

Attention Atenza

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

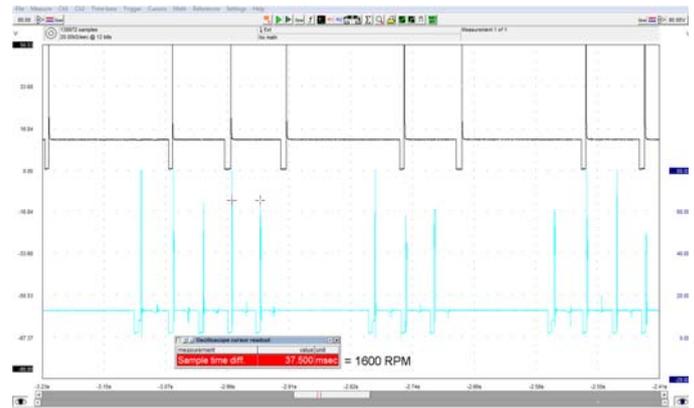
Vehicle: 2002 Mazda Atenza, 4 cylinder variable cam timing, 2 DIS ignition coils, fresh Japanese import.

Problem presented to the help desk

This vehicle is starting fine, running reasonably well except at higher revs it starts surging badly. It has been checked for fault codes, none were found. The garage that checked the codes passed the vehicle on to a YES (www.yesnz.co.nz) member who found the problem after some serious head scratching.

Where do we start?

Let's check a few basics first. Almost always best to start is ignition over injection.



Picture 1: *ATS 5000 2 channel recording of injection vs ignition at high idle while surging.*

Clear to see that the ECU makes a mess of the ignition and the injection, as soon as the revs go over around 2000 RPM (varies). This points directly to a calculation error between the crank/cam speed and position signals, so the next measurement should be crank shaft and/or camshaft sensor.



**ATS
4 Channel
Scope**

ATS 5004D

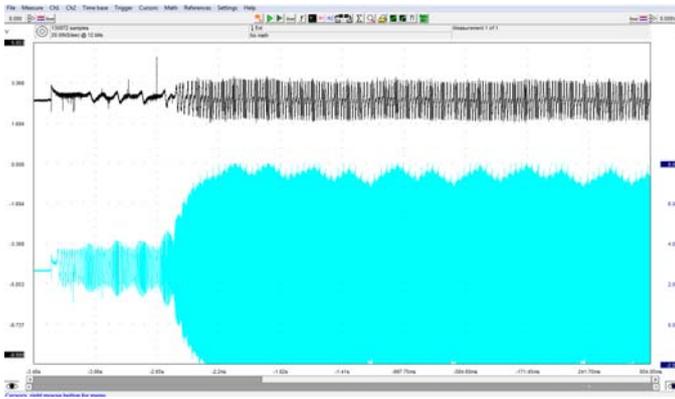
Top of the line 4 channel automotive differential oscilloscope. 4 x 50 MS/sec sample rate with four independent differential channels. The combination with ATIS makes this high ability tool a real easy to use frontline fault finder. The unmatched signal library makes even an inexperienced technician an diagnostic expert.



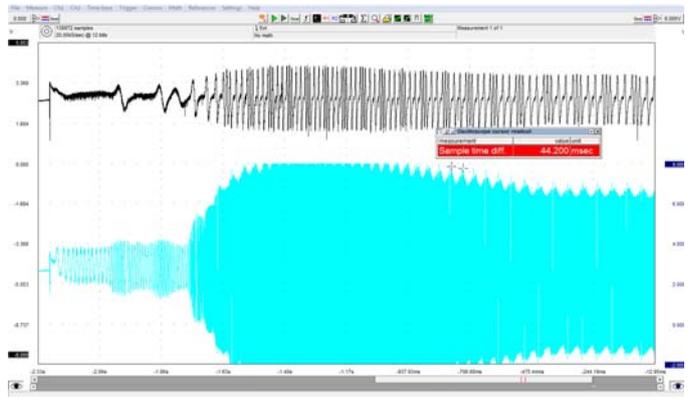
Special!

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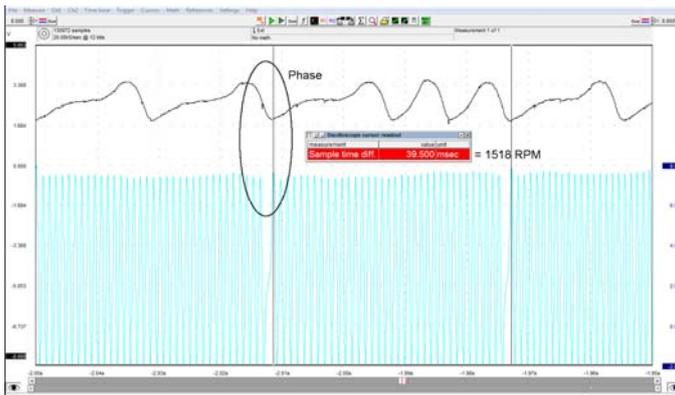
colours and laptop might vary from picture. Call for details.
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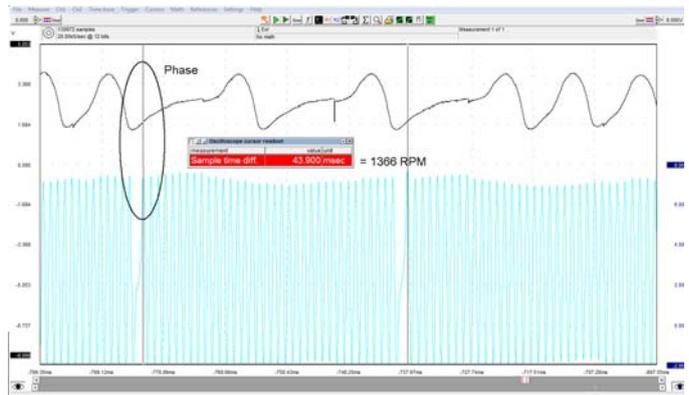
Picture 2: Recording of camshaft and crankshaft sensors from startup on the patient.



Picture 4: ATS scope recording from YES colleague on a similar vehicle.



Picture 3: Recording of camshaft and crankshaft sensors zoomed in. Please note the phase offset between the cam and crank shaft.



Picture 5: Crank and cam shaft sensor signals zoomed in. Please note the difference in phase offset!

The recorded pattern in Pictures 2 & 3 shows clearly that the engine is 'hunting' at around 1600 RPM. It also shows that both sensors produce a seemingly good signal. Perhaps we were wrong with our conclusion....

Compare

This diagnostician is member of a nationwide diagnostic network, which is supported by AECS. He asked one of the fellow YES inc. members to record the pattern on a similar car so he could compare the two recordings and analyse.

The recorded signals in Pictures 4 & 5 were sent to him:

This pattern (Pictures 4 & 5) looked very similar to the first, except when the signal was zoomed in and analysed. Please look at the difference in phase offset! Roughly estimated the difference between the two vehicles is 18 degrees.

That is the problem alright!

Special

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\$3000 + gst



BrainBee Automotive scope
Simple to use and e-mail support
Cost effective diagnostics!

Did you know?

- ▶ Fiat uses on the late model petrol models (Bravo, Grande Punto, Panda) as injector rail pressure check valve an R134a air-conditioning fitting. If during service the vacuum pump gets connected to this connector there is a **real danger of an explosion happening**.
- ▶ A lot of garages think that diagnostics is simpler and quicker with just a Scantool. Yet in the cases that we get involved in, we only use the Scantool in around 10% of the cases, and this only to assist in diagnostics.
In **all** cases we need the use of an **oscilloscope**. At AECS, we are only biased towards quick and effective repairs, not towards any tool type. This is also reflected in our training methods.

Patch up

The diagnostician decided to look at the sensor on the bad car and noticed that it seemed to be fitted in an angle. Please judge for yourself:



Picture 6: Engine bay with cam sensor highlighted



Picture 7: Cam sensor sits in a funny angle, (also with the bolt in) could this be why there is a signal offset?

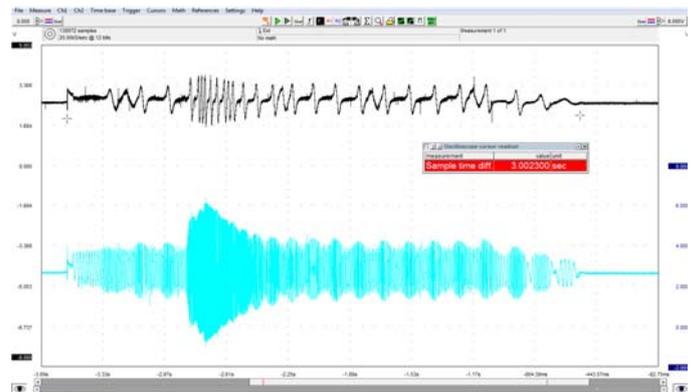
The sensor got removed and a small piece of steel, cut from a split pin or something was found under the sensor's seat



Picture 8: Split pin tab removed from under the base of the cam sensor!

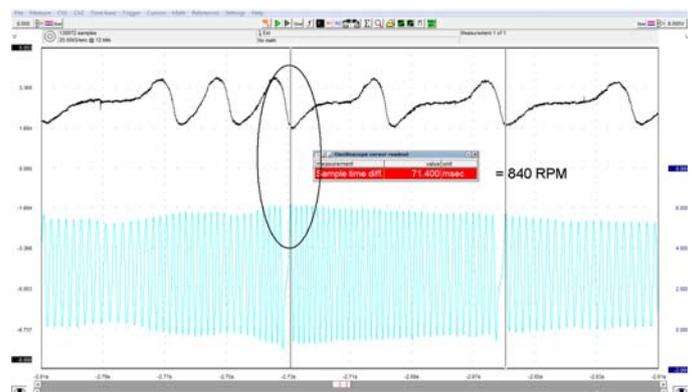
Found it?

Great, found the problem. Fit sensor properly and straight and then the car surely should run good again.



Picture 9: Crank cam recording of the 'patient' with the cam sensor fitted properly

The engine gave one beat during winding over and then died again, this had made it worse! Better zoom in on the phase offset.



Picture 10: Cam crank phase offset on the patient with sensor fitted properly...

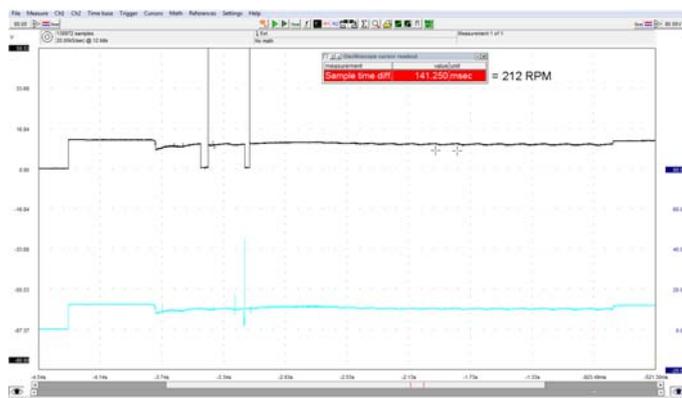
The signal offset has shifted in the wrong direction! The phase offset is another approximately 4 degrees further away from the position of where the signal is on the good vehicle.

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Injection vs ignition on patient with camshaft sensor properly fitted.

Hiding an error

Now the picture becomes clear, it seems that the cam timing is out and that someone has tried to compensate for this by altering the camshaft sensor's position! Very Clever!

Number 8 wire

It was decided to remove the front of the engine and inspect the cam timing. It was found that the timing was out one or two teeth. The chain was refitted and timed correctly. The engine runs fine now. Some people move at extraordinary lengths to hide a job gone wrong, but this one beats all the

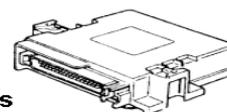
ones in my book!

I need to say that the 'repair' would have been done in Japan as the vehicle was not registered in NZ yet. This is also probably why a split pin was used and not number 8 wire ;-)

Conclusion

This diagnostic shop obviously owns the ATS 2 channel scope and received training plus technical support from their equipment provider (AECS). Attention to detail on the high resolution ATS scope patterns paid off. We from the YES diagnostic network are there to help the industry with diagnostics on problem vehicles. As is evident from this vehicle, sometimes even with non electronic issues!

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For **AECS**
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