Australian Government

# AURETR3023 Diagnose and repair electronic spark ignition engine management systems

**Release 1**

INDUSTRY SKILLS COUNCILS
Creating Australia's Future

# AURETR3023 Diagnose and repair electronic spark ignition engine management systems

## Modification History

| Release | Comment |
|---|---|
| **Release 1** | Replaces AURE321171A Service and repair electronic spark ignition engine management systems<br>Performance Criteria and Range Statement updated to reflect technologies |

## Unit Descriptor

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

# Application of the Unit

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| **Application of the unit** | Work applies to light and heavy petrol fuelled vehicles; LPG, CNG and LNG fuelled vehicles; motorcycles; outdoor power equipment; and marine environments.<br><br>Engine management systems are systems where the electronic control unit (ECU) incorporates control over fuel injection and ignition timing control and all other systems relating to engine performance and emissions.<br><br>Work requires individuals to demonstrate some judgement and problem-solving skills in managing own work activities and contributing to a productive team environment. |

# Licensing/Regulatory Information

Not applicable.

# Pre-Requisites

Not applicable.

# Employability Skills Information

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| **Employability skills** | This unit contains employability skills. |

# Elements and Performance Criteria Pre-Content

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| 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. |

# Elements and Performance Criteria

| ELEMENT | PERFORMANCE CRITERIA |
|---|---|
| 1. Prepare to diagnose and repair electronic spark ignition engine management systems | 1.1. ***Workplace instructions*** are used to determine job requirements<br>1.2. ***Workplace health and safety (WHS) requirements*** are observed throughout the work<br>1.3. ***Procedures and information*** are sourced and interpreted<br>1.4. ***Options for diagnosing faults*** are identified and used, using appropriate tools and diagnostic techniques<br>1.5. ***Tools and equipment*** are identified for effective repair methods |
| 2. Diagnose electronic spark ignition engine management systems | 2.1. ***Electronic spark ignition engine management systems*** are tested to isolate faults according to workplace procedures and without causing damage to components or systems as a result of ***inappropriate testing procedures***<br>2.2. ***Faults*** are identified from test results and causes of faults are determined<br>2.3. Diagnosis findings are reported according to workplace procedures, including recommendations for necessary repairs or adjustments |
| 3. Repair electronic spark ignition engine management systems | 3.1. ***Repair options*** are analysed and those most appropriate to the circumstances are selected<br>3.2. Appropriate tools, techniques and materials are selected and prepared<br>3.3. Repairs and component replacements and adjustments are carried out without causing damage, according to workplace procedures and manufacturer and component supplier specifications<br>3.4. ***Post-repair testing*** is carried out according to workplace procedures and relevant legislation |
| 4. Prepare vehicle and equipment for delivery to customer after repair is completed | 4.1. Final inspection is made to ensure work is to workplace expectations<br>4.2. Vehicle is cleaned to workplace expectations and presented ready for use<br>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<br>5.2. Waste and scrap are removed according to workplace practices<br>5.3. Tools, equipment and work area are cleaned and inspected |

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| | according to workplace procedures<br>5.4. Tools and equipment are maintained according to workplace procedures<br>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 electronic spark ignition engine management systems
  - recognise a workplace problem or potential problem and take action
- 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 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
  - seek information and assistance as required to solve problems
- self-management skills to:
- select and use appropriate equipment, materials, processes and procedures
- recognise limitations and seek timely advice
- 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 electronic spark ignition engine management systems

**REQUIRED SKILLS AND KNOWLEDGE**

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

- technology skills to:
  - operate diagnostic and test equipment
  - use technology to collect, analyse and provide information

**Required knowledge**

- WHS regulations, requirements, equipment, material and personal safety requirements relating to diagnosing and repairing electronic spark ignition engine management systems, including:
  - individual state and territory legislation
  - codes of practice
  - personal protection needs
- principal types of vehicle electronic spark ignition engine management systems, including:
  - electronic ignition systems: distributer and distributer-less systems
  - coil on plug ignition systems: two and three wire
  - fuel injection, return and non-return systems
  - turbo and supercharger control
  - variable intake
  - variable valve timing
  - drive-by-wire systems
- application, purpose and operation of electronic spark ignition engine management systems, including:
  - misfire detection
  - ignition timing and spark advance
  - electronic control of spark advance
  - dwell period
  - camshaft and crankshaft sensors
  - knock sensors
  - spark plugs
- technical information, graphic symbols and diagrams relating to electronic spark ignition engine management systems
- diagnostic and testing procedures, including:
  - diagnostic procedures for electronic spark ignition engine management systems, including:
    - accessing and interpreting diagnostic trouble codes (DTC)
    - 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

**REQUIRED SKILLS AND KNOWLEDGE**

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

- component corrosion
- repair procedures, including:
  - component removal and replacement procedures
  - component and associated system adjustment procedures

# Evidence Guide

| EVIDENCE GUIDE | |
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| 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.<br>A person who demonstrates competency in this unit must be able to:<br>• observe safety procedures and requirements<br>• select methods and techniques appropriate to the circumstances<br>• complete preparatory activity in a systematic manner<br>• diagnose and repair a range of electronic spark ignition engine management systems<br>• conduct diagnosis and repair procedures according to workplace, manufacturer and component supplier requirements<br>• 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.<br>Assessment is to occur:<br>• using standard workplace practices and procedures<br>• following safety requirements<br>• applying environmental constraints.<br>Assessment is to comply with relevant:<br>• regulatory requirements<br>• Australian standards<br>• industry codes of practice.<br>The following resources must be made available for the assessment of this unit:<br>• workplace location or simulated workplace<br>• vehicles with electronic spark ignition engine management faults relevant to the qualification being sought<br>• equipment appropriate for the testing of vehicle electronic spark ignition engine management systems |

| **EVIDENCE GUIDE** | |
|---|---|
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| **Overview of assessment** | |
| | • specifications and workplace instructions<br>• tools appropriate for repairing, replacing and adjusting vehicle electronic spark ignition engine management systems. |
| **Method of assessment** | Assessment must satisfy the endorsed Assessment Guidelines of this Training Package.<br><br>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.<br><br>Assessment methods must be by direct observation of tasks and include questioning on required skills and knowledge to ensure correct interpretation and application.<br><br>Competence in this unit may be assessed in conjunction with other units which together form part of a holistic work role.<br><br>Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate the needs of diverse clients.<br><br>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** | |
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| 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. | |
| ***Workplace instructions*** may include: | • electronic or hard copy instructions<br>• verbal instructions<br>• written instructions. |
| ***Job requirements*** may include: | • diagnosis and repair methods, processes and equipment. |
| ***Workplace health and safety requirements*** may include: | • personal protective clothing and equipment<br>• hazards associated with:<br>  • high voltage ignition systems<br>  • LPG, CNG and LNG fuels<br>  • high pressure fuel rail systems and components<br>• safe use of tools and equipment<br>• safe handling of material<br>• use of fire-fighting equipment<br>• workplace safety policies and procedures<br>• workplace first aid equipment<br>• hazard control, including control of hazardous materials and toxic substances. |
| ***Procedures and information*** may include: | • verbal, written and graphical instructions<br>• signage<br>• work schedules, plans and specifications<br>• work bulletins and memos<br>• material safety data sheets<br>• diagrams and sketches<br>• safe work procedures relating to repairing and replacing electronic spark ignition engine management systems<br>• regulatory and legislative requirements relating to automotive industry<br>• Australian Design Rules<br>• engineer's design specifications and instructions<br>• workplace work specifications and requirements<br>• instructions issued by authorised workplace or external persons<br>• Australian standards<br>• vehicle service requirements and repair manuals. |

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| ***Options for diagnosing faults*** may include: | • isolation of faults<br>• component inspection and evaluation. |
| ***Tools and equipment*** may include: | • hand tools<br>• testing equipment, including multimeters, ohmmeters, voltmeters and tachometers<br>• fuel pressure and flow meter<br>• insulation testers<br>• power tools and air tools<br>• tune scopes<br>• engine analysers<br>• dynamometers<br>• oscilloscope<br>• diagnostic scan tools. |
| ***Electronic spark ignition engine management systems*** may include: | • electronic ignition systems<br>• direct fire ignition (DFI) systems<br>• coil-on-plug ignition systems<br>• turbo chargers and intercoolers<br>• air intake<br>• exhaust emission control<br>• throttle control. |
| ***Inappropriate testing procedures*** may include: | • intrusive **t**esting (which must not be performed as it is not a recommended test and repair method), which includes:<br>  • back probing terminals and connectors and fuse holders with inappropriate test probes<br>  • probing terminal and connectors with inappropriate test probes<br>  • pushing sharp probes and objects into wiring insulation. |
| ***Faults*** may include: | • engine difficult to start or will not start<br>• engine misfiring<br>• poor engine performance<br>• engine knock<br>• overheating<br>• DTC being set. |
| ***Repair options*** may include: | • pre- and post-repair testing |

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| | • identifying and testing components<br>• diagnosing and determining faults<br>• component repair procedures, including:<br>  • removal, replacement and adjustment procedures<br>  • dismantle, repair, re-assembly and adjustment procedures<br>• electrical measurements<br>• peak voltage testing<br>• visual and functional assessments, including for damage and wear. |
| ***Post-repair testing*** may include: | • validating effectiveness of the repair action<br>• confirming that reported fault has been rectified<br>• confirming that no other faults are present as a result of the repair action. |

## Unit Sector(s)

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| **Competency field** | Electrical |
| **Unit sector** | Technical – Electrical and Electronic |

## Custom Content Section

Not applicable.