REVERSE CYCLE AIR CONDITIONING

This brochure provides information on reverse cycle air conditioning systems (also known as 'heat pumps'). These are electric heating systems which also provide refrigerative cooling.

How does reverse cycle air conditioning work?

Most electric heaters create heat directly, using elements which heat up when an electric current passes through them. These 'direct element' heaters include portable heaters, panel convectors and off-peak storage heaters. They have a maximum efficiency of 100%, when all the electricity is converted to heat and delivered to the room. Reverse cycle air conditioning extracts heat from the outside air, even on mid-winter nights, and transfers it inside. A refrigerant is passed through an external coil, absorbing heat from the outside air. This refrigerant is then pumped through a compressor into a fan coil unit (or 'condenser') inside the home, releasing its heat into the room. Up to three or more units of heat can be transferred for every unit of electricity used to run reverse cycle air conditioning. Therefore, running costs can be as low as one-third of those for direct element heaters. By reversing the flow of this refrigerant, reverse cycle air conditioners also provide efficient refrigerative cooling in summer.

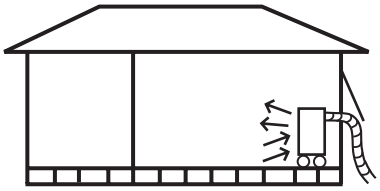
What is its advantage?

- One of the most economical forms of heating
- Able to provide both heating and cooling
- Remain cool to touch at all times
- Have no exposed elements or flames
- Lifetime of up to 20 years
- Filter and dehumidify air

What types are there?

Portable units

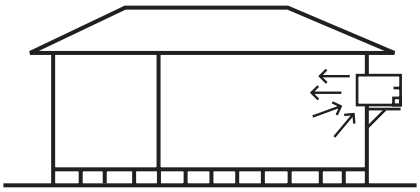
Portable units can be moved from room to room or house to house. Most units consist of a separate indoor and outdoor unit connected by flexible refrigerant lines. They are connected to standard power points. External units are usually hung outside an open window. Portable units are particularly suitable where several smaller rooms need to be air conditioned at different times. They may also be suited for people who are renting their home, move home frequently, or in situations where permanent installation is not possible. Consider carefully before purchasing portable units, as they are relatively expensive to buy compared to window/wall units of similar capacity. They are suitable for rooms up to 35 m^2.



Portable unit

Window/wall units

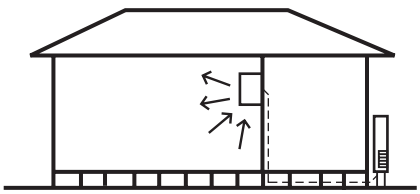
Window/wall units have all their components together in one unit, which is permanently mounted through an external wall or window. They are the cheapest type of reverse cycle air conditioner to buy. Some models can be connected to standard power points. As the motor is contained in the same unit as the internal fan, window/wall units may be noisy during operation. In addition, installation requires either cutting a large hole in the wall, or removing a pane of glazing from a window. Curtains must be left open during operation if installed in a window. They are suitable for rooms up to 70 m².



Window/wall unit

Split systems

Split systems are permanently-mounted systems with the compressor unit located externally and a separate condenser inside the home. These are joined together by piping, which carries the refrigerant. The remote location of the compressor makes these units significantly quieter than window/wall models. The internal unit of a split system is most commonly installed on a wall. However, units which can be located at floor level (which gives optimum heating performance), on the ceiling surface, or in the ceiling as a cassette are also available. Wall units must generally be installed on an external wall to provide adequate draining of condensate. Floor-mounted units have slightly decreased cooling effectiveness. This should not usually be a concern, as heating is generally required more often than cooling. Alternatively, consider purchasing a wall unit with adjustable louvres, and mounting it approximately 1.5–2 m above the floor. The louvres should be directed downwards for heating and horizontally or upwards for cooling. Split systems are generally more expensive to buy than window/wall units. In addition, the external compressor may be a nuisance to neighbours if it is excessively noisy. They are suitable for rooms up to 100 m².



Split system

Multi-split systems

Multi-split systems are split systems with more than one internal unit connected to an external compressor. Systems with between two to seven internal units are available, and are able to heat multiple rooms independently. As in standard split systems, internal units can be mounted on the wall, at floor level, on the ceiling or as a cassette. Depending on system design and total output, efficiency and output to individual rooms may be decreased if operating more than two outlets at once. It is vital that you decide which rooms, if any, need to be heated or cooled simultaneously, and have the system sized to cope with this demand. They are suitable for areas up to 200 m^2.

Ducted systems

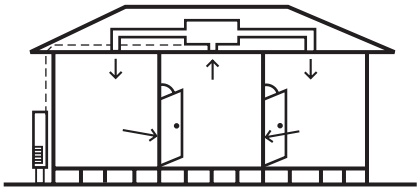
Ducted systems are designed to centrally heat and cool a large number of rooms or an entire home. They can be suitable if you have an open-plan house, and/or prefer heating and cooling in all or most rooms of your house simultaneously. They are more expensive to purchase and run than other types of air conditioners, as they heat and cool larger areas.

Ducted systems consist of:

- the heat pump itself, located outside or in the roof space
- ducting, usually installed above the ceiling to distribute the conditioned air throughout the home
- vents, attached to the ceiling or walls (or sometimes the floor), directing the conditioned air into each room
- a return air vent (grille), to recirculate air back to the system for reheating.

Filters can be attached to the grille to reduce dust circulation. Wherever possible, it is recommended that ducted systems be zoned. Zoning divides a home into two or more sections that can be heated or cooled separately. This enables living areas to be conditioned during the day and sleeping areas at night, reducing running costs by up to 50%. Purchase costs are also reduced, as a smaller system can be used. A single ducted unit can heat areas up to 200 m². It is also possible to install a

single duct outlet as part of a split system installation. The vent can be mounted in the ceiling or wall, and is capable of conditioning open areas up to 80 m².



Ducted system

Inverter technology

Inverter technology is now available with several brands of reverse cycle air conditioners. This technology enables the compressor to operate at variable speeds depending on the output required, and can potentially reduce running costs, particularly over longer operating periods. Inverter air conditioners also tend to have faster heat up times and maintain more comfortable internal temperatures.

Geo-exchange heat pumps

Geo-exchange heat pumps use the heating and cooling capacity of the earth to provide the air conditioning requirements of a home. Like any type of reverse cycle air conditioner, it simply moves heat energy from one place to another. By using a refrigeration process, geo-exchange heat pumps remove heat stored in the ground or ground water, and transfer it to the home. In summer the process is reversed and indoor heat is extracted from the home and transferred to the earth. Geo-exchange heat pumps are very efficient as they have the ability to transfer 3–5 units of heat for every unit of electricity consumed. A typical geo-exchange heat pump centrally heating and cooling a home will cost more than a conventional central heat pump system, but can pay for itself in 3–5 years.

Air conditioners in cold climates

Some models may not function as effectively in temperatures below 5°C, although some do have an auxiliary heater or de-icing capacity to assist in cold weather. Auxiliary heaters run on peak rate electricity, and can increase running costs if used excessively. If you live in colder areas of Victoria, it is critical to check with your supplier, before purchasing, about the minimum temperature your system will operate under before purchasing.

Will my power supply be sufficient?

It is recommended you contact your electricity supplier to ensure you have sufficient power supply available to run any systems which are not connected to standard power points. Larger split and ducted systems, particularly with outputs greater than 11 kW, may require three phase power to operate.

Sizing

Economical running costs rely on selecting a reverse cycle air conditioner that is the right size for your needs. Accurate sizing is essential before buying a unit and should include a detailed heat load survey of your home by a qualified technician recommended by a unit's manufacturer or retailer. Under or oversized units will give poor performance. Ask for the reverse cycle air conditioner output capacity to be expressed in kilowatts (kW). Horsepower (HP) is often inaccurate and misleading as it measures the size of the motor, but does not accurately reflect the unit's output.

Features to look for when buying air conditioners

Energy Rating labels

All new single phase reverse cycle air conditioners must display an Energy Rating label with between 1–6 stars. This includes the majority of window/wall and split systems, but excludes most whole-house systems which usually have a greater output. The Energy Rating label identifies the energy efficiency of the unit—the more stars, the more efficient. Efficient units produce more heat for each unit of electricity used. For similarly-sized units, one of high efficiency (3–6 star) can be up to $220 a year cheaper to run. For larger units energy efficiency can be measured by the unit's 'co-efficient of performance' (COP). COP measures the amount of heat the unit can produce for each unit of electricity it consumes. The higher the COP, the lower the running cost will be for units of similar output. For example, a unit of COP 3.0 can be up

to $220 per year cheaper to run than one of COP 2.5. When choosing a reverse cycle air conditioner that is not star rated, look for a COP of at least 2.5.

Programmable thermostats

Programmable thermostats help in setting the most appropriate temperatures and to turn the system on and off at different times of the day. Generally, living areas should be kept at 18–20°C, with bedrooms between 16–18°C. If the unit has an external thermostat, it should be placed in a draught-free position in the main living area. It should not be placed near a return air grille or on an external wall, and should be kept out of direct sunlight. 'Economy' cycles also help to save energy. These gradually decrease the output temperature of a unit for a few hours after it has been switched on.

Correctly insulated ducting

Poorly insulated ducting will significantly decrease the performance of even the most efficient ducted air conditioning system, with significant heat losses and gains occurring through it. Ducting and all fittings should be insulated to a level of at least R1.5*, with all joints well-sealed and taped. Your ducting supplier will be able to provide ducting with the correct insulation level.

*R values measure the ducting's resistance to heat loss and gain. The higher the value, the less heat will move through the ducting's outer surface. Ducting R values typically range from R0.6 to R1.5.

Vents (ducted systems only)

Ceiling vents should be located centrally in a room or between the centre and external walls. They should never be placed towards the internal walls, as air circulation will be impeded. 'Four directional' ceiling vents, or vents with adjustable louvres directed downwards rather than sideways, provide optimum heat distribution.

Return air grille location (ducted systems only)

Locate the grille at floor level, centrally positioned in the home. Ensure conditioned air flows directly through living areas before being recirculated. If you are installing a zoned system, your supplier will ensure the grille is located correctly to enable the zoning to operate effectively.

Maintenance

Maintain and service the reverse cycle air conditioner in accordance with manufacturer's instructions.