# Fixing the un-fixable car

A 2009 Audi A3 recently went around to many garages in Ireland, in search for a cure for a severe running problem. After many unsuccesful repair attempts, eXponentia's Steve Carter was asked to diagnose the problem.

Steve Carter, eXponentia

This troublesome car, a 2009 Audi A3 with a 1.6L petrol engine, was recently sold second hand, but after a few months the car was returned to the seller with a severe running problem. Every time the car was started, the engine would only rev up to around 1500 rpms and had no acceleration at all. The sluggish condition would last around 30 seconds and then the car would drive normally. The problem would only be present after start up and would never repeat until the engine was restarted.

Many parts were replaced in numerous attempts by numerous garages to solve the problem, but the problem never went away, never improved, and never got worse. At one point the dash was even removed and sent out for testing, in what was hoped would be a repair, but no fault was found in the dash.

The owner of the car even looked up the problem he was experiencing with his car on Google. He was excited to find that indeed at least one other person was experiencing the same driving problem with a car just like his. However, it turned out to be his own car that one of the mechanics that had tried to repair the car had also asked for help on-line! The owner was lost for an answer yet again. With the future of this car firmly in doubt, as it was considered by everybody to be unfixable, beyond the grasp of any mechanic.

As I was going to be in Ireland teaching some technical training courses, I was approached with a request to look at the car to diagnose the problem. With advance warning, I was able to do some preliminary checks to see if that particular model had any known problems that could be the cause.

I started out checking for trouble codes and noting all of the new parts that had been recently installed, and there were many. There were a few codes in the car, but with all of the work that had been done, it was no surprise. The codes were all cleared and the car was started up and immediately bogged down on acceleration for about 30 seconds and then went back to normal, but no trouble codes were set by this event. When the live data was examined, the reason for the engine bogging down became clear: the ignition timing rapidly went from normal to 15 degrees retarded during the fault, and then returned to normal. After the engine came back to normal, the ignition timing was functioning as expected.

The next thing that was examined was the knock sensor, to see if it was detecting what it thought was a knock and was retarding the timing. It was in good working order. My suspicions were next turned to the Electronic Stability Program (ESP), as it is designed to drop engine power during specific events, such as loss of control of the car by the driver in events such as oversteer. While there is an EPS button on the dash of this car, turning it to the off position merely dilutes it's operation. In case the driver actually does lose control of the car, the ESP system will still respond, in an attempt to avoid or lessen the severity of the event. Switching off the ESP with the button had no effect on the problem.

The next step was to look at the live data from the wheel speed sensors, to confirm that they were all reading about the same speed. All of the speed sensors were in good order without any signs of a problem. If there was a significant difference in wheel speed data, the ECU would think that the driver had lost control of the car and would take action by decreasing engine power. In order to disable the ABS, you must remove the fuses for the ABS under the bonnet. Removing ABS fuses in the passenger compartment, does not completely disable ABS. With the ABS turned off, the car was driven and it ran perfectly.

There were only two sensors left that could have triggered the ESP to decrease engine power, the steering angle sensor, that detects the angle of steering requested by the driver, and the yaw sensor, which detects when a car is spinning out of control.

With the car sitting still and on level ground, the yaw sensor was reading 0.49g's, or a very serious spinning motion. The normal at rest reading from the yaw sensor should have been almost zero, with a reading of 0.2 to -0.2g's when you push down on each front corner abruptly. When the front corners of this car were pushed down, the yaw sensor was reaching 1.2g's, way beyond any reasonable value in anything but a Formula 1 car. The yaw sensor was located in a box firmly fixed under the front passenger seat. The wiring to the box was disconnected, the ABS fuses replaced and the car was taken for another test drive.

This time the car ran perfectly, the problem had been located. The root problem was that the yaw sensor was sending a signal to the ECU, that would normally only occur when the car was being driven too fast around a corner that resulted in oversteer. As the ECU thought that a crash was imminent, it retarded the ignition timing, in an attempt to cut back on engine power. Apparently, the power reduction will occur for only a finite set of time and will not call for reduced engine power during that key cycle.

While this problem is highly unusual, it was solved by following a clear plan of action: Determine the facts and confirm/eliminate possible sources until the problem is fixed. The cornerstone of the process is being current with technology that is in the cars that come into your garage everyday.

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