



Australian Government

AURETH012 Service and maintain electrical components in hybrid electric vehicles

Release: 1

AURETH012 Service and maintain electrical components in hybrid electric vehicles

Modification History

Release	Comment
Release 1	New unit of competency.

Application

This unit describes the performance outcomes required to service and maintain electrical components in hybrid electric vehicles (HEVs) and plug-in hybrid electric vehicles (PHEVs). It involves working with the automotive electrical components and electrical systems that support the control and operation of the vehicle. Importance is placed in the unit on applying high voltage (HV) rechargeable energy storage system (RESS) electrical safety procedures.

It applies to those working in the automotive service and repair industry.

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of publication.

Pre-requisite Unit

AURETH011 Depower and reinitialise hybrid electric vehicles

Competency Field

Electrical

Unit Sector

Technical - Hybrid Vehicle and Battery Electric Vehicle

Elements and Performance Criteria

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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold and italicised text is used, further information is detailed in the range of conditions section.

Elements Elements describe the essential outcomes.	Performance Criteria Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold and italicised text is used, further information is detailed in the range of conditions section.
1. Prepare to service and maintain electrical components in HEVs and PHEVs	1.1 Job requirements are determined from workplace instructions 1.2 Workplace procedures and manufacturer specifications are accessed and interpreted 1.3 Hazards associated with the work are identified and risks are managed according to safety requirements and AS 5732 Electric vehicle operations - Maintenance and repair 1.4 Tools and equipment are selected and checked for serviceability
2. Test electrical systems and components	2.1 Diagnostic equipment is used to retrieve system parameters and information 2.2 HEV or PHEV systems and components are tested for electrical efficiency according to manufacturer specifications 2.3 Electrical circuits are tested according to manufacturer specifications, workplace procedures and safety requirements, and without causing damage to components or systems 2.4 Faults in HEV or PHEV electrical systems and components are identified
3. Service and maintain electrical systems and components	3.1 Problems associated with performance of electrical systems and components are identified, and appropriate corrective action is taken 3.2 Faults within electrical systems and components are identified and required corrective action is taken or reported according to workplace procedures 3.3 Components are repaired, replaced and adjusted according to manufacturer and component specifications and workplace procedures 3.4 Post-service testing is carried out to ensure correct and safe operation of HEV and PHEV, any reported problems are resolved, and no other problems are present
4. Complete work processes	4.1 Final inspection is made to ensure work is to workplace expectations and vehicle or equipment is presented ready for use 4.2 Work area is cleaned, waste and non-recyclable materials are disposed of, and recyclable material is collected 4.3 Tools and equipment are checked and stored and any faulty electrical equipment is identified, tagged and isolated according to workplace procedures 4.4 Workplace documentation is processed according to workplace procedures

Foundation Skills

This section describes those language, literacy, numeracy and employment skills that are essential to performance and are not explicit in the performance criteria.

Skills	Description
Learning skills to:	locate appropriate sources of information efficiently.
Reading skills to:	interpret text, symbols and diagrams in testing, servicing and maintenance information in manufacturer specifications, and workplace instructions and procedures.
Writing skills to:	legibly and accurately fill out workplace documentation when servicing and maintaining electrical components in HEVs or PHEVs.
Oral communication skills to:	- ask questions to clarify workplace instructions - participate in verbal exchanges to report faults, and service and maintenance findings, and make required repair recommendations.
Numeracy skills to:	- match materials and component part numbers to workplace instructions, component part lists, and manufacturer specifications - interpret measurements of voltage, current and resistance relating to electrical circuits - measure components to determine compliance with manufacturer specifications.
Planning and organising skills to:	plan own work requirements and prioritise actions to achieve required outcomes and ensure tasks are completed within workplace timeframes.
Problem solving skills to:	identify hazards and risks and take action to minimise them.
Technology skills to:	use specialised tools.

Range of Conditions

This section specifies work environments and conditions that may affect performance.

Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included. Bold italicised wording, if used in the performance criteria, is detailed below.

<i>Safety requirements</i> must include:	- work health and safety (WHS) and occupational health and safety (OHS) requirements, including procedures for: - identifying hazards and controlling risks associated with:
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	• working with high voltages on HEV and PHEV electrical systems • wearing jewellery while working around high electrical currents • determining appropriate procedures for minimising risk associated with hazards, including applying electrical safety precautions when: • using personal protective equipment (PPE), including electrical safety gloves with 1000 volt rating and Australian standards rated HV insulating mat • identifying and using firefighting equipment as appropriate • using the 'one hand' rule • following live system warning tags and signs • depowering vehicle • isolating HV RESS electrical supply • stabilising vehicle electrical system.
Tools and equipment must include:	• those specified in the specific vehicle service maintenance procedures, including: • digital multimeter with Cat III 1000 volt rating • insulation tester • residual voltage tester, if specified in original equipment manufacturer (OEM) test requirements • scan tool.
Corrective action must include:	• tightening connections • balancing state of charge • replacing faulty or damaged cable connections • removing and replacing faulty or damaged components.

Unit Mapping Information

Equivalent to AURETH4012 Service and maintain electrical components in hybrid electric vehicles

Links

Companion Volume implementation guides are found in VETNet -

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

Assessment Requirements for AURETH012 Service and maintain electrical components in hybrid electric vehicles

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Performance Evidence

Before competency can be determined, individuals must demonstrate they can perform the following according to the standard defined in the unit's elements, performance criteria, range of conditions and foundation skills:

- safely test, service and maintain two different hybrid electric vehicles (HEVs) or plug-in hybrid electric vehicles (PHEVs).

Knowledge Evidence

Individuals must be able to demonstrate knowledge of:

- work health and safety (WHS) and occupational health and safety (OHS) requirements relating to servicing and maintaining HEV and PHEV electrical components, including procedures for:
 - identifying hazards and controlling risks associated with:
 - working with high voltages on HEV and PHEV electrical systems
 - wearing jewellery while working around high electrical currents
 - determining appropriate procedures for minimising risk associated with hazards, including applying electrical safety precautions when:
 - using personal protective equipment (PPE), including electrical safety gloves with 1000 volt rating and Australian standards rated high voltage (HV) insulating mat
 - identifying and using firefighting equipment as appropriate
 - using the 'one hand' rule
 - following live system warning tags and signs
 - depowering vehicle
 - isolating HV rechargeable energy storage system (RESS) electrical supply
 - stabilising vehicle electrical system
- requirements of AS 5732 Electric vehicle operations - Maintenance and repair

- key electrical components of HEVs and PHEVs and their functions
- RESS battery construction, including:
 - battery internal resistance
 - battery types
 - terminal corrosion
 - terminal resistance
- key components of RESS theory, including:
 - cell failure theory
 - charging characteristics
 - open circuit cells
 - reverse polarisation
 - series cell configuration
 - strapping and layout
- different types of HEVs and PHEVs, including:
 - series, parallel and series parallel
 - strong, mid or weak hybrid systems
- operating principles of RESS and battery management system (BMS)
- key characteristics of HV battery charger and direct current (DC) to DC converter
- operating principles of power distribution unit (PDU).

Assessment Conditions

Assessors must satisfy NVR/AQTF assessor requirements.

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 electrical systems and components they have serviced and maintained in HEVs or PHEVs, 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
- PPE, including electrical safety gloves with 1000 volt rating and Australian standards rated HV insulating mat
- manufacturer specifications and service procedures for the HEVs or PHEVs being worked on
- AS 5732 Electric vehicle operations - Maintenance and repair
- two different operational HEVs or PHEVs requiring service and maintenance
- electrical test equipment appropriate to the HEVs and PHEVs being serviced, including:
 - digital multimeter with Cat III 1000 volt rating

- insulation tester
- residual voltage tester, if specified in original equipment manufacturer (OEM) test requirements
- scan tool
- tools, equipment and materials appropriate for servicing and maintaining HEVs and PHEVs.

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