

**BUMPER 116**-page issue

**SPECIAL SUPPLEMENT**

# CAR

## MECHANICS

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# GADGETS for your GARAGE



SEE PAGES 46-71

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**VW up!**

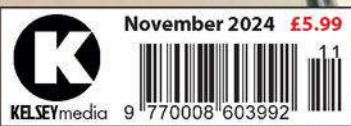
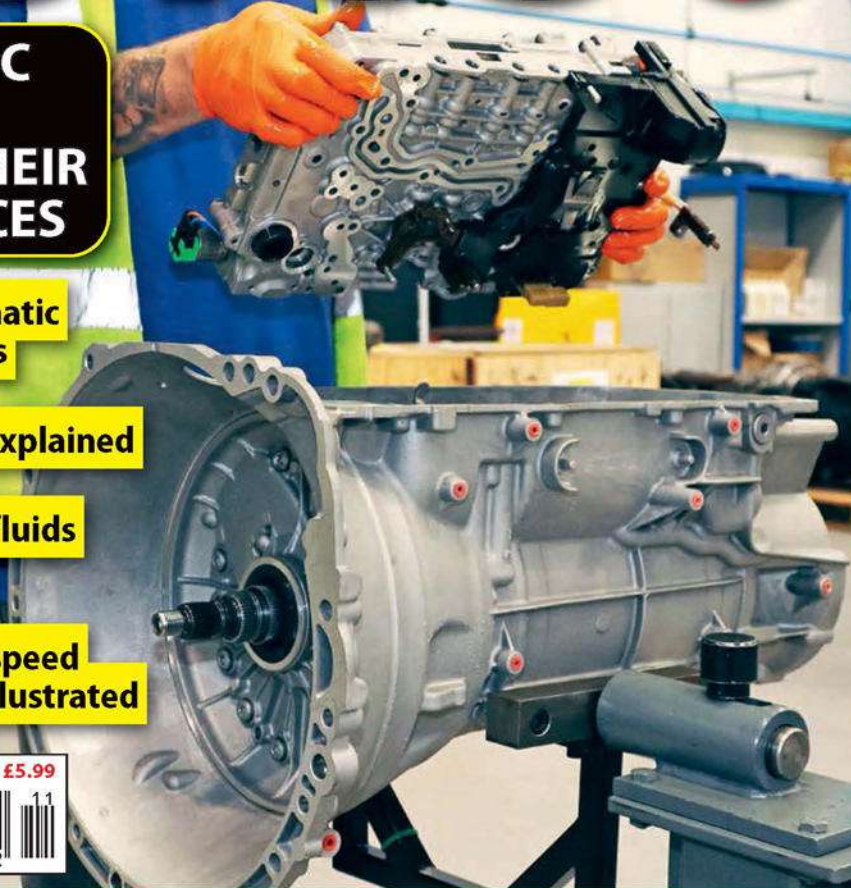


# TAKE OUR DEEP DIVE INTO AUTOS

**11**  
PAGE SPECIAL

**AUTOMATIC GEARBOX TYPES & THEIR DIFFERENCES**

- How an automatic gearbox works
- Clutch packs explained
- Transmission fluids outlined
- ZF 8HP eight-speed components illustrated



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## A cluster of gadgets

► Our bumper issue contains a supplement on Gadgets (see from page 46 onwards). We welcome your recommendations too, so please send in any ideas to me at the above email.

On pages 70-71, our 'top gadgets' section from CM contributors and readers, looks at tools we've purchased that we could now not do without.

Two tools recently bought that had me wondering how I managed without them... I was working on my 2004 Toyota Corolla Verso brakes. The brake backplates (dust shields) were basically just full of rust – the offside fell off as I tugged at it. I know backplates aren't a requirement for a MOT pass, but me being me, wanted to put it back to original condition. Thinking that as each backplate was held on with three 10mm bolts, the hub didn't need to be disturbed to fit new ones – they just wrapped around half the hub. So... I ordered a pair of new backplates from Autodoc – the only place selling them – for £45 delivered.

Taking off the old backplates was going OK. I started with the offside and managed to get a ratchet spanner onto the 10mm bolts after spraying them first with Bilt Hamber Ferrosol. Now onto the nearside and the middle bolt of the three decided to round. Space is limited due to the hub face hindering anything bigger than a spanner – a socket wouldn't fit. On eBay I bought, for £25.99 delivered, this Irwin 5-piece Bolt-Grip Remover Set.

The reason I went for these is firstly, they have 8, 10, 13 and 19mm sizes

(and three imperial) and secondly, the hexagonal section can be used with a spanner or pliers – offering extra leverage when trying to undo the damaged bolts. As said, with limited space, I found that using a large chisel up against the Irwin Bolt-Grip, I was able to hammer the chisel to push the Bolt-Grip firmly onto the damaged bolt.

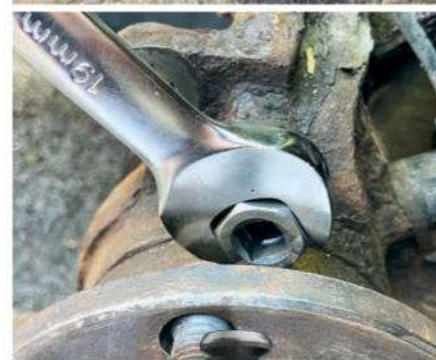
Using a 19mm spanner on the hexagonal section, the damaged 10mm bolt came undone with ease. With the Bolt-Grip removed, a 3/8in ring spanner undid the now loosened bolt fully. Perfect. Six new bolts were purchased from MR2-BEN Ltd.

The only thing that isn't perfect at the moment is that once the backplates arrived, I noticed that they were made fully round – there's no slot at the bottom to place the plates onto the hub as I was first thinking. I believe the hub nut will have to come off and the hub moved forwards to get to the back of the hub!

### Brake bleeder

My other purchase is one that I've wanted to buy for about 10 years. A one-man brake/clutch bleeding tool – this time bought from one of Sealey Tools online shops at £53.95.

Model number VS820v4 made light work of bleeding the brakes on the Corolla Verso. The container holds up to 2.5 litres of fresh fluid – and with around 18-19psi pressure, I drew 250-300ml from each nipple. The unit replenishes the brake fluid reservoir as you work.



## BMW

### Buy, Own, Run

► Our 14th 'yellow book' is now on-sale at WHSmith stores and online. As part of the **CM Expert** range, we have put together this 100-page book printed from previously published articles in *Car Mechanics*.

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We are sorry, but apart from material sent to *Help!* or *Diagnostics Doctor*, not all correspondence can be replied to personally, though everything is read carefully. Emails will be treated in the same way as ordinary mail – the editor is not normally available to provide instant replies.

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The

# Peter Simpson



**Peter has found a fabulous garage-workshop, but clearing the previous occupants stuff turned out to be surprisingly emotional.**

## COLUMN

► I've had a spot of luck this month and managed to fulfil another lifetime's ambition. I've found myself a lovely garage/workshop which is big enough to hold the entire classic car collection in one place. It's secure – owners live next door has light and power, and there's room to store them all, and without cramming them in so tightly that I can't get to any.

But the real clincher is that all this occupies just half of the available space. The other side contains the real *piece-de-resistance* – a Bradbury four-post lift which looks to have come out of an MOT station somewhere as it includes front wheel swivel plates. At the time of writing this isn't operational (the whole place has been unoccupied for at least a year) but I've booked a man who knows all about hoists to come and take a look next week. In any case, even if it was working I wouldn't want to go under a hoist until it has been checked over and serviced. I'll let you know what happened next time.

It was a classic case of being in the right place at the right time; it came up on the local Facebook Marketplace while I was scrolling, so knowing how sought-after decent storage space is, I made contact straightaway, viewed the next morning and agreed to take it there and then. I then paid three month's rent up front in cash. Handing over a four-figure sum in cash to someone you have only just met may sound risky, as indeed it is, but I had carried out a bit of 'due diligence' on my new landlady online and it was clear that she was exactly who she said she was. Past experience has also shown that in cases like this, paying a decent sum upfront shows good faith. It also makes it harder for someone to change their mind.

## Clearing the decks

As I say, this is the first time ever that I've been able to get four or maybe five cars under one roof. It's also the first time since 2010 that I've had any garage-type space. I've spent the past couple of weeks getting this one ready and suitable for my needs. The main issue so far has been sorting through and clearing out stuff left by the previous occupant.

In this case someone was supposed to have done this before – the 'deal' was that if they took everything and dumped the rubbish, they could have anything that was worth having FOC. But as so often happens with deals like this, the removal of rubbish was nothing like as thoroughly executed as the removal of stuff with value...

So, I had a fair amount of junk to shift, and in this case the whole thing was a bit, shall we say, emotional, because the previous occupant had passed away, and at times it felt a bit like I was picking through his life. Finding his work-boots was a bit sad, but the thing that really came close to bringing a tear to the eye was finding various broken and/or modified

tools which the chap concerned had either modified to do a particular job or broken in a failed attempt at doing another.

In short, the whole life of someone who was clearly an extremely skilled engineer was laid out before me and in a medium that was a lot more appropriate for him than a photo-album. The remaining workshop contents told the story of his other life, pottering in the workshop and enjoying himself no end... There was some stuff which, though I'd been told that I could clear out anything I didn't want, I just couldn't bring myself to dump.

There was, though, plenty of obvious rubbish – as I say, trusting a 'clearance' specialist to remove everything isn't always wise. There were various well-worn tractor parts plus a sprinkling of 1990s Ford parts, all of which went for scrap. and I've also smashed up and removed various old wardrobes and other pieces of redundant bedroom furniture that was being used as storage – for me the floorspace is more useful.

## Making use of some items

But as always in cases like this, there's also stuff which you don't want to dump because you can make use of it. In my case the stash included several solid wooden blocks which have clearly been used for lifting/supporting purposes, plus a half-empty 25 litre tub of 10W-30 engine oil which, once the contents have been used, will do very nicely indeed as a place to hold waste oil pending collection.

That was part one of project workshop. Part two involved bringing all my garage-type stuff in and arranging everything how I want it. Down the centre, and dividing the two 'sides', there's a hefty 30ft metal workbench with space underneath – under this I've put items which might be needed on either side – engine oil, stuff to soak up spillages, screenwash and so on. Of course, now I've got room to store it, I can buy items like this in big quantities. This is something I recommend anyone who can to do – long-term the savings are amazing! It was also a case of finding all the former garage contents where they'd been stored, garden shed, hobby room and upstairs. It will also be nice to have my toolbox out of the lobby.

At the time of writing this process is still ongoing. I hope to show you the finished and fully equipped 'facility' next month.

I'm sure one or two of you are wondering whether this new 'facility' means I no longer need to trim the collection, as discussed last month. To be totally frank, the jury is still out, though having extra space does take the pressure off a little. Overall, though, my gut feeling is still that one has to go, and I'm still thinking that the one to go might be the Rover 827 Coupe. But I'm not 100% sure that I want to. But at least there's now a bit of breathing-space...





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# Automatic Transmissions

With fewer than 30% of last year's new cars possessing traditional H-pattern manual gearboxes, **Rob Marshall** dives into the complex topic of automatic transmissions, including a technical insight into the latest technologies.

Once derided as blunting the driving experience, automatic gearboxes have improved to such an extent that some of today's new car models are not even marketed with manual transmissions. Automatic-only driving tests are also growing in popularity, comprising 20% of all examinations, compared with 5% a decade ago.

Do not think that this situation is down to a conspiracy against the manual. Significant improvements in automatic gearbox technology have even won over many driving enthusiasts. More appropriate gear changes, manual overrides, quick responses and even downshift rev-matching are all such features that have consigned the indecisive, sluggish and poorly executed automatic gearbox of yore to the dustbins of history.

Much of this transformation has been down to sophisticated electronics replacing mechanical systems. Transmission Control Units (TCUs) can be loaded not just with pre-determined manufacturer software but they can also self-learn, adapting themselves not just to driving style but also road conditions. They can also adjust themselves to changing internal tolerances, as the transmission's moving parts wear.

## Making efficiency desirable

From the late 1990s, when carbon dioxide emissions and corporate average fuel economy figures were chosen by the political classes as measures by which

► **Modern automatics cram more into less, while combining strength with lightness and preserving driver enjoyment with efficiency. How the traditional automatic has achieved this is little short of remarkable.**

car owners (and manufacturers) could be taxed/penalised, automatic gearboxes were still relatively inefficient, compared to manuals. Carmakers realised that business fleets and private buyers alike were becoming increasingly unwilling to accept the elevated costs, associated with higher fuel consumption and emissions, for the luxury of clutchless gear changes. With corporate average fuel economy legislation being enforced upon them, manufacturers were also under pressure to look for alternatives to the traditional automatic gearbox.

The subsequent introduction of single and twin-clutch automated manuals accelerated automatic transmission developments, especially in the efficiency stakes. While single-clutch automated manuals are not revered by the typical driving enthusiast, the far more complex and satisfactory twin-clutch (2CT), popularised by Volkswagen's DSG, ensured that motorists really could enjoy efficiency savings and a heightened driving experience. Now that these new-fangled transmissions have become de-rigour, including their not exactly blemish-free reliability records, it is easy to overlook the fact that the 'traditional' torque converter, electronically-controlled, epicyclic-gear automatic transmission has been fighting back.



Carmakers tend not to produce automatic gearboxes. Instead, they turn to a handful of specialists to provide the hardware. Therefore, you will find versions of the same gearbox used in different makes and models but this does not mean that they are identical. For this feature, we shall focus on ZF, a company that you may recognise as the parent company behind Lemförder and BOGE suspension components, TRW brakes and Sachs clutches. Yet, it is also one of the world's largest suppliers of automatic gearboxes, with a global customer base of vehicle manufacturers. It is not an easy task. The German-headquartered firm, with bases all over the world, including the UK, reports that carmakers demand transmissions that are light but dependable. It needs them to be compact but must cram in an increasing number of gears. The casings must also be shallow, so the gearboxes can be positioned as close to the ground as possible, to retain a low centre of gravity for maximum handling advantage. They must also be capable of handling more power and require less maintenance. These engineering demands are considerable and so it is not unreasonable to respect the automatic gearbox as one of the most advanced components fitted to a modern motor car.

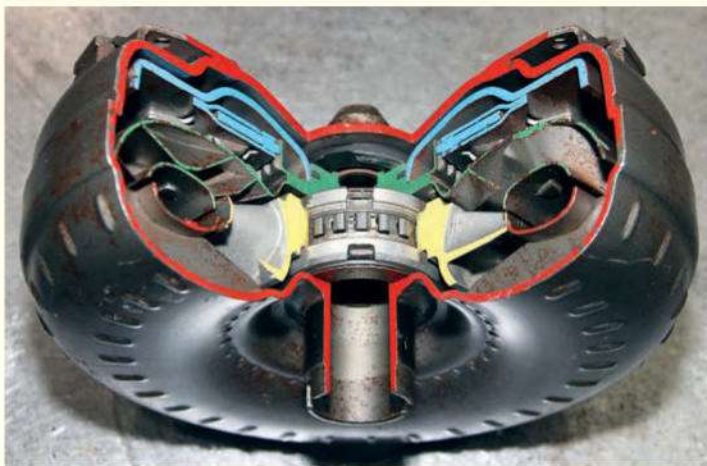


# HOW AN AUTOMATIC GEARBOX WORKS

► Despite appearing immensely complex and notwithstanding their fine tolerances, even a modern automatic gearbox is surprisingly simple. They comprise five main working parts:

## 1 Torque Converter

Located within the bellhousing, the torque converter is positioned between the driveplate (the auto's equivalent of a flywheel) and transmission. It replaces the manual gearbox three-piece clutch. Its role, therefore, is to act as a fluid coupling, transfer torque and multiply it from the engine crankshaft into the transmission. Instead of relying on friction, between a lining and the steel flywheel face, the torque converter uses hydraulic fluid. While clutch slippage on a manual car will wear the clutch rapidly, this is not a problem with a fluid coupling. Unfortunately, torque converters are sealed units, so they cannot be repaired without specialist equipment. Do not forget the driveplate, which tends to be used as a ring gear for the starter motor and, possibly, as a means for the engine ECU to detect engine speed. It does not have any vibration-damping properties, unlike a Dual Mass Flywheel.



## 2 Epicyclic gear set

The planetary gears are a defining feature of this traditional automatic gearbox. They comprise a sun gear in the middle, planet gears that surround the sun gear and a ring gear on the outer extremities. The planetary gear set is how the different gear ratios are selected.



## 3 Clutches

Multiple clutches and bands are employed that engage and disengage the various gear sets, according to the required ratio. The clutches lock parts of the planetary gear set accordingly but a degree of slip permits less aggressive and more comfortable changes.



## 4 Hydraulics

The hydraulic system is the nerve centre of the automatic gearbox. It permits the unit to function, while providing lubrication and cooling functions. Condition and specification of the hydraulic fluid are essential, not just for transmission operation but also for a long life. A pump (pictured) pressurises the fluid, which is directed to an electro-hydraulic valve body. Hydraulic pistons apply pressure to the clutch packs, squeezing them together with a force appropriate to the amount of torque that they transmit. As older transmissions lack electrical management, they rely on hydro-mechanical systems, instead.



## 5 Electronics

While early autos were controlled solely by hydraulic and mechanical means, modern units rely on electronics.

Mechanical governors and cables, which determine throttle position, for instance, have been replaced by lighter, cheaper and more reliable electronic sensors. The brain of the entire operation is the Transmission Control Unit (TCU), which contains the basic car manufacturer software, as well as self-learning data. TCUs do not work in isolation on modern cars. Through CANbus data networks, they communicate with other ECUs on the vehicle and take into consideration multiple data sources, including those from the steering angle sensor and even GPS data, allowing it to read the road and optimise shift patterns accordingly.



## The need for change

Unsurprisingly, the traditional automatic gearbox has evolved considerably but the latest units retain the defining epicyclic planetary gear sets. They also utilise hydraulic pistons, clutch packs and oil pumps. Yet, these parts differ greatly from those fitted to their forebears,

benefitting from the latest in advanced materials and manufacturing techniques, while remaining lightweight but strong.

A crucial way, in which the modern gearbox has changed, is the more intelligent management of hydraulic pressure. Where old transmissions shed hydraulic pressure wastefully, modern units direct pressure to areas where it is needed.

Traditionally, torque converters used to 'slip', whenever the throttle was applied. This meant that fuel would be wasted, by its internal impellor and turbine rotating at different speeds, causing an unnecessary rise in engine RPM. While the solution is to lock them together mechanically in top gear, modern torque converters can be locked on-demand.



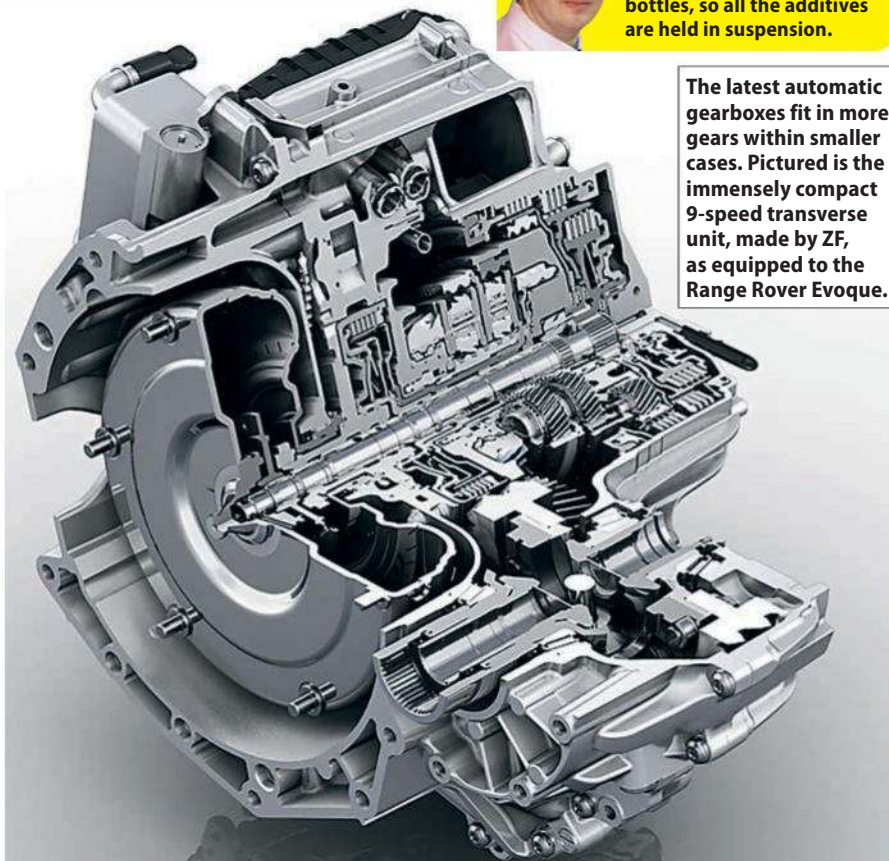


## ROB'S TOP TIP

Shake ZF Lifeguard ATF fluid bottles, so all the additives are held in suspension.

## The ZF input

Although ZF started making automatic transmissions in the 1970s, the British market became more familiar with the four-speed transverse unit, fitted mainly to French models in the ensuing decade. The company introduced five-speed units in the 1990s, six-speeds in the noughties, eight-speeds from 2009 and nine-speeds in 2013. Each generation added more gears, with fewer gaps between each ratio, which helps keep the engine at its most efficient operating speeds. These transmissions have also become lighter but capable of transmitting more power. ZF's eight-speed transmission, for instance, is 13% more efficient, compared with the preceding six-speed unit. Yet, the new nine-speed gearbox is over 10% more efficient than the eight-speed. While carmakers start winding down their parts supplies ten years after production of a specific model ends, ZF's spares division, ZF Aftermarket, remains committed to supplying parts and technical information for its older transmissions through its ZF Tradition programme. More information about this can be found online at: <https://bit.ly/3ZKSM8u>



The latest automatic gearboxes fit in more gears within smaller cases. Pictured is the immensely compact 9-speed transverse unit, made by ZF, as equipped to the Range Rover Evoque.

## TRANSMISSION FLUIDS

► The transmission fluid is the automatic gearbox's lifeblood. It cools, lubricates, protects and provides a hydraulic medium. As it experiences higher temperatures than manual transmission gear oil, it is more prone to thermal degradation. Yet, many carmakers state that their gearboxes are filled for the life of the vehicle and require neither topping-up, nor draining. One car manufacturer told *CM* that it defines life of the vehicle as seven years, or fewer, if the car is used for towing. This is below the average age of a typical car on UK roads and is almost certainly less than the average *CM* reader will expect.

Unlike engines, automatic gearboxes hold plenty of fluid in suspension, most of which within the torque converter. Therefore, to conduct a thorough oil change, the system should either be flushed, or you could conduct multiple changes. In either case, you need a lot of oil, much of which will be discarded.

Be paranoid about oil specification, because not all transmission fluids are the same. Consult your user handbook and, if using an online oil checker, try several different versions and verify that the advice is consistent. Many classic transmissions, such as Borg Warner 35/65s, use historic Ford specifications, which are not compatible with the later and more popular automatic transmission fluids, which are based upon General Motors' Dexron ratings. Generally, Dexron VI (from 2005) is backwards compatible with earlier types up to Dexron II (1978). However, Dexron ULV (Ultra Low Viscosity from 2014) is not. Should your handbook provide manufacturer part numbers but no explanation about the oils specification, ZF Aftermarket provides a useful guide in its TE-ML11 document, which can be downloaded from: [https://aftermarket.zf.com/lubricants/en/te-ml\\_11-en.pdf](https://aftermarket.zf.com/lubricants/en/te-ml_11-en.pdf).

Such fluids are incompatible with hybrid and e-drive automatic gearboxes, including electrified ZF eight-speed units. Fortunately, ZF Aftermarket has made e-fluids available, the cars for which they are suitable can be accessed in the TE-ML-30 technical information: <https://aftermarket.zf.com/remotedia/new-structure-2020/applications/ol-lubricants/ol-en/ol-te-ml-30-en.pdf>

For its six-speed automatic gearboxes, ZF recommends that you change the fluid every eight years, or 90,000 miles, whichever comes first, using 'Lifeguard 6' fluid. For its eight-speed automatics, ZF advises its 'Lifeguard 8' with the same change interval. Its nine-speed gearbox, which is used, most commonly, by the Range Rover Evoque, requires a five-year/60,000 miles oil change, owing partly to its relatively reduced oil capacity.

While automatic transmission fluids are not everlasting, they cannot be stored for long periods, either. ZF Aftermarket advises that its Lifeguard Fluids have a four-year shelf life and should be stored in a relatively cool, dry and well-ventilated place. Should Lifeguard fluids be older than three years, ZF Aftermarket comments that the additives can separate, necessitating adequate mixing before being used.





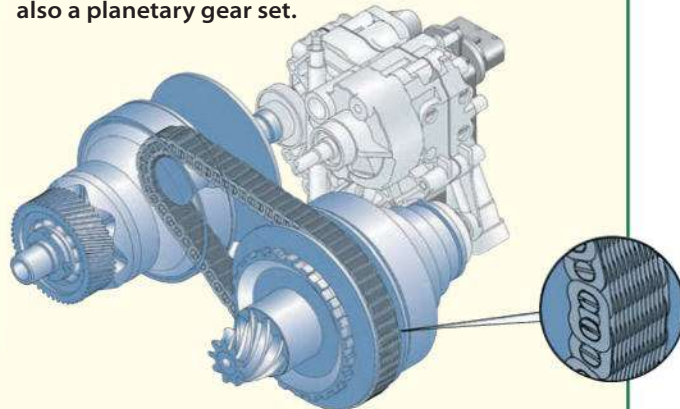
## PICKING THE 'AUTO' FOR YOU

▶ Not helped by mechanically-ignorant salespeople, you will encounter different types of automatic transmissions, which work and can feel very different from one another. Some motorists have expressed dissatisfaction, when their 'new' auto behaves differently to the transmission on their older car. Rather than a fault, the issues tend to be intrinsic to the transmission's operating principles, meaning that the supposed issues cannot be resolved. The problem stems from the gear lever gate for all of the various types of transmissions sharing the now universal 'P, R, N, D' format – meaning that the driver may think that all automatic gearboxes are the same, when they are not.



### **A** The 'trad' auto

The gearboxes that feature within the article are the traditional, albeit highly-developed automatic transmissions. These are defined not just by possessing a fluid flywheel torque converter but also a planetary gear set.

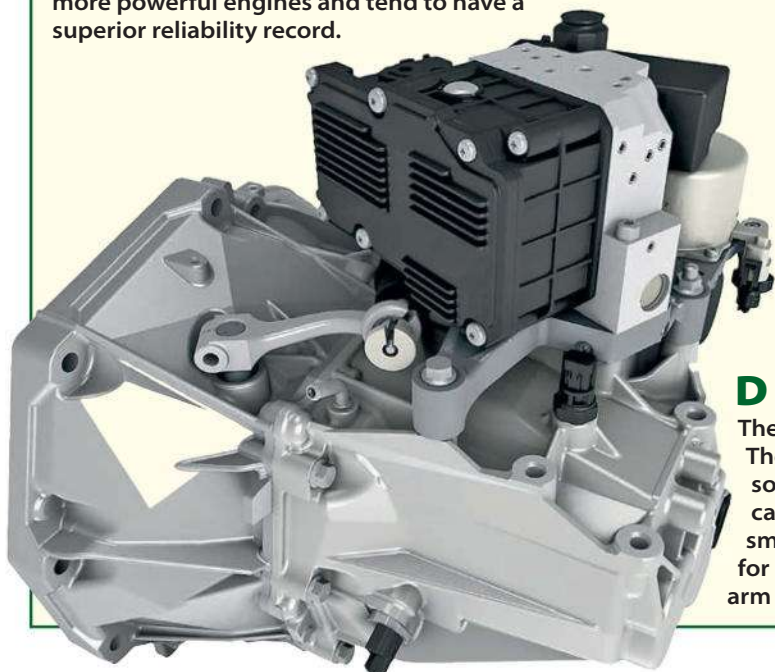


### **B** Belt drive

An alternative is CVT (Continuously Variable Transmission), which employs a pulley drive to vary the gear ratios infinitely between two points. To make this step-less transmission seem more conventional, their makers tend to add software-driven gear points and give them a 'creep' function, whereby the car would move forward slowly at engine idle speed, whenever a forward, or reverse, gear is selected. These functions did not appear on the original DAF rear-wheel-drive systems, which utilised rubber-reinforced belts that required periodic replacement. Modern metal CVT belts are enclosed within the transmission case and are designed not to be replaced – although many of them require it at some stage.

### **C** Twin-Clutch automated manuals

Popularised by the Volkswagen Group's DSG gearbox, Twin Clutch (2CT) gearboxes have more in common with manual transmissions than traditional automatics. They comprise two gearboxes, linked together by a pair of clutches. The gears are pre-selected and the change occurs, by manipulating the clutches. The result is a very fast ratio change. These units can possess dry, or wet clutches, with the latter being fitted to more powerful engines and tend to have a superior reliability record.



### **D** Automated manuals

The last type of automatic is an automated manual. These units are relatively dim-witted, compared to more sophisticated and expensive gearboxes, but they allow carmakers to produce a cost-effective automatic option on small and budget cars. They are especially popular in India, for instance. The manual gears are operated by a motorised arm and the dry clutch is powered by a servo motor.

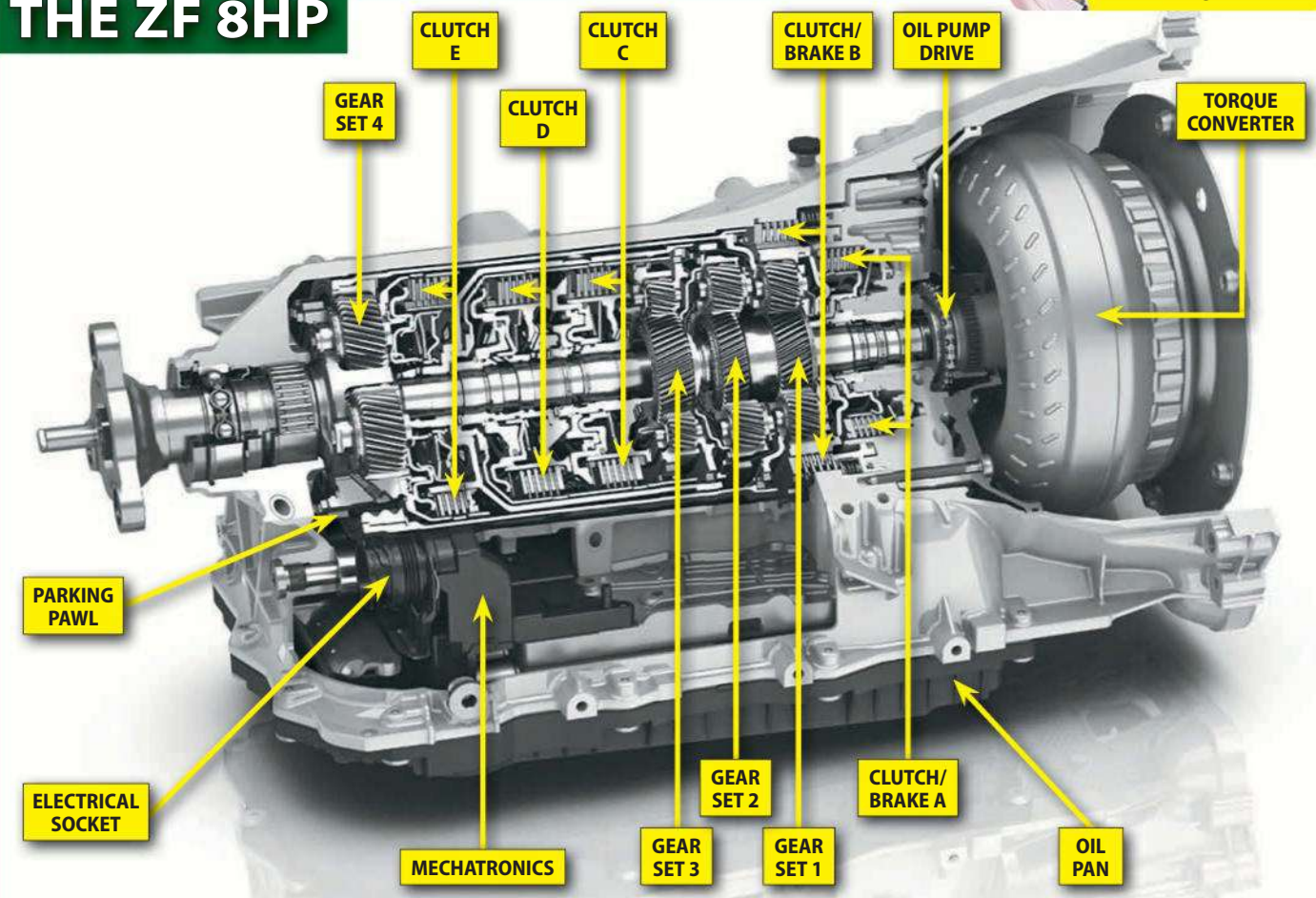






**ROB'S TOP TIP**  
Oil changes tend to increase gearbox life.

## THE ZF 8HP



► This feature examines the eight-speed ZF transmission, introduced first in 2008, and fitted to a huge variety of makes and models. This unit, therefore, is modular and immensely flexible, incorporating not just all-wheel-drive variants but micro, mild and high-voltage hybrids. The net result is that the 8HP family comprises 700 different versions, plus almost double the quantity of software variations.

This huge variation is one reason why seeking second-hand parts is unwise. To identify the exact version fitted to your car, inspect the identification plate. '8' means eight-speed. 'HP' identifies an hydraulic planetary geared automatic transmission. The next number indicates its maximum torque capacity, or design size, divided by 10. For instance, 50 means 500Nm, or '70' means 700Nm. Finally, letters might be included, such as 'A', or X, for All-Wheel-Drive, or 'P' for Hybrid. This formula can be applied as a general rule to identify ZF's automatic gearbox range but be wary that it is not entirely accurate to identify the torque capacity of older units.

While this article focusses mainly on hardware, we

should highlight that the self-learning TCU is integrated within the mechatronics unit inside the gearbox casing. While you should be able to communicate with the TCU to access live data and record/delete fault codes, ZF Aftermarket highlights that it is inadvisable to delete the adaptive parameters, because this 'reset' means that the gearbox loses the allowances it has made for wear. Some transmissions can take hundreds of miles to re-learn and ZF Aftermarket reports that success is not always guaranteed.

ZF Aftermarket emphasises that car owners and even general garages are very unlikely to succeed with physical automatic gearbox repairs. The main reasons are the requirement for almost sterile conditions, the need for specialist expensive tools and a significant risk of general tools and unskilled persons damaging the transmission beyond repair. Rather than following a formal rebuilding protocol, the following overview demystifies what is inside a modern automatic transmission and what the various parts look like, using an 8HP unit that ZF Aftermarket uses to train dedicated UK transmission professionals.



◀ Getting the transmission fluid level right is immensely important. Too little risks overheating and ruining the gearbox. Too much can carry similar risks, although many gearboxes will eject the fluid through their breathers. The latest gearboxes, such as ZF's 9-speed units, require special tools to ensure that the level is just right. This drain plug possesses an extension, so excessive fluid drains out on refill.

► The torque converter transmits power from the engine into the gearbox. Being a fluid coupling, automatic fluid is the medium, which is flung outwards from the impellor into the turbine's blades, encouraging the turbine to rotate and, therefore, power the gearbox. Modern torque converters contain a clutch that locks the turbine and impellor together, so they rotate at the same speed.





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## **ROB'S TOP TIP**

The mechatronics combines the valve body and the TCU.

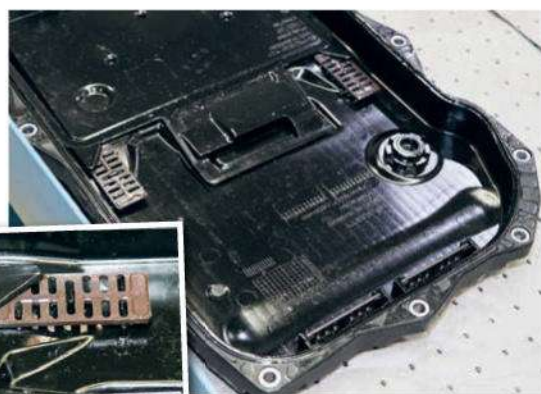
## **ZF EIGHT-SPEED COMPONENTS**



**A1** ◀ Our demo transmission is a rear-wheel-drive ZF eight-speed gearbox. It is pictured mounted upside down, with the oil pan facing skywards.

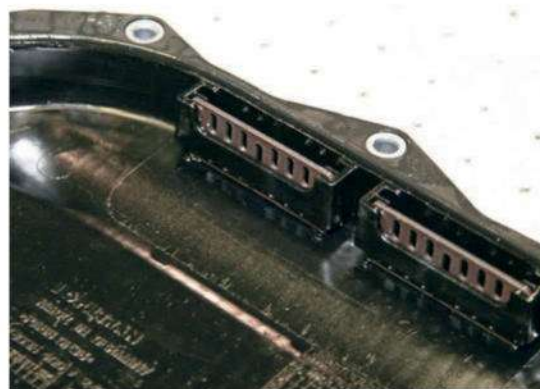


**A2** ▶ The plastic oil pan is secured by a ring of Torx bolts. Once these are removed, the pan and its gasket can be dismantled, allowing access to the internal components.



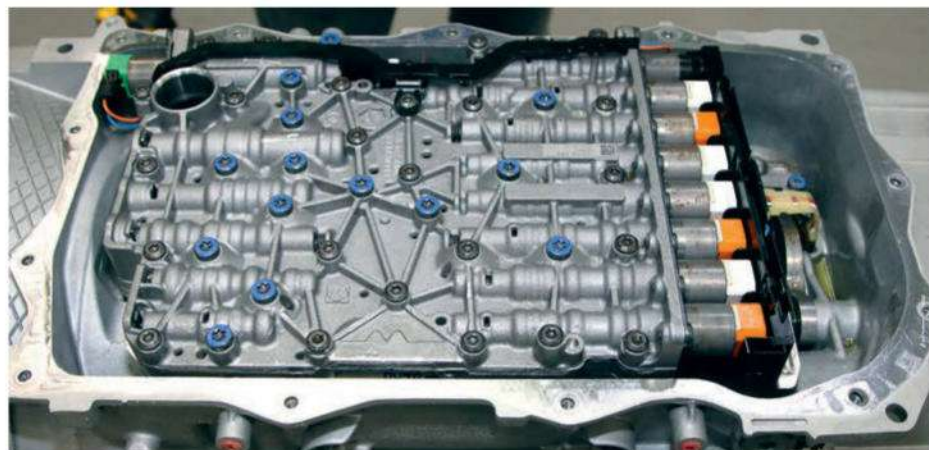
**A3** ◀ The sump pan contains several filtration magnets, which help to prevent abrasive metallic particles from circulating and damaging other components.

**A4** ▶ Do not be tempted to install extra magnets in any redundant slots from the removed plastic sump, because this well-meaning move can prevent the parking pawl from engaging, especially on certain BMW models.



**A5** ◀ Cars that feature Stop-Start systems pose a challenge, because the mechanical oil pump cannot build sufficient pressure at a high enough rate to allow the transmission to react fast enough. To improve the driver experience, a Hydraulic Impulse Storage (HIS) unit is installed to support gearbox hydraulic pressure.

**A6** ▶ Despite being precision-made, the HIS works on simple principles, being a hydraulic cylinder that contains a piston. It is bolted to the transmission casting but a common error is to tilt the unit as it is being withdrawn, which breaks the plastic end. As the HIS is non-repairable, a replacement unit costs approximately £800.



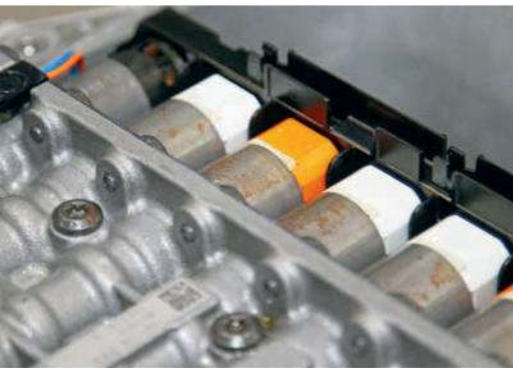
**A7** The combined hydraulic and electrical mechatronics unit dominates the view. It is a delicate unit that can be damaged by static electricity, introduced when handled. Torx bolts secure the unit to the transmission – for clarity, these are painted blue in this example. The other bolts hold the unit together. ZF recommends that the assembly is not split. Should those bolts not be tightened correctly, the reduction in tolerance can 'pinch' the internal hydraulic pistons, preventing correct gearbox operation.



**A8** Pictured is the parking pawl's pivot. Understandably, the pawl is made from thick steel, which engages with the output shaft. It is designed not to engage, when the road wheels are turning. Should this happen, the likelihood is that the resultant force would crack the transmission casing, rather than damage the pawl. See also Steps A14 and A15.



# Getting to grips with **AUTOMATIC TRANSMISSIONS**



**A9** Electrical solenoids (that act as pressure regulators) form part of the mechatronics unit. They can be tested in the conventional way for an open circuit condition when cold but they share neither the same resistance values, nor operational values. Should you be unsure, you can contact ZF Aftermarket via telephone, or e-mail – details are on page 6.



**A10** The solenoids are supplied with power from the large plastic electric port, mounted to the transmission's side. It contains multiple electrical pins that also form a vital part of the vehicle's communication bus network. Being made from plastic and containing multiple electrical pins, it is a delicate component and should be treated carefully.



**A11** This electrical port is retained firmly by a strong internal metal collar. Therefore, attempting to twist the port from outside the gearbox will risk fracturing it.



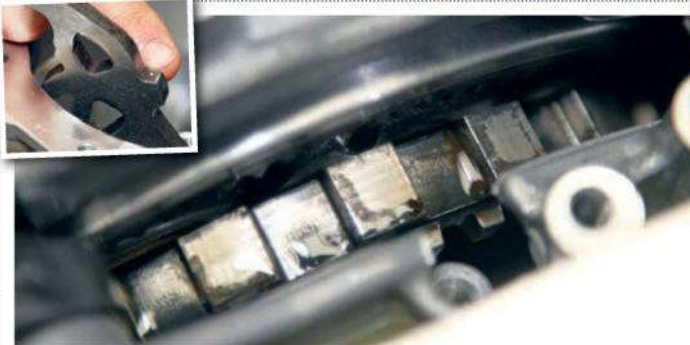
**A12** The transmission also feeds back speed information, using accurate but delicate speed sensors, such as this one for the output shaft that is part of the mechatronics assembly. As the unit can be lifted out, it can be replaced.



**A13** The mechatronics dominates the 8HP's lower chamber, with the shafts, gears, clutch packs and pistons being contained within the main casting. Once lifted from the transmission...



**A14** ...the rest of the parking pawl is exposed, revealing how it operates. The external mechanical operating pivot shaft can be manipulated manually, should the gearbox refuse to come out of 'Park', due, possibly, to an external electronic actuator failure.



**A15** To elaborate on Step A8, the parking pawl locks the output shaft but is designed to skip over the teeth, should the shaft be rotating. The picture shows the components that are beneath the plate, retained by the three painted blue Torx screws from Step A14.



**A16** ◀ Even so, the transmission detects whether 'Park' is engaged, or not, by using this hall sensor (magnet and pick-up) arrangement.

**A17** ▶ The oil pump and front cover assembly are positioned behind the torque converter, within the bellhousing, held in place by a ring of bolts.







## ROB'S TOP TIP

Approach your carmaker for TCU updates, not ZF Aftermarket.

## ZF EIGHT-SPEED COMPONENTS CONTINUED



**A18** A dedicated puller is required to remove the oil pump and front cover assembly. It clamps to the torque converter drive (as indicated) and applies force to the input shaft.



**A19** As modern transmissions must be lightweight, they have less tolerance for unapproved methods of dismantling and repair. Attempting to lever two parts apart may have worked in the past but, when this technique is used on a modern transmission, the risk increases of damaging expensive parts beyond repair, including the casing.



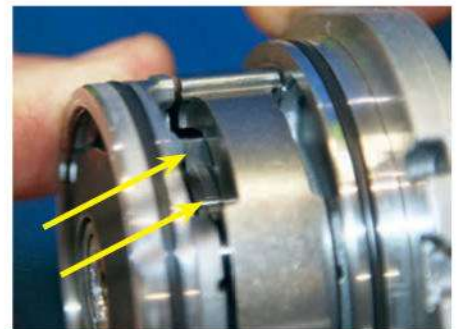
**A20** Pictured is the complete oil pump and front cover assembly, removed from the transmission.



**A21** The oil pump on this gearbox is chain-driven, the drive of which can be viewed through the aperture. Certain Hybrid versions of the 8HP possess electric-powered pumps. Also visible are the oil pump inlet and outlet.



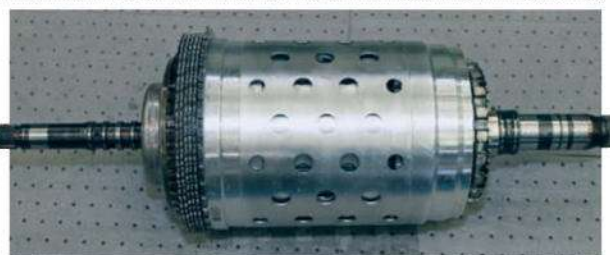
**A22** The oil pump is a separate component, within the front cover. Pictured is a removed unit, held against the cover to show the fitting position.



**A23** Some 8HP oil pumps possess oil pump vanes that extend outwards as the shaft spins (arrowed). Should you allow transmission oil to drain for an extended period, refill the transmission and start the engine, the pump might not prime. A useful solution is to engage 'Park' and rev the engine to around 3000-4000rpm, so the vanes spread out. You should then find the drive restored.



**A24** ◀ As well as the oil pump, the front cover houses the front clutch pack A, which acts as a brake. A large circlip retains it in place and, after it has been removed, the individual friction plates and steels can be accessed.



**A25** ▶ An interesting feature of the ZF eight-speed transmission is that the rest of the components can be withdrawn as one unit. This assembly includes a one-piece input shaft, which ZF says makes its eight-speed unit stronger. The earlier six-speed (6HP) unit possesses two input shafts, joined by a bushing contained within the E clutch.



**A26** ◀ ZF says that its input shaft is hardened by a special heat treatment at the factory and the process creates a blueish tinge. This is intentional. Should your transmission rebuilder report that the input shaft needs replacing, due to the shaft's colour indicating it has been weakened by overheating, this conclusion is likely to be incorrect. Note the holes, through which transmission fluid flows (arrowed).



**A27** ▶ At this point, the transmission case appears to be empty. Note that part of the brake for the B clutch is incorporated within the casting. Brake A is incorporated within the front cover/oil pump drive, pictured in Steps A20 and A21.







**A28** Pictured is the second clutch pack (clutch B, which is also a brake) being lifted from the input shaft.



**A29** Beneath the hub, pictured being lifted away, is the planetary gear assembly, that comprises the first gear set.



**A30** Once the first gear set is lifted from the input shaft, the sun gear can be seen for the second gear set.



**A31** With the sun gear assembly raised, the rest of the second planetary gear set is revealed.



**A32** The second gear set lifts out with the complete input shaft.



**A33** The third planetary gear set's sun gear is then lifted out, followed by the third gear set.



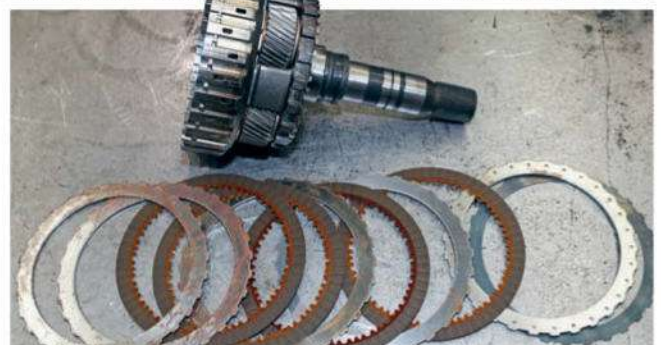
**A34** ◀ The large-holed basket contains a set of components, which mesh with the fourth gear set.

**A35** ▶ Pictured from left-to-right, these components are: the basket, a drum with an integral sun gear that meshes with gear set 4, C clutch, D clutch and an annulus for the fourth gear set.



**A36** ◀ The fourth gear set is positioned at the back of the gearbox. During this dismantling demonstration, the gearbox is mounted on a special stand, so you cannot see the output shaft.

**A37** ▶ You can view the shaft here. Gear Set 4 also incorporates Clutch Pack E. The rusty steels are a symptom of antifreeze/glycol contamination.





## ZF EIGHT-SPEED COMPONENTS CONTINUED



**A38** The 'blueing' on the outer drum (which is not hardened from new, unlike the input shaft) indicates that the clutches have been slipping and overheating.

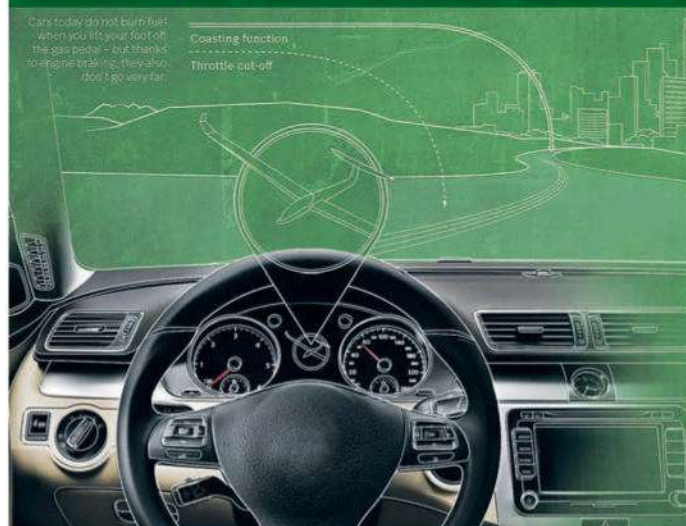


**A39** The drum incorporating Gear Set 4 includes the integral hydraulic piston that squeezes the clutch packs together.

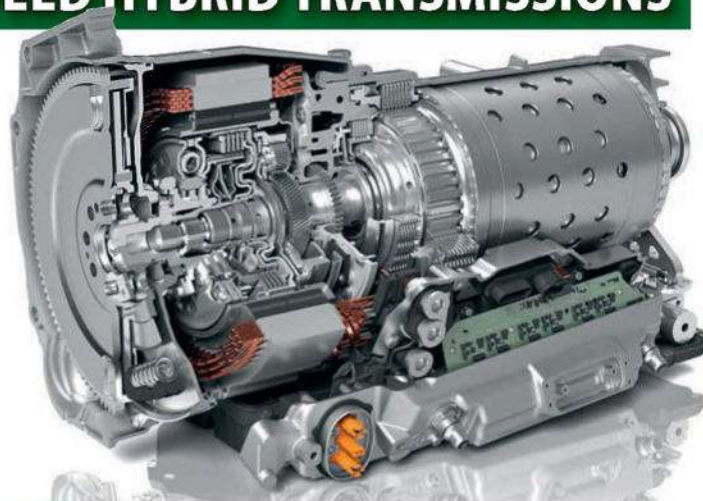


**A40** As shown in Step A25, the components behind the oil drive/front cover are contained within a large basket, which is incredibly light and strong. However, it can be broken surprisingly easily by inexperienced repairs.

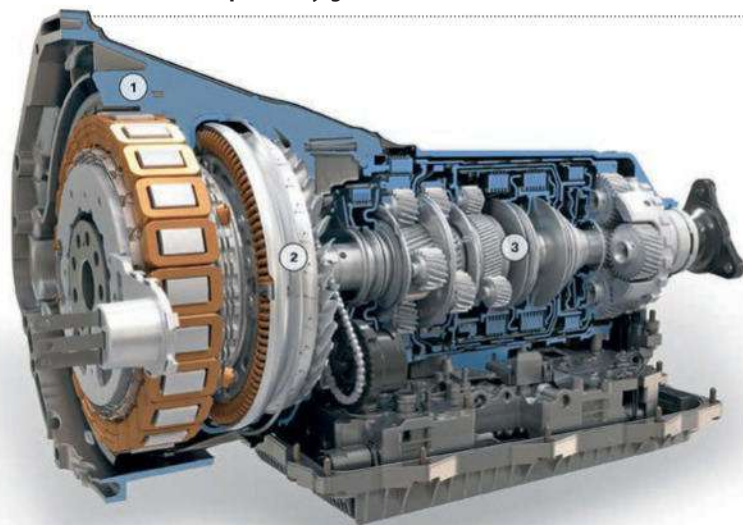
## ELECTRIFICATION: ZF EIGHT-SPEED HYBRID TRANSMISSIONS



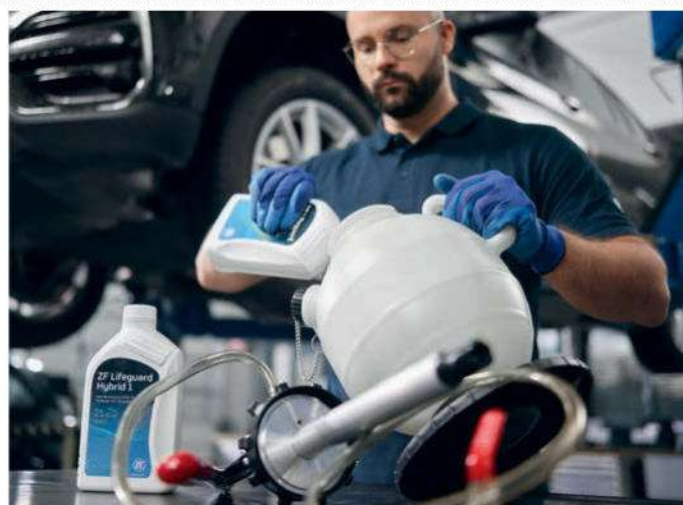
**B1** The need for not just new fuel and CO<sub>2</sub>-saving technologies but also electric-only propulsion does not mean the end of the well-established planetary-gear automatic transmission.



**B2** ZF's eight-speed gearbox is used in micro (i.e. Start-Stop) and mild-hybrid 48-volt cars. The high-voltage parallel hybrid means that the car can be driven in electric-only mode, too. The main difference is the inclusion of a large electric motor. Yet, you can see the main gearbox components enclosed within a large basket.



**B3** This different cutaway shows another ZF eight-speed parallel hybrid transmission, which retains the same basic layout, including the four planetary gears. Annotation (1) denotes an electric motor, producing 210Nm of torque. (2) is an hydraulic torque converter that boasts a lock-up clutch. (3) shows the main gearbox components.



**B4** These high-voltage parallel transmissions have special lubrication requirements, which must be followed. We do not recommend working on high-voltage vehicles unless you are suitably qualified and aware of the potential dangers. For more information, see *CM* March 2024 issue.



# CLUTCH PACKS



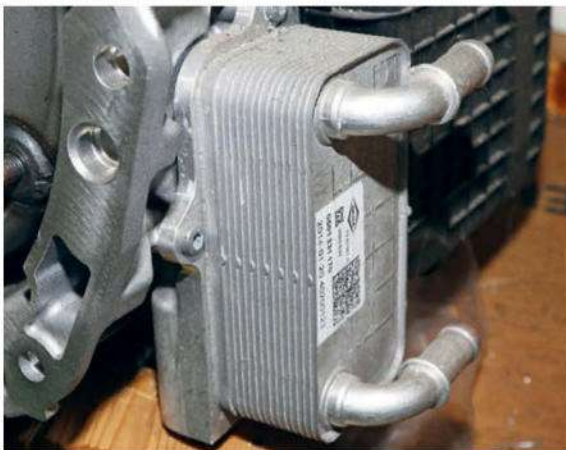
## ROB'S TOP TIP

A Power Control Module (PCM) controls both engine and transmission. A TCU controls the transmission, only.

▶ All drive passes through the clutch packs within the gearbox, which are lubricated by the transmission fluid. These comprise metal rings, to which friction material is bonded, which bear against separate metal rings, called 'steels'. A set of friction discs and steels make up a clutch pack. If the manufacturer adds more friction plates and steels to a pack, the surface area is increased and, therefore, the transmission can transmit more power. Clutch slippage is important for smooth changes. Yet, excessive slip generates a lot of heat, which either wears, or damages, the clutch pack. Extreme temperatures have ramifications for transmission oil longevity, too. A useful way of checking if the clutch packs are in good order is to inspect the transmission fluid, especially if the car has a manual dipstick. Should the fluid be brown, or black, and/or possess a burning odour, the clutch packs may require renewal. Naturally, this necessitates that the gearbox be removed and stripped down.



**C1** When the transmission is apart, professional remanufacturers look for failure clues. A way that they detect excessive temperatures within the clutch packs is to look at the steels. As seen here, the blue marking indicates that this steel has overheated.



**C2** ◀ Glycol within antifreeze causes the friction material to swell and become detached from the metal plates. It also corrodes the internal metal parts and degrades all of the delicate rubber seals. The most common reason for failure is transmission oil cooler corroding internally. Should you suspect that anti-freeze has entered the gearbox, you can buy glycol test kits to test the transmission fluid. Budget for a gearbox overhaul, should any be present.

# TUNING

▶ ZF reports that the stated figure is the maximum permissible peak torque figure that can be transmitted reliably through that specific transmission. While ZF might produce the gearbox, and even the electronic hardware, the car manufacturer writes the software. Typically, this is designed to provide the best of all worlds. For instance, quick gearchanges tend to be at the expense of comfort. Slow changes might be ideal for passengers but they can frustrate the sporting driver, as well as shortening clutch life, owing to the increased slippage.

However, when aftermarket tuners raise engine output, they may also offer a TCU remap. This tends to involve raising the hydraulic pressures, so more clamping force is applied to the clutches, allowing them to transmit more torque without slipping. The downside of taking the transmission past its design limits in this way is that the unit is under greater stress and runs hotter. ZF Aftermarket advises that any transmission that has had its software modified should be treated in the same way as one that has been used for towing and serviced more regularly.



**C3** ZF Aftermarket reports that, while friction discs and seals are assembled as packs, they are unavailable as a kit. Therefore, parts are ordered individually. Pictured is a new friction plate.



**C4** ▲ Remanufacturers also assess friction plate condition. This one has light wear.

**C5** ▲ This disc has moderate wear.



**C6** ▲ Whereas, this glazed disc boasts heavy wear.

**C7** ▲ The difference between worn and burnt-out discs is easier to distinguish.



# CM Insider

**Martyn Knowles** brings you news and product reviews from the automotive industry



## New research reveals extent of MOT crisis in Great Britain

► Data crunched by motor factor delivery partner **Gophr**, has revealed the true extent of the MOT crisis in Great Britain, as garages struggle to get cars back on the road. A lack of MOT-authorized garages, increasing numbers of cars on the road combined with vital parts becoming harder to source quickly, means that mechanics face a pile-up of vehicles awaiting tests to prove that they are roadworthy.

Gophr's 'Pressure for Parts' research, has shown that the number of MOT-authorized vehicle testing stations (VTSs) in Great Britain that can carry out class 4 MOTs (the standard MOT test for most cars or vehicles with up to 8 passenger seats) has dropped by 167 in the past 12 months to 22,962 vs 23,129 in 2023. As a consequence nominated testers (NTs) are overstretched and struggling to meet demand in these areas, while drivers are also being forced to travel far out of their local area just to get an MOT test.

Adding to this pressure on test centres, is the 11.31% increase in passenger vehicles over the last ten years, with 32,694,800 cars on the road in 2024.

Gophr's also revealed that 'MOT Deserts,' outside of London, are most prevalent in Milton Keynes, with 3621 cars per MOT test centre (VTS) with Swindon (2753 cars per VTS) and Brighton (2434 cars per VTS) rounding off "The Top Three".

The "Top Ten 'MOT Deserts' (GB excluding London) are:

<b>Milton Keynes:</b>	3621 cars per VTS	318,700 cars ÷ 88 VTSs
<b>Swindon:</b>	2753 cars per VTS	261,600 cars ÷ 95 VTSs
<b>Brighton:</b>	2434 cars per VTS	92,500 cars ÷ 38 VTSs
<b>Leeds:</b>	2034 cars per VTS	437,400 cars ÷ 215 VTSs
<b>Sunderland:</b>	1911 cars per VTS	118,500 cars ÷ 62 VTSs
<b>Portsmouth:</b>	1707 cars per VTS	116,100 cars ÷ 68 VTSs
<b>Edinburgh:</b>	1455 cars per VTS	180,500 cars ÷ 124 VTSs

<b>Luton:</b>	1379 cars per VTS	91,100 cars ÷ 66 VTSs
<b>Birmingham:</b>	1370 cars per VTS	426,300 cars ÷ 311 VTSs
<b>Coventry:</b>	1228 cars per VTS	147,400 cars ÷ 120 VTSs

Meanwhile, the story in London makes for worse reading for those hoping for a quick MOT turnaround.

Gophr's Top Ten 'MOT Deserts' across all London Boroughs are:

<b>Westminster:</b>	12,500 cars per VTS	62,500 cars ÷ 5 VTS
<b>Islington:</b>	8400 cars per VTS	33,600 cars ÷ 4 VTS
<b>Kensington &amp; Chelsea:</b>	4762 cars per VTS	38,100 cars ÷ 8 VTS
<b>Lambeth:</b>	3163 cars per VTS	60,100 cars ÷ 19 VTS
<b>Sutton:</b>	2907 cars per VTS	84,300 cars ÷ 29 VTS
<b>Southwark:</b>	2750 cars per VTS	55,00 cars ÷ 20 VTS
<b>Bromley:</b>	2641 cars per VTS	142,600 cars ÷ 54 VTS
<b>Hackney:</b>	2531 cars per VTS	40,500 cars ÷ 16 VTS
<b>Redbridge:</b>	2438 cars per VTS	102,400 cars ÷ 42 VTS
<b>Hammersmith &amp; Fulham:</b>	2405 cars per VTS	45,700 cars ÷ 19 VTS

Drivers having to use MOT centres within emission zones in non-compliant vehicles also run the risk of paying the emission charge twice if their vehicle has to be kept in overnight – further increasing the need for centres to clear backlogs quicker.

Adding to MOT pressures – garages are also increasingly finding it difficult to source vital parts for non-MOT related problems, with their mechanics struggling to get hold of radiator hoses, dashboard panels and steering shafts leading to 'jams' in getting cars back on the road. Additionally, the industry is facing a significant skills shortage, leading to garage owners increasingly calling in contractors to cover the excessive workload.



## SEALEY launches tool promo

► Get ready for winter with SEALEY's latest Tool Promotion, featuring over 1900 incredible deals and more than 120 new products. This season's promotion spotlights essential heating, charging and lighting tools to help you prepare for the colder months ahead.

### Explore the new LED twist family

This edition introduces new additions to SEALEY's popular LED Twist family of inspection lamps. The range starts with the compact LED201G, delivering 200 lumens, and extends to the LED2001G model providing a powerful 2000 lumens.

### CHRISTMAS GIFT IDEAS

Look out for the gift idea logo throughout the promotion for fantastic gift inspiration. Highlights include the new 40-piece Tool Kit Advent Calendar and three stylish Mini Toolboxes, available in Red, Black and Green.



## WIN a Winter Workshop Essentials package

► One lucky winner will receive a winter essentials package, including Rollcab, RoadStart®, Heater and LED Twist Inspection Lamp, valued at over £870 list price. Enter online for your chance to win this incredible prize.

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News in Brief



**NEW Machine Mart Autumn Winter Catalogue**

► Featuring 500 pages of Tools and Machinery for hobbyists, DIY enthusiasts and professional tradesmen alike, the **Machine Mart** range has everything your brass cogs could possibly conceive of, from wrenches to racking and heating to hammers. Brimming with bumper bargains, and over 1000 price cuts and new products. To get your **FREE** copy of the catalogue, visit [www.machinemart.co.uk](http://www.machinemart.co.uk), go to one of our friendly Machine Mart stores or call **0844 880 1265**.



**Castrol** has launched **MAGNATEC 0W-20 GSX/DSX** – a low-viscosity lubricant specially formulated to deliver high standards of wear protection for engines fitted to a wide range of **Stellantis** group vehicles. The new **MAGNATEC** formulation is the first to meet both Fiat 9.55535-GSX and Fiat 9.55535-DSX specifications that cover Euro 6 petrol and diesel engines. The new product is also compatible with the European Automobile Manufacturers' Association's (ACEA) C5 and C6 specifications. This latest addition to the **MAGNATEC** product range is now available to workshops in large packs of 208- and 60-litres, and smaller packs of 5- and 1-litre capacities.

NEW FROM THE TOOL CONNECTION

Three additions to lighting range

► The **9043** Pull-Out Rechargeable Work Lamp offers a dual-function lighting solution, combining a 500-lumen COB work lamp with a 100-lumen LED torch. Powered by a rechargeable 3.7V 1600mAh polymer battery. Its durable ABS plastic body features knurled thermoplastic rubber (TPR) grips for enhanced handling, along with a rotatable magnetic base and a hanging hook for flexible mounting options. The COB work lamp automatically activates when pulled out and can be rotated 180°, providing precise illumination where needed. The unit is supplied with a USB Type-C charging cable. The operating time of the work lamp is approximately 4 hours, the LED torch 10 hours. Charging time: 4-6 hours.



9043

**£40.20 RRP**  
[www.lasertools.co.uk/Product/9043](http://www.lasertools.co.uk/Product/9043)

The **9044** Folding Rechargeable Work Lamp is a professional-grade lighting solution that combines a fold-out 500-lumen COB work lamp with high and low settings, alongside a 20-lumen LED torch. The ABS plastic body features knurled TPR side panels for superior grip, while the magnetic base and hanging hook provide flexible mounting options.



9044

**£50.30 RRP**  
[www.lasertools.co.uk/Product/9044](http://www.lasertools.co.uk/Product/9044)

Both the COB work lamp and LED torch can be rotated 180°, with the COB lamp offering a 360° swivel function, allowing for precise light direction in tight or awkward spaces. Switch modes: high COB (500 lumens), low COB (200 lumens) and LED torch (20 lumens).

The unit is supplied with a USB Type-C charging cable for quick recharging of the 3.7V 1800mAh lithium-ion battery. The operating time is 1.5 to 3 hours, depending on the mode, with a charging time of 4-5 hours.

The **9045** Mini Work Lamp delivers powerful illumination in a compact package, offering 1000 lumens of bright light from its 10W COB LED. Featuring high, low, and flashing settings, this work lamp is powered by a rechargeable 2000mAh lithium-ion battery. The durable ABS plastic and thermoplastic rubber (TPR) construction ensures longevity, while the fold-out stand with a magnetic base allows for hands-free use and precise positioning. Additionally, an integral carabiner clip offers portability and convenience, keeping the lamp easily accessible during work.

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► Premium oils and lubricants brand, **ROWE**, has launched a range of sustainable engine oils, **ROWE SUNSPEED®**. This provides UK workshops, factors and consumers with a far more sustainable alternative to traditional engine oils without compromising performance. **ROWE** has extensively invested in the development of sustainable products and manufacturing processes at its state-of-the-art facility in Worms, Germany. With 60% of the factory's energy requirements being self-generated via photovoltaics, it makes **SUNSPEED®** one of the most environmentally-conscious ranges currently available. **ROWE SUNSPEED®** engine oils use a 100% biosynthetic base with zero mineral oils from fossil origins. The range uses base oils containing high-performance synthetic hydrocarbon compounds synthesized entirely from biomass, offering an impressive combination of sustainability and performance. They are also fully compatible with conventional engine oils for problem-free topping off and refilling. You can learn more about the **SUNSPEED®** range here: [www.rowe-oil.com/en/sunspeed](http://www.rowe-oil.com/en/sunspeed)



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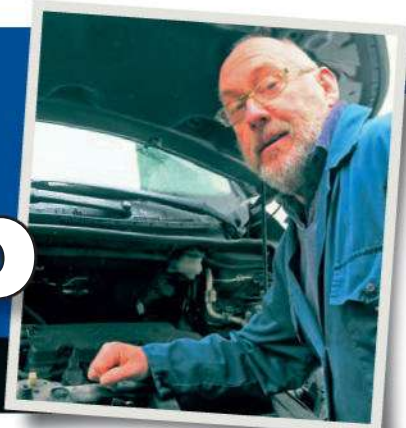
Q The maximum torque of the CIR184LIP in Nm is?  
A 400





# Tales from the workshop

Fixing advice from our garage proprietor **Steve Rothwell**



## SUBARU IMPREZA

### Cylinder pressure loss

▶ There was a pronounced misfire when this 2007 Subaru Impreza 2.5 WRX drove onto the forecourt. This was also accompanied by a popping sound from the exhaust and the first check once the engine had cooled down was to carry out a compression test.

This was conclusive and showed a lack of compression in number 1 cylinder. With the flat-4 engine this an engine out and cylinder-head off job. The book time for this is just under nine hours, and once the engine was removed and the cylinder-head released from the block, the offending exhaust valve could easily be seen. The next stage was to strip out the old valves and then recut the valve seats before fitting the new exhaust valves.

With the new valves in place and the cylinder-head refaced, the block face was also cleaned up before fitting the

The lack of compression was down to the missing section of exhaust valve which had been burnt away.



new head gasket and bolting up in the specified sequence.

Once the engine was all back together, it was put back into the vehicle and bolted up. The cooling system was flushed through and when the engine was fired up it sounded quite a bit smoother than it had.

## VOLKSWAGEN TIGUAN

### Driveshaft vibration

▶ I have come across a few problems with the propshaft centre bearing on the VW Touareg, but even though they are apparently just as common, this was the first one I had seen on the smaller sibling the Tiguan. This 2008 VW Tiguan 2.0 TDI, had been suffering from a vibration on the motorway for some time, but now the judder from the centre of the vehicle was apparent at speeds as low as 30mph.

With the motor up on the ramp after a quite glance at the propshaft centre bearing, the source of the vibration was clearly due to the failure of the rubber surrounded bearing.

Like the Touareg the option from Volkswagen is a complete unit, but the centre bearing can be purchased and fitted, saving the hefty cost of the new propshaft.

The labour time is of course a little longer, but the overall saving does make up for this.

Once all back together the owner was pleased with the now smooth-running Tiguan and the price changed for the job to be carried out.



One look at the propshaft centre mount was enough to know exactly where the vibration was coming from.

## HONDA CIVIC

### Leaking brake caliper

▶ One of the things that I often notice is that some problems which develop slowly go unnoticed for some time, and it is then only when a different driver uses the vehicle that a problem which has been slowly developing will then be noticed.

This 2005 Honda Civic 2.0 Type R was being driven around by its owner with little concern – it was only when the motor came into me for an MOT that I jumped in and was immediately alerted to the poor brake operation.

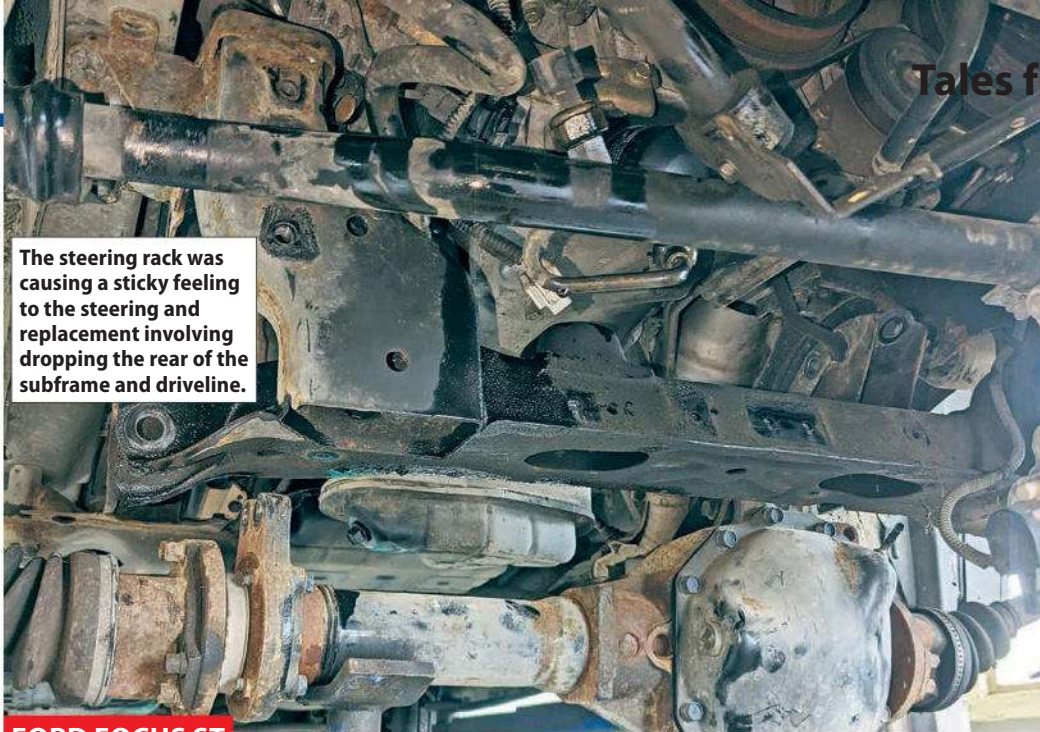
The pedal felt very spongy and certainly not as I would have expected. A check over before the MOT showed the reason to be a slightly weeping rear brake caliper. This was, I suspect, not only allowing the brake fluid to seep out but also allowing air to enter giving the soft brake pedal.

With a new brake caliper fitted and the brake hydraulic system bled out, the Honda was put through the test – and when the owner collected his Honda he remarked on the improvement to the feel of the brake pedal.



The leaking brake caliper, as well as allowing the loss of brake fluid, had allowed a small amount of air to enter the hydraulic system giving a soft pedal.





The steering rack was causing a sticky feeling to the steering and replacement involving dropping the rear of the subframe and driveline.

**FORD FOCUS ST**

## Sticky steering means new rack

▶ The owner of this 2007 Ford Focus ST 2.5 had been concerned that the steering didn't feel quite right for a little while now. The problem wasn't excess play but the feeling that the steering wheel was sticking slightly in place as the steering was turned.

With the Focus ST up in the air and the wheels off, I disconnected the track rod ends to check that the hubs were turning freely and that this was not the area of the problem. Happy that no part of the front suspension was cause of the issue, I disconnected the lower steering coupling from the column and had a feel of the rack, turning it slowly by hand.

This was not overly tight, but the owner agreed that replacement at this stage before things developed would be the best option.

Dropping the back of the subframe to remove the rack, the job is given a book time of just over two hours, and this is mainly due to the stripping down required to access the rack.

With the new unit up in place, the owner also wisely requested a couple of new track rod ends, be fitted. The power steering fluid was bled through, and a quick check was made to ensure the steering wheel was centralised before then setting the tracking.

The steering felt a lot smoother on a road test.

Follow Steve on Twitter: [www.twitter.com/cmtips](http://www.twitter.com/cmtips)



**PEUGEOT PARTNER**

## P1704 code

▶ This 2018 Peugeot Partner Tepee was on the back of a pick-up truck when it arrived at the workshop. The automatic transmission which is the auto shift manual (ASM) type, would only select first gear and the owner rightfully decided that driving it was not a good option.

Reading off the codes from the on-board diagnostic socket, P1704 was discovered, which would normally point to the transmission control module, or the connecting harness to the transmission. A conversation with the owner revealed that this problem had suddenly occurred and up until the fault had surfaced the Peugeot had been driving perfectly.

I decided to first check over the connections to the transmission control module mounted on the transmission and ensure that the loom was in good order.

It all appeared to be in good condition and so it was moved to another part of the workshop for a more serious look. At that point it was noted that the brake lights were not working.

I have found numerous problems that at first glance appear to be serious and have turned out to be a faulty brake position switch, and so I decided that renewing this before going any further would be the best option.

When the new switch arrived, it was fitted and if by magic the gearbox once again performed as it should. A timely reminder to always check the basics.



The problem could have been quite involved but turned out to be the brake position switch.



**BMW 2-SERIES**

## Brake judder

▶ The front brake discs on this 2019 BMW 2-Series M2 Coupe 3.0 were starting to look a little shabby – and corrosion had begun to creep in around the drillings in the vented brake discs. The reason for the owner asking for new brakes to be fitted was not cosmetic though but was due to the hard shudder that was now resonating through the BMW when braking from higher speeds.

New brake discs and pads were needed and because the owner was known to use the range in the M2 with the occasional track day he was quite insistent that EBC Bluestuff pads and discs should be used.

This is straightforward job, but care does need to be taken to ensure that the hub flanges are perfectly clean before fitting the new discs. It is also important to check the run-out on the new discs to ensure that everything is sitting as it should.

Happy that the new brake discs were going to give a smooth braking experience and with the new Bluestuff pads fitted, this 2-Series was ready for the road (or track) free of the brake judder.



With the new brake discs fitted and the calipers cleaned up, the new Bluestuff brake pads were fitted.



## CITROËN BERLINGO

### Diesel loss

► Poor starting was the first symptom noticed by the owner of this 2005 Citroën Berlingo 2.0 HDi. After a little cranking of the starter, the engine then always fired into life, followed by a small puff of grey smoke from the exhaust.

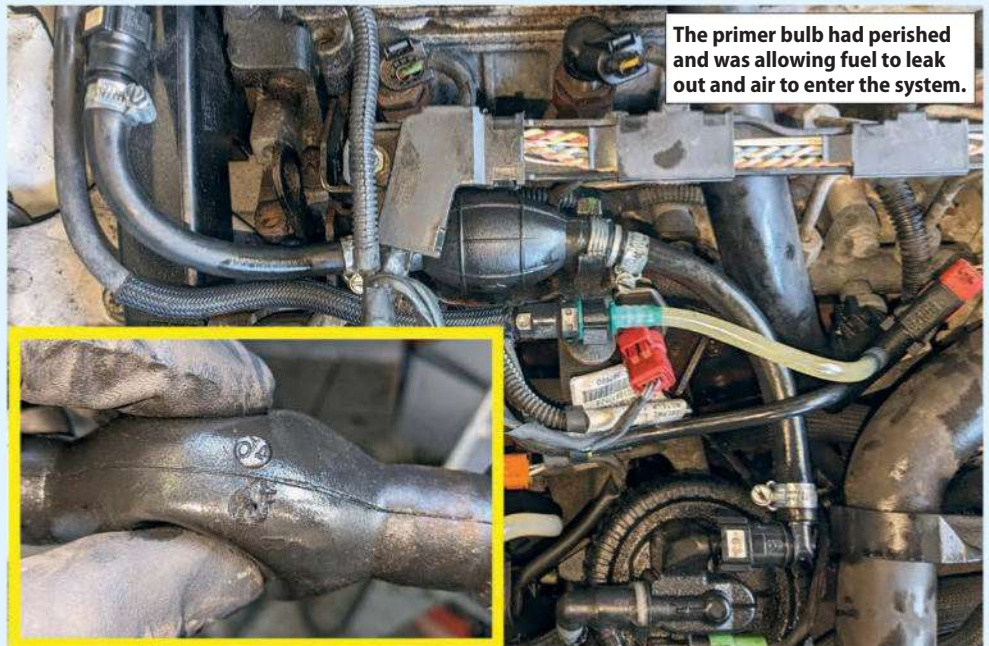
The problem had now developed, and the starting had become a little harder and under advice from a mate, the owner decided to try and bleed the fuel system through before attempting to start the engine in the mornings.

He now discovered that when he squeezed the primer bulb under the bonnet, that his hands

were getting treated to a covering of diesel fuel. With the fuel leak under the bonnet and the starting becoming more difficult he decided to throw the towel in and just bring the Citroën along to me so I may have a look.

The remedy needed was easily diagnosed and a quick look at that primer bulb revealed that this was the culprit and the source of all the troubles. The perished bulb was allowing the permutation of air into the system and allowing fuel to escape.

A new primer bulb was fitted along with a new fuel filter, ensuring at the next starting attempt the following morning the engine fired straight into life and without the addition of any grey smoke.



## VAUXHALL CORSA

### Stuck O2 sensor

► The orange engine management light had come on in this 2013 Vauxhall Corsa 1.4 and hoping it would go away the owner carefully ignored it for a couple of weeks – that is until their partner drove the Corsa and noticed the light.

At this point the Corsa was driven along to my workshop, and I was asked to diagnose the problem. The code P0053 was showing on the scanner indicating that the O2 sensor had a high heater resistance, the terminals were checked, and it decided that the sensor needed to be renewed.

On this Corsa the O2 sensor sits directly into the exhaust manifold and is quite easily accessible. The problem on this one was that the sensor was corroded firmly into the top of the manifold. After soaking the threads with a penetrating fluid and then removing the connecting cable, a six-sided

socket was used to release the O2 sensor from the manifold.

I did at one point think that the top was going to sheer off leaving me with a bigger problem which I was hoping would not occur. Thankfully this did not happen.

With the new sensor in place and the codes cleared, the engine now ran without the EML showing up on the dash.



The O2 sensor was well and truly corroded into place in the manifold but with a good soak and a strong socket it did budge.

## AUDI A3

### Petrol filter contaminated

► With just over 110,000 miles under its belt, the owner of this 2009 Audi A3 1.6 petrol noted that under motorway driving conditions a problem was occurring which was limiting the power of the engine. The A3 was in for a full service, and I suspected that the symptoms described was going to be a result of a possible blocked fuel filter.

Unlike many modern petrol motors, the A3 does have an easily replaceable fuel filter fitted underneath the vehicle. With quick release clips on the fuel pipes, the filter is very easy to replace, and if performing the swap over quickly very little petrol is lost in the process. The outside of the filter did not look too bad, but as the case is an alloy it does not suffer from rust in the same way a steel cased filter would.

Once the filter had been changed, the old one was drained into a container and with a good shake as the old fuel drained

out proved that it was quite highly contaminated. Many owners forget that the petrol filter needs changing, and this one does not appear to be included in the service schedule, but it should not be forgotten.

A road test after the service was carried out without any problems showing up so I do suspect that the new petrol filter rectified the running problems previously felt.

The petrol filter sits under the vehicle and is easily forgotten, but it is important to replace the filter at regular intervals to prevent fuel supply problems.





**VOLKSWAGEN GOLF**

## Starter stutter

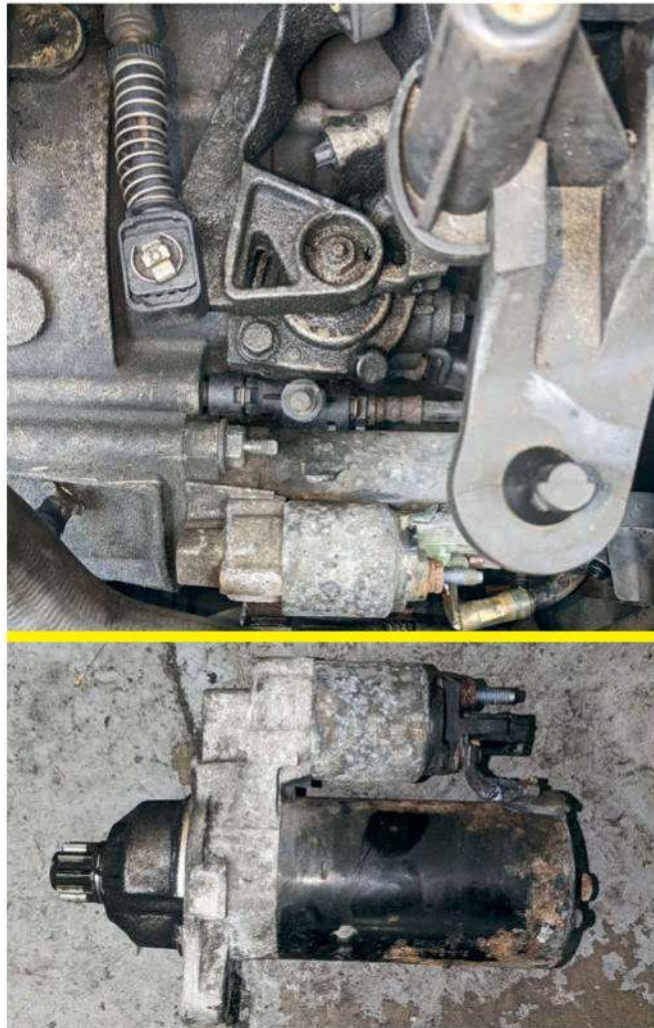
▶ The owner described the noise from the engine when it refused to start as a stutter but listening to the explanation of the symptoms – this is what I would describe as the classic machine gun sound.

The starter attempts to operate, but the load on the starter causes the solenoid to disengage, then once disengaged and with no load, the solenoid attempts to throw the starter gear back into mesh, and the starter begins to rotate again. This loads the solenoid which then cuts out, and the whole viscous circle begins again.

The simple answer is normally a new starter, but it is always worth checking that the connections and the earth cable on the engine are in good order, just in case this is the cause of the problem.

On this 2007 VW Golf 2.0 TDI it did turn out to be the starter that needed replacing, and with the starter motor located in a nice accessible position, this job can easily be completed within the hour.

The Golf now fired into life without the stuttering sound at every attempt.



**FORD FOCUS**

## Fuel smell problem

▶ Smelling fuel when topping up the tank, the owner of this 2009 Ford Focus at first thought that the smell was originating from the filling station. It was only when parking up and then returning to his vehicle an hour or so later, that he once again smelt the odour of fuel and realised it was from his Focus.

Looking around the filler neck he could sense that the fumes were from this area and so decided to ask me to have a look and trace the source of the smell.

Once in the workshop and up on the ramp I could see that the filler neck was leaking around the point of the air bleed pipe built into the filler tube.

The leak at this stage was not too serious, but the owner was aware that these problems never fix themselves and over time the problem was going to develop.

With this in mind he decided to ask me to renew the pipe now, before things got worse, and with the price of fuel it was not only the thought of the fumes that were alarming him, but also the thought of wasting precious fuel.



The connecting pipe from the air bleed to the filler neck was allowing a slight leak of fuel, this was just enough to create a problem smell.

**RENAULT WIND**

## Sprung spring

▶ It is often the case that a broken spring will either just allow the body to drop slightly or even go unnoticed for a while, but it can be the case such as on this 2011 Renault Wind that the failed spring will go on to inflict damage to other parts of the vehicle.

Often, as this was the case, it will be the tyre closest to the spring that suffers. The edge of the broken spring not

content with escaping from the strut decided to stick out far enough to cut through the sidewall of the tyre as the owner drove off.

I would add that perhaps if the owner had not had the audio system at quite such a volume, then they may have noticed the strange scraping sound and stopped before the burst tyre allowed the motor to drop – and damage the wheel rim.

So now instead of just a relatively easy spring to be changed, the owner also had to fork out for a new tyre. Thankfully for them I was able to get the alloy wheel back in shape.





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## Bodywork, tyres & more...

**Part FIVE:** Small bodywork repairs require professional help and new tyres arrive courtesy of Kumho. **Martyn Knowles** reports.

**W**e intended to renew the DMF on our Caravelle this month, but it's a full day (or more) in the workshop and we've not had ramp time available at the moment. We will cover this in the next issue.

So, it gave me time instead to send our Caravelle T5.1 to the bodyshop for some small repairs and full respray of the rear tailgate. The VW Transporter can come with two types of tailgate – either one large panel, hinged from the roof area or barn type doors (two), opening outwards and hinged from the side of the van.

I sent the Caravelle to my local bodyshop – Coastal Auto Body in Eastbourne. Owner Chris explained that as the tailgate was rusty in one area and had a deep scratch in another with a few dents, it might be wise to paint the huge whole panel. That involved taking off the rear number plate with its chrome surround, followed by badges and high-level brake light.

I bought a cheap Chinese replacement brake light as the original had a protective film (waterproof) stuck over it – the red plastic lens had a split in it. Although, as you will read, I had to buy another light to make a good repair.

### New tyres

Kumho supplies Volkswagen with OE fitment tyres for its latest Multivan in either 235/55R17 or 235/50R18 sizes. Founded in 1960, Kumho headquarters are located in South Korea and they operate various tyre-making factories around the globe making tyres for cars, 4x4s, SUVs, trucks and vans.

Our current tyres are all fit and healthy, but the offside rear has been changed recently. Our front tyres are Michelin CrossClimate2 tyres

manufactured in 2022 and the nearside rear is a 2019 fitment. The offside rear is a Pace Alventi with a different tread pattern to the Michelins. All these tyres are 103Y XL spec – 103 is the load rating, 'Y' is the speed rating (186mph) and XL being Extra Load, which offers reinforced sidewalls over non-XL.

I had a discussion with Stuart at Kumho marketing and he was curious (like me) to find out why VW fitted 235/55R17 103W rated tyres to our T5.1 van. If you enter our registration number into a tyre supplier's website, they start by offering us T-rated tyres, which is good for a potential 118mph top speed. However, I have a full printed list of OE fit parts from the factory to reference, where it states our van is fitted with 235/55R17 103W (XL). Plus the January 2010 'New Caravelle' brochure I bought on eBay shows that the Executive models fitted with Neva alloy wheels does have this size tyre as standard fit. Does anyone

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known why VW specify a W-rated tyre? 'W' is speed-rated to 168mph.

Even the tyre pressures label stuck within the driver's door aperture only mentions T-rated tyre pressures.

Four new Kumho Ecsta HS52 tyres are now fitted to our Caravelle and they look and feel great. I've not at the moment driven too far due to the rattling DMF, but the steering has become a bit lighter with the new rubber. We have kept our removed old all-season tyres for use in the winter months.

### BODYWORK REPAIRS



**1** The nearside rear wheelarch section had a deep scrape touched in by the previous owner. Plus we had a few scratches above this. It was decided to just prepare a small area for paint by rubbing down this section shown right.



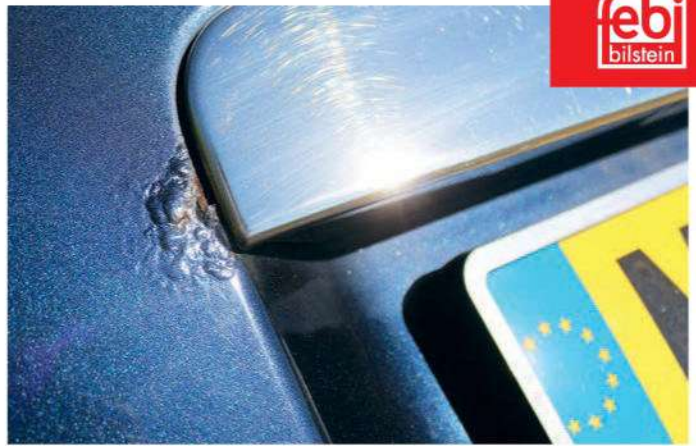
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**2** The area was filled with body filler, then sanded back. After adding on lightweight sheeting to avoid overspray, a black primer was used to find any high spots in our repair. Another light covering of filler, before rubbing back and more primer added.



**3** I can see how the tailgate can easily get damaged – it is huge. When parking you have to take into consideration that it needs extra space to open it fully. Our tailgate had this rust scab next to the chrome numberplate surround. Plus a few dents and scratches.



**3** More work is required on the rear tailgate. Badges, numberplate and associated wiring are removed first, plus masking up of the tailgate handle and surrounding area. The panel paint is smoothed back with a 180-grit sander, then dents and the rust spot near the numberplate are tackled next.



**4** Once satisfied, the filler is smoothed and feathered into the surrounding paintwork, then a coat of primer is added. As you can see the whole tailgate isn't painted with primer, just the area that requires filler work.



**5** Into the paint booth, more detailed masking takes place. You can see our primed area more prominently.

**6** The first coat of Night Blue goes on the tailgate and rear arch section.



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## BODYWORK REPAIRS CONTINUED



**7** Once the paint has dried, the next stage is to apply lacquer to the new paint. This helps lift the paint and give the shine. Two coats of lacquer went on and the booth was heated to help it dry.



**8** The final stage is to buff the newly-painted areas. Here bodyshop owner, Chris Legate, puts a shift in to get it finished before Editor Martyn arrives to inspect their skills. The finished job looks fab.

## HIGH-LEVEL BRAKE LIGHT



**1** I gave the bodyshop a new LED high-level lamp to fit into the top of the tailgate. It cost £12.89 on eBay. On the first drive home, I noticed when parked, that the lamp wasn't sitting flush with the bodywork. I'm unsure what was happening with it, so decided to buy an OE part instead. Here, Lee our technician, is about to pull off the rear tailgate trim to reveal the bottom of the high-level lamp.



**2** With the trim removed, we found rain water had entered the lamp in the few days preceding – water was sitting in the trim part. Three T20 bolts hold in the lamp. Our new OE lamp came via the VW main dealer. It was £46.80 including the VAT. The new lamp included these three bolts.



**3** The lamp can be withdrawn from the opening in the front of the tailgate. The wiring is clipped into the new lamp – and before we refitted, we turned on the ignition and applied the brake pedal to see the LEDs light up. The lamp was pushed into position and the bolts screwed in progressively.

## PARKING SENSOR FAULT



**1** ◀ Our Caravelle has front and rear parking sensors. They mainly don't work. Lee asked me to sit in the VW, turn on the ignition and select reverse. He went around each sensor to listen for a buzz. He deduced that the nearside rear sensor was at fault.

**2** ▶ Fiddly to remove, they can come out without disturbing the bumper. Using the OE part number, I've bought a new sensor from AliExpress for £13.49 delivered. Once here, it will need painting on the tip, but I have a rattle can in the correct colour. We will report on the fitment in Part 7 of the project.



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## BRAKE PAD WARNING WIRE



**1** The 'check brake pads!' warning light has warned me of a problem since the day I collected the Caravelle from BCA Nottingham. Fitting a new set of discs and pads wasn't going to fix the problem because when we did do this job we found that someone had made a mess of the wiring where the pad warning wire exits a connector just above the disc. Volkswagen do sell patch repairs. The garage ordered this via TPS and, as you can see above, consists of Yellow wire and a new connector.



**2** The original wiring from the main loom had unfortunately been pulled at some point – and the loom was broken before this connector. The idea is to cut the wires back and solder in the new Yellow wire instead.



**3** Our technician Lee feeds both ends of the new Yellow wire into our new connector. Each wire should lock into position once in place. VW only sell Yellow wire – it is to show that a repair has been undertaken.



**4** The Yellow wire is fully cut at its midway point to now give us two wires and we trimmed the lengths a bit to what we think we require to connect to the original wiring. To make the repair we need to remove a section of outer insulator, so a section of this is removed with a wire stripper.



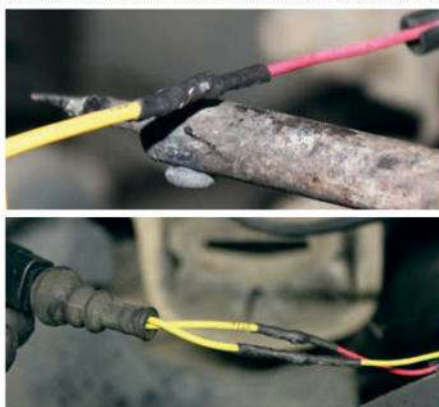
**5** The original Red/Yellow wiring is snipped from its connector. The outer sheath is carefully cut with a sharp razor blade so that the two wires can be pulled out away from the sheath. We don't want the sheath to burn when we get the soldering iron out!



**6** The original wiring was corroded due to its exposure to the elements. We had to cut more and more wire back before we found shiny copper coloured wire.



**7** A black heat-shrink tubing insulator is fed onto the original wire – we will melt this onto our repair once done. There's two wires to solder, so Lee starts by twisting the new wire to the old before soldering the two wires together. Solder is highly conductive and will produce a strong repair.



**8** Once the solder has hardened, Lee moves the heat-shrink tubing over the repair. While the iron is still hot, Lee uses the shaft of the iron to melt the insulation to complete a weather-proof seal.



**9** The final job is to wrap the whole repair in electrical tape to keep any moisture out. With the key in the ignition, I fired the engine – the pad warning symbol had disappeared – for good. A cheap repair.

Searching becomes finding!

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**NEW TYRES**



**1** Our new Ecsta HS52 tyres from Kumho. They are the correct 235/55R17 103W XL size that were fitted new to our Caravelle. Each new tyre sold in the UK must include this chart stuck to the tyre. As we have seen, a 'C' rating for economy – the rolling resistance of a tyre – and 'A' (top) rating for wet grip. Plus noise emission of 72dB.



**4** Apply tyre soap next to the inner side of the new tyre. This will help it slide on to the rim using the tyre machine. Check for any rotational marks and 'inside' and 'outside' markers so that the tyre goes on correctly. Once on the rim, inflate the tyre until the tyre 'pops' onto the rim. Inflate (or deflate) to the correct pressure.



**2** I've tried using the tyre removal machine before – it's hard going. But once you are experienced, the job is like riding a bike... First our old tyres need to come off the rim. It looks like torture for the old rubber as they get distorted in all directions. But, they bounce back into life and can be refitted again – we will use these as winter tyres.



**3** The old valve core is cut off and renewed. The outer rim is cleaned with a wire brush to remove any corrosion and old sealant. If the rim is rusty, you can use a bead sealer to help seal the tyre to the rim.



**5** Now onto the tyre balancing machine. First the old wheel weights are removed and that area is cleaned as best as possible to accept new weights. The balancing machine rotates each wheel and determines the amount of vibration. The computer then splits the wheel into two halves and gives the operator a figure for both inner and outer. Weights of the correct size are added to the rim. The wheel is spun again and hopefully the readings should indicate zero. That means our wheel is now ready to torque to the hub. The new Kumho tyres look a good fit.



**PURCHASE PRICE** £10,883.96

**PARTS COSTS**

Engine oil x 8 litres (febi 32946)	<b>£92.00</b>
Engine oil filter (febi 36634)	<b>£7.75</b>
Sump drain plug (febi 48871)	<b>£5.30</b>
Fuel filter (febi 26950)	<b>£28.83</b>
Air filter (febi 32244)	<b>£8.98</b>
Cabin filter (febi 21316)	<b>£6.95</b>
Brake discs front pair (febi 28504)	<b>£84.02</b>
Brake pads front (febi 16462)	<b>£28.53</b>
Brake discs rear pair (febi 28682)	<b>£60.84</b>
Brake pads rear (febi 16860)	<b>£23.13</b>
Pad fitting kit front (febi 181911)	<b>£9.38</b>
Pad fitting kit rear (febi 181919)	<b>£11.80</b>
DSG oil x 5 litres (febi 39071)	<b>£74.35</b>
DSG oil x 1 litres (febi 39070)	<b>£18.95</b>
DSG filter (febi 107342)	<b>£21.89</b>
Rear shock absorbers x 2 (GT Automotive)	<b>£76.80</b>
Rear lower spring cup bush x 2 (Polybush 44FF)	<b>£47.50</b>
Timing belt kit (febi 37021)	<b>£96.55</b>
Water pump (febi 36048)	<b>£31.62</b>
Auxiliary drive belt (febi 28952)	<b>£12.44</b>
Coolant G12++ 1.5l (febi 37400)	<b>£18.91</b>
Brake pad wiring repair	<b>£103.50</b>
High-level brake light	<b>£46.80</b>
Kumho tyres x 4	<b>£377.92</b>
Paintwork repairs	<b>£960.00</b>
<b>TOTAL PARTS</b>	<b>£2254.74</b>

**USEFUL CONTACTS**

**bilstein group partsfinder**  
[partsfinder.bilsteingroup.com](http://partsfinder.bilsteingroup.com)  
**Coastal Auto Body Ltd**  
**01323 381910**  
**Vasstechnik** [vasstechnik.co.uk](http://vasstechnik.co.uk)



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IT1500

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Little Devil II	10.3	£89.98	£107.98
Devil 700	15	£114.98	£137.98
Devil 900	24.9	£158.98	£191.98
Devil 1600	36.6	£189.98	£227.98
Devil 2100	49.8	£249.00	£298.80
Devil 4000	131	£479.00	£574.80

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MMA/TIG 160

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MMA/TIG 120	10A - 120A	£99.99	£118.98
MMA/TIG 160	10A - 160A	£119.98	£143.98
MIG150 MULTI	30A - 140A	£239.00	£288.80
MIG200 S-MULTI	20A - 200A	£599.00	£718.80

### Clarke 1 TONNE PORTABLE GANTRY CRANE

CWGC1000

**PRICE CUT**  
~~£499.00 inc.VAT~~  
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**WAS £692.80 inc.VAT**

**1000kg**

### Clarke STRUT SPRING COMPRESSOR

SSC1000G

- Foot operated
- Hydraulic powered
- Adjustable for springs up to 400mm dia. & 520mm in length
- Adjustable spring retainers
- Inc. spring retaining guard

**FROM ONLY £189.98 inc.VAT**  
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**1000kg**

### Clarke ALUMINIUM RACING JACKS

CTJ1250AC

Quick lift • Non-marking nylon wheels • Rubber contact pad - helps protect vehicle underside

**LOW ENTRY ONLY 85MM**

**PRICE CUT**  
~~£125.99 inc.VAT~~  
~~£125.99 inc.VAT~~  
**WAS £191.98 inc.VAT**

Model	Lifting Cap.	exc.VAT	inc.VAT
CTJ1500UL	1.5t	£104.98	£125.98
CTJ1250AC	1.25t	£129.98	£157.98
CTJ2500ULGB	2.5t	£169.98	£203.98
CTJ1800AB	1.8t	£194.98	£239.98

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XR60B	14.7kW	£219.00	£262.80
XR110	29.3kW	£310.00	£382.80
XR160	46.9kW	£389.00	£480.80
XR210	61.5kW	£449.00	£558.80

### Clarke FAN HEATERS

2.8kW

2850

**NEW**

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Devil 2000PTC-B	2kW	£29.98	£35.98
Devil 2850	2.8kW	£42.98	£51.98
Devil 2800PTC-B	2.8kW	£49.98	£59.98

### Clarke ELECTRIC HEATERS

DEVIL 6003

DEVIL 7003

**BEST SELLER**

Model	Voltage	Heat Output	exc.VAT	inc.VAT
Devil 6003	230V	1.5-3KW	£64.99	£77.99
Devil 7003	230V	3KW	£64.99	£77.99
Devil 7005	400V	5KW	£89.98	£107.98
Devil 6009	400V	4.5-9KW	£119.98	£143.98
Devil 7009	400V	9KW	£147.99	£177.99
Devil 6015	400V	5-10-15KW	£179.98	£215.98
Devil 7015	400V	15KW	£219.98	£263.98

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Model	Motor HP	CFM	Tank	exc.VAT	inc.VAT
Tiger 87260	2	7	24lt	£107.99	£129.98
Tiger 77260	2	7.8	24lt	£109.98	£131.98
Tiger 8350	2	5.0lt	50lt	£149.98	£179.98
Tiger 11750	2.5	9.3	50lt	£189.98	£228.80
Tiger 16750	3	14.5	50lt	£239.00	£288.80
Tiger 16750S	3	14.5	100lt	£289.00	£358.80

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- Super light & compact

Model	Min/Max Output	Exc. VAT	Inc. VAT
MMA/AT140A	20A-140A	1.6-3.2	£104.98
MMA/AT200A	20A-200A	1.6-4.0	£139.98
AT165	10A-160A/2.5/3.2/4.0		£219.98

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XEV16/150/400V/1	14	3	150lt		£599.00	£738.80
XEV16/200/OLIT	18	4	200lt		£753.00	£910.80
XEV35/200	30	7.5HP	200lt		£1178.00	£1414.80
XEV37/201	28	2X3HP	270lt		£1399.00	£1682.80
XEV37/270/OLIT	36	2x4	270lt		£1459.00	£1750.80

### Clarke INDUSTRIAL SCREW COMPRESSORS

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**5.5HP + 17.1cfm**

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Model	cfm	Hp	RCVR	exc.VAT	inc.VAT
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CXR15R	5.3	15	270lt	£3895.00	£4874.00
CXR20R	6.5	20	500lt	£4959.00	£6274.00
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Tiger 1800B	110/1595	3	£269.00	£322.80
Tiger 2600B	180/2610	4	£379.00	£454.80
Tiger 3000B	200/2900	6.5	£509.00	£618.80
PLS135B	130/1890	5.5	£478.00	£574.80
PLS220R	230/3235	9	£669.00	£802.80
PLS255B	225/3235	13	£1749.00	£1998.80
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Suitable for wheels from 4" to 21"

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- Weight - 27kg

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IBC7	12/24V	7A	£39.98	£47.98
IBC15	12V	15A	£49.98	£59.98
IBC20	12/24V	20A	£92.98	£111.98
IBC25	12/24V	25A	£79.98	£96.98
IBC40	12/24V	40A	£99.98	£119.98

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BC190	38/180	£104.98	£125.98
BC210C	25/200	£148.98	£178.98
WBCT190	38/180	£159.98	£191.98
WBCT40	45/240	£184.98	£221.98
WBCT60	60/350	£219.00	£262.80
BC320P	50/510	£259.00	£310.80

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GIG61015	4.5x3x2.4m	£279.00	£334.80
GIG81216	4.9x3.7x2.5m	£319.00	£394.80
GIG81020	6.1x3x2.4m	£349.00	£418.80
GIG81220	6.1x3.7x2.5m	£389.00	£478.80
GIG81224	7.3x3.7x2.5m	£469.00	£568.80
GIG1432	9.7x4.3x3.6m	£1099.00	£1318.80
GIG1640	12x4.8x4.3m	£2599.00	£3118.80

### Clarke 2 & 3 TONNE TROLLEY JACKS

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Model	Type	Tonnes	exc.VAT	inc.VAT
CTJ2L	Long	2	£42.98	£51.98
CTJ250LP*	Low Profile	2.25	£49.98	£59.98
CTJ3000GB	Pro Garage	3	£109.98	£131.98
CTJ3000QLC*	Quick Lift	3	£114.98	£137.98
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CIR	Cordless	2X 4AH	£144.98	£173.98
184LP #		LI-ION		

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Includes sandblasting gun, delivery hose, 4 ceramic nozzles and safety hood

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CPB100B	32 litre	6-25 cfm		£169.00	£202.80
CPB200B	63 litre	6-25 cfm		£209.00	£250.80

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CTJ1250AC

Quick lift • Non-marking nylon wheels • Rubber contact pad - helps protect vehicle underside

**LOW ENTRY ONLY 85MM**

**PRICE CUT**  
~~£125.99 inc.VAT~~  
~~£125.99 inc.VAT~~  
**WAS £191.98 inc.VAT**

Model	Lifting Cap.	exc.VAT	inc.VAT
CTJ1500UL	1.5t	£104.98	£125.98
CTJ1250AC	1.25t	£129.98	£157.98
CTJ2500ULGB	2.5t	£169.98	£203.98
CTJ1800AB	1.8t	£194.98	£239.98

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Includes sandblasting gun, delivery hose, 4 ceramic nozzles and safety hood

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### Clarke STRUT SPRING COMPRESSOR

SSC1000G

- Foot operated
- Hydraulic powered
- Adjustable for springs up to 400mm dia. & 520mm in length
- Adjustable spring retainers
- Inc. spring retaining guard

**FROM ONLY £189.98 inc.VAT**  
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JSM1200	600A	1200A	£59.98	£71.98

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Provides essential home, garage and roadside assistance • Integral work light • 910 includes air compressor • Long life battery

Model	Starting Boost	Peak Amps	exc. VAT	inc. VAT
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JST1000C	500	1100	£93.98	£118.39
4000	700	1500	£104.98	£127.98
JST12/24	1000	2000	£179.98	£219.98

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FROM ONLY **£59.99** exc. VAT

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JS1950	1600	1950psi	£94.98	£113.98
Jet7500	1600	2030psi	£149.98	£179.98
Jet8500	2100	2610psi	£189.98	£227.98

### Clarke PARTS WASHERS

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CW1D	45Ltrs	Floor	£144.99	£173.99
CW20	22.5Ltrs	Floor	£109.00	£124.80
CW40	75Ltrs	Floor	£219.00	£262.80

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REAR LOCKING SECURITY BARS

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EXTRA WIDE 56" CHESTS/CABINETS IN STOCK

EXTRA WIDE 56" CHESTS/CABINETS IN STOCK

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CTC900C	9 Dr Chest	£99.99	£117.99
CTC700C	7 Dr Cabinet	£175.00	£210.00
CTC1300C	13 Dr Combination Chest/Cabinet	£189.99	£227.98

Model	Description	exc. VAT	inc. VAT
CBB203C	3 Dr step up	£93.69	£104.99
CBB209C	3 Dr Chest	£154.99	£186.99
CBB217C	7 Dr Cabinet	£279.00	£334.80

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# Project BMW 335i



# The end of the jobs list



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**PART EIGHT:** In the final episode, **Rob Hawkins** replaces a sticking bonnet lock, services the sunroof, changes the cabin filter and assesses the remaining issues.

**T**aking on a high-performance saloon such as our BMW 335i can seem like a daunting and potentially expensive prospect. However, as we've discovered, the work involved in servicing the engine and brakes and replacing the suspension hasn't been as complicated as we'd anticipated. Replacing the headlight was more frustrating than technically demanding.

We've also found the range of tools required to work on this car hasn't involved anything special and, in many cases, a Clarke cantilever toolbox containing the usual assortment of spanners, sockets, screwdrivers and pliers has been all that's needed.

We're confident that our 335i is in



a better state than when we bought it, although it's a typical project car that can go on being improved, so there are some modification plans already underway, which will appear through *Fast Car* online. We're confident everyone at *FC* won't be disappointed by the breathtaking performance from this

335i. Its modest appearance says nothing about how well it handles and drives.

In this last instalment for *CM*, we've finally fixed the sticking bonnet lock that was identified at the beginning of the project series, serviced the sunroof to make sure it doesn't stick and assessed any remaining issues.

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## SERVICING THE SUNROOF



**1** The electric sunroof in our BMW 335i seemed to be opening and closing fine, including the additional tilt function, but Rob wanted to see if a little maintenance would help, or whether it was even needed.



**2** His first thought was to look along the side channels to see if there was any dirt that could affect the operation of the sunroof. There was a little dirt and, more importantly, no signs of blocked drains full of moss.



**3** ◀ LIQUI MOLY produces a silicone spray for lubricating windows and sunroofs, so Rob sprayed this along the side channels, then moved the glass sunroof back and forth to help work it in.

**4** ▶ Next, he partially opened the sunroof and noticed lots of green plant life along the front edge of the glass. This won't help the rubber seal along the outer edge of the glass.



**5** Armed with a multi-purpose cleaner from Meguiar's, an old toothbrush and a cloth, he gently scrubbed the green growth and wiped it away. It was straightforward to remove.



**6** The sunroof was then tilted, which opens the rear edge of the glass. In this case, Rob could see more unwanted green growth that needed cleaning off, but he didn't want it to drop inside the cabin or into the sunroof mechanism.



**7** ◀ So, a large old towel was placed on the roof of the 335i and fed underneath the rear of the glass, allowing the back edge to be cleaned and restored to being black instead of green.

**8** ▶ Finally, the sunroof was fully opened again, and the front edge of the roof was wiped over to remove traces of dirt. There's a piece of plastic trim here that moves up and down when the sunroof is opened and closed so dirt doesn't want to get trapped inside it.



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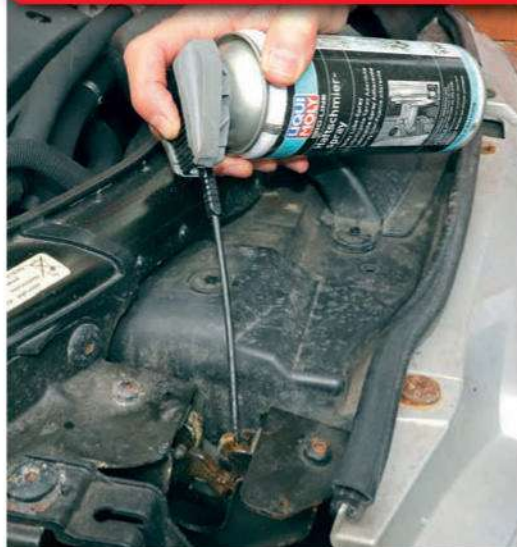
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## STICKING BONNET LOCK



**1** ◀ We knew from the start of this project series that the bonnet locks weren't easy to release via the lever inside the cabin, requiring a shake of the bonnet to help, but what was the problem? Rob started with a spray of lube over the two locks.

**2** ▶ Using a long flat-blade screwdriver, he tried to flick the locking mechanism over to mimic locking the bonnet. The nearside lock moved over easily and could be reopened via the release lever inside the cabin.



**3** ◀ The offside bonnet lock put up more of a fight and was very stiff to move into the closed position. Rob reckoned he had found the cause of the problem – the offside mechanism was seized, so he sprayed penetrating fluid into it and worked it back and forth. Sadly, it didn't help.

**4** ▶ A replacement bonnet lock was bought through Amazon for a bargain £22.65, whereas the local BMW dealership wanted nearly £70. We thought that we'd need to remove the front bumper, but whilst visiting AES, mechanic Pete was confident we wouldn't need to. He started by undoing three Torx T30 screws across the front edge of the bumper.



**5** Next, he undid a couple more Torx T30 screws that seemingly held the locking mechanism inside a metal mount. He was hoping he'd be able to extract the mechanism by pulling the top of the bumper forwards.



**6** The locking mechanism was still attached by its release cable, so Pete traced this cable back a little and found a connection along the offside inner wing that was straightforward to detach.

**7** The bonnet locking mechanism and its short cable were now free to move and Pete managed to pull the lock through the gap created by undoing the Torx T30 screws along the top edge of the bumper.



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**8** There was no point in pulling the cable all the way through because it was being reused, so Pete used a screwdriver to detach it from the old locking mechanism.

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**9** Comparing the old bonnet locking mechanism with the new one, they were clearly identical. We were relieved to discover we'd bought the right one.



**10** The end of the release cable was attached to the new locking mechanism, then the two were manoeuvred into the mount, the two Torx T30 screws fitted, and the other end of the cable reconnected. Flicking the latch over, the release lever opened it, so we shut the bonnet and opened it, this time with ease.



## TRACING OIL LEAKS

► Editor Martyn had spotted several traces of oil on the underside of our 335i when he acquired the project. On the ramp at AES, we started to investigate them. First, we noticed the engine sump was coated in oil and wondered whether its gasket was leaking, but there were more traces of oil higher up in the engine bay. Mark Shipman at AES suspected the turbo had started to leak oil, especially when he worked his way around to the front of the engine bay and the boost pipes. He also spotted more oil residue around the gearbox. We decided to wipe off the oil as best as possible and monitor it, along with the oil level in the engine. If oil loss is minimal, then it may be more economical to live with it.



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## PROJECT COSTS

Purchase price **£5800.00**



Brake pads (febi bilstein) **£23.41**

Wear sensor with wiring (febi bilstein) **£11.73**

Handbrake mechanism (febi bilstein) **£23.56**

Wheel speed sensor (febi bilstein) **£52.53**

Oil filter (Blue Print) **£8.70**

Drain plug (febi bilstein) **£3.60**

5W-40 oil (febi bilstein) 2 x 5L **£85.50**

Rear suspension dampers (Bilstein) **£261.60**

Pair of lower damper mounting bushes **£49.98**

ARB droplinks, front lower arms and track control arms (febi bilstein) **£300.00**

Headlight level sensor and arm **£112.66**

Used headlight **£145.00**

Bonnet lock **£22.65**

Cabin filter (Blue Print ADB112506) **£14.21**

**TOTAL £6615.13**

## CABIN FILTER



The cabin filter is located inside a large plastic housing that's fitted beneath the windscreen and accessed via the engine bay. The housing is secured in position with six 8mm bolts although, in our case, one of these had been replaced with a Torx T25 screw. Upon removing the housing and flipping it over, the cabin filter can be seen, but it can't be removed until three plastic tags have been detached – they can easily break off if the cabin filter is forced out. Fitting the new Blue Print cabin filter also requires some mechanical sympathy for these plastic locating tags.

## CAN OF WORMS



The rear suspension components look more like tree bark than metal, and some of the bushes appear to be deteriorating, so should we replace them? Shaking a raised rear wheel doesn't produce any excessive movement in these bushes so, in theory, there should be no benefit in replacing them. More worrying is what problems we may get into if we did attempt to replace them. Looking at the condition of the fastenings and the rear subframe, seized nuts and bolts that need cutting off is inevitable, which means the best plan of action would be to remove the rear subframe and overhaul everything. Such a job is uneconomical, especially considering there are no suspension issues.

## USEFUL CONTACTS

AES 01904 780149

[autoelectricsyork.co.uk](http://autoelectricsyork.co.uk)

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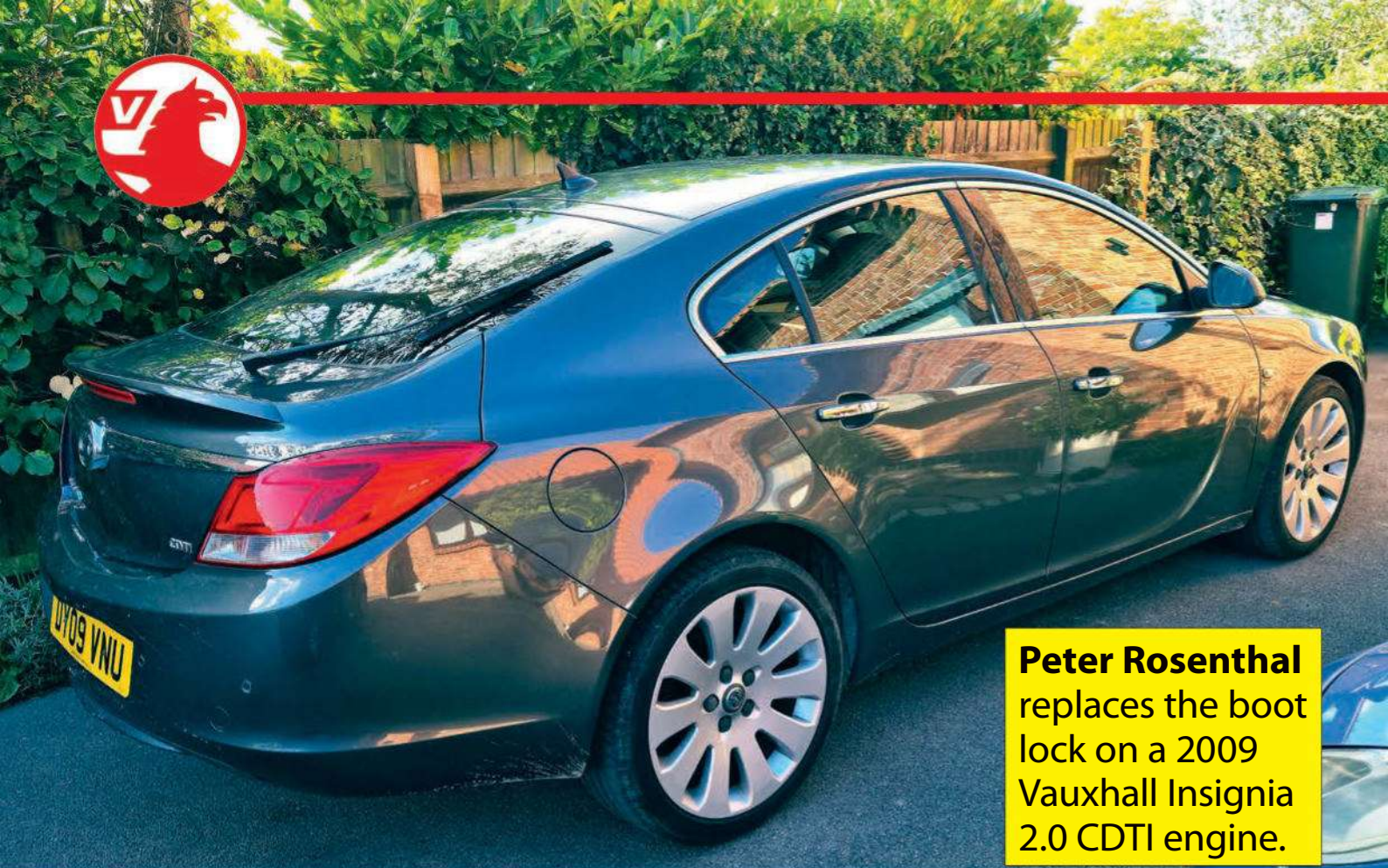


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Explore the Range





**Peter Rosenthal** replaces the boot lock on a 2009 Vauxhall Insignia 2.0 CDTI engine.

# Vauxhall Insignia

# TAILGATE SWITCH

**A** common issue with the Insignia hatchback is that the boot switch mechanism can stop working. If the boot only unlocks on the key fob, it's highly likely that this is the issue. While it's not a big deal and some people choose to ignore it, it can be annoying to live with and as a genuine Vauxhall replacement switch only cost £23.50 it's not going to break the bank. Ours was part number 13422268 supplied by the Vauxcentre ([vauxcentre.co.uk](http://vauxcentre.co.uk)).

Fitting it took under an hour and proved straightforward with only basic tools needed, so it's quite a satisfying evening or weekend fix.

### Equipment required

- ▶ 7mm and 10mm sockets
- ▶ ¼-inch ratchet or impact driver



**2** Open the tailgate and start by removing the plastic cover that covers the claw latch. It simply pulls off.



**1** If the key fob unlocks the tailgate without issue, there's clearly nothing wrong with the mechanism, so just the tailgate switch needs replacing.



**3** Using a 7mm socket and either an impact driver or ratchet, remove the screw securing the plastic shut handle in place.





**4** The tailgate inner lining can now be removed. It's only clipped in place so start by firmly pulling down the rearmost section and then remove it from the front slots.



**5** These metal clips on the carpeted inner might move during removal, so make sure you collect any that have come loose and refit them. They're quite durable and shouldn't break.



**6** Next the fixings to the chrome boot trim need to be removed. To access the outermost ones, remove these rubber covers to reveal the nuts.



**7** Remove the two outer 10mm nuts with either an impact driver or a 1/4-inch driver ratchet. Little force will be needed as they're only light duty fixings.



**8** Two more 10mm nuts secure the chrome boot trim in place on either side of the lock's electrical connector. Remove these.



**9** The chrome trim will not fall off at this point as it's still secured by a pair of plastic clips. With one hand supporting the chrome trim on the outside of the tailgate, squeeze these clips together with your other hand to release the clips.

**10** The chrome trim should now come away from the car once the electrical connector is unclipped. Take care not to scratch the paintwork with the exposed studs on the trim.



**11** With the chrome trim section inverted and placed on the parcel shelf of the car, compare the old and new switches are compatible.



**12** Unclip the electrical connector from the chrome trim as a first step. Make sure you don't fully shut the tailgate at this point.





# 2009 Vauxhall Insignia TAILGATE SWITCH MECHANISM



**13** ◀ The actual switch can now be unclipped from the chrome trim. No tools are needed for this, it will simply unclip.



**14** ▶ Clip the new switch into place until it clicks neatly home. It shouldn't be loose and needs to be flush with the surround.



**15** ◀ Checking the orientation, push the new electrical connector into the chrome trim housing until it sits flush.



**16** ▶ The chrome trim section can now be offered back up to the car (again taking care not to scratch the paintwork with the studs) and the electrical connector plugged in.



**17** ◀ The whole trim section can now be clicked into place – the plastic trim clips will hold it in here while the tailgate is raised.



**18** ▶ Refit the 10mm nuts on either side of the boot switch, followed by the two outer 10mm nuts. Don't overtighten them – you might want to use a ratchet socket for the outer ones.



**19** Before you refit the carpet trim, shut the tailgate and check that the new lock works and that the tailgate still unlocks on the key fob.



**20** If all is well, refit the rubber covers to the ends of the outer 10mm nuts and then refit the carpeted liner, slotting it into the C-pillar trims first and then clicking the rearmost clips into place. Refit the 7mm screw securing the grab handle and click the latch cover back into place.



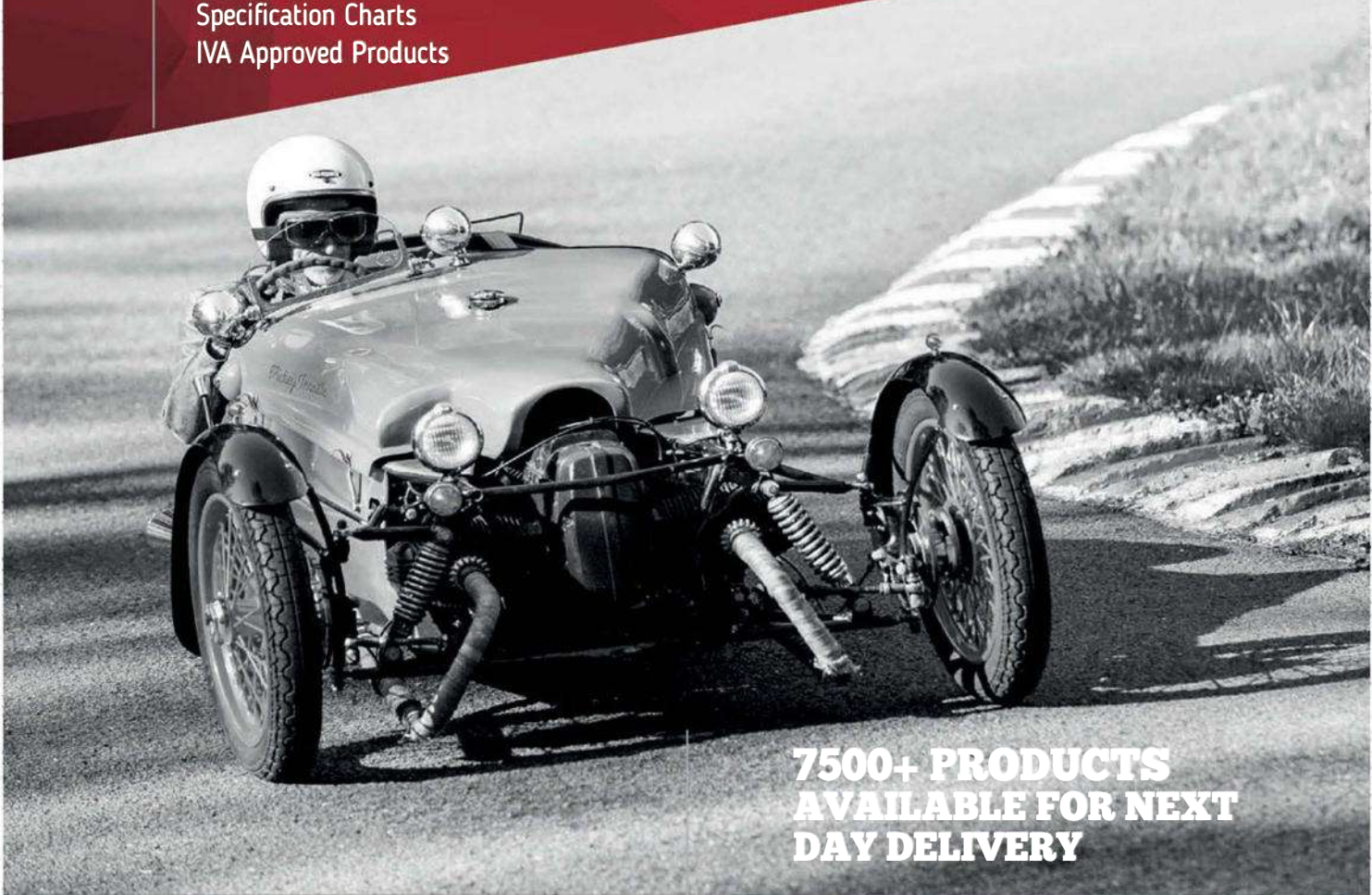
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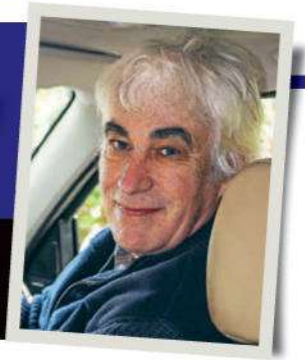


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# Dealer's Diary



**Peter Simpson** provides us with an insight into the automotive sales trading world – and beyond.

## New source of stock?

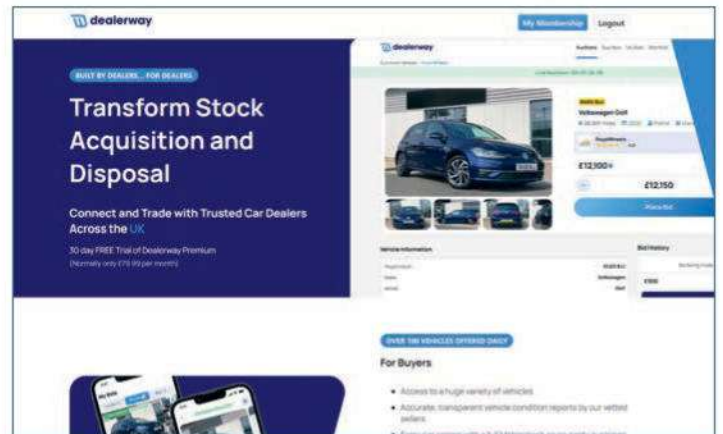
► The Dealerway trade buying and selling app launched on September 30. This has developed from Facebook group PartX Gold, which was founded by north-east based trader Scott Sibley has been running as a trade-only car buying and selling platform for some time. Dealerway.co.uk, which is run by Scott and Stephen Douglas, both of whom have “decades” of direct motor trade experience and have found it increasingly difficult to source decent quality stock. They also wanted a quick and easy way of disposing of part-exchanges and other cars which aren't suitable for them to retail.

Everyone involved must provide proof of ID and a motor trade insurance certificate, but on top of that, they must be verified directly by means of a live phone call.

The App will, it's claimed, offer over 1000 cars a day to registered and genuine traders and all cars will come with full Motorcheck “to ensure no nasty surprises.” Listings will also include *Auto Trader* retail prices (though cars will be sold at trade prices) and a “forced review system” to ensure everyone plays fair. Fixed price and auction listings are offered.

Cost-wise, there are two options. For an £80 monthly subscription, you can buy or sell as many cars as you like, and a month's free trial is currently on offer. Alternatively, for those who work on a smaller scale, a pay-as-you-go option is also available, at a rate of £30 per car bought or sold.

We stress that we are reporting this as a news story, and this is not in any way a recommendation. It is also a strictly



trade-only platform, and while this does mean trade prices, it also means that all transactions are on strictly trade-to-trade terms. Most consumer laws do not apply in a trade-to-trade sale (the law's basic position is that traders are capable of looking after themselves without added protection). In particular, a trade buyer has no post-sale comeback whatsoever; once the car has been bought it's yours, faults and all! But if you know someone who buys and sells a bit, or who sources cars for others, then this could be interesting.

To register, or to find out more, go to [www.dealerway.co.uk](http://www.dealerway.co.uk)

## VW dealership shake-up

► VW Group has announced a dramatic reduction in its UK dealer network is underway. It's been claimed (and not denied by VW) that the overall aim is to reduce the number of 'retail partners' from its present 132 down to just 25.

This does not, however, mean there will be just 25 outlets. The current 132 firms operate 519 new-car franchises between them out of 447 showrooms. VW appear to have adopted a different approach to other manufacturers such as the Stellantis – they issued termination notices to all dealers and then offered fresh contracts to the ones they wanted to keep.

VW, however, talked directly to affected dealers – some, it's understood, were approached back in March. It seems that the plan is to have one dealership per area, and it's being suggested that dealers who are being terminated sell their businesses to whoever is appointed to cover their area. The problem with that, of course, is that if only one firm is able to buy the franchise as a going concern, they can offer basically whatever they like for the dealership goodwill part of the franchise.

Some rearrangement of the VW dealer network is clearly needed, not least because it still contains some dealerships that cover just one of the five brands (Audi, Cupra SEAT, Skoda, and Volkswagen) which make up the group. However, given that many of the affected dealerships are family-run businesses with excellent local reputations, changes like this need to be sensitive and proportionate.





# More variety, more problems...

▶ As we all know, the motor trade has changed a lot in the past 40 years; so much so that if a sheepskin coat wearing trader from 1984 and his well-thumbed pocket-sized *Glasses Guide* were to suddenly find themselves transported on to a forecourt today, he'd barely recognise the trade. Obviously, most change has occurred since the internet became a massive thing, but probably the biggest is how many more people now buy cars from outside their immediate locality. By and large, it is a lot easier to travel around the country and more cars are advertised on a national basis.

The main reason, though, is that today's buyers have a lot more choice. Some may mourn the days when virtually every car on as British street was British made, but realistically that meant that for most people the choice of cars was limited to the number of domestic manufacturers, as BL, Ford, Vauxhall and Rootes/Chrysler didn't generally offer more than one model to suit each market sector. Someone in 1984 wanting a five-year-old mid-range car, for example, could choose a RWD Morris Marina, Ford Cortina or Vauxhall Cavalier or a FWD Leyland Princess or Chrysler Alpine. Today, they'd have choice of around three times that number.

But that's only half the story. There's also much greater choice when it comes to type of car – nowadays the SUV is probably king, but the previous 'supermini' class has become sub-divided, and people look much more at premium brands because of the variety. It's no longer enough for the sales manager to have a high-spec example of the same car as his salesmen drive.

As I say, all this means that people can and often will travel a long way to buy the exact model that they want. From a trader's point of view, it's obviously good to have more people to sell to. There are, though, a couple of possible caveats. Firstly, 'distance selling' (in other words where a customer agrees to buy a car without seeing it first) means the customer has the legal right to return it within 14 days.



They don't have to have, or give, any reason for doing this, and you cannot deduct anything from the refund. What's more, you probably have to arrange collection! As I've mentioned before, the only way of avoiding this is by insisting that all sales are conducted face-to-face.

The other issue is dealing with any warranty problems that might occur. Decent traders want to look after customers, and the usual way of dealing with issues that arise is by asking the customer to "bring it in and we'll take a look."

That, however, isn't really practical if the dealer is in London but the customer is in Glasgow. This means the dealer's only option is to either trust a garage of the buyer's choosing (which is more likely to favour the local buyer than the far-away trader) or to bite the bullet cost-wise and involve a main dealer. And what if the customer is simply pulling a fast one, and the alleged 'fault' doesn't exist at all?

Maybe someone needs to create a register of trader-friendly repairers across the country, firms that help local traders out and who can be relied on to act as honest brokers? And maybe dealers who need help could pay a small fee for a recommendation from said register? A potential win-win for everyone...

## A nasty con

▶ Heard a disturbing story the other week, via an online dealer group. A new trader in Birmingham sold a Ford Kuga that had been fully and thoroughly prepared and was in excellent condition. Ten days later, the buyer was on the phone saying that the engine had developed a nasty noise, and they wanted a full refund. Car came back, and sure enough, the car was knocking itself apart. But the dealer also noticed that a couple of grilles had damage which hadn't been there when it was sold, and that there was also a massive crack right across the car's panoramic roof which again wasn't present at the time of sale.

The initial question on the group was how much should be deducted for the damage. However, several people pointed out that there was a distinct possibility that someone was trying to con the trader concerned. The con works by someone buying a problem car from Copart or similar, and, at the same time, sourcing a good example of the exact-same car from a dealer. They then swap the bad bits over from the bad car to the good one and vice-versa, before claiming the good one has gone wrong and demanding a refund!

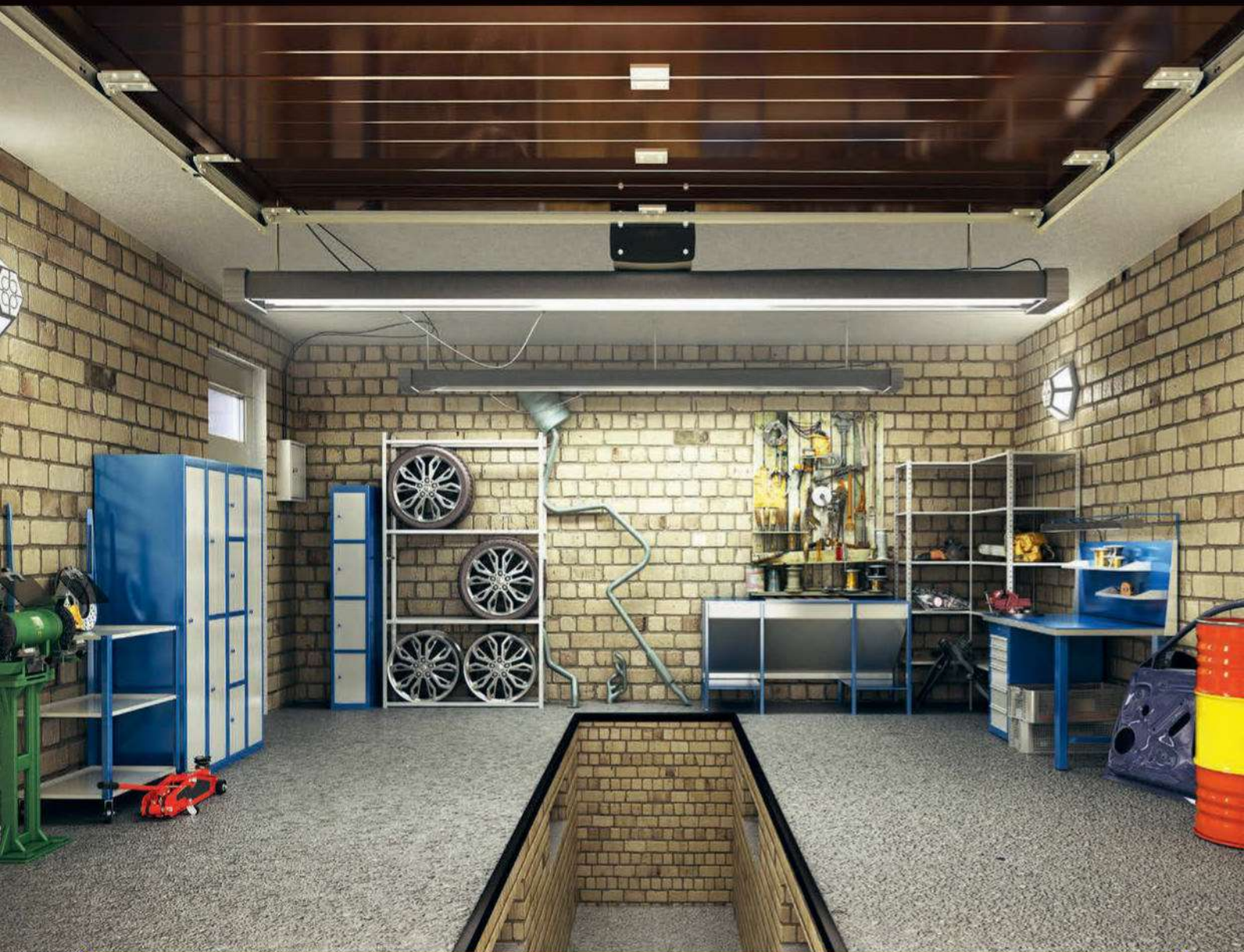
The problem of course can be proving that this has happened. In this case the selling dealer happened to have photographed the engine bay and this, along with his pictures of the outside, was enough to show what had happened. The fraudsters had, incidentally, swapped the engines ID over, but if one looked closely this was pretty obvious. The final proof, though, came via a 4am drive past the buyer's home – the 'other' Kuga was parked outside.





# GADGETS for your

# GARAGE



**Rob Hawkins** picks out some of the equipment he thinks you can't be without for working on vehicles, discovers some of the latest products and asks *CM* contributors for their opinions.





**T**here's no better feeling than being confronted with a job on a vehicle and finding a tool or piece of equipment helps. Similarly, choosing the right tools and equipment can make your life so much easier, whether it's a case of having a torch that illuminates effectively, clothing that keeps you warm or an impact driver that reliably slackens seized fastenings.

The following pages cover many of the obvious topics but delve a little deeper into the technicalities of what to think about when buying a torch, heating a garage or ensuring you can start a car if its 12V battery is flat. And to give you a little inspiration, we've asked the people behind the scenes at CM to come up with their own recommendations.

*Rob Hawkins*

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# LIGHTING

► The technology behind lighting equipment seems to be forever improving to the point that if your handheld torch, head torch or worklight is more than a year or two old, then the chances are it will have been replaced with something that's longer lasting and more powerful.

We've tested numerous pieces of lighting equipment in *CM*, the last one being Steve Hole's group test of head torches in the April 2024 issue. We've also been using a variety of lighting equipment, which is often shown in our photographs of project vehicles and in regular features including *Service Bay* and *Electronic Diagnostics*.

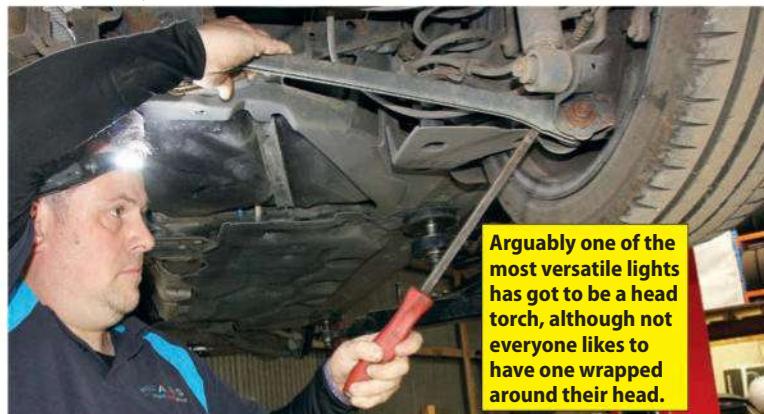
If you're wondering what the best solution is to light up your garage or an area of a vehicle you are working on, you may conclude that it's one particular light that saves the day, or a few of them.

LED battens (like the traditional fluorescent strip lighting, but much brighter), for instance, help to illuminate an entire garage, and are now quite cheap to buy and very cheap to run. Additional spotlights will add lighting to any dark spots or help to illuminate areas in a garage you often work in, such as over a workbench. Mobile lighting, such as handheld torches, head torches, worklights and underbonnet lamps are a potential minefield, so we've tackled these products under two separate headings.

In all cases, when it comes to lighting, it's important to have some knowledge about illumination to ensure that whatever you invest in is sufficiently bright. The brightness of a light is measured in lumens, but this can get confusing for several reasons. One of those reasons is down to the intensity of the light. For example, a handheld torch at 500 lumens is noticeably bright because the light produced is concentrated

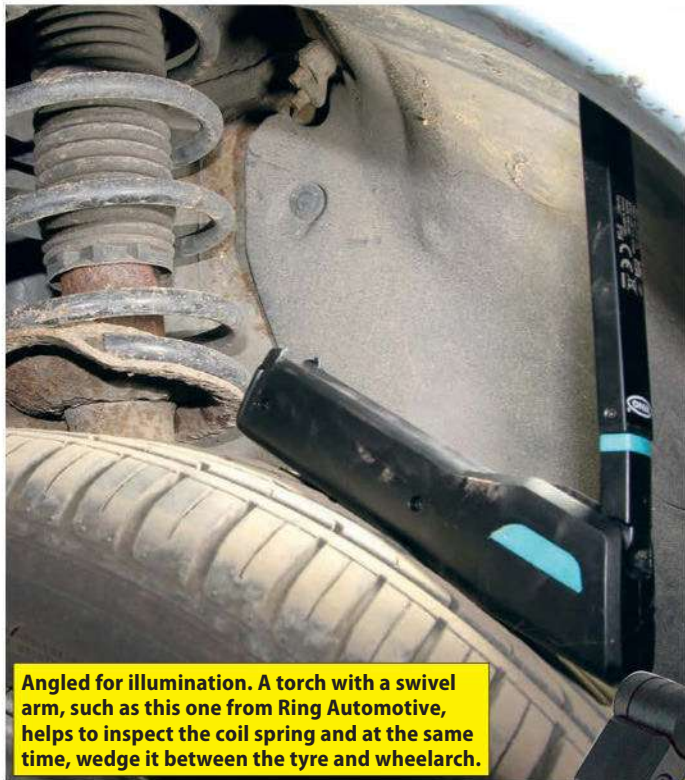
on a small area (high intensity). An LED batten with the same 500 lumens isn't particularly bright because that light is more dispersed than a torch, so most of them have an output of a few thousand lumens.

Another factor to consider when choosing LEDs is the colour temperature, which helps to indicate whether the light produced is either a warm or bright white, for example. This is measured in Kelvin (often represented by the letter K), and as a guide, the light from the sun is generally around 5500-6500K (less at sunrise and sunset). However, when it comes to LED lighting, you may choose lighting that produces 3000K, which gives a soft white or slightly yellow cast, whereas 4000K produces warm white and is found in many shops and offices. If you want bright white illumination, then look for around 5700K, which can seem to have a blue tint, but it's useful for high-visibility areas, such as car parks and workshops.



Arguably one of the most versatile lights has got to be a head torch, although not everyone likes to have one wrapped around their head.





Angled for illumination. A torch with a swivel arm, such as this one from Ring Automotive, helps to inspect the coil spring and at the same time, wedge it between the tyre and wheelarch.



This handheld torch from Ring Automotive has magnets on its base and back for securing it to metal surfaces, an easy-to-find on/off button on the back, battery status lights to warn you when the battery is flat and two points of illumination. Maximum output is only 250 lumens, but it's bright enough for close-up jobs, such as checking an engine's oil level.

## Handheld torches

► There's an abundance of handheld torches, so here's a list of the features we reckon you need to consider when buying one:

**RECHARGEABLE:** there's no point in using a torch that needs AA or AAA batteries. A built-in rechargeable lithium-ion battery is much less hassle, and all the latest lamps can be recharged with a simple USB-C lead. However, having a battery status light on the torch does help to know when the battery is about to go flat.

**SIMPLE BUTTONS:** when you're bent double inside a wheelarch with your hands covered in grease and trying to switch a torch on or off, that's when you

We think this design of angled LED light is perfect for working on a vehicle. This one is from Car Builder Solutions and costs £38.40.



want something that's easy to use. So, choose a torch that has controls which are easy to find and simple to operate – many have multiple light settings to work through on one button, but if left on for several seconds, a single press of that button will simply switch off the light.

**VARIABLE BRIGHTNESS:** a high output of light (measured in lumens) is attractive in a torch, but the maximum illumination can sometimes be too much, so having a lower setting is useful. Our favourite is an adjuster wheel.

**MAGNETS:** hanging hooks can be useful, but the best means of securing a torch in a specific position is to have multiple sets of magnets installed into its body, or at least the base and back of it.

**ANGLING:** directing the light at a specific area on a vehicle can be very frustrating, so whilst the aforementioned magnets will help, having some means of adjusting the angle of the body of the torch is essential.

## TOP GADGET

### Peter Clayton's TORCH tips

"Without my inspection lamp I'd be struggling at most jobs," says CM contributor Peter Clayton. "I've been through a few types but this Ring lamp with a single COB LED really packs a punch. I prefer the single light source over multiple bulbs as it reduces the number of shadows. I have two of these so that one is always fully charged and ready when the other runs out of juice."





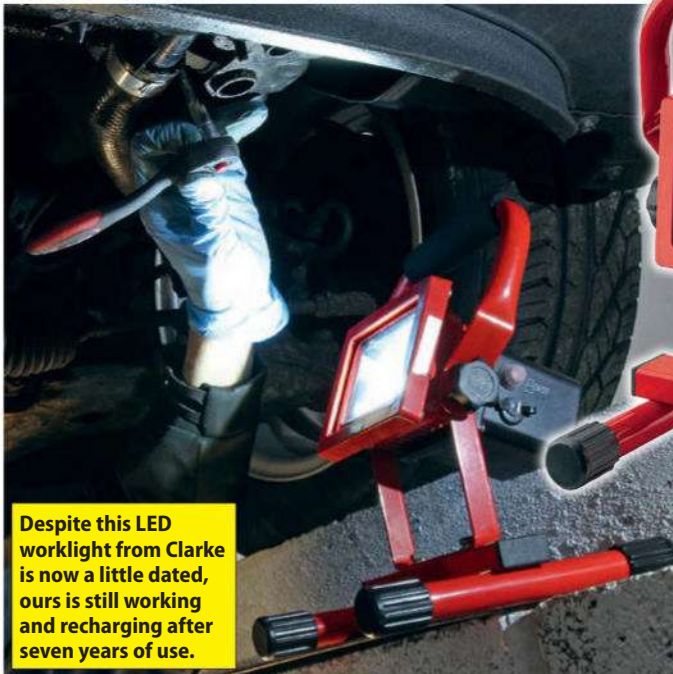
## Worklights and underbonnet lamps

▶ Mobile worklights can produce better illumination when compared to torches because they are larger, so there's room for more LEDs. However, our testing has often revealed that they are not as versatile, so they don't replace a torch.

A worklight with a stand does help to make it more versatile, transforming it into a mobile floodlight. From the ones we've tested, they are powerful, and the controls are easy to use. We've been using an older design of rechargeable LED worklight from Clarke since 2018 (it now costs £35.98 – search for 010813617 at Machine Mart). Offering a mere 650 lumens, but with a colour temperature of 6500K, it doesn't light up a garage but is a useful means of additional lighting. And more importantly, after nearly seven years, it's still working, and the battery still holds its charge.

We're a big fan of underbonnet lamps, despite their limitations, although we have successfully used them inside vehicles by suspending them to the door apertures. If you want one to use all day, then look for one that can be plugged into the mains to recharge the battery and continue using it at the same time (the battery usually only lasts for 3-4 hours).

Underbonnet lamps are not just for engine bays. We've used this entry-level UBL from Machine Mart's Clarke range on our project BMW 335i and for several Service Bays. Priced at £77.99.



Despite this LED worklight from Clarke is now a little dated, ours is still working and recharging after seven years of use.



Rechargeable floodlight from Sealey can be purchased with a tripod. We've been using one for most of 2024 and find it's ideal for providing essential illumination inside an engine bay, a vehicle's interior, or underneath it when raised on a ramp.



Continued  
on page  
**52**



Your trade

Our tech

# #MyLamp

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Sealey's RoadStart jump starter also includes a tyre inflator, power bank and LED torch. Expect to pay around £100.



## BATTERY CARE

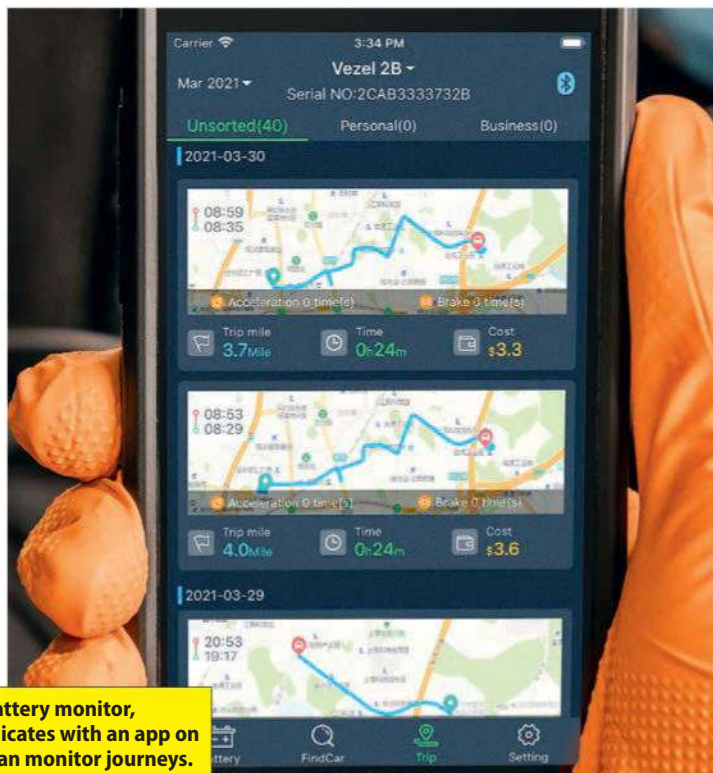
► There was a time when a voltmeter, hydrometer, bottle of distilled water and a battery charger were all you needed to look after a vehicle's 12V battery. Nowadays, the voltage output may not have changed, but with Stop-Start systems there are more sophisticated AGM and gel-type batteries, so keeping up with the technology requires a more complicated range of equipment, which we've outlined over the next three pages.

### Battery monitors

► A simple battery monitor connected directly to the 12V vehicle battery can help to save you from a flat battery and/or a non-start situation. Budget for around £30 for one, which uses Bluetooth to connect to a mobile phone and a dedicated app that not only informs you of the battery's voltage, but where your vehicle is located and the journeys it has taken.



Like the Streetwise battery monitor, Sealey's unit communicates with an app on a mobile phone and can monitor journeys.





Battery monitors, such as this one from Streetwize, connect directly to the 12V battery, but use Bluetooth connectivity to keep you informed via a mobile phone app.



Intelligent battery charger from Laser Tools has a 10-stage charging cycle, dropping to a trickle charge to avoid overcharging. Budget for around £56.

## Jump-starts & mobile power

► Many of the large luggable jump-start packs have now been replaced with lighter lithium-ion and lithium-polymer technology. We've tested a few of the budget-priced compact jump-starters that are no bigger than a hardback novel, and whilst they are effective at providing the additional juice to start an engine, they are generally only useful for one or two attempts before they need a recharge, which is probably sufficient in most cases. Some also double up as a power bank and include useful accessories, such as a light or even a tyre inflator.

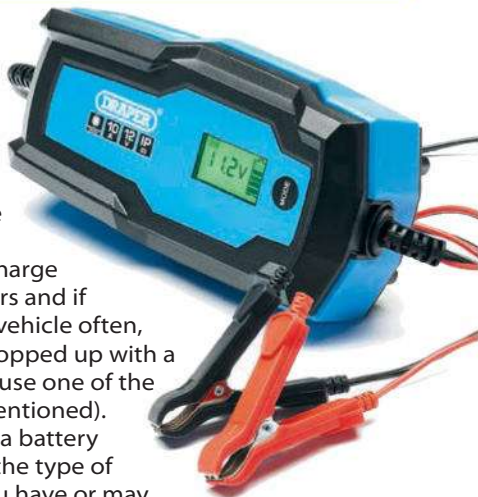
We have killed off a few of these compact jump-starters, especially if they are not regularly recharged. In fact, Clarke's range of Jump Start Micros should be recharged every month, whereas the recently launched Hylite Jump-Lite's battery should last for a full year.

The claims made for how many engines can be started where the vehicle's battery is flat has been a difficult aspect to test. In our experience, we've usually flattened a jump-starter after trying to start one engine, but it all depends on the condition of the vehicle battery – at the very least, it will be low enough to not be able to start the engine.

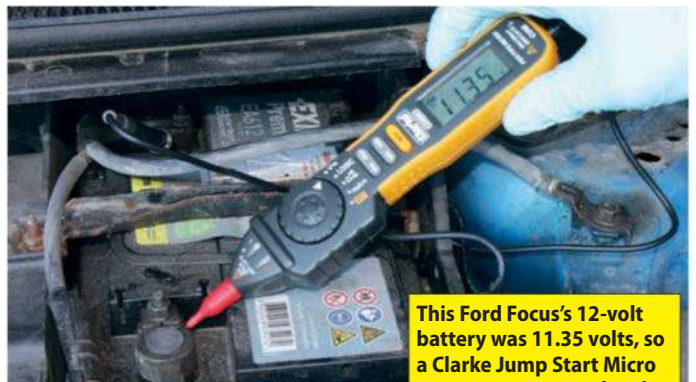
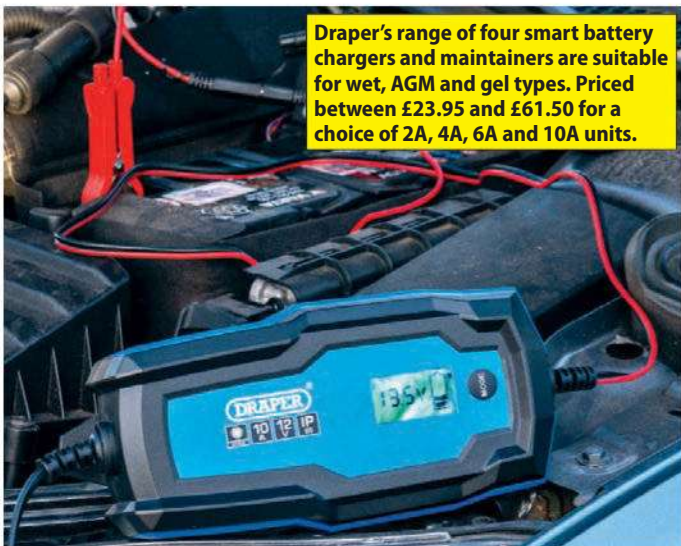
## Chargers & maintenance

► Whilst a jump-start will rescue a flat battery in seconds, in some cases, this can damage the battery, especially if it has to be done regularly. A better approach is to recharge it over several hours and if you don't use the vehicle often, keep the battery topped up with a trickle charger (or use one of the monitors we've mentioned).

When choosing a battery charger, consider the type of vehicle battery you have or may have in the future. Anything with a Stop-Start system may require a charger that caters for AGM batteries. You may want a charger that can analyse the battery status and calculate how much time will be required to recharge it.



Draper's range of four smart battery chargers and maintainers are suitable for wet, AGM and gel types. Priced between £23.95 and £61.50 for a choice of 2A, 4A, 6A and 10A units.



This Ford Focus's 12-volt battery was 11.35 volts, so a Clarke Jump Start Micro 1200 was connected and helped to start the engine, but zapped its state of charge from 100% to 48%.





# GADGETS for your GARAGE BATTERY CARE



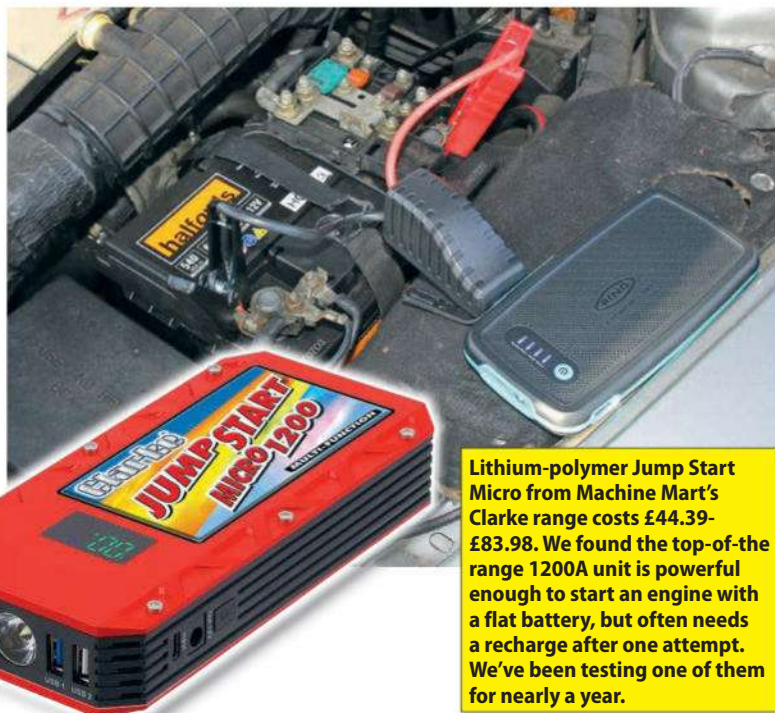
Available from Car Builder Solutions for £108, this compact jump-start pack is powered by a lithium-polymer battery.



Available from Defender Security Products, the all-new Hylite Jump-Lite claims to be able to jump-start 10-30 times on a single charge, and its fully-charged battery lasts for a year. Priced at £129.95.



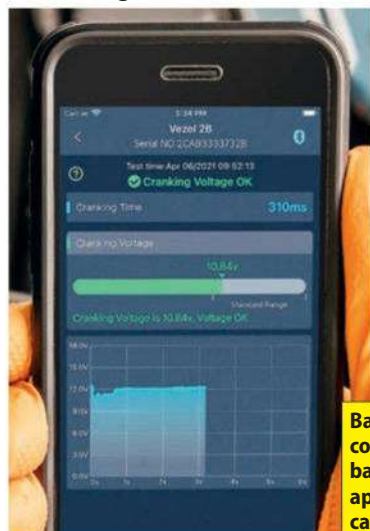
Sealey's all-in-one jump-start pack also has a hose attachment to inflate tyres.



Lithium-polymer Jump Start Micro from Machine Mart's Clarke range costs £44.39-£83.98. We found the top-of-the-range 1200A unit is powerful enough to start an engine with a flat battery, but often needs a recharge after one attempt. We've been testing one of them for nearly a year.

## Testing a battery

▶ Knowing the voltage of a vehicle's battery can help to determine whether it's sufficient to be able to start the engine, but it won't determine whether the battery can withstand the draw of amp-greedy equipment, such as lighting and heated seats and glass. This is where a battery tester can provide a better analysis.

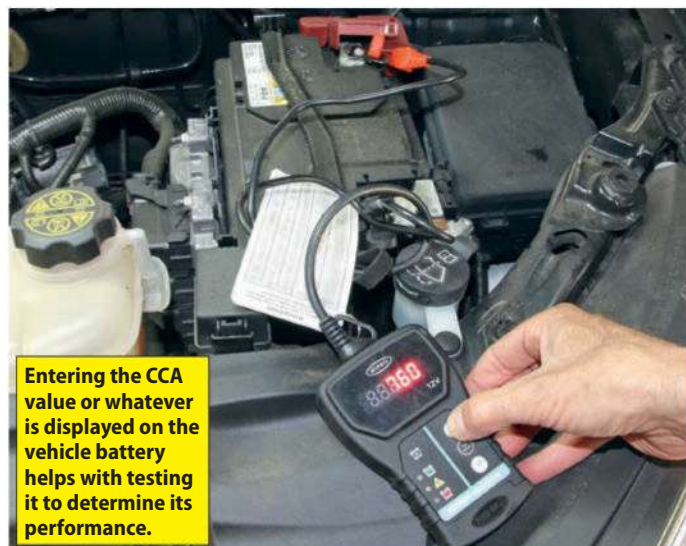


Battery monitor from Sealey connects directly to the 12V vehicle battery, but uses a mobile phone app and Bluetooth connectivity. It can even test the battery.

Most battery testers require the output of the battery to be entered, which is often displayed on the side of it. Look for letters such as CCA (cold cranking amps), DIN (German standard), SAE (American Society of Automotive Engineers), JIS (Japanese standard) or EN (European standard). This can be inputted into the

battery tester, followed by any value that's displayed with it on the battery, which helps to determine the battery's condition.

Some battery testers can assess the battery when the engine is being started, which really helps with its performance. Others can assess it when the lights and heating system are switched on. And some of the battery monitors we've outlined also include a range of test functions.



Entering the CCA value or whatever is displayed on the vehicle battery helps with testing it to determine its performance.



Having an accurate tyre pressure gauge is a must. When we tested them in the November 2018 issue of *CM*, we found this one from PCL was the most accurate.



# TYRE SAFETY

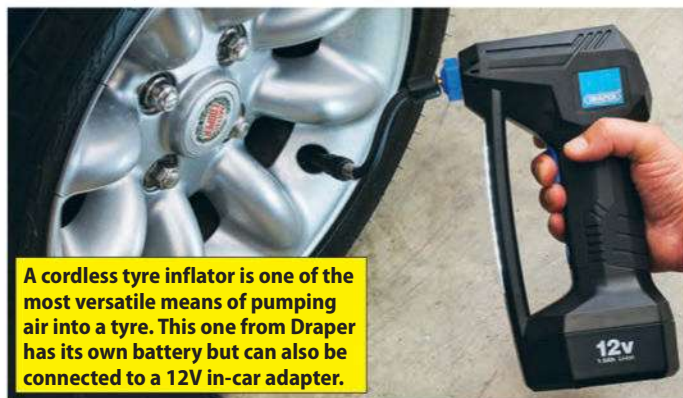
► Whether you use a foot pump, electric pump or one at your local fuel station, keeping your vehicle's tyres correctly inflated is an essential part of routine maintenance to help save on premature wear. One gadget we'd recommend buying is an accurate tyre pressure gauge (we tested several of them in the November 2018 issue of *CM*) to ensure your vehicle's tyres are correctly inflated.

A tyre inflator is also a must and the latest range of battery-powered (cordless) equipment has some interesting features, such as an auto-off when inflating to a set pressure and a power bank. Some can be powered by two sources – a removable battery that can be used with other tools, and also

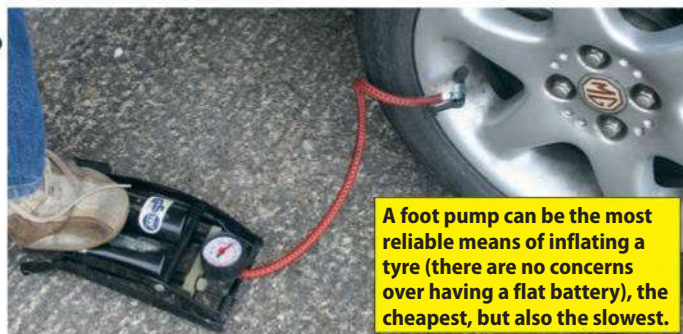
a 12V car adaptor. We're currently testing a range of them for a product test that will appear in a forthcoming issue of *CM*.

If the air in your tyres hardly ever needs topping up, then a cordless tyre inflator may not be the answer, especially as its battery may need to be recharged every month or two to keep it in good working order. Consequently, a cheaper 12V-powered electric pump could suffice, or even a foot pump. Budget for upwards of £10.

Single-barrel foot pump from Machine Mart costs a bargain £9.59. If you rarely need to top up the air in your tyres, then this may be all you need.



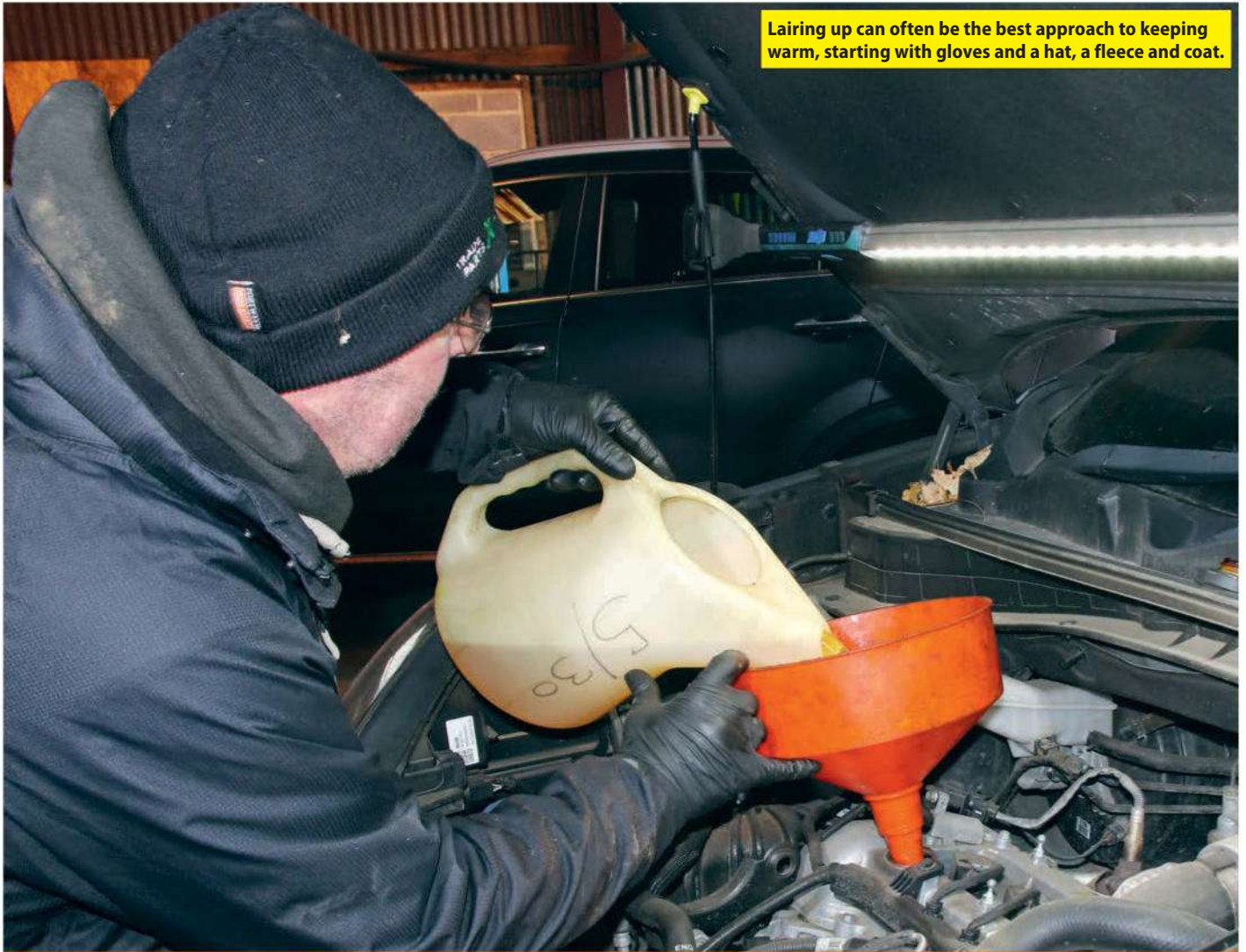
A cordless tyre inflator is one of the most versatile means of pumping air into a tyre. This one from Draper has its own battery but can also be connected to a 12V in-car adapter.



A foot pump can be the most reliable means of inflating a tyre (there are no concerns over having a flat battery), the cheapest, but also the slowest.



Lairing up can often be the best approach to keeping warm, starting with gloves and a hat, a fleece and coat.



## KEEPING COMFY

▶ Working on a vehicle can be backbreaking, hard on your knees and rough on your hands, but there are lots of accessories to help reduce the strain on your body and reduce the risk of injuries and long-term problems.

It's essential to keep warm, especially when the weather is cold. This could be in the form of thermal clothing, such as a vest, socks and even traditional long johns. However,

there is also a vast range of heated clothing, which works off a rechargeable battery pack. This type of clothing contains heater elements (thin wires) fitted inside the material that generates heat, so it's popular for heated jackets and body warmers, for instance, but also hats, shoes, insoles and gloves (although gloves are often bulky and difficult to use when working on a vehicle).

A beanie hat is one of the best ways to keep warm and some, such as this one from Laser Tools, includes a rechargeable LED. Expect to pay around £15.



Heated clothing does have its limitations, based on battery power and the temperature of the generated heat that can be applied to your body. An alternative solution to heating your body is to use infrared heating. With prices starting





We've been using one of these work mats for over 10 years and it's still intact. Available from Machine Mart for £39.98.



3-in-1 car creeper from Machine Mart costs £59.98 and folds into a seat.



at £20-£25 for a small, wall-mounted infrared heater and up to £200-£300 for a large panel, the principle of infrared heating is to warm up objects, such as your body, through the transmission of infrared radiation that's similar to the rays from the sun (but not ultraviolet light). This type of heating doesn't warm up the air, only objects.

If you prefer to warm up the air inside your garage or workshop, the cheapest and smallest option is to use an electric fan heater, which costs from around £20, although these are only effective for warming up a small area.

An oil-filled radiator is another solution to heating the air, but like central heating, it takes time to warm up the inside of a garage. Budget from around £35.

The quickest solution to warming the air inside a garage is to use a space heater, which blows warm air out. Prices start at around £100, and most are gas powered so they require a gas bottle. Consequently, they can be quite bulky and also noisy. And some form of ventilation is required to avoid inhaling excessive amounts of carbon monoxide.

Whilst keeping warm is often a major concern, avoiding muscle strain, a bad back and joint pain is possibly just as important. Scrambling underneath a vehicle can be made easier with drive-on ramps, tall axle stands or even a lift, but such equipment requires careful planning and isn't so easy to acquire when your car's exhaust is hanging off and you need to fix it on the driveway.

The more obvious solutions to lying flat on your back on a cold surface or having to kneel down to change a set of brake pads come in the form of work mats and car creepers. A simple cushioned or foam kneeling mat costs under a tenner, whereas a work mat that's big enough to lay on can cost a little more. We've been using a foldable work mat from Laser Tools for over 10 years, which is still available for around £40. Whilst the ties to hold it together (when folded) have snapped off, the padding and exterior have survived, so it's still saving our knees and helping us to crawl underneath vehicles.

Car creepers are a more upmarket version of a work mat, and the latest ones are very versatile, with tool trays and folding parts to transform them into a seat (stool).

Continued on page 60



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An impact driver is often more effective at slackening or loosening a nut on the end of a steering or suspension balljoint where there's a greater risk of it spinning if it was manually turned with a spanner or ratchet.



## POWER TOOLS

► Impact drivers, wrenches, reciprocating saws and chisels are some of the power tools that can help save the day when a fastening is proving difficult to undo. At times, the shock of an impact driver is the most efficient way of undoing a nut for a suspension or steering balljoint without spinning the entire assembly. And power tools save time.

So, whilst we may agree that power tools are worth having, the big question concerns which type to invest in. We've outlined all the options over the following pages to help weigh up their advantages and disadvantages.

### Battery power

► Battery-operated power tools are by far the most versatile option when it comes to using an impact driver, drill or polisher. It does, however, require a little planning before purchasing them to avoid falling into the trap of having numerous different types of batteries and chargers for a vast assortment of tools. And when a battery fails, it can sometimes be more economical to buy a bundle deal consisting of a new tool with batteries.

Deciding on a range of tools that use the same battery isn't always as simple as it sounds. A compact impact wrench for getting into tight spots and undoing small fastenings probably won't use the same type of battery as a heavy-duty impact driver that's capable of slackening a hub nut. So, you may have to resort to having at least two groups of tools.

There are a couple of points to consider for batteries. The voltage rating, which is typically either 10.8V, 12V, 18V or 20V, helps to determine how powerful a tool can be. As a rule, the greater the voltage, the heavier the battery, which may be



a deciding factor if you are looking for lightweight power tools.

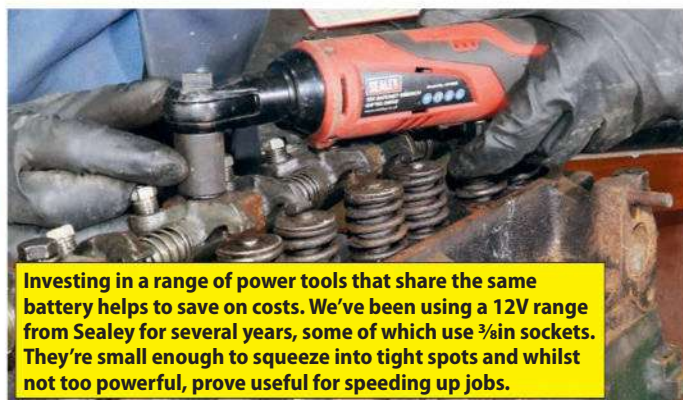
Although the voltage rating of the battery can help to determine the power rating of the tools, impact drivers and ratchets should state how many Nm they are rated at, which helps to work out whether they will be capable of undoing particular fastenings. Unfortunately, we've found this to be rather vague, especially when we used an 18V impact driver/wrench rated at 160Nm to undo wheel nuts that had been tightened to around 120Nm. The tool couldn't undo them, although, to be fair, they had probably corroded a little and also, wheel nuts often tighten over time instead of slackening.

Another point to consider when looking at battery power is the amp hours (Ah) value. The higher the value, the longer the battery will last, which could be important for demanding jobs, such as undoing tough fastenings with an impact driver or rectifying paintwork with a polisher. Spare batteries may be required, and short recharge times can help.

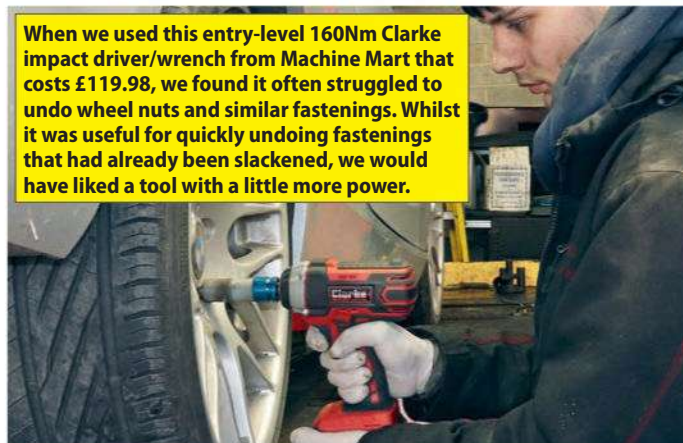
New from Machine Mart's Clarke range is this 18V impact driver/wrench that's rated at 400Nm, includes two batteries, and costs £173.99 for the lot.



Priced at around £260, this range of 12V cordless power tools from Sealey share the same battery and charger.



Investing in a range of power tools that share the same battery helps to save on costs. We've been using a 12V range from Sealey for several years, some of which use 3/8in sockets. They're small enough to squeeze into tight spots and whilst not too powerful, prove useful for speeding up jobs.



When we used this entry-level 160Nm Clarke impact driver/wrench from Machine Mart that costs £119.98, we found it often struggled to undo wheel nuts and similar fastenings. Whilst it was useful for quickly undoing fastenings that had already been slacked, we would have liked a tool with a little more power.

## Take the lead

► If your power tools are always going to be used in one location, such as a garage that has mains electricity, then it's worth questioning the point of using battery-operated tools. Mains-powered tools, such as drills, impact drivers and polishers, are much cheaper to buy and better value for money – an impact driver rated at around 400-500Nm costs under £100 for one that uses mains electricity, but around double that amount for one that's battery powered.

Having a lead to plug into a mains socket can raise a few issues. If it's too short, then you'll need an extension lead. If you're using a polisher, it can drag across the paintwork. And leads inevitably get dirty, knotted and taffled.

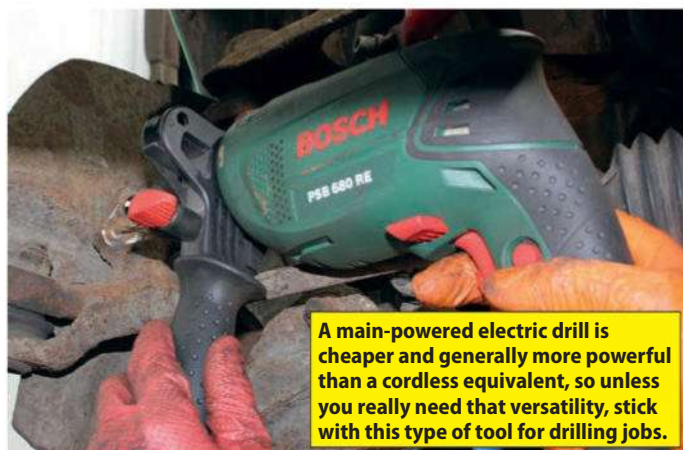
Not all power tools with a power lead need to be plugged into a mains socket. Some can be connected to the vehicle's 12V adapter (cigarette lighter socket). We've been using such an impact driver from Machine Mart for over 20 years, which is rated at 350Nm and costs £35.98. It's a little agricultural in comparison to similar battery- or mains-powered tools, but for the price and versatility (ideal for changing a wheel at the roadside), it's a winner.



Power leads can get in the way, especially when polishing, so they need to be sufficiently long, such as this 5m lead attached to a Draper Storm Force polisher.

## Brushed vs brushless

► Traditionally, an electric motor in a drill or polisher for example, uses carbon brushes to enable it to rotate. These brushes wear down and eventually need to be replaced. A brushless motor doesn't have these brushes, but uses electronic circuits to rotate the motor. There's less friction, which results in less noise, heat and energy consumption (useful for battery-powered tools). This type of motor is more expensive to manufacture, but it's lighter, smaller and generally creates less vibration.



A main-powered electric drill is cheaper and generally more powerful than a cordless equivalent, so unless you really need that versatility, stick with this type of tool for drilling jobs.



Priced at a bargain £35.98, this 350Nm impact driver/wrench from Machine Mart plugs into a vehicle's 12V adapter/socket. We've been using one for over 20 years and find it useful for undoing wheel nuts.



# AIR POWER



Airmaster range of portable air compressors from Machine Mart starts at £131.98. The cheapest are useful for light jobs, but there's a price to pay for portability and size in that the compressor may be running for most of the time you are using the tools connected to it.

► There was a time when air-powered tools were the ultimate set-up inside a garage or workshop. The biggest investment is often the air compressor, which needs to be capable of producing enough compressed air to be able to operate a selection of tools, some of which may be used for long periods of time, such as a polisher, drill or saw. So, look for a CFM (cubic feet per minute – 1 CFM is roughly 28 litres per minute) rating, which indicates the amount of air the compressor can supply. It's also important to know the capacity of the compressor's tank for storing that compressed air, which is usually measured in litres. The larger the tank, the less times it will need to be refilled, which helps to cut down on noise and waiting times.

Talking of noise, you may wish to fit the compressor away from where you are working. Routing air-lines and additional outlets around the garage will make it easier to connect to the compressor without having a long hose dragging around after you. If, however, you want to be more versatile, then there are portable compressors, which are useful for light jobs.

Air tools are generally cheap, and you are not tied to one brand, unlike a range of battery-operated power tools. Power ratings for impact drivers are just as good as the electric-equivalent tools and many air-powered tools are light and small.



Draper's bundle of air tools includes a ½in impact wrench, ¾in ratchet, chisel, die grinder and two blow guns along with a host of accessories, all for around £160.

## TOP GADGET

### Jake Belder's HANDY BLOWER

CM contributor Jake Belder says that he finds the air nozzle attachment for his air compressor is useful for among other things, blasting dust and dirt out of hard-to-reach places.



Continued on page 64



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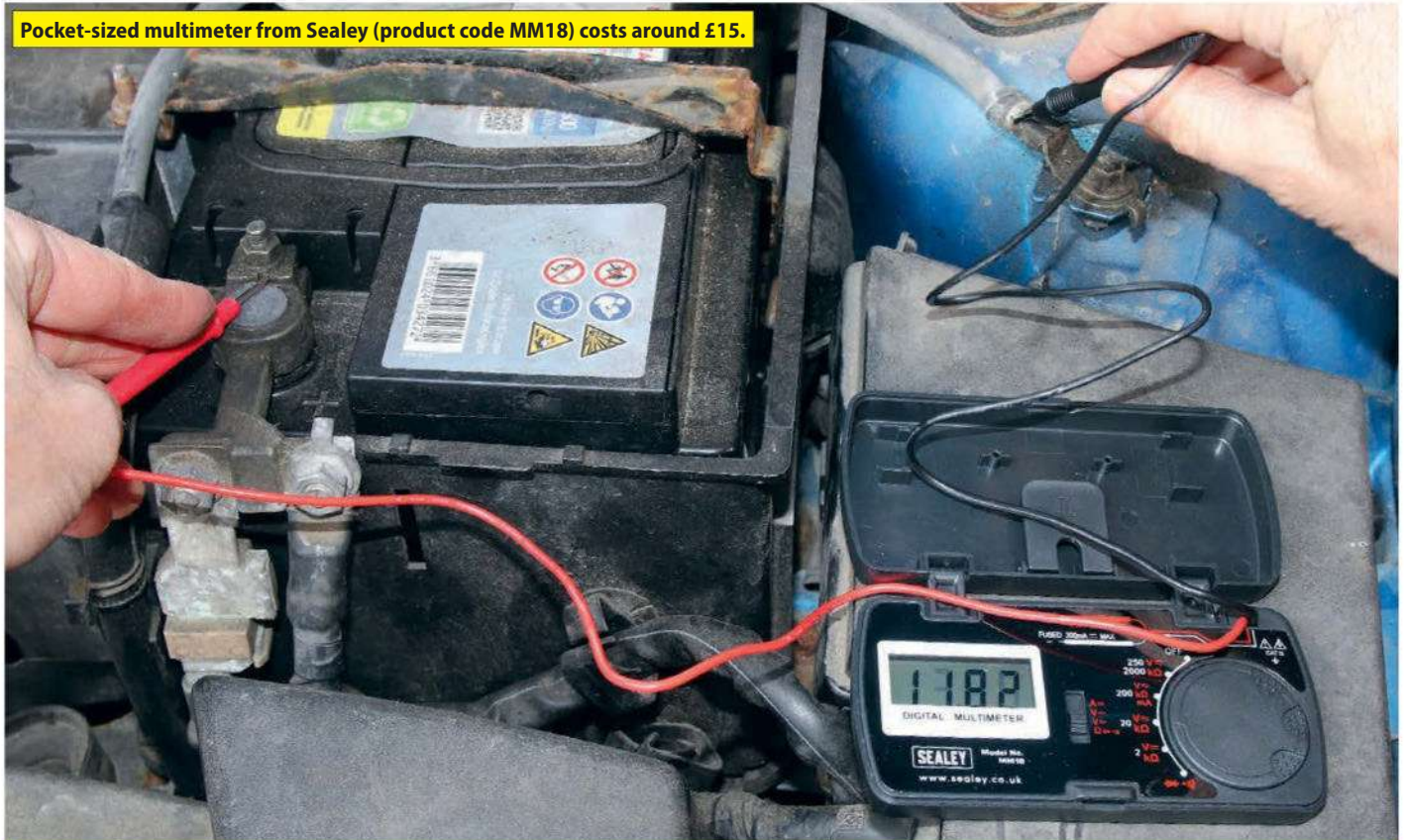
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Pocket-sized multimeter from Sealey (product code MM18) costs around £15.



# DIAGNOSTICS

► The vast assortment of equipment that's available to help diagnose problems can soon overtake the number of spanners, screwdrivers and other tools that are traditionally used to repair vehicles. Some of them can prove invaluable, whereas others become yet another gadget to have. We've tried to outline the ones we think you need to own.

## TOP GADGET

This has got to be the coolest-looking multimeter on the market. Available from Draper, it looks like a colourful mobile phone, but switch it on, connect a couple of wires and you can perform all the functions of a typical multimeter and more, including auto-ranging with AC and DC volts and amps, temperature testing, a Hold function and resistance testing (including a continuity buzzer). It is powered by an on-board rechargeable battery that uses the latest USB-C connection. Expect to pay around £50 (search for Draper 16232).



## Multimeters

► A multimeter is probably the most useful all-round testing equipment when it comes to working on a vehicle's electrics, whether it's simply checking the battery voltage, measuring the current draw or looking for a live wire. And whilst the traditional multimeter, which now costs under a tenner, is often sufficient, there are some more sophisticated devices which can measure continuity or make a sound when it's found, display a maximum reading (useful for when voltage or current is constantly changing) and even cater for household electrics.

We've tested a range of compact, pocket-sized multimeters and alternatives, such as a Clarke pen probe from Machine Mart, and found them to be, in some cases, just as good if not better than the more traditional style of multimeter.

The Clarke pen probe digital multimeter is powered by a couple of AAA batteries (included), has a 1m-long earth lead with a probe on the end and a live probe fitted to the body. Both probes can be equipped with colour-coordinated crocodile clips. Having the live probe so short and fixed makes it easier to position by holding the body of the multimeter. Everything from millivolts (mV) to 600V (AC and DC) can be measured and, in some cases, voltage up to one or two decimal places can be displayed, which is ideal for checking a 12V battery. There's a useful Hold button that stores and displays a reading until the button is pressed again to cancel it. And we also liked the Max button, which when pressed once will only display the highest reading taken until the button is pressed again.

We couldn't quite understand the purpose of the Logic function, which illuminates a green LED if a voltage reading is below 1.5V, but changes to red if it's above this value, up to 5V. We suspect it's useful for 5V circuits.





Is there a better alternative to the traditional multimeter? We like features such as data hold, maximum value, auto-ranging, measuring AC and DC volts and an audible continuity test.



Available from Machine Mart for £35.98, this pen probe has proven to be a useful alternative to a traditional multimeter.



The traditional multimeter is competitively priced and still highly capable, but there are some more interesting alternatives worth trying.

We did, however, like the NCV (non-contact voltage) function, which is helpful for tracing live wires behind a wall inside a house, but when it comes to car electrics, it can help to check for live wires behind a panel before drilling a hole through it, for example.

Sealey sells a couple of compact multimeters (search for MM102 and MM18) alongside their traditional range. We've tested both and found them useful for measuring everything from a 1.5V battery to household/domestic 240V AC electrics. Whilst we liked the pocket-sized multimeter (MM18) for its compact size, we preferred the slightly larger MM102 (pictured below) because of its additional features, such as auto-ranging, which helps to avoid the old problem of measuring voltage and having to change settings when you're working with small voltage versus large. For example, we measured the voltage for a 1.5V AA battery where the reading was 1.498V, then tested a very flat CR2032 battery where the reading automatically changed to millivolts (mV). With room to display four digits on the LCD screen, the multimeter automatically adjusted its range.

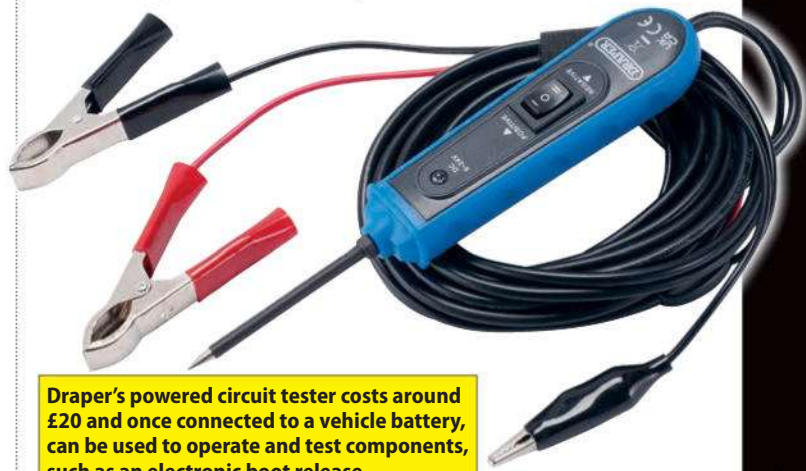


Sealey's compact multimeter comes with a useful auto-ranging function to help switch between millivolts and volts and provide a more accurate reading.

## Circuit testers

► If you need to check for live and earth connections, then a circuit tester may be better than a multimeter in some cases (although most multimeters offer the same features as entry-level circuit testers). Budget-priced circuit testers can be quite simple, capable of measuring between 3V and 48V, and with an LCD display that's illuminated red or green, depending on the polarity. Some require battery power (AAA or CR2016, for example), whereas others are powered by the circuit being tested. Expect to pay upwards of £15 for one of these.

Whilst we can appreciate the benefits of a circuit tester for finding and checking connections, for instance, there are greater benefits from a device that can provide power to a component to help with more in-depth diagnosis. This can help with a component, such as a window motor that doesn't work, to connect power to it directly and check that it hasn't failed.



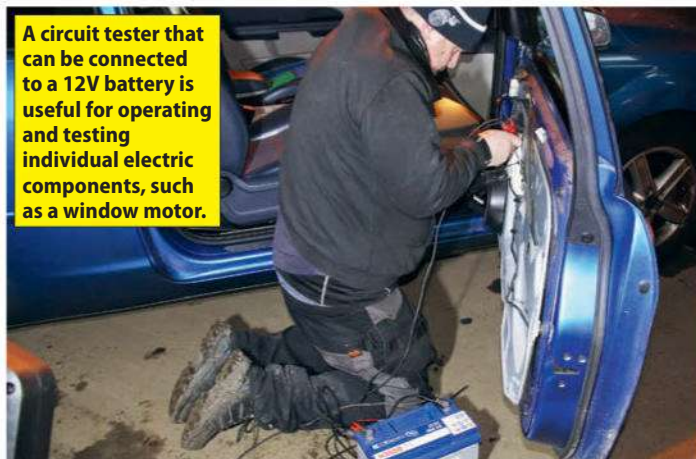
Draper's powered circuit tester costs around £20 and once connected to a vehicle battery, can be used to operate and test components, such as an electronic boot release.



# GADGETS for your GARAGE DIAGNOSTICS



This comprehensive circuit tester from Draper includes an assortment of fittings to help probe into a vehicle's electrics.



A circuit tester that can be connected to a 12V battery is useful for operating and testing individual electric components, such as a window motor.

## Leak detection

▶ Looking for leaks often starts with a visual inspection, but there are some cases where equipment can help or is the better solution. Take coolant leaks, which can usually be detected by looking for residue, but if that doesn't help, then pressurising the engine's cooling system to safely look for leaks, whether it's from the end of a hose or between the engine block and cylinder-head will do the job..

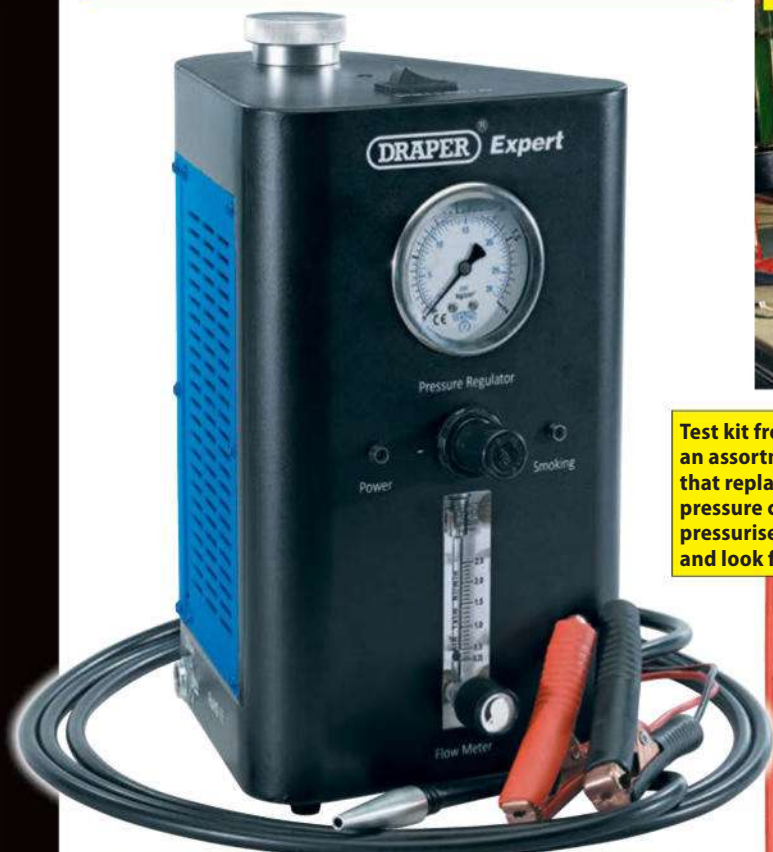
Smoke detection is a useful method for finding leaks within an induction system, vacuum and boost pipes. Some machines use mineral oil and pressurised air to generate smoke and feed it into a system. Any leaks will be easy to spot as the smoke exits through them. The only disadvantage with these types of machines is they cost around £300 or more, so unless you are routinely testing for leaks, they can be an expensive item to purchase for occasional use.



Laser's circuit tester can measure voltage between 3V and 60V and includes a useful retractable protector for its sharp metal probe.



Pressurising an engine's cooling system can help to locate a leak from a hose or an outlet.



Smoke diagnostic machine from Draper's Expert range uses a mixture of mineral oil and pressurised air to force smoke into induction, boost and vacuum hoses to help locate a leak.

Test kit from Sealey includes an assortment of adaptors that replace a standard pressure cap to help pressurise a cooling system and look for leaks.







# FAULT CODE READERS

► When the dreaded engine management light (EML) appears on the dashboard, or your vehicle's engine develops a problem, a worthwhile starting point is to identify any logged fault codes to help diagnose the issue. Known as fault code readers (FCRs), scanners and diagnostic equipment, the simple entry-level devices for around £20-£30 can usually communicate with the vehicle's ECU, retrieve any stored or pending fault codes (also called diagnostic trouble codes or DTCs) and get you started with your investigations.

Should you need to dig any deeper, then having the ability to view live data will help to ensure readings are accurate, such as ambient air temperature for a suspected faulty intake air temperature (IAT) sensor. Some equipment can look at

stored data (freeze-frame) when a fault arises to help work out why it was triggered.

Whilst early FCRs consisted of a stand-alone machine with its own screen, and these are still widely available, connecting to a laptop to use dedicated software can offer greater flexibility. And using a smartphone as the display increases portability.

If you have a select number of cars and all you want to do is diagnose fault codes when they arise, then an entry-level device should be sufficient, but note that it may only provide a starting point for helping to fix a problem. If you want more information and more features beyond the engine, then we'd recommend investing in a fault code reader that caters for your vehicles, especially if you require in-depth functions beyond simple fault code reading, such as switching off the service light, investigating ABS faults and testing equipment. However, some manufacturers of this type of equipment sell subscription packages per model.

We've tested numerous stand-alone, PC- and phone-connected fault code readers – the last group test being in the January 2024 issue of *CM* when we looked at several Bluetooth-

connected devices that plug into the EOBD port of a vehicle and use specific software on a phone or laptop. There's no clear winner and, as we've discovered after visiting many diagnostic specialists, you'll probably accumulate lots of equipment.

**The most portable FCRs are those that consist of a dongle to plug into the EOBD port and an app for your mobile phone.**



**Entry-level FCR from Gendan costs around £35 and can read and reset fault codes, record freeze-frame data and view live data.**





Dustless blasting machines cost several thousands of pounds, but some can be hired. They can be used to strip paint and corrosion from bodywork. Water helps to dampen the dust, and the leftover media can be swept up afterwards.

# CLEANING UP

► Fixing cars can be a messy job, so it helps to have some means of cleaning parts to reduce the risk of transforming your garage into a bin on the inside where the floors are a skating rink. It also helps to restore some pride in your work, despite you may feel it's a waste of time meticulously cleaning a brake caliper carrier, for example, only for it to get covered in brake dust and road dirt within a few weeks.

A dedicated parts washer is undoubtedly the equipment to have and prices for small portable units start at under £100, although they're not big enough to clean anything large, such as a cylinder-head. Stand-alone parts washers take up more space but are generally large enough to accommodate bigger components.

The advantage of a parts washer is that it has an electric pump to circulate a cleaning solution and feed it out through a nozzle or brush. This sets it apart from simply using a large metal tray and cleaning solution, but if you infrequently need to clean parts, this may be all you need.

The effectiveness of parts wash solution is more important than choosing a suitable parts washer. Check that whatever you use is a degreaser because, in most cases, the dirt that needs to be removed will include oil. However, if there's corrosion, then there are several liquids that promise to lift rust. From the ones we've tried, we've found them useful for the initial removal of corrosion, but still benefit from a scrub with a wire brush afterwards.

Talking of scrubbing, this is another aspect of cleaning that's worth looking into because the main gadget in this category is blasting equipment. A small air-fed blasting cabinet is a good starting point, with prices from under £200, but limited to small components. Larger cabinets can easily cost around £500 or more, and if you need to clean large panels or a chassis, for instance, then hiring a dustless blasting



Entry-level blasting cabinet from Machine Mart costs £178.80 and requires compressed air from an air compressor to fire a suitable media (eg. grit) at a component to help clean it.

machine may be the better solution. This enables a component to be cleaned inside a workshop and often uses water to dampen the dust generated from blasting (the debris can be swept up afterwards).





Hammerite's rust remover gel can be applied, left to soak in for 2-3 hours then washed off before a surface is painted. A 750ml tub costs £26.40 from Car Builder Solutions.



We have found that rust removal solutions, such as Evapo-Rust, are useful for soaking off surface corrosion, but often a thorough scrub with a wire brush is still necessary.



A dedicated parts washer usually includes a pump to circulate a parts wash solution through a stiff brush, which helps to clean components.



Large items can be awkward to fit into a parts washer or blasting cabinet, so you may have to resort to making a mess on a workbench and cleaning up afterwards.



## TOP GADGET

Not quite a gadget for your garage, but for your driveway, Rob hasn't looked back on washing cars and unblocking drains after fitting this Titan auto hose reel from Screwfix. Costing £89.99 – it's not as cheap as a standard manual-winding hose reel but is much more convenient to use with its retractable mechanism.



## TOP GADGET ONE-MAN BLEEDING

There are several ways to bleed your brakes or hydraulic clutch, but when you're on your own, it can get a little more awkward and time-consuming. A one-man bleed kit is often the answer and whilst there are a number that operate from compressed air from an air compressor or spare wheel/tyre, this one from Car Builder Solutions for £54 has its own manual pump. Connect it to the reservoir, pump up the pressure and start slackening those bleed nipples.



## TOP GADGET Jake Belder's LONG SPANNERS

"I really like my long-handled spanners because of the extra reach and leverage they offer," explains *CM* contributor Jake Belder. "I use them a lot." With the potential to apply more leverage, it's essential to invest in a good-quality set of long spanners to reduce the risk of them slipping in use and causing injury. Budget for around £100 or more for a set.



## TOP GADGET THE NEXT GENERATION OF SPANNER

We're a big fan of ratchet spanners because they can speed up a job, but they can be difficult to use when space is tight. Having detachable ends to turn them into finger ratchets can solve this problem, which is what this set from Laser can do. A single flexible-headed spanner handle allows 12 interchangeable 72-tooth ratchet ring spanner heads to be fitted, which range from 8mm to 19mm. Each Bi-Hex (12-point) ratchet ring can handle a maximum torque load of 150Nm (110lb.ft). Expect to pay around £60 for them.



## TOP GADGET

### Peter Clayton's ROTARY TOOL

"I never realised how much I'd benefit from using a rotary tool such as a Dremel until I bought one!" exclaims *CM* contributor Peter Clayton. "They are especially good for cleaning up nooks and crannies with sanding and wire wheels, as well as cutting smaller corroded nuts in awkward places. There is also a fantastic flexible attachment that allows you to get into even tighter places."



## TOP GADGET Colin Smith's WAXOYL INVENTION

*CM* reader Colin Smith emailed us to say he has resolved the problem of applying Waxoyl that inevitably blocks up his spray equipment and renders it useless for the next time he needs it. "My Waxoyl dispenser consists of two large emulsion paint tubs," he explains. "The larger one is used upside down and forms a lid on top of the slightly smaller one. The slightly smaller emulsion tub has a one-litre ice cream tub (with four 12mm holes in its side near its base) bolted to the centre of its base. The top black plastic retaining bracket is homemade using a hot air gun. The yellow cup is a blank end stop from a scaffolding pole and in combination with the black plastic bracket and the ice cream tub centres the Würth pressure sprayer in the emulsion tub. This bracket is required to hold the pressure sprayer down in place because without it, when both the emulsion and ice cream tubs are filled with hot water, the sprayer becomes buoyant. I keep my sprayer with the top tightly screwed down and three-quarters full of Waxoyl at all times so that it is ready to go, except for filling with water. Sometimes it stays like this for years and has never let me down!"



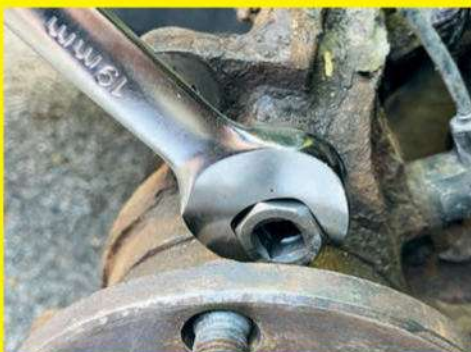
"When I first made this, my big worry was that congealing Waxoyl would block the fine spray nozzle, but this doesn't happen. Once filled with hot water from the tap (no higher than the bottom of the Würth screw cap is needed), it takes between twenty minutes in the summer and 30 minutes in the winter to heat it up to a good working temperature – including the spray nozzle. The larger emulsion tub is used as a lid to help keep the hot moisture in. All the small bolts and wing nuts are stainless steel. During actual spraying use I have found it helpful to periodically wipe drips from the spray nozzle and clean up with white spirit."



## TOP GADGET

### Martyn's NUT GRIPPERS

Editor Martyn Knowles recently invested in a set of Irwin nut grippers, which he has found to be a lifesaver when it comes to undoing fastenings where the head of a bolt or the flats around a nut have rounded off. Rob Hawkins has owned a similar set for over 20 years and swears by them, having bought them from Screwfix in the days when it was a mail order company. And Machine Mart has recently launched their own range under their Clarke brand, which cost £29.99.



## TOP GADGET

### Peter Clayton's PLIERS

"These Knipex spring hose clamp pliers are professional grade, so quite an expense (around £50) but you can really feel the quality," says CM contributor Peter Clayton. "There are gripping inserts on the end that swivel to grab the ends of a hose clamp. The adjustable head allows for a variety of sizes and long handles enable you to get deep into engine bays."



## TOP GADGET

### SELF-OPENING CROWFOOT WRENCHES

We've been using crowfoot wrenches for several years because they provide more grip than an open-ended spanner and are useful for undoing fastenings where a socket or ring spanner can't be fitted. This new set from Laser Tools can be used with a 3/8in square drive extension bar and feature a spring-loaded quick snap design, allowing them to stay in the open position when placed around a pipe or wiring. This, together with their ratcheting action makes them ideal for using in a confined area. Sizes include 10mm, 12mm, 13mm, 14mm, 17mm and 19mm. Expect to pay £108.30 for the full set (part number 8874) but shop around for the best deals.



## TOP GADGET

### Peter Clayton's CAMERAS

CM contributor Peter Clayton has found a couple of cameras help with a range of jobs. One of them is an inspection camera (also called a borescope), which he says, "In the past I've used borescopes that connect to a laptop and phone, but they were far too fiddly to use. This all-in-one type (pictured right) has a wheel that can be operated with the same hand which remotely adjusts the angle of the camera at the end of the probe. It can even bend back on itself, which is great for examining the upper part of a cylinder-head when inspecting via the spark plug aperture, for example."

Peter also finds an infrared thermal imaging camera is useful, saying, "While the cheaper laser-style infrared thermometer gun works well to establish the temperature of a component, it only provides a single spot reading. This thermal video camera, however, displays a colour-coded image, providing thermal contrast that the former tool would struggle to pick up. It's great for identifying the effectiveness of the heating element in seats and windows, circuits that have particularly high current running through them, and can even pick up cool spots in a running exhaust manifold, helping pinpoint potential combustion issues."





# Timing Belt Clinic

## 2013 VW up! 999cc 3-cylinder



VW's three-cylinder 1.0 MPI engine is slightly unusual from a timing belt change perspective, but different doesn't always mean difficult, as **Peter Simpson** explains.

### TIMING BELT CHANGE INTERVAL

It's complicated; see text!

### TOOLS REQUIRED

- ▶ T30 Torx bit
- ▶ 13mm, 15mm, 16mm, 17mm and 18mm spanner or socket
- ▶ 30mm ring spanner (socket NOT suitable)
- ▶ Short and long M10 splined bits
- ▶ Torque wrench
- ▶ Couple of flat-bladed screwdrivers
- ▶ Camshaft locking tool is optional, see text!

### TORQUE SETTINGS

Wheel nuts	<b>110Nm</b>
Timing belt idler and tensioner	<b>20Nm + 45°</b> for final lockdown
Crankshaft bolt	<b>180Nm plus 180°</b>

**T**hese days, we're used to some pretty long timing belt change intervals – 100,000 is fairly commonplace, and sometimes the mileage change-interval recommendation can be as high as 160,000. Something this long will, though, usually be accompanied by an age-change recommendation of, typically, eight to ten years. The point here is that rubber deteriorates through age as well as use, and despite huge improvements in materials and manufacturing techniques, it really cannot be expected to last forever.

However, according to VW in Germany, a VW up! timing belt does not need a routine change at all. Yes, really! Their official recommendation is to "check" the belt's visible condition at 160,000kms (which is effectively 100,000 miles) but renew it only if it shows evidence of wear or deterioration.

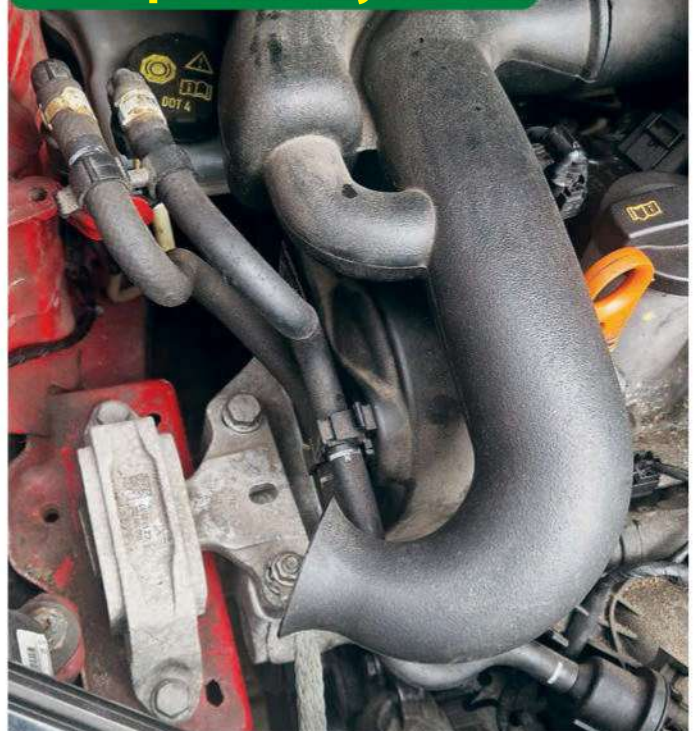
I'm not happy with that recommendation. Nor, it seems, were VW UK. Until the middle of last year, they were recommending changing an up! timing belt at five years/70,000 miles. That now seems to have been replaced by the same 'check at 100k' recommendation as used by VW Germany. Why that's been changed no-one seems to know. Or perhaps no-one wants to admit!

Anyway, there was no way on earth that I was going to take a chance on the up! that I've just bought my daughter as her first car. That's got nearly 100,000 on the clock, and with no evidence in the service history of the belt having ever been changed, it was clearly something that needed doing. Especially given how straightforward the job is.

### Not quite round!

The 1.0-litre up! engine – which of course was also used in the SEAT Mii and Skoda Citigo – is a twin overhead cam unit with

## VW up! 1.0 3-cylinder



**1** Overall view of the working area. Some very simple deck-clearing is needed for access. Specifically, you need to pull the air cleaner box and inlet pipe off as one unit and unplug the two fuel lines running across the timing belt top cover.



slightly triangular-shaped camshaft sprockets. The timing belt connects only the two cam sprockets at the top with the crank at the bottom, though it runs via an idler and a tensioner, both of which are renewed with the belt.

The water pump is not driven by the timing belt. It's at the other end of the engine and driven off the rear camshaft by a separate drivebelt. It therefore doesn't need to be touched during the timing belt change, though the water pump belt condition is a routine service check.

As I say, the job itself is straightforward enough with, by the standard of modern timing belt swaps, pretty good access. A special locking tool is available to lock the camshafts so they can't move once the belt is off, and if you are new to this sort of thing, investing £40 or so in a camshaft locking tool might be worthwhile.

But having said that, we found it extremely difficult to get said tool to snap in, and though we've shown it being used, we found that using the tool seemed to introduce an issue, in that after we'd done the job with it, and turned the engine two complete revolutions, one of the cams ended up a tooth out! But when we reset it a second time, this time using the trade method of simply watching that the cam timing marks remained aligned, it worked fine!

## Thanks to

Craig Dawson at **Dawson Motors** (Peterborough – 07504 552063) for allowing us to photograph this procedure on his premises.

I'm really not sure what was going on here, though my guess is that the issue was with our locking tool – it was an ultra-cheap £9.99 eBay job. The point, though, is that we were able to do the job without a tool and without any real difficulty.

Just a couple of other things to note. Firstly, we've seen some instructions online which say you need to disconnect the cam sprockets from the cams. We didn't and can see no reason whatsoever for doing this. Secondly, because the cam sprockets aren't actually circular, it is part of the design for the timing belt tensioner to move in and out as the belt turns. Therefore, the normal tension-setting position will seem slightly unusual. The tensioner is of course designed to move in this way and is up to the task, but we would say that this design characteristic makes it even more important that the tensioner, idler and belt are always renewed together.

Anyway, our picture-sequence shows the full job. The belt kit we used came from febi bilstein – with parts like this quality is of course paramount. We also, of course, changed the auxiliary drivebelt – it had to come off anyway.

Overall, we found the swap remarkably straightforward. There are various comments online about needing special tools, etc., but as you can see, we did it without, and it all went absolutely fine.



**2** The timing belt cover is in three sections; the top one seen here is plastic, along with one at the bottom. The third, largest part is an alloy casting. The top piece is easy to remove. Just undo the T30 Torx screw at the top...



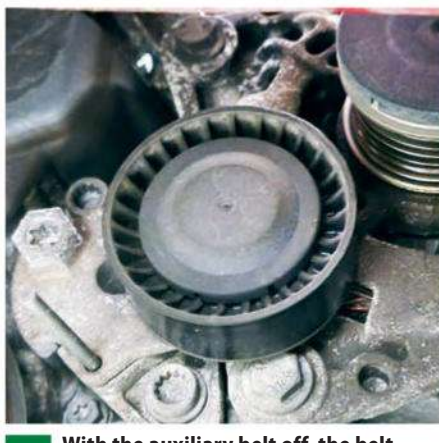
**3** ...and then release the clips on each side, and you can lift the top cover off. In our case this revealed that, interestingly and somewhat reassuringly, our belt looked to be an aftermarket one, suggesting that it had already been changed at least once. Disconnect the battery at this stage.



**4** With the up! supported on axle stands or raised on a ramp, the offside front road wheel is removed. Now tackle the inner wheelarch liner which, as usual, is held in place by a series of plastic screws and clips. Avoid damage to these by using screwdrivers that are a good tight fit into the crosshead screw heads.



**5** This will reveal the auxiliary belt which needs to come off next, though this is very easy; just put an 16mm spanner on this nut and pull. This will take the tension off the belt, so you can just slide it off. We'd fit a new belt on reassembly as a matter of course.



**6** With the auxiliary belt off, the belt tensioner comes next. Due to restricted access, you'll need a short and long M10 spline bit to do this. Check the tensioner spins freely but without sideways play, and without rumble and/or stiffness. If, though, it's OK you can reuse it.



**7** After that, the bottom crankshaft pulley comes off. Officially this requires a special tool, but Craig was able to use a Laser 30mm socket – this is pointed around the inside rather than having flats. Needless to say, this bolt will be pretty tight.





**VW up! 1.0 3-cylinder** CONTINUED



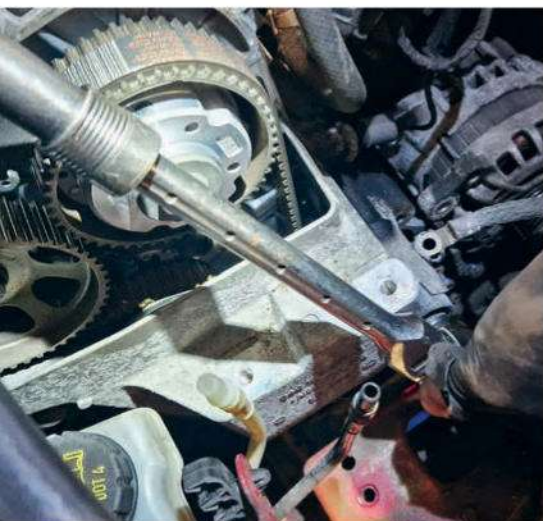
**8** Once the bottom pulley is off, the bottom of the timing belt around the crankshaft comes into view, and the second, bottom, section of the timing belt cover can come off; once again, it's held in by T30 Torx fittings.



**9** As the offside engine mount attaches to the middle section of timing belt cover it, too, has to come off. First support the engine using a trolley jack or similar under the engine (with a block of wood to spread the load). Then undo the four 15mm upward-facing bolts seen here.



**10** As the alternator top-mount attaches to the timing belt cover, that, too, must be disconnected. Remove the bolt at the top – 13mm spanner – and then lever the alternator away from the cover.



**11** Now you can remove the bolts securing the cover and move it back and out of the way. Removing it completely may or may not be possible but isn't necessary – you can just push it to the back and out of the way.



**12** With the cover out of the way, the belt's entire run can be seen, and by modern standards at least, it's pretty simple. The only position-critical parts are the two camshaft sprockets at the top, and the crank at the bottom.



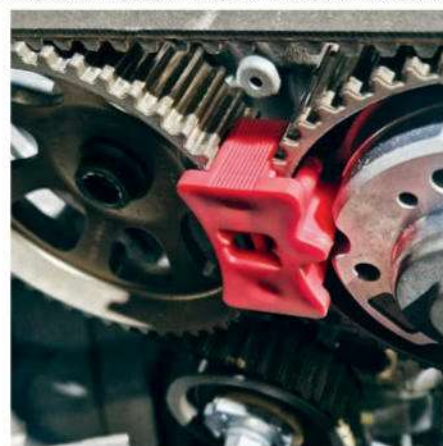
**13** You now need to refit, temporarily, the crankshaft pulley so that you can turn the engine until the top and bottom timing marks align. Some people take the spark plugs out, so the engine turns more easily, but it isn't really necessary on this engine.



**14** This is the bottom timing mark, highlighted in the traditional way using Tippex typewriter correcting fluid, assuming of course that you can still find someone who stocks it in the post-typewriter era!



**15** And this is the top, camshaft timing marks (circled) – again very clear, easy and unmistakable. Once the belt is off, these need to stay exactly aligned if you aren't using a locking tool. We tried it with a tool first, but it didn't seem to work.



**16** Here is our locking tool in position. Getting it in was a struggle, and when we did the job using it, we finished up with one of the camshafts a tooth out! Doing it without the tool worked fine, however. We think the problem was a poor-quality tool – if you're going to use one, buy a good 'un!





**17** To remove the old belt you have first to release and remove the tensioner, by taking out the 17mm that holds it on. This releases the belt tension, allowing it to be taken off.



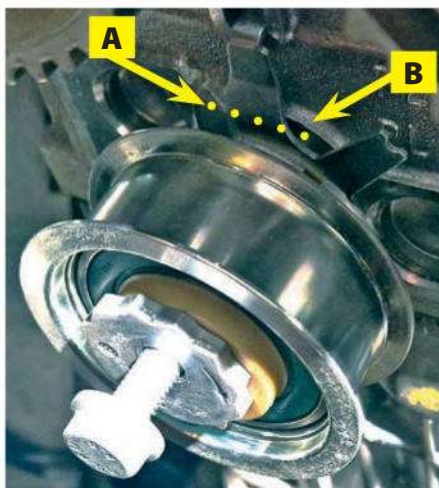
**18** Belt and tensioner off. The belt kit also comes with a replacement idler wheel (arrowed). Changing this is simply a matter of removing the main mounting bolt – 17mm spanner – followed by the idler.



**19** Fit the replacement idler and tensioner before fitting the new belt. With the tensioner, the washer-type component with the pointed section around the edge (arrowed) is used to set the tension, and the bolt passing through locks it down once set.



**20** Fitting the new belt is totally conventional; and actually, a lot easier than many, as there's plenty of space. Thread it so that the tension is even all round. In this picture Craig is pushing it round the tensioner, to lock the belt on to the rear (left in picture) cam.



**21** The belt tension setting marks, shown here without the belt for clarity. The tension is correct when the pointer (arrow A) is exactly mid-way in the cutout section (arrow B). As explained in the text, this may seem slightly unusual – that's due to the non-circular cam sprockets.



**22** And this is how you align the marks. You use downward pressure on a 30mm ring spanner to bring the tension marks into line, and then lock that position using a 18mm socket or spanner. This bolt is new, and torqued to 20Nm plus, when you're ready to lock it finally, another 45°.



**23** After setting and locking the belt tensioner, we removed the locking tool and cranked (using the crankshaft sprocket and 30mm socket) the engine through two complete revolutions to check nothing had moved. In our case the sprocket marks did not align after this...



**24** ...so we had to take the belt off again, go back to Step 17, and do it again, but this time setting the cam marks by eye rather than using our (possibly-defective) locking tool. This time it was fine, so we refitted the covers etc, and all's good.



# Buying & Owning

Ian Cushway searches out new and used parts prices

## Ford Focus ST

Folk have always liked fast Fords and the value-packed Mk3 ST is unlikely to disappoint.

If you're of a certain age, despite its horrendous torque steer, you'll still be in awe of quick Fords from the nineties like the Escort RS in its many guises. Well, things have moved on a bit since then in terms of subtlety and while there's still hairier options available in the form of the 350bhp Mk3 RS Focus, we're directing our attention here on the much easier to live with ST instead. While its turbocharged 2.0-litre EcoBoost engine isn't as characterful as the Mk2 ST's juicy five-pot 2.5-litre, it puts out a bit more power, is just as quick and far more economical.

And anyway, what the newer car lacks in terms of cylinders it more than make up for in terms of visual appeal with its bigger rear wing, aggressive front bumper, central exit exhaust and extensive use of race-oriented carbon fibre inside. Oh, and as well as being more wallet-friendly at the fuel pumps,

it boasted better real-world practicality by having two extra doors and the option of a family-friendly estate.

Make no mistake though, the Mk3 ST is a great car to drive; with its lighter engine, the handling's neutral and no longer nose heavy, and the suspension pleasingly firm thanks to stiffer settings and a 10mm lower ride height over the stock Focus.

As you'd expect, spec was sporty with hip-hugging Recaro seats up front with power adjustment, lots of toys and even a rather retro-looking set of gauges in a pod on top of the dash. To sum up, the entry ST-1 had 18in alloys, basic aircon and keyless entry, the ST-2 added colour-coordinated part leather seats, heated windscreen and better in-car entertainment, while the range topping ST-3 came with full leather, rear parking sensors, heated front seats, bi-xenon headlamps, unique Rock alloys and LED daytime running lights.

A facelifted Focus ST arrived in October 2014 (the Mk3.5) and controversially perhaps, the range was extended to include a 182bhp 2.0-litre TDCi diesel. Further revisions included xenon headlamps, painted brake calipers, rectangular foglamps, a cleaner looking dash, revised front springs, uprated dampers, stiffer suspension bushes and a recalibrated electrically-assisted steering. The ST-1 was discontinued first (in February 2017), and the model replaced altogether by the Mk4 in June 2018.

### Engines

The ST will let you know when an oil and filter change is due but under normal driving conditions, expect to do it every 7500-10,000 miles, though it could be sooner if the car's driven particularly hard. It runs a timing chain, so be sure to use a 5W-30 fully-synthetic that conforms to the necessary Ford specifications.

Reliability is good, though inevitably lots of STs get whacked with the tuning





## Which model?

▶ There's only one choice, petrol or diesel – or three if you include the estate option. For sheer enjoyment (and lack of potential DPF issues) we'd go for the petrol and stick to the more value-packed hatch. And if you can, stretch to the facelifted model which is nicer inside and better to drive.

Spec-wise, we'd opt for the ST-2 which tends to be the most liked model. That said, with the various option packs available, it's unlikely you'll find two cars the same, so do your homework and pick the one where the first owner got tick happy with their choices. Desirable options include privacy glass, the premium audio setup with its subwoofer on top of the spare wheel and niceties like a heated steering wheel.

stick so it's best to stay clear of cars with extreme engine maps; too much boost can easily result in piston failure. Beware blue smoke from the exhaust which suggests turbo wear – often at high revs, especially on hard-worked cars, or at idle if the car has had a decat exhaust fitted. White smoke is a worry, too, as it points to coolant coming from a crack in the water jacket in the cylinder-head, and straight through the turbo. It's an internal fracture around the cylinder exhaust-to-turbo port, so it can't be repaired.

Meanwhile, poor idling and stalling could be due to a problem with the wiring loom on the throttle body. Stateside STs were recalled for a fix, and although the loom was replaced under warranty on some British cars, it could still be a problem.

As for the diesel, there's been a few reports of DPF issues, mainly because of failed sensors.

The six-speed Getrag MMT6 manual gearbox on the petrol is rugged but watch for clutch slip (the diesel was offered with a semi-auto). More of a worry is vibration through the clutch pedal which points to a faulty dual mass flywheel.

**Turbo 2.0 EcoBoost is a great engine that should prove reliable – as long as it's not had a wild ECU map applied!**



### Engine component prices

#### OIL FILTER

Main dealer £16.08

Independent from £4.69

#### CLUTCH KIT

Main dealer £304.93

(slave +£170.62)

Independent from £389.99

#### DUAL MASS FLYWHEEL

Main dealer £505.19

(+£25 surcharge)

Independent from £219.99

**The commodious ST estate was available from the start. They're rare though and seldom appear in the classifieds.**





# Buying, Owning CONTINUED



Hip-hugging Recaros were standard fit on the ST. Five-door Mk3 ST will prove a lot more practical than its three-door predecessor.



## Steering and suspension

There was no limited-slip diff offered which means there's still some torque steer, though things were much improved in this respect on the facelift Mk3.5.

If you notice a metallic clunk while going from lock-to-lock when parking, a broken coil springs seem to be common on this car. Some early STs had issues with the variable electric assistance (cured by a software upgrade), while facelifted versions were recalibrated for improved feel.

Rear droplink bushes can crack and wear, so check these too and when replacing bushes, it makes sense to fit polyurethane items instead.

### Brake component prices

#### FRONT BRAKE DISCS (PAIR)

Main dealer £220.13

Independent from £135.98

#### FRONT BRAKE PADS

Main dealer £93.07

Independent from £36.99

## Brakes

Stock ST brakes are capable enough but if there's judder

Deep boot with a capacity of 316-litres is about on par with other hatch rivals.



### Steering & suspension component prices

#### FRONT COIL SPRING (EACH)

Main dealer £52.69

Independent from £72.99

#### REAR DROPLINK BUSH

Main dealer £69.52

Independent from £13.49

(bush only)

through the wheel when hauling up the anchors suspect warped/contaminated discs/pads. The stock front discs are

320mm, the rears 271mm. Some owners have upgraded to Focus RS Mk3 Brembo front calipers, 350mm discs and braided hoses, so if this has already been done see it as a bonus if you're into more spirited driving.

## Other issues

Like fast Fords of old, the ST is sensitive when it comes to geometry and tyre choice so avoid the budget brands and pay to have a four-wheel laser alignment carried out if there's uneven wear or lots of noise. It will always be money well spent.

Xenon headlamps, if fitted, can be problematic so check they level correctly and move with the steering (and re-centre) as they should.

Another very common Mk3 ST niggles is door rubbers which come unstuck, usually coming adrift from the frame at the bottom first. The key here is to clean all the surfaces and re-stick with a strong double-sided tape or adhesive.

Body-wise, look for early signs of rust







**Other component prices**  
**XENON HEADLAMP**  
 Main dealer £1130.40  
 Secondhand from £200

The 2.0T's were six-speed manual only.



Dashtop mounted gauges for oil temperature, boost and oil pressure add a touch of visual drama.

in the rear wheelarches, lacquer peeling off plastics and poor panel gaps (which points to previous accident damage).

Besides that, look out for water ingress in the boot, condensation in headlights and flickering daytime running lights which is something that seems to plague ST owners.

## USEFUL CONTACTS

Ford Focus ST Forum  
[www.focusstoc.com](http://www.focusstoc.com)

Focus ST UK [www.focusst.org](http://www.focusst.org)



Entry ST-1 came with 18in alloys. These are 19s fitted to a facelifted car with painted calipers.

## What to pay

► We've seen STs advertised privately for as little as **£5000**, though between **£6000-£8000** is a more realistic figure for a tidy pre-facelift example. Post facelift cars – including diesels – usually kick off at **£7000**, though a late, very low-mileage ST-3 could be as much as **£16,000-£18,000**. The least expensive estate we found online was a blue 2013 2.0T ST-2 with 118,000 miles under its belt at a dealer in Norfolk for **£6950**. As a final note, there's an abundance of crashed, stolen and cloned Mk3 STs in the classifieds, so before parting with any cash be sure to get a comprehensive history check.

## Running costs

► Unsurprisingly, given its performance and attractiveness to thieves, the 2.0T will be pricey to insure, being classed as group 34. Annual road duty is £305. The diesel, as well as being a lot more frugal, is cheaper to run – insurance group 26 and an annual VED from £20 being the main attractions.

## Focus ST 2012-2018

Model	2.0T	2.0 TDCi
Engine (cc)	1999	1997
Power (bhp)	246	182
0-60mph (sec)	6.3	7.8
Top Speed (mph)	154	135
Average fuel (mpg)	39	67

## Verdict

► The Mk3 ST is a great alternative to a Golf GTI which, all things considered, makes it one of the best-buy hot hatches on the market right now as far as we're concerned. Moreover, if you keep things as the factory intended, it's proving super reliable and won't be dear to maintain, either.



# Service Bay



**2018 Kia Sportage  
1.6 T-GDi petrol**

## All-wheel-drive SUV

Powered by a 1591cc petrol engine driving all four wheels through an auto shift manual and transfer box, **Rob Hawkins** outlines the routine servicing on the fourth-generation Kia Sportage.

Overall difficulty rating



**THANKS TO**

AES York Ltd  
01904 780149

[autoelectricsyork.co.uk](http://autoelectricsyork.co.uk)

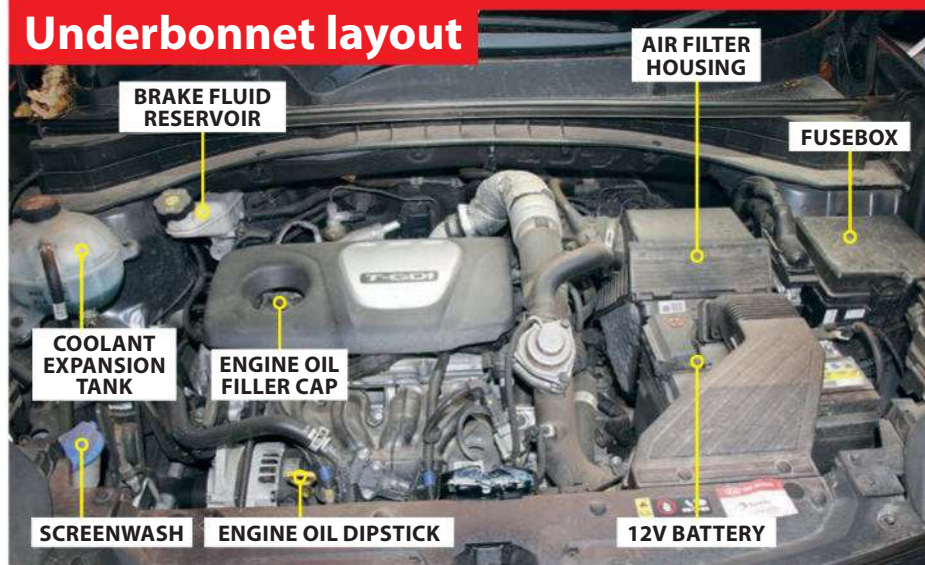
**T**he fourth generation of the popular Kia Sportage first appeared in 2015, lasting until 2022 and being facelifted in 2018. The example we're servicing is powered by a 1591cc turbocharged petrol engine, which produces 174bhp at the flywheel and can propel the 1583kg SUV from stationary to 60mph in 9.2 seconds.

Under the skin of the Sportage, there's space to access all the serviceable items and inspect the brakes and suspension.

The air filter is one of the easiest to change that we've seen. The cabin filter requires the glovebox to be detached, but all the fittings are straightforward to remove. And when it comes to changing the engine oil and filter, there's only an undertray in the way.

We visited AES York Ltd to follow the service of this Kia Sportage. Anyone who recalls *CM's* own third-generation Sportage 2.0 CDTi (see the Aug 2022 to Jan 2023 issues) may recognise a few familiar components (and it was also featured in *Service Bay* of the Feb 2023 issue), especially concerning the suspension.

### Underbonnet layout



### Rob says

► The ride quality of the Sportage can be adversely affected if the wheel alignment needs adjusting and the suspension mounting bushes have become worn, so routinely check all of this. And a full set of the same brand of tyres will also help, inflated to the recommended pressure (34psi in this case).



### ESSENTIAL TOOLS

► Sockets/spanners: 10-17mm



Restore the original performance and efficiency of the engine with Injection Cleaner

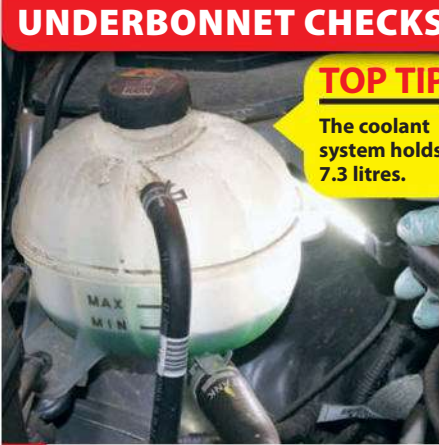




**UNDERBONNET CHECKS**

**TOP TIP**

The coolant system holds 7.3 litres.



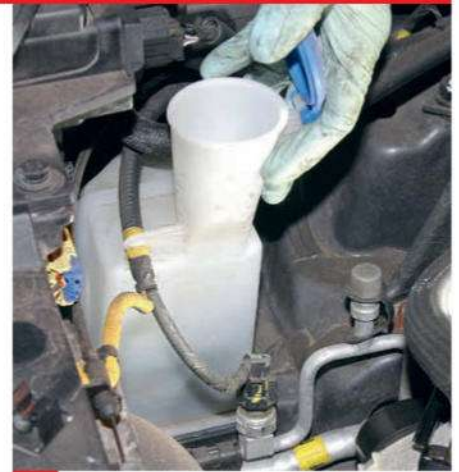
**1 CHECK COOLANT**

Shine a torch against the side of the coolant expansion tank to check the level against the MIN and MAX markers. According to Autodata, the recommended coolant is blue-coloured ethylene glycol, which should be refreshed every two years regardless of mileage.



**2 CHECK BRAKE FLUID**

The brake fluid reservoir is next to the engine coolant in the offside rear corner of the engine bay. Its level can be checked by shining a torch on the side of the plastic reservoir to see if it's within the minimum and maximum markers. The fluid should be refreshed every two years.



**3 TOP UP SCREENWASH**

Pour diluted screenwash into the windscreen washer reservoir in the offside front corner of the engine bay. Operate the windscreen washers and the rear wash wipe to check the spray pattern and to look for blocked jets.



**4 INSPECT AUXILIARY BELT**

Shine a torch down between the offside inner wing and the engine to check the condition of the auxiliary drive belt. Look for cracks across the ribs and frayed edges. A replacement drive belt costs around £30.



**5 SQUEEZE HOSES**

Look around the engine bay for any rubber hoses for the engine coolant, turbo (boost pipes) and induction system. Pinch them to check for perishing. Inspect their ends to look for leaks and insecure fastenings.



**6 TEST BATTERY**

The battery is partly concealed by a feed pipe to the air filter housing. Make sure the battery and its terminals are secure (release the plastic cover for the positive terminal to check underneath it). Use a battery tester to check the health of the battery.



**7 CHECK FUSES**

There's a fusebox to the right of the battery (when looking at it from the front of the vehicle). Remove the plastic lid of the fusebox to inspect the fuses and relays for water ingress and corrosion. If you suspect a fuse has blown or a relay switch has failed, there's a diagram (key) printed on the underside of the lid.



**AIR FILTER**

**8 FIND THE AIR FILTER**

The air filter is contained inside a plastic housing in the nearside rear corner of the engine bay. Open the access panel shown here – it's hinged along the bottom edge, so release the top edge to open it.



Which oil is the right one? Check out the online oil guide at [www.liqui-moly.com](http://www.liqui-moly.com)





**AIR FILTER** CONTINUED



**9 ROTATE PLASTIC CATCHES**

The air filter is secured inside its housing by a couple of plastic catches/locks (visible after opening the access panel for the housing). Turn them to the vertical position to allow the air filter to be removed.



**10 EXTRACT AIR FILTER**

Carefully pull the old air filter out of the housing. If it's stuck, check the two plastic catches mentioned in the previous step are turned to the correct position – writing on the edge of the air filter explains which way they need to be turned to unlock them.



**11 FIT NEW AIR FILTER**

Remove any dirt from inside the housing. Make sure the new air filter is the same size as the old one before fitting, with its catches in the unlock position and facing towards the front of the vehicle. Once fitted, turn both catches to the lock position and refit the access panel.

**CABIN FILTER**



**12 OPEN GLOVEBOX**

With the door of the glovebox open, release two large plastic screws from the inside edges by twisting each one a quarter of a turn clockwise. Detach the stop shown here on the nearside outer edge. Allow the glovebox to drop down to the footwell on its hinge (don't remove it).



**13 REPLACE CABIN FILTER**

Once the glovebox has been fully opened, there's room to see an oblong-shaped access panel for the cabin filter. Detach it by releasing a plastic tag on the side. You should now be able to see the old cabin filter, so extract it, check the new one is the same shape and size, then fit it with any airflow arrows pointing in the same direction as those on the old filter.

**OIL & FILTER**



**14 REMOVE UNDERTRAY**

The engine undertray is secured with a selection of 10mm bolts and four plastic trim plugs. Spray over the bolts with penetrating fluid to help release them and be patient with the plastic trim plugs as they can be awkward to remove.



**15 DRAIN OIL**

With a drain bowl underneath the sump, carefully undo the 17mm drain plug and remove it to drain the oil. Leave this to drain for a few minutes, but in the meantime, see the next steps for changing the oil filter.



**16 RELEASE OIL FILTER**

The spin-on oil filter can be accessed from underneath the vehicle and is next to the sump. Use an oil filter strap, wrench or pliers to unscrew it a couple of turns, but do not fully remove it yet as oil will start to drain from it. Leave it to drain unless you don't mind oil running down your arms.



**17 REPLACE FILTER & PLUG**

Once the oil has finished draining from the filter, remove it and check the new one is the same size and shape. Add a smear of fresh oil to the seal of the new oil filter, then fit and tighten it by hand (it should be tightened to 14Nm (+/-2Nm). Fit a new sump drain plug, tightening it to 39Nm (+/-5Nm).



Sticky manual transmission?  
Gear Oil Additive can help







**18 REFILL ENGINE OIL**

Having replaced and fitted the oil filter and drain plug, measure 4.5 litres of 5W-30 (other grades are also recommended, depending on climate) fully-synthetic engine oil into a clean measuring jug, then carefully pour this into the engine.



**19 CHECK DIPSTICK**

After a few minutes, check the oil level on the dipstick (wipe it clean, refit and extract it) and top up if required. Run the engine and make sure any oil pressure or low-level warnings don't remain displayed. Switch off, check around the engine for oil leaks, then recheck the dipstick, topping up if necessary.

**UNDERSIDE CHECKS**



**20 INSPECT COIL SPRINGS**

Visually inspect the front coil springs over the tops of the tyres (there's more room if the vehicle is raised, allowing the suspension to hang down). The rear coil springs can be checked from underneath the vehicle. Look for corrosion of the coils and fracturing. Carefully brush any dirt from the area.



**21 CHECK BRAKE DISCS & PADS**

There's room to measure the thickness of the brake discs and the brake pads' friction material without removing the road wheels. Use Vernier calipers to measure the discs (minimum 23.4mm front, 8.4mm rear) and a brake pad thickness gauge for the pads (MOT states a minimum of 1.5mm).



**22 INSPECT FLEXI-HOSES**

The rubber brake flexi-hoses can be inspected from behind the road wheels. Look for perishing of the rubber and leaks. Check the condition of the brake pipes, looking for corrosion and leaks.



**23 PINCH BOOTS**

Squeeze the corrugated rubber gaiters on the ends of the driveshafts (front and rear) to look for cracks, splits and signs of leaking grease. Pinch the rubber dust covers around the steering track rod ends (front only) to look for similar signs of damage, which could result in premature wear.



**24 LEVER LOWER ARMS**

Use a pry bar to lever against the mounting points for the front lower suspension arms (two inner mounts and an outer balljoint) to look for excessive play, which could lead to uneven tyre wear and handling issues. A replacement balljoint costs around £30, whereas a complete arm is in the region of £100.



**25 INSPECT GEARBOX MOUNT**

Visually inspect the condition of the lower gearbox mount, which can be seen from underneath the engine bay. Look for perishing and splits in the rubber components. Lever a pry bar against the mount that's secured to the subframe to check it for excessive movement. Budget for around £30-£50 for a new one.



**26 CHECK REAR LOWER ARMS**

Lever against the inner and outer mounting points to check for excessive movement. Check the trailing arm bushes (frontmost) for perishing and wear, and lever against the link arm's mounting bushes.

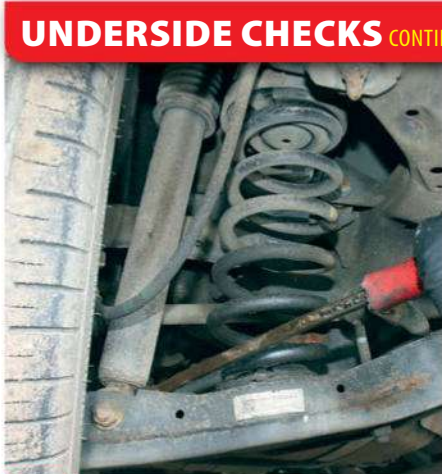


Extra wear protection for the engine with Cera Tec





**UNDERSIDE CHECKS** CONTINUED



**27 LEVER REAR DAMPERS**

Look around each rear telescopic damper for leaks (misting) and corrosion. Use a pry bar to lever against the lower mounting bush. A replacement damper costs around £110.



**28 CHECK ARB DROPLINKS**

Anti-roll bars are fitted at the front and rear of the Sportage. Lever a pry bar against the ends of each ARB to check for excessive movement in their mounting bushes and the droplinks.



**29 INSPECT PROP BEARING**

Visually check the condition of the centre bearing for the propshaft, which is mounted underneath the vehicle. If it's perished and subsequently worn, there may be excessive noise and vibrations when driving. Budget for around £45 for a replacement.



**30 CHECK TRANSMISSION OILS**

There's an inspection plug/filler hole on the side of the gearbox (auto shift manual in this case), transfer box and rear differential. Check the oil inside is just below this hole. Top up with GL4 70W for the ASM box, and GL5 75W-90 for the transfer box and rear diff (or whatever has been used before).



**31 INSPECT EXHAUST SYSTEM**

The exhaust system is routed underneath the middle of the vehicle. Check all of its rubber mounts (hangers) for perishing and splits. If it's safe to do so, run the engine and stand underneath the vehicle, listening for leaks.



**RECOMMENDED SERVICE SCHEDULE**

**EVERY 10,000 MILES or 12 MONTHS**

- ▶ Change engine oil & oil filter
- ▶ Check coolant level & test concentration
- ▶ Check tyre condition, pressure & tread
- ▶ Top up screenwash fluid
- ▶ Check battery
- ▶ Check wiper blades & washer jets
- ▶ Check all underbonnet components & hoses for fluid leaks
- ▶ Inspect brakes
- ▶ Check steering & suspension components
- ▶ Check auxiliary drive belt
- ▶ Inspect exhaust system & mountings
- ▶ Check operation of all electrical systems
- ▶ Lubricate all locks & hinges

**EVERY 20,000 MILES or 24 MONTHS**

- ▶ Change cabin filter

**EVERY 24 MONTHS**

- ▶ Replenish brake & clutch fluid
- ▶ Replenish coolant

**EVERY 40,000 MILES or 48 MONTHS**

- ▶ Renew air filter
- ▶ Renew fuel filter

**EVERY 50,000 MILES or 60 MONTHS**

- ▶ Renew spark plugs

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# Help!

Your *non-diagnostic* vehicle-related problems solved by **Steve Rothwell**



## GENERAL

### Nut extractors

**Q** Do you have any experience with these rounded nut/bolt extractors. There seems to be two types of design available – the spiral flute type and (for want of a better description) the straight edge type. Both Laser and Draper offer the latter type and I'm just wondering which design is the best/effective and if you're able to recommend a specific model.

Also do you have any experience with barrier creams? I have eczema and wearing gloves in warm weather can leave my hands quite pruned. I've been looking at them online and I've seen "derma shield" which gets good reviews, but then it ought to given its price.

A product called PR88 has caught my eye, it seems to get good reviews and is reasonably priced and seems to protect your hands from everything you'll likely encounter when working on cars. Can you recommend any others?

**Anthony Pattinson**

**A** With regard to the nut extractors, I own a set of the spiral flute type, from Blue-Point and I would not be without them. They are one of the best options I have ever found to remove rounded fixings. Due to the design, they do self-grip and the tighter the bolt, the more grip is given.

The Laser product I am presuming you are referring to is a set such as the Laser 7200 which does look to be quite capable of the task and uses a set of square edges to bite into the rounded fixing. Having used the Blue-Point set I have for some years now without any problems I have had no need to try another type.

With regard to barrier cream, I am of the generation that grew up using barrier cream as gloves were not an option in my youth. The process of applying the barrier cream was needed before working and the cream would wash off with the grease and grime at the end of the session. I did though always have hands stained by the oil and greases I came into contact with, and it must be noted that the barrier creams are not a perfect solution. But if you do have problems with gloves then they are an alternative.

I did look up PR88 and this appears to be around £10 per litre, for which price you would get around 150ml of Derma Shield.

Another product to consider would be Deb Stoko PROTECT. This is around the £10 per litre price mark, from this website <https://bit.ly/CMaRBCc> and DEB products I have always found to be a good option in the motor trade.



The Blue Point nut extractors I use and the Laser product.



## GENERAL

## GENERAL

### TPMS

**Q** Regarding your Help! section and your reply to Arnold Holmes about Tyre Pressure Monitoring Systems in the July 2024 issue of CM. His question could have been clearer, but I don't think he was asking how the TPMS monitored his unused spare wheel. The TPMS is clever enough to know when a spare wheel is not being used.

Maybe it's just co-incidence when he exchanged the spare wheel that one of the road wheels got a TPMS warning on the same day. Anyway, I was wondering, if the TPMS knows the location of each wheel monitor, does that mean the system needs to be reprogrammed when using the spare or rotating the wheels during a service?

**Les Lumb**

**A** There are two different systems of Tyre Pressure Monitoring System – the first and most basic (passive) uses the ABS system to read and compare the road speed of each wheel. If one wheel alters speed in relation to the others, it is deduced by the ABS system that this is because that tyre is deflated,

and the deflated tyre will have a smaller circumference and as such will need to rotate at a marginally faster rate to keep up to pace with the vehicles speed.

On these systems, the importance of the wheel position is nil, as the only important factor is the rolling circumference of the wheel, and I would note that these systems can be sensitive enough to be confused by a worn tyre on one side and a new tyre on the other, and this may have been the case in the letter you refer to.

The second system (active) does use a sensor in each wheel, and these again fall into two specific types of system. Some (not many) do detect the position of the sensor, but most need to be programmed to determine the position of the sensor, and as many modern vehicles do not have a spare wheel, it is often the case that the spare will not have a sensor fitted and be simply a space-saver spare wheel.

The system used on the Fiesta in the question you refer to could be either the passive or active type, but even the active type on the Fiesta does not monitor the spare wheel and so is not clever enough to know if the spare wheel is being used or not. The active type of

monitoring system on all vehicles does need to go through a learning process to allow the system to adapt to the parameters of the system. This will vary depending on the vehicle.



## FORD FIESTA

### Heater resistor

**Q** My friend's 2011 Ford Fiesta 1.2 interior fan only works on its fastest speed so it's more than likely that the resistor has failed. They are available from my local factor for the princely sum of £14, however can you confirm its location? YouTube suggests down at the base of the heater box accessed via the footwell.

**Anthony Pattinson**

**A** Providing the Fiesta is not fitted with automatic temperature control, then the resistor is close to the blower motor. The ATC unit is located in the centre console, but as you have priced the unit up at £14, this



would be the standard resistor pack, and not the electronic version used in the vehicles with ATC.

It is as you have mentioned at the base of the heater box near the footwell and can be accessed by first removing the small kick panel which is held in place with three clips to the rear, and a fastener towards the front.

Once this panel is removed the resistor pack should be easily visible and after the electrical plug is disconnected and the securing screw is removed, the unit can be pulled free.

## FORD EXPLORER

### Ignition key trouble

**Q** My ignition key barrel on my 1997 Ford Explorer 4.0 V6 runs out of travel before engaging the acc. position. I have removed switch from lower column and acc. position engages OK by hand.

Thought there might be adjustment here but appears not so. Switch is operated by rack and pinion from key barrel, I suspect this could be worn. Need to remove steering wheel to access.

Please advise correct procedure to remove and replace airbag and steering wheel.

**Roger Vincent**

**A** As you have mentioned I suspect that the mechanism is worn and this is the cause of the problems you are having, this would explain why the key runs out of travel as it needs to take up the slack as it turns.

From the information I have on the earlier Ford Explorer the procedure should be as follows:

▶ **Disconnect the battery and allow ten minutes before proceeding with the airbag removal.** The details I have indicate that the airbag is secured to the steering wheel with two bolts that can be accessed by removing the small cover plugs to the rear sides of the steering wheel. Once the plugs are removed the airbag retaining bolts can be removed allowing the airbag to be lifted out of position. The connecting plug can then be disconnected.

It is also noted that a puller should be used to remove the steering wheel, and a new securing bolt should be used when replacing the steering wheel, although no torque is specified in the data I have.

I did also find an informative site from the USA which suggests the actuator part number FODZ-3E715-A can be obtained separately and this can be fitted to remedy the problem. As you wrote in, I'm not sure if you have internet access, but if you do this website may be of interest to you <https://bit.ly/CM0E2v2> as it gives the full procedure to replace plastic rack section of the mechanism.

## FORD MONDEO

### Seat fault

**Q** My 2015 Ford Mondeo 2.0 TDCi has an irritating fault where the front passenger seat adjustments (all electrical) mostly doesn't work. Occasionally full functionality will return but generally it doesn't operate, the driver's seat works fine.

I have uncoupled the impressively large seat connector and cleaned the terminals and checked the relevant fuses all to no avail.

Can you please tell me if there are any pre-conditions that need to be met for the seat to operate or where I should investigate next?

**Matthew Goodrum**

**A** The seat should operate at all times, in the same fashion that the driver's seat does, and as the operation is occasionally returned, I would suspect that the source of the problem is either the multi-plug connection or the operating switch pack.

One of the common faults on these electric seat systems is that the gear will strip and even though the motor will operate, the seat will not adjust. As you do not mention hearing any noise during the operation of the seat, I suspect that this is not the source of your problem.

With this in mind, I would as a next move remove the switch pack and check the multi-plug on the rear, cleaning it as you have done with the main multi-plug, and if this does not achieve the desired result, then I would attempt to operate the seat with the switch removed, whilst manipulating the body of the switch.

If this does restore the seat operation, then it may be the case that the switch pack will be the source of the problem.



The seat switch pack which may be the source of trouble.

## FORD FOCUS

### Clutch operation

**Q** I very recently changed the clutch and concentric slave cylinder on my Mk2 Ford Focus 1.6 TDCi and have been struggling to get and keep a decent clutch pedal. After various attempts at bleeding and upon further investigation today I have found clean fluid leaking from the bottom of the bellhousing and I'm certain that it's from the CSC.

So, I have obviously made a mistake when fitting or bleeding it. I did end up using a Gunsons Eezibleed at the recommended 8psi, and achieved a pedal feel that I would describe as about 80% good at the time, but the following morning it would have sunk lower, which I could overcome to a degree with some manipulation.

I will probably give it another go at some point soon but don't want to make the same mistake twice so would you hazard a guess to where I might have gone wrong? The operation feels smooth so I'm doubtful as to whether the seal has turned but I've never experienced that before so can't say for sure.

**Dean Savage**

**A** I would first say, it may not be your mistake, and it should be considered that you have been unlucky and fitted a faulty concentric

slave cylinder. I am sure the bleeding process was not the cause of the problem, and there may be one or two possible scenarios depending on the type of concentric slave cylinder fitted. Some are a one-piece unit with hard plastic pipes to the outside, and others have a metal pipe from the cylinder to the outside of the gearbox.

The first scenario to consider as mentioned is that the concentric slave cylinder is faulty and has allowed the fluid to leak past the seals, or if it is the plastic type may even have been cracked. This would account for the fluid leaking from the bellhousing.

The second possible scenario is that the section which connects between the slave cylinder and the outer bellhousing if the plastic type has not been positioned well, and may have cracked as it was tighten up, either this or the connection at the outer edge of the bellhousing to the hydraulic pipe is not positioned well and is leaking. If you have the type with a metal pipe from the slave cylinder to the outer edge of the gearbox, this pipe may be leaking at the inner connection.

If the problem is the outer connection, outside the bellhousing this may be allowing the fluid to drip through the gearbox and exit at the bottom of the bellhousing as you have seen.

**FOOTNOTE:** I did hear back from the reader and the problem was the seal between the pipe and the concentric slave cylinder – this he managed to replace without the removal of the gearbox.





## JAGUAR XJ8

### Coolant issues

**Q** I have owned my Jag for a year now and the past two weeks have been a nightmare! I saw a small leak of coolant appear below the right-hand engine bay – as I had just parked up at work, I left it until I returned at 12:45 where the puddle was larger. I called the RAC – eight hours later they arrived (but that’s another story).

Took the XJ to the garage (making sure the coolant was topped-up) with normal temp on the temperature gauge and two hours later they diagnosed a holed water pump. “The pump was hard to source as there was none in the country”, said the

garage owner (a hard part to find apparently, never went to SNG Barrett they have loads). Once fitted I paid my money (2.5hrs labour plus parts) and he said, “it was a bugger to bleed”, keep an eye on the coolant.

Two days later I had to put the demister on whilst travelling and it blew cold air – checked coolant level which was a little low but still within the high and low marks. I took it back to the garage immediately, temp gauge still on normal, although it did slightly dip below as we were getting closer to the garage.

He said it was the thermostat probably. I told him it was an airlock, and it wasn’t bled properly. To which he also agreed!

Five days later he replaced the thermostat (a hard part to find apparently, never went to SNG Barrett they have loads), but the problem was still there. Heats when stood still but blows cold when travelling. He has now told me he is going to pressure test it!

As he thinks it might be the head gasket. He also said, “it is getting to the point of an uneconomical repair”, to which I replied “my XJ come in for a new water pump which you replaced and did not repair properly you have left the engine with an airlock.”

I am today taking the car out of the garage as I do not have confidence in him pressure testing as if he does this wrong the head gasket will blow under the wrong pressure. Also, he has topped-up with water rather than coolant (his words) and the weather is getting colder and the XJ left outside!

#### I then received an update on the problem...

Just to update you, I went into the garage yesterday, he has now told me that the engine is all good, and had bled it again – also taken the temperature of the engine and is saying my temperature gauge is wrong, it stays normal although the engine is hotter (he turned the fan off?) and took the temperature from the thermostat sensor? What if the sensor is wrong? Apparently, the heater is working but cooler on the driver’s side.

*Doug Mead*

**A** As you have mentioned I do suspect that the system has not been correctly bled initially.

Unlike some systems the Jaguar coolant bleeding instructions specifically specify that the engine should not be run with the expansion cap removed. The heater should be set to Max and the engine should be run until the heat is felt from the heater vents, if the engine temperature begins to go above the normal, the engine should be switched off, allowed to cool and after ensuring the coolant level is correct, the process should be repeated.

Jaguar also recommend a vacuum fill on the vehicle, which would normally eliminate any concerns that air would be present in the system.

I do suspect that the problems that have arisen since the leak are due to air in the system, and I would expect if the problem were the head gasket, that pressurising of the system would have occurred, and also that the garage could have checked this using a chemical test or gas analyser.

I would also say that it should not be possible to cause any damage to the cylinder-head gasket when performing a coolant pressure test, as the head gasket should be able to remain sealed at pressures far above that which the cooling system could hold.

It is also sometimes possible to remove air locks in the cooling system by putting it under pressure using a cooling system pressure tester – this can often move the air to an area that it can be dispersed from.

As you say it is possible for the engine sensor to be reading incorrectly, and this could be occurring due to a fault in the sensor, or if an air pocket is surrounding the sensor preventing it from reading correctly.

## JAGUAR XJ8

### Audio fault

**Q** My 2006 Jaguar XJ8 Sport has an intermittent loss of audio fault where the screen will display communication fault – please consult your dealer – and ICE is unavailable. This could stay for a few weeks then recover with a prompt to key in the radio code after which all will be fine.

It has a previously installed parrot hands-free phone system and I have noticed that this is unpowered while the radio is unavailable. Could you please advise what to look for in attempting to rectify the fault?

*Matt Goodrum*

**A** As the display does still operate then I would expect that the main connection is still connected, but the communication fault message is suggesting that at some point, a poor connection is present. The past fitment of a

Parrot hands-free system may be the reason and with this in mind, I would first remove the audio unit and make a check of the connected multiplugs. The Jaguar workshop manual states that the resistance in the loom should not be more than 5 ohms, and it also mentions that the earth system should be checked, and so these would be important points to cover.

If nothing in this area can be found that may be causing the issue, then I would also check the connections to the amplifier which is located in the rear nearside of the luggage area close to the wheel well behind the side trim.

If at this point nothing has been discovered that may be the source of the problem, it may be worth carrying out a hard reset of the system by disconnecting the 12V battery and then connecting the two disconnected battery terminals together, effectively forming a circuit without the battery. This will then drain any capacitive charge in the system and allow a fresh start. The battery should then be reconnected.

After this process it may require the engine management system parameters to be re-learnt during the next drive cycle, and it may also require that the electric handbrake needs to be reset as follows:

- ▶ Switch the ignition on and depress the brake pedal fully and hold it down. Then while holding the brake pedal down, pull and release the EPB switch. Switch ignition off and release the brake pedal.
- ▶ The code will then need to be entered into the audio system, and the automatic windows will also need to be reset.



The readers photo showing the screen that appears on his XJ8.





## VAUXHALL MERIVA

# Parking brake

**Q** My wife has a Meriva B 1.4 on a 13-plate. It doesn't do a lot and is currently on just under 56,000 miles and only does about 50 miles a week over three days. Recently she has noticed the release of the parking brake is harsher than normal and has once complained of noise from the rear brakes. I took it out myself for a run and noticed the rear offside brake is ineffective to the point there was no noticeable increase in temperature at the disc whereas there was in the other three corners. Brake balance and stopping power currently seems fine and there is no ABS warning present.

Is this likely to be a conventional problem of the components needing a service and inspection, or do they suffer a similar issue to the Corsa D with its faulty ABS unit stopping braking to one wheel?

Also, what is the process for stopping inadvertently operating the parking brake during maintenance?

**John Tyrell**

**A** The electronic parking brake works using a motor to pull the parking brake cable. This operates the cable on the right-hand rear caliper, and the left-hand rear caliper is then operated via an equaliser mounted on the cable. As you have no ABS warning present, I do suspect that this is a mechanical problem.

As the problem does appear to affect only the one side, and no ABS light is present I would expect this to be a mechanical issue that may be related to the cable section of the handbrake system. As the brakes did pass the MOT and



Help!

this problem has arisen since, I would start by checking the physical operation of the parking brake cables and the parking brake system. This may reveal a sticking cable that could cause this problem. If the cable is sticking and not releasing fully, this will prevent the brake pad automatic adjustment from operating and can give the lack of braking symptoms you have.

As this is a cable-operated system via the electric parking brake, there is not a specific system to prevent the brake from being applied, and there are no adjustment procedures required afterwards other than the standard pumping of the brake pedal to set the brake pads.

## VAUXHALL CAVALIER

# Hunting in traffic at low rpm

**Q** This time I'm asking for help/guidance with my 1990 Cavalier 2-litre CDi with 84k on the clock. 20NE engine and Motronic 1.5 ECU. F16/5W gearbox. A memory test! Very economical, runs well, starts well hot and cold but in slow moving traffic (5/10mph) with a light throttle 1100/1300rpm it will 'hunt', causing drive line shunt? The only way to avoid this is by dipping the clutch – not an ideal solution!

Decided it 'could' be a problem within the mass air meter so today I dismantled it (see photos) to find some atmospheric dirt on the vane side, which wiped off easily, smooth bearings with no shake. The electronic side showed a good carbon track and wiper – and this gave a smooth resistance change with its movement.

I applied a contact cleaner with lubricant and cycled its movement. I was hoping to find an obvious problem, but it all looked pretty good for 34 years! After a test run today, I found no change to the symptoms.

Obviously, a symptom of gearbox wear although no leaks, changes well with no noises but I guess internal clearances have increased. Could a thicker oil help as it appears worse when hot? Gearbox has EP80 in it now.

Have you come across this before, it seems like an 'older vehicle' problem!

**Alan Worland**

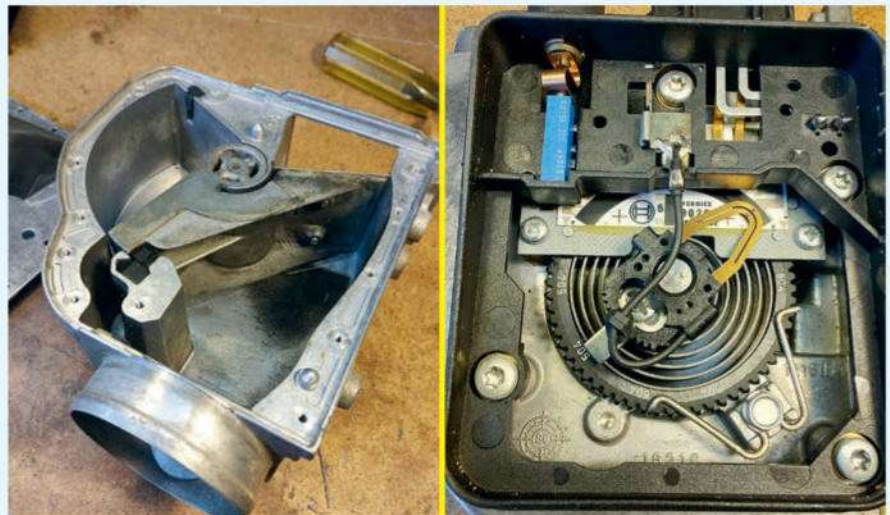
**A** The symptoms do sound more of a fuel supply problem than an ignition or drive train fault. The VAF (Volume Airflow Sensor) can suffer from electrical stability problems, and it would be worth testing this using a voltmeter to ensure that current flow change is smooth. The first test is to ensure that the feed to the VAF sensor has a steady and constant 5-volt feed – this can be done by probing terminal 3 (the Blue/Black wire) and using a good earth.

If the feed voltage is a stable 5 volts, then the next test is to place the probe between terminals 2 and 4 (Blue/Green and Brown/Green wires) the voltage with the ignition on should be between 0.1-1.3 volts.

The VAS plate should then be slowly moved whilst watching the voltage on the meter, during the movement the voltage should rise to around 4.5-5 volts. This voltage rise should be steady and smooth.

If this is not the case then the VAS unit may be the source of the problem, but if these tests show that the VAS is operating correctly then the next step would be to check the throttle position sensor and check the voltages – the feed wire on terminal 2 (Blue/Black) should be 5 volts. Providing this is correct, the voltage between terminals 1 and 3 (Brown/Green and Brown/Blue) should be 0.1-1.3 with the throttle closed and 3.9-5 volts with the throttle open.

If these tests do not show up any inconsistencies, then this may be a fuel pressure problem and checking the fuel pressure regulator and fuel system may be the next step. If the voltage to any of the sensors is not stable, then a check of the engine control module earth system would be a good check to carry out.







## SAAB 9-3

### Servo braking

**Q** I have looked after and owned my 2008 Saab 9-3 saloon 1.9 TiD auto, for four years and it's in good nick, and I like the car. It has covered 144,000 miles.

The brakes, discs, calipers and pads, new flexi hoses, are well serviced and in good order. I have lost the servo assist at the pedal. Heavy feel and on startup the pedal does not descend. Otherwise, all is good with the braking except the heavier than normal pressure needed.

Vacuum I've checked. With the engine off, I removed the vacuum line at the servo. I thought it came out with a pop and strong resistance. I then attached a vacuum gauge to the line and on startup immediate 15psi registered. Is this sufficient to condemn the servo unit? Is it an unusual failure?

Spare parts aren't readily available, and a second-hand unit might have to be used, although I would like to use a new one. The

markings on the servo show TRW, it must be possible to find one.

What are your thoughts? Is it correct to condemn the servo unit? Thanks.

*Derek Houghton*

**A** The servo should operate fully with a vacuum of 13psi (0.9 bar) and so with the reading you have of 15psi, this does suggest that the vacuum pump is operating fully. As you have also confirmed that the vacuum is reaching the servo, this would suggest that it is the servo which is at fault.

One further test which may help confirm would be to disconnect the brake master cylinder (this can be done leaving the hydraulic pipes attached) and pull this gently away from the servo in order to check the internal operation of the servo. This may aid the diagnosis in confirming that the servo is at fault.

As there is a vacuum at the servo and this appears to be held given that a pop is heard when removing the vacuum pipe, this would suggest that the diaphragm in the servo is complete and not leaking. With this in mind, then the failure of the servo assistance may be due a mechanical issue and the removal of the master cylinder may reveal this.



## VOLVO XC70

### Battery trouble

**Q** You have been able to help me before with my old rear-engine Skoda Rapid, now I have a question on my modern vehicle. My 2014 XC70 is a D4 auto AWD with the 5-cylinder 2.4-litre diesel. It does not have Stop-Start. I have had the car since new and it still on its original battery. Over the first lockdown it got very little use and the battery suffered, although at no time did it fail to start the engine.

I used the pulse repair setting on my battery charger and since then I have not seen a 'low battery Charge' warning.

My question is, can I change the battery myself or does the new battery need to be 'coded' to the car in some way? I have had different answers from two different battery suppliers.

The car has the full Volvo safety support package with blind spot monitoring, auto anti-collision braking, adaptive cruise control, etc. But there is no mention of a radio code in the handbook.

*Mark Fisher*

**A** It is very likely that the battery in your Volvo is reaching the end of its useful life, and it would be wise to replace it now before it gets to the stage where it will let you down.

If your vehicle does not have the battery condition monitor then it is possible to replace the battery yourself without any resetting required, and from the details I have the radio is coded to the vehicle and so when the battery is replaced, the radio will recognise it is in the correct vehicle and a further code should not be required. If a code is needed, then your supplying Volvo dealer should supply this for you FOC.

The replacement procedure is as follows:

- ▶ Ensure all electrical equipment is turned off and the ignition is switched off and the key/fob removed from the vehicle.
- ▶ Wait five minutes before disconnecting the battery, removing the negative (-) lead first. If an auxiliary battery is fitted this should also be disconnected.
- ▶ Fitting the new battery in reverse order with the negative (-) lead fitted last. Once the new battery is in place the ignition should be turned on without entering the vehicle.

The electric windows and sunroof (if fitted) will need resetting as follows:

- ▶ Switch the ignition on. Lift and hold window close switch to fully close window. Continue to hold switch for 1 second. Release switch. Immediately

## SAAB 9-3

### Subframe corrosion

**Q** My 2006 Saab 9-3 TiD had an advisory on the last MOT related to corrosion on the front subframes. I started treating the rust, wire brushing it first then brushing on a rust convertor. Finally, a coat of underbody wax was added. Most of it is what I would call surface rust, and the integrity of the mainframe is still OK.

However, there is one patch near the rear of the subframe where the wire brush went straight through. The hole is about 2in long by 1in wide – I attach a picture. Is this now an MOT failure? Is this permitted to be welded (professionally)? If I get a good used subframe what's the book time for a subframe change.

*Ed Hambley*

**A** The MOT guidance states that corrosion within any load-bearing or supporting structure or supporting panelling within 30cm of the mounting location is a reason for failure.

The corrosion is classed as serious when the corrosion has caused a hole in the metal, the area does not feel firm when you press it with your finger and thumb or your finger or thumb, or a corrosion assessment tool, creates a hole.

Given these details and looking at the picture you have sent, the corrosion to your Saab would be a failure point.

It is difficult to access from the picture if the area would be repairable by welding and this would need to be looked at in further detail. If a repair could be made to restore the structure of the subframe then this would be permitted, but for a weld to be possible it would depend on the quality of the surrounding metal.

The book time I have for the front subframe crossmember is 1.8 hours and for the replacement of the subframe mount which involves the complete removal of the front subframe is 3.2 hours.



The readers photo showing the corrosion on his Saab 9-3.





lift and hold window close switch in automatic close position for 1 second.

- ▶ Repeat procedure for remaining windows/sunroof. Check that the automatic open and close function is now operating correctly, if not, repeat procedure. Switch the ignition off.

If your vehicle does have the battery condition monitor then this would need the power management system to be programmed using diagnostic equipment, but there is another method of resetting the system manually which should work. This is as follows:

- ▶ Switch the ignition on (do not start engine). Turn the dipped beam headlights on. Press the rear fog light button quickly five times, then press the hazard switch quickly three times. This is not turning the switches on and off but is purely pressing them as indicated.
- ▶ The resetting of the system should be acknowledged by the battery light flashing three times.

If you did want to purchase a tool to carry out the function the Foxwell NT680 Pro ALL Systems Scan Tool would cover this and many more systems on your Volvo and a wide range of vehicle. The current cost from [gendan.co.uk](http://gendan.co.uk) is £399 and includes lifetime updates and delivery.

## VOLVO S60

### Cooling fan

**Q** I have a question regarding the cooling fan. Yesterday the cooling fan came on while out for a trip and stays on until the engine is turned off – as soon as I start the engine it comes on.

The coolant is spot on and the engine temp stays at normal, I have read it may be A/C level is low but as the A/C can be turned on and off by a button, surely if it is off, the A/C level wouldn't be an issue right?

After reading a post on a Volvo forum, if I disconnect the battery for a few hours the fan behaves as normal for a while, so maybe electrical rather than A/C related?

*Doug Seabrook*

**A** I would not expect the cooling fan issue to be due to the A/C gas being low, as the A/C system will simply not operate if the pressure of the gas is reduced.

The cooling fan has a blower control module which is located next to the fan on the front cowling. I would suspect that this module is the source of the trouble. The module may have suffered from water ingress or simply failed.

As you do not have an engine management light on, then providing the engine sensors are operating correctly and reading as they should the blower control module would be the first point to check. As disconnecting the battery does appear to reset things, this is an indication of such a failure.

## VOLVO V70

### Anti-skid message

**Q** I am after some help please with a dashboard warning message 'Anti Skid Service Required' on my 2005 Volvo V70 2.4. I have lived with this message coming on/going off for over a year with no adverse effect on the running of the car, but have now decided I ought to try and find a cure for what is an annoying message. The message comes on from time to time and usually disappears when the ignition is turned off and the key extracted then left for 20 minutes approx. Sometimes no message reappears but then sometimes it say 'Anti-Skid Temporarily Off' and this message then disappears after a short distance of travel.

I travelled up from Yorkshire with the caravan on the back to Northumberland, around 180 miles. No message until around 150 miles had been travelled when on a dual carriageway at 60mph in a straight line, the message suddenly appeared out of the blue. Whilst we were there for a week we travelled around short distances and the message would come on from time to time, on a couple of occasions when I just started the engine in the morning.

On other days no message. On the way home no message at all. I have tried to work out what I have been doing with the car when the message comes on but have not tied it down to anything particular. It might be my imagination but the brake pedal does seem to be a very little harder when the message is on.

I have been on the Volvo Forum and five possibilities seem to be mentioned:

Faulty brake pressure sensor(s).  
Brake pressure sensor wires/connections need cleaning.

Split reluctor rings.

Faulty sensor in the DEM.

Faulty steering angle sensor.

I have had the brake pressure sensors wiring connectors off twice and cleaned them but no difference. I have checked the reluctor rings but they seem OK – if split I would have the message all the time I feel. My local garage clears the messages when MOT comes round but is not sure what is really causing the problem.

I have no faith in my local Volvo dealership after poor service and diagnostics on a previous problem which cost me quite a bit of money and didn't solve the problem. I worked out it was worn engine mounts which were not noticeable until dismantled which I replaced but were not spotted by the dealership.

Brake sensors I'm told are around £100 each and the steering angle sensor around £150 so I don't really want to be splashing plus fitting if the replaced item isn't causing the problem. Are you able to help please?

*Peter Uttley*

**A** I would first say that if the local garage cleared the message, they should then be able to give you the code in the system which was causing the message to show up. This would give an indication of the area of the fault.

As the message can come and go and the distance driven can vary widely, this does indicate a more abstract fault, and although you have checked the reluctor rings, a small amount of corrosion or a sensor which is slightly out of position allowing a greater air gap than there should be would be a possible cause of this problem.

Among the possible causes you have listed there is also another sensor which could be at fault and this is the YAW rate – lateral G-force sensor, and hopefully if the codes were retrieved this would narrow down the fault to one area.

Unfortunately, the code reader is now an essential tool in the diagnosis of many faults.

## VOLVO XC90

### Parking brake

**Q** I have a 2007 Volvo XC90 2.4 D5 and as you might know the parking brake on these vehicles is pretty dire. I took it to my garage, they replaced discs and brake shoes and adjusted the cable, but still seems very poor. It will not hold on any sort of slope.

I have been online and some websites advise fitting an adjuster in place of the solid H-bar. Do you have any experience on these and are they difficult to fit?

Your advice would be much appreciated.

*John Willison*

**A** The adjuster piece can be fitted in place of the solid bar, and this does allow a better adjustment of the handbrake shoes which should improve the handbrake. The part numbers are 30793438 and 30793437 – two of each are needed to fit both sides, and other than causing the brake shoe spring to push slightly out of place. The conversion is easily completed.

It is worth mentioning that many of the problems with the Volvo handbrake are due to a worn or sticking brake expander mechanism at the end of the cable. Part Number: 31257570. Providing this is fully operational, then the option of fitting the adjusters in place of the H bar Part Number: 31257573 would be worth considering.

The fitment does of course require the brake calipers and discs to be removed, but once this is done the fitment is an easy process. The handbrake shoes should then be adjusted after the disc is refitted with the handbrake cable slack.

Once adjusted then the handbrake cable can be adjusted to the optimum position of 2-8 notches.







## BMW 5-SERIES

### Brake fluid change

**Q** I've owned this 2014 BMW 5-Series F10 M5 for nearly two years, and the service indicator on the dashboard has started reporting: 'Time for Brake Fluid Renewal'. I normally change the brake oil using the Gunson Kit I have (which utilises the pressure in a spare tyre to push-out the old fluid), however I'm not sure if this 'simple' method would be suitable for this BMW. There is no Haynes manual for it (not surprising perhaps), and I can't find much advice on the web or YouTube as regards changing brake fluid for the car.

I'd like to ask if you have any data or experience with the 5-Series F10 (particularly the M5), and would there be any special procedures for a brake fluid change? I believe my Autel code reader should be able to reset the Service Indicator. I would prefer to carry-out the fluid change myself using the Gunson Kit, but will use BMW if I have to!

**Gerald Reeves**

**A** There is a requirement on your M5 when bleeding the brake system for diagnostic equipment to be used to enable the hydraulic modulator solenoid valves to be operated. It is also recommended that pressurised bleeding equipment should be used with a maximum of a 2 bar (29psi) pressure.

The sequence to use when bleeding is:

- ▶ LH rear
- ▶ RH rear
- ▶ LH front
- ▶ RH front

Your Gunson kit would be suitable, but you would also need a diagnostic scanner such as the MaxiECU for BMW which would be able to operate the actuator valves.

If you have a compatible laptop, the investment in the MaxiECU for BMW at £140 from [gendan.co.uk](https://www.gendan.co.uk) may prove an asset. The full functionality of the unit can be found at <https://bit.ly/CMhXtMsB>

## BMW 4-SERIES

### Pollen filter

**Q** My eldest son has recently bought his dream car – a 2016 BMW F36 430d. We performed a service recently and I never trust that the last guy to put the cabin filter in correctly – so does the fan blow air into the filter or suck it through it? The filter is located to the right of the blower.

## BMW 1-SERIES

### ABS sensor change

**Q** I was working on a work colleague's BMW 116i the other day as the ABS light is on due to the sensor contacting the reluctor ring as a result of rust underneath it. The plan was to remove the shaft and replace the ring. Unfortunately, the shaft was well stuck into the hub and the only way I could get it to move was to have the owner hold a bar with a nut and bolt through the end on the shaft while I hit it with a 10kg headed sledge hammer! I quickly realised this was going to be pointless as it would only go so far like that and then I would need a hub puller to get it the rest of the way – a tool I don't have although I have now ordered one as they seem cheap enough.

One thing that has got me puzzled after doing a bit of research online and YouTube is that the shaft also seemed very reluctant to come out of the differential. YouTube videos would suggest that this should be relatively easy to do even by hand. This was not the case, I taped a flat screwdriver in between the two flanges of the shaft and diff, and whilst the shaft started to move away from the diff there was a lot of tension pushing the shaft back in.

I should mention that I tried this before attempting to free the shaft from the hub and it was at this point, I thought it may have to be freed from the hub end first to allow it to be removed from the diff, but again YT would contradict this.

So, a temporary fix has been attempted for now consisting of a thinnish washer under the sensor to raise it up a bit to clear the ring. Not sure if this will work, YT suggests it will, but the ABS light remained illuminated after a drive. Do ABS codes self-clear or do they need to be cleared manually?

**Anthony Pattinson**

**A** To answer your last question first, if the code is pertaining to the ABS sensor signal which is picked up from the reluctor ring, then when the problem is rectified, the code should clear, as this is reset every time the ignition is switched on. If the code is pertaining to another issue, then this would need to be cleared. The problem you encountered removing the shaft from the outer hub, is one that I have come across on several different makes and models, and I do know how tight the shaft can become in the hub. A puller used to push the shaft through is the preferred method as striking it with a drift can cause distortion and is not recommended.

The inner joint is secured to the flange by a ring of bolts and once the bolts are removed, it can be the case that the joint will be stuck to the flange by the accumulated dirt and rust that has built up, this is quite normal and a good tap with a hammer will normally release this, but on occasions this can be quite firm.

I should also add that when fitting the shaft, the inner flange bolts should be checked after around 150 miles, as they can settle and loosen.

Whilst there are some good YouTube videos, there are also some poor practices shown – and edited videos that may not show the full story.



The readers photo showing the inner drive joint in place and the area it was stuck.

My son says YouTube sources state the arrow on the filter should point towards the engine. Any advice would be great Steve.

**Gary Mills**

**A** The airflow through the filter is from above to below, so the arrows on the filter should point downwards, the fitting details can be seen in the Mann filter fitting instructions at this website <https://bit.ly/CMbmw3F>

I did have a quick look at some of the sources that give various information, and many do

confidently give incorrect advice and so I can see the reason for confusion.

The airflow is clearly marked on the MANN fitting instructions and hopefully this should prevent any confusion.





## BMW 3-SERIES

## Stop-Start system

**Q** I have a query regarding my 2012 BMW 320d F31 Touring auto which has covered 108,000 trouble-free miles. I think the fault I describe below has occurred with other models of BMW automatics judging by discussion on the internet. However as far as I can see no one has been able to resolve it with any certainty. Hopefully it is of general interest to other BMW owners.

The issue is that when the Stop-Start system is activated (eg. when stopped at traffic lights), the engine will sometimes restart without warning a few seconds later, but having put itself into Park. The gearshift must then be moved into Drive by the driver in order to proceed. It doesn't do this every time – perhaps once every 30 minutes of driving at random. No error codes are recorded.

I have heard various speculation for the cause: low battery (I have no reason to believe this is an issue with my car); an issue with the gearbox mechatronic; crankshaft sensor fault; or software update (although I believe my software is current).

Any thoughts on this frustrating issue very much appreciated.

**Mark Hough**

**A** The most common reason for the problem is due to low battery voltage. The Stop-Start system is reliant on the full battery capacity being available to operate, and if the system senses that the battery voltage is below the requirements then the Stop-Start system will not operate.

If this drop in sensed battery voltage occurs during the stop cycle of the Stop-Start procedure, the Mechatronics unit can engage Park due to the failed communication.

I would first say that if the battery on your BMW has never been replaced then it would now be due, but if it has been replaced the battery data should have been programmed into the power management system using diagnostic equipment. If this was not done, then this could be the source of the trouble.

However, this is one of those problems which, it seems, is even baffling BMW – and after software updates the fault on some owners vehicles has not been rectified. As battery voltage is so crucial to the operation of the vehicle systems, I would suspect that the fault will be in either the battery or due to a poor connection at some point in either the main system or one of the multiplugs between the Mechatronics unit and the vehicles ECU. The smallest of voltage drops will prevent these systems from operating correctly.

## BMW i3

## Aircon trouble

**Q** I have decided to try electric and hedged my bets somewhat with a 2016 BMW i3 60Ah REX model to alleviate range anxiety. Shortly after having the car I realised the aircon wasn't right – the dealer asked me to take it to a specialist to check/repair and they would pay for it. It was a couple of seals that had perished and once replaced all was OK. That was just over a year ago and now I think there's a problem with it again. It hasn't been right for a while.

My concern isn't so much that I don't get cold air in the cabin but whether any malfunction is also affecting the battery cooling. I'm not sure if the two are connected.

Just before it was fixed last time the specialist did a check while I waited and knew it was leaking somewhere. It took a couple of weeks before he could have it in to fix. In that fortnight the main fans for the battery cooling came on nearly all the time including when charging the batteries on my drive, sounding rather like a hovercraft! I think that was because the system had much less gas in it following the check (I understand it needs non-standard gas in these cars). They haven't activated since it was fixed. I get no warning lights and the car is operating normally at the moment.

The aircon dash light on the switch sometimes illuminates, sometimes not and

sometimes flickers, but no cooled air.

I know I'll have to take it to either BMW or a specialist to get it looked at/fix, but I would value your opinion first, especially about potential battery overheating.

**Andy Powis**

**A** The refrigerant in your BMW should be R1234yf – this is basically a more environmentally friendly substance than the earlier R134a and works under a slightly higher pressure. It is widely used now in modern vehicles. The inverter coolant for the electrical drive system and batteries is a separate system from the A/C and uses, BMW LC-87. This is a conventional lifetime antifreeze/coolant. This is a sealed for life system and does require specialist equipment to refill if required.

The cooling fans do though operate when either the engine/motor cooling system or the A/C system are in need of the cooling assistance, and so this would explain why the cooling fans continued to operate when the A/C system was faulty.

Having found perished seals in one part of the system, it may now be that seals in another part of the system have also perished, and so a pressure test of the system should be carried out, if it is found that the gas level is down. The fault may also be due to an electrical issue, and this should be detectable by the specialist using diagnostic equipment.

## BMW 5-SERIES

## Suspension fail

**Q** I'm afraid I have a problem with my wife's car which is a 2016 BMW 5-Series 520d F11 with about 46,000 miles. A few weeks ago, it started dropping at the rear, both sides. I removed the air suspension compressor and found it very wet inside. I cleaned it out and used a hair dryer on the desiccant, put it back no difference. It only drops intermittently and as soon as you start the car the height is restored.

There are many instances of people complaining about the air suspension on these cars nearly always to do with defective airbags. However, I have checked the airbags by spraying them with soapy water and could not find a leak nor a leak in any of the pipes. I have however replaced both the solenoid valve and valve block in the compressor with no difference.

Sometimes when you complete a journey, very shortly thereafter the rear drops yet on other occasions it will stay up for some days. Any ideas please?

I therefore look forward to hearing from you in respect of these problems.

**Martin Selwyn**

**A** Having checked the air springs for leaks, they can hopefully be discounted, as can any leaks from the jointing pipework.

Having found moisture in the compressor I would connect the problem to a possible failure of the solenoid valve in the pump, but again as you have replaced the solenoid and valve block, this should eliminate this possibility.

This leaves the suspension control module located in the luggage area behind the right-hand trim panel. It is possible that corrosion has entered the connecting plug for this module and that it is an electronic error causing the valves to operate incorrectly.

This would be less common as most air suspension faults I have come across are rectified by either replacing a faulty air spring, or the compressor.



The suspension pump assembly on the BMW 5-series.





## MERCEDES-BENZ GLA

### Crabbing

**Q** Having recently purchased a 2014 Mercedes GLA 45 AMG. I have had the misfortune to experience the problem of crabbing with the front wheels. I am hoping you could help as Mercedes will not help with the repair or any suggestions of anything that can be done, even though this problem is of a Mercedes issue.

What I'm worried about is the crabbing going to wear my tyres prematurely out as I have just replaced the two front tyres at a

cost of nearly £600.

The issue is when Mercedes built the GLA it was left-hand-drive only – they then decided to convert it to right-hand-drive which caused the problem with the steering geometry. Surely this should be rectified by Mercedes as with a few other new models it is still happening. This is not Mercedes engineering that I have experienced in the past.

I feel very let down and this has ruined a very good car. I would be very grateful for any help and advice you could give me.

**Brian Reid**

**A** The tyre crabbing is an issue that is experienced by GLA and GLC owners. The reason for the crabbing has been attributed to the repositioning of the steering mechanism to accommodate right-hand-drive

vehicles, and so this issue does only affect those with the steering wheel on the right. In Australia there have been petitions to ask Mercedes to address the problem. Mercedes have replied that the tyre skipping or crabbing is a characteristic and not a fault.

As this issue does only affect the vehicle when on full or nearly full lock, then on a daily basis it should not prematurely wear the tyres. One of Mercedes replies does indicate that using winter tyres in the colder weather does help eliminate the issue. The winter tyre having a more flexible sidewall does help alleviate the effect.

Whilst in this country the seasons are not always pronounced enough to swap winter and summer tyres, it has been suggested that using an all-season tyre, does slightly alleviate the crabbing issue and this has been the answer for many owners.

Other than ensuring that the steering geometry is correctly set, and this should have been done when the tyres were replaced, the only other advice I can give would be to consider the make and type of tyre fitted. A Michelin all-seasons tyre may give the best service, but the skipping or crabbing will only occur on a harder lock, so everyday driving should not prematurely wear down the tyres with correctly adjusted steering geometry.

## MERCEDES-BENZ C-CLASS

### Service indicator



**Q** I now have a 2015 C-Class 200 AMG and although I have serviced it, once again a message comes up telling me how many days the service is overdue. Do you know how to reset this.

**Alistair Stewart**

**A** The service indicator may not always be reset using the manual method if the service parameters have been exceeded by too greater margin. But presuming that this is possible the method is as follows:



- ▶ Ensure all doors, boot and bonnet are closed and turn ignition key to position I.
- ▶ Ensure odometer is displayed. If not, press and hold button A until odometer is displayed.
- ▶ Within five seconds: Press and hold button B. And then within one second: Press and hold button C.
- ▶ Keep buttons B and C depressed for approximately five seconds until "Vehicle data", "Dynamometer test" and "ASSYST PLUS" appear in the display.
- ▶ Repeatedly press button D until "ASSYST PLUS" is highlighted. Then turn the ignition key to position II.
- ▶ Press button C to confirm. "Service data" and "Full service" will appear in the display.
- ▶ Repeatedly press button D until "Service data" is highlighted, then press button C to confirm.
- ▶ A workshop code is displayed. Record workshop code.
- ▶ Repeatedly press button E to display engine oil data and time/distance to next service.
- ▶ Press button A. Then repeatedly press button D until "Full service" is highlighted. Press button C to confirm.
- ▶ Service items will be displayed. Record all service items. Repeatedly press button D until "Confirm serv" is highlighted. Press button C to confirm. Oil type selection or "Service carried out?" will appear in the display.

If oil type selection is displayed:

- ▶ Repeatedly press button E to select oil used. Press button C to confirm.
- ▶ Repeatedly press button D until "Yes" is highlighted. Press button C to confirm.
- ▶ "Reversal not possible" will appear in the display.
- ▶ Repeatedly press button D until "Confirm" is highlighted. Press button C to confirm.
- ▶ "Full service completed" will appear in the display.
- ▶ Press and hold button A until odometer is displayed.
- ▶ Switch ignition off, the reset process is complete.

## MERCEDES-BENZ E-CLASS

### Audio unit

**Q** I'm thinking of upgrading my 2014 Mercedes E-Class with a CarPlay infotainment system such that I can utilise my iPhone for music, sat-nav, etc.

I recall a recent CM article where this was done to your project Range Rover. However, I'd like to retain my existing display and retain the cars OEM dash look.

There seems to be a lot of devices out there and some useful YouTube videos which guide you through the installation process. Many of the videos are North American and nearly all the bits are Chinese manufacture. I'm baffled by the choice out there, but my main concern is how reliable some of these units and the installation instructions are?

I don't want to remove half the dash and then discover that the upgrade fails to deliver. Please can you offer any advice as to which reasonably priced device I should consider?

Or please direct me to a reliable source who can guide me to suitable equipment and the installation process?

**Dave Steele**

**A** I can confirm that after-fitting an upgraded sat-nav and digital radio option to my Honda which was sourced from a Chinese manufacturer, I have since reverted to



## MERCEDES-BENZ E-CLASS

## Annoying rattle



**Q** I have been looking after my cars back to my Ford Anglia of 1965. A fault on my 2007 E320 though has so far got the better of me. A rattle has formed on the front offside wheel suspension.

There is no problem on dead smooth road but on any other road I get a quick fast frequency rattle. Rat tat tat...

I am lucky to own a car lift and this car has been up and down at least 12 times in the last about two months. I have changed the shock absorber and some balljoints and checked all. The noise will happen at low or higher speeds. I have tapped the tyre's side and disconnected the anti-roll bar, but the rattle is still there. I have read online the same car, similar miles with exactly the same problem but no solution! Have you any idea please?

**Gareth Owen**

**A** It can be difficult to locate a noise, and as you have covered quite a few of the options I would have suggested, and as you do have access to a ramp which gives a good opportunity to check the underside thoroughly. Then I suspect we may be looking for a noise which is deeper in the suspension, and one that when the vehicle is resting, is difficult to find.

The most common issue on this vehicle is the lower control arm inner bush which can emit a knock as the bush is hydraulic filled, and this can over time disperse. This does though normally leave a brown stain and can be easily spotted with the vehicle up on the ramp.

You do mention you have disconnected the anti-roll bar links, and this should eliminate the outer link arm joints, but what it may not do would be to eliminate the inner anti-roll bar D-bushes. The sound that the inner D-bush can emit does tie in with the conditions that you have heard the noise, and it is surprising the noise that can be emitted from the rubber D-bush when the bush becomes hard with age.

The anti-roll bar can jump within the bush creating the knock you describe, and having covered all other possible sources, this would be the area to investigate.



The anti-roll bar D-bush that may have gone hard allowing the knocking noise.

the original setup which gives a much better reception and much clearer sound when using the hands-free option.

I can therefore appreciate your concern at replacing the infotainment centre in your Mercedes and appreciate that you would not want this to be a retrograde step.

As you will appreciate without direct experience of the available options, it is difficult to make a recommendation. For this reason, I would contact this company <https://bit.ly/CMTNmas> who can supply the required unit and have dealers across the country. This would give you the option to possibly visit a local dealer who should be able to address your concerns on the fitment and reliability of any chosen unit.

## MERCEDES-BENZ ML

## Flickering headlamps

**Q** Could you give me your thoughts on the following please? My daughter-in-law drives a 2015 Mercedes ML 3.0-litre diesel. When the headlights are on, the offside one flickers on and off as if there is a loose connection

that needs pushing back on if you see what I mean. The local garage had it for two days but then unable to find the cause, referred her to a Mercedes specialist who he uses now and then.

The specialist looked at it yesterday and has said that she needs a new headlight. My daughter-in-law said, "the bloke in the garage said it's either a relay or switch which is faulty because the headlight is only getting 9 amps or volts instead of 12". I don't think she listens properly to be honest. A new light will cost £600 and £300 to fit, so £900 altogether according to the specialist, and second-hand ones are hard to get hold of.

This sounds like a lot to me even for a Mercedes. What are your thoughts – are Mercedes part really that expensive because the electricals are so complicated on these cars? Thanks very much in advance.

**Ken Chadwick**

**A** Having owned a few older Mercedes I would comment that I was often been surprised by the cost of genuine parts, which I have found were often cheaper than some of the aftermarket alternatives. I think that the costs are rising though, and this may no longer be the case.

Given the prices quoted, I suspect that the ML is fitted with Xenon headlamps

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and this may explain the source of the problem. If the ML is fitted with standard halogen headlamps, then I would be concerned at the reason for replacing the headlamp for what can only be a poor connection at some point, and this should be rectifiable by cleaning or securing a connection.

If the ML is fitted with Xenon headlamps it may still not be the headlamp that is faulty but the headlamp control module that is fitted at the rear LH side of the engine bay.

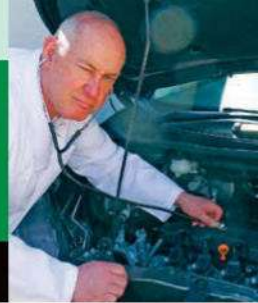
If the control module is the source of the problem, then this would explain the details given by the garage with reference to the supplied voltage to the unit, and if this is the case then the replacement headlamp will not achieve the desired result.

Given the costs involved, I would like a guarantee from the Mercedes specialist that if the headlamp is fitted and the fault remains, there will be no further costs for discovering another link in the chain (the control module) has failed.



# ▶ Diagnostics Doctor

Steve Rothwell answering your **ENGINE MANAGEMENT** queries



**AUDI Q3**

## Glow plug removal



**Q** My 2015 Audi Q3 2.0 TDI engine (CUVC) management light has come on and using my VAG-COM has given me a code P0674-00 glow plug circuit on number 4-cylinder. I am looking for advice on the removal and installation of a new plug.

My issue is not to break the old plug taking it out! Is there anything I should do to assist the removal? Any tips you can give?

Do you know what torque for the removal and installation? Any special tools required, long socket and size required also the location of number 4 cylinder on the engine.

*John Hynd*

**A** The code P0674 does as you correctly say indicate a circuit malfunction in number four glow plug, and the problem may be in the circuit and not the glow plug. For this reason, it would be worth checking the resistance of the glow plugs and also the continuity to the glow plug module. The module itself is also a possible cause of the code.

If the problem is with the glow plug, the time to replace all four glow plugs is 0.6 hours, number one cylinder is at the timing belt end with number four at the transmission end.

Glow plug torque for cylinders 1, 2 and 4 is 17Nm, for cylinder 3 which has an integrated pressure sensor the torque is 12Nm

The tools required for the removal and replacement of the glow plugs are a deep 10mm socket and u/j, a 12mm deep glow plug socket. A special pair of pliers (VAG part number 3314) is also recommended to remove the plug connectors. These need to be lifted off and the grooved pliers fit the cap to make this process easier.

The 10mm socket is used on cylinders 1, 2 and 4 and the 12mm socket is needed for glow plug number 3 which has an incorporated combustion chamber pressure sensor. After removing the engine cover the plugs are quite easily accessible and the biggest problem is removing the connectors as these can be tight. Using the recommended pliers VAG no 3314 or similar will make this job easier.

As the vehicle is not too old it should be possible to remove the plugs without too much of a problem, but it would be best to make a few preparations. Spraying a penetrating oil down around the base of the glow plug and then ensuring the engine is warm should assist the removal process.

If the plug begins to tighten up as it is removed, then spray a little more penetrating fluid around the base and wind it back in for a couple of threads before the reattempting removal.

I should also point out that the glow plugs operate at 4.4V so you should not test them by applying a 12V feed to the glow plug as this will damage them.



The pliers designed to remove the glow plug caps without damage.

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**JAGUAR XJ**

## Cat efficiency fault code

**Q** I wonder if you can help with two problems. I have purchased a 2003 Jaguar XJ6 3.0 petrol as a project car for my retirement. I am happy to spend some money on it hoping to do any remedial work myself.

It has produced a P0420 (Cat efficiency Bank 1) code. The engine runs superbly and idles really well. Possible symptoms are it can sometimes smell 'rich' and maybe sometimes a few exhaust fumes on hot days. Otherwise, it's good. I delete the code, and it comes back after around 100 miles. There is also a P1000 code which I cannot delete, and I can't find out what this means. Which is Bank 1?

I bought the Jaguar with a few electrical issues (I'm an electrical engineer by trade) but before I "dig in" I am wondering if there are any known problems?

The front roof interior lights don't work. All other interior lights do. The auto gearbox works smoothly but only on the right-hand side of the J-gate, which I believe is cable operated. The left-hand side of the J-gate does nothing, I understand that this side is electronic in operation. The Sport button and traction control button are inoperative too.

I have found the code C1093 on my Launch CRP129. The parking sensors are inoperative.

My question is: is there anything common here – ie. a control unit or earth point? I would be grateful to hear any ideas you may have.

*John Wren*

The Jaguar J-gate gearchange.



JAGUAR

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## HONDA HR-V



## Fault codes

**Q** Could you please advise me on the following codes I have on my 2017 Honda HR-V 1.6 diesel with electric parking brake? There are two faults U3006-13 1g1 open. U0401-68pcm malfunction. Engine fault P0133 air fuel ratio slow response sensor1. The EPB light is flashing, and the engine malfunction light is on, both came on to together. The park brake is working. Thank you.

*Alan Price*

**A** The code U3006 is indicating a perceived fault in the control module supply voltage input A and the code U0401 is indicating that Invalid data has been received by the engine control module (ECM). The code P0133 is showing that the Oxygen Sensor (O2S) 1, bank 1 has a slow response.

The Electric Parking Brake light flashing is indicating that a fault has been detected in the system, and with the U codes that you have I would expect this to be due to the information between the parking brake module and the engine control module conflicting.

Because one of the codes is indicating a low voltage

situation, and because a poor battery may be the result of all these codes, I would as a first step ensure that the battery is holding and maintain a standing voltage of at least 12.4 volts with the ignition off. If you do have the original battery on your Honda, I would suggest that this would be a good time to replace it. The modern vehicle electrical systems do rely on a stable voltage and if the battery has begun to calcify then this could be the source of the problem.

If the battery is good and this is not the source of the troubles, then the next step would be to ensure that the multiplugs to the engine control module and the parking brake modules, are clean and that the poor communication is not a result of corrosion or Verdigris on the terminals.

Whilst the P0133 code may be a separate issue, I would expect this to be connected to the other codes, but if it is not rectified with the actions taken to remedy the U codes, then it may be that the O2 sensor will need to be renewed, but I would not carry this out until the rectification of the other faults.

## MERCEDES-BENZ C-CLASS

## NOx sensor

**Q** My 2015 Mercedes C200 has a failed NOx sensor which is bringing on the management light. I replaced it with an aftermarket one from Amazon which has failed after 600 miles. Most of them seem to be Chinese but the one from Mercedes costed £750.

I wondered if you had come across this issue and could suggest a reliable source to purchase one? Thanks.

*Alistair Stewart*

**A** The NOx sensor problem has been quite prevalent, and as such there was for quite a time a shortage of the sensors. This meant that even the vehicles under warranty needed to wait for a while for the required sensor.

There are, as you mention, a number of sources where lower cost sensors can be obtained, but the one I would use is this site <https://bit.ly/CMnMNOX>. The sensors are a good price and come with one year's guarantee, ensuring that the if sensor does fail within 600 miles, it will be renewed.

The NOx sensor problem has been quite common on the Mercedes.



**A** The code P0420 does indicate that the catalytic converter system, bank 1 efficiency is below the required threshold. Bank one is the side with cylinder 1, and on your Jaguar, this is the right-hand side (offside) bank.

The code is normally showing that the catalytic convertor is not affecting the CO2 levels and that the front and rear O2 sensors are both giving the same readings. Whilst this may be an air leak in the system or possibly a wiring fault, the most likely scenario is that the cat has failed.

The code P1000 is indicating that the system readiness test is not complete. This can be for several reasons, and can indicate a poor connection within a circuit, or the engine control module or within the connection to the transmission control module or another circuit.

The code C1093 is indicating a CAN data bus, traction control master switch – signal fault. This may be a broken circuit, a poor connection or a traction control component such as the ABS system.

The J-gate gearchange has one cable which operates on both sides of the J-gate to inform the transmission of the desired selection position, but the left-hand side of the J-gate uses hall effect switches and a micro controller within the selector to generate

an electronic code to allow manual electronic selection of the gears.

Given the range of the problems, I would suspect that the connections and the integrity of the CANbus circuits would be a good starting point and whilst I am not sure that this would be connected to the P0402 fault code you have, it may well be the source of the other problems,

Checking the connections to all the associated modules may help identify some of the faults that are present. Checking the multiplugs on the parking aid module which is in the boot and can be found after removing the spare wheel, the ABS module and the engine control module which are both under the bonnet would be a good first move.

Starting with the communication problems on the vehicle would I suspect be the best option and you should find that once these are resolved the P1000 code will be extinguished.

If the P0420 code does remain then a careful examination to ensure no air leaks are present should be carried out. If when checking the output from the O2 sensors, it is found that they do exactly mimic each other, then it should be considered that the catalytic convertor may have failed.

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# Diagnostics Doctor

CONTINUED

VAUXHALL ADAM

## Catalyst system efficiency



**Q** My son recently bought a 2013 Vauxhall Adam 1.2 (M13 engine code XEL) which has covered 137,000 miles. After they had looked over and driven it, and although higher than average mileage, the MOT history suggested that most was possibly covered on longer runs. It was in good condition and ran very well.

About 10 days the EML came on, however the car was still running OK but using more fuel than usual. My Foxwell Auto Master Pro NT644 showed DTC P0420 (catalyst system efficiency below threshold bank 1), the code was cleared and two days or so later the EML returned with the same code.

We're all disappointed that this problem happened so soon, so to avoid throwing parts at it my question is: how do we accurately diagnose if the cause is the pre-cat Lambda sensor, post-cat Lambda sensor or the cat itself, which I believe is integral to the exhaust manifold? Any advice hints, tips, etc., will be gratefully appreciated.

*Roderick Campbell*

**A** As you did kindly supply the registration number, I was able to look at the MOT history and see that between the years 2017-2019 the Adam was covering around 30,000 miles a year. The usage since then dropped and in the last few years the mileage was down to around 3000 miles per year.

The code P0420 does as you have mentioned indicate that the catalytic converter system, bank 1 - efficiency is below the required threshold. The actual cause of this code is that the downstream O<sub>2</sub> sensor (after the Cat) is detecting the same pattern as the upstream sensor located in the exhaust manifold.

There can be a few reasons for this, and the most common is that the catalytic converter is not operating and so the oxygen content of the exhaust gases after they have passed through the catalytic converter has not altered from when detected by the upstream O<sub>2</sub> sensor.

Before discarding the catalytic converter, it would be worth ensuring that there are no air leaks in the system. It can be the case that air entering the exhaust system will distort the reading sufficiently to set this code. It may also be a circuit problem with either a fault within the O<sub>2</sub> sensor or the loom. I would also try using a Cataclean additive which can help restore the properties of the catalytic converter and may give the required results.

If this does not rectify the situation and no leaks or faults in the loom can be detected, it may be worth asking your local MOT test centre if they can run a quick check on the exhaust emissions - if the catalytic converter has failed, this would then show up in the exhaust gas analysis.



## Diagnostics Doctor

Diagnostics Doctor is a **FREE** helpline service for CM readers - including trade readers - who are struggling with diagnostic/engine management related faults.

**Steve Rothwell** will answer all your queries.

He will need as much detail as possible:

**MAKE, MODEL, YEAR, ENGINE CODE** and **NUMBERPLATE** of your vehicle - and the type of management system installed. Obviously, Steve will not be able to assess the vehicle up close, so his answer will be on the basis solely of your description. This is a FREE service and it may take some time to respond to certain problems. If you would like to receive a personal response via post, please enclose an SAE.

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## Common abbreviations

<b>ATS</b>	Air Temperature Sensor
<b>AFM</b>	Air-Flow Meter - not a MAF type (see below). It could be, for example, a vane type
<b>CAS</b>	Crank Angle Sensor
<b>CPS</b>	Crank Position Sensor
<b>CTS</b>	Coolant Temperature Sensor
<b>ECT</b>	Engine Coolant Temperature
<b>ECM</b>	Electronic Control Module
<b>ECU</b>	Electronic Control Unit
<b>EGR</b>	Exhaust Gas Recirculation - meters exhaust gas back to the intake manifold
<b>EML</b>	Engine Management Light
<b>EMS</b>	Engine Management System
<b>EPC</b>	Electronic Power Control
<b>FCR</b>	Fault Code Reader
<b>HT</b>	High Tension - ignition output to the spark plugs
<b>IAV</b>	Idle Air Valve
<b>ISCV</b>	Idle Speed Control Valve - usually operated by a motor controlled by the ECU
<b>LOS</b>	Limited Operating Strategy - if the ECU detects a malfunction, it runs a programme to allow the car to still go, but at reduced efficiency
<b>MAF</b>	Mass Air-Flow meter
<b>MAP</b>	Manifold Air Pressure
<b>MIL</b>	Malfunction Indicator Lamp
<b>PCV</b>	Positive Crankcase Ventilation - takes crankcase gases and recycles back to the inlet system
<b>TBPS</b>	Turbo Boost Pressure Sensor - used by the ECU to regulate turbo output
<b>TPS</b>	Throttle Position Sensor
<b>VSS</b>	Vehicle Speed Sensor
<b>WOT</b>	Wide Open Throttle

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# Welcome to WREXHAM

The former Welsh mining town may be synonymous with a certain Disney football documentary starring Ryan Reynolds and Rob McElhenney, but, as **Phil Weeden** discovers there's another global superstar in the region, otherwise known as ZF Aftermarket, which has been remanufacturing brake calipers under the Brake Engineering brand for over 40 years.

**T**he customer service department at ZF Aftermarket's 20,000sq m facility in Wrexham is used to receiving strange requests. Even so, it was still somewhat surprising to get a call from the owner of rare 1960s Lamborghini, allegedly once owned by Nicholas Cage, seeking a replacement pair of brake calipers. While the owner probably wished these parts were gone in 60 seconds, within a matter of weeks, ZF Aftermarket's facility in Wales was able to remanufacture the original calipers for this rare Italian supercar. For more mundane requests, ZF can actually turn things around within three to five days if it's not already on the shelf. If it's in stock, you can usually get it within 24 hours.

## Welsh Dragon

This low-key production facility on the outskirts of this former mining town, ZF Aftermarket's Wrexham plant was founded in 1981 as Brake Engineering by John Willis. A family business, it built an enviable reputation for remanufacturing brake components for thousands of vehicle applications. TRW acquired the business in 2015, which itself was acquired by ZF Group in 2019. Since those humble origins in 1981, ZF Wrexham has remanufactured over

nine million calipers; it has over 7000 active part numbers for calipers, 1100 disc applications and over 600 piston part numbers. With 120 new caliper applications introduced into the market every year, and ZF Aftermarket, both in Wrexham, its sister plant in Nottingham and the R&D site at Blyth Valley near Birmingham, the company remains at the forefront of brake remanufacturing. Thanks to continual investment in new technologies, including a recently installed 3D printing facility, ZF Aftermarket can respond to market demand quickly and efficiently.

It uses copious amounts of data and interaction with motor factors the world over to ensure that it retains the right amount of stock and has the ability to remanufacture calipers as quickly as possible to avoid delays on workshop ramps. The company is rightfully proud of its 90% availability. Its catalogues are updated monthly, and the business is always doing its utmost to anticipate demand for brake components for popular models. Typically, once a car hits five years old that's when demand for refurbished brake components starts to pick up, but ZF Aftermarket needs to be in there well before then. Its links to OEMs through ZF's other subsidiaries means that not only is technical information

readily available to ensure products are made to the right manufacturer spec, but it also means the business adheres to high quality thresholds as demanded by carmakers. Rigorous, independent testing on brake calipers has proven ZF's quality and durability claims.

The company's mission now is to remind the aftermarket sector of the great work they do, and how important it is for motor factors and garages alike to make informed decisions when it comes to choosing replacement brake components. Too often, less informed motorists buy purely on price, choosing cheap, unbranded products from the Far East, whose provenance cannot be truly known. With the reputation and credibility of ZF, the boffins at Brake Engineering in Wrexham know how important it is to ensure motor factors and garages continue to insist on picking quality over price, particularly with safety critical components like brakes. Conveying that message will be an ongoing challenge, and certainly not an easy one to resolve. But reminding people of the engineering excellence here in the UK is a good place to start. Now part of the massive, global ZF Group, there's nothing stopping the talented individuals at ZF Aftermarket in Wrexham. Well, apart from their excellent brake components that is...





# Electronic Diagnostics

Land Rover  
Discovery  
Sport  
180 Auto

Tracing and fixing faults in electronic engine management systems

**Rob Hawkins** discovers the common problems that can arise on an Ingenium-powered Disco by visiting independent JLR specialist Tasker & Lacy of Leeds.

**J**aguar Land Rover's range of Ingenium petrol and diesel engines sounded promising when they were announced in 2011 and the first diesel appeared in 2015. JLR had taken on the responsibility of designing and manufacturing these advanced engines that would be low on emissions and high on performance.

Unfortunately, the 1999cc Ingenium diesel engine (known as the AJ200) doesn't appear to be as reliable as expected, although its poor reputation is only a result of the disasters that have come to light – we don't hear about the engines that run reliably.

One of the most common complaints about this engine concerns timing chain failure, with talk of the chains stretching, skipping and even breaking up, and also the

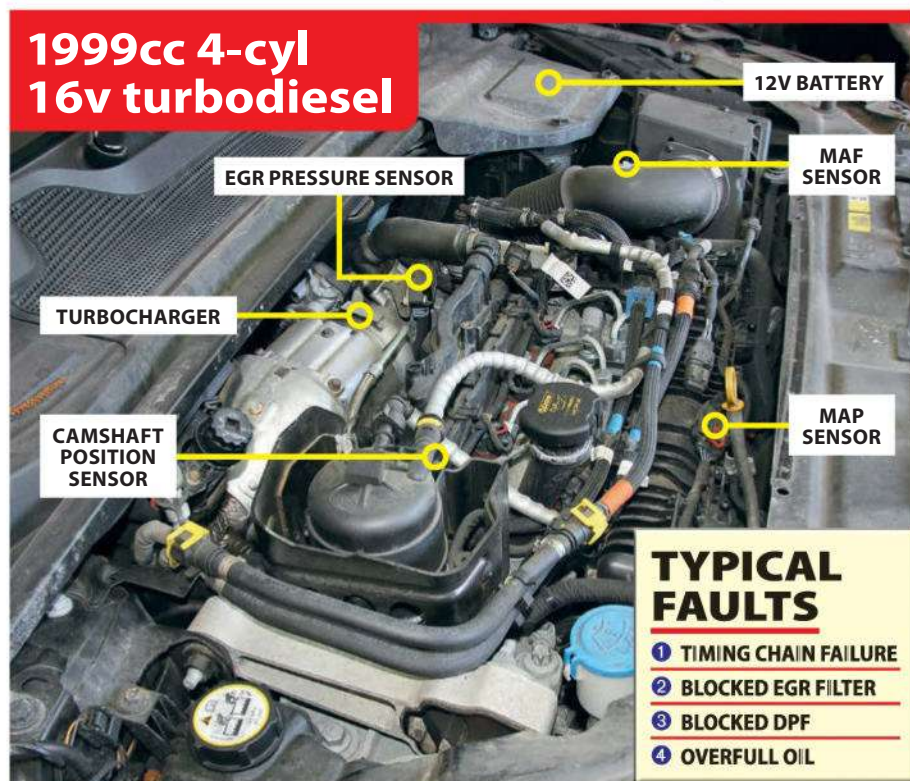


tensioner failing. This is something that diagnostic software can analyse, taking oscilloscope readings from the crank and camshaft position sensors. Some software can conduct what is called a stretch test, which takes the same readings to determine the timing chain's condition.

So, what's causing these timing chain issues? Oil dilution appears to be one of them, and when we visited independent

JLR specialist Tasker & Lacy to look over the 2018 Discovery seen here, the oil level on the dipstick was overfull. They used their diagnostic equipment to analyse the oil and measure its dilution, which is often caused by fuel. The fuel can get into the oil when excess amounts of it are being added to the engine, such as during a DPF regeneration that gets halted before it has finished or through short journeys or stop-starting the engine. Diesel fuel is injected into the engine on the exhaust stroke to help burn off carbon deposits (soot). This is called an active regeneration, but the fuel can pass down the pistons and into the engine oil.

Whilst some software updates have helped to rectify the problems created by an active regeneration to then warn the driver that the oil needs changing because it's diluted, oil dilution and the knock-on effect of this still seems to be a major issue. Diluted oil means it loses its ability to lubricate, so it's not only the timing chain assembly (especially the tensioner) that loses out, but crankshaft bearings and any other moving component that needs lubrication.



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Fortunately, there's a dipstick for the engine oil, so weekly checks are a must, but it doesn't help to know that the recommended oil change intervals for this engine can be a colossal 21,000 miles or two years! Should oil dilution be detected, then the service indicator may appear on the dashboard, but otherwise, 21k or two years seems far too long. For longevity, we recommend changing the engine oil and filter every 5000-6000 miles or annually.

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## Typical LR DISCO INGENIUM COMPONENTS



**1** The vehicle 12V battery is located under a plastic cover in the nearside rear corner of the engine bay. Unscrew four trim plugs to remove the cover and see it. It's worthwhile connecting a support pack to it to help reduce the risk of voltage drops and anomalies when diagnosing faults with the ignition switched on.



**2** A turbocharger is located at the back of the engine bay and is seemingly easy to access. Even the oil feed pipe to it is in plain sight. Removing the heatshield/covers around it improves access.



**3** Attached to the nearside of the turbocharger is a multi-plug with five wires. There's an electronic actuator to control and release boost pressure, and this multi-plug is attached to it.



**4** An EGR pressure sensor is fitted over the nearside of the turbocharger. EGR-related faults can arise, often caused by a blocked EGR filter (see *Fault 2*).

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## Typical LR DISCO INGENIUM COMPONENTS



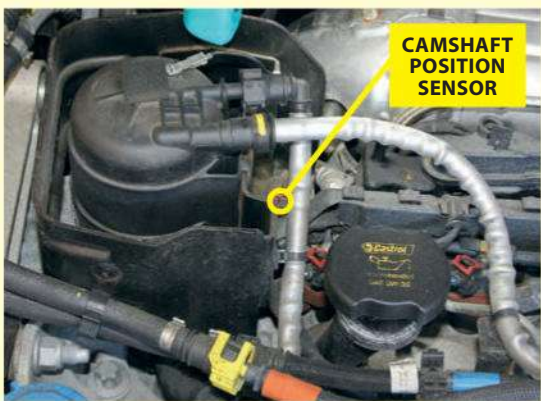
**5** The air filter housing is in the nearside front corner of the engine bay. Attached to the induction pipe that's routed from it is a mass airflow (MAF) sensor.



**6** Removal of the top engine cover (it sits on locating pegs) and the soundproofing material underneath exposes the fuel injectors and more sensors.



**7** ◀ There's a fuel rail in front of the injectors, which has a large fuel pressure sensor on the nearside end of it and a fuel temperature sensor at the opposite end.



**8** ▶ Below the location of the fuel filter, there's a small Camshaft Position Sensor (CPS). This is at the timing chain end of the engine and access to it is restricted.



**9** ◀ Across the front of the engine bay (behind the slam panel), there's the inlet manifold with a Manifold Absolute Pressure (MAP) sensor fitted. The plug next to it is blanked off in this case, so it's redundant.



**10** ▶ There's a turbo boost pressure sensor fitted to the boost pipe located underneath the air filter housing. Look for a black- and blue-coloured connector plug.

## TECHNICAL SPECIFICATIONS

<p><b>Engine</b> 1999cc 4-cylinder twin-cam turbocharged common-rail diesel</p> <p><b>Engine code</b> AJ200</p> <p><b>Engine oil grade</b> 0W-30</p> <p><b>Oil classification</b> STJLR.03.5007 (low ash)</p> <p><b>Oil capacity/schedule</b> 6.5 litres</p>	<p>with filter every 21,000 miles or 24 months or when the service indicator is displayed</p> <p><b>Coolant</b> Havoline XLC (orange)</p> <p><b>Cooling system total capacity</b> 7.4-7.8 litres (depending on gearbox and auxiliary heater)</p> <p><b>Brake fluid</b> DOT 4 (LRES22BF03)</p>	<p><b>TORQUE SETTINGS</b></p> <p><b>Sump drain plug</b> 23Nm</p> <p><b>Oil filter</b> 27Nm</p> <p><b>Glow plugs</b> 18Nm</p> <p><b>Crankshaft Position Sensor</b> 8Nm</p> <p><b>Camshaft Position Sensor</b> 8Nm</p> <p><b>Nitrogen Oxides (NOx) sensor</b> 48Nm</p> <p><b>Road wheels</b> 70Nm then 133Nm</p>
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**11** The ECU is located underneath the scuttle trim panel at the back of the engine bay. It can be seen if the panel for the battery (see Step 1) is removed.



**12** The EOBD port for connecting diagnostic equipment (or a dongle) is in the driver's footwell, close to the gearbox tunnel.

## Typical LAND ROVER INGENIUM FAULTS

### TIMING CHAIN FAILURE

► There are numerous reasons why the timing chain fails, including a failed tensioner, which results in the chain becoming stretched and the engine timing being affected. Infrequent oil changes along with dilution of the oil with fuel can add to this problem. Tasker & Lacy have lost count of the number of Ingenium engines they have replaced and stripped.

**FAULT 1**



### BLOCKED EGR FILTER

► Accessed from underneath the engine, a blocked EGR filter will raise EGR-related fault codes. The filter can be removed and replaced, but according to T&L, it's a finger-crunching job.

**FAULT 2**



### BLOCKED DPF

► A warning light (as shown here) may appear on the dashboard if the DPF is blocked and cannot be regenerated. Infrequent oil changes can contribute to a blocked DPF, along with overfull and diluted engine oil (the DPF may not regenerate as a result).

**FAULT 3**

### OVERFULL OIL

► Fortunately, the Ingenium diesel engine shown here still has an engine oil dipstick, so the oil level can be easily checked. The reading was clearly overfull, which could mean someone has added too much oil, the oil has become diluted with fuel through short journeys, or the DPF has started to regenerate and hasn't finished. Diagnostic equipment can measure the dilution of the oil to help determine the cause. Diluted oil can affect numerous internal components, including the timing chain.



**FAULT 4**

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**CAR MECHANICS**



# Our Cars

## Andrew Everett

Special Contributor

### A tale of two props



**W**hat an entertaining month it's been for the 2006 BMW 118d. Have I finally banished the two main gripes?

First was the instrument cluster going mental on first start-up. BONG! it would exclaim, lighting up like a Christmas tree with the speedo and rev counter needles flicking back and forth – the only way to stop this was to turn off the engine and restart – very boring. Some said it was water in the Park Distance Control (PDC) module (it was dry), others suggested that my fitting a BMW Professional radio from a much later car in place of the horrid original (BMW Business) caused it. That may have explained why the rear PDC had stopped working – the PDC bongs come through the radio and speakers.

I must have been bored one day because I rechecked the PDC module and found that it was the wrong one. I dug through my stash and found one with a superseded part number, fitted that and... suddenly the PDC now worked and



**The first job was to replace the front wing – it had a dent by the sill, a short but deep scratch and rust was bubbling through the arch – time for a good used one painted to colour.**

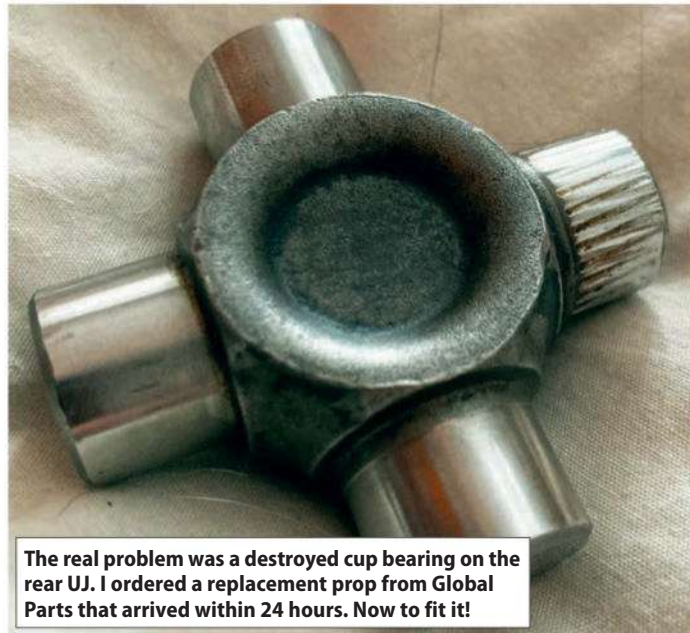
since that day, the instrument cluster has worked as it should. How about that? The joy of CANbus electronics.

Far worse was the propshaft drama that came to a head recently. Ever since I've owned this car, there has been an annoying vibration at motorway speeds that is worse in 6th gear. I thought it may have been the worn dual mass flywheel that we replaced a while back and whilst that did improve it, the vibro-massage was still there. Still, around town it was OK apart from the clonk on pulling away. That was solved by tightening a

loose 18mm diff retaining bolt.

But what's this new noise? Under the slightest acceleration – but not on the overrun – there was this rhythmic shh-shh-shh noise, like a brake pad trying to stick to the disc. I thought the noise was too fast for that, more propshaft speed. Looking under the car I couldn't see anything. So, the day that I replaced the rusting passenger front wing (that was easy) I dropped the undertray and exhaust heatshields to have a good look and see where the prop was rubbing – it wasn't. What I did see though was a great

**This appeared to be the root cause of the driveline vibration – the prop centre bearing was badly split after 19 years. Replacing it actually made the problem worse.**



**The real problem was a destroyed cup bearing on the rear UJ. I ordered a replacement prop from Global Parts that arrived within 24 hours. Now to fit it!**



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Replacing the prop is easy enough and the exhaust stays on – I've got it down to 20 minutes now. This is the new one about to go back on.



split in the prop centre bearing rubber mount – gotcha! I had a long trip down to Dorchester the next day from Sheffield, so it made sense to fix this now. I had a low mileage propshaft from a 116i, though whilst the prop is different and won't fit, the centre bearing certainly will as it's the same part number. I had the prop off the 118d in about 30 minutes, sliding off the front section only and leaving the diff end on the car – the halves had already been marked for correct balance on reassembly. I drifted the old centre bearing off and fitted the replacement, carefully refitted the prop, tightened everything up and tensioned the centre bearing forwards slightly – and went for a drive.

## Worse than ever

Now we had a horrible vibration just about everywhere. I went back, readjusted the centre bearing and tried again. Better, but still not right. It was OK at motorway speeds, so I did the 500 miles to Dorchester and back. Once home, I vowed to fix or scrap this car.

I decided to inspect the prop again – and on closer look at the rear UJ, there it was... rust streaking out of a needle roller bearing cup and noticeable play. Now, if this was a 120d with the bigger diff and the Giubo coupling I would have had a choice of £20 secondhand prop but no, the 118d from 2004 to mid-2007 has a unique

prop and nothing else fits. Those early 118d's with the M47N engine used a small case diff with a four-bolt UJ rear coupling just like the four-cylinder petrol 1-Series and E90 3-Series range. You just cannot replace staked in UJ's yourself so a trip to a local BMW breaker didn't find a 118d prop, but an E90 325i rear section that is an inch shorter on the splined section – not ideal but the car can be driven.

This bought me breathing space whilst I looked for a 118d prop. A place on eBay called Global Parts had one for £100 posted – there must be a cheaper one! Another eBay seller had one for £55 but with no part number and rubbish photos. If they would care to take more pics and get the part number off it, I would go and get it that day. But no, they were obviously

too busy. OK then. A Facebook seller then ghosted me despite saying they had it, off the car and 20 miles away. Brilliant. So, I ordered the prop from Global Parts and it arrived 24 hours later, excellent condition and superbly packed.

In the meantime, I went up to my favourite breakers for eBay stock (I run an eBay BMW parts shop) and there was a 2006 118d that I had previously burgled the rare diff from. And the propshaft was there, laughing at me. £18 later, I had another prop. I bought a new febi centre bearing and Giubo front rubber coupling and fitted the eBay prop with the new febi bits. It's driving pretty well now and hopefully, that will be the end of it. Well, until something else falls off or breaks. Can you tell I'm not a fan?



Whilst the centre bearing was still quite good, I just replaced it with a new one from febi – I'm fed up with taking the prop off this thing. Hopefully it's fixed for good.



The front rubber Giubo was looking pretty sad – not just the deep cracks but you can see the fibres of 'string' starting to come out. It's finished.

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# Our Cars

## Peter Clayton

Special Contributor

### MINI revival (Part 1)



**B**ought from new and once the daily driver of the household – our 2006 MINI One R50 had now become neglected, assigned to the driveway for a little over three years. With all my attention on keeping the rest of the fleet operational, the little runaround had been regrettably sidelined until recently. On its last drive before hibernation I did ensure the fuel tank was brimmed to keep condensation in the tank reduced (E5 was also used, but this was before E10 was even a thing). A generous dose of fuel stabiliser to keep it from going off too quickly was also tipped in. It had a good long drive, giving the engine a chance to get hot enough to force any moisture from the oil and crankcase. Once parked up, removing the battery was a given to prevent it going flat, followed by pumping up the tyres to their maximum rating of 51psi to reduce the effects of flattening out the tyres. I just have to remember to deflate them back to operating pressure when driving on the road! The wheels were then protected in polyester covers originally designed for camper homes. Neighbours and delivery drivers always ask what they're for and I explain the covers would keep the rainwater out, but also ensure the UV radiation from the sun would not

prematurely break down the tyre's rubber (only moving tyres properly give out the special sunscreen compounds mixed in with the rubber).

Finally, I placed a couple of kilos of silica gel packs on the dashboard in hope that any moisture build-up would be reduced to stop the interior getting mouldy – every few months I would air out the cabin regardless and dry out the packs in the microwave. Three years later, the MINI's time had come for its revival.

### First start prep

Getting the MINI inside my garage to work on it properly meant I had to move it under its own steam. For that I'd have to be sure that I could safely stop while also ensuring the wheels would not lock up when moving it for the first time. I raised the rear axle and found the wheels would not budge. There was surface rust everywhere, so the wheels had to come off to allow me to clean everything. With the locking nut in the boot, I hooked up some 12 volts and attempted to get the boot open. Over the

years the main boot seal had started to stick to the lid and proved difficult to open, so a bit of Würth Gummi cleaner helped revitalise the rubber and all was fine. Those wheel bolts however were quite corroded – especially the locking ones, but luckily febi do replacements. With the help of some old long subframe bolts that use the same thread as the wheel hubs, I utilised a crowbar to help free up the brakes slightly. They were still binding however, so I took some deblock oil to the handbrake mechanism on the caliper to free up the arm. Slowly but surely the hub began to spin freely after lightly cleaning up both sides of the brake discs with some P120 abrasive paper.

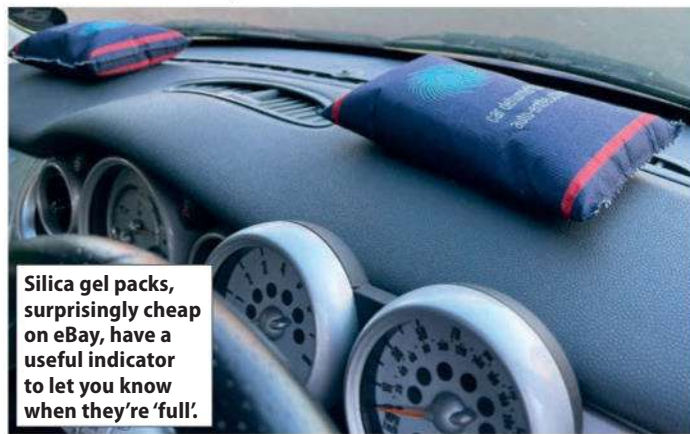
Next on my list was underbonnet checks. Popping the bonnet revealed that the gas struts had lost their mojo (it happens to the best of us...) and wouldn't prop up any longer. This is a common failure point especially with the heavy headlamps integral to the bonnet – febi again to the rescue as they also stock OE quality replacements. In the meantime, I used some locking pliers with just



A battery-operated air compressor makes life much easier over having to plug in to the car's power or wrangling with air compressor hoses.



Silica gel packs, surprisingly cheap on eBay, have a useful indicator to let you know when they're 'full'.



More than 48,000 different spare parts in OE matching quality







Apart from the occasional wash the MINI remained untouched for three years.

enough 'bite' to keep things up! The coolant was a nice colour and at the right level; having replaced it three years ago it was deemed fine. The oil was at the 'max' mark, smelled good and looked golden with no mayo emulsion so was decent enough to use for a short while.

The power steering fluid was clean, although a little low. The brake fluid looked clean too although the brake pedal was unsurprisingly spongy – this would need a change! Undoing the air filter housing I was surprised to see no debris at all – this is a must to check before starting after long periods as



Febi Bilstein supplies replacement wheel bolts which lift the look a fair bit.



A crowbar and lubricating the handbrake mechanism helped free up the seized brakes.

I have seen these boxes being used by mice to nest in the past! The auxiliary belt looked good, and all earth straps were nicely protected with the coat of grease I applied all those years ago. With the battery reinstalled (at full charge) the only thing left was to check the spark plugs. All four came out and were in good condition. With them out, I then sprayed a good amount of fogging oil down the bores and left to settle for a few hours before cleaning the spark plug seats of oil and retorquing the plugs into place.

With a tank full of 36-month-old fuel I was in two minds as to whether to drain the stuff out or not. Having used stabiliser and smelling the opened fuel tank it didn't seem stale, so I thought to chance it. With the key turned, I held my breath and hoped for the best – on the first cylinder compression there was a little resistance on the starter motor but after another three or four compressions the engine fired into life – first turn of the key! The MINI was quite happy idling (although having a clackety timing chain)



Check the length, use a screwdriver to lever out the clips then pop off the ball joints – easy!

and there were no warning lights on the dash, either. I did hear the power steering motor, an electric unit, was awfully whiny. Looking at where the high- and low-pressure lines went into the rack I could see small drips – I wondered if it had sprung a leak despite a very recent rack replacement! It would certainly explain the loud pump – probably having bubbles running through it.

## Maiden voyage

With the engine idling, I then went about playing 'car Tetris' with the rest of my fleet – my Lupo GTI, having been hibernating over the winter, had to be brought back into life, however it was stuck solid in reverse gear! After a lot of knocking and wiggling on the gear-change turret on top of the gearbox combined with a few pumps of the clutch it finally freed off. When it came to moving the MINI, which is an automatic, I decided to move the gear selector in all the different positions a few times to ensure the CVT 'box was happy before moving off. The brakes were thankfully good enough to hold the car on the steep driveway so had the confidence to manoeuvre safely into the garage. A few things remain on my list to get the MINI back on the road and through its MOT, so stay tuned!



Rubber revitaliser does wonders for door and hatch seals.

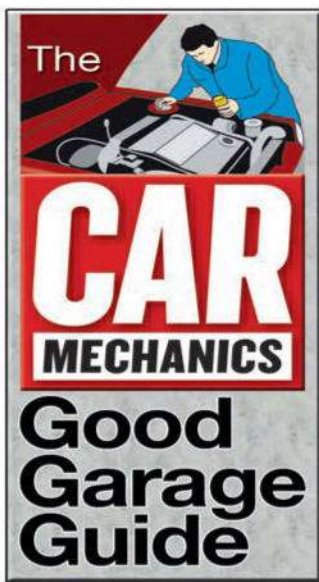
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This listing is published every **THREE** months and will next appear in our **February 2025** issue. We welcome further nominations (from satisfied customers only please, no self-nominations) of businesses to be included, so that we can make this listing as useful as possible to readers throughout Britain and Ireland. Please write to:  
**Car Mechanics Good Garage Guide, Kelsey Media, The Granary, Yalding Hill, Yalding, Kent ME18 6AL.** Or email: [martyn.knowles@kelsey.co.uk](mailto:martyn.knowles@kelsey.co.uk)

## AVON

**Lockleaze Service Station**, Lockleaze Road, Bristol BS7 9RU.

## BERKSHIRE

**Mike Farina Auto Services**, 21 Sedgewell Road, Sonning Common, nr Reading, Berks RG4 9TA. Tel: 0118 972 4036. *Servicing, repairs.*

## BUCKINGHAMSHIRE

**Stokenchurch Service Centre**, Wycombe Rd, Stokenchurch, Bucks HP14 3RR. Tel: 01494 483355. *Servicing, repairs, tuning, MOTs, welding, exhausts, batteries.*

**M D Autocare**, 54/55 Rabans Close, Aylesbury, Buckinghamshire HP19 8RS. [www.md-autocare.co.uk](http://www.md-autocare.co.uk)

## CAMBRIDGESHIRE

**D.L.M. Autos**, 63a Orchard Road, Great Shelford, Cambs CB22 5AA. *MOTs, servicing/repairs on modern & older cars.*

**G Nice and Sons Ltd**, 3 Chapel Street, Waterbeach, Cambs CB25 9HR. Tel: 01223 860241. *Isuzu specialist, MOT testing, aircon specialists.*

**Kings of Witcham**, The Slade, Witcham, nr Ely, Cambs CB6 2LA. Tel: 01353 778403, email: [info@kingsofwitcham.co.uk](mailto:info@kingsofwitcham.co.uk). *Independent Volvo specialist since 1996.*

**Saabmaster Garage Services**, Unit 7, Robert Davies Court, Nuffield Road, Cambridge CB4 1TP. Tel: 01223 420055. *Independent Saab specialists.*

**Swift Car Care**, 145-147 St Pauls Road, Peterborough. Tel: 01733 897080.

**VW Technics**, Unit 10, Highgate Farm, Over Road, Willingham, Cambridge CB24 5EU. [vwspecialistcambridge.co.uk](http://vwspecialistcambridge.co.uk)

## CHESHIRE

**Andy Stockton Autocare Ltd**, Unit 26, Heron Business Park, Tan House Lane, Widnes WA8 0SW. Tel: 0151 420 2838. [asautocare.co.uk](http://asautocare.co.uk) *Vauxhall specialist.*

## CLEVELAND

**Ron Payne & Son**, Baltic Street, Hartlepool TS25 1PS. Tel: 01429 273646.

## CORNWALL

**Dale Brett Autos**, Gilston Road, Saltash, Cornwall PL12 6TW. Tel: 01752 849448. *Family owned and run. 10/10 everytime.*

**Ferris Garage Ltd**, Truro TR3 6RE. Tel: 01872 862218.

**M Clark Motors**, Polperro Road, West Looe PL13 2QP. Tel: 01503 265511. *MOTs, servicing, welding, tracking, bodywork, exhausts, batteries.*

## CUMBRIA

**Cleator Moor Auto & Body Repairs Ltd**, Ennerdale Road, Cleator Moor, Cumbria, CA25 5LD. Tel: 01946 811800. *Service is brilliant and the mechanics very knowledgeable.*

**Riverside Garage**, Holmrook, Cumbria CA19 1UH. Tel: 01946 724228. *Friendly helpful and professional service.*

**Wheatsheaf Garage**, Low Road, Brigham, Cockermouth CA13 0XH. Tel: 01900 825946. *Excellent service. Classics welcome, especially Minor & MGB.* [www.wheatsheafgarage.com](http://www.wheatsheafgarage.com)

## DERBYSHIRE

**The Service Garage Ltd**, Engineering Services, 51 Derby Road, Borrowwash, Derby DE72 3HA. Tel: 01332 663982 or 677131.

**Walgrove Garage Ltd**, Walgrove Road, Brampton, Chesterfield, Derbyshire S40 2DS. Tel: 01246 278181. *French & VAG specialists. MOTs, tyres and welding.*

**Walkers Motors Servicing & Repairs**, 9 Platt Street, Padfield, Glossop SK13 1EB.

## DEVON

**Racecourse Garage, Babbage Road**, Totnes Industrial Estate, Totnes, Devon TQ9 5JA. Tel: 01803 862297. *Offers excellent service and competitive rates.*

**Tuned Auto Repairs**, Newcourt Barton, Clyst Road, Topsham, Exeter EX3 0DB. *Excellent customer service at cheap rates.*

## DURHAM

**Skipbridge Garage**, Hurworth Moor, Darlington, County Durham DL2 1QL. Tel: 01325 720498.

## ESSEX

**Bennetts BMW Specialists**, Unit 1, Haltgate House, Hullbridge Road, South Woodham Ferrers, Chelmsford, Essex CM3 5NG. Tel: 01245 328601, [www.bennettsbmw.co.uk](http://www.bennettsbmw.co.uk) *BMW specialists, also all-makes repairs.*

**The Bodyshop**, 31-37 Tomswood Hill, Barkingside, Essex IG6 2HL. Tel: 020 8500 9228 [bodyshop.uk.com](http://bodyshop.uk.com)

**D & A Autos**, Unit 1A, Pools Lane, Highwood, Chelmsford, Essex CM1 3QL. Tel: 01245 248317.

**Frank Shaikley and Sons**, Hawkins Road, The Hythe, Colchester, Essex CO2 8JY. Tel: 01206 796657.

**Halfway Garage, behind Frinton Gate Motors**, Colchester Road, Tendring, Essex CO16 9AA. Tel: 01255 831285. *Service, repairs, MOTs incl motorbikes.*

**Motorvation 2000**, Unit 13 Stondon Road, Hallsford Bridge Industrial Estate, Ongar, Essex CM5 9RB. Tel: 01277 364241. *Engine rebuilds, MOT, servicing, electrics.*

**Oakdene Autos**, Daniels Farm, Wash Road, Laindon, Essex SS15 4AZ. Tel: 01268 280909. [www.oakdeneautos.co.uk](http://www.oakdeneautos.co.uk) *Bodywork, welding, MOT & servicing work.*

**Pristine Bodyworks/RR Automotive**, Scaldhurst Farm, Larkhill Road, Ashington, Essex SS4 3RU. Tel: 01702 257177. *Family run – one brother handles mechanical work, the other bodywork.*

## GLOUCESTERSHIRE

**Stonehouse Exhaust**, Unit 1, Orchard Place, Stonehouse, Gloucestershire. Tel: 01453 822971. *Excellent garage. Good old-fashioned service!*

## HAMPSHIRE

**Keylink Systems Ltd**, 15/16 The Calvert Centre, Woodmancott, Winchester SO21 3BN. Tel: 01256 379150. *Mercedes/BMW specialists but will take care of anything.*

**SJB Autotech**, Unit 3, Beresford Centre, Wade Road, Basingstoke RG24 8FA. Tel: 01256 477 411. [sjbautotech.co.uk](http://sjbautotech.co.uk) *Jim, the owner, is extremely experienced with the VAG range.*

**Memdem Motors Ltd**, Unit 4, Stacey Industrial Park, Silchester Road, Tadley RG26 3PY. Tel: 0118 970 2222. [memdemmotors.co.uk](http://memdemmotors.co.uk) *Everything from aircon to wheel alignment.*

**Wes & Co. Shootash Garage**, Salisbury Road, Romsey, Hants SO51 6GA. Tel: 01794 515003. *MOT station, servicing.*

## HEREFORDSHIRE

**DC Rogers Auto Repairs**, Unit 11, Beech Business Park, Tillington Road, Hereford HR4 9QJ. Tel: 01432 264200.

## HERTFORDSHIRE

**Broxbourne MOT and Motorist**, Unit 1, Bridge Works, Nazing New Road, Broxbourne, Herts EN10 6SG.

## KENT

**Bexley Lane Garage**, 33-47 Bexley Lane, Crayford DA1 4DD. Tel: 01322 527279 [bexleylanegarage.co.uk](http://bexleylanegarage.co.uk) *Lockheed Authorised Brake Safety Centre, MOTs, servicing.*

**Chelsfield Motor Works**, Court Lodge Farm, Warren Road, Orpington BR6 6ER. Tel: 01689 890689. *Mechanical repairs, MOTs, bodywork, aircon, diagnostics.*

**Hartley Garage Services Ltd**, Ash Road, Longfield DA3 8EL. Tel: 01474 706501. *All usual garage services plus MOTs/aircon.*

**Ivydene Garage Ltd**, Unit 99, Ellingham Way, Ellingham Ind. Est., Ashford TN23 6LZ. Tel: 01233 636081. *Mechanical repairs, servicing all makes, MOTs, aircon, Bosch diagnostics.*

## LANCASHIRE

**Mick's Garage**, Unit 2A Old Station Yard, Kirkby Lonsdale LA6 2HP. Tel: 01524 237785. <http://micksgarage.net/> *Proprietor Mick Gudgeon is a time-served MB tech but also works on all other makes. MOT station up to Class 7 with a 6.5m bay.*

## LEICESTERSHIRE & RUTLAND

**Broad Street Garage**, The Old Forge, Brook St, Enderby, Leicester LE19 4ND. Tel: 0116 286 1416.

**L&H Exhausts MOT & Service Centre**, 4 Charlotte Street, Melton Mowbray, Leics LE13 1NA. Tel: 01664 562684. [lhexhaustsmotcentre.co.uk](http://lhexhaustsmotcentre.co.uk) *Very good independent garage.*

**Tarsel Motors Ltd**, 173 Church Hill Road, Thurmaston, Leicester LE4 8DH. Tel: 0116 693333.

**J. T. Tilley and Son**, 3 Lutterworth Road, Burbage, Hinckley, Leics LE10 2DJ. Tel: 01455 239303.

## LINCOLNSHIRE

**Corten Miller Performance Centre**, Friskney Eaudykes, Skegness, Lincs. *Very knowledgeable highly-skilled staff.*

**Derek Chapman Motor Services**, 13 High Street, Alford, Lincolnshire. Tel: 01507 462571. *An excellent and friendly garage and bodyshop.*

**G Harniess (Louth) Ltd**, Bolingbroke Road, Fairfield Industrial Estate, Louth LN11 0WA. Tel: 01507 603341. [gharniess-louth.co.uk](http://gharniess-louth.co.uk)

**Huttoft Service Station**, Mumby Road, Huttoft, Lincs LN13 9RF. Tel: 01507 490283. *Village garage with all usual repair facilities plus LPG stockists.*

**W H Brand and Son**, Whaplode Drove, nr Spalding, Lincs. Tel: 01406 330265. *Daewoo/Chevrolet franchise and independent MG Rover specialists.*

## LONDON (GREATER)

**Barnet Service & Tuning Centre**, 1 Motor Way, Margaret Road, New Barnet, Herts EN4 8DW. Tel: 020 8441 6667. *All usual garage services plus MOT testing.* [www.scimitarmotorservices.co.uk](http://www.scimitarmotorservices.co.uk)

## MANCHESTER (GREATER)

**Phoenix Close Honda**, Unit 208 Phoenix Close Industrial Estate, Heywood OL10 2JG. Tel: 01706 366500. [pchondaspecialists.co.uk](http://pchondaspecialists.co.uk) *Proprietor Chris assisted by Phil are both Honda trained. Mechanical & diagnostic work. Wouldn't take our CR-V anywhere else.*

## MERSEYSIDE

**Village Auto Repairs**, 6a Greenes Road, Whiston, Prescot, Merseyside L35 3RF. Tel: 0151 426 0999. *Servicing and repair of cars & light commercials. Also a Class 4 MOT testing.*

## NORFOLK

**Herring and Palmer**, Hewett Yard, Hall Road, Norwich. Tel: 01603 666585. *BMW specialists, all makes catered for.*

**Threeways Garage**, Watton Road, Shipham, Norfolk IP25 7PE. Tel: 01362 820430. *Independent Citroën specialist, also repairs/services other makes. MOTs.*

**S & R Motors**, Sunset Lodge Industrial Units, St. Germans, Kings Lynn. Tel: 01553 617696 or 07788 268121. *Run by Steve Smith. Service is excellent.*

**Stone Chips Ltd**, 12 Garden Street, Norwich NR1 1QU. *Minor paintwork repairs, bumpers, etc. Valeting, interior repairs, alloy refurbishment.*

## NORTHAMPTONSHIRE

**Rob Price Automotive Services**, 146 Northampton Road, Broughton, Kettering, Northants NN14 1NS. Tel: 01536 790901.

## NORTHUMBERLAND

**JT Auto Services**, The Old Works, Red Row, Morpeth, Northumberland NE61 5AU. Tel: 01670 761711. *Repairs, servicing.*

## NOTTS

**PVS (Professional Vehicle Servicing)**, Glaisdale Drive, Nottingham NG8 4GY. Tel: 0115 928 3333. *Repairs, servicing, reasonable prices, helpful staff.*

**Wright Engineering Co Ltd**, 332 Colwick Road, Nottingham NG2 4BG. Tel: 0115 950 2284. [wright-engineers.co.uk](http://wright-engineers.co.uk)

*Automotive services including milling, turning, grinding, and fabricating.*



## OXFORDSHIRE

**Oxford Autogas**, Tiddington Garage, London Road, Milton Common/ Tiddington, Oxon OX9 2NU. Tel: 01844 279588. [oxfordautogas.com](http://oxfordautogas.com)  
LPG installation and servicing. MOT, service and repairs.

## SHROPSHIRE

**Bridgnorth Motor Services**, Station Lane, Hollybush Road, Bridgnorth, Shropshire WV16 5DP. Tel: 01746 762562 or 07708 167346. *Mark is an ex-Ford mechanic and seems very experienced.*

## SOMERSET

**Hatley Garage**, 86 Kewstoke Road, Kewstoke, Weston-super-Mare, North Somerset BS22 9YH. Tel: 01934 622495. *Specialising in classic Minis.*

**N S Autos**, Prowles Cross, Yeovil, Somerset, BA22 9RG. Tel: 01935 872891. [nsautos.co.uk](http://nsautos.co.uk)

## STAFFORDSHIRE

**Midland VW**, 21 Conduit Road, Norton Canes, Cannock, Staffs WS11 9TJ. Tel: 01543 495700. [midlandvw.com](http://midlandvw.com)

**Snows Garage (Hanley) Ltd**, 706 Leek Road, Hanley, Stoke-on-Trent, Staffs ST1 4NP. Tel: 01782 215544.

**Squire Automotive**, Unit 2A Zone 2 Ring Road, Burntwood Business Park, Burntwood, Staffs WS7 3JQ. Tel: 01543 672247. [squireautomotive.co.uk](http://squireautomotive.co.uk)

## SUFFOLK

**Barrett-Lee Ltd**, 4 Byford Road, Sudbury, Suffolk CO10 2YG. Tel: 01787 468900.

**DN Autos Mobile Mechanic**, based Saxmundham, Suffolk – but travels. Tel: 07895 078447. *Trustworthy bloke, reasonable prices. My family's go-to mechanic.*

## SUSSEX

**Coles Automotive**, Browns Meadow, Edburton Road, Edburton, Henfield, West Sussex BN5 9LN. Tel: 01273 857520. [colesautomotive.co.uk](http://colesautomotive.co.uk) *Land Rover ralliers.*

**Cradle Hill Motors**, Unit 16, Cradle Hill Ind Est, Seaford, East Sussex. Tel: 01323 890737.

**Rew Auto Services**, Unit 13, Eastmead Industrial Estate, Lavant, Chichester, West Sussex PO18 0DB. Tel: 01243 839520.

**Vasstechnik**, Unit 2, Potts Marsh Est., Eastbourne Road, Westham, Pevensey, East Sussex BN24 5NH. Tel: 01323 438754. [vasstechnik.co.uk](http://vasstechnik.co.uk)  
*Servicing/repairs to VAG and MG/Rover.*

## SURREY

**MCM**, Station Lane, Milford, Surrey GU8 5AD. Tel: 01483 424815. *VW/Audi, BMW, Mercedes – all quality car specialists.*

**Elmwood Vehicles Ltd**, 278 Kingston Road, Ewell, Surrey KT19 0SH. Tel: 0208 394 2847 [carserviceandrepairsurrey.co.uk](http://carserviceandrepairsurrey.co.uk)

## TYNE & WEAR

**Gavin Reed Ltd**, Sunnyside Garage, Front Street, Sunnyside, Newcastle-Upon-Tyne NE16 5EE. Tel: 0191 488 7298.

**Scotts Bank Motor Services**, Scotts Bank, Southwick, Sunderland. Tel: 0191 549 7500. *Volvo-trained.*

## WEST MIDLANDS

**Cottage Garage**, Brandon Way, West Bromwich B70 9PW. Tel: 0121 525 4413.

**GW Motors**, 172 Sockfield Road, Acocks Green, Birmingham B27 6AU. Tel: 0121 706 2327 or 0121 706 4770. *Family-owned and "friendly, helpful and no bullshit."*

## WILTSHIRE

**FJ Chalke Ltd**, Talbot Garage, Mere, near Warminster Wiltshire BA12 6HE, Tel: 01747 860244 [www.fjchalke.co.uk](http://www.fjchalke.co.uk). *Kia agent, before that Austin then Rover.*

**Melksham CarCare Centre**, Bath Road, Melksham SN12 8DB. Tel: 01225 703014.

## WORCESTERSHIRE

**RK Services**, Lower Leys, Evesham, Worcestershire WR11 3AB. Tel: 01386 48935. [rkservices.com](http://rkservices.com)

## YORKSHIRE

**Hargreaves Jeep Specialists and MOT Centre**, Bradford Road, Sandbeds, Keighley, West Yorks BD20 5LY. Tel: 01274 569262. [hargreavesgarage.co.uk](http://hargreavesgarage.co.uk)

**Horbury Garage**, 35 Westfield Rd, Horbury, Wakefield WF4 6HS. Tel: 01924 265283.

**Pure Car Mechanics**, Westgate Carr Business Park, Westgate Carr Road, Pickering, North Yorkshire YO18 8LX. Tel: 01751 475794. [purecarmechanics.co.uk](http://purecarmechanics.co.uk)  
*The garage is female-friendly.*

**RTN Auto Services**, 11 Waggon's Way, Stainforth, Doncaster, South Yorks. Tel: 01302 351167. *Peugeot/Citroën specialist.*

**W Sykes & Son Ltd**, Lower Wortley, Leeds LS12 6AB. Tel: 0113 263 9388. *MOTs, servicing and repairs. Small family garage.*

**Victoria Motors**, Victoria Street, Stocksbridge, Sheffield S36 1GY.

[victoria-motors-stocksbridge.co.uk](http://victoria-motors-stocksbridge.co.uk)

**Yorkshire Vehicles 24-7**, Unit 5 Sunshine Mills, Leeds LS12 3HT. Tel: 0113 318 5259. [yorkshirevehicles24-7.co.uk](http://yorkshirevehicles24-7.co.uk)

## NORTHERN IRELAND

**T.F. Cars (Tommy Fegan)**, Motor Engineers, 35-39 Parkmount Road, Antrim Rd, Belfast BT15 4EQ. Tel: 028 9037 1868. *A father and son outfit, doing mechanical and MOT work at reasonable rates.*

**McKay Motor Works**, 616a Antrim Road, Newtownabbey BT36 4RF. Tel: 07787 806597. *Toyota Master Technician.*

## SCOTLAND

**Greenend Motors**, 20 Sunnybank Terrace, Lower London Road, Edinburgh EH7 5TW. Tel: 0131 661 4825.

**Lewiston Garage**, J A Menzies & Sons Ltd., Lewiston, Drumadrochit, Inverness IV63 6UL. Tel: 01456 450212. *Good village garage. MOTs. Excellent and helpful.*

**Lothian Motors**, 68 Lothian Street, Bonnyrigg, Midlothian EH19 3AQ. Tel: 0131 663 1076. *Family-run, electronic and aircon repairs, servicing and MOT.*

**Sutherland Arms Garage**, Victoria Road, Brora, Sutherland KW9 6QN. Tel: 01408 621721. *Vauxhall specialist, MOTs, aircon and servicing to all makes.*

**The Garage (Wishaw) Ltd**, 70A Alison Court, Motherwell, Scotland ML1 2DN. Tel: 01698 265303. *Japanese performance specialist, MOTs. Excellent diagnostics.*

## WALES

**MB Motors**, Cowbridge Road, Brynsadler, Pontyclun, Mid Glamorgan CF72 9BT. Tel: 01443 229522.

**The Olde Pounce Garage**, Penperlleni near Pontypool. Tel: 01873 880312. *MOTs, plus general repairs/maintenance.*

**Three Arches Services Ltd**, Heathwood Road, Cardiff CF14 4HT. Tel: 02920 752101.

**AJ Autos**, 2a Gaskell Street, Newport, Gwent NP19 0GH. Tel: 01633 250513.

## IRELAND

**Harkin's Garage**, Gleneely, nr Carndonagh, Co Donegal, Ireland.

This listing is provided as a reader service and based on recommendations and information supplied by **Car Mechanics** readers. We have not ourselves visited, used or in any way tested the companies listed, and as always, potential customers must make their own enquiries and decisions. While every car has been taken in the compilation of this list, **Car Mechanics** and **Kelsey Media** cannot accept responsibility for the actions of any of the companies listed here, nor can we become involved in any disputes between readers and companies on this list, though reports – good and bad – are always welcome. We would also appreciate being told if readers discover any garages listed here are no longer trading so we can verify this and, if appropriate, remove their entry.



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## Porsche Boxster window regulator

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## BMW 1-Series front wing swap



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## OCTOBER 2024

Turboschargers & Superchargers - Project VW Caravelle 2.0 TDI, Pt4 - Project BMW 335i, Pt7 - Focus Mk2 Door Mirror & Electric Windows - Buying + Owning: Hyundai ix20 - Audi A6 2.0 TDI Oil Pump - Service Bay: Peugeot 108 1.0 - Electronic Diagnostics: Mitsubishi Outlander PHEV.

## SEPTEMBER 2024

Understanding Wet Belts - Project VW Caravelle 2.0 TDI, Pt3 - Project BMW 335i, Pt6 - Hyundai Santa Fe Droplinks & Rear Bushes - Buying + Owning: Audi A4 B8 - Porsche Cayman S Discs & Pads - Service Bay: Suzuki Ignis SZ-T Dualjet - Electronic Diagnostics: Ford Transit Custom 2.0.

## AUGUST 2024

A Guide to DIY Painting - Project VW Caravelle 2.0 TDI, Pt2 - Project BMW 335i, Pt5 - Clutch Clinic: Ford Focus Mk2 1.6 petrol - Buying + Owning: Nissan Qashqai Mk2 - Vauxhall Zafira Cabin Filter - Service Bay: Citroën C3 Picasso 1.6 HDI - Electronic Diagnostics: Renault Captur 898cc.

## JULY 2024

45 Used Buys under £10k - A Guide to Steering & Suspension - Project VW Caravelle 2.0 TDI, Pt1 - Project BMW 335i, Pt4 - Project Bentley Flying Spur, Pt5 - Buying + Owning: Mazda RX-8 - Service Bay: BMW 118d 2.0 - Electronic Diagnostics: Nissan Note 1.6 petrol.

## JUNE 2024

Pass the MOT first time - Project BMW 335i, Pt3 - Project Bentley Flying Spur, Pt4 - Product Test: Car Polishers - Buying + Owning: Volvo XC90 - Porsche Boxster 2.7 Alternator - Service Bay: Nissan Juke 1.6 FWD - Electronic Diagnostics: Vauxhall Corsa E 1.4 16v petrol - Looking back at diesel.

## MAY 2024

Lubrication Explained - Project BMW 335i, Pt2 - Project Bentley Flying Spur, Pt3 - Vauxhall Insignia turbo intake pipe - Wet Belt Disasters - Buying + Owning: Peugeot 208 - Ford Focus Front Wing Swap - Service Bay: Jaguar XJ X358 2.7D - Electronic Diagnostics: Volkswagen Fox 1.2.



## APRIL 2024

Hand Tools - Project BMW 335i, Pt1 - Project Bentley Flying Spur, Pt2 - Product Test: Head Torches - Regenerative Braking - Buying + Owning: Mercedes-Benz S-Class - History of the Car Radio - Service Bay: Kia Sorento 2.2 CRDi 1.6 - Electronic Diagnostics: Vauxhall Insignia 2.0 CDTi.



## MARCH 2024

Hybrids - Project Bentley Flying Spur, Pt1 - Renewing a Front Wheel Bearing (Ford Focus) - DSG Oil & Filter Change - Modern Oil Investigation - Vauxhall Meriva FlexiPipe Swap - Buying + Owning: Alfa Romeo Giulia - Service Bay: Suzuki Swift 1.2 Dualjet - Electronic Diagnostics: Citroën C5 2.0 HDI.



## FEBRUARY 2024

Sensors - Clutch Clinic: BMW 1, 3, 5-Series DMF + Clutch - Low-Pressure EGR Filter Clean - Brake Disc Skimming Investigation - DIY Wheel Alignment - Alternative Alternator Fix - Buying + Owning: Jaguar XJ X351 - Service Bay: MG ZS 1.0T-GDI - Electronic Diagnostics: Fiat 500 1.2 - Spotlight: VAX SpotWash.



## JANUARY 2024

On-and-off Car DPF Cleaning - Project Lexus IS 250, Pt6 - Project Range Rover L322 4.4 V8, Pt8 - Haldex Gen 4 Coupling Oil & Filter - Product Test: Bluetooth FCRs - Buying + Owning: Kia Stinger 2017-on - Service Bay: BMW 335d xDrive - Electronic Diagnostics: VW Golf 1.6 TDI - Previous Project Cars, Pt2.



## DECEMBER 2023

Modifying your Car - Project Lexus IS 250, Pt5 - Project Range Rover L322 4.4 V8, Pt7 - Clutch Clinic: Ford Mondeo 2.0 TDCI Mk4 - Buying + Owning: Tesla Model 3 2017-on - Pothole Problem - Service Bay: Citroën C3 1.2 - Electronic Diagnostics: Jaguar F-PACE 3.0 TDV6 - Previous Project Cars, Pt1.



## NOVEMBER 2023

Kit out your Workshop Supplement - Vehicle Networking - Project Lexus IS 250, Pt4 - Project Range Rover L322 4.4 V8, Pt6 - Saving a BMW Z3 - Buying + Owning: Nissan GT-R 2009-2022 - Service Bay: Volvo C70 D3 - History of UK Registration Numbers - Electronic Diagnostics: Mercedes-Benz C320 CDI.



## OCTOBER 2023

DIY Servicing - Project Lexus IS 250, Pt3 - Project Range Rover L322 4.4 V8, Pt5 - Buying + Owning: Vauxhall Insignia 2008-2017 - Product Test: Cordless Vacuum Cleaners - 30 Car Accessories and Practices from long ago - Service Bay: Suzuki SX4 S-Cross 1.6 - Electronic Diagnostics: Audi A3 8P 2.0 TDI.



## SEPTEMBER 2023

A Guide to Aircon - Project Lexus IS 250, Pt2 - Project Range Rover L322 4.4 V8, Pt4 - CM Visit: Burton Power - Buying + Owning: VW Beetle 2012-2018 - BMW Front Lower Suspension Arms - Clutch Clinic: Vauxhall Astra J - Service Bay: Skoda Citigo 1.0 - Electronic Diagnostics: MINI Cooper S D F55.



## AUGUST 2023

An Introduction to ECUs - Project Lexus IS 250, Pt1 - Project Range Rover L322 4.4 V8, Pt3 - Summer Fun! - Buying + Owning: Toyota GT86 2012-2021 - Timing Belt Clinic: Ford Mondeo 2.0 TDCI - Service Bay: Vauxhall Astra J 1.6 - Electronic Diagnostics: VW Golf 1.4 TSI DSG - Diagnostics Case Study: BMW 7-series.



## JULY 2023

30 Used Cars for under £10k - Fixing Hard Taps - Project Range Rover L322 4.4 V8, Pt2 - Project Ford Mondeo 2.0 TDCI, Pt6 - Hybrid Faults & Fixes, Pt2 - Buying + Owning: Fiat 124 Spider 2016-2019 - Service Bay: Toyota Avensis 2.2D - Product Test: Ratchet Spanners - Electronic Diagnostics: Peugeot 208 1.2 non-turbo.



## JUNE 2023

Tackling Smart Repairs - Project Range Rover L322 4.4 V8, Pt1 - Project Ford Mondeo 2.0 TDCI, Pt5 - Hybrid Faults & Fixes, Pt1 - Buying + Owning: BMW i3 2013-on - DIY Garage Makeover - Service Bay: VW Tiguan 2.0 TDI - Electronic Diagnostics: Honda CR-V 2.2i-DTEC.



## MAY 2023

Understanding AdBlue & SCR Systems - Project Ford Mondeo 2.0 TDCI, Pt4 - Skoda Fabia 1.4 TDI Oil Pump Chain Failure - Swapping Front Control Arms - Buying + Owning: Porsche Cayenne 2011-2018 - Service Bay: Jaguar XKR 5.0 - Electronic Diagnostics: Citroën DS3 1.6 THP.



## APRIL 2023

Getting to grips with Grease - Project Ford Mondeo 2.0 TDCI, Pt3 - Project Fiat Panda 100HP, Pt6 - Ford Bonnet Lock Fix - Buying + Owning: VW Golf Mk6 2009-2016 - Product Test: 21 Car Shampoos - Service Bay: Jeep Wrangler JK 3.8 V6 - Electronic Diagnostics: Land Rover Discovery 4 3.0 TDV6.



## MARCH 2023

Glow Plugs - Project Ford Mondeo 2.0 TDCI, Pt2 - Project Fiat Panda 100HP, Pt5 - Ford Bonnet Lock Fix - Buying + Owning: BMW Z4 2003-2008 & 2009-2017 - Residential Garage Damp-Proofing - Service Bay: MINI F54 Clubman Cooper S 2.0 petrol - Electronic Diagnostics: Kia Sportage 2.0 CRDi AWD.



## FEBRUARY 2023

Cooling Systems - Project Ford Mondeo 2.0 TDCI, Pt1 - Project Fiat Panda 100HP, Pt4 - Buying + Owning: Volvo XC60 2008-2017 & 2017-on - Past Innovations - Service Bay: Kia Sportage 2.0 CRDi AWD - Electronic Diagnostics: Citroën C4 1.6 HDI - Our Cars: 2013 BMW 5-series & 2007 Skoda Fabia TDI.



## JANUARY 2023

Lighting - keep your vehicle street legal - Project Fiat Panda 100HP, Pt3 - Project Kia Sportage, Pt6 - Buying + Owning: Mercedes-Benz A-Class 2013-on - Love a Lock-up? - Service Bay: Land Rover Freelander 2 - Electronic Diagnostics: Jaguar XE 2.0D - Xmas Fun!



## DECEMBER 2022

Additives - should you use them? - Project Fiat Panda 100HP, Pt2 - Project Kia Sportage, Pt5 - Buying + Owning: MINI Clubman 2015-on - MINI R50 Getrag 5sp Gearbox Repair (Pt2) - Nine Screwdriver Sets on Test - Service Bay: MG6 1.9D - Electronic Diagnostics: Citroën C6 2.7 V6 HDI.

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## CARS FOR SALE



**MAZDA MX-5 2.0 SPORT.** 6-speed. 94,300 miles. MOT until Feb 2025. Thermostat changed, 4 new tyres last year, less than 1000 miles on them, I carried out a full oil and coolant change this year and previous owner had diff and gearbox oil changed last year. Some past service history. O2 sensor changed to fix emission failure on MOT but that was all. Leather heated seats work fine. Pioneer stereo upgrade and steering wheel controls, re-trimmed steering wheel, front DLR lights added. I cleaned and waterproofed the roof at end of last year. Drain plug regularly cleaned. V5 and 2 keys. Few extras – engine had K&N filter and engine brace installed, Zunsport front and rear grille. Few low rust spots appearing on rear wheelarch and door. **£3000. 07540 772810.** Luton.

**ROVER 75 TOURER.** 2.0 V6. 2003. Manual. Gold. MOT Jan 2025. 121,400 miles. All new – lower suspension arms, droplinks, battery, exhaust and cat, discs/pads all-round, brake pipes. Towbar, roof rack. **£1400. 02476 468720.** West Midlands.

**MERCEDES ESTATE.** 2010. C220 Sport Diesel. Silver. 140,000 miles, MOT 21/7/2025, 5-speed auto or steering wheel paddles manual. Newly powder-coated AMG wheels, recent discs/pads all-round, 2 new tyres, great runner, no rust, fully serviced. **£2850. 07718 933778.** Scotland.



**VOLKSWAGEN TRANSPORTER T4 WINDOW VAN.** 1999. LWB. 8 seats. 38,750 miles, 2.5 TDI 5-cylinder, 5-speed manual. MOT 05/08/2025. Fabulous paint, no rust. Factory PAS, aircon, twin-glazed side doors, tailgate. Large glass sunroof. Full tinted glazing. Lowered. Side bars. Parking sensors. Ply lined. Soundproofing. OE and replacement wheels. Recent recommission including timing belt, brakes, service. **£10,000. 07478 893003.** South East.



**AUDI A1.** 2017. 1.4-litre. 34,000 miles, S line, 6-speed manual. Front and rear parking sensors. Bluetooth DAB radio, LED lights. Very reliable. Cat S have pics from previous damage. **£8500. 07931 11419.** North West.



**RANGE ROVER SPORT.** 2007. 149,000 miles, Long MOT. New air suspension, TV, DVD. May have slight problem on ECU but drives spot on. **£1700. 07874 3426653.** Yorkshire.



**VOLKSWAGEN GOLF.** 2003. Mk4 1.9 TDI auto. 12 months MOT. Aircon, e/w, e/m, sunroof. Original radio. 60mpg. Please email [ptg04@hotmail.co.uk](mailto:ptg04@hotmail.co.uk). **£2250. 07856 896019.** East Midlands.

## PARTS FOR SALE



**HYDRAULIC DRIVE-ON CAR RAMPS** – Heavy Duty CRO12. Hardly used, weight capacity 1363Kg (3000lbs). Bought from CJ Autos. Excellent condition. **£350.** Nottingham. Email the Editor in the first instance: [martyn.knowles@kelsey.co.uk](mailto:martyn.knowles@kelsey.co.uk)



**PORSCHE ALLOY WHEELS.** A complete set of Porsche OEM alloy wheels. In perfect condition, no marks, scratches or blemishes. Fitted with Michelin Pilot Sport tyres, with 4mm plus remaining depth in great condition. Alloy sizes are: Front at 235/40/ZR18 (95Y). Rear at 265/40/ZR18 (101Y). Will fit Boxster and Cayman models from 2006-11. No rim marks or scratches. **£850. 07729 679059.** Ireland.

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Sometimes, a bit of extra spending is all you need for happy motoring. Mike Humble explains...

## STOP! And think for a moment

▶ One of the best phrases I like to hear is 'how long is a ball of string'. This is everyone's normal 'go to' quip when something silly is asked like how long a light bulb should last or when is an acceptable length of time for a fuse to eventually blow. Well, recently I was talking to a chap a few doors down whose wife runs an old Suzuki Alto. It was mentioned during one of those 'ere, you might know' conversations that often occurs during driveway banter – how long should a pair of brake discs last these days. Now this is a very good question that begs the answer in the form of the sentence at the top of this article. The factors vary too much to put any kind of time or mileage point upon it, but when he explained the distances involved, it was worrying.

Style of driving, number of occupants regularly carried, whether it's an automatic or used as a towing car, all have a direct bearing on anything rotational outside the car, namely tyres and brakes. In days of old, a typical car could run when driven in 'normal' situations to around at least 50,000 miles before your anchors were worn out. The ingredients used in brake pad material to replace asbestos is more aggressive so that can shorten the life of the discs, but another factor is the quality of the discs themselves. This little Suzuki is covering less than 10,000 miles per year before brake juddering is being noted, and in the last MOT, the car actually failed because of a fluctuating reading.

### Fitting advice

In my Rover days, I remember Unipart issuing a windy pamphlet all about brake discs – the correct way to fit them and how to assemble everything to the letter. The reason for this was down to the sheer number of parts being sent back under warranty due to the phenomenon that is brake judder. When tested and inspected, the boffins at Cowley were discovering that a colossal number of discs heading for the scrap bin were in fact fit for purpose but going out of 'true' due to improper fitting procedures. Things like a build-up of rust or dirty grease on the hub was the biggest culprit, so the pamphlet would explain about wire brushing or using a wire drill attachment to scour the hub flange clean. This would offer the discs a true flat surface to fit against and greatly reduce the occurrence of juddering.

By banging the drum throughout every Austin Rover dealer up and down the land saved Unipart a considerable sum in warranty claims and waste materials. Fast forward to modern times, some motor factors and dealerships are having the same problems again. Only this time, it isn't so much to do with poor fitting techniques, but more to do with poor quality materials. Again, go back a few years and names like Bosch and Intermotor were bywords for being right straight out of the box. Sadly, Bosch is mainly a trading name made under licence in lands far afield as China or India with very little these days being made in the Bavarian fatherland except washing machines and other white goods.

It isn't that long ago when buying brake components, the choice was limited but you'd heard of all the brands. These days there's some cheap and nasty aftermarket pads and discs just ready to catch out the buyer looking for a bargain. Just



have a look at internet auction sites for proof, some are being sold so cheap you'd wonder how any profit is made. Also, on YouTube, there's a handful of videos showing you brake discs, drums, pads and even crankshafts being literally hammered and cobbled together in India in workshops that would make anyone's mental idea of the Black Hole of Calcutta become six shades darker. And these parts, dear readers, have made their way onto the aftermarket parts shelves. One such nationwide factor sells a budget brand of brake discs that are made of Chinese recycled steel – of really dubious quality.

Nothing wrong with recycled steel these days, except that when the steel you are using is already of poor quality before you start the recycling bit, the longevity of the end product would possibly be bettered by simply using a pair of Cliff Richard 45's as discs.

As the adage goes 'you can't put a price on safety' and the same applies to tyres as well. Go too cheap on your rubber and you'll very easily find why the trade calls some bargain basement tyres as 'ditchfinders'. Not that long ago, a good mate of mine bought a high-mile Rover 75 which we did the head gasket on and got it running smoother than a Bernina sewing machine. It came fitted with some Chinese budget tyres on the front that were so ineffective in the wet, I kid you not that it had all the cornering prowess of a bear on roller skates – it was genuinely frightening even at moderate speeds.

So, we arrive back at Phoebe's old Suzuki. My usual chosen motor factor has just supplied her with some Mintex brakes this time around and I'll bet you my last Rolo they'll still be on the car come its next MOT. The Suzuki was her mother's from new and despite being older than most motors in the breakers, it's as pretty as a picture and will be sitting on top of most modern small hatchback cars when it comes to the final weigh in. If you are lucky to have an old Suzuki where the dreaded Sheffield tin worm hasn't taken hold, those hardy little Japanese cars can often outlive their owners. When it comes to brakes and tyres an extra pound spent here and there can make all the difference, sometimes even save your life and of course save you repetitive workshop labour charges.



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