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Repairing Instrument Clusters

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Litterbugs

► Our ex-project Mercedes-Benz C180K is still on my drive... and it's playing up!

Two days after a new Lambda sensor was fitted by the main dealer, the MIL came on. The Merc went back into the workshop for a software flash and the MIL came back again within 200 miles. After a week of investigation, I was told it needed a new cat and a post-cat Lambda sensor. Total cost? £1760.

As we're selling the car for £1700, that just wasn't cost effective. Instead, I took it to my local MoT station for a sniff test and they established the exhaust emissions were indeed outside the test criteria. I've left it with the garage for further investigation. No news yet.

It was a fine morning when I dropped it off, so I decided to walk the mile or so back home, only to get disgusted at the sight of litter strewn on the verges.

This particular stretch of road is a short 'national speed limit' section (less than half-a-mile of 60mph max), with fields either side. Which is ideal for antisocial people to discard their litter by lobbing it out of a fast-moving motor. OK, some rubbish could mistakenly be drawn out of an open window, but not plastic bottles or metal cans, fast-food wrappers or even black bin-bags with unknown contents. I'm not really talking about fly-tipping here – that's a totally different subject – just littering.



During 2015, I've also noticed rubbish lying on the sides of major A-roads. The A22 in East Sussex was particularly bad at one point, with paper stuck in trees and hedges for miles. The A1 is just as bad. I'm sure you've seen litter amassing on roads near you.

Why is this problem escalating? I can't help but think that the increase of 'drive-thru' fast-food outlets has helped contribute to the problem of roadside waste disposal. Even while on a cycle ride on quiet back roads in rural East Sussex, I spotted a fast-food container from a certain burger chain – literally eight miles from the nearest outlet!

The situation has reached such epidemic levels that UK councils and Tory peer Lord Marlesford are asking for powers to combat it. They want to be able to fine the owner of any vehicle caught throwing items from the cabin, even if it was the passenger that threw it!

Martyn Knowles, Editor

Enjoying supercharged Jaguar power

► As a motoring journalist, I occasionally get to drive some fine motor cars. I've waited a long time to experience the latest Jaguar XJ X351 model (2009-on). However, when I received confirmation I could test-drive the XJR containing the supercharged 5.0-litre V8 and eight-speed ZF auto, I was absolutely ecstatic.

There are some things in life that you should experience and a whistling V8 from the JLR factory is one of them. I won't bore you with the finer details of the vehicle, but suffice to say that I didn't want to give it back after a week on the Knowles' driveway. Pure luxury with a kick to boot. The style and grace of this top-of-the-range Jag will remain with me forever.

The best news, however, is that Jaguar cars continue to be assembled at Castle Bromwich in Birmingham and that Tata Motors' continued investment in the business is proving a success. Well done, JLR.

If you have a special occasion approaching, why not treat yourself to a Jaguar or Land Rover driving day or manufacturing tour? See <https://shop.jaguar.co.uk/driving-experiences>



The Jag XJR V8 produces 550PS. One optional extra on this vehicle is a carbon-fibre engine cover – at £1295! Few of my secondhand car purchases cost that much...

Stuttgart or bust

► Following my announcement in the March 2015 issue, CM is still making plans for a road-run to Germany in October. By the end of July, I should have finalised the route and stop-overs – a PDF will be available to anyone who is interested.

The event starts in Calais on **Saturday, October 10** and we plan to leave at 09.00 on **Sunday 11**, heading East towards Germany.

Our first night will be at the famous Nürburgring circuit. On **Monday 12** we head SW to the Liqui Moly oil producing factory for a tour of the refinery. Then onto Stuttgart.

During the next two days, we will visit the Mercedes-Benz and Porsche museums, before heading back to the UK on **Thursday, October 15**.



The Mercedes-Benz and Porsche museums charge eight euros per adult for entry.

The event rules are simple: acquire a vehicle for £300 or less, Y-reg (2001) and older. Points will be awarded for various tasks en route, with prizes for the winners.

CM will supply the route and stop-over information, but you'll have to organise your ferry-crossing tickets, book any hotels, and pay for fuel, insurance (for overseas driving), any tolls and tickets for places of interest.

The maximum number of cars taking part in the run will be limited to **EIGHT**, so please email me at martyn.knowles@bauermedia.co.uk if you'd like further information.



We can't guarantee these beauties will be at the Liqui Moly oil-making factory!

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Car Mechanics, Bauer Media, Media House, Lynchwood, Peterborough PE2 6EA.
Email: carmechanics@bauermedia.co.uk
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EDITORIAL – Phone 01733 468000

Editor **Martyn Knowles**
Production Editor **David Taylor**
Editorial Assistant **Leise Enright**

CONTRIBUTORS

➤ Rob Bradshaw ➤ Ted Connolly ➤ Ian Cushway
➤ Andrew Everett ➤ Richard Gunn ➤ Rob Hawkins
➤ Jeremy Haworth ➤ Kim Henson ➤ Rob Marshall
➤ Dave Peacock ➤ Steve Rothwell ➤ Ian Seabrook
➤ James Stanbury ➤ John Ward ➤ Steven Ward

ADVERTISING – Phone 01733 468864

Group Commercial Director **Charlie Brookes**
Commercial Director **Kelly Millis**
Key Accounts **Anna Skuse**
Account Manager **Daniel Jackson**

MARKETING – Phone 01733 468000

Marketing Director **Patrick Horton**
Brand Manager **Rachael Beesley**
Direct Marketing Manager **Laura Holdup**
Head of Newstrade Marketing **Leon Benoiton**
Newstrade Marketing Manager **Jon Freeman**

PRODUCTION – Phone 01733 468341

Print Production Manager **Hollie Swift**
Advertising Production **Zoe Bellamy**
Printed by Wyndeham Group
Distributed by Frontline

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BAUER CONSUMER MEDIA

Managing Director/Consumer Cars **Niall Clarkson**
Editorial Director **June Smith-Sheppard**
Head of Digital **Charlie Calton-Watson**
Group Direct Marketing Director **Chris Gadsby**
Finance Director **Lisa Hayden**

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Group Finance Director
Group Managing Director
CEO

Sarah Vickery
Rob Munro-Hall
Paul Keenan

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INSTRUMENT CLUSTERS

A faulty instrument panel is now more than a mere inconvenience – apart from being a possible MoT fail point, it could also cause a breakdown. **Rob Marshall** investigates the most common problems and how to put them right.

Although only a speedometer and several warning lamps are required by law, it has been a long-standing trend in car design to incorporate more instrumentation and warning lights in the driver-focused binnacle. As vehicle electronics have developed, the individual gauges have relied less on a mechanical means of operation and, notably since the advent of Controller Area Network (CAN-bus) communication, the instrument cluster is no longer a standalone unit. Nowadays, it works in tandem with other vehicle systems, including the anti-lock braking, stability controls, seat belt pre-tensioners and airbag ECUs.

Many instrument clusters now incorporate other functions – the vehicle



Single-type instruments, such as those used on some sports/kit-cars, can be stripped at home, but consult a classic car specialist for advice on recalibration or parts.

immobiliser being the most common. Therefore, a faulty instrument panel might prevent the car from being started, as well as resulting in more obvious



Elderly fuel and engine temperature gauges used to work by heating a bi-metallic strip, which bends and causes a needle to deflect across a scale. Inaccurate readings tend to be due to a faulty voltage stabiliser, which promotes a 10-volt supply in 12-volt systems.

faults, such as the lack of certain warning lamps, but be aware that an inoperative main beam tell-tale and speedometer back lighting will result in an MoT fail.

What goes wrong

► The separate instruments fitted to both specialist and classic cars (and motorcycles, boats, etc) tend to be very reliable. The main problems involve the speedometers magnetic heads becoming weak, nylon internal cogs stripping their teeth, the glass frontages rattling, or the steel outer casing suffering from corrosion. Fortunately, replacement seals, bezels and other parts are available from various specialists, many of which offer a reconditioning service that also addresses tasks that are outside the scope of the average DIYer, such as speedometer calibration. Personalisation options, such as changing the instrument needle type or dial face designs, are also available.

Many years after the speedometer cable became obsolete, most cars that were built in the last decade

utilise a CAN-bus communication system, which permits other ECUs (of which there may be more than 50) to connect with the instrument cluster and this feature concentrates on the repair of them. Several circuit boards can be incorporated within a single instrument cluster, which boast multiple chips and microprocessors. Not only can these electronic elements suffer from physical failure, through both vibration and heat (like those fitted to a computer, instrument cluster processors can become very hot), but low voltage spikes can also corrupt their software. Even were you to source a replacement, new items are devoid of any programming. Secondhand chips, scavenged from a used binnacle, might not contain software that is compatible with your car – the data can not only be encrypted (meaning it cannot be read easily) but the coding also tends to evolve continually over the production

life of a specific vehicle model and might not be decipherable by your particular car.

Other parts can fail, too. The tiny plastic gears within each instrument's motor housing tend to fail, causing erratic needle operation, followed by total failure. LCD and dot-matrix screens, which tend to require their operating voltage to be stepped up to over 150 volts, can either stop working completely, develop missing pixels or start spouting gibberish. Buzzers develop crackles, LED bulbs break down internally, transistors overheat and the circuit boards themselves can suffer from dry joints, broken tracks, corrosion and general heat damage. The aforementioned software corruption can cause total failure of the cluster, as well as result in an engine non-start and even complete loss of communication with the security information from the car keys' transponder.

Preventive measures

▶ Surprisingly, there are things that you can do to reduce the risk of your instrument cluster failing prematurely, although you should note that some faults are inherent. Preventing low voltage spikes will help reduce the chance of software data corrupting. Replacing an elderly car battery that struggles during engine cranking is one solution. Be aware that the instrument cluster will go



through a test procedure, when the ignition switch is turned to the 'engine running' position, so you should verify that nothing unusual occurs.

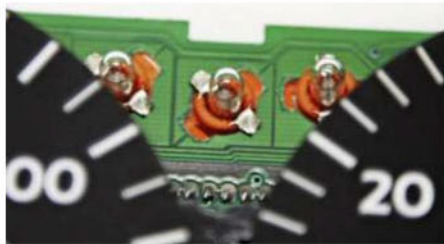
The self-check can be detected

by either the needles twitching, or them performing a full sweep, prior to returning to their rest positions. Investigate any intermittent issues, such as an instrument that fails to work properly, because trying to ignore the symptom is likely to cause more widespread damage within the cluster, due to the small fault causing voltage fluctuations. This could lead to data corruption in other areas, including the EPROM chip, which contains sensitive data, such as that for the immobiliser.

Repair options

Unfortunately, obtaining and fitting a complete secondhand instrument cluster is a less viable option than it once was, because the car may either reject the replacement part or require it to be recoded. As a result, this operation tends to be only possible for a new part.

French and German (Mercedes-Benz excepted) carmakers tend to be the most difficult in this regard, whereas many Japanese vehicles are more compliant. Incidentally, obtaining the original coding from the cluster manufacturer is a futile exercise and even specialists can fail to do so. Providing that you can obtain the relevant security code, you might be able to download the original programming from the EPROM (Erasable Programmable Read Only Memory) chip in the removed unit and transfer it over, but this will be of little use if the original coding has been corrupted.



Most older cars used small bulbs within the cluster, the holders of which can be twisted and removed easily. While some LEDs were affixed into a removable holder, later cars have them soldered directly to the circuit board, making replacement difficult.



Some instruments have their pointers attached to rotating discs that are mounted in front of the gauge faces, which can jump from their mounts.

Ensuring that the mileage is swapped over accurately is also an issue. For example, Peugeot/Citroën models tend to have the total vehicle mileage hard-wired into their central BSIs (body control computers), which will override a lower readout from a replacement mileage cluster. However, if a binnacle boasting a higher figure is fitted, the recorded mileage will not be lowered to match that on the BSI. Mileage correction services may be able to help, but the technology has been abused by vehicle 'clockers' that the EU has announced it plans to ban firms from offering the service after 2018. You could also be prosecuted if you sell a car with an instrument panel that has a mileage discrepancy, unless you declare the actual mileage clearly to a prospective purchaser.

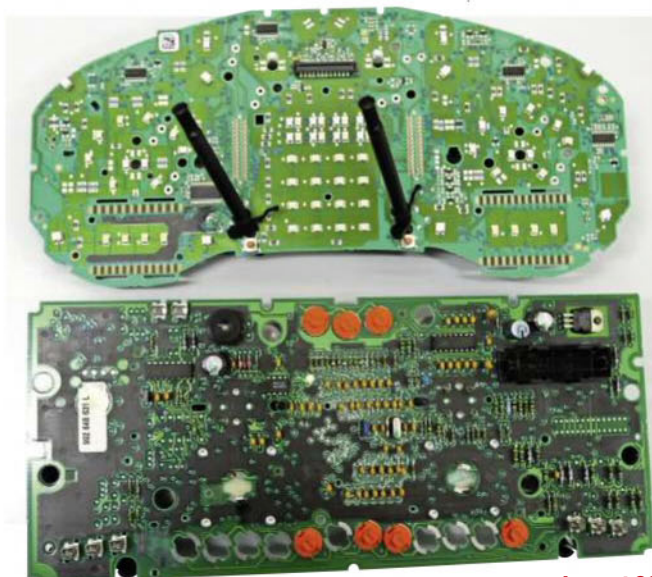
It is possible to dismantle the cluster at home, but you have to be careful, not only because the instrument panel is delicate, but also because identifying the components and accessing the coding is difficult, if not impossible.

To demonstrate a comprehensive repair exercise, we turned to ECU Testing of Heanor in Derbyshire, which has built up an enviable reputation for not only reconditioning faulty units on a mail order basis, but also developing cures to solve inherent faults in many different clusters. In most cases, a reverse-engineering process is carried out by a dedicated research and development team.

Obtaining technical data via motor trade sources, such as the carmaker or the component supplier, is often impossible. Yet, the business is so confident in the quality of its repairs that a lifetime warranty is offered on any cluster that it reconditions, which is valid for the period in which the customer owns the car.

ECU Testing's managing director, Roger Bagg, told *CM*: "We tend not to advise the enthusiastic DIYer to dismantle instrument clusters at home. This is not to protect our business, but we have found that the hardest clusters to repair are those that have been tampered with. Although modern instrument clusters generate a degree of heat, we have only seen four that have caught alight. All of them had suffered from poor domestic repairs."

The R&D manager at ECU Testing noted that not only is sourcing technical information difficult, but obtaining quality components poses a major challenge and DIY repairers should be aware of a potential false economy. He said: "It is possible to buy parts online, especially from auction sites, but there tends to be very little guarantee of quality. For example, an inexpensive, poorly-made replacement instrument motor may seem a bargain, but it could draw too much current and would damage other delicate components within the cluster."



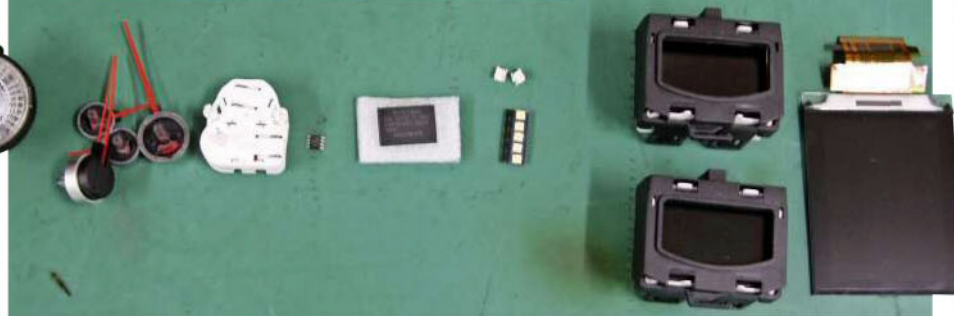
ROB'S TOP TIP

Should an instrument cluster give signs of failure, get it repaired without delay.

Developments in electronics have seen circuit boards in modern clusters perform more operations with fewer components, mainly thanks to the use of chips. Pictured at the top is a modern cluster board, below that is one from the late-1990s.

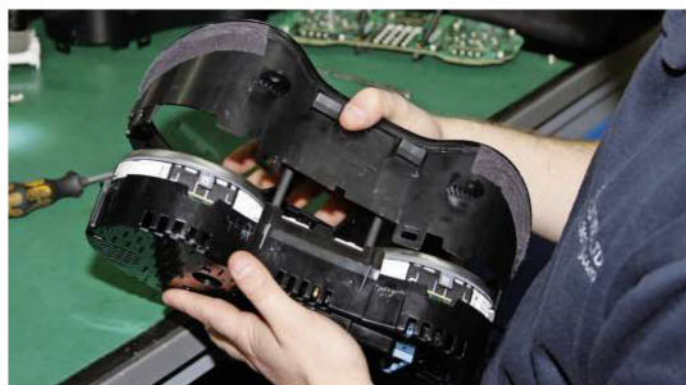
Instrument cluster repairs

REPAIR PROCEDURE



1 Common new parts that are required for reconditioning an instrument cluster are (from left to right) the buzzer assembly, pointer needles, motor unit, CAN-bus integrated circuit, processor, LEDs, dot-matrix screen and LCD screen.

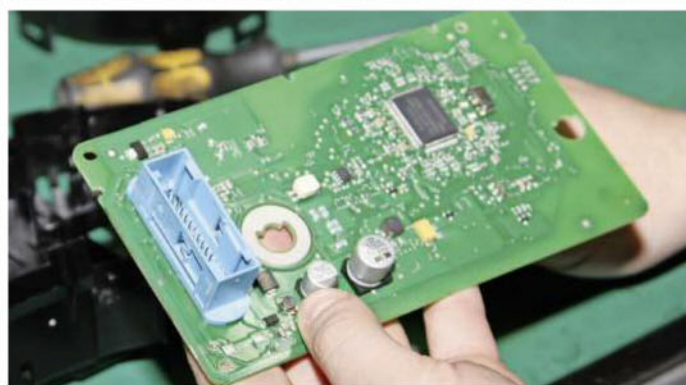
2 All units are tested for operation and CAN-bus communication. If nothing is found to be wrong with the cluster, no service charge is made. This Audi A3 (2003-2008) binnacle exhibited several problems, plus erratic communication.



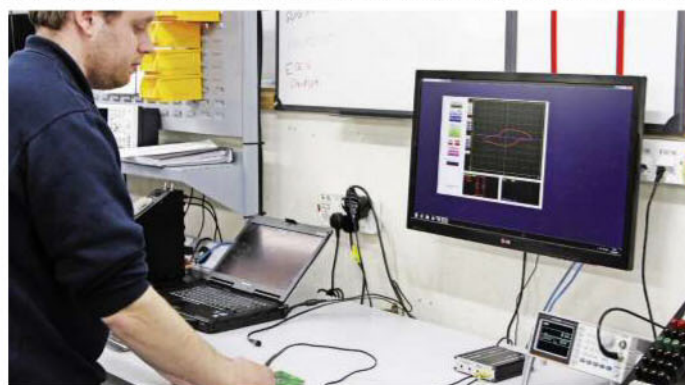
3 Work begins by unclipping the translucent frontage from the cluster. The clips need to be manipulated carefully, because the plastic can be brittle. The frontage is stored away from the working area.



4 After removing several screws from the back of the Audi's cluster, the main instrument panel and its associated circuits can be freed from the processor's board.



5 This board is known weak spot for this model, so it was unclipped carefully from the cluster's rear moulding. The operator is always earthed, to prevent static electricity from damaging the delicate electronics.



6 Faulty boards are tested on ECU Testing's comprehensive PCB analyser for short circuits and any other anomalies. It can also highlight any shortcomings with the main processor, which was revealed to be at fault on this cluster.



7 As the board is so fragile, a steady hand and precision tools are essential. The processor is heated to a temperature high enough to melt the solder, but not sufficient to damage the board.



8 As the processors differ between clusters, the replacement part has to be an exact match and must be flashed with the correct software. The faulty processor is de-soldered and removed carefully.

Continued on page 10

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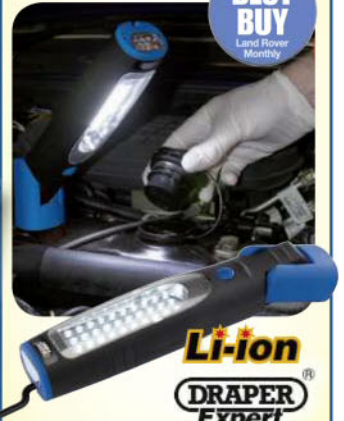
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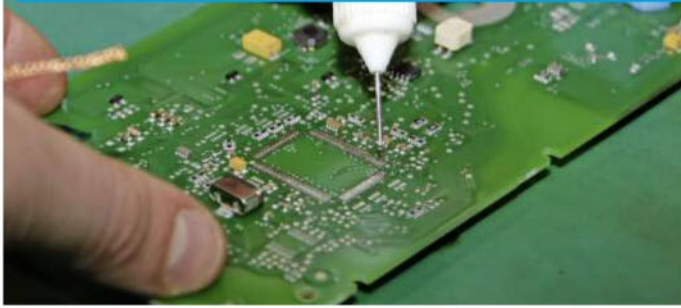
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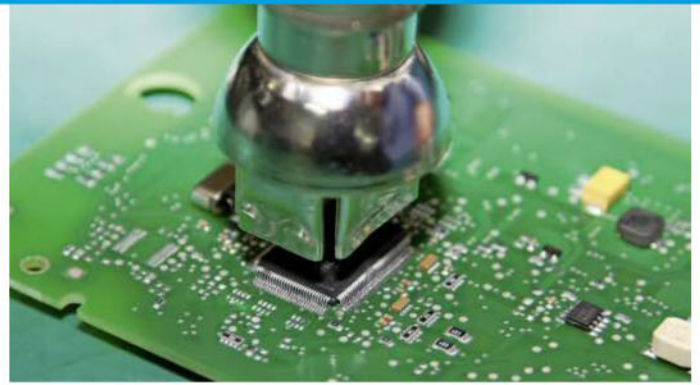
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Instrument cluster repairs

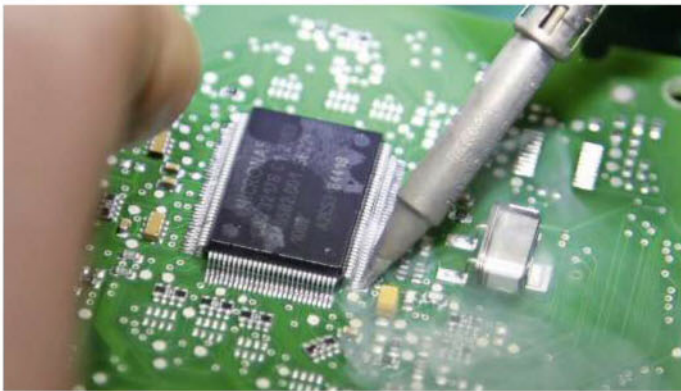
REPAIR PROCEDURE *continued*



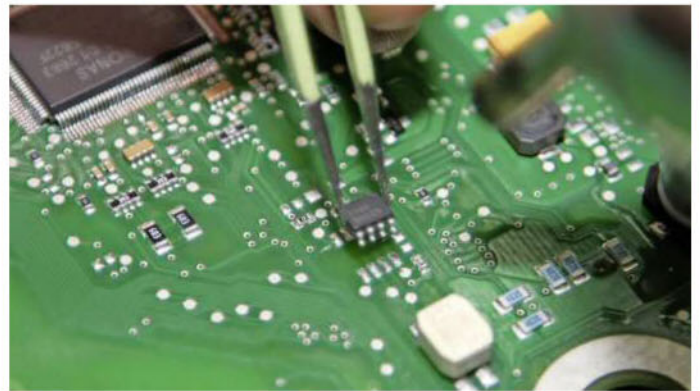
9 The pads on the circuit board are cleaned, in order to remove old solder and negate the risk of a short circuit. A special flux (pictured) is used, along with a de-soldering braid strip (see Step 13).



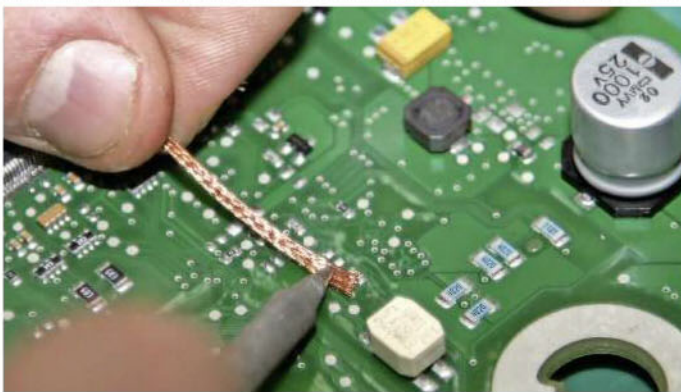
10 A dedicated handling and heat gun tool is used to manoeuvre the new processor into position, which removes the risk of bending the delicate legs. While this can be sufficient...



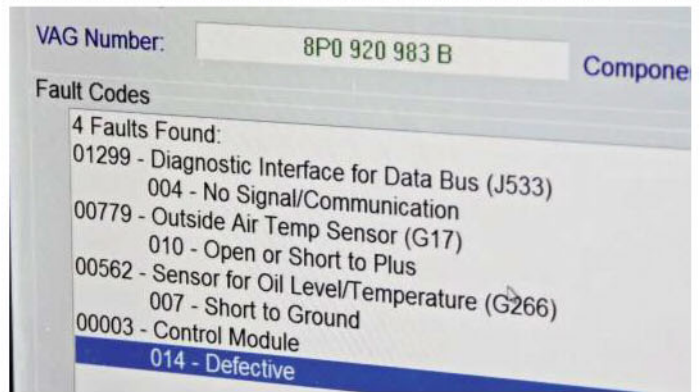
11 ...to attach the processor to the board, ECU Testing prefers to solder each leg manually as well, to ensure that each connection to the board is as strong as possible.



12 The CAN-bus integrated circuit chip was also not communicating and the technician identifies its location on the board. It is then de-soldered, removed from its location and discarded.



13 Step 9 is repeated (pictured is the de-soldering braid strip) and the new replacement part is soldered into place. The board is then cleaned with an air-drying solvent and re-interrogated.



14 The results show that the ailing processor had also corrupted data on the EPROM chip, which is why the circuit board was still registering the pictured faults on the subsequent diagnostics test.

ECU Testing's TOP 15 FAILURES

AUDI A3 (2003-2013)

Intermittent operation will lead to a complete loss of all displays and gauges. Engine non-starting can be caused by faulty/corrupted hardware and software – look for any fault codes indicating 'internal control module defective'.



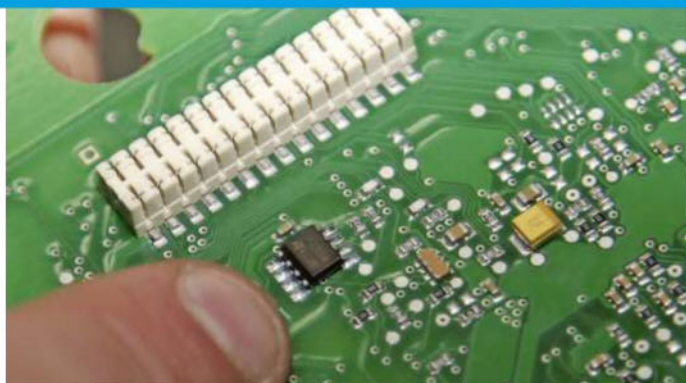
AUDI A6 (2005-2011)

Common failures include a centre display that either fails completely or flickers intermittently. Gauges can either read incorrectly or cease working at all. A less common problem is immobiliser lock-out, resulting in an engine non-start.

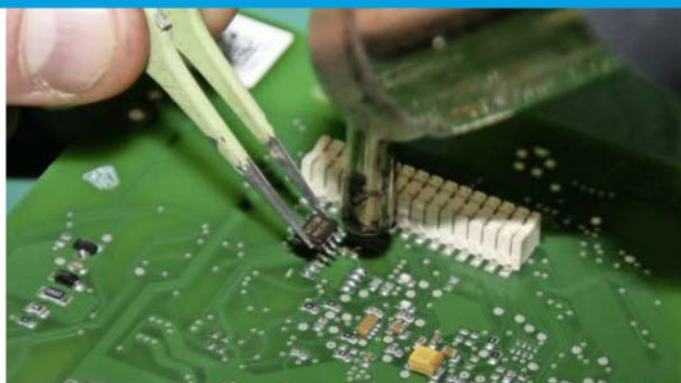


AUDI TT (1998-2006)

Issues include fuel and/or temperature gauges reading incorrectly, a pixelated LCD display, all gauges and lights flickering or 'chattering'. Plus complete loss of all lights, displays and instrument readings.



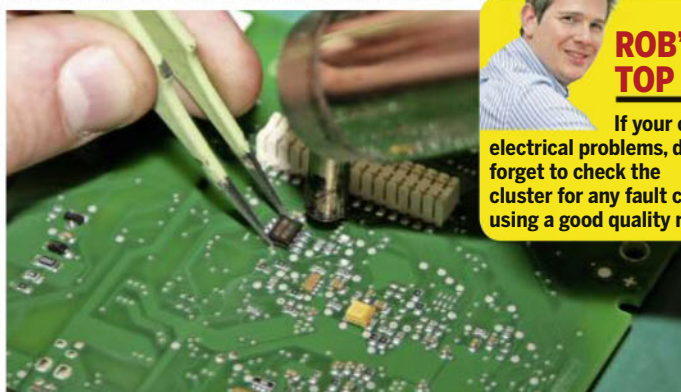
15 This is the position of the Audi's EPROM chip on the board, the data on which is corrupted. It must now be verified with ECU Testing's Checksum checker but this cannot be done with it in situ...



16 ...therefore it has to be unsoldered carefully and removed. Step 9 is repeated to clean the board and reduce the chance of a short circuit that could cause irreparable damage.



17 Corrections and additions to the corrupt data on the EPROM chip have to be inputted and programmed manually by the technician, who has the experience to work around data that has been encrypted.

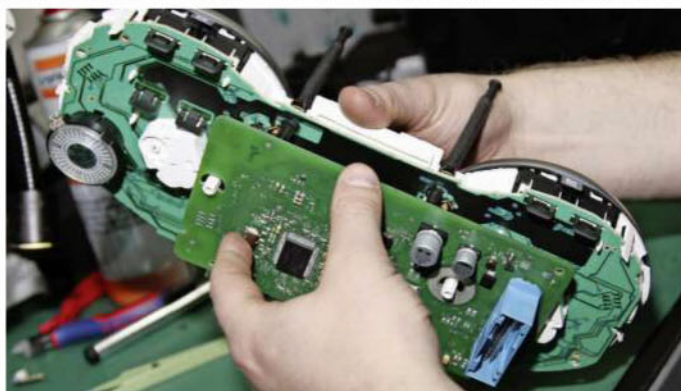


18 The EPROM chip cannot be checked for faults individually in situ. It has to be re-soldered to the circuit board first, before the complete unit is hooked up to the diagnostic analyser.

ROB'S TOP TIP
If your car has electrical problems, do not forget to check the cluster for any fault codes, using a good quality reader.



19 The results show that all fault codes have been cleared. If this were not the case, the chip would have to be de-soldered again, removed, reprogrammed, refitted to the board and then re-interrogated.



20 With the circuit board repaired, it is reunited with the other board that incorporates the instrument gauges. Now that communication has been restored, the second board can be interrogated for faults.



AUDI TT (2006-2014)

Complete loss of all instrument functions and lights, non-starting due to immobiliser lock-out, no backlight illumination or failure of the centre display are typical. These faults start out being intermittent, but then gradually become permanent.



FORD FIESTA (2008-2013)

A very common failure that causes either intermittent or total loss of all instrument functions. This may also result in the non-starting of the engine, creating a stored fault code 'B10D7 - Immobiliser, key ident not received'.

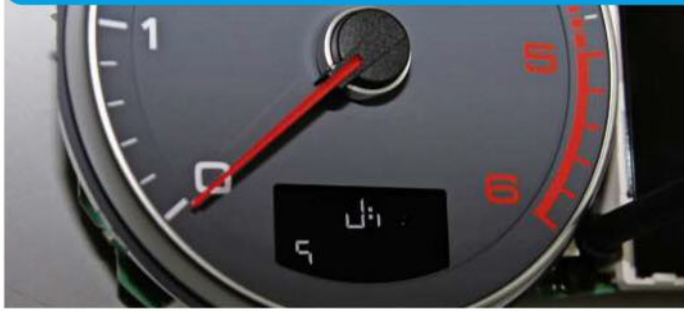


FORD FOCUS (2005-2011)

Symptoms include intermittent engine cutting out, rough running or non-starting. A failing gauge can possess a mileage display showing only dashes. Fault codes include 'P1260-61-PCM-Theft Detected' and 'U0155-61-PCM-Communication failure'.

Instrument cluster repairs

REPAIR PROCEDURE *continued*



21 The subsequent diagnostic check reveals not only a lazy speedometer needle but also an inoperative central LCD screen and missing pixels from both dot-matrix displays (left unit pictured).



22 Instrument needles need to be removed carefully; simply pulling them off might damage the motors. Those on this Audi cluster require turning anticlockwise, before being eased from their stubs.



23 The instrument faces can be unclipped from the main mounts, prior to the mounts themselves being detached from the circuit boards. Care must always be taken, when handling delicate plastic lugs.



24 The LCD screen is removed by gently prising its flexible ribbon connector from the connector block and unclipping the screen's cradle assembly from the circuit board.



25 The faulty board is unclipped from its cradle, discarded and the new part located in place. The unit was then mounted back onto the circuit board and the ribbon inserted into the connector block.



26 Moving to the faulty motor unit for the speedometer, which is mounted to the rear of the circuit board, the technician unclips the two mounting pins that protrude from the other side of the board...

ROB'S TOP TIP

If you choose to repair the unit at home, be sure to buy good quality components.

Continued on page 14

ECU Testing's TOP 15 FAILURES



MERCEDES A-CLASS (2004-2012)

Impending failure can cause intermittent loss of the centre display or the complete failure of all readouts, including gauges.



MERCEDES C-CLASS (2002-2008)

Common failures include a diminishing lower information display or complete loss of instrument cluster functions.



MERC CLK & E-CLASS (2002-2010)

This unit suffers from loss of all instrument cluster functions. Following failure, you will also be unable to communicate with the cluster using diagnostic equipment.

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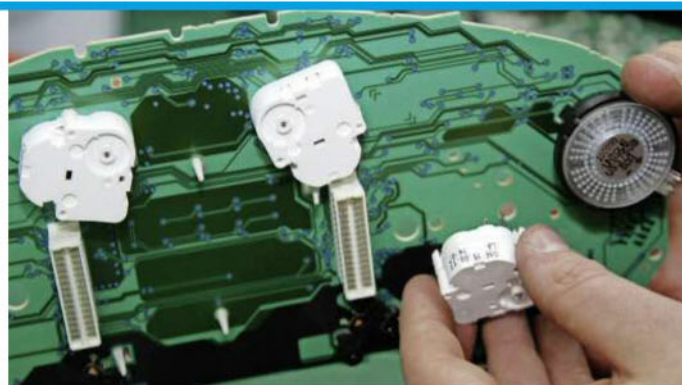
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REPAIR PROCEDURE *continued*



27 ...prior to identifying the appropriate terminals and de-soldering the connections. This frees the motor unit, which houses the internal gears. The motor unit is sealed and stripped cogs cannot be repaired.



28 A replacement unit is clipped onto the board and its connectors are soldered into place. Here's the rear of the board, showing the two motors for the fuel level and engine water temperature gauges.



ROB'S TOP TIP

Handle the cluster carefully – it's extremely delicate.

29 The dot-matrix screens on this unit simply clip directly to the circuit board, with each part's power supply strip connected directly to the board's contacts, meaning that no soldering is required.



30 The cluster can now be reassembled. The risk of damaging the cluster tends to be far less on reassembly. Work continues by clipping the instrument face mount into its circuit board.



31 The original instrument face is marked, and because cleaning would cause further damage, it is replaced with a new part. The other faces can be reused and are clipped into position.



32 When replacing instrument needles, care has to be taken not to damage the motors. Before they are refitted, the needles have to be calibrated, which takes place on a diagnostic rig...

ECU Testing's TOP 15 FAILURES

MINI (2001-2009)

Look for erratic fuel/temperature gauge readings, a sticky or bouncy speedometer needle, illumination failure or a complete loss of display.



RENAULT SCÉNIC (2003-2009)

Look for flickering of the entire display, the timer and clock resetting on their own, or a complete loss of all displays. The mileage can jump forwards by as much as 10,000 miles each time the cluster resets.



SEAT LEON (2005-2009)

Engine non-starting, fault codes for immobiliser communication, LCD screen failure or complete loss of all instruments and displays plague this frequently failing cluster.



33 ...on which the motor position is set manually, before the needles are aligned with the appropriate marker. The technician checks that the motors work correctly throughout their operating range.



34 Provided calibration is successful, the two halves of the cluster are separated and the processor's circuit board is replaced in the rear cluster half (also pictured in Step 4) and its screws are replaced.



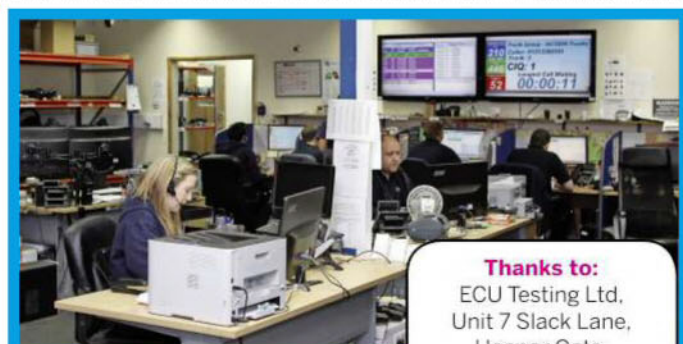
35 The second half of the instrument panel is reunited with the outer casing and the newly-fitted circuit board, the mounts for which are checked to make sure they have all 'clicked' into position.



36 The translucent front cover has several deep scratches, so it's replaced with a new part. It is simply a press-fit with the main outer casing, although all clips are checked to verify correct fitment.



37 Once assembly is completed, the cluster is checked on another diagnostic machine, which replicates not only low-speed CAN-bus signals from the body control module, but also high-speed signals from the engine management system



ECU Testing offers free technical help, which means you can turn to them if you are unsure about your cluster being the cause of a specific fault elsewhere on the car.

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VOLKSWAGEN PASSAT (2005-2011)

Sudden failure of the centre display is common, which may start out as an intermittent failure but which then tends to become permanent.



VOLKSWAGEN TOURAN (2003-2010)

Faults are wideranging, including complete loss of all displays, dimmed lights, warning lights remaining illuminated continuously or loss of the centre screen display.



VOLVO S60/S80/V70/XC70/XC90 (2000-2015)

Complete failure of the cluster is common. The fault is initially intermittent, then becomes permanent. Look for failure of the main beam warning light, pixelation of the bottom left screen, an SRS warning message and the clock counting forwards.

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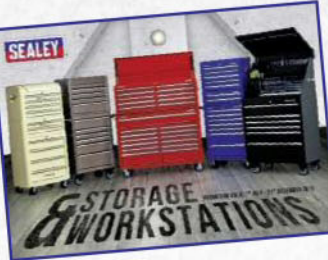
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integrated fans ensure that potential gases escape safely. The 12V accessory socket auto-resets if activated. A fusible link integrated in the charging cable provides surge and spike protection, preventing damage to delicate and sophisticated vehicle electronics, and an audible warning system

advises if the unit has been turned on for too long without being connected to a battery. The clamps are manufactured with a braided link to each jaw for maximum power transmission, while the easy cable wrap storage with clamp 'holsters' ensures the unit is tidy when not in use.

The five battery chargers and maintainers in the Schumacher range feature patented **Speed Charge** technology and can charge a battery up to three times faster than conventional chargers without causing damage. The chargers incorporate easy-to-read LED status lights and wipe-clean touchpad controls, while models **SPI3S**, **SCI12S** and **SCI15S** also have an LCD progress display screen.

Battery pre-sets include conventional calcium, AGM/GEL, leisure and stop/start batteries, while the **SPI3S** can also handle the next generation Lithium vehicle batteries. The operator can override the standard charge rate and choose a soft-start programme for very cold or small batteries, while de-sulphating mode (not available in the SCI6S) enables even deeply discharged batteries to be charged and fully automatic float mode ensures that the battery is kept fully charged and ready to use for extended periods of time.

For full specs on the Road Start emergency power packs and Speed Charge battery chargers and maintainers, plus details about special promotional prices, visit www.sealey.co.uk

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Car Painting



CAR PAINTING
MATTHEW JONES
AND IAN TAYLOR

Matthew Jones & Ian Taylor
(Crowood Press)

Reviewed by Richard Gunn

However have-a-go you might be with most car jobs, applying paint is something many of us leave to a professional. But if you've ever fancied being more competent with anything other than a rattle can, this book could be your way forward. Aimed at keen amateurs and professionals, it takes you step-by-step through the entire process, from setting up a paint booth and stripping a car through to applying coachlines and decals. There's also a section on how to sort out painting disasters. There are full colour pictures throughout – well, they could hardly be anything else – and the information is well-written and detailed. For example, did you realise that the best shade to begin your spraying career with is beige, because it's less reflective than other colours? So now you know.

Car Painting is published by the Crowood Press at **£16.99** from amazon.co.uk or www.crowood.com

Schumacher Intelligent Speed Charge SCI15S 15Amp battery charger from Sealey

► The top-of-the-range SCI15S is a fully automatic, microprocessor-controlled battery charger and maintainer featuring patented Speed Charge technology that actively monitors the charge acceptance and constantly modifies the charge output. It includes all of the unique features associated with the Speed Charge range (as outlined in the main feature), while automatic voltage detection determines if the charger is connected to a 6V or 12V battery. The SCI15S charger has an RRP of **£143.94** inc VAT.



1 TO GIVE AWAY

WIN

We have one Sealey/Schumacher Intelligent Speed Charge SCI15S 15Amp battery charger to give away. For a chance to win it, complete the coupon on page 21.

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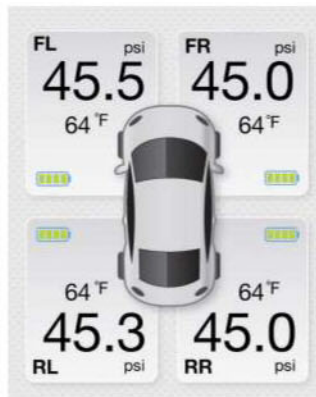
World's first Bluetooth TPMS system now available

FOBO has developed the first consumer-fit Bluetooth Tyre Pressure Monitoring System (TPMS) in the world and it is now available in the UK through branches of Maplins.

The FOBO Bluetooth TPMS device can be fitted to any car to accurately monitor tyre pressure and temperature, alerting the driver to changes through an easy-to-use Bluetooth smartphone app.

It provides exact readings per tyre and ensures that tyres remain at safe and efficient levels at all times.

Recent data shows that three-quarters of motorists are driving with underinflated tyres. According to EU figures, underinflated tyres are a contributory factor in 9% of all fatal road accidents and 41% of accidents resulting in serious injury.



TPMS systems have the potential to seriously reduce accidents resulting from dangerous tyre pressures, while improving fuel efficiency and carbon emissions. In addition, they can help drivers to avoid penalties of up to £2500 per wheel if they are found to be driving on tyres that are not roadworthy.

Government legislation from January 2015 means that all new models of cars must have TPMS fitted as standard. However, motorists with older cars previously had no simple way of gaining accurate tyre pressure readings for all four tyres, much less being able to constantly monitor tyre performance throughout a trip. The FOBO device corrects this imbalance.

The FOBO Bluetooth Tyre Pressure Monitoring System is available for **£149** at Maplin stores throughout the UK. To find out more, visit the website www.maplin.co.uk

FOBO Bluetooth Tyre Pressure Monitoring System

► The FOBO Bluetooth TPMS can be installed in under five minutes



without professional help. You do not need to change or modify your tyre's existing pressure valve – just screw on the FOBO sensors (using the optional T-valve if necessary), which are waterproof and feature an anti-theft lock, then download the free app to your mobile.

The system uses Bluetooth 4.0 that is compatible with Android 4.3 and iOS 7.1. It also comes with an intelligent in-car monitoring unit that sends alerts independently of your smart phone. The system constantly monitors the state of your tyres, even when your car ignition is switched off, and does not need an external power source. The device is supplied with batteries (2 x AA for the in-car unit and CR2032 for each sensor), which last up to two years and are then easily replaced.

WIN

We have one **FOBO Bluetooth Tyre Pressure Monitoring System** to give away. For a chance to win it, complete the coupon on page 21.

Upgraded Comma Performance Motor Oils

The Comma Performance Motor Oils range of 15 advanced engine oils provides up to 99% coverage of vehicles in the UK. Five of the most popular oils in the range have newly upgraded specifications: fully-synthetic Syner-Z 5w30, fully-synthetic Pro-Tech 5w30, fully-synthetic Syner-G 5w40, fully-synthetic PD Plus 5w40 and semi-synthetic Eurolite 10w40.

Every Comma PMO grade is now available in 1 litre top-up packs; the top selling Comma Xtech 5w30 (Ford) and Comma Eurolite 10w40 (MB & VW) are also available in 2-litre top-up packs.

For further information, visit www.commaoil.com



NEWS IN BRIEF



► **Andrew Page** has added the new collection of clutch kits from Mintex to its product range. Mintex manufacturers OE standard products using formulated friction materials on the drive plates, offering a smoother clutch engagement with the clutch bearings. For full details contact your local Andrew Page outlet.



► **BMW** took the International Engine of the Year title at the awards ceremony at Engine Expo 2015 in Stuttgart on June 17 with its 1.5-litre three-cylinder electric-gasoline hybrid powertrain in the BMW i8. Ford had been hoping to clinch the award for the fourth year running for its 999cc 3-cylinder turbo Ecoboost motor, but was beaten in a closely fought contest.



► **GSF Car Parts** has launched its 2015 retail brochure. There are original equipment (OE) products and budget 'matching quality' alternatives available savings of up to 50% off dealer prices. Pick up a copy of the 180-page catalogue from your local GSF outlet.

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NEWS IN BRIEF



► **BorgWarner's R2S** regulated two-stage turbocharger improves the performance and fuel economy of Ford's new powerful 2.0-litre diesel engine, the first Ford engine for passenger cars equipped with a two-stage turbocharging system. The fuel-efficient diesel engine will debut in the Ford Mondeo, S-Max and Galaxy in mid-2015.

► **Klarius** has produced and successfully fitted a type-approved aftermarket exhaust system for the Toyota Prius. The exhaust system on a hybrid vehicle has to be of the highest quality and perfectly installed or the performance of the car can be affected. Further info at www.klarius.eu



► A gas-powered bus set a new world speed record at the **Millbrook** test track in Bedfordshire by breaking the current record of 76.785mph with a top speed of 80.78mph. The bus, which runs on bio methane compressed natural gas produced from cow manure, took a day off from ferrying passengers round Berkshire at a maximum speed of 56mph to break the record. Meanwhile, **Honda** is putting its 1.6 i-DTEC engine to the test in an 8500-mile drive in a Civic Tourer across all 24 contiguous EU countries with the aim of setting a new Guinness World Record for fuel efficiency.

Spot Lift in action.



The **Spot Lift Pro** is hydro-pneumatic and can effortlessly lift the front or the back of vehicles up to 2.5 tonnes to a height of 1.5m, making it ideal for both car body and mechanical workshops. Featuring adjustable steel wheelbase pads with non-slip rubber coatings, it can be used with any width of vehicle. It is supplied with a pair of safety links to support the vehicle after lifting. At its lowest height it measures just 14cm.

Made by GYS in its factory in France, the lifts are available now through distributors nationwide with special launch promotional offers. Full specs are available from www.gys-welding.com

GYS portable lifts

For garages or workshops where there isn't enough space for a permanent full-size car lift, GYS has expanded its range to include two portable lifts: the Spot Lift and Spot Lift Pro. Each can quickly raise the vehicle to a safe and comfortable working height using only compressed air. Operator benefits include efficiency through faster job turnaround and reduced risk of back problems.

The **Spot Lift** is a hydraulic crick lift with a column structure, specially designed to lift vehicles by the wheel up to a weight of 2.5 tonnes. A 500-bar hydraulic pump drives a hydraulic cylinder, which, in turn, drives a sleigh fixed to a chain to lift the vehicle to a maximum of 70cm. The reduced dimensions of the lift and high level of mobility provided by its wheels, gives excellent stability and ease of handling. It can be fitted with an optional rocker panel lifting tool.



Spot Lift Pro.

Bilstein B3 OEM springs for Mazda MX-5 MkII

The latest addition to Bilstein's B3 range of OEM replacements springs is for the Mazda MX-5 MkII. As with all B3 kits, high-quality chrome vanadium or chrome silicone steel is used for an extremely high level of break resistance. Each spring is also seated after the forming process to prevent any heat losses, while careful surface compression and class-leading coating processes are applied for a long and durable service life.

The use of premium tapered wire offers optimum suspension characteristics with silent operation, even on uneven ground and under heavy loads. Unusually for the aftermarket, Bilstein also offers side-load spring designs, which offer compensation of lateral forces occurring at the MacPherson strut on the front axle through the curvature of the springs.

Bilstein B3 Mazda MX-5 springs cost **£74+VAT** each. For more details, please visit www.bilstein.de



Teroson repair tape

This high-strength adhesive tape from Henkel is ideal for a multitude of automotive emergency repairs. Teroson VR 5080 is suitable for temporarily reinforcing, fixing, sealing or protecting a wide variety of parts – including bodywork where kerbside repairs may be necessary.

It adheres to any dry, oil- and dust-free surface and has good weathering resistance, as well as being temperature-resistant up to 70°C. It can also be used in bodyshops during glazing replacement, to hold glass in the correct position until the adhesive has fully bonded.

For further info, see www.loctite.co.uk



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Bosch OBD 100 and OBD 150 portable scan tools

The latest additions to Bosch's family of diagnostic equipment is an entry-level tool that's intuitive enough for a DIY mechanic to use, but also powerful enough for a professional technician.

The Bosch OBD 100 and OBD 150 scan tools are suitable for the fast diagnosis of faults, including home repairs and when assessing used cars for sale. Working to EOBD standards, both units provide relevant diagnostic data, and display fault codes and allow them to be reset.

The OBD 100 provides support for seven OBD modes, can present data in freeze-frame, provides advanced manufacturer-defined codes and displays the Vehicle Identification Number



(VIN). The more advanced OBD 150 supports all 10 OBD modes, provides a comprehensive trouble-shooting function and displays graphical representation of actual values via a multi-line display. In addition, the OBD 150 can receive firmware updates via its USB port.

The Bosch OBD 100 and OBD 150 are priced at **£89** and **£129** respectively, come with a two-year warranty, and are available from leading Bosch distributors.

NEWS IN BRIEF



► **Leading UK aftermarket manufacturer Holts has launched its new website to enhance the online customer experience. The redesign improves the functionality and usability of the website, with particular focus on easier navigation and availability of product content and more stockist information. Visit www.holtsauto.com**

► **Autodata has added jacking mode procedures to its new online database, to reduce the risk of significant cost in damages during the raising of some vehicles. The new module gives comprehensive step-by-step instructions when raising and lowering vehicles fitted with height adjustable suspension across a range of manufacturers, including illustrations to avoid potential damage.**

Gtechniq I2 Tri-Clean

► High-performance surface coating expert Gtechniq has teamed up with BioCote, leader in antimicrobial technology, to introduce I2 Tri-Clean, an interior cleaner that kills bacteria and neutralises odours inside vehicles. I2 is a powerful pH neutral cleaner with deep cleansing properties that kills 99.9% of bacteria and eliminates tacky residues that attract dirt.

There is no need to use water, simply spray on a surface and wipe until the area is clean. Ingredients in I2 Tri-Clean include a true odour absorber that neutralises rather than simply masks smells.

Gtechniq I2 Tri-Clean comes in 500ml bottles priced at **£12.98**.

For more information, please visit www.gtechniq.com

► In addition to announcing the launch of I2 Tri-Clean, Gtechniq has also introduced two other new advanced car care products.

The MF4 Diamond Sandwich Microfibre Drying Towel offers a significantly higher absorption rate compared to standard microfibre cloths. Composed of an highly absorbent inner core 'sandwiched' between two super-soft outer layers, it draws water through the towel's outer membranes and traps it inside. It retails for **£9.98**.



The WM2 Microfibre Wash Mitt has an advanced dirt-cling that picks up even the smallest specks of grime, holds them tight and allows swirl free washing. It has an inner foam reservoir designed to hold as much soap solution in the mitt as possible. This unique composition draws contaminants away from the surface and releases them



into a rinse bucket with ease. The WM2 Microfibre Wash Mitt is available for **£12.25**.



5 TO GIVE AWAY

WIN We have five bottles of Gtechniq I2 Tri-Clean to give away to CM readers. For a chance to win one of them, please complete the coupon below.



COMPETITION WINNERS

AIR EQUIPMENT

Martyn Oakley, Bury St Edmunds

Q What is the air displacement of the V-twin compressor in cfm?

A 14.5

To be in with a chance of winning one of our **FREE** giveaways this issue, please indicate your preferred product below:

- Sealey/Schumacher battery charger Gtechniq I2 Tri-Clean
 FOBO Bluetooth Tyre Pressure Monitoring System in Silver or Black

Simply fill in your details below and send to: **Car Mechanics Giveaways August, Bauer Media, Media House, Lynchwood, Peterborough PE2 6EA. Offer closes August 19, 2015.**

Name: Address:

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Tales from the workshop

Finding & fixing advice from our garage proprietor **Steve Rothwell**



VOLKSWAGEN POLO

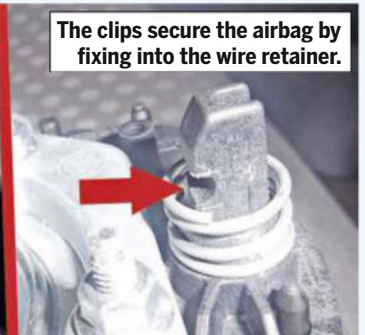
Steering wheel removal

▶ Although this 2003 VW Polo was in the workshop due to a problem with the headlamps, the steering wheel needed to be removed to enable access to the dip/main beam light switch. Removing the steering wheel is an easy enough job once the airbag pad has been detached.

As with all airbag work, the battery should first be disconnected and a period of at least 10 minutes observed before any circuit is disconnected. The airbag unit is then disconnected from the steering wheel by releasing



The clips secure the airbag by fixing into the wire retainer.



the small spring clips which secure it in place. The clips are accessed via a small hole on either side of the back of the steering wheel. Using a small screwdriver, the spring securing the clips can be pushed in and away from the clip, releasing the pad.

Once free, the centre fitment of the airbag connector needs to be removed

to allow it to be unplugged. With the airbag out of the way, the steering wheel removal is easy and is even marked so that refitting in the correct position is assured.

Once the headlamp problem was resolved, the steering wheel could be refitted, before connecting up the airbag and clipping it back into position.

VOLKSWAGEN GOLF

EGR diagnosis

▶ Some drivers feel that the job of motor vehicle diagnosis must be very simple now: just plug in a scanner, read off the fault codes and replace the part as instructed by the computer. In practice, however, things are not that simple and this 2002 VW Golf proved that point when it was bought in with the EML illuminated.

The fault code was 'P0401 Exhaust EGR Flow Insufficient'. This would seem to indicate that the EGR valve was faulty, but in this case the code had been flagged up because there



The oil filler cap adapter was not securing to the cam cover.

was insufficient vacuum to open the valve. Checking the hoses proved that these were all good, but the problem did turn out to be something other than the EGR valve.

The oil filler cap on this model has a short adapter to raise it above the engine cover and this adapter was not securing onto the cam cover. As a result, the engine crankcase emissions system was not sealed, allowing air pressure to enter the system.

PEUGEOT 206

Heater fan failure

▶ This 2004 Peugeot 206 had only one heater fan speed working and that was full blast. As is commonly found, the problem was the resistor.

On this 206, the heating unit is positioned up under the driver's side of the dash and stretches up into the air ducting. With the heater intake in the recirculation position, the resistor unit is easily accessed and, at £23, the resistor is cheap enough.

Once you've accessed the unit, turning the resistor bayonet

The resistor is located under the driver's side of the dashboard.



fixing and dropping it down will enable the connecting plug to be detached. Fitting the new unit in place is the same procedure only in reverse, except that the plug snaps back into place easier than it is disconnected.

When testing the unit after fitting, it should be remembered that the fan only operates with the engine running.

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AUDI A6 ALLROAD

Lighting problems

► Due to the complex electrical systems used by manufacturers, sometimes even something as seemingly simple as a blown bulb can cause problems. This 2008 Audi A6 had come in for a routine service with a note saying that the bulb failure symbol was showing on the dash. We later discovered that none of the offside rear side lamp lights were illuminating.

The A6 uses one bulb to perform different functions. This is done by adjusting the voltage supplied to the bulb in order to alter the brightness for either a side marker or brake light. Inspecting the bulbs, we discovered none had failed. However, we found a corroded connection to the lamp fitted in the tailgate.

Normally we would simply have replaced the bulb holder unit at £15 and a loom repair kit at £8, but, in this case, the lamp was allowing in water. The new lamp cost £80, but once fitted with the new connector kit, all of the lights worked perfectly again.



The plug and terminals had become badly corroded.

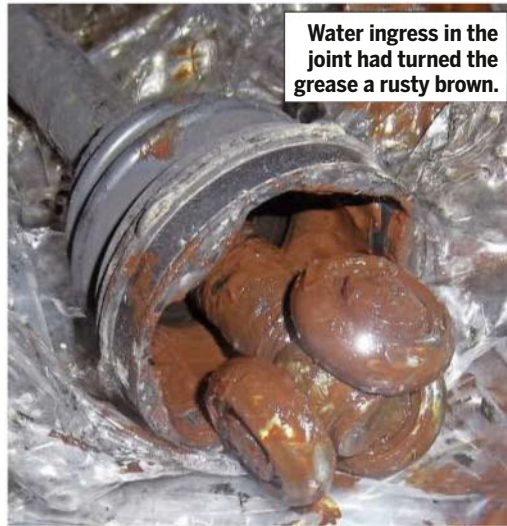


The new hub bearing comes complete with the flange.



LAND ROVER DISCOVERY 3

Water ingress in the joint had turned the grease a rusty brown.



Water ingress ruins hub bearing

► In for a noise from the nearside front of a 2007 Land Rover Discovery which the owner suspected was a worn hub bearing, we jacked up the vehicle to check it out. Sure enough, the owner appeared to have correctly diagnosed the problem and we could feel both lateral play in the hub, as well as a roughness when spinning.

When starting to strip the front hub – which comes as a complete unit with the bearing fitted – we noticed that the inner CV boot on the front nearside shaft had a small split. With the hub stripped off, it made sense to replace the split boot at the same time.

This proved to be a good move as, having removed

the boot, we discovered that water had breached the gaiter and the grease in the joint was turning a rusty brown.

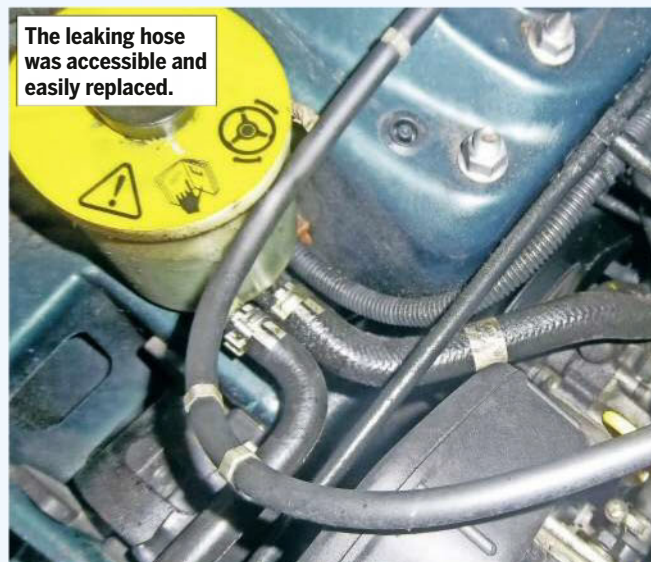
Cleaning out and re-greasing the joint before fitting the new boot, then reassembling the front hub, meant that not only was the noise silenced on this Disco, but the joint was not due to fail prematurely.

ROVER 414i

Power steering leak

► Having to top up the power steering fluid on her 1998 Rover 414i every couple of months was not a big inconvenience, but our customer knew the fluid level should not be going down.

A quick check around the power steering hoses revealed that there were a couple of small leaks in the system – one was in the main supply hose from the reservoir to the pump and the other was in the return hose from the oil cooler to the reservoir.



The leaking hose was accessible and easily replaced.

The second leak could be fixed by simply fitting a new clip to the hose, but the main supply hose had become porous and needed to be replaced. A new hose costs £18, so it

was not a great expense to cure the leak. Once the new hose had arrived and was fitted, we washed away the old escaped fluid and the steering was topped up and then bled out.

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SUZUKI SUPER CARRY CAMPER

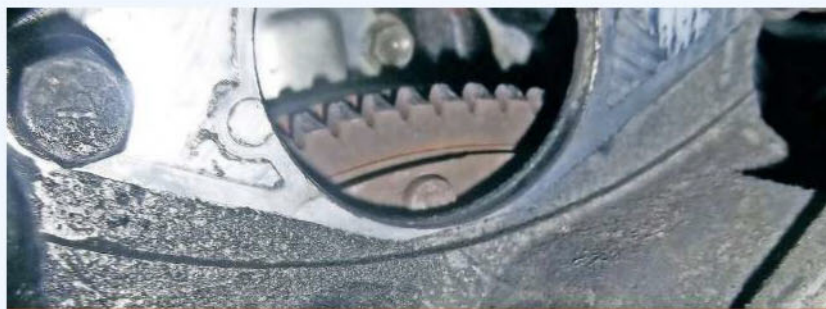
Starting troubles

► This 1990 Suzuki Super Carry Camper was loaded up and ready to take its family off for their annual holiday. Turning the starter produced a grinding, ringing sound. The owner phoned us, hoping we could get the vehicle back into service – quickly!

We were in no doubt that the problem was due to the starter motor not engaging. So after disconnecting the battery, we went underneath to remove the starter motor. On this little Suzuki everything is readily accessible and we soon had the old unit sitting on the bench.

It only took a glance to see that the teeth on the starter had not been pushing fully into mesh and had suffered as a result. Looking up at the flywheel, we were not surprised to see that the teeth on the flywheel ring gear were also in need of attention.

Although we managed to locate a starter motor for the 24-year-old Suzuki, locating the ring gear was not possible within the time demands set by the owner. The end result was an agreement to fit just the starter with a quick file up of the ring gear. How long this will last remains to be seen, but it will, in time, ruin the new £70 starter we had just fitted.



The teeth on the starter and ring gear were both badly burred.



MGF

Electrical problems

► Having broken down and had the problem diagnosed by the breakdown service, the owner of this 2000 MGF was pretty sure the alternator needed changing. However, it is our policy to always check for ourselves the required action – something that had stopped us from making a few costly mistakes over the years.

When driving the car into the workshop, we discovered that the power steering was not operating, but as it is electrically operated, we didn't pay it much attention initially. Then, while carrying out a few checks, the battery suddenly began to charge and the steering once again had power assistance.



The terminals on the back of the alternator were one of the points we cleaned.

Further inspection revealed that the problems were all down to a couple of poor connections in the system. Our remedy was to remove and clean all the terminals and the earth connections. Once this was completed, a road test confirmed that all was now operating correctly.

When the owner collected the vehicle, she was pleased at saving the cost of an alternator and also impressed that the power steering was working again – apparently it had packed up a few weeks previously but she had not bothered to get it fixed.

BMW 530D

Rattle from the rear

► If you were to ask what were the three most common causes of rattles, I would probably say: link arms, link arms and link arms. The small links that connect the anti-roll bar to the front or rear of the body are the most common cause of annoying noises. This is not really surprising when you consider how much the small joints at the end of these arms are used. Every lump and bump in the road is transferred through the small balljoint at the end of the links.

When this 2002 530d failed its MoT because of excessive movement in this area, it was quite a relief for the owner that at last he was



These small links can make a big noise.

going to get the constant rattle cured. The small links cost less than £15 each, so the price of silencing the rattle was not going to be a budget breaker.

Once the new links were fitted, the Beemer got its MoT ticket and the owner had a smooth, quiet ride again.

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The hidden filter and the hand-primer bulb.



RENAULT MEGANE SCENIC

Hidden fuel filter

► I can still remember the first Renault Megane diesel that I serviced, with the fuel filter hidden at the front of the offside inner wing. I had checked all the brakes and refitted the wheels, then, after draining the oil, I lowered the ramp back down to the ground to carry out the underbonnet work, only

to discover the offside wheel needed to be removed again.

There are quite a few variations to the actual filter fitted to the Megane and over the course of a week I had fitted three different types – one was an element, one was a metal canister and the third was a triangular-shaped plastic unit. The only common

factor to all three of the vehicles was that they all had a little bulb under the bonnet to hand-prime the filter before starting the vehicle.

The filter on the 2009 Renault pictured here was a metal canister, which is less messy than the element type, but comes with a higher price tag.

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FIAT PUNTO

Brake discovery

► In for a routine service, this 2000 Fiat Punto was not one we had seen before. When carrying out a full service, we always remove all road wheels to check the brakes, even if the pads are easily checked through the gap of its alloy wheels. This Fiat did not have alloys.

While everything else appeared to be in order, we discovered that one of the clips on the brake pad retaining pins was missing. Although the pin was a tight fit and had not started to wiggle out of position, the possibility was there. It is exactly this type of small but essential detail which we are always on the lookout for when carrying out a service. A quick check is never enough.



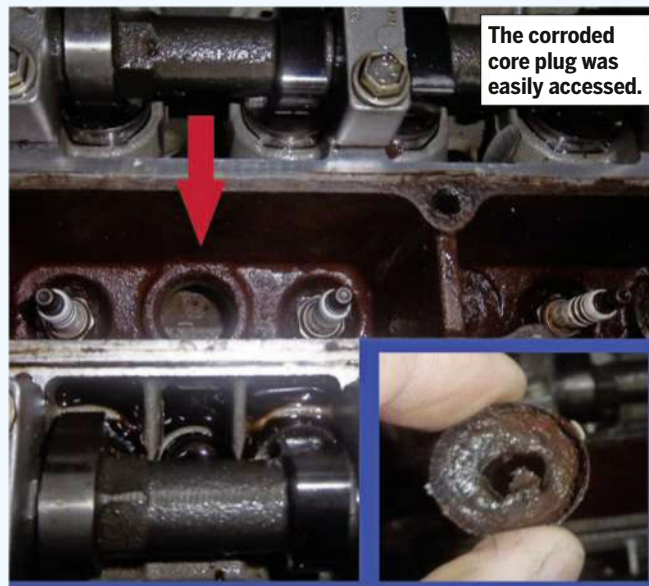
The clip was missing from the brake pad retaining pin.

FORD FOCUS

Core plug failure

► The problem that occurred on this 2005 Ford Focus is one we had seen in the past and, as the engines get older, will most likely see more of in the future. The owner was out on a family visit when he felt the engine begin to shudder. It wasn't long before the engine stalled altogether and refused to start again.

Calling out his recovery service, the Focus was towed to our workshop. We soon discovered that a leaking core plug in the head had allowed coolant to fill the channel where the spark plugs sit. As the coolant turned to steam



The corroded core plug was easily accessed.

it coated the plug leads in condensation, shorting out the spark and preventing the engine from running.

The repair job was not too complicated. Once the cam cover had been removed, there was plenty

of access to the two core plugs. After cleaning out the channel, we removed the old corroded core plugs and fitted two new shiny ones in place. Once all dried off and reassembled, the Focus ran smoothly again.

Follow Steve on Twitter:
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1 CLB600	6 Dr chest	660x305x365	£78.99	£94.79
2 CLB900	9 Dr chest	660x305x475	£99.98	£119.98
3 CLB200	2 Dr step up	672x310x195	£49.98	£59.98
4 CLB1005	5 Dr cabinet	685x465x795	£169.98	£203.98
5 CLB1007	7 Dr cabinet	685x465x955	£199.98	£239.98

SEE WEBSITE FOR PACKAGE DEALS WITH TOOLS

MECHANICS/PROFESSIONAL TOOL CHESTS/CABINETS

Clarke MECHANICS RANGE NOW INCLUDES **BALL BEARING ROLLER DRAWERS**

• Superb quality & value for automotive workshops

FULL EXTENSION ROLLER RUNNERS FOR SMOOTH OPENING ACTION

1 **£64.99** EXC.VAT
£77.99 INC.VAT

2 **£49.98** EXC.VAT
£59.98 INC.VAT

3 **£169.98** EXC.VAT
£203.98 INC.VAT

PROTECTIVE TOP MAT

MODEL	DESCRIPTION	DIMS WxDxH (mm)	EXC.VAT	INC.VAT
1 CTC600B	6 Dr chest	600x260x340	£52.99	£63.99
CTC900B	9 Dr chest	610x255x380	£64.99	£77.99
CTC500B	5 Dr cabinet	675x335x770	£119.98	£143.98
2 CTC800B	8 Dr chest/cab set	610x330x1070	£104.99	£125.99
CTC700B+	7 Dr cabinet	610x330x875	£124.98	£149.99
CTC1300B	13 Dr chest/cab	620x330x1320	£149.98	£179.98
3 CTC103	3 Dr step up chest	672x310x250	£49.98	£59.98
4 CTC106	6 Dr drop front	662x305x365	£64.99	£77.99
CTC109	9 Dr chest	662x305x421	£74.99	£89.99
5 CTC105	5 Dr cabinet	685x465x790	£169.98	£203.98
CTC107	7 Dr cabinet	685x465x950	£199.98	£239.98

‡ was £155.98 inc.VAT

EXTRA LARGE EXTRA HEAVY DUTY

BALL BEARING ROLLER DRAWERS

RUBBER GRIP SIDE HANDLES

GAS STRUTS Hold lid open

1 **£269.98** EXC.VAT
£323.98 INC.VAT

EXTRA DEEP DRAWERS

2 **£459.00** EXC.VAT
£550.80 INC.VAT

EXTRA LARGE SIDE HANDLE FOR EASY MOVEMENT FITS EITHER SIDE

EXTRA LARGE DRAWER PULLS

1.5M TALL

GREAT LOOKING, BIG 5" INDUSTRIAL CHROME SPOKED WHEELS FOR EASY MOVEMENT*

* Except on CBB231B & CBB230B
‡ was £215.98 inc.VAT

HEAVY DUTY & PROFESSIONAL TOOL STORAGE!

THE ULTIMATE IN TOOL STORAGE!
• Extra heavy gauge double wall steel construction

MAX. WEIGHT LOADING 500KG EVENLY DISTRIBUTED

RUBBER GRIP SIDE HANDLES

EXTRA LARGE SIDE HANDLE FOR EASY MOVEMENT FITS EITHER SIDE

EXTRA LARGE DRAWER PULLS

BLUE YELLOW BLACK & GOLD

FULL DETAILS - SEE IN-STORE OR VISIT WEBSITE

MODEL	DESCRIPTION	DIMS WxDxH (mm)	EXC.VAT	INC.VAT
1 CBB206B	6 Dr Chest	710x328x365	£99.98	£119.98
2 CBB209B	9 Dr Chest	710x315x420	£119.98	£143.98
CBB210B	10 Dr Chest	710x315x475	£139.98	£167.98
3 CBB203B	3 Dr step up	710x315x250	£69.98	£83.98
CBB215B	5 Dr Cabinet	758x468x815	£199.98	£239.98
4 CBB212B	3 Dr Cabinet	755x470x810	£169.98	£203.98
5 CBB217B	7 Dr Cabinet	758x468x975	£249.98	£299.98
CBB213B	3 Dr Cabinet	758x481x975	£199.98	£239.98

GREAT LOOKING, BIG 5" INDUSTRIAL CHROME SPOKED WHEELS FOR EASY MOVEMENT

Clarke HD PLUS TOOL CHESTS/CABINETS

LOCKABLE FRONT COVERS STORE NEATLY WITHIN CABINET

BALL BEARING ROLLER DRAWERS

1 **£179.98** EXC.VAT
£215.98 INC.VAT

PRICE CUT
* **£179.98** EXC.VAT
£215.98 INC.VAT
WAS £227.98 inc.VAT

NEW

LARGE 37" CABINET

MODEL	DESCRIPTION	DIMS LxWxH MM	EXC.VAT	INC.VAT
1 CBB209DF	9 Dr chest	710x370x420	£129.98	£155.98
2 CBB211DF	11 Dr Cabinet	785x490x1075	£299.98	£359.98
3 CBB309DF	9 Dr chest	975x370x420	£179.98	£215.98
4 CBB311DF	11 Dr Cabinet	1045x490x1075	£379.00	£454.80

MODEL	SIZE	DESCRIPTION	DIMS WxDxH (mm)	EXC.VAT	INC.VAT
CBB306BG+	36"	6 Dr Chest	910 x 305 x 47	£169.98	£203.98
CBB229B	41"	21 Dr chest	1045x415x486	£249.98	£299.98
CBB315	36"	5 Dr Cabinet	927 x 416 x 985	£299.98	£359.98
CBB228B	41"	8 Dr cabinet	1126x468x1000	£399.00	£478.80
1 CBB224B	41"	14 Dr chest	1045x415x486	£269.98	£323.98
2 CBB226B	41"	16 Dr cabinet	1126x468x1000	£459.00	£550.80
CBB231B	56"	9 Dr chest	1460x615x490	£419.00	£502.80
CBB230B	56"	13 Dr cabinet	1503x622x1011	£649.00	£778.80

Clarke BOLTLESS SHELVEING

• Simple, fast assembly in minutes using only a hammer

ROLLED EDGE UPRIGHTS GIVE:

- EXTRA STRENGTH
- SMOOTHER FINISH
- SLEEK LOOK

ASSEMBLE AS SHELVEING, BENCH OR CORNER UNIT

FROM **£29.98** EXC.VAT
£35.98 INC.VAT

PER SHELF

150 (evenly distributed) Strong 9mm fibreboard shelves

350 (evenly distributed) Strong 12mm fibreboard shelves

Contents not included (all items)

CHOICE OF 5 COLOURS

RED, BLUE, BLACK, SILVER & GALVANISED STEEL

MODEL	SHELF DIMS WxDxH (mm)	EXC.VAT	INC.VAT
150Kg	800x300x1500	£29.98	£35.98
350Kg	900x400x1800	£49.98	£59.98

SAVE 10%

WHEN YOU BUY ANY MIX OF 5 FROM THIS RANGE
SAVE AT LEAST £17.99 INC.VAT

NEW STORE
MANCHESTER CENTRAL - NOW OPEN

ALUMINIUM RACING JACKS

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

FROM ONLY **£84.99** EX.VAT
£101.99 INC.VAT

steel chassis

Clarke RACING

Machine Mart

NOW 65 SUPERSTORES NATIONWIDE

WHERE QUALITY COSTS LESS



airmaster

TURBO AIR COMPRESSORS

8/250 Superb range ideal for DIY, hobby & semi-professional use

FROM ONLY **£79.98** EX.VAT
£95.98 INC.VAT

HUGE CHOICE OF SPRAY GUNS & AIRTOOLS

MODEL	MOTOR CFM	TANK	EX.VAT	INC.VAT
Tiger 8/250	2Hp	7.5	£79.98	£95.98
Tiger 7/250	2Hp	7	£89.98	£107.98
Tiger 11/250	2.5Hp	9.5	£119.98	£143.98
Tiger 8/510	2Hp	7.5	£129.98	£155.98
Tiger 11/510	2.5Hp	9.5	£149.98	£179.98

Clarke 2 TONNE TROLLEY JACKS

CTJ2001G

FROM ONLY **£19.98** EX.VAT
£23.98 INC.VAT

Voted Best Buy in Car Mechanics Test

MODEL	TYPE	EX.VAT	INC.VAT
CTJ2B	DIY	£19.98	£23.98
CTJ2MB	DIY	£24.99	£29.99
CTJ2250LP*	Low Profile Pro Instant	£39.98	£47.98
CTJ2JLG	Pro Instant	£69.98	£83.98
CTJ2001G	Pro Garage	£74.99	£89.99
CTJ2GLC#	Pro Long High Lift	£169.98	£203.98

* CTJ2250LP has a 2.25 tonne capacity, has a low entry of only 80mm and includes 2 sockets

Clarke 3 TONNE JACKS

CTJ3000G

FROM ONLY **£44.99** EX.VAT
£53.99 INC.VAT

quick lift

JACKS ALSO IN STOCK UP TO 5 TONNE

MODEL	TYPE	MIN-MAX mm	EX.VAT	INC.VAT
CTJ3000QL	Quick Lift	195-520	£44.99	£53.99
CTJ3000G	Pro Instant	145-520	£83.99	£100.79
CTJ3000G	Pro Garage	120-520	£84.99	£101.99

Clarke PRO AIR TOOLS

CAT127

FROM ONLY **£19.98** EX.VAT
£23.98 INC.VAT

HUGE CHOICE IN-STORE/ONLINE

MODEL	DESCRIPTION	EXC.VAT	INC.VAT
CAT127	3" Cut off tool	£22.99	£27.99
CAT128	1/4" Die Grinder	£19.98	£23.98
CAT131	1/2" Impact Wrench	£59.98	£71.98
CAT132	13Pc 1/2" Impact Wrench Kit	£74.99	£89.99
CAT133	3" Cut Off Tool & 1/4" Die Grinder	£47.99	£57.99
CAT134	1/2" Reversible Ratchet	£34.99	£41.99
CAT136	6" Dual Action Sander	£34.99	£41.99
CAT137	3/8" Keyless Reversible Drill	£34.99	£41.99
CAT139	150mm Air Hammer inc 4 Chisels	£19.98	£23.98

Clarke 3HP V TWIN AIR COMPRESSORS

TIGER 16/510

FROM ONLY **£219.98** EX.VAT
£263.98 INC.VAT

Ideal for air tools and spraying equipment

MODEL	AIR RECEIVER	AIR DISPLACEMENT	EXC. VAT	INC. VAT
Tiger 16/510	50 litre	14.5 cfm	£219.98	£263.98
Tiger 16/1010	100 litre	14.5 cfm	£269.98	£323.98

Clarke SPRAY GUNS

PRO12C

FROM ONLY **£19.98** EX.VAT
£23.98 INC.VAT

HUGE CHOICE IN-STORE/ONLINE

MODEL	DESCRIPTION	EX.VAT	INC.VAT
PRO12C/14C/18C	1.2mm, 1.4mm, 1.8mm	£19.98	£23.98
PG14	Pro, Gravity	£26.99	£32.99
SP14/18C	1.4mm, 1.8mm	£27.99	£33.99
PRO12C	HVP AP15, 2.2mm	£27.99	£33.99

Clarke CAR RAMPS

FROM ONLY **£26.99** EX.VAT
£32.99 INC.VAT

Lift cars safely and quickly • Tough angled steel construction

MODEL	CAPACITY	EXC.VAT	INC.VAT
CR2	2000KG	£26.99	£32.99
CRW25	2500KG	£36.99	£44.99

UK MADE

Clarke HYDRAULIC BOTTLE JACKS

FROM ONLY **£7.99** EX.VAT
£9.59 INC.VAT

MODEL	EX.VAT	INC.VAT	MODEL	EX.VAT	INC.VAT
2 tonne	£7.99	£9.59	8 tonne	£17.99	£21.59
4 tonne	£11.99	£14.39	12 tonne	£24.99	£29.99
6 tonne	£14.99	£17.99	20 tonne	£34.99	£41.99

Clarke BODY REPAIR KITS

FROM ONLY **£79.98** EX.VAT
£95.98 INC.VAT

Includes metal case • Fast action pump

MODEL	CAPACITY	EX.VAT	INC.VAT
CS4BRK	4 tonne	£79.98	£95.98
CS10BRK	10 tonne	£139.98	£167.98
CS10SBRK*	10 tonne	£149.98	£179.98

Clarke AUTOMOTIVE WHEEL DOLLY SET

AWD1

FROM ONLY **£44.99** EX.VAT
£53.99 INC.VAT

Four swivel castors for easy movement in confined spaces • Heavy duty steel construction - load rating 500kg per dolly

Clarke INDUSTRIAL AIR COMPRESSORS

FROM ONLY **£369.98** EX.VAT
£443.98 INC.VAT

Offers the durability & reliability demanded by professionals.

MODEL	CFM	MOTOR/CVTR (HP) (LTR)	EXC.VAT	INC.VAT
SEV11C*	9	2	£369.98	£443.98
SE16C100*	14	3	£399.00	£478.80
SE16C150*	14	3	£439.00	£526.80
SE16C200*	14	3	£519.00	£622.80
SE18*	18	4	£569.00	£682.80
SE26*	23	5	£689.00	£826.80
SE29+†	28	2x3	£969.00	£1174.80
SE36*	30	7.5	£979.00	£1174.80
SE37+†	36	2x4	£1099.00	£1318.80
SE46#*	40	10	£1499.00	£1798.80

* 230V Supply • Run From 30 Amp Supply • Run From 40 Amp Supply • 400V 3 Phase • Supplied With Direct On-Line Starter • Supplied With Sequential Direct On-Line Starter • V-Twin • Supplied With Pre-Wired Star Delta Starter

was £838.00 inc. VAT

Clarke ARC WELDERS

For home user, automotive and industrial applications.

FROM ONLY **£46.99** EX.VAT
£56.39 INC.VAT

MODEL	AMPS	EXC.VAT	INC.VAT
EA110	40-100	£46.99	£56.39
105N	40-100	£49.98	£59.98
EA165	65-160	£62.99	£75.59
115N	30-110	£64.99	£77.99
EA200	60-200	£89.98	£107.98
160N	40-150	£67.99	£81.59
190N	50-185	£94.99	£113.99
190TEN#	35-180	£139.98	£167.98
235TEN#	40-210	£149.98	£179.98

Clarke AXLE STANDS

FROM ONLY **£18.49** EX.VAT
£22.19 INC.VAT

Ratchet action for quick height adjustment • Sold in pairs

MODEL	MAX HEIGHT	MIN/MAX HEIGHT	EX.VAT	INC.VAT
CAX-3TBC	3	300-430mm	£18.49	£22.19
CAX-6TBC	6	400-615mm	£29.98	£35.98

Clarke DRILL PRESSES

CDS3

FROM ONLY **£19.98** EX.VAT
£23.98 INC.VAT

Drill not included

MODEL	EX.VAT	INC.VAT
CDF5EB	£19.98	£23.98

Clarke PRO 7" SANDER/POLISHER

FROM ONLY **£69.98** EX.VAT
£83.98 INC.VAT

Variable speed • Includes backing pad and wool bonnet • 1200W motor

Clarke 5 PIECE AIR TOOL KIT

FROM ONLY **£19.98** EX.VAT
£23.98 INC.VAT

Gravity Fed Spray Gun • Air Wash Gun • Tyre Inflator • Air Blow Gun • 5 Metre Air Recoil Hose

Clarke NO GAS/GAS MIG WELDERS

Uses flux cored steel wire, which creates own gas shield as it burns

FROM ONLY **£169.98** EX.VAT
£203.98 INC.VAT

MODEL	AMPS	EXC.VAT	INC.VAT
90EN	24-90	£169.98	£203.98
105EN	30-100	£184.99	£221.99
151EN	30-150	£209.98	£251.98
160EN	30-150	£259.98	£311.98

Clarke NO GAS/GAS MIG WELDERS

Professional • Turbo Fan Cooled • Fast conversion to gas with optional accessories

FROM ONLY **£131.98** EX.VAT
£159.98 INC.VAT

*no gas only • was £203.98 inc.VAT

MODEL	MIN/MAX AMPS	EXC.VAT	INC.VAT
MIG 120NG*	35/90	£109.98	£131.98
MIG 145	35/135	£149.98	£179.98
MIG 152 †	40/140	£164.98	£197.98
MIG 180	40/160	£179.98	£215.98
MIG 196	40/180	£199.98	£239.98

Clarke ENGINE STANDS

FROM ONLY **£49.98** EX.VAT
£59.98 INC.VAT

Rotates through 360° • Engines up to 227Kg • Fully tested to proof load

MODEL	EX.VAT	INC.VAT
CES500A	£49.98	£59.98
CES750A (SHOWN)	£59.98	£71.98

Clarke ENGINE/GEARBOX SUPPORTS

FROM ONLY **£69.98** EX.VAT
£83.98 INC.VAT

Aids removal of gearboxes and transmissions • Max Cap. 500Kg

Clarke BATTERY CHARGERS/ENGINE STARTERS

FROM ONLY **£47.98** EX.VAT
£57.98 INC.VAT

Ammeter • Multi-position charge regulator • Overload protection on charging cycle

MODEL	MAX AMPS CHARGE/BOOST	EX.VAT	INC.VAT
BC100N	15/100	£47.99	£57.99
BC130C	15/120	£61.99	£74.99
BC190	38/180	£89.98	£107.98
BC210C	15/120	£94.99	£113.99
BC410E	35/400	£129.98	£155.98
BC520N	50/510	£189.98	£227.98

Clarke ARC ACTIVATED HEADSHIELDS

CWH6

FROM ONLY **£39.98** EX.VAT
£47.98 INC.VAT

Activates instantly when Arc is struck • Protects to EN379 • Suitable for arc, MIG, TIG & gas welding

Clarke ARC/TIG INVERTERS

Used for ARC/TIG welding • Low amp operation - ideal for auto bodywork & mild stainless steel

FROM ONLY **£129.98** EX.VAT
£155.98 INC.VAT

PRICE CUT • WAS £187.98 INC.VAT

MODEL	AMPS	ELECTRODE DIA.	EXC.VAT	INC.VAT
AT101†	10/80	1.6 - 2.5mm	£129.98	£155.98
AT132	10/130	1.6 - 3.2mm	£169.98	£203.98
AT161	10/160	1.6 - 4.0mm	£199.00	£238.80
AT135	30/130	3.25mm	£219.00	£262.80

Clarke LOAD LEVELLER

FROM ONLY **£29.98** EX.VAT
£35.98 INC.VAT

Max load capacity - 500Kg • Fine screw adjustment for precise leveling

Clarke ANTI FATIGUE FOAM FLOORING

FROM ONLY **£19.98** EX.VAT
£23.98 INC.VAT

6 interlocking foam tiles protect flooring & provide comfort when standing or kneeling • Ideal for use in garages, workshops etc. • Each tile is 610x610mm & includes detachable, yellow borders

Clarke HYDRAULIC MOTORCYCLE LIFT

FROM ONLY **£349.00** EX.VAT
£418.80 INC.VAT

Safety locking device • Hinged ramp for easy loading • Table size 2200 x 685mm • Fully mobile • Max lift height 770mm

Clarke MIG WELDERS

Quality machines from Britain's leading supplier • All models featured are fan cooled (except PRO90) • See online for included accessories

FROM ONLY **£179.98** EX.VAT
£215.98 INC.VAT

MODEL	MIN-MAX AMPS	EX.VAT	INC.VAT
PRO90	24-90	£179.98	£215.98
110E	30-100	£214.99	£257.99
135TE Turbo	30-130	£239.98	£287.98
151TE Turbo	30-150	£269.98	£323.98
165TE Turbo	30-155	£339.99	£406.80
175TECM Turbo	30-175	£409.00	£490.80
205TE Turbo	30-185	£449.98	£539.98

Clarke 24V CORDLESS IMPACT WRENCH

FROM ONLY **£89.98** EX.VAT
£107.98 INC.VAT

Inc. 17, 19, 21 & 23mm chrome vanadium sockets • 2x 24V Ni-Cd Batteries & 1 hour battery charger

Clarke ENGINE CRANES

FROM ONLY **£144.99** EX.VAT
£173.99 INC.VAT

Folding and fixed frames available • Robust, rugged construction • Overload safety valve

MODEL	DESC.	EX.VAT	INC.VAT
CFC500F	1/2 ton folding	£144.99	£173.99
CFC100	1 ton folding	£149.98	£179.98
CFC100LR	1 ton long reach	£189.98	£227.98

Clarke HYDRAULIC MOTORCYCLE LIFT

FROM ONLY **£349.00** EX.VAT
£418.80 INC.VAT

FOLDS FLAT FOR EASY STORAGE

Clarke PACKAGE DEAL

TOOL CHEST AND TOOLS

SAVE OVER £62 OFF OUR NORMAL PRICE

FROM ONLY **£259.98** EX.VAT
£311.98 INC.VAT

329 HAND TOOLS

This great value set includes CT900B 9 drawer chest & CT500B 5 drawer cabinet • Includes the most popular sockets, spanners, pliers, drivers, wrenches etc

Clarke JUMP STARTS

Integral work light • Extra long 1M leads
910 includes air compressor
Long life battery

BEST VALUE

FROM ONLY **£49.98** EX.VAT
£59.98 INC.VAT

MODEL	START BOOST	PEAK AMPS	EX VAT	INC VAT
900	400A	900A	£49.98	£59.98
910	400A	900A	£59.98	£71.98
4000	700A	1500A	£109.98	£131.98
12/24	1000A@12v	2000A@12v	£129.98	£155.98
	500A@24v	1000A@24v		

HEAVY DUTY 17KG

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Clarke HEAVY DUTY INSTANT GARAGES/WORKSHOPS

• Ideal for use as a garage/workshop • Extra tough triple layer weatherproof fabric • Heavy duty powder coated steel tubing • Ratchet tight tensioning

NEW 10' RANGE NARROWER WIDTH GREAT WHERE SPACE IS TIGHT

FROM ONLY **£219.90** EX.VAT
£262.90 INC.VAT

ZIP CLOSE DOOR

MODEL	SIZE (LxWxH)	EXC.VAT	INC.VAT
CIG1015	4.6 x 3 x 2.4M	£219.90	£262.80
CIG1216	4.9 x 3.7 x 2.6M	£249.90	£298.80
CIG1020	6.1 x 3 x 2.4M	£269.90	£322.80
CIG1220	6.1 x 3.7 x 2.5M	£299.90	£358.80
CIG1224	7.3 x 3.7 x 2.5M	£379.90	£454.80

LENGTH UP TO 24'

Clarke GENERATORS

Honda engine models available

FROM ONLY **£89.98** EX.VAT
£107.98 INC.VAT

CHECK FRAME TYPE WHEN ORDERING

was £191.98 inc.VAT

MODEL	KVA	HP	EX VAT	INC VAT
G720	0.7	-	£89.98	£107.98
G1200	1.1	-	£149.98	£179.98
G6250	2.4	6.5	£189.98	£227.98
G6300	2.8	7	£229.98	£275.98
G6300	3	8	£359.00	£430.80
G64050ES	4.5	11	£469.00	£562.80
G65100ES	5.5	13	£539.00	£646.80

Clarke JETSTAR PRESSURE WASHERS

JET9000 & 9000 include hose reel

FROM ONLY **£49.98** EX.VAT
£59.98 INC.VAT

Detergent applicator for extra cleaning power

MODEL	MOTOR	MAX. PRESSURE	EXC.VAT	INC.VAT
JS1750	1600w	1522psi	£49.98	£59.98
JS1900	2000w	1957psi	£79.98	£95.98
JET8000	2400w	2610psi	£134.99	£161.99
JET9000	2600w	2900psi	£159.98	£191.98

Clarke PETROL POWER WASHERS

FROM ONLY **£179.98** EX.VAT
£215.98 INC.VAT

Honda & Diesel engine models available

PLS190N

MODEL	MAX ENGINE PRESSURE	EX	INC
Tiger 1700	1595psi	2.6	£179.98 £215.98
Tiger 2500	2465psi	4	£249.98 £299.98
Tiger 2900	2900psi	6.5	£379.98 £455.98
PLS190N	2697psi	6.5	£379.98 £455.98
PLS260N	3625psi	13	£569.98 £682.80

Clarke 3-IN-1 SHEET METAL MACHINES

NEW

FROM ONLY **£169.98** EX.VAT
£203.98 INC.VAT

Bend, Roll & Shear metal up to 1mm thick • Min. Rolling Diameter: 30mm • Bending angle 0-90°

MODEL	BED WIDTH	EX VAT	INC VAT
SBR305	305mm	£169.98	£203.98
SBR610	610mm	£349.00	£418.80

Clarke POLISHING KITS

Kit inc: Tapered spindle, Coloured mop for initial cleaning, pure cotton mop for polishing and polishing compound

FROM ONLY **£19.98** EX.VAT
£23.98 INC.VAT

4" £19.98 Ex.VAT £23.98 Inc.VAT
6" £24.98 Ex.VAT £29.98 Inc.VAT
8" £29.98 Ex.VAT £35.98 Inc.VAT

Clarke BENCH GRINDERS & FLOOR STANDS

Stands come complete with bolt mountings and feet anchor holes

STAND FROM ONLY **£41.99** EX.VAT
£50.39 INC.VAT

FROM ONLY **£27.98** EX.VAT
£33.58 INC.VAT

6" & 8" AVAILABLE WITH LIGHT

CBG8W features 8" whetstone, 1" & 2" diamond, # With sanding belt

MODEL	DUTY	WHEEL DIA.	EX VAT	INC VAT
CBG6RP	DIV	150mm	£27.99	£33.59
CBG6RZ	PRD	150mm	£37.99	£45.59
CBG6RSC	HD	150mm	£47.99	£57.59
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Clutch, DMF & release bearing

PART SEVEN: In the final instalment of our Jaguar X-TYPE project, **Rob Hawkins** follows the work involved in separating the engine and gearbox to renew the clutch and flywheel.

Autodata calculates that a clutch and dual mass flywheel renewal on a Jaguar X-TYPE diesel should take just over seven hours, but we were anticipating a few hours more to take photographs and notes. However, this isn't a job that can really be tackled on a driveway or in a single garage, armed with a trolley jack and axle stands. You ideally need a two-post lift to allow you to stand underneath the engine bay area and manoeuvre the gearbox across to the nearside to provide enough space to be able to renew the clutch, flywheel and release bearing.

With that in mind, we visited our local garage, MJ Motors, to make use of their facilities and mechanics. As you'll see from the step-by-step photographs, we're glad we had the extra help, especially when we'd finished the job

and realised the starter motor had failed (it's a common problem, caused by clutch dust contamination).

One alarming discovery we made this month concerned the front tyres. When we removed them, we found the nearside front was excessively worn down the inside edge of the tread, and more so in one area. This uneven and excessive wear wasn't typical of poor tracking, but possibly due to the age and quality of the tyre. We've now fitted a full set of new tyres from Davanti and have noticed the road noise has dramatically reduced.

So our X-TYPE project has come to an end. We've covered just over 3000 miles, spent around £500 on fuel, and averaged 44 miles to the gallon. When we bought the car at the end of last year, it had a noisy rear wheel bearing, a rattling rear suspension and clutch release bearing, a cool running

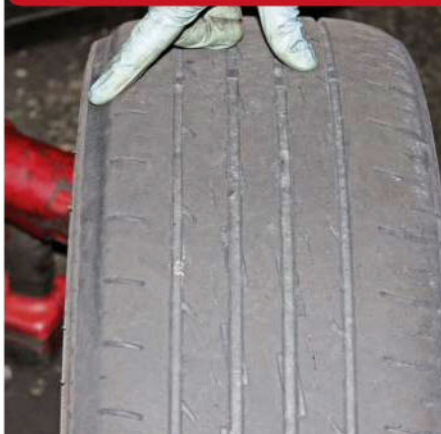


JOBS LIST

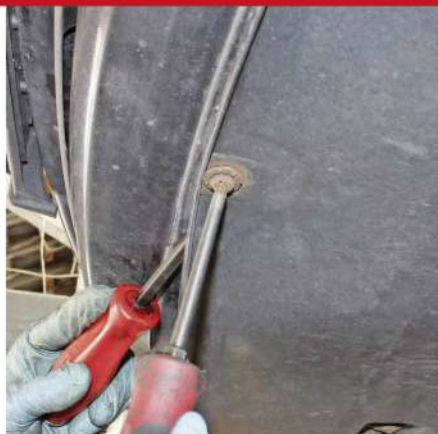
✓ SERVICE ENGINE	PART 2 MAR 15
✓ FIX PULLING TO LEFT ON BRAKING	PART 2 MAR 15
✓ RENEW WORN REAR ANTI-ROLL BAR D-BUSHES	PART 2 MAR 15
✓ RENEW AND SERVICE BRAKES	PART 2 APR 15
✓ REPLACE RUSTY WINDOW GLASS SEALS STRIPS	PART 3 APR 15
✓ DIAGNOSE COOL ENGINE RUNNING	PART 4 MAY 15
✓ RENEW WORN REAR WHEEL BEARING	PART 4 MAY 15
✓ INVESTIGATE ERRATIC CLIMATE CONTROL/REFILL AIRCON GAS	PART 5 JUN 15
✓ FIX OFFSIDE REAR DOOR'S CENTRAL LOCKING	PART 6 JULY 15
✓ RUSTPROOF SILLS	PART 6 JULY 15
✓ INVESTIGATE NOISY CLUTCH RELEASE BEARING	PART 7 AUG 15
✓ FIX FRONT FOGLIGHTS	PART 7 AUG 15

engine and brakes that veered to one side. We've managed to fix all of those problems and more, as well as improving many aspects of our Jaguar.

DUAL MASS FLYWHEEL & CLUTCH RENEWAL



1 With the X-TYPE raised on a two-post lift, we removed the undertray, which is secured with Torx T30 screws, then both front wheels. This is when we noticed the uneven and excessive wear on the inside edge of both tyres.



2 The small plastic undertray that's fitted underneath the front bumper needs to be detached to allow access to the frontmost subframe mounting bolts. We had several Torx T30 screws to undo – all of them had seized.



3 We resorted to cutting the heads off the screws with an angle grinder and metal cutting disc. After decapitating a few screws, we could now pull down on the front undertray and reach the subframe bolts.



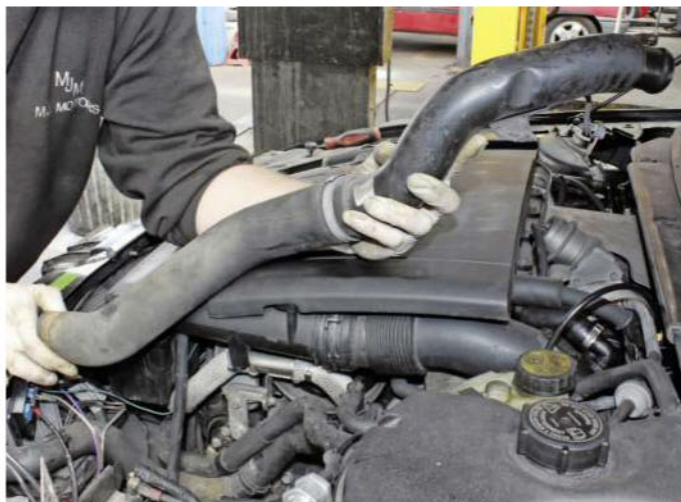
THE BRITISH RANGE

BLUE PRINT PARTS NOW AVAILABLE FOR JAGUAR, LAND ROVER & MINI





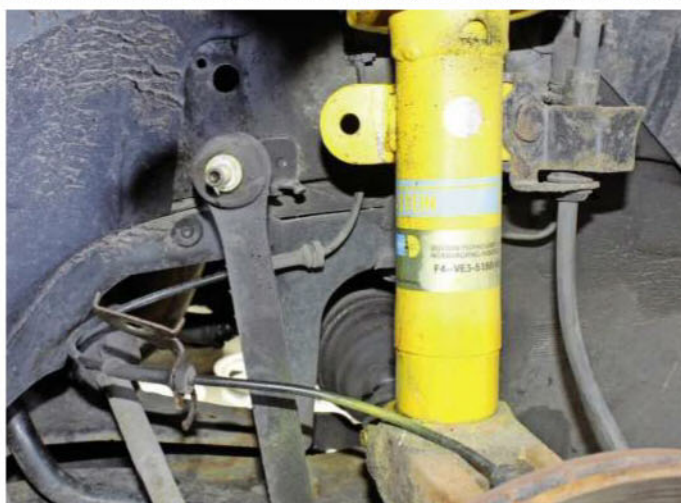
4 In the engine bay, we needed to gain access to the top of the gearbox to detach the gear linkage and undo the upper bellhousing bolts. The first component to be removed was the battery, which is secured with a clamp and 10mm nuts. Rob has memorised the code for the radio!



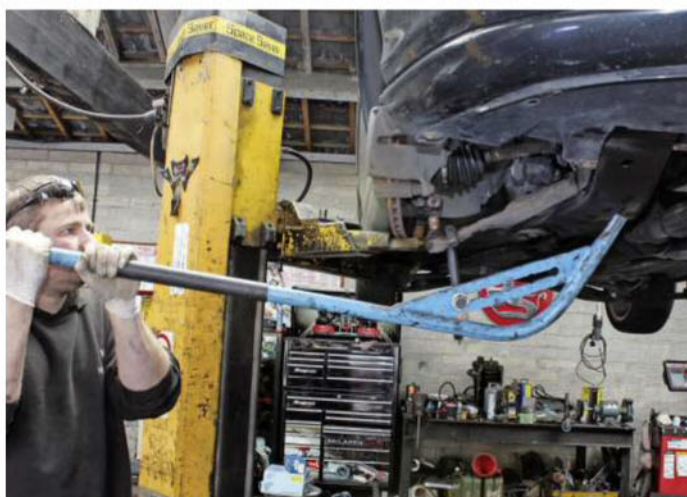
5 A boost pipe from the turbo to the bottom of the front-mounted intercooler obstructs the removal of the gearbox, so we detached this by undoing a few jubilee clips and a 13mm mounting nut. The jubilee clip at the base of the intercooler was rusty it broke.



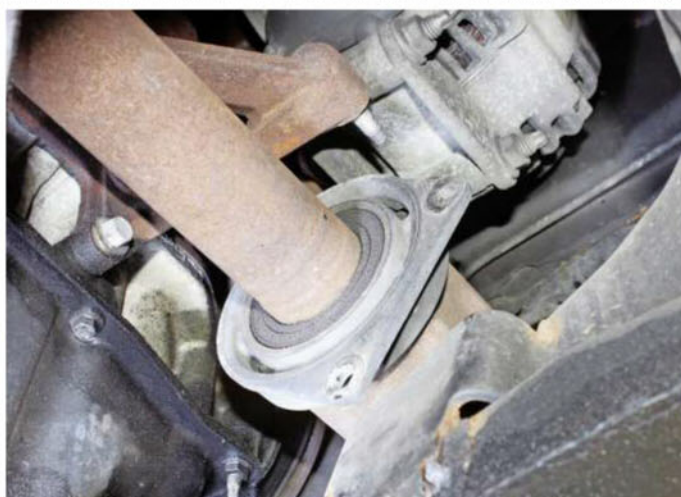
6 The two gear linkage cables at the gearbox were straightforward to detach by pushing down on their connectors. Then there were 13mm and 15mm nuts to undo to detach their mounting bracket.



7 The ends of the front anti-roll bar obstruct the movement of the driveshafts, which could be a problem when manoeuvring the gearbox, so they were detached at the struts by undoing the 15mm nuts.



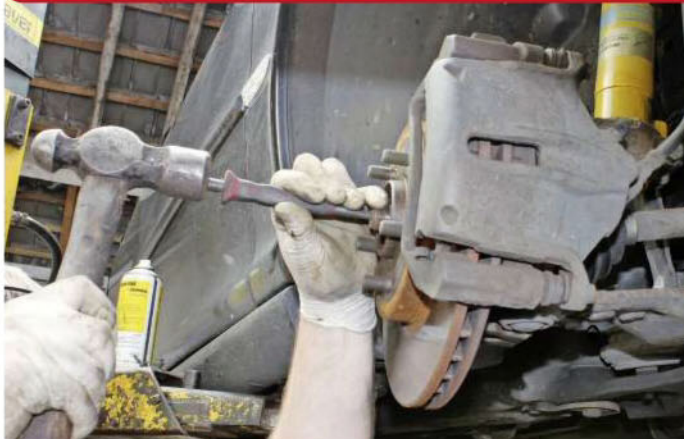
8 The lower arm outer balljoint needs to be separated from the upright to enable the driveshaft to be moved aside when working on the gearbox. First, the pinch bolt and 18mm nut were undone and a lever was used to separate the balljoint.



9 The offside front driveshaft is routed through a bearing housing, which restricts its movement. After undoing two 13mm bolts, it was possible to move the driveshaft when detaching it from, and connecting it to, the gearbox.

BLUE PRINT THE BRITISH RANGE BLUE PRINT PARTS NOW AVAILABLE FOR JAGUAR, LAND ROVER & MINI 

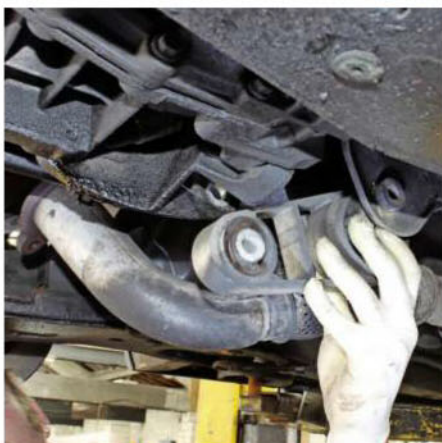
DUAL MASS FLYWHEEL & CLUTCH RENEWAL *continued*



10 After undoing the 32mm hub nut on each side of the car, we tried to release the end of each driveshaft, but both of them had seized. At this stage, we hoped there would be enough room to manoeuvre the gearbox and driveshafts.



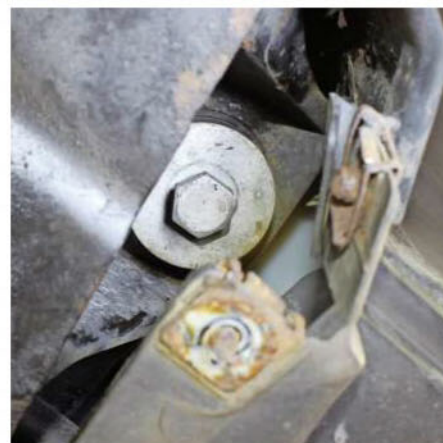
11 We decided to remove the exhaust system's centre section to ensure we had good access to the offside driveshaft. After undoing a couple of 15mm nuts at both ends of this centre section, it was straightforward to extract.



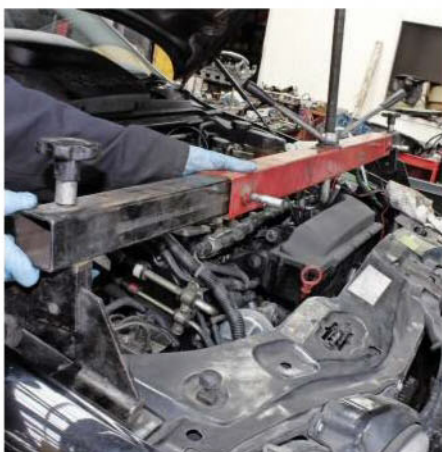
12 The rear mount for the gearbox, which is underneath the car, was detached; it's secured with two 15mm bolts. With the gearbox still attached to the engine, along with an upper mount, we didn't feel the need to fit a transmission jack at this stage.



13 The front subframe needs to be dropped down a little to be able to move the gearbox. First, we undid the two 15mm bolts on each rear subframe mount and slackened the larger 21mm bolt.



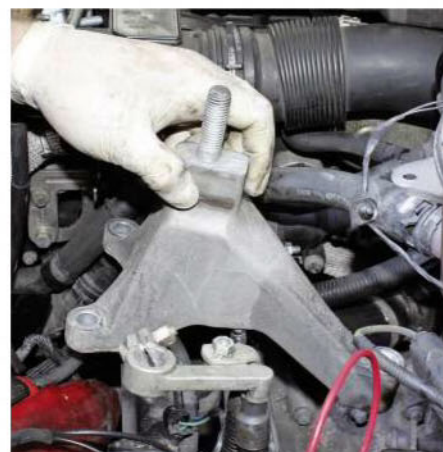
14 Prising back the plastic undertray that's attached to the bottom of the front bumper, we could see the frontmost subframe mounting bolts (21mm head). The nearside front was removed, but the offside front was left slack.



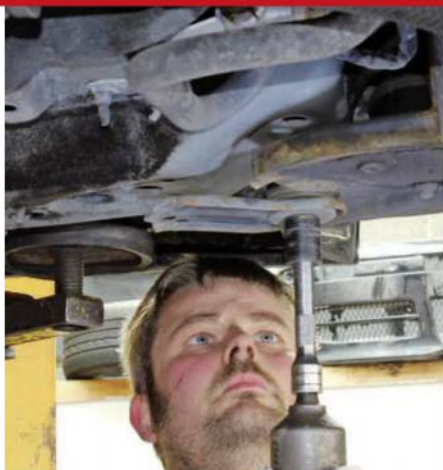
15 Returning to the engine bay, we fitted a support bar across the tops of the front wings, then fitted an exhaust clamp between it and the lifting eye that is fitted above where the engine and gearbox are connected.



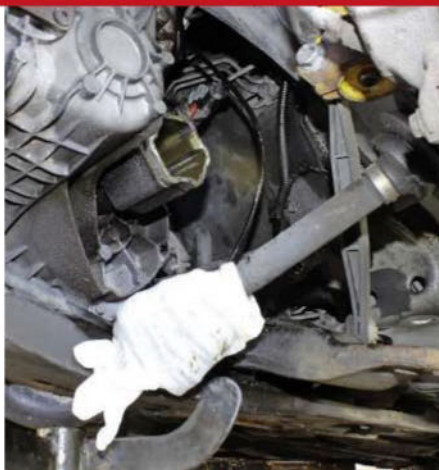
16 With the engine/gearbox supported, we tackled the upper gearbox mount, which is secured with a 21mm and four 15mm nuts. Once all of these fittings had been released, we could wobble the mount free and lift it out.



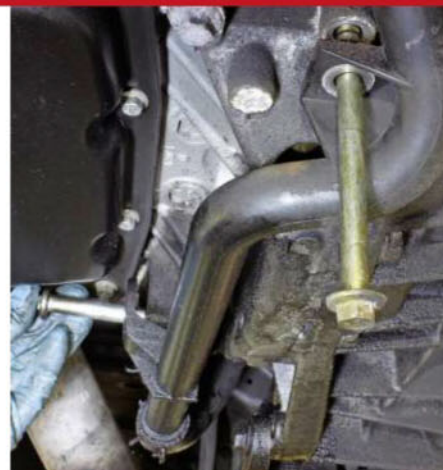
17 The gearbox mount consists of two halves and the part that remains attached to the gearbox may get in the way when the gearbox is being moved, so we decided to shift it by undoing its three 15mm nuts.



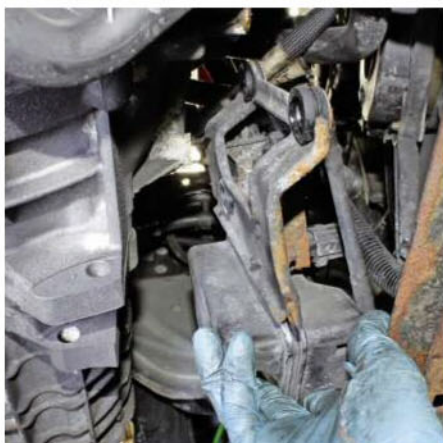
18 Back to the underneath of the engine. After fitting a transmission jack under the subframe, we then removed the 21mm nuts that secure the back of the front subframe to the underside of the body.



19 In preparation for the gearbox being moved, we extracted the nearside driveshaft and protected the end with a rubber glove. We couldn't release the other end from the hub as it was seized in position.



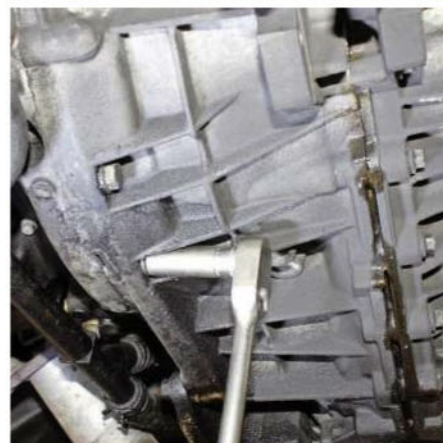
20 An oil cooler coolant pipe is routed underneath the engine and gearbox. Fortunately, it doesn't need to be removed, but its long 10mm and 13mm mounting bolts had to be undone.



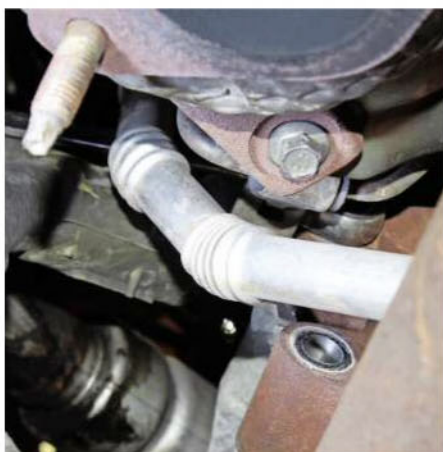
21 This vacuum canister for the EGR is secured to the side of the gearbox with three 13mm bolts, so it had to be detached and left suspended inside the engine bay. We could have disconnected everything to it, but there was space to leave it in position.



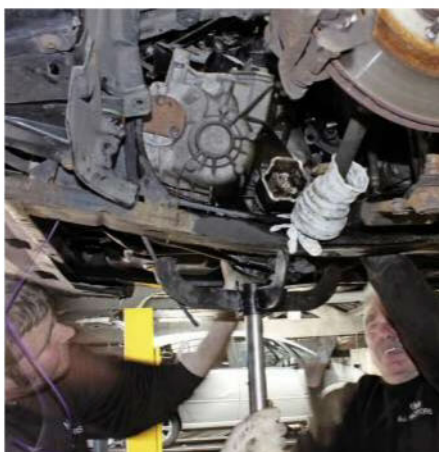
22 Looking through the nearside front wheelarch, we could see an earth strap mounted to the gearbox with a 13mm bolt. There was room to squeeze an extension bar through and undo the bolt to ensure the lead didn't get stretched.



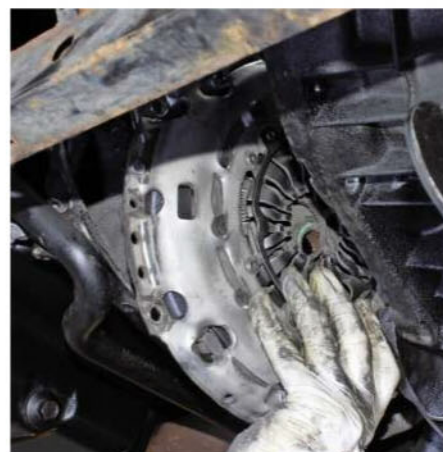
23 After all our previous hard labour, we were now finally ready to undo all the bellhousing bolts and separate the gearbox from the engine. We found three 13mm bolts across the top of the gearbox and another four along the bottom and the side (front).



24 We discovered two more bellhousing bolts underneath the turbo. There was just enough room to undo them with a spanner, but they can easily get missed. We were now ready to separate the gearbox and engine.



25 Mike and Dan Smith at MJ Motors made short work of separating the gearbox from the engine and moving it far enough over to the nearside to be able to access the clutch, flywheel and release bearing.



26 After undoing six 10mm bolts, the two-piece clutch assembly was removed, then eight Torx E14 bolts were undone and the flywheel was extracted. The old clutch wasn't too bad, but the flywheel was rattling.

BLUE PRINT THE BRITISH RANGE BLUE PRINT PARTS NOW AVAILABLE FOR JAGUAR, LAND ROVER & MINI 



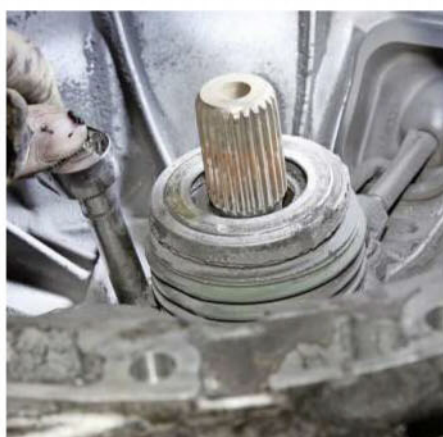
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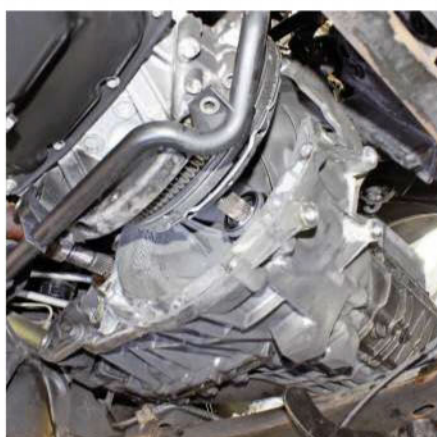
DMF & CLUTCH RENEWAL *continued*



27 We fitted new components from Blue Print. After checking they were the same as the parts we'd removed, the flywheel went in first, followed by the two-piece clutch with the help of an alignment tool. The Sachs clutch release bearing came from Euro Car Parts.



28 The hydraulic clutch release bearing is secured by two 8mm bolts and there's a pipe to disconnect. Once the old one was removed, we quickly fitted the new one to reduce the amount of fluid leaking out.



29 The gearbox was manoeuvred back into position, making sure the offside driveshaft was connected to the gearbox. Then we refitted the bellhousing bolts and spent a couple more hours refitting everything else.

DAVANTI TYRES

We've fitted a full set of 225/40 ZR18 tyres from Davanti to our X-TYPE because the old tyres were unevenly worn and misshapen. We suspected the old tyres were the cause of excessive road noise and we were right. After fitting the new tyres, balancing all the wheels (the fronts needed 20g each and the rears required 35g and 40g), we refitted them and drove for 150 miles. The road noise had been dramatically reduced and we didn't need to turn up the stereo to drown it out!



FAULTY FOGS

The previous owner told us the front foglights didn't work, but we've since tested them and they are working fine. If only all the faults on our Jag had been so simple to fix!

USEFUL CONTACTS

Blue Print www.blue-print.com

MJ Motors 01924 472404

Davanti Tyres www.davanti-tyres.com

Jaguar Forum www.jaguarforum.com

PROJECT COSTS



PURCHASE

£1000.00

PARTS COSTS

Road tax	£145.00
Rear ARB D-bushes (two)	£18.48
5 litres of Triple QX 5w30 fully-synthetic oil (two)	£49.60
Blue Print oil filter (ADJ132125)	£6.07
Blue Print oil filter removal tool (ADG05519)	£13.14
Blue Print air filter (ADJ132225)	£4.43
Blue Print fuel filter (ADJ132318)	£38.58
Blue Print pollen/cabin filter (ADJ132516)	£12.70
Blue Print torque wrench 5-25Nm (ADG05515)	£46.91
Rear anti-roll bar drop links from ECP	£31.66
Blue Print front brake discs (ADJ134356) & pads (ADJ134231)	£75.77
Blue Print rear brake discs (ADJ134357) & pads (ADJ134236)	£84.27
Used set of window seal strips from Eurojag	£60.00
Blue Print rear wheel bearing (ADJ138306)	£140.00
Blue Print glow plug removal tool (ADG05513)	£14.50
Bosch battery from ECP	£88.80
Blue Print glow plugs (ADJ131802)	£57.12
Main engine thermostat from ECP	£79.4
Oil cooler thermostat (Jaguar main dealer part)	£28.37
Brake pipe and pipe nuts	£5.00
MoT test	£35.00
Bilstein B12 suspension kit (part number 46-194046)	£930.78
Jaguar front upper strut bearings (C2S44944 and C2S30556)	£152.90
Aircon refill at Tasker and Lacy	£42.00
Noisekiller soundproofing kit including fitting	£300.00
Blue Print auxiliary drivebelt (AD04R735)	£8.00
Used glovebox from Eurojag	£36.00
Used NSR door lock from Eurojag	£30.00
Blue Print two-piece clutch kit (ADJ133005)	£186.09
Blue Print dual mass flywheel (ADJ133505)	£526.75
Sachs clutch release bearing from ECP	£33.96
Starter motor repair	£100.00
Davanti DX640 225/40ZR18 92Y XL tyres x 4 (including fitting)	£360.00
TOTAL COSTS	£4669.82

Blue Print prices supplied by Andrew Page



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Air Filter (Reisse)	£3.99
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Front Brake Pads (Fahren)	£14.49
Rear Brake Shoes (Braymann)	£26.49
Water Pump (First Line)	£33.05
Track Rod End (Fahren)	£8.49
Lambda Sensor (Cambiare)	£50.95

MG TF 1.8 2002-2009

Oil Filter (Reisse)	£3.59
Air Filter (Reisse)	£5.99
Fuel Filter (UFI)	£8.69
5L S/Synthetic Engine Oil (Comma)	£19.49
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Rear Brake pads (Fahren)	£16.99
Water Pump (Fahren)	£18.49
Track Rod End (First Line)	£11.18
Lambda Sensor (Cambiare)	£36.45

Prices correct as of 01/07/2015 and for typical model; some variants may be different



*Not all member stores currently offer buy online / collect in store but all stores offer a telephone ordering service.



New dampers & full service

PART FOUR: Our Ka may still have its original fuel filter and spark plugs in place! Plus, we find some interesting suspension bodgery. **Andrew Everett** describes how he put it right.

Having put the Ka's horribly neglected brakes to rights last month, our attention turned to the rest of it. Upon purchase, Editor Martyn had the disgusting engine oil changed; having done about 1000 miles, we wanted to change it again as part of a full service. Looking at the rest of the car suggests that it has been treated on a 'fix it when it breaks' basis, but it's stood up to this treatment surprisingly well.

Ford sometimes builds cars in unconventional ways. Things like the quick release fuel filter pipe connectors make servicing easy, but the 'use once' filter retaining clip is a bit strange. Still, at least you know if it has ever been changed!

Air-conditioning check

The aircon didn't work when we got the Ka, but neither did that of our Mercedes

C180K or Zafira projects. In both cases, a re-gas from KwikFit restored the systems to full working order. The same goes for the Ka, although the aircon system in these cars was never very good, taking quite a while to get into its stride. We will monitor its performance to confirm if there is a leak anywhere.

Shock tactics

Our final job this month was to change three dampers. Only three? When we got the car, the driver's front strut had just been replaced with a new KYB unit, but it had been fitted by someone who really should not be working on cars – the fact that they had not refitted the bump stop or the dust cover indicates their level of craftsmanship. Needless to say, we removed that strut and fitted a bump stop and dust cover.

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JOBS LIST

- ✓ REPLACE WATER PUMP, COOLANT & DRIVEBELT **PART 2 JUN 15**
- ✓ REPLACE HEATER VALVE & CHECK AIR-CONDITIONING **PART 2 JUN 15**
- ✓ REPLACE DAMAGED LEATHER STEERING WHEEL **PART 2 JUN 15**
- ✓ RENEW BRAKE DISCS, PADS, SHOES & FLUID **PART 3 JULY 15**
- ✓ RENEW REAR WHEEL BEARINGS **PART 3 JULY 15**
- ✓ SERVICE ENGINE **PART 4 AUG 15**
- ✓ CHECK GEARBOX OIL **PART 4 AUG 15**
- ✓ REPLACE FRONT & REAR DAMPERS **PART 4 AUG 15**
- ✗ REPAIR RUSTY REAR WING, PAINT BOTH SIDES & BONNET
- ✗ RUSTPROOF UNDERBODY & SILLS
- ✗ REPLACE TYRES
- ✗ RENOVATE ALLOY WHEELS

Plus anything else that goes wrong in the next few months

USEFUL CONTACTS

Frost Auto Restoration Techniques www.frost.co.uk
Euro Car Parts www.eurocarparts.com

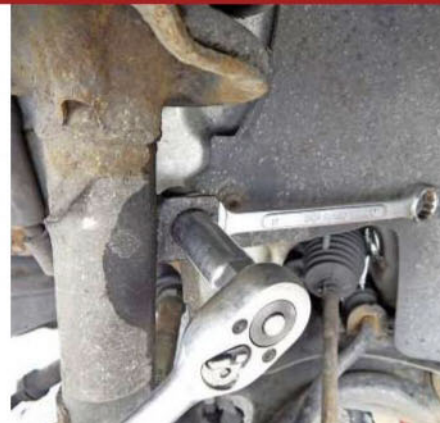
FRONT DAMPER RENEWAL



1 First, slacken this top nut with an 18mm ring spanner while holding the centre steady with a 6mm Allen key. The nut only secures the top mounting plate, so you won't get springs and bits flying everywhere when it's removed. Leave the plate in place for now.



2 Pull the front brake flexi-hose from the mounting lug on the strut. The hose follows a twisty route and can be badly split. Our hoses were in decent condition, so they didn't need replacing. Refit them with a dose of penetrating fluid to help ease them in.

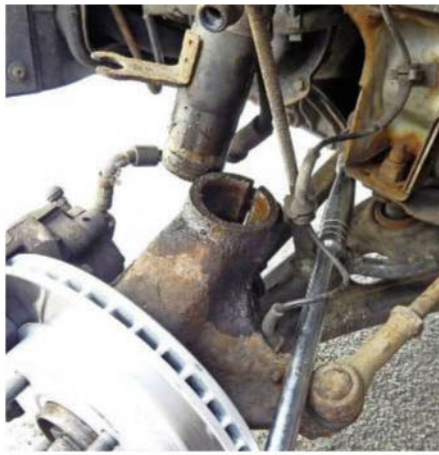


3 Now disconnect the anti-roll bar link from the front strut body by holding the centre pin steady with a 17mm open-ended spanner (as shown) and undoing the 16mm nut. Aftermarket links may have different sized nuts, of course.

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4 This 19mm bolt clamps the hub onto the strut. Be very careful here as the bolt can be rusty and snap off. Use heat if needed and plenty of penetrating fluid. Turn the bolt back and forth slowly, to ease it out. If it snaps, drill it and use a spline drive to remove the remains.



5 Force the front hub down off the strut, using a suitably-sized block of wood and a heavy hammer to beat the hub downwards. Apply lots of penetrating fluid while wiggling the hub from side to side to free it – it can be quite tough going.



6 With the strut removed, the top mount just comes off – it relies on the weight of the car as well as that top plate to secure it. You can see here the long threaded shaft, the brass 19mm retaining nut and the small top mount bearing – replace anything worn out.



7 Bring the spring compressors into play to clamp up the spring as much as possible. Compress it until the top spring plate is loose, then undo the 19mm brass top nut and remove the top spring plate and the spring. Now clean everything up and examine it for damage.



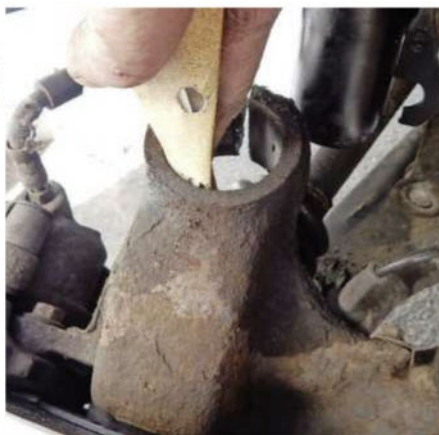
8 The rubber bump stop that had been left off the driver's side damper was replaced prior to our purchase. The bump stop is there to protect the damper from damage by bottoming out, while the rubber gaiter stops water and grit from damaging the damper shaft seals.



9 Here is the new KYB front damper from Euro Car Parts. No matter where you go, Ka dampers are quite expensive – you can get aftermarket BMW ones for less. We chose KYB as these Japanese dampers are renowned for being well made.



10 The new front nearside strut. It's almost impossible to torque the 19mm brass nut because you need to hold the damper shaft still with an Allen key – just use a dab of thread lock and do it up decently tight with a long ring spanner.



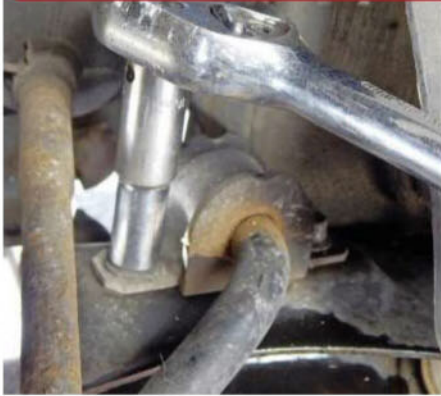
11 Before the strut can be fitted into the hub, the hub will need cleaning as it's a tight fit. Use coarse 120-grit emery until it's bright metal. Smear it with copper grease, then insert the strut body into the hub so the locating tang lines up with the slot in the hub.



12 With the tang lined up, get the strut started in the hub. Then lift a trolley jack under the front outer balljoint. This will ease the hub onto the strut – waggle the hub from side to side and hit it with a hammer until it's home. Threadlock the bolt and tighten to 51Nm.

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FRONT ANTI-ROLL BAR BUSH RENEWAL



1 These anti-roll bar bushes are notorious for causing a knock from the front footwell area even when they appear to be OK, but they're easy to change. Start by undoing these two 10mm bolts with the steering on full lock; start with a 3/8in drive and finish with 1/4in drive – access is tight.



2 Once the two bolts have been extracted, the top retaining plate can be prised off and the bush removed (as shown). These bushes have a matted inner coating – when it's worn out, the anti-roll bar knocks against the subframe.



3 New Lemförder bushes are available from Euro Car Parts and they're just the job. Refitting is very easy: give the bush a smear of grease before fitting, press down the top bracket, then do up the bolts evenly to a decent tightness.

REAR DAMPER RENEWAL



1 Remove the rear wheel, open the tailgate, pull the boot trim to one side and you'll find this 19mm top nut. Hold the centre steady with a 6mm Allen key and undo the nut. Only do one side at a time – you'll strain the brake hoses if the rear axle comes down too far.



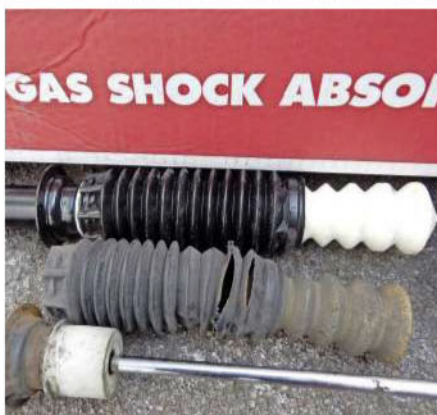
2 With the car secure on axle stands, slacken and undo the lower 15mm bolt – it's pretty tight at 120Nm. With the bolt removed, lever the axle down a bit with a long bar and wriggle the complete strut up and out.



3 As with the front strut, you need to compress the rear spring until the top spring plate is loose. You need to be able to see about an inch of damper rod because Ford has come up with an odd way of securing the top spring plate.



4 This small circlip stops the top mount from moving about; there's another one below. The top one can be removed by hand with the help of a screwdriver. If you lose one, there are new lower rings on the new dampers. You can use the old lower ones.



5 Luckily, the new KYB rear dampers come with rubber dust boots and bump stops, because the dust boots were split on our old ones. The new rear dampers are much better – the old rears had little resistance when compressed and didn't return.



6 Reassemble everything as it came apart, but don't fully tighten the lower damper fixing bolt just yet. Instead, refit the road wheel and lower the car to the ground, roll it backwards a foot or so to settle the suspension, then torque the bolt to 120Nm.

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OIL & FILTER CHANGE



1 The filter sits at the front of the engine and is easy to remove with large gas pliers. Make sure the oil is warm and wear gloves. Drain the oil via the 13mm sump plug which should be torqued to 25Nm once the oil has fully drained.



2 Using your finger, smear some fresh oil onto the top seal of the new filter. Do up the new filter hand-tight only – never use a removal tool to tighten it because it will probably never come off again! We used a Crosland filter at £2.89 from Euro Car Parts.



3 Add 4.35 litres of Ford-specific 5w30 oil to WSS-M2C913-D, such as this Triple QX brand from Euro Car Parts. Start the engine but don't rev it until the oil light has gone out – it takes a couple seconds. Check the oil level on the dipstick as a final guide.

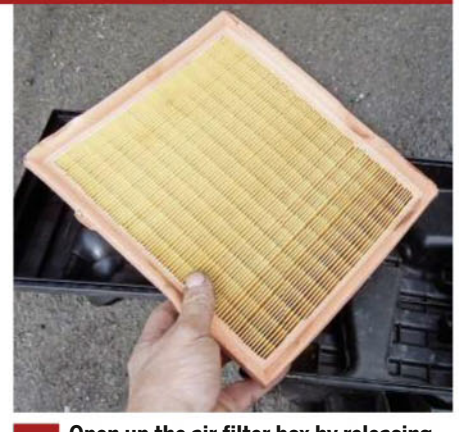
AIR FILTER SWAP



1 Open the bonnet and remove this plastic lump – it is a resonator for the air filter box to reduce induction noise. It just pulls out and can be put to one side. Don't forget to replace it later.



2 The air filter box comes out easily. Start by slackening the hose clip on the intake hose, then release the breather hose from the top of the cam cover. Pull the box upwards to release it from the front mounting clip and the two rear mounting prongs and rubber rings.



3 Open up the air filter box by releasing the four spring clips and splitting the two halves. If you have a compressor, blow the air filter box with compressed air or else use carburettor/brake cleaner and a rag to give it a good clean before reassembly.

FUEL FILTER SWAP



1 The fuel filter is next to the fuel tank and is secured to the body bracket by a clip that needs to be cut or twisted off. You can't really reuse it, so use a suitably-sized narrow hose clip for reassembly. We had one from a BMW intake hose that fitted perfectly.



2 Remove the fuel pipes from both sides of the filter. We were expecting hose clips, but instead it had quick release type clips. Squeeze with fingers and off they come; they are refitted the same way.

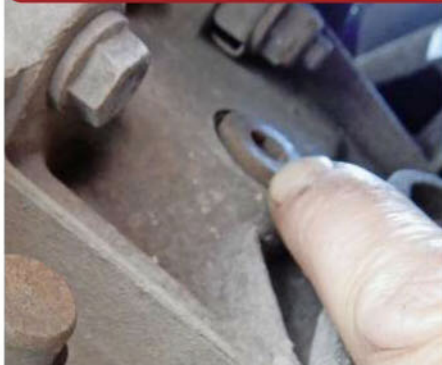


3 We used a Mann fuel filter – a well-known quality brand that's less expensive than an official Ford part. Most probably the original filter hadn't been renewed since the Ka left the factory, but nothing nasty came out.

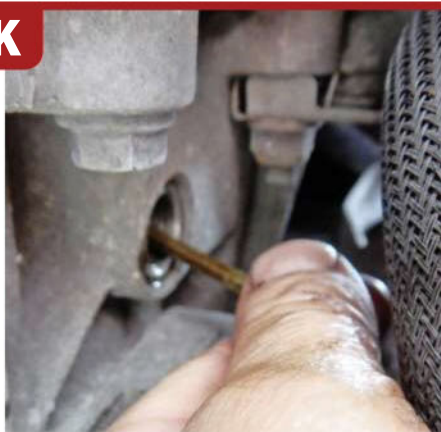
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GEARBOX OIL CHECK

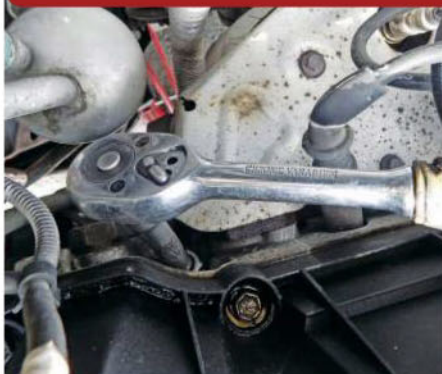


1 There is no drain plug on the Ka's Fiesta-type gearbox, so all you can do is check the fluid level and top it up if required. You will need an 8mm Allen key to undo the 'check and refill' plug, located on the front of the gearbox casing (as shown here). It will be fairly tight.



2 The car needs to be on a level surface to check the fluid level, so get the front and rear of the car on equal height axle stands. Using a small Allen key, insert the short end – the oil should be 5mm below the level. Do NOT allow it to run out of the plug hole. The oil used is 75w90 synthetic.

NEW SPARK PLUGS



1 On the later Zetec engine, the spark plugs are hidden away down the back of the engine, so at least they don't rust in situ like they did on the old Endura E engine. Once unwound, you'll need long-nosed pliers to retrieve them and to then insert new ones, before tightening to 15Nm.



2 Here is one of the original Motorcraft plugs next to a new NGK TR5B-13. The car has done more than 70,000 miles and we wonder if they are the originals or were changed at some point. They're worn out, but the car still started and ran fine – modern plugs do last a long time.

POLLEN FILTER CHANGE



1 Open the bonnet and remove the passenger-side plastic scuttle trim – secured by four crosshead screws; you don't need to remove the wiper arms. Next, undo this single screw and remove the plastic water barrier that covers the heater valve.



2 The pollen filter lives in this plastic box. Just flip the two plastic catches and the filter box opens up to reveal the top of the old filter, which can now be extracted. This is most probably the original as it's choked with dirt and dust.

PROJECT COSTS



PURCHASE OF CAR

£1273.00

PARTS COSTS

Thermostat (new Ford part)	£114.00
Steering wheel (used)	£25.00
Rear parcel shelf (used)	£10.00
Heater valve (used)	£10.00
Heater control panel (used)	£15.00
Part worn 165/60x14 tyre	£10.00
Water pump (ECP)	£22.99
Water pump drive belt (ECP)	£20.35
Brake discs (ECP)	£31.00
Brake drums (ECP)	£78.00
Brake pads (ECP)	£22.00
Brake shoes (ECP)	£22.99
Wheel cylinders (ECP)	£40.98
Wheel bearings (Factors)	£18.31
Brake fluid (Halfords)	£13.99
Mann Fuel filter (ECP)	£4.99
Crosland Oil filter (ECP)	£2.89
Air filter (ECP)	£5.09
Pollen filter (ECP)	£17.49
5 litres oil (ECP)	£19.99
Front KYB damper (ECP)	£65.99
Pair KYB rear dampers (ECP)	£93.18
Four NGK plugs (ECP)	£7.16
Front anti-roll bar bushes (ECP)	£8.38
Aircon re-gas (KwikFit)	£40.00
TOTAL	£1992.77

NEXT ISSUE

We take our Ka to a bodyshop to cut out the rusty bits, replace them with new metal, and have both sides and the bonnet repainted.



3 Compare the pure white of the new filter with the black of the original. It's obvious which way the filter fits – the flow arrows should point downwards as it draws air from the scuttle vents above and filters down into the heater box below. Once in place, snap the filter box shut and reassemble the scuttle trims.

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Product Test



James Stanbury puts products through their paces

Torx kits

Which of the combined internal and external Torx sets is best to update your toolkit? *CM* puts **10** to the test.

One of the most frustrating aspects of automotive mechanics is car manufacturers' love of inventing new styles of bolt head. You commence a job, only to find that your comprehensive toolkit no longer cuts it when you're confronted by... well, what is it? Is it a Torx, Spline, Star, Polydrive or something completely different? Why can't manufacturers stick with simple nuts, bolts and Pozis?

The simple truth is that, like everything else on a car, fixings have evolved and advanced. The amount of torque a Torx tool can transmit to a Torx screw or bolt is significantly greater than a conventional socket or spanner on a traditional Hex nut/bolt head. One benefit of this is that smaller bolts and screws can be used.

On the whole, modern fastenings loosen a whole lot more successfully than traditional nuts and bolts. And on the rare occasion where they are rusted solid or seized, it's just as easy to clamp grips around their edge as it is a rounded nut or bolt.

In short, Torx is here to stay. And that means the couple of Torx sizes bundled in with the last screwdriver or socket set you bought will be woefully inadequate for working on new cars. But go to buy Torx tooling, and you'll come across a bewildering variety of options. There are Torx keys – much like Allen keys but with a Torx profile on the end – Torx spanners, Torx bit sets, Torx bits set in sockets and even – slightly confusingly – Torx sockets.

TESTING CRITERIA

EXTRAS

Two points were awarded to kits with extras. The first point concerned tools for other configurations, such as Pozi, Hex, Spline or RIBE. The other point was only awarded if drive accessories, such as a ratchet, are included.

DURABILITY

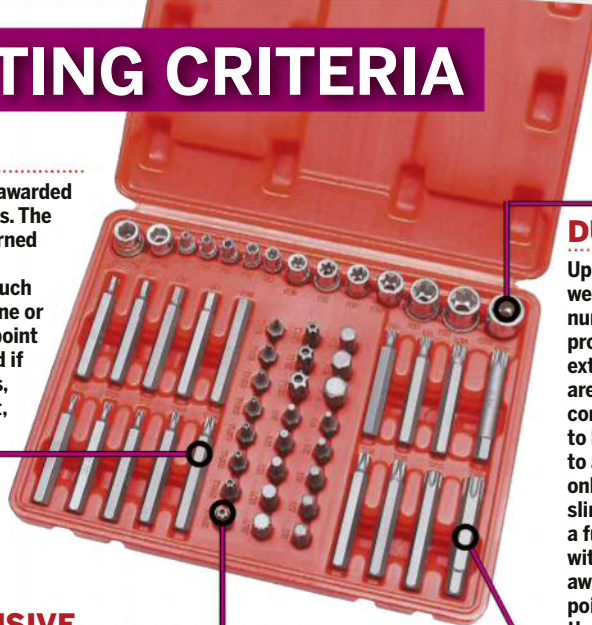
Up to three points were awarded for the number of E-sockets provided, and as external Torx bolts are just as likely as conventional bolts to be situated close to an obstruction, only sockets with the slimmest walls earned a further point. Along with the Torx bits, we awarded up to three points to sets with the toughest, most durable tools.

ALL-INCLUSIVE

Three points were for grabs for sets catering for the most internal T-sizes, with only the most comprehensive set bagging all of them. Some Torx heads feature a centre dot to prevent other tools being used on them. Known as tamperproof Torx, this pattern occasionally crops up on vehicles, so it's an advantage if the T-tools supplied can work with standard and tamperproof fixings.

VERSATILITY

Like all other styles of bolt or screw, Torx bolts are sometimes positioned at the bottom of deep recesses. So an extra point went to all sets with T-sizes repeated in long-reach bits.



Serrated grip strips always prove invaluable when trying to rotate a tight socket and bolt with oily fingers.

As with any screw or bolt, Torx bolts may be positioned at the bottom of deep wells or shafts. Long-reach Torx bits are essential in such situations.

Laser's Alldrive profile (right) is claimed to work with conventional bolt heads (metric, AF and Whitworth) plus external Torx and Spline configurations.



The bit on the left is used with tamperproof Torx bolts. Its hole fits over the small shaft formed into the centre of a tamperproof Torx bolt's star shape.



For this test we're comparing full Torx kits because we feel they're the best option for anyone looking to update their toolkit. Most include a good range of Torx sizes, which go far beyond the few token sizes often bundled with other screwdriver and socket sets, and all of the sets here include Torx sockets, better known as E-sockets.

Generally, most Torx fixings have an internal pattern, much like an Allen bolt has an internal Hex shape. But just as conventional nuts and bolts have their Hex on the outside, occasionally manufacturers use bolts with the detailed Torx pattern forged on the outside of the head. And that's where those E-sockets – E stands for external – prove essential.



CLARKE PRO164

PRICE:	£35.98
PRICE FROM:	www.machinemart.co.uk
CONTACT:	01992 565300
WEB:	www.clarkeinternational.com
PERFORMANCE:	10/14
IS IT WORTH THE MONEY?	6/6
OVERALL SCORE:	16/20

► Clarke has always had a knack of getting the balance of quality, quantity and price spot on, and this set is testimony to that. It covers 23 Torx sizes: T10-T60 and E4-E20. Better still, many of the internal T-sizes are catered for with standard and long-reach bits. On top of that, there's also a good selection of Spline and Hex bits thrown in. What's more, all pieces are made from S2 steel, which is considered the gold standard for these types of tools.

SEALEY AK6197



► Another comprehensive set made from mega-durable S2 steel. The set covers almost all internal and external torque sizes you're likely to encounter on a car, specifically 15 sizes between T7 and T60, plus a further 13 covering sizes E4 to E24. Ideally, we would have preferred some long-reach bits, especially as many of the sizes are duplicated unnecessarily for standard Torx and tamperproof Torx screws; in reality, tools for tamperproof Torx screws work on standard Torx screws.



PRICE:	£36.91
PRICE FROM:	www.tool-net.co.uk
CONTACT:	01284 757500
WEB:	www.sealey.co.uk
PERFORMANCE:	9/14
IS IT WORTH THE MONEY?	5/6
OVERALL SCORE:	14/20

SEALEY AK6198



► Essentially a bigger, more expensive version of the AK6197, with four double-ended spanners being the most obvious addition. These cater for eight of the most common E-sizes, and the E-sizes are repeated – along with another four from E6-E20 – in sockets. This duplication makes sense – often, bolts that cannot be tackled with a socket are fair game for a spanner. As with the AK6197, providing many of the 11 Torx sizes (T10-T60) twice – in standard and tamperproof versions – is pointless when tamperproof tools alone would suffice.



PRICE:	£51.82
PRICE FROM:	www.tool-net.co.uk
CONTACT:	01284 757500
WEB:	www.sealey.co.uk
PERFORMANCE:	10/14
IS IT WORTH THE MONEY?	4/6
OVERALL SCORE:	14/20

OTHER BOLT STYLES

► **Star** A generic name for Torx, which is actually a registered trademark. Tx and TRX are other common abbreviations.

► **Spline** Immediately recognisable by their twelve-sided internal spline shape – the tools' profile is much like a driveshaft in miniature.

► **RIBE/Polydrive** Sometimes confused with Torx due to them both being based around a six-sided star shape. However, where the outside edges of a Torx star are very pointed, on a RIBE/



Polydrive head the six external points are wider and look more like narrow grooves and their internal points are much more rounded. RIBE/Polydrive fasteners tend to be used by certain European manufacturers, especially Fiat.

► **Torx Plus** A development of Torx that uses a more squared-off star profile to further increase torque transfer. Due to the different shape, conventional Torx tools and Torx Plus tools are not interchangeable. Tamperproof Torx Plus fasteners are also available – as with tamperproof Torx bolts, an extra shaft or pin is added into the centre of the Torx Plus's star shape. Tamperproof Torx Plus fasteners also use a five-, rather than six-, sided star shape.



CLARKE PRO151

PRICE:	£20.39
PRICE FROM:	www.machinemart.co.uk
CONTACT:	01992 565300
WEB:	www.clarkeinternational.com
PERFORMANCE:	7/14
IS IT WORTH THE MONEY?	6/6
OVERALL SCORE:	13/20

► A smart little set that's pretty much the *Best Buy* on a budget. Anything that's not strictly Torx, such as Hex and Spline bits, has been removed, while the 10 Torx tools provided (sizes T10-T55) are all standard length only. In a move that Sealey could learn from, all bits are for tamperproof Torx screws, meaning they work on both standard and tamperproof screws. For the external Torx configuration, 11 E-sockets cover sizes E4-E20 and are all beautifully slim-walled.



CLARKE PRO162

► Given how similar this set is to its PRO151 sibling – in both spec and price – it's surprising Clarke doesn't amalgamate the pair. Overall, the cheaper set is the better buy. While this boasts one more Torx size (T8), it's a pretty small bit that often crops up in conventional socket and screwdriver sets, so chances are you won't need it. Although an extra E-socket is included, the sockets are more like those in the *Best Buy* – the walls are considerably less slim than the PRO151.

PRICE:	£23.98
PRICE FROM:	www.machinemart.co.uk
CONTACT:	01992 565300
WEB:	www.clarkeinternational.com
PERFORMANCE:	7/14
IS IT WORTH THE MONEY?	6/6
OVERALL SCORE:	13/20



DRAPER 59985

► We could almost describe this up as Draper's take on the *Best Buy*. A good choice of T- and E-Torx tools – all in S2 steel – is complemented by a selection of flat-blade, Phillips, Pozi, Hex and Spline tools. Another similarity is that the 10 Torx sizes (T20-T70) are catered for in long-reach and standard length. Although 12 E-sockets span E4-E20, just 10 Torx sizes may seem stingy at this price level. However, we feel Draper has taken the right approach – if sizes are to be omitted, make it the small ones that crop up in so many other toolkits.



PRICE:	£52.95
PRICE FROM:	www.tooled-up.com
CONTACT:	0238 0494333
WEB:	www.drapertools.com
PERFORMANCE:	10/14
IS IT WORTH THE MONEY?	3/6
OVERALL SCORE:	13/20



LASER 3081

► A tiny set, but one that covers the popular sizes of T7-T55 and E4-E16 – that's 13 Torx bits and nine E-sockets. All of the sockets are 3/8in drive and the

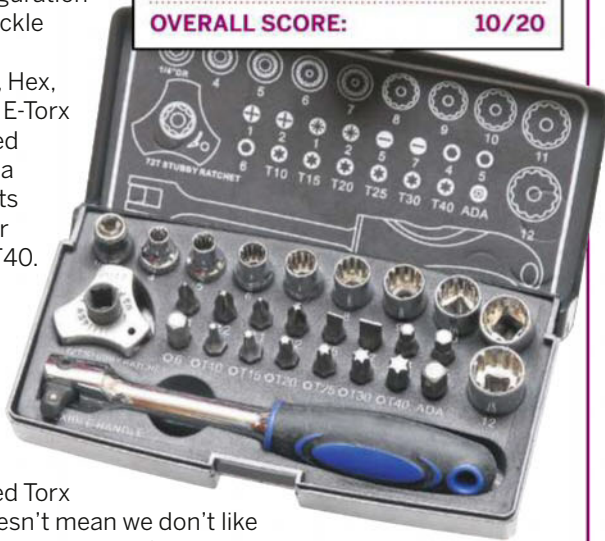
Torx pieces fit into the supplied single bit carrier. The sockets have an indestructible feel to them, except that their walls are a little chunky, which could be an issue on bolts situated close to obstructions. Our only other niggle is that so many of the smaller Torx sizes here will probably already be in your toolkit; focusing on bigger sizes would have made more sense.



PRICE:	£27.00
PRICE FROM:	www.toolbay.co.uk
CONTACT:	01926 815999
WEB:	www.lasertools.co.uk
PERFORMANCE:	6/14
IS IT WORTH THE MONEY?	4/6
OVERALL SCORE:	10/20

LASER 3925

► Not a true Torx set, but actually part of Laser's Alldrive range. Alldrive sockets use an innovative spline-drive configuration that can tackle metric, AF, Whitworth, Hex, Spline and E-Torx bolts. Added to that are a few Torx bits catering for sizes T10-T40. While the relatively low score reflects the lack of a large selection of dedicated Torx sizes, it doesn't mean we don't like the set. The super-fine 72-position thumb ratchet is excellent and can be driven by the tiny breaker bar supplied, for initial loosening or final tightening.



PRICE:	£29.13
PRICE FROM:	www.toolbay.co.uk
CONTACT:	01926 815999
WEB:	www.lasertools.co.uk
PERFORMANCE:	6/14
IS IT WORTH THE MONEY?	4/6
OVERALL SCORE:	10/20

FRANKLIN SE600

► At first glance it would be easy to conclude that this is little more than an orange version of Laser's 3081, albeit around £4 cheaper and with four fewer pieces – the sizes covered are T15-T55 and E7-E20. However, the sockets feature the slimmest walls in the group and are the exact opposite of those in the Laser set, which are among the widest. Fortunately, durability is guaranteed by the use of S2 steel. If you definitely already have the smaller Torx sizes – covered in Laser's set, but not included here – this is a better buy.



PRICE:	£22.76
PRICE FROM:	www.toolbox37.co.uk
CONTACT:	0114 272 1429
WEB:	www.franklin-tools.co.uk
PERFORMANCE:	5/14
IS IT WORTH THE MONEY?	4/6
OVERALL SCORE:	9/20

LASER 2982

► Ten-out-of-ten for appearance, both in terms of the smart tin supplied and the clear marking of sizes once the lid is opened, but this seems a pricey kit when compared against the more comprehensive, yet cheaper, offerings from Clarke and Sealey. Granted, the sizes covered, T8-T70 and E10-E24, are similar to our award-winners, but the lack of any long-reach Torx tools or other configurations such as Hex or Spline, makes the premium price hard to justify. Especially when the sockets are far from the slimmest-walled here.

PRICE:	£44.50
PRICE FROM:	www.toolbay.co.uk
CONTACT:	01926 815999
WEB:	www.lasertools.co.uk
PERFORMANCE:	6/14
IS IT WORTH THE MONEY?	1/6
OVERALL SCORE:	7/20



VERDICT

Clarke's Pro164, our Best Buy, caters for 23 of the most common internal and external Torx sizes. The few Spline and Hex tools included may just get you out of trouble one day. Sealey's AK6197 is a good alternative to the Best Buy in that it caters for even more Torx sizes, even if this is at the cost of other configurations or long-reach Torx bits for recessed screws. Sealey's second offering, the Recommended AK6198, has eight external Torx E-sizes moulded into four double-ended spanners. Our final award winner is Clarke's PRO151 Best Budget Buy. This set is a simplified version of the Best Buy, catering purely for Torx – internal and external – and with no long-reach bits. On the other hand, it costs almost £15 less than its bigger sibling, despite only missing one size.

All prices are inclusive of VAT and were correct at the time of going to press.



Your Letters

Your letters should be addressed to
Martyn Knowles,
Car Mechanics,
Bauer Consumer Media Ltd,
Media House, Lynchwood,
Peterborough PE2 6EA

Email: martyn.knowles@bauermedia.co.uk

Please include a postal address with letters submitted by email.

HIGH & LOW TECH

Reading Kim Henson's article on visiting Mechanex 2014 prompted me to write to you. I have attended the Mechanex show for the past two years and I can say that it is full of technical expertise, especially the seminars. *Car Mechanics* needs to cover these specialised areas.

I have been a subscriber for the past 15 years, but I fear that *Car Mechanics* is not keeping up with the demands of modern car maintenance. You have done some fantastic articles on diagnostics, CAN-bus and many other high-tech issues, but these should be the norm in every issue where the theory is applied to various different cars, not just for special features.

The general themes that dominate the magazine tend to be very old-school. For the last 10 years or so, cars have become very sophisticated and require procedures with no compromise. For example,

Build Your Own Tracking Gauge should have been in a classic car magazine, and *Car Mechanics* should be testing modern tracking equipment. I still see articles that suggest using Tipp-Ex for cambelt changes, when the correct procedure should be to loosen the tapered cam pulley so that tension is equalised all round.

Sorry for whining, but I fear the magazine is not keeping up with even 10-year-old cars.
Shabaz Mohammed

The Editor responds: First, I would like to say that *CM* isn't a trade-only title. The ethos of the magazine is to give a DIY approach to car maintenance. You can get a feel of which vehicles *CM* readers own/drive by looking at the Q&A sections of *Help!* and *Diagnostics Doctor*.

In general, most of our step-by-step guides are conducted at independent garages – it's easier for our writers to take notes and photos while watching someone else do the work. Our project cars are more

hands-on, of course. We tend to purchase project cars in the region of 8-13 years old as we feel that this is the prime time to purchase a vehicle, with depreciation at almost 10% of its original sale price.

When I meet people who say "You can't work on modern cars", my reply is always the same: "There's still a set of pistons rising and falling, as invented nearly two centuries ago". What have moved on in the last 30 years are emission control regulations imposed on engines, which is primarily controlled by the ECU and various electrical sensors.

In a magazine which covers such a broad spectrum of motoring subjects, it will never be possible to deliver the in-depth technical detail of a seminar. In fact, if you see the amount of information detailed in a modern (electronic) workshop manual you will realise just how difficult it is to condense all of this data into a few pages for the published features.

Obviously, we have a regular dedicated diagnostics section in the magazine and this will grow over the coming years as engines and their operating systems continue to develop.

Our feature on making a tracking gauge was written by a *CM* reader, who thought it might help others construct a similar device. I agree it's old-school, but the tool is usable on most of today's vehicles that have just left the assembly line. Plus, I'm not sure how many readers will have bought alignment devices for home use – they can be rather expensive for a tool used very infrequently.

With regards cambelt changes, remember that all engines are individual. Some require the cam pulley to be loosened when replacing the timing belt, but this is not a general rule and is not applicable to all vehicles.

GETTING THE HUMP

The subject of speed ramps is not discussed often enough. I feel they are too severe in many cases and too frequent. I can understand their deployment near schools, the entrance to shops, etc, but councils put them on roads where 30mph is quite acceptable, yet in a small car you could be slowed down to 20mph or even 10mph. Imagine the nightmare if they put them on every road!

First there is the height of the things. The front edges are often square, rather than curved, so you really feel the impact. As you drive over the top, the tarmac on the other side is often missing, so it's like falling into a hole. People have had exhausts taken off, springs can crack and front valances can break.

It's unfortunate that a minority of drivers speed excessively, but surely there are better ways of tackling this?

Vince Leonard

RESERVOIR SLOG

You ran an article explaining how to change the coolant reservoir in a Volkswagen and solve a situation where the low coolant warning light was on all the time, meaning a potential MoT failure (*CM*, March 2015).

I just wanted to advise that changing the reservoir was not necessary in my Skoda Octavia Mk1, which has the same spherical reservoir as the VW. When my car displayed the same problem after two years of ownership, I assumed some residue had coated the probes, so I removed the cap and scraped the leading edges of the two metal probes with the edge of a screwdriver. This immediately cured the issue and, 11 years later, there has been no reoccurrence.

I can't guarantee that this works for every situation, but you may like to pass on this tip to save some owners £100 and an hour's unnecessary labour.

Peter Howells

The Editor responds: Useful tip, Peter. The job cost us nearly £18 for a genuine reservoir and 15 minutes of our time – plus the coolant change, of course.



HOT OR NOT?

In an old issue of *Hot Car* magazine during the 1970s, I remember seeing a feature about two men who were trying to build an engine that used solenoids to operate the valves, so that there was no need for a camshaft. Have any readers ever heard of this and can they tell me whether or not it would work? It sounds like a good idea.

B Jones

ROVER RUNNING

My Rover 45 had similar issues to the *Help!* query ('Cold start problem', April 2015). I read Steve Rothwell's recommendations with interest. I had already changed the fuel and air filters, and checked the igniters and fault codes, but it was still reluctant to pull away when cold. Following Steve's advice, I changed the Lambda sensor and my 45 now starts and runs fine. *CM* does it again!

Alex Fairbridge

SMOOTH OPERATOR

In the feature on your Mercedes project (CM, February 2015) you mention that the front discs were seriously rust-welded to the hubs and recommended using a hide mallet or heavy steel hammer to remove them. Readers may be interested in a little tip I picked up years ago, which makes disc removal a smooth operation without the need to knock seven bells out of the poor car!

Often a bolt can be screwed into a threaded hole in the disc hub to push the disc off the hub. However, in cases such as the C-Class, where there is no such hole, the procedure is illustrated in the picture. It is usually necessary to remove the caliper to get the disc off, so just push two long bolts through the caliper fixing holes with a nut between the caliper mount and the disc. Then tighten the bolts and tap the disc hub lightly (it may take more than one tap) and the disc will soon pop off. The bolts need to be long enough to come into contact with the disc face and it can help to have a nut on each side of the caliper mount to keep the bolts running true and avoid the possibility of damage to the caliper mount threads.

The picture is of my Lexus IS250, which actually does have a push-off hole, but I used this technique on it to illustrate the method.

John Cookson



STAR LETTER

STAR LETTER



The reader awarded the **STAR** letter will receive a Sealey LED034 – 10W rechargeable Lithium-ion CREE LED aluminium torch with adjustable focus

- Single 10W CREE LED produces extremely bright, white light with an output of over 350 lumens, and gives a working range up to 500 metres.
- Illumination type can be changed from spotlight to wide area by simple push/pull action of the head.
- Features lightweight aluminium housing.
- Five function on/off push-button for full, half, low, flashing and SOS light.
- Powered by 3.7V 2Ah Li-ion rechargeable battery.
- Supplied with mains charger.

SEALEY

SCIENCE IS EASY WHEN YOU KNOW HOW

Having purchased a 55-plate Ford Focus Zetec with 62,000 miles on the clock and lots of lights on the dash, I thought that fixing the problem would involve complex electronics well beyond my mechanical abilities. The solution came

from the Morgan Owner's forum and was a lesson to me in not being blinded by science.

For all the talk of OBD access and electronic trickery in modern cars, would you believe the culprit was nothing more than a dodgy thermostat

of the same sort as we have been using for decades. Fixing it was simply a case of looking at the temperature gauge instead of hunting down fault codes, then paying £30 for a replacement thermostat!

Tom Law

KATASTROPHE

I was interested to read about your Ford Ka project (CM from May 2015) as I have just purchased one on eBay. Mechanically it is in fine fettle, but rust-wise it is a dog! The problem areas are the sills and rear suspension mounts, which appear to have been finished in the factory with a type of underseal applied to the chassis, but no paint of any description. Another rust trap would seem to be the window pillars where they join the front wing.

When bought, it was three months into its MoT. The garage that has just spent a couple of weeks welding the sills reckon it must be a 'bent' MoT. I would advise anyone to steer clear of these cars on eBay – if I could have viewed the car locally, I would not have touched it.

Anyway, I intend to carry out more welding on the body myself, so I will be watching your series with interest. Please hurry up and get onto the bodywork!

David James



The bodywork repairs on our Ka project will commence in the next issue.

CLASSIC QUERY

One of your readers, S Wolfenden, asked about insurance for his 2002 Daihatsu Sirion and the fact that premium costs had increased ('Obtaining insurance', *Help!*, January 2015). My advice is to barter with the insurance broker if you have been with them for a while, as most of the time they do try it on in the knowledge that most people dislike the hassle of getting new insurance quotes.

Mr Wolfenden suggested that his car might possibly be regarded as a classic regardless of its age and wondered if it was worth exploring the idea of classic car insurance. I am in a similar position with my 2003 Rover 75 CDTi Connoisseur tourer, which I cherish and keep in top condition. These cars are often referred to as "a modern classic", due to being the best modern Rover ever built. They are a superb design and the diesels return 47mpg during urban usage and up to 56mpg on a long run.

Worried that if mine was ever written-off, and knowing that I would only get back a fraction of its true value, I have



a clause with my insurer that I get first refusal to buy it back if it is a write-off. Which means I can at least revive the car if it's just something silly like a damaged wing or bumper.

With regards classic car insurance, anything less than 20 years old is unlikely to be considered a classic. Plus adopting that type of insurance would mean losing your existing no claims bonus, because agreed-value classic car insurance is a flat rate and does not involve any driver discounts. This means that, when coming off classic car insurance, one has to start all over again, which frankly isn't viable.

I suggest Mr Wolfenden contacts some of the main classic car insurers and asks their advice – Carole Nash helped me with my 1995 Rover Cabriolet some time ago.

Karl Sheridan

Dealer's Diary



Our man in the trade, **Steven Ward**, rubbishes car dealer service plans... and the electronic handbrake

Fail to plan

It would seem no service adviser worth their basic + commission isn't straining to sign you up for a service plan right now. I can understand and sympathise: these plans pay the way for both dealer and wage slave. The business gets a guaranteed income, while service gets consistent bookings and upsell opportunities.

But, to the inquisitive *Car Mechanics* reader, are they 'A Good Thing'? Of course not, but then you'd expect me to say that, wouldn't you?

I'm not suggesting they are all bad. Some manufacturer deals on new cars are worth it if you intend to keep the vehicle in the dealer network. But what I'm hearing from colleagues tethered to the big dealer groups offering such packages to existing customers is that they are akin to pyramid selling. Take a tight month of new sign-ups or a historically quiet month for service work and the accountants will slide over to the service advisers and quietly whisper



Personally, I'd stick the service plan money in a savings account

that, say, the fund for filters is fiscally flummoxed. That creates a knock-on effect. Filters that should be changed might not be or, if they are, they're of inferior quality. I've seen it enough times when preparing cars for sale with main dealer histories itemised in the book.

Even on a good month, I've more than a sneaking suspicion that service-planned cars are often bumped through the service bay – the drain plug isn't out long enough for the oil to finish draining,

the wheels aren't removed, just a quick once-over and a rushed (inferior grade) oil and filter change. These are not high roller repairs as they've already got your money. Forget your pollen filters, expensive fuel filters and an airbox check, these cars are literally budgeted through, with a cursory glance at what can be upsold. Brake and coolant changes will be an Optional-At-Extra cost, regardless of what the manufacturer intended and assuming they can squeeze in such an involved job that day.

If you think I'm scaremongering based on the mutterings of overworked service desk jockeys, consider the story below.

The other week, I was buying a new car for the other half. I asked the salesman about the service plan schemes plastered on the walls. His reply? "You can do better by phoning up and asking for their best price when the time comes."

Personally, I'd stick the service plan money in a savings account and then shop around for a keen price when you're ready. That way the obligatory Vehicle Health Check will be in your favour rather than their account department's.

Backwards brake

I would love to know the thinking behind the electronic handbrake, as I can see no benefit to them at all. They make servicing a car painful, because the minute you switch off, the handbrake automatically applies itself. This means you either have to leave the ignition on to 'spin the wheels' before servicing or else you plug-in to release them. Likewise changing the shoes and/or pads and discs is no longer just a screwdriver and spanner job.

Renaults used to have an 'emergency pull cord' to release the handbrake, which required a diagnostic reset afterwards, but even this fail-safe has fallen by the wayside as other manufacturers weren't as diligent. Selling the gimmick to a customer unfamiliar with them is a tricky job, as the amount of space saved hardly justifies the added expense.

Essentially, they simply add a chunk of unnecessary weight and complexity to the vehicle as they are just a big black box with a motor that does the pulling of



Probably the worst example of handbrake madness is the Disco 3

the handbrake cables for you. And those cables are just as prone to wearing out, filling up with crud and snapping as they were when you pulled the lever yourself.

Probably the worst example of handbrake madness is the Land Rover Discovery 3. As most of these cars are autos, you can avoid using the daft handbrake altogether. However, come MoT time, if it hasn't been used in ages, it'll struggle to apply and then fail to release. Except that where a replacement cable cost a tenner, a new

electronic handbrake will set you back a few hundred quid.

I've got a good specialist who'll do the job for £1000+VAT – and that's cheap. The repair includes new cables, a new motor, an upgrade to Disco 4 parts (the Disco 3 bits are NLA) and a trip to a main dealer for a software upgrade to accommodate the newer model's kit.

And it's not just the Disco that gives grief. Some cars locate the motor in the rear wheelarch – not an ideal location for an electric motor, a multi-plug and some cables, I'm sure you'll agree.

As car manufacturers struggled to shed weight and cost from a car, why did they lump these ungainly devices into the mix? It's not like they did away with the centre console to save space either. Which is probably why some vehicles, like the Astra, reverted back to a lever.

I'm told that the next-generation of electric handbrake is a significantly more sensible device as it's only the piston in the caliper that's motorised. I'll report back on them in the next decade, when they filter down to our level, and tell you if they are as good as promised.

Less taxing

Since the last change in the road tax rules, cars with large petrol engines and 4x4s with less than nine forward gears have become more saleable again, finally lifting residuals. This is good news for us who enjoy a touch of luxury to smoke around in, as we can still buy them cheap and stand a chance of moving them on again when we're bored with them.



This is thanks entirely to the Government allowing a monthly direct debit to be taken out for costly annual road fund licences. You're actually paying more for less (there's a small fee for the privilege and you no longer get a paper disc), but it's a whole lot easier giving 12 payments than one or two lumpers.

Therefore, I strongly recommend you go out and buy something big and petrol-fuelled before the public gets wind of the deal. May I suggest an aluminium-bodied Jaguar XJ8 or, if you need something more practical, a Discovery 4.4 V8 petrol? Both will dignify your stressful commute and make you remember why you loved driving. Let's face it, petrol isn't going to be this (relatively) cheap for quite a while.

None of the above

While the General Election came and went, boring most of us senseless, the ballyhoo of the ballot blattered the motor trade. The lengthy lead-up to the election put punters right off buying cars, a dramatic turnabout following a cracking March. This has left many dealers overstocked and facing a hit on most vehicles in order to shift them for some income.

The election put punters right off buying cars

As the consequences of the Conservative victory registered, the timid purchaser got the jitters and settled for a new pair of bowlers instead of a new chariot on chucky (finance). Let's hope this is just a minor blip, because it's going to be a long winter if it isn't.

No Maccess

Following the demise of Unipart Automotive, another long-established name in aftermarket factors bit the dust recently. However, unlike the dignified demise of Unipart, the loyalty of the staff in this instance was disgracefully abused.

My introduction to Maccess started in the early 1990s, when a schoolmate went to work for them straight after our GCSEs. I'd never heard of them, but once I joined the trade, visiting my local warehouse was a common errand. And what an errand: I used to forget to go back to work!

You see for me, a trip to Maccess was like a visit to a sweet shop and toy shop combined. Imagine a huge Halfords selling anything and everything you could want for a car, van or bus: accessories, parts, leisure kit, oils, repair items, manual choke conversions, tools, books, cycles, trailers – you name it. There was no regard for shelf life or fast moving items. If you could rummage – and you could – then you could find it.

But for many, Maccess was bad, as it broke the aftermarket mould by cutting out the middleman. All those family run, High Street car parts shops suffered as the trade bought direct and in minuscule volumes if so desired. Another friend at Brown Brothers secretly raged as they lost out as managers realised there was no need to bulk buy.

Maccess regularly held 'trade days', where they fed and watered you all

A trip to Maccess was like a visit to a sweet shop and toy shop combined



through the day and late into the evening. Get carried away with a series of purchases and they'd give you a slab of Carling for your trouble. This meant free booze from 12pm to 8pm – and then they'd give you more to take home!

I once sold one of the founders of Maccess a Ford Escort Estate when they were still fashionable and he revealed that the company name came from a business ideal of 'motorway access' – something demanded for both swift and easy sales and deliveries.

Sadly, the minute the banking crisis hit, Maccess staff was cut to the bone overnight. Existing staff were flogged hard to make up the shortfall. A series of takeovers changed the atmosphere and the party was definitely over: no trade days, less stock and less access to it. This was due to pilfering, as there were so few staff on the floor. It also led to unscrupulous traders swapping expensive parts into cheaper part boxes – a nasty trick for honest traders to discover later.

Then, on returning from the Christmas break in January 2014, all the delivery drivers had been promised new vans. The old ones had been cleaned

and returned, and everyone was eager. Confusingly, only half the required number of vans was waiting in the compound. It transpired that if you got a set of keys, you kept your job. The rest had to walk away, literally.

Things got worse. On the morning of the last Thursday in March this year, the staff discovered they hadn't been paid. They turned up for work to find themselves locked out. Furthermore, agency staff were in and emptying the warehouse, loading vans, lifting and shifting.

The local press were called in and it made the headlines, but that is little consolation to those who've known nothing else. Most of the staff in my warehouse were either related through marriage or blood, such was the loyal and close-knit workforce that remained.

The businesses that frequented Maccess are putting up a protest of sorts. The receivers are demanding the payment of accounts, however they aren't allowing anyone to return incorrect parts, damaged parts or failed parts. Furthermore, no credit notes have been issued for previously returned items. So, at the time of writing, nobody has paid their bills.

Reassuringly French

The C4 had a bold style that its rather conventional rivals lacked, especially in three-door form. But are they as fragile and complex as Citroëns of old? **Ian Seabrook** says not.

The Citroën C4 was an eye-catching vehicle and it needed to be. It replaced the Xsara, a car that was dependable but just a little bit dull – not something you'd expect from the company that had developed such remarkable designs as the Traction Avant, DS and 2CV.

While the C4 was certainly nothing fancy beneath its bold exterior, it retained the good points of the Xsara: entertaining handling, zingy petrol engines and powerful, economical turbodiesels. The three-door coupé was a no-compromise fashion diva, with an avant garde split rear window and a sporty air about it. The five-door hatchback was rather more conventional and put practicality foremost. Thus there was a C4 for the trendy young things to dash about town, and one for them to consider when family demands became more prominent.

Inside, the stylishness continued, with an entertainingly quirky fixed-hub steering wheel, central speedometer and a brushed aluminium finish on the sportier models. Sadly, it wasn't quite as well-proportioned as its rivals, with

some people finding the footwells and boot space lacking in dimension.

At launch, engine options included the 1.4-litre ET3 and 1.6-litre TU5 petrol engines. A 2.0-litre petrol unit offered stronger performance, especially in 180bhp VTS form, but could be had in lower states of tune, too. The 1.6-litre HDi was available in 92bhp or 110bhp form, while more grunt and a six-speed gearbox came with the 2.0-litre HDi on higher-spec models.

The 1.6-litre HDi engine gained a reputation for being problematic – something shared with the many cars from Ford, Mazda, MINI, Peugeot and Volvo that used it. It isn't necessarily bad news, but excellent service history is a must. You'll find plenty of them out there with high mileages, so they aren't all bad.

There were 18 recalls during the C4's production life, with some safety-critical issues such as possible failure of the brake booster and master cylinder, and a situation where airbags might not deploy. All the details can be found online, or else head to a main dealer, who may be able to advise if there are problems with a particular car.



Manufactured from
2004-2010

Engines

▶ The 1.4-litre petrol engine is hardly brisk, but 90bhp ensures a reasonable amount of go. Watch out for the classic signs of head gasket failure – ie, creamy deposits under the filler cap – although too many short journeys can also cause this. On the other hand, these engines can and do blow their gaskets. They can also leak oil from the top cover – an easy fix – and from the head gasket, so check for oily deposits in the coolant and stains down the engine. The head needs to be removed to repair this properly, so it often gets neglected.

The 1.6-litre (pre- and post-2008) and 2.0-litre petrol engines are very robust and don't generally give much trouble. The VTi and THP engines use a timing chain, whereas the earlier engines had a belt. Be aware that the chains can fail, although they often get very noisy before they do. You can expect to pay less than £100 for a chain and sprocket kit, but it's best to ensure the correct engine oil (5w30) and filter (genuine) have been used as it's failure to adhere to this that typically leads to issues.

The 2.0-litre HDi is a good, strong unit, although injector seal leakage can cause engine runaway. Not everyone is happy to leave the timing belt until 100,000 miles before changing it, so it may be safer to observe a shorter interval. A chirp at idle could be a tired water

Specifications

Engine	Power	Average consumption	Weight	0-60mph	Top speed	VED band
1.4 petrol	90bhp	44mpg	1182kg	12.4sec	113mph	G
1.6 VTi	120bhp	42mpg	1220kg	9.7sec	121mph	G
1.6 THP	150bhp	41mpg	1271kg	8.1sec	131mph	G
1.6 HDi (90)	92bhp	62mpg	1257kg	12.1sec	112mph	C
2.0 HDi	138bhp	51mpg	1381kg	9.4sec	129mph	F
2.0 VTS	180bhp	33mpg	1337kg	8.0sec	141mph	J



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Bodywork

► The bonnet is aluminium and can suffer paint reaction issues around its leading edge. At the rear, make sure that all the electronics in the tailgate – high level brake light, rear wiper and heated rear screen – are working, because the wiring loom often fails where it enters the tailgate. In fact, a recall applied to some C4s.

On models with self-levelling headlamps, a failed load sensor will cause the lamps to point down in front of the car; this can cost £140-170 to repair. Bulb replacement is another pain if Xenons are fitted – you'll need to remove the front bumper and it's estimated that a couple of hours is needed to replace both bulbs. With Halogen headlamps, the job is merely frustratingly fiddly.

pump – look for red dust around the timing belt cover. Incredibly, the belt replacement interval was 150,000 miles on the 1.6, though after many belt failures, 60,000 miles is now seen as more sensible. The 1.6-litre HDi has some other serious flaws, primarily that oil passages get clogged, starving the turbocharger so that it fails. Carbon build-up and sludge are one enemy here, so it's vital these engines are serviced regularly, with a good low-SAPS engine oil. A low-SAPS oil should help keep the EGR valve clear, too. Failed injector seals are another problem. With a 1.6-litre HDi it is vital to check the service history thoroughly – bills, as well as stamps in a book – and ensure no error codes are showing. A test drive will quickly tell you whether the turbocharger is boosting properly and whether it is excessively noisy, indicating tired, oil-starved turbocharger bearings. Another clue is to have a sniff around the engine bay – can you smell oil that has leaked onto the exhaust?

Expect to pay around £400 for a genuine replacement turbocharger, but note that a technical bulletin has been issued by PSA indicating that a large amount of additional work is needed to prevent another failure. At the time the bulletin was issued, there was a 15% rate of failure with replacement units.

1.6 VTi 120



DPF faults are common on the 1.6-litre HDi and (post-2008) 2.0-litre. The filters get clogged and need to be cleaned out, although removal is a tricky job. Expect to pay £140 for a DPF overhaul or £400 for a new replacement. Then there is the additive that the car adds to the tank to help with burning off particulates. Depending on chassis number (see www.c4owners.org for more details), the car will have either a pouch or a small additional tank for EOLYS fluid. Filling the tank will cost approximately £125+VAT, while a replacement pouch costs around £100+VAT, and this may be necessary from as little as 50,000 miles. If a pouch



1.6 THP 150

is fitted, fluid is injected every time you fill up, so you should really only fill the fuel tank when the level is low and avoid putting in small amounts of fuel on a regular basis.

On top of all that, diesels also have dual-mass flywheels to contend with, so pay a garage to replace a clutch and you can expect a bill of £1000 or more. Listen out for a DMF death rattle, and if a car is advertised as having had a replacement clutch, ask whether the flywheel was also replaced.

One final 1.6-litre trait is that the exhaust heat shield can fail. This causes an annoying rattle at first, but can cause issues with the oil cooler if ignored.



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Trim levels

► Trim levels vary depending on whether the C4 is a coupé or hatchback. The coupé range starts with the **VT** and the hatchback with the **LX**, both of which still boast a multi-function steering wheel hub, cruise control, electric windows, remote central locking and no less than six airbags. **VTR/SX** gets you air-conditioning, while the **VTR+** (both models) adds digital climate control and automatic headlamps and wipers. The **VTS/Exclusive** added Xenon headlamps, parking sensors and larger engine options.

The **By Loeb** model was launched in 2007, to reflect Sebastian Loeb's World Rally Championship prowess in a C4. Just 400 were sold in the UK but, in truth, it's just a **VTS** with some sporty trim. Confusingly, there was later a **C4 by Loeb** that was available with diesel power; this later incarnation was not a special edition.



Running Gear

Manual gearboxes are very robust, although the gearchange was never particularly pleasant. However, the automatic – an automated manual with steering wheel paddles – is a C4 only for the brave. They're not particularly quick or smooth with changes and

are prone to a number of problems. Clutches can wear out quickly and you need to listen out for a whining noise, especially at speed, that could indicate failed bearings. Electrical gremlins can cause the car to lose gearchanging ability, or refuse to engage a gear at all. Even C4 enthusiasts are dismissive of the self-shifting gearbox.

In terms of suspension, watch out for broken coil springs and bear in mind that the ride on some models is not what you'd call Citroën-smooth. The VTS is rather firm, and the fitting of low-profile tyres doesn't help. Balljoints and track rod ends are no more liable to fail than on any other car, while a set of front discs and pads is likely to cost around £50.



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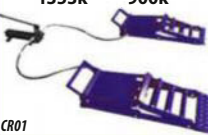





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 <p>Hydraulic Lift CL02</p>	 <p>Wheel Arch Roller MW01</p>	 <p>3000lbs Rotisserie CT06B</p>	 <p>Transmission Jack GT07BB</p>	 <p>Adjus Car Ramps CR02</p>	 <p>New 2 Ton Mobile Cradle CM07</p>
 <p>Hydraulic Wheel Skates CM02</p>	 <p>Side Car Lift Air Operated CL06A</p>	 <p>2000lbs Rotisserie CT06A</p>	 <p>Planishing Hammer MW02</p>	 <p>New Hydraulic Ramps 1353k 900k CR01</p>	 <p>Mobile Axle Stands CM05C</p>
 <p>3 in 1 Tilting Lift CL01</p>	 <p>Side Car Lift CL06M</p>	 <p>Autovip CT02</p>	 <p>Basic Roller CT01</p>	 <p>English Wheel</p>	 <p>Basic Roller CT01</p>

Five-door models were offered with four years' 0% finance back in 2006.



The power steering pump can fail, usually intermittently at first, so ensure assistance is continual during a test drive. Expect to pay over £300 for a new replacement or £120 secondhand.

The C4 was given a facelift in 2008 to bring it in line with the rest of the Citroën range. External changes were fairly minor: new bumpers, different

rear light lenses and new wheel designs. Under the bonnet, the old-school petrol engines were replaced by new 1.6-litre VTi and THP units that had been jointly developed with BMW. The THP used a turbocharger to pump out 150bhp and ensure strong performance, while the VTi had an impressively sparkly 120bhp. At the same time, the 2.0-litre HDi

gained a DPF – good news for company car tax rates, less good for longer term owners. The C4 was replaced in 2010 by a newer model, which was only available in five-door form.

Interior

Glovebox failures are very common, usually involving the handle.

Expect to pay £80 for a good used replacement or £140 for a new one. A replacement latch mechanism can cost less than £10 and may be a good investment. Look for damage caused by someone trying to force a broken lid.

Next, check the operation of the heater. The cogs that control heat and placement can fail, leading to a heater that only blows hot or cold. It is dual zone, so check that both sides heat/cool effectively. A modification kit costs just £25, but, if problems persist, you may need to replace the heater box at £650 plus labour. Failed fan speed resistors are very common, but should cost no more than £40 to repair and are an easy fix.



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Seatbelts were subject to a recall, so make sure they retract properly, especially on the coupé. It's generally worth checking all interior trim, because the quality of some pieces is poor.

Citroëns are hardly immune to electrical faults, so it's well worth checking that all equipment is fully functioning, including the electric windows and the remote central locking, where fitted. When you unlock the car, check that the boot does not pop open unexpectedly; if it does, the lock mechanism is faulty, though it's only a half-hour job to replace.

The cruise control system can be especially prone to niggling faults, with switches on the clutch, brake pedal and steering hub all prone to failure. Most are easy to replace.

Why should I buy one?

The C4 coupé certainly offers something far more dramatic than its rivals, and while the hatchback is a rather bland by comparison, it offers greater practicality. Running costs should be low, as the petrol models can nudge 40mpg on a run and diesels should be able to exceed 60mpg. That said, diesels can be problematic, so you need to question whether you'll really cover enough mileage to justify the extra cost to buy and maintain one.

The sporty petrol C4s can be great fun, with lovely handling tempered only slightly by over-assisted steering. Do bear in mind that, to really get them

shifting, you'll need to make use of the top-end of the rev range



– the 180bhp 2.0-litre produces maximum power at an ear-bashing 7000rpm, so they're not as relaxing in daily use as the punchy diesels.

Consider trim levels, too. While the higher-spec models were very well equipped, that could just mean a larger number of problems as these cars age – the oldest are now more than a decade old.

Contacts

The Chevronic Centre Ltd 01462 45528 www.chevronics.co.uk

C4 Owners Forum www.c4owners.org

Retail Valuations

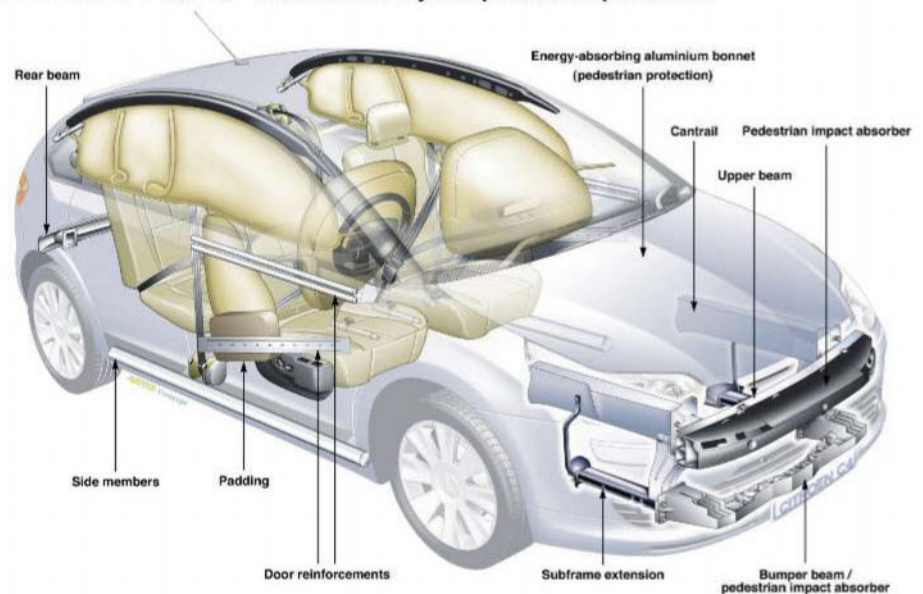
► Early C4s are already comfortably **under £1000**, although this leaves them very much in banger territory. If any big job is needed, owners will be questioning their sanity in paying as much as the car is worth to get it done. There are plenty of them for sale though, so even in this price range you can afford to be choosy.

Mileage is a key consideration and C4s with less than 60,000 miles still hold their value reasonably well. Expect to pay around **£1500** for a 2006 1.6i SX hatchback with 60,000 on the clock, or a 2.0-litre HDi Exclusive with 100,000 miles.



Prices currently top out at around **£5000** for the very best – probably a three-door. Five-door values at the top end have been driven a little lower by brisk depreciation of the current model. A quick search online by CM turned up a 2009 C4 By Loeb 1.6-litre HDi coupé with 40,000 miles on the clock for **£4500**.

CITROËN C4 Passive security and pedestrian protection



Verdict

► The C4 has depreciated hard and fast, so now is the time to buy. Choosing which one to go for is tricky, as engine options are varied and have many pros and cons. Some have found the 1.6-litre HDi absolutely reliable with regular servicing, but it remains an engine that can easily generate some eye-watering repair bills. The 2.0-litre seems a better bet for the money.

Petrol engines make a certain degree of sense, especially if you fancy something with a bit of zip. There are C4s out there that have had very enthusiastic owners and they're the ones to seek out.

One final thought: Vehicle Excise Duty rates for C4s vary dramatically. The 1.6HDi is typically only £30 per year, while a 2.0-litre VTS is £265. It's worth checking before you buy.



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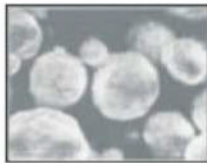
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Press Articles

QUENTIN WILLSON

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SUNDAY MIRROR, 4th SEPTEMBER 2005, page 56

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Survival Guide

Ian Cushway searches out new and used parts prices

Bentley Continental GT

Supercar performance with VW underpinnings – what's not to like about this now affordable luxury express? Ian Cushway investigates.



Who'd have thought we'd be featuring the Crewe-built Bentley Continental GT in *Car Mechanics*? Now that the earliest ones are 12 years old, it's become a relatively affordable luxury car that outclasses anything Jaguar or BMW has to offer. Indeed, savage depreciation early on has rendered it something of a bargain, with the cheapest we've seen in the classifieds kicking off at £22,500.

Featuring the four-wheel drive Quattro system and six-speed auto transmission from the Audi A8, the GT boasts leech-like grip and extreme levels of comfort despite its size. And of course, there's that Bentley badge on the bonnet for added kudos.

Although the GT changed very little up until its revamp in 2010, there was an even more potent Speed model from 2007, which had extra power, more torque and even more agile handling thanks to a specially-tuned chassis. From 2005 there was also a longer-wheelbase Flying Spur saloon, then a GTC convertible from 2006 for those that wanted to make the most of that sonorous W12 soundtrack. The fact that the GT is basically a Volkswagen

Phaeton underneath simply adds to its undoubted appeal.

However, maintenance isn't always cheap, and having earned the dubious accolade of producing the second greatest number of warranty claims for a European manufacturer in a Warranty Direct survey, owning one isn't without its worries. The pre-2006 models particularly seem blighted by minor build issues, so with early cars it's worth checking the service history and getting an extended warranty.

Engines

The 6.0-litre twin-turbo W12 engine is a dependable unit that is unlikely to give many problems if it's looked after. That said, it's a tight squeeze in the engine bay, so anything beyond basic servicing – such as replacing the starter motor, changing the oxygen sensors or replacing a duff turbo – will end up being an eye-wateringly expensive engine-out procedure. Even getting to the spark plugs involves removing the intake plenum, so it's just as well they only need replacing every four years.

The ancillary belts need changing every 60,000 miles or so, and it's a six-hour job because you need to remove the radiator to do it. As for oil changes, they need to be done annually or every 10,000 miles, using a top-quality fully-synthetic brew such as Mobil 1.

The only other real issue to affect the GT concerns the radiator, which will cause the engine to overheat if it lets go. Fitting a new one means taking off the front bumper to gain access.



Bentley's VAG-derived W12 is a thing of beauty, but for anything other than routine servicing it's a case of taking out the engine.

The six-speed ZF 6HP26 auto transmission is rugged and complaints are rare and mostly related to software glitches that result in brutal gearchanges. Repeating the adaption process will usually sort such problems, but it's a specialist job.

Engine component prices

OIL FILTER
Main dealer £17.89
Independent from £13.99

Electrics

There's a vast amount of gadgetry in the Bentley, so there's lots of scope for things to go wrong. A particularly worrying feature of early GTs – and, oddly, something that it shares with VAG cars of old – is the design of the plenum chamber. It easily blocks, causing the plenum to fill with water, and when it does the loom and engine control module can become flooded, with disastrous results. If the corrosion has travelled along the loom, you can splice in new

CONTINENTAL GT

2003-2010

Model	GT
Engine (cc)	5998
Power (bhp)	552
0-60mph (sec)	4.8
Top speed (mph)	196
Average fuel (mpg)	17

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TOP TIP

Check the Continental GT's plenum chamber, because leaves and other debris can block the poorly designed drain plug, allowing water ingress into the loom and the engine control module.

sections – the factory now supplies a special kit. As for the module itself, most can be revived if left to dry out, otherwise it will be a case of buying a Bentley replacement which is £936.34.

Other niggles include the park distance control going off for no reason, problems with the motor on the boot and issues with the sat-nav. The latter is particularly clunky on early cars, which is why many owners choose to fit an aftermarket unit instead.

Despite the fact that there are two batteries – the main one and a smaller secondary unit to start the car in an emergency – because the various modules require a constant voltage, if the car's not used every day the battery can drop below the required voltage. If it does, you will need to reset each ECU individually. It's likely to prove much cheaper to invest in a trickle charger or good battery conditioner.

Coil pack issues have been reported by some owners, so if there's a misfire this could be why. Replacement coils are £19.99 from Euro Car Parts.



Crewe-made Continental GT is based very loosely on VW Phaeton underpinnings.

The Bentley features tyre pressure sensors and these have a lifespan of around five years – replacements cost £104.58 from Bentley.

Electrical component prices

COIL PACK

Main dealer £42.10
Independent from £19.99

TYRE PRESSURE SENSOR

Main dealer £104.58

Suspension

The GT is a heavy car, so while the air springs are generally robust, there may be some early signs of wear in the front drop links, top arms and anti-roll bar bushes after as little as 15,000 miles. A knocking sound over rough road surfaces or while mounting a lowered kerb is a tell-tale sign that they are past their best. Droplinks cost £56.83 each, the anti-roll bar is £226.01 (complete), while the upper link arms are roughly £100 apiece (there are two each side). Where it gets expensive is if you need to replace the bottom link arms at the front as well, as these start at £246 each. All prices are from Bentley specialist Flying Spares.

With the car being sensitive to camber adjustment, you'll also need to get a four-wheel laser alignment carried out once the new components have been fitted.

Suspension component prices

ANTI-ROLL BAR

Main dealer £226.01

AIR SPRING UNIT

Main dealer £1852.21
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Sophisticated air spring set-up is generally trouble-free, although the GT eats front end suspension components and they aren't cheap.

Brakes

Spirited driving can result in rapid brake wear, and because of their size (405mm at the front), replacing discs can be pricey.

Brake component prices

FRONT BRAKE DISCS (PAIR)

Main dealer £605.40
Independent from £589.98

FRONT BRAKE PADS

Main dealer £289.80
Independent from £116.99

Miscellaneous

Rust shouldn't be an issue, but some owners have complained about corrosion on the chrome door trims.

Tyres can also be an unseen expense and featuring such big rubber means it will pay to shop around for the best quote. The best price we found when looking for 275/40x19 tyres was £89.18 (fitted) for Pirelli Zeros from Blackcircles.com.

Miscellaneous parts prices

TYRES (275/40 R19)

Blackcircles £89.18 each

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STARLET EXPRESS



THE CAR IN FRONT IS A TOYOTA

If you are prepared to put in a little time and effort, you don't need to spend a fortune on a vehicle that's capable of giving reliable, economical service. In **Part One** of a three-part series, **Kim Henson** explains how he became involved with a budget-priced Toyota.

The Toyota Starlet joined the Henson family recently when our other car was written off by an errant driver not looking where they were going, emerging at speed from a side road, driving into the left-side of our vehicle and rolling it over. My daughter Rachel was at the wheel at the time, but despite the damage inflicted, no-one was seriously hurt. It did, however, leave us urgently in need of another car, in particular for a new role as Rachel's daily commute.

We wanted a relatively compact, reliable, five-door hatchback that was economical enough to run for 200 miles each week. Dependability was far more important to us than style, and knowing there were bargains out there on allegedly unfashionable cars, we set ourselves a budget of £500.

Initially we were thinking along the lines of an older Rover Metro/100, Ford Fiesta, Hyundai Getz, Skoda Felicia or

VW Polo. Then Rachel spotted a five-door Toyota Starlet and was attracted to its slightly individualistic design.

Although superseded in 1999 by the Yaris, the Starlet had earned an excellent reputation for its all-round competence. There were still plenty of 90 Series cars (produced from 1996 to 1999) available.

We searched for a suitable car in the classifieds and on the internet. Very tidy examples could still be found, but low-mileage cars were up to three times our budget. My attention was caught by a 1996 five-door for sale on an internet auction site. It was an upmarket CD version with standard-fit central locking, power-assisted steering, electrically-operated front windows, an electrically-driven glass sunroof and a CD stereo system (the original unit had been replaced by a very nice Kenwood).

From the wording of the ad, it sounded promising, but with nearly 130,000 miles on the clock it had a much higher mileage

than was ideal and most of the red paintwork had faded to a dull, matt pink. In addition, it had picked up a few scuffs, plus a dented left-hand front wing.

I contacted the seller, who was totally honest about the vehicle. He had owned it for some years, and had always had it garage-maintained. He advised us that the proprietor of the village garage in Kent where it had been serviced during his ownership had always told him what a good car it was. The seller also told me that, despite its relatively high mileage, the car ran beautifully and drove perfectly, and that it was definitely not an oil burner. The damaged front wing was down to vandalism rather than poor driving.

Before we put in a bid on the vehicle, I did a bit of research. My impression of Toyota's sound build quality and reliability was supported by the huge numbers of people expressing great satisfaction from their respective Starlets. In addition, I gave the Starlet an



1 Our first view of the Starlet was in a railway station car park in north Kent. The £490 Toyota was exactly as described by the seller, who was honest about the vehicle's history. Underneath the matt finish there was potential for the car to look very smart again. In fact, the rear bumper and the sills had retained some of their original lustre.



2 The most significant bodywork damage was a dented left-hand front wing, caused by vandalism while the car was parked up.



3 There were a few scrapes and minor dents, but no corrosion damage could be found and there was no evidence of any underbody welding.

HPI Check (0845 300 8905; www.hpicheck.com) and it revealed no hidden horrors in the Toyota's past.

The bidding ended on this Starlet at £490 – £10 under budget. It was ours.

A Starlet is borne

When buying a car online, it is always wise to view the vehicle before handing over any cash. After driving 150 miles to view/collect the Toyota, it was clear the car was precisely as described.

A test run revealed that the engine ran quietly and pulled strongly. Even when fully warmed up, it showed no signs of oil smoke nor distress, while the gearbox, brakes, steering and suspension were in fine fettle. We allowed the engine to cool before checking the oil and coolant.

I also gave the Starlet a close visual examination. The only area of concern was that the radiator seemed to be in poor structural condition, although it wasn't actually leaking. Otherwise, the faded exterior paintwork was completely flat, with hardly a trace of a shine.

I felt that, with a little elbow grease, improvements could be made in this area.

Of more concern was the fact that the spare key had been mislaid. This meant that if the remaining key was lost or damaged, we would not be able to use the car – the key has to be programmed to the vehicle. Thus obtaining and programming a spare key was a priority.

During the 150-mile drive home, the Starlet performed admirably and consumed little fuel – we estimated it was giving 48mpg. The engine was eager,

JOBS LIST

✗ RADIATOR RENEWAL	PART 2 SEP 15
✗ FULL SERVICE COMPLETION	PART 2 SEP 15
✗ CAMBELT RENEWAL	PART 3 OCT 15
✗ BRAKING SYSTEM CHECKS	PART 3 OCT 15

smooth and quiet, and the car drove and handled beautifully.

Back at home, I checked the engine oil – it was very clean – and the level hadn't dropped discernibly during the journey. We then started to list the jobs required on the Toyota, as the car was going to be pressed into service immediately. We knew that the Starlet could be improved further while being used and enjoyed.



4 At some point, someone had scraped the plastic-coated front bumper, but the damage was more cosmetic than serious, although the plastic coating had been abraded away in one small area.



5 Closer examination of the bodywork revealed parking scrapes on the wheelarch lips, but mostly only the upper layers of the topcoat had been affected, minimising the need for touching-up.



6 The front seats were grubby but otherwise in good condition, with just a tiny hole in the fabric around the base of the driver's seat. All the instrumentation and warning lamps were working.



7 We inherited the various motoring-related items left in the Starlet's boot. The boot itself was undamaged, with the exception of a dodgy attachment point for the parcel shelf.



8 An incorrect rear wiper blade had been fitted and it clobbered the washer jet every time it carried out a sweep. We replaced all the wiper blades with correct new items.



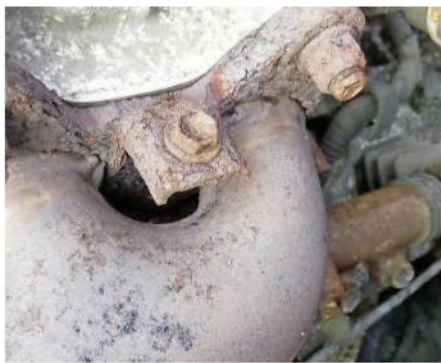
9 Cosmetically, the 1332cc engine and its compartment were in totally original condition. There was some maintenance documentation included with the car, which proved that the mechanical aspects had been looked after very well over the years.



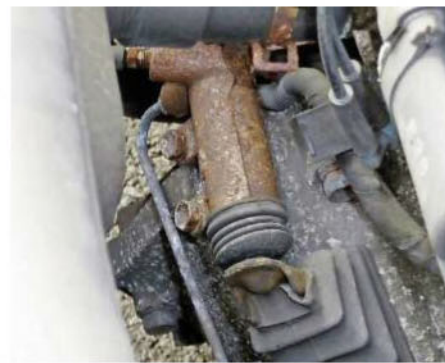
Starlet on a shoestring



10 The radiator was definitely living on borrowed time, with many of its fins absent and the rest in poor condition. Fortunately, it was not actually leaking.



11 The exhaust manifold and its securing studs/nuts showed signs of surface corrosion, but the rest of the engine was sound, albeit slightly shabby.



12 Surface rust was evident on the clutch's slave cylinder, but the clutch itself was working perfectly and there were no signs of any fluid leaks.



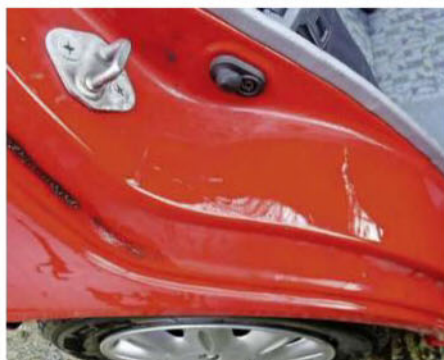
13 The nearside rear tyre was suffering from surface wall crazing and another was nearing the minimum tread depth limit. Both were renewed with Avon 155/80 R13s.



14 Our Starlet came with only one key. A blank replacement key was acquired from and programmed by Dean Birch (info@onboard-diagnostics.co.uk).



15 The data read from the original key was transferred electronically to the chip within the new spare key. The key was then cut to match the original and tested.



16 The paint was badly faded, but it was clear from the door shuts that the bodywork had the potential to shine again – these areas were used to colour-match.



17 The bonnet had faded from bright red to a dull pink, and the roughness in the texture of the paint surface could be detected by hand.



18 We started off the cosmetic work by giving the whole exterior a watering with a strong hose, then a wash with car shampoo and sponge, followed by a rinse.



19 Grit, moss and other contaminants adorned the door window and screen seals. These were removed, first by soaking with warm water/car wash mixture, then using a soft-bristled brush.



20 Accumulated dirt had built up around the top and sides of the tailgate aperture, as well as the tailgate itself. We used a soft sponge and a jug of warm water to gently wipe and wash away the debris.



21 Following its wash, when the exterior paintwork had fully dried, we tried to restore some shine to the paint, applying a mild cutting agent (T-Cut), to remove old paint and expose fresh layers beneath.



22 Using cutting agent takes time. However, after just half-an-hour or so, a substantial section of the bonnet and one front wing were beginning to regain their former shine.



23 This shot shows the contrast between the untouched right-hand side rear door and the rear pillar panel just behind it. The pillar had just been treated to a mild cutting agent in liquid form.

PROJECT COSTS

PURCHASE OF CAR

£490.00



PARTS COSTS

Collection of vehicle £45.00

Two Avon 155/80 R13 tyres £62.00

NEXT MONTH

Changing the radiator and carrying out routine maintenance.

Wiper blades (three) £19.00

New spare key, including programming £71.00

Cutting agent, polish and extra gloss paint protection £36.97

TOTAL COSTS £723.97



24 The roof responded brilliantly to an application of mild cutting liquid, followed by gloss polish (Autoglym Super Resin Polish, £12.99) and a protective sealant compound.



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Air-conditioning

PART FIVE:

Examining the motor car's often troublesome air-conditioning system, **Rob Marshall** looks at how it was developed and how it works.

The importance of keeping occupants comfortable and well-ventilated became apparent soon after the motor car's passenger compartment became enclosed. Today, the majority of new road vehicles are equipped with air-conditioning, to both cool and dehumidify the incoming air.

Despite what you might think, air-conditioning does not 'create cold'. It removes heat energy from the interior as its captured refrigerant changes from a liquid to a gas. Nature uses this principle to keep us cool: our bodies lower their temperatures not by releasing moisture in the form of perspiration but by our sweat's evaporation, where it turns to a gas. Certain fluids can evaporate faster than perspiration, such as alcohol and petrol, to provide a faster chilling effect.

Artificial cooling, which is used by both domestic refrigerators and air-conditioning systems, harnesses this process and creates a cycle. A pump (or compressor) circulates hot gas into cooling pipes, located at the back of the fridge or in the condenser fitted in front of a car radiator, where heat is shed, making the refrigerant condense into a liquid. It then passes into an evaporator, where it vaporises into a gas again. The vicinity in which this process occurs becomes very cold. In refrigerators, the evaporator might be the icebox unit itself; in cars, the unit tends to be fitted behind the dashboard, often within the heater box. The gas then passes back to the compressor and the cycle repeats.

From house to car

Although refrigeration has become essential to modern life, it was viewed as a luxury. The ancient Romans imported snow to cool their wine and, from the



Chevrolet and Frigidaire were both owned by General Motors, which adapted the technology originally developed for domestic refrigerators to be used for vehicle air-conditioning.

mid-19th Century, ice was cut from lakes and delivered to private residences, where it was stored in an ice safe. The UK used to import ice from North America and Scandinavia, prior to a widespread domestic electricity supply being established, which allowed every home to install a refrigerator.

The first patent for an industrial fridge was granted in the mid-1830s, but there was no real commercial demand, thanks to the already well-established natural ice industry. It took approximately 30 years before artificial refrigeration found its first practical use – in Australia, to cool lager on an industrial scale!

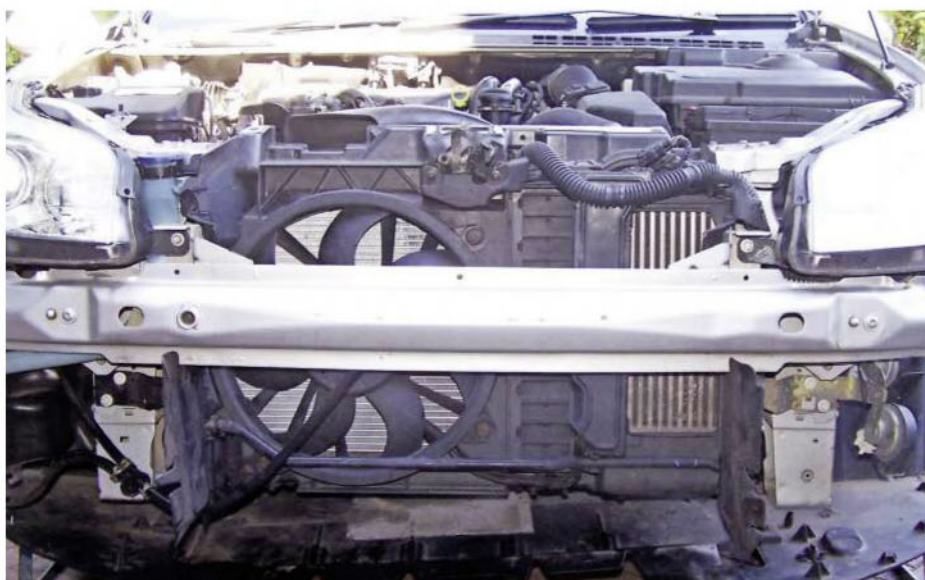
Buildings and hospitals started being equipped with air-conditioning in the early 1900s, which used the same working principles as those of an industrial fridge, but it was especially popular for offices, because the artificial ventilation meant that workers no longer had to be positioned close to a window. This pleased landlords, not only because the structure could be more simply (and cheaply) built, but also because there would be more interior space to let.

It took until the 1920s for the working parts of industrial air-conditioning to be made compact enough to fit within a domestic kitchen, with

North America leading the way in refining refrigerator design to impart a sophisticated and desirable image. As certain domestic chiller manufacturers were owned by parent companies that also manufactured cars – such as Frigidaire, which was a subsidiary of General Motors – the technology was shared from the kitchen to four wheels, enhancing luxury motor cars' advanced and decadent aura.

The first car thus equipped was a 1939 Packard. Not only did its compressor run full-time, but the system's bulky evaporator and blower had to be situated in the luggage compartment. Post-World War Two, Cadillac ensured that its air-conditioning could be disengaged, even though its controls were positioned on the rear parcel shelf. Some cars also featured ducting on the roof, which tended to affect the driver's visibility through the rear window.

In 1954, Nash-Kelvinator developed an air-conditioning system with its controls mounted on the fascia, as well as a compressor that could be disengaged by an electric clutch, which permitted greater control of the cabin's temperature. By the 1960s, the focus turned to automating the system further and some carmakers combined the air-



As refrigerant turns from a gas to a liquid, the condenser sheds heat, which is why it's located in front of the main coolant radiator. Cooling fans tend to work continuously when the aircon is on.

conditioning and heating into one unit. Cadillac's Comfort Control is credited as being the first climate control system that allowed the exact temperature to be dialled-in by the driver. By 1965, over 75% of Cadillacs sold in North America boasted climate control.

Moving with the times

With both air-conditioning and climate control becoming increasingly popular, subsequent decades have seen the system become more efficient, including ensuring that it does not run at maximum power unless necessary. On cheaper vehicles, the compressor's drive can be disconnected and reconnected periodically, whereas more sophisticated cars benefit from variable displacement compressors, which reduce the power required to run the system as the temperature/humidity within the passenger cabin drops. More recent advances include the use of extra sensors (including those that regulate sunlight

intensity) and electrically-powered compressors, fitted to certain hybrid and electric vehicles, that can continue working in 'stop-start' situations.

The refrigerant used in air-conditioning systems is harmful to the environment, but it has been difficult for car-makers to find suitable gases that are neither too corrosive, nor flammable and toxic. Early cars utilised R12 gas, an ozone-layer damaging CFC. Legislation in the early 1990s forced a change to R134a, which is less harmful, but strict regulations were introduced for anyone working on air-conditioning, including making it illegal to charge a system with refrigerant knowing (or suspecting) that it has a leak. A new gas, R1234yf (called also HFO-1234yf), is even less harmful than R134a and was intended to become mandatory for all new cars from January 2011. For various political, practical and environmental issues, this deadline has been extended by the EU and, even by the end of 2014, not all new cars were compliant.

Reliability concerns

Despite the humble refrigerator being one of the most dependable appliances in the home, automotive air-conditioning is probably the least reliable feature in a car, even though both systems share the same operating principles. The reason for this is that the environment beneath a car bonnet is considerably harsher than that of the average kitchen, with more vibration, higher temperature variation and the fact that the condenser is prone to being punctured, due to its vulnerable position in front of the radiator.

The flexible rubber refrigerant pipes, which are not required on domestic fridges, are also permeable, meaning that refrigerant seeps out naturally over time, necessitating a recharge every other year or so. Moisture can also enter the system, which can then freeze and affect operation. This is why a water trap (also known as a dryer) is often bolted adjacent to the condenser.

Finally, a domestic fridge has its compressor lubricated by a bath of oil within a totally sealed unit. In an automotive application, the lubricant is mixed with the refrigerant. Should the air-conditioning system not be activated for a while, the compressor seals can dry out and cause further leaks.

Even today, a totally reliable air-conditioning system for cars is an elusive goal that has not been met.

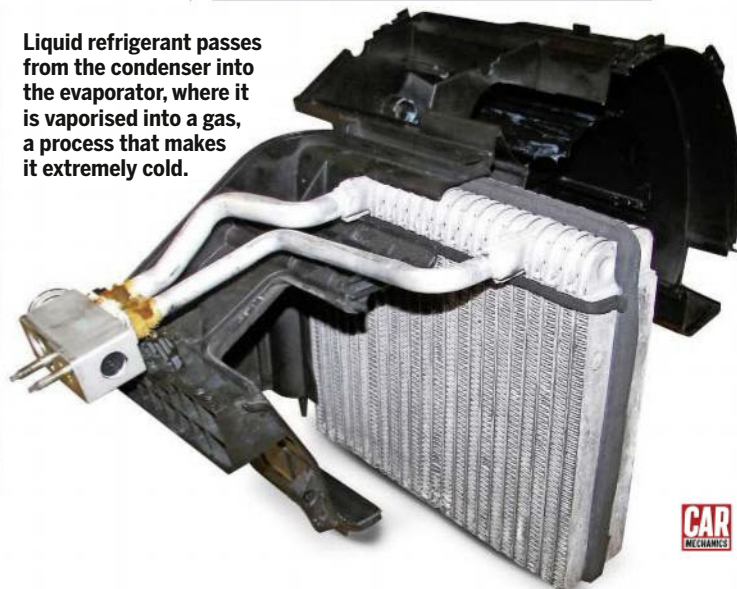
PREVIOUSLY

Part One (May 2014)	The Wheel
Part Two (Aug 2014)	The Bodyshell
Part Three (Nov 2014)	Instruments
Part Four (Feb 2015)	Exhausts



The dryer, which is also sometimes called the water trap, is bolted adjacent to the condenser to stop any moisture from entering the system and freezing.

Liquid refrigerant passes from the condenser into the evaporator, where it is vaporised into a gas, a process that makes it extremely cold.



DIY Servicing



2000 Ford Mondeo Verona 1.8 MkII

Spend less money on your Mondeo

The original Mondeo may be over 20 years old, but with so many sold, there are still a lot around. And, being an older model, it's straightforward to service, says **Richard Gunn**.

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ZF MOTION AND MOBILITY

Equipment required

- › Jack › axle stands › oil tray › oil filter › sockets and spanners › flat-blade › Phillips and Torx screwdrivers › Allen keys › small hammer › antifreeze hydrometer › electronic brake/clutch fluid strength checker › wire brush › abrasive paper › copper grease › spray grease › tyre pump › torch › torque wrench › rags for cleaning › disposable gloves

Richard says

One thing you should keep an eye out for during your service is corrosion. Fords of this era didn't have the best rustproofing and they will have gone through at least 15 British winters, so even pampered examples are likely to be suffering. Check everywhere – not just underneath – for any impending problems.

RICHARD GUNN
Special Contributor



Overall difficulty rating



Here's a bit of trivia: the name Mondeo is derived from the Latin word 'mundus', meaning 'world'. Designed to be a world car, the Mondeo name needed to work in all sorts of different languages – thus 'world' is 'monde' in French, 'mondo' in Italian, etc (although the US version did break the chain, being known as the Ford Contour and Mercury Mystique).

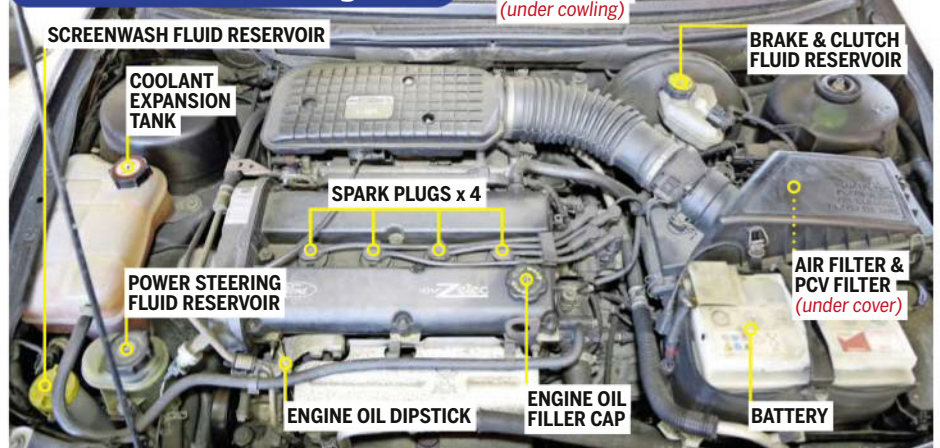
Launched in November 1992, with sales beginning in March 1993, the Mondeo replaced the relatively short-lived Sierra in the UK. It's now in its fourth generation, but the example we're looking at here is a first-gen 1.8 Zetec-engined car, albeit one of the last of the facelift MkII variants.

Despite being one of the most expensive new car development programmes ever, the original Mondeo didn't exactly set the motoring world

on fire. The MkII revamp addressed three of the biggest issues of uninspiring looks (by adopting an oval grille), poor lighting (it gained larger trapezoid headlamps) and insufficient space for passengers in the back. It was, in general, an improvement over what had gone before, although subsequent generations enhanced the formula still further.

Now in bargain basement territory, they're decent value for money for anybody looking for a cheap runaround that is sufficiently modern and well-equipped to cut it on today's roads. The good news for budget-conscious owners is that servicing is very straightforward (anybody used to having to remove covers, take off coil packs and do other dismantling to get at spark plugs on more recent machines will relish the Mondeo's accessibility) and parts are cheap.

Underbonnet layout



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Under the bonnet



1 CHECK COOLANT

The coolant expansion tank is transparent and the 'MIN' and 'MAX' marks are easy to see on the side – make sure the coolant is between these marks. If you want to check the strength of the mixture, use a hydrometer to ensure it is capable of withstanding winter temperatures. Blue coolant requires two-year changes, red is five years.

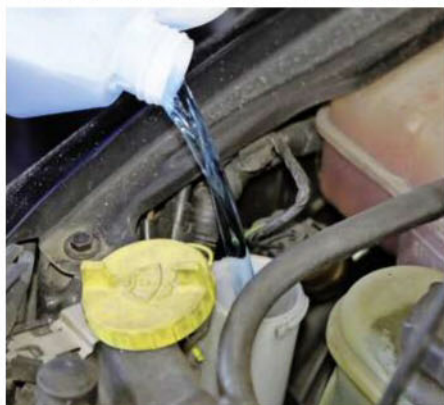
TOP TIP

While the old filter is out, also remove the small foam filter (for the positive crankcase ventilation system) from the right-hand corner of the housing and clean it using a solvent if it's dirty or oily.



2 CHANGE AIR FILTER

There are six clips holding the air filter box in place, some of which are more difficult to get at than others, such as the longer clip partially hidden by the battery. Pull the top aside and then remove the old paper filter element. Clean inside the box with a cloth, then fit a new filter, making sure it's inserted the right way up.



3 CHECK SCREENWASH

Peeping up from beside the coolant expansion tank is the top of the screenwash reservoir, identified by its yellow cap. Refill with the correct ratio of water and screenwash until the liquid reaches to the top of the neck. Check the jets function and aim properly at the windscreen; adjust them with a pin if required.



4 CHANGE SPARK PLUGS

The spark plugs are right on the top of the engine. Pull off each plug lead in turn. Check there's nothing lurking in any of the holes, then use a long reach socket to undo the plugs. We suggest a flexible magnetic grab to gently extract the plugs. Replacements are NGK PTR 5 A-10 items or equivalent.



TOP TIP

Fluid should be changed every two years as a matter of course – over time, it absorbs water, which reduces its efficiency. A car's stopping ability is something you really don't want compromised!

5 CHECK BRAKE FLUID

The brake/clutch fluid reservoir is against the bulkhead in a position that makes it difficult to see the level inside, especially if it's grimy. It's probably easier just to pop off the top. You should do this anyway to use an electronic fluid checker, to satisfy yourself that not too much water has been absorbed.



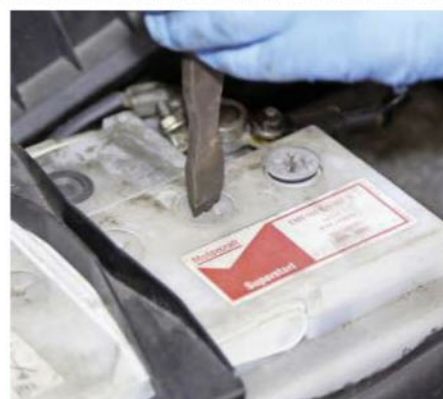
6 CHECK POWER STEERING

Huddled next to the coolant expansion tank and screenwash reservoir is the power steering fluid bottle. It's clear plastic, so you can check the level, although given how the container can get quite dirty, taking off the top to make sure is a wise move. Use Ford spec ATF fluid to top up if required.



7 CHECK DRIVEBELTS

Look at all auxiliary drivebelts in the engine bay, checking for fraying or tearing that could result in a breakage. Also check the tension. You should be able to twist belts no more than a quarter-of-a-turn in between pulleys – anything more and they'll need tightening. Check the integrity of all hoses, too.



8 CHECK BATTERY

Check the acid levels by undoing the six peepholes (assuming the battery is the type that has them). The acid should be covering the plates inside. If topping up is needed, do so using distilled water. Also make sure the terminals are secure – a coating of protective grease for them is a wise idea.

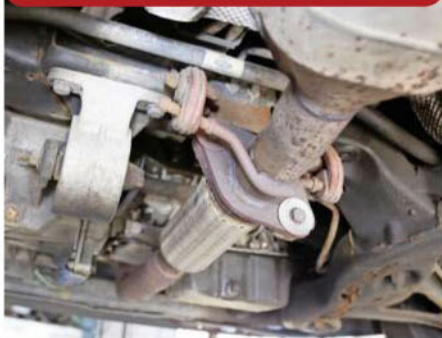
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MOTION AND MOBILITY

Under the vehicle – front



9 CHECK UNDERBODY

Once you're underneath the car, check everywhere for corrosion – these are old cars, so rust and damage is likely by now. Areas to specifically look at are the exhaust system for any problems – usually around seams or joints – as well as its mountings. Check exposed metal brake and fuel lines, too.



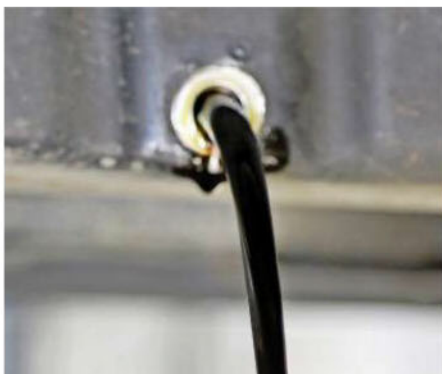
10 DRAIN FUEL SYSTEM

The fuel filter only needs to be changed every 60,000 miles. It's situated at the front right-hand corner of the fuel tank, by the jacking point. You should remove fuse 14 (for the fuel pump) from the fusebox in the engine bay and start the car until it runs out of fuel, to drain some of the fuel from the filter.



11 CHANGE FUEL FILTER

Position a rag to soak up any spilled fuel. Squeeze the pipe locking lugs together and pull off both pipes. Here, there's a plastic tie – but it should be a metal clamp. Slacken it, remove the old filter (taking note of which way the arrow points) and put on a new one, making sure the arrow points in the same direction.



12 DRAIN ENGINE OIL

The sump drain plug can be undone using a 13mm socket. Drain the oil when it's warm, rather than hot. System capacity is 4.25 litres, so have something big enough underneath to catch the old oil, which should be disposed of in an environmentally-friendly manner.



13 CHECK SUMP PLUG

Once the oil has fully drained, the plug can go back in, torqued up to 25Nm. Before that, however, check the plug itself. Most Ford cars have a rubber insert as part of the drain plug. If this is damaged, it's best not to reuse it, as it will probably leak. Fit a new one instead.



14 CHANGE OIL FILTER

The oil filter is up above the sump, but access is quite limited. Use a strap wrench to undo it. When you fit the new filter – which should be done up hand-tight – make sure you fit the new rubber O-ring that should come with it, applying a light skim of oil to aid sealing.



15 REFILL ENGINE WITH OIL

Use 5w30 grade fully-synthetic oil to refill the engine. Capacity is 4.25 litres, but due to excess old oil left in the system, you won't get all that in. Put in about three litres, then start the engine briefly to circulate it. Stop the engine, then top up slowly, making reference to the dipstick as you do so.



16 CHECK GEARBOX LEVEL

To check the level and condition of the transmission fluid, you'll need to undo the plug on the side of the gearbox casing using an 8mm Allen key. Dip a finger, cable tie or bit of paper in to the now visible hole, to make sure the fluid is up to the neck. It shouldn't smell burnt or look too dark.



17 CHECK WHEELS & TYRES

Check all wheels for items stuck in the tyres, cracking, kerbing and bulging. Also ensure they're road legal. Rock the wheels top to bottom; significant play signals suspension problems. Finally, spin the wheels; a drone suggests a worn wheel bearing. Tyre pressures are 31psi all around, wheel nut torque is 85Nm.



Under the vehicle – front (continued)



18 REMOVE FRONT WHEELS

While we doubt too many people will want to steal 15-year-old Mondeo alloys these days, there are locking wheelnuts on this car. Make sure you have the unlocking tool, otherwise you won't be able to work on the brakes. If it's lost, your best course of action is probably to drill out the offending nut.



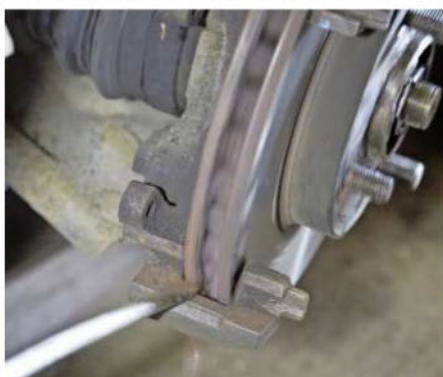
19 CHECK SUSPENSION

Once a wheel is off, check the suspension and steering components. Look for signs of perished rubber bushes plus tears or gaps in the CV boots; turn the wheels lock-to-lock to make sure. Other things to watch for are broken road springs and leaks from dampers and brake lines (usually around the unions).



20 REMOVE BRAKE CALIPERS

Use a wire brush to clean up the outside of the brakes, then remove the caliper. To do this, you'll need to remove the two small plastic covers on the back of the caliper, then use a 7mm Allen key to undo the two bolts they cover. Next, use pliers to pull off the pad retaining clip.



21 REMOVE BRAKE PADS

If there's more than 2mm of friction material left and no contamination from oil or grease, the pads can be reused (on this car, they needed to be replaced). Do further cleaning with the pads out of the way, including inside the calipers. Turn the disc rim against a flat-blade screwdriver to remove loose corrosion.



22 CLEAN BRAKE PADS

Use abrasive paper laid on a flat surface to clean up the front of the pads. The rears and mounting lugs (plus where they mount around the disc) should receive a coat of copper grease. Also apply copper grease to the rear caliper bolt shafts – which act as sliders – and the holes where the caliper clips sit.



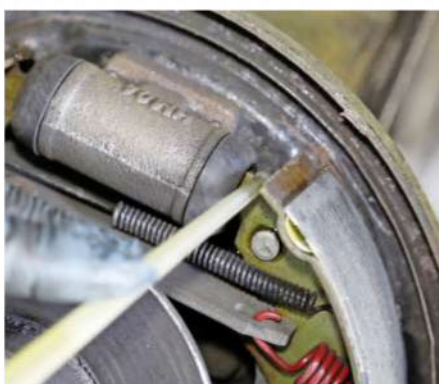
23 DISASSEMBLE BRAKES

Our car has drum brakes at the rear. Once the wheel is off and you've done similar suspension and brake line checks to those at the front, you can pull off the drum. Be warned: it may be a little stiff, in which case gentle persuasion, using a screwdriver as a lever or giving it a tap with a hammer, might be necessary.



24 CLEAN BRAKES

Use a wire brush to generally clean up the brakes. Then use abrasive paper to tidy the brake shoes if they don't need replacing due to wear or contamination. Clean inside the drum itself the same way. You should push back the rubbers on the slave cylinder to make sure no fluid is leaking.



25 CHECK BRAKES

Put a dab of copper grease on a bent-over hacksaw blade and apply some to the points where the brake shoes rest against the backplate, using a screwdriver to gently lever the shoes away from the plate. You should also lubricate the handbrake lever pivot with a drop of household or engine oil.



26 ADJUST BRAKES

Before you refit the drum, move the shoes outwards using a screwdriver as a lever. Then trial-fit the drum. If you can't spin it without resistance, take it off and move the shoes in again using the knurled adjuster wheel under the linkage bar. Repeat this process until the drum goes on and spins freely.

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MOTION AND MOBILITY

Other items



27 LUBRICATE ALL LOCKS

All the locks, catches and hinges should be lightly lubricated, using either spray grease or ordinary household oil, to help keep them from going stiff or seizing up. An extension nozzle will allow you to get right into locks. As this is often overlooked at services, it might not have been done for a while.



28 CHECK ALL WIPERS

Make sure that the wipers are fit for their job – less use during the summer months can allow the rubber to degrade. Issues with the ones at the front might be obvious, but problems with the back one less so. Check the rubber isn't perished or torn, which could lead to the glass being marked.

Don't forget to also...



- ▶ Clean any **body and door drain holes** (arrowed), using something like a small screwdriver – they can get blocked up.
- ▶ Check the **handbrake** – brakes should start to engage after one click and be fully on by four clicks.
- ▶ If you need to change the **pollen filter**, you'll find it under the cowl grille at the bottom of the windscreen, which is secured by various screws, some of which are under covers.



29 CHECK ALL INSTRUMENTS & CONTROLS

Make sure all the instruments, controls and lights are functioning properly – if you don't have a helper to verify the brake lights are working, back the car up to a wall and look for the reflection of the lights. Or sit a full can of oil on the brake pedal while you check the bulbs. Also pull on the seatbelts hard to make sure they grab properly.



30 CHECK SPARE WHEEL

The spare wheel – a conventional type rather than a spacesaver – is located under the boot floor. Undo the hook screw that secures it, then do all the checks that you've already carried out on the other tyres. Make sure the pressure is at 33psi, since a few pounds will be lost from natural wastage before you need to use it.

Service schedule

EVERY 10,000 MILES or ONE YEAR

- ▶ Change engine oil and filter
- ▶ Check power steering fluid level
- ▶ Check brake and clutch fluid level and strength
- ▶ Top up screenwash fluid
- ▶ Check coolant level and strength
- ▶ Check wiper blades
- ▶ Check tyre condition and pressure
- ▶ Check battery
- ▶ Check all instruments and controls
- ▶ Check drivebelt condition and tension
- ▶ Check hoses for condition and leaks

- ▶ Check manual transmission fluid level
- ▶ Check seatbelts for wear and operation
- ▶ Check steering and suspension
- ▶ Check CV boot condition
- ▶ Check underbody condition, exhaust and fuel/brake lines
- ▶ Lubricate all locks, hinges and catches

EVERY 20,000 MILES or TWO YEARS

- ▶ Change pollen filter

Thanks to **Ellingworth's Garage** of Fengate in Peterborough, Cambridgeshire for its help with this feature. This friendly, long-established and family-run business is happy to work on practically anything with an engine. For further details, telephone **01733 343941**.

EVERY TWO YEARS

- ▶ Change brake fluid
- ▶ Change coolant fluid

EVERY 30,000 MILES or THREE YEARS

- ▶ Change air filter
- ▶ Clean positive crankcase ventilation (PCV) filter

EVERY 40,000 MILES

- ▶ Change spark plugs

EVERY 80,000 MILES or FIVE YEARS

- ▶ Change timing belt

AutoInsider Live! 2015

Jeremy Haworth goes to a new venue for the recent series of equipment exhibitions by the automotive parts supplier Andrew Page.

Following various mergers and acquisitions in the past year – notably Camberley Auto Factors in the south of the country – the automotive parts supplier Andrew Page is continuing the series of regional shows it began last year under the name AutoInsider Live! The shows comprise exhibition stands hosted by some of the leading movers and shakers in the motor industry. Many of the companies on display sell through other suppliers, but a fair number are closely associated with Andrew Page and are promoted through its outlets.

This year, we attended the second of five regional shows, held mid-May at Sandown Park Racecourse in Surrey. This mid-south-east catchment area includes 25 AP branches out of a national total of 114.

A number of major companies were displaying examples of their wares and had helpful technical staff on hand to talk to visitors. These included TMD Friction, better known as Mintex for their range of brake linings, discs and drums that cover the vast majority of vehicles, and NGK, who are best known for its spark plugs, but also has a huge range of ignition-related equipment including high-speed ceramic glow plugs (generating around 900°C in a half-second) and covering automotive, air and marine applications.

Mann Filter had an excellent display illustrating the side effects of filter failure due to poor materials and low manufacturing standards, which included a black museum of low-grade brands. The moral was not to go for the cheapest of the cheap in air or fluid filtration, but to use a decent brand. Preferably Mann, of course.

Unipart was present, an old name revived with a range of stated original equipment quality parts available through suppliers and independent garages.

Among other exhibitors worthy of note were BM Catalysts, one of the largest independent manufacturer of catalytic converters, diesel particulate filters and front pipes in Europe, and Turning Circle steering and suspension components, which makes everything from basic bushes to suspension arms covering a claimed 90% of UK cars. One particularly helpful bit of advice for engine cooling and climate control products was imparted by Nissens UK, who said that best practice is to run your aircon frequently at the lowest setting, especially in winter, to keep the fluid in motion and the seals lubricated.

And as is usual with this and other trade shows, visitors received a free T-shirt and a voucher for a free bacon roll. Full meals and drinks were also available from the exhibition caterers.



The keen team at Mann Filter had all the displays and knowledge to show just why it is very bad economy to use the cheapest filters.



Schaeffler Automotive (UK) develops and manufactures the FAG, LUK and INA brands. Pictured is an innovative transaxle contained within the clutch system casing.



Hoffman Megaplan UK is a family-owned business dealing in tyre and alignment equipment, such as this balancer. It was agreed that no-one present had ever removed a tyre using hand levers!



Andrew Page had its own dedicated area for small personal technical seminars on garage equipment, diagnostics and training.

AutoInsider Live! will be showing at the **Imperial War Museum, Duxford, Cambridgeshire** on **22 October** and **Doncaster Race Course, Doncaster, South Yorkshire** on **26 November**. Venues for 2016 will include **Stoneleigh Park, Warwickshire** in **March** and the **Metro Arena, Newcastle-upon-Tyne** in **June**. Entry is via pre-booking on the www.andrewpage.com website or by turning up on the day and signing in. Parking is free.

Help!

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



GENERAL

Garage ramp hire

Q Could you tell me if there are any DIY garage ramps for hire in either the Scotland or Peterborough areas, where I could work in some comfort on the underside of my vehicle? I have heard that there is one in Aberdeen and another in London somewhere, but they are a bit off the beaten track for me up here. I go down to Peterborough a couple of times each year, so somewhere in that neck of the woods would also help.

R Bloy

A Making a quick search online, I discovered that many DIY workshop facilities have been set up in the past, but very few seem to be still operating. This may be due to the overheads of running such an operation, as well as the insurance implications.

I have found garages that are available to rent by the hour or day in

Southend-on-Sea, Bletchley, Coventry, Darlington, Bristol, Darwen, Acton, Sheffield, Chessington, Birmingham and, most relevant to yourself, Glasgow. Unfortunately, after further checks, it appears the Glasgow unit has now closed its doors to the public. This means the nearest one to you is Darlington. The company is called Rent-A-Ramp and can be contacted on 01325 337005, although I have never used this firm myself and so cannot comment on the facilities available.

GENERAL

Insurance advice

Q I have bought and sold a few cars recently and I'm looking to take it more seriously. I have been buying the temporary day-to-day insurance from RAC, but this really eats into profits. For example, getting insurance coverage of one day to test drive the car, another day to get its MoT and a third day if it fails costs roughly

£90. Ideally, I am looking for cover that will allow me to drive my own personal car as well as the one or two I may have in the lock-up being repaired, given that I'll be selling them in the near future. Do you know of any companies or links to sites to get some sort of insurance cover to meet my needs? I am nearly 30 and hoping to turn this into a small extra earner for myself and see where it goes.

Paul McCully

A Standard trade insurance (also known as road risk insurance) should cover you for any vehicle in your control. Your own personal vehicle will be included on the policy and you should be given access to an insurance database, where you will be able to add and remove the vehicles in your care as you buy and sell them. It used to be that a trader needed separate premises to obtain trade insurance, but the rules seem to have been relaxed. A quick search online will bring up a number of companies that can supply the trade insurance you require.



FORD FOCUS

Erratic gauge

Q My 2003 Ford Focus 1.6. petrol has an erratic temperature gauge reading. After a short journey, the needle doesn't move over to hot gradually but in jerks, even though the engine hasn't reached normal running temperature. This can result in the EML light showing and the engine going into 'limp-home' mode. I have replaced the temperature sender, water pump and thermostat, to no avail. The vehicle is driveable with the thermostat removed – it does not go into 'limp-home' mode, but the heater operates poorly.

In an earlier issue of *CM*, a faulty temp gauge caused problems of a different nature. I have considered fitting a used instrument panel, but this would result in an incorrect mileage display.

John Moore



The needle of the temperature gauge in a Ford Focus is jerking rather than moving smoothly.

A You first need to diagnose if the problem is electrical or mechanical. Although you say that the gauge reads hot when the engine has not reached running temperature, you also mention that the engine runs without problems if you remove the thermostat. While you say the heater does not get hot, this would be the case without a thermostat.

On the mechanical side, you have replaced the water pump, so we can assume the impeller is operating correctly. From past experience, I would not make any assumptions

about the thermostat and would give this a test by placing it in a mug and pouring boiling water over it. Although this is a crude test, it will at least confirm that the new thermostat is operating. If the thermostat is opening correctly, I would refit it in the cooling system and carefully bleed out the system.

Next, you need to check the electrical circuit. As the indicated temperature causes the vehicle to enter 'limp-home' mode, I would suspect the fault is within the loom between the CTS and ECU. Checking the resistance of the wires in the circuit should ensure this is not a faulty area. I would also carefully check the pins within the plug going to the CTS – it is possible the old unit was weeping and has corroded the connections. I would then check the earth connections on both the ECU and the dash pod. If possible, checking the sensor readings using a scanner will confirm that the CTS is reading correctly.



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FORD FIESTA

Aircon workings



Q I require assistance with an air-conditioning problem with a 2009 Ford Fiesta. The vehicle was brought to me for a check-over as I have slightly more knowledge of what happens under the bonnet than the owner, who was complaining that the air-conditioning didn't seem to be working as it should be. I put on the gauge from one of those air-conditioning kits you can get from Halfords and, after following the recommendation about allowing the aircon to run on full cold for three minutes (*Help!*, CM, August 2014). The reading on the gauge was in the red, going down to amber and back.

One thing I noticed was that on the outside end of the air-conditioning pump there's what I can only describe as a spinning plate, which has the ancillary belt and pulley between it and the pump. Under observation, this stopped and started spinning every two seconds or so, with a rise and drop in engine rpm (with no human intervention), with no noticeable change in cabin temperature. I'm assuming this is the correct operation for the pump regardless of whether there's an air block in the system, loose wiring or the pump itself is faulty.

Not knowing enough about air-conditioning to diagnose and repair the fault, I advised the owner to take it to a garage to have it more thoroughly checked, preferably by someone with more knowledge on the subject than me. Please can you advise on what the fault could be and if I'm anywhere near the solution?

John King

A The air-conditioning pump is operated by the connection and disconnection of the drive via a magnetic clutch. The drivebelt continually drives the outer pulley, but the drive will only be transferred to the pump when the electromagnetic clutch kicks in. This will be the 'spinning plate' you mention. When this kicks in, it should stay running for long enough to compress the gas in the system and the secondary cooling fan on the radiator should start to operate.

There could be a few factors causing the fault you describe, but with the constant cutting in and out of the compressor, the most likely one is a faulty pressure sensor within the system. As replacing this will require the system to be degassed and then recharged, you have given the correct advice to get the vehicle properly checked by a garage with the correct equipment to cope with the necessary procedures. Air-conditioning systems should never be discharged into the atmosphere and the system should not be allowed to run while empty.



A professional aircon recharge unit

FORD FOCUS

Rear brake screech

Q I maintain my daughter's 2003 Ford Focus hatchback. For some time the car has suffered from a screeching from the rear drum brakes. It is mostly driven around town and usually the brakes are only lightly applied, with the resulting noise.

I am aware this is not an uncommon problem with the Focus.

On several occasions, I have removed the drums and cleaned out the dust using brake cleaner, which seems to improve the situation for a very short time. Can you advise on a more permanent solution?

Would replacing the non-Ford brake shoes with official items help, or else replacing the brake springs, as the car has now completed more than 70,000 miles?
Malcolm Blaker

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A As you say, brake squeal is quite a common problem. The noise is caused by a high-pitched vibration as the brake shoe touches the drum, although the braking material does contribute to the problem. I would first try to cure the fault before replacing what are still serviceable brake components.

As you have already taken the first steps to remove unwanted brake dust, the next move is to chamfer off the leading edge of the brake shoes. This can be done with a file and will allow the contact between the brake shoe and drum to be more progressive and should help eliminate the noise.

You should also ensure that the braking surface within the drum itself is clean and without any hotspots (these may be indicated by blue marks). Finally, using a brake lubricant between the contact points of the brake shoes and back plates will also help to prevent the noise.

FORD KA

Steering pump pulley

Q What tools do I need to remove the power steering pump pulley from a 2002 Ford Ka?

A Murray

A You do not say if your Ka has the Duratec or Endura engine. If it has the Duratec engine, the tool part number is 211-016. For the Endura engine, the tool is part number 13-022.

Bear in mind that if you purchase the unit from a factor you will find that service exchange units will come with the pulley already fitted.



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FORD PROBE

Off-the-road advice

Q I have a Ford Probe that has been on SORN for four years. It has recently received a reconditioned head, Lambda sensor and coolant temperature sensor.

The compressions are 170psi. The exhaust is new except for the catalytic converter. All new gaskets were used on reassembly. I run it at standstill in the garage most days and, on start-up, it smokes considerably (grey smoke that smells of petrol) after about 20 seconds. There is also a steady dribble of water from the tailpipe. When normal temperature is reached, the smoke subsides to an acceptable level and the dribble stops.

Fred Webb



A Ford Probe that has been on SORN for four years now smokes excessively on start-up.

A From what I can gather, the vehicle has not been on the road since the work was carried out. I am assuming that the main content of the grey smoke is steam. This is perfectly normal and is the result of the catalytic convertor working as it should. Basically, it converts the unburnt hydrocarbons into water. If you couple this with the fact that your engine has not yet run under load conditions, you will probably find that the exhaust rear box could be retaining the water, as without a run it is doubtful that the complete exhaust has reached an operating temperature.

You say that, once the engine reaches operating temperature, the smoke subsides and this reassures me you are not looking at a serious problem. I am assuming that you plan to put the vehicle back on the road – you should find that the situation stabilises after a short period of regular use.



JAGUAR X-TYPE

Radio code

Q I have a 2003 Jaguar X-TYPE 3.0 Sport. I have replaced the battery, but because I haven't got the code number for the radio, the radio does not work. Is there a magic formula to bring it to life? I do not want to get caught up in the clutches of a Jaguar main dealer if I can help it.

D Robertson

A There are a few variations of audio system that may be fitted to your Jaguar, but if your system is asking for a radio code then this will need to be found. The radio code is set at the factory by a complex algorithm based on the unit's serial number. To obtain the code you will need to extract the radio and access the serial number.

To remove the radio you will first have to lift the gearchange surround from the centre console and locate the two screws holding the ashtray in position. Once these are removed, pull out the ashtray, unplugging the cigar lighter connections in the process. Next, detach the small cover at the top of the climate control panel to reveal two fixing screws. After undoing these and the two lower fixing screws, the climate control panel should pull forward, revealing the fixing screws for the audio unit.

You need to find the nine-digit serial number from the unit. Once you have this, you can get the radio code for a small fee from an online firm such as radio-code.co.uk or else a local radio installer may be able to help you.

Although you expressed a reluctance to get involved with your local Jaguar dealer, it may be worth contacting them as they possibly have the code on record.

JAGUAR X-TYPE

Loss of power

Q I have a 2003 Jaguar X-TYPE 2.0 petrol (it is actually a 2.1-litre but they call it a 2.0) with 103,000 miles. The problem is that there isn't a lot of power compared to when I first owned the vehicle. It had then covered 90,000 miles. The problem has occurred about three times. I will be driving along at around 40mph in fifth gear when, all of a sudden, I get full power, but this only lasts about 10 seconds before it goes back to no power.

I have changed the ECM (twice), the coolant sensor and the MAF sensor, and the camshaft and crankshaft sensors. I have also replaced the spark plugs, the oil and filter, and the air filter. When I changed the four oxygen sensors and the aspirator, it gained a little more power.

J Cheetham

A As you say, the engine in your Jaguar has a displacement of 2.099 litres, so is technically much closer to a 2.1 than 2.0.

ROVER 45

Key fob cover needed

Q I need help in finding a key fob cover for my 2005 Rover 45. It is circular and has a three-button application. Mine has cracks on two of the three buttons, but still works OK. I have searched the web and visited local garages without any luck. I wonder if you can offer me some direction?

Dave Jones

The round remote fob

A The circular key fobs on your Rover are not as common as the two-button fob found on most Rovers. There is a company that offers a refurbishing kit for the three-button fob for £35+VAT and they can be found here: <http://bit.ly/15gmJ1d>. Not having used this company, this is only a suggestion not a recommendation.





Among the items you have listed as changing, you do not mention the fuel filter. If this has not been replaced then this should be your first move – the filter can be found under the offside rear of the vehicle just in front of the fuel tank. You also do not say if you have used a code reader on your Jaguar and, again, if this has not been done it may prove beneficial, even if no management light is present.

If the fuel filter has been replaced, I suspect your problem could either be the fuel pressure sensor in the fuel rail, or the throttle body assembly or throttle pedal unit. The pedal unit can be tested with an ohmmeter by checking the resistance between pins 1 and 6, and 2 and 3, on the connecting plug. The resistance between pins 1 and 6 should be within the range of 546-1134 ohms, and the resistance between 2 and 3 should be between 975-2025 ohms.



VAUXHALL ASTRA

Remote key reset

Q I have remote central locking problems with my wife's 2000 Vauxhall Astra 1.6 auto. Neither of the remote locking/unlocking works from the fob, although all the doors lock and unlock by key in the driver's door lock. I have fitted new batteries.

Do you have the information to reprogramme the keys to the car as I suspect this may be the problem?

Graham Moore

A If the remote battery goes flat or if the battery change operation takes more than three minutes, the coding between the car and fob can be lost.

Resetting the existing remote control fob can be done as follows: Switch the ignition on and, within 30 seconds, press the lock or unlock button on the fob. The central locking should operate to indicate correct synchronisation.

Unfortunately, programming new remote fobs can only be done with diagnostic equipment.

VAUXHALL ASTRA

Lack of temperature gauge



Q My son has bought a 55-reg Astra H. It seems that Vauxhall decided not to fit a temperature gauge to this car. The handbook says there is a coolant warning light under the battery light on the dash, but this light does not come on when I turn on the ignition. The car drives fine and the temperature light does not come on, although the engine gets up to temperature.

Should the temperature light come on when the ignition is switched on, before the engine is started, and if the light comes on when driving is it too late by then? How do you know if the bulb/LED is working? Some people on the internet think there is some kind of computer-controlled shutdown on this model, which may prevent the car being driven when it is too hot. Do you know anything about this?

Roger Poore

A The light will only illuminate when the engine temperature becomes too high. If the light does illuminate then the engine should be stopped immediately and the cause of the overheating investigated. The light will illuminate at the same point that a gauge would enter the red section, so provided the engine is stopped immediately no further damage should occur.



There is as far as I am aware no shutdown that will stop the engine if the light is illuminated, although the engine should go into 'limp-home' mode when the temperature rises too high. However, on some models, there is a secret menu that allows you to bring up the engine temperature in the display. To activate this, press the settings button, press down and then press and hold the settings button again until you hear a beep. Then, using the BC button, scroll through until you reach the engine temperature (if you have a two-line display, then you need to press the 'Display' button). When the engine is switched off, the display will revert to normal.

Another alternative is to purchase a Scangauge (www.scangauge.com), which can be plugged into the EOBD port and, amongs other things, will display the engine temperature while driving.

VAUXHALL CORSA

Heavy steering

Q My father has bought a 51-plate Vauxhall Corsa 1.0 12v with 110,000 miles, and it has just passed its MoT. The steering is lighter when turning left than when turning right. Do you know of any common faults on these cars that could account for this? The EPS light comes on with the ignition and goes out after starting and does not come on while driving.

Craig Christie

A The heavy steering in one direction is often mistaken for a sign that the electric power steering unit is failing. However, very

often all that needs doing is a simple adjustment of the steering angle torque sensor. To access this you will need to remove the under-dash cover panel to expose the EPAS unit. With the panel removed, you will see a metal cover held on with two screws at the point the steering column meets the body of the steering unit. After removing this cover, the steering angle sensor will be visible, held in place with two screws in adjustable slots. By loosening off these screws and adjusting the sensor, you should be able to balance the steering. Before making any adjustments, mark the sensor to give a reference point.

If this is not successful then www.ecutesting.com can carry out a repair by return of post.





VAUXHALL ASTRA

Display configuration

Q On start-up of a 2010 Astra 1600 SE, the small driver information display between the tachometer and speedo always defaults to 'Trip 1' (menu position 1). Using the collar on the LH stalk, I can click round six more menus until I get to 'Digital speedo' (position 7). Is it possible to reset this so the digital speedo always appears on start-up? This is easier to see than the analogue speedo, which doesn't have '30' marked on the dial.

L Goodman

A It should be possible to save the vehicle settings so that, when the same key is inserted into the ignition, the vehicle display reverts back to where it was when the key was removed. This is done via the infotainment centre. First press the 'CONFIG' button on the infotainment centre, then by turning and pressing the multifunction knob select 'Vehicle settings'. In the sub-menu you should be able to save the display settings.

VAUXHALL ASTRA

Gear oil change

Q I want to change the ATF in my 2000 Astra 1.6 Club. The Haynes manual says to use Vauxhall part no 09 117 946. Can I use any other equivalent ATF? All the online forums seem to disagree on this subject. I'm simply looking to save some money, but not at the expense of the gearbox!

Alan Hayes

A Part 09 117 946 is not really the number of the oil, but rather the number of one litre of the oil. The actual part number or specification number of the oil is 19 40 767. Using that number it will be far easier to find the equivalent oil that meets the specification.

Fuchs Titan ATF 4000 is one of the oils that can be used. This can be purchased online at this website: <http://bit.ly/1doX2PH>. Oil technology involves far more than simple lubrication, especially in automatic gearboxes.



AUDI A2

Softer suspension

Q I have an Audi A2 1.4 Sports petrol model and the ride is a quite harsh. Is it possible to retro-fit softer shocks at the front only

– to keep costs down – to give a softer ride? Or would I have to replace the springs, too?

Sri Sharma

A You do not mention the year of your A2, but as they were only made between 1999 and 2005, I am assuming yours falls into this category. Although it is often possible to find a firmer aftermarket

AUDI A5

Radio issues



Q I am hoping you can offer me some advice on a couple of small issues I have with my Audi A5 3.0 TDI Quattro sport. I bought the car about a month ago and one of the LED daytime running lights on the driver's side has gone out. I have made inquiries about whether it can be fixed, but the only advice I hear is that I have to replace the whole light. This seems a bit extreme just for one small LED, especially as Audi parts are not the cheapest. Do you know of any way to replace the LED or do you know of any specialist company that can fix or change the light?

My second question concerns the MMI sat-nav with the Bang & Olufsen music system. When I am cleaning the car, the radio cuts out after 10 minutes. If I am outside cleaning the car, it's very inconvenient as I have to go inside to reset it. I understand the system has a battery saver, but 10 minutes is a bit ridiculous!

Some of the Audi forums say that you can go into a secret menu to alter a load of settings, but the details are very vague and some people talk about a bootloader and that if you mess with it you have to visit Audi for a reset.

Barry Davis



A Replacing the whole unit for the failure of a single LED light on the DRL does seem a bit much. Unfortunately, I can find no company that can repair these lights and I would appeal to any readers who may know of such a company to please let me know the details.

On the subject of your MMI system, there is indeed a hidden menu. Before I explain how to access it, I will confirm that you must not access or alter the 'bootloader' on the menu as this will lock the radio. The reason that the operating time of the radio is limited is because the MMI system is far more than just a radio and the battery drain is that much higher.

Ideally the system should be set using the VAGcom system, but you can – at your own risk – access and alter the hidden menu as follows:

- Switch the ignition key to the 'On' position. If your vehicle has a standard key, this is the 'Acc' position; if you have the advanced key, press the start button without pressing the clutch or brake.
- Switch on the MMI unit and select 'Radio'.
- Press and hold down the 'Setup' button. While continuing to hold down the button, press the 'Car' button. After around five seconds, the orange screen should turn green.
- Release all buttons.

You can now scroll through the diagnostic menu, pressing the 'MMI' button to select the appropriate menu. Once you have made the changes, you can then scroll down to 'Accept changes'. Press the 'Return' button to exit the menus one by one until the orange screen returns.





shock absorber, as far as I can see there are none on the market that will give a softer ride.

Provided the vehicle has not been lowered, it would be possible to fit replacement shock absorbers without changing the road springs. However, by fitting just the front shock absorbers for a different type, you may alter the dynamic balance of the vehicle.

If the shock absorbers have stiffened up with age, then replacing just the front pair should be no problem. I would also check the tyre pressures to ensure they are adjusted to the lower, single occupant setting.



VOLKSWAGEN POLO

Product questions

Q There are two products, both connected with the care of engine oil, on which I would appreciate your comments. The first is Oil Spy and the second is FILTERMAG. Do you think that either or both of these are worth getting? If you think the FILTERMAG is worth getting, what size would I need for my 2012 Polo?

J Mitchell

A As I have never tried either of these products, I can only give a general opinion. Oil Spy (www.oil-spy.com) seems to be a good and, as far as I know, unique product that's able to diagnose impending problems by performing a low cost analysis of the engine's oil. Given the age of your vehicle, though, unless you have specific concerns, I do not think it would benefit you.

FILTERMAG is intended to prolong the life of an engine by trapping the tiniest particles of metal within the oil filter, preventing them from circulating around the engine. In the past, you could get magnetic sump plugs to perform a similar function. For the FILTERMAG to work, the engine needs to be fitted with a canister-type oil filter as opposed to the element type fitted to many vehicles nowadays.

VOLKSWAGEN SHARAN

Bearing noise



Q My brother-in-law recently bought a 1998 VW Sharan 2.0 petrol, with 115,000 miles. There is a noise coming from the car, which has been getting louder over the last two weeks. It sounds like a worn wheel bearing, with a slight rumbling. We have fitted new wheel bearings and CV joints to both sides, along with drop links, anti-roll bar bushes and new brake pads.

I know it's hard to diagnose the problem without hearing it yourself, but the noise also gets louder the faster the car is driven. The clutch and gears work fine apart from this.

Steve Wooldridge

The anti-roll bar inner bush



A As you say, diagnosing noises without hearing them can be difficult, but I am going to try! By eliminating the components you have changed, there is only one obvious part that might cause such a rumbling: the inner anti-roll bar bushes. These bushes tend to go hard over time and a tiny amount of play between the anti-roll bar and the bush can create quite a rumble. The small 'D' bushes are relatively easy to change, although I would also recommend replacing the small metal clamp that secures the bush in position as this will make clamping them back up slightly easier.

Compressing the new bush sufficiently to refit the bolt into the clamp is the hardest part of the job and I find that fitting a longer bolt initially helps to wind the clamp down into position. After this, the longer bolt can be removed and the correct bolt fitted.

One other component that could be causing the rumbling would be worn shock absorbers, although given the work you have already carried out, you should have noticed any problems with these already.

Assuming your Polo has the canister-type filter, I believe the FILTERMAG could only benefit the long-term life of the engine. The diameter of the filter fitted to your Polo should be 76mm. This would make the part number you require FMSS300 (70-87mm).

VOLKSWAGEN PASSAT

Purchase advice

Q I am looking at a 1999 VW Passat 1.6 SE with 124,000 miles on the clock and was wondering if there are any known problems with these? Do they have a dual mass flywheel, as I looked on the Euro Car Parts website and it lists a normal clutch and a dual mass flywheel? Also, the recommended cambelt life is 80,000 miles. The one I'm looking at has done 124,000 miles, but there's no proof of a belt change. Would it have lasted this long without one?

Steve Cloke

A According to the data I have available, the Passat you are looking at does have a DMF.

It would be hard to say if the timing belt is the original unit, but, with no history, it should be assumed that the belt would require changing. The book time for this is three hours and the job involves removing the front of the vehicle to gain access.

Other than the standard checks which should be applied to purchasing any used vehicle, the Passat does not have any specific problems. Check the condition and level of the oil and coolant to ensure there is no contamination. When driving the vehicle, check that the clutch does not slip slightly before taking up when changing gear and listen for any light knocking noises on tickover which may be coming from a worn dual mass flywheel. Ensure the brakes work efficiently and check the dash for any warning lights that are illuminated or that don't illuminate when the ignition is first turned on.





HYUNDAI SANTA FE

High emissions

Q I have a 2002 Hyundai Santa Fe 2.4-litre petrol. When it is first started from cold, it revs at 1800rpm even on warm days, settling down to 750rpm once warmed up. Soon after the engine reaches normal operating temperature (about three to four miles) there is a loss of power when under load – it's fine if I'm cruising constantly – and when you reach a junction or in town, it idles erratically, sometimes stalling, then struggles to rev under load. If you stop the engine and restart it, it's usually fine, and for the rest of the day it usually runs OK. When cruising, the vehicle appears to have a very slight misfire or to be holding back slightly. It is more noticeable on cold days.

My main concern is that the long-term fuel trim is -12.50% at idle – the maximum the ECU will go. When driving, the LTFT varies from -5% to -12.50%.

In December, the car went for its MoT and the emissions were very high: idle CO₂ was 0.205% and fast idle was 0.157%. At its MoT, 12 months previously and 7000 miles earlier, it was very clean. Recently on three occasions I've had the error code 'P0421 – warm up catalyst efficiency below threshold' and the second O₂ sensor is now switching nearly in time with the first O₂ sensor. I have checked the injectors for leakage, but these appear OK. I have also run the vehicle for a short time with the purge valve vacuum pipe blocked, but there's been no change. The coolant reaches its operating temperature of 86° fairly quickly – this has been confirmed by my handheld scan tool and also by the dash gauge.

I have replaced the spark plugs, coils, HT leads, both O₂ sensors (although I have put the old ones back as it runs no differently and the MIL light has stayed off so far), the crankshaft sensor, fuel pressure regulator, the MAF sensor with a used unit (identical readings as the original, including intake air temperature), the thermostat and front exhaust section. I have replaced the fuel filter three times (you helped me with this last June), once with an aftermarket one and also with two genuine Hyundai



A Hyundai Santa Fe has developed erratic running problems and high emissions.

filters, but the vehicle refuses to start until the original one is back in.

I have not checked the fuel pressure as there is no dedicated take-off point and I am reluctant to cut the fuel line and drive afterwards with a repair splice in a high-pressure fuel system. What are your views on this?

I have replaced the timing belt with new pulleys and tensioner. I have also replaced the engine coolant with long-life antifreeze. I have serviced the vehicle using a good semi-synthetic 10w40 oil, fitting new oil and air filters. The vehicle uses no oil or water.

Nick Lett

A The code 'P0421' indicates that the catalytic converter is not working as efficiently as would be expected by the vehicle's ECU. This generally means that the catalytic convertor needs replacing, although the code can be triggered by a leak in the exhaust system. Another cause would be the O₂ sensors, although, as you have tried replacing these, you should be able to discount them as the problem.

Unless the catalytic convertor is blocking up, then this is unlikely to be the cause of your erratic idle or low power. It may be worth finding a local garage that has an exhaust system pressure tester. This screws into the front O₂ sensor hole and measures the back pressure. Having this test done will give a better idea of what the problem may be.

Taking into account the repairs you have carried out and the previous issue with the fuel filter, I am inclined to think that the fuel pressure may be the source of the problem. There is a dedicated adapter needed to test the fuel pressure and I would not advise cutting the fuel lines to carry out such a test. The fuel pressure problems could be resulting from several different sources – it could be the electric fuel

pump, the pressure regulator or the fuel tank pressure sensor.

To ensure that the fuel tank is not pressurising due to a blocked carbon filter or canister purge valve system, I would try disconnecting the hose to the carbon filter temporarily and seeing if this improves performance. Also, in the same area, I would check that the purge control valve is operating correctly.

HYUNDAI AMICA

Auto gearbox oil advice

Q My wife has a 2007 Hyundai Amica 1.1 CDX auto that has covered 19,500 miles. The Hyundai handbook recommends changing the auto transmission fluid (ATF) every five years. Although there are currently no problems with the autobox, as the car is now seven years old, I booked it into my local garage, which I trust and which has been most reliable in the past.

They phoned me after checking the gearbox function and ATF, saying the ATF was fine and probably good for another 20,000 miles and that I would be wasting my money having it changed, but that they would change it if I insisted. I decided to leave it for the time being. The ATF fluid is cherry red, has no odour and the level is correct.

Did I make the right decision, given Hyundai's recommended ATF change interval and the fact that the car invariably does short journeys?

Mark Dawson

A As you correctly say, the recommended replacement time for the autobox fluid in your Hyundai gearbox is five years. Although you have not covered a great distance in the vehicle, the majority of your trips are short journeys, so I think it would be wise to replace the fluid now.

Not being able to physically check the fluid, I can only give my advice based on the details you have given me. To my mind, it makes more sense to replace the fluid now than to wait until it is displaying signs of burning or contamination, by which time it could be too late. Putting in fresh oil now will not only protect the future of the gearbox but give you peace of mind.





TOYOTA PASEO



Service information

Q I have a 1997 Toyota Paseo SI. Can you please supply the following information as I have no handbook for the vehicle:
1) The spark plug type and gap.
2) The brake fluid.



Also, the nearside electric door mirror is broken. Can you tell me if a replacement mirror is available for this model or whether there is another mirror that will fit?

Christopher Magrath

A I am making the assumption that your Toyota is fitted with the 1.5 engine (5E-FE). This should be a four-cylinder double overhead camshaft engine with 16 valves.

The spark plugs for this engine should be NGK BKR5EP-II or Bosch FR8DCX and the gap should be 0.8 mm

The brake fluid should be DOT3 or above.

I can also tell you that the oil capacity is 2.8L and 0.2L for the filter and that the recommended grade is 5w30. The timing belt should be changed every eight years or 75,000 miles.

With regards to the door mirror, the vehicle was based on the Toyota Tercel, which has the same platform as the Starlet, and some parts are interchangeable, although I cannot confirm that this applies to the door mirrors. However, a quick search on the internet showed several vehicle breakers who could supply secondhand parts for the Paseo.

TOYOTA YARIS

Cold start noise

Q I have owned a 2006 Toyota Yaris 1.0-litre three-cylinder petrol model since new and have done regular oil and filter changes using good quality 5w30 oil. The car has now covered 135,000 kilometres, mainly on the open road and not for urban stop/start driving. My problem is that, when the car is started from cold, the engine makes a sound reminiscent of noisy tappets. The noise does not affect the running and it disappears when the car reaches normal temperature. This engine is shared with Citroën/Peugeot.

My local mechanic has dismissed the timing chain as being the problem. I have not checked the valve clearances, and even if they needed adjustment, I understand it involves taking out both camshafts, which I feel would be a Toyota main dealer job incurring considerable labour costs. I am considering using a can of Bardahl hydraulic valve lifter for about a week's driving (240 kilometres) and then

flushing out the old oil and refilling it with a new filter.

Have you encountered any issues such as I have described?

Declan Kelly

A The 1KR-FE engine in your Toyota was a development of the Daihatsu unit and is also used in the Citroën C1 and Peugeot 107, as well as other vehicles. You have been regularly changing the oil with the correct grade and I would have not have expected you to experience engine problems at this mileage.

The most common source of such noises on these engines is the timing chain, but that has been checked and dismissed. As the problem sounds like a noisy tappet, I suspect it may be one of the cam followers that's sticking slightly when cold. If this is the case then using Bardahl hydraulic valve lifter may help, but because your cam followers are not hydraulic you should not be suffering such problems. It may simply be a case of wear to the follower, which, once warmed up, expands sufficiently to halt the noise.

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As Help! is a free service, some complex questions may require more time and resources than we can reasonably allow – when this is the case we will let you know.

Steve will reply to all queries as quickly as possible, but please allow up to 28 days for a reply. Difficult/complex questions or those requiring research may take a little longer – please be patient.

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These Help! pages are dedicated to the late RODNEY JACQUES, who answered Q&As here from 1995 to 2012.

According to the manufacturer's schedule, the valve clearances should be checked at 90,000-kilometre intervals, putting your vehicle in line with the standard procedure.

Another more serious possibility is that the inlet cam dephaser may be worn or sticking. If it is sticking then the Bardahl treatment may solve the noisy problem.



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DIAGNOSTICS

FAULT-FINDING & DIAGNOSING AT MAIN DEALER LEVEL

CASE STUDY

Volkswagen Golf MkIV 1.6 automatic

Volkswagen's four-speed autobox has produced the fault code 'N93', requiring further investigation.

Report from
Jack Moore

Customer complaint:

Engine light on dash, down on power

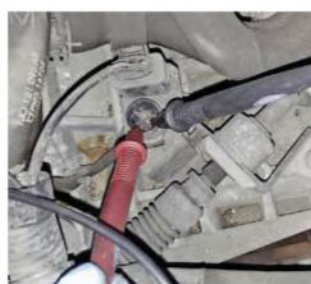
The customer had complained of an emissions warning light illuminating on the dashboard and thought the car was lacking in power. He also noted that his fuel consumption appeared to have increased in recent weeks.

As with any warning light, we carried out a scan to check for faults. Using the VCDS scan tool – probably the best aftermarket scan tool for VAG cars – we were surprised to find no faults stored in the engine control unit (ECU). Slightly confused, we carried out a scan of all remaining control units and this revealed a fault stored in the one for the automatic gearbox. Not having its own dedicated warning light for gearbox faults, the emissions warning light is used to indicate both engine and gearbox faults. We hadn't seen this before, as this VW-built four-speed 'box is usually pretty reliable.

The 01M four-speed gearbox is electronically operated through an external control unit. Shift points are determined from a variety of inputs, including vehicle speed, engine speed, throttle position, engine load and the selected gear range. The shifts are controlled using a series of solenoid valves located on the valve body. The torque convertor used with this gearbox is fitted with a lock-up clutch, allowing torque to be transferred directly between engine and gearbox.

The fault stored related to the pressure control solenoid (N93) located in the valve body within the gearbox. This solenoid is controlled using pulse width modulation to vary the line pressure for smoother gear changes. When the solenoid is de-energised, the pressure goes to maximum. When the transmission control unit detects a fault with a sensor or solenoid, all solenoids will be turned off so the gearbox operates in 'Safe Mode'. While in 'Safe Mode' and with 'D' selected, the gearbox will operate in third gear.

As the transmission control unit is external, it was possible to carry out an electrical check of the circuit for the pressure control solenoid without removing the gearbox sump or draining the oil. This was done following the wiring diagram and confirmed there was indeed an open circuit and that the fault was internal. The gear oil was drained and the sump removed to access the valve body and solenoid valves. With the suspected solenoid disconnected, a continuity check of the wiring was carried out and proved to be OK. The internal resistance of the valve should be 4.5-5.1 ohms. The valve in question was showing an open circuit.



A test of the solenoid circuit is carried out before stripping.



Here's the valve body with the gearbox sump removed.



The faulty solenoid is located on the right.



The solenoid valve removed from the valve body.

According to our local Volkswagen main dealer, there are no replacement parts available and the complete valve body has to be replaced, at a cost of almost £700! As this would have pushed the cost of the job way beyond the customer's budget, we did a little digging and managed to find a replacement solenoid from a local transmission specialist for under £35.

With the new valve fitted, along with a new gear oil strainer and sump gasket, the oil has to be filled to the correct level. When refilling the gearbox after repairs, it must first be filled with three litres of ATF. After this initial filling, the engine can be started and run until the ATF reaches 40°C, with the temperature measured by using VCDS to read actual data from the gearbox control unit. The drain bung in the gearbox sump is fitted with a spout about three inches long. The ATF should be level with the top of this spout at 40°C, with the engine running. If it needs to be topped up, the ATF can be pumped into the drain plug using a filler pump and the correct fitting; failing that, ATF can be added through the breather cap until it drips from the spout.

After reassembly, the gearbox control unit was checked for faults and the memory erased. A quick test drive ensured it was shifting smoothly through all gears and that the warning light was staying out.

ELECTRONIC DIAGNOSTICS BACK NUMBERS

Over the past 20 years we've covered a wide range of engine management systems.

Alfa Romeo 155 (Bosch Motronic 2.10.4) - Mar 2007
 Alfa Romeo 156 (Bosch Motronic ME 2.1) - Aug 2000
 Alfa Romeo GTV (Bosch Motronic M2.10.3) - Feb 2006
 Audi 80 (Bosch KE-Motronic) - July 1996
 Audi 100 (Siemens SW) - Oct 2000
 Audi A2 1.4 petrol (Marelli 4MV) - April 2010
 Audi A3 (Bosch Motronic 3.8.2) - Aug 1998
 Audi A3 1.6 (Siemens 71 CM) - Feb 2013
 Audi A4 1.8T Sport Quattro (Bosch ME 7.5) - Feb 2014
 Audi A4 3.0 V6 TDI (Bosch EDC 16) - July 2013
 Audi A4 TDI (Bosch EDC 15) - Aug 2003
 Audi A6 (Bosch MPFI) - June 2003
 Audi A8 1.8T (Bosch ME 7.5 2001) - July 2007
 Audi A8 4.2 petrol (Bosch ME 7.11) - Nov 2011
 Audi S8 (Bosch ME 7.1.1) - Aug 2008
 Audi TT 1.8T (Bosch ME 7.5) - Nov 2010
 BMW 3 Series (Bosch Motronic 3.3.1) - July 1998
 BMW E46 318i (Bosch Motronic ME9.2) - Jan 2013
 BMW E46 318i (BMW BMS 46) - May 2007
 BMW 3 & 5-Series 1.8 (Bosch Motronic M1.7) - Mar 1995
 BMW 3 & 5-Series 2.4 (Bosch Motronic M3) - June 1997
 BMW 528i (Siemens MS41) - May 2002
 BMW 530EA E60 (Bosch EDC16) - July 2011
 BMW 728i (Siemens MS42) - Oct 2008
 BMW 730i Sport (E65) (Siemens MS45) - June 2013
 BMW Mini Cooper (Siemens) - Sept 2007
 BMW X5 (Bosch ME 7.2) - May 2010
 BMW Z3 (Bosch Motronic 5.2) - June 2009
 Chrysler Grand Voyager 2.8 CRD (Bosch EDC 15) - Sept 2013
 Chrysler Grand Voyager 3.3 V6 (Chrysler SBECC SCI) - Aug 2011
 Chrysler PT Cruiser 2.0 (Chrysler SBECC SCI) - Nov 2013
 Citroën AX (Bosch MA 3.0) - July 1997
 Citroën Berlingo 2.0 HDi (Siemens SID 803) - July 2012
 Citroën C3 1.6 (Bosch Motronic ME7.45) - June 2015
 Citroën Saxo (Bosch MP2.2) - Aug 1999
 Citroën Xantia (Bosch MP5.2) - June 2001
 Citroën Xsara Picasso (Bosch M7.4.4) - Dec 2004
 Citroën Xsara Picasso 2.0 HDi (Bosch EDC) - April 2008
 Daewoo Matiz (Daewoo Siemens 2S) - Mar 2002
 Daewoo Nubira (GM Multec F) - Nov 2005
 Fiat Bravo/Brava (Magnetti Marelli IAW 06F/16F) - July 2005
 Fiat Croma 1.8 (Siemens Simtec 75.3) - Sept 2014
 Fiat Panda 1.2 (Magnetti Marelli IAW 5NF) - May 2011
 Fiat Punto 1.2 (Magnetti Marelli 6F) - May 1997
 Fiat Punto 1.2 Mk2 (Magnetti Marelli IAW 59F) - Feb 2007
 Fiat Stilo 1.8 (Magnetti Marelli IAW5NFT1) - Jan 2006
 Fiat Ulysse 2.0 8v (Magnetti Marelli 8P) - Sept 2004
 Ford (ESC ignition) - Jan 1999

Ford Zetec (EEC IV Zeta 16v) - Aug 1995
 Ford Escort Cosworth (Weber IAW) - Nov 1997
 Alfa Romeo GTV (Bosch Motronic M2.10.3) - Feb 2006
 Ford Fiesta 1.25 (EEC V) - Feb 1998
 Ford Fiesta XR2i & RS Turbo (EEC IV KAM) - Nov 1995
 Ford Focus (EEC V) - Oct 2002
 Ford Focus 1.6 Zetec (EEC V) - Aug 2007
 Ford Focus 1.6 TDCi (Bosch EDC 16) - May 2013
 Ford Focus 1.6 Zetec (Siemens 28) - Dec 2013
 Ford Fusion/Fiesta (Siemens SIM22) - Jan 2010
 Ford Galaxy 2.3-litre (EEC V) - Mar 2001
 Ford Galaxy diesel (Bosch EDC 14) - Mar 2005
 Ford Galaxy 1.9 PD (Bosch EDC 15P) - July 2008
 Ford Granada 2.9i (EEC IV enhanced) - Feb 1995
 Ford Ka (EEC V) - Nov 1999
 Ford Mondeo (EEC V) - Oct 2001
 Ford Mondeo V6 (EEC V) - Jan 2004
 Ford Mondeo TDI (EDC) - Nov 1998
 Ford Mondeo TDCi Duratorq (EEC V) - May 2008
 Ford Sierra & Granada 2.0i (EEC IV basic) (Pinto engine) - Oct 1994
 Ford Sierra & Granada 2.0i (EEC IV) (DOHC engine) - Mar 2000
 Ford Transit Connect (EEC IV Delphi) - July 2010
 Ford Transit (Bosch PSG5) - Jan 2012
 Honda Accord 2.0 i-VTEC (Honda PGM-FI) - Mar 2015
 Honda Civic 1.4 (PGM-FI) - Oct 2009
 Honda Civic 1.6 (PGM-FI non-Cat) - April 1996
 Honda Civic 1.6 (PGM-FI) - Aug 2001
 Honda CR-V (2002-on) (PGM-FI) - June 2008
 Honda HR-V (PGM-FI) - March 2003
 Honda Legend V6 (2.7 PGM-FI) - Oct 1995
 Honda Stream (PGM-FI 3.0) - Dec 2011
 Hyundai Accent 12V (Motronic 79.0) - Nov 2007
 Hyundai Coupe 2.7 V6 (Siemens MFI) - Dec 2008
 Hyundai Matrix 1.6 (Bosch Motronic M79.0) - Dec 2014
 Jaguar 3.2/4.0 (Lucas JSOU) - July 2001
 Jaguar X300 3.2 (Sagem GEMS) - April 2007
 Jaguar 3.6 (Lucas 9CU) - June 1996
 Jaguar S-TYPE (P-Tech) - Sept 2006
 Jaguar X-TYPE 2.5 V6 (Ford EEC V) - Jan 2009
 Jaguar X-TYPE 2.0 diesel (Delphi HPCR) - July 2014
 Jeep Cherokee 2.5-litre - April 2001
 Kia Picanto 1.1 petrol (Bosch MPI) - May 2014
 Kia Shuma (Siemens MSTG FX 5.1) - Oct 2005
 Land Rover Freelander (MEMS 1.9) - Jan 2002
 Land Rover Freelander 2.5 V6 (Siemens EMS 2000) - June 2007
 Land Rover Freelander TD4 (Bosch EDC 15C) - Aug 2009
 Lexus LS400 (Toyota TCSS) - Oct 2006
 Lotus Elise (MEMS MPI V1.6) - Dec 1999
 Mazda 323 1.6GT (EGI) - Sept 2001
 Mazda 626 V6 (MECS) - Sept 1998

Mazda5 2.0 petrol (Mazda ECS) - Oct 2014
 Mazda6 2.0 diesel (Denso EDC) - Mar 2014
 Mazda MX-5 (Mazda EFI) - Sept 2002
 Mercedes-Benz 190E (Bosch KE Jetronic) - Dec 1998
 Mercedes-Benz 200 (Bosch Siemens PMS) - Dec 2000
 Mercedes-Benz A-Class (HFM-SFI) - Sept 1999
 Mercedes-Benz C180 Kompressor (Siemens ME) - May 2008
 Mercedes-Benz E-Class (Bosch PMS) - July 2002
 Mercedes-Benz E220 (VDO HFM) - Jan 2007
 Mercedes-Benz ML320 (Bosch ME2.1) - Jan 2005
 Mercedes-Benz ML500 (Bosch ME FSI 2.8) - Oct 2013
 Mercedes-Benz S320 CDI (Bosch EDC 15C6) - June 2010
 Mercedes-Benz SLK 230K (Bosch ME 2.1) - April 2014
 Mercedes-Benz Vito 115 2.1 CDI (Bosch EDC 16) - Aug 2013
 MGF (MEMS MPI) - Oct 1997
 MG ZT 1.8T (MEMS MPI 3) - Sept 2012
 MG ZT 190 (MEMS 2000) - Dec 2009
 Mini (MEMS 2.1) - June 1999
 Mitsubishi Space Star (Mitsubishi EGI) - May 2005
 Nissan Almera 1.5-litre (EECS 2) - Dec 2007
 Nissan Micra 16v (EECS) - Feb 1997
 Nissan Micra K11 16v (EECS) - June 2004
 Nissan Micra K12 1.6 c+C (EECS) - July 2015
 Nissan Primera (EECS) - Aug 1997
 Nissan Primera 2.4-litre (EECS) - Sept 2003
 Nissan Terrano 1.8-litre (EECS) - Aug 2005
 Nissan X-Trail 2.2 dCi (Nippondenso) - Oct 2010
 Peugeot 106 1.1 HDZ (Bosch MA3.1) - Sept 2005
 Peugeot 107 1.0 (Bosch Motronic ME 795) - Nov 2012
 Peugeot 205/309 & 505 GTi (Bosch LE Jetronic) - Jan 1995
 Peugeot 206 (Magnetti Marelli IAP) - Feb 2004
 Peugeot 206 1.4 8v (Sagem S2000-2A) - Sept 2009
 Peugeot 206 HDi (Bosch EDC15) - May 2003
 Peugeot 207 1.4 petrol (Sagem JS4) - June 2014
 Peugeot 306 (Motronic 5.1) - Mar 1999
 Peugeot 307 (EDC 15C2 LICM) - Aug 2010
 Peugeot 307 CC (Magnetti Marelli IAW 6LP) - Aug 2012
 Peugeot 405 1.8i (Bosch Motronic MP5.1) - Mar 1997
 Peugeot 406 1.8i (Peugeot Sagem SL96) - Dec 2001
 Peugeot 406 2.2 HDi (Bosch EDC 15C) - Jan 2011
 Peugeot 407 1.6 HDi (Bosch EDC16 C34/CAN) - Feb 2015
 Porsche 911 (Bosch Motronic) - Jan 2003
 Porsche 944 (Bosch Motronic ML3.1) - June 2005
 Porsche Boxster S (Bosch Motronic 72) - May 2009
 Porsche 911 Carrera 3.4-litre (Bosch Motronic 72) - Mar 2011
 Proton Persona (ECI Multi) - July 2003
 Range Rover (Lucas 4CU) - Mar 1996
 Range Rover 4.6-litre (Lucas GEMS) - Nov 2006

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 Most of these Back Numbers listed here are now **OUT OF STOCK**. Call 01733 468485 to enquire.

GENERAL
 Basic Systems - July 1994
 Basic Equipment - Aug 1994
 Immobilisers - May 1999 Test

Renault Clio 1.2 (Bosch Monopoint SPI) - Jan 1996
 Renault Clio 1.2 (Sagem Safir) - Dec 2006
 Renault Clio 1.4 (Fenix 5) - July 2006
 Renault Clio 1.4 (Fenix 5.1) - Dec 2005
 Renault Espace 2.2 diesel (Bosch EDC15) - April 2011
 Renault Espace 3.0 V6 (Siemens Fenix) - July 2004
 Renault Laguna 1.8 (Sagem S2000) - Mar 2010
 Renault Laguna 2.0 (Renix/Bendix R) - Sept 1997
 Renault Laguna 3.0 V6 (Bosch MP7) - Feb 2000
 Renault Mégane 1.6 16v (Sagem S3000) - Jan 2014
 Renault Mégane Scenic (Fenix 5) - July 1999
 Renault Mégane Scenic (SIRIUS 32) - Jan 2008
 Rover from 1980s (Lucas AB17 programmed ignition) - July 1995
 Rover EFI (Lucas 11CU) - June 1995
 Rover 214/414 1.4 (MEMS SPI) - Nov 1994
 Rover 214 (MEMS MPI) - April 1999
 Rover 414 (MEMS 1.9) - April 2002
 Rover 414 (Honda PGM-FI) - May 2004
 Rover 600 (PGM-FI) - May 1998
 Rover 800 (PGM-FI) - Oct 1995
 Rover 820 (Lucas 10CU) - May 1996
 Rover 820 16v (MEMS MPI) - May 1995
 Rover 25 1.4-litre (MEMS 3) - Feb 2008
 Rover 45 (MEMS 3) - Mar 2006
 Rover 75 (MEMS 3) - April 2004
 Saab 900 (non turbo) & 9000 (Bosch LH 2.4 Jetronic) - Nov 1996
 Saab 900 (non turbo) (Bosch M2.10.3) - May 2000
 Saab 9000 (Saab Trionic) - Dec 2003
 Saab 9-3 (Bosch M2.10.3) - Feb 2005
 Saab 9-3 turbo (Trionic T7) - Aug 2006
 Saab 9-3 turbo (Trionic T8) - Sept 2011
 Saab 9-3 1.9 TDI (Bosch EDC 16) - March 2013
 Saab 9-5 HOT turbo (Trionic T7) - June 2012
 SEAT Ibiza GTI (Bosch Digifant 1.7) - May 2001
 SEAT Leon 1.6 (Marelli 4MW) - Oct 2011
 Skoda Fabia (Siemens Sips 3PA) - Nov 2009
 Skoda Felicia (Siemens SPS) - Feb 2001
 Skoda Octavia (EDC 15P 22.3) - Feb 2012
 Skoda Octavia 1.9 TDI (Bosch EDC 16) - May 2015
 Subaru Impreza (Subaru MPFI) - April 2003
 Subaru Legacy 113hp (Subaru MPFI) - June 2006
 Subaru Legacy Outback 2.5 (Subaru MPI) - Aug 2014
 Suzuki Wagon R (Nippon Denso) - Feb 2003
 Suzuki Vitara 416 (Suzuki EFI) - Nov 2004
 Toyota Carina E (TCSS) - June 1998
 Toyota Corolla (TCSS) - Nov 2002
 Toyota Corolla T3 (TCSS) - May 2006
 Toyota Corolla 1.6 petrol (TCSS) - Jan 2015
 Toyota Prius 1.5 (TCSS) - Dec 2012
 Toyota RAV 4 (TCSS) - Sept 2008
 Toyota Yaris (TCSS) - Mar 2004

Vauxhall Ecotec (Simtec 56.1) - Jan 1997
 Vauxhall 1.8i (Bosch LE3 Jetronic) - Sept 1996
 Vauxhall Astra, Cavalier & Calibra 2.0i 16v (Bosch Motronic M1.5/M2.5) - April 1995
 Vauxhall Astra 1.4i (Multec M) - Mar 1998
 Vauxhall Astra 1.4i (Multec M) - Jan 1998
 Vauxhall Astra 1.6i 16v (Multec M) - Jan 2001
 Vauxhall Astra 1.7i CDTi (Bosch EDC16) - Nov 2014
 Vauxhall Astra 2.0 turbo diesel (EDC 15M) - Oct 2007
 Vauxhall Astra 2.0 turbo (Bosch Motronic M1.5.5) - June 2011
 Vauxhall Combo 1.4i dual-fuel (Bosch Motronic 1.5.5) - May 2012
 Vauxhall Corsa 1.0i 12v (Bosch Motronic ME7.6) - Feb 2002
 Vauxhall Corsa 1.2 Ecotec (Bosch Motronic M2.8.3) - April 2013
 Vauxhall Frontera 2.2i (Bosch/Eotec M1.5.4) - Aug 2002
 Vauxhall Meriva 1.6 16v (Multec) - April 2009
 Vauxhall Omega V6 (Bosch Motronic M2.8.1) - Feb 1999
 Vauxhall Tigra B 1.4 (Bosch ME7.6) - April 2015
 Vauxhall Vectra 2.0i 16v (Siemens Simtec 56.5) - Nov 2001
 Vauxhall Vectra 2.0-litre TD (Bosch EDC 15M) - Oct 2003
 Vauxhall Vectra C 2.0-litre DTI (PSG16) - Dec 2010
 Vauxhall Vectra 2.5 V6 (Bosch Motronic M2.8.3) - Jan 2000
 Vauxhall Vivaro 1.9 CDTi (Bosch EDC 15C.3) - Feb 2011
 Vauxhall Zafira 2.0-litre turbo-diesel 16v (Bosch PSG 16) - Nov 2008
 VW Beetle 2.0 (Bosch Motronic ME 7.5) - Mar 2009
 VW Golf 1.4 (Bosch Motronic M1.2.3) - Nov 2000
 VW Golf/Vento/Corrado/Passat/Sharán 2.0-litre (Simos) - April 1998
 VW 1.8 Golf & Jetta GTI (Digifant) - Sept 1995
 VW Golf Mk4 GTI (Digifant) - Dec 1996
 VW Golf Mk4 GTI (Bosch Motronic 3.8.5) - Oct 2004
 VW Golf TDI (Siemens) - Oct 1998
 VW Golf MkV TDI (BKC EDC16-U1) - Feb 2010
 VW Golf MkV 1.6 FSI (Bosch MED 9.5.10) - Mar 2012
 VW Passat 1.8T (Bosch Motronic ME 7.5) - April 2005
 VW Polo 1.2 (Siemens Simos) - July 2009
 VW Polo 1.4 TDI (Bosch EDC15P+) - Sept 2010
 Volvo 850 2.5 (Fenix 5.2) - Sept 2000
 Volvo 940 2.0 (Bosch EDC 11EK) - April 1997
 Volvo 960 (Bosch Motronic M1.8) - Oct 1999
 Volvo C70 (Bosch ME 7.0) - Oct 2012
 Volvo S60 (Bosch Motronic ME7) - Feb 2009
 Volvo V40 (Fenix 5.1) - Nov 2003

CAR MECHANICS NEXT MONTH



Turbocharging

Considering the hostile environment in which they work, it's surprising that turbo failures are not more common. CM investigates how and why forced induction became popular and how the experts put turbos right when they go wrong.

SEPTEMBER 2015 issue out AUGUST 20



NEW project car

Living with a MIN

- Modification series starts – Part 1: Fitting a Polybush kit
- Volvo XC90 best parts prices
- Hyundai Matrix buying guide
- Renault Clio 1.2 DIY service
- BMW 1-Series DPF change



Range Rover body off

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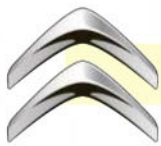
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▶ Diagnostics Doctor



Dave Peacock answering your engine management queries



CITROEN C3

ABS failure

Q I have a 2007 Citroën C3 with a 1.6 16v petrol engine and an AL4 autobox. I had a problem with the ABS, so I sent the body control unit and ABS pump off for testing. The ABS pump was declared dead and beyond repair, so a refurbished one was purchased, but it showed the same faults, which will not clear.

My code reader with Lexia software gives me fault codes 'U1308' and 'U1318'. The car has a variety of issues, reporting that road speed information is not being received from the ABS ECU, although if you go for a drive all the wheel speed sensors report the same speed and it also shows a road speed.

I've read about people having

problems with the fuse panel in the engine bay, so I pulled it out for a look, but the board is covered in potting compound. I'm thinking about getting a replacement for this, but I'm reluctant to just keep throwing money at it – the ABS pump was very expensive!

Andy



A replacement ABS pump failed to clear the fault codes being shown by a Citroën C3.

A You need to have the CAN-bus data checked out using a digital storage oscilloscope. Unless you have this equipment and can use one, you need to take the car to a specialist. Your best bet is to locate a genuine Bosch service agent – plenty of workshops have a Bosch sign outside but are not service agents. Service agents are trained diagnostic specialists with up-to-date equipment. You can find one in your area by entering your postcode on this website: <http://bit.ly/17BODIV>

I took the car to the local Citroën main dealer as they have a mechanic who comes in to diagnose their difficult electrical problems. The result of his diagnostics was a faulty refurbished ABS pump. I'd imagine it helped having a new one there to plug in as well.

I'd left the original one in the car, which he also plugged in. He said the refurbished one was actually in worse shape than the original. An expensive reminder that you should never assume new parts aren't faulty!

Andy



MERCEDES-BENZ SLK

Faulty air pump

Q On my 2005 Mercedes SLK350 R171, the EML is coming on and showing fault code 'P0410', which I understand is associated with the air pump. Having looked into this problem online, I have done the following: replaced the relay with a updated 70A version (I tested the old relay and found it was switching OK and

Common abbreviations

ATS	Air Temperature Sensor
AFM	Air-Flow Meter – not a MAF type (see below). It could be, for example, a vane type
CAS	Crank Angle Sensor
CPS	Crank Position Sensor
CTS	Coolant Temperature Sensor
ECT	Engine Coolant Temperature
ECU	Electronic Control Unit
EGR	Exhaust Gas Recirculation – meters exhaust gas back to the intake manifold
EML	Engine Management Light
EMS	Engine Management System
FCR	Fault Code Reader
HT	High Tension – ignition output to the spark plugs
IAV	Idle Air Valve
ISCV	Idle Speed Control Valve – usually operated by a motor controlled by the ECU
LOS	Limited Operating Strategy – if the ECU detects a malfunction, it runs a programme to allow the car to still go, but at reduced efficiency
MAF	Mass Air-Flow meter
MAP	Manifold Air Pressure
MIL	Malfunction Indicator Lamp
PCV	Positive Crankcase Ventilation – takes crankcase gases and recycles back to the inlet system
TBPS	Turbo Boost Pressure Sensor – used by the ECU to regulate turbo output
TPS	Throttle Position Sensor
VSS	Vehicle Speed Sensor
WOT	Wide Open Throttle

VAUXHALL ASTRA

Recurring misfire

Q My wife's current car is a 2006 Vauxhall Astra 1.6 petrol twinport with the Z16XEP engine. It has covered just over 104,000 miles and is regularly and carefully serviced. It is running perfectly well, but recently the engine MIL keeps illuminating. The first time it happened, the stored codes were: 'P0300-00 – random multiple cylinder misfire detected' 'P0301-00 – cylinder 1 misfire detected' 'P0302-00 – cylinder 2 misfire detected' 'P0303-00 – cylinder 3 misfire detected' 'P0304-00 – cylinder 4 misfire detected' 'P0314-00 – single cylinder misfire detected'

As it was running perfectly, I thought there must be an error, so I just cleared the codes. About 100 miles later, the MIL came back with the same stored codes.



This time, I inspected the coils and plugs for signs of damage, but all seemed well. I also checked the coil pack electrical connector pins for corrosion, but all were clean. I cleared the codes once more, but about 100 miles later, the MIL and codes returned.

Searching on the internet, a number of people suggested a fault with the EGR valve. I removed it to investigate and there was a little soot, but not a great deal. I cleaned it anyway and cleared the codes once more. After about 100 miles, the MIL and codes were back.

Bruce



A Mercedes-Benz SLK350 was displaying fault codes relating to the air pump.

that it had continuity after the switch was activated), checked the 40A fuse and also inspected the pin associated with + power on the fuseboard (the pin I refer to is the one connecting the plug from the air pump to the fuseboard – I believe it's connection 17).

Having cleared the fault code, the EML light came on again a few days later. I then confirmed I had continuity from the relay output to the connection at the air pump, which was OK. I also applied power to the + wire on the air pump connection 17 and the pump was running, confirming that it was working. Can you advise on any further checks?

Finally, when looking at the fault codes, I keep getting some other old codes ('P0810' and 'P0814'), which don't clear when using the torque app on my phone (connected to an OBD-II reader). I think these relate to the clutch position sensor and transmission range display.

Ken

A The air pump comes on at start-up to inject added oxygen into the exhaust so that the cats fire up in under two minutes. The

air pump comes on for a few minutes when the engine is cold (you can hear it pumping when the engine is at high idle on a cold start, then it goes off).

The OBD-II system checks it periodically for proper functioning. I would check the vacuum lines to it. Disconnect the feed lines to the exhaust and spray them with choke cleaner, and ensure that the check valves are operating freely. These check valves can fill with moisture, causing seizing, particularly in cold weather. They're a cheap part to renew if they look dodgy. Beyond this, the causes could be more expensive, as the cylinderhead may need removal to unblock the passageways.

Does your transmission have a fault associated with the codes you get?

I am also getting fault codes 'P0810' and 'P0814', which I think are clutch control and transmission related. Do you think they are part of the problem? If so, can you recommend any additional tests?

I did check the changeover valve and found it to be switching OK, allowing air through to the line with the blue check valve in it. However, I suspect that the check valve is not great, as I found it hard to blow through it. I will change it with a new one and get some carb cleaner for the exhaust line.

Ken

No, those codes are not part of the problem. Unless you are having problems in the transmission area, I would live with them.

Diagnosics Doctor

Diagnosics Doctor is a **FREE** helpline service for CM readers – including trade readers – who are struggling with diagnostic/engine management related faults. **Dave Peacock** of the Nottingham-based diagnostic company ECU Testing Ltd will answer all your queries. We need as much detail as possible:

MAKE, MODEL, YEAR and ENGINE

CODE of your vehicle, and the type of management system installed

Obviously, Dave 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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e-mail: dpeacock760@gmail.com

website: www.ecutesting.com

The EML has stayed off for the past week. I sprayed the non-return valve in the vacuum line. I did, however, take your advice and replaced the valve – it was only £14 from Mercedes.

Having run another diagnostic check, all the codes have now gone, so codes 'P0810' and 'P0814' must have been triggered as part of the main code 'P0410'.

Ken

A From the codes you have, it would appear the cause of your fault is confined to a single item that influences all of the cylinders, so you can rule out the injectors, spark plugs, HT coils, etc, as they are not all going to fail together.

It could be a stuck/blocked/leaking EGR valve or a dodgy connection to it. When you removed the EGR valve, did you check for freedom of operation and for good connection to the ECU? It could also be a faulty pre-catalyst oxygen sensor – check for correct switching here – or else a faulty camshaft position sensor, which is pretty cheap to replace, or a defective ECU, which can be sent for testing.

This evening, while the engine was still warm, I looked at the oxygen sensor readings. Bank 1, sensor 1 was switching between 98mV and 781mV every 1.5 seconds or so at idle speed; bank 1, sensor 2 was fairly stable around

700mV. I then activated an EGR valve test, but the engine immediately stalled. Once I'd reset the valve, the engine restarted easily. For good measure I added some Cataclean, then cleared the fault codes again.

I will investigate further as soon as I can. I'll perform the EGR valve test again with it removed, to check operation, and I'll try to verify the electrical connections to the ECU and also look at the cam sensor. Incidentally, the cambelt was renewed about 8000 miles ago.

Bruce

An EGR valve fault is increasingly likely, so try blanking it off to see if the fault disappears. Your oxygen sensor readings are fine.

I renewed the oxygen sensor and removed the codes. Within a few miles, the engine MIL had returned. A blanking plate was installed between the EGR valve and head (including the

gasket) and the codes were deleted. After about 20 miles, the engine MIL returned. The only code now showing is 'P0171-52 – Fuel Trim System Lean'. Is this as a result of the EGR being blanked off or is it coincidental? Does this prove the EGR is at fault? Should I renew the EGR or can it be left blanked off?

Bruce

EGR blanking off should cause a rich trim result, not the lean trim result that you have. Look at the MAF sensor and try running the car with it disconnected to see if the code disappears. You will, of course, get an extra code for the MAF, but if the 'P0171' code does not reappear then clean or renew the MAF and check for intake air leaks and exhaust system leaks, and inspect the injectors, fuel pressure and air injection system to the exhaust if fitted.





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**VOLVO
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Tracing and fixing faults in electronic engine management systems

Stylish, comfortable and respected for their solidity and durability, Volvo's S40 and V40 models can make sound buys today. **Kim Henson** and **Dean Birch** look at the diagnostic intricacies of the non-turbocharged petrol versions.



NOTE: All references in our text and captions to 'left' and 'right' sides are from the point of view of someone sitting in the car and looking ahead.

Volvo's 400 series models were phased out in the mid-1990s, with the four-cylinder versions effectively being replaced by the new S40 ('S' denoting a four-door saloon) and V40 ('V' referring to the five-door estate) models. These newcomers were built in Holland on a platform shared with the Mitsubishi Carisma, under a joint venture between the two companies, and made their UK debut in spring 1995. The S40 was the first vehicle to gain four stars under the NCAP safety rating scheme.

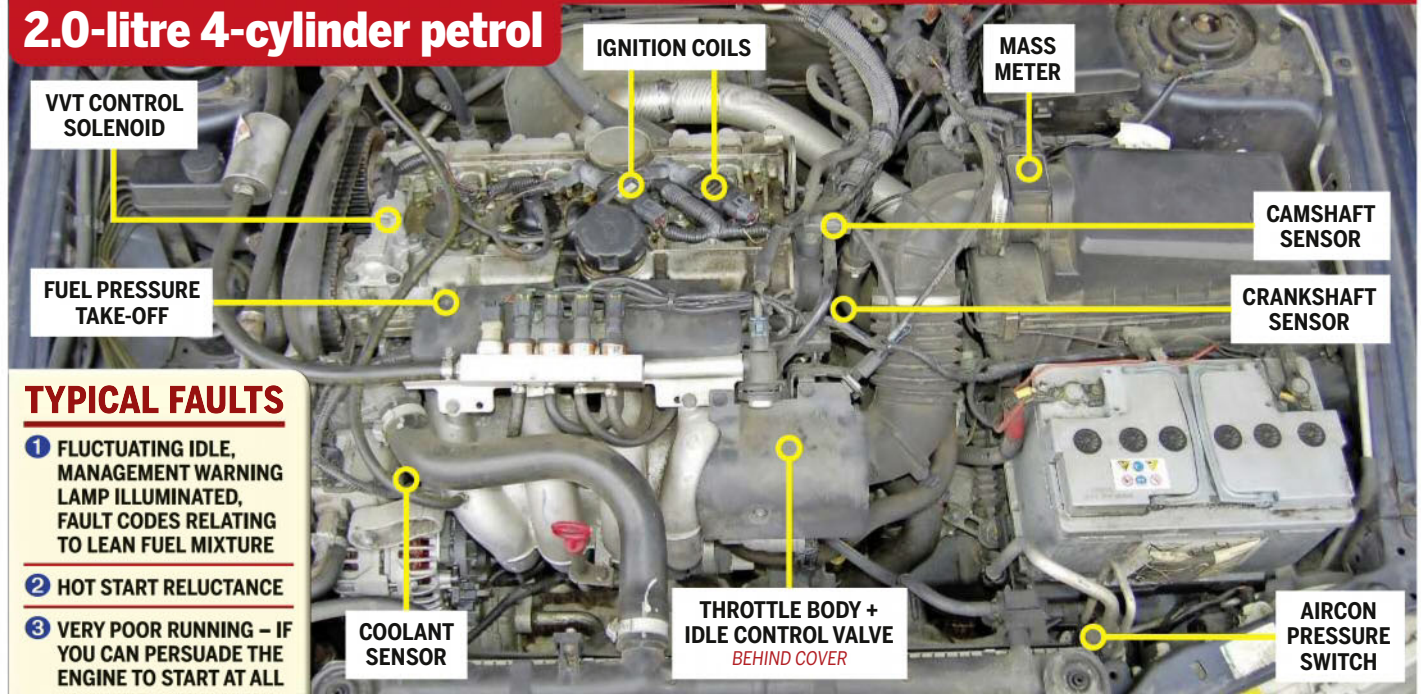
Various mechanical upgrades were made during the production life of

the models. From spring 2002 (for 2003 models), an egg crate-style front grille replaced the original, which had incorporated vertical bars.

Petrol engines offered included a fuel-injected 16-valve, twin overhead camshaft, four-cylinder 1.6- (1596cc), 1.8- (1731cc until spring 1999, thence 1783cc) and 2.0-litre (1948cc naturally-aspirated and low pressure turbo or LPT) units. Volvo also provided the option of bi-fuel variants that could run on petrol or LPG. From a diagnostic viewpoint, the engine management systems for these cars are generally similar to those of the

petrol-powered versions, although, of course, the equipment specific to LPG operation needs to be in good condition and properly set up. Much more powerful turbocharged petrol engines – 1.9-litre (1885cc) and 2.0-litre (1948cc) – were sold in Britain from 1997. In addition, from spring 1998 until autumn 2000, customers could opt for a further variation: a common rail petrol-injected 1.8-litre (1834cc) Mitsubishi-derived Gasoline Direct Injection (GDI) motor. Direct injection diesel-powered S40 and V40 models joined the UK line-up in summer 2000.

2.0-litre 4-cylinder petrol



TYPICAL FAULTS

- 1 FLUCTUATING IDLE, MANAGEMENT WARNING LAMP ILLUMINATED, FAULT CODES RELATING TO LEAN FUEL MIXTURE
- 2 HOT START RELUCTANCE
- 3 VERY POOR RUNNING – IF YOU CAN PERSUADE THE ENGINE TO START AT ALL

Second-generation S40 saloon and redesignated V50 estates, built on a new Volvo platform, arrived in 2004.

In this feature we are concentrating on the first-series non-turbocharged petrol-powered models, not including the Mitsubishi GDI 1834cc engine. The guinea pig vehicle is a 2002 1948cc bi-fuel version of the first-generation S40 (engine code B4204S2), operating with the Siemens EMS2000 management system. Our guide to this Volvo's engine and its management system is Dean Birch of Onboard-Diagnostics (info@onboard-diagnostics.co.uk).

Preparation

Always check the service history of the vehicle; if unsure of its past, carry out a full service, including changing the engine oil and filter. It's essential that engine oil to the correct specification is used and that it's changed regularly, as recommended by Volvo. For correct operation, the VVT

set-up is especially sensitive to running with clean oil of the specified type.

Always fill/top-up the engine oil with care, as spillage around the top of the engine can result in oil finding its way into the spark plug wells and other crevices in the vicinity, leading to

contamination of the high tension leads and associated misfiring.

Make sure that OE or equivalent specification spark plugs are used at all times. This is especially important with bi-fuel cars, for which the plugs should be renewed at 40,000-mile intervals.

Engine management

The **Siemens EMS2000** management system used on this S40 incorporates these primary components:

- ▶ A 90-pin single-harness edge connector control unit.
- ▶ Four pencil-type fuel injectors.
- ▶ A hot film mass airflow sensor.
- ▶ Two DIS ignition coils plus two high tension leads.
- ▶ A single knock sensor, fitted beneath the inlet manifold.
- ▶ A single main system relay.
- ▶ An inductive twin-wire crankshaft sensor.
- ▶ A two-wire idle control valve.
- ▶ Stereo Lambda/oxygen/O₂ sensors.
- ▶ A separate immobiliser control module.
- ▶ A three-pin Hall-Effect camshaft sensor.
- ▶ An in-tank fuel pump.

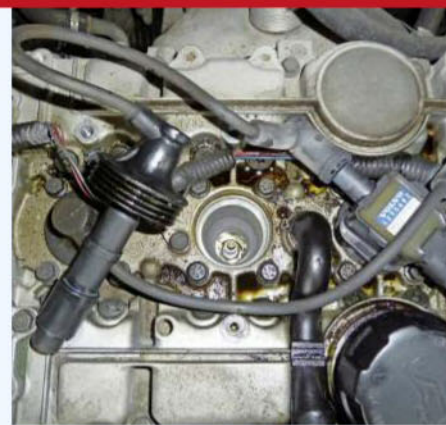
Typical Volvo S40 faults



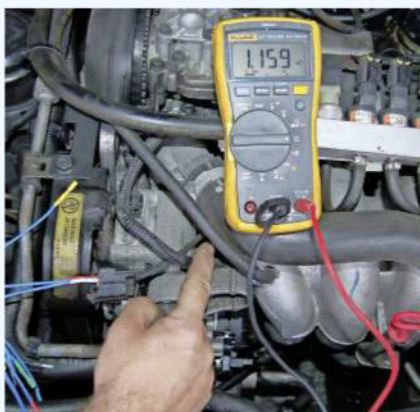
1 With the plastic covers removed from the top of the engine, the wiring to the variable valve timing solenoid is exposed. Check very closely for evidence of missing or very brittle insulation – this is not helped by engine heat.



2 This important earth connection (arrowed) is found on top of the cylinderhead. Ensure the connection is secure, clean and not corroded. If in doubt, separate the connection, clean and reassemble it, making sure the bolt is tight.



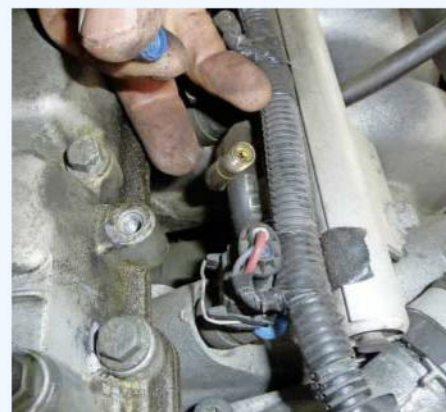
3 With the high tension wiring/connector to each spark plug removed, you can access the plugs. Check for oil ingress into the spark plug wells, often the result of careless topping-up via the adjacent filler point or due to a perished breather hose.



4 Here, Dean is checking the resistance of the coolant temperature sensor, located towards the right-hand end of the engine. The sensor is hidden beneath the nearby hose, but the harness plug provides easy access for electrical checks.



5 Found at the front of the engine, towards the left-hand side, is the idle control valve, seen here removed from the engine. It's secured by two bolts (10mm spanner size). On refitting, check the gasket is in undamaged condition or else renew it.



6 The fuel pressure take-off point takes the form of a Schrader fitting, found in the fuel line towards the right-hand side of the engine. It is normally hidden beneath a plastic cover (on this car also accommodating LPG injectors), held by two Torx bolts.

While the diagnostics of bi-fuel versions are similar to those of petrol-only models, you need to be aware that bi-fuel cars incorporate a variety of vacuum pipes and wiring specific to engine operation on LPG. Problems with these components can have an impact on the engine management system and affect engine running. To address ailments specific to the LPG system, it is necessary to consult someone authorised to carry out work on the system.

Even petrol-only versions feature a number of hoses located around the inlet manifold, throttle body assembly and airbox.

Fault 1: PCV valve failure

When our first fault occurs on an S40 or V40, the idle speed may fluctuate up or down, along with illumination of the management warning lamp. Fault

codes may be stored relating to a lean or over-weak fuel mixture malfunction or, in severe cases, Lambda/oxygen/O₂ sensor ailments.

In the above situation, the engine may be running with a fuel mixture that is too lean/weak. Sometimes a high-pitched squeal may be evident once the engine has warmed up, which can help to confirm the diagnosis of an internal Positive Crankcase Ventilation (PCV) system leak. If removal of the oil filler cap or dipstick tube with the engine running results in the noise subsiding, this suggests the presence of excessive vacuum levels within the crankcase.

If the engine's breather PCV valve unit is faulty, it can allow internal air leakage, so that too much vacuum is created within the crankcase. Over time, the diaphragm inside can begin to perish, causing higher than normal levels of vacuum to bleed through. This results in the engine control unit adapting for a lean condition. Once the level has

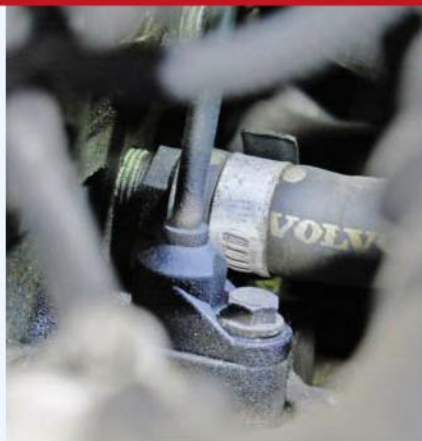
Technical specs

Actual values

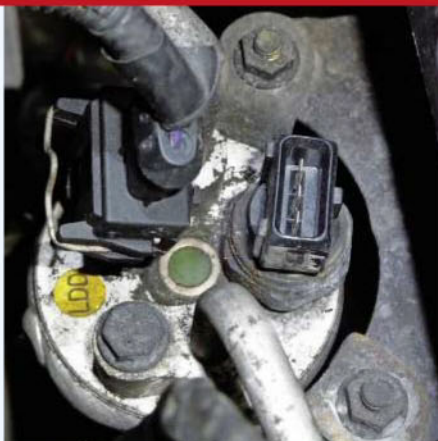
Component	Value
Fuel pressure	2.9-3.2 bar (no vac)
Camshaft sensor (Hall-Effect)	5.0-volt square wave
Air mass (hot idle/no load)	11-13kg/hr
VVT solenoid	5-9 ohms
Coolant temp:	
At 20°C	2-3k/ohm
At 50°C	0.6-1.0k/ohm

exceeded its working limit, the check engine lamp is illuminated.

Renewal of the valve requires removal of the inlet manifold, as the valve is tucked underneath the manifold. We advise renewing the PCV valve's gasket at the same time as the unit, and also



7 Doing its best to hide from our camera in this shot is the crankshaft position sensor, fitted at the bellhousing, towards the left-hand side of the engine bay, and deeply buried amidst a number of hoses.



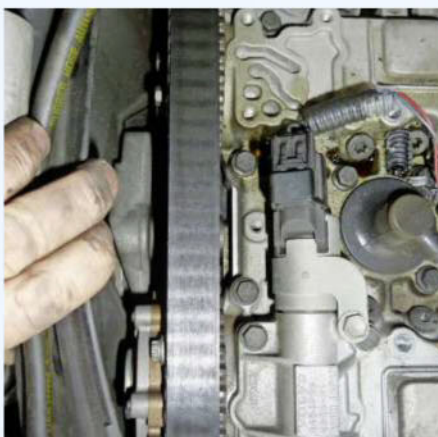
8 The air-conditioning system's pressure switch, seen here with its wiring harness plug disconnected. As mentioned in *Fault 3*, this sensor can be the cause of very erratic/poor starting and running.



9 Positioned just inboard of the left-hand front suspension tower and towards the rear of the engine bay is the underbonnet fusebox, incorporating a vital relay for the engine management system.



10 Adjacent to the bulkhead at the rear of the engine bay are the wiring harness plug assemblies for the crankshaft and knock sensors. They are shown here with the wiring disconnected.



11 It is essential that the cambelt is renewed in accordance with Volvo recommendations. This shot shows the upper section of the belt, along with the sprocket-mounted variable valve timing mechanism.



12 The diagnostic socket is found on the right-hand side of the centre console, just beneath the lower edge of the fascia assembly and facing outwards, towards the right-hand footwell.



closely examining the hose linking the PCV valve to the engine's valve cover.

You should exercise caution if considering Lambda/oxygen/O₂ sensor renewal, since it is likely that the sensor may be functioning perfectly and is just doing its job of reporting an unusually lean/weak mixture.

Fault 2:

Coolant temperature sensor alignments

In the case of our second fault, the car may be very difficult to start when the engine is hot, with extended cranking being required before the engine will fire. Fault codes may or may not be stored, and there could be a strong smell of petrol when the engine eventually does fire. In addition, the idle speed may fluctuate erratically.

The cause of such strange operational behaviour may be an ailing coolant

Tool of choice

For this feature, Dean is using the **Bosch KTS** diagnostic tool.



temperature sensor, resulting in incorrect voltage output and resistance values, which can fool the ECU into thinking the engine is cold (at, say, zero or 10°C), when it is hot (maybe 85-90°C). In this situation the ECU will initiate an extended injection event, resulting in far too much fuel entering the cylinders (as it thinks the engine is trying to start from cold).

You should use a multimeter or serial tool to observe operation of the sensor over a long period of time, looking for electrical noise or a glitch, such as intermittent variations in voltage output/resistance, as the engine warms up, which may indicate failure of the sensor.

If the cooling system is in poor condition, it can hasten the demise of the coolant temperature sensor. It pays to properly maintain the system and use good quality antifreeze with effective corrosion inhibitors, and to renew the coolant as recommended by Volvo.

Renewal of the coolant temperature sensor is fairly straightforward.

Fault 3:

Failed air-conditioning system pressure switch

Symptoms for our third fault include extremely poor operation (coughing, spluttering, problems with keeping

Typical Volvo S40 faults (continued)



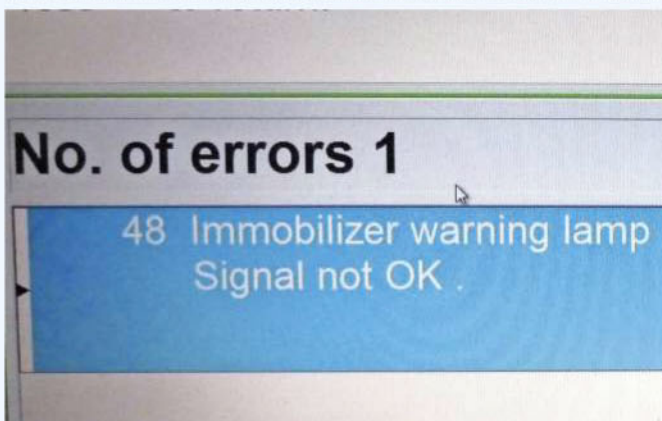
13 The ECU is positioned within the centre console assembly. It can be seen here within a substantial protective steel bracket assembly, as viewed from the right-hand side footwell, with the centre console's right-hand side cover removed.



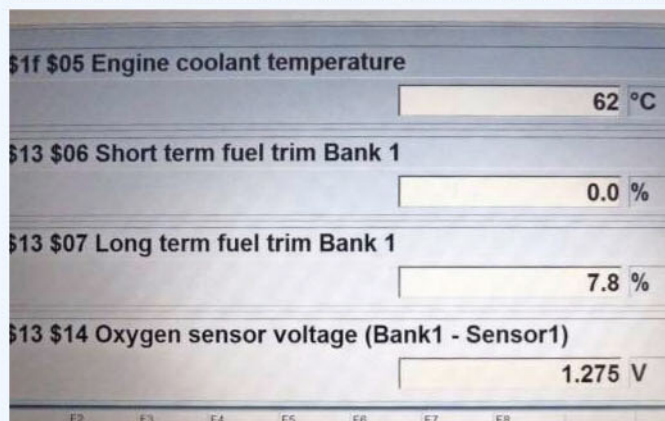
14 This is how the back of the ECU appears when viewed from the left-hand footwell, with the centre console's left-hand side cover panel taken off. Removal of the protective bracket is necessary in order to access the ECU.



15 Above the accelerator pedal is this small interior fusebox. In order to reach it, you need to remove the lower trim/insulation panel from beneath the right-hand side of the dashboard/fascia assembly.



16 This laptop screenshot, generated by the Bosch KTS tool, is showing live data indicating a stored fault in the immobiliser control unit, relating to the warning lamp circuit.



17 Processed via the Bosch KTS tool and showing information relating to emissions data. The amount of fuel correction being applied by the Siemens management system can also be viewed.

the engine running, huge flat spots, constantly having to feather the throttle, etc), if you can even get the motor to start at all. Fault codes may be stored relating to the camshaft sensor, throttle position sensor or aircon pressure sensor.

It's possible that the fault codes, once cleared, will immediately be reset on restarting the engine. Although the sensors are not directly interconnected, they all rely on a five-volt supply (reference voltage) generated by the ECU. If one of the sensors in this chain is ailing (say, internally shorting to

ground/earth), the voltage supply to the other components will be compromised, resulting in malfunctions.

It is often the case that a failed air-conditioning system pressure switch will result in the symptoms described. You should disconnect the aircon switch from the rest of the system by unplugging its harness plug, then see if normal engine operation is resumed. If so, the switch is the likely culprit and should be renewed. This is straightforward: the switch is located just behind the headlamp on the left-

hand side of the engine bay.

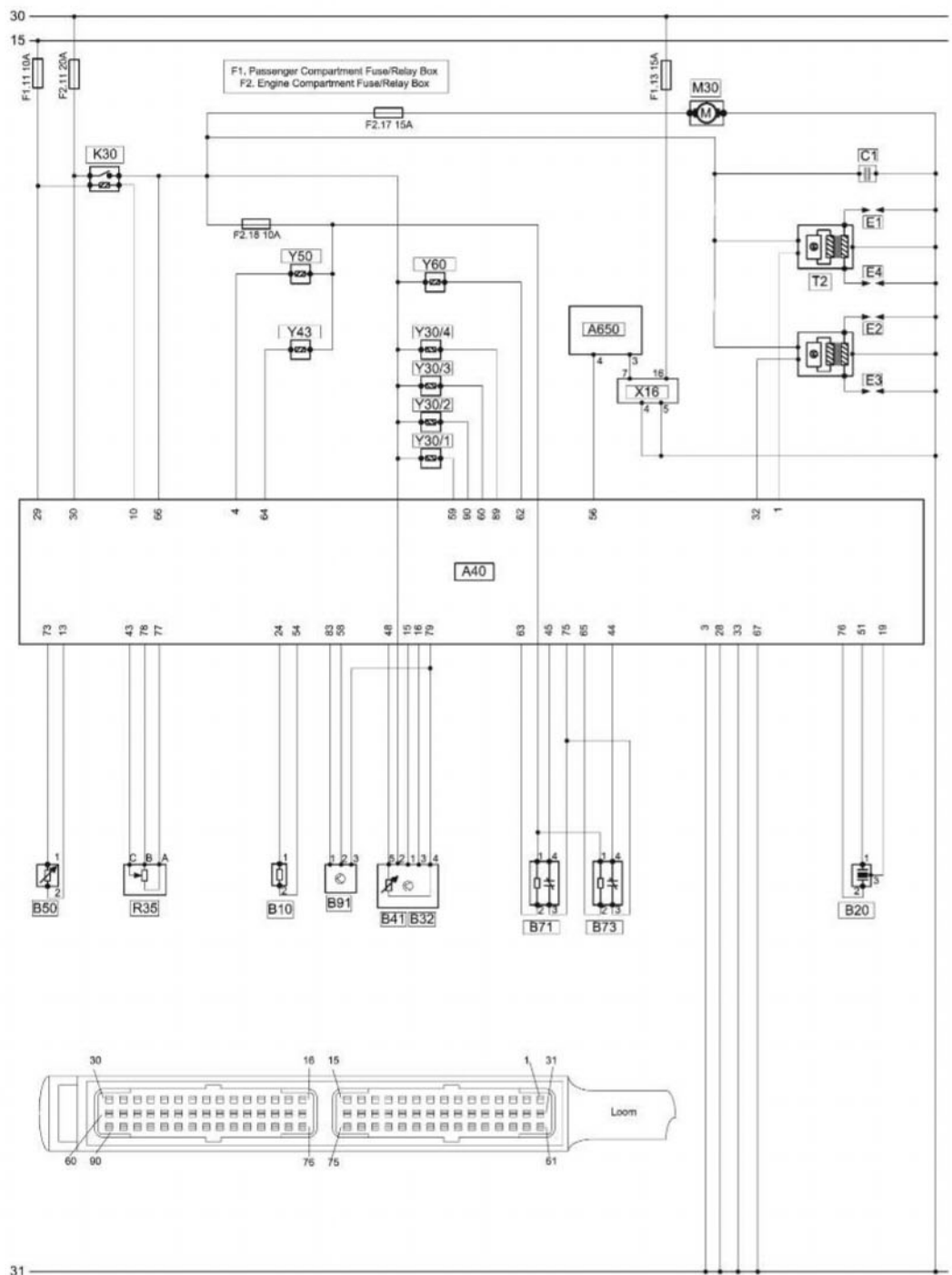
In one such situation, instead of 5 volts, the reference voltage reading from the ECU was just 1.5-3 volts, so consequently the signal from the camshaft sensor was very weak. The owner admitted the S40's air-conditioning system had not operated for many years. However, although the air-conditioning system's pressure switch was no longer operational, it was still connected to the circuit, effectively dragging down the reference voltage for the other sensors and resulting in poor running.



SIEMENS EMS2000 CIRCUIT DIAGRAM

Diagram drawn by
Keith Ravenhill

- 15 IGNITION SUPPLY
- 30 BATTERY SUPPLY
- 31 GROUND SUPPLY
- A40 ENGINE MANAGEMENT ECU
- A650 IMMOBILISER ECU
- B10 CRANKSHAFT POSITION SENSOR
- B20 KNOCK SENSOR
- B32 MASS AIR FLOW SENSOR (HOT WIRE)
- B41 INTAKE AIR TEMPERATURE (INTEGRAL WITH MAF SENSOR)
- B50 COOLANT TEMPERATURE SENSOR
- B71 PRE-CAT OXYGEN SENSOR
- B73 POST-CAT OXYGEN SENSOR
- B91 CAMSHAFT POSITION SENSOR
- C1 IGNITION COIL CAPACITOR
- E1-4 SPARK PLUGS
- F1- FUSES IN PASSENGER COMPARTMENT FUSEBOX
- F2- FUSES IN ENGINE COMPARTMENT FUSEBOX
- K30 MAIN RELAY
- M30 FUEL PUMP
- R35 THROTTLE VALVE POSITION SENSOR
- T2 WASTED SPARK IGNITION COIL
- X16 J1962 DIAGNOSTIC CONNECTOR
- Y30 MULTI-POINT FUEL INJECTOR
- Y43 FAST IDLE VALVE
- Y50 PURGE VALVE
- Y60 CAMSHAFT SOLENOID VALVE



Our Cars

Andrew Everett

Special Contributor

A tempting prospect



As Oscar Wilde once said: "I can resist everything except temptation". For me, that temptation is cheap old cars. In this respect, eBay is my worst enemy. This is where, one evening last October, I spied a 1999 318i convertible for which bidding had stalled at £190.

Intending to just keep a tab on the auction, I put in a bid for £300 and promptly forgot all about it. Until the dreaded 'You have won this auction' message pinged through. There was no going back – better go and pay the man.

Thankfully, the car was only five or so miles from my home. So, I got a lift to Chesterfield to collect a car I'd never actually seen. I handed over £300, collected the two sets of keys (a bonus) and the handbook pack, then headed outside and got in it to drive home.

It started on the first turn of the key and sounded healthy enough, albeit a little blowy from the rear exhaust. The aircon panel didn't do much, so there was no fan and I knew about a nasty dent on the front corner of the bonnet. No matter. It went OK and the suspension felt good, although the steering was a bit vague, but then the seller had mentioned a worn-out front outer balljoint in the eBay listing.

Half-an-hour later, T52 KCL was in the workshop getting a cursory look over. The hood did indeed power up and down, as did all the windows, but the plastic rear screen was holed in two



places. In addition to this, the interior was filthy and the rear tyres were looking very tired indeed.

With 209,000 miles on the clock, there was no point in going mad restoring it. No bodyshop action here – it all had to be DIY.

Bodywork fettle

Annoyingly, Halfords don't do an off-the-shelf rattle-can of Orient Blue, so you're at the mercy of either BMW for £24 or a custom-made Halfords can at £15. Or you can do as I did and get a can of Ford Ink blue metallic that is almost dark enough.

The rusty rear passenger wheelarch was ground back to metal, and rather than try to blow in the arch, I elected to paint the whole back quarter between the two swage lines. Before the top coat

went on, I painted the whole repaired section in satin black and then sprayed on the blue – the black makes the top coat darker. Once I'd given it three coats of lacquer, I left it for a few days before flattening it with 2500-grit and T-Cut to give a decent finish.

The bonnet I was dreading, but after hammering the front edge straight using a good used nosecone grille panel as a guide, I applied the first lot of filler. Hmm, not bad. A session with 40-grit brought it down quickly, followed by another skim. After the third skim I had it bang on, so a fourth very light skim was spread on to fill the sanding scratches. Rubbed down with 600-grit and water, the repair was primed, blacked, colour-coated and lacquered. While it's not quite perfect, it's damned close – and has saved the bonnet.



Once the nasty dent in the bonnet had been hammered upwards and the front edge had been straightened to fit the nosecone, it was then sanded down and the first skim of filler applied.



It took three attempts to get the shape right and then a final fine skim before rubbing down with 600-grit wet-and-dry used wet. Then it was given a good coat of primer filler.



With the bits of bodywork done, the convertible look like it's worth more than £300. I had a couple of dings in the door removed by a local dent guy.

That good used nosecone was taken from my stock of used E36 bits, as were a pair of excellent Goodyear 225/50x16 tyres for the back. The exhaust was sorted out cheaply – a scrap 318i at my local breakers donated a very recent Bosal replacement rear box for a tenner and it bolted straight on – while the non-working heater was sorted with a £3 resistor, so even the aircon works now.

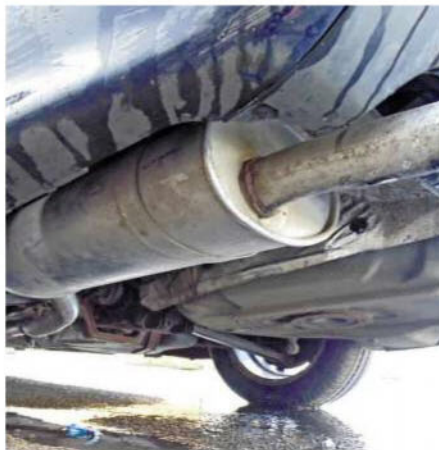
To get some money back, I removed and sold the very tidy M Technic steering wheel for £60 and fitted a standard one in its place. I had a nice new balljoint in stock as well, so the wishbone was removed and taken to Parkside BMW in Worksop, who let me borrow the balljoint replacement tool – another problem solved for a few quid. The car currently stands me a shade under £300 – not bad work.



I impressed myself with this DIY bonnet repair. I'd like to find another Orient Blue bonnet, but it's not urgent by any means.



The ugly scab on the rear wheelarch was ground back to metal, given a skim of filler and then painted.



The exhaust that came on the car was the 1999 original BMW unti and was totally knackered. The new one cost a tenner.

In Andrew's garage

1999 BMW E36 318i convertible

Bought for £300 on eBay. DIY bodywork and other repairs done as cheaply as possible.

1998 318i Touring Bought for £400 in September. Remarkably tidy, a three-owner car with FSH and a good spec. A good daily smoker.

1995 318Ti Compact Sport 'Individual' Owned for six years and has recently undergone a complete body restoration and colour change. With work now completed, it has been taxed and MoT'd.

1989 BMW 730i Owned for more than 10 years. Now with 299,000 miles and only used for classic car shows. It's mint.



The ugly rear arch responded well to careful use of filler and rattle cans.



Our Cars

Richard Gunn

Special Contributor

Cheap but indispensable



It's the Volvo 940 estate I bought from fellow *Car Mechanics* contributor Russ Smith the best £250 I've ever spent? Quite possibly. To recap my last *Our Cars*, I acquired the 1994 940 2.3 SE, with 160,000 miles on the clock, for use as canine transport. With various scrapes and bruises on it, it wasn't the prettiest of vehicles, but then again, these Swedish tanks never were, even when new. There is a certain Brutalist charm to them though. A bit like Preston bus station.

The 940 has been immeasurably more useful than just as a dog carrier though. Recently, my partner and I bought a house in Stamford, Lincolnshire. That meant moving stuff from my flat in Peterborough – about 20 miles away – and her existing place in Stamford to the new



Despite some of the flatpack furniture invading the front of the Volvo, the trip to IKEA was so successful that it inexplicably caused Richard to do Michael Caine impersonations.

home. There was enough to fill at least one removal truck, but why bother when you have a boxy old Volvo instead? With the rear seats folded down, I found myself absolutely astonished at its TARDIS-like ability to swallow such bulky items as sofas and wardrobes. The 940 coped with everything – and that included a mini greenhouse strapped to its roof. No wonder antique dealers loved these cars.

Then came getting new furniture. What better excuse for introducing one Scandinavian icon to another than by using the Volvo for a trip to IKEA. The bookshelves I'd picked to kit out my home office may have been flatpack, but they were also very long. In almost any other vehicle, they either wouldn't have fitted or we would have had to drive about 50 miles with the rear door open. But again the Volvo took everything in its stride.



Volvo chunky remote control fobs hadn't worked for years; reprogramming using instructions found on the internet solved that.

All loaded up for house moving – the precarious-looking plastic framework on top is a miniature greenhouse.



Catalytic converter has seen better days and is likely to need replacing soon, but still passed the MoT.



This – and more – is how much you can fit inside a Volvo 940 estate. The birdhouse came too.



The 1990s Guard Alarm I sensor and LED panel. Programming the Guard Alarm I system involves pairing the key fob to the sensor when the red LEDs tell you. Press the right buttons when the lights come on and – voila! – remote control locking and alarm activation.



Jobs during this time have been simple. I'm not bothering with the bodywork – I rather like the decrepit hulk of the 940 – but I've been sorting out little details inside. Such as getting the light in the centre cubbyhole/rear ashtray working. The bulb had blown, but the item, with its two prongs on the bottom, is only available from Volvo itself. Fortunately, the company has used it in a series of cars from the 1980s right up to the present day, so it was still readily available from my local dealer. That also gave me the opportunity to get some new trim clips to reattach the droopy rubber weatherstrip on the engine bay bulkhead.

Lock and load

More challenging was getting the door lock and alarm remote controls working. The car came with two blipper fobs, but they hadn't done anything for as long as the previous two owners could remember. A little bit of internet probing revealed that the triangular LED panel sensor attached to the inside of the driver's A-pillar controlled the 'Guard Alarm I' system. Pressing buttons on the panel, then on the fobs, in the right combination according to the LED sequence successfully programmed both remotes for the first time in several years. If you've got an older Volvo with this system and it doesn't seem to work, do some research. It's surprisingly easy to rectify and very satisfying when you get it right.

The Volvo also breezed through its MoT, with only an ABS sensor needing replacing to get rid of the warning light on the dashboard. Even the flaky-looking catalytic converter made it through, albeit with an advisory.

So that £250 is still proving a genuine bargain for a car that really does seem capable of doing it all.

In Richard's garage

2002 Suzuki Jimny 1.3 J LX auto Compact Japanese off-roader being used by my girlfriend Dianne to learn how to drive, something it's surprisingly good for.

1994 Volvo 940 SE Like a supertanker on wheels, the Swedish leviathan is proving unstoppable, whatever gets bunged inside.

1989 Saab 900 Turbo T16 Currently on SORN awaiting a decision on its future. It needs work – two front tyres, a proper service and some bodywork – but the biggest issue is that it won't fit in the garage of the new place.

1987 Peugeot 205 GR 50mpg economy – yes, really – means that the Pug is being used for any trip where cargo capacity isn't an issue.



Removing the rear ashtray to get access to the bulb underneath involves pressing in two tabs using a screwdriver. It's also what you need to do to adjust the handbrake cable. The design of the bulb, mounted in a plastic holder with two spade connectors at the bottom, seems very particular to Volvo, so isn't widely available.

Next time: The Volvo starts losing water inconspicuously after a long drive from Lincolnshire to Cornwall and back. Is it head gasket failure or something else?



In this case, flashing Volvo indicators make Richard happy – it means the 940 is locking and unlocking itself remotely for the first time in many years.

SUMMER FORD

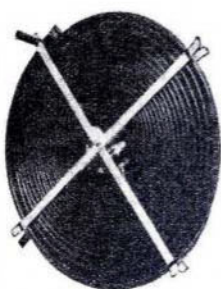
John Ward trawls through the library of 1950s and 1960s motoring magazines to investigate the assorted gadgets and services that tempted the motorists of the day.

MAKE LIGHT WORK OF YOUR CAR WASHING PROBLEMS

WITH
**PLANSEL
GARAGE HOSE**

The "Plansel" Garage Hose weighs only 1½ lb. It is made of durable maroon plastic, which will resist most oils, greases, acids, and detergents, etc.

A plastic jet/spray nozzle which will not scratch if allowed to fall on the car, together with a tap connector, plated spool and wall bracket is supplied.



★ Also available in crystal clear P.V.C.

Supplied complete as above . . . 35/-

45' of Hose Complete

31/6



CREATORS LIMITED

Car Accessories Div., Plansel Works, Sheerwater, Woking, Surrey, England

The first job of summer is usually to clean the car. Nowadays, you either pay a small fee and let an East European valeting team loose or else buy a pricey jetwasher and a handheld vacuum for the interior. In the past, help was at hand for less than the price of a single wash today. The **Plansel Garage Hose** was made of durable maroon-coloured plastic that claimed to resist most oils, greases, detergents and acids (!). It was supplied with a spray nozzle that reassuringly would not scratch the car bodywork if dropped on it, along with a plated spool and wall bracket for tidy storage. All this for a mere 31/6 (£1.50 in today's money) from Creators Ltd in Woking, Surrey. If you really fancied splashing out, you could order the hose in clear PVC for 35/- (£1.75).

One great British summertime pursuit is the picnic luncheon. **The Country Life Low-cost Complete Picnic Set** had all you needed for alfresco dining for four, housed in a smart attaché case – all for just 69/6 (£3.48) from Stadium Ltd of Enfield in Middlesex. One of the most intriguing features of the set was colour-coded cutlery for each diner.

Treat yourself to this **LOW-COST COMPLETE PICNIC SET**
The outstanding value of the motorists' year!

- Each case contains 31 pieces.
- Cups, saucers, non-spill plates, knives, forks, spoons.
- Separate colours for each of four people.
- Colourful case also contains two vacuum flasks, food containers, etc.

Available from stores, garages and HALFORDS branches.

Stadium COUNTRY LIFE 69/6 COMPLETE

STADIUM LTD, 30-36 QUEENSWAY · ENFIELD · MIDDX

Picnicking on the beach? Then invest in a **Karpartment**, described as "The NEW easy-to-erect changing tent". A mere 70/ (£3.50) was not much to ask to not only preserve your modesty, but also avoid the risk of dislocating a shoulder, as anyone who has ever tried to change clothes in a Mini will attest. Easily clipped to a car roof, it contained helpful pockets for towels and clothing.

THE NEW EASY-TO-ERECT CHANGING TENT

KARPARTMENT 70/-

KARPARTMENT is the very latest invention which does away with the discomfort of changing in the car. It folds for easy carrying and takes up very little space. It is easily clipped to the top of the car door and in two minutes you have a ready-made changing tent. Included in the KARPARTMENT is a window curtain for complete all round privacy. Pockets are provided for clothes and towels.

CHANGE IN COMFORT—CHANGE IN KARPARTMENT



... and you don't have to be an irate parent to feel the benefit of the CE-LAST silent approach! Whatever make of car you drive, a CE-LAST silencer gives improved all round engine performance, reduces back pressure and vibration to a minimum, and is guaranteed against bursts or blowouts. Obtainable from your local garage.

CE-LAST Silencers

Send for our free Catalogue!

SILENCERS (BOLTON) LTD., WATERLOO ST., BOLTON, LANCs.

Modesty was obviously not something that troubled the canoodling couple in the ad for **Ce-Last Silencers**, who seem totally nonplussed at having been discovered in flagrante by a disapproving father in true seaside-postcard fashion. Once you've stopped sniggering, the notion that Silencers (Bolton) Ltd of Bolton in Lancashire could produce exhaust systems that were so whisper-quiet that they would let you sneak up and spy on courting couples without their knowledge actually has some rather distastefully voyeuristic undertones. Mind you, one can see potential applications for Ce-Last in police cars and vehicles in the MI5 car pool.

Continuing the non-PC theme, please allow us to introduce the **NMC Automatic Car Cigarette Lighter**, a relic from those far off days when all cars were fitted with ashtrays rather than small dashboard drawers to hold loose change for parking meters. This innovative device could be loaded up with cigarettes, rather like bullets in a gun magazine, then not only light one up at the touch of a button but helpfully pop it into straight into the smoker's waiting hand. This ergonomic masterpiece cost 43/9 (£2.17) and was manufactured by Novelec Mechanical Components Ltd, Hampstead Road, London, NW1.

You will know it is right

There are five main purposes of a modern motor oil. As a motorist, you should know in an easy, understandable way - what these are and why all five are so efficiently carried out by

FINA MOTORTONIC MOTOR OIL

Find out about it by filling in the coupon below and attaching a copy of our brochure.

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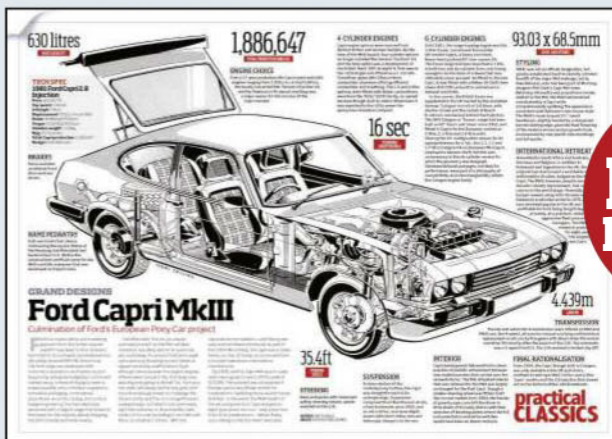
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Ted Connolly



Ted asks if fast-fit centres are all they're cracked up to be.

Centre of attention

MANY people – especially of the more-mature generation – mourn the loss of the corner shop. As an aside, I'm not sure why that expression is used to describe such businesses, because a good percentage of corner shops are in a terrace and not on a corner at all. Anyway, such matters aside, it is sad to see so many small establishments being forced to close.

The main reason is that they simply can't compete with supermarkets in terms of variety and price. The big concerns have loads of space and huge buying power because of the quantities they purchase, so David almost invariably loses out to Goliath. The irony is that those who moan about local shops disappearing are causing it by shopping at supermarkets. In the same way, I suppose, that people who complain about phone masts being erected in their neighbourhood ring up to complain using their mobiles.

I visit my local corner shop a fair bit because a) it is well-stocked, b) it is convenient and c) it's open until 9pm, which means that I needn't panic about running out of beer when I'm in the zone (if you like beer, you'll know what I mean; if you don't, it's about time you tried it). However, I am not ignorant of the fact that supermarkets offer the lowest prices, so if stuff is needed in any quantity, that's where I head.

In the car world, the equivalent of supermarkets are the fast-fit tyre and exhaust centres. They do more or less anything – tyres and exhausts (of course), batteries, shock absorbers, general servicing and myriad other tasks. I don't necessarily trust them with



specialist repairs, on the basis that they tend to be jack-of-all-trade outfits with no particular area of mechanical expertise. That's not a criticism, just an opinion based on experience. However, I have bought my tyres from such centres for many years. Boots do not come any cheaper.

He quoted about £50 less than the fast-fit centre

Thus, upon noticing that the front tyres on my PT Cruiser were starting to shave off their outer treads after a mere 10,000 miles, it seemed obvious the tracking was out. So off I purred to the fast-fit centre I'd been using for some time to get it checked. I had a figure in mind for the job – adjusting the tracking would be a few quid and the tyres around £70 each, plus balancing. I've had Falkens fitted for a while, because they are reasonably priced, provide excellent grip and will generally cope with

30,000-40,000 miles before they need replacing.

The technician got my Chrysler on the ramp, fiddled around for a few minutes and proclaimed that not only did the front suspension bushes need replacing, but the front discs and pads were shot. Plus, the boots were near the end of their lives. I wasn't worried about the bushes and brakes (to be explained shortly) and requested they simply set the tracking and fit a new pair of tyres.

The bloke on reception – now assuming a new role in life as protector of all things automotive – loudly proclaimed that I either had everything done or nothing at all. He refused point blank to only allow the tyres to be replaced and presented me with a quote approaching £800, probably expecting me to be shocked into submission by reports of such woeful maladies on my car. Well, I wasn't and made it plain that I wasn't.

Going back to the bushes and brakes, I wasn't being irresponsible in ignoring these because, coincidentally,

I'd checked the discs and pads a few weeks earlier and they were fine. As for the bushes, they had gone through two MoTs and, although slightly worn, were still totally serviceable – and I knew that.

Nevertheless, I dropped by at the small, independent garage that services my car and explained what had happened. The obliging chap in the workshop popped the car up in the air, said the bushes were a bit splayed, but had loads of life left in them, and that the discs and pads were similarly healthy. He then said that there was a little tyre bay at the back of an adjoining yard and suggested I drop in and have a chat.

Knowing that such little places can't compete with the big fellas on prices, I was sceptical, but followed his recommendation. The guy took note of the tyre size, said he'd order a pair of Falkens to match the rear end and to call back in two days. Incredibly (well, to me), he quoted about £50 less on the boots than the fast-fit centre and said the tracking would be adjusted for Sweet Felicity Arkwright. I was delighted to use his services and will go there again. I also learnt that big is not always best or cheapest, and that the small establishments can sometimes offer a far better service at a surprisingly competitive price.

Not long after that, the Cruiser went through its MoT and all was well, albeit that the front bushes earned an advisory (which they have for three consecutive tests, but without further deterioration). I will never, ever, go back to the big centre that I used to trust so implicitly and will endeavour to follow the hackneyed, but nevertheless wise, advice to shop around. Just remember that age-old saying: use it or lose it (and if it's approaching 9pm, booze it).

Thought for the month

SHOULD the term be spark plug or sparking plug? I reckon it's spark plug when referring to the object and sparking plug when it is actually in action. I asked a mechanic in a garage and he replied: "Dunno, mate. I'm a diesel fitter."

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