



Australian Government

Assessment Requirements for AURETH114

Diagnose complex faults in hybrid and battery electric vehicle network management systems

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Modification History

Release	Comments
Release 1	This version first released with AUR Automotive Retail, Service and Repair Training Package Version 6.0

Performance Evidence

The candidate must demonstrate the ability to complete the tasks outlined in the elements, performance criteria and foundation skills of this unit, including evidence of the ability to:

- diagnose complex faults in the embedded network management systems of:
 - at least one battery electric vehicle (BEV)
 - at least one hybrid electric vehicle (HEV) or one plug-in hybrid electric vehicle (PHEV)
- develop a testing strategy to diagnose the cause of at least two of the following complex faults, each present in one of the above vehicles:
 - an intermittent fault
 - a fault that affects more than one system
 - a fault introduced as a result of a system repair
 - an indirect fault caused by the influence of external systems.

Knowledge Evidence

The candidate must be able to demonstrate knowledge to complete the tasks outlined in the elements, performance criteria and foundation skills of this unit, including knowledge of:

- methods to locate and interpret information required to diagnose and repair complex faults in hybrid and battery electric vehicle network management systems, including:
 - hybrid and battery electric vehicle network management systems system manufacturer specifications
- workplace procedures required to diagnose and repair complex faults in hybrid and battery electric vehicle network management systems, including:
 - establishing the serviceability of tools and equipment
 - documentation procedures
 - housekeeping procedures, including:

- examination of tools and equipment
- storage of equipment
- identification, tagging and isolation of faulty equipment
- safe disposal of materials
- recycling procedures
- workplace health and safety (WHS) requirements relating to diagnosing complex faults in hybrid and battery electric vehicle network management systems, including procedures for:
 - identifying hazards and controlling risks associated with:
 - working with high voltages on vehicle electrical systems
 - working with hazardous materials and toxic substances
 - wearing jewellery while working around high electrical currents
 - minimising risk, including:
 - analysing task to define risk
 - applying electrical safety precautions, including one hand rule, live system warning tags and signs, depowering the vehicle, isolating the high voltage (HV) rechargeable energy storage system (RESS) electrical supply, and stabilising the vehicle electrical system
 - using personal protective equipment (PPE), including electrical safety gloves with 1000 volt rating and Australian standards rated HV insulating mat
 - identifying and using fire safety equipment
 - lifting and moving the RESS using safe manual handling techniques
 - using workplace first aid equipment
- environmental requirements relating to hybrid and battery electric vehicle network management systems
- types of complex faults relating to hybrid and battery electric vehicle network management systems, including:
 - intermittent
 - multi-system
 - introduced as a result of system repair
 - indirect, caused by the influence of external systems
- operating principles of network management systems and data multiplexing in HEVs, PHEVs and BEVs
- key features of hybrid and battery electric vehicle network management systems, including:
 - direct current (DC) electric motor types, including:
 - separately excited motors
 - permanent magnet motors
 - alternating current (AC) electric motor types, including:
 - induction motors
 - brushless motors
 - motor controllers, including:

- variable pulse width DC types
- variable frequency, variable amplitude AC types
- inverters and converters, including:
 - AC to DC
 - DC to AC
- batteries, including:
 - lead acid batteries
 - nickel metal hydride batteries
 - lithium ion batteries
 - ultra capacitors and super capacitors
- parallel hybrid electric vehicles
- series hybrid electric vehicles
- power split hybrid electric vehicles
- testing procedures for hybrid and battery electric vehicle network management systems, including:
 - vehicle dynamic and static testing
 - abnormal noise analysis
 - component failure analysis
 - vehicle continuous and non-continuous monitored systems
- key features and limitations of diagnostic testing equipment required to diagnose complex faults relating to hybrid and battery electric vehicle network management systems
- procedures for accessing and interpreting scan tool system data, including:
 - diagnostic trouble codes (DTCs), including:
 - conditions that set the DTCs
 - conditions for running DTCs
 - live data.

Assessment Conditions

Competency is to be assessed in the workplace or a simulated environment that accurately reflects performance in a real workplace setting.

Assessment must include direct observation of tasks.

Where assessment of competency includes third-party evidence, individuals must provide evidence that links them to the HEV, PHEV and BEV network management systems that they have worked on, e.g. repair orders.

Assessors must verify performance evidence through questioning on skills and knowledge to ensure correct interpretation and application.

The following resources must be made available:

- automotive repair workplace or simulated workplace
- workplace instructions

- AS 5732 Electric vehicle operations: Maintenance and repair
- manufacturer HEV, PHEV and BEV network management system specifications
- one BEV and one HEV or PHEV with complex network management system faults
- BEV, HEV and PHEV network management system diagnostic equipment, including:
 - digital multimeter
 - scan tool
 - oscilloscope
 - specialist BEV, PHEV and HEV tools and equipment as specified in original equipment manufacturer requirements
- tools, equipment and materials appropriate for diagnosing complex faults in HEV, PHEV and BEV network management systems.

Assessors of this unit must satisfy the requirements for assessors in applicable vocational education and training legislation, frameworks and/or standards.

Links

Companion Volume Implementation Guide is found on VETNet -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b4278d82-d487-4070-a8c4-78045ec695b1>