Restricted Refrigerant Recovery Licence
Instruction Booklet

Contents

About the Australian Refrigeration Council

People working in the refrigeration and air conditioning (RAC) industry in Australia must hold a licence issued under the Ozone Protection and Synthetic Greenhouse Gas Management Regulations 1995 (the Regulations). It is illegal to handle the fluorocarbon range of refrigerants without a relevant licence.

The Australian Refrigeration Council (ARC) is the relevant authority that can issue you with such a licence. The ARC administers the licensing system on behalf of the Australian Government Department of Sustainability, Environment, Water, Population and Communities. The ARC assists the industry to comply with the regulations that encompass refrigerant handling licences and refrigerant trading authorisations.

The ARC provides helpful information and regular updates to assist the industry with ongoing developments on its website www.arctick.org

About the Restricted Refrigerant Recoverer licence

The Restricted Refrigerant Recoverer licence applies to those who may handle fluorocarbon refrigerants while decommissioning stationary domestic systems and automotive air conditioning systems. Stationary domestic systems include refrigerators, freezers and air conditioners (split system and window air conditioners).

Individuals requiring this licence may typically work in auto recycling, car removals, waste transfer stations, building demolition and metal recycling or fridge exchange operations.

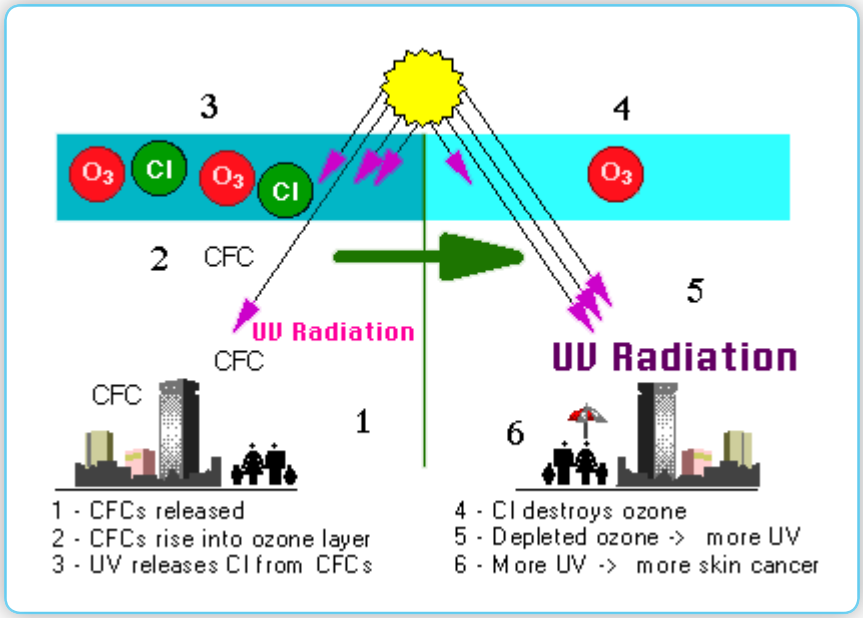
The Restricted Refrigerant Recoverer Licence entitles the holder to recover fluorocarbon refrigerants from damaged equipment or equipment that has reached the end of its service life. This includes the following types of equipment: vehicle air conditioners and stationary domestic systems.

This instructional booklet explains the procedures required to recover fluorocarbon refrigerant from these systems. The booklet complements information contained in a separate training video. Both resources must be referred to for the purposes of learning and assessment. The resources are also an informative reference for supervisors/managers.

Note that the training for the licence, including information in this booklet and the video, is intended **only for recovery of fluorocarbon refrigerants.** It does not include procedures to recover non-fluorocarbon refrigerants such as hydrocarbons, ammonia (NH3) and carbon dioxide (CO2).

Ozone problem

Ozone gas mainly exists in the stratosphere (8-10km above the earth's surface). The ozone layer absorbs most of the ultra-violet light from the sun, while letting light of different wavelengths through. Some natural and many synthetic pollutants deplete the ozone layer. Holes, or thinner areas in the ozone layer allow excessive amounts of ultra-violet light through, causing damage to humans, plants and wildlife.



The inability of the ozone layer to absorb the ultra-violet radiation can result in negative effects to the life on earth, including:

- Skin cancer
- Eye damage, such as cataracts
- Immune system damage
- Reduction in phytoplankton that forms the basis of all marine food chains
- Damage to the DNA in some life-forms.

Causes of ozone depletion

A major contributor to ozone depletion is the range of fluorocarbon refrigerants, which include chlorofluorocarbons (CFCs) like R11 and R12 and hydrochlorofluorocarbons (HCFCs) such as R22. These synthetic gases are known to cause substantial damage to the ozone layer.

The hydrofluorocarbon (HFC eg. R134a) range of refrigerants have no effect on the ozone layer, however they are synthetic greenhouse gases and therefore contribute to global warming. All of these gases are used in refrigeration systems, air conditioners, aerosols, solvents and in the production of some types of packaging.

Approximately 30 per cent of the CFCs released into the atmosphere come from refrigeration and air conditioning gases. Activities involving the handling of refrigerants in refrigeration and air conditioning applications are therefore controlled to reduce potential emissions to the atmosphere.

The refrigeration and air conditioning industry has taken significant steps to reduce and manage the use of ozone depleting refrigerants.

Global warming problem

The Earth is wrapped by a thin layer of gases which form the atmosphere. The atmosphere creates the conditions necessary for life on Earth - the natural greenhouse effect.

Human activities over the last 200 years have altered the composition of the atmosphere through the emission of synthetic pollutants. Many of these pollutants are adding to the natural greenhouse effect and are commonly referred to as synthetic greenhouse gases (SGGs).

The greenhouse gases raise the Earth's average temperature by trapping heat in the atmosphere, which would have normally been given off into space. This is commonly known as 'global warming'. Global warming seriously threatens the health and survival of humans, plants and wildlife.

All of the fluorocarbon refrigerants (including the HFCs) have a global warming potential (GWP) and therefore all activities involving the handling of these refrigerants are controlled to help prevent emissions to the atmosphere.

The Refrigerant Handling Code of Practice 2007

The Refrigerant Handling Code of Practice 2007 is a two-part document developed by refrigeration and air conditioning industry associations in Australia and New Zealand with the intention of reducing emissions of fluorocarbon refrigerants into the atmosphere. Part I – Self Contained Low Charge Systems – is the relevant part of the code that should be reviewed and it includes best practice recommendations for the recovery of fluorocarbon refrigerants from stationary refrigeration and air conditioning systems and should be complied with at all times.

A copy of the Refrigerant Handling Code of Practice 2007 is available from the ARC website www.arctick.org

The Australian Automotive Code of Practice 2008

The Australian Automotive Code of Practice 2008 is a document that has been developed by automotive associations in Australia and provides the minimum standards for operation, servicing and repair procedures of motor vehicle air conditioners (MVAC). It includes procedures for recovery and recycling of refrigerants to control emissions of fluorocarbon refrigerant gases.

A copy of the Australian Automotive Code of Practice 2008 is available from the ARC website www.arctick.org

Occupational health and safety

Manual handling

Manual handling is not just about lifting heavy objects, it can also involve physical exertion such as lowering, pushing, carrying, moving, holding or restraining. Have you ever performed any of the listed activities:

- pushed a box or other heavy load around a storage or service area
- lifted a heavy cylinder into a vehicle
- strained to reach an overhead item on warehouse racks?

Poor manual handling processes or procedures involving these activities could lead to a range of injuries, including:

- strains or sprains

- neck or back injury
- cuts, bruises or broken bones.

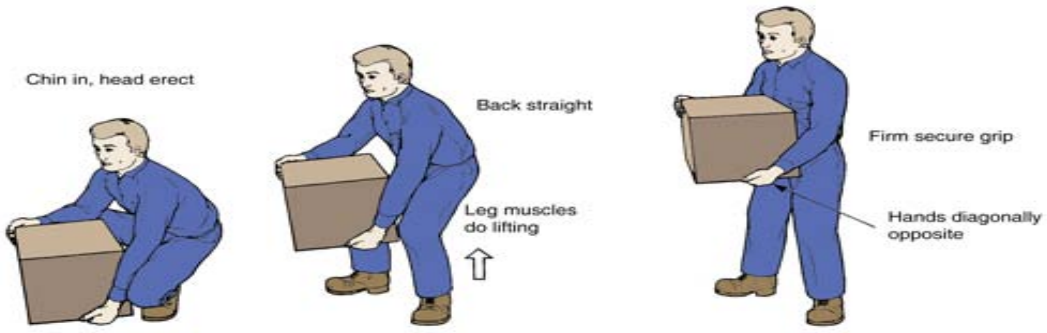
When handling refrigeration and air conditioning units as well as refrigerant recovery equipment it is important to be aware of the potential for injury from lifting or handling. Some tips on how to minimise the risk of injury are outlined below.

Tips to avoid injury

To avoid any physical injury, use alternative methods to lifting wherever possible. Some suggestions on the alternative methods include:

- using a work trolley to move items
- using a lifting device such as a chain block
- dividing the load up into smaller and lighter pieces
- moving the load in stages
- asking someone to help you.

When picking up and lifting items, always bend your knees and lift with your legs, keeping a straight back. Keep the load close to you and do not overreach.



Occupational health and safety is the responsibility of employers and employees. For more information about occupational health and safety visit the Safe Work Australia website: www.safeworkaustralia.gov.au

Hazardous materials

Definition

Some materials and substances are classified as hazardous if they meet certain criteria.

Hazardous materials, if not stored or handled correctly, can cause harm to workers, members of the public, property and the environment due to their physical, chemical and biological properties.

Refrigerant gases are classified as a hazardous material for one or more of the following reasons:

- they are extremely cold and may 'burn' your skin on contact
- some refrigerants are flammable
- they are toxic/poisonous
- they are damaging to the environment
- many refrigerants are contained under high pressure.

Other common hazardous chemicals include:

- paints
- cleaning chemicals
- degreasing agents and detergents
- pesticides
- herbicides
- diesel fuel
- liquefied petroleum
- gas welding fumes.

Classes of dangerous goods

Dangerous goods are substances which pose a direct threat to people, property or the environment due to their **chemical or physical** properties. They are usually classified with reference to their immediate risk.

There are nine classes of dangerous goods, based on a United Nations (UN) system. They represent different types of hazards and some are divided into sub-classes.

Each class is denoted by a different symbol. Storage vessels and appliances containing dangerous goods are always labelled with the appropriate symbol. This assists with easy identification of the contents and the hazard it represents.

The red diamond is used for class 2.1 gases. All flammable gases are placed in this class. Examples include LPG, acetylene and the hydrocarbon range of refrigerants such as propane (R290) and isobutane (R600a).

The green diamond is used for class 2.2 gases. All non-flammable and non-toxic gases are placed in this class. Examples include nitrogen, carbon dioxide (744) and almost all of the fluorocarbon types of refrigerant (R134a, R22, etc).

The white diamond is used for class 2.3 gases. All toxic gases are placed in this class. Examples include ammonia (R717) and sulphur dioxide (R764) (Sulphur dioxide was used as a refrigerant in domestic refrigerators until 1935).

Dangerous goods storage

Dangerous goods include any substances that are a hazard to people, property or the environment. They may be flammable, explosive, poisonous or corrosive.

Legislation requires that a risk assessment be carried out for each storage location.

The risk assessment must address:

- potential spillage or leakage
- fires and explosions
- incompatibility of chemicals/refrigerant (could create an adverse reaction)
- plant used in or around the storage area
- impact of an incident on the surrounding area (including adjacent buildings)
- risks associated with occasional work such as repairs and maintenance
- security of the dangerous goods in use or storage.

For detailed information about the storage of refrigerant gases refer to the Handling and Storage sections in Part 1 of the 'Australia & New Zealand Refrigerant Handling Code of Practice 2007' or the Storage section in 'The Automotive Code of Practice 2008 - Control of Refrigerant Gases During Manufacture, Installation and Servicing'.

These publications are available from the Australian Refrigeration Council website www.arctick.org

Material Safety Data Sheet

A Material Safety Data Sheet (MSDS), also referred to as a Safety Data Sheet (SDS), is a document that describes the chemical and physical properties of a material and provides advice on its safe storage, handling and use.

Occupational Health & Safety legislation requires the manufacturer or supplier of a hazardous substance to provide users with a Material Safety Data Sheet (MSDS). The MSDS is usually supplied with the first delivery of the hazardous substance.

It includes details of health and other hazards, exposure controls, personal protective equipment, safe handling and storage instructions, emergency procedures and disposal advice.

The information is important to doctors, engineers, safety officers, managers, emergency service persons, employers and employees.

The most important sections an employee must be familiar with are:

a. hazard identification information

b. health hazard information

c. precautions for use and

d. safe handling information.

A company risk management plan should be developed by the business with reference to the type of refrigerant handling normally carried out on a daily basis.

The ARC Guide to Producing a Risk Management Plan provides more detailed information to help businesses develop a refrigerant risk management plan. The publication is available on the Australian Refrigeration Council website www.arctick.org

Refrigerants you may encounter

This section provides an overview of the various types of refrigerant used in the systems you may be required to de-commission. It also indicates refrigerant types you are not permitted or required to recover.

Refrigerants you may recover

Refrigerant	Description	Application
R12 	• A Class 2.2 refrigerant that is a single substance· • A CFC that is no longer available however, systems charged with this refrigerant may still exist.	Commonly used through the 1970s and 1980s as a refrigerant in the following systems: • vehicle air conditioning • window type air conditioners (also known as room air conditioners) • domestic refrigerators and freezers.
R134a 	• A Class 2.2 refrigerant that is a single substance· • A HFC that was introduced to the industry in the early 1990s to replace R12.	Commonly used since 1990 as a refrigerant in the following systems:· • vehicle air conditioning • domestic refrigerators and freezers.
R22 	• A Class 2.2 refrigerant that is a single substance· • A HCFC that is still available however, it is being phased out. It is currently illegal to manufacture new air conditioning systems which use this refrigerant.	Commonly used up until 2010 as a refrigerant in the following residential air conditioning systems: • split system air conditioners • window type air conditioners.
R407C 	• A Class 2.2 refrigerant that is a mixture of three other refrigerants • A HFC that was developed as a direct retrofitting replacement for R22. A few RAC equipment manufacturers have used this refrigerant in new systems.	Minor use since approx. 2000 as a refrigerant in the following residential air conditioning systems: • split system air conditioners • window type air conditioners.

Refrigerant	Description	Application
R410A 	• A Class 2.2 refrigerant that is a mixture of two other refrigerants • A HFC developed as a replacement for R22 in new systems • Considered to be a high pressure refrigerant. • Normal service gauge manifold set must not be used. (use R410A gauge manifold set only).	Major use since approximately 2008 as a refrigerant in the following new residential air conditioning systems: • split system air conditioners • window type air conditioners.

Refrigerants you must not recover

Recovery of non-fluorocarbon refrigerants is not covered in this training booklet or the video. Therefore, you should not be recovering any non-fluorocarbon refrigerant. Non fluorocarbon refrigerants include hydrocarbons, ammonia and carbon dioxide. Hydrocarbon refrigerants are highly flammable. Carbon dioxide and ammonia are toxic and may operate under very high pressures.

Note: The procedures and safety requirements to recover non-fluorocarbon refrigerants do not form part of the Refrigerant Recoverer Licence or this training.

Refrigerant	Description	Application
R290 	• A Class 2.1 refrigerant that is a single substance • Also known by trade names Minus 40 or Care 40 • From the HC (hydrocarbon) family. A natural substance, commonly known as propane that does not deplete the ozone layer but has a very low global warming potential. • R290 is highly flammable.	Commonly used from the early 1990s but discontinued by the late 90s. Seeing renewed use as a refrigerant in the following systems: • vehicle air conditioning (retrofitted - manufacturers not using in new systems yet) • split system air conditioners and a few window types (new (recent) systems or retrofitted) • some domestic refrigerators and freezers (retrofitted - manufacturers not using in new systems at this time)

Refrigerant	Description	Application
R600a 	• A Class 2.1 refrigerant that is a single substance • Also known by its trade names - Minus 10 or Care 10 • From the HC (hydrocarbon) family. A natural substance commonly known as isobutane that does not deplete the ozone layer, but has a very low global warming potential • R600a is highly flammable.	Commonly used from the early 1990s but discontinued by the late 90s. Seeing renewed use as a refrigerant in the following systems: • split system air conditioners and a few window types (new (recent) systems) • most domestic refrigerators and freezers from 2010.
R717 	• A Class 2.3 refrigerant that is a single substance • A natural substance commonly known as ammonia (NH3). It does not produce the environmental effect usually associated with fluorocarbon refrigerants, however it is corrosive.	Refrigerant has been commonly used in the following systems: • three-way absorption caravan refrigerators and freezers • old kerosene refrigerators and freezers These are recognised by the fact that they are not fitted with a compressor. They are charged with a mix of ammonia and water.
R744 	• A Class 2.2 refrigerant that is a single substance • A natural substance commonly known as carbon dioxide (CO2) Carbon dioxide does not produce the environmental effect usually associated with fluorocarbon refrigerants • Considered to be a **very high** pressure refrigerant.	Finding recent use in: • bus and truck cooling • car air conditioning • in supermarkets and ice skating rinks.
Oils	Refrigeration lubricating oil within the sump of every compressor becomes contaminated with the refrigerant used in the system. As a result, the oil will continue to release a small quantity of refrigerant vapour long after the compressor has been removed from the refrigeration system.	The lubricating oils commonly used in compressors will absorb large amounts of the hydrocarbon range of refrigerants. You are not required to recover hydrocarbon refrigerants. However, hydrocarbons are highly flammable, so always apply safe work practices when handling or disposing of any compressor that may have been removed from equipment containing hydrocarbon refrigerant.

Recovery of fluorocarbon refrigerant

This section describes the procedure for recovering fluorocarbon refrigerant from stationary and automotive RAC equipment using a recovery unit.

Applicants for the Restricted Refrigerant Recoverer licence must study the procedure and practise it before undertaking a knowledge and practical assessment.

The information that follows is also presented in an online video. Learners should watch the video, as well as read through this booklet. The booklet contains additional and more detailed information to support the video. It should be kept handy while you are learning the recovery procedure under the supervision of an authorised person and for future reference.

Read each step carefully. This symbol  means you need to complete an activity with your coach/trainer. Space is provided for you to write down any notes.

This booklet should be used together with Information for Applicants, which describes the learning and assessment process. If you have not read Information for Applicants read it before continuing.

Applicants may refer to the relevant refrigerant handling code of practice (available on the ARC website). These provide additional information outlining best practice with regard to the refrigerant recovery process.

Identify appliances with refrigerant

Fluorocarbon refrigerants can be dangerous and harmful to humans, plants, wildlife and the environment if released into the atmosphere. It is very important that fluorocarbon refrigerant gases are safely recovered from any equipment that has reached the end of its service life. The recovered refrigerant, if uncontaminated, can be reused. If it is contaminated, it will be destroyed in a process which would reduce fluorocarbon refrigerant into salty water.

Systems that you may need to deal with once they have reached the end of their service life include:

- stationary domestic refrigerators and freezers
- vehicle air conditioners
- in-window air conditioners
- split system air conditioners.

Pictures of some typical systems are shown on the next page:

Vehicle air-conditioner

Domestic refrigerator/freezer

In-window air-conditioner

Split-system air-conditioner
(external unit)

Equipment from which you must not recover refrigerant

Do not attempt to recover refrigerant from any equipment:

- that contains non-fluorocarbon refrigerant
  or
- does not clearly identify the refrigerant contained within it
  or
- when you are uncertain of the refrigerant contained within it.

In any of the above situations seek the advice of a qualified technician before attempting to recover the refrigerant.

Do not attempt to recover refrigerant from certain appliances, such as three-way absorption caravan refrigerators and freezers.

Some examples of caravan and portable refrigerator/freezers are shown below.

Caravan Refrigerator

Portable fridge/freezer

Note the visual differences between the rear of a three-way absorption portable/caravan style refrigerator and a typical domestic refrigerator

Caravan Refrigerator

Domestic fridge/freezer

Always check the refrigerant label and confirm the refrigerant before recovering. If the refrigerant cannot be confirmed, or you are in doubt, seek qualified advice.

Activity

a. With your coach/trainer, identify and discuss the refrigeration and/or air conditioning units at your workplace from which you will need to recover fluorocarbon refrigerant. Your coach/trainer may also point out equipment containing refrigerants that you must not recover.

Refer to the tables earlier in this booklet to correctly identify the refrigerant types you may and may not recover.

Notes

Tools and equipment

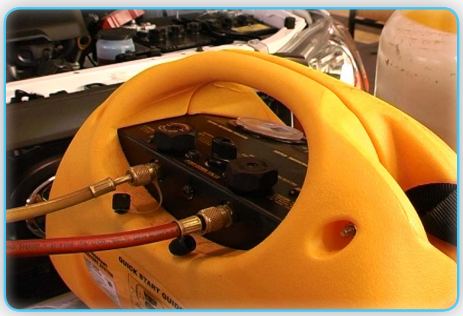
Organise the tools and equipment you will need

To recover fluorocarbon refrigerant you will need some or all of the following tools and equipment:

- hand tools
- refrigerant recovery unit
- refrigerant recovery cylinder
- scales
- service gauge manifold set
- automotive R134a system access adapter and other automotive adapters
- blanking caps (for split air conditioning units)
- line piercing tools.

Service gauge manifold set

Refrigerant recovery cylinder



Refrigerant recovery unit

Scales

Some of the equipment needed for fluorocarbon refrigerant recovery

Hand tools

Hand tools, such as a range of various sized spanners, pliers, screwdrivers and hex or 'Allen' keys may be needed to gain access to the system. A rubber mallet may also be of help during the fluorocarbon refrigerant recovery process.

Refrigerant recovery unit

A refrigerant recovery unit is used to pump fluorocarbon refrigerant out of refrigeration and air conditioning systems and into a recovery cylinder. A typical refrigerant recovery unit is shown on the previous page.

Recovery cylinders

These are coloured yellow and come in various sizes, the main nominal sizes being:

- 10 kilogram
- 22 kilogram
- 65 kilogram (less common).

Typical refrigerant recovery cylinders are shown below for comparison.

10kg (front) and 22kg (rear)

22kg cylinder

65kg cylinder

Use a hand trolley to move cylinders, since they can become quite heavy when full. It is a good idea to set up the recovery unit and cylinder on a hand trolley, together with service hoses and gauges.

Recovery equipment set up on hand trolley

Scales

Scales are used to weigh the recovery cylinder in order to check and monitor the quantity of fluorocarbon refrigerant in the cylinder. Overfilled cylinders can rupture or explode if overfilled.

Service gauge manifold set

Gauges mounted on a manifold are connected between the refrigerant recovery unit and the appliance from which the fluorocarbon refrigerant is being recovered. They are used to monitor the pressure of refrigerant in the appliance and to isolate service hoses and the recovery unit.

Colour coded service hoses are used in refrigerant recovery to help with making the right connections. Connections are made as follows:

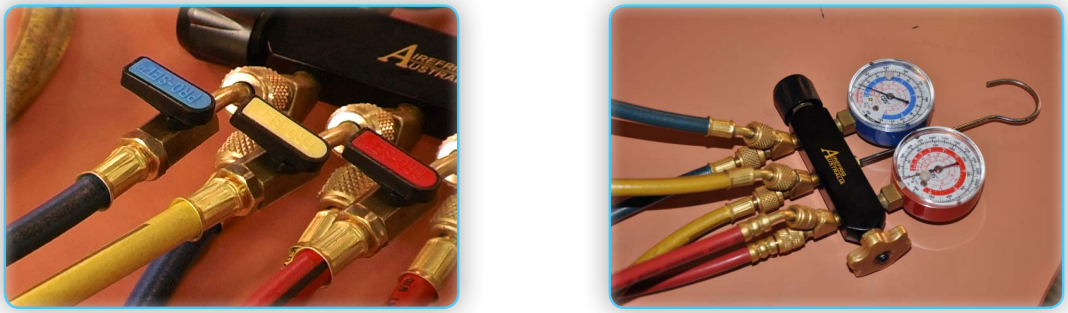
- BLUE: connects the gauge manifold to the unit containing fluorocarbon refrigerant in a vehicle, fridge or air conditioner
- YELLOW: connects the manifold to the inlet of the recovery unit
- RED: connects the outlet of the recovery unit to the inlet of the yellow recovery cylinder.

Note: Only one hose of each colour is needed for refrigerant recovery in situations covered by this licence. Other service hoses are used by licensed refrigeration technicians for various operations.

Best practice guidelines recommend that service hoses are fitted with 'ball' valves at one end. Ball valves prevent the accidental release of fluorocarbons into the atmosphere and assist in the safe removal of the service hoses. When the ball valve handle is parallel to the hose refrigerant will flow. When the ball valve handle is at right angles to the hose refrigerant cannot flow.

Many service hoses currently in use do not have ball valves. Note that this will not affect your ability to recover refrigerant.

The pictures below show colour coded service hoses fitted with and without ball valves.



Service gauge manifold and service hoses with ball valves closed (left) and without ball valves (right)

Piercing tools

Stationary units such as refrigerators and small air conditioners may not have a service hose access port (service valve). In such cases you will need to pierce the line with piercing pliers. Once the line is pierced with the tool a small valve prevents the flow of refrigerant. Once your blue service hose is connected to the tool, fluorocarbon refrigerant will flow to the recovery unit. A commonly available set of piercing pliers is shown below.

Piercing pliers

Another tool commonly used to pierce refrigerant lines is known as a 'bullet piercing valve'. The two halves of the valve are clamped around a suitable copper pipe in the system and a small pointed screw is wound in it until it pierces the pipe.

Bullet piercing valve disassembled (left) and assembled on pipe (right)

Activity

a. With your coach/trainer, examine the tools and equipment used for fluorocarbon refrigerant recovery. Ask your coach to explain the use of each item and how it works.

Notes

Safety and personal protective equipment

Ensure good ventilation & always wear protective equipment

When recovering fluorocarbon refrigerant it is vital to ensure good ventilation. Fluorocarbon refrigerant vapour can be hazardous and its burnt by-products can be lethal. When working indoors, ensure there is adequate airflow/ventilation in the work area and use a separate circulation fan if necessary.

Never recover refrigerant near heat sources or use heat sources near where refrigerant gases are stored. Always work in a well ventilated area.

NEVER recover refrigerant in an enclosed area or near heat sources

Liquid refrigerant is extremely cold and can burn your skin. The burns caused by liquid refrigerant are similar in effect to placing your hand in boiling water. This is one reason why you must wear the appropriate protective personal equipment (PPE) at all times. PPE includes the following:

- eye protection - safety goggles, glasses or shield
- hand protection - safety or chemical resistant gloves
- long sleeves
- long pants
- safety footwear.

In some work places you might also be required to wear protection such as:

- a hard hat
- a safety fluorescent vest.




A range of personal protective equipment

Activity

a. With your coach/trainer identify the areas in your workplace with suitable ventilation for carrying out the recovery process.

b. Your coach/trainer will show you the required personal protective equipment. Try each item on and ensure you can use it correctly.

Notes

Check your equipment

Check the recovery unit, service hoses and recovery cylinder

Recovery unit, service hoses and gauges

Always check the recovery unit, service hoses and gauges before use, particularly if they have not been used for some time. Make sure you check the following:

- recovery unit electrical plug and lead – bent, broken or cracked
- hoses – wear, cracks
- rubbers in the service hose fittings
- connector bodies and seals – deterioration or damage
- gauges - damage, correctly 'zeroed'.

Note: Zeroing of gauges is explained later in this booklet

Do not use any equipment if it has deteriorated or if the service hoses are cracked or broken. Report any unserviceable equipment according to your workplace procedures.

Refrigerant recovery unit with service hoses and connectors (left)
and a deteriorated hose (right)

Recovery cylinder

Check the recovery cylinder and valves for dents, corrosion, deterioration or other damage.

All gas cylinders are stamped with a 'test date' (month and year). This may be stamped on the cylinder valve pad, ID plate, cylinder neck or foot ring. Recovery cylinders must be retested every 10 years.

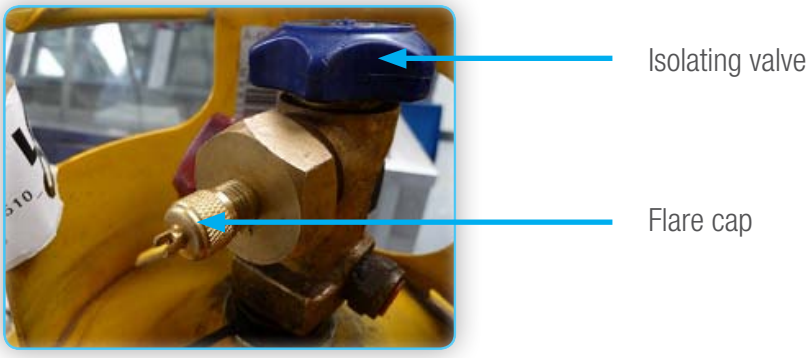
A test date stamped on the cylinder neck

Damaged or out of date cylinders can rupture or explode, causing serious injury. If you are in doubt about the maximum filling capacity of any recovery cylinder, always check with the refrigerant cylinder supplier or a RAC/AUTO licensed technician.

DO NOT use a cylinder if more than 10 years have elapsed since the last inspection date

Return out of date cylinders to a gas wholesaler or service centre for testing or exchange.

NOTE: Recovery cylinders must be fitted with an isolating valve and flare cap. The valve must be turned off and the ¼" flare port capped securely while the cylinder is not in use.



Activity

a. With your coach/trainer check the condition of the refrigerant recovery unit, service hoses and gauges. Ask your coach to point out acceptable and unacceptable conditions. Find out the procedure for reporting unserviceable equipment.

b. With your coach/trainer locate and examine a refrigerant recovery cylinder. Together check the cylinder and valve for any dents, corrosion, deterioration or other damage. Locate the cylinder test date and confirm that the cylinder is safe to use.

Notes

Make the connections

Service hose colours

Colour coded service hoses are used in refrigerant recovery to help with making the right connections.

BLUE: Connects the service gauge manifold to the vehicle, refrigerator or air conditioner containing refrigerant.

RED: Connects the outlet of the recovery unit to the inlet of the recovery cylinder.

YELLOW: Connects the service gauge manifold to the inlet of the recovery unit.

Access points for RAC

Vehicles and some refrigeration and air conditioning systems are fitted with an 'access port'. This is an attachment point to which the blue service hose from the service gauge manifold can be connected directly, or by use of an adapter.

However, some stationary units such as refrigerators and small air conditioners do not have an access port. In such cases you will need to pierce the refrigerant line with **piercing pliers** or a bullet valve. Once the line is pierced with the tool, the fluorocarbon refrigerant can flow into the recovery unit.

Domestic refrigerators and freezers

Domestic refrigerators and freezers are generally not fitted with an access port by the manufacturer. They initially charge the system through the process tube. This is a short length of ¼" copper tube (approximately. 100mm long) protruding from one side of the compressor. If a process tube is fitted with a 'Schrader valve' you can screw your blue service hose directly to the valve to recover the refrigerant. Refer to the section Split System Air Conditioners for an explanation of Schrader valves and their operation.

Most refrigerators and freezers don't have a Schrader valve fitted, so you will need to pierce the copper line with piercing pliers or a bullet valve in order to recover refrigerant. One option is to pierce the process tube, but if no process tube is fitted then any suitable straight piece of tube should be selected.

The procedure to pierce the copper refrigerant line is explained in the section Using piercing pliers and bullet valves.

Process tube with Schrader valve

Process tube (crimped end)

Window type Air Conditioners

These types of air conditioners are not normally fitted with an access port by the manufacturer (depends upon age and brand). As with refrigerators, they are initially charged through the process tube.

Most window air conditioners will not have a Schrader valve fitted, so you will need to pierce the refrigerant line with piercing pliers or a bullet valve. This procedure is explained in the section Using piercing tools

In-window air conditioner (front)

In-window air conditioner (rear)

Split System Air Conditioners

The outdoor unit of a split air conditioning system is normally fitted with at least one access port by the manufacturer. These are found on the side of the unit as shown below.

Split system air conditioner access ports

Several methods are available to recover refrigerant from a split system unit. These are:

- piercing the refrigerant line
- connecting to one of several isolation valves.

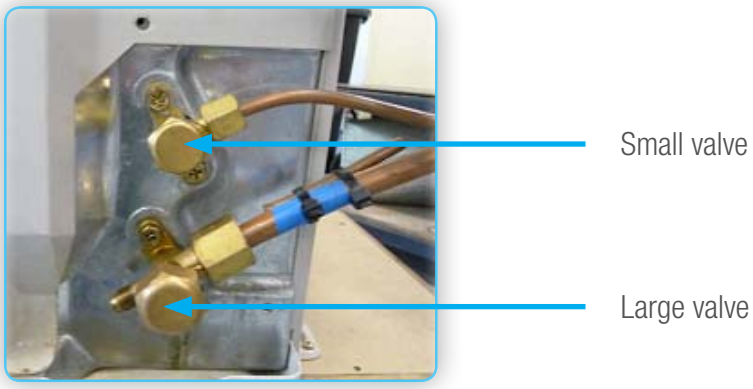
Piercing the refrigerant line

The approach will vary from unit to unit, however the general steps for this method are as follows:

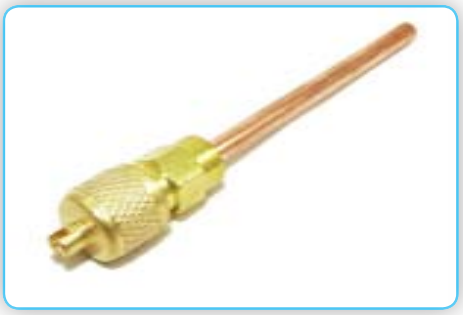
- remove one panel of the outdoor unit to access the pipework inside
- locate a straight section of pipe and connect piercing pliers or bullet valve
- follow standard procedures to connect recovery unit and to recover refrigerant.

Connecting to an isolation valve

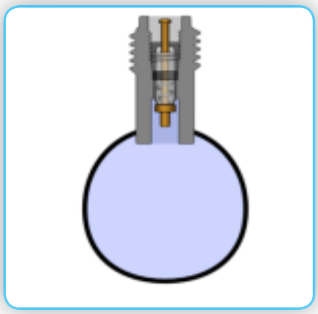
The second method involves accessing one of several isolation valves on the side of the outdoor unit. There are two valves, one large and one small. Either valve can be used for the recovery process.



Each valve is fitted with a 'Schrader valve'. A Schrader valve operates in a similar way to the common tyre valve of the same name. When the hose is attached, it depresses a plunger in the valve, allowing refrigerant to flow.



Typical Schrader valve

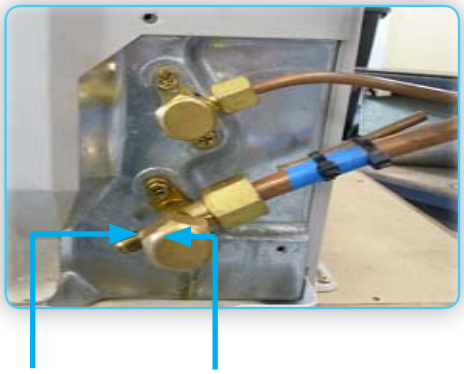


Cutaway showing plunger in valve stem

Connecting to the valve

Usually the person removing the outdoor unit will have shut off the small and large isolating valves and either severed the copper refrigerant tubes near the valves, or will have replaced the tubes and fitting with a brass blanking cap. (See photos below.)

Blanking cap



Access port Valve cap

If no blanking cap has been fitted you must fit one before proceeding to recover refrigerant. Make sure you have a range of different sized blanking caps on hand. Typical sizes are ½, 5/8, 3/4 inch (12,16,19 mm respectively).

Once a blanking cap has been fitted, carry out the following steps:

- connect the blue service hose to the isolating valve access port
- remove the isolation valve cap
- wind out the spindle using an Allen key to open the valve. Refrigerant will then flow through the blue service hose to the gauge manifold

- follow standard procedures to recover the refrigerant
- when you have recovered all the refrigerant and have purged the recovery unit as described later in this booklet, close the valve spindle, replace the valve cap and remove the blue service hose
- remove the blanking cap and store it safely for future recovery operations.

Connection to access port

Access points for vehicles

Vehicle air conditioners

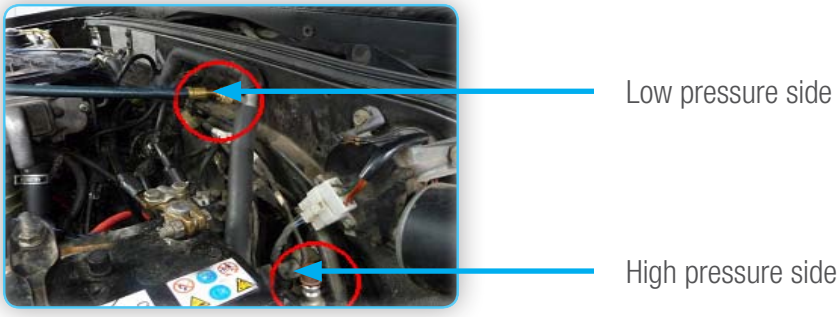
A vehicle access port is often referred to as a service nipple. Vehicles are fitted with two access ports by the manufacturer. One is located in the low pressure side of the system and the other in the high pressure side of the system.

There are several ways to identify the low and high pressure sides:

a) colour coded protective caps. A blue cap indicates the low pressure side and a red cap indicates the high pressure side

b) the protective caps may be grey or black and stamped with “L” for low and “H” for high

c) generally the low pressure point is located closest to the car interior, often on the rigid line at the back of the engine bay.



Vehicle air conditioner access ports

Access port types

Air conditioners in vehicles built before 1992 contained a refrigerant known as R12 and have an access port that suits a standard service hose (1/4 inch SAE).

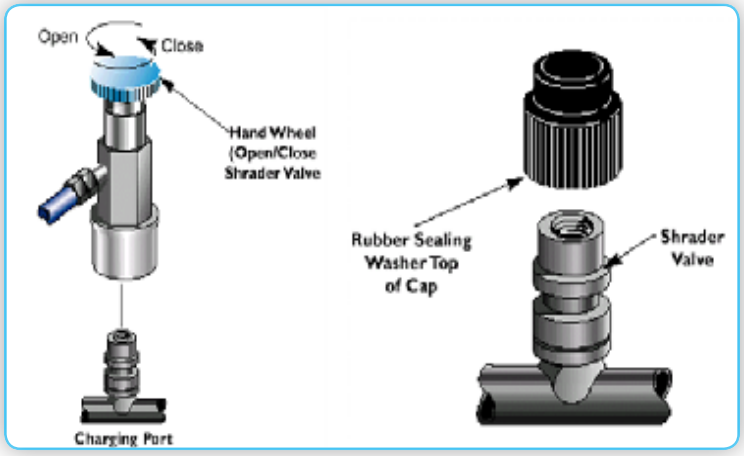
Air conditioners in vehicles built after 1992 contain a more environmentally friendly refrigerant known as R134a. These have a different access port, shown below (right).

R12 access point

R134a access point

Where vehicles are fitted with an R134a access port you will need a special adapter to recover refrigerant. Note that some pre-1992 vehicle air conditioners may have been 'retrofitted' with R134a access ports. Therefore you will need the adapter to recover refrigerant from these vehicles.

R134a adapters screw onto the end of the service hose and have a 'snap on' fitting for the access port on the vehicle.



R134a Quick coupler R134a Charging port

R134a adaptors
(blue low/red high pressure)

Adapter on vehicle

You may encounter variations to the basic set up for vehicle refrigerant recovery. For example, an R12 access point may contain a Schrader valve. In these situations you will need to use another adapter to control the flow of refrigerant to your service gauges.

Which access port do I use?

In previous sections you will have noticed that a standard set of recovery gauges is supplied with three service hoses. One end of the blue service hose attaches to a single appliance access port or piercing tool. Since vehicles are fitted with two access ports an extra service hose would normally be used to recover refrigerant.

This booklet will only require you to use one service hose to access either the low or high pressure side of a vehicle air conditioning system. For automotive air conditioners that have reached the end of their service life it doesn't matter which access port you attach the hose to.

Some auto recyclers may use a dedicated recovery unit with an extra (fourth) service hose for the second access port. If this is the case, attach the two service hoses to each access port and follow the normal recovery procedure.

Activity

a. Ask your coach/trainer to identify the access points for the different appliances you will be required to recover refrigerant from. Take notes and write down any special points to remember.

Notes

Checking service gauges

It is important to check that your blue service gauge is zeroed correctly. In most cases, the procedure is as follows:

1. make sure the service hose is disconnected from the gauge
2. remove the front protective glass or remove the silicone access plug if fitted
3. turn the adjusting screw slowly until the gauge needle aligns exactly with the zero pressure mark on the gauge
4. replace the front protective glass or access plug.

Activity

a. Ask your coach to show you how to zero the blue service gauge. Practise zeroing the gauge until you are confident you can carry out the procedure.

Notes

Using piercing tools

As discussed earlier, some stationary units, such as refrigerators and small air conditioners, do not have an access port. To recover refrigerant you will need to pierce the copper tube with piercing pliers or a bullet valve.

Always follow the manufacturer's instructions when using piercing pliers or bullet valves. The following pictures show piercing pliers and a bullet valve being used to pierce a copper refrigerant line.

Piercing pliers

Piercing pliers have a sharp, conical pin that pierces a copper line when the clamp is tightened. There is a special fitting on the clamp onto which you can screw the blue service hose. The following picture shows a pair of piercing pliers clamped onto a copper line, with the blue service hose attached.

Piercing pliers connected to rerigerant line

Bullet valves

The two halves of a bullet valve are clamped around the copper pipe and a small pointed screw is wound in it until it pierces the pipe. The valve has an attachment point to receive the blue service hose. The pointed piercing screw will continue to seal the pipe until it is wound out, allowing refrigerant to flow.

It is important to select a bullet valve with the same sized body as the copper tube. Most valve sets come with sleeves to suit different pipe diameters.

Bullet valve

Bullet valve clamped on pipe

Activity

a. Select an appliance that has been emptied of all refrigerant. Your coach/trainer will show you how to pierce the refrigerant line using piercing pliers and a bullet valve. Note down the section of line that was used. After your coach has demonstrated the procedure, make sure you practise it yourself on several other empty appliances.

Notes

Connect the service hoses

Up to this stage you should have located the access port or, for stationary domestic appliances, attached piercing pliers or a bullet valve, if required. You are now ready to make all the service hose connections.

The following steps are general and apply to automotive and domestic stationary equipment. Your coach/trainer will show you any necessary variations.

First, position the recovery unit and recovery cylinder close to the appliance.

Before making the connections, ensure that the blue service hose is connected to the service gauge manifold and that all hand valves and caps are closed.

Now connect the BLUE service hose from the blue left hand service gauge port (blue gauge) to the access port on the appliance.

Connect the YELLOW service hose from the centre port on the service gauge manifold centre to the **inlet** port of the recovery unit.

Connect the RED service hose from the **outlet** port of the recovery unit to the **inlet** port of the recovery cylinder after removing the cylinder's protective/flare cap. Store the cap in a safe place.

Ensure that the attachments are secure by gently finger tightening connectors. **Do not over tighten the connectors.**

The picture below shows all service hoses set up and ready for fluorocarbon refrigerant recovery.

Note the attachment locations for the red, yellow and blue service hoses.

Rerigerant recovery unit and service hose setup

Remember:

BLUE hose: service gauge manifold to system access port

RED hose: recovery unit outlet to recovery cylinder

YELLOW hose: service gauge manifold to recovery unit inlet

Activity

a. Ask your coach/trainer to identify the service hose access ports for the different appliances you will be required to recover refrigerant from.

b. With the help of your coach/trainer, position the recovery unit and make all the service hose connections required for fluorocarbon refrigerant recovery.

Notes

Recovery cylinder capacity

Calculating maximum filled weight of a recovery cylinder

Before you recover any refrigerant it is important to know the following:

- approximately how much fluorocarbon refrigerant is in the appliance
- the size of the cylinder
- the weight of the cylinder when empty (tare weight)
- the maximum filling capacity of the recovery cylinder
- how much fluorocarbon refrigerant is already in the recovery cylinder.

How much refrigerant is in the appliance?

The amount of fluorocarbon refrigerant contained in refrigerators and air conditioning units varies dramatically. As a rough guide the following quantities apply:

- domestic refrigerators and freezers - 50 grams to 400 grams
- vehicle air conditioners - 750 grams to 1 kilogram
- window type air conditioners - 300 grams to 1 kilogram
- split system air conditioners - 300 grams to 2 kilograms .

Cylinder sizes

Refrigerant recovery cylinders are available in a range of sizes (capacity). The most common size is 22 kg; however 10 kg and 65 kg cylinders are sometimes used. For visual comparison, most people would associate the physical size of a 22 kg cylinder with a 9 kg LPG barbeque cylinder. This is because refrigerant weighs twice as much as LPG.

However, these are just notional sizes and the actual size, or capacity, is usually stamped on each cylinder. The actual size refers to how much water the cylinder can hold and is known as the Water Capacity (WC) of the cylinder. For example, a '22 kg' cylinder may be stamped with WC 21.5kg.

Water capacity stamp (WC)

Weight of the cylinder when empty

The weight of an empty cylinder is its tare weight and is stamped on the cylinder. For example, a cylinder with a WC of 12kg may be stamped with tare weight of 6.0 kg.

Note that cylinders of the same size may have different tare weights due to the various types of materials used in their construction by different manufacturers.

Maximum filling capacity of the recovery cylinder

The mass of refrigerant that may be added to a cylinder is never the same as the water capacity (WC) of the cylinder because every refrigerant has a different density to that of water. Different fluorocarbon refrigerants may be recovered into the same cylinder. Therefore, a safe filling capacity value is used for each type of refrigerant to prevent overfilling of the cylinder and a dangerous situation from occurring.

Different fluorocarbon refrigerants may be mixed together in the same cylinder.

Remember, overfilling a recovery cylinder can cause it to rupture or explode. A simple, safe and slightly conservative method of calculating the safe filling capacity is to never fill the cylinder more than 80 per cent or 0.8 of its water capacity. This formula allows for the different weights of various refrigerant mixes.

In the examples below, the total filled weight of the recovery cylinders listed should never exceed 80% of the WC as shown:

- a cylinder with a WC of 10 kg must never exceed 8 kg
- a cylinder with a WC of 22 kg cylinder never exceed 16 kg
- a cylinder with a WC of 65 kg cylinder never exceed 50 kg.

A more accurate, but slightly more complex, method used by approved industry practitioners is based on the density of each refrigerant being recovered. For more information on this method refer to Appendix A.

Note that both methods are acceptable for the recovery of fluorocarbon refrigerants.

How much refrigerant is already in the recovery cylinder?

Recovery cylinders can hold the refrigerant charge from numerous appliances. Each time you use the cylinder you should work out how much fluorocarbon refrigerant it already contains.

By subtracting the current weight of the partly filled cylinder from the maximum safe filled weight of the cylinder (tare weight plus 80%WC), you can estimate how much more refrigerant the cylinder can hold. If the remaining capacity is less than the typical refrigerant weight range for the appliance type shown earlier in this section, **do not use the cylinder.**

It is good practice to keep the recovery cylinder on the scale whilst recovering refrigerant. This enables you to monitor the weight, ensuring you don't overfill the cylinder.

A typical set of scales for weighing cylinders

Example calculation

The following example calculation is for a 22kg cylinder with a stamped maximum water capacity (WC) of 21.6kg

Maximum allowed weight of refrigerant at 80 per cent of WC = 17 kg

Current weight of the partly filled cylinder = 21 kg

TARE weight of cylinder = 15 kg

Step 1: Weight of refrigerant presently in cylinder 21 – 15 = 6kg

Step 2: Safe remaining refrigerant fill capacity is 17 - 6 = 11kg

Step 3: Current weight of partly filled cylinder plus safe remaining refrigerant fill capacity is 21 +11 = 32kg

In the above example you could not safely fill the cylinder beyond a maximum safe filled weight of 32 kg (tare weight plus 80%WC).

Activity

a. Identify the nominal size of recovery cylinders used in your workplace i.e. 10kg, 25kg or 65kg.

b. Next, examine a recovery cylinder and complete the following steps:

- write down the water capacity (WC) stamped on the cylinder _____
- write down the tare weight stamped on the cylinder _____
- weigh the cylinder and record it here _____
- subtract the tare weight to find out how much refrigerant is already in the cylinder _____
- now subtract the existing refrigerant weight from the maximum recommended refrigerant weight for that cylinder size to find out the remaining capacity of the cylinder. _____
- finally, add the result above to the current weight of the cylinder and contents to find out the maximum safe filled weight of the recovery cylinder. _____

c. Repeat this for several different cylinders until you are confident you can work out the maximum safe filled weight of several cylinders.

Notes

Refrigerant recovery

Recover refrigerant from the appliance

Identifying types of refrigerant

Before recovering refrigerant from any appliance, it's important that you first identify the type of refrigerant it contains. The range of refrigerants you may need to work with was covered in an earlier section of this booklet. Check the identification plate or label of the unit for the type of refrigerant it contains.

During the life of the system other refrigerants may have been added. So, the refrigerant label may not always reflect the contents, or there may be no label at all!

Always assume there could be contaminants, so always exercise extreme care and follow all safety procedures.

If in doubt, always check with a RAC/AUTO licensed technician before recovering the refrigerant. For questions relating to recovery of refrigerant from air conditioners, fridges and freezers check with a RAC licensed technician. Questions relating to refrigerant recovery from vehicles should be directed to an AUTO licensed technician.

Remember: If an appliance is not labelled with the type of refrigerant it contains, do not recover any refrigerant from that appliance. Contact a RAC/AUTO licensed technician for assistance. You can search for a RAC/AUTO licensed technician on the ARC's consumer website www.lookforthetick.com.au

Before you access the system, remind yourself of the following dangers:

- the gas pressure within any system can cause lethal damage if not handled safely
- R410A is a high pressure fluorocarbon refrigerant, most often found in new residential split system and window type air conditioners
- skin contact with any of the refrigerants when in a liquid state may cause third degree burns and/or frostbite.

Hydrocarbon, carbon dioxide and ammonia refrigerants fall outside the ozone protection and synthetic greenhouse gas regulatory requirements for controlled substances because they are not fluorocarbon refrigerants.

Do not attempt to recover these gases for the following reasons:

- the pressure of carbon dioxide is well above the operating pressure capabilities of any recovery pump or normal recovery cylinder
- all hydrocarbon refrigerants are highly flammable. The quantity of vapour in these systems may be small but may be lethal if allowed to ignite
- ammonia is highly toxic and is not compatible with most of the materials inside a recovery pump.

REMEMBER:

- **Only recover refrigerant that you can identify as being a fluorocarbon refrigerant and that you have been trained to recover.**
- **Do not recover any other refrigerants including hydrocarbon refrigerants, carbon dioxide or ammonia.**
- **Some appliances may be retrofitted with hydrocarbon refrigerants. If you determine or suspect that this is the case, do not recover any refrigerant from that appliance.**
- **If you are in any doubt about the type of refrigerant contained within an appliance, do not recover any refrigerant from that appliance. Contact a RAC/AUTO licensed technician.**

Recovering the refrigerant

If refrigerant is present in the appliance, the needle on the recovery unit gauge will move up from zero kilopascals (0 kPa) and into a positive pressure when the gauge on the manifold is opened. A pressure gauge is shown below.

Refrigerant pressure displayed on the recovery gauge

Once you have made all of the connections, you are ready to recover the refrigerant! It is important to firstly remove or 'purge' any air from the service hoses. Follow these steps to open the valves and purge air from the system:

1. open all ball valves on the service hoses if fitted
2. next, open the left hand valve on your gauge manifold (next to the low pressure gauge and blue service hose). This will allow refrigerant to flow through the manifold and into the centre (yellow) service hose
3. purge the yellow service hose by 'cracking' (slightly opening) it at the point of connection to the recovery machine. Do this by loosening the knurled nut until a slight 'hiss' can be heard. Maintain this for two seconds then re-tighten the connection. Do not over tighten - finger tight is enough
4. open the inlet and outlet valves on the recovery unit. This will allow refrigerant vapour to flow through the recovery machine and back out into the red service hose and up to the inlet valve on the recovery cylinder
5. once again, purge the red service hose at the cylinder by cracking the red service hose at the cylinder end for approximately two seconds, and then retighten the connection
6. place the recovery cylinder on the scales
   Caution: HAVE YOU CHECKED THE REMAINING REFRIGERANT CAPACITY OF THE RECOVERY CYLINDER?
7. open the recovery cylinder valve.

This is a general guide only. Check your recovery unit for specific instructions, since steps may vary from unit to unit.

Now turn the recovery unit **on** according to the manufacturer's operating instructions.

You are now recovering refrigerant!

Allow the recovery unit to run until the gauge pressure reads zero (0 kPa) or it stops by itself (most recovery machines are now fitted with an automatic pressure control set to stop the machine once the pressure in the system is equivalent to atmospheric pressure).

Close the left hand valve on your gauge manifold and turn the recovery unit off. Refrigerant will often remain in various parts of the system, and this will be shown by a rise in the system pressure. You may need to repeat the recovery procedure several times to recover all traces of refrigerant.

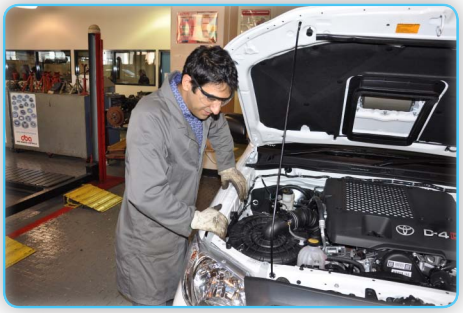
Allow the system pressure to rise and stabilise, then turn the recovery unit back on again until the pressure drops once again in the blue gauge to 0kPa.

Repeat this process until the entire refrigerant charge is recovered and the pressure remains stable at 0kPa (or just above) for approximately five minutes.

It is possible to assist in the movement of refrigerant through the system and in the release of refrigerant vapour from the compressor oil during the recovery process. Do this by gently rocking, shaking or agitating the compressor by hand. It is also acceptable to tap the compressor gently with a soft rubber mallet.

TIP: Rocking the vehicle/appliance or gently tapping the compressor with a rubber mallet can increase the refrigerant recovery amount by up to 100 per cent.

If you intend to recover refrigerant from several appliances in succession, you can simply leave the service hoses connected between the gauge manifold, recovery unit and cylinder without purging the recovery unit. However, be careful not to exceed the maximum safe filled capacity of the cylinder.



Gently rock vehicle or appliance

Shake or tap the compressor

If you do not know the maximum safe filled weight of a cylinder you will need to calculate it before commencing any new recovery operation. If you estimate the refrigerant charge in any appliance will exceed the safe filling capacity for the cylinder, change the cylinder before recovering refrigerant from the appliance (see Changing recovery cylinders).

Purging the recovery unit

Purging the recovery unit transfers any fluorocarbon refrigerant remaining within the recovery unit into the recovery cylinder.

After finishing all your recovery tasks, purge the recovery unit so that it is ready for next time.

Most units today have an automatic 'self-purging' mechanism. Automatic purging simply requires you to turn a valve to the self clearing/purging position. However, follow the manufacturers' instructions in order to purge your particular machine.

If there is no automatic purging mechanism on your unit, you will need to manually purge the recovery unit. Recovery units have the capacity to hold a small amount of refrigerant internally, so it is not critical that every little bit of refrigerant is removed from the recovery unit. The process to get most of the refrigerant out is straightforward.

At the end of the recovery process, when the pressure in the appliance remains stable at 0 kPA, follow this simple process.

1. check that the gauge manifold left hand inlet valve is closed
2. remove the blue service hose from the appliance
3. ensure all other valves on the gauge manifold, service hoses, recovery unit and cylinder remain open
4. turn on the recovery unit and allow it to run until the pressure on the recovery unit inlet gauge reaches approximately minus 10 kPa (if there is no gauge on the recovery unit, run the unit approximately five to ten seconds)
5. turn off the recovery unit
6. close all remaining valves on the gauge manifold, service hoses, recovery unit and cylinder.
   Leave this set up for next time.
7. when the cylinder reaches its maximum safe filled weight, close the isolating valve on the cylinder, close the ball valve on the red service hose (if fitted) and detach the hose from the cylinder. If no ball valve is fitted you may hear a hiss as you remove the red service hose. The release of a small quantity of pressurised refrigerant vapour from the red service hose is acceptable.
8. fit and secure the flare cap on the recovery cylinder and store the cylinder in a safe place ready for return to the refrigerant recycler. Locate an empty cylinder and reattach the red service hose.

When connecting or disconnectiong recovery equipement from systems, exercise caution.

- **Service hoses may contain liquid refrigerant**
- **Always wear correct PPE!**

Activity

a. With your coach/trainer select an appliance from which to recover fluorocarbon refrigerant and identify the fluorocarbon refrigerant it contains.

b. Set up the recovery unit and make all the necessary connections. With the help of your coach, recover fluorocarbon refrigerant following the steps outlined in this section:

- purge the service hoses of air
- recover all refrigerant from the appliance
- purge the recovery unit
- disconnect service hoses.

c. Practise the recovery procedure on different appliances until you can perform it confidently. Write down important things to remember.

Notes

Storage and disposal

Safe storage and disposal of refrigerants is important

Cyclinder labelling

Mixed refrigerants **must not** be put back into service. Cylinders containing reclaimed fluorocarbon refrigerant **must** be clearly marked with the following:

Reclaimed; non-contaminated - safe for re-use

Or

Reclaimed contaminated; not to be re-used

You also need to place a 'degassed' label or sticker on the unit. This identifies that the unit has been emptied of fluorocarbon refrigerant. Degassed stickers are available from the ARC.

Degassed label

Degassed ARC sticker

Record keeping

The regulations require you to keep records of how much fluorocarbon refrigerant has been sent to the wholesaler for disposal.

However, it is also good practice to record details of each appliance you recover refrigerant from, as well as the type and quantity (by weight) of fluorocarbon refrigerant you recover from each unit. This can help with working out rebates, which are financial incentives for returning your collected refrigerants to a wholesaler.

Note: Your records may be audited by the ARC.

You can make up your own form or use the sample Refrigerant Recovery Record Sheet included at the end of this booklet.

Storing refrigerants

Containers used to store refrigerant must be kept in a place that is:

- well ventilated
- secure
- cool (at or below 48C unless otherwise specified by the manufacturer)
- away from fire risk
- shielded from sources of direct heat.

Activity

a. Your coach/trainer will show you how to mark and label recovery cylinders. Make sure you find out where labels are kept in your workplace.

b. With your coach/trainer find out how to record details of refrigerant recovery. Practise working out the type and quantity (by weight) of refrigerant you recover from different appliances.

c. Ask your coach to show you where empty and filled cylinders are stored in your workplace.

Write any notes in the space below.

Notes

Returning refrigerants: Refrigerant Reclaim Australia

Refrigeration Reclaim Australia (RRA) is a not-for-profit organisation created to work nationally with industry to share the responsibility for, and costs of, recovering, reclaiming and destroying surplus and unwanted fluorocarbon refrigerants.

Rebates are available for returning the fluorocarbon refrigerant you collect to a wholesaler.

RRA arranges for the fluorocarbon refrigerant to be collected from wholesalers, tested and then destroyed using a plasma-arc process. This transforms it into harmless salts and water. In 2005/2006, RRA paid out around $1.3 million in rebates to contractors.

RRA has 150 collection points across Australia, available through the industry's existing wholesaling branch network.

Procedure to return refrigerant gas

You can return reclaimed refrigerant and claim your rebate in four easy steps:

Step 1: obtain a recovery cylinder from your refrigerant wholesaler. These can be rented or purchased

Step 2: recover the contaminated and unwanted refrigerants from appliances that have reached the end of their useful service life

Step 3: when the recovery cylinder is filled to the maximum recommended safe fill capacity (by weight), take it to your refrigeration wholesaler

Step 4: the wholesaler will weigh the cylinder and provide you with a rebate for each kilogram of fluorocarbon refrigerant recovered.

The wholesaler will provide you with an empty replacement cylinder.

For more information visit or call Refrigerant Reclaim Australia (02) 6230 5244.

Activity

a. Find out the nearest refrigerant wholesaler to your workplace. Write the contact details down for future reference.

b. Find out about your workplace's procedure for storing and returning filled cylinders. If possible, return a filled cylinder to the wholesaler yourself or go along with another employee.

c. If it applies to your job role, find out more details about the rebate available through your wholesaler

Notes

What to do now

Once you have read this booklet, re-read it or sections of it until you are completely familiar with its contents. Always keep the booklet handy while you are training and for future reference.

Practise the fluorocarbon refrigerant recovery procedure with your coach until you can perform it with confidence.

The Information for Applicants booklet contains 15 knowledge questions. These are also available online. All questions are based on the content in this booklet, as well as being covered in the online video.

Read each question carefully and find out the answers by referring to this booklet or the online video. The questions will be used during your assessment, so you need to be able to answer them with confidence.

When you have finished your training you are ready to be assessed. Refer to the Information for Applicants booklet for details on how to arrange and undertake your assessment.

Sample fluorocarbon refrigerant recovery record sheet

REFRIGERANT: Reclaimed/Recovered for Disposal Records

Authorisation No: AU.....

Quarter ending:.....Page No:.....

Date in Quarter	Detail of who refrigerant returned to (This will generally be the refrigerant wholesaler)	Quantity returned

Quarterly summary = Total (kgs)	

Appendix A

Safe Fill Capacity (SFC)

This is the quantity of liquid refrigerant that can be safely added to a storage cylinder without causing undue stress on the cylinder. The SFC is determined using the following formula:

SFC = WC x SFR

Where:

SFC = The Safe Fill Capacity in kilograms (kg's)

WC = The Water Capacity of the cylinder being filled in kilograms (kg's)

SFR = The Safe Fill Ratio for the refrigerant being added to the cylinder

Water Capacity

All cylinders in Australia are stamped with their respective water capacity. This is, as the name implies, the quantity of water that the cylinder can hold.

Refrigerant cylinders are now fairly standardized with the following types being common:

Type	WC (kg)	Usual Tare Weight (kg)
N	11kg	6.5
P	22kg	9.5
R	66kg	23

Safe Fill Ratio

Ullage is a term used to describe the vacant space between the top of the liquid and the top of the cylinder. To prevent explosion, a cylinder should always have some ullage (empty space). The safe fill ratio is a number that is based on the density of the refrigerant but also includes a safety factor for the ullage.

Typical Safe Fill Ratios are show on the next page.

R134a	1.04
R22	1.03
R404A	0.82
R407C	0.94
R410A	0.80
R290	0.42
R600a	0.49

Using the information in these two tables and applying the formula we find that:

Calculations

An 'N' type cylinder can be filled with 11kg x 1.04 = 11.44kg of R134a however, that same cylinder can only be filled with 11kg x 0.82 = 9.02kg of R404A.

The calculations above apply to cylinders holding new refrigerants. The formula changes slightly for second hand refrigerants. The Refrigerant Handling Code of Practice states that the ullage volume must be increased by 20% when the cylinder is holding a recovered refrigerant. The formula above changes to:

SFC = WC x SFR x 0.80

Where:

0.80 = the additional safety margin created by filling the cylinder to 80% of its normal safe capacity.

Therefore, an 'N' type cylinder being used to store 'recovered' R134a can only be filled to 11kg x 1.04 x 0.80 = 9.15kg instead of the 11.44kg calculated above.

Australian Government
Department of Sustainability, Environment, Water, Population and Communities

Manufacturing Skills Australia

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