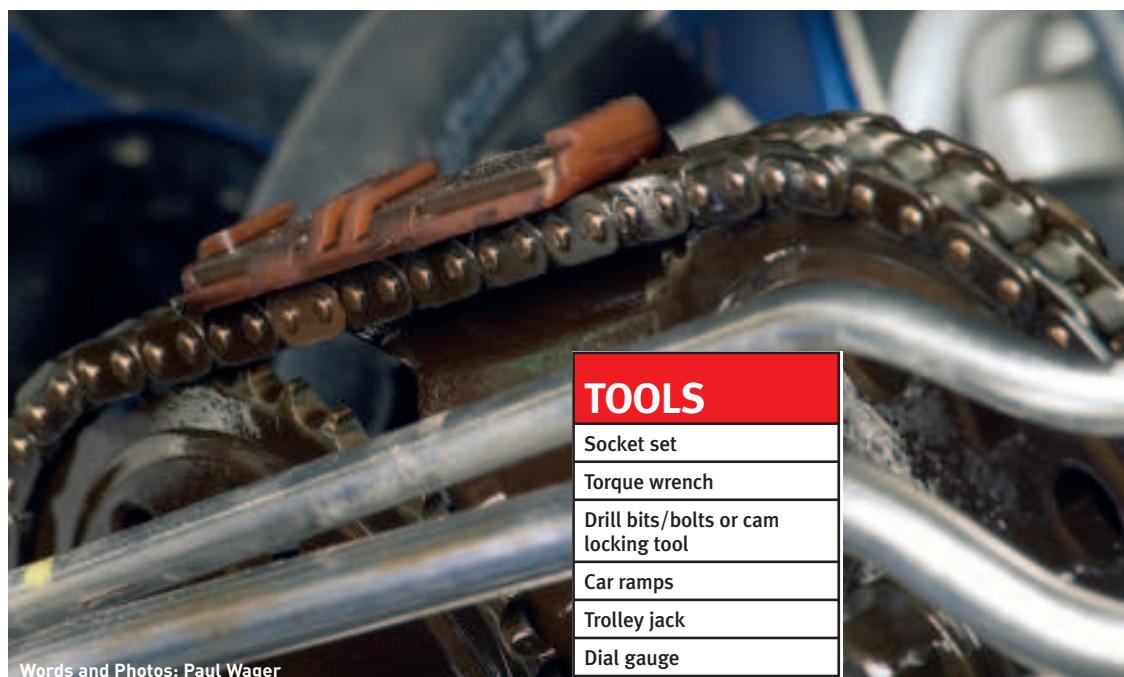
A chain is better than a belt, right? Not if it's the Vauxhall 2.2 motor with its habit of snapping chains. We show you how to swap the cam chain and while you're in there, it's just rude not to do the balancer shaft chain too.

In the old days, camshafts were driven by chain. They got noisy and rattled a bit, but they hardly ever broke. Then in the name of refinement, someone invented a camshaft driven by a rubber-toothed belt that made a nice little earner for the dealership service department. As we all know, a rubber cam belt might be quieter than a chain but it also has a habit of wearing out and snapping, taking your head and valves with it.

So a chain-driven cam is the better option then? In theory yes, but in the case of the Vauxhall 2.2 motor, the chain tensioner and chain itself have developed a reputation for premature wear. Affecting cars on a Y-plate up to 2002 registration, the problem can start with a ratty chain but in extreme cases can snap, at which point it's goodbye to 16 valves and your cylinder head. A recall was never issued for this problem, but it would most likely have been quietly attended to if you took the car for main dealer servicing.

All of which explains why we're changing the chain on this Astra Coupe belonging to Derek at VMR Autos in Dursley (01453 890736). Sensibly wanting to avoid a top-end rebuild, Derek was fitting a new chain and tensioner before any expensive damage happened, and as the chain which drives the 2.2 engine's twin balancer shafts is fitted behind the camshaft drive chain, it makes sense to replace that at the same time.

We used genuine Vauxhall kits for both chains, which came complete with new drive sprockets, tensioners,



Words and Photos: Paul Wager

### TOOLS

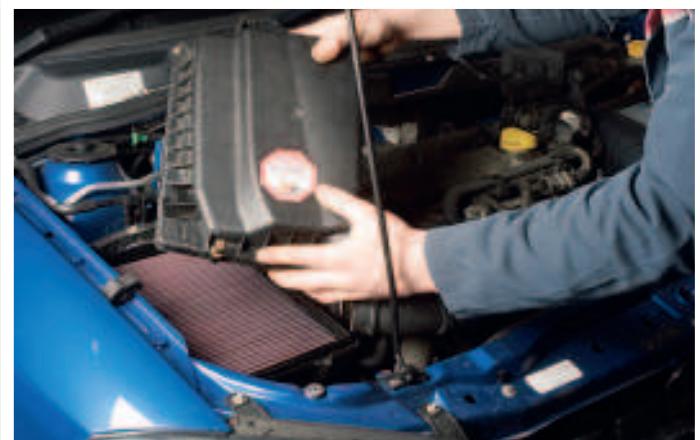
Socket set
Torque wrench
Drill bits/bolts or cam locking tool
Car ramps
Trolley jack
Dial gauge

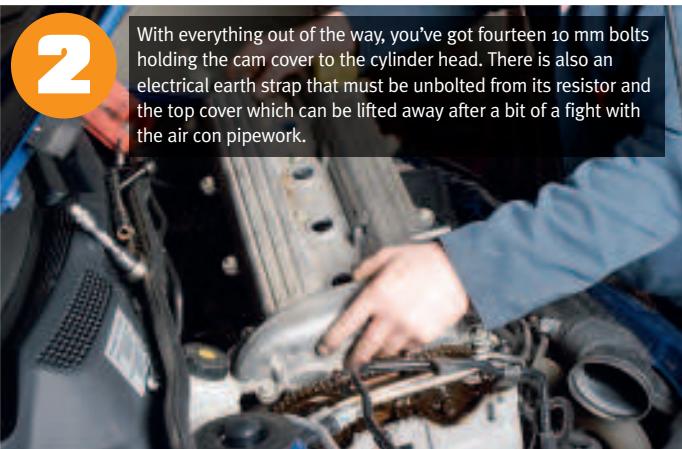
guides and of course the chains themselves. Timing the chains is actually simple, as the new chains come with handy paint marks that line up with the timing marks on the sprockets — these only go on one way, so you can't get it wrong.

Frequent oil changes can alleviate the problem, but even on this low mileage Astra Coupe which had enjoyed 10,000-mile oil changes, we still found slack in the chain. It goes without saying though, that VMR would change the oil and filter as a matter of course when doing a job like this.

The workshop guides advise less than four hours for this job and if you've done it once, we reckon we could rip through it the next time. If you're doing the job at home, you should allow most of a day — cam timing is something you really shouldn't rush.

In theory you need the special tool that we use here to lock the cam sprockets, but it's possible to use two big drill bits instead. You'll also need your big torque wrench and a dial gauge, but if you're doing it at home remember that you'll need access under the car too, so drive it onto some ramps before you start ripping the engine apart. Right then, here's how it's done.

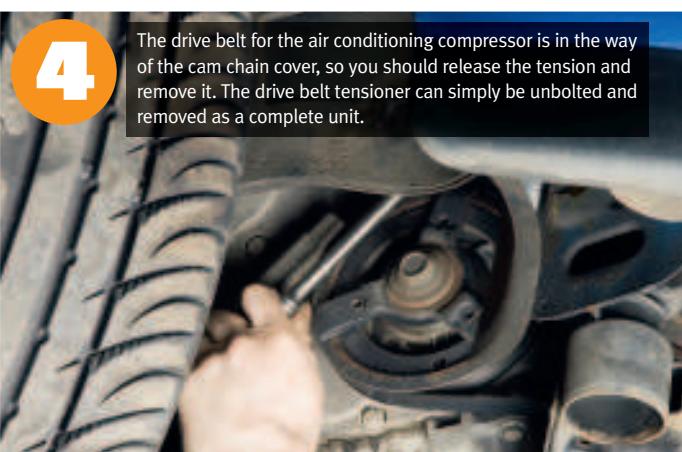


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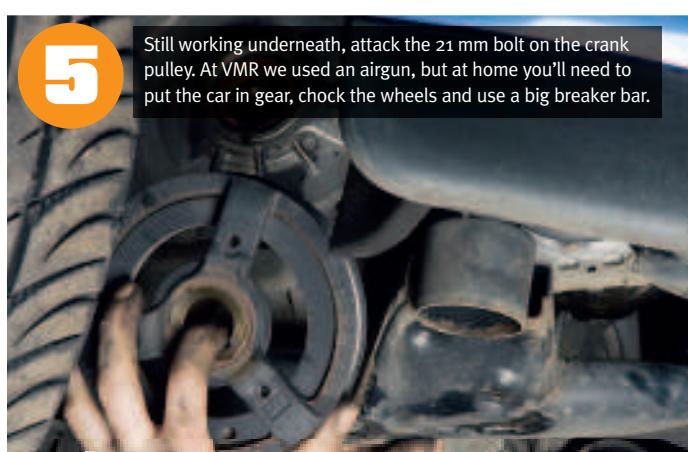
With everything out of the way, you've got fourteen 10 mm bolts holding the cam cover to the cylinder head. There is also an electrical earth strap that must be unbolted from its resistor and the top cover which can be lifted away after a bit of a fight with the air con pipework.

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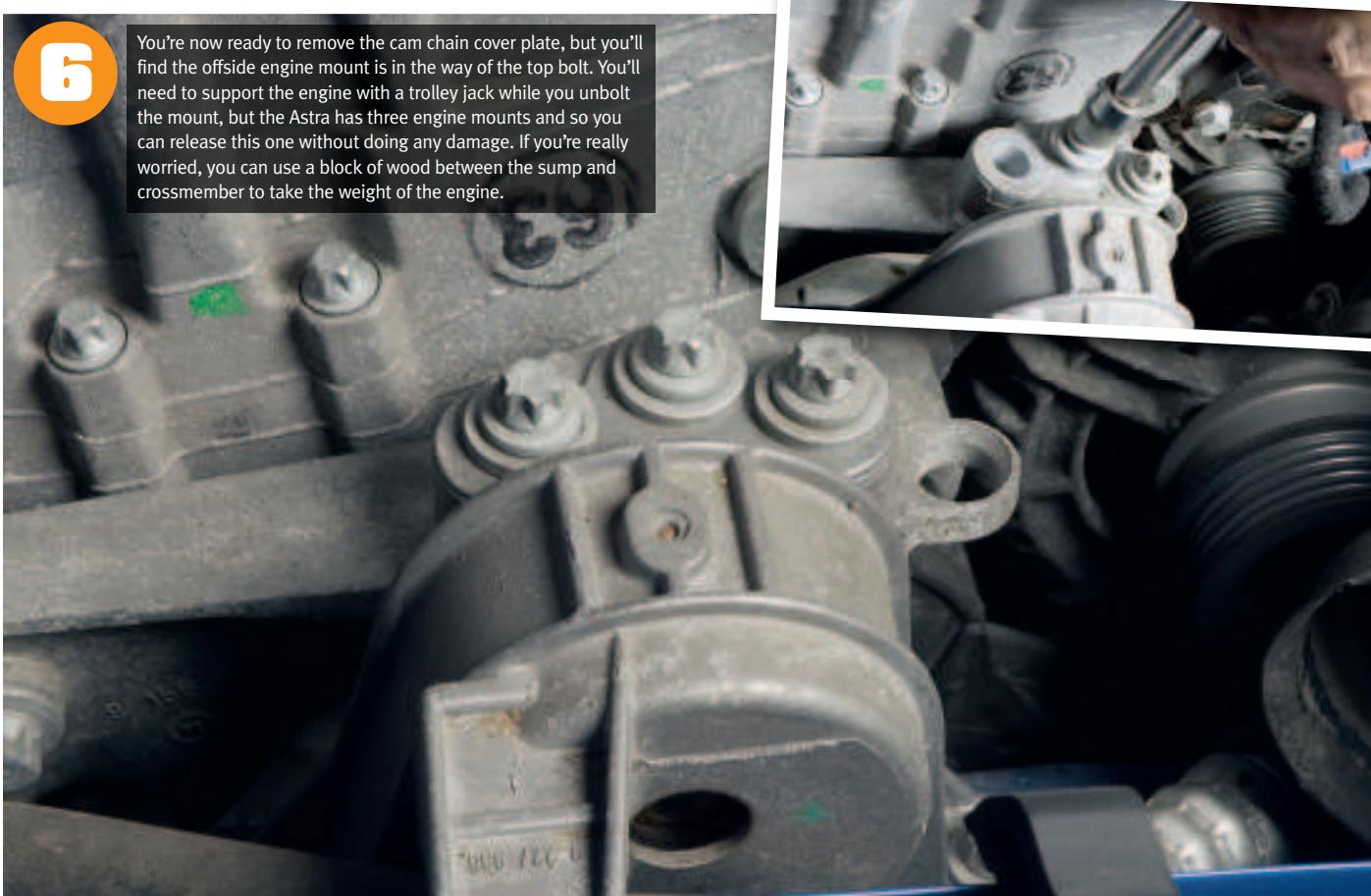
You will now need to get under the car to remove the plastic undertray. If you're using car ramps at home, you should be able to reach this easily.

**4**

The drive belt for the air conditioning compressor is in the way of the cam chain cover, so you should release the tension and remove it. The drive belt tensioner can simply be unbolted and removed as a complete unit.

**5**

Still working underneath, attack the 21 mm bolt on the crank pulley. At VMR we used an airgun, but at home you'll need to put the car in gear, chock the wheels and use a big breaker bar.

**6**

You're now ready to remove the cam chain cover plate, but you'll find the offside engine mount is in the way of the top bolt. You'll need to support the engine with a trolley jack while you unbolt the mount, but the Astra has three engine mounts and so you can release this one without doing any damage. If you're really worried, you can use a block of wood between the sump and crossmember to take the weight of the engine.





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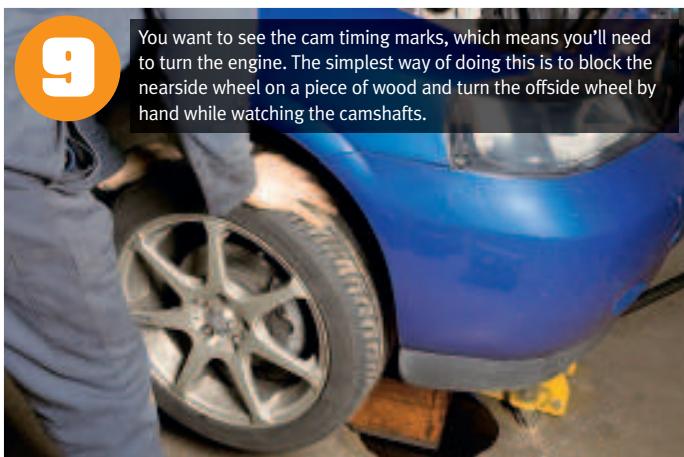
Now you're ready to wind out the ten 10 mm bolts holding the cam chain cover. Don't forget the 13 mm bolt in the middle.

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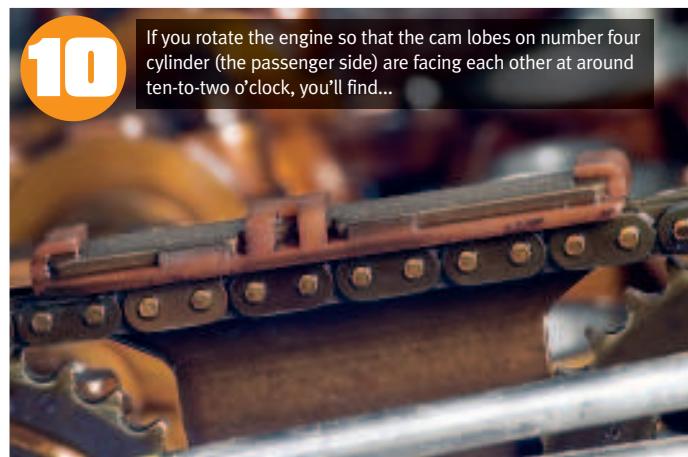
The cover is located by two dowels at the top corners, so you'll need to prise it away from the block. Do it carefully and you won't need to buy a new gasket. Lift the cover upwards and it can be removed completely. About a cupful of oil will run out when the cover comes off, so have something ready to catch it.

**9**

You want to see the cam timing marks, which means you'll need to turn the engine. The simplest way of doing this is to block the nearside wheel on a piece of wood and turn the offside wheel by hand while watching the camshafts.

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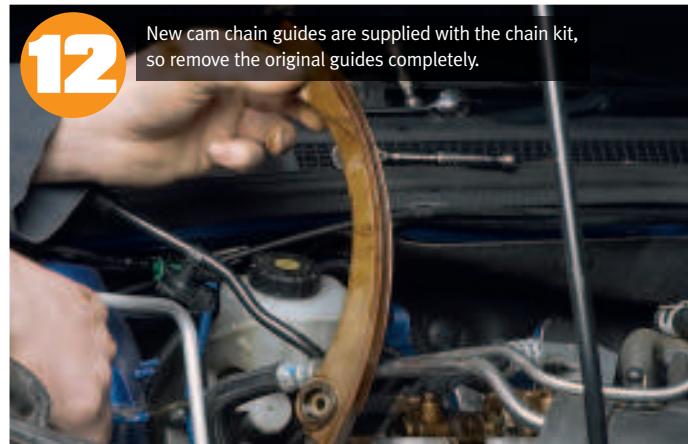
If you rotate the engine so that the cam lobes on number four cylinder (the passenger side) are facing each other at around ten-to-two o'clock, you'll find...

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... that the timing marks are visible on the cam sprockets. The new (genuine Vauxhall) chain comes with coloured marks that line up with the markings machined into the cam sprockets.

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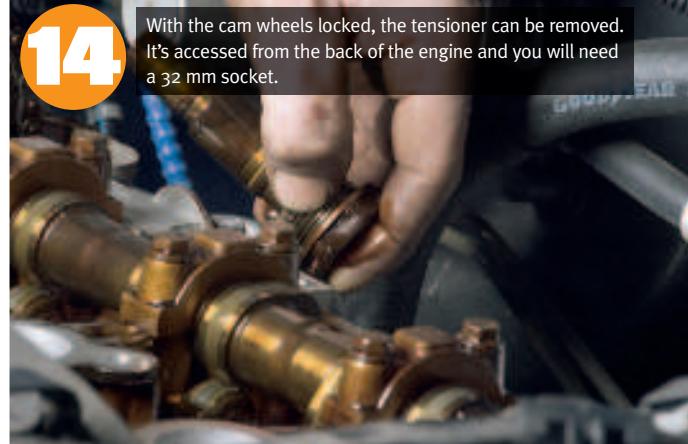
New cam chain guides are supplied with the chain kit, so remove the original guides completely.

**13**

The next step is to remove the tensioner, but the cam sprockets need to be locked at this point to stop them from turning. We used the proper locking tool (which we'll show you later) but if you don't have access to the tool, here's how you can improvise by using a couple of big drill bits or bolts.

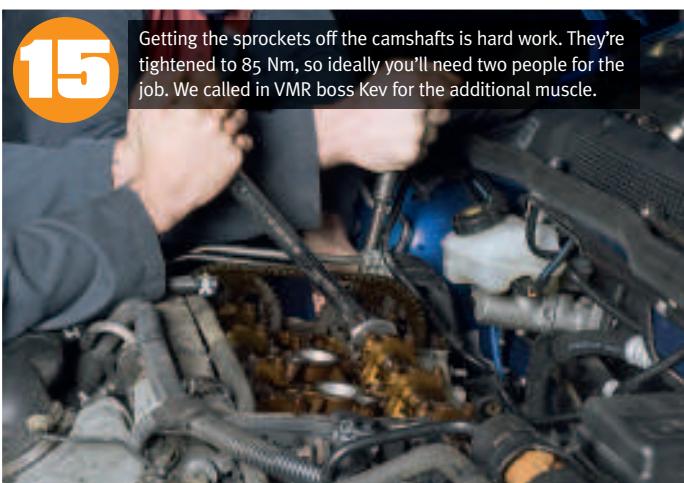
**14**

With the cam wheels locked, the tensioner can be removed. It's accessed from the back of the engine and you will need a 32 mm socket.

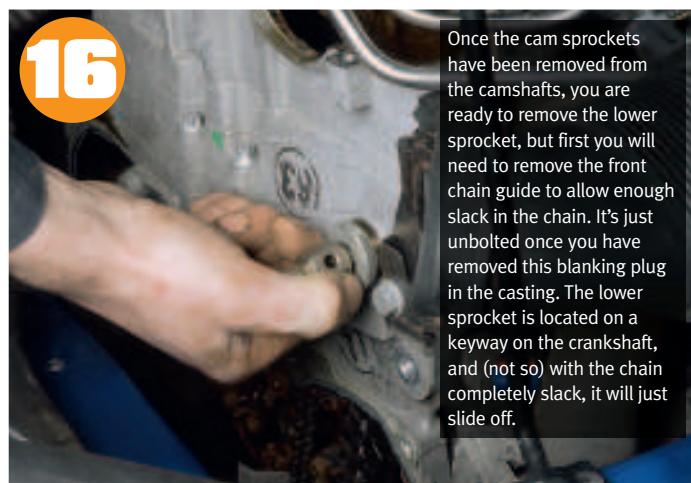


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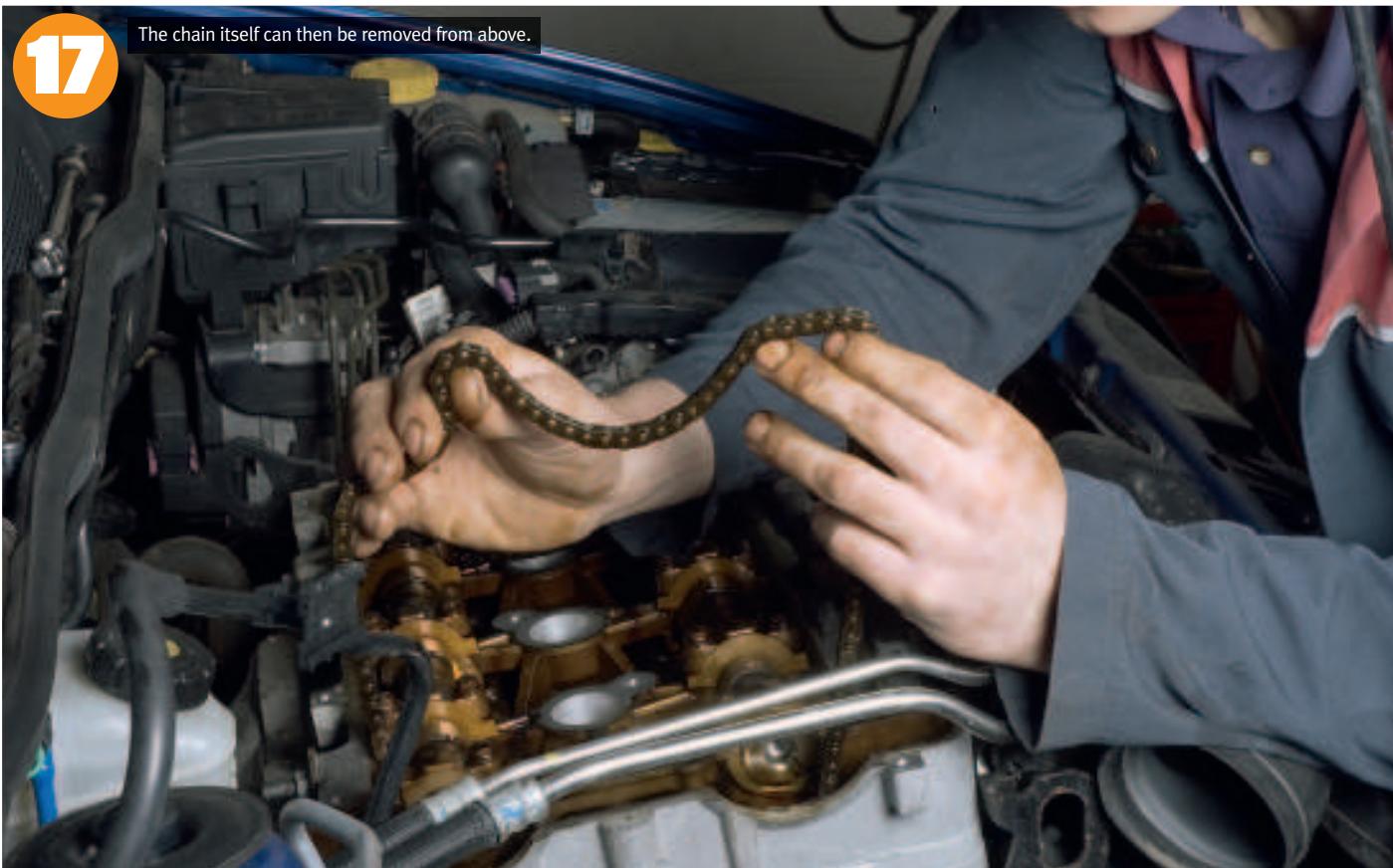
Getting the sprockets off the camshafts is hard work. They're tightened to 85 Nm, so ideally you'll need two people for the job. We called in VMR boss Kev for the additional muscle.

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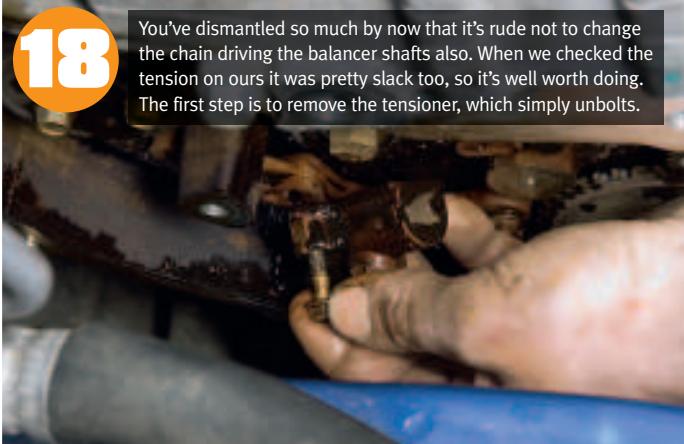
Once the cam sprockets have been removed from the camshafts, you are ready to remove the lower sprocket, but first you will need to remove the front chain guide to allow enough slack in the chain. It's just unbolted once you have removed this blanking plug in the casting. The lower sprocket is located on a keyway on the crankshaft, and (not so) with the chain completely slack, it will just slide off.

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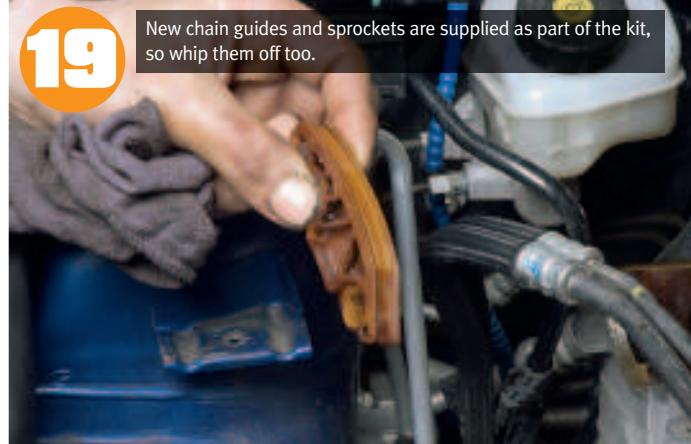
The chain itself can then be removed from above.

**18**

You've dismantled so much by now that it's rude not to change the chain driving the balancer shafts also. When we checked the tension on ours it was pretty slack too, so it's well worth doing. The first step is to remove the tensioner, which simply unbolts.

**19**

New chain guides and sprockets are supplied as part of the kit, so whip them off too.

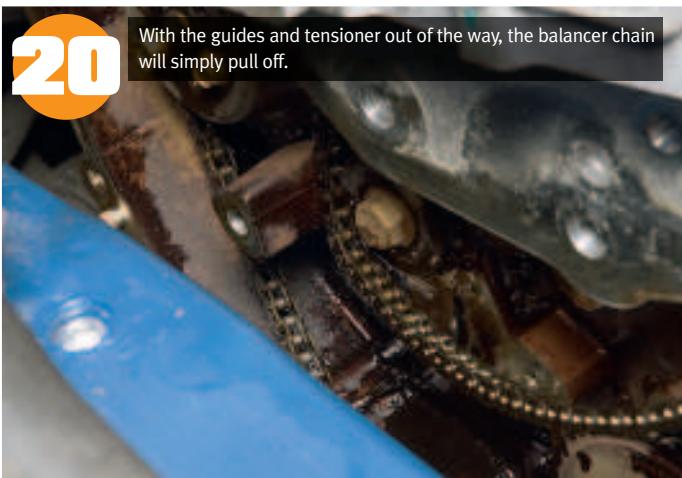




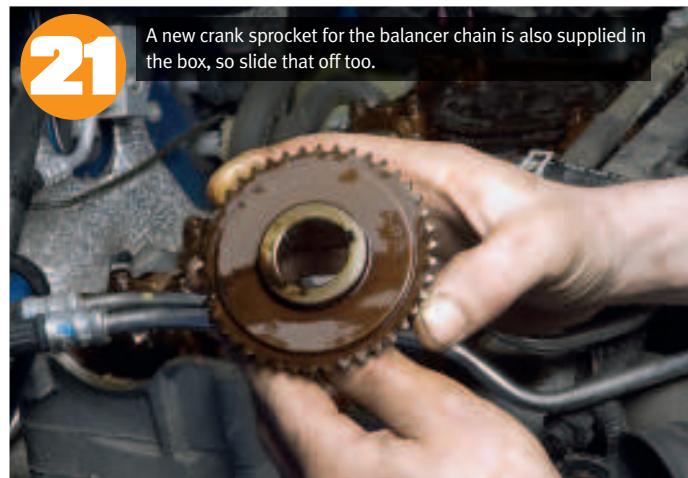
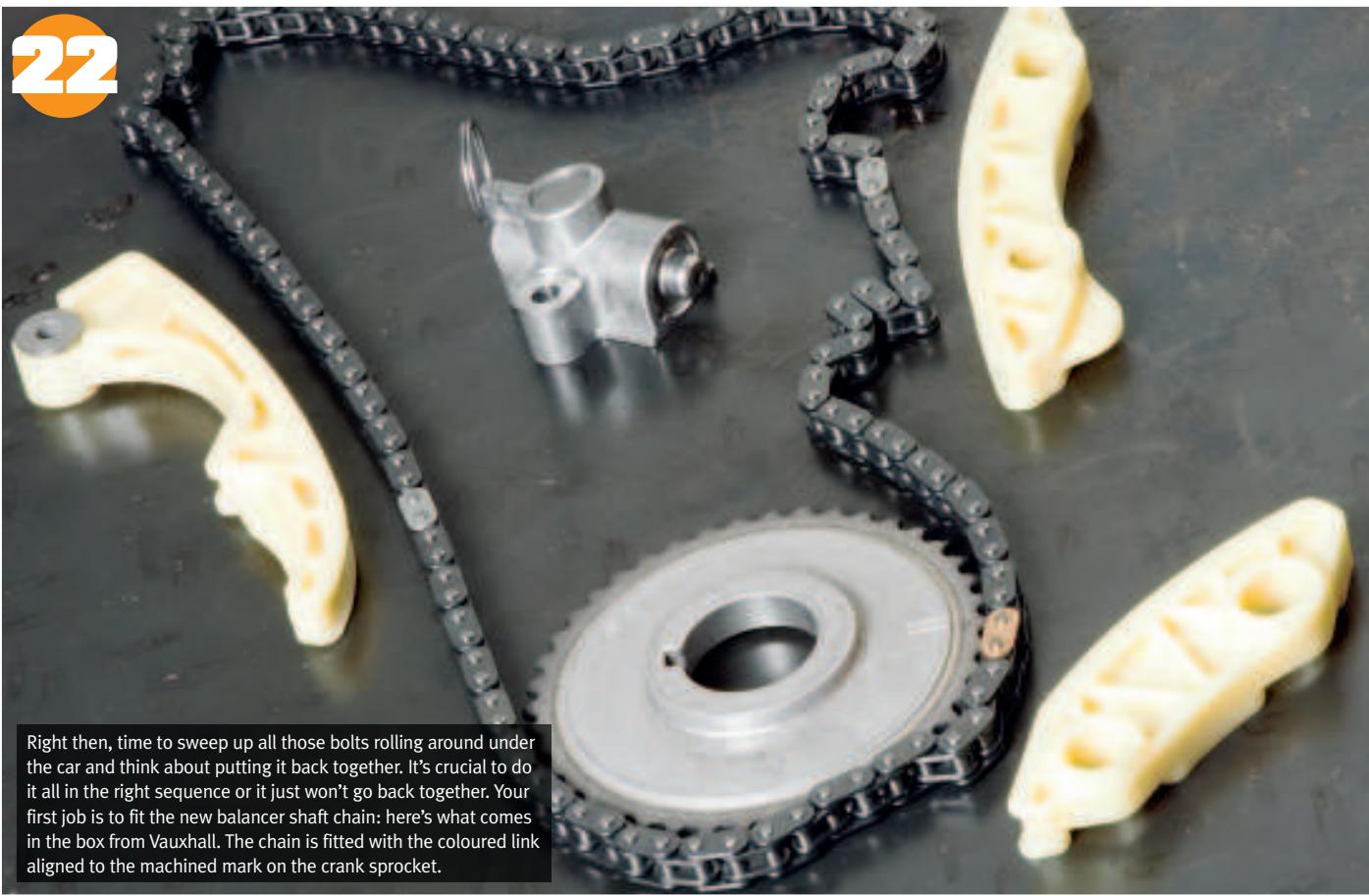
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With the guides and tensioner out of the way, the balancer chain will simply pull off.

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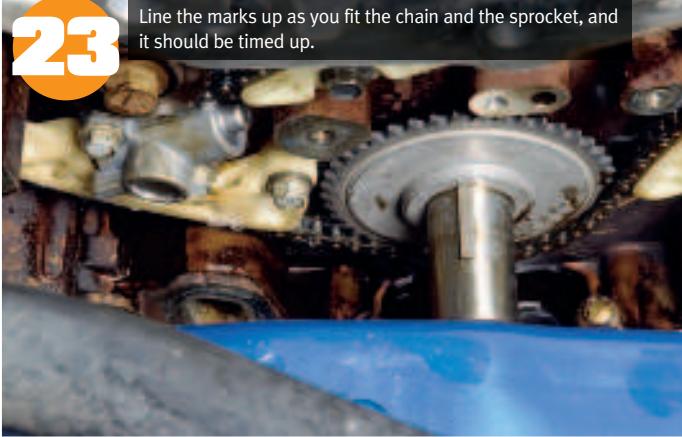
A new crank sprocket for the balancer chain is also supplied in the box, so slide that off too.

**22**

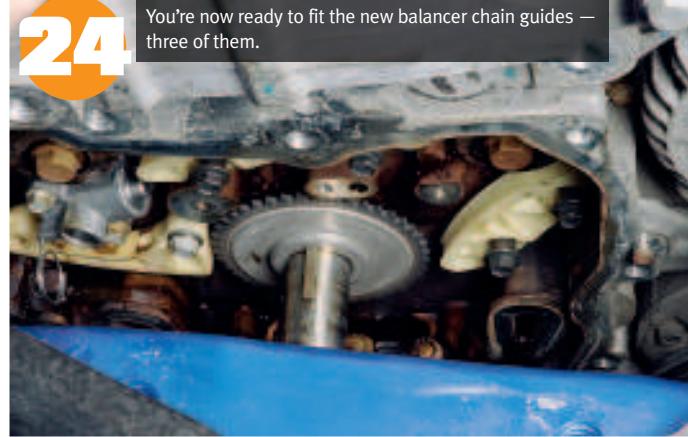
Right then, time to sweep up all those bolts rolling around under the car and think about putting it back together. It's crucial to do it all in the right sequence or it just won't go back together. Your first job is to fit the new balancer shaft chain: here's what comes in the box from Vauxhall. The chain is fitted with the coloured link aligned to the machined mark on the crank sprocket.

**23**

Line the marks up as you fit the chain and the sprocket, and it should be timed up.

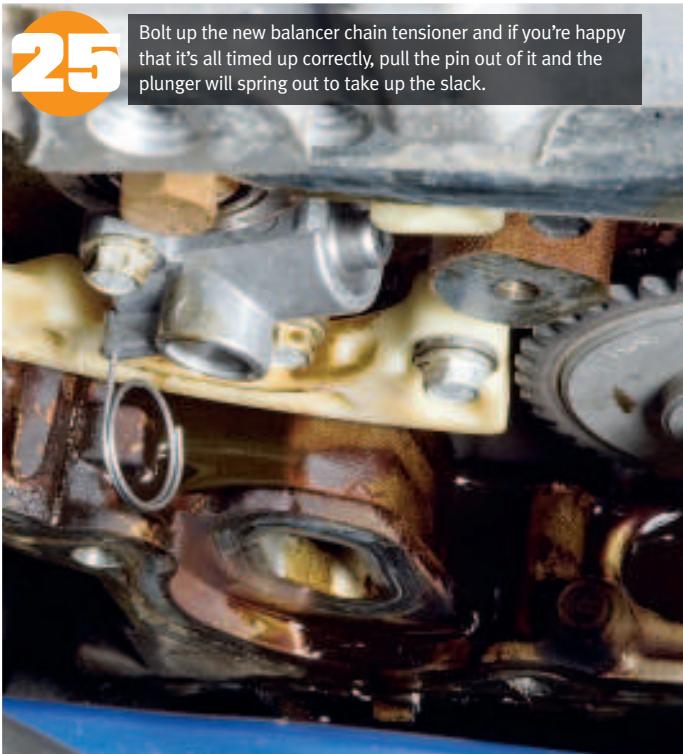
**24**

You're now ready to fit the new balancer chain guides — three of them.

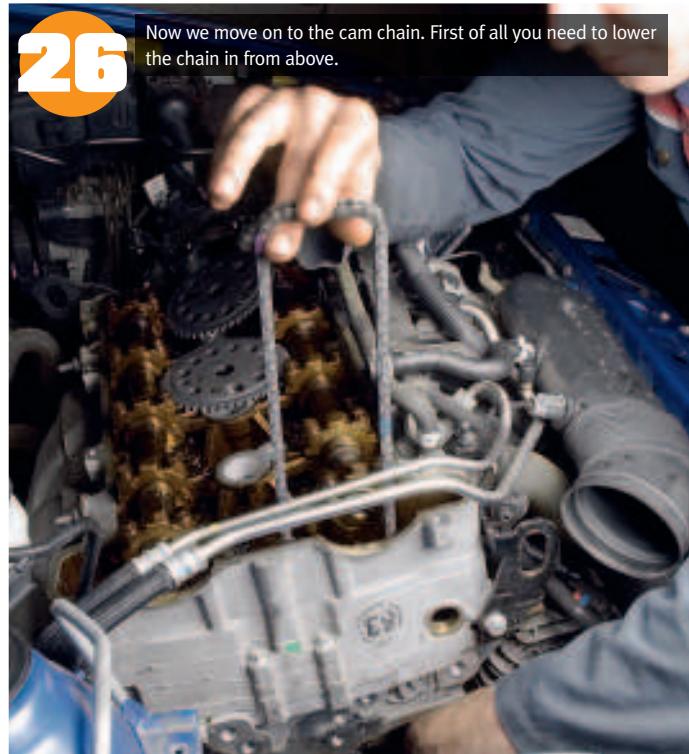


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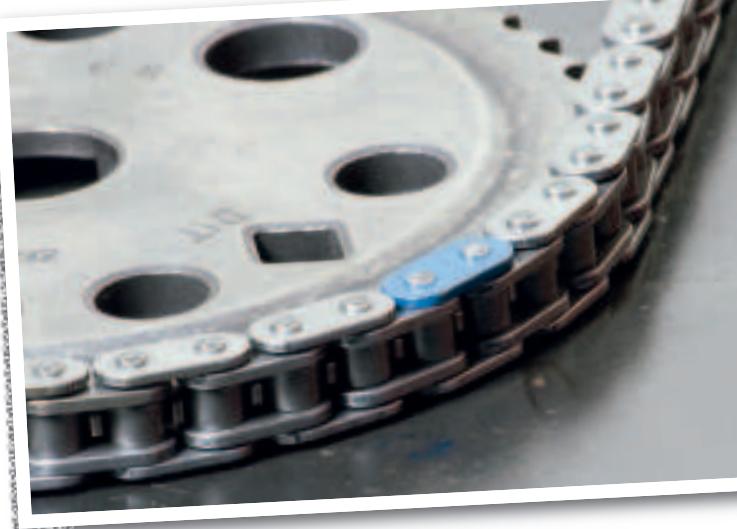
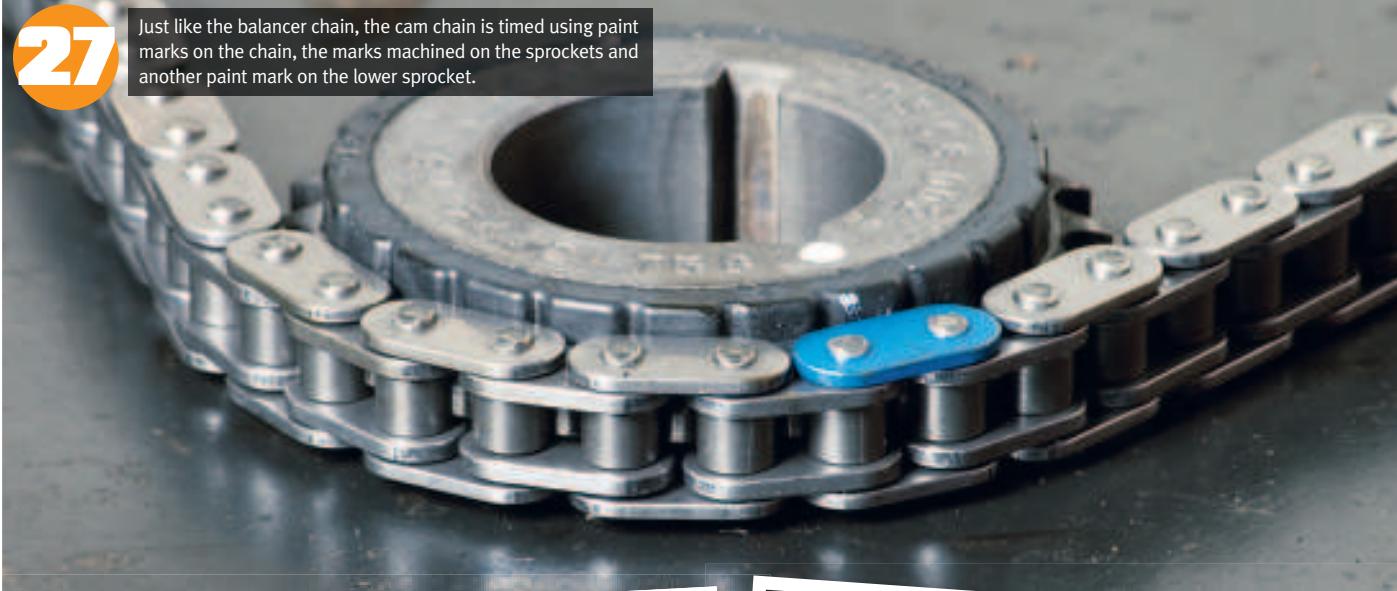
Bolt up the new balancer chain tensioner and if you're happy that it's all timed up correctly, pull the pin out of it and the plunger will spring out to take up the slack.

**26**

Now we move on to the cam chain. First of all you need to lower the chain in from above.

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Just like the balancer chain, the cam chain is timed using paint marks on the chain, the marks machined on the sprockets and another paint mark on the lower sprocket.





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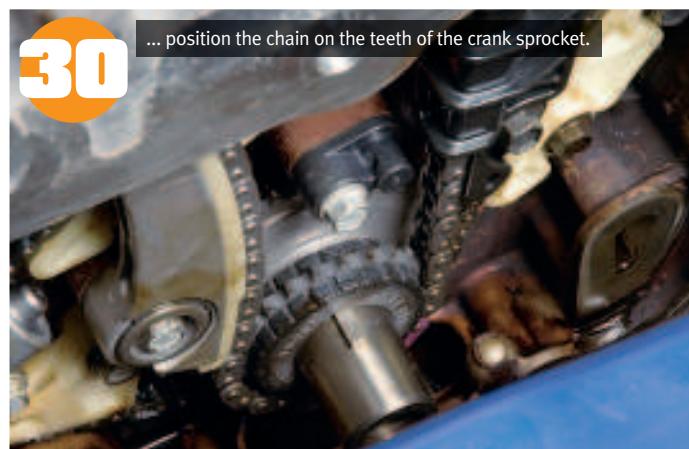
At this stage you need to do things in the proper order. First fit the rear guide — the white one.

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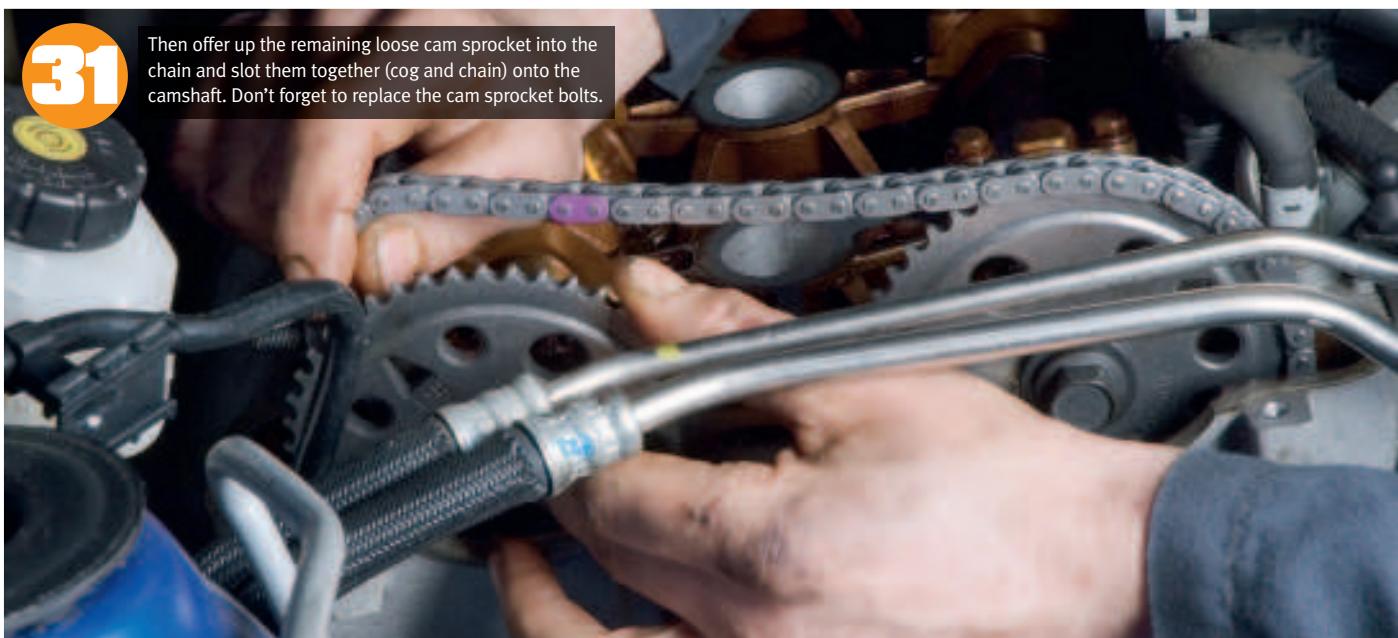
Next (having refitted one cam sprocket, and it doesn't matter which), fit the chain loosely in position and then...

**30**

... position the chain on the teeth of the crank sprocket.

**31**

Then offer up the remaining loose cam sprocket into the chain and slot them together (cog and chain) onto the camshaft. Don't forget to replace the cam sprocket bolts.

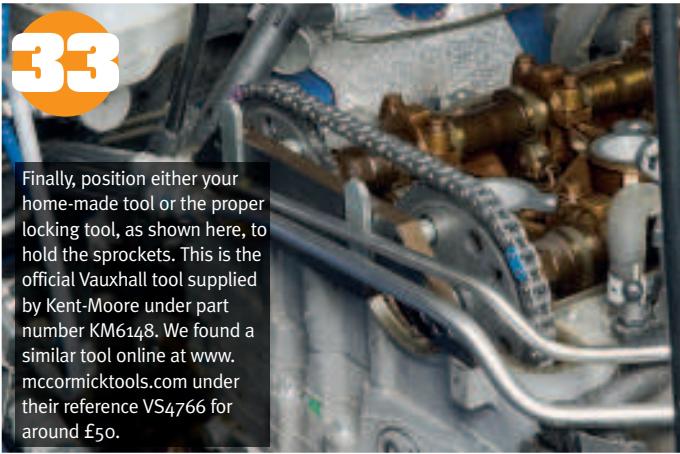


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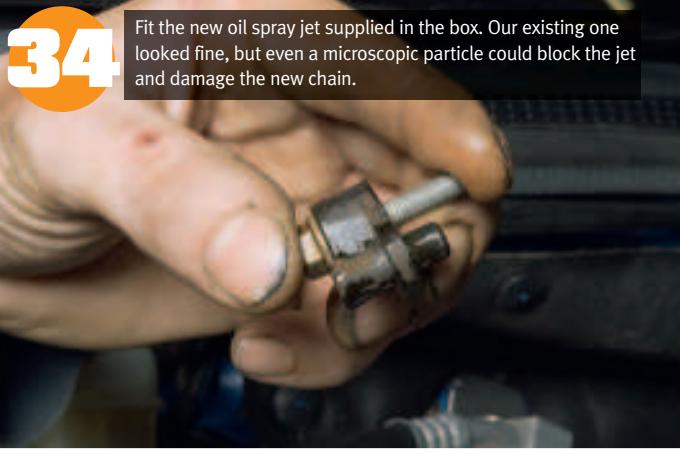
Fit the front guide — the black one.


**33**

Finally, position either your home-made tool or the proper locking tool, as shown here, to hold the sprockets. This is the official Vauxhall tool supplied by Kent-Moore under part number KM6148. We found a similar tool online at [www.mccormicktools.com](http://www.mccormicktools.com) under their reference VS4766 for around £50.


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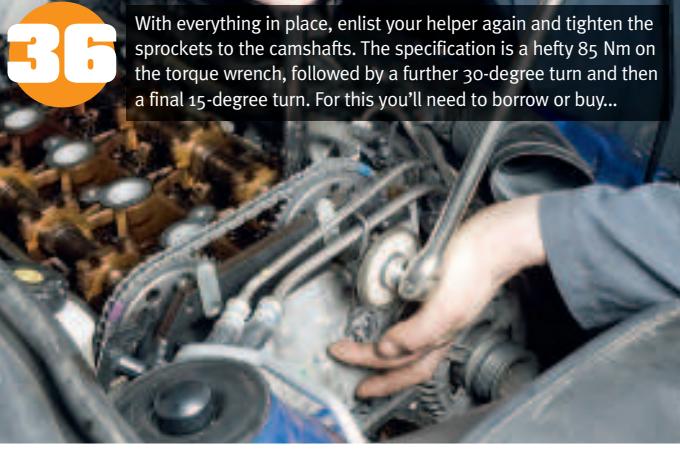
Fit the new oil spray jet supplied in the box. Our existing one looked fine, but even a microscopic particle could block the jet and damage the new chain.


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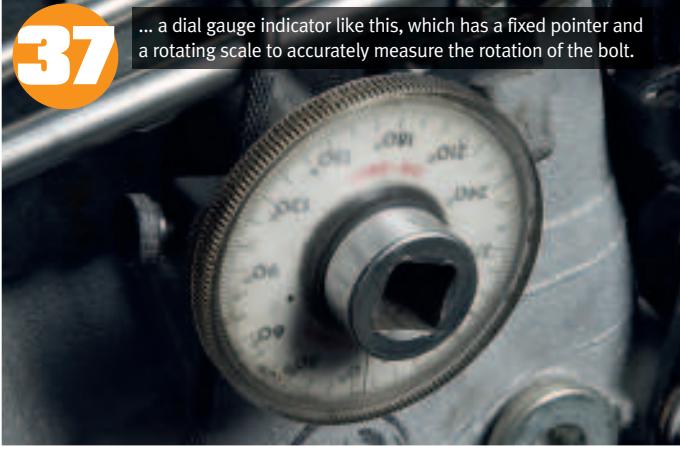
Fit the new cam chain tensioner from the side of the engine. As you bolt it into place, you'll feel the slack being taken out of the chain — after fitting ours, the chain was noticeably tighter than before.


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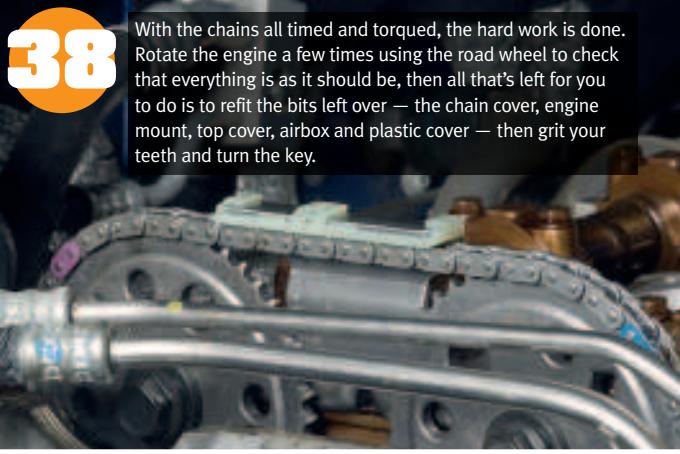
With everything in place, enlist your helper again and tighten the sprockets to the camshafts. The specification is a hefty 85 Nm on the torque wrench, followed by a further 30-degree turn and then a final 15-degree turn. For this you'll need to borrow or buy...


**37**

... a dial gauge indicator like this, which has a fixed pointer and a rotating scale to accurately measure the rotation of the bolt.


**38**

With the chains all timed and torqued, the hard work is done. Rotate the engine a few times using the road wheel to check that everything is as it should be, then all that's left for you to do is to refit the bits left over — the chain cover, engine mount, top cover, airbox and plastic cover — then grit your teeth and turn the key.



## PARTS

**Camshaft chain kit**

## PRICE

**£115.00 (inc VAT)**

**Balancer chain kit**

**£105.00 (inc VAT)**

**Camshaft locking tool**

**£50.23 (inc VAT)**