



Australian Government

AURETU106 Diagnose complex faults in air conditioning and HVAC systems

Release: 1

AURETU106 Diagnose complex faults in air conditioning and HVAC systems

Modification History

Release	Comments
Release 1	This version first released with AUR Automotive Retail, Service and Repair Training Package Version 6.0

Application

This unit describes the skills and knowledge required to diagnose complex faults in air conditioning and heating, ventilation and air conditioning (HVAC) systems and identify the repair action necessary to restore system performance. The systems used vary based on the work context. It involves confirming the existence of a fault, developing a diagnostic testing strategy, diagnosing the cause of the fault, 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.

The unit applies to those who work 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. An Australian Refrigeration Council accredited (ARCTick) Refrigerant Handling licence is required for those carrying out this work.

Unit Sector

Electrical Technical – Air Conditioning and HVAC

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
<i>Elements describe the essential outcomes.</i>	<i>Performance criteria describe the performance needed to demonstrate achievement of the element.</i>
1. Identify and confirm the work requirement	1.1 Identify job requirements from workplace instructions 1.2 Confirm nature of fault according to workplace procedures

ELEMENT	PERFORMANCE CRITERIA
	1.3 Identify hazards and environmental issues associated with diagnosis activity, assess potential risks and implement control measures in line with workplace policies and procedures
2. Prepare to diagnose complex faults	2.1 Identify required information for diagnosis activity 2.2 Analyse diagnostic options and develop testing strategy, including, diagnostic method sequence, tests and testing processes 2.3 Identify tools and equipment required for testing strategy and establish serviceability according to workplace procedures
3. Apply diagnostic procedures	3.1 Implement diagnostic tests set out in testing strategy according to manufacturer and workplace procedures, and workplace health and safety requirements 3.2 Verify and report diagnostic findings using reliable alternative process according to manufacturer specifications and workplace procedures 3.3 Develop and report recommendations for necessary repairs according to workplace procedures 3.4 Communicate findings to workplace supervisor and customer and confirm next steps
4. Complete work processes	4.1 Conduct final inspection according to workplace procedures and confirm vehicle is ready for repair process or return to customer 4.2 Clear work area and dispose of or recycle materials according to workplace procedures 4.3 Complete documentation according to workplace procedures

Foundation Skills

This section describes those language, literacy, numeracy and employment skills that are essential to performance but not explicit in the performance criteria.

SKILL	DESCRIPTION
Learning	• Locates required sources of information efficiently • Develops own approach to a task, including steps to confirm findings • Applies diagnostic skills to different vehicles, vessels or machinery

SKILL	DESCRIPTION
Reading	Organises and interprets technical information from manufacturer and workshop literature when seeking air conditioning and HVAC system specifications and procedures
Oral communication	- Clarifies instructions - Obtains information from customers and supervisors
Numeracy	Measures air conditioning and HVAC system components and uses mathematical operations, including addition and subtraction, to calculate tolerances and deviations from manufacturer specifications
Planning and organising	- Plans own work requirements - Prioritises actions to achieve required outcomes - Ensures tasks are completed within workplace timeframes
Technology	- Uses specialised diagnostic equipment, including: - manifold and gauge sets - leak detectors - digital multimeters - thermometers.

Unit Mapping Information

Supersedes and is equivalent to AURETU006 Diagnose complex faults in air conditioning and HVAC systems.

Links

Companion Volume Implementation Guide is found on VETNet -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b4278d82-d487-4070-a8c4-78045ec695b1>

Assessment Requirements for AURETU106 Diagnose complex faults in air conditioning and HVAC systems

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Performance Evidence

The candidate must demonstrate the ability to complete the tasks outlined in the elements, performance criteria and foundation skills of this unit, including evidence of the ability to:

- diagnose a complex fault in the air conditioning and heating, ventilation and air conditioning (HVAC) systems of two different vehicles, vessels or machinery in which the work must involve developing a testing strategy to diagnose the cause of at least two of the following 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
- develop testing strategies in the course of the above work for faults in the following systems:
 - multiple zone systems
 - electric controlled compressor systems.

Knowledge Evidence

The candidate must be able to demonstrate knowledge to complete the tasks outlined in the elements, performance criteria and foundation skills of this unit, including knowledge of:

- methods to locate and interpret information required to diagnose complex faults in air conditioning and HVAC systems, including:
 - air conditioning and HVAC system manufacturer specifications
 - Australian automotive code of practice: control of refrigerant gases during manufacture, installation, servicing or de-commissioning of motor vehicle air conditioners, procedures for preventing loss of refrigerant to atmosphere
 - communicating with customers and supervisors
- workplace procedures required to diagnose complex faults in air conditioning and HVAC systems, including:

- establishing the serviceability of tools and equipment
- documentation procedures
- housekeeping procedures, including:
 - examination of tools and equipment
 - storage of equipment
 - identification, tagging and isolation of faulty equipment
 - safe disposal of materials
 - recycling procedures
- workplace health and safety (WHS) 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
 - selecting and using personal protective equipment (PPE)
 - emergency procedures and incident management requirements and procedures
 - handling flammable refrigerants
 - preventing loss of refrigerant to environment
 - identifying and using fire safety equipment
- environmental requirements relating to air conditioning and HVAC systems, including procedures for:
 - preventing loss of refrigerant to the atmosphere
 - handling materials and refrigerant recovery equipment
- 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
- types and function 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)
- key features 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.

Assessment Conditions

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.

Assessors of this unit must satisfy the requirements for assessors in applicable vocational education and training legislation, frameworks and/or standards; and hold an Australian Refrigerant Council (ARC) Refrigerant Handling licence.

Links

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