



Unit 1 Advanced diagnostic techniques

Description

This unit is about the practical skills and theoretical knowledge required to identify, diagnose and rectify vehicle system faults. The unit focuses on faults that may be non-standard and intermittent in nature and in the context of complex vehicle systems and technology. It requires the candidate to plan and apply logical and systematic fault finding and rectification techniques and procedures.

In order to achieve this unit the candidate is required to demonstrate they can combine a theoretical knowledge of current automotive vehicle technology with the practical application of fault diagnosis and rectification techniques.

Learning outcomes.

The candidate must:

1. Access information
2. Evaluate information
3. Select fault finding techniques
4. Use advanced diagnostic techniques
5. Understand advanced vehicle systems
6. Evaluate effectiveness of diagnostics and repairs.

1. Access information on the vehicle and its fault characteristics

- 1.1 Review vehicle service and maintenance history
- 1.2 Review Vehicle make and model for warranty/concern recalls
- 1.3 Question the driver to determine the symptoms of the vehicle fault
- 1.4 Question the driver to determine
 - driver's actions
 - weather conditions
 - road conditions
 - vehicle speed
- 1.5 Vehicle load, approved parts etc
- 1.6 identify the symptoms that indicate a vehicle fault e.g. noises, unusual events, failed operation, poor performance (low power, high fuel consumption), vibrations, blowing fuses, poor handling etc.
- 1.7 Road/static test the vehicle with the driver driving/operating the vehicle.
- 1.8 Record driving and operational conditions before and when the fault occurs.

2. Evaluate information

- 2.1 Evaluate the information gathered from the driver, the road/static test and the vehicle history
- 2.2 Consider the possible connection between the fault symptoms and the information obtained
- 2.3 Decide the range of possible causes of the fault

3. Select fault finding techniques

- 3.1 Determine the visual inspections to be used to identify the causes of the fault: accident damage, accident damage, coolant levels leaks unusual wear evidence of abrasion. frayed cables security and, fit, of: components, electrical connections, fuses.
- 3.2 Determine specialist and non-specialist equipment required to diagnose the faults. identified
- 3.3 Prepare and calibrate tools and equipment required for fault diagnosis.
- 3.4 Select manufacturer's recognised tests and procedures to be used to diagnose the identified faults.
- 3.5 Determine best practice tests and procedures to be used to diagnose the identified faults
- 3.6 Determine relevant manufacturer's settings, values and fault codes Set out and use a logical sequence of tests and measurements and use the results to re-evaluate assumptions made about the causes of the faults.
- 3.2 Determine specialist and non-specialist equipment required to diagnose the faults identified

4. Use advanced diagnostic techniques

- 4.1 Apply a logical sequence of tests and measurements and use the results to re-evaluate assumptions made about the causes of the faults.
- 4.2 Conduct visual, aural and physical checks of the vehicle.
- 4.3 Conduct mechanical and electrical checks appropriate to the vehicle system being tested
- 4.4 Rectify any minor defects and incorrect settings
- 4.5 Apply logical and systematic procedures to eliminate potential defects and identify cause of faults

- 4.6 Use the results to re-evaluate assumptions made about the causes of faults
- 4.7 When appropriate isolate systems and components to eliminate possible causes of faults.
- 4.8 When appropriate substitute components or units to eliminate potential causes of fault(s).
- 4.9 Confirm successful diagnosis and repair by repeat testing and road/static testing
- 4.10 Record the outcomes for administration purposes and for sharing with colleagues

5. Understand advanced vehicle systems

- 5.1 The different types of engine management system e.g. analogue, digital, programmable, non-programmable, open loop, closed loop.
- 5.2 The use of engine maps to enhance vehicle performance.
- 5.3 The advantages of variable valve timing and variable valve lift systems.
- 5.4 The principles of hydraulic control and electronic control automatic transmission systems
- 5.5 The principles of four wheel drive systems e.g. Hub assemblies, couplings, electronic control system.

The principles of

- traction control and vehicle stability control system
- electronic and speed sensitive steering systems
- anti-lock and electronic brake control systems
- active suspension systems
- Control Area Network (CAN) bus systems
- vehicle security systems
- satellite navigation systems
- air conditioning and climate control

6. Evaluate effectiveness of diagnostics and repairs

- 6.1 Conduct tests on vehicle and/or components to determine the effectiveness of repair and fault rectification.
- 6.2 Carryout road test to confirm satisfactory operation of the vehicle
- 6.3 Conduct visual inspection of vehicle and/or components to ensure correct fitting of parts and good standard of presentation of the vehicle
- 6.4 Recognise the effect on customer's perceptions of poor re-instatement of components and poor presentation of vehicle following repair.


Assessment requirements

Candidates are required to complete centre devised assignments to meet the requirements of the assignment evidence summary and learning outcomes. These assignments must be devised and marked in accordance with the City & Guilds centre devised assignment template.

Quality assurance

City & Guilds external verifiers will sample candidates marked assignments to ensure compliance with the assessment and marking criteria.

Assignment Evidence summary

	HLQ
	Evidence Reference
Diagnose and rectify faults in engine systems	
Diagnose and rectify faults in transmission systems	
Diagnose and rectify faults in electrical/electronic systems	
Diagnose and rectify faults in chassis systems	

Unit assessment and verification declaration

<p>Candidate declaration: I confirm that the evidence listed for this unit is authentic and a true representation of my own work.</p> <p>Candidate name:</p> <p>Candidate enrolment number:</p> <p>Candidate signature: Date:</p>
<p>Assessor declaration: I confirm that this candidate has achieved all the requirements of this unit with the evidence listed. Assessment was conducted under the specified conditions and context, and is valid, authentic, reliable, current and sufficient.</p> <p>Assessor name:</p> <p>Assessor signature: Date:</p> <p>Countersignature: (if relevant) Date:</p>
<p>Internal verifier Declaration: (This section to be left blank if sampling of this unit did not take place.) I have internally verified the assessment work on this unit in the following ways (please tick):</p> <p>?sampling candidate and assessment evidence</p> <p>?observation of assessment practice</p> <p>?discussion with candidate</p> <p>?other – please state:</p> <p>I confirm that the candidate’s work meets the standards specified for this unit and may be presented for external verification and/or certification.</p> <p>Internal verifier name:</p> <p>Internal verifier signature: Date:</p> <p>Countersignature: (if relevant) Date:</p>

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Key/Core skills signposting

Key Skills	Core Skills
Communication: C2.1; C2.2; C2.3	Communication: Access 3, Outcome 2 Intermediate 1, Outcomes 2 and 3
Application of Number: N2.1; N2.2; N2.3	Numeracy: Access 3, Outcome 1 Intermediate 1, Outcomes 1, 2 and 3
Information Technology: IT1.1; IT1.2; IT1.3	Information Technology: Access 3, Outcomes 1, 2 and 3
Working with Others: Not applicable	Working with Others: Not applicable
Improving Own Learning and Performance: LP2.1; LP2.2	<i>No parallel unit.</i>
Problem Solving: PS2.1; PS2.2; PS2.3	Problem Solving: Intermediate 1, Outcomes 1, 2 and 3