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AUTOMOTIVE EQUIPMENT & TRAINING

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CONFIDENT CAPTIVA

By Hamish Van Lier

VEHICLE: 2012 HOLDEN CAPTIVA LE9 2.4

This diagnostic article takes you through the process our technical support team use with problematic vehicles. We look at the issues involved and share how we resolved the problem. This an inside look, from the profound to everyday issues automotive workshops encounter.

Problem presented from the workshop to our Technical Support Team:
We have a client's Holden Captiva in for service today. The owner complained of flat performance and an occasional check engine warning light on the instrument panel. The owner would like this fixed but is constrained by a limited budget. I am sure many of us can relate to this particular part of the problem!

The technician had carried out a scan of the vehicle's engine system with the Launch Auscan, which presented them with fault code P0010.

Launch Auscan2 screen dump of the fault code

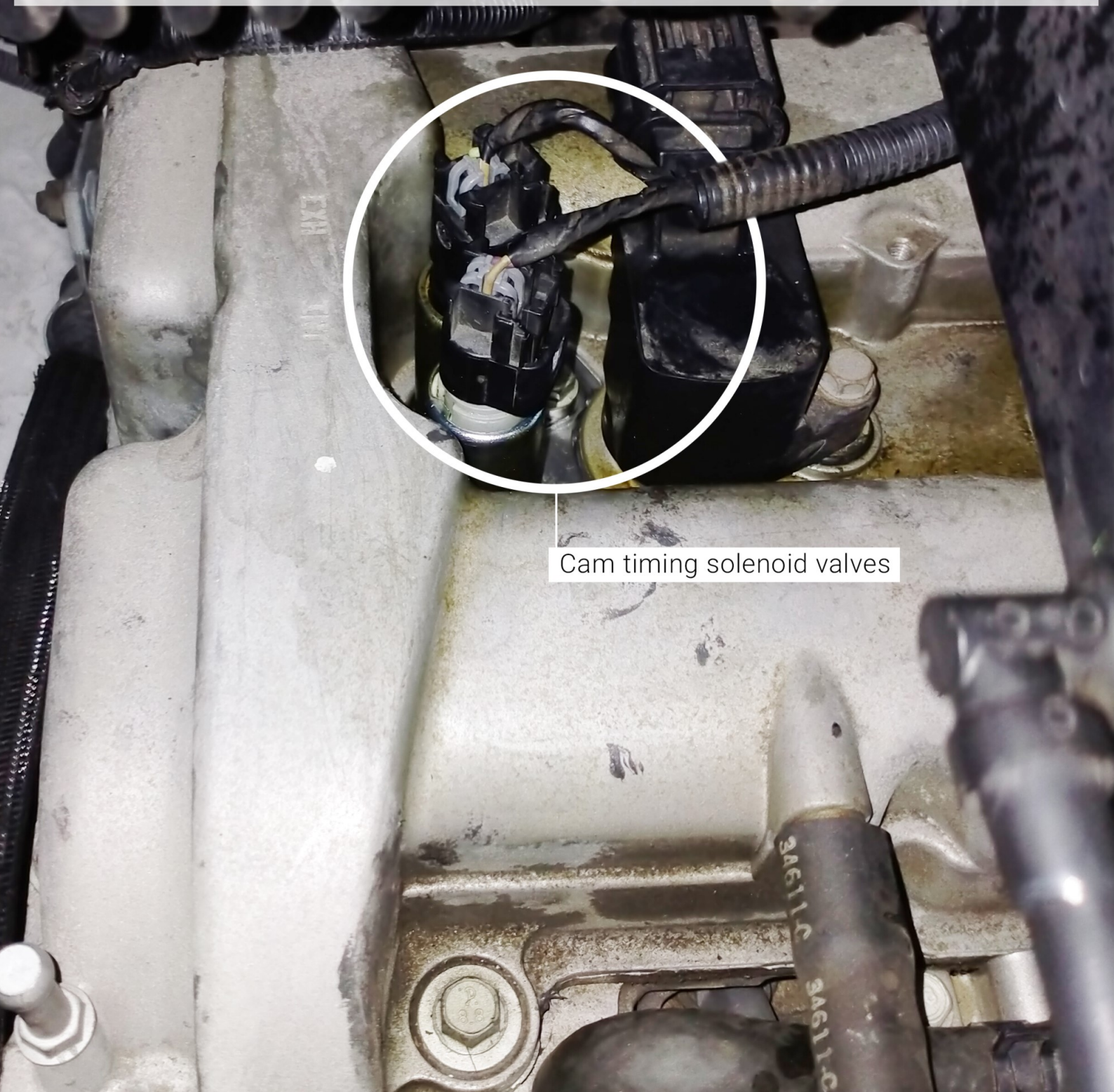
The code indicates an issue with the camshaft position solenoid control circuit. Let's see what is happening in this circuit when it is operating. Only an oscilloscope will be able to capture this fast-changing signal, it is the only certain and quick way to identify the fault in the circuit.

“A scan tool tells us where it might be...
A scope tells us what it is”

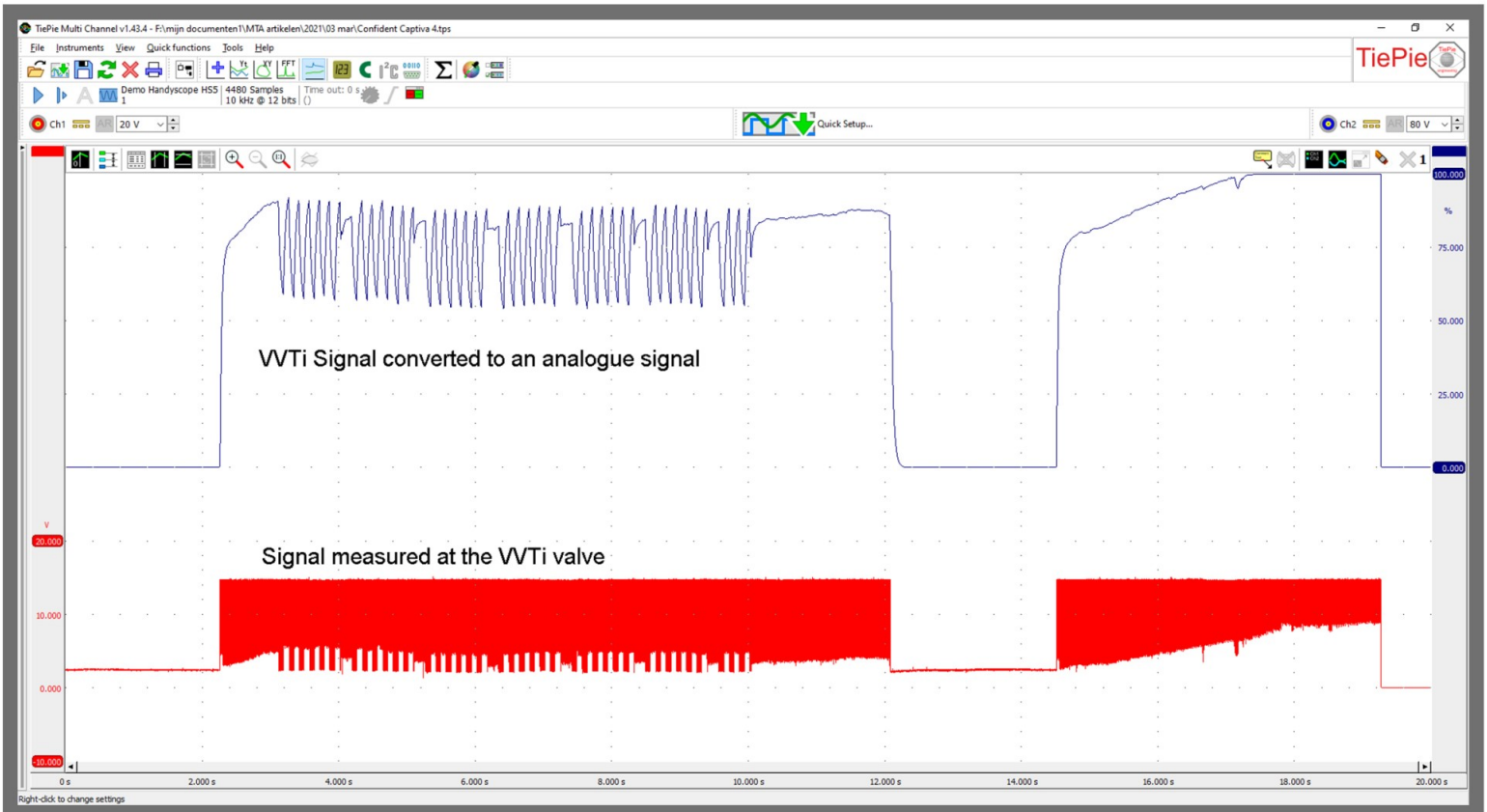
The workshop had recently purchased from AECS a two-channel ATS500XM scope kit, completed scope training and had subscribed to AECS technical support. They wanted some assistance in the hookup and pattern diagnosis produced.

Measure

We asked the technician to go into the scopes measurement software and select one of the preset duty cycle measuring templates. In this case, the earth switched solenoid with the engine ECU controlling the earth and subsequent ON/OFF ratio of the solenoid.
The easiest connection point was to go directly to the solenoid’s signal wire by back probing the connector and battery negative which were both easily accessible.



The following pattern was recorded and sent through for technical support and comment.



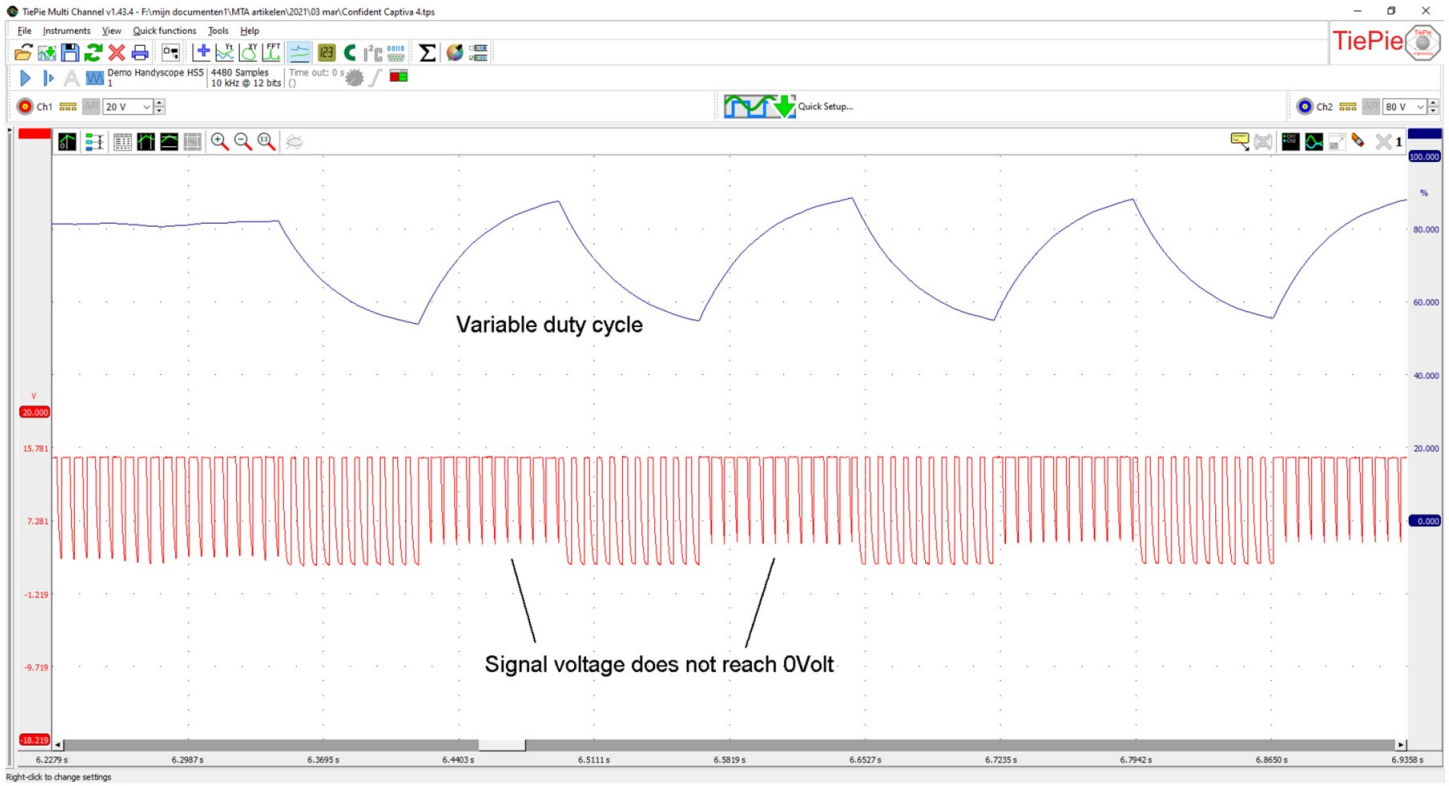
VVTi signal measured (20 seconds) and converted to an analogue signal which is unique to the ATS scope since 2008.

In the above signal, we could see immediately the issue in the camshaft advance control solenoid control. The duty cycle is the on/off time of the solenoid which is controlled by the engine ECU to send out the required oil pressure to move the camshaft actuator to its predetermined position.

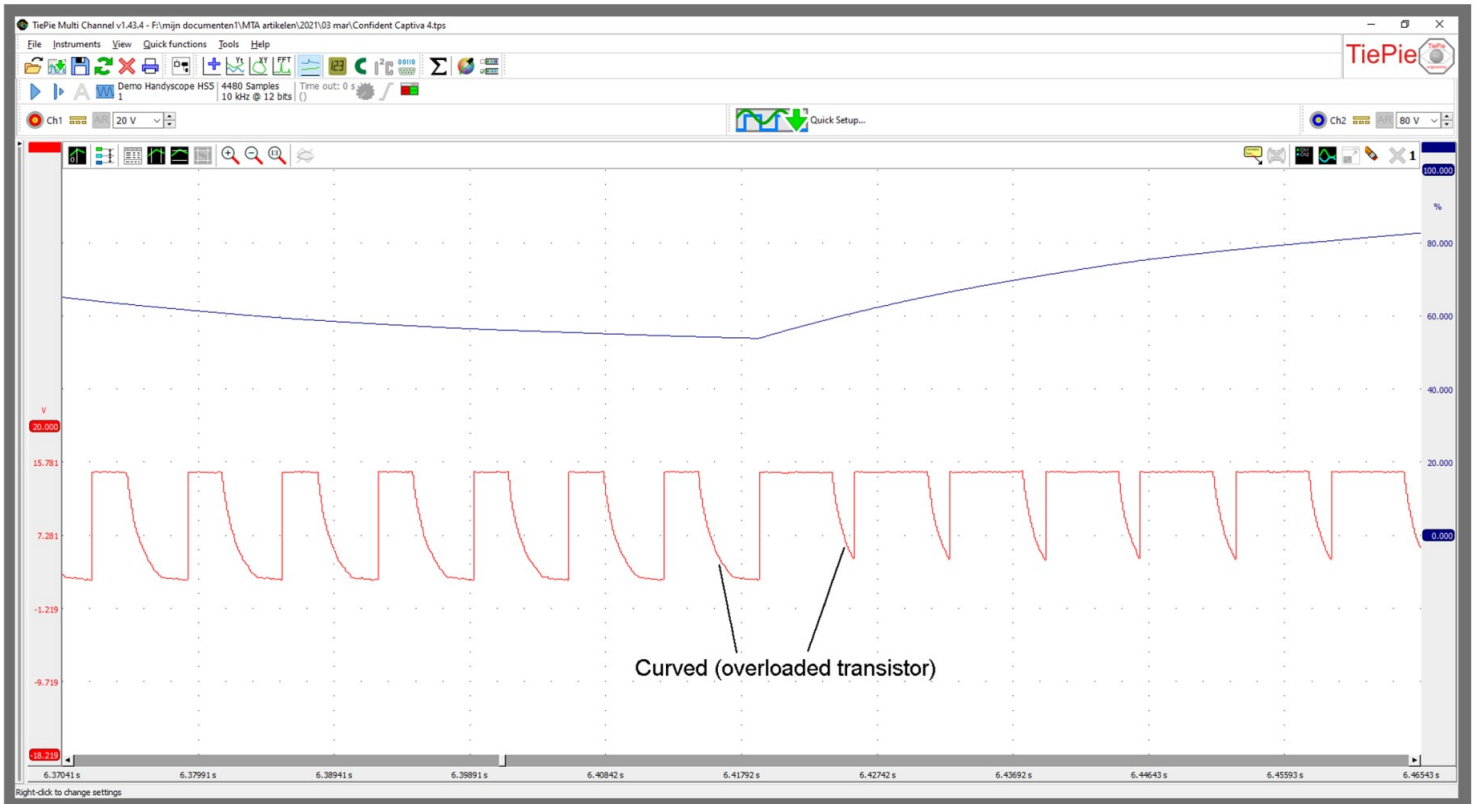
The blue trace on our scope recording is a calculated analogue duty cycle line, created in the scope software. It is indicating the on-time of the solenoid represented as a percentage. Solenoids have a fairly narrow control range. Often in the 15 to 50% range would be a general rule. Seeing the swinging sawtooth line and the eventual 100% duty cycle also informs us the ECU is struggling to control with this solenoid the cam timing to the desired position.

Let's Zoom

Zooming in on the recording shows something real interesting:



During the wildly varying duty cycle period, the voltage measured does not seem to switch to earth (0Volts) properly in part of the pattern (high duty cycle). Yet in other parts of the pattern, it does switch properly to earth. Better zoom in more.



Zoomed in ATS scope recording.

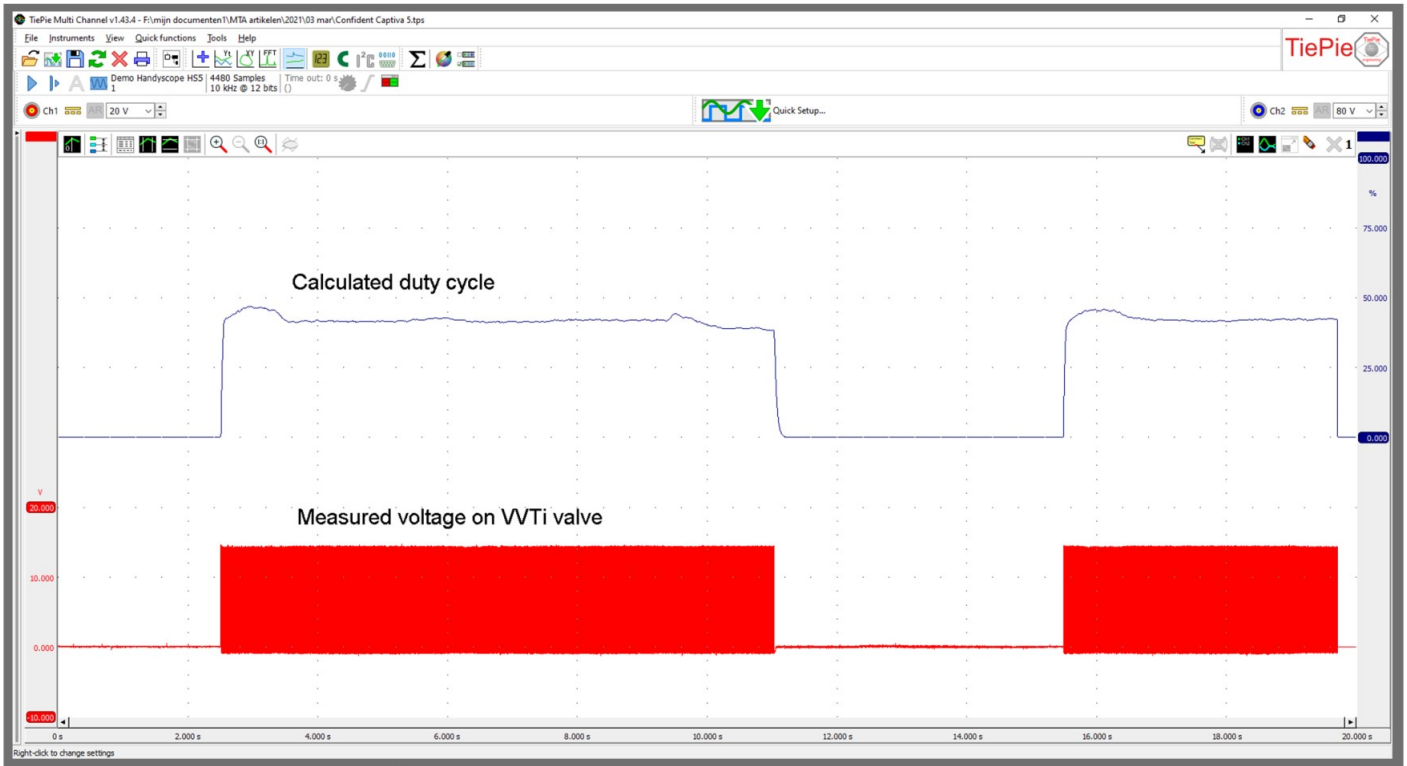
Nice! It now shows every switch effort the ECU does. When the ECU switches the valve to earth for longer the voltage drops to zero, but slowly (curved pattern). This proves that the ECU is capable to switch the valve to the ground and that the ground connections are fine. When the ECU switches the valve for a short time it does not reach zero, but the pattern is still as curved.

Short

There is a clear short inside the control solenoid, the curve can only mean one thing, and that is that the current in the shorted windings of the valve is too high for the transistor inside the ECU.

New

A new cam actuator solenoid was ordered and fitted. The following pattern was recorded with the new solenoid. We can clearly see our new solenoid switching from system voltage to 0 volts every activation. No more bite marks on the earthside of the pattern. Our duty cycle is under control sitting at approximately 40% with only minor control fluctuations required from it.



AECS ATS Scope recording of the good valve.

Conclusion

This was not a highly technical job. It does however require the right tools, the Launch Auscan 3, ATS500XM scope, AECS training and support to make a job like this down right easy!

With aid of the AECS technical support help desk, our client carried out the diagnosis with complete confidence in 30 minutes, including confirmation the circuit was now correctly functioning and not going to result in any sort of a comeback repair job.

The vehicle owner was able to be contacted and informed of the fault with complete confidence in terms of costs and cause. The diagnosis of the fault was fast and enabled a fair return on time to be achieved within the owners limited budget. Who would not rather be in a position where they don't have confidence in their diagnosis? Guessing based on probability is just too expensive in these more challenging times we all find ourselves in. *We are here to make things easy for you!*

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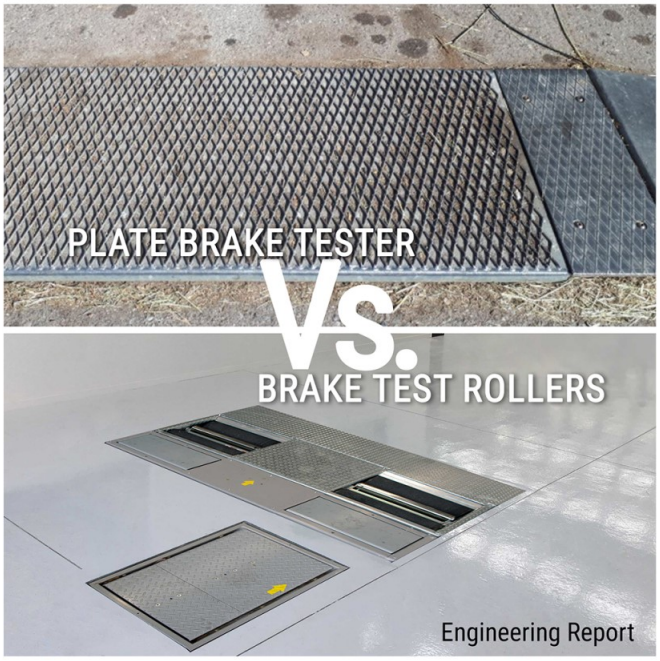
AECS NEWS
DID YOU KNOW?



< Brake Tester Article - Feedback

We've had some really good and interesting feedback from our previous two articles on plate brake testers and brake test rollers.

If you missed reading our comprehensive engineering report you can read it here.

Delivered & Spoken >

Herbert & Cunie spent time in Blenheim last week with the CRA. Herbert spoke to a full house of 285 industry-leading motor body builders and panel beaters.

We had a stall set up which highlighted the latest in car & truck ADAS, aircon service and of course you can't forget the amazing Auscan 3 and new Eurotab 2.

Find out more about: Car ADAS | Truck ADAS Aircon | Auscan 3 | Eurotab2

< Off High-Way

Hamish who is one of our team based in Auckland put his Jaltest through its paces, performing diagnostics on the latest Magni Telehandler. We're liking just how good Jaltest works with this latest equipment.

Find out more about: Jaltest OHW | Jaltest AGV Jaltest Commercial Vehicle | Jaltest Bus

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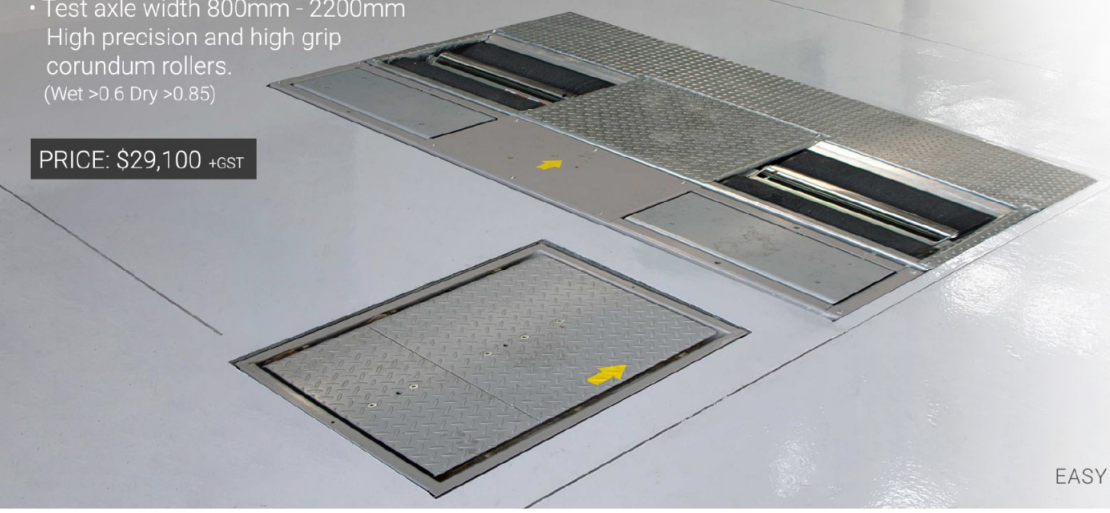

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AECS TRAINING

Location	Course Name	Course ID	Date	Time
April				
Hastings	First-Line Diagnostics	EMS 1-1	22 Apr - 23 Apr	9:00 AM - 5:00 PM
Auckland	Automotive Electronic Diagnostics	AED (c)	28 Apr - 29 Apr	9:00 AM - 5:00 PM
Auckland	Hybrid/EV Safety	HVS1-1 (c)	30 Apr	9:00 AM - 12:00 PM
May				
Hastings	Online EV customer initiation	EV11 Webinar	3 May	8:00 AM - 11:00 AM
Palmerston North	Air-Conditioning Systems	ECAC 1-1	3 May - 4 May	9:00 AM - 5:00 PM
Wellington	Hybrid/EV Safety	HVS1-1 (c)	5 May	1:00 PM - 4:00 PM
Wellington	Air Conditioning HV Service & Repair	ECAC 1-2 (c)	6 May	9:00 AM - 5:00 PM
New Plymouth	Scan Tool - Level 2	SCAN 1-2	10 May - 11 May	9:00 AM - 5:00 PM
Palmerston North	Automotive Electronic Diagnostics	AED (c)	12 May - 14 May	9:00 AM - 5:00 PM
Palmerston North	Automotive Electronic Diagnostics	AED (c)	19 May - 21 May	9:00 AM - 5:00 PM
Auckland	Air-Conditioning Systems	ECAC 1-1	25 May - 26 May	9:00 AM - 5:00 PM
Auckland	Air Conditioning HV Service & Repair	ECAC 1-2 (c)	27 May	9:00 AM - 5:00 PM
Auckland	CAN databus	CAN 1 (c)	28 May	9:00 AM - 12:00 PM
June				
Hastings	online EV Diagnostics & Maintenance: Part 1	EV21 Webinar	1 Jun	1:00 PM - 2:00 PM
Palmerston North	Hybrid/EV Safety	HVS1-1 (c)	2 Jun	1:00 PM - 4:00 PM
Hastings	Online EV customer initiation	EV11 Webinar	8 Jun	8:00 AM - 11:00 AM
Auckland	Hybrid/EV Diagnostics	EMS 1-4 (c)	14 Jun - 15 Jun	9:00 AM - 5:00 PM
Auckland	Diesel Electronic Diagnostics	DED	16 Jun - 17 Jun	9:00 AM - 5:00 PM
Christchurch	Air-Conditioning Systems	ECAC 1-1 (c)	21 Jun - 22 Jun	9:00 AM - 5:00 PM
Christchurch	Diesel Electronic Diagnostics	DED (c)	23 Jun - 24 Jun	9:00 AM - 5:00 PM
Palmerston North	Automotive Electronic Diagnostics	AED (c)	30 Jun - 2 Jul	9:00 AM - 5:00 PM
July				