



Australian Government

AURETU105 Retrofit automotive air conditioning and HVAC systems

Release: 1

AURETU105 Retrofit automotive 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 retrofit automotive air conditioning systems, including heating, ventilation and air conditioning (HVAC) systems, fitted to a range of vehicles and machinery. It involves preparing for the task, selecting the correct de-gas procedure, carrying out the retrofit and associated modifications, performing post-retrofit testing, and completing workplace processes and documentation. Air conditioning systems may contain a mixture of both natural and flammable synthetic refrigerants that are difficult to accurately identify and safely recover. To minimise the possibility of ignition, the procedures and equipment used when recovering refrigerants must be those required for flammable refrigerants.

The unit applies to those who work in the automotive service and repair industry. Automotive air conditioners, including HVAC systems, include those in agricultural machinery, heavy commercial vehicles, light vehicles or mobile plant machinery.

Licensing requirements apply to this unit. Users are advised to check with 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. Prepare to retrofit system	1.1 Identify job requirements from workplace instructions 1.2 Identify required information for retrofit activity, including manufacturer specifications and Australian automotive code of practice

ELEMENT	PERFORMANCE CRITERIA
	1.3 Identify refrigerant required according to workplace procedures and workplace health and safety and environmental requirements 1.4 Identify retrofit option required for the job 1.5 Identify hazards and environmental issues, assess potential risks and implement control measures in line with workplace procedures 1.6 Identify tools and equipment required for inspect and servicing activity and establish serviceability according to workplace procedures
2. De-gas system	2.1 De-gas system according to manufacturer specifications, Australian automotive code of practice, workplace procedures, and workplace health and safety and environmental requirements 2.2 Refrigerant is recovered into required refrigerant recovery cylinder according to manufacturer specifications, Australian automotive code of practice, workplace procedures, and workplace health and safety and environmental requirements 2.3 Measure oil recovered and determine replacement volume
3. Retrofit system	3.1 Carry out air conditioning retrofit procedures according to manufacturer specifications, Australian automotive code of practice, workplace procedures, and workplace health safety and environmental requirements 3.2 Pressure test system and confirm there are no leaks according to manufacturer specifications, Australian automotive code of practice, workplace procedures, and workplace health and safety and environmental requirements 3.3 Evacuate system according to manufacturer specifications, Australian automotive code of practice, workplace procedures, and workplace health and safety and environmental requirements 3.4 Re-gas system with refrigerant gas and lubricating oil according to manufacturer specifications, Australian automotive code of practice, and workplace procedures 3.5 Carry out post-retrofit testing according to workplace procedures
4. Complete work processes	4.1 Conduct final inspection according to workplace procedures and confirm vehicle is ready for use 4.2 Clear work area and dispose of or recycle materials according to workplace procedures 4.3 Complete Australian Refrigeration Council accredited (ARCtick) service decal sticker and workplace

ELEMENT	PERFORMANCE CRITERIA
	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
Reading	- Interprets text, symbols and diagrams relating to retrofit and associated modification information from manufacturer specifications, and workplace instructions and procedures - Interprets key requirements of Australian automotive code of practice relating to retrofitting air conditioning and HVAC systems
Writing	Fills out workplace documentation legibly, including ARCTick stickers, when reporting test findings, making retrofit recommendations, and recording parts and material used
Oral communication	Listens to workplace instructions and asks questions to clarify job requirements
Numeracy	- Matches refrigerant types and identification numbers to workplace instructions, vehicle and component part lists, and code of practice requirements - Interprets weighting measurements, including tare and gross weights - Interprets readings on digital and analogue pressure gauges - Measures temperatures and pressures, and uses basic mathematical operations, including addition and subtraction, to calculate deviations from manufacturer specifications
Planning and organising	- Plans own work requirements - Prioritises actions to achieve required outcomes - Ensures tasks are completed within workplace timeframes

SKILL	DESCRIPTION
Technology	• Uses workplace technology and tools.

Unit Mapping Information

Supersedes and is equivalent to AURETU005 Retrofit and modify 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 AURETU105 Retrofit automotive 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:

- retrofit the air conditioning and HVAC systems of two different vehicles or machinery, in which the work must include changing the type of refrigerant.

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 retrofit automotive 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
- workplace procedures required to retrofit automotive 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 retrofitting air conditioning and HVAC systems, including procedures for:
 - working with refrigerants at boiling point given risk of frostbite

- working with system lubricants, including carcinogenic oils
- identifying refrigerant and oil type, including:
 - service decal sticker
 - testing refrigerant
 - types and location of service ports
- handling, storing and transporting refrigerant cylinders and recovery cylinders, including:
 - pressure ratings
 - pressure relief devices
 - outlet connection type
- identifying and handling refrigerants, including hydrocarbon (HC) refrigerants
- selecting and using personal protective equipment (PPE)
- identifying firefighting equipment
- environmental requirements, including procedures for:
 - preventing loss of refrigerant to the atmosphere
 - handling materials and refrigerant recovery equipment
- key requirements of federal Ozone Protection and Synthetic Greenhouse Gas Management Regulations, including refrigerant handling licence and refrigerant trading authorisation
- purpose and operation of automotive air conditioning and HVAC systems and components, including:
 - high pressure and low pressure sides of air conditioning systems
 - compressors, including:
 - piston, scroll and rotary vane compressors
 - electric compressors
 - variable displacement compressors
 - clutchless compressors electromagnetic clutches
 - condensers
 - receiver-dryers, including filters and desiccants
 - expansion valves, including capillary tubes
 - evaporators
 - thermostats
 - refrigerants, including R12, R134a, R1234yf, and hydrocarbon blends
 - compressor oils
 - air conditioner and heating controls, including levers and ducting
 - air conditioner and heating electrical circuits and sensors, including:
 - high and low pressure switches
 - pressure relief valves
 - temperature sensors
 - climate control systems

- procedures for retrofitting and associated modifications for air conditioning and HVAC systems, including:
 - determining original system fitted to vehicle, including refrigerant and oil type and types of components
 - determining appropriate retrofit and associated modification options, including:
 - determining required system performance output
 - component replacement, including O rings and seals
 - refrigerant and oil selection
 - procedures for removing and replacing system components
- procedures for changing system refrigerant, including:
 - changing refrigerant gas from R12 to R134a:
 - receiver dryer filter replacement
 - change system fittings for manifold gauge attachment
 - change oil type
 - reasons why R134a refrigerant must not be retrofitted to R1234yf
 - reasons why R134a refrigerant must not be retrofitted to blends of hydrocarbons
- procedures for recovering automotive refrigerant, including:
 - testing refrigerant to determine its type
 - connecting manifold and gauge set and recovery unit, including types and location of service ports
 - identifying recovery cylinder appropriate to the refrigerant
 - operating recovery unit, including weighing recovery cylinder before and after recovery
 - disconnecting and storing recovery unit and cylinder
- procedures for re-gassing air conditioning and HVAC systems, including:
 - testing system for leaks using vacuum testing and dry nitrogen pressure testing
 - evacuating the system using a vacuum pump and vacuum gauge
 - using manifold gauges, refrigerant scales or charging station to charge system
- post-retrofit testing procedures for air conditioning and HVAC systems, including procedures for checking for:
 - refrigerant leaks
 - heater core and system water coolant leaks
 - system performance is operating to manufacturer specifications
 - reported pre-modification issue has been resolved
 - no other faults are present
- static and dynamic performance tests of air conditioning and HVAC systems, including checking:
 - ambient temperature
 - vent temperature
 - condenser and suction line temperature.

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 retrofitted, 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
- vehicle or machinery 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
- two different vehicles or machinery with air conditioning and HVAC systems requiring retrofitting
- retrofit and testing equipment for air conditioning and HVAC systems, including:
 - manifold and gauge set
 - recovery unit and recovery cylinder
 - vacuum pump and gauge
 - leak detector
 - refrigerant analyser
 - refrigerant
 - refrigerant scales or charging station
 - dry nitrogen cylinder and gauge.

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.

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