One wheel speed sensor causing multiple systems faults

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As more and more systems share data from various sensors, vehicle manufacturers have reduced the amount of sensors fitted to a vehicle. While it does make for a cleaner and simpler design, this can complicate diagnosis in unknown ways. A recent case study revealed just how a single sensor can affect multiple systems in ways that can confuse the most skilled technicians.

A 2015 Ford Kuga 2.0 TDCi was in for various system failure codes. Systems with issues included ABS, reporting a left rear speed sensor signal error. ADAS was not operating correctly, and the park distance control was also non-operational. The customer had complained that the presence system had shut down, and was not warning of vehicles approaching from the rear. The power steering was functioning, but was complaining of data issues on the CAN network.

The connector may be grey or black depending vehicle configuration

Suspecting a system wide communication issue, diagrams for the vehicle networks were investigated. CAN from the ABS showed no issues with the signals, or bus loading problems.

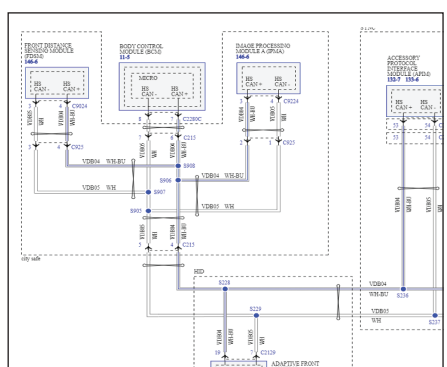
The High-Speed CAN network showed connections to the front distance sensing module (FDSM), the image processing module (IPMA) and the BCM adaptive front lighting module and then to the rest of the High-Speed CAN network.

Scope traces for this network showed no issues. Even the CAN-Bus traffic load was as expected, at around 45% load.

As the only sensor reporting a fault was the left rear ABS speed, the sensor was suspected as being faulty, and a replacement was ordered. This is where it becomes apparent that this sensor is system specific. Vehicles fitted with ADAS, park distance control, presence detection, etc., have wiring connectors that are coloured grey. Other versions of these vehicles will have a black connector. This wheel speed sensor was a special order, and Ford had seen this specific multiple faults issue before.

After Replacing the wheel speed sensor and resetting all fault codes, every non-functioning system returned to normal operation.

This only shows the reliance from systems to share sensor data to other modules that are not expected to rely on that sensor for information.



Vehicle network diagrams were used to identify modules on a common circuit