



Common rail diesel diagnostics quick health check

by AK Training

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Common rail diesel fuel system diagnosis doesn't have to be complex or involve expensive equipment. Good system knowledge, some simple tests and an understanding of what results to expect should point a technician in the right direction.



When basic checks have been completed (low pressure fuel supply, interrogate for DTC's, check for fuel contamination etc.), a quick health check of the high pressure fuel system can be done using the graphing function of a scan tool to evaluate live data values for rail pressure and engine speed during cranking, idle and snap acceleration. The fuel rail pressure sensor of a healthy system produces a characteristic waveform which forms the basis for this check.

The quick health check takes just a couple of minutes and will be described over the next few pages along with an example of how the procedure was used by AK Training to diagnose a real time fault on a vehicle.

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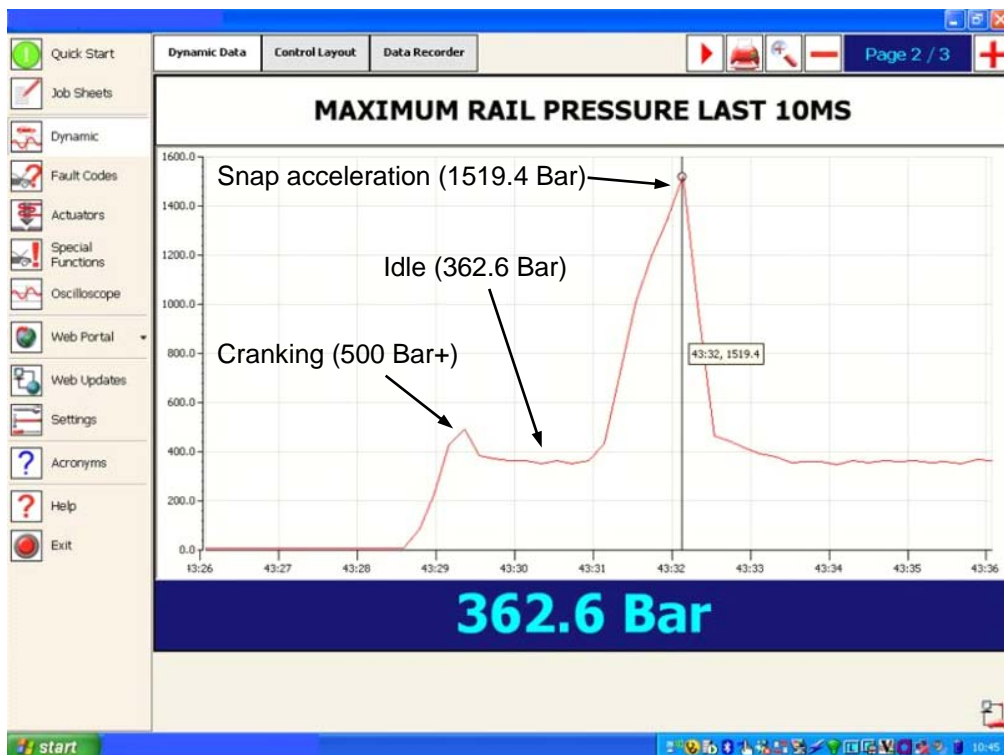
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During cranking, fuel pressure peaks at the start of the waveform. A value of approximately 350 Bar is common for the average passenger car. What to look for is a sharp, almost instantaneous pressure rise. Faults like excessive injector leak back can affect the rate and peak of the pressure rise. When the engine starts, pressure settles down at idle speed to a value of approximately 280-300 Bar. Higher pressures are obtained on commercial vehicles.

With the engine now running, the next part of the check is a snap acceleration. This tests the high pressure pump output. Maximum rated pressure depends upon the age and type of system. For example, a healthy system post 2004 with a rated maximum pressure of 1600 Bar typically produces 1300-1600 Bar during snap acceleration. Earlier systems still produce average values of 1000-1350 Bar. Remember, these are typical values only. Careful evaluation and judgement is essential to avoid mis diagnosis.

The graph below shows an example of the fuel pressure waveform produced by a healthy common rail system on a light commercial van using an OEM scan tool.



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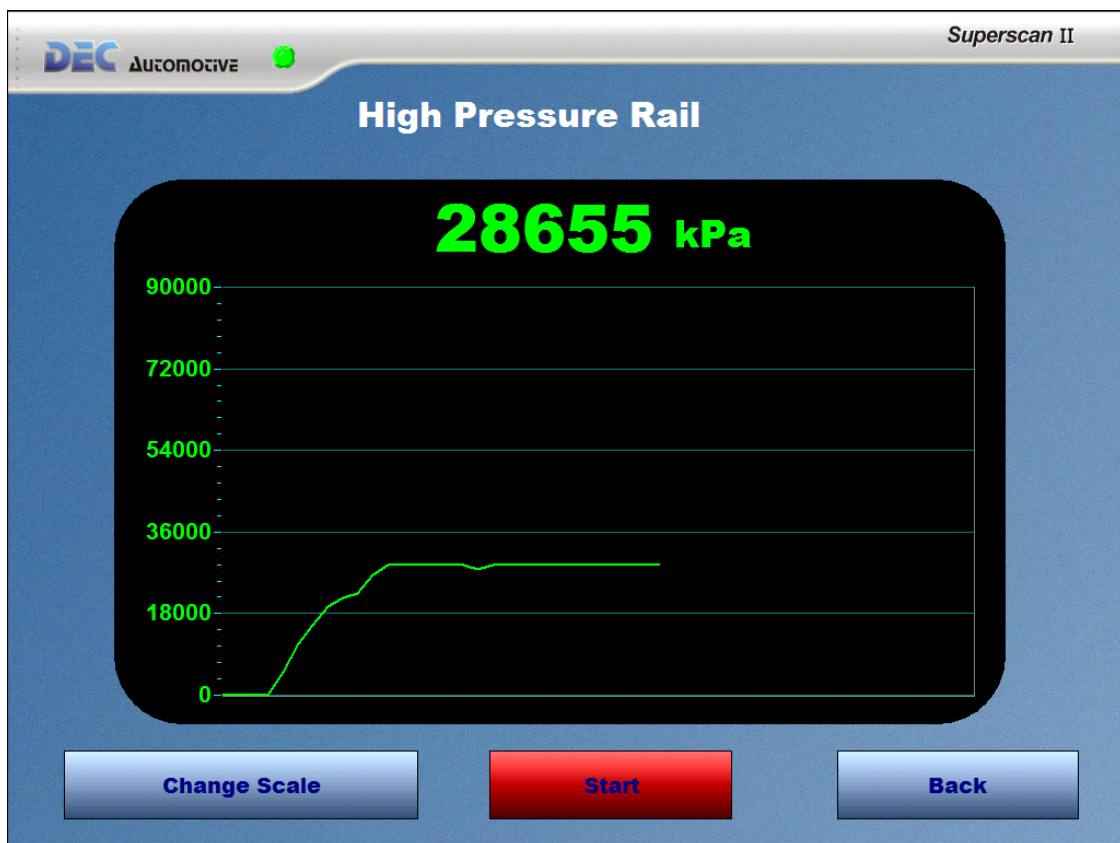
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The following live data captures came from a fuel system fault on a Rover 75, model year 2002 with DDE 4.0 fuel system and Bosch CP1 high pressure pump using a generic scan tool. Symptoms with the engine hot were long cranking times and low, unstable idle speed. There were no DTC's in the ECM.

During cranking, rail pressure increased very slowly (hence the long cranking time) and no pressure peak occurred in the waveform. At idle speed however, pressure was approximately as expected (28655 kPa = 286 Bar).



DEC Superscan II diagnostic scan tool supplied by Maverick Technology

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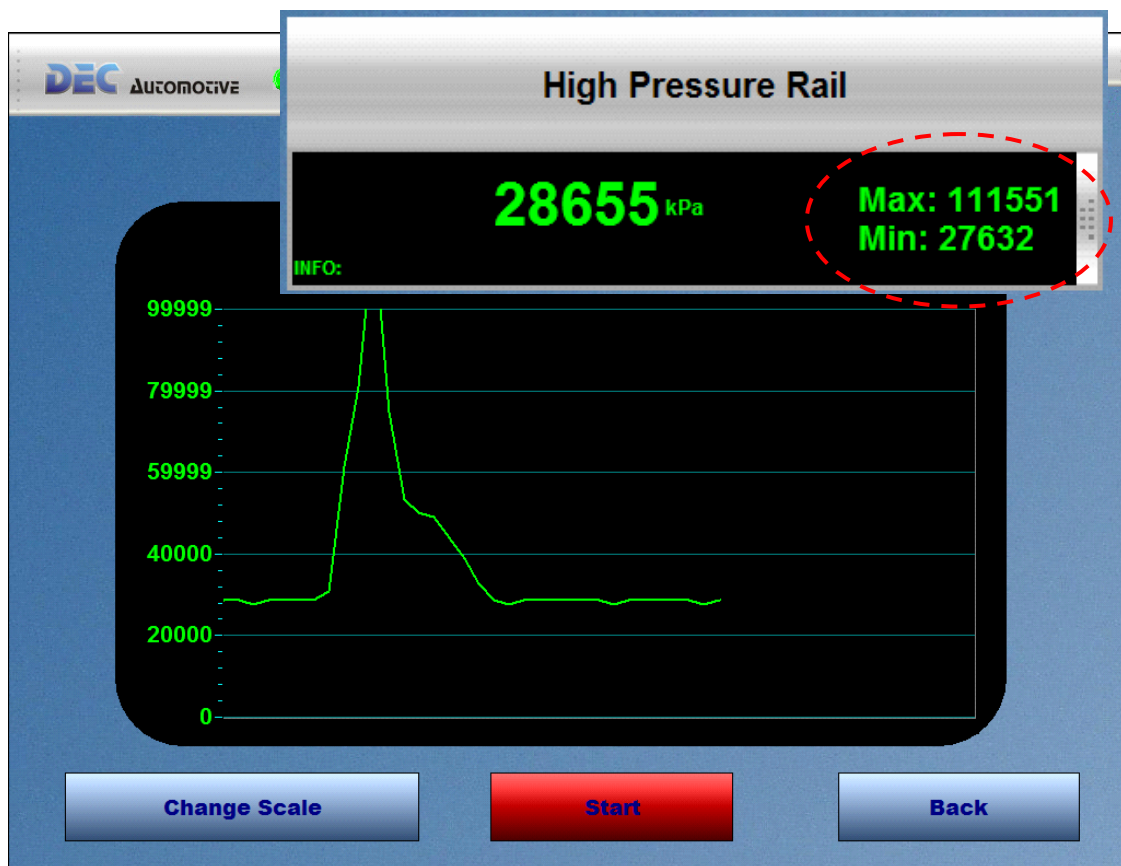


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During snap acceleration, the peak fuel rail pressure exceeded the maximum measurement capability of the scan tool graphing function and so the MIN/MAX function was used instead. The pressure peaked at 111551 kPa (1115 Bar). This value effectively eliminated the high pressure pump and pressure regulation system as a possible cause of the fault. This only left the injectors to be tested.



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An injector leak back test identified excessive leak back from two injectors (filling the bottles in under 20 seconds).



Conclusion

A scan tool is standard equipment in a modern vehicle workshop. An injector leak back kit costs around £100.00. This diagnostic procedure took less than an hour. With the right knowledge, equipment and a methodical approach, common rail diesel diagnostics doesn't have to be complex or involve use of expensive tools and test equipment.

Common rail diesel fuel systems course

The common rail diesel fuel systems course from AK Training covers practical diagnostic techniques for fault finding on modern diesel fuel systems. See the following pages for further information.

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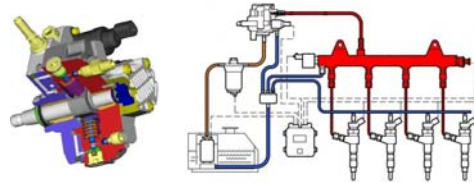
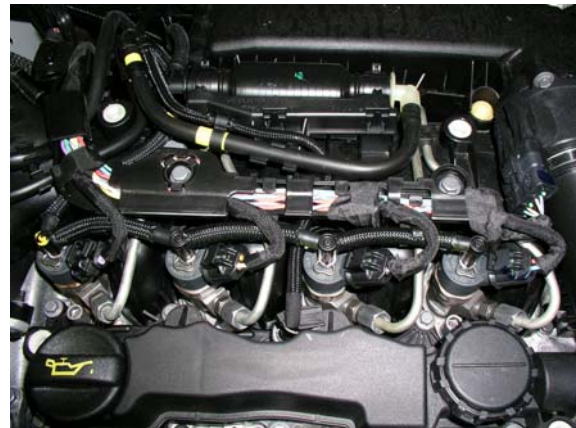


Common Rail Diesel Fuel Systems

by AK Training

This is a one day technical course covering fault finding and diagnosis of common rail diesel fuel systems. Course content includes the following main subjects:

- Introduction to the common rail diesel fuel system
- Low and high pressure fuel supply
- High pressure fuel pumps and pump diagnosis
- Fuel metering regulation
- Fuel high pressure control
- Injectors: operation, testing and diagnosis (including piezo injectors)
- Engine management control functions
- EOBD
- Fault finding and diagnostic techniques
- Course summary and review



The aim of the course is to explain how to carry out cost effective diagnosis of common rail diesel fuel systems. The course comprises of classroom and workshop based practical sessions on live vehicles and working engine rigs. During workshop sessions, delegates will learn how to diagnose common rail diesel fuel system faults using available test tools, diagnostic equipment, oscilloscopes and workshop information systems. By the end of the course, participants will have gained knowledge and skills that will be useful to them when working on modern diesel fuel systems.

See over the page for further details about this course

COMMON RAIL DIESEL COURSE INFORMATION

Courses are run from selective venues or can be delivered on site at clients premises. For further information including next available course dates, course fees and to book a place on a course, contact:

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Further information

Common Rail Diesel Fuel Systems

The course begins by highlighting health and safety considerations when working on diesel fuel systems. There follows a review of developments in electronic diesel control comparing past with present. An introduction to common rail fuel systems includes familiarization with the fuel system layout and a detailed technical overview of the main components. The benefits of common rail will be explained with particular regards to emission legislation and performance.

The operation of the high pressure fuel pump will be explained and there will be an overview of fuel pump types and variants. Several examples of actual fuel pumps will be shown on the course.

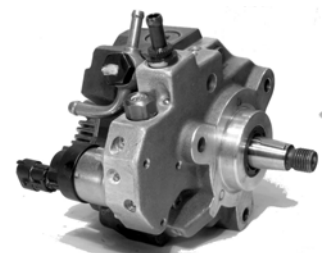
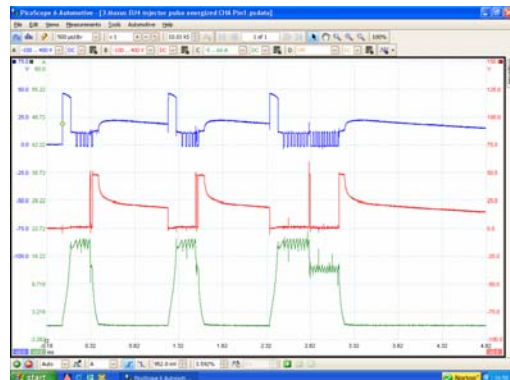
Fuel metering, rail pressure control and two point fuel pressure control will be explained along with the operation of the fuel control solenoids. A technical overview of fuel injectors includes the Piezo stack actuator as well as solenoid type injectors.

The course covers engine management control functions and explains the torque orientated control of modern diesel fuel systems. It also covers emission control systems and EOBD (mandatory for diesel passenger cars since 2004).

Practical activities during the course include testing and diagnosis of the fuel and engine management systems using dedicated tools and equipment, test instruments, oscilloscope, diagnostic scan tool, wiring diagrams and available technical information.

At the start of the course, participants each receive a fully illustrated colour workbook. By the end of the course, delegates will understand the operation of the common rail diesel fuel system. They will have gained knowledge and skills that should be useful to them in carrying out servicing and repairs to their customers vehicles.

There is a short assessment at the end of the course comprising of a multiple choice questionnaire. Those who successfully complete the course will receive a certificate from AK Training in recognition of their attendance.





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