

## Testing the injectors

For my next test I tried an 'injector balance test'. The tool I used was an injector actuating tool, which has three settings (10-30-100 millisecond) and for this test you need to connect the fuel pressure gauge, disconnect the harness from all the injectors and connect the actuating tool.

On this occasion I used the scan tool to prime the pump, although recycling the ignition key will do. The test showed injector #1 dropped in pressure by 10 PSI, which is my benchmark. Injector #2 was 10 PSI, injector #3 showed a drop of 9 PSI and injector #4 showed a drop of 6 PSI. It was here that I found the cause of the problem.

This test supports the drivability problem, which is due to uneven fuel delivery, as it should be even across all cylinders with the manufacturer stating that a difference of 1.5 pounds is acceptable. In this case injector #4

## "A quality scope is a must-have tool as it helped to verify cam and crank correlation and that the cam signals were incorrect."

was definitely faulty while #3 was on its way out. I recommended replacing both #3 and #4 to the customer, who agreed. The injectors were subsequently replaced and the performance of the vehicle was restored.

We then carried out a further test drive to confirm that the repairs made were correct. This is a typical example of an ecotec engine with multiple problems – cam sensor failures are all too common and it is clearly something that caught the previous two garages out. There are at least three variants to this engine or system design and they share

similar problems. The original cam sensor had probably failed and a replacement aftermarket part – which was not compatible with the system – only made matters worse.

It's important that the test drive, symptoms, information and a correct procedure are put into place. In my opinion, a scan tool wouldn't have proved very helpful in this particular case; in fact using trouble codes to 'diagnose' the problem is what caused the previous garages to run into trouble in the first place.

For this reason I believe a quality scope (in my case, the Pico 4000) is a must-have tool as it helped to verify cam and crank correlation and that the cam signals weren't correct. The other key here was the correct information from the supplier.

The injector actuating tool also proved invaluable, as it took me ten minutes to check all four injectors and to conclude my repair.

# PicoScope®

pico  
Technology

1529 waveforms. Showing 1 to 24

**Vehicle details**  
VIN / ID Code  
Make [Select Make] [v] [m]  
Model [Select Model] [v] [m]  
Generation  
Year <YYYY-YYYY>  
Transmission  
Test Conditions

**Engine details**  
Engine Code  
Primary Fuel  
Secondary Fuel  
Cylinders  
Configuration  
Capacity (l)  
Capacity (cu in)  
ECU Make [Select Make] [v] [m]  
ECU Model

**Channel details**  
Add channel  
[Select Label] [v] [m] Remove  
[Select Good/Bad/Unknown]  
List view Grid view Clear choices Search

**Car Details**  
Make/Model: Ford / Falcon  
Year: 2009  
Transmission: Automatic  
Engine code: ford 4 L  
Primary fuel: LPG  
Cylinders: 6  
Configuration: Inline  
Engine capacity: 4 L  
ECU make/model: Motorola / ford  
Test conditions: Key on Engine Running Idle  
Notes: this car was running very bad at idle popping from exhaust the Valve timing was out only at idle the car has variable valve timing .. the fix was to fit new exhaust camshaft sensor  
Uploaded by: tangoman

**Car Details**  
Make/Model: Volkswagen / Bora  
Year: 2002  
Transmission: Manual  
Engine code: ASV - 81kW  
Primary fuel: Diesel  
Cylinders: 4  
Configuration: Inline  
Engine capacity: 1.9 L  
ECU make/model: Bosch / EDC 15  
Test conditions: Key on Engine Running Idle  
Notes: Channel A: Engine Speed Sensor G28 signal This waveform are taken at idle speed. ( 914 RPM ) The black line is a math conversion of the engine speed sensor signal into a readable RPM value.  
Uploaded by: KimAndersen

**Now over 2000 waveforms**

Did you know PicoScope Automotive includes a fantastic feature that allows the Pico Community to benefit from each other's experience? The Waveform Library Browser enables you to search a global database of waveforms uploaded by PicoScope users from around the world, and contribute yours to share with others.

# WAVEFORM LIBRARY

WWW.PICOTECH.COM/AT317