

CROAKY Cruiser

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

Vehicle

2001 Chrysler PT Cruiser 4 cylinder petrol Auto.

Problem presented to the Helpdesk

We have a 2001 Chrysler PT cruiser in the workshop. The car has a hesitation over 60km/h. The joy with this fault is that it is not intermittent; it is there all the time at any speed above 60km/h. We have sent you some scope patterns with the fault on it, captured through the intermittent fault function of our ATS scope.

I have checked/scoped all the earth's and power supplies to the ECU and found no fault.

Your advice on this fault would be greatly appreciated. There are no fault codes.

P.S. the garage that sent the vehicle to us, had changed spark plugs, injectors, air mass sensor, oxygen sensor and the auto gearbox, prior to it coming to us, with no change in the driveability. They then refitted the old gearbox and sent the car to us for professional diagnosis.

So where do you start?

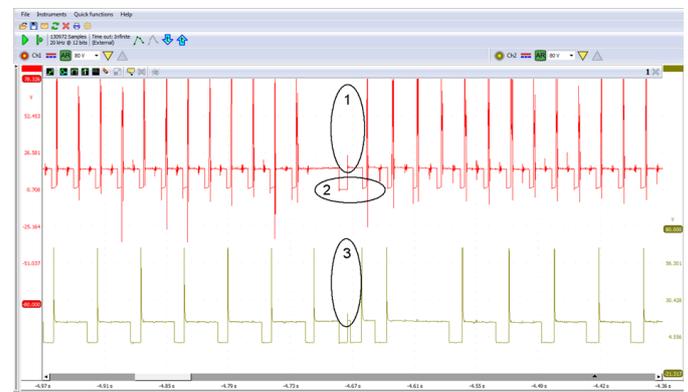
As almost always the best place to start is Injection over ignition dual channel, this will reveal why the car hesitates in almost all cases. It shows timing problems, ignition quality problems, injection quantity problems, etc. The diagnostician emailed the following recording to the AECS help desk.



ATS 5000 6 Second flawless recording of ignition vs injection when the slight misfire happened twice

A quick scroll through the ignition injection pattern showed immediately a problem with both the ignition and injection signals.

Zoomed in the pattern revealed even more:



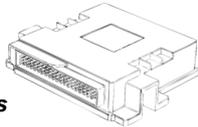
ATS 5000 scope pattern zoomed in on area of interest.

The pattern shows irregular injection and ignition at the same time. It looks as if both suddenly get triggered at the same time, while they are never triggered the same elsewhere in the pattern. Also the missing inductive spike (1 and 3); indicate there is no collapsing magnetic field in both the

Some of the information discussed in this article is studied further in EMS 1-1.

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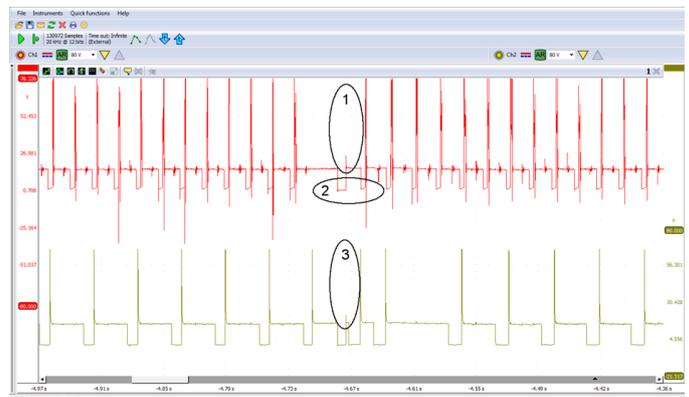
injector and ignition coils. The poor ignition earth seems also suddenly good (2). This all points to an interruption in the combined power supply of both the ignition coil and the injectors for a very brief period of time (about one revolution).

Wiring diagram

Looking at the wiring diagram revealed that both the ignition coil and injector get their power supply from a system main relay. Next measurement needs to be done at that relay to see if the relay gets deactivated for a brief period of time or that simply the contacts in the relay are faulty.

The measurement made on the ignition coil and system relay output was not saved, but the power supply to the coils and the voltage at the output of the relay disappeared at the same time.

The following measurement was made on the relay activation wire and the ignition coil.



ATS 5000 scope pattern zoomed in on area of interest.

The relay was being de-activated at regular intervals for about 12 msec !

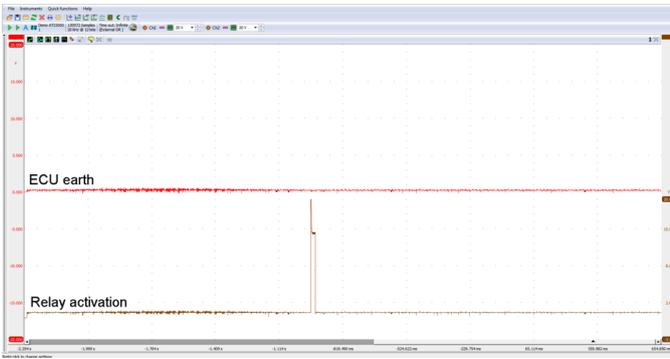
Why?

Why would the system relay be deactivated for such a short period of time? Was the relay being de activated because the ECU told it to do so? Or was it because the relay activation circuit was crook?

We measured the relay activation wire dual channel with the ECU earth.

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Recording of the relay activation wire and the ECU earth measured at the ECU.

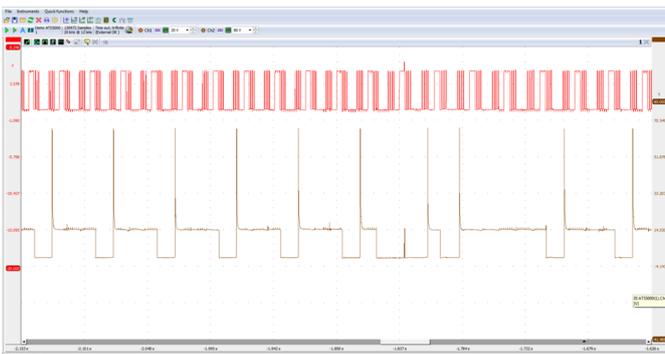
The earth of the ECU looked really beautiful while the fault happened, so an intermittent earth problem and an intermittent break in the signal wire were ruled out.

It had to be the ECU commanding that the relay be de-activated for that period of time.

What was the ECU up to?

Why would an ECU mid-flight decide to switch the main system relay off? It could do this as a result of incorrect inputs. The main contenders are crank shaft/camshaft signals and the torque control management of the ECU. I must honestly say that we were not sure if the torque management is a signal from the ECU to the gearbox or the other way around, for now it was easiest to measure both signals.

For editorial purposes I have only printed the Crank shaft and Injection pattern:



Crankshaft and injection recording while fault occurred.

There were no discrepancies in the crankshaft, camshaft and torque control patterns while the fault occurred. We even went as far as hitting the

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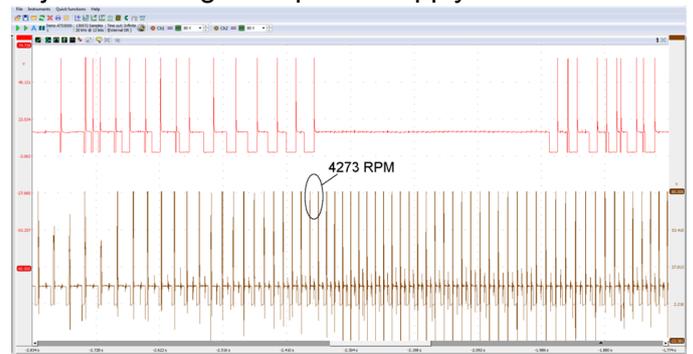
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rev limiter to see if the ECU would actually cut the injection and ignition power supply.



From the recording we learnt that the rev limiter cuts injection actuation but not the injection power supply, and it does not affect the ignition.

ECU fault??

ECUs hardly ever fail, but this left us with one option. The relay is controlled by the ECU and since there is no input error to the ECU and no wiring fault we concluded that it had to be the ECU.

This AECS customer bought a second hand ECU plus key and immobiliser. They fitted and programmed the ECU's into the car and the car runs fine now.

Conclusion

I can see why one of the previous workshops had fitted a replacement transmission as they had tried everything else in their (incorrect) view.

The relay was switched off for 12 milliseconds at the time. How would you have found this without a scope? Remember there were no fault codes.

All people who have attended the AED seminar know how a missing inductive spike means that there was no magnetic field to collapse in the first place, that was really the clue in the first recording.

Anyone attending the EMS 1-1 knows that you need to start with ignition over injection almost all of the time.

Training, support and proper recording equipment was the key to a speedy find in this very expensive job.

Herbert

For **AECS Ltd**:
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(trainer/research)
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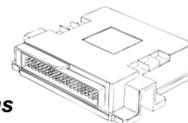


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