Working with what you know

Sometimes you encounter a problem on a car that doesn't seem to have a clear solution. Sometimes the only thing you can do is fix what you can, and then see what effect that has on the rest of the situation. Using this method, eXponentia's Steve Carter encounters a seemingly un-fixable Volvo, and fixes it.

Steve Carter, eXponentia

A 2008 Volvo V70 with a D5 turbocharged diesel engine was towed to a garage after breaking down on the road. The car would not crank, there were some warning lamps illuminated on the dash and the brake lamps were on. The garage set about checking the battery, to make certain it had enough power to crank the engine and then plugged in their diagnostic scanner to read the Diagnostic Trouble Codes (DTC).

Much to the mechanic's surprise, only airbag trouble codes were displayed. The ABS and Engine Management fault lamps were both illuminated on the dashboard, but his scanner could not display any DTCs from these systems. A quick check of the physical connection between the car and the scanner, and a check to see that the scanner was indeed switched on and was connected to the car, did not sort the problem.

Faced with these two sets of contradicting facts, it was time to start at an even more fundamental level. The scanner came under suspicion, but when connected to another car it worked as expected. The thought that the scanner might be incompatible with that car prompted the mechanic to try another brand of scanner. This garage was located in a business park that had two other garages close by, so another scanner was handy, but the results were the same - no DTCs from either the Engine Management or ABS systems could be seen. When a third brand of scanner was connected to the Volvo the result was the same. No Engine Management or ABS DTCs could be seen when he knew that they had to be in there, but he didn't know why.

Now the mechanic had three heads working on the problem, but no solution was in sight. Anything they tried or checked did not get them any closer to a solution. And of course the owner of the Volvo wanted to know what was wrong, how much was it going to cost to fix it and when would it be ready. Even more unknowns to worry about. It's a tough spot to be in with a customer that has put their faith in your abilities, but it seemed as if towing the car to a Volvo dealer would be the only solution. It seemed time to surrender the car to a Volvo dealer.

As luck would have it, I had come round to the garage to collect a car for a training course being held the next day. I was pressed for time, but offered to have a quick look to see what could be done. A one minute recounting of the details was provided, and I set about seeing what could be done. This car was equipped with CAN-Bus, so there was no direct wiring between the components, all communications between components is over a network.

Because multiple scanners alone had been unsuccessful on their own, I attached a breakout box to the data port of the car. The breakout box allowed me to see what activity there was, at any

A scanner alone could have sorted this problem

A breakout box provided a clue, but it was not essential

pin in the connector. On this Volvo, with the key on and engine off, there should have been network activity at 6 and 14 and also on 3 and 8. There was activity on 3 and 8, which was the network that controlled the airbags. There was no activity on 6 and 14, which is the network that controlled not only Engine Management, but also the ABS. That explained why the scanners had all failed, the network that was supposed to report the DTCs was not working.

Given that there was only one network active, the next step was obvious: you do what you can do and see where that gets you. A quick scan of the airbag network showed a total of at least 15 faults, all CAN-Bus related. Once these faults were cleared, there was network activity between 6 and 14. The Engine Management and ABS could now be scanned. There were also at least 15 DTC on each of these systems, and as would be expected now, all but one were CAN-Bus related. The remaining fault code related to the brake light switch, and it was the only fault code that was not CAN-Bus related.

Do you remember that the brake lights were on at all times? When the brake light switch was unplugged, the car started and ran perfectly. The source of the problem had been identified in less than 15 minutes, with the proper tools and knowledge of how the control network on this car really works. While the breakout box was not essential in solving this problem, it did provide a bit more information, and it confirmed the nature of the problem. The problem could have been sorted without a breakout box, by using the scan tool to look at the airbag system, clear those codes and then checking the other networks as they would have come back to life.

Now the question you should also be asking is: How could a faulty brake light switch bring the entire car to a stand still? The initial fault was reported and caused a cascading series of discrepancies in the network that created more faults, relating to the CAN-Bus network. These new faults caused even more faults. The faults accumulated in the system until it became paralyzed and simply switched itself off, either incapable of resolving too many conflicting messages, or believing that some serious problem existed that might cause damage to the car.

The mechanics who had been stumped by this were a bit shocked that a solution had been so simple, and the lesson so clear: Do what you can do and see where that gets you.

eXponentia™
The Automotive Training Experts