

HOW ARE YOU **SCOPING**?

One would hope that the majority of workshops would agree that a diagnostic scan tool is simply not enough; however, this would not appear to be the case. Pico assert the need to include oscilloscope diagnosis into the diagnostic journey.

The Pico Journey forms a typical yet simplistic example of how PicoScope sits alongside any scan tool on the road to a successful diagnosis. The flow chart demonstrates how customer expectations can be far exceeded as result of implementing PicoScope during the diagnostic journey, not only ensuring a first time fix, but protecting all parties involved with physical before and after test results. Let's take a look at what is all too often a repeatable scenario when PicoScope is not included in the diagnostic journey.

Without PicoScope

Our customer arrives with an engine management light (MIL) illuminated and complaining of power loss. The Scan tool is attached and a fault code of P1251 is stored with the relevant freeze frame data (P1251 Turbo over-boost). A basic inspection is carried out confirming hoses are OK, and no connection issues are apparent. The fault code is erased and the vehicle road tested with no reported concerns. The customer is charged accordingly but returns the following day with the identical symptoms mentioned above.

The scan tool is connected and once again code P1251 is retrieved. The live data

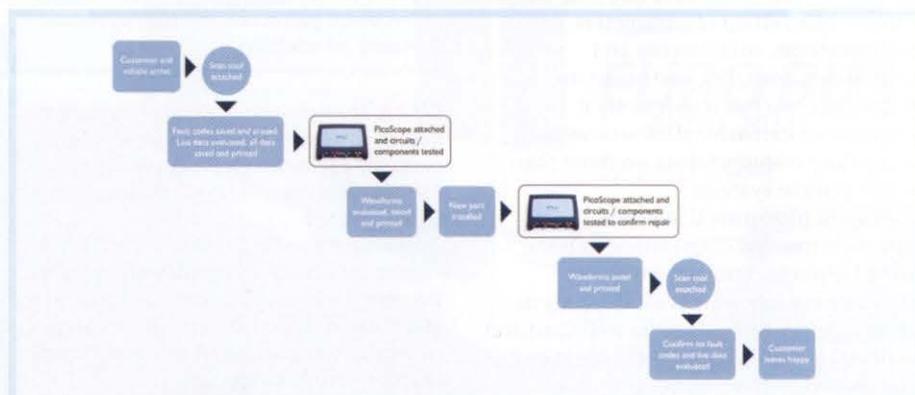
is examined during a road test and no issues are identified. Given that the same fault code has returned, a decision is taken to replace the turbo boost control vacuum switching valve (VSV) complete with hose network and the vehicle returned to the customer. Once again the vehicle returns to the workshop with fault code P1251 stored and loss of power. As a result of intense customer pressure from loss of vehicle revenue, the garage reluctantly opts to install a replacement turbo charger without evidence to confirm if the turbo is in fact the cause of the original code P1251.

With heart in mouth, the vehicle is released to the customer in the hope the

fault has cleared. A week has elapsed with no sign of the customer and so it would seem the fault has cleared and the issue is resolved. This is diagnosis by the seat of your pants, with no evidence or documentation to warrant such a repair, resulting in a customer who now questions the professionalism of the workshop in question. Does this sound familiar?

With PicoScope

Now let's take the same diagnostic journey when PicoScope is included. Our customer arrives with an engine management light (MIL) illuminated and complaining of power loss. The Scan tool is attached and



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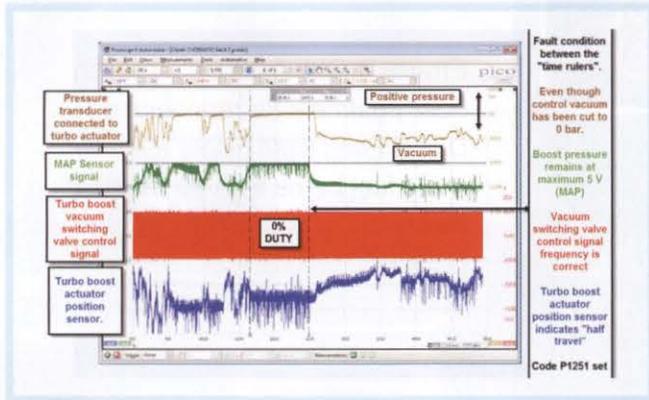
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a fault code of P1251 is stored with the relevant freeze frame data. A basic inspection is carried out confirming hoses are OK, and no connection issues are apparent, but in addition the PicoScope is now attached to evaluate boost pressure actuator vacuum control using a pressure transducer, the control signal to the boost control VSV, the MAP sensor signal and turbo boost actuator position sensor.

With all the above inputs in place, the vehicle is road tested in an attempt to reproduce the symptom. Whilst our fault code did not return, clear evidence was gathered confirming early stages of a momentary over-boost condition not indicated by the ECU detection strategy but clearly visible using PicoScope.

The image above demonstrates how monitoring the input to the boost control VSV and corresponding vacuum in real time via parallel not serial testing (scan tool). We can see live events as they happen and not the ECU's interpretation and presentation of events.

Looking closely at the vacuum control signal supplied to the boost control VSV we can see how the command to reduce boost was sent from the ECU and the correct response was followed by the boost control VSV given the fall in vacuum level to the boost control actuator. However, MAP pressure remained high whilst the boost actuator position sensor indicating only half travel.

From the above captured data we can conclude the ECU to be functioning correctly as the command signal to reduce boost was sent. We can confirm the wiring to the boost control VSV and the valve/hose network to be functioning correctly as reported by the pressure transducer, leaving only one possible explanation for the failure in the reduction of manifold pressure... Turbo charger variable vanes sticking.

Introducing the PicoScope during the diagnosis has given the technician the ability to monitor command and response times with respect to turbocharger control so identifying the true cause of fault code P1251, where the engine control unit would have been monitoring the turbocharger control under a specific strategy requiring an over boost condition for a predetermined time period and count. Here the technician has irrefutable evidence to present to the customer and the relevant warranty companies that the turbocharger in question has developed an intermittent fault resulting in over boost.

The turbo charger is replaced with confidence resulting in minimal impact on workshop loading. The vehicle is then returned to service in a timely fashion leaving a lasting positive impression upon the customer.

For more information on the PicoScope circle 073 on the readerlink card