Air & Water
Air Conditioners E-Book

Learn everything you need to know about air conditioners in our 35 page guide.

http://www.air-n-water.com
What are Air Conditioners?

Home air conditioners are appliances that are designed to make the air in your home more comfortable. The basic thing that most people think of when they hear "air conditioner," is a device that cools down the air in a room to make the people in the room more comfortable during hot weather.

All kinds of air conditioners take extra moisture out of the air and some of them filter particles (such as pollen and dust) out of the air, in addition to cooling the air.

An appliance that only takes moisture out of the air is called a "dehumidifier." Dehumidifiers often simply vent the warm air right back into the room.

Appliances which filter or otherwise clean particles out of the air are called "air filters" and "air purifiers." Most of them do not heat or cool the air.

The basic air conditioner works in almost the same way as your refrigerator, except that it blows the cold air out into the room instead of holding it inside an insulated box. The simple explanation of how an air conditioner works is to say that the device moves heat from one place and puts it somewhere else. That's what all the tubes, and fans, and noisy parts are for.
Benefits of Having an Air Conditioner

An air conditioner on its own makes your house more comfortable during hot weather, by keeping the air nice and cool. Are there small children, elderly people, or pets in your home? The cooler air helps keep them safe.

Small children and the elderly have a harder time keeping their bodies at a safe, healthy temperature, and an air conditioner helps them do this. In the same way, the cooled air helps to keep your dogs, goldfish, and ferrets from getting heatstroke.

Since all air conditioners dehumidify, yours will help prevent mold and mildew from taking over your home. The dehumidifying aspect of your air conditioner can also prevent water damage to wooden floors and furniture when the weather is muggy.

An air filter on the air conditioner takes dust out of the air, which cuts down on the amount of cleaning you need to do. The more bits of airborne stuff ("particulate matter") the filter takes out of the air, the healthier your lungs will be. This is especially important for people with asthma, allergies, and lung disease.

Air conditioners can come with different kinds of filters which trap different amounts of particulate matter. The most basic filter looks like a piece of fluffy fabric tucked in some kind of cage or frame. It will trap pieces of fur, some kinds of pollen, household dust, and the like. On the other hand, some most advanced types of filter will even trap tiny viruses.
Do You Need a New Way of Cooling Your House?

Maybe you already have an air conditioner and you're not sure if it's time to consider a new one.

- Do your electric bills go way up in the summer? It might be worth checking to see if a newer energy-efficient model might save you money.
- Is your air conditioner working too hard and not getting the results you want? It might be too small. Before replacing it, however, make sure the air filter is working correctly. If it's clogged, the air conditioner must work harder.
- Do you need to call the repairman a few times each season? Or has a major component failed? It might be time to for your air conditioner to retire. They eventually wear out.
**Types of Air Conditioners**

There are four kinds of air conditioners in common use in the United States today:

- **Portable**
  These are the ones that can be wheeled around the floor and set up without much—or any—installation.

- **Window**
  These are the box-like devices that stick out of windows on apartment buildings in many cities, and are the first thing people picture when they think of “ACs.”

- **Split**
  These are a clever hybrid between a window air conditioner and central air.

- **Central**
  These are the most common kind for large office buildings and schools, with ductwork through the building.

**Chassis:** With split and window air conditioners, you will be looking at a further choice between having a “fixed chassis” and a “slide-out chassis.” According to the Merriam-Webster, a chassis is “the supporting frame of a structure (as an automobile or television),” so this is the part of the air conditioner that the working parts are attached to. It usually looks like some kind of box. (Mirriam Webster, 2014)

- As the name suggests, a “slide-out chassis” is one that can be pushed or pulled out of the main body of the machine. This makes it much easier to maintain and repair the parts inside. A “fixed chassis” doesn’t slide out. It is “fixed” (or stuck) in place.

- Generally speaking, a window air conditioner with a slide-out chassis can be installed in a hole in the wall. This is not an option for fixed-chassis window air conditioners.
Pros and Cons of Different AC Units

<table>
<thead>
<tr>
<th></th>
<th>Pro</th>
<th>Con</th>
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</thead>
<tbody>
<tr>
<td><strong>Portable Air Conditioners</strong></td>
<td>• Energy Efficiency</td>
<td>• Relatively small area</td>
</tr>
<tr>
<td></td>
<td>• Cost</td>
<td>• Frequent maintenance</td>
</tr>
<tr>
<td></td>
<td>• No Installation</td>
<td>• Floor Space</td>
</tr>
<tr>
<td></td>
<td>• Easy to Move</td>
<td></td>
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<tr>
<td><strong>Window Air Conditioners</strong></td>
<td>• Perfect for high-humidity rooms (eg., Kitchen)</td>
<td>• Requires a suitable window</td>
</tr>
<tr>
<td></td>
<td>• Easy Installation</td>
<td>• Obstructs the window</td>
</tr>
<tr>
<td></td>
<td>• Efficient</td>
<td>• Usually less efficient than a portable model for low-to-mid humidity conditions</td>
</tr>
<tr>
<td></td>
<td>• Programmable</td>
<td></td>
</tr>
<tr>
<td><strong>Split Air Conditioners</strong></td>
<td>• Some can serve several rooms at once</td>
<td>• Requires an outdoor location for main unit</td>
</tr>
<tr>
<td></td>
<td>• Takes up less interior space</td>
<td>• Installation includes drilling through walls</td>
</tr>
<tr>
<td></td>
<td>• Installation is easier than for central air</td>
<td></td>
</tr>
<tr>
<td><strong>Traditional Central Air Conditioning</strong></td>
<td>• Can serve entire building</td>
<td>• Expensive</td>
</tr>
<tr>
<td></td>
<td>• Convenient</td>
<td>• Complicated Installation</td>
</tr>
<tr>
<td></td>
<td>• Can combine heating and cooling in one unit</td>
<td>• Most of the maintenance needs to be done by a pro</td>
</tr>
</tbody>
</table>

Which Air Conditioner is Right for You?

Any time you are thinking about the purchase of an appliance for your home, you think about what you’re going to use it for and what you need it to do. It’s no different when you’re considering an air conditioner.

**Where are you using it?**

The type of room you’re planning to put it in will make a big difference to what model of air conditioner is right. The perfect unit for a small home office with an eight-foot ceiling isn’t likely
to work well at all for an open-concept combination of kitchen and living-room with cathedral ceilings and south-facing picture windows.

The intended location will determine how quiet the unit needs to be, how much humidity it needs to take from the air, and how large an area it needs to cool.

<table>
<thead>
<tr>
<th>Room</th>
<th>Best Air Conditioner</th>
<th>Why</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kitchen</td>
<td>Window</td>
<td>Efficient, and directs moisture right outside</td>
</tr>
<tr>
<td>Home Office</td>
<td>Portable</td>
<td>Moveable, quiet, doesn't require renovation</td>
</tr>
<tr>
<td>Bedroom</td>
<td>Portable or Split</td>
<td>Quiet, efficient</td>
</tr>
<tr>
<td>Nursery</td>
<td>Split</td>
<td>Quiet, no cords, and can't be climbed upon</td>
</tr>
<tr>
<td>Workshop</td>
<td>Portable</td>
<td>Can be moved to exactly where it's needed</td>
</tr>
<tr>
<td>Living-room</td>
<td>Split</td>
<td>Quiet, and no cords to trip or fray</td>
</tr>
<tr>
<td>Bathroom</td>
<td>Window</td>
<td>Vents moisture directly outside</td>
</tr>
<tr>
<td>Whole house</td>
<td>Central</td>
<td>Efficient, can combine with heating, convenient</td>
</tr>
<tr>
<td>Apartment</td>
<td>Portable</td>
<td>Can be used with odd window shapes and without damaging or altering the walls</td>
</tr>
</tbody>
</table>
Finding the Correct Size Air Conditioner

Quite possibly the most important consideration when choosing an air conditioner is its “size.” This isn’t the physical size of the device itself, but rather the number of “BTUs” it puts out.

“BTU” stands for “British thermal unit.” This is a unit of measurement equal to 1054.4 joules. (Weisstein, 1996-2007) It is a way to measure how much energy is needed to heat something. Calories are another such unit of measurement. A single BTU is enough energy to heat or cool a pound of water by one degree Fahrenheit. In the case of air conditioners, the BTU rating tells you the amount of heat they can take out of a room in an hour. For example, 12,000 BTUs are equal to one ton of cooling capacity. That’s a lot of cooling.

To determine how many BTUs you need, first figure out the area of the room in square feet. As you probably remember from school, the area of a square or rectangle is calculated by multiplying the length times the width, in feet. If there is a triangular area, figure it separately: length multiplied by width, then divided by two. A room with a complicated shape can be figured out by sketching out the shape and marking off square and triangle sections. Measure and calculate them separately, and then add the areas together at the end. Once you have calculated the area, take a look at the room-size chart below.

<table>
<thead>
<tr>
<th>Area To Be Cooled (square feet)</th>
<th>Capacity Needed (BTUs per hour)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 up to 150</td>
<td>5,000</td>
</tr>
<tr>
<td>150 up to 250</td>
<td>6,000</td>
</tr>
<tr>
<td>250 up to 300</td>
<td>7,000</td>
</tr>
<tr>
<td>300 up to 350</td>
<td>8,000</td>
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<tr>
<td>350 up to 400</td>
<td>9,000</td>
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<tr>
<td>400 up to 450</td>
<td>10,000</td>
</tr>
<tr>
<td>450 up to 550</td>
<td>12,000</td>
</tr>
<tr>
<td>550 up to 700</td>
<td>14,000</td>
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<tr>
<td>700 up to 1,000</td>
<td>18,000</td>
</tr>
<tr>
<td>1,000 up to 1,200</td>
<td>21,000</td>
</tr>
<tr>
<td>1,200 up to 1,400</td>
<td>23,000</td>
</tr>
<tr>
<td>1,400 up to 1,500</td>
<td>24,000</td>
</tr>
<tr>
<td>1,500 up to 2,000</td>
<td>30,000</td>
</tr>
<tr>
<td>2,000 up to 2,500</td>
<td>34,000</td>
</tr>
</tbody>
</table>
Adjusting BTU Calculations for Other Variables

![Table showing adjustments for other factors](attachment:table.png)

One must also consider the location in which an AC will be used, and any additional factors that may increase the ambient temperature either through appliance use or body heat. The BTU capacity of your AC will be affected by these variables, in which case, BTUs will be added by number or by percentages.

Other Factors to Consider Before Buying

**All-In-One Units**

**All-in-one units** are an efficient use of space and resources for homes in mild and hot climates. A **built-in heater** can be convenient, particularly in a portable unit. If your house only needs a little extra heat sometimes, in the winter, this can be perfect because the same appliance can cover you’re heating and cooling needs. An **electric heater** is a simple electrical device that uses electricity to heat up a coil, which then radiates the warmth to the surrounding air.

Many central and split all-in-one units include a **heat pump**, rather than an electric heater. A heat pump is a little like an air conditioner in reverse: it gathers the ambient heat from outside your home and distributes it inside. Some kinds of heat pumps are effective until the outside temperatures reach -20F. The main advantage of the heat pump is the energy saving. It can use as little energy to heat your whole home as to heat a single room with an electric heater. (Natural Resources Canada, 2014).

Some central and split all-in-ones also include a **secondary heating method**, such as gas or electric, for when the outside temperatures are too cold for a heat pump to work.
Most all-in-one units include a dehumidifier. Dehumidifiers pull the moisture out of the air. This helps to prevent the growth of molds and mildew, in addition to making the air seem cooler. They are especially helpful in areas where the relative humidity is often above 50%. There is a range of how much moisture a humidifier can remove in a day. The usual ones range from two-and-a-half to almost nine gallons per day, with the most common being around eight.

Some are smaller, and some seriously heavy-duty units can do much more. The degree to which the dehumidifier can lower the humidity in the room is largely connected to the air temperature in the room. Raising the room temperature, or raising the humidifier above the floor where the coldest air temperature is, will allow it to make a greater difference in the room’s relative humidity.

Built-In Air Purification

Modern air conditioners offer a number of different kinds of filters to help purify the air while it is cooling.

The basic washable cloth-like floss filters will catch pet fur, household dust, and the like. For some households, that’s all that is needed.

Are odors a problem in your house, perhaps from your pets or cooking with lots of garlic? An activated charcoal filter will help. The charcoal absorbs the “volatile oils” that cause the smells.

Ionizing and High-efficiency Particulate Air (HEPA) filters clean and even sterilize the air they filter. HEPA filters are used in places where it’s extra-important to clean the air for health reasons, such as in medical facilities.

The filter needs to be checked at least once a month. In dusty or smoggy conditions, it’s better to check every week or two. A dirty filter doesn’t work well, and it interferes with the cooling function. It’s much more convenient to check, clean, and replace filters when they are easily
accessible. Sure, it’s easy to overlook this detail now while you're shopping, but it will come back to haunt you later.

**Variable Fan Speeds**

The fan in the air conditioner serves to move the cooled air out into the room. This makes the unit more efficient. Without the fan, the room would be cooled eventually, as long as the air conditioner is strong enough for the task. With a fan, the job gets done faster and with less energy.

The movement of the air is measured in **cubic feet per minute**, which is often written as “**CFMs**” or “**ft³/min**.” You’re more likely to see “**CFM**” on most air conditioning descriptions, and this measurement is especially important for **central** air. Strictly speaking, CFM measures the quantity of air that passes a specific spot in a minute.

This air movement is needed to cool the room more than a few feet from the air conditioner itself. **Calculating the CFMs you need** is an easy bit of math. You’ve already calculated the area of the room, to figure out how many BTUs you need, right? For every square foot of on average room, you need one CFM.

For example, for a room that is 550 square feet, you need 550 CFMs. If there are 2,000 square feet, you need 2,000 CFMs. That said, if the room is very sunny or contains many heat-producing appliances such as computers or ovens, you may need to double this.

It’s very convenient to have **variable fan speeds**. Use the fastest speed to cool down a room quickly, such as when you get home in the evening on a very warm day. Once the room is cool, turn the fan speed down to make less noise. Because fans make noise, you’ll probably want it on its lowest setting when you’re sleeping unless the weather is very, very hot.
**Self-Evaporative Technology**

Some models of air conditioners use “self-evaporative technology.” This means that at least some of the water that was condensed by the air conditioner is evaporated again and sent out through the vent, instead of collecting in the water tank or dripping out through the hose. This results in less water collecting in the water tank, and fewer times that you need to empty it. This technology is especially useful in places with humid climates, where the air conditioner’s water tank can be filled in an hour or less.

**Energy Efficiency**

Nobody wants to spend more on their electricity than they need to, and choosing an energy-efficient air conditioner means that less money will be going out the window. It’s also good for the environment. Unfortunately, all the ratings and alphabet soup that you see on the specs and ads can get very confusing.

**EER** – “EER” stands for “energy efficiency rating,” and it is used for window and portable air conditioners. (Air & Water, undated, 3) This is a simple mathematical calculation in which an air conditioner’s BTU rating is divided by its wattage. The more efficient the device is, the higher the score.

**SEER ratings** --- SEER stands for “seasonal energy efficiency ratio,” and it is used for central air conditioners. (US Dept. Energy, 2014) This rating simply tells you whether the product needs a higher or lower amount of energy to give you the same amount of cooling. In other words, it is an indication of how energy efficient the device is. The SEER ratio uses a number scale. Here again, the higher the number, the better the score is. As of 2006, the minimum SEER ratio for new air conditioners is 13.

What does **Energy Star** mean? ---- If you have already been looking around at air conditioners (or any other electrical appliance) on the market, you’ve probably seen the Energy Star logo.
According to their website, “ENERGY STAR is a U.S. Environmental Protection Agency (EPA) voluntary program that helps businesses and individuals save money and protect our climate through superior energy efficiency.” (EPA, undated) If you see their label on an air conditioner, it means that the device has been tested for energy efficiency in a laboratory recognized by the EPA, and not associated with the company that made the product.

**Quiet Operation**

The noisy part of the air conditioner is the compressor, or pump. (US Dept. Energy, 2014) If quietness is your most important consideration, a split air conditioner is probably your best bet. All else being equal, a split will produce less noise in the room than the others simply because the noisiest part is outside the building.

The amount of noise made by the air conditioner is more important in some rooms than others. You don’t want to be kept awake all night by the air conditioner in your bedroom, but noise in the kitchen or workshop isn’t so bad.

Sound decreases with distance, which is why it is harder to hear someone whisper from across conference hall than from across the kitchen table. Walls, curtains, and other barriers can also decrease the amount of noise. This is good to keep in mind if you have neighbors close by, as in an apartment complex.

What is a “decibel” (dB)? A “bel” is a unit of measurement, like a mile or a ton. It measures the intensity of sound, otherwise known as “loudness.” Because of the way it is calculated, loudness is usually described as being ten times however-many bels. This makes it “decibels” because the prefix “deci” means “times 10.” (Nave 2014)
**Electrical Requirements**

All air conditioners require electricity to run, and they pull more electricity than the average television or lamp. The electricity to run the air conditioner costs you money, so you’ll want to know how much to budget for this.

Some units require a special plug if the voltage, amperage, or frequency is high enough. Check the shape and configuration of the prongs on the plug of the air conditioner you are thinking of buying. (See next page.) You might need to have **wiring changed and new electrical sockets** installed. This is a job for a professional. The risks of electrocution and fire are too high to leave this project to a weekend hobbyist.

In some places, all air conditioners are required by law to have a **grounded plug**. Even if it isn’t required in your area, it’s a good idea. If the air conditioner has a compressor (the main “noisy part”) – and most do -- it must have protection against ground faults and short circuits.

In case you’re wondering why the prongs are all arranged in different designs, the main reason is to prevent people from accidentally sticking them in the wrong kind of socket. (Spitaels, undated) In addition to the prong arrangement, the voltage and amperage are often stamped on the cord itself.

Each **plug looks a little different**. The ones with the curved holes are twist-lock plugs, and they normally have the prefix “L.” Generally speaking, the number before the dash indicates the voltage: “5” indicates a 120 volt type and “6” indicates 208 volts. The number after the dash indicates the amperage: “15” indicates 15 amps, “20” indicates 20 amps, and so on.
So, how do you determine how much voltage is needed for your unit? Voltage, wattage, and amperage are all connected to each other. Usually, all three of these are listed in the specifications for the unit, along with the frequency which will be expressed as a number of “Hz.”

If only a couple of them are listed, there’s a little bit of math involved. You can figure out wattage by multiplying the number of volts by the number of amps. Likewise, you can divide the watts by the amps to get the volts, or the watts by the volts to get the amps.

Depending on the weather in your area, air conditioning can eat up between forty and seventy percent of your electricity budget. How much electricity will your air conditioner use? The wattage is useful for figuring how much energy you will be paying for. It’s time to pull out the calculator again.

First, divide the wattage by 1000. This will give you the kilowatt (kW). Multiply the kilowatt by the number of hours you use the unit. Multiply this result by the price per kilowatt-hour ($/kWh) your utility company charges, and this end result it what the operation of your air conditioner should cost you.

**Location of Windows**

Windows are an important consideration when you are choosing a window or portable air conditioner for a room. Unless you want to knock a hole in the wall, the room will need a window for venting.

If you have a choice of windows, choose the one with the least amount of exposure to the afternoon sun. You'll save energy and wear on the machine.

Window air conditioners come in several sizes, and these days there are small ones especially designed for small windows. Practically, the minimum width for the window is fourteen inches (14”). The larger the window is, the more options you will have available.
Other Features

An ever-widening assortment of special features is being added to air conditioners. Some of them might be exactly what you need in your house, and some of them are things you might never use.

Timers, including “sleep” settings and “energy saving” settings, turn the air conditioner on and off when it would be less convenient for you to do it.

For example, if you work outside the home and have no pets (i.e., nobody is home during day), there’s no reason to run the air conditioner during the hottest hours. Using dollar bills to light your barbeque would be a better use of your money. On the other hand, you probably don’t want to come home to a sweltering house. Set the timer to turn the air conditioner on half an hour or so before you normally get home, and you will have a comfortably cool house without the wasted money.

In the same way, on warm nights, the air conditioner helps you be comfortable enough to sleep. However, when the temperature dips later in the night, the air conditioning is no longer needed. The timer for a sleep setting can turn off the unit when it is no longer needed. Some sleep settings can also turn down the air conditioner without turning it off completely.

Many modern air conditioners, especially portable and window units, still use a manual control. Often, this is in the form of one or more knobs with little pictures of fans and snowflakes. These are easy to use, easy to understand, and easy to fix if something goes wrong. Electronic controls allow for more options, such as complex timers and precise temperature ranges. Some electronically controlled units also have a remote control, which is handy for people with mobility challenges. When it is hard to get around, it’s nice to be able to adjust the temperature without walking or wheeling across the room.
Thermostats are usually associated with heating systems. They are set at a specific temperature; and whenever the thermostat detects that the air temperature has dropped below that point, the heater is turned on. Then, the heater turns off when the thermostat detects the temperature has risen to the appropriate point.

Thermostats work just as well for air conditioners. The only difference? The thermostat turns the unit on when the air temperature rises above the temperature setting, and turns off when the temperature comes down.

Because this means that the air conditioner is only working when it is actually needed, using a thermostat saves energy and your money.

Thermostats are available in both manual control and electronic control units. Electronic ones tend to be more precise.

Sometimes, the weather is cool enough not to need an air conditioner but warm and still enough that you’d like a breeze. This is the time when a fan is handy. Many air conditioners have “fan mode” settings in which the fan is running but the rest of the system is off. This saves energy, by not running the whole device when it isn’t needed, and it saves space, by not needing an extra appliance in the form of a separate fan. It saves you money by saving energy and by eliminating a purchase. Fan mode is a common feature on both electronic-controlled and manual-controlled units.

A “louver” is a flap or slat (or a set of flaps or slats) that directs air flow. It looks a little like a horizontal window blind. The angle at which the slat is tilted determines where the air is sent. Most louvers can also be closed completely, to keep dust out of the unit when the air conditioner isn’t in use, and to turn off the air conditioning in one or more rooms of a multi-room set-up, such as with a split or central system. Motorized louvers are convenient for multi-
room systems. Adjustable louvers are nice to have in portable units, to make the most of cooling on very hot days.

**Set Up, Maintenance and Troubleshooting**

**Set Up and Installation**

One of the most obvious differences among the various kinds of air conditioners is the question of how easy or difficulty each unit is to install. A portable unit can be installed by a single person, while a window unit needs at least two. A split unit requires cutting into the house and electrical know-how, and the installation of a central system is a job for a team of experts. Instructions for the latter two are beyond the scope of this booklet.

**Installing a Window Air Conditioner**

Before you start installing your shiny new window air conditioner, be sure you have everything ready to go and a strong helper. This isn’t a one-person project. In addition to parts that came in the box, you’ll also need a carpentry level; and some caulking, caulking gun, and spatula to seal the outside. For most units, you’ll need some basic household tools. If the window is not close to the ground, you’ll also need a ladder. Read through the installation instructions in your unit’s manual before starting. This basic overview cannot account for all the variations in window units.

*Note: Most window air conditioners are designed with double-hung windows in mind. It’s possible to install a window unit in other types of windows, but it will be more complicated.*

- Start with the **window extensions and brackets**. Some models come with these already in place, out of the box, and some models require “some assembly.” Assembly will usually require a screwdriver. There are enough variations in this very important step that it is *essential* to consult the manual that came with the unit.
- Open the window.
- Carefully lift the unit onto the window sill. Ask your helper to hold it steady so you can proceed with the next step.
- Arrange the extensions. They should fill up the gaps on left and right sides of the unit.
- With your helper, carefully arrange the unit so that it is either perfectly level or slightly tilted, according to the manual’s instructions.
- Attach the unit to the window sill or brackets, according the manual’s instructions, while your helper holds the unit steady. If your unit also has attachments at the top, connect these now, too.
- Finish attaching the extensions. At this point the unit should be secure.
- There should be weather-stripping included with the unit. Use this to seal around unit from the inside.
- Use the caulking to seal around the outside. This is where the ladder will be useful.
- Plug in the unit and enjoy the fruits of your project.

**Venting a Portable Air Conditioner**

Portable air conditioners need to get rid of the hot air produced when it is working. You don't want that hot air to be released back into the room, of course, because that would defeat the purpose of running the air conditioner in the first place. Directing the hot air out of the room is called "venting." It is accomplished by running a wide hose-like tube outside the room, much like the tubing for a clothes-drier vent.

Most people use a **window** for venting their portable air conditioners, but it is possible to use a door, a drop ceiling, or even a hole cut into the wall. The installation kit that comes with your unit is designed for use in a sliding window.

**Installing a Portable Air Conditioner with a Window Kit**

Although it can be awkward to get everything in place, **venting a portable air conditioner** is
relatively simple for one person and easy for two.

Open the box and make sure all the parts are accounted for. The parts will usually include:

- At least one long, flat piece of plastic with grooves along the long edges and one or two holes cut in the main flat section. Sometimes this part is metal, and it is made up of two or more flat sheets which fit together to make a telescoping device which can be adjusted to the size of the window. The telescoping version usually includes brads or screw-type fasteners.
- One or two pieces of tubing that look a little like the venting tube on a clothes drier. These tubes are usually at least six inches across, and they might be foldable like an accordion.
- Fittings for the ends of the venting tubes. These may be attached to the tubes when they come out of the box, or they might need to be screwed on.
- A power cord which either is permanently attached to the unit or plugs into it.
- A water tank, which will usually be in place in the unit already, and/or a draining tube which is a long narrow hose usually no more than half an inch across: you won’t mistake it for the venting tube.

- Slide the window open enough to admit the long, flat piece of plastic. The plastic might be too long for the window. If so, carefully mark the correct length on it with a pencil, choosing the end furthest from the venting holes.
- Keep in mind that you will be cutting the excess length off of the plastic.
Check to see if a directional marker is printed or stamped into the plastic. You must do this first before you cut the excess length off. Sometimes it makes a difference which side faces outward. Strong kitchen shears are sometimes strong enough to cut the piece to the correct length, but a knife or even a saw might be easier for some. **Be sure to leave the venting holes intact with at least two inches to spare in all directions.**

- Push or screw the venting tube or tubes into the venting holes. If the tube is meant to be pushed, the ends will be smooth. If they are meant to be screwed in, there will be spiraling grooves. Don’t worry: it will be pretty easy to see.

- Place the plastic piece in the open window, and carefully align the grooves with the window casing. Close the window onto the plastic, again carefully aligning the grooves with the window edge.

- If your unit has a draining tube, connect one end to the nozzle on the back of the air conditioner (if it is not already connected) and thread the other end through the venting tube and out the window. If there are two venting tubes, the draining tube will normally go through the lower one.

- Push the air conditioner into position, and push or screw the venting tube or tubes into the slots on the back. You might need to adjust the angle of the air conditioner or the amount of “accordion folds” in the tubing.

- Check the water tank, if any. Slide it back into place. With most of them, it’s possible to hear or feel when it sets in place correctly.

- Plug the unit into the wall socket, and turn it on.
Maintenance

Regular maintenance of your air conditioner will keep it in working order for years to come, and will save you money on repair costs. The basics are similar for all types, with minor variations.

- **Portable**
  - Wipe the outside clean with a damp soft cloth. Avoid using any harsh cleaning products on it.
  - Any plastic parts that are exposed to direct sunlight (such as the case) will eventually become discolored, so keep the air conditioner out of direct sunlight as much as you can.
  - If there has been smog or heavy pollen recently, check the filter more often. Clean it if it looks dirty at all, and replace it when cleaning it doesn't get the job done.
- **Window**
  
  - Unplug the device.
  - Check the filter. Clean or replace it, if it looks dirty.
  - If the coils they are difficult to reach, try using a soft “chenille stem” or “pipe-cleaner” from the craft store.

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**Window Air Conditioners**

- Clean dust or grime from the coils
- Wipe down the case with a soft damp cloth
- If the user manual suggests oiling the parts, do that!

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**Note:** It is very important to always unplug your unit before attempting any kind of maintenance or cleaning.
• **Split**
  
  o Check the filter. Clean or replace it, if it looks dirty.
  
  o Clean and oil the compressor (the noisy thing outside). There are oils designed especially for this.
  
  o Dust and clean the air ducts. You might want to hire a professional to do this at least once a season, to get a really thorough job done. The people who clean cars and upholstery often offer this service, if your local AC repairman doesn’t.
- **Central**
  - Turn off the unit.
  - Dust the accessible parts, such as the air outlets, to keep them clear of debris. Clean the coils with a damp cloth or sponge if they look dusty or dirty. Any grunge on the coil is going to hold heat and make it harder for the coils to do their jobs.
  - Change the filter once a month. If there has been an unusual amount of dust in the air or if the air conditioner doesn't seem to be working as well as it used to, change the filter more often.
  - Contact a professional for seasonal maintenance of the main workings and to clean the ducts.
Cleaning

Air conditioners, by their very nature, collect dust. However, they work better when they are clean. To keep your unit in top condition, it’s best to clean it at least once a month.

It’s easy to clean most units, but avoid using any harsh chemicals on your unit. Even alcohol-based cleaners can damage the plastics.

- Unplug the unit. At the very least, turn it off, if it can’t be unplugged.
- Check the filter. Clean or replace it as needed. (See next page.)
- Use a damp soft cloth to clean the areas you can safely reach: the case, the exposed parts, and the bits behind movable hatches or doors.
- Clear dust and grime off the coils, to keep them working efficiently.
- Check for mold and mildew, because these can be a problem. The coils are often the first place you’ll see them. Clean off any mold or mildew that is starting to grow, using your handy damp soft cloth. (Use vinegar or another any-mildew cleaner to clean the cloth when you’re done, if you don’t intend to throw it out.)
- Dust the ducts, tubes, vents, and similar bits. A vacuum cleaner can work well for this, but a regular dusting cloth or fluffy duster will get the job done, too.

Over time, you might notice that any plastic on the case starts to change color or fade, especially if the air conditioner is often in the sunlight. The color change isn’t a result of being dirty, and it can’t be fixed. Other than how it looks, this discoloration is not a serious problem.

Air conditioners work better when they are clean. Under normal circumstances, a little basic cleaning once a month will keep your unit running nicely.
Of course, sometimes the circumstances are not normal. Weird funky smells, mysterious stains, heavy dust or pollen in the air, or evidence that the family pet has decided to "mark" the air conditioner are all indicators that an extra cleaning is in order.

**How to change the filters**

**Portable**

- Check the manual to see where the filter is in your unit. Unplug the unit.
- Open the section where the filter is. You might need a screwdriver to open it.
- If your unit uses a charcoal filter, replace it according to the instructions on the package. If it uses one of the washable floss filters that look like a loose fabric or quilt batting, slide it out and clean or replace it.
- Slide the filter back into its position.
- Close the cover.

**Window**

- Unplug the unit.
- Remove the cover; you might need a screwdriver to do this, depending on the model.
- The filter will be immediately visible. If there are any screws holding it in, unscrew them. Otherwise, just pop it out.
- Push the new one in, and replace any screws you unscrewed.
- Replace the cover.
Split

- Unplug the unit.
- Open or remove the front of the part of the air conditioner that is on the wall.
- Pull out the used filter.
- Push in the new or clean filter.
- Close or replace the front of the unit.

Central

- Turn off the unit.
- Gently remove the filter from the filter-frame. This will be somewhere in the "return air duct," which is the duct that draws air from the house.
- Wipe the filter-frame down with your handy-dandy damp soft cloth.
- Check the arrow on the replacement filter and line it up so it will be facing the same direction as the air flow through the duct. Slide the filter into the frame.
- Close any parts you needed to open to access the filter-frame.

Cleaning your filters is just as important as anything else. Here are the steps to clean them:

| Step 1. Brush it off or vacuum it. | Step 2. Slosh it around in a bucket of soapy water | Step 3. Hang it to dry completely before replacing it. |
Storage

Storing a portable air conditioner is pretty simple. Start by cleaning the appliance the same way you’d done during the time it’s been used: wipe down the exterior with a damp cloth, clean the filter, dust or vacuum the venting tubes, and empty the water tray. If your unit has a “fan mode,” turn that on for a few hours to dry out its interior. (Air & Water, undated, 2).

Now that it’s as dry as it can get on its own, unplug the device and clean whatever interior parts you can access according to the manual. You want the device to be as clean and dry as possible before you store it for the season. Otherwise, molds and mildews could grow in there.

If the unit has a convenient set of cord hooks, wrap the cord on these. If not, try wrapping the cord around a coffee can to prevent kinks.

Choose as dry a location as you can for storing your portable air conditioner. Cover it with a tarp if you don’t still have the box it came in, and keep the smaller parts such as tubing and the manual in a box or tote-bag with the main device.

Safety Note: Many portable air conditioners are heavier than they look. Be extra careful when carrying the device to the storage location. Carrying any but the smallest air conditioner is a two-person job.

Troubleshooting

It may seem obvious, but if your air conditioner isn’t working, it might have become unplugged.

Check for spilled water near the electrical cord before touching it. Then, check both ends to make sure they are connected correctly. If the cord runs under a carpet or other hiding places, take a look at the full length of the cord. If it looks frayed or damaged, unplug the air conditioner, because it is not safe to use.
Some cords unplug at both ends and simply need to be traded out for a new one. These are heavy-duty cords. Your best option is to buy the new cord from an air conditioning specialist or directly from the manufacturer.

If one end is permanently attached, then cord replacement for an air conditioner is a job for a professional. Don't try this one at home.

The next thing to check is the **temperature setting**. It’s possible that the actual room temperature is at (or lower than) the temperature that will trigger the air conditioner to start. High humidity will make a room feel warmer than it really is. Try lowering the temperature setting. Does that make the unit start? If so, the problem is solved.

If not, **check the fuse**. Many air conditioners have their own fuse, in addition to the one for the power socket. Check both, if you can. One or both of them might need to be replaced.

Quite possibly the most common problem with an air conditioner is caused by the **air filter** being neglected. In many cases, the first thing the repairman will ask is, “When did you last clean your filter?” If it’s been more than a month, change the filter, and see if that solves the problem. A dirty filter won’t let the air through as well, so itmesses things up.

While you’re checking the filter, take a look at the **coils**, too. Do you see any dust or grime or other unpleasantness there? Anything stuck to the coils – dust, oily “goo,” frost – will interfere with the cooling process, because the grime and frost will actually insulate the coil. Insulated coils are exactly what you don’t want in an air conditioner.

Sometimes the **venting tubes** come loose, on portable units. Also, it’s possible for a duct or tube to become damaged. It’s simple to push or screw a venting tube back into the window kit, or into the back of the unit, if it has come loose. Damaged ducts might require a professional’s touch, but damage on a window kit can be temporarily repaired with a bit of duct tape.
Safety

Although air conditioners are generally safe appliances, there are some safety precautions to keep in mind.

**Small Children and the Elderly** – They are at higher risk for heatstroke than teenagers and younger adults are. Their bodies simply can’t maintain their proper temperatures as well. Using an air conditioner when the weather is hot helps keep these people safer, but be sure the vent can’t come loose to vent the hot air back into the room.

If there are toddlers and preschoolers in the house, you already know how they like to climb on anything they can reach. Window units and the tall, narrow portable units pose a falling risk, and are tempting to climb on. Keep these out of the little ones’ reach.

Cords are also a risk for small children. Keep any live electrical cords out of reach of youngsters until they are old enough to understand the dangers. Many air conditioners use more electricity than smaller appliances, but even a lamp cord can kill.

**Pets** – People keep many kinds of pets in this country, and the risks are different for some of them.
### Pet Safety

<table>
<thead>
<tr>
<th>Pet</th>
<th>Risks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dog</td>
<td>- Puppies will chew cords</td>
</tr>
<tr>
<td></td>
<td>- Jumpy dogs can knock down a floor unit or window unit</td>
</tr>
<tr>
<td>Cat</td>
<td>- Some cats will jump onto window units, eventually dislodging the unit</td>
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<tr>
<td></td>
<td>- Tall, narrow floor units can be knocked over by a cat making a running leap, even if the unit weighs fifty pounds or more</td>
</tr>
<tr>
<td>Ferret</td>
<td>- Ferrets can and will crawl into any duct with an opening an inch across or larger (the size of a twenty-five-cent coin).</td>
</tr>
<tr>
<td>Rabbit</td>
<td>- Rabbits will chew cords, and cannot be trained out of this. Keep all cords out of their reach.</td>
</tr>
<tr>
<td>Rats and other small rodents</td>
<td>- Keep the rodent cage out of the draft from the fan.</td>
</tr>
<tr>
<td></td>
<td>- These animals can wiggle into tiny gaps. If they will be loose in a room with an air conditioner, cover the access vents with mesh.</td>
</tr>
<tr>
<td></td>
<td>- All rodents chew, to keep their teeth from over-growing. Keep cords out of their reach.</td>
</tr>
<tr>
<td>Birds</td>
<td>- Exposed fans are a risk to birds which fly loose in the house.</td>
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<tr>
<td></td>
<td>- Make note of where the fan directs the air flow, and keep the bird cage away from that spot. Drafts are dangerous to the animal’s health.</td>
</tr>
<tr>
<td>Fish</td>
<td>- Position the tank away from the outlet of the air conditioner and away from direct sunlight. Frequent changes of temperature of the water will make the fish sick.</td>
</tr>
</tbody>
</table>
General Safety Tips – As with any appliance or heavy piece of furniture, it’s always a good idea to take steps to avoid accidents.

Make sure the cords and tubes are out of the main traffic routes in your home. If one of them must be in a “tripping zone” temporarily, try putting a chair over or under it, to make the obstruction more obvious.

There are struts available to brace window air conditioners. This is an extra safety precaution, to prevent the unit from overbalancing and falling from the window. It’s especially important if someone in or near your house might try climbing on it, such as a small child, a raccoon, or a cat.

Many portable air conditioners are on wheels. These can be braced on the floor by using door jambs or furniture “coasters”, in case someone might try leaning on the device for some reason. Placing a rubberized mat under the unit can also help.

Much to Consider in an Air Conditioner

Having considered all the different types and features of modern air conditioners, and taken a look at the installation and maintenance requirements, you are now well-equipped to choose exactly the right unit for your home.
About Air-N-Water

Air & Water is a leading independent online retailer of heating, cooling and home appliances. Since the inception of the company, we’ve helped hundreds of thousands of customers all across the US. We have helped living and working environments stay cool and comfortable in the summer and hot and cozy in the winter. Our headquarters is located in Orange County Southern California.
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