

# Cranky Camry

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

AECS has been assisting NZ and Australian workshops with diagnostic trouble cases for over ten years. Many cases have not been published, as they were either too complex or too simple to write about. In a number of cases, the information we received was too incomplete to be able to publish, but one thing is for sure we deal with thousands of cases a year. This service is for AECS customers and serves for us at AECS as a method to keep our training seminars current, as we are in touch with what happens out there.

Following is yet another lovely case, which happened recently.

## Vehicle:

2003 Toyota Camry 2.4 Ltr 2AZ-FE Petrol.

## Problem presented to the help desk

This car came into our workshop from a "car computer repair guy", local to the workshop involved. He is good at diagnosing difficult ECU problems but this one had him stumped, according to the diagnostician.

The car would not start when cold. It would crank and try to fire but would not start. No fault codes stored in the engine ECU. He had scanned the vehicle for codes, checked live data, and used a not so good oscilloscope to test most signals. He could not find the fault. As it cranked the starter, made grinding/clunking sounds as the spark fired all wrongly timed.

With disconnected the coils (4 COP coils) the engine cranked smoothly. If you could get the engine to start, it ran and drove perfectly. It would start when hot but still would not fire straight away and still made clunking/grinding noises.

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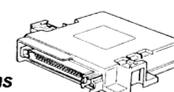
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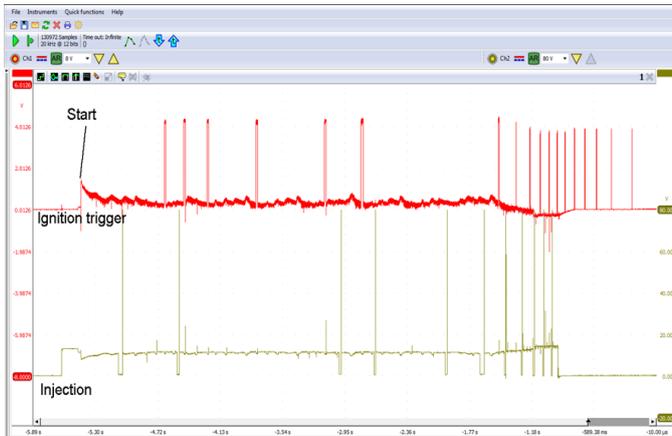
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## Measure

As usual with these jobs you need to start with, measuring ignition over injection to make visible what is going on. The recording, which was first performed, was the coil trigger signal and injector signal both on Cylinder 1.



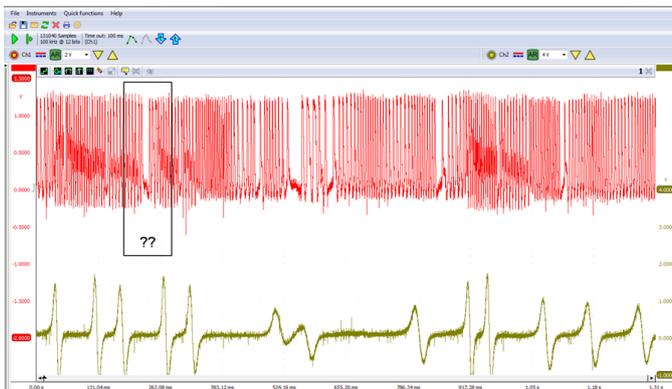
**ATS 5000 scope recording of ignition vs. injection while winding over**

Clear is that the ignition and injection both are very irregular. It IS injecting and it IS igniting, but all at the wrong time. The fuel injected and ignited at the incorrect time caused the 'funny' starter motor noises.

If anyone would listen to pulses on the injectors, (some technicians find this a good method to inspect..) or if anyone would connect a coil to a spark plug on the rocker cover (also a popular inspection method...), they would not have seen anything untoward.

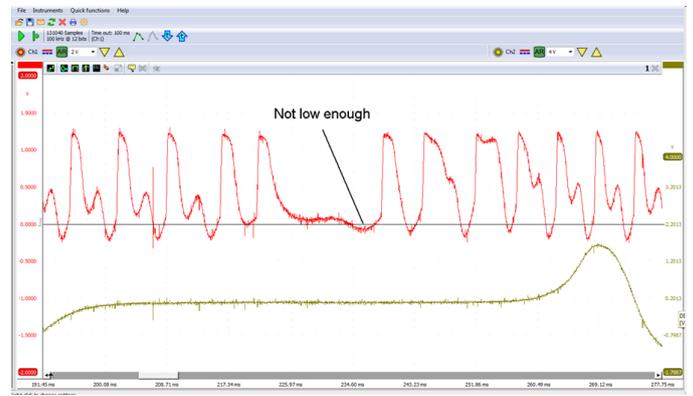
## Second measurement

Obviously are there timing and calculation issues. Seeing this pattern makes even the untrained technician progress to the crank/cam sensor signals.



**ATS 5000 Cam/crank shaft sensor recording**

Well there are some spots, which require attention on the crankshaft pattern. Zoomed in it looks like the picture following:



**Zoomed in pattern of crank vs. cam shaft sensor**

The crankshaft is clearly the problem, the signal is not balanced around the zero volt line. The 'arm and fire points' (AED training) are not achieved at various times during starting.

This makes the ECU not reading the correct quantity of teeth in relation to the camshaft sensor.

No fault was set as the ECU still 'saw' crankshaft sensor activity.

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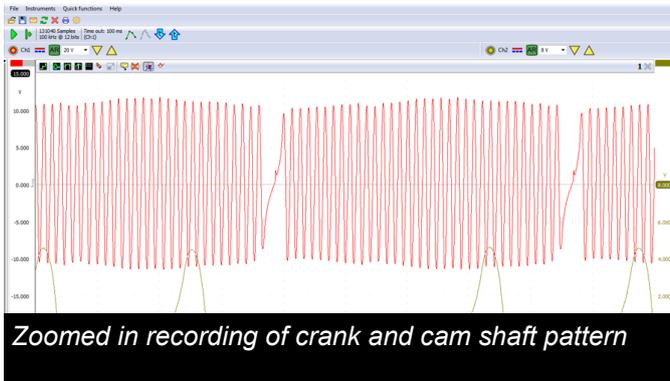
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## Why did it start when hot?

The engine would have been winding over a bit quicker when hot, increasing the sensor voltage (higher signal amplitude), and crossing the 'arm and fire' points. This is also, why the engine would keep running when it finally did start.



## Sure.

That leaves no doubt, a perfect pattern plus a good starting and running engine confirms that the repair was done properly and most of all efficiently. No niggly thoughts like "the car runs fine now, is this because we disturbed something?" Just a decent feeling that the job was done perfectly thanks to the ATS scope.

## Conclusion:

This job was easy, it did not take more than about 45 minutes to locate the fault. No modern technician should struggle with this, certainly not anyone who is in electrical repairs!

The technician on the job had attended a number of AECS training seminars and gained the skill needed to get to the bottom of such problems quick and direct.

It should again be clear that attempting jobs like these without a proper scope like the ATS 5000 or ATS 5004d makes even a good technician look bad.

Choose your equipment, training and support supplier with consideration for quality and track record.

**Herbert**

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