This Mini Cooper has an enthusiastic fan that nobody would want.

A voltage drop was enough to bring this VW Golf to a stop.

A Hyundai Lantra’s rear wiper didn’t know when to quit.

The engine light on this Ford Escape fooled by a faulty DPF.

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APPLY ON PAGE 28
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A
s you can see by the cover story, I’ve been doing a little driving in the far outback, where the New South Wales, South Australian and Queensland borders meet.

On the way, I dropped copies of the TaT magazine into mechanical workshops and chatted to the people on the tools. What a mixed bunch of talents they were.

In small towns, hundreds of kilometres between petrol pumps, are people with a range of skills who collectively keep the western fleet and the travelling public on the road.

I was a little surprised at how few mechanical workshops there were in the area and I guess it says a lot about the stamina of the modern vehicle that breakdowns are relatively few.

Certainly, most of the locals who travel these outback tracks are well prepared. It’s common to see vehicles carrying not one but two or more spare wheels, as well as extra fuel, a spare battery, winches and a shovel. Out there, hundreds of kilometres from anywhere, there are few options for rescue.

Over a cold one at the Birdsville pub, I was told that if a novice got stuck on the Simpson Desert, it could cost $7,000 or more to rescue the vehicle and passengers.

There are no house calls by technicians out there. There’s a sign at the Birdsville police station which warns overseas tourists to contact their country’s embassy before they venture into the Simpson.

Interviewing Birdsville’s only mechanic, Peter Barnes, and then chatting with him at the Birdsville pub after work, I was impressed with his knowledge of motors and his bush mechanic’s intuition.

You got the feeling that there was nothing this guy could not fix.

With little real effort on my part, Peter subsequently became a TaT subscriber because he realises that with the march of technology, it is going to become increasingly difficult to diagnose some problems with limited resources.

I discussed my admiration of the bush mechanics I met with co-director Jeff Smit, and between us we became inspired to begin a nation wide campaign to identify the bush mechanics, and tell their stories. So if any reader knows of someone like Peter Barnes, please let us know.

We then decided that while the dying breed of bush mechanics deserved well-earned recognition, we should heap an equal amount of praise on the new breed of technician who is at the leading edge of the vehicle technology revolution.

Like the guy Jeff met recently in a provincial NSW workshop who is developing a purpose built centre to deal with hybrid repair and servicing. Now that’s what you call being prepared.

There are so many stories to be told. TaT wants to pay homage to both ends of the motor repair spectrum. So raise your glasses to the bush mechanics of Australia, and then raise them again to the progressive technicians of tomorrow.

In the meantime, some of our regular wholesale supporters might be tempted to join the campaign and put up some of their latest high tech equipment as prizes.

…and please note that our circulation is rising. TaT submits to a CAB audit, and the latest one up to March 2009 verified an increased circulation, and also, for the first time, verified the number of magazines mailed through Australia Post or mailing houses.

- KN

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The Automotive Technician 3
Boys and their toys

Cover story by Ken Newton

After seven days and 4,300 kilometres exploring the Australian outback around Birdsville and Cooper Creek, I reached the conclusion that if Toyotas hadn’t been invented, very few people would have been able to experience the wonder of this incredibly beautiful, but unforgiving land.

Toyota Prados and their brand brothers were in plague proportions at every watering hole, from Cunnamulla to Bulloo Downs, from Tibooburra to Merty Merty, from Innaminka to Birdsville and on to Windorah.

I didn’t set out to heap praise on Toyota to help their flagging sales, but facts are facts. Birdsville’s only mechanic, Peter Barnes, a colourful veteran of thousands of busted vehicles, told me he holds a large array of ‘bits and pieces’ for a variety of vehicles including quite a few Toyota parts, because most of the cattle stations around his neck of the woods use Toyotas.

The big mining camps through Western Australia also rely heavily on Toyota vehicles because according to trainers we know, the Toyota is one of the few vehicles which can consistently take the punishment of rough roads, dust and mud.

To be fair, I spent half of the trip in the front seat of the Suzuki Vitara and it performed admirably. It was as comfortable as the much bigger Prado, although didn’t handle sand dunes nearly as well. In fact, it didn’t handle sand dunes at all because of its lower clearance.

As we punished the vehicles through the gibber plains and wide gravel stretches of the Birdsville track with its undodgeable over-size rocks, I marvelled at the stamina of the tyres.

That was until an almighty ‘bang’ and cries of “What the bloody hell was that?” brought us back to earth, so to speak, as we slowed to accommodate a completely flat front offside wheel.

That was my first blow-out since I was a kid. Back then, a blow-out would result in an out-of-control zig-zag off the road, often leading to a roll-over.

The Suzuki didn’t flinch. Peter didn’t wrestle the wheel. It came to a sedate and controlled stop from...
100 kph on a very loose-gravel road. But then it let us down. Whoever designed the jack handle arrangement for the Suzuki needs a lesson in off-road wheel replacement. Trying to be really smart, Suzuki designed the screwdriver handle with a hook on the other end which is fed through the jack winder holes. Then a hole in the wheel brace handle is supposed to slide over the screwdriver, turning the arrangement into a very unstable winding handle. They should have stuck with the old-fashioned jack handle because in the heat and flies on the side of the Birdsville Track, it was tossed aside in an oath not fit for publication, and the jack was raised and lowered by laborious single arcs of the screwdriver handle.

And here’s another bit of good advice for anyone planning such a trip. Cut out a 30 or 40 cm square of thick marine ply as a platform for the jack. Luckily we were on a gravel road. It would not have worked on the sand tracks. With another 120 clicks (get used to it) to go, we pressed on into Birdsville, hoping that the little cross hole in the middle of the tread could be plugged.

We drove into Birdsville Auto Centre and General Store, comforted by the big sign over the driveway ‘Yes, we fix punctures’.

Around the back, in the spacious workshop, was Peter Barnes, the only mechanic in Birdsville – in fact the first mechanic in Birdsville. He pronounced the tyre unfixable. There was a long slit on the inside. Peter is the lessee of Birdsville Auto, the pioneer workshop and fuel station for Birdsville, first established in a primitive shed across the road in 1990.

Partially thanks to the publicity given to the Birdsville race meeting, this town at the gateway to the Simpson Desert is growing up fast. We were on a gravel road. It would not have worked on the sand tracks. With another 120 clicks (get used to it) to go, we pressed on into Birdsville, hoping that the little cross hole in the middle of the tread could be plugged.

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The urge to travel took over again and Peter moved to Rabaul, New Guinea, in 1996, working as a mechanic there for almost a year. Then back to manage a cattle station on the Strzelecki Track, for about six and a half years.

“How big was this place,” I asked, totally unprepared for the enormity of the reply. “Two million acres. Had one paddock of a million acres and divided the other million into eight paddocks. Only 7,000 head of cattle.”

Having just driven through the vast gibber plains heading north into Birdsville, we marvelled at the fat cattle we saw on the roadside, with not a blade of grass between our vehicles and the horizon. “You can’t see it, but there’s plenty of grass out there.” I still don’t believe it, but out here, the scenery can be wildly deceptive.

Eventually, Peter Barnes returns to Birdsville to run the big Birdsville Auto Centre. “Why?” I asked.

As he’s the only mechanic in the middle of nowhere, I asked if he ever got time off.

“Always around. But if I’m not, they just have to wait.” It’s the code of the west. Peter can’t be everywhere and he doesn’t try to be. He’s around seven days a week. His house is on the same block at the garage so there’s no escape.

What spare time he has, Peter designs off-road mustering vehicles and on the subject of off-road, Peter is a bit of a legend himself. He builds or rebuilds off-road racers, which his son drives in major events on the circuit.

In the Birdsville pub that same night, there was Peter, regaling us with stories of his off-road conquests and describing in intimate technical detail how different engines, suspensions and power trains respond to the rigours of racing.

But that’s another story. In the meantime, here is my survival check list for four-wheel drive explorers, based on personal experience of this outback trip.

1. When stopping on dirt roads, don’t open the door until the dust cloud you created passes you.

2. At every pub or fuel stop, engage your fellow travellers. Talk about the roads, ask where they’ve come from. The only reliable information on road conditions comes from those who have just driven through it.

3. If in doubt, drop in to the local police station. The cops in the west are different. At Cunnamulla, we asked road conditions to Hungerford after the big wet. The cops advised us to stock up on a slab of beer, in case the pub there had run out.

4. Know where your tools are, and practice changing wheels before you leave home. Don’t forget the piece of marine ply to put under the jack. Take spare fuel — recommended is two ten-litre plastic cans for ease of handling.

5. Fuel up at every stop. Never assume you will have enough fuel to get you to the next point. Watch for temporary signs at fuel stops which might say “Cameron Corner is out of fuel”. It’s a great service, but means you may have to stock up on fuel containers.

6. Two vehicles, connected by simple two-way, is the best insurance you can have on these outback tracks. Don’t assume that wildlife understand our road rules. Slow down. It’s not good form to enter town with entrails of emu or kanga dangling from your bull bar. Remember that these animals are your Coat of Arms.

7. The pubs hold the outback together. Treat them with respect. The people behind the bar know a lot. Drink light beer if you are still driving and restrict it to two for the driver. At Birdsville, find the local bakery and order a curry camel pie.

8. Drive early in the morning to enjoy the scenery, but avoid total darkness. You could miss a cross road that might be the difference between one hour and ten. We arrived late into Charleville, and for the last two hours, it was 60 kph to avoid thousands of wallabies and kangaroos.

9. Take plenty of dry snack foods. The meals in most pubs are great, even if they are ricoscles, but the intervals between meals can be long.

10. Conventional repellents don’t work for bush flies. Buy yourself a broad brimmed hat and a fly net.

**Survival Checklist:**

- Trucks bring big stuff to Birdsville from Adelaide and Brisbane once very two weeks. Urgent small parts can reach him by regular flights every few days.

- Like the variety. Like the challenge. I simply enjoy the place. Don’t worry, I have a good time and it suits me,” grins Peter, surrounded by trucks, tractors and bulldozers all waiting for his mechanical attention, or parts.

- “Two million acres. Had one paddock of a million acres and divided the other million into eight paddocks. Only 7,000 head of cattle.”

- “Always around. But if I’m not, they just have to wait.” It’s the code of the west. Peter can’t be everywhere and he doesn’t try to be. He’s around seven days a week. His house is on the same block at the garage so there’s no escape.

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- In disguise behind his fly nets (from left) Peter Fitzkwoski, Darren Morris, Keith Goode, Brian Palesy and Ken Newton.
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LETTER FROM AMERICA by Julian Hentze

All eyes on US car makers...

Projections of US car sales released in May show very clearly how this once great industry has been slaughtered.

In a ‘usual’ year an average of just over 16 million cars, utes and SUVs are sold. This year, the expected sales are just over nine million. This means trouble for the big three - well actually just a big two at the moment.

Chrysler has filed for Chapter 11 bankruptcy which is like going into receivership with the chance of clawing out. Chrysler is reducing its dealership network by 800 and has begun negotiations with Fiat for a merger. There are some very annoyed Chrysler dealerships left with many vehicles to sell and limited time to do it.

Everyone is now watching General Motors. The US Government has given GM until 30 June to get its house in order and start paying back the money the Government lent them, or the debt will be called in, forcing GM into Chapter 11 bankruptcy. There’s wide speculation that GM won’t make it as they notify 1,100 dealers that they intend to close them down, and they are also selling off some brands.

What went wrong?

Chrysler does not have a good reputation for building cars that last. They look great but cost a fortune to maintain. Let me put it this way - Chrysler evaporators are among the top sellers for the company I work for.

GM has massive debt from earlier times. In America, superannuation until recently was paid for by the employer. When GM owned the market it sold a lot of cars, which meant they had a lot of employees. Their brand strategy has also been diluted.

It used to be easy - Chevrolet was the entry level vehicle; you leave school and buy a Chev, then as you earned more money you moved up to a sporty Pontiac; when you started a family the Oldsmobile came on board; if you became reasonably affluent, you moved up to a Buick and if you did really well you drove a Cadillac.

With each brand came a management team who wanted more and more from their brand. Chevrolet became an ‘everything for everybody’ brand, Oldsmobile brought in an entry level car for young people, Pontiac built people movers to keep their young buyers.

To make matters worse, GM saw the issue with Chevrolet and started the Saturn brand. It was a case study I did at University on how to create the perfect brand. It was to be the basic, single model entry-level vehicle.

In 1994, 44,000 Saturn owners drove from all across America to the manufacturing plant in Tennessee for the ‘homecoming’. What does Saturn build now? A full range of vehicles including a $50,000 SUV. The entry level vehicle was dumped. As for Saturn, it’s one of the brands that GM is selling.

Mark 30 June in your calendar, it may be an important day in our industry. - Julian

The collapse of the car industry doesn’t interfere with Julian’s softball play. That’s him far right with the company team.
sensor, coolant temperature

Problem Summary

The car will only rev up to 3000-4000 rpm, then it feels like a rev limiter comes in. This happens in park and on the road. This car had been to a local BMW agent who had put on a new coil, then told the customer that they didn’t know what to do from there. It then spent three weeks at another local garage where about 40 hours was spent trying to find this problem. The parts changed by then included cam and crank sensor, coolant temperature sensor, air flow meter and oxygen sensor and the exhaust was dropped to rule out a suspect catalytic converter and more.

Diagnostic Sequence

Visual checks around engine. Scanned for DTCs - none present.

Checked charging system for over/under charging.

Checked the engine ECU was receiving a signal from the gearbox to change from ‘park’ to ‘drive’.

Pulled out the ECU, fitted a break-out box and checked ECU lives and earths on the PicoScope.

Fault Description

A close look at the harmonic coupling when the engine was running and some oscillation could be seen showed that the coupling was out of true, causing the signal on the crank sensor to vary every revolution.

This will cause problems with the injection and ignition timing.

Fault Solution

A replacement harmonic coupling was fitted. The fault disappeared.

Recommended Time

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

Simon Forsey
Hellensville, New Zealand

(‘Some of our subscribers are great’, said Jeff Smit when this email came from across the Tasman. We told you we had readers in New Zealand – and jolly smart ones at that. Thanks Simon, you are now a published author.)
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The story so far: TaT trainer and technical writer Nick Murphy has taken over a well established workshop in Sydney. He began by having a huge cleanout, during which he found some interesting pieces of equipment. The passageways were cleared and some semblance of efficient workshop operation returned.

Nick has moved into a most important phase of his workshop makeover – firming up his client base and adding to his list of potential clients. He’s approaching this in a few different ways. In the first episode of the make-over for Barr’s Automotive, it was revealed that computer records were non-existent.

There were plenty of client cards, but nothing on computer that could help generate service reminders to keep the customer connected to the workshop.

The accumulations of the past 30 years have been picked over, and now they can see the floor.

“Phase one of the office make-over is complete,” says a satisfied Nick. “All records are on our new computer and with the help of our marketing program, we can generate reminder letters at the right time.

“That ensures our existing clients stay connected, but we needed to reach out to potential new clients within our market zone,” said Nick. He did this by taking advertising space on the back of the Woolworths and Coles docketts generated at his local shopping centres. He promoted the workshop’s professional service capabilities and, while the campaign is a limited one, it has so far delivered good results.

“We might not get an immediate rush through the door, but it does help remind people that there are local service workshops which might be more convenient for them, and where they can expect a high level of personal service.

The exercise certainly adds to our database of potential new customers,” Nick said.

In a way, the law in New South Wales which requires all vehicles over three years old to be inspected every year, is a great marketing tool in itself to generate new customers for local workshops.

But, as Nick found out, you can never assume that potential customers get the right message from the signage out front of the workshop.

A motorist hesitatingly poked his head around the workshop door recently and asked, “I see by your notice board on the front of the building that you only do Rover cars. Can you service my Toyota by any chance?”

The old sign which quite rightly let the world know that Barr’s Auto was a Rover specialist, could well chase other car makes away. 

“Some tools which were simply old and worn cost less than $1,000 to repair, whereas to replace them might have run into $10,000 and more.

“The workshop must first show that it can generate the income to warrant leasing new gear. This is our honeymoon period, so we are conserving our resources because we want this marriage to last,” Nick added.

This was the technical request form TaT received:

Toyota Supra 1993, with a 5SFE engine. I have fixed this problem but wasn’t sure where to let you know. The car would not start and would only run with the key held in the start position.

I checked all the basic stuff - fuses, relays and the like.

Checked the power supply at the back of the ignition switch and it was OK. Tested the spark and found it was not being grounded.

Checked as many power and earth points at the ECU as the crappy diagrams would allow and they were OK too.

Removed the ECU and found the capacitor had blown.

Removed capacitor, cleaned the board, soldered in a new capacitor refit to the car and it now goes.

Thank you Jeff and Deyan for guiding me through this repair.

Jeff, I also had a ‘94 XV10 Camry 5SFE which was driven in, running well, but the ‘check engine’ light and ‘over drive’ lights stayed on. No codes.

Went through various checks and tests which again led to me removing the ECU to find (yes) another blown capacitor (in the same week).

Replaced the capacitor and cleaned the board but further damage must have been done (that stuff is very corrosive) so I had to replace the ECU to fix the problem. Thanks again for your help on this one.

Neil Swanson
Neils Automotive
Hillcrest Qld

(Thanks Neil. Good feedback - we appreciate it. Yes, you are correct in describing what the capacitors can do to the circuit boards. This is not an unusual problem, especially in the Mitsubishi ECUs. Sometimes you can do a sniff test and if it smells fishy then there is a problem. Open it up and sure enough there it is, capacitor is leaking. Just yesterday I had an a/c dash control panel from a 1997 Accord with two blown capacitors and one mini transistor. I believe this is getting to be very common when the vehicles reach that magic 10+ years.

Cheers, Deyan)
Just when we thought it was safe to remove our ear plugs...

There are many good things to flow from the growing use of electric cars on the roads. One of them is silence.

Oh, the joy of a car silently cruising down the suburban street outside our house, instead of the roar of turbo charged exhausts, hotted up, with a howl at the wheel who is already heading for deafness because of the 100 watts of sound pouring into his head from his iPod earbuds.

Can you imagine the sheer bliss of the future? Just a bit of wind and tyre noise as silent cars zip around the streets.

But now, some do-gooders from America (where else), are concerned about the dangers to pedestrians of silent cars.

Some professors in California, with nothing better to do, have wasted a great deal of time doing ‘studies’, which apparently proved that blindfolded pedestrians could not detect an electric vehicle until they were 65% closer than a vehicle with a petrol engine at speeds of under 32 kph.

Now the American Congress is considering a bill to make a minimum level of sound law for all vehicles.

In other words, they want to introduce artificial noise back to the traffic. Apparently the European Commission is thinking along similar lines.

Someone was silly enough to ask the professors in California what sort of noise an electric car should make to warn of its arrival. “Perhaps a beep as they approach a pedestrian crossing. Maybe a buzz like a power tool”.

Car makers could end up creating their own sounds to express their brands. It has even been suggested that electric car buyers could choose their car by the noise it makes, along with colour, design or interior finish.

In the aftermarket, electric car drivers may be able to download their individual car noise like people now do with phone ring tones.

Has the world gone totally mad?

If I’m going to be denied the silence I was hoping would come with electric cars, where can I get an electric car that plays Mozart or Brubeck?

Either that, or tell the stupid pedestrians to take out their earbuds and watch where they’re going!

A weird EL Falcon...

Some readers might be interested in this 98 EL Ford Falcon which was towed in, not running.

The car reportedly was running fine, then coughed, farted and stopped. The engine turned over with what sounded like a timing issue. We tested the battery and put it on charge and checked the timing with a timing light.

Sometimes the timing would be fine, others not and would be bouncing around. It even had multiple sparks. Weird.

We rotated the engine by hand onto TDC and the rotor lined up with No.1. (How this was to be when we found the problem I do not know.)

Checked the PIP signal out of the module and found another weird signal – it was not a steady 50% duty cycle. We had been busy and assumed that the PIP in the distributor either worked or it did not. Now as the module was producing an output it must have received a signal from the PIP.

Tested all the powers and earths and they were a little bad but not enough to stop the car starting. Replaced the module thinking it was getting confused but alas – no go. So we thought - go back to the basics. It sounds like a timing problem. It looks like a timing problem.

Checked rotation of the distributor and found the problem. The distributor shaft was not turning properly and even backwards every now and then. This explains the multiple sparks.

Removed the distributor to find the gear on the camshaft had a section stripped off it. Checked the service history and found the car had received minimal servicing.

The job then turned out to be an installation of a reconditioned engine - how good is that?

With the whole economic situation [forcing people to hang on to their cars] and cars getting older with kilometres mounting up it’s not too bad a situation for us mechanics. Especially when we know how to fix them.

Matthew Fish
Jindabyne Auto Repairs
Jindabyne NSW 2627

(You are dead right Matthew – as long as you know how to fix them. Thanks for sharing this beauty with your fellow techs. You can all help each other get through this financial mess. Ed.)

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- Used by the Australian Defence Forces, Government, mines, TAFE

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Ask about purchase options including leasing.
When I was asked to do a Top Tools report on the BG Liquitech fuel system service kit, it got me thinking about how to make sure that the results were fully transparent and also that I could deliver some proof that this sort of service is actually worth the time and money.

There are a lot of fuel injection cleaners on the market, from the off-car injector flushing machines to the plain old fuel additive which you just pour in the fuel tank. First, I gave a lot of thought to which vehicle to use, and, for a number of reasons, decided on a customer’s Holden Commodore 2001 VX.

The vehicle has been looked after very well and serviced every six months from new and now has 142,389 kilometres on the clock. It was due for its regular service but is still running very well. The main reason for picking this vehicle is the easy access into the inlet manifold, which I thought was important so we could really see the results before and after the fuel system and throttle body service.

To begin, I decided to inspect the condition of the inlet manifold and received my first surprise of the day. I was expecting to find a relatively clean inlet manifold and throttle body. As you can see (pic 1) it was not pretty. Both the manifold and the throttle body were quite dirty and in certain areas the carbon build up was very bad - up to three millimetres thick. Here was a vehicle, well maintained and serviced, with a manifold in this state. Imagine the state of other vehicles that are not maintained to the same standard!

The BG Liquitech fuel system service is a three part procedure. First there is a fuel tank treatment, CF5, which is added to the fuel in the tank, as long as there is more than quarter of a tank of fuel in the vehicle.

This advanced formula ensures an even and effective clean up and also protects against rust and corrosion of the fuel system and its components.

Next step is the throttle body and inlet manifold. I believe this is one of the most forgotten areas of the modern vehicle which directly impacts on the drivability of all vehicles. For this step the BG Vehicle Injection Apparatus (VIA) is used. A nozzle is attached, which is bent in a shape so it can be placed into the throttle body.

The VIA is connected to the workshop air supply (pic 2 and 3). The vehicle is then started and runs while the air intake system cleaner is injected into the throttle body and inlet manifold. Moving the nozzle from side to side will also ensure that the cleaner is accessing all areas of the throttle body and inlet manifold. This step takes about six minutes.

For the final step, the VIA is connected to the fuel lines of the engine and the vehicle’s own fuel pump is either immobilised or bypassed (pic 4). For this step the vehicle is again started and run on the petrol injection system cleaner. The time required for this step varies depending on the engine size and takes around 15 to 20 minutes.

This cleaner removes carbon and varnish deposits from injectors, valves, combustion chamber, sensors and EGR systems.

After reconnecting the vehicle’s own fuel lines, it is advisable to take the car for a reasonable run to ensure that all the cleaning fluid is used and is burnt off. It was after these steps that we again removed the inlet manifold lid to see the results - and what a difference (pics 5, 6 & 7).

The results were a big surprise to me because I now freely admit that I was one of those sceptical technicians who was not convinced that fuel systems needed added attention during normal servicing.

After doing a little more research on this subject, I am now convinced that regular fuel system maintenance is essential on modern vehicles.

The difference that this service made to this vehicle was certainly appreciated by its owner who reported noticeable improvements in performance. They regarded the service as a job well done and, more importantly, money well spent.

Contact: Liquitech Australia 03 9873 2155
http://www.liquitechaustralia.com
The most important tool in the workshop is information. Now you can access it easier, faster and in more detail than ever before with the new Bosch KTS 340 diagnostic tool. Let the KTS 340 (powered by Bosch’s ESI[tronic] software) guide you through each repair with confidence. Targeted trouble shooting, maintenance schedules and service bulletins can all be accessed quickly and easily from this powerful, yet compact, diagnostic solution. Invest in Bosch diagnostics and you get a service partner for life. **Bosch Diagnostics 1300 783 031  www.bosch.com.au**
Gateway

Most manufacturers will employ at least two or more communication speed protocols. The task of a gateway is to enable deferring speed of communication nodes, rings or channels to exchange information with each other. These gateways are very much model and manufacturer specific and they do change from model to model. For example, a manufacturer may assign the Instrument Data Display to be the gateway for one model, yet in the very next model may assign Body Function Control Module to the gateway (reference 3).

BUS make-up

It is paramount that prior to any diagnostic work, the technician must decipher the BUS make-up which is often referred to as BUS configuration. In simple terms, BUS make-up is the manner in which control units are inter-connected to each other. This can be in the form of a daisy wheel chain or perhaps a star BUS make-up or any combination (reference 5).

Communication networks

There are many ways in which data can be transmitted from one control module to another. For example, data may be transmitted via a single copper wire such as high speed CAN BUS or LIN (where the chassis earth is used as a signal return) or information can be carried over two copper wires such as high speed CAN C BUS without relying on an earth return. Some manufacturers use fibre optics (reference 6)

Two-wire CAN BUS

Most manufacturers use two-wire systems for fast data acquisition protocols which are easily identified in a circuit diagram by the two terminating resistors at either end of the high speed communication network. This means that 120 ohm resistors are used at either end of a two-wire network, rendering both resistors in parallel, yielding a total sum of 60 ohms (reference 7).

High and low side of the two-wire CAN BUS

By definition, two-wire high speed CAN BUS (or even mid speed CAN BUS) has two wires where the information is transmitted in a 'push-pull' arrangement. That is, the transmitted data or signals, while identical, are out of phase by 180 degrees - hence the push-pull arrangement. This technique is used to provide maximum possible noise immunity to the data transmitted on two-wire BUS.

Traditionally, one wire is often termed as the high side of high speed BUS and the other as low side of high speed BUS. This must not be confused with data speed or transfer rate. Both wires communicate on the high speed CAN BUS at high speeds (baud rate of 500 Kbps), the low and high side of the two wires will reflect the push–pull arrangement out of phase by 180 degrees (reference 8).

Voltage swings of high and low side of the two-wire CAN BUS Initially, while there may be no data transmitted on the out-of-phase or push-pull two-wire high speed CAN BUS, both wires will exhibit a steady voltage measurement of 2.5 volts. And as soon as data is to be transmitted, the high side of the two-wire high speed BUS will swing to about 3.6 volts and the low side of the two-wire high speed BUS will drop to 1.6 volts.

While this differential voltage swing may vary between manufacturers the concept remains the same (out-of-phase or push-pull). The electronics within each control unit decipher the differential voltage swing between the high and the low side as a voltage swing between zero and two volts (reference 9 and 11).

Single-wire CAN BUS

Single-wire BUS communication protocols such as LIN/CAN/ UART (Universal Asynchronous Receive Transmit) have a typical voltage swing of either zero to five volts or zero to 10 volts (reference 10 and 11).
Customer complaint

Engine fan running all the time and flat battery.

Problem summary

After testing, high speed thermo fan on all the time even with key off and vehicle locked. This caused battery to go flat.

Diagnostic sequence

General inspection of thermo fan wiring and testing all in-car and under-bonnet fuses.

1. Remove front bumper bar, a/c condenser and radiator unit to access thermo fan unit.
2. Remove and inspect relay and fan resistor unit.
3. Confirm low speed resistor has blown.

Inspect high speed relay, contained in resistor box, confirm contacts welded together causing fan to stay on.

Fault description

Due to low speed fan resistor having blown, the vehicle relied only on the high speed resistor for engine cooling.

When the high speed was switched on from a standing position, the current draw for start up was very high and caused the contacts to weld together.

Testing current draw of the fan motor also showed high current draw. This was the cause of the low speed resistor burning out.

Fault solution

Fit new complete fan housing and refit radiator and a/c condenser.

Road test and ensure that both low and high speed fans operate.

Part no.M17101475577
Fan Housing
New resistor and relay only available as a complete fan unit from BMW.

Recommended time

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

Whenever replacing thermo fan relays, we recommend testing for the current draw of thermo fans be carried out.

Toyota Camry clutch hydraulics...

I was called to replace a failed clutch slave cylinder on a V6 Camry 2001 as diagnosed by road service.

On inspection I found a hydraulic component, bolted to the gearbox, that is called an accumulator and it had failed. Brake fluid squirted from the unit when the clutch pedal was pressed.

This accumulator consists of an aluminium cast housing, an inlet port and an outlet port and there are no restrictors or valves.

The only part within this housing is a stainless steel disc of about 50mm diameter, sealed with an O-ring underneath it and a steel ring above the disc to allow flexing of the disc. It is held in place on a steel bracket that stops the disc from popping out of the housing.

The disc had cracked, allowing the brake fluid to squirt from between the aluminium housing and the mounting bracket. It is interesting that the inlet pipe is attached to the top and the pipe connecting to the slave cylinder comes from the bottom, making it very difficult to bleed.

I have never encountered this component on a clutch hydraulic system and wonder what the purpose of it is?

Gary Poot IAME
Home Tune Hills District
Windsor Drive NSW

(Someone must know the answer to Gary’s last question? Thanks for the input Gary. Ed)
These photos are of a cooling pipe connector from an oil cooler under the base of an oil filter on a Daihatsu Feroza. This vehicle had suffered engine failure and was diagnosed as a blown head gasket between cylinders 3 and 4 with severe engine knock consistent with top end or piston wear. Someone has previously replaced a water pump using silicon as a gasket sealant together with a gasket. A reasonable amount of silicon sealant had found its way into the oil cooler pipe leading to the oil cooler at the base of the oil filter. Although not conclusive as to the cause, it is most likely that the loss of coolant flow to the oil cooler may have contributed to this engine failure. Further dismantling may result in more blockages in the cooling system.

I have seen similar results on an oil pickup when an engine sump was replaced with an over-zealous amount of sealant. I hope this information will help my fellow technicians.

Graham Patterson
Apps Automotive

(Your pictures are worth a thousand words Graham. Well done. We want more. Ed)
Customer complaint
Rear wiper on all the time.

Problem summary
Rear wiper motor in hatch won’t stop even if switch unplugged when ignition is on.

Diagnostic sequence
1. Located the rear wiper delay relay in the left rear area under floor panel.
   - Disconnected the relay and rear wiper still working.
2. Removed the rear wiper motor assembly and found the capacitor in the wiper motor plug was shorted out bleeding a +ve feed to the trigger circuit.

Fault description
The capacitor internally shorted. It is positioned between the constant power and the trigger supply.

Normally this is a +ve pulse only by the delay relay and the internal self park circuit takes over for the rest of the sweep.

Fault solution
3. By cutting the capacitor out the rear wiper stopped.
4. Replacement of similar capacitor from an old alarm circuit board solved the problem.

Other option was a new wiper motor assembly.

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

Another Navara mystery...

I was reading about the Navara fault (‘Even scan tools can get confused’ P8 April 2009).

I had a D22 Navara with the ZD30 engine in it that had no power in third gear. Well, that was what I eventually figured out after being given instructions to rectify a lack of power.

The fault was the gearbox neutral switch. It was indicating the transmission was in neutral when being driven in third gear causing the EFI system to react in this manner.

God! I look back lovingly on the days when all we had to work on was HQ Holdens and the like. A 202 engine out in 20 minutes, replace a cylinder head in two hours...

Jon Hams
Off Road Autos Mackay Qld

(Yep. Times have sure changed Jon. Quite frankly, I don’t know how you guys keep up with the multitude of models on the road. Bit like being able to play all the instruments in the orchestra. Thanks for the interesting story. Ed)
Customer complaint
Check engine light on while driving.

Problem summary
Road tested vehicle. Appeared to run OK. ECM light was on.

Diagnostic sequence
Tested ball fuses and battery connections.
Hooked up scan tool and checked for fault codes. Fault code P1406.
DPFE downstream hose off/plugged, related to EGR system.
Visual check of pipes and hoses.

Fault description
The differential pressure feedback sensor (DPF) is faulty.

Fault solution
1. Replace the DPF sensor.
2. Clear fault code and road test vehicle.

Recommended time
Labour time was 1.75 hours, taking into account research time, location of parts and actual time spent fixing the problem.

Tips for ideas division
Always check all the hoses and vacuum lines for any cracks or deterioration.

Customer complaint
No headlights.

Problem summary
Blinkers illuminate when headlight switch is on.

Diagnostic sequence
Checked all fuses and battery connections.
Checked earth points and found the earthing point front of main relay box was tight but there was a bad connection between the lug and the cable.

Fault description
The lug was a badly crimped connection.
This created a bad earth and circuit bleed through the blinkers to ground.

Fault solution
1. Removed and repaired all the earth connections.

Recommended time
Labour time was 1 hour, taking into account research time, location of parts and actual time spent fixing the problem.
TaT backs apprentice award

TaT has thrown its weight behind the 2010 National Automotive Apprentice of the Year Program.

Workshop managers are encouraged to nominate their 3rd and 4th year apprentices. The program runs for a year, with nominations closing in January 2010.

The form can be downloaded at: www.apajournal.com.au

The winners receive a limited edition Darren Morgan Tool Kit, a day with Darren Morgan and his team, a $1000 gift voucher from BOSCH, Trades Plus Cards and many other benefits.

The National Automotive Apprentice of the Year Program is an initiative of the Auto Parts & Accessories Journal.

TaT technical director Jeff Smit said his team was happy to support the search for Australia’s top apprentices in the motor trade. “We need to acknowledge that with technology changing rapidly, the industry is going to need a new breed of technician to keep our vehicles on the road.”

If all the technologies which just keep getting better and a lot more reliable, the improvements in LED lighting deserve acknowledgment.

One company, LED Technologies, a long time supporter of TaT, is among the leaders. TaT speaks with some authority because LED Technologies products have been in use in TaT workshops for some time with great success.

TaT directors were among the many who applauded the company for their award for the Best New Aftermarket Product (Parts) at the recent AAAA awards breakfast, held as part of the big AAAE Expo in Sydney.

Their MaXilamp3XR and MaXilamp5XR was the product which appealed to the judges.

These lamps will modernise the transport industry with their futuristic and robust design and aesthetic appeal.

LED Technologies have backed up their judgement with an unheard of seven year warranty.

They light up your life

The MaXilamp3XR and the MaXilamp5XR feature as standard, stop and tail lamps, indicator lamps, reverse lights and reflectors. The high impact acrylic cover makes it tough and it has UV protection against fading.

The LEDs and associated components are encased in a resin compound that cannot be penetrated by air or water and are also vibration proof.

They are naturally ADR compliant and are Dual Volt (12-24) Compatible.

The company also took home another purple ribbon, for having the best (and the brightest) display stand under 36 square metres.

It would be interesting to compare the current draw of all those LED lights to that which would have been needed to fire up the same display of the old incandescent lights! www.ledautolamps.com
I began this history lesson two issues ago, with a close look at the Impco-based systems on earlier Ford EB and ED models. This time, I will cover the Vialle Venturi systems as fitted on the six cylinder EF and EL sedans and wagons and XH utes.

Ford has provided factory installed LPG kits for some time. The following kits are dual fuel and require the petrol system to be operational to start. This can be bypassed on some models.

1993/94 EB and ED Ford - conversions using Impco equipment and APA tanks
- 225 mixer E converter with ADP (adaptive digital processor)
- mounted under driver’s seat

EF 6 Vialle LPG/Autogas Management System (AMS) computer dual fuel
- uses Ford computer dual fuel

EL 6 Vialle LPG/AMS computer dual fuel
- uses Ford computer dual fuel

The rest are straight LPG mono fuel
- AU1 Vialle LPG
- uses Ford computer

Always Vialle LPG
- uses Ford computer

BA Vialle LPG - uses Ford computer
BF Vialle LPG - uses Ford computer
BG Vialle LPG - uses Ford computer

Future - injection?

In the sedans, the tanks are mounted in the front section of the boot. In the wagon, the tank is mounted above the existing petrol tank under rear floor, which then requires the spare wheel to be relocated into the rear luggage compartment.

In the ute, the tank is mounted in the spare wheel well and the spare wheel is relocated.

The Vialle system uses Venturi or a donut ring to introduce LPG at the throttle body. A Vialle complex converter is mounted on the driver’s side inner guard with the AMS computer mounted inside the vehicle.

This computer controls the LPG system functions such as safety switch control, petrol injector disable, stepper motor mixture control and fuel gauge operation.

The system uses the petrol dash gauge to show fuel quantity for each fuel (the dash gauge swaps over to show LPG when on LPG, and petrol while running on petrol). The petrol pump is mostly turned off while the vehicle is running on LPG.

The petrol system is used to assist starting while on LPG. Petrol injectors are pulsed for the first few seconds when LPG is selected to assist starting and help prevent backfiring.

Venturi based systems are prone to backfiring due to faults in the ignition system. Spark plugs and leads can cause backfiring and so can lean mixtures.

Spark plugs are normally a colder heat range and reduced gap with shorter change intervals than a petrol fuelled vehicle.

It is imperative to keep the ignition system at its optimum on these vehicles.

Some of the AMS computer inputs include rpm, throttle position and oxygen sensor signals taken from the existing petrol EFI system. A stepper motor is fitted to the vapour output hose of the converter. The AMS controls this stepper motor operation to open or close the vapour outlet which then enriches or leans mixtures depending on oxygen sensor readings.

On the EF and EL XH Ford a dedicated Vialle tester is best used to check the stepper motor count and also gives oxygen sensor signals. A typical stepper motor reading is 165 counts at idle and varies slightly under load.

When LPG changes from a liquid to a vapour inside the converter, it requires heat taken from the cooling system heater water hoses to prevent the converter from freezing. Should there be any issues with the cooling system, this can cause the converter to freeze up. This could cause damage to the diaphragms in the converter which then causes water to be drawn into the motor via the LPG vapour hose. During normal servicing you should check the converter for any sign of water.

The LPG Vialle set-up procedure allows the AMS to know the best position of the stepper motor at idle and at 3000 rpm and should be done every 20,000 kilometres or when spark plugs are replaced.
The change-over switch mounted on the dash has LED lights which show green when on LPG and red when running on petrol - AMS needs to be put into set-up mode.

Prior to set-up make sure the ignition system is in optimum condition, the air filter is clean, there are no vacuum air leaks and the O2 sensor is in working order.

Drain the LPG converter through two 6mm drain bolts at the base of the converter. Small sludge can come out but no water (if water is in the converter it would require an overhaul and stepper motor replacement due to water contamination).

Clean the LPG idle jet found beneath the solenoid. Remove the coil and plunger housing, watch for the brass jet and ensure the spring doesn’t fly out. Beneath these is a small jet. Use the manufacturer's removal tool which consists of a long small screw with the removable spark plug screw cap which uses the spark plug thread to pull out the jet. Clean the jet with compressed air and reinstall.

Locate the AMS computer either above the handbrake or under the driver’s seat. Locate the yellow wire near the AMS wiring for O2 sensor and attach either a Vialle tester or a volt meter to check voltage for O2 sensor and attach either a Vialle tester (note number count at idle approximately 130-175 steps). A multimeter can also be used to confirm that the O2 sensor is in closed loop.

Common problems with these vehicles include backfiring caused by problems in the ignition system. There are also converter issues due to water problems and idling issues due to the idle jet being blocked. Major sludge or contamination in the converter slows the reaction time of the diaphragms inside, which can also cause lean mixtures and backfiring.

Other problems include blocked fuel injectors and petrol pump issues due to the petrol system not being maintained. LPG vehicle owners trying to save money forget to run their vehicles on petrol routinely once a week to stop the petrol from going stale and to give the injectors some fresh fuel to help maintain good flow patterns.

In the next issue I will cover later model vehicles which use the dedicated Ford computer to control the LPG system in which scan tools can be used for diagnosis.

Locate the AMS computer either above the handbrake or under the driver’s seat. Locate the yellow wire near the AMS wiring for O2 sensor and attach either a Vialle tester or a volt meter to check voltage. Locate the black and blue wires in a single detachable connector around the AMS wiring. Release the connector and provide 12 volts from the battery to the blue side wire.

Start the vehicle and the change over switch will flash. This will enable the system to learn the desired stepper motor position for idle and, after a period of time, the light will stop flashing.

If there is a problem with the mixture control, the change-over switch LEDs will flash. Very fast flashing would indicate a more in-depth problem. When the light stops flashing, bring the vehicle up to exactly 3000 rpm, press the changeover switch and again the LEDs will start flashing.

And again, if a problem exists it will be reflected in the flashing rate. When the LEDs stop flashing, the AMS has learned the required stepper motor value for 3000 rpm.

Turn the vehicle off and reconnect the wiring previously disconnected to initialise set-up. Recheck the closed loop operation with a Vialle tester (note number count at idle approximately 130-175 steps). A multimeter can also be used to confirm that the O2 sensor is in closed loop.

The three hour evening workshops are a mix of problem solving, diagnostic techniques and business development.

Jeff implores his audience to start giving their car-owning customers more choice in the parts their cars need, and to invoice for their brains and high tech tools, and not just their hours.

Despite the march of ever-baffling technology coming from the car makers, he suggests technicians should get back to the basics, like spending more time with the customer and test driving every vehicle regardless of the original problem.

The intensive training schedule around Queensland, New South Wales, Victoria and South Australia was possible only with the enthusiastic logistical support of Burson Auto Parts, Autodata, the Capricorn Society and Motor Traders.

Many technicians say the training sessions are the best they have ever attended, with ‘brilliant information and technical knowledge’.

The next series of training nights will be announced soon. Go to: www.tat.net.au for details and booking forms.

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Century races along

Australia's oldest battery manufacturer, Century Batteries, has been appointed official battery supplier to the Australian V8 Utes Series and Team Bray Racing.

All 32 race vehicles will be powered with a Century Battery at each event in the 2009 race calendar.

The racing body cited Century’s strong brand heritage, proven product range and 80 years of Australian manufacturing expertise as good enough reasons for the honour.

Century has also joined forces with Team Bray Racing to supply them with performance batteries for their race cars and fleet of support vehicles.

Victor and Ben Bray compete in the Australian Top Doorslammer Championship, regularly turning in performances which have cemented them as the leading names on the race circuit.

A Team Bray racer at work
SCRAP BATTERIES POISON OUR ENVIRONMENT

Create a cleaner future.

For more information contact your local CenturyYuasa representative on 1300 362 287 or visit our website: www.recyclemybattery.com.au
A lot has happened since I last touched base. While the world media concentrated on a swine flu pandemic, the United States managed to become more liberal with their airspace access and telecommunications with Cuba, and Mexico legalised possession of drugs, with relatively little protest.

I’ve made the change from Mexican tacos to Turkish kebabs, from a wake-up call of car horns to the songs of Allah, but meanwhile the world remains relatively the same. Since you are really interested only in cars, the theme of change got me thinking...

I talked with more than 50 company executives in my time in Mexico, and it became obvious that the two constants which lead to survival and success in an ever-changing world are versatility and a focus on quality.

The manufacturers of canned beans, face masks, antibacterial soap and anti-flu drugs took the meaning of diversification to an extreme as they prospered out of the swine flu (sorry, H1N1) epidemic. But in general terms, it seems those with the ability to read the market, identify trends, prepare in advance and not be afraid to be flexible have a competitive advantage.

In the automotive world, not only do economical, environmental and technological trends come into play, but there’s an over-riding fashion trend attached to car buying. Why else would there still be so many SUVs on Mexico City’s small, traffic-clogged streets and such a variety of fuel guzzling utes on Australia’s city streets if this were not the case?

In the words of one business owner who grew his company to 150-plus employees in their first year, with profits to match, ‘you have to be in continuous communication with your market, and be flexible enough to adjust and adapt to the changes that are happening all the time. If you are too strict with your implementation, the market will change and whether or not you see it, you are left behind.’ Wise words.

It sounds simple, but the contradictory trends in the automotive industry make predicting the evolution of cars as difficult as that of the next flu outbreak.

There’s a paradox between large car purchases and the environmental trend towards smaller, energy efficient vehicles; the hype surrounding new hybrid technologies versus the concerns of the oil-rich nations which have a vested interest in the petroleum consumer.

So, where is the industry headed and what is being done by those who wish to prosper, or indeed survive, in the future?

If you look towards Japan, the future beholds a complete overhaul of the automotive industry as we know it today, both for OEMs and the aftermarket repainers – future motorists will be the Jetsons, and auto technicians will be the geniuses.

Staying in touch with what’s cool, what’s legal, what’s most technologically advanced, environmentally efficient and the consumer’s new ideas on what represents service, is a tough task, but that's what you have to think about.

So get your heads out from under the bonnet occasionally and look around you. Put your spanner down every now and then and read the trends, talk to your customers, join an association, get the feel of the market. You’re not just a mechanic or a technician any more – you are part soothsayer.

For me, it makes adjusting to a new country and new style of meat in flatbread a breeze. So I’ll leave you to your work and your explorations of the future.

*From Istanbul, Hayley*

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**Merc goes hybrid...**

**Mercedes Benz has just released their first full production hybrid, the S400.**

Their claim of 7.9 litres per 100 kilometres is not bad considering its size and weight. It may even belong in the limousine class. The main engine is a 3.5 litre petrol V6 which is then linked with an electric motor before going into a six speed automatic transmission.

The battery pack in this model is lithium-ion.

To achieve its 7.9 litres per 100 kilometres, the petrol engine switches off when the vehicle is stationary, and starts when the acceleration pedal is depressed.

The S400 is currently available only in left hand drive but plans are in place to market a right hand drive model after 2012.
Most people take the simple task of the Idle Air Control (IAC) for granted, apparently not understanding completely the influence this device has on the correct functioning of related components.

Let me give some examples of vehicles that have suffered the fate of faulty IAC. Holden Commodore, say from VT onwards, relies on correct idle speed to control correct emissions at a predetermined idle speed. This is called Desired Idle Speed and has a big bearing on things like transmission control pressure and sitting on the correct fuel cell or adaptation.

Idle speed can be incorrect for different reasons. For example, air leaks via external faults such as manifold gaskets, air induction hoses or incorrect Throttle Position Sensor (TPS) voltage can cause high or low idle speed due to the computer thinking the throttle is now open. This creates a difference between the TPS telling the computer the throttle is open and the signal from the Mass Air Flow (MAF) giving a low air flow reading. This can cause the engine to hunt as the MAF signal changes at different idle speed.

There are a number of ways the ECU controls idle. It can be through a stepper motor type commonly used in Holden Commodores, a solenoid construction that you would normally see in earlier Falcons and the rotary type used in a lot of European vehicles.

Lately the trend has gone to throttle body control, whereas the throttle body has no mechanical connection between the foot pedal and the engine (commonly known as fly by wire). This system means the throttle is controlled by the ECU. It also allows the ECU to control other functions such as cruise control and traction control through the throttle body.

The solenoid type has two pins – battery power to one side and is switched by the computer on the other pin. The ECU pulses the negative side of the solenoid via a frequency while controlling the length of time it stays open with duty circle (Fig 1).

The testing procedure is to use a multimeter to check for power and frequency. Ideally an oscilloscope is the better option. Generally the IAC fails by going open circuit or short through to the body of the IAC, which can damage the idle circuit in the computer.

Stepper motor type IAC is a little bit more complicated. The most common are the four pin and six pin types. In the six pin Mitsubishi type, there are two internal coils with each coil having two windings, making up three rows of two pins each.

When looking at the housing with the six pins, the two centre pins are supplied with 12 volt power and the outside four pins are supplied with earth triggers controlled by the ECU. The ECU will trigger the four windings in different sequencing depending on whether the spindle head needs to extend or retract (Fig 2).

The construction is made up of the centre being a live magnet with a north and a south pole. By energising the fields on either side, the magnet can be spun either way. The magnet is threaded on the inside where the threaded spindle for the air passage opening is situated.

As the magnet turns, the pintle is wound up or down depending on the idle speed required.

Testing is best done with an oscilloscope or through the data in your scan tool (Fig 3).

There is an inexpensive tool you can make, using an old IAC carcass, that clips into the harness which enables you to test the computer switching side (Fig 4).

The ECU is able to count the amount of steps from idle position to when there is a load put on the engine -for example when the a/c is switched on or the transmission is selected into drive. If for some reason, such as the battery being disconnected the ECU can lose that memory and it will have to be relearned.

Some manufacturers will build into the software a function known as actuation where the scan tool can reset the memory. This process can enable the ECU to then go through the function of driving the IAC in and out from zero to maximum steps. It knows where the IAC is and at the correct amount of steps for idle.

The rotary IAC motor works on the same principle as the solenoid type, whereas the solenoid will move in and out, the rotary will rotate, exposing the air inlet for higher idle. Most commonly used on European cars, it has a quicker response time compared to the solenoid type. Testing is the same as for the solenoid version, once again better done with an oscilloscope (Fig 5).

Fly by wire type throttle is best tested through a scan tool. The data will normally have two pieces of information from the pedal - voltage increasing and decreasing with pedal operation. This lets the ECU know what amount of movement is required at the throttle.

To coincide with the pedal position, the Throttle Body Control (TBC) will let the ECU know of its position by sending a voltage signal back to the computer. Some manufacturers had some trouble with earlier versions and had to upgrade through the software, so before you rush out and replace the TBC, check and make sure there is an upgrade for it.

VW use a similar system to fly by wire but with the throttle cable going to the throttle body, the cable controls the throttle opening above idle but the throttle is controlled by the motor on the side of the butterfly shaft at idle.

This system does have its fair share of problems and may have to be realigned. This is done through the scan tool under measuring blocks, basic settings or adaptation.

The procedure is called Throttle Body Alignment (TBA) and you will find most scan tools will carry out this function.

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Nick Murphy

Happy diagnosing

Nick Murphy
By Deyan Barrie

Do technicians realise how easily a Body Control Module (BCM) can fry instantly if they don’t pay attention to the thermo fan relay replacement?

As is the case with situations like the one in this story, it’s a matter of understanding how the circuits operate.

In this case study, a Holden Commodore VT, engine thermo fan change-over circuit operation, it is the earth side of the fans which is controlled and switched on and off.

Bosch identifies all relay pin numbers and gives them a specific job description. We will only look at the relevant pin numbers in the change-over and standard relay configuration.

Listed by their terminal pin numbers and definition of each, here they are:

- Pin 30 = input or source
- Pin 85 = output, actuator (end of winding to ground or negative)
- Pin 86 = start of winding
- Pin 87 = input
- Pin 87a = 1st output (break side)

The wiring diagram shows the power supplies to the two fan motors (M6), highlighted in red. The power supplies to the two thermo fan relays (K12-1 and K12-11).

In fact this is the circuit that comes from the fan motor looking for an earth to make it run. This is shown in the diagram as dotted red. The other terminal with voltage is pin 85 and this is a positive supply from the EFI relay output.

On the VT the BCM gives a negative output trigger to pin 86 energising the relay (yellow).

Pin 87 is an earth supply (green).

Pin 87a is normally closed when at rest and is connected to pin 87 of the high speed fan.

Instead of supplying an earth to a relay coil winding, what it is waiting for is 12 volts through the fan looking for that earth to make it operate. Zap! There go the BCM micro circuits that are designed to carry very little current - certainly not the load of a thermo fan motor.

If you fit the incorrect relay, the pins 30 and 86 will have swapped. Pin 86 of the relay will have a power supply via the fans and so does pin 85 from ignition, therefore the relay will not energise.

Have a good look at the relay connections and their sources.

In one scenario, removal of the original relay because it failed, and fitting another that may look the same but is not, will cause damage to electronic components.

This needs clarification. The difference between the earlier style common change-over relay and the newer European or Hella configuration is that they swapped the location of pins 30 and 86 (pics 1 and 2).

If you fit the incorrect relay, the pins 30 and 86 will have swapped. Pin 86 of the relay will have a power supply via the fans and so does pin 85 from ignition, therefore the relay will not energise.

But check out what is going on with pin 87a. It is at rest and a circuit is made through to pin 30 which will have an earth supplied to it by the BCM when the engine reaches operating temperature or the a/c is switched on.

This applies to the Commodore V6s VT to VZ as far as the change-over relay is concerned.

The early VT has two dual speed fans and from there on it depends on a combination of things such as whether it is a super-charged model or not, a Berlina or Calais and so on. With single speed engine fans, the passenger side fan was fan 1 or low speed, and driver’s side the high speed.

In the VT and VX the low speed is triggered by the BCM and the high speed by the PCM.

In the VY and VZ, both relays are controlled by the Powertrain Control Module (PCM) which is even more frightening. The VE still has the same change-over relay but it appears the wiring has been changed so that pin 85 is the earth trigger side and pin 86 the power supply.

I would like to recommend that technicians check this out. Get wiring diagrams for engine fans of all four vehicles mentioned above. Make as many copies as you need and turn this into a basic in-house training program.

You should get some colour marker pens and trace the circuit through. Mark the power going to all the components in red, the earths in green and the triggers in yellow. Use blue to highlight the circuits waiting to be switched on.

We are never too young or old to learn something and you might be pleasantly surprised at the outcome of this little exercise.
Auto CPR on New Years Eve...
By Gary Reid

31 December 2008

The vehicle is a Nissan R33 Skyline (import). The vehicle just stopped while being driven. I think I’m going to need as much help as I can get. I need to apply CPR.

So I start with the questions. ‘Madam, is there any repair history you could tell me about before I commit time and resources to this problem?’

‘Yes! My ex who is a motor mechanic maintains the vehicle and he will be paying you for your efforts. Will it be ready soon? I’m a single mum and its 10am New Years Eve’.

‘Hmm! If you could wait a few minutes, I’ll have a quick look in case it’s something simple’.

Some basic checks, like voltage supply at the battery and checks of earth points. Jumped into the vehicle and turned the ignition on. No dash warning lights. Glanced at the center console and the auto stick is in park.

Looked back at the key to confirm it was a single metal key with no evidence of a transponder. Flicked the headlights on to confirm battery voltage. OK. Looked for and found an aftermarket alarm warning LED (not illuminated). I also noticed a turbo timer, an expensive aftermarket sound system and an array of buttons and switches that were not fitted by the vehicle manufacturer.

Grabbed my 10W incandescent test light and boldly went under the hood (be careful where you use this type of test light) with the ignition key on, hoping to find some power at the ignition coil packs or anything that might resemble an inertia switch. We should all know that an inertia switch usually isolates the fuel pump, but being an import you never know. No joy at all.

At this point I informed the client this may take a while. I’ll call her when I have some news - prognostic results strong enough to be used in a diagnosis.

Before the vehicle owner toddled off I thought I should use the C (collect info) in auto CPR and ask if there were any alarm keys for this vehicle. I was informed there were two new remotes in the glove box but they had not been programmed as the system worked well just by locking the car manually.

After collecting the information from the customer, I moved on to printing all the information. I filled in my vehicle event form (VEF) so that I had all the information as I progressed. Also, if another technician were to take over this job, there would be enough information and history to continue the diagnosis.

The C in CPR also means collecting enough info about a system to make you feel confident about performing further diagnosis.

(Note: If you don’t know the system, don’t take on the job unless you have enough information as you could unintentionally make things worse. The website www.tat.net.au is a good starting point. Search for similar vehicle system faults.)

I know from experience that in order to locate and repair the fault with this vehicle I would need good information such as a wiring diagram including a component location guide, or technical assistance (lots of luck at 11am New Years Eve.)

I determined it was blown by a hard short to ground ‘high current, short time’. This vaporises the fuse wire. Not a slow current ramped over a long time frame as in a motor winding or solenoid short. This deforms and melts the fuse as evidenced by the residual fuse wire.

I substituted the blown link with my short circuit locator, a non-thermal, 34 millisecond trip time manual reset circuit breaker. Turned the key on and, wait for it, the circuit breaker stayed engaged! The instrument cluster and all the accessories lit up like a Christmas tree, the fuel pump roared into life and she was ready to go.

What the heck! Come on, it’s New Years Eve. The thoughts of my family commitments and fireworks over Sydney Harbour were fading as my stress level elevated. Then I remembered what I had stated in an earlier article about not stressing out if you perform CPR correctly.

At this point, I would definitely have added some more questions to my VEF, like, has this ever occurred before? I was expecting the pizzo siren in the tester to go ballistic as the short tripped the tester contacts. The engine started and approximately three seconds later ‘buzzzzzz’ - the short was there.

The short was present for only a few seconds after the engine was running and for a few seconds after engine shut down. I repeated the test procedure and the results were the same. So the window of opportunity to trace the problem was only a few seconds. What do I do now? I know, back to CPR!

R: In this case I studied the wiring manual and decided to remove (in a logical sequence) all downstream items associated with the fuse link. The easiest connector to isolate was the ignition coil’s power supply (pic 2).

Presto! The short was no longer there. After I disassembled the turbo crossover plumbing and the coil on plug (COP) protective
cover (pic 3) it revealed the reason I needed engine vibration to entice the short to occur (pics 4 and 5).

From personal experience, about 50% of vehicle faults are induced by humans

This diagnostic should have been easy and stress free. I had a tight schedule in which to perform a quick miracle! If it weren’t for the auto CPR method I may not have successfully repaired this vehicle as efficiently.

Did anyone notice I did not use a scan tool to assist in the collection of usable info in the beginning of the auto CPR?

The reasoning is that, due to the lack of ignition voltage at the coils, instrument pack and no audible fuel pump or relay, I concluded the engine and transmission ECUs would be incapable of communication with a scanner.

As I mentioned in a previous article, while you have the scanner connected it’s good practice to scan the entire vehicle with the intention of pre-warning the owner of any impending faults.

In this case a DTC for high AFR compensation, lambda too lean, was logged probably due to the factory 7.5lbs of boost being manipulated to 12lbs. And a DTC for the 4WS that’s most likely set due to the nine-plate trunk mounted battery. Under cold crank the 4WS ECU would receive less than nine volts.

Fellow technicians, may I suggest, in a confusing stressful diagnostic situation, stop! Take a breath! Reach deep inside to pull out your equivalent of auto CPR, and modify your VEF.

Feedback is always appreciated by TaT so if you have a diagnostic life saving experience please let them know.

Happy diagnosing everybody, especially next New Year’s Eve.

Gaza

TaT brings real life repair dramas to training...

TaT trainer Jeff Smit continues to add value to the AutoPartners training nights being conducted across the country.

The popular events, which are free to technicians, feature presentations by a range of manufacturers and suppliers, augmented by TaT’s hands-on problem solving experiences from its own workshops.

Program:

Wed 10 June - Rockhampton Qld
Thur 11 June - Bundaberg Qld
Mon 22 June - Campbelltown NSW
Tue 23 June - Penrith NSW
Wed 22 July - Capalaba Qld

Tue 28 July - Cheltenham Vic
Wed 4 August - Perth WA
Wed 5 August - Rockingham WA
Tue 11 August - Gosford NSW
Wed 12 August - Chatswood NSW
Wed 25 August - Geelong Vic

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Autodata Australia will soon launch Australasia's only dedicated electronic air-conditioning information system on CD which will be supported by twice-yearly updates and technical phone help.

National Sales Manager Brett Engeman said the new product would have great appeal to technicians specialising in a/c, with the module priced pitched at less than one-third the cost of the standard full automotive package.

“It’s a perfect solution for the technician who needs quick access to features like system pressure information, wiring diagrams and component locations in the engine bay and facia, covering a wide range of makes and models,” said Brett.

The air-conditioning information module will be updated twice a year, and these will be posted to the subscribers.

The Autodata system is unique in that the company, with more than 30 years experience in automotive information and publishing, uses a special software code which delivers a dynamic and highly interactive program rather than static drawings.

“By using our new CD, a technician can quite conceivably avoid a costly and embarrassing a/c repair simply by knowing that he doesn’t have to pull out the whole dash to get to some evaporators,” Brett said.

The CD covers more than 50 car and truck makes, and thousands of models.

A seven-day trial of the a/c CD is available at: www.autodata.com.au/aircon

Information Ph: 07 3245 3282
b.engeman@autodata.com.au
May 2009 Federal Budget - Superannuation

The Global Financial Crisis has severely affected all parts of the economy including the financial services sector and harsh measures were much foreshadowed. However in reality the measures announced in the Budget for the superannuation industry were arguably far less than anticipated. The 2009 Budget has introduced the following proposed changes to superannuation:

Concessional contributions cap

The concessional contributions cap will be reduced from $50,000 to $25,000 with effect from 1 July 2009. This cap will continue to be indexed.

The transitional cap for concessional contributions for those aged 50 years and over will also be reduced, from $100,000 to $50,000. This reduced cap will apply for the 2009/10, 2010/11, and 2011/12 financial years, after which individuals aged 50 and over will revert to the lower $25,000 cap (indexed). The transitional cap is not indexed.

Non-concessional contributions cap

The non-concessional contributions cap will remain at $150,000 for the 2009/10 financial year, and will only increase when the new lower $25,000 cap is increased by indexation.

Going forward, the non-concessional contributions cap will be calculated as six times the level of the (indexed) concessional contributions cap.

It is expected that the bring-forward provisions will continue to allow eligible individuals to make non-concessional contributions of up to $450,000 over a three-year period.

Temporary reduction to the Government Co-contribution Scheme

The Government will temporarily reduce the matching rate and maximum co-contribution that is payable on an individual’s eligible personal non-concessional superannuation contributions, with effect from 1 July 2009.

The superannuation co-contribution matching rate will be reduced from 150 per cent to 100 per cent for contributions made in the 2009/10, 2010/11 and 2011/12 financial years, and to 125 per cent for contributions made in the 2012/13 and 2013/14 financial years.

The maximum co-contribution payable will be reduced to $1000 for contributions made in the 2009/10, 2010/11 and 2011/12 financial years, and to $1250 for contributions made in the 2012/13 and 2013/14 financial years.

The co-contribution matching rate and maximum co-contribution payable will return to 150 per cent and $1500 for contributions made in the 2014/15 and later financial years.

The co-contribution income thresholds will continue to be indexed. No changes were announced in relation to other eligibility requirements for the co-contribution.

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<td>Matching rate</td>
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<td>100%</td>
<td>125%</td>
<td>150%</td>
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<td>Maximum co-contribution</td>
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<td>$1,000</td>
<td>$1,250</td>
<td>$1,500</td>
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<tr>
<td>Reduction (per dollar of income in excess of the lower threshold)</td>
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<td>3.333 cents</td>
<td>4.167 cents</td>
<td>5 cents</td>
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Minimum drawdown on account-based pensions

The Government will halve the minimum drawdown amounts on account-based pensions for the 2009/10 financial year. This extends the drawdown relief provided by the Government for the second half of 2008/09. This change is intended to assist pension account balances to recover from capital losses associated with the global recession.

Small and insoluble superannuation accounts

Superannuation providers will be required to transfer certain lost superannuation accounts to unclaimed monies, with effect from 1 July 2010. Superannuation providers will be required to transfer lost accounts with balances of less than $200 (small accounts), and those which have been inactive for a period of five years and have insufficient records to identify the owner of the account (insoluble accounts).

There are currently around 3 million lost accounts with balances of less than $200 and this measure will potentially reduce the problem by 40 per cent.

It will also bring long-term benefits for funds as they will no longer need to administer or apply member protection to dormant accounts. It will also improve equity for other fund members where costs are currently apportioned to those members when applying the member protection rules.

Former holders of these lost accounts will still be able to reclaim their money from the ATO at any time.

For more information please contact MTAA Super on 1300 362 415

The information in this article is provided by Motor Trades Association of Australia Superannuation Fund Pty Ltd (ABN 14 008 630 628 AFSL 238718), Trustee of the MTAA Superannuation Fund (ABN 74 559 365 913). Any advice contained in this article is of a general nature and does not take into account your objectives, financial situation or needs. All care has been taken to ensure that the information contained in this article is correct at the time of this publication; however, neither the Trustee of MTAA Super nor its advisors accept responsibility for any error or misprint, nor for anyone acting on this information.
A few issues back, this magazine ran a story about this new and rather idealistic plan that would see Australia as the third country in the world to establish an electric car network.

International company Better Place had teamed up with AGL Energy and Macquarie Capital Group to put the infrastructure in place that could see this country’s vehicle fleet running on battery power.

TaT wondered at the time why a story with such far reaching impact on the way we move around received such a poor reception in the Australian media. Perhaps the concept was too unbelievable, but lately, Better Place’s CEO in Australia, Evan Thornley, had been getting his message across. TaT thought it was time to revisit this story, and invited Evan to put his case to technicians through this magazine.

Better Place is the world’s leading electric vehicle services provider, delivering services to enable confident adoption and use of electric cars. They build and operate the infrastructure and systems to optimise energy access and use, and work with ecosystem players to enable a compelling and integrated solution.

We at Better Place believe the mass adoption of electric vehicles is inevitable.

Anyone experienced with motors would know that electric motors have significant energy cost and engine efficiency benefits. A typical internal combustion engine converts below 30% of the energy it consumes into propulsion – the rest is lost as heat and vibration. By contrast, a typical electric motor converts over 80% of the energy consumed into propulsion, and that efficiency figure is continually improving.

There is less need for investment in heat and vibration management and less wear and tear on the motor and vehicle, which means lower ownership costs. This fundamental efficiency advantage – combined with the lower noise and exhaust emissions – has long seen electric vehicles identified as an attractive alternative form of transport.

Indeed, back when cars were first being produced, electric vehicles outnumbered internal combustion engines. However, they quickly lost out to petrol power, partly because there was at that time limited availability of electricity in the countryside and because of the power to weight disadvantage of batteries which tended to force compromises on either the performance (speed and acceleration), size or range of electric vehicles.

The wide availability of the electricity grid and recent advances in battery and engine technology have made electric cars a real alternative. New lithium ion battery chemistries combined with latest generation permanent magnet electric motors offer the potential to build full size electric vehicles with driving ranges that cover nearly all daily journeys while providing superior performance to conventional vehicles.

This new generation of battery technologies is also able to sustain a higher number of charge cycles over their lifetime, which lowers the lifetime per kilometre cost of electric transportation below that of oil-based fuels. Global auto makers including Nissan, Renault, Ford, General Motors, BMW, Volkswagen, Toyota and Mitsubishi and new entrants BYD (Chinese automobile manufacturer, founded in 2003), Tesla Motors and Fisker Motors are now actively pursuing the electric vehicle (EV) market opportunity.

Economically it makes increasing sense for consumers to buy EVs, with battery costs continuing to fall and energy, even renewable energy, costing substantially less than petrol. Consumers will also enjoy reduced servicing and lubricant costs, and regenerative braking also helps extend the life of brake pads. It should also be noted that once EVs enter scale production, the vehicle (without battery) should be the same or less cost to produce than a conventional vehicle.

Sound economics will not be the only compelling reason for consumers to purchase EVs. EVs can provide superior acceleration from rest and do not need multiple gears to match power curves. EVs will have better handling due to low positioned batteries lowering the centre of gravity, and lower cabin noise. Consumers will also be motivated by their desire to make a contribution to the environment. Over time, as the full design potential of electric motors is realised, cabin room will be increased as motors can be positioned in the wheels.

Governments also have a lot of reasons to encourage consumers to choose EVs. Most obviously, EVs emit no exhaust. This is a significant benefit to cities with air quality issues. EVs powered by low emissions energy sources can also significantly lower emissions from the transport sector which is globally responsible for 14% of all carbon dioxide emissions. Governments in oil importing nations will be attracted by the opportunity to significantly improve their energy security and increase their flexibility to shift to new energy production sources as they come onto the grid. Governments will also be attracted to the increased input cost stability of electricity, further limiting the effect of oil price volatility on their economies and on their voters’ household budgets.

Many governments will be particularly attracted to the natural fit between battery powered EVs and intermittent renewable energy sources such as solar and wind, the storage capacity in the batteries making intermittency much less of a problem.

With consumer electronics and public policy now moving firmly behind EVs, there remain only a few barriers to mass EV adoption - battery range, battery price and infrastructure requirements.

The Better Place solution has five major components to deal with residual challenges of the fleet converting to EVs - charge spots, battery switch stations, on-board software, the service and control centre and standards-based technology.

In short, the solution comprises infrastructure that allows cars to recharge whenever they are parked or be quickly and conveniently recharged on longer journeys, providing batteries to consumers as part of a long term contract for services, software and network control facilities that manage the system and global standards and technology systems.

Together, this means that owners of an EV can start each day with a ‘full tank’, conveniently ‘refuel’ whenever they want to and face no price barrier to switching.

We think a lot of people will want to switch. We’re aiming to start a major infrastructure rollout by 2012 and believe that because the market is mobilising behind EVs, the majority of the Australian car fleet will be converted to electric in the next 20 to 30 years.

Watch a video of Better Place’s switch station mechanism removing and replacing an EV battery in less than 60 seconds on their website:

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