Intelligent Engine Analyzer

Training

Wheel of Fortune

John Anello - Auto Tech on Wheels


Fig. 1

I was called to a shop with a complaint of a no start condition on a 1996 Dodge Caravan with a 3.3L engine (figure 1). This shop only had a scan tool in its arsenal of equipment. No scope, no graphing meter combined with a component tester or even a repair information system. With no codes in memory the shop resorted to the feels like tactics. They used their best instincts to replace parts associated with their visual inspections and old school test procedures. The spark tester they were using only showed spark on one coil so the list included coil pack, crank sensor, cam sensor and an ECM. The old ECM was bad due to a damaged coil driver that was holding one coil primary constantly on. This I have seen many times in the field caused by a bad coil assembly with
a shorted coil primary winding. So I can justify their replacement of the coil assembly and the ECM but the vehicle at this point still had a problem with a no start. This shop is not alone in the way they diagnose cars. All too often I cater to these type of shops and I try my best to educate on site how important it is to keep themselves up to date on training and have the proper equipment to perform tasks that will only save them time and unwanted parts. It will only make them a better technician in the long run. It is never too late to step up to the plate to take it to the next level. The worst thing in any business is to let technology surpass you. You will only find yourself stuck in the past with not much of a future to keep afloat. When I arrived at the shop I attempted to start the car but it only spit back a few times like it wanted to start. The shop tech told me that the #2/5 ignition coil was the only coil firing during cranking. The other coils did not fire at all. At this point I decided to hook up my scope to some selected signal lines to get a visual concept of what was exactly going on. I used my EScope Limited 4-trace scope and placed my channels on the cam sensor and all three coil drivers. As I cranked the engine you could see (figure 2) that the cam sensor was providing the proper signal pattern but the ECM had a problem controlling the coil drivers. One driver attempted to ground the coil while another driver was held on for as long as 600mS of on time. By current ramping the one working coil against the crank and cam signals (figure 3) you could see that the coil driver was maintaining about 8.5 amps of current for almost one camshaft revolution. There is no way any driver would hold a coil primary that long unless that driver was in love and just did not want to let the coil go. It was a relationship that just went bad with no one to give advice to just let go. Someone was just not telling the ECM to let go of the coil. Now I am wondering if this caused the failure of the coil driver within the old ECM.
This erratic coil operation could only be caused by a defective ECM with an internal driver failure, a corrupted crank/cam signal input or a crank/cam sensor correlation problem. The cam and crank sensors seem to be producing the proper patterns with correct amplitude but I needed to compare their synch correlation. I used my Ace Misfire crank/cam waveform database and pulled up a good known crank/cam pattern for this vehicle (figure 4). You can see how the cam sensor pattern repeats the 1-2-3-1-2 pattern while the crank signal repeats the 4-4-4-4-4-4 pattern. It is between where

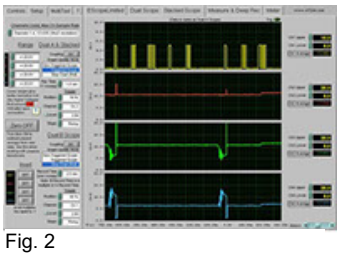
Fig. 2

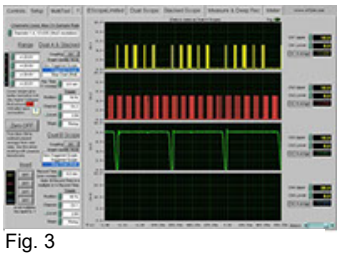
Fig. 3

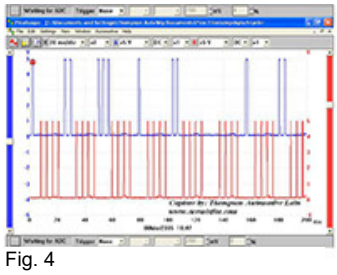
Fig. 4