



**Australian Government**

# **AURETR3030 Diagnose and repair starting systems**

**Release 1**

## AURETR3030 Diagnose and repair starting systems

### Modification History

Release	Comment
Release 1	Replaces AURE319166B Repair charging systems Performance Criteria and Range Statement updated to reflect technologies

### Unit Descriptor

Unit descriptor	<p>This unit describes the performance outcomes required to diagnose and repair starting systems. It involves diagnosing deviations from correct operation, repairing starting system components and associated systems, and undertaking post-repair testing procedures.</p> <p>The unit also involves identifying and confirming work requirements, preparing for work, and completing work finalisation processes, including clean-up and documentation.</p> <p>Licensing, legislative, regulatory or certification requirements may apply to this unit in some jurisdictions. Users are advised to check with the relevant regulatory authority.</p>
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### Application of the Unit

Application of the unit	<p>Work applies to vehicles in light and heavy vehicle, mining, construction, agricultural, motorcycle, outdoor power equipment and marine environments.</p> <p>Work requires individuals to demonstrate some judgement and problem-solving skills in managing own work activities and contributing to a productive team environment.</p>
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### Licensing/Regulatory Information

Not applicable.

## Pre-Requisites

Not applicable.

## Employability Skills Information

<b>Employability skills</b>	This unit contains employability skills.
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## Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the required performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge and/or the range statement. Assessment of performance is to be consistent with the evidence guide.
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## Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Prepare to diagnose vehicle starting system	1.1. <i>Workplace instructions</i> are used to determine <i>job requirements</i> 1.2. <i>Workplace health and safety (WHS) requirements</i> are observed throughout the work 1.3. <i>Procedures and information</i> are sourced and interpreted 1.4. <i>Options for diagnosing faults</i> are identified and used, using appropriate tools and diagnostic techniques 1.5. <i>Tools and equipment</i> are identified for effective repair methods
2. Diagnose vehicle starting system	2.1. <i>Starting systems</i> are tested to isolate faults according to workplace procedures without causing damage to components or systems as a result of <i>inappropriate testing procedures</i> 2.2. <i>Faults</i> are identified from test results and causes of faults are determined 2.3. Diagnosis findings are reported according to workplace procedures, including recommendations for necessary repairs or adjustments
3. Repair vehicle starting system	3.1. <i>Repair options</i> are analysed and those most appropriate are selected 3.2. Appropriate tools, techniques and materials are selected and prepared 3.3. Repairs and component replacements and adjustments are carried out without causing damage, according to workplace procedures and manufacturer and component supplier specifications 3.4. <i>Post-repair testing</i> is carried out according to workplace procedures and relevant legislation
4. Prepare vehicle for delivery to customer	4.1. Final inspection is made to ensure work is to workplace expectations 4.2. Vehicle is cleaned to workplace expectations and presented ready for use 4.3. Workplace documentation is processed according to workplace procedures
5. Clean up work area and finalise work processes	5.1. Material that can be reused is collected and stored according to workplace sustainability practices 5.2. Waste and scrap are removed according to workplace practices 5.3. Tools, equipment and the work area are cleaned and

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b>
	inspected according to workplace procedures 5.4.Tools and equipment are maintained according to workplace procedures 5.5.Faulty equipment is identified, tagged and isolated according to workplace procedures

## Required Skills and Knowledge

### REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

#### Required skills

- communication skills to:
  - follow verbal and written instructions
  - clarify workplace instructions and determine job requirements
  - gain information from appropriate persons and assistance as required
- initiative and enterprise skills to:
  - apply learning when diagnosing and repairing various starting systems
  - recognise a workplace problem or potential problem and take action
- learning skills to identify sources of information, assistance and expert knowledge to expand own skills, knowledge and understanding
- literacy skills to:
  - read and follow information in written job instructions, specifications, standard operating procedures, charts, lists, drawings and other applicable reference documents
  - obtain and record measurements
  - document required repairs and parts
- numeracy skills to:
  - test, measure and analyse test equipment results compared to desired system performance
  - assess tolerances and apply accurate measurements and adjustments
- planning and organising skills to:
  - plan own work requirements and prioritise actions to achieve required outcomes and ensure tasks are completed on time
  - identify risk factors and take action to minimise them
- problem-solving skills to:
  - determine the underlying causes of faults
  - refer problems outside area of responsibility to appropriate person and suggest possible causes or solutions
  - seek information and assistance as required to solve problems
- self-management skills to:
  - select and use appropriate equipment, materials, processes and procedures
  - follow workplace documentation, such as codes of practice and operating procedures
- teamwork skills to apply knowledge of own role to complete activities efficiently to support team activities and tasks
- technical skills to use hand, power, measuring and specialised tools relating to the repair of starting systems
- technology skills to:
  - operate diagnostic and automotive test equipment

## REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

- use technology to collect, analyse and provide information

### Required knowledge

- WHS regulations, requirements, equipment, material and personal safety requirements when working with vehicle while either on a hoist, trolley jack or safety stand, including:
  - individual state and territory legislation
  - codes of practice
  - personal protection needs when working on vehicles in an automotive workshop
- application, purpose and operation of starting systems
- principal types of starting systems, including:
  - direct drive
  - solenoid pre-engaged, including:
    - reduction
    - spark ignition systems
    - compression ignition systems
  - control circuit, including:
    - key start
    - push button start
    - remote start
- techniques for reading and interpreting automotive technical information, graphic symbols and wiring diagrams
- operating principles of DC and AC motors
- diagnostic and testing procedures, including:
  - diagnostic procedures for starting systems, including:
    - typical starting system faults and their symptoms
    - accessing and interpreting diagnostic trouble codes (DTCs)
    - diagnostic flow charts
  - analysis of system operation using electrical test equipment, scan tools, oscilloscopes and other industry-relevant test equipment
  - visual, aural and functional assessments, including:
    - component damage and wear
    - component corrosion
- repair procedures, including:
  - component removal and replacement procedures
  - component and associated system adjustment procedures

## Evidence Guide

### EVIDENCE GUIDE

The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, required Skills and Knowledge, the Range Statement and the Assessment Guidelines for the Training Package.

#### Overview of assessment

#### Critical aspects for assessment and evidence required to demonstrate competency in this unit

The evidence required to demonstrate competency in this unit must be relevant to workplace operations and satisfy all of the requirements of the performance criteria and required skills and knowledge.

A person who demonstrates competency in this unit must be able to:

- select methods and techniques appropriate to the fault being diagnosed
- complete preparatory activity in a systematic manner
- apply and demonstrate knowledge of DC and AC motors
- diagnose and repair a range of starting systems
- conduct diagnosis and repair procedures according to workplace, manufacturer and component supplier requirements
- present vehicle in a condition that complies with workplace requirements
- clean up work area and maintain equipment to workplace standards.

#### Context of, and specific resources for assessment

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

Assessment is to occur:

- using standard workplace practices and procedures
- following safety requirements
- applying environmental constraints.

Assessment is to comply with relevant:

- regulatory requirements
- Australian standards
- industry codes of practice.

The following resources must be made available for the assessment of this unit:

- workplace location or simulated workplace
- a range of starter motors and components relevant to the qualification being sought



## EVIDENCE GUIDE

The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, required Skills and Knowledge, the Range Statement and the Assessment Guidelines for the Training Package.

### Overview of assessment

- vehicles with starting faults relevant to the qualification being sought
- equipment appropriate for the testing of starting systems
- specifications and workplace instructions
- tools appropriate for repairing, replacing and adjusting starting systems.

### Method of assessment

Assessment must satisfy the endorsed Assessment Guidelines of this Training Package.

Assessment methods must confirm consistency and accuracy of performance (over time and in a range of workplace relevant contexts) together with the application of required skills and knowledge.

Assessment methods must be by direct observation of tasks and include questioning on required skills and knowledge to ensure correct interpretation and application.

Competence in this unit may be assessed in conjunction with other units which together form part of a holistic work role.

Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate the needs of diverse clients.

Assessment processes and techniques must be culturally sensitive and appropriate to the language, literacy and numeracy capacity of the candidate and the work being performed.

## Range Statement

### RANGE STATEMENT

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

<p><b><i>Workplace instructions</i></b> may include:</p>	<ul style="list-style-type: none"> <li>• electronic or hard copy instructions</li> <li>• safe work procedures relating to the repair of starting systems</li> <li>• verbal instructions</li> <li>• written instructions.</li> </ul>
<p><b><i>Job requirements</i></b> may include:</p>	<ul style="list-style-type: none"> <li>• diagnosis and repair methods, processes and equipment.</li> </ul>
<p><b><i>Workplace health and safety requirements</i></b> may include:</p>	<ul style="list-style-type: none"> <li>• workplace first aid equipment</li> <li>• workplace safety policies and procedures</li> <li>• safe handling of material</li> <li>• hazard control, including control of hazardous materials and toxic substances</li> <li>• hot surfaces and moving parts and components</li> <li>• personal protective clothing and equipment</li> <li>• use of fire-fighting equipment</li> <li>• use of tools and equipment.</li> </ul>
<p><b><i>Procedures and information</i></b> may include:</p>	<ul style="list-style-type: none"> <li>• Australian standards</li> <li>• engineer's design specifications and instructions</li> <li>• instructions issued by authorised workplace or external persons</li> <li>• workplace work specifications and requirements</li> <li>• regulatory and legislative requirements relating to automotive industry</li> <li>• Australian Design Rules</li> <li>• safe work procedures relating to repairing and replacing starting systems and components</li> <li>• vehicle service requirements and repair manuals</li> <li>• verbal, written and graphical instructions</li> <li>• signage</li> <li>• work schedules, plans and specifications</li> <li>• work bulletins and memos</li> <li>• material safety data sheets (MSDS)</li> <li>• diagrams and sketches.</li> </ul>
<p><b><i>Options for diagnosing faults</i></b> may include:</p>	<ul style="list-style-type: none"> <li>• obtaining vehicle service history</li> <li>• isolating faults</li> </ul>

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	<ul style="list-style-type: none"> <li>• inspecting and evaluating components.</li> </ul>
<b><i>Tools and equipment</i></b> may include:	<ul style="list-style-type: none"> <li>• hand tools</li> <li>• vehicle lifting devices</li> <li>• power and air tools</li> <li>• specialist tools for removal and replacement</li> <li>• soldering equipment</li> <li>• electronic testing equipment, including:             <ul style="list-style-type: none"> <li>• multimeter</li> <li>• test light</li> <li>• load tester</li> <li>• inductive ammeter</li> <li>• test benches</li> <li>• oscilloscope</li> <li>• scan tools.</li> </ul> </li> </ul>
<b><i>Starting systems</i></b> may include:	<ul style="list-style-type: none"> <li>• dynastart</li> <li>• inertia</li> <li>• pre-engaged</li> <li>• axial and coaxial</li> <li>• fixed and remote solenoid</li> <li>• direct drive</li> <li>• gear reduction</li> <li>• protection lockout</li> <li>• inhibitor switch</li> <li>• series-parallel switching</li> <li>• battery isolation switch</li> <li>• single/multiple battery system</li> <li>• permag starter motors</li> <li>• DC and AC motors.</li> </ul>
<b><i>Inappropriate testing procedures</i></b> may include:	<ul style="list-style-type: none"> <li>• intrusive testing (which must not be performed as it is not a recommended test and repair method), which includes:             <ul style="list-style-type: none"> <li>• back probing terminals and connectors and fuse holders with inappropriate test probes</li> <li>• probing terminal and connectors with inappropriate test probes</li> </ul> </li> </ul>

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	<ul style="list-style-type: none"> <li>pushing sharp probes and objects into wiring insulation.</li> </ul>
<b><i>Faults</i></b> may include:	<ul style="list-style-type: none"> <li>component malfunction, including:             <ul style="list-style-type: none"> <li>low battery voltage</li> <li>discharged battery</li> <li>excessive voltage drop</li> <li>noisy operation</li> <li>seized mechanical components</li> <li>worn mechanical components</li> <li>failure to engage drive pinion</li> </ul> </li> <li>control circuit faults</li> <li>open or short circuits to power, ground and reference circuits</li> <li>high circuit resistance</li> <li>DTC being set.</li> </ul>
<b><i>Repair options</i></b> may include:	<ul style="list-style-type: none"> <li>component repair procedures, including:             <ul style="list-style-type: none"> <li>removal, replacement and adjustment procedures</li> <li>dismantle, repair, re-assembly and adjustment procedures.</li> </ul> </li> </ul>
<b><i>Post-repair testing</i></b> may include:	<ul style="list-style-type: none"> <li>validating effectiveness of the repair action</li> <li>confirming that reported fault has been rectified</li> <li>confirming that no other faults are present as a result of the repair action.</li> </ul>

**Unit Sector(s)**

<b>Competency field</b>	Electrical
<b>Unit sector</b>	Technical – Electrical and Electronic

**Custom Content Section**

Not applicable.