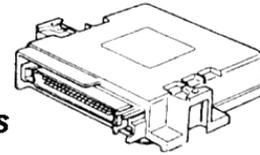


March 2010 Technical Newsletter

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Automotive
Electronic
Control
Systems



AECS
Training, Equipment and
Data for Automotive
Diagnostic Specialists

www.aecs.net
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Delicate Delica

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

Vehicle: Mitsubishi Delica 1999 2.5 ltr Diesel non turbo WL (Mazda) engine

Problem presented to the help desk.

The vehicle was bought 6 weeks ago. The engine had a slight knock which developed very quickly in a destroyed number 4 big end bearing, seizing the engine. The car was offered for repair to the garage in a no go state. The engine was rebuilt and refitted in the vehicle. The old injectors and Diesel pump were reused to keep the price of the job down.

After start up it was noticed, that the engine was a bit smoky. The vehicle was driven for about 100 Km's after which the engine was still rather smoky (black) and they noticed the engine did not sound quite right, there was an intermittent sort of a rattle in the engine.

It was decided to get the injectors serviced, to first of all cure the smoking problem.

The injectors where in an average state, still the nozzles where replaced. This made no difference in the smoking or in the occasional rattle.

Regarding the intermittent rattle, it was decided to check the valve train, cam timing and pump timing, just to be sure. They panned out all okay.

Measuring

The diagnostic garage involved decided not to risk blowing up the new engine and sent the customer on its way but get to the bottom of the smoking. It was considered to get the pump rebuilt, but before the pump was removed, a series of mobile emission tests were done and sent to the AECS help desk.

Looking for a quick hook up tool?

New!

Intro special \$1,250 plus gst



Just connect to

your USB port and

www.AECS.net

you make even the fastest signal visible, all for the price of a multimeter!

Check the awesome ability on our website.

Can also be used as an extra channel for the ATS 5000 and ATS 5004 scope!

- **HP3** single channel scope
- 0.2V to 800V direct differential input(!)
- Up to 100MS/sec
- 1.2M point buffer powered by USB port.

AECS Training coming up:

AED	22nd & 23rd MARCH	Auckland
HYBRID	24th & 25th MARCH	Auckland

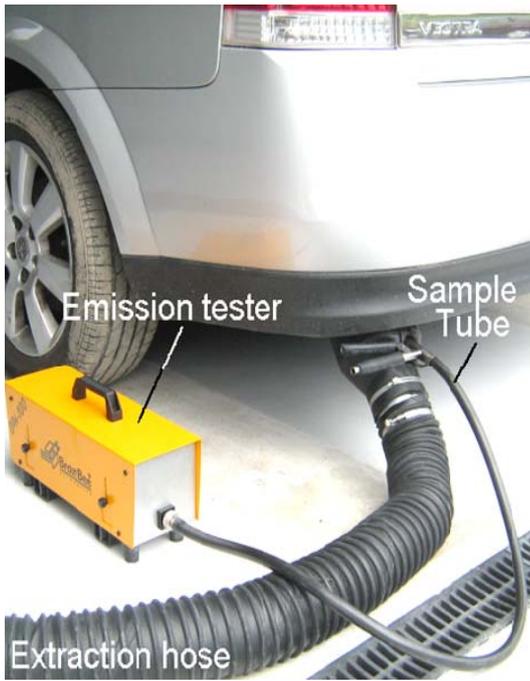
AED	29th & 30th MARCH	Hamilton
DMS1-1	31st MARCH & 1st APRIL	Tauranga

See our website for more details www.aecs.net

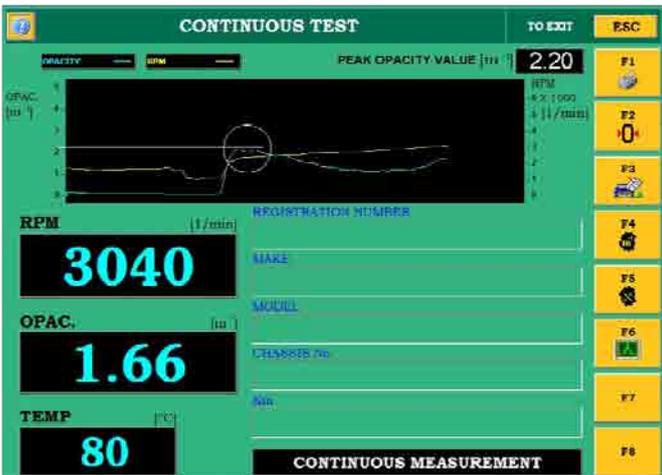
Taking enrolments now!
PH 06-874 9077

Check out the Training Calendar on back page... for the dates of the Hybrid courses

The measurements were performed on the road during full acceleration.

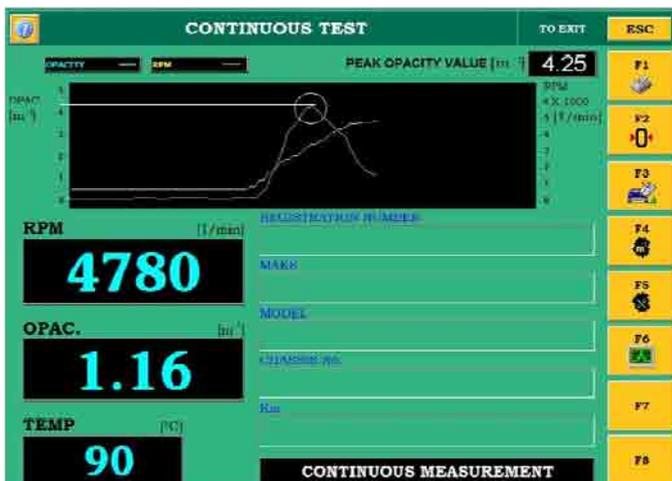


Sample picture of Diesel emission test in progress



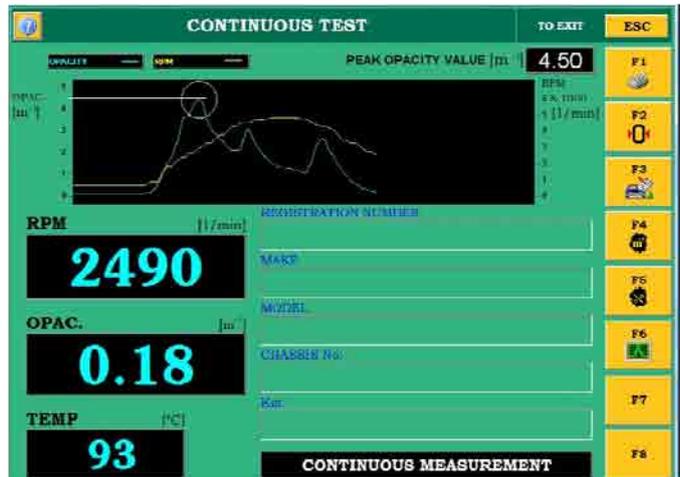
Laptop printout of Brainbee Opacity Emission test 1

It is clear to see in the graph that during acceleration the opacity climbs to an opacity of $K = 2.2 \text{ m}^{-1}$. The test was repeated again with the following results:



Brainbee Opacity Emission test 2

This time a peak opacity of $K = 4.25 \text{ m}^{-1}$ is logged.



Brainbee Opacity Emission test 3

The same vehicle under the same circumstances logs a high peak opacity of $K = 4.5 \text{ m}^{-1}$.

A further set of tests was done with pretty much the same results, with the highest reading $K = 5 \text{ m}^{-1}$.

Logic look at the test results

The first measurement is really the one we at the help desk were worried about. The low $K = 2.2 \text{ m}^{-1}$ compared to the mostly high results did not make sense. If a pump or injectors are at fault it seldom happens that the emissions are high one time and low another time while the same test is performed. This to me indicated that there was a pump control problem.

The pump has electronic controlled injection timing and mechanical quantity control, let's have a look at the injection timing control to make sure that the timing was controlled correctly.



Hot special !
\$4,999 + gst

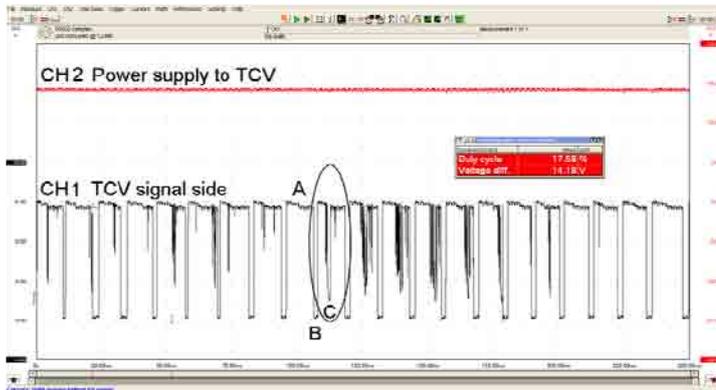
57 car brands
12 month updates

Launch X431
latest model!

Parallel import.
New shipment arriving soon!

Electronic check, easy!

The diagnostic shop owns an ATS 5000 recording scope and provided the AECS help desk with a number of recordings. The Timing Control Valve (TCV) signals are printed below.



*ATS 5000 dual channel TCV recording.
A = non actuated, B = actuated, C = bad contact*

Found it!

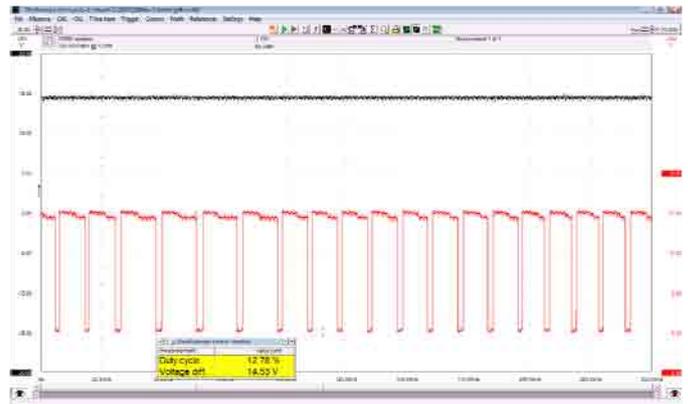
The signal on CH1 is not correct! The hash in between the actuations indicate that there is a bad connection or a short circuit somewhere, the signal on CH 2 indicates that at the same time the power supply to the TCV is fine.

We made the diagnostician first think about if there could be a short circuit or a bad connection in the TCV circuit:

- ▶ Consider that a short circuit to earth on the signal side of the TCV will actuate (open) the TCV uncontrolled. Anyone who attended the AECS Diesel training seminars will understand that an open TCV will retard the injection timing. The garage mentioned an intermittent rattle in the engine, which indicates overly advanced injection timing, so at this stage forget about a short circuit.
- ▶ Consider a bad connection between the TCV and the power supply wire or between the TCV and the signal wire in for example the connector. A bad connection will reduce the current and therefore the TCV will be less open, advancing the injection timing. This will cause Diesel knock, which ultimately destroys engines..... Big end bearing?

The diagnostician inspected the connector on the TCV and found that the two female terminals were stretched wide making intermittent contact. He suspected that the wiring loom hanging on the connector was too much over a period of time and caused the (expensive) damage.

He bend the terminals back and recorded the following pattern.



ATS 5000 perfect TCV signal after the repair.

Fixed it

He replaced the terminals in the connector and the vehicle is going good now!

He was able to charge the engine and diagnostic job out with the comfortable knowledge that the job would not come back to bite him. The emissions are down to a nice and clean $K = 1.2 \text{ m}^{-1}$.

Conclusion

This job had the real potential to blow up, literally. An expensive come back would have been the result. I am confident that the bad connection in the TCV was the cause of the engine failure in the first place.

How do you charge your customer twice for an engine job? Does your insurance perhaps cover damage as a result of work half done?

Do it properly first time, that avoids disputes and increases your credibility. This shop was well equipped with a Brainbee emission tester and ATS 5000 oscilloscope, which both come with the technical back up of AECS Ltd. I am not sure how he would have found the real problem without this real diagnostic equipment, certainly in such a short period of time.

Herbert

For **AECS Ltd**:
H.P. Leijen
(trainer/research)
E-Mail: hpleijen@aece.net

Did you know.....?

that most late model cars will only log a fault code in the engine management system when the air-conditioning charge has leaked down until there is no liquid refrigerant present anymore, out of a 700 gram system you only recover 15 grams or so. A compressor running on 15 grams of refrigerant will have ground itself to bits already due to a lack of cooling and lubrication.

AECS
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ECK 2900

ECOTECHNICS
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\$ 7,916 (+gst)



New!
Hybrid Course.



24th & 25th March in Auckland
19th & 20th May in Christchurch
8th & 9th June in Wellington

- How does it work.
- How to stay safe.
- How to maintain.
- How to repair.

Please check the course descriptor at
www.aecs.net/seminars.

AECS Training Plan 2010

March	April	May	June	July	August
1	1 Tauranga DMS 1(1)	1	1	1 Palmerston North Scan1	1
2	2 Good Friday	2	2	2 Palmerston North Scan1	2
3	3	3	3	3	3 Wellington AED
4	4	4	4	4	4 Wellington AED
5	5 Easter Monday	5	5	5	5 Private Training AED
6	6	6	6	6	6 Private Training AED
7	7	7	7 Queens Birthday	7	7
8	8	8	8 Wellington EMS1-4	8	8
9	9	9	9 Wellington EMS1-4	9	9
10	10 Private Training AIRCON	10	10 Private Training AED	10	10
11	11 Private Training AIRCON	11	11 Private Training AED	11	11
12	12 Private Training AIRCON	12	12	12	12
13	13	13	13	13	13
14	14	14 Nelson DMS 1(3)	14	14	14
15	15	15 Nelson DMS 1(3)	15	15	15
16	16	16	16	16	16
17	17	17	17	17	17
18	18	18	18	18	18
19	19	19 Christchurch EMS1(4)	19	19 Auckland EMS 1(1)	19
20	20 Gisborne AED	20 Christchurch EMS1(4)	20	20 Auckland EMS 1(1)	20
21	21 Gisborne AED	21 Christchurch AED	21	21 Auckland ATS	21
22	22 Auckland AED	22 Hastings EMS 1(2)	22	22 Auckland ATS	22
23	23 Auckland AED	23 Hastings EMS 1(2)	23	23	23
24	24 Auckland EMS1(4)	24 Greymouth AED	24	24	24 YES! Meeting
25	25 Auckland EMS1(4)	25 Anzac day	25 Greymouth AED	25	25 YES! Meeting
26	26	26	26	26	26 YES! Meeting
27	27	27	27	27 Whangarei DMS 1(1)	27 YES! Meeting
28	28	28	28	28 Whangarei DMS 1(1)	28
29	29 Hamilton AED	29	29 New Plymouth AED	29 Auckland AED	29
30	30 Hamilton AED	30	30 New Plymouth AED	30 Auckland AED	30
31	31 Tauranga DMS 1(1)	31	31	31	31

Key:

- Sundays
- Public/school Holidays
- Date Changes
- PRIVATE Training

ABS = ABS/ Traction Control Systems seminar
 EMS1(1) = Engine management Systems 1 (module 1) seminar
 EMS1(2) = Engine management Systems 1 (module 2) seminar
 EMS1(4) = Engine management Systems 1 (module 4) seminar (hybrid)
 SCAN1 = Scan Tool diagnostics
 AED = Automotive Electronic Diagnostic seminar
 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
 ATS= Comprehensive Scope training
 TBA - To be advised

Created 08 March 2010 CML

Did you know we accept MTA vouchers?

Please note: All effort has been made to ensure the training & course dates are correct, however please contact us first before publishing information from this calendar.

Ph: 06-874 9077.