



**Australian Government**

# **AURETR2012 Test and repair basic electrical circuits**

**Release 1**

## AURETR2012 Test and repair basic electrical circuits

### Modification History

Release	Comment
Release 1	<p>Replaces AURE218708A Carry out repairs to single electrical circuits</p> <p>Performance Criteria and Range Statement updated to reflect technologies</p>

### Unit Descriptor

Unit descriptor	<p>This unit describes the performance outcomes required to test and carry out repairs to basic electrical circuits in an automotive retail, service or repair environment. The unit also involves identifying and confirming work requirements, preparing for work, identifying faults and potential causes, repairing and replacing basic circuit components, and completing work finalisation processes, including clean-up and documentation.</p> <p>It includes replacing fuses, circuit breakers, lamps, switches, terminals and connectors; and basic wiring repairs. It includes the following fault types: open circuits, short circuits and high resistance circuits to power, signal and ground paths.</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

<b>Application of the unit</b>	<p>Work applies to testing and repairing basic electrical circuits in light and heavy vehicle, mining, construction, agricultural, motorcycle, outdoor power equipment and marine environments. It applies to circuits in an automotive retail, service or repair environment.</p> <p>Work requires individuals to demonstrate judgement and problem-solving skills in managing own work activities and contributing to a productive team environment within the scope of this unit.</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 for work	<p>1.1. <b>Workplace instructions</b> are used to determine <b>job requirements</b></p> <p>1.2. <b>Workplace health and safety (WHS) requirements</b> are observed throughout the work</p> <p>1.3. <b>Procedures and information</b> are sourced and interpreted</p> <p>1.4. <b>Tools and equipment</b> are identified for effective testing and repair procedures</p>
2. Test basic electrical circuits and identify faults	<p>2.1. <b>Basic electrical circuits</b> are visually checked to establish the extent of failure or damage, applying knowledge of electrical fundamentals</p> <p>2.2. <b>Options for diagnosing faults</b> are identified and used, using appropriate tools and diagnostic techniques</p> <p>2.3. Inspection and testing are undertaken without causing damage to components or systems as a result of <b>inappropriate testing procedures</b></p> <p>2.4. <b>Faults</b> are identified from test results and causes of faults are determined</p> <p>2.5. Diagnosis findings are reported according to workplace procedures, including recommendations for necessary repairs or adjustments</p>
3. Complete repairs to basic electrical circuits	<p>3.1. <b>Repair options</b> are analysed and those most appropriate are selected</p> <p>3.2. Appropriate tools, repair techniques and materials are selected and prepared</p> <p>3.3. Repairs and component replacements and adjustments are carried out without causing damage, according to workplace procedures and manufacturer and component supplier specifications</p> <p>3.4. <b>Post-repair testing</b> is conducted and results are documented according to workplace procedures</p>
4. Prepare vehicle and equipment for delivery to customer after repair is completed	<p>4.1. Final inspection is made to ensure work is to workplace expectations</p> <p>4.2. Vehicle is cleaned to workplace expectations and presented ready for use</p> <p>4.3. Workplace documentation is processed according to workplace procedures</p>
5. Clean up work area and maintain equipment	<p>5.1. Material that can be reused is collected and stored</p> <p>5.2. Waste and scrap are removed following workplace procedures</p>

	<p>5.3. Equipment and work area are cleaned and inspected for serviceable condition according to workplace procedures</p> <p>5.4. Faulty equipment is identified, tagged and isolated according to workplace procedures</p> <p>5.5. Operator maintenance is completed according to manufacturer and component supplier specifications and site procedures</p> <p>5.6. Tools and equipment are maintained according to workplace procedures</p>
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## 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 testing and repairing basic electrical circuits
- learning skills to identify sources of information, assistance and expert knowledge to expand 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 work performed
- numeracy skills to:
  - test, measure and analyse test equipment results compared to desired system performance
- planning and organising skills to ensure tasks are completed within an acceptable time frame
- problem-solving skills to 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
- technical skills to use workplace technology and tools to test and repair basic electrical circuits and components in vehicles, including:
  - specialist tools and equipment
  - electrical measuring equipment
- technology skills to:
  - operate a range of electrical diagnostic test equipment
  - use technology to collect, analyse and provide information

#### Required knowledge

- WHS regulations, requirements, equipment and material relating to testing and repairing electrical circuits, including personal safety requirements
- electrical principles, including:
  - current, voltage, resistance and power
  - series circuits
  - parallel circuits

**REQUIRED SKILLS AND KNOWLEDGE**

- series and parallel circuits
- Ohm's law
- basic electrical circuit components, including:
  - cable types and sizes and current carrying capacity
  - circuit protection devices
  - switches
  - relays
  - automotive globes
- techniques for reading and interpreting technical information, including circuit types, diagrams and symbols
- types and operation of electrical testing equipment, including:
  - digital multimeters
  - test lights and probes
- electrical measuring and testing procedures, including:
  - resistance and voltage drop tests
  - open and short circuit tests
  - inspecting for component moisture ingress and connector damage
- repair procedures of electrical circuits, including:
  - wire soldering procedures
  - terminal crimping
  - removal and replacement procedures for basic electrical components

## 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:

- observe safety procedures and requirements
- select methods and techniques appropriate to the circumstances
- complete preparatory activity in a systematic manner
- read and interpret circuit wiring diagrams
- test basic electrical circuits to determine short, open and high resistance between power, signal and ground paths
- demonstrate understanding of the principle of current flow in a simple circuit and voltage drop across a resistive load
- test and repair basic wiring harnesses and looms to manufacturer specifications
- perform electrical connections, including crimping and soldering to manufacturer specification
- perform a terminal retention check following replacement of terminals in a wiring connector
- accurately interpret test results
- present vehicle and equipment in a condition that complies with workplace requirements.

#### 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



**EVIDENCE GUIDE**

	<ul style="list-style-type: none"> <li>• industry codes of practice.</li> </ul> <p>The following resources must be made available for the assessment of this unit:</p> <ul style="list-style-type: none"> <li>• workplace location or simulated workplace</li> <li>• material relevant to testing and repairing basic electrical circuits and components</li> <li>• equipment, and hand and power tools appropriate to testing and repairing basic electrical circuits and components</li> <li>• specifications and work instructions.</li> </ul>
<b>Method of assessment</b>	<p>Assessment must satisfy the endorsed Assessment Guidelines of this Training Package.</p> <p>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.</p> <p>Assessment methods must be by direct observation of tasks and include questioning on required skills and knowledge to ensure correct interpretation and application.</p> <p>Competence in this unit may be assessed in conjunction with other units which together form part of a holistic work role.</p> <p>Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate the needs of diverse clients.</p> <p>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.</p>

## 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.

<b><i>Workplace instructions</i></b> may include:	<ul style="list-style-type: none"> <li>• electronic or hard copy instructions</li> <li>• verbal instructions</li> <li>• written instructions.</li> </ul>
<b><i>Job requirements</i></b> may include:	<ul style="list-style-type: none"> <li>• testing and repair methods, processes and equipment.</li> </ul>
<b><i>Workplace health and safety requirements</i></b> may include:	<ul style="list-style-type: none"> <li>• personal protective clothing and equipment</li> <li>• hazards associated with high voltage ignition systems</li> <li>• safe use of tools and equipment</li> <li>• safe handling of material</li> <li>• use of fire-fighting equipment</li> <li>• workplace safety policies and procedures</li> <li>• workplace first aid equipment</li> <li>• hazard control, including control of hazardous materials and toxic substances</li> <li>• identifying hazards associated with soldering processes</li> <li>• identifying hazards associated with working with vehicle supplementary restraint systems (SRS).</li> </ul>
<b><i>Procedures and information</i></b> may include:	<ul style="list-style-type: none"> <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</li> <li>• diagrams and sketches</li> <li>• regulatory and legislative requirements relating to automotive industry</li> <li>• Australian Design Rules</li> <li>• engineer's design specifications and instructions</li> <li>• workplace work specifications and requirements</li> <li>• instructions issued by authorised workplace or external persons</li> <li>• Australian standards</li> <li>• vehicle service requirements and repair manuals.</li> </ul>
<b><i>Tools and equipment</i></b> may include:	<ul style="list-style-type: none"> <li>• hand tools</li> <li>• digital multimeters</li> </ul>

**RANGE STATEMENT**

	<ul style="list-style-type: none"> <li>• test lights and probes</li> <li>• insulation testers</li> <li>• crimping tools</li> <li>• soldering iron</li> <li>• heat-gun or blower</li> <li>• wire and cabling of various colours and sizes</li> <li>• heat shrink sleeving and flexible conduit</li> <li>• terminals and connectors</li> <li>• electrical tape.</li> </ul>
<b>Basic electrical circuits</b> may include:	<ul style="list-style-type: none"> <li>• basic single wire circuits (non CAN-bus networked circuits)</li> <li>• door ajar switch interior courtesy light</li> <li>• battery B+ to fuse panel</li> <li>• accessory B+ to lighter or accessory socket</li> <li>• heated rear demister</li> <li>• interior lighting</li> <li>• exterior lighting</li> <li>• rear brake lighting</li> <li>• wiper and washer</li> <li>• electric engine cooling fan.</li> </ul>
<b>Options for diagnosing faults</b> may include:	<ul style="list-style-type: none"> <li>• verification of fault</li> <li>• continuity testing</li> <li>• insulation testing</li> <li>• isolation of faults</li> <li>• replacement of blown fuses</li> <li>• replacement of blown globes and lamps</li> <li>• replacement of damaged terminals and connectors</li> <li>• visual inspection and evaluation of components.</li> </ul>
<b>Inappropriate testing procedures</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> <li>• pushing sharp probes and objects into wiring insulation.</li> </ul> </li> </ul>
<b>Faults</b> may include:	<ul style="list-style-type: none"> <li>• open circuits</li> <li>• high resistance circuits</li> <li>• short circuits</li> <li>• damaged insulation</li> <li>• frayed wires</li> <li>• burnt wiring</li> </ul>

**RANGE STATEMENT**

	<ul style="list-style-type: none"> <li>• water and moisture ingress</li> <li>• connector damage</li> <li>• terminal damage</li> <li>• diagnosis trouble codes (DTC) being set.</li> </ul>
<i>Repair options</i> may include:	<ul style="list-style-type: none"> <li>• pre- and post-repair testing</li> <li>• identifying and testing components</li> <li>• diagnosing and determining faults</li> <li>• component repair procedures, including: <ul style="list-style-type: none"> <li>• removal, replacement and adjustment procedures</li> <li>• dismantle, repair, reassembly and adjustment procedures</li> </ul> </li> <li>• electrical measurements</li> <li>• visual and functional assessments, including for damage and wear.</li> </ul>
<i>Post-repair testing</i> may include:	<ul style="list-style-type: none"> <li>• validating the 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.