



**Tim Stock**

## Always Verify...

I recently had a call from a workshop about a 2009 Mazda6 MZR 2.2 Diesel with a running issue. The vehicle had been previously with another workshop, but the customer was unhappy with the ongoing diagnosis and decided to give it to a new garage for a fresh look.

The first workshop had already charged for replacing the timing chain and MAF sensor. So we did not expect either of these to be required.

A scan was done to help decide on a diagnostic plan. Key-on fault code P0336 was present but cleared, and remained clear until the engine was cranked over.

A crankshaft sensor range and performance code logged almost immediately once the engine started. We suspected a problem with Cam or Crank signals, or possibly a valve timing problem.

The Picoscope was deployed, and the signals were sent to me for comparison to a known good waveform from the database.

As a second confirming point, the serial data PID for timing showed a 7 degree drift from the expected value. This was what the ECM had detected on engine start.

As you can see from the Database file and the customer's waveform, we definitely have a timing drift of several degrees late on the Cam timing. The customer opted for the garage to begin again and replace the timing chain with an original part.

After the Technician had completed the repair, the timing signals were assessed and the fault code was cleared and did not return. The scope trace confirmed alignment. And was sent for us to backup our database of known good signals. With this engine the timing is aligned with coloured links 25 teeth apart to reference marks on both the cam and crank sprockets. Both of these were in alignment. Some engines are prone to chain stretch, as was the case with this particular vehicle.

It is also worth noting that there is a function available to relearn the new timing chain coherence values after the repair has been completed.

On 2009 model the reset is performed as follows:

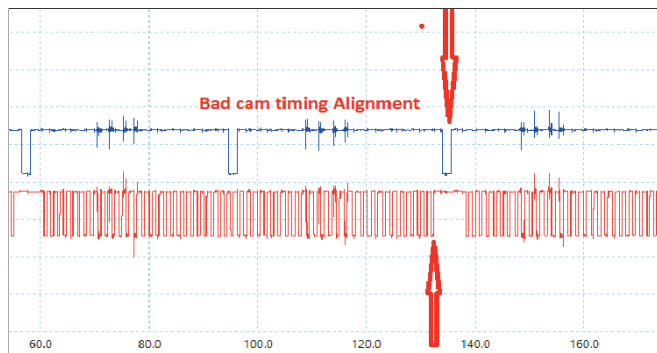
With Data link connector located in fuse box under bonnet:

- Identify the top right hand pin
- Start vehicle and allow to idle
- Earth data link connector pin top right
- Depress and release the clutch and brake pedals simultaneously, 5 times within 5 seconds.
- Check that the DPF light has extinguished

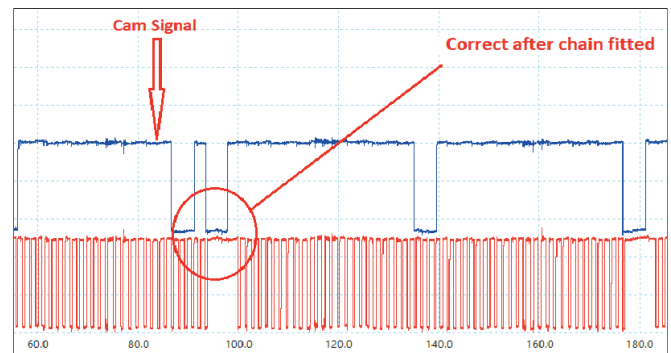
Another satisfied customer, and the garage was confident the fix was done correctly.

So the Moral of this fix is always verify any diagnosis for yourself, as we should not take any previous work as being correct without verifying it.

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**This Cam signal (blue line) is out of synch with the crankshaft**



**This cam signal is in synch, after a new timing chain was fitted**

## When in time is not quite in time

I had a call from a workshop working on a Vivaro 1.9 Di. X83 model that was in a non-start situation. The vehicle had an auxiliary drive belt failure that had wrapped itself behind the timing belt, but the timing belt did not break.

The Technician from the garage decided that a new timing belt was a good idea. The customer agreed as the history of the belt was unsure. He

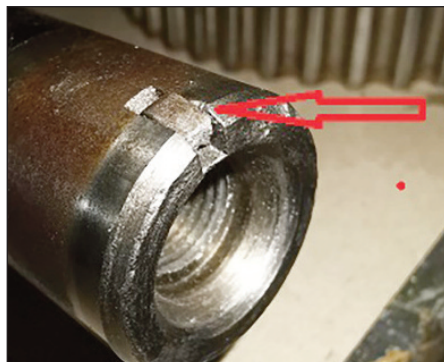
followed the timing belt instructions from the data service he had, but the engine refused to start.

As it was bringing up a code for cam and crankshaft correlation, he checked his work twice and all seemed to be lining up as the instructions indicated. He used his newly acquired Picoscope and signals from both sensors were taken. He sent them to the helpline for verification against our library of known good signals on file. All seemed to be well with the scope trace.

But as we have seen this scenario before, we asked for the pulley to be removed from the camshaft and inspect the location peg in the back side of the pulley. It was then that he saw a not uncommon failure, the location peg had sheared off and the pulley had spun on the camshaft.

A new pulley was ordered and fitted, but the belt seemed too long. It is worth noting that the F9Q 1.9 engine has a few variations, and the Di and DCi have differing teeth counts on the timing pulleys.

The correct pulley was fitted for an F9Q 762 and the engine was retimed. The engine started with no problem or recurrence of the correlation codes.



**The location peg had been sheared off, allowing the pulley to slip position**



**The pulley had been allowed to rotate on the camshaft after the locator sheared off**

Pleased with the result, the technician sent in the pictures of his work as a thanks for our support with his ongoing scope training.

It is always a good idea to get a second opinion when unsure of the diagnosis. The helpline deals with cases like this every day.