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TECH TIPS

5th Issue
September 2014

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Tech Tips

Technically speaking ...

The average age of the Irish car parc now stands at 10 years old. This figure will not change much, but within a few short years what will change is the large amount of modern cars that will be pouring into independent garages, out of warranty and packed with new technologies.

We have some of the best-trained mechanics in the world, but we need to keep on top of the newer technologies. Help is at hand now with garage concepts, independent training from Bosch, HELLA, eXponentia and more. Watch for upcoming training courses in Autobiz magazine and at www.autobiz.ie/training.

This 5th issue of Tech Tips has a round up of all Tech Tips published in the past five issues of Autobiz. Also, our online Tech Tips+, at www.autobiz.ie/techtips, has over 300 technical documents and counting.

John O'Callaghan, Technical Editor

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Tech Tips

Low fuel pressure in a Galaxy

Dave Gordon, TEXA

A 2007 Galaxy TDi was having intermittent starting problems, accompanied by a warning light on the dash. The Galaxy was recovered to a garage during a recent no-start episode, but the fault could just as easily have caused a hard starting condition. TEXA's Dave Gordon recounts the puzzling information collected on his way to solving this problem.

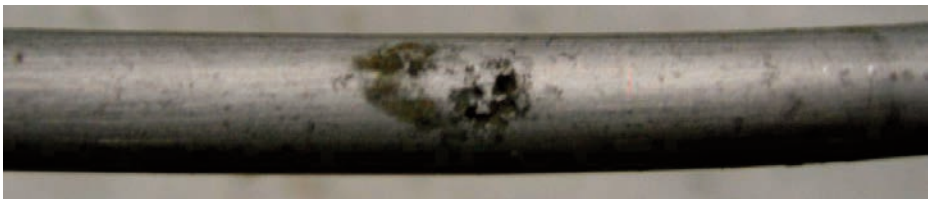
It all began when a 2007 Ford Galaxy TDI would not start and was recovered to a garage. The Galaxy had been experiencing intermittent problems not starting, and a fault light was showing on the dash. The warning light indicated a fault in fuel delivery to the engine. After a quick visual inspection under the bonnet, a TEXA Axone 4 Mini, and Navigator Nano, were used to scan the whole vehicle for errors.

After removing all of the error codes in the TGS3 function, an attempt was made to start the car. It started this time, but immediately logged a pre-pump low fuel pressure fault, indicating a failed pre-pump. The live parameters were checked, and the Actual Fuel Pressure was marginally below the stated Desired Fuel Pressure, by around 1.5 Bar.

The fuel tank was removed to inspect and test the pre-pump. Out came the tank and out came the fuel sender unit. The real problems started when the sender unit was removed from the tank, and it was discovered that there wasn't a pre-pump in the tank at all. According to Ford and Autodata, this Galaxy should have a pre-pump, if the chassis and engine code were to be believed. This information was obviously not true, and a faulty pre-pump was not the cause of the fault.

Back to the drawing board and starting with a clean slate. The fuel tank and lines were refitted, and the car was scanned and the live data was checked again. The same error code came back, and the fuel pressure was still the same 1.5 Bar too low.

When you get to a point like this while diagnosing a problem, it is always a good idea to understand what it is that you have measured and know, and what are all of the possible causes. Sometimes this means checking a variation of what you've already tested to either confirm or refute an assumption as to the actual problem you are dealing with. Often, a quick check will send you into a new direction that you might not have considered with the information from your initial assessment. This is the kind of thinking and diagnostics that will lead you to fixing any problem in an efficient and thorough manner.



A pin-hole leak on a fuel line was sucking air into the line, but wasn't leaking diesel yet

With that idea in mind, the pressure prior to the filter was measured and it was also the same 1.5 Bar too low. What was looking like a partially plugged fuel filter was now looking like another problem entirely. Additionally, an interesting thing was seen in the fuel as it was flowing to the filter - there were small air bubbles in the diesel. The bubbles provided an invaluable clue that clearly showed that the problem was not only located between the fuel tank and the fuel filter, but that it was probably caused by air entering into the fuel supply. As you will remember, air is compressible while diesel, and petrol, is virtually incompressible. The air bubbles in the fuel were compressing, robbing the fuel of some of it's pressure. Now all that was needed was to find the source of the air entering into the fuel supply.

The next step was to create a temporary test fuel system from the fuel tank to the filter. The temporary fuel system consisted of a pipe connected to the inlet of the fuel filter, with its other end in a fuel can. Having eliminated all the Galaxy's pipework, non-return valve, and the tank itself, the fault was cured. All that was needed then was to inspect all of the by-passed fuel system to find the real fault.

All of the covers on the fuel lines were removed, and the non-return valve was located. There weren't any fuel leaks to be seen, but a small pin-hole was found on the fuel feed line near the tank. While the pin-hole wasn't leaking any fuel (yet) it was allowing small amounts of air to be sucked into the line along with the diesel from the tank, like a straw sucking up air. If the pin-hole had grown larger, it would have started to leak fuel and would have been more noticeable.

A new pipe was fitted, and all of the fault codes and low fuel pressure readings were no longer present. A successful repair of an odd failure.

TEXA

Malcolm Short, Schaeffler

Clutch Clinic

Mark 4 Golf 1.6P

The Mark 4 Golf was introduced in 1997 and continued in production until mid-2005. With many of these vehicles on the road, the clutch replacement is well into the independent garage business. LuK offers a clutch replacement guide on the 1.6 petrol engines.

No special tools are required to complete this repair; the only additional tools needed are a transmission jack, an engine support cradle and a long axle stand. A four post ramp was used in this example, however, a two post ramp could also be used for the repair. For the sake of safety, it's considered best practice to disconnect the battery earth lead before commencing work. If the vehicle has alloy wheels, it may be fitted with anti-theft wheel bolts, so make sure you have the wheel nut key before you start.

Remove the plastic battery cover and unclip the satellite fuse box situated on top of the battery. Disconnect both battery terminals and remove the plastic surround from around the battery. Unbolt the battery clamp and lift out the battery. Undo the bolts securing the plastic battery undertray and remove it making sure to disconnect any attached wiring harnesses. Disconnect the electrical connections to the starter motor and any that are attached to the top of the gearbox. Unbolt the brackets fitted to the face of the starter motor bolts. Unbolt the two starter motor bolts and remove the starter. Unbolt the earth strap attached to the gearbox and remove the slave cylinder and stow it to one side.

Remove the gear selector linkage by removing the large circlip on top and releasing the remaining linkages with a forked tool. If extra clearance is needed, the mounting bracket can be unbolted to aid the removal process. Disconnect the reverse light switch (fig-1) and the speedometer connectors on top of the gearbox. Unbolt the power steering pipe, near to the gearbox mounting, and stow it to one side. Support the engine and gearbox with the support cradle and remove the complete gearbox mounting assembly (fig-2). Remove the

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remaining bell-housing bolts that are accessible from the top and raise the vehicle part way.

Remove the nearside wheel and raise the vehicle. Remove the engine undertray and undo the bolts on the nearside driveshaft flange and stow it to one side. Undo the offside driveshaft flange and release it from the gearbox. Undo the large gearbox steady support bracket and the remaining lower gearbox bell-housing bolts. Finally using the transmission jack carefully lower the gearbox to the floor.

Using a flywheel locking tool, undo the clutch cover retaining bolts and remove the cover. Release the locking ring (fig-3) and remove the release plate from the clutch assembly. Undo the large bolts securing the pressure plate and remove the plate. To replace the release bearing, tilt the gearbox slightly (to prevent fluid loss) and remove the gearbox end cap. Remove the old bearing from the housing using a large magnet (fig-4) and install the new bearing, ensuring that the end cap is replaced and not reused.

With the transmission removed, clean the first motion shaft splines and any debris from the bell housing. Ensure that the release bearing is always replaced if the clutch has worn out. Check that the pushrod is not excessively worn or bent and that the oil seals surrounding it are not leaking. Put a small dab of high melting point grease (not a copper based product) on the first motion shaft splines and make sure the new driven plate slides freely back and forth. This not only spreads the grease evenly, but also makes sure you have the correct kit. Wipe any excess grease off the shaft and the driven plate hub. Check that the driven plate is the correct way, "Getriebe Seite" is German for "Gearbox Side". The clutch can be bolted to the engine evenly and sequentially.

Before fitting the gearbox, make sure the locating dowels are in place and not damaged. Refit any that have become dislodged and refit the gearbox. Make sure the gearbox bell housing bolts are secured before lowering the jack. Refitting is the reverse of the removal and make sure the manufacturers recommended torque settings are always used.

For technical support and repair installation tips, go to www.RepXpert.com or you can call the LuK technical hotline on 0044-143-226-4264.

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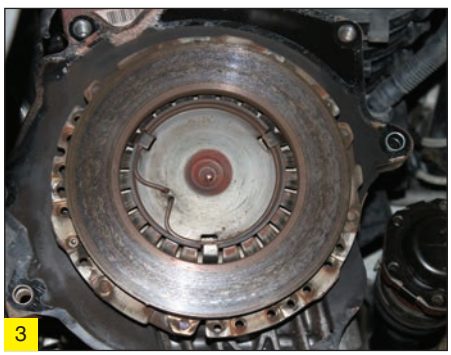

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5W/30 Engine Oils explained

When emission regulations changed in 2011, vehicle manufacturers changed their designs to comply. These changes brought about a greater need to use the proper engine oil for each application. Granville oil explains some of the specifications of 5W/30 oil and their meaning.

Regulations changed in 2011, designed to further reduce vehicle emissions and set a common standard for replacement parts. Most manufacturers now produce vehicles that comply with the new standards, by fitting exhaust after treatment devices, mainly diesel particulate filters (DPF) or three way catalytic convertors (TWC), together with the need for Low SAPS oils (Sulphated Ash, Phosphorus and Sulphur), High temperature/shear rate viscosity oils (HTHS) AdBlue to lower emissions.

Using the correct engine oil is vitally important, even if the vehicle is not in warranty. The exhaust after treatment device needs to be looked after so that it can regenerate and clean the soot particles held within, prior to emitting them out through the exhaust, whilst retaining a small amount of ash.

Failure to look after these devices will result in expensive repairs - or even replacement of the unit. DPFs are designed to accept a certain size of emission particle, governed by the specification of the recommended oil for the vehicle. Put simply - using the wrong oil means the emission particles will be of the wrong size and over a period of time will clog the DPF, not allowing regeneration, causing the vehicle to lose performance and power.

Remember - even though the warranty may have expired, the DPF or TWC remains fitted to the vehicle and needs to function properly.

Engine oils are complex formulations to meet the exacting specifications of the engine manufacturer, they are formulated to obtain the desired fuel economy, service intervals and emissions.

The information below outlines the ACEA oil sequences. (Taken from ACEA Website)

A/B: Petrol and Diesel engine oils

A1/B1 Stable, stay-in-grade oil intended for use at extended drain intervals in petrol engines and car & light van diesel engines, specifically designed to be capable of using low friction oils with a high temperature/high shear rate. The oils are suitable for use in some engines. Consult owner manual or handbook if in doubt.

A3/B3 Stable, stay-in-grade oil intended for use in high performance petrol and light van diesel engines and/or for extended drain intervals where specified by the engine manufacturer, and/or for year-round use of low viscosity oils, and/or for severe operating conditions as defined by the engine manufacturer.

A3/B4 Stable, stay-in-grade oil intended for use in high performance petrol and direct injection diesel engines, but also suitable for applications described under A3/B3.

A5/B5 Stable, stay-in-grade oil intended for use at extended drain intervals in high performance petrol engines and car & light van diesel engines designed to be capable of using low friction low viscosity oils with a High temperature/High shear rate. These oils are unsuitable for use in some engines. Consult owner manual or handbook if in doubt.

C: Catalyst compatibility oils

C1 Stable, stay-in-grade oil intended for use as catalyst compatible oil in vehicles with DPF and TWC in high performance car and light van diesel and petrol engines requiring low friction, low viscosity, low SAPS oils with a minimum HTHS viscosity of 2.9 mPa.s. These oils will increase the DPF and TWC life and maintain the vehicles fuel economy. Warning: these oils have the lowest SAPS limits and are unsuitable for use in some engines. Consult owner manual or handbook if in doubt.

C2 Stable, stay-in-grade oil intended for use as catalyst compatible oil in vehicles with DPF and TWC in high performance car and light van diesel and petrol engines designed to be capable of using low friction, low viscosity oils with a minimum HTHS viscosity of 2.9mPa.s. These oils will increase the DPF and TWC life and maintain the vehicle's fuel economy. Warning: these oils are unsuitable for use in some engines. Consult owner manual or handbook if in doubt.

C3 Stable, stay-in-grade oil intended for use as catalyst compatible oil in vehicles with DPF and TWC in high performance car and light van diesel and petrol engines, with a minimum HTHS viscosity of 3.5mPa.s. These oils will increase the DPF and TWC life. Warning: these oils are unsuitable for use in some engines. Consult owner manual or handbook if in doubt.

C4 Stable, stay-in-grade oil intended for use as catalyst compatible oil in vehicles with DPF and TWC in high performance car and light van diesel and petrol engines requiring low SAPS oil with a minimum HTHS viscosity of 3.5mPa.s. These oils will increase the DPF and TWC life. Warning: these oils are unsuitable for use in some engines. Consult owner manual or handbook if in doubt.

Granville

Alternator diagnostics for Opels with Isuzu Engines

There are some common faults associated with the charging system on Opel applications using the Isuzu 1.5 and 1.7 diesel engines. Blue Print gives some pointers to correctly diagnosis charging system faults prior to replacing the alternator, and to assist in the prevention of further problems.

If the charge warning lamp is illuminated while the engine is running, it is strongly suggested that the following checks are made prior to the alternator being replaced (in addition to a basic battery test);

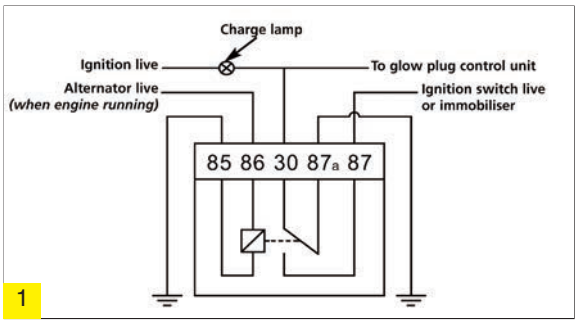
Charging voltage test

Test the battery voltage when the engine is running. The voltage should be between 13.7 and 14.7 volts at 1250 rpm. If it is within the above guidelines, the unit is charging correctly (see charge lamp relay test). Please note that the battery must be in good condition and be fully charged, with non-essential electrical loads switched off. A battery fault may cause overcharging, low voltage readings, or cause the alternator to 'burn out' after prolonged use.

Charging lamp relay test

The Charging Lamp Relay is prone to failure. The relay controls the dashboard charging light operation and alternator excitation. It also gives a signal to the diesel system self-diagnostics and glow plug control unit for post-glow operation. It is strongly recommended to change the relay when replacing the alternator, as it is possible for an internal alternator fault to damage the relay.

A quick and simple test involves separating the round 4-pin alternator loom connector (on the driver's side inner wing (see fig 5). With the ignition on (and the immobiliser cleared, if applicable), give a fused positive feed to the relay energising wire. This wire is normally Yellow/Red



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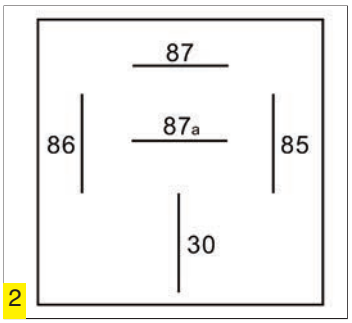

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Wiring diagram for the charging lamp relay circuit, on left, and the relay itself, on right

(male connector, vehicle side) and will correspond to terminal 86 at the charge lamp relay. Alternatively, apply a fused feed directly to terminal 86 at the relay (under the same conditions) to eliminate a harness fault. (see figs 1,2 for relay circuit wiring diagram).

If the charge warning lamp on the instrument display goes out, the relay is functioning correctly and attention should be given to the alternator and loom. If the lamp does not go out, further tests at the relay holder are needed.

Alternator loom continuity

There are two common failure points. Firstly the large main alternator cable connector on the inner wing is very susceptible to severe corrosion (see fig 4). Partial contact here will restrict or stop alternator charge from reaching the battery, and in some cases cause the alternator to fail prematurely. This should be checked, cleaned or replaced as necessary.

Secondly, the wires in the alternator loom are prone to breakage (at the alternator end). Test with a multi-meter by measuring continuity between the inner wing connection and the alternator plug. Be aware that the wire positions in the connectors at each end of this loom will not be the same. The rubber 'bungs' in the back of the loom connectors should be removed to show the true wire location (see fig 10). Also, ensure that the terminals in all of the connectors are 'tight' and have no evidence of corrosion.

Other associated vehicle problems

Air bag warning light on - sometimes caused by an overcharging alternator.

Initial excitation - sometimes requires two minutes at 2,500 rpm to initially start from new.


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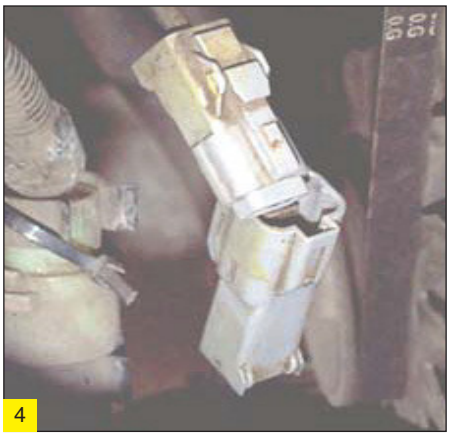
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Clutch Clinic

Honda CR-V 2.2cdti

Malcolm Short, Schaeffler

The Honda CR-V, launched in 1995, is a popular multi-purpose vehicle that's now onto its fourth generation. LuK takes a look at the clutch replacement on the third generation 2.2cdti model.

No special tools are required to complete the repair but you need to support the engine, gearbox and subframe. We used four transmission jacks but you could use two jacks and some rope to support the subframe. A two post ramp was used for the replacement.

Open the bonnet and for safety reasons, disconnect the battery terminals. Remove the battery and the housing tray. Slacken and remove the air filter case fixing that is attached to the battery support bracket, and remove the air flow pipe that is in two sections. The air filter case is removed by carefully levering the rear of the case from the two push fit connector bracket, the bracket will also need to be removed (fig-1). Remove the battery support bracket and stow the terminals safely to the side.

The reverse light connector, now exposed, can be disconnected and stowed safely. Remove the gear selector linkages by slackening three bolts from the bracket. It is less fiddly than unclipping them individually from the bracket and can be stowed safely as one complete unit (fig-1). Three further multi plug connectors to be disconnected located on the gearbox.

Remove two bolts from the slave cylinder bracket. Remove one nut that holds the hydraulic pipe and stow safely as one unit. Remove the bracket with the earth cable still attached and stow safely.

Remove two nuts and one bolt that hold the top engine mount in place. The mount does not need to be removed. Slacken the two bolts from the gearbox mount, and remove them. Before raising the vehicle, remove two bell housing bolts from the top of the gearbox. The bolt closest to the bumper is in a slightly tricky position, and secures a wiring harness.

Remove both front wheels, and raise the vehicle. Remove the push-in retainer clips that are holding the under shield flaps inside the wheel arch, there are two clips on each side. Remove all retaining push-in clips holding the under shield in place. There are quite a few, and you will find two that are hidden, one on each side towards the front that also need to be removed (fig-2). Pull away the complete under shield, taking extra care of the flaps from inside the wheel arch, as it is all one piece. Support the engine and gearbox with transmission

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jacks, and drain the gearbox oil.

Remove two nuts and one bolt on each side so that secures the lower suspension arm to the ball joint and unlink. Remove the rubber bracket from the exhaust closest to the catalytic convertor. Unlink the front end prop shaft by slackening the four double hex bolts. Remove the bolt that secures the power steering pipe bracket to the subframe (fig-3) and unclip the pipe from the two clips holding it in place.

Free the driveshaft on the left hand side and remove. Slacken the eight subframe bolts, four on each side, to allow the subframe to lower slightly without removing it fully. Remove the bolt that secures the engine stabiliser, and lower the subframe from the rear.

Remove the intercooler pipe, as this blocks two bell housing bolts, and then remove the eight bolts from the bell housing. One of the bolts is in an awkward position, so use a spanner to remove this (fig-4). Another bolt is secured through the starter motor.

With the clutch removed, check the dual mass flywheel (DMF) for signs of heat stress and evidence of grease loss. The DMF should also be tested for free play and rock between the primary and secondary masses, LuK tool number 400 0080 10 is specifically designed for this purpose on all LuK manufactured DMFs. Full instructions and tolerance data for all DMFs are contained on a CD which comes with this special tool.

Clean the first motion shaft splines and any debris from the bell housing (especially important when a release bearing has failed). Put a small dab of high melting point grease (not a copper based product) on the first motion shaft splines and make sure the new driven plate slides freely back and forth. This not only spreads the grease evenly but also makes sure you have the correct kit. Wipe any excess grease off the shaft and driven plate hub. Using a universal alignment tool and checking the driven plate is the correct way round (note "Getriebe Seite" is German for "Gearbox Side") the clutch can be bolted to the flywheel evenly and sequentially.

Before fitting the gearbox, make sure the locating dowels are in place and not damaged. Refit any that have become dislodged and refit the gearbox. Make sure the gearbox bell housing bolts are secured before lowering the jack. Refitting is the reverse of the removal.

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Toyota Aygo clutch replacement

The Toyota Aygo (KGB10), which is platform shared with the Citroën C1 and Peugeot 107, is known to suffer from premature clutch disc wear. Some drivers also complain about clutch noise. Blue Print gives some advice on how to successfully replace this clutch

The noise that drivers complain about is attributed to a release bearing 'squeak', which is caused by a worn clutch cover diaphragm spring and/or a broken release bearing tab, which may make the clutch feel heavy and make it difficult to change gears.

Blue Print advises, that if you are working on an Aygo, C1 or 107 that has symptoms relating to a worn clutch disc, then a complete clutch kit replacement is required. It is also recommended that if you are replacing the clutch kit, or the complaints relate to the symptoms highlighted above, then the clutch fork must also be checked for stress fractures, and replaced if necessary. In this situation the increased effort required to change gear may result in stress fractures in the clutch release lever.

The manufacturer has issued a service bulletin to highlight that the design of the fork has been improved to prevent future issues with heavy clutch operation and release lever damage, therefore, if you find stress fractures on the clutch release lever, replace both the clutch fork and the clutch release lever with Blue Print part numbers ADT33351 (clutch fork) and ADT33352 (clutch release lever).

There is a second service bulletin issued by the manufacturer regarding premature clutch disc wear. To maximise the service life of the clutch disc, they have replaced the original 180mm diameter disc with the 190mm disc used on the Yaris (KSP90). Blue Print's clutch kit ADT330246 for the above applications is only supplied with the 190mm clutch assembly to address this problem and extend the clutch service life.

With the larger clutch disc installed, the clutch engagement point will be 15-20mm lower, which could be noticed by the driver. Also, because of the increase in diameter, it is essential to check the condition of the flywheel and if required, replace it or have it machined.

When fitting the new release bearing, you must follow these guidelines:

1. Apply clutch spline grease only to the input shaft splines.
2. Do not apply the grease to the release bearing or other parts of the input shaft.

Finally, the manufacturer has issued a third bulletin, which highlights that the lifetime of the clutch disc can be extended by adjusting the clutch pedal free play. If there is no free play, clutch disc wear increases.

To check and adjust clutch pedal free play:

1. Push the clutch pedal down by hand (Fig. 1) checking for smoothness of operation. Stiffness or roughness in operation will require further investigation to determine the root cause.
2. Measuring the free play in the pedal can be done quickly and easily, by applying

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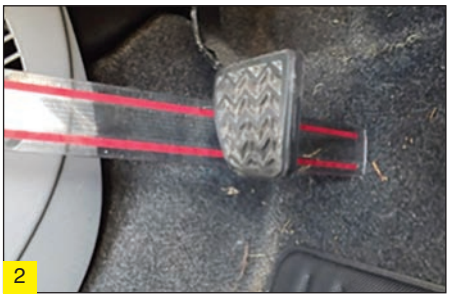
gentle force to the pedal with your hand



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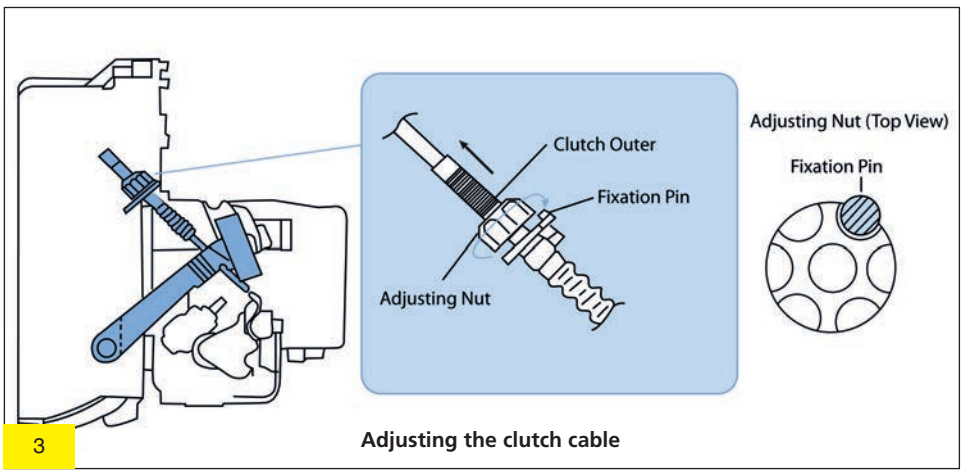
(approx 15-20Nm) until you feel the amount of pressure required increase. Measure the distance travelled by the pedal with a ruler. The amount of free play in the clutch pedal should be 23mm, +/- 5mm (Fig. 2).

To adjust the clutch cable:

1. Pull the clutch outer cable until it is released from the Fixation Pin (approx 3mm).
2. Rotate the Adjusting Nut to increase or decrease the free play as necessary (1 full turn of the Adjusting Nut is equivalent to about 6.5mm of pedal free play).
3. Ensure the Adjusting Nut is locked back in place on the fixation pin after adjustment.
4. Operate the clutch 2-3 times.
5. Re-measure the clutch pedal free play and adjust as necessary.

After adjustment, the clutch pedal may be higher than the brake pedal. A higher clutch pedal is normal, but be certain to explain this to your customer.



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Adjusting the clutch cable

Timing belt changes for the wary

Malcolm Short, Schaeffler

Love them or hate them, timing belt changes are not getting any easier. We can probably all admit to getting it wrong at least once. Here are some hints and tips from INA to avoid the costly mistakes.

Plan the job

The engine should be at room temperature when setting the belt tension. As the engine gets hotter it expands, so setting the belt tension of a cold belt on a hot engine will mean it is not as tight as the vehicle manufacturer's process specified when hot. A cold engine is a constant that you should stick to. Getting the engine at room temperature before you set the belt tension can be tricky, especially if it's a quick job and the customer has driven 10 miles to get to you. Make sure you get a tea break or lunchtime in the process, or better still, get it on the ramp the night before.

Always change all the pulleys and tensioners. INA tensioner sets & kits contain all OE components and all the bits you need to change the timing belt.

Think about the Front End Auxiliary Drive (FEAD) components. You have to remove most of them to get to the timing belt, they have done the same mileage as the timing belt and they can do as much damage as a timing belt if they fail. Why not change them at the same time?

Read the instructions

Some garages believe that vehicle manufacturers (VMs) dream up a complicated process to deter independent garages from doing the work. It is certainly working, but they don't do it for that reason. VMs will start from the position "I need X tension to make sure the belt doesn't fall off until the scheduled belt change". Then they develop a process that gets them there as quickly and as accurately as possible, repeatedly. Remember they have to do the same as you, but on a moving production line and they're doing it hundreds of times a day. If it will be OK if you miss a few bits out of the process, don't you think the VM would have done it like that too?

Read the instructions again

This time thinking about if it actually tells you how to replace all the pulleys and tensioners. Remember that some of the OE processes you have access to in aftermarket publications may not give you enough information to change the tensioner. Rover KV6 is a good example. If you follow the OE instructions with a new tensioner, it comes loose and you bend valves. Another good example is the Corsa 1.7 CDTi, where it says retract the tensioner from the belt and lock it and after fitting the new belt just let it go, but if you have the new tensioner in your hand which way do you turn it?

Special Tools

VMs will develop an accurate timing process and tools that produce repeatable and reliable engine or fuel pump timing, in a production environment to give maximum performance and minimum emissions every single time. If that involves some expensive special tools, then that is what is required and a bottle of Tipp-Ex just won't give the same results!

Special tools are sometimes crucial and will save you time and trouble

Repair all leaks

Timing belts and tensioners that use friction washers to damp out vibrations don't like oil or water. Leaving a leaking oil seal or a leaking water pump is not doing your customer a favour, you are risking total engine failure. A €2 seal and a few minutes work would be doing your customer a favour.

Understand "free wheeling cam pulleys"

One of the most common mistakes, usually due to lack of timing pins or tools, is to not lock the cams and loosen the cam pulleys using the "universal timing tool" (Tipp-Ex) to guess the valve timing. Unfortunately when it comes to tensioning the belt, not having loose pulleys means you will have a loose side of the belt and a tight side of the belt. Unfortunately the tensioner is usually on the slack side, so setting the belt tension in this condition will result in an over-tensioned belt.

With the camshafts locked and the pulleys loose, you will have even tension all around the belt (which is how the VM intended you to tension the belt). The same can apply to fuel injection pumps, which when pinned, the pulleys can be slackened on banana slots, to allow some free movement of the belt.

Torque wrenches and values are vital

Turn the tensioner the right way

Some tensioners are not marked and when you turn it one way, the pointer goes in the opposite direction (just to confuse you). Read the instructions carefully and if you are not sure or it's not clear, ask.

Get the torque right

Torque wrenches and torque values are vital pieces of kit when it comes to replacing timing and auxiliary belts and their associated tensioners and guide pulleys etc. With belt loads increasing and space reducing, some of these components are expected to perform harder than ever before. Not using a torque wrench can prove fatal to an engine if the bolt breaks.

Final Step

Always turn the engine over by hand after the process to make sure it turns ok. If possible, it's also a good idea to leave the belt cover off, so you can see that the belt sits nicely on the pulleys when running, before assembling it fully.

For technical support and repair installation tips, go to www.RepXpert.com or you can call the LuK technical hotline on 0044-143-226-4264.

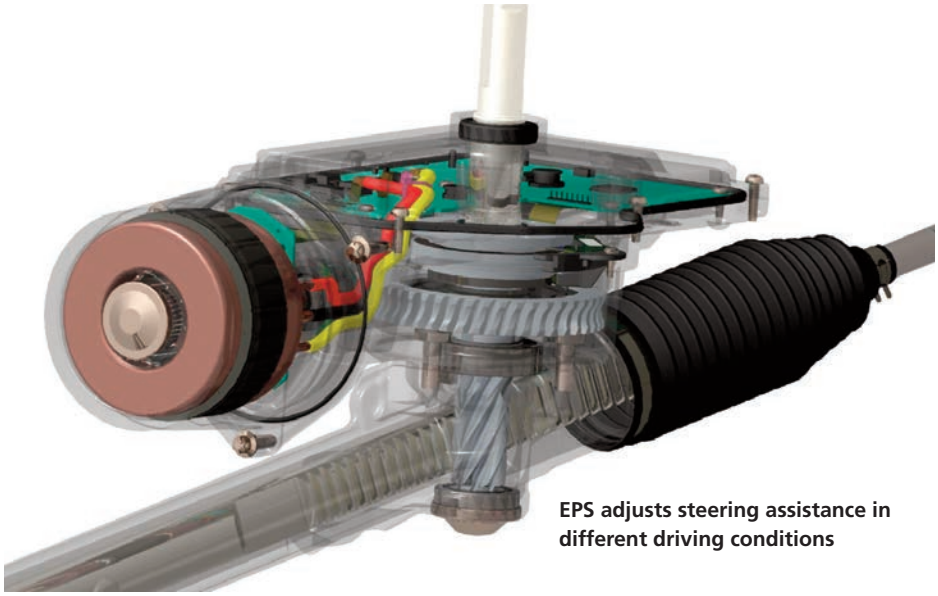
Resetting a Corolla ESP torque sensor

A 2007 Corolla was brought to A.D.S Ryan recently with no power steering assistance. Seamus Ryan recounts the steps needed to get the car back on the road, and explains some EPS basics.

The Corolla was brought to our garage because their was a problem with the electronic power steering system (EPS). The warning light on the dash was on, and the system was not providing any assist to steering.

A Vedis II was connected to the Corolla and all of the trouble codes were read. After checking all of the components and wiring, it was determined that the EPS ECU was faulty and needed to be replaced.

The EPS ECU, located under the dashboard on the driver's side, was replaced, but needed to be adjusted before it would function properly. A torque sensor zero point adjustment is required when either the EPS ECU or steering column have been replaced. This adjustment can be done with an Autoland Vedis II or iScan II wt, with step by step instructions from the Autoland website, autolandscientech.com.



EPS adjusts steering assistance in different driving conditions

Before explaining the procedure for a torque sensor zero point adjustment, a better understanding of the basic function and operation of the EPS will help you with diagnoses and repair.

EPS Modes

There are a several modes in which the EPS operates, depending on operating conditions and driver demands.

Normal Mode: Left and right steering assist is provided in response to driver demands. The amount of assist varies with vehicle speed.

Return Mode: Used to assist steering to return to the neutral (driving straight ahead) position. Feedback from the steering position sensor prevents the EPS from overshooting the neutral position.

Damper Control Mode: Used to improve road feel and dampen kickback. This mode is usually only active at higher vehicle speeds.

Protection Mode: Used to protect electrical components in the EPS from thermal damage and excessive current flow, if the steering is held all the way to one side in the lock position for too long.

EPS Backup Protection

There are circumstances that will change the amount of assist provided to steering. The EPS may limit, suspend or even stop steering assist completely, when certain situations arise. This is done to prevent one fault or failed component from causing further problems.

The EPS will limit assist if the:

- EPS motor is overheated.
- EPS ECU temperature is too high.
- EPS ECU temperature sensor of is faulty.
- vehicle speed sensor signal is faulty.
- engine speed sensor signal is faulty.

The EPS will stop assist if the:

- torque sensor is defective.
- EPS motor is overloaded.
- EPS motor is shorted.
- EPS ECU system has a fault.

The EPS will suspend assist if the voltage supply to the EPS is defective.

A torque sensor adjustment is required in the following circumstances:

- EPS ECU replacement
- Steering gear assembly replacement
- Difference in left/right steering force
- DTC C1515/C1516 only (Toyota only)

Torque Sensor Adjustment

Adjusting the torque sensor can only be done when all other EPS DTC faults have been cleared. The only DTCs that can be present are C1515 and C1516. Adjusting the torque sensor can be quickly and easily carried out with the use of an Autoland Verdis II or iScan II wt. After plugging the scanner into the car, follow these steps:

- Select Vehicle Diagnostics
- Select Asian
- Select Japan
- Select Toyota
- Select OBD II and confirm the correct multiplexer
- Select Diagnosis
- Select Chassis System
- Select EMPS/EHPS
- Select Read Fault Codes
- Confirm that only DTCs are C1515 & C1516
- Select Adaptation and select proper type
- Follow all directions and confirm conditions
- Wait for sensor adjustment to complete
- Confirm that all DTCs have been cleared.

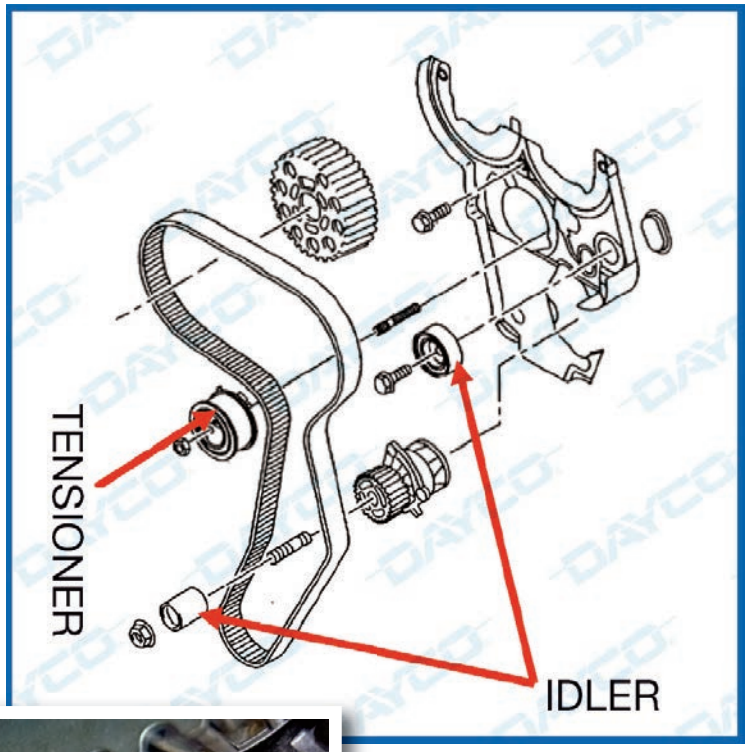
While these details are particular to a 2007 Toyota Corolla, many of the details of the operation and fundamentals of EPS are the same for most cars. EPS will become more common with every new model year, so a full understanding of the way in which it operates and controlled is vital.

A.D.S
Automotive Diagnostic Services

Timing belt installation

VW 2.0 TDi

The popular 2.0 TDI engine used in several VW Group models can cause problems, if the correct procedure is not followed during the installation of a replacement timing belt kit. In the worst case, incorrect installation can result in the system failure with potentially catastrophic consequences for the engine. Dayco has produced the following guidelines to help technicians follow the correct installation procedure.



Replacement must only be carried out when the engine is cold, so ensure the engine has not been run for at least four hours. Once the timing drive system is exposed, rotate the crankshaft clockwise to TDC on cylinder one. Make sure the camshaft pulleys are locked into position using the appropriate locking pins, and that the crankshaft locking tool is also in place. After checking that the timing marks are aligned, slacken the camshaft pulleys so they can just rotate, and then loosen the tensioner bolt.

Turn the tensioner pulley anti-clockwise and insert the tensioner locking pin (Dayco tool number T10115), then rotate the tensioner fully clockwise until it stops. Re-tighten the nut and remove the timing belt starting at the water pump. Then remove the old tensioner and the idlers.

Install the new tensioner, taking great care to ensure that the locking tab is correctly inserted into the hole in the rear case. Failing to follow this step is the biggest single reason for subsequent belt failure on these units. Then install the new idlers.

Insert the tensioner pulley locking pin and secure the tensioner in its clockwise position, using Dayco tool number T10115, and turn the camshaft pulleys clockwise within their slotted holes. Then, noting the direction of its rotation, fit the new timing belt clockwise, starting from the crankshaft and ensuring it remains taut between the pulleys on the non-tensioned side.

Remove the locking pin from the tensioner pulley, slacken the nut and slowly rotate the tensioner until the pointer aligns with the notch, making sure the nut does not also turn. Then, while holding the tensioner in place using the tool, lock the tensioner with Dayco tool number T10020 and tighten the nut to 20 Nm + 45°.

Hold the left camshaft pulley with Dayco tool number T10172 and tighten the camshaft bolts on both pulleys to 25Nm. Then remove the tool, camshaft locking nuts and crankshaft locking tool.

Rotate the crankshaft, slowly, two turns until just before TDC on cylinder one. Insert the camshaft locking tool into the left camshaft pulley, while slowly turning the crankshaft to TDC. Ensure that the camshaft locking tool for the right hand pulley and the crankshaft locking tool can easily be inserted, make sure the timing marks are aligned and check that the tensioner pointer is aligned with the notch, or is within 5mm to its right.

Repeat the installation process if any of these measures cannot be met, but otherwise, reassemble the components in reverse order of their removal. When reinstalling the crankshaft pulley, use new bolts and tighten to 10Nm + 90°.

For more information regarding the OEM quality power transmission products in the Dayco range, please call Team PR Reilly on: 01-832 0006 email: sales@team.ie or visit: www.dayco.com.

DAYCO®

Front wheel bearing Avensis D4D

Malcolm Short, Schaeffler

The Toyota Avensis 2.0 D4D was introduced to the market in 1997. It has seen three generations, the most recent from 2009 on. With a repair time of 2.1 hours, this article will assist any garage with the removal and repair on this popular model.

In this article we tackle the second generation Avensis D4D front wheel bearing. The type of bearing used is a generation 1 bearing with no encoding sensor built in, so the bearing can be installed either way, however it can still be a little tricky, as the bearing has to be pressed into the hub. If done incorrectly, the bearing can be damaged.

Firstly, check to see if the vehicle is fitted with anti theft locking bolts if it has alloy wheels. If it does, make sure that you have the key before starting the repair. Raise the vehicle on the ramp to the full working height (although the repair could be carried out on the floor if necessary) and remove the wheel on the relevant side. It is advised to replace the wheel bearings in pairs, as it is more than likely that the bearing on the opposite side is just as worn as the one you are replacing.

Undo the large hub nut that secures the drive shaft to the hub and release the drive shaft from its position. Clean the track rod end using a wire brush, to remove any hard rust and remove the locking pin. Loosen and remove the nut from the track rod end and release from its position and move to the one side.

Remove the brake calliper and support it by hooking it directly to the coil spring (fig 1). Remove the two bolts that secure the brake calliper mount to the hub and remove the complete assembly away from the work area. You will need to gain access to the wheel arch, but the removal of the wheel arch liner is unnecessary, just remove the fixing bolts to the front half of the liner and allow it to hang down (fig 2). The ABS sensor is to be disconnected and this is found inside the wheel arch. With the liner now free, you will have enough access to reach the sensor and disconnect it. Remove the ABS lead from its support bracket once disconnected.

Release the wish bone from the ball joint by removing 2 bolts. Undo the two bolts that secure the hub to the suspension strut to release the hub from the strut. With the hub removed, we can now concentrate on the removal of the bearing. The drive flange has to be removed from the bearing, in this example

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we used a strong steel tube positioned centrally on the flange. Using a press, carefully push the flange out to remove it (fig 3).

Remove the back plate from the hub to make it easier to remove the bearing and remove the circlip. We removed the bearing from the wheel hub by using an old bearing and a press to push the bearing out. Because the bearing can be fitted either way, it could be a good idea to note the position of the old bearing and install the new bearing the same way.

The inner raceway of the bearing will then have to be removed from the hub. It can be a little tricky to attach a puller securely to remove this. Hold the hub secure in a vice and with a die grinder carefully score part way through the inner race just enough to weaken it and taking extra care to not cut right through and damage the hub (fig 4). Using a blunt air chisel to crack and then remove is a nice, controlled way of removing the inner race without causing damage.

Once the bearing has been removed, take the time to check that the hub profile is perfectly round and not damaged. The outer race of a bearing will always take the shape of the hub its being pressed into, so if the hub has been damaged and is not perfectly round this could prematurely wear the bearing. Clean the hub and drive flange to remove any dirt and rust.

When you fit the bearing into the hub, make sure you press on the outer race and not on the flange. By doing this, you ensure that the pressing force is not transmitted through the balls or rollers in the bearing, but only through the outer race. In our case we are using the old bearing to press the new one into the hub, as this will be a perfect diameter and will not cause any damage. The new bearing will have a new circlip supplied, which can now be fitted. After finding a suitably sized tube the same size as the inner race, the hub can then be pressed onto the drive flange, avoiding any damage to the ball races.

The installation of the remaining parts are the reverse of the removal.

For technical support and repair installation tips, go to www.RepXpert.com or you can call the LuK technical hotline on 0044-143-226-4264

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Clutch Clinic

Vivaro 2.0CDTi

Malcolm Short, Schaeffler

The Vivaro, launched in 2001, is an excellent example of shared ventures between vehicle manufacturers. The Trafic and Primastar are quite similar applications. With many Vivaro 2.0CDTi FH07MYJs on the road today, this handy article from LuK should prove useful to any independent garage undertaking the 7.5 hour repair time.

It is possible to find two types of gearbox designs, they changed around late 2006 to early 2007 on these applications. In this article we tackled the later version of the Vivaro, with the wiring loom positioned at the top of the gearbox, hiding the top bell housing bolts. In this repair we used a two post ramp, two transmission jacks and a suspension arm lever.

The first stage of the repair is to remove the top gear box mount nut with the vehicle still at ground level. The remainder of the repair can then proceed from underneath. Raise the vehicle and drain the gearbox oil. Remove the nearside front wheel. Inside the wheel arch, release two bolts holding the side shield. Support the gearbox using a transmission jack. Release the power steering pipe positioned on the side of the gearbox, by removing two bolts from the retaining brackets and remove the bolt holding the earth cable in position and stow safely (fig 1). Release the second power steering pipe positioned at the front of the engine, held by two bolts mounted to the gearbox mount and one bolt at the rear of the engine.

Remove the three bolts that hold the gearbox mount in place, two on the side and one on the top, and then release the top mount from its position. Disconnect the ABS sensor connectors and release the three nuts connecting the lower suspension arm to the ball joint on the near side. Using the suspension arm lever, separate the parts and swing the suspension leg to the side, while holding and releasing the driveshaft from the gearbox. Repeat this procedure for the off side, taking care when releasing the driveshaft from the gearbox, as it locates through a support bearing. The bracket will need to be removed by releasing two bolts (fig4). Swing the suspension leg to the side, and the driveshaft and bearing will slide out of its location. Secure the driveshaft in place, using a pair of locking grips through the support bracket to stop it from returning to its original position (fig 2).

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Remove the gear linkage and bracket as one complete assembly by removing three bolts, two situated on the side and one on the top of the gearbox.

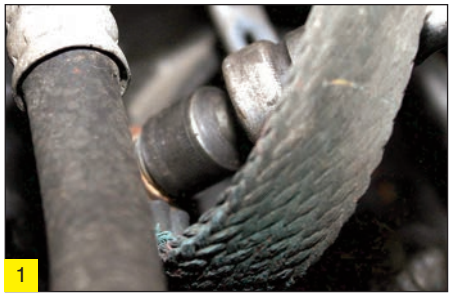
Disconnect the reverse light switch (fig 3). Remove the plastic wiring loom carrier by removing two bolts one at the front, and one at the rear of the gearbox. Stow the wiring loom using cable ties (fig 4). Remove the top two bell housing nuts and the two starter motor bolts, and then release the two bell housing bolts on the rear of the gearbox. Secure the front section power steering pipe, using cable ties to ease the removal of the gearbox. We tried to lower the gearbox without doing this and the pipe can get caught on the bell housing, so the pipe must be stowed to prevent any damage. Support the gearbox with a second transmission jack and cradle.

Remove the four bottom bell housing bolts and carefully lower the gearbox to the floor. Remove the worn clutch cover, drive plate and release bearing. With the clutch removed, check the flywheel for signs of heat stress. Clean the first motion shaft splines and any debris from the bell housing (especially important when a release bearing has failed).

Put a small dab of high melting point grease (not a copper based product) on the first motion shaft splines and make sure the new driven plate slides freely back and forth. This not only spreads the grease evenly but also makes sure you have the correct kit. Wipe any excess grease off the shaft and driven plate hub. Using a universal alignment tool and checking the driven plate is the correct way round (note "Getriebe Seite" is German for "Gearbox Side") the clutch can be bolted to the flywheel evenly and sequentially.

Before fitting the gearbox, make sure the locating dowels are in place and not damaged. Refit any that have become dislodged and refit the gearbox. Make sure the gearbox bell housing bolts are secured and the gearbox mount is installed before removing the transmission jacks. Refitting of the parts is the reverse of removal.

For technical support and repair installation tips, go to www.RepXpert.com or you can call the LuK technical hotline on 0044-143-226-4264.



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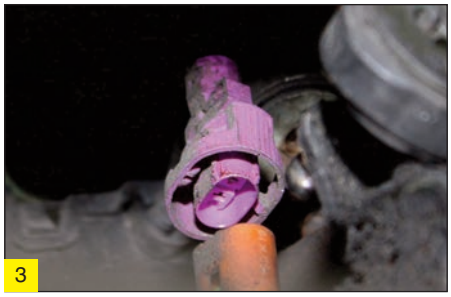

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DPF cleaning made easy

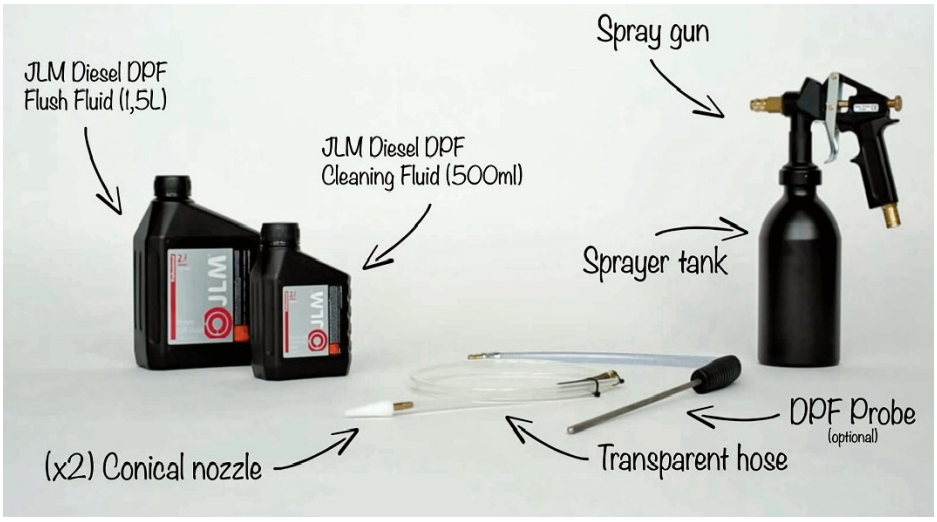
Diesel particulate filters (DPFs) trap soot in diesel exhaust and then burn it, leaving only ash and fine particulates. The problem for most Irish drivers is that DPFs were not designed for slower and stop/go driving, which eventually fills then clogs the DPF. JLM gives step-by-step instructions on how to clean a DPF that can't clean itself, during what is typical Irish driving conditions.

There is no way to get around the fact that a modern diesel engine produces relatively large particulates in it's exhaust. The drive for cleaner emissions has meant that many manufacturers have equipped their diesel models with a diesel particulate filter (DPF) fitted on the exhaust. DPFs collect larger particulates in the exhaust. When a sufficient amount of particulates (soot) have been accumulated, various strategies are used to increase the temperature in the DPF, causing the accumulated soot to burn off. This process leaves smaller particulates in the DPF that are allowed out of the tail pipe.

A DPF is capable of functioning as designed, but this almost always requires sustained time at faster speeds. Slower, and stop/go driving, a common pattern of many Irish drivers, means that many Irish cars will have DPFs that slowly become more and more clogged. Once clogged a mechanic will have to force a regeneration, or manually clean the DPF.

To offer technicians an alternative, JLM Lubricants has launched a new professional solution, that it claims will enable any workshop to clean and flush a blocked DPF in just one hour.

This means that a vehicle can be quickly put back on the road, with minimum disruption to the customer and to the workshop. This equates to a valuable additional service, offering to help deal with a growing problem associated with low mileage or urban cycle diesel engines.



How does it work?

The JLM DPF Cleaning Kit includes a stage 1 powerful cleaning solution. Using the dedicated pressure fed dispenser and connector, the cleaning fluid is added directly to the DPF. The filter is then flushed using the stage 2 flushing solution, to remove the contamination that is blocking the filter. Afterwards, the vehicle should go through a 'forced' regeneration cycle, to complete the cleaning process. Finally, especially for low mileage cars, treating the fuel system with JLM DPF Cleaner can help prevent repeat blockages.

Cleaning a plugged DPF can be easily carried out following these steps:

1 - Fill the sprayer tank with the Stage 1 JLM DPF Cleaning Fluid.

2 - Connect the conical nozzle to the soft hose of the front DPF pressure sensor. Steadily spray all the cleaning fluid into the DPF for approximately one minute and let it settle for two to three minutes.

3 -Run the engine for two to three minutes at 2,000-3,000 RPM. Make sure a collector is placed under the exhaust.

4 -Fill the empty sprayer tank with JLM DPF Flush Fluid. Gradually spray all the Flush (1.5L) through the DPF while keeping the engine running at 2,000 - 3,000 RPM.

5 - After flushing, dry the sensor hose thoroughly and reconnect.

6 - Add 1 x JLM DPF Cleaner to prepare the DPF for optimal regeneration (recommended).

7- Start a regeneration cycle via the on-board computer, following the vehicle manufacturer's guidelines. Reset any warning signals related to the DPF. Alternatively, drive the vehicle for approx. 20 minutes at suitable speed/RPM to initiate a regeneration cycle.

You can watch the full process, as well as a promotional video offering further information about JLM DPF Cleaning Kit, by logging on to YouTube at /www.youtube.com/watch?v=GJ8zfLsuKo or by scanning the QR code with your phone, tablet or iPad.

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