

The Australian automotive code of practice 2008

Control of refrigerant gases during manufacture, installation, servicing or de-commissioning of motor vehicle air conditioners



Australian Government
Department of the Environment,
Water, Heritage and the Arts



Motor Trades Association of Australia



The Australian automotive code of practice for the control of refrigerant gases during manufacture, installation, servicing or de-commissioning of motor vehicle air conditioners 2008

Attention: This code does not address the use of hydrocarbons in motor vehicle air conditioning



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Acknowledgements

This code of practice replaces Item 34 in Regulation 135 of the Ozone Protection and Synthetic Greenhouse Gas Management Regulations 1995 (the Regulations); the Australian automotive code of practice for the reduction of emissions of a refrigerant gas in motor vehicle air conditioners, published by the Motor Trades Association of Australia in 2000.

The revised code is based largely on material and ideas prepared by the Motor Trades Association of Australia and the Vehicle Air Conditioning Specialists of Australasia.

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Foreword

Depletion of the stratospheric ozone layer and the enhanced greenhouse effect (leading to global warming) have focused the world's attention on the atmosphere. Both are exacerbated by avoidable emissions of refrigerants used in automotive air conditioning.

The objective of this code of practice is to assist in the control of emissions into the atmosphere recognising the important role of the Australian automotive air conditioning industry. This code is helping achieve the objectives of the Montreal Protocol on Substances that Deplete the Ozone Layer by reducing emissions of ozone depleting substances. In addition, this code recognises the potential environmental effects on global warming through emissions of refrigerant gases.

The code does not constitute a technical design document and must be used with other standards and codes of practice already in existence. In particular, AS 4211.1 - 1996 Gas recovery or combined recovery and recycling equipment.

Compliance with this code of practice is commensurable with Regulation 135 of the Ozone Protection and Synthetic Greenhouse Gas Management Regulations 1995 (the Regulations) made under the *Ozone Protection and Synthetic Greenhouse Gas Management Act 1989*.

Any person who handles fluorocarbon refrigerant gases must hold a national Refrigerant Handling Licence. These gases include refrigerants such as R12, R22, R134a and R410a. Any technician who, for example, decants or reclaims gas or decommissions or installs systems will be required to have a Handling Licence. Handling refrigerant gases without a Handling Licence is an offence.

These amended Regulations equally apply to any person or company who buys or sells refrigerant gases, who is required to hold a Refrigerant Trading Authorisation. For manufacturers of refrigeration and air conditioning equipment, a RAC Equipment Manufacturers Authorisation is also required.

Investigations of breaches and subsequent enforcement action against an individual or company, holding or not holding a licence or authorisation will be handled by the Department of the Environment, Water, Heritage and the Arts. For more information on licensing and authorisations or to download an application form, access the Australian Refrigeration Council (ARC) website on www.arctick.org

The use of hydrocarbons (HCs) in automotive air conditioning equipment is regulated by individual state or territory legislation. Any person considering their use should first refer to the appropriate legislation.

Through the adoption of work practices outlined in the code, service personnel will play a crucial role in helping to protect our environment.

CODE OF PRACTICE 2008

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VEHICLE CATEGORIES COVERED BY THIS CODE

- ▶ Passenger cars
- ▶ Forward control passenger vehicles
- ▶ Off-road passenger vehicles
- ▶ Registerable commercial vehicles and omnibuses
- ▶ Any other off-road vehicle, including tractors and farm machinery fitted with an air conditioning system of a type normally used in the above category of vehicles
- ▶ Automotive plant & equipment
- ▶ Any other self-propelled vehicle, which has a cabin fitted with a type of air conditioner normally fitted to one of the vehicle types listed above

PART A of this code addresses the vehicle fitting, servicing, repair, commissioning and decommissioning responsibilities.

PART B of this code contains references.

PART A

The Australian automotive code of practice for the control of refrigerant gases during manufacture, installation, servicing or de-commissioning of motor vehicle air conditioners

A.1 Scope

This code of practice provides for minimum standards for operation, servicing and repair procedures of motor vehicle air conditioners (MVAC) and includes procedures for recovery and recycling of refrigerants to control emissions of refrigerant gases.

Users of this code should refer to the relevant motor vehicle or air conditioning service manual for details of specific systems.

Technicians must comply with the requirements of the Regulations, this code, the instructions and service manuals provided by equipment manufacturers. Where there are contradictory instructions, the requirements of the Regulations take precedence over this code and this code takes precedence over any other instructions or manuals.

A.2 Licensed service person

- A.2.1 For the purpose of the code, a licensed service person is a person holding an Automotive Air Conditioning Refrigerant Handling Licence as defined in Table 131 of the Regulations.
- A.2.2 For the purpose of the code, a licensed trainee is a person holding a Refrigeration and Air Conditioning Trainee Licence as defined in s134 of the Regulations.
- A.2.3 Only licensed service persons or a licensed trainee under the direct supervision of a licensed service person may carry out repairs and service to air conditioning systems.

A.3 Preliminary inspection

A.3.1 The owner and/or the driver of the vehicle and or appliance **should** be made aware of the service organisation's responsibility to conduct the service as required under Government legislation.

A.3.2 The system **must** be inspected and leak tested for any signs of leakage.

A.3.3 Signs of ageing or wear of pipework or hoses **should** be noted.

A.3.4 Debris, which may inhibit air flow to the condenser **should** be noted.

A.3.5 If, in the opinion of the licensed technician there are doubts about the integrity of the system, the system **must** not be re-gassed prior to the necessary rectification work having been completed.

A.4 "Topping up" of air conditioning systems

A.4.1 The addition of refrigerant to an existing system charge to "top up" **must not** be carried out.

A.5 Equipment

- A.5.1 A licensed service technician undertaking the servicing of motor vehicle air conditioning systems **must** have access to the following equipment:
- ▶ Refrigerant calibrated charging cylinder or weighing mechanism
 - ▶ Manifold with pressure gauges
 - ▶ Vacuum pump
 - ▶ Refrigerant recovery system (including compressor and oil collector)
 - ▶ Electronic leak detector
 - ▶ Appropriate thermometer
- A.5.2 Only recovery/recycling equipment complying with AS 4211.1, 1996 and the reference documents listed in Clause 1.3 of AS 4211.1,1996 should be used. In any case, the recovery/recycling equipment **must** be appropriate for the refrigerant type being used. Any system purchased or constructed after 1 January 2009 must comply with AS 4211.1,1996.
- A.5.3 Recovery equipment **must** be operated and maintained in accordance with the manufacturer's instructions and records must be kept of all maintenance and calibration conducted.
- A.5.4 Vacuum pump oil **should** be changed either in accordance with the manufacturer's instructions or at regular intervals.

A.6 Recovery, recycling and re-gas equipment

- A.6.1 Recovery/re-gas equipment **should** be designed to minimise hose length that requires purging.
- A.6.2 Pipes or hoses **should** have an isolating valve at the compressor end with the manifold valve sealing the other end.
- A.6.3 Hoses to be attached to the high or low pressure side of the air conditioning system **should** have the isolating valve located no further than 300mm from the end of the hose.
- A.6.4 Recovery equipment **must** have an isolating valve fitted at the recovery cylinder.
- A.6.5 Isolating valves **must** be closed and refrigerant retained in the hose between use.
- A.6.6 The isolating valves **must** be of a positive on/off type which will effectively seal the hose.
- A.6.7 The equipment **should** incorporate particle filter capable of trapping particulates of 15 micron spherical or greater; the equipment should incorporate an in line filter preceding the compressor or pump.
- A.6.8 Recovery equipment **should** incorporate an oil separator so that the oil lost during recovery can be measured and the equivalent amount be replaced.
- A.6.9 Cylinders containing reclaimed refrigerant **must** be clearly marked, either:
- ▶ **'Reclaimed; non-contaminated - safe for re-use'**
 - or*
 - ▶ **'Reclaimed contaminated; not to be re-used'** and must be returned to an authorised refrigerant supplier for disposal.

- A.6.10 Extreme care **must** be taken to ensure the refrigerant recovery cylinders are not filled to beyond 80% capacity. Any cylinder used for recovery should incorporate a device that automatically shuts down the recovery equipment to prevent the cylinder from overfilling. It is **recommended** these inbuilt devices be checked regularly for accuracy.

(Refer to AS 4211.1–1996 and the reference notes mentioned therein for more detail on Clause 6)

A.7 Equipment operating instructions

- A7.1 The equipment manufacturer and/or supplier **should** provide instructions for necessary maintenance procedures and covering information for the complete maintenance of the equipment to ensure continued proper and safe operation.

A.8 Safety requirements and functional description

- A8.1 The equipment manufacturer and/or supplier **must** ensure the equipment complies with all of the safety and functional requirements stipulated in AS 4211.1,1996.
- A8.2 Refrigerants that have been mixed **must not** be put back into service.

A.9 De-gassing

- A.9.1 Whenever a system is de-gassed and opened for repair, the open lines **must** be immediately capped or plugged.
- A.9.2 Refrigerant **must** only be removed from the air conditioner by the use of a refrigerant recovery system.

- A.9.3 Recovered refrigerant **must** be collected for recycling or returned to an authorised refrigerant supplier, who is authorised to acquire refrigerant gas under the Regulations.
- A.9.4 Refrigerant of one type **must not** be mixed with refrigerant of any other type if refrigerant is to be recycled for re-use.
- A.9.5 Records **must** be kept of the amount and, where it is known, the type of refrigerant removed from air conditioning systems.

A.10 Oil

- A.10.1 In the event of a hose failure or oil having been removed from the system during servicing, the quantity of oil remaining in the system **must** be checked against the manufacturer's specifications and a corresponding amount of oil added, if deemed necessary.

A.11 Cleaning

- A.11.1 Refrigerant gas **must not** be used for the purpose of cleaning debris or dust from the air conditioner condenser fins or other parts.
- A.11.2 If refrigerant gas is used for flushing it **must** be recovered.
- A.11.3 Debris which may inhibit air flow **should** be removed from the condenser.

A.12 Filter/dryer and accumulators

A.12.1 Whenever the refrigerant system is opened, the filter/dryer or accumulator, when fitted, **must** be replaced in accordance with the manufacturer's instructions.

Where the manufacturer has not issued instructions, the units **must** be replaced whenever the system is opened or after 5 years of service.

A.12.2 Where during servicing and after the filter/dryer or accumulator has been replaced it is found necessary to re-open the system, the filter/dryer-accumulator **should** again be replaced if:

(i) The system has been left open to atmosphere for more than 10 minutes

or

(ii) The system when properly capped or plugged, has been de gassed for a total of more than 2 hours

unless

(iii) Specific recommendations are contained in the manufacturer's instructions

Note: Climatic conditions - humidity and/or wet weather may lessen the time spans in (i) and (ii) above.

A.13 Pressure/temperature relief

A.13.1 Any system not fitted with a high/low pressure cut-out device **should not** be re-gassed until a suitable switch is fitted.

A.13.2 Pressure/temperature relief devices which vent to atmosphere are only permitted when the system is also fitted with a high/low pressure cut-out switch.

A.13.3 When a pressure relief device is fitted the high pressure cut-out switch **must** be set to operate at a lower value than the pressure relief device.

A.14 Hoses

A.14.1 All hoses which show signs of ageing or physical damage **must** be replaced.

A.14.2 All replacement hoses **must** comply with the appropriate SAE Standard. (Refer Section B)

A.14.3 Steel fittings **should** be used on all connections that are subject to high vibration, torsional or shear loads. For example, some large diesel engine plant and equipment.

A.15 Connections

A.15.1 Hose connections **must** use one of the following methods:

- ▶ crimped, using correct crimping tools

Note: Whenever crimped joints or hose clamps are undone they must be replaced with the specified new fitting.

- ▶ flared joints meeting the appropriate standard of **“Refrigeration Tube Fittings”**

- ▶ “O” ring seals

Note: Whenever an “O” ring joint has been opened the “O” ring **must** be replaced with a new one as specified.

- A.15.2 A suitable refrigerant lubricant **must** be applied to, and behind, all mating surfaces and sealing items, for example “O” rings, gaskets and flares, to avoid damage during tightening. Some newer equipment specifies that joints must be assembled dry; it is imperative that manufacturer’s guidelines are followed.
- A.15.3 All pipe work and fittings **must** be free of contamination prior to fitting.
- A.15.4 All joints **must** be leak tested on completion of assembly.

A.16 Compressor

- A.16.1 Check compressor mounting bolts and mounting bracket bolts for tightness and tension to manufacturer’s specifications.
- A.16.2 Check the compressor drive belts for wear and damage and replace as necessary. The compressor **must** be correctly aligned and the drive belt be correctly tensioned to manufacturer’s specifications.

A.17 Filling and charging equipment

- A.17.1 When filling the charging equipment from the refrigerant cylinder, the hoses should be as short as practicable and be fitted with isolating valves (see Section A6).
- A.17.2 The hose may be lightly purged with refrigerant when initially installed. At other times some refrigerant **must** be retained between the two isolating valves.
- A.17.3 During filling, the displaced refrigerant gas **must** be returned to the recovery cylinder.

A.18 Evacuation and re-gassing process

A.18.1	Where practicable the compressor oil level should be checked and topped up to the correct level.
A.18.2	The equipment must be capable of ensuring the evacuation of air and moisture from the system being serviced, by reducing the system to a gauge pressure of minus 90 KPa, or below. The vacuum pump should operate for a minimum time of 30 minutes before isolating the system.
A.18.3	The system pressure should be checked one minute after isolating from the vacuum pump and re-checked 5 minutes later. A rise in excess of 2 KPa (15mm Hg) indicates a leak or moisture in the system. The fault must be rectified.
A.18.4	If no leaks are detected, the air conditioning system may be serviced in accordance with the manufacturer's instructions (while complying with the code of practice). If leaks are detected, the refrigerant must be recovered and the system repaired.
A.18.5	The air conditioning system should be performance tested and must be leak tested.
A.18.6	Whenever a vehicle air conditioning system is serviced, the service organisation must attach a durable label in a prominent position showing at least the following information: <ul style="list-style-type: none">i. Name of the service organisationii. Name and Refrigerant Handling Licence number of the technician conducting the serviceiii. Date of the air conditioner serviceiv. Date of the last filter changev. Type of refrigerant in the systemvi. Type of oil in the systemvii. Type of dye, if any added.

A.19 Leak detection

Preparation for electronic leak detection:

Prior to leak testing, a refrigerant identification check should be carried out if the refrigerant composition is unknown. This is to minimise the risk associated with the use of electronic leak detectors that use an electrical discharge across the tip in the presence of hydrocarbon refrigerants.

A.19.1 To overcome the practice of topping up the system with a coloured dye and asking the owner/driver to drive the car for a few days, the following notes **should** apply:

- ▶ Suitable leak detection equipment must be used in the detection of refrigerant leaks. The equipment can be electronic, visual or pressure leak detection.
- ▶ Irrespective of the type of leak detection equipment used, the equipment must be used in accordance with the equipment manufacturer's and or supplier's operating instructions and maintained accordingly.
- ▶ If Refrigerant Handling Licence holders use dry nitrogen test equipment to detect leaks, reference must be made to the vehicle manufacturer's service guidelines.

A.19.2 The use of ultraviolet dye as a diagnostic tool to detect leaks is acceptable if all other available means of leak detection have failed and the technician still suspects the presence of a leak. Adding dye to a system **must not** be used as a diagnostic tool of the first resort.

A.19.3 A technician that proposes to use ultraviolet dye as a diagnostic tool to detect leaks **must** have documented all other efforts made to detect the leak.

A.19.4 Technicians **must** refer to the manufacturer's specifications to ensure that the use of dye does not impinge on the warranty or future serviceability of the system.

A.20 Advice to vehicle owner/operator

- A.20.1 Owners/operators **must** be advised to operate the air conditioning system for a minimum of 5 minutes each week, regardless of the season. The reason for this i.e. to keep the system functioning effectively and keep seals well lubricated is so that they don't crack or leak.
- A.20.2 Owners **should** be advised to periodically inspect or have the air conditioning system inspected for evidence of leakage.
- A.20.3 Where a refrigerant used to charge a system is a different refrigerant than was originally designed for that system, the vehicle owner **should** be advised.

A.21 Storage

- A.21.1 Refrigerant containers **must** be stored in a secure, cool place, away from fire risk and sources of direct heating and must be within test date.
- A.21.2 Refrigerant containers **must** be stored at or below 48°C unless otherwise specified by the manufacturer.
- A.21.3 Containers **should not** be dropped. Mechanical damage to the container and its valve should be avoided by careful handling. Refrigerant containers must be secured at all times to avoid accidental damage.
- A.21.4 When not in use, container valves **must** be closed, the valve outlet cover nut fitted and the valve protection cover replaced.
- A.21.5 Containers **must** be dedicated to one type of refrigerant.

A.22 De-commissioning

- A.22.1 Any automotive system leaking refrigerant **must** either be repaired in accordance with this code, or alternatively the owner must be advised that the system should be de-commissioned by a licensed person.
- A.22.2 In the case of a vehicle that is being scrapped or dismantled, the air conditioning system **must** be de-commissioned.
- A.22.3 When any air conditioning system is de-commissioned, even where there is an intent to re-install the system in another vehicle, all the refrigerant **must** be removed from the system as noted in A.9 "De-gassing."

A.23 Retrofitting

- A.23.1 Permission from the owner **must** be obtained prior to any work being performed.
- A.23.2 A comprehensive performance and component check list **should** be provided which would record all relevant details. Where components are considered doubtful, this should be brought to the vehicle owners' attention.
- A.23.3 Wherever possible, retrofit guidelines **should** be referred to. Leak testing must be carried out prior to and after retrofitting.
- A.23.4 A label containing the following information **must** be affixed to the vehicle following service and/or repair of the air conditioning system:
- i. Name of service organisation
 - ii. Name and Refrigerant Handling Licence number of the technician carrying out the work
 - iii. Date of service or repair
 - iv. Quantity of refrigerant
 - v. Type of refrigerant
 - vi. Type of oil
 - vii. Odometer reading.

- A.23.5 In the case of a retrofit to R134a, the special R134a charge fittings **must** be attached to existing and easily accessible 1/4" charge fittings in such a way that they become an integral part of the system. Any other 1/4" fittings must be plugged to prevent their further use.
- A.23.6 Where the use of non-fluorocarbon refrigerants is contemplated, the relevant state and territory legislation, where this exists, **should** be referred to and complied with.

PART B

References

- ▶ HFC-134a (R134a) Service Hose fittings for Automotive Air Conditioning Service Equipment, Society of Automotive Engineers (SAE) J 2197
- ▶ Hose Clamp Specification, Society of Automotive Engineers (SAE) J 1508, 1997
- ▶ Refrigerant R12 Automotive Air Conditioning Hose, Society of Automotive Engineers (SAE) J51, 2004
- ▶ Refrigerant R134a Automotive Air Conditioning Hose, Society of Automotive Engineers (SAE) J2064, 2005
- ▶ Refrigerant Recovery Equipment AS 4211.1, 1996
- ▶ Refrigerant Tube Fittings – General Specifications, Society of Automotive Engineers (SAE) J513, 1999
- ▶ Refrigerating Systems AS 1677.1, 1998
- ▶ Safety Standards for Motor Vehicle Refrigerant Vapour Compression Systems, Society of Automotive Engineers (SAE) J639, 2005
- ▶ Service Hose for Automotive Air Conditioning, Society of Automotive Engineers (SAE) J2196