



Australian Government

AURETU205 Retrofit automotive air conditioning and HVAC systems

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Modification History

Release	Comments
1	This unit of competency was first released in AUR Automotive Retail, Service and Repair Training Package Release 10.0.

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 recovery 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.

Retrofit activities addressed by this unit include changing the class of refrigerant within an existing system, including the use of drop-in replacement refrigerants. Retrofit does not include fitting a system to a vehicle that has not previously had air conditioning system.

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

Licensing/Regulatory Information

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

An Australian Refrigeration Council (ARCtick) Automotive Refrigerant Handling Licence is required for those carrying out this work. An ARCTick trainee licence is required to undertake this training.

Pre-requisite unit(s)

No pre-requisite units

Competency field(s)

Electrical

Unit sector(s)

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 retrofit information for the retrofit activity 1.3 Identify refrigerant required for the retrofit according to retrofit information , workplace procedures and safety and environmental requirements 1.4 Identify retrofit options 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 retrofit activity and establish serviceability according to workplace procedures
2. Recover refrigerant from system	2.1 Identify refrigerant in the system and recover refrigerant according to retrofit information , workplace procedures and safety and environmental requirements 2.2 Recover refrigerant into a recovery cylinder appropriate to the identified refrigerant class according to retrofit information , workplace procedures and safety and environmental requirements 2.3 Determine lubricant replacement volume based on quantity recovered and manufacturer specifications
3. Retrofit system	3.1 Carry out air conditioning retrofit procedures according to retrofit information , workplace procedures and safety and environmental requirements 3.2 Check system for leaks according to retrofit information , workplace procedures and safety and environmental requirements 3.3 Evacuate system according to retrofit information , workplace procedures and safety and environmental requirements 3.4 Charge system with refrigerant and lubricants according to retrofit information , workplace procedures and safety and environmental requirements

	3.5 Carry out post-retrofit testing according to <i>retrofit information</i> , workplace procedures and <i>safety and environmental requirements</i>
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 service label and workplace documentation according to workplace procedures

Foundation skills

This section describes the foundation skills essential to performance.

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 safety data sheets (SDS)
Writing	Legibly and accurately fill out workplace documentation, including the service label appropriate to the work performed and the licence conditions held, when reporting findings, making retrofit recommendations, and recording parts and materials used
Oral communication	Listens to workplace instructions and asks questions to clarify job requirements
Numeracy	- Matches refrigerant classes and identification markings to workplace instructions and vehicle and component part lists - Interprets weight 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

Technology	• Uses workplace technology and tools
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Range of conditions

<i>Retrofit information</i> must include:	• vehicle and refrigerant manufacturer specifications • Australian automotive refrigerant handling code of practice • relevant regulations and standards
<i>Retrofit options</i> must include:	• refrigerant change, including use of drop-in replacement refrigerants • refrigerant and lubricant selection to meet required system performance output • component replacement, including O-rings and seals • receiver dryer filter replacement • change of service port fittings, where required for compatibility with the replacement refrigerant
<i>Safety and environmental requirements</i> must include:	• work health and safety (WHS) and occupational health and safety (OHS) requirements • environmental requirements under the <i>Ozone Protection and Synthetic Greenhouse Gas Management Regulations 1995</i>, including procedures for preventing loss of refrigerant to the atmosphere and restrictions on prohibited refrigerant charging

Assessment Requirements for AURETU205 Retrofit automotive air conditioning and HVAC systems

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 air conditioning and HVAC systems on two different makes or models of vehicles or machinery, with at least one retrofit involving a change of refrigerant type.

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 refrigerant handling code of practice
- 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
- work health and safety (WHS) and occupational health and safety (OHS) requirements relating to retrofitting air conditioning and HVAC systems, including procedures for:
 - interpreting safety data sheets (SDS) for refrigerants and lubricants
 - managing risk of freeze burn and cold burns when handling refrigerants
 - working with system lubricants, including health and safety issues associated with handling refrigerant lubricants
 - handling, storing and transporting refrigerant cylinders and recovery cylinders, including:
 - pressure ratings
 - pressure relief devices

- identifying refrigerants, including hazard recognition for Class A3 (higher flammability) refrigerants
 - selecting and using personal protective equipment (PPE)
 - identifying fire safety equipment appropriate for refrigerant class
- environmental requirements under the Ozone Protection and Synthetic Greenhouse Gas Management Regulations 1995 and procedures in the Australian Automotive Refrigerant Handling Code of Practice relating to retrofitting automotive air conditioning and HVAC systems for:
 - preventing loss of refrigerant to the atmosphere
 - handling materials and refrigerant recovery equipment
 - refrigerant handling licence and refrigerant trading authorisation
 - prohibited refrigerant charging, including:
 - a non-scheduled refrigerant may not be replaced with a GWP refrigerant
 - a replacement refrigerant must not have a higher GWP than the design refrigerant
 - exceptions for essential uses such as health or public safety, where neither the design refrigerant nor a lower- or zero-GWP replacement is available
- 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 type, including variable displacement compressors
 - scroll type
 - rotary vane type
 - electric compressors
 - clutchless compressors and electromagnetic clutches
 - condensers
 - receiver-dryers, including filters and desiccants
 - flow control devices, including thermostatic expansion valves (TXV) and orifice tubes
 - evaporators
 - thermostats
 - refrigerants relevant to automotive air conditioning systems and their safety classifications, including:
 - Class A1 – lower toxicity, no flame propagation, including R-134a

- Class A2L – lower toxicity, lower flammability, including R-1234yf
 - Class A3 – lower toxicity, higher flammability, including R-600
- 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
 - 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 lubricant type and types of components
 - service label
 - testing refrigerant using an analyser or identifier
 - types and location of service ports
 - determining appropriate retrofit and associated modification options, including:
 - determining required system performance output
 - component replacement, including O-rings and seals
 - refrigerant and lubricant selection
 - procedures for removing and replacing system components
- procedures for changing system refrigerant, including:
 - changing refrigerant in accordance with manufacturer specifications, including:
 - changes within a refrigerant class, including drop-in replacement refrigerants
 - receiver dryer filter replacement
 - confirm service port compatibility with the new refrigerant class, and change fittings where required
 - change lubricant type
 - reasons why Class A1 (no flame propagation) refrigerants must not be retrofitted to Class A2L (lower flammability) systems
 - reasons why Class A1 (no flame propagation) and A2L (lower flammability) refrigerants must not be retrofitted to Class A3 (higher flammability) systems
- 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:
 - methods for testing system for leaks, including:
 - pressure testing using oxygen-free nitrogen (OFN)
 - vacuum decay testing
 - electronic leak detection
 - 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:
 - leaks checking refrigerant leaks using electronic leak detection or tracer gas testing, where compatible with system materials
 - 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
- performance tests of air conditioning and HVAC systems, including checking:
 - ambient temperature
 - vent temperature
 - discharge line temperature
 - liquid line temperature
 - suction line temperature
- procedures for completing workplace documentation, including service label.

Assessment Conditions

Assessment of skills must take place under the following conditions:

- 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 refrigerant handling code of practice
 - 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 (either as a standalone item or integrated into a combined recovery, evacuation and charging unit)
 - recovery unit and recovery cylinder
 - leak detection equipment appropriate to the refrigerant class and system being tested, such as:
 - oxygen-free nitrogen (OFN) cylinder and regulator for pressure testing
 - electronic leak detector compatible with the refrigerant class
 - vacuum pump and vacuum gauge for vacuum decay testing
 - refrigerant analyser
 - refrigerant
 - refrigerant scales or charging station
 - service label.

Assessors of this unit must hold an Australian Refrigeration Council (ARCTick) Automotive Refrigerant Handling Licence.

Mandatory Workplace Requirements

Assessment of performance evidence may be in a workplace setting or an environment that accurately represents a real workplace.

Unit Mapping Information

Previous Code and Title	Equivalence	Comments
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AURETU105 Retrofit automotive air conditioning and HVAC systems	Equivalent	Superseded by and equivalent to AURETU205 Retrofit automotive air conditioning and HVAC systems
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Links

Companion volumes, including implementation guides, are found on the national training register - <https://training.gov.au/training/details/AUR>.