

Sore Soarer

This article is a true description of an AECS technical help desk problem and how it was solved.

Vehicle

1991 Toyota Soarer 1UZ-FE V8.



(Picture sourced from internet)

Problem presented to the Helpdesk

This Toyota rarely starts and runs, other times it appears to run on some cylinders very briefly but then dies. The vehicle was towed to the workshop.

The vehicle was purchased with mechanical warranty so when the fault occurred the owner took it to a workshop to be repaired. Finally, after a lot of "swapnastics" it was taken to a workshop equipped with diagnostic equipment. Being of this vintage the vehicle only had the older 20pin Toyota diagnostic plug, we tried to establish communication with the Launch Pro3 however the tool informed us that only flash codes could be extracted and that we should monitor the check engine light to get the codes.

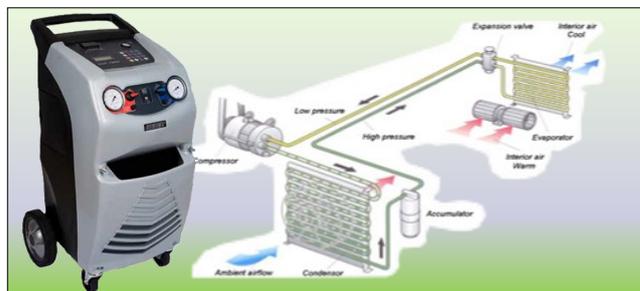
When looking closer no check light or oil pressure light were present!!!

Nevertheless, the diagnostician was not distracted by what could potentially be a blown MIL light bulb and grabbed an ATS scope.

Ignition over Injection

Ignition and injection are in most cases the starting point in diagnostics, fuel needs to go into the combustion chamber and it needs to be ignited. So the first measurement should always be ignition over injection. Being a V8 with two coils, two ignitors and 8

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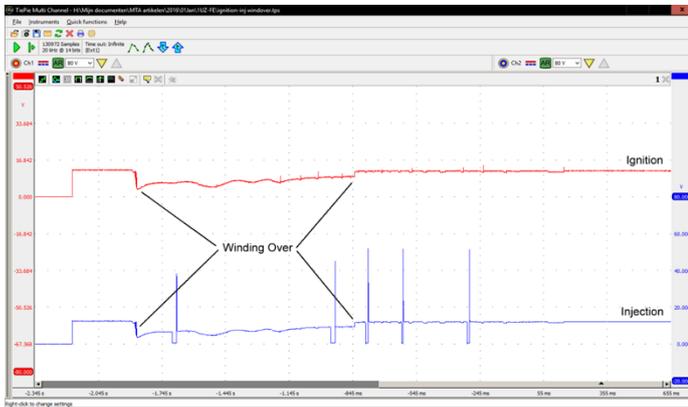
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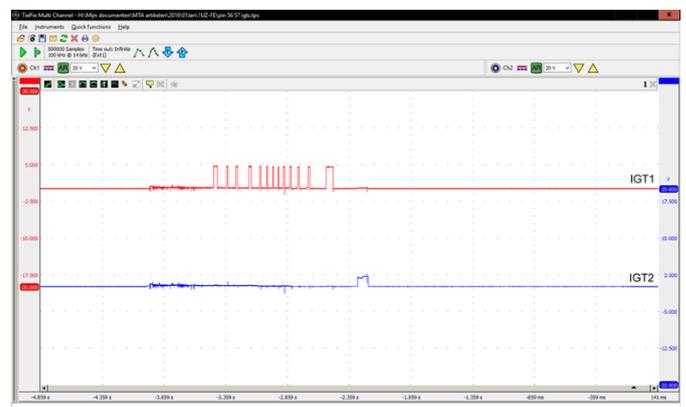
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Picture 1: ATS scope recording of ignition over injection winding over

injectors it is a pick-one approach. Wanting the job finished efficiently the technician grabbed the easiest-to-get-to injector and coil. In picture 1 is what he measured. From this scope recording it is pretty clear why the engine doesn't start! There is no switching happening on the ignition coil. Hmm..... with two coils and two ignitors the place to measure was the ignition triggers. (Picture 2)



Picture 2: Ignition triggers measured at the ECU.

Logic

What could cause one of the ignition trigger pulses to be missing? This vehicle has two cam shaft sensors and a crank shaft sensor. A missing camshaft sensor input can have as effect that one of the banks isn't triggering. Although on more modern EFI systems the ECU will wait for the cam signal and if it doesn't arrive a code will be logged and the vehicle will be in limp-home and calculate its phasing off the one remaining good sensor. However, we were not sure on the behaviour of this older control system.

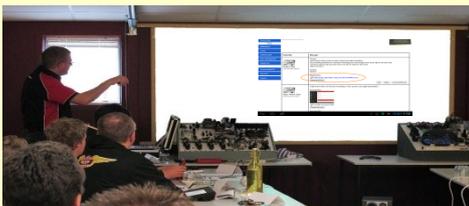
Did you know?

That AECS has introduced two new trainings for 2016...

In September 2015 we wrote about the SCAN 2 that had been developed to follow on from the SCAN1 training and the ATS1-2 which has been designed exclusively for ATS Scope users.

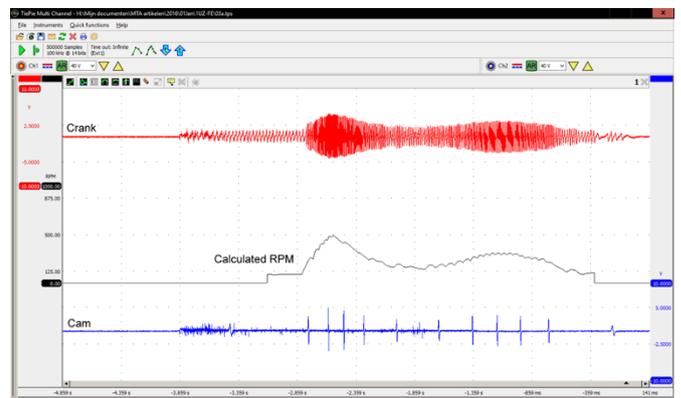
The SCAN2 training looks at diagnostic live data

recordings (practical study cases) by having a number of live data



recordings loaded on our training forum, for you to diagnose and learn from in a class room situation. The practical part of this training is a really nice part where late model vehicle technology is looked at and where the live data recording plays a crucial role.

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Picture 3: ATS500XM 2CH scope recording of Crank vs. Camshaft sensor with Calculated RPM line

As the next logical step the crankshaft and both cam shaft sensor voltages were checked at the ECU in picture 3. The sensor earths and signals were OK.

Brick wall

The ECU core inputs were correct, the ECU earths and power supplies were also correct but the outputs from the ECU were still not OK! Hmm... one of the ignition modules could have an internal short. To confirm this the modules were

swapped from the LHS to the RHS with no change.

There could be a short in the wiring loom. The faulty Ignition trigger wire was cut at the ECU to see if the trigger pulses would return.

The pattern that was measured is shown in picture 4.



Picture 4: Faulty IGT and good IGT

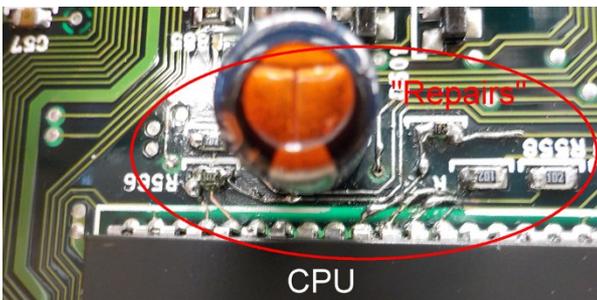
The pattern shows that the good ignition trigger happily pulses the coils whereas the faulty ignition trigger produces a voltage output greater than 5V?? Huh!

A deeper look

The technician has confirmed that the inputs to the ECU are good, yet we still have a faulty output from the ECU. Therefore, the ECU must be at fault!

Here I must emphasise that many technicians jump to the wrong conclusion and replace the ECU. Please realise that ECUs are rarely faulty and that in many cases replacing the ECU unnecessarily can cost you hundreds if not thousands of dollars.

In this case however the technician opened the ECU for a closer look. (picture 5)



Picture 5: Inside the ECU

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It is clear that somebody has already had a decent go at trying to solve this problem vehicle. To me it looks like the capacitor has leaked and the alkaline from the capacitor has eaten away the traces and components on the circuit board which has subsequently been “professionally” repaired.

Conclusion

The owner of the vehicle is now deciding whether or not to proceed with ECU replacement as the vehicle is old, so unfortunately we cannot tell you if this was the only problem.

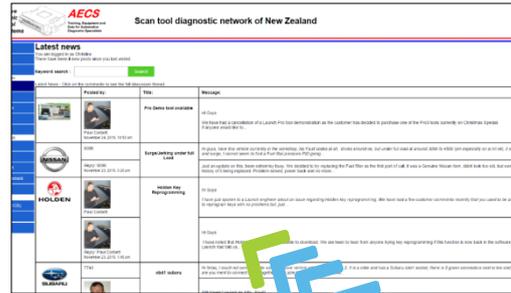
Quality equipment, a good skill set and accurate information has led the technician directly and efficiently to a major fault and was able to inform the owner at minimal costs what needed to be done next.

Systematically working through the inputs and outputs have made this job on normally uneconomic vehicles still profitable for the workshop.

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3	AED - Auckland		3	3	3		3	3	3
4	CAN Bus - Auckland		4	4	4		4	4	4
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SCAN 1— Scan Tool Diagnostics (SCAN1) training seminar
 SCAN 2— Scan Tool Diagnostics (SCAN2) training seminar
 RBM1-1— RBM training for COF VIs

EMS1-4—Hybrid Management Systems (EMS1-4) training seminar
 EMS1-5—Engine Management Systems 1 (module 5) (EMS1-5) training seminar (immobiliser)
 DMS1-3—Diesel Management Systems 1 (module 3) (DMS1-3) training seminar (common rail)
 ECAC 1-1— Electronic Controlled Air-conditioning 1 (module 1) (ECAC1-1) training seminar

Course Key
 AED—Automotive Electronic Diagnostics
 ATS1-1— ATS Comprehensive Scope training on software
 ATS1-2— Competent scope users Supplement training seminar
 EMS1-1— Engine Management Systems 1 (module 1) (EMS1-1) training seminar
 EMS1-3— Engine Management Systems 1 (module 3) (EMS1-3) training seminar (cam timing, variable lift, and direct injection petrol)

Full comprehensive descriptors with training content pictures on www.aecs.net