



Australian Government

AURETR023 Diagnose and repair spark ignition engine management systems

Release: 1

AURETR023 Diagnose and repair spark ignition engine management systems

Modification History

Release	Comment
Release 1	New unit of competency.

Application

This unit describes the performance outcomes required to diagnose and repair faults in the spark ignition engine management systems of vehicles or machinery. It involves preparing for the task, selecting the correct diagnostic procedure, carrying out the diagnosis and the repair, performing post-repair testing, and completing workplace processes and documentation.

It applies to those working in an automotive service and repair industry. Spark ignition engine management systems include those in agricultural machinery, heavy commercial vehicles, light vehicles, marine vessels, mobile plant machinery, motorcycles or outdoor power equipment.

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of publication.

Competency Field

Electrical

Unit Sector

Technical - Electrical and Electronic

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 diagnose and repair spark ignition	1.1 Job requirements are determined from workplace instructions 1.2 Diagnostic information is sourced and interpreted

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.
engine management system	1.3 Diagnostic options are analysed and those most appropriate to the circumstances are selected 1.4 Hazards associated with the work are identified and risks are managed 1.5 Diagnostic tools and equipment are selected and checked for serviceability
2. Diagnose engine management system	2.1 Diagnostic tests are carried out according to workplace procedures and safety requirements without causing damage to components or systems 2.2 Faults are identified from diagnostic test results and causes of faults are determined 2.3 Diagnosis findings and recommendations for necessary repairs or adjustments are reported according to workplace procedures
3. Repair engine management system	3.1 Repair information is sourced and interpreted 3.2 Repair options are analysed and those most appropriate to the circumstances are selected 3.3 Repair tools, equipment and materials are selected and checked according to manufacturer specifications and workplace procedures 3.4 Repairs and component replacements and adjustments are carried out according to manufacturer specifications, workplace procedures and safety requirements, and without causing damage to components or systems 3.5 Post-repair testing is carried out according to workplace procedures to confirm fault rectification, and any further problems detected as having been introduced during the repair process are rectified
4. Complete work processes	4.1 Final inspection is made to ensure work is to workplace expectations and vehicle or machinery is presented ready for use 4.2 Work area is cleaned, waste and non-recyclable materials are disposed of, and recyclable material is collected 4.3 Tools and equipment are checked and stored and any faulty electrical equipment is identified, tagged according to workplace procedures 4.4 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:	identify and locate various sources of information efficiently.
Reading skills to:	interpret text, symbols and wiring diagrams in diagnostic and repair information from manufacturer specifications and workplace instructions and procedures.
Writing skills to:	legibly and accurately fill out workplace documentation when reporting diagnostic findings, making repair recommendations, and recording parts and material used.
Oral communication skills to:	- clarify instructions - report diagnostic findings and make repair recommendations.
Numeracy skills to:	- match spark ignition engine management system components and identification numbers to workplace instructions, vehicle and component part lists, and manufacturer specifications - interpret vehicle spark ignition engine management system voltages and readings - measure voltage, current and resistance and use basic mathematical operations, including addition and subtraction, to calculate deviations from 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 equipment, including multimeters and scan 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: - using specialised tools and equipment - using appropriate personal protective equipment (PPE) - identifying hazards and controlling risks associated with: - working on vehicle high voltage ignition systems
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	• wearing jewellery while working around high current wiring systems. • working with high pressure petrol fuel systems.
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Unit Mapping Information

Equivalent to AURETR3023 Diagnose and repair electronic spark ignition engine management systems

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 AURETR023 Diagnose and repair spark ignition engine management systems

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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 and performance criteria, range of conditions and foundation skills:

- diagnose and repair a fault in the spark ignition engine management systems of three different vehicles or machinery, including:
 - faults in two system input sensors
 - faults in one system output actuator.

Knowledge Evidence

Individuals must be able to demonstrate knowledge of:

- work health and safety (WHS) and occupational health and safety (OHS) requirements relating to diagnosing and repairing spark ignition engine management systems, including procedures for:
 - using specialised tools and equipment
 - using appropriate personal protective equipment (PPE)
 - identifying hazards and controlling risks associated with:
 - working on vehicle high voltage ignition systems
 - wearing jewellery while working around high current wiring systems
 - working with high pressure petrol fuel systems
- operating principles of spark ignition engine management systems and associated components, including:
 - combustion, including:
 - air-fuel ratios and chemistry of combustion
 - composition of petrol fuel, including octane rating
 - indirect and direct fuel injection

- application, purpose and operation of spark ignition engine management systems and components, including:
 - fuel system, including:
 - fuel filters
 - fuel pumps
 - fuel pressure regulators
 - fuel injectors
 - electronic control system, including the following system inputs:
 - throttle position sensors
 - coolant temperature sensors
 - oxygen sensors
 - load sensors and air flow meters
 - intake air temperature sensors
 - crankshaft position sensors
 - camshaft position sensors
 - battery voltage
 - accessory load sensors
 - knock sensors
 - key features of electronic control units (ECUs), including:
 - read-only memory (ROM)
 - programmable read-only memory (PROM)
 - electronically erasable programmable read-only memory (EEPROM)
 - random access memory (RAM)
 - multiplexing
 - adaptive learning
 - short-term fuel trim (STFT)
 - long-term fuel trim (LTFT)
 - sensor reference voltages and sensor grounds
 - system outputs, including:
 - injectors
 - idle speed control devices
 - fuel pump relays
 - engine cooling fans
 - air conditioning compressor controls
 - broadband intake manifolds
 - exhaust gas recirculation solenoid controls
 - carbon canister purge controls
 - throttle motor (drive by wire) controls
 - variable valve timing controls
 - assembly line diagnostic link (ALDL)

- ignition systems and components, including:
 - spark plugs
 - ignition leads
 - ignition coils, including electromagnetic induction
 - ignition timing, including varying ignition timing according to engine load, speed and knock sensor input
 - dwell period
- ECU control of ignition coil switching and methods of generating timing signals, including:
 - profile ignition pick-up (PIP) and crankshaft position sensor signals, including inductive pick-up, Hall effect and light emitting diode (LED)
 - waste spark ignition systems
 - coil-on-plug ignition systems
 - integrated ignition systems
- diagnostic testing procedures for spark ignition engine management systems, including:
 - diagnostic flow charts
 - fuel system testing, including:
 - low pressure fuel system testing
 - high pressure fuel system testing
 - testing electrical systems, including procedures for:
 - accessing electrical terminals and using test probes without damaging connectors, fuse holders or wiring
 - injector testing
 - sensor testing
 - actuator testing
 - accessing and interpreting industry-relevant test equipment data, including:
 - fault codes
 - live data
 - freeze frame data
 - waveforms
- repair or replacement procedures for spark ignition engine management systems, including procedures for:
 - removing and replacing the following electrical or electronic components:
 - sensors
 - actuators, including fuel injectors and fuel pumps
 - adjusting and recalibrating components and associated systems
- post-repair testing procedures, including procedures for:
 - clearing fault codes
 - assessing engine performance
 - checking for electrical connector mating.

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 spark ignition engine management systems that they have worked on, 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
- workplace instructions
- manufacturer specifications for spark ignition engine management systems
- three different vehicles or machinery with spark ignition engine management system faults
- diagnostic equipment for spark ignition engine management systems, including:
 - multimeter
 - scan tool
- tools, equipment and materials appropriate for repairing spark ignition engine management systems.

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