

Leaping Lexus.

AECS' core business is supplying NZ (and Australian) workshops with Equipment, Training and Technical support for diagnosis on vehicles. Please find below an actual case from our Technical support line.

Problem presented to the Helpdesk
2000 Lexus IS200, engine 1G-FE 2.0 Ltr drive by wire throttle with variable cam timing. This car was idling at a little over 3000 RPM when warm. Every time you put it in drive the car would leap forward. Very uncomfortable to drive around town.

When the engine is cold, it runs normal. According to the previous garages, there is some times a fault code logged, but the scan tool at hand only shows P1349, "undefined code".



VVTi Solenoid Lexus

The car has been in and out of a number of workshops over a period of weeks now before it arrived here. Can you help?

Measure?

I normally almost always start by asking to measure ignition over injection with trouble cases, but in this case that is clearly not necessary as the engine runs fine, just way too fast.

The Launch X431 scan tool was connected to the car by the garage, which has AECS support. There was no fault code, and the throttle was in the idle position (life data). The engine speed was 3250 RPM according to the print out. The throttle body looks clean and normal. When the engine is idling fast with the intake air ducting removed, the throttle angle looks normal. This garage suspected a large leak in the intake manifold and proceeded to close the intake off. No hissing sound and it was easy to kill the engine.

Why could an engine run so fast while yet according to the "experienced" eye and the scan tool the throttle was shut to the idle position, without mani-

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fold leaks?
 Maybe in the "experience", lays the problem....

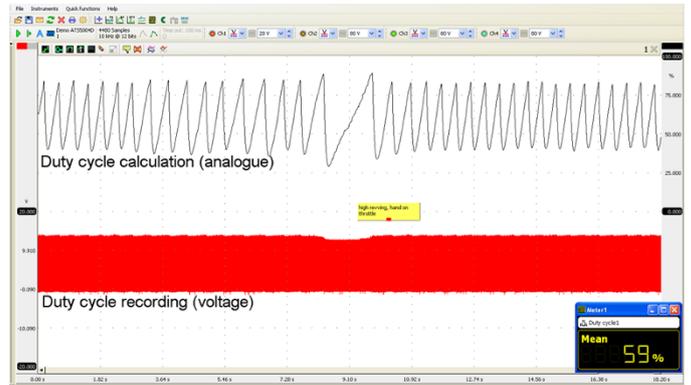
Most technicians are used to a throttle butterfly angle on older vehicles, with either a standard EFI system or even carburetors. Those engines have a fixed intake and exhaust valve-opening angle (cam timing) which is ideal for usually mid-range running, and not ideal for idle and high speed. This vehicle has variable cam timing, VVTi. Maybe that the ideal cam angle made the engine rev up, advancing the ignition timing (20+ degrees) compounding the problem?

Measure!

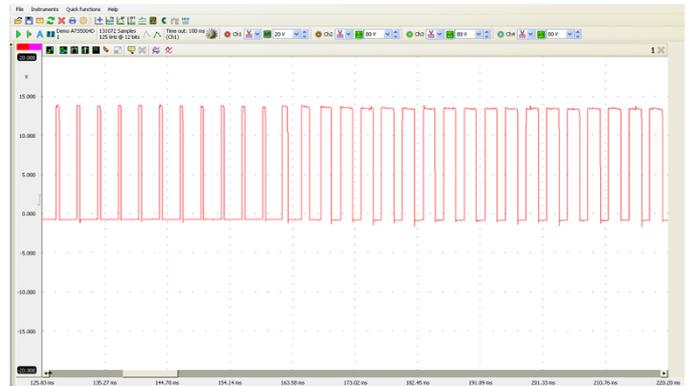
It is not much effort to have a look at the VVTi solenoid and see if the ECU is trying to adjust the cam to perhaps an extreme position. If the ECU has achieved the desired cam position the output of the ECU, (duty cycle to VVTi solenoid) will show this by not being extreme.

If the ECU cannot achieve the desired position the duty cycle signal will move on most systems to either approx. 5% or 95% depending on where the timing is stuck, in the too much advanced or too much retarded position.

Below is the ATS scope recording of the VVTi valve.



Single channel ATS scope recording of VVTi solenoid valve duty cycle while idling at 3000 RPM. The top trace is the duty cycle as an analogue signal; the bottom trace is the actual signal.



Zoomed in scope recording of VVTi duty cycle signal.

AECS equipment

VTEQ (made in Spain) is a long established brake tester manuf. producing equipment for distributors all over the world, including AECS Ltd in NZ.

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Cam to loose or too tight?

The extreme variable duty cycle is a clear indicator that the cam timing is not moving the way the ECU intended! This signal could be an 'over shoot / undershoot' situation (PID control), where the cam timing is moving too much, or it could be a stuck cam adjustment mechanism, where the ECU tries to get the actuator to move again.

If the cam was moving, too much I reckon that the technician would have heard the engine randomly misfire, or at least he would have heard that the engine note was not right and kept changing. A stuck adjustment mechanism made more sense in our view.

Why would the cam adjustment not move?

With many modern vehicles the oil change interval gets neglected, detergents get used to flush the engine or the wrong oil gets used. This can lead to all sorts of cam timing issues, like oil crust blocking the oil channels, detergents swelling the seals in the cam adjustment mechanism, or incorrect grade oil making the adjustment system move too quick or too slow at different temperatures.

Plenty of oil

Best in my view was to take the solenoid out and check for oil supply at the solenoid by winding the engine briefly over. Plenty of oil came out of the solenoid valve channel.

Next stop was to test the solenoid valve while it was still hot (the problem only occurred with a hot engine). For this the ATS 5000's signal generator and solenoid driver was being used, to simulate the ECU's activation of the valve.

Signal generator.

The AECS solenoid driver was connected to the VVTI valve (see picture on pg4) and to the ATS scope's signal generator. A variable duty cycle signal between 10% and 90% was being sent to the valve while looking at the actual valve slide. No change of position (seized valve)!



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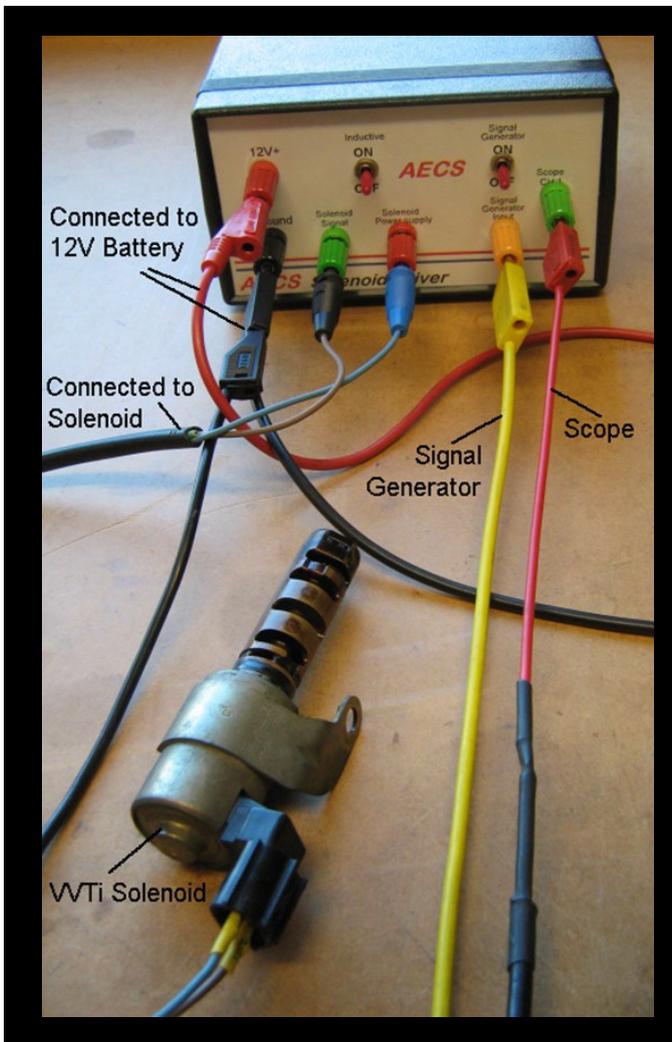
Did you know.....?

If you haven't returned your survey yet and you wanted to we have extended the return date to the 15th October.

Did you know that you could be eligible to a discount by completing and sending the survey form back to us.

special conditions apply.

If you need to print this newsletter and need a high quality print version, visit our website www.aecs.net



AECS solenoid driver

Found it!

No matter how much oil you supply to a valve, if the valve slide is not moving, than nothing you do has an effect!

We left the valve on the bench for a little while to cool down. Remember that the car was running fine when cold.

After about 15 minutes or so, we tried it again, 10% and 90% duty cycle. Now it moved beautiful! So much for testing a valve!

If we were not quick, enough setting up the scope and signal generator the temperature could be cold enough to show us a good working valve.

This would have left us wandering....



Please also realise that the strain of the valve being bolted in the valve body could just have had enough effect on the valve/ valve slide clearance to make it seize. Not in this case.

With hindsight, it would have been better to actuate the valve while it was undisturbed, in place, in the cylinder head. Operate the valve with the signal generator and listen for the engine to change note, or not.

I guess we were lucky!

Scanner data

Disconnecting the valve after refitting the old valve in the cylinder head brought the following life data lines and fault codes up on the Launch scan tool:

P 1349	VVT system Malfunction bank one
P1656	OCV circuit Bank one
Engine speed	3306 RPM
IGN Advance	25degree
IAT	31degree
TPS	20.58%
Injector	2.30ms
IDL sw	ON

Please note that the Launch scanner had a

AECS

Solenoid Driver

\$450.- +gst



- Maximum voltage rating: 60 V
- Maximum current rating: 20 Amp
- Connections: 4mm banana receptors.
- Maximum switching frequency; 1 Mhz
- Minimum signal generator current; 250mA (5V)
- 10 second current of 10 Amp max.
- Complement this unit with an ATS Scope.

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"total electronic control"

relevant description for the P1349 Code! If one of the workshops that had the car earlier, only had an appropriate tool, it might have been fixed sooner!

The signal generator in the ATS scope conclusively proved that the issue was in the valve itself.

Repaired

The valve was replaced for a new one and the car is running fine now.

Conclusion

This job was quick and easy for the last garage that worked on this car. Including the technical support, it took no more than 45 minutes to find the problem.

This garage used the ATS 5000 scope, the solenoid driver, a Launch X431 scan tool and AECS as their equipment, training and technical support provider.

We are only too happy to help our customers!

Herbert

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

Did you know?

The Solenoid Driver built by **AECS** is a **20 Amp, amplifier**, capable of actuating for example electronic controlled throttle bodies (also GDI's). With the ATS5000 scope's signal generator you can control the solenoid driver. With the ATS scope and Solenoid Driver you can EXACTLY control the fuel delivery amount, or for example the injection timing on a Diesel engine or on a test bench.

Application examples:

1. Timing solenoid valves on all Diesel pumps (CAV, Bosch, Kiki, Zexel, EPIC, etc.).
2. Diesel quantity control solenoid valves (EDC Bosch, Zexel, Kiki, EPIC, etc.).
3. Petrol Injectors (e.g. for use in conjunction with the [ultrasonic cleaner](#)).
4. Automatic gearbox solenoid valves.
5. ABS pump or stuck ABS solenoid valves.
6. EGR solenoid valves.
7. Idle control valves.

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Please help us prepare the training calendar for the next year!

We value your custom and we want to offer you or your staff a \$37.50 discount off your next AECS training in exchange for your help in putting our 2012 training calendar together (please read conditions below).

We would appreciate if you can answer the 4 questions below and send them back to us by ~~the 30th September 2011~~

Extended to the 15th October!

1. Which courses would you or your staff members like to attend in 2012

Course ID	<input checked="" type="checkbox"/>	Description	Normal price
SCAN1		Scan Tool diagnostics	\$512.50+gst
MDE		Mechanical Diesel Diagnostics (VE pump mechanical diagnostics)	\$512.50+gst
AED		Automotive Electronic Diagnostics (AED) training seminar	\$512.50+gst
ATS1		Comprehensive ATS scope users training seminar	\$512.50+gst
EMS1-1		Engine Management Systems 1-1 (Ignition systems, Oxygen sensors, etc)	\$512.50+gst
EMS1-2		Engine Management Systems 1-2 (Drive by wire, immobiliser, etc.)	\$512.50+gst
EMS1-4		Engine Management Systems 1-4 (HYBRID engine management systems)	\$512.50+gst
EMS2-1		Engine Management Systems 2-1 (Blank screen chip programming)	\$512.50+gst
DMS1-1		Diesel Management Systems 1-1 (Denso spill valve V3/V5 diagnostics)	\$512.50+gst
DMS1-2		Diesel Management Systems 1-2 (Bosch VP 44 Diagnostics, CAN, etc.)	\$512.50+gst
DMS1-3		Diesel Management Systems 1-3 (Common rail Diesel Diagnostics)	\$512.50+gst
ABS1		ABS/traction control training seminar	\$512.50+gst
ECAC1		Electronic Controlled Air-conditioning 1 Maintenance and diagnostics	\$512.50+gst
Any		We have someone for any of the above seminars.	

2. Please indicate which months of the year 2012 you prefer for a training seminar.

Jan Feb Mar April May June July Aug Sept Oct Nov Dec

(please delete the months which are not suitable for you)

3. Where?

Please indicate which of the main centres suits you best (please tick one or more).

Location	<input checked="" type="checkbox"/>	Location	<input checked="" type="checkbox"/>
Whangarei		Nelson	
Auckland		Christchurch	
Hamilton		Greymouth	
Tauranga		Dunedin	
Rotorua		Invercargill	
Gisborne			
New Plymouth		Fremantle	
Hastings (HQ)		Melbourne	
Palmerston North		Sydney	
Masterton		Brisbane	
Wellington		Cairns	
Almost any area (we are prepared to travel)			

Your contact details.

Name.....

Title.....

Address.....

Phone Nos.....

Email address.....

Conditions:

Thank you! for taking the time to complete this questionnaire and helping us making a practical calendar. We will keep a note that you are eligible to attend for \$485.00+gst if you attend ***the seminar of your choice and in the area of your choice in 2012.***

We will post the training 2012 calendar on our website and e-mail you a copy plus an invitation once we have collated the results.

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