

This month we continue our series looking at the essentials of maintaining your Seven. Even if you don't want to become a home mechanic, we hope this will encourage you to learn a little more about your car.

The notes for this series are prepared by **Andy Belcher, Rob Davis and Michael Calvert**, and the photographs are by **Jamie Jones**.

GET TO KNOW YOUR SEVEN

PART 3: Gearbox and differential lubricants

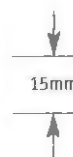


Fig 1: a shallow reach Allen (hex) key is needed for the gearbox filler plug which has limited access in the transmission tunnel.

IN THIS INSTALMENT we explain the procedure for checking and topping-up the oil levels in the gearbox and differential. Specific gearboxes, the Caterham 6-speed in the CSR for example, has a drain plug fitted enabling the oil to be easily changed if required. Where no drain plug is fitted in the gearbox, and for all differentials, a vacuum pump or syphon could be used via the filler should you wish to change the oil completely.

Safety:

These operations would typically be undertaken with the car raised and secured on axle stands; safe procedures for this were covered in Part 1. Take care!

Equipment and parts required:

Tools:

- Jack and axle stands
- Oil drain pan
- Inspection lamp
- 10mm Allen key, to modify – reducing 'reach' to 15mm (*see text*)
- An unmodified Allen key may suffice for the differential (*see text*)
- A short length of steel pipe (*approx 10mm bore*) to use as an extension for leverage on the Allen key.
- Oil pump can, approximately 0.5 litre capacity if topping up; or funnel and length of tubing if refilling (*see text*)

Parts:

- Caterham Gearbox Oil (semi-synthetic, GL4) – 2 litres if replacing oil
- Caterham Differential Oil (semi-synthetic) 1 litre to top-up, plus Limited Slip Diff' supplement if appropriate.

Gearbox

Unlike engine oil, which becomes contaminated over time by the very nature of the combustion process, gearbox oil does not require such regular replacement. However, over time, the gearbox oil level may need to be topped-up through oil being lost via minor leaks in the propshaft, or speedo-drive seals. It is therefore good practice to check the level and top up as necessary.

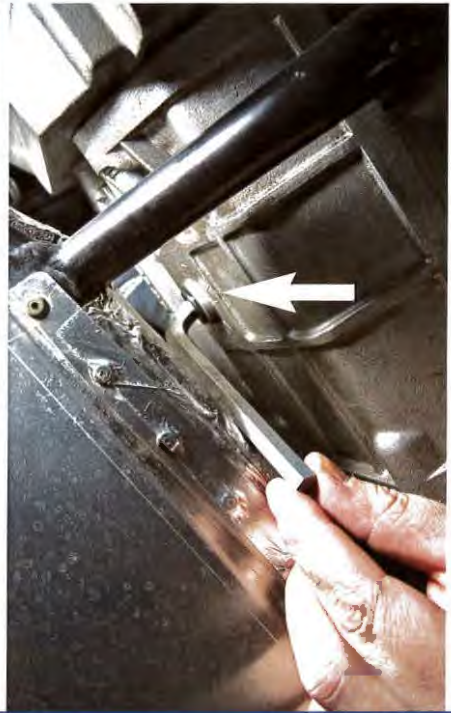
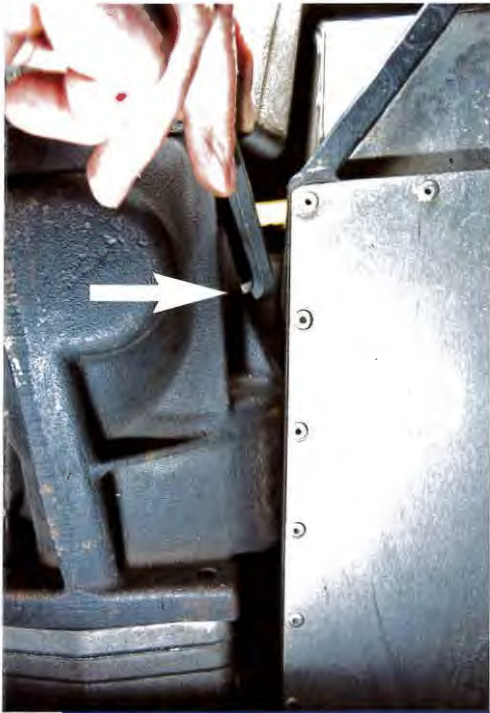
The method for checking the gearbox oil level and topping it up is very similar for all Caterham models.

The filler plug on the Ford 5-speed 'box is on the passenger side (*right-hand drive car*) of the casing; on a Caterham 6-speed 'box it's on the driver's side of the casing.

This is both the filler plug and the level gauge, since oil should be added until it starts to run out again, signifying that it has reached the required level. Therefore, it is important that the car be on flat ground – and raised equally front and rear – before starting this operation.

From the transmission tunnel access to the filler plug is, unfortunately, very limited. The wider SV and CSR models offer slightly more access room compared to the S3 model, but in either case, a cut-down 10mm Allen key is required to remove and re-fit the plug.

The Caterham build manual shows the dimensions that the Allen key needs to be reduced to – in essence, the short end of the



Figs 2 (left) and 3: view from beneath car showing oil filler/level plug on side of 5-speed 'box and 6-speed 'box (right, in this case in CSR chassis) with Allen key in place in the plug. In both cases the front the car is at the top of the picture.

Fig 4: improvised devise for replenishing gearbox or diff oil: funnel, hose and angled pipe for oil delivery (see text).

key needs to be reduced to a maximum reach of 15mm, as in **Fig 1**. Unless you have a lot of patience, and access to a lot of hack-saw blades, this is really a job for an angle grinder, so you may want to borrow a previously prepared cut-down key from a fellow club member if you do not have access to one.

When using an angle grinder, ensure the correct eye and ear protection equipment is used at all times.

Working under the car, place the inspection lamp so that it shines under the car between the gearbox casing and the tunnel. The gearbox filler plug should now be visible.

Figs 2 & 3 show the filler plug locations for the S3 and CSR respectively.

Using the 'reduced' Allen key, fit the shortened end into the filler plug. If the plug is too tight to release by hand, use a steel pipe as an extension (often referred to as a 'cheater bar') over the key to provide additional leverage. Undoing this a bit at a time, you should be able to get your fingers onto it eventually.

Don't be alarmed if a little oil comes from the filler plug, so have the drain pan ready just in case. Topping up the oil, should it be necessary, can be achieved using a hand-pumped oil can.

Whilst the gearbox oil is good for many tens of thousands of miles, you may decide to drain the oil completely from the gearbox. Certain gearboxes fitted to Caterhams are

equipped with a drain plug at the base of the gearbox. The drain plug is on those 6-speeders the opposite side to the filler/level plug, near the bottom of the casing.

If the drain plug is removed, take the time to clean the drain plug magnet which collects any loose metal swarf from the gearbox oil. Once all the oil has drained from the gearbox, refit the plug and tighten. Make sure the brass/copper washer is in place.

Many gearboxes, however, are not equipped with a drain plug – but most of the oil can be removed with the gearbox in situ, via the filler plug, using an oil suction gun (effectively a large syringe), which is available from most tool suppliers (for example, Pella).

Refilling the gearbox is straightforward, and can be achieved in more than one way...

From above the engine, using an appropriately adapted funnel, a length of rubber pipe and a 'L' shaped metal tube endpiece on the pipe. Andy is shown with such a device in **Fig 4**. Or alternatively, albeit more time consuming, fill the gearbox from underneath the car using the oil pump can used for topping up the oil. Really hard work on the thumbs – the gearbox oil capacity is around 1.9 litres – but it can be done!

When oil comes out of the filler plug hole (in the side of the casing) the gearbox is full, so re-fit and tighten the filler plug using Allen key. The operation is now complete. ➤

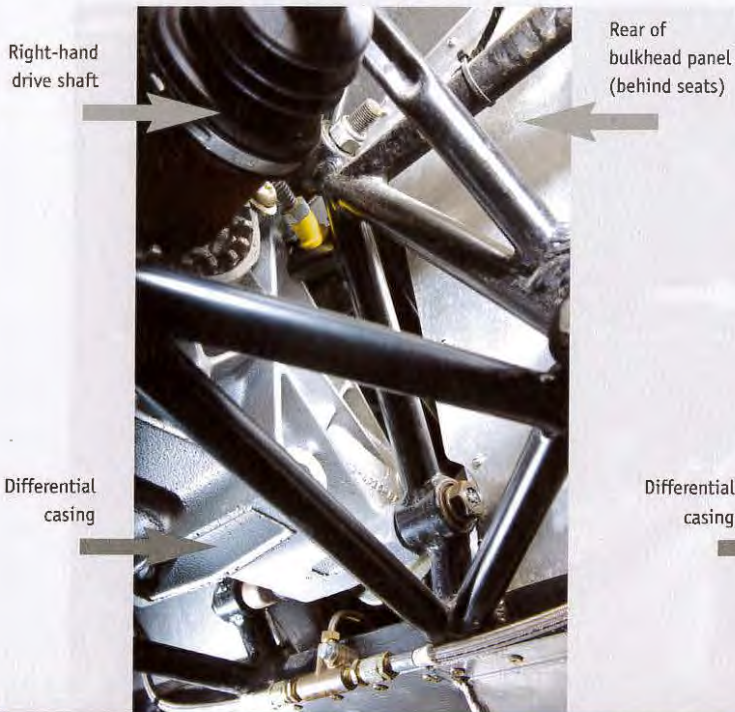
A few thoughts about tools and tight corners

As noted, the filler plug for the gearbox (like thankfully few other parts compared to a conventional modern car) can be frustratingly fiddly to access in situ. On most chassis, the location of tubing even prevents the foresighted from making an access hole in the tunnel skin during initial build.

As detailed in the text, a hex key is a cheap enough item to buy to modify, but if you're uncomfortable with wielding an angle grinder (I tried with a hacksaw once – it closely resembled hard work and is not to be recommended), you might find it easier to just buy a stubby hex key – *Bondhus*, for example, make them with an extended 'long' side for more leverage; a good tool merchant can get them, but in the UK you may need to buy a set. They're useful things to have though, and you can get them in inch-sizes too.

If you have a suitably long 5/16" (or 8mm) spanner (or even better, a ratchet spanner) you could improvise something with a short hex bit.

continued overleaf...



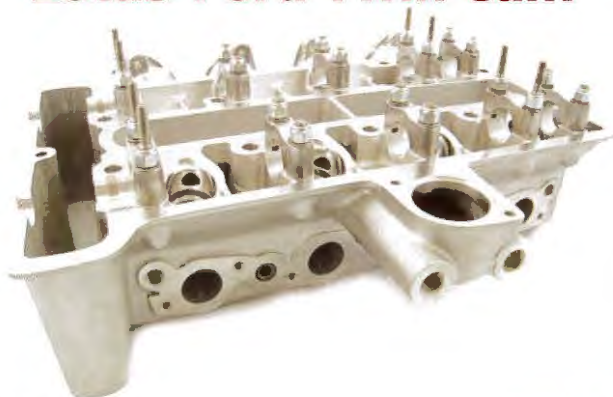
Differential filler plug, on the rear-facing cover of the differential casing

If you're not used to working on your own Seven, this might be an area of the car you've had less chance to explore; a few of the more obvious components are marked here to help you orientate yourself.

Figs 5 and 6: the differential and its surroundings viewed from beneath the rear of the car. This is a CSR, but aside from 'cradle' of tubing here to support diff and the CSR's independent rear suspension, the general arrangement on S3-sized and SV cars is the same. In Fig 5 (left) we are looking from below right rear wheel/hub/brake area. In Fig 6 (right) we are looking forward and up from beneath the petrol tank.



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Differential

Although the differential oil does not require regular changing, heavy cornering, during track use in particular, tends to force oil out of the diff's breather (the breather is a small outlet on the top of the casing, usually fitted with a small plastic tube – this is directly below the boot floor). It is therefore important to regularly check the differential oil to ensure that it is at the required level.

It should be noted that the differentials fitted to the Series 3, SV and the CSR do not have drain plugs, only filler plugs. Should, for any reason, you need to remove the oil, a suction pump as mentioned previously, could be used to withdraw most of it via the filler.

It is important to know if your car is fitted with a limited slip differential (LSD) or not. If it is, then check that the correct type of oil is used (available from Redline and Castrol). There are different types of LSD too (and yours may perhaps have been fitted aftermarket) and it may also need to be mixed with

the correct quantity of LSD supplement—which is essentially a friction modifier; this is available from Caterham Cars.

Working at the rear of the car, use the inspection lamp to locate the diff filler plug, as shown in **Fig 6**. Using the 10mm (modified or unmodified) Allen key—and possibly your extension pipe again since restricted access may prevent you getting a good grip—release the diff filler plug. A small quantity of oil may come out, so don't be alarmed by this but do have the oil drain pan ready.

Once the filler plug has been removed, take the opportunity to clean out any metal swarf which has been captured by the magnet in the plug.

If the diff requires topping up, use the oil pump can to fill using the correct grade of lubricant and any appropriate LSD supplement if you have one fitted. Replace the filler plug and tighten using the Allen key to hand tight. And the job's done. ■

...about tools and tight corners

from previous page...

There are a number of ratcheting bit holders, but those taking a 10mm bit tend to be a little bulky, so check what clearance you have on your car before you buy, or modify, a tool specially for the job.

Many of us probably have little tricks or obscure tool hints for familiar difficulties when working on our Sevens, but if we've used them for a long time we possibly take them for granted. If you have any really useful tips that others seem to be unaware of, please let us know! **Tony**

Next time, we'll be looking at wheel bearings.

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