

Funny Familia

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

Vehicle: Mazda Familia 1.5 ltr Automatic 1996, Japanese import

Problem presented to the help desk

This vehicle was presented to a garage with an apparent gearbox problem. It was surging really badly only under full acceleration and only in first gear.

Gentle acceleration in low gears is smooth, full acceleration in high gears is also smooth and without a hitch.

However, the gearbox fluid is clear and smells normal, making the technician doubt about gearbox failure. Maybe a bad 1-gear activation of solenoids fault?

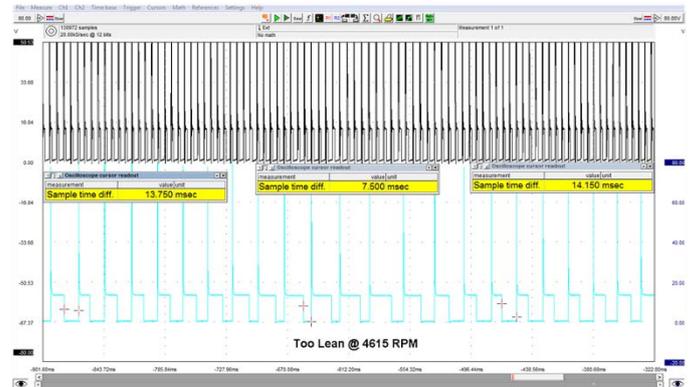
Time to check. A scan tool did not reveal any fault codes.

Measurements

If you really want to see, what is going on you must use a large buffer recording scope. Okay the diagnostic technician half suspected the gearbox, but starting with the engine still seemed like a good idea to me.

A bad running engine can feel like a gearbox fault, just as a bad auto gearbox can feel like an engine misfire. Do not always trust your feelings!

The whole drive process starts with the engine so, why not start by measuring with the prime signals of the engine.



Picture 1: Ignition vs injection while the engine was hunting badly.

Any electronic engine management fault upsetting the running of the engine will be visible in the ignition vs injection measurement. This first recording showed instantly the cause of the engine hunting at high revs and high load.

The injection pulswidth is extremely variable, within a few revolutions it varies from 13.7 msec to almost half (7.5msec) the quantity of

BrainBee made in Italy

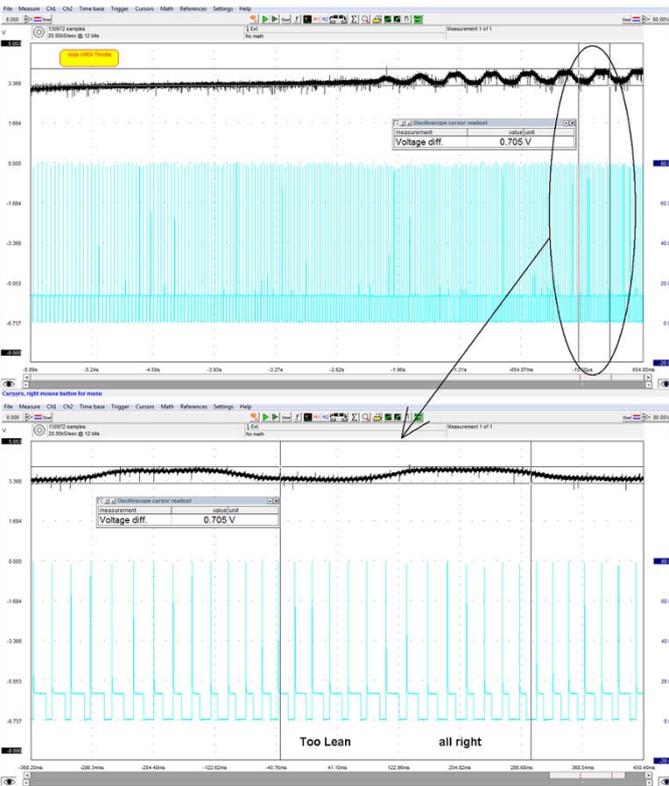
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fuel, back to 14.1msec, all without moving the foot on the accelerator.

Such massive changes can only be caused by one of the main inputs in the injector pulse width calculation: (in sequence of importance) the air-mass sensor, the TPS or the ECT.

Zoomed in a quick check on the ignition showed beautiful ignition patterns, so that did not need any more attention.



Picture 2 & 3: Ignition patterns

Let us do a second measurement of the injection vs one of the core ECU inputs.

Culprit

Clearly visible in the above combination of the injection vs air-mass pattern is that the air-mass signal 'waves' up and down, taking the injection pulse width down and back up again.

The air-mass fluctuations are only 0.7 Volt in height, but enough to have a big impact on the pulse width calculation.

We did not have to look at any of the gearbox components or activations anymore.

All we had to do now is to determine why the air-mass sensor was fluctuating so much.

The signal is too clean for it to be a faulty sensor, an intermittent faulty sensor usually shows a lot of hash every so now and then, but none of that was present.

It was almost as if the actual airflow was disturbed, maybe something floating around in the air cleaner like in a previous article?

Found it

While taking the air cleaner/air-mass sensor off, the flexi hose between the throttle body and the air-mass sensor has to be removed.

You can do more with a scope!

A lot of garages think that diagnostics is simpler and quicker with just a scan tool.

Yet the support cases that we at AECS get involved in, we only use in around 10% of the cases a scan tool, this only to assist in diagnostics.

In all cases we need the use of an oscilloscope. We at AECS are only biased towards quick and effective repairs, not towards any tool type. This is also reflected in our training methods.

ATS 5004
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on investment.



Diagnose
quick and
efficient!

I am not sure if it is visible in the picture but that flex hose had a large crack at the bottom out of sight.



Picture 4 : Flex hose with crack. We have put some white paper in the tube to make the crack more visible.

Every time when the engine torqued enough (hard acceleration in low gear) the movement of the engine would open up the crack and let in air bypassing the air-mass sensor (drop in voltage).

The lower amount of air would result in less fuel. The actual mixture would be too lean, reducing torque, letting the engine drop back in the mounts. With the engine back in original position, the crack would be closed and the air-mass signal would climb again, bringing the mixture back to 'good' again. The correct mixture would produce enough torque to lift the engine up, opening up the crack again.

This cycling between too lean and good mixture made the car surge badly.

DID YOU KNOW.....?

The Brainbee AGS 688 emission tester has a special function for testing the radiator for exhaust gasses.

It gives you a definitive answer if there is a leak between the combustion chamber and the cooling system. VERY handy to have and also good to print out hand to the customer!

Patch

A quick patch with tape around the hose for confirmation proved that we were right. The car accelerated normal again. Sorry gearbox shop.....

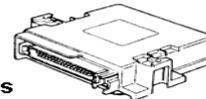
After replacing the flex hose, the car was given back to the customer again.

Conclusion

It was a quick and profitable job and very easy to diagnose wrong! The fast dual channel (or 4 channel) large buffer recording ATS scope made this job a treat. The scan tool proved only that systems knowledge (AECS training) and the ability to read wave forms (AECS training) and good tools (ATS scope) makes the difference between an average shop and one with high returns.

This simple job was quick and profitable for this AECS trained diagnostician.

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AECS Training Calendar- Date changes

We have attached our **amended** training calendar as there have been some changes for Auckland and Christchurch. A comprehensive scope course has been added in Christchurch due to popular demand. Also some of the bigger companies have asked us to organise in house training. These are added to the calendar too.

We do have enrolments already for all of the courses. Talk to Christine to register your enrolment as there is space left on a number of the courses. Ph:06 874 9077

AECs Training Plan 2009

April	May	June	July	August	Sept	October	November
1		1 Queen's Birthday	1 ATS Palmerston North	1	1 AED Private Training	1	1
2		2	2 EMS1(1) Palmerston North	2	2 AED Private Training	2	2
3		3	3 EMS1(1) Palmerston North	3	3	3	3 DMS1(1) Auckland
4		4	4	4	4	4	4 DMS1(1) Auckland
5	5 EMS 1(2) Motueka	5	5	5	5	5	5 ATS Auckland
6	6 AED Hastings	6	6	6	6	6	6 ATS Auckland
7	7 AED Hastings	7	7	7	7	7	7
8	8 EMS 1(1) Hastings	8	8	8	8	8	8
9	9 EMS 1(1) Hastings	9	9	9	9	9	9
10	10 Good Friday	10 EMS 1(2) Wellington	10	10	10	10	10
11	11 EMS 1(2) Invercargill	11 EMS 1(2) Wellington	11	11 DMS1(3) Rotorua	11	11	11
12	12 EMS 1(2) Invercargill	12 ATS Wellington	12	12 DMS1(3) Rotorua	12	12 AED Christchurch	12
13	13 Easter Monday	13 ATS Wellington	13	13	13	13 AED Christchurch	13
14	14 EMS 1(2) Christchurch	14	14	14	14	14 DMS1(2) Christchurch	14
15	15 EMS 1(2) Christchurch	15 AED Private Training	15	15	15 AED Tauranga	15	15
16	16	16 AED Private Training	16	16	16 AED Tauranga	16	16
17	17	17	17	17	17 ABS Hamilton	17	17
18	18	18	18	18	18 ABS Hamilton	18	18
19	19	19	19	19	19	19 AED Private Training	19
20	20	20	20 AED Auckland	20	20	20 AED Private Training	20
21	21	21	21 AED Auckland	21	21	21 AIRCON Private Training	21
22	22	22	22 EMS 1(2) Auckland	22	22	22 AIRCON Private Training	22
23	23	23	23 EMS 1(2) Auckland	23	23	23	23
24	24	24	24	24 YES! Meeting	24	24	24
25	25	25	25	25 YES! Meeting	25	25	25
26	26	26	26	26 YES! Meeting	26	26	26
27	27	27	27	27 YES! Meeting	27	27	27
28	28	28	28 EMS1(1) Whangarei	28	28	28	28
29	29	29	29 EMS1(1) Whangarei	29	29	29	29
30	30	30 ATS Palmerston North	30 DMS 1(3) Auckland	30	30	30	30
31	31	31	31 DMS 1(3) Auckland	31	31	31	31

Note: No training in Dec

Last updated
6/4/09 (CGLK)

- Sundays
- Public Holidays
- Date Changes
- PRIVATE Training
- AED = Automotive Electronic Diagnostic seminar

ABS = ABS/ Traction Control Systems seminar

EMS1(1) = Engine management Systems 1 (module 1) seminar

EMS1(2) = Engine management Systems 1 (module 2) seminar

ATS= Comprehensive Scope training

SCAN1 = Scan Tool diagnostics

DMS1 (1) = Diesel Management Systems 1 Module 1 seminar

DMS1 (2) = Diesel Management Systems 1 Module 2 seminar

DMS1 (3) = Diesel Management Systems 1 Module 3 seminar

Aircon = Air-conditioning training