



Australian Government

AURETU006 Diagnose complex faults in air conditioning and HVAC systems

Release: 1

AURETU006 Diagnose complex faults in air conditioning and HVAC systems

Modification History

Release	Comment
Release 1	New unit of competency.

Application

This unit describes the performance outcomes required to diagnose complex faults in air conditioning and heating, ventilation and air conditioning (HVAC) systems and determine the repair action necessary to restore system performance. It involves confirming the existence of a fault, choosing the diagnostic procedure and tools, applying the diagnostic procedure, reporting conclusions and making repair recommendations.

Complex faults are outside the normal scope of a technician's diagnosis and repair work. They include intermittent faults, multi-system faults, faults introduced as a result of system repairs, and indirect faults caused by the influence of external systems, requiring the application of complex diagnostic processes to resolve.

It applies to those working in an automotive service and repair industry. The air conditioning and HVAC systems include those of agricultural machinery, heavy commercial vehicles, light vehicles, marine vessels or mobile plant machinery.

Licensing requirements apply to this unit. Users are advised to check with the relevant regulatory authority.

Competency Field

Electrical

Unit Sector

Technical - Air Conditioning and HVAC

Elements and Performance Criteria

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.
1. Identify and confirm the work requirement	1.1 Nature and objective of diagnostic requirements are determined from workplace instructions 1.2 Existence of fault in air conditioning and HVAC system is confirmed from direct or indirect evidence 1.3 Hazards associated with the work are identified and risks are managed according to workplace procedures and safety and environmental requirements
2. Prepare to carry out diagnosis	2.1 Manufacturer specifications and other technical information for air conditioning and HVAC system are accessed and interpreted 2.2 Diagnostic procedures and options are identified 2.3 Diagnostic method sequence, tests and testing processes are selected from the range of available options 2.4 Testing equipment is selected and prepared according to manufacturer specifications and workplace procedures 2.5 Tools, equipment and materials required to support the diagnostic process are identified, selected and prepared for use
3. Apply diagnostic procedures	3.1 Selected diagnostic process is followed and testing is carried out according to manufacturer specifications, workplace procedures and safety requirements 3.2 Diagnostic findings are verified, as required, by using reliable alternative or optional process according to manufacturer specifications and workplace procedures 3.3 Conclusions are drawn from findings and documented according to workplace procedures, including recommendations for necessary repairs 3.4 Conclusions are provided to appropriate personnel or customer to confirm further action to be taken
4. Complete work processes	4.1 Vehicle, vessel or machinery is presented ready to be repaired or returned to the customer 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 and isolated 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:	- locate and evaluate appropriate sources of information efficiently - apply diagnostic skills to different vehicles, vessels or machinery.
Reading skills to:	research, organise and interpret technical information from manufacturer and workshop literature when seeking air conditioning and HVAC system specifications 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, gain information from customers and supervisors, report diagnostic findings and make repair recommendations.
Numeracy skills to:	measure air conditioning and HVAC system components and use basic mathematical operations, including addition and subtraction, to calculate tolerances and deviations from manufacturer specifications.
Planning and organising skills to:	plan own work requirements and prioritise and sequence actions to achieve required outcomes and ensure tasks are completed within workplace timeframes.
Technology skills to:	- use specialised diagnostic equipment, including: - manifold and gauge sets - leak detectors - digital multimeters - thermometers.

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 and environmental requirements</i> must include:	- work health and safety (WHS) and occupational health and safety (OHS) requirements, including procedures for: - identifying hazards and controlling risks associated with
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	wearing jewellery while working around high electrical currents • working with refrigerants at boiling point given risk of frostbite • working with system lubricants, including carcinogenic oils • handling flammable refrigerants • preventing loss of refrigerant to environment • using personal protective equipment • identifying fire safety equipment (PPE) • environmental requirements, including procedures for preventing loss of refrigerant to the atmosphere.
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Unit Mapping Information

Equivalent to AURETU4006 Diagnose complex faults in air conditioning and HVAC 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 AURETU006 Diagnose complex faults in air conditioning and HVAC 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 this unit's elements, performance criteria, range of conditions and foundation skills:

- diagnose a complex fault in the air conditioning and heating, ventilation and air conditioning (HVAC) systems of two different vehicles, vessels or machinery
- the above diagnosis must involve two of the following types of complex faults:
 - an intermittent fault
 - a fault that affects more than one system
 - a fault introduced as a result of a system repair
 - an indirect fault caused by the influence of external systems.

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 complex faults in air conditioning and HVAC systems, including procedures for:
 - identifying hazards and controlling risks associated with wearing jewellery while working around high electrical currents
 - working with refrigerants at boiling point given risk of frostbite
 - working with system lubricants, including carcinogenic oils
 - handling flammable refrigerants
 - preventing loss of refrigerant to environment
 - using personal protective equipment (PPE)
 - identifying and using fire safety equipment

- environmental requirements, including procedures for preventing loss of refrigerant to the atmosphere
- types of complex faults relating to air conditioning and HVAC systems, including:
 - intermittent
 - multi-system
 - introduced as a result of system repair
 - indirect, caused by the influence of external systems
- requirements of Australian automotive code of practice: Control of refrigerant gases during manufacture, installation, servicing or de-commissioning of motor vehicle air conditioners, including procedures for preventing loss of refrigerant to atmosphere
- methods for locating and content of manufacturer specifications, workplace procedures and other technical information relating to air conditioning and HVAC systems
- types, function and operation of air conditioning and HVAC systems, including:
 - climate control systems
 - single and dual zone systems
 - electric controlled compressor systems
- testing procedures for air conditioning and HVAC systems, including:
 - vehicle HVAC performance testing
 - component failure analysis
 - vehicle continuous and non-continuous monitored systems
- procedures for using testing and diagnostic tools and equipment, including:
 - scan tools
 - oscilloscopes
 - manifold and gauge sets
 - vacuum pumps
 - leak detectors
 - nitrogen cylinder and regulators
 - digital vacuum gauges (vacrometer)
 - digital multimeters
 - infra-red thermometers (pyrometer)
- types, functions, operation and limitations of diagnostic testing equipment required to diagnose complex faults in vehicle air conditioning and HVAC systems
- procedures for accessing and interpreting scan tool system data, including:
 - diagnostic trouble codes (DTCs), including:
 - conditions that set the DTCs
 - conditions for running DTCs
 - live data
 - freeze frame data
 - waveforms
- methods and processes for documenting and reporting diagnostic findings and recommendations.

Assessment Conditions

Assessors must satisfy NVR/AQTF assessor requirements and hold an Australian Refrigerant Council (ARC) Refrigerant Handling licence.

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 air conditioning and HVAC 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 air conditioning and HVAC system specifications
- two different vehicles, vessels or machinery with complex faults in their air conditioning and HVAC systems
- testing and diagnostic tools and equipment appropriate for diagnosing and repairing complex faults in air conditioning and HVAC systems, including:
 - manifold and gauge sets
 - leak detectors
 - digital multimeters
 - thermometers
- tools, equipment and materials appropriate for diagnosing complex faults in air conditioning and HVAC systems.

Links

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