



Australian Government

AURETHX01 Depower and reinitialise electric vehicles

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Modification History

Release	Comments
1	This unit of competency was first released in AUR Automotive Retail, Service and Repair Training Package Release 11.0.

Application

This unit describes the skills and knowledge required to depower and reinitialise battery electric vehicles (BEVs), hybrid electric vehicles (HEVs), and plug-in hybrid electric vehicles (PHEVs). It involves isolating the vehicle high voltage (HV) rechargeable energy storage system (RESS) using the appropriate isolation method according to manufacturer procedures, confirming the high voltage system is depowered, and securing the isolation. It also involves reinitialising the vehicle and confirming the affected subsystems have correctly recalibrated.

The unit emphasises the safe application of electrical safety procedures for the high voltage RESS and, where applicable, the separated extra low voltage (SELV) system. The unit applies the same voltage definitions as Australian Standards (AS) 5732 Electric vehicle operations - Maintenance and repair.

The unit applies to those who work in the automotive service and repair industry and applies to vehicles fitted with a RESS. Work is undertaken in line with manufacturer specifications and AS 5732. This unit does not cover vehicles or equipment that operate from an external electrical supply. It does not cover opening the RESS enclosure, or work on RESS modules or cells.

Licensing/Regulatory Information

Licensing, legislative and certification requirements that apply to this unit can vary between States, Territories, and industry sectors, and must be sourced from state jurisdictions prior to applying the unit.

Pre-requisite unit(s)

No pre-requisite units

Competency field(s)

N/A

Unit sector(s)

Electrical Technical - Hybrid Vehicle and Battery Vehicle

Elements and Performance Criteria

Element	Performance criteria
<i>Elements describe the essential outcomes.</i>	<i>Performance criteria describe the performance needed to demonstrate achievement of the element.</i>
1. Prepare to depower and reinitialise electric vehicle	1.1 Determine job requirements from workplace instructions 1.2 Access and interpret manufacturer procedures required to depower and reinitialise vehicle 1.3 Identify hazards associated with the work, assess risks and implement control measures according to safety requirements, workplace policies and procedures 1.4 Select and inspect tools, PPE and equipment required for the work and establish serviceability according to workplace procedures 1.5 Apply warning tags and signage to vehicle to indicate potential hazards according to workplace procedures
2. Depower vehicle high voltage system	2.1 Isolate HV RESS using the method specified in manufacturers procedures, including SELV supply disconnection where required 2.2 Confirm high voltage system is depowered by testing and verifying components and equipment are at a zero-energy state according to manufacturer procedures 2.3 Secure isolation against accidental or unauthorised reactivation according to workplace and OEM procedures
3. Reinitialise vehicle	3.1 Reconnect high voltage RESS and reactivate vehicle according to manufacturer procedures 3.2 Carry out tests to ensure correct recalibration of subsystems affected by depower process according to manufacturer procedures 3.3 Check RESS and vehicle subsystems for correct operation 3.4 Report any post-reactivation faults according to workplace procedures
4. Complete work processes	4.1 Conduct final inspection according to workplace procedures and confirm vehicle is ready for use 4.2 Clear work area and dispose of or recycle materials according to workplace procedures

	4.3 Check and store tools and equipment, and identify, tag and isolate any faulty electrical equipment according to workplace procedures 4.4 Complete documentation according to workplace procedures
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Foundation skills

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

Oral communication	• Listens to workplace instructions and asks questions to clarify job requirements
Numeracy	• Interprets measurements of residual voltage and high voltages against manufacturer specifications
Planning and organising	• Plans own work requirements • Prioritises actions to achieve required outcomes • Ensures tasks are completed within workplace timeframes
Technology	• Uses specialised tools and equipment

Range of conditions

N/A

Assessment Requirements for AURETHX01 Depower and reinitialise electric vehicles

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:

- depower the high voltage RESS on at least two different vehicles from the following
 - battery electric vehicle
 - hybrid electric vehicle
 - plug-in hybrid electric vehicle

The two vehicles may be of the same or different electric vehicle type.

- reinitialise each vehicle and confirm correct operation.

In the course of the above, the candidate must:

- identify and apply manufacturer-specific information and procedures, WHS and AS 5732 requirements to depower and reinitialise each vehicle
- apply electrical isolation procedures appropriate to the RESS configuration of each vehicle
- use test equipment to verify no residual high voltage before commencing service or repair work, in accordance with manufacturer specifications

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:

- the requirements to depower and reinitialise electric vehicles, including:
 - vehicle manufacturer specifications and procedures
 - vehicle identification and high voltage system configuration information
 - requirements of AS 5732 Electric vehicle operations - maintenance and repair
- workplace procedures required to depower and reinitialise electric vehicles, 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

- work health and safety (WHS) requirements relating to depowering and reinitialising electric vehicles, including procedures for:
 - identifying hazards and controlling associated risks:
 - hazards caused by direct current (DC) and alternating current (AC) energy sources
 - effects of electric shock on the body
 - energy stored in the RESS, including energy retained after the RESS is isolated
 - wearing jewellery while working around high electrical currents
 - precautions to minimise the risk of electric shock, arc-flash and arc-blast
 - determining appropriate procedures for minimising risk associated with hazards, including applying electrical safety precautions when:
 - using personal protective equipment (PPE), including arc-rated (CAL-rated) protective clothing of an appropriate rating
 - responding to the indicators of a battery thermal management event or thermal runaway according to workplace emergency procedures, including evacuation and exclusion zone control
 - escalating a high voltage or thermal event to emergency services according to workplace emergency response procedures
 - following live system warning tags and signs
 - stabilising vehicle electrical system
 - electrical fundamentals relevant to depowering and reinitialising electric vehicles, including:
 - voltage, current and resistance, and their relationship
 - differences between DC and AC as applied to RESS and vehicle drive systems
 - open circuit and closed circuit concepts as applied to the depower and isolation process
 - sources and behaviours of residual voltage and capacitance discharge in HV systems
 - relationship and interaction between HV RESS and SELV systems
 - procedures for using and operating electrical test equipment, including limitations and causes for incorrect measurements
 - procedures for depowering battery electric and hybrid electric vehicles, including:
 - depowering high voltage systems and allowing residual voltage to dissipate before measurement
 - isolating high voltage RESS by manual/mechanical method

- isolating high voltage RESS by an electronic/software-controlled method
- verifying residual voltage using the test points, instrument and sequence in OEM specifications, including proving the correct operation of the test instrument before and after measurement
- securing the isolation against accidental or unauthorised reactivation, including lock-out/tag-out, retention of the service disconnect and control of vehicle keys
- using the 'one hand' rule
- procedures for reinitialising the electric vehicles, including secure gateway access requirements
- operating principles of electric vehicles, including:
 - battery electric vehicles (BEVs)
 - hybrid electric vehicles (HEVs)
 - plug in hybrid electric vehicles (PHEV)
 - the relationship between the RESS and internal combustion engines in hybrid electric vehicles

Assessment Conditions

Assessment must include direct observation by the assessor of the individual depowering, verifying the absence of voltage, and reinitialising an electric vehicle.

Where assessment of competency includes third-party evidence, it must identify the individual and each electric vehicle by VIN, include isolation and voltage verification results and be signed by a workplace supervisor competent in depowering and reinitialising electric vehicles. Assessors must confirm its authenticity with the third party.

The following resources must be made available:

- automotive repair workplace or simulated workplace
- AS 5732 Electric vehicle operations - Maintenance and repair
- PPE and safety equipment, including electrical safety gloves of an appropriate voltage rating in accordance with AS 5732, arc-rated clothing and face protection, and an insulating mat
- manufacturer specifications and service procedures for the electric vehicles being depowered and reinitialised
- two electric vehicles as specified in the performance evidence
- electrical test equipment, including:
 - digital multimeter, in accordance with manufacturer specifications and the applicable standards

- scan tool or equivalent electronic isolation and diagnostic equipment
- tools, equipment and materials appropriate for depowering and reinitialising electric vehicles.

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

Mandatory Workplace Requirements

Assessment of performance evidence may be in a workplace setting or an environment that accurately represents a real workplace.

Unit Mapping Information

Previous Code and Title	Equivalence	Comments
AURETH011 Depower and reinitialise hybrid electric vehicles	Not equivalent	Updated Title, Application, Elements, Performance Criteria, Foundation Skills, Performance Evidence, Knowledge Evidence, and Assessment Conditions. Unit now applies to battery electric vehicles, plug-in hybrid electric vehicles, and hybrid electric vehicles.
AURETH101 Depower and reinitialise battery electric vehicles	Not equivalent	Updated Title, Application, Elements, Performance Criteria, Foundation Skills, Performance Evidence, Knowledge Evidence, and Assessment Conditions. Unit now applies to battery electric vehicles, plug-in hybrid electric vehicles, and hybrid electric vehicles.

Links

Companion volumes, including implementation guides, are found on the national training register - <https://training.gov.au/training/details/AUR>.