



This month BMW are in the spotlight, I want to concentrate on the management system rather than a particular model. Direct coil systems have been in use with various BMW's since 1988. The reason I have chosen this type of system I am sure many of you will agree presents several technical difficulties in obtaining accurate diagnostic data.

These cars are now in wide use in the previously owned market and offer an opportunity for repair and service to the more discerning owners.

BMW have for many years been concentrating in the total engineering package where aesthetics have played a prominent role.

To you and me this means accessibility to components and especially wiring is difficult if not impossible without the right tools.

Serial data acquisition is becoming more widely available from a number of suppliers, Bosch KTS 650, Autodiagnos and Car soft offer what are probably the most comprehensive packages.

Parallel testing demands break out box the use of which speeds up and simplifies testing the Bosch 88 pin systems.

#### Preparation and evaluation

As always don't change a system that works and jump in at the deep end. Collect and evaluate serial DTC's if present and compare with the customers complaint. The symptoms and problems together with our approach and repair in this article relate to a real situation only two weeks ago. Our customer approached us with a 320 24v, having been to other garages including the main dealers without success. His description of fault was textbook, comprehensive factual without exaggeration and including historical problems. The main complaint was flat bottom end performance, above say 3k rpm the vehicle was normal. No DTC's were present, due to this other repairs were at a loss to act. The franchised dealers had replaced the lambda sensor "without any improvements" the customer's exact comments take note and be warned. Other events worthy of note occasionally the vehicle would fire back through the inlet and the idle speed would suddenly rise to 3k and return to normal.

For me the last comment was the one I wanted most, many direct coil systems are suffering premature ECM coil failure and or including radio frequency interference into sensitive circuits glitching the ECM.

The symptoms are often no DTC's accompanied by incidents like idle control glitching, intermittent mil lamp illumination, intermittent driveability errors only lasting a fraction of a second and or dtc's stored in sensor circuits.

First of all let me explain what happens in this system when glitching occurs. The management system will switch off individual injectors if the ignition coil fails, the entire system can go "off line" if the induced spike is severe enough. Switching off all ignition and fuel pulses. It takes approx. 1.5 revolutions for the system to re initiate often resulting in the idle valve opening fully to prevent a stall. If this happens when you are driving the vehicle it can throw you forward out of your seat! If you are lucky a DTC for an injector error may be stored. So what action can we take to correct or prove glitching.

The simple answer first, remove the coils and examine carefully using a magnifying glass look for cracks or dull powder deposits around the coils or rubber coil plug adapters, examine plugs for "corona" ringing and examine the cylinder head and apertures around the coil housings for signs of tracking.

A note of interest here our customer commented that the problem "went away" for a short period when new plugs were fitted and why? The firing voltage was reduced below the glitch threshold. Replace all defective items the coils and plug adapters and replace the plugs at the same time.

The technical answer, use an oscilloscope with pulse width triggering capability down to at least 100 Nano seconds, that comment alone puts every automotive oscilloscope out of the game, set a rising edge trigger with a pulse of less than 100 micro seconds at a threshold of say 100volts, set the trigger to "single shot" or update on trigger.

In plain English you have to set an electronic trap for the coil induction rise time which takes approx. 6µs with a peak max threshold of 300-400 volts. You are using this trap to compare other circuit failures with this occurrence. Therefore proving the failure is symmetrical with the coil induction

Back down to earth lets look @primary ignition trace. This sample was taken from a Textronics 3020 digital phosphor oscilloscope. The trace is a perfect sample so can be used to compare other coil samples across the BMW range.

Key information is taken from the following.

1. Ignition burn time 3m/s
2. Firing line voltage 30v
3. Induced voltage (off screen) 350v +/- 50v
4. Dwell 3.5 m/s
5. Coil ringing 3-5 rings

By probing into each primary circuit you can evaluate the coils easily and in a very short time with no special equipment.

A final word of advice, the 3 series BMW ECM is @ the rear of the battery, bolted in a recess, it often leaks water badly.

The cure to our vehicle new coils and plugs approx. £400 and VAT but you cant have everything and perfection.

*(Please include our usual foot note regarding training and equipment supply)*