



Australian Government

AURETH002 Service and maintain battery electric vehicles

Release: 1

AURETH002 Service and maintain battery electric vehicles

Modification History

Release	Comment
Release 1	New unit of competency.

Application

This unit describes the performance outcomes required to service and maintain battery electric vehicles (BEVs). It involves working with automotive electrical components, maintaining rechargeable energy storage systems (RESS), and performing basic tests on electric drive motors. Importance is placed in the unit on applying high voltage (HV) RESS and separated extra low voltage (SELV) 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

AURETH001 Depower and reinitialise battery electric vehicles

Competency Field

Electrical

Unit Sector

Technical - Hybrid Vehicle and Battery Electric Vehicle

Elements and Performance Criteria

Elements	Performance Criteria
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.
1. Prepare to service and	1.1 Job requirements are determined from workplace instructions

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.
maintain BEV	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 RESS and drive motor system operation	2.1 Diagnostic equipment is used to retrieve system parameters and information 2.2 RESS and vehicle drive motor system are tested for correct operation according to manufacturer specifications 2.3 Problems associated with performance of RESS or drive motor system are identified and reported according to workplace procedures
3. Deactivate vehicle RESS	3.1 Vehicle is depowered according to manufacturer specifications and workplace procedures 3.2 Vehicle is identified with warning tag or sign to indicate potential hazards 3.3 SELV supply is located and disconnected according to manufacturer specifications 3.4 RESS service plug or manual service disconnect is located and removed to depower vehicle HV RESS according to manufacturer specifications 3.5 Vehicle is stabilised and checked for zero residual voltage according to manufacturer procedures 3.6 RESS service plug or manual service disconnect is secured and retained to prevent refitting by third party
4. Check drive motor and associated components	4.1 Electrical drive motor is checked to confirm condition 4.2 Problems associated with performance of electric drive motor and associated components are identified 4.3 Corrective action required to achieve optimum motor performance is reported according to workplace procedures
5. Check associated electrical subsystems and components	5.1 Condition and operation of associated electrical subsystems and components are checked 5.2 Problems associated with performance of electrical subsystems and components are identified 5.3 Required corrective action is reported according to workplace procedures
6. Reinitialise vehicle	6.1 SELV and RESS service plug or manual service disconnect are

Elements	Performance Criteria
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.
RESS	reconnected in correct order, and vehicle is reactivated 6.2 Diagnostic test equipment is used to check and recalibrate subsystems affected by depower process as required 6.3 RESS and vehicle subsystems are checked for correct operation 6.4 Post-service testing is carried out to ensure correct and safe operation of BEV, any reported problems are resolved, and no other problems are present
7. Complete work processes	7.1 Final inspection is made to ensure work is to workplace expectations and vehicle is presented ready for use 7.2 Work area is cleaned, waste and non-recyclable materials are disposed of, and recyclable material is collected 7.3 Tools and equipment are checked and stored and any faulty equipment is identified, tagged and isolated according to workplace procedures 7.4 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 from manufacturer specifications, and workplace instructions and procedures.
Writing skills to:	legibly and accurately fill out workplace documentation.
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, vehicle and component part lists, and manufacturer specifications

Skills	Description
	- interpret measurements of voltage, current and resistance relating to electrical circuits - measure materials and 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.
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: - working with high voltages on BEV 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.
<i>Tools and equipment</i> 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.
<i>Corrective action</i> 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 AURETH3002 Service and maintain battery 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 AURETH002 Service and maintain battery 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 battery electric vehicles (BEVs).

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 BEVs, including procedures for:
 - identifying hazards and controlling risks associated with:
 - working with high voltages on BEV 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 components of BEVs 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
- battery charger characteristics and operation, including battery cooling system and refrigerant flow through RESS
- battery management system (BMS) theory
- power distribution unit (PDU) operation.

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 BEVs they have serviced and maintained, 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 BEVs being worked on
- AS 5732 Electric vehicle operations - Maintenance and repair
- two different operational BEVs requiring service and maintenance
- electrical test equipment appropriate to BEVs 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 testing, servicing and maintaining BEVs.

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