What’s in the boot?
Wayne Broady’s secret conversion

A faulty resistor stopped the fans in this Camry
Replacing the part on this Alfa Sprinter wasn’t really the answer

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APPLY ON PAGE 28
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With each email from a technician that crosses my desk, with every phone call to a TaT subscriber, my admiration of the skills and sheer brainpower of the automotive technician goes up another notch.

When I agreed to get involved in this great enterprise, I admit to being ho-hum about the subjects I would be editing. I mean, how complex or interesting can a mechanic – sorry, technician – be?

Editing a stack of technical articles is relatively straightforward, as long as a technical expert writes them. All I had to do was correct their spelling, throw in a few full stops, and do was correct their spelling, expert writes them. All I had to forward, as long as a technical

I might be handy with a keyboard and know the difference between a comma and a question mark, but, now that I’ve been exposed to many great technicians, I can only borrow the words of the great Australian bard CJ Dennis, The Sentimental Bloke, ‘I dips me lid to yez’.

Yep. I’m mightily impressed. The knowledge you need to have to be an automotive technician these days is, in my mind, akin to the skills one would need to be a brain surgeon or a rocket scientist.

I know Anthony Tyd, one of our eager subscribers, won’t mind me telling this tale, but this is the guy who kicked off one of the liveliest debates we’ve seen here at TaT, about radiators and their failings through corrosion, stray current, electrolysis – whatever.

Like many of you who write to us, Anthony does his long day at work, solving very tricky issues, then goes home to his family, plays with the kids and at some stage of the evening, sits down at his computer to throw his thoughts down on problems that bug him. He’s not a typist, he’s a technician. He bashes out the words, probably by banging the keyboard with two fingers, so the stuff he sends in is a little on the rough side.

With emails between technicians coming thick and fast, Anthony thought he should apologise for his lack of keyboard skills.

Why apologise Anthony? Mate, I couldn’t begin to write what you write. It is fascinating stuff and I speak bluntly here. I’ve handled text from leaders of industry and prime ministers in my journalistic career and none of them were as interesting as what you and all of the other TaT subscribers write in to us.

Fancy words don’t matter, it’s the content and the skills and knowledge behind it that really count.

I stumbled on an article about the meaning of the word connoisseurs recently, and was reminded that connoisseur was almost exclusively used to describe men of taste who knew enough about their subject that they could make a judgement about quality or lack of it.

But more than just knowing rubbish when you see it, if you have taste, it usually extends to having a taste for living and for gaining knowledge.

I regard you all as connoisseurs because of your knowledge and the sheer joy you seem to take in solving issues, or finding the truth in technology.

So if any of our readers would like to share a story or a discovery with us, don’t worry about your keyboard skills. Just bash it out and send it in. We are always looking for interesting stories about what technicians do. Just read our cover story for inspiration.

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What is believed to be Australia’s first hybrid vehicle to offer three fuel choices – petrol, electricity and LPG – has been converted at a Sydney workshop and is now undergoing tests in an attempt to prove that its range can top more than 1500 kilometres on full tanks of all three fuels.

What’s even more impressive about the conversion of this Toyota Prius, is that the LPG components are so well integrated into the vehicle that only a trained eye would be able to pick up that the vehicle is fitted with LPG. With no loss of passenger space or boot size this conversion could be an attractive proposition to fleet owners such as taxi companies.

This new twist on energy efficiency is the brainchild of a Sydney LPG conversion expert, Wayne Broady, who owns a small workshop in Hornsby specialising in LPG conversions.

‘It all started with the question – can we combine three technologies to produce the most economical combustion engined vehicle in Australia,’ Wayne explained.

‘Development and information gathering began in 2008. ‘My wife Anna was in need of another vehicle so we found a suitable vehicle that had only done 7000 kilometres. LPG had been popular due to rising fuel costs and the government rebate but interest had begun to wane through the usual complacency as motorists got used to the price of petrol. At the same time, vehicles were becoming more complicated to convert and more fuel efficient,’ he added.

‘With great support from our LPG mechanic Loreto Santiaguel, who played a major part in the installation and the ideas behind it, we scoured the internet and while we did find out what we planned had been done overseas, getting useful information was difficult, so we did our own design.

‘Liquid injection was our first choice because it gives slightly better performance and economy over LPG vapour injection, but the development of tanks was an issue.

‘Liquid injection relies on a matched LPG tank with an LPG pump integral with the tank.

‘The tank is specific and options are limited. The tank supplier, Blue LPG, was able to match tank requirements using a standard vapour injection tank.

‘This was suitable to mount a toroidal tank in place of the spare tyre. Fortunately the well for the spare tyre had enough room for us to mount the tyre after we changed the offset of the rim to reduce the rim width. This allowed it to sit under the original boot floor carpet thereby not interfering with visual boot space.

‘The LPG capacity is 35 usable litres of 44 WC. A modified Corolla LPG filler allowed us to hide the LPG filling attachment inside the existing petrol flap.

‘A Prins vapour injection system was sourced. This system uses a computer to interrupt petrol injectors and employs modified millisecond injection pulses to supply vapour via an LPG regulator to quality Kehlin LPG injectors,’ Wayne added.

‘The LPG electronic control unit is mounted beside the petrol ECU. Computer wiring is interrupted at the petrol ECU. This turns off the petrol injectors or connections for tacho signal power and earth. We were then able to connect a laptop to change the parameter setup to suit each particular vehicle.

‘We soldered in quick release connectors which allow a quick removal of all LPG ECU should any issue occur with the LPG system.

‘As can be seen in the photos, space under the bonnet is an issue but the LPG system is well hidden and integrated into the vehicle.

‘LPG injectors allow the control of vapour LPG to flow into the drilled manifold with the injector nozzle as close to the petrol injectors as possible. The LPG regulator is mounted to the left hand front of the chassis rail with the water hose from the throttle body connecting through the regulator to prevent the unit from freezing. We thought we might have issues with coolant temperature but once the conversion was completed our concerns were unwarranted. In fact the vehicle warm-up periods were quicker than expected.'
and monitor the LPG level in the tank. We also fitted the electronic Flashlube system.

'This helps overcome valve recession inside the engine due to reduced lubrication qualities of LPG. Instead of the usual one vacuum hose drilled to the centre of the throttle body, we drilled and fitted valve saver nozzles to each intake runner to evenly distribute valve saver lubricant. Once the equipment was installed, the setup was very easy using a laptop, Prins software program and generic scan tool.

'We watched fuel trims while on LPG and petrol, making appropriate adjustments to ensure that fuel trims were similar on both petrol and LPG. This allowed the New South Wales RTA emission test to be passed at the vehicle’s first appearance.

'We are unable to substantiate how much the LPG hybrid costs to run at this early stage, but a range of more than 1500 kilometres is not out of the question using a combination of full tanks of LPG, petrol and hybrid power,’ is Wayne’s reckoning.

Wheelnote:
Wayne Broady has been involved in LPG since the early 1990s, learning his skills from his father whose experience was exceptional.
Wayne has all necessary qualifications for working with liquefied petroleum gas and natural gas, and has attended many training courses.

In 1988 he gained the highest pass in Automotive Ignition Systems, in 1994 the highest pass in the Natural Gas Tradesman’s Certificate and in 2006 was a finalist in the MTA NSW automotive workshop awards. He is an RTA examiner for unregistered light vehicles, an authorised taxi inspector and a light vehicle inspector.
Wayne is a regular contributor of LPG articles to this publication.

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Halogen lamps are commonly used by auto electricians as ‘current limiting’ devices to trace shorts in electrical circuits, but there’s been little research into why? And why a halogen lamp? What is so special about the behaviour of the halogen lamp that it can be used in this role?

TaT’s research department decided to explore the unusual behaviour of the halogen lamp filament and in so doing unfolded the genie of the lamp.

Let’s assume that we have a vehicle that keeps blowing a 10 amp fuse in a circuit due to a short and we are not sure of its cause. And if, after the tenth fuse and lots of wire wiggling we are still no wiser, the question becomes – what can we use to exhibit a visual display of the short without blowing another fuse? The answer could be to substitute the fuse with a H7 halogen lamp. But why?

As can be seen from the oscilloscope trace (pic 1) the current drawn by the halogen lamp (measured as a voltage drop across a 0–1 ohm resistor) is highest at the instant voltage is applied (15 amps). And as time progresses the current drops to a nominal value (3.5 amps).

Initially, when the filament’s resistance is at its coldest, it draws maximum current (acting as a fuse – low resistance) and as the current heats up the filament the current drops to a much lower value (acting as a current limiter). So, it lends itself to visual display of the existence of a short without blowing another fuse. That’s the genie of the lamp.

What is a current limiter?

A current limiter should exhibit a low resistance under normal operating conditions and as circumstances change and the circuitry begins to draw excessive current, the current limiter should exhibit a high resistance path. Not only does the magic lamp exhibit most of the qualities of a current limiter, but it also exhibits a visual display of any shorting circuit (pic 2).

What is cold resistance?

Cold resistance is the resistance of the filament of a halogen lamp measured at room temperature straight out of its packaging box. And the H7 halogen bulb resistance measured with an ohmmeter is nominally 0.3 ohm.

This means that when the H7 halogen bulb is substituted with that of a fuse, it will have inadvertently introduced a 0.3 ohm extra resistance in the circuit. This indeed is negligible considering the supply voltage is often between battery supply voltage of 12.6 and 14.2 volts (pic 3).

The table below illustrates different commercially available halogen lamps and their measured parameters.

<table>
<thead>
<tr>
<th>Halogen Type</th>
<th>Wattage</th>
<th>Cold resistance (ohms)</th>
<th>Measured current-amps (average)</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>100</td>
<td>0.2</td>
<td>7.6</td>
</tr>
<tr>
<td>H3</td>
<td>125</td>
<td>0.1</td>
<td>8.9</td>
</tr>
<tr>
<td>H4</td>
<td>55 - 60</td>
<td>0.4 - 0.5</td>
<td>4.8 - 5.2</td>
</tr>
<tr>
<td>H7</td>
<td>55</td>
<td>0.3</td>
<td>4.2</td>
</tr>
</tbody>
</table>
calculate a resistance value of 0.6 ohms. At that instant the filament will just begin to glow (pic 4).

Is current draw linear or exponential?

As the current begins to increase through the filament, the filament will begin to light up brighter. Brightness will give rise to more heat which in turn will increase the resistance of the filament exponentially. As a rule of thumb the combination between current draw of a circuit (fuse rating) and the type of halogen lamp used (eg. H7 or H3) will dictate the knee of the current draw. The filament of the globe being used in a correctly operational circuit ideally should not be any brighter than demonstrated in pic 5.

What is the relationship between current draw and voltage across the filament?

The H7 halogen bulb was subjected to differing voltages and the current draw was measured and tabulated. The resistance of the heating filament and power drawn was then calculated and plotted (pic 6).

H3 or H7 halogen magic lamp?

The answer hinges on the current rating of the fuse and current draw of the circuit.

As can be seen from the oscilloscope trace (pic 7) the H3 draws 35 amps when the filament is first turned on (very low cold resistance). The current decreases as the light intensity (heat) increases. The resistance then maintains a nominal value of 9 amps. Regardless of the fuse current rating, the filament of the globe being used in a correctly operational circuit ideally should not be any brighter than demonstrated in pic 5.

Under this condition, the diagnostian gains a visual display of the circuit’s performance while maintaining negligible added resistance to the circuit.

Audible as well as visual display?

When tracing and chasing a short in areas where visibility is limited, eg. boot and fuse box under dash, then all that needs to be done is to place a buzzer across the halogen lamp (in parallel) and if the short occurs, the buzzer will sound, providing an audible and visual feedback.

In summary

The magic of the halogen filament lamp with its unique positive temperature coefficient characteristics places it on a very unique pedestal in your workshop. It provides a visual display of any short in a circuit while maintaining low added resistance.

So next time a customer presents a vehicle with perhaps a brake light fuse blowing (randomly), if you substitute the blowing fuse with a halogen lamp (with a buzzer connected across it) this will provide visual and audible feedback whenever the short occurs, eg. differing circumstances such as cornering and speed humps.

Note: Prolonged illumination of halogen lamps may generate sufficient heat to cause damage to interior facades of vehicles. All measures must be taken to provide adequate ventilation to avoid soiling or damaging fittings such as interior cowlings or carpets.

Happy illumination

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The young are the restless

I f you find it difficult to keep up with the demands and attitudes of the widely diverse age groups that drive cars, wait till you hear what the youth are expecting in their future vehicles.

Generation Y demands are apparently more challenging to map, monitor and market to than those of their elders, particularly when it comes to technology.

According to Deloitte’s 3rd annual Gen Y survey, which considered the expectations of car owners across three generations, technology is defined differently by each generation.

For Baby Boomers, technology is utilitarian and is defined by safety features such as blind spot, crash detection, ABS and stability control. Gen X wants practical safety features and what they call ‘value experiential cockpit technologies’ – electric windows, mirrors, remote-locking and perhaps an enabling for their iPod as well.

But the Ys want it all. The researchers find that their values are changing much faster than those of the generations that preceded them.

For example, in 2009 safety was most important to the 20–30 age group. In 2010, they wanted value for money, and in 2011 they want both of those, plus more integrated technology, so that they can take their technology-driven lifestyle with them in the car.

By 2012, Gen Y, with their values in constant flux, will account for 40 per cent of the car buying population. This represents an interesting paradox that will be entertaining to track and perhaps frustrating to tackle. Manufacturers will battle to deliver to young drivers the technologies that connect with their ‘personal technology cocoons’ in a way that is not disruptive and integrates with their everyday pursuits. The successful companies will be those who keep up with the trends, while addressing the real and perceived safety issues associated with distracted driving.

A business research team at Carnegie Mellon University in the US summed it up nicely:

‘Regulation keeps trying to say texting is distracting to driving, but for the consumer it is really the driving that is distracting to texting.’

Survey results suggest Gen Y is not going to change its expectations, and neither is the pace at which new technologies are expected to advance. So, watch this space.
The transistor and the Hyundai headache

Hyundai Santa Fe 2001 model manual 2.4 litre petrol

This was towed in and colleagues removed the ECU, immobiliser and the key antenna and sent them away for checking. They returned with an ‘all clear’ report and were re-installed but the engine refused to start.

With lab scope in hand I sampled the cam angle sensor and recorded a 0 to 5 volt square wave signal. I then hooked into the crank angle sensor and uh-huh, a 0 to 2.4 volt distorted signal.

In the process of removing the old crank angle sensor I found the harness partially trapped between the timing belt tensioner and the oil pump housing.

Before installing the new sensor I tried to get a signal from it by plugging it into the engine wiring socket and flicking an earthed feeler strip through the sensor’s gap. Yep, it worked and we saw a 0 to 5 volt signal from the crank angle sensor for the first time. My colleagues were speechless.

During the install, I removed the tensioner and relieved enough material to allow the new harness to slip past the tensioner and sit closer to the block where the niggling movement of the tensioner would not be felt by the harness.

I reassembled the engine and cranked it with no earthed feeler strip through the sensor’s gap. Yep, it worked and we saw a 0 to 5 volt signal from the crank angle sensor.

Right, I know what to do. Let’s try this at 1800 rpm for 10 minutes and see what happens.

After about eight minutes the smoke had to be seen to be believed.

The coil on the left is the one I had just barbequed. But I still hadn’t diagnosed the actual cause. I pulled out the ECU and removed the motherboard. I couldn’t see anything wrong.

I hooked up my oscilloscope on dual channel on both ignition coils’ signal wires. I was told to expect a pulse width of 1.5 to 2 milliseconds. Anything more than this would be a computer fault. I saw well over 3 milliseconds and when the engine suddenly ran normally I saw equal square wave patterns slightly chopped on the top of the leading edge.

Enter my electronics guru, Jay Mullins, who just happened to have his vehicle in for a rego check.

I showed him the board which had four output transistors on one side, which we agreed were the injector drivers. On the other side of the board were two output transistors which were obviously the ignition coil drivers.

One was sitting on a disturbed pad of solder which Jay said was due to overheating.

We marked the suspect transistor and sent the ECU, immobiliser and key reader back to the same people who had given it the all clear. They agreed that this transistor was faulty. They returned the repaired ECU, I re-assembled the vehicle and ‘hey presto’ it all worked perfectly.

We have one of the most interesting trades in the world surely. Many thanks guys.

Doug Lowry
Hicks Automotive & Exhaust Centre
LITHGOW NSW

(Agree about the interesting trade bit Doug. Why else would we stay in it. Ed)
The vehicle: Ford BA LPG
2005 i6

Complaint:
Vehicle cutting out, but restarts straight away and the gear selector indicator light on the dash cluster flashes. The engine won’t re-start until the key is switched off then on again.

Investigated so far:
Code checks, wiring checks and throttle body

Scanner codes:
P0773, P1213, P2105

Steps taken:
Code checks, live data, cleaned the throttle body, swapped over the throttle body, checked for rubbed wiring, tightened all earth and power wires, checked power supplies

Repaired already:
Swapped over the throttle body

Stage reached:
Research stage. Need to find out what will cause the vehicle to go into throttle-forced shutdown, and can a trans-electrical fault cause throttle shutdown. Note: this vehicle is a factory LPG car.

Hi Andrew
First up we have to look at what the codes relate to. P0773 is generic and tells us we have an auto solenoid circuit problem. P1213 relates to an LPG start injector circuit and P2105 relates to a forced throttle shutdown. My first question is, did the engine actually shut down or did it come down to idle and would not accelerate? I believe that the throttle shutdown could be affected by the transmission, and it could also be affected by a bad air leak.

I suggest that you check the wiring harness that comes up from the box to the connector plug near the powertrain control module. The wiring has a tendency to break in this area due to engine movement. Grab each wire and give them a pull. Have a look at a couple of TaT’s a Facts to give you an idea of what I am talking about: FORBA03120, FORBA04215 and FORBA03215 in the BA section.

Hi Deyan
You asked me if the engine shut down or just went back to idle. The engine did shut down and stopped and if you tried to restart without first turning the key off, then on, the engine would not crank at all. I don’t think the fault is air leak related as the engine runs well when the fault is not present.

Hi Andrew
The ignition switch via the body control will not allow the starter to engage once the vehicle is running or has been running until the ignition is turned off and back on again. Have you sorted out the reason for the stalling and gear select flashing?

Deyan
Hi Deyan
Thanks for the help. Turns out the problem was coming from one of the ignition coils. Even though the engine had no misfire, the number six coil was cracked, causing the vehicle to log the trans-shift solenoid code and throttle-forced shutdown code. I spoke with a Ford technician about the fault and would you believe they too had a vehicle with the same problems. He said the engine electronic control unit was getting back electromotive force from the coil. We changed the coils and the fault went away.

Hi Andrew
Well done. A great result and thanks for sharing it. I have also had an intermittent coil failure with mine but it had a definite miss, so this is a good one to share with all the subscribers. They are getting trickier as they evolve, with modern electronics being affected in all sorts of ways.

Andrew Moules
Fleurieu Automotive
VICTOR HARBOR SA

(We welcome your contributions Andrew. Just send them in as you find them and we will share with your fellow technicians. Deyan Barrie)
The vehicle was a 12/2004 Ford Territory 1, with 86,542 kilometres on the clock.

The complaint was that on this dual zone climate control system, the left hand side was not hot, but always cold.

Knowing these cars normally break mixer shafts on single zone systems, I found out that dual zone systems have two smaller mixer shafts, one for the right side and one for the left.

Removed the glove box and inserted a small camera to check the shaft on the left hand side near the heating ventilation and air conditioning system integrated module (HIM).

On finding this to be suspect, I removed the centre console and the entertainment centre to check it properly. This confirmed that the left hand mixer shaft was broken.

Completely removed the dash assembly, removed the HIM to remove and replace the broken left hand mixer shaft. Removed the right hand blend door motor to replace the right hand mixer shaft as a precaution.

Refitted the dash and the steering column, all the wiring and the entertainment centre. Thoroughly tested the system and it was OK. Refitted the other parts, retested and road tested. All was OK. Time taken to do this job was five hours.

I had not done a dual zone climate control Territory before but I have done a few single zone Falcons. In the past I have written down how to remove and refit Falcon dashes, so when I referred to my notes, the job went really smoothly and that’s what you want — no stress.

Special precautions:
There are two long bolts on each side of the left and right hand ‘A’ pillars that need to be loosened to remove the dash assembly. These two bolts cannot be removed completely because they are too long and stop when they touch both front doors. Do not move the front doors with these two bolts removed. In some cases, it is possible to damage the front doors, so be careful.

Be careful removing and refitting the mixer shafts as it is possible to damage the mixer doors. When lifting the dash assembly out of the left hand front door, this is at least a two person job so plan to have help available.

Jason Smith
JDS Automotive
MOOROOLBARK VIC
(Thanks again Jason. Your contributions are a great help to others in our growing network. Ed)
There are few things worse for an auto electrician to hear, than ‘it’s just a set of worn brushes’. As soon as it’s said, everything goes pear-shaped. Both the customer and the mechanic may believe a new set of brushes is the quick and simple fix. But you would be both out of step with what is actually wrong and what has to be done about it.

The fact is that if a set of brushes is worn out through a normal working life of an alternator or a starter motor, the unit itself is likely to be totally worn out – bearings, bushes, slip rings, overheated stator, diodes worn, slipping clutch pulley and starter drive slip. The contacts will be worn, commutator segments blown apart, armature pulled out, field coils melted and so on. I’m sure you get the picture.

When a unit is repaired by an auto electrician, the customer expects it to last a reasonable amount of time after it’s fixed, but typically, they only expect to pay for ‘a set of brushes’ because they and their expert mates have told them ‘it will only be new brushes’.

There are three words that can’t be used in the same sentence, and they are ‘quality, fast, cheap’. Not many technicians rebuild units any more and that’s a shame. This trend began with the discovery of cheap imports, but my experience shows that many cheap imports are hit and miss.

When second rate parts are returned in a short space of time, it’s a big smack on the face because not only do you have to fix it as soon as possible, but the customer is cheesed off. To add insult to injury, when you send the part back to the wholesaler, you get questioned about why it failed. You may be lucky enough to get a refund or a replacement but you’ve lost the income on your wasted time and you may well have lost a good customer.

These pictures are a good example of what happens to a late model alternator. I’ve lost count of the number of times a nice, clean alternator has been plonked on our counter. I usually ask, ‘Why is it so clean?’ The reply usually has something to do with not wanting to bring it in all filthy. They might admit it was dripping with oil when they removed it from the car. So what were they going to do about the oil? There’s rarely a valid answer to that, but then comes the clincher, ‘How much to fix it – it’s probably just a set of brushes’. Around 40 per cent of the failures of alternators in later model vehicles are the result of external interference from oil or coolant penetration or even mud. These are failures which have nothing to do with old age or normal wear and tear. As you can see, the brush gear in the first picture no longer exists – it’s just a blob. This is due to the decomposition of the material, abrasive friction, poor connection and rotor-current-causing heat. We’ve seen them catch fire.

When you have a close look at the slip ring you will see how the brushes have worn the copper rings down through to the insulating material.

So when you see an alternator with oil (engine or power steering), coolant or mud all over it, there is little point in just replacing it with another because next time you will run out of warranty stories. You need to address the original problem and that will mean finding out where the oils or other contaminants are coming from.

The last thing you want is an unhappy customer, but that’s what you’ll end up with if you don’t bite the bullet and address all the external issues before simply agreeing with your customer that, ‘Yeah, it’s probably only a set of brushes’.

Thanks to TaT for the article, How to convert volt scope to current scope (TaT issue 17, October 2010), which covered being able to convert an oscilloscope from a volt scope to a current scope, by introducing a 5 watt 0.1 ohm resistor into the system.

Being the curious guy I am, I thought I should try this out. The pics will demonstrate the result.

Some time later I was discussing a few of the finer points of this story with a friend of mine who runs his own electronics test business.

He agreed that, yes, this was a pretty cool thing to be able to do and it could potentially be used to diagnose intermittent fuel pump faults among other things.

A few years ago, I was doing a course at night school called ‘complex fault diagnosis’. The same friend was helping me with one of the projects I was stuck on. At the time he said he could not believe some of the stuff we were being taught, because some of it was what he had learnt when doing his university degree. Now I am not saying any of my qualifications are the same as a uni degree but our industry has certainly changed and some of the stuff I am learning every day is pretty cool.

Thanks again

Jason Smith
JDS Automotive
MOOROOLBARK VIC

(Every technician should follow your lead and try out everything they read in TaT. Thanks again for leading the way Jason. Ed)
**Leaky VE fix**

Here is a quick tip for fixing a VE Commodore leaking washer bottle.

The car in the workshop was a 2007 model.

The windscreen washer wasn’t working. The motor could be heard working but when the washer fluid was poured in, it leaked out immediately.

The problem was that the corrugated tube that joins the fill tube and the washer bottle itself was cracked and because the washer bottle is mounted horizontally behind the grill just below the front bumper, over a very short time the washer fluid leaked and emptied completely.

**Here’s the fix:**

Order a new corrugated tube from Holden, remove the bolt holding the filler tube and remove the grill. While supporting the washer bottle with the left hand, use your right hand from inside the engine compartment near the radiator to twist and pull the washer tube and filler out.

Fit the new corrugated tube to the filler tube, then refit the new corrugated tube and filler to the washer bottle, once again using your right hand to push the tube from near the radiator and support the washer bottle with your left hand from the front where the grill was. Fill the washer bottle, check for leaks, test and refit all parts. All this takes about five minutes.

Removing the grill is optional. If you have good dexterity you should be able to do the job without removing it. I always remove the grill though, so I can support the washer bottle properly so as not to break it and to check for leaks properly as well.

**Jason Smith**

**JDS Automotive**

**MOOROOLBARK VIC**

(This is what you call ‘hands on’ advice. Ed)
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Customer Complaint
No interior fan operation.

Problem Summary
Interior fan had no speeds at all even though fan speed segments were indicated on the dash with fan switch operation.

Diagnostic Sequence
Checked under dash passenger side at interior fan motor plug. Had power to fan motor and a voltage out through the motor (looking for an earth return).

Components are located above the driver's left foot in the HVAC box on the side. Resistor is located above fan speed control unit.

The resistor is a large single circuit and is used for the lowest fan speed. It also has a thermal cut out circuit.

There was voltage to the resistor connector, (from the fan motor out) and a good earth at other end.

Disconnected the 2 pin connector and checked the resistance – it was open circuit.

Fault Description
This system uses one fan speed resistor that is connected directly to the output side of fan circuit. The other end of the resistor goes to earth and this creates a constant low speed.

The fan speed control unit is positioned across the resistor. Had a control voltage input which varied with switching at the fan speed control unit.

By varying the signal voltage to the control unit, it varies current across the resistor, thus controlling the speed of the fan motor.

The fan speed control module regulates an alternate earth (pulse width modulation) across the resistor (fixed resistance) to earth, therefore controlling the fan speeds.

The fan speed control module senses that there is a problem with the resistor circuit (open circuit) and does not allow switching to protect itself from overload.

Fault Solution
Removed the fan resistor.

Made sure the thermal link was intact. It was open circuit (faulty). Checked the fan motor current draw.

Fitted the new resistor and tested the fan speed operation.

Fan speed control amplifier working correctly.

Recommended Time
Labour time was 2.5 hours, taking into account research time, location of parts and actual time spent fixing the problem.

If the motor works on low speed only and the fan speed indication on the dash works but no speed changes, the most probable cause is the fan speed controller.
Customer Complaint
ABS light is on.

Problem Summary
ABS light is on. The driver’s side wheel bearing had just been replaced.

Both owner and repairer say light had not been on previously.

Diagnostic Sequence
The repairer had already replaced the driver’s side front ABS sensor.

The code came up for driver’s side front sensor faulty and the fault code would not clear.

Carried out continuity tests between front left and right and all checked OK. (Note that this sensor type does not have a circuit you can check by resistance with an ohmmeter.)

Acquired a relevant wiring diagram and scoped the two sensor signals by back-probing circuits at the ABS unit. At the passenger side sensor circuit there was a changing signal on rotation of the wheel, a reading of between 1 volt and 2 volts.

We were not getting a signal variation from the right sensor, only a steady 1 volt flat line.

When the sensor was removed and a screwdriver moved across its side face, the sensor would switch between 1 and 2 volts.

The repairer assured us that the wheel bearing replaced was correct because it was supplied by a dealer and it was a direct replacement part and the only type available.

The repairer was advised and he ordered another bearing, got the same thing and was told that this it was the only part available.

Fault Description

3 What we found was that the original bearing had an external plastic cover embedded with strips of what we assume is metallic material.

4 The sensor sits very close to the bearing side face. That is how it picks up the movement of the wheel.

Fault Solution
We then asked to see the original bearing. It was found in the bottom of a bin.

The cover had come off in the removal process and had been damaged but we managed to re-use and refit to the new bearing in place of the metal cover. The new bearing was refitted to the vehicle hub assembly.

After re-assembling all the parts, the vehicle was road tested and the ABS light now operated correctly with no more fault codes.

Recommended Time
Labour time was many hours, taking into account research time, location of parts and actual time spent fixing the problem.

For more info on ABS sensors, TaT subscribers can go to the Index of technical stories and type in ‘ABS systems’ and you will find a story on this problem and also on sensors by Nick Murphy.
The fascinating experiment on the stray current theory and its effect on radiators, published in TaT Issue 21 (The cloudy waters of stray current) has stirred up a hornets’ nest and is, without doubt, the biggest debate on one controversial subject since TaT began in early 2008.

Subscriber Anthony Tydd shared his experiment with TaT and its readers, in the hope that somebody would provide some answers to some puzzling questions about radiator failure and the hoary old subject of stray current.

What Anthony did was replicate a radiator in a vehicle, but actually separated the two from each other. ‘A stroke of genius,’ said our own Jeff Smit. ‘He reached the only conclusion possible, the radiator was turning itself into a battery.’

The story gets rather complicated after that. Where does the stray current come from, and what effect does it have on radiators, especially poor quality radiators. It seems that many radiators fail quickly because of corrosion caused by, well, stray current (however you define it). The story brought a tidal wave of comment from workshops that have all had bad experiences with failing radiators, and even worse experiences when claiming warranty. The trend seems to have been that corrosion in radiators, in the eyes of those who make them, is caused by current faults external to the radiator, so ‘it’s not our problem – take it to a sparky to sort out’.

One radiator company attacked the story. ‘Your article in TAT shows a lack of understanding and a lack of research. Faulty diagnosis by some technicians does not mean the problem of stray current does not exist.’ Interestingly, this was the only voice of protest. The rest of the feedback applauded the story, with comments like ‘...a Pandora’s box of stories and opinions... why do we have to redo so many jobs because of poor quality parts (radiators he means)... this has been a subject a long time coming... the radiator industry has hidden behind the ease of stray current as a way out for too long.’

TaT approached some leading makers of radiators for comment on our article. They were helpful up to a point. One international company made available a detailed booklet on stray current but, according to the TaT team of experts, it only covered ‘the bleeding obvious’.

Another well known Australian manufacturer was also helpful, up to a point, but then said they couldn’t share any more information. Was the kitchen getting too hot?

In short, TaT has yet to find any authority capable of casting judgement on Anthony’s experiment and giving the technicians of Australasia a clear line of diagnosis and avoidance of this mysterious stray current. The radiator companies, naturally, will never admit that radiator construction materials have anything to do with the generation of stray current and subsequently corrosion of the radiator.

So much research was done by the expert TaT team, with help from many technicians and other helpful people, that the big response we planned for this issue could not happen. There are so many conflicting opinions, many of them from so-called radiator experts, that more work has to go in to separating fact from fiction.

Our promise is for a well-researched, up-to-the-minute story in our October edition which may or may not lift the lid on the whole issue of stray current and where it comes from, but hopefully will provide a useful and factual diagnostic, repair and maintenance guide for technicians who are about to install a new radiator in any vehicle.

And we repeat, Anthony Tydd’s story in the last edition was an opinion piece by a technician who was faced with a real problem of failing radiators in his workshop, and set about proving a point by using a superb piece of detective work. Many experts have read the story and all (except the one mentioned earlier) agree there was absolutely nothing wrong, incorrect or deceiving in the story.

Rightly or wrongly, workshops think that the radiator suppliers could be taking a more proactive stance in the stray current issue. Many say they have been hammering away at the radiator industry for years about their perception of stay current and their general assertion that ‘it’s the sparky’s problem because it’s electrical’.

We are not saying the radiator industry is at fault, but there seems to be a widespread feeling in the workshops that they could be taking a bigger share of ownership of the problem.

Watch for the TaT wrap-up story on radiators and corrosion in the October issue. Any reader who has some information that may throw new light on the debate, feel free to email us at jsmit@tat.net.au
At last, a detailed visual reference to help you close more sales

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The vehicle is a Toyota HiAce with a 1KD turbo diesel engine.

We had serviced this vehicle since new in 2008. It now has 170,000 kilometres on the clock. We used above-spec oil as recommended in the Toyota service manual and genuine filters.

The vehicle was brought in with the engine control module light on. Our scan tool wouldn't recognise the code.

We removed the exhaust gas recirculation system (EGR) valve, which took 20 minutes and were astounded.

The 51mm diameter intake duct was reduced to a hole the size of a 20 cent piece with carbon (pic.1). We cleaned the unit until it was spotless.

We also noticed that the water cooled EGR pipe was very dirty. We also cleaned that as much as possible, reassembled and reset the code.

It was all good, but it lasted 12 days.

The light came back on also, the day after the vehicle lost power, but came good after the ignition was turned off and restarted.

We rescanned the vehicle and found a faulty turbocharger actuator.

The vehicle was taken back to a Toyota dealer and work was done including a new turbo actuator (not available separately) and the EGR pipe.

We have found out since that another Toyota dealer has replaced seven turbos in the past 12 months under warranty. Another technician told my customer that a Hilux turbo (similar setup), had been replaced recently.

I would like to know if anyone has heard of similar turbo problems and EGR dramas?

The dealer wouldn’t say whether the contamination was oil related or fuel related. The oil consumption between services was nil, and I’m not sure about fuel quality. Maybe it’s because of the lower quality fuel in Australia compared with Europe.

We have now switched to full synthetic Havoline C3 oil, hoping this will help with the gumming up problem of the EGR and intake system.

Vehicle has now done 40,000 kilometres since the repairs and this is the result (pic.2)

I have posted this issue on the TaT forum in general discussion and I am looking to comments or experiences.

Jeff Neve
Dutchy Auto, WALLACIA NSW
(Thanks for this Jeff. Somebody out there must have experienced this. Check out Jeff’s question in the online chat page and satisfy his curiosity. Ed)
A customer comes in with his remote and asks if you can take a quick look at his remote and alarm, because it is not locking the vehicle every time.

He might add, ‘Shouldn’t be much. Probably a loose wire or a dicky fuse.’

Because he’s a regular customer, you ask him to grab a coffee while a technician checks it out within the hour.

The remote is checked. Signal strength appears OK. So you go looking for the aftermarket module which is usually under the driver’s feet. You take the bottom covers off and you are confronted by this mess of wiring.

This is typical of a customer’s wishful thinking.

For a start, the alarm was fitted to a price and not to quality by a tradesman (I would hope) although I must admit there were no scotch locks or twisted wires. But we did see a bullet connection.

Unfortunately we see no soldered main supply points. How the hell do we deal with this mess. Do we spend time trying to sort it out and clean up a mess he has already paid someone else to make?

Do we just advise that it be ripped out and the wiring put back to standard?

If the customer is prepared to accept that advice, he has the option of starting again properly with a new alarm. At least the dodgy wiring will not create more problems if it’s removed.

But our experience says that patching it up and just making it work will always bite us, because if something else happens, we own the problem. If that happens, the owner will be expecting us to fix whatever went wrong, at little or no cost.

My advice is that if you land this kind of job, before you go ripping it out, make sure the owner sees it, or at least take some photos to show him how bad it looks.

Discuss it with the owner before spending any amount of time on it. Give the owner the options. That way you will get an idea of how much he is willing to budget on the fix, if that is what he chooses.

It will too often turn out to be a bigger deal than anticipated, so don’t quote. Just estimate on the first stage and then advise and communicate as required.

A Rat’s Nest of Wiring
by Deyan Barrie

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Big gains from waste heat recovery

A waste heat recovery system that, among other things, claims to reduce engine wear by more than 96 per cent won the gold medal at 2011 Automotive Engineering Excellence Awards presented in Melbourne in July 2011 by the Society of Automotive Engineers–Australasia (SAE-A).

SAE-A judging panel chair, Bill Malkoutzis, commented, ‘Australians should be proud to be one of the few nations capable of building new vehicles from concept right through component manufacturing to vehicle production. Our component and vehicle manufacturing industry contributes about $7 billion a year to the economy and employs more than 50,000 people.’

The gold medalist was Frank Will, senior lecturer at Deakin University, for his waste heat recovery system trade-marked OVER7.

The technology reduces the frictional losses of engines by redirecting exhaust heat and by increasing heat transfer into the engine oil. This modification of the lubrication system includes simple piping, a valve and a new heat exchanger, and will pay back the investment in less than one month if installed in the factory.

Because this system greatly reduces engine warm up time, it reduces engine wear by more than 96 per cent.

Two patent applications have been filed for OVER7. It has been adopted by one car manufacturer for its next generation of engines, and it is being reviewed by other leading global vehicle manufacturers.

Tests conducted in a certified laboratory using the legal drive cycle confirmed fuel consumption reduction of over 7 per cent and emission reductions of up to 30 per cent.

If the system is implemented in only 1 per cent of the Australian passenger car fleet, 15 million litres of fuel will be saved every year and CO2 emissions will be reduced by more than 36,000 tonnes per year.

This system works even better with the more efficient power trains such as hybrids, diesel engines and down-sized turbocharged direct injection engines.

Chopsticks handy for light globe replacement

Here’s a quick tip for replacing a centre stop light globe on a Hyundai Sonata 5/2007. This can be a little tricky if you have not done one before.

The problem is that the hole in the rear parcel shelf inside the boot where you are expected to reach in and replace the globe is in the wrong spot, so the globe for the rear centre stop light cannot be replaced easily.

You are left with two options:

Lie on your back in the boot and, through the globe replacement hole, using two screwdrivers like chopsticks, rotate the globe holder. This will allow the globe holder and base to drop down into the void between the parcel shelf and inside the boot so you can replace the blown globe. That was the easy part.

After replacing the globe and then using your two screwdrivers like chopsticks again, raise the globe into position and rotate the globe holder so it locks into place.

It is possible, but very difficult to do – it really is not a nice job.

Or: From inside the boot, unbolts the lamp assembly and then, from inside the car, lift the whole assembly. You will not be able to remove it all the way because the globe holder base is far too long. Just lift it enough to get a pair of long-nose pliers in so you can rotate the globe holder from the lamp assembly.

Remove the whole lamp assembly from the car, leaving the globe and holder behind. Replace the globe.

Now with a pair of side-cutting pliers, cut the long tail of the globe holder off. You will now be able to refit the new globe and holder into the lamp assembly.

Remove the lamp assembly from the car, leaving the globe and holder behind. Replace the globe.

I asked one of the technicians at the local Hyundai dealership how they replaced the globe and was told they use the second option in that model Sonata.

I hope this description is helpful to someone and saves them a little bit of time and confusion.

Jason Smith
JDS Automotive
MOOROOLBARK VIC

(Well explained Jason. I hope I never have to do it. Ed)
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Sample RANGES screen

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**Bosch Car Service**
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Electronic parking brakes have been installed since 2001 in cars like the Renault, Audi, Subaru, Jaguar, Citroën and the BMW 7 series.

Vehicles with electrically operated calipers require diagnostic equipment to replace pads – for example, the VW Passat 2006 requires a scan tool.

The operation can be completed in two major steps with the KTS diagnostic tool.

Step one involves the retraction of the parking brake control motor to allow the pad to be replaced. The KTS screens will guide you through the procedure.

Step two deals with advancing the parking brake control motors as far as the stop so they can adapt to the new brake lining thickness. Again, screens guide you through the process.

One type of electronic parking brake uses conventional cables with an electric motor to actuate them. Vehicles using this type include the Renault Scenic II, Espace IV and the Citroën C4 Picasso.

Another system has electric motors on the calipers that actuate the piston directly. These are controlled by the parking brake ECU. Vehicles with this system include the VW Passat and the Audi A6.

Yet another system is the Sensotronic Brake Control (SBC) system as fitted by Mercedes-Benz. This is a brake-by-wire system that did not rely on a driver to produce the hydraulic effect by pushing the brake pedal, but on a computer and hydraulic modulator to generate pressure.

The SBC system builds up brake fluid pressures independently of the brake pedal and so working on the brakes without using diagnostic tools can result in serious injury.

The integration of electronics into braking systems is becoming more commonplace and you will need to use a scan tool, or turn the job away. Even now, some systems allow for pad replacement without a scan tool but the scan tool is needed to reset fault codes.

**Pad replacement using a KTS scan tool**

This can be complicated due to the addition of electronic controls. Typically, on motor operated cable systems, if the parking brake is released, it should allow for the conventional method of replacing the brake pads. However, on some vehicles it may be necessary to use diagnostic equipment.

Vehicles with electrically operated calipers do require diagnostic equipment to allow the pads to be replaced. A common question concerns brake pad replacement on the 2006 VW Passat using Bosch KTS diagnostic equipment.

It is advisable to have all the necessary tools at hand so that the brake pad replacement can be done in one operation. Keep the KTS in communication with the electric handbrake control unit throughout as problems can arise when re-establishing communication.

Have the KTS communicate with the electric parking brake 3.0 system. It is always best practice to check for fault codes. If no codes are stored, proceed to Service/Adaption, select Brake Lining Replacement Step 1 and follow the on-screen prompts.

The KTS will display the following messages: *Safety-specific system. Do not perform test step while driving. During test, switch on ignition, engine OFF, do not press brake, release parking brake.*

**Brake Lining Replacement Step 1**

This function fully retracts the parking brake control motors. The hydraulic brake section must be reset in the conventional manner. After exiting from the test step or interrupting the diagnosis link, the brake can no longer be applied with the parking brake button. The warning lamps in the button and instrument cluster flash.

On completion of lining replacement, the brake must be re-applied with the test step.

**Brake Lining Replacement Step 2**

When the caliper motors are operating, a noise (which is quite normal) should be heard from both sides of the vehicle. Typical values are between 0.9 to 2.0 amps. When fully retracted, the calipers read 0 amps, or near as, and the noise stops. When looking at the calipers the pistons will still be in contact with the brake pad. This is normal.

The caliper can now be removed and the piston pushed back. Do not rotate the piston. It should push back with very little effort using a suitable tool. Once the new brake pads and calipers have been fitted, Brake Lining Replacement Step 2 can be selected.

Again, follow on-screen prompts as directed, through each page. The KTS will display the following messages: *Safety-specific system. Do not perform test step while driving. During test, switch on ignition, engine OFF, do not press brake, release parking brake.*

**Brake Lining Replacement Step 3**

This function advances the parking brake control motors as far as the stop for adaption of the brake lining thickness.

Follow the on-screen prompts as directed. The motors should then be heard to operate again, to bring the pistons into contact with the back of the pad.

The KTS will then display the following: *Note: Basic setting is now performed and the fault memory will be erased.*

Then follow on-screen prompts as directed. Motors will again be heard to operate. They are motored in and out to set the brake pad clearance.

The current display on the KTS should fluctuate and start to climb as the piston starts to push up against the pad.

Once finished, the KTS displays the following message: *Note: Basic setting of the parking brake control motors has been successfully implemented.*

Many thanks to Bosch Australia for this procedure.
It’s been a challenging season over here.

I don’t have to tell you that vehicle movement and extreme heat or cold are major factors that help break things in cars. In my business, all I really care about is the failure of air conditioning systems.

It’s interesting to note that the latest statistics I have on vehicle repair spending in the US show that vehicles travelled more miles, but repair expenditure fell. There are some pretty obvious reasons for this.

The average age of a motor vehicle here is 10.2 years, a big change from when I first opened my business. In my business, all I really care about is the state of the US economy. The best way to explain its performance is to think how a learner driver would drive a manual semi-trailer – lots of bunny hops and stalling. The economy here just doesn’t seem to be able to get moving.

There has been another round of job cuts at the local government level here. There was a story in Chicago where police recruits who graduated from the academy were fired an hour after the ceremony. Why? Because the state couldn’t afford to pay them. I personally wouldn’t walk around Chicago without an Australian SAS team with me, and they go and fire police recruits?

Summer temperatures have been very inconsistent across the country, with snow still holding firm in the north. In the south, temperatures have been ranging from 20 to 40 degrees Celsius. It’s been crazy, but I can thankfully say that the company I work for is still powering ahead.

I know that we all love a good American story and I’ve got one for you – it’s called ‘Carmageddon’.

LA had to temporarily completely close one of its major freeways, the Interstate 405 that carries 250,000 vehicles every day, so that workers could demolish one side of a bridge and add a transit lane.

Everyone was terrified of closing one of the busiest interstates in the US. But, with the people of LA staying at home to avoid the inevitable chaos, the construction workers were able to pull it off ahead of schedule.

Now the talk is about Carmageddon 2, the sequel. They plan to do the other side of Interstate 405 next year. Ah – only in America.

Julian wanted to prove he did in fact visit Australia briefly in June. Yep, that’s the harbour bridge alright.

A 2007 Ford Focus with a 1.6 litre FYJA engine had no air conditioning working. The owner had only recently bought the car and didn’t know much of the history. The fan speeds and all the modes worked fine. No other symptoms were noticed.

I checked the basic things first, like battery condition, terminals and all lights, with a visual inspection of a/c components such as the pressure switch plugs.

Hooked up a gauge set and the system had refrigerant pressure. When the air conditioning was turned on the light in the a/c switch came on, and there was no radiator fan or clutch operation.

I sourced a wiring diagram. The a/c control panel sent the ‘a/c on’ request to the powertrain control module (PCM) through the low pressure cycling switch and then through the high pressure cut-out switch.

The PCM then turned the a/c relay on. I tested these circuits and all was OK. Tested all other relevant circuits and could find no fault. Hooked up my scan tool and extracted one fault code from the PCM. PO693 – transmission shift solenoid 3 fault was present and I couldn’t erase it. There were no other fault codes. After more investigation I found that the PCM was not turning on the clutch relay.

When I turned it on manually the relay and clutch worked but there was no cooling fan. The PCM was receiving the ‘a/c on’ request as I could see it via the live data.

Now some head scratching began as I tried to work out what could be upsetting it, and what was this transmission code doing in there? I decided to road test the vehicle to check the transmission operation. It was all OK and I couldn’t fault the operation of the shifting. I thought that the transmission fault code could be upsetting the PCM enough to not turn the a/c on.

Some further research revealed a different meaning for PO693 to what my scan tool had told me. The meaning that I found from more than one source was ‘No. 2 cooling fan circuit voltage low’.

Referring back to the wiring diagram I could see that the PCM turned on both the low and high speed cooling fan relays. I located the low speed relay (behind the glove box inside) and removed it.

Then I scanned for fault codes and found another code, PO691 – transmission shift solenoid 1 fault.

When I checked the meaning of this code it was ‘No.1 cooling fan circuit voltage low’. I refitted the relay and erased the codes and was left with the original code PO693.

My scan tool was giving me incorrect code descriptions.

I then went looking for the cooling fan high speed relay (in the engine bay near the battery). I removed the relay and rescanned for faults. The same code, PO693, was present. I checked the resistance across the pull-in winding of the relay and it was OK.

When I went to check the ignition feed to the relay, the fault was looking at me. The connector pin had somehow been pushed down out of its locator where the relay pushes in and wasn’t contacting the relay pin. I pushed and clicked it properly into place and refitted the relay correctly.

Now the PO693 code was gone and the a/c worked fine. I did a performance check and all was OK. I’m guessing that because the PCM couldn’t see the voltage from the high speed relay it knew that it couldn’t turn the fan on high, and then said ‘no I’m not turning the a/c on’.

So my lesson for the day was to always double check the fault code descriptions against the scan tool meaning. This was the first time that I’d had this problem.

Labour time was 2.5 hours, with research time, head scratching and actual time spent fixing the fault.

Marty Hosie
Barclays Radiator Service &
Wagga Car Air-Conditioning

WAGGA WAGGA NSW

(Learning, learning all the time, hey Marty. Thanks for sharing it. Ed)
Century Launches New Selection Guide

Call 1300 362 287 today to get your copy
The 2011 training program concentrates on the co-branded 9 steps to a better workshop, being managed by Capricorn Society and delivered by TaT Biz.

The business training workshops are open to all, whether or not you are a Capricorn member, a TaT subscriber or a VASA member, so if you see a date below that suits you, don’t hesitate to get in touch with the Capricorn Society.

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Thursday 8, Cranbourne VIC
Monday 12, Mildura VIC
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Wednesday 12, Adelaide south SA
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The Automotive Technician
AUS$115 (NZ$150) covers 12 months access to technical solutions and six issues of this magazine

This is where you find the database of repair solutions, stories from all TaT issues, training programs and much more.
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More and more vehicles are not equipped with an accessory drive belt tensioning device. Instead, they use specially engineered self-tensioning belts which require special tools for installation.

Gates Stretch Fit™ belts can be found in many popular vehicles including Mazda 3, Ford Focus, Ford Fiesta and Peugeot 307 and there are many more on the way. Gates developed the first self-tensioning belts and these are now available in the aftermarket.

Prior to installation, Stretch Fit belts are shorter than actual working length, but once they have been properly installed using the special tool they automatically tension to ensure optimum load carrying capacity and proper tension over the life of the belt.

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The Drivetech 4x4 range from Motospecs now includes new products, Drivetech 4x4 CV driveshaft assemblies and Drivetech 4x4 Enduro shock absorbers.

Instead of using reconditioned driveshafts, the Drivetech driveshaft assemblies are more cost effective and hassle free. The Driveshaft tends to be a weak point within 4WD drivelines. It twists at extreme angles and can generate a lot of heat.

The boot the driveshaft sits in can be easily damaged during off-road driving and once dust or water enters the driveshaft, the part is really compromised.

The Drivetech 4x4 Enduro shock absorbers cater for most makes and models of 4WDs, AWDs and SUVs.

The shock absorbers are nitrogen charged and feature rubber bushes for long life. Increased bore size means a better ride and reduced fade, while the twin tube construction guarantees durability.

1800 463 646

Drawing diagrams is a demanding job

The wiring diagrams which map the nervous system of a vehicle are the most requested pieces of information by the automotive aftermarket industry.

The demand for accuracy is treated seriously by data provider, Autodata, which boasts the largest database of wiring diagrams in Australasia. So seriously in fact that the Australian arm recently sent tech room staffer Shayne Brooks to Autodata’s UK headquarters for two weeks of specialist training.

He is now a member of an elite team of seven wiring diagram drawers. Autodata aims to produce 800 new diagrams every year.

It can take between eight and 20 hours to do each drawing. Shayne needed to learn special computer programming to allow for Autodata’s unique hot spotting, which brings up a description when the mouse hovers over a wire or component.

With the new software the company has adopted, users can zoom in to see the fine detail of the drawings that are also colour labelled.

07 3245 3282
a.cohen@autodata.com.au
www.autodata.com.au

Engineers on the shelf...

A ustralian engine remanufacturer, HM GEM Engines, has released a range of powerful and highly competitive new V8 Chevrolet and Ford engines to meet a growing demand for performance motors.

Ideal for re-powering utilities, vans and 4WDs, the range includes new 350 Chevrolet engines, 7.4 litre 454 Chevrolet L29 1996 remanufactured long engines, Ford 4.6 litre engines plus special performance 262 and 350 marine Chevrolet engines.

Steps taken: Cleared fault codes and as soon as the vehicle plays up these fault codes re-appear.

Nothing has been replaced yet and unable to test the key reader as we do not have any specs for it.

I’ve read about engine control units being problematic on these.

TaT technical research director Deyan Barrie responded:

I recommend you concentrate on the key reader side of it.

Make sure the connections at the reader coil are good and the pins have not lost their tension. I recall some CE Lancers having problems with the connection to the reader coil. If this is not the problem, how much is a new reader and ask the dealer if the system requires reprogramming.

Ben came back:

Just thought I would let you know, we’ve replaced the key reader and no further problem was found. Thank you for your guidance.

Ben
UltraTune
VICTORIA POINT QLD

(It’s nice to know the network really does work and our advice is appreciated. Thanks Ben. Ed)
1. **Heavy duty junction box**
Narva has an eight-way 12-port waterproof junction box designed for commercial trucks, trailers and construction vehicles. It has a 50 amp per circuit rating and is supplied with six filler plugs. Part No 57850

2. **Heavy duty brake pads**
Bendix heavy duty European brake pads can be fitted to passenger vehicles, 4WDs, SUVs and light commercials without having an impact on the new vehicle warranty. They are made from a hard working compound with an insulation layer meaning the pads can operate at high temperatures while offering longer pad and rotor life. www.bendix.com.au

3. **Cargo case**
Kincrome’s new 900mm cargo case is made from thick UV-stabilised plastic that’s impact resistant, weather resistant, will not rust or dent and is resilient to dust, chemicals and oil. It has a rubber water and dust seal www.kincrome.com.au

4. **LED load resistors**
Narva has introduced 12 and 24 volt LED load resistors to overcome problems relating to load sensitive flasher systems where low current LED lamps have been fitted. These Narva load resistors replace the load that has been reduced by fitting LED lamp replacements for standard incandescent lamps. Load resistors 90034BL (12V) and 90036BL (24V)

5. **Square torque**
Kincrome has extended its deflecting beam torque wrench range with a large three-quarter-inch square drive. The deflecting beam mechanism has no spring and less moving parts, offering more accurate calibration. It includes both an audible click and a visual signal when the specified torque has been reached. www.kincrome.com.au

6. **Mini torch**
Narva has a neat mini LED torch for your glovebox which charges from the accessories power socket. It’s 12 volts and has four ultra bright LEDs to provide wide angle illumination. It even comes with a lanyard and a clip lock for your car keys.

7. **VDO catalogue**
The VDO 2011 catalogue from Continental includes the new performance tachometer with ranges up to 10,000 rpm as well as the VDO monster four function 0–10,000 rpm tachometer with voltmeter, oil pressure and water temperature. Also included are CAN cockpit instruments for processing data from various analogue and digital sensors via a master instrument connected to a CAN bus. enquiries-au@continental-corporation.com

8. **Durst jumper units at the front line**
Durst portable high capacity 12 and 24 volt jump start units have a fully automatic three-stage switch mode battery charger which maintains batteries in a full state of readiness. They will jump start vehicles with dead flat batteries and also can be used as a heavy duty mobile power supply from the panel mounted, fully fused cigarette lighter socket. These units are being used by the defence service in Afghanistan and getting rave reviews in rough climatic conditions.

9. **Century battery guide**

10. **Pressure sprayers**
Kincrome has released a range of pressure sprayers ideal for automotive uses. There are four models including a two-litre hand sprayer, five-litre and eight-litre sprays and a 15 litre back pack sprayer. www.kincrome.com.au

11. **New brake fluids**
Brake manufacturer Bendix has a new range of DOT3 and DOT4 brake fluids, suitable for hydraulic and conventional braking systems in cars, motorcycles and commercial vehicles. The fluids are designed to minimise corrosion while being inert to rubber used in brake hoses, cups and seals.

12. **Mobile table**
Kincrome has released a handy mobile work table featuring adjustable height and rubber bumpers on the corners to protect against accidental vehicle damage. It will carry up to 100kg. www.kincrome.com.au

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When we play sport it’s the scoreboard that ultimately tells us who has won and who has lost.

Imagine the issues that would occur if we didn’t have a scoreboard. Imagine playing a five-day test match and there was no scoreboard. It would be impossible for the players to know what was going on. Slowly but surely the intensity and motivation of the players would fall as they realised there was never going to be a result. Relate this situation to your workshop. Your technicians come to work and they play a five-day test match every week. You keep them in the dark about the result but still expect them to give you 100 per cent performance.

Referring back to the cricket, it is impossible to get your technicians to operate at 100 per cent capacity if they don’t know the score. Eventually their motivation and output will fall, and you will feel that your technicians don’t care about how the business is going. If you want to get the most out of your technicians then they need to see a scoreboard so they get a sense of the result. If they are losing, they need to know about it straight away so they can act on it the very next day. Your scoreboard needs to relate to work results that your technicians can control or influence. They need to know that the result the workshop is looking for is hours of labour sold.

There is nothing confidential about your technicians monitoring how many labour hours they have sold. I recommend you set up a daily ‘hours sold’ scoreboard in the smoke room for all your technicians to see. Set them daily/weekly ‘hours sold’ targets and update them every day. This way everyone knows what kind of a day they have had. ‘Did I reach my target or did I miss my target?’

You might like to include some form of incentive to reward your technicians when they do reach their targets. Apply this principle to your workshop to motivate your staff and maximise your labour output.

Stay tuned for more tips and tricks.
Bosch KTS 340 - Comprehensive vehicle coverage at your fingertips

A scan tool with comprehensive vehicle coverage is vital for workshops. The KTS 340 (powered by Bosch ESI[tronic] software) utilises a comprehensive database of local, European and Asian makes of petrol, diesel and hybrid vehicles. Detailed information is easier, faster and more accessible than ever before with the Bosch KTS 340 scan tool. Testing and repairs are made simple with the help of step-by-step instructions, displayed on an 8.4” touch screen. With three years worth of quarterly software updates included, it’s never been easier for workshops to access information than with the Bosch KTS 340. Bosch design vehicle systems, so who better to diagnose them?

For further information on the Bosch KTS 340 call the Bosch Diagnostics Customer Service Line on 1300 783 031. www.bosch.com.au
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